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ISBN: 978-94-6122-154-4

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Cover Design: Lugnt BV
Lay-out: Nivel
Printing: GVO drukkers & vormgevers B.V. /Ponsen & Looijen

The strength of primary care in Europe

De sterkte van de eerste lijn in Europa

(met een samenvatting in het Nederlands)

Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit Utrecht op gezag van de rector magnificus, prof.dr. G.J. van der Zwaan, ingevolge het besluit van het college voor promoties in het openbaar te verdedigen op maandag 12 november 2012 des ochtends te 10.30 uur

door

Dionne Sofia Kringos

geboren op 12 februari 1982
te Utrecht

Promotoren:
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Part of the research in this book was carried out with Financial support from DG SANCO (European Commission; co-funding the PHAMEU project), the Netherlands Institute for Health Services Research (NIVEL), the partner institutes of NIVEL in the PHAMEU project, the World Health Organization Regional Office for Europe (funding the WHO PC Evaluation Tool), and the Dutch Ministry of Education, Culture and Science.

Contents

1
General Introduction

This chapter introduces the subject of this thesis: primary care in Europe. The background and reasoning behind the study are described, as well as the research questions to be answered. Furthermore, a description of the applied methodology is given. The chapter ends with an outline of the structure of the thesis indicating the link between the seven chapters.

Background: primary care on the policy radar

All health care systems in the world aim to improve their population's health.[1] Despite this common goal countries appear to organise their health care systems differently in response to their own (e.g. political, economic, social, demographical and cultural) context.[2] European integration in terms of mobility of health professionals and patients and an intensified need for the integrated delivery of health care services (e.g. to tackle non-communicable diseases)[3], has raised an increasing political attention to the differences between health care systems. Rising health care costs, ageing populations, more complex health needs, lack of accountability and inefficiency in health care delivery are just a number of critical developments that most health care systems in Europe are faced with.[4-8] Decision makers are searching for models to adapt their health care system in order to respond properly to these challenges. The differences in organisation and strategies of health care systems for coping with these developments provide a political need and a scientific opportunity for benchmarking national strategies, experiences, successes and pitfalls of health care systems.

Ever since the WHO Alma Ata Declaration[9] in 1978, strengthening the primary care level of health care systems has increasingly been considered to be of great importance to dealing with specific health care system challenges (e.g. rising costs, multimorbidity) and improving the overall performance of a health care system. However, there is still debate about the scientific evidence-base for this. Primary care is the first level of a health care system where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied.[7] Strong primary care is assumed to contribute positively to health system goals including (equity in) population health, sustainable health care expenditures, and responsiveness of care. This can among others be concluded from the wealth of charters, resolutions, and statements from governments and non-governmental organizations worldwide. Among the recent examples are the Resolution WHA62.12 urging WHO member states to strengthen their health care systems through the values and principles of primary care; and the World Health Organisation's (WHO) World Health Report 2008 articulating the need to bring responsive health services closer to the population and to provide people-centred care organised in primary care.[6;8] We also see a clear focus on primary care in many countries' policies. Strengthening primary care services has been a priority of health care reforms in Europe. The backgrounds, and reasons for change together with the implementation strategies are however not always similar in all parts of Europe. In

Western Europe emphasis on primary care is expected to be an answer to questions of rising costs and changing demand. Central and Eastern European countries are each in their own way struggling to fundamentally improve the performance of their entire health systems following their restoration of independence. Primary care, which used to be poorly developed in these countries, is now being developed to bring adequate and responsive health services closer to the population. Approaches and models of primary care reforms introduced have varied widely from country to country. Some countries have attempted systemic interventions combining legal, structural, organisational, and financing reforms. Most countries however, touch on one or more aspects of primary care such as changes in the provision of services delivery by introducing evidence-based protocols; improving the generalist approach of primary care by improving the academic embeddedness of general practice; or introducing financial incentives for patients or providers to stimulate long-term relationships between single providers and patients.[10-15] As a result of this diversity of (often incremental) interventions, different configurations of primary care exists across Europe.

Problem 1: lack of information

Despite the significant investment in (and reliance on) boosting primary care development, so far little attention has been paid to systematically measure the variation of primary care in Europe. There is no single source of information that provides basic information on the organisation and delivery of primary care services across Europe. For example, internationally comparative information on how much financial resources are invested by countries in primary care, how many primary care professionals are active and how they are employed and the amount of remuneration they receive is not easily available or non existent. There are many reasons underlying this. A major cause is the lack of a common definition of primary care that can capture the variation in organisation and services delivery models. For example, the boundaries between primary care, specialist care and public health and social care can differ between countries, professionals that are part of the PC workforce in one country may be part of medical specialist workforce in another country, and also the breadth of primary care services depends on the organisation of the health care system. This asks for a clear conceptualisation of primary care and consensus on how to measure the complexity of primary care. Another important cause for the lack of up to date comparative information on primary care is the lack of effort of countries to invest in the collection of reliable and valid data on the functioning of primary care at a regular basis. Although the policy interest in primary care seems to be substantial at the moment, this has not sufficiently been backed yet with the needed financial means and information infrastructure to realise systematic monitoring of primary care.

Problem 2: lack of evidence on the causes and consequences of strong primary care

The lack of comparable information on primary care across Europe, limits opportunities to provide benchmark information on the functioning of primary care to policymakers (e.g. to measure the impact of health care policies on primary care), identify strong features or options to improve the functioning of primary care, and explain variation in the strength of primary care between countries. Moreover, without such comparable information, it is not possible to scientifically test whether primary care is indeed contributing to better health outcomes, cost reductions and improved quality of care in Europe, as several studies – primarily within the USA context ––have shown so far.[5;7;16;17]

The regulation and organisation of health care, and therefore also primary care, still is largely a national affair in the European Union. This explains to an important degree why scientific efforts to study elements of primary care so far predominantly depended on national efforts. However, with the gradual convergence of health care system contexts and national health policy agenda's (e.g. focused around shared values of solidarity, equity in health, affordability of health care) and pan-European policies affecting health care (e.g. the formal right to use, under conditions, health care in other EU member states), the added value of an European approach to study national primary care problems is becoming increasingly evident.

The answer: Europe-wide research

Over the years, the European Union has funded several primary care studies, contributing to our current understanding of aspects of the organisation and services delivery of primary care across Europe.[10;18-20] For example, in 1985 the (at that time) European Economic Community (EEC) ran a Concerted Action Committee on Health Services Research (COMAC-HSR) with a subprogramme on primary care research. This programme funded the first European General Practice Workshop in 1987, but also the Interface and Sentinel practice studies that studied the relationship of general practitioners with medical specialists and hospitals in 12 countries.[18] The 'European Study of Referrals from Primary Care to Secondary Care' was also funded by this programme.[19] A group of general practitioners (which participated in the international Workshop) with a special interest in studying national differences in primary care investigated in 15 countries the referral behaviour of general practitioners. But the first Europe-wide study (covering 32 countries) was co-funded by the European Commission (DG Research) twenty years ago, which studied an important aspect of primary care: the delivery of general practice care. This 'European Study of General Practitioners' Task Profiles' produced a Europe-wide comparative overview of the diversity in general practice care. It clarified relationships between health system features and the provision of services.[10;21] To measure and improve the performance of primary care as a

whole, a broader system perspective is however needed (and not limited to general practice), for example by also investigating policy priorities, legal and financial arrangements, workforce development issues etc. In 2006, the European Commission's Public Health Programme (DG SANCO) recognised the need for an up to date overview of international comparative information on the structure, process and outcomes of primary care in Europe in its Work Plan 2006.[11] It specifically called for scientific research established through 'co-operation between Member States' […] 'to improve information and knowledge for the development of public health' […] by 'collecting and providing information on an information system for primary care activity and resources to strengthen comparability of data and create a basis for routine data collection'.
To satisfy the need for information on the strength of primary care and its contribution to health care system outcomes, the Primary Healthcare Activity Monitor for Europe (PHAMEU) project was co-funded by DG SANCO of the European Commission, making possible the work described in this thesis.

Thesis aim
The aim of this thesis is to describe variation in primary care across Europe, to explain why countries differ in the organisation and delivery of primary care, and to investigate the relationship of primary care with important health care system outcomes.
To derive hypotheses about the factors affecting strong primary care, and the importance of primary care for health care system outcomes, it is important to be aware of the health care systems functions that are essential to the delivery of primary care services, and thus define primary care.

Defining primary care
Primary care is the entry level of a health care system providing *accessible*, *comprehensive* care in an ambulatory setting to patients in their own context on a *continuous* basis, and *coordinates* the care processes of patients across the health care system.[7] The mix of disciplines which make up the primary care workforce may differ from country to country. The most common primary care providers in Europe are general practitioners/family physicians, but also general internists, paediatricians, dentists, allied health professionals, therapists (e.g. physio-therapists, speech therapists), mental health care workers (e.g. community psychiatrists, psychologists) and nurses are part of the primary health care workforce.[13-15;22]

Accessibility of primary care can be defined as the ease with which primary care services are reached.[23] Primary care ideally provides accessible care to all patients with any kind of health problems regardless of age, sex, or any other personal characteristic.[12] When primary

care is organized in a way that facilitates access whenever a patient is in need for health care[24] , treatment can then be provided before health problems become more severe.[25] Access to primary care is, among other things, also influenced by financial thresholds for consultations and the geography of primary care provision.[26]

Primary care is intended to provide the most *comprehensive scope* of health services within a health care system to address the wide variety and often very basic needs existing in the community.[27] Boerma (2003)[10] has defined four areas that determine the comprehensiveness of primary care services provided by the predominant providers of primary care. Firstly, the provision of first contact care for acute health problems, such as health problems of children, health problems of women, and psycho-social problems. Secondly, the application of medical procedures such as minor surgical and investigative procedures. The third area is concerned with disease management of patients presenting acute and chronic conditions. The fourth area covers providers' activities in preventive medicine and health education.

The provision of *continuity of care* is a core attribute of primary care.[28] There is clear uniformity in the literature on this. Less agreement has been reached on the definition of the concept.[29] Hjortdahl (2004)[30] has defined continuity of care as serving as a single source of care to patients over a period of time regardless of the presence or absence of particular health-related problems or the type of problems. Continuity of care is however much more complex than just a reflection of the duration of a patient-physician relationship.[31] Continuity of patient care is interpersonal, chronological, geographic, interdisciplinary and informational.[32] Saultz (2003)[33] reviewed the medical literature on continuity of care and concluded that continuity can best be defined as a hierarchy of 3 dimensions in which the aspects of Hennen (1975)[32] are integrated, viz.: informational, longitudinal and interpersonal continuity. Informational continuity refers to the availability of comprehensive information about the patient's previous health encounters to any provider who cares for the patient, regardless of the location of the provider.[33] Longitudinal continuity implies a longitudinal relationship between a patient and a primary care provider that transcends multiple illness episodes. It can be identified by an ongoing pattern of health care interaction that occurs between the same patient and the same (team of) primary care provider(s).[33] The interpersonal nature of the continuity relationship refers to the quality of the longitudinal relationship that, ideally, evolves in a strong bond between patients and their primary care provider characterized by a sense of responsibility for the delivery of coordinated and comprehensive care, and a feeling of trust and loyalty.[34]

Coordination of care is often referred to as the ability of primary care providers to guide the use of care with other parts of health care, so that providers can work together to meet patients' needs.[16] Since primary care is offered by various disciplines including medical and paramedical workers, therapists and social workers, it is important that there is also a sense of coordination of patient care within the level of primary care itself.[35-37] Therefore, to achieve a strong coordinating role for primary care it is necessary to put mechanisms into place that ensure coordination of patient care between primary care providers, as well as ensure coordination of patient care between primary care and other levels of health care.[38] Effective communication both with patients and, at the primary and secondary care interface is an essential requirement for coordinated care.[39] It requires recognition of the interdependency of the roles of health professionals within a health care system. Only when health care professionals provide complementary patient care, a smooth process of patient care through the system will be achieved.[40] Without coordination of care, patient care will be fragmented and disintegrated, which will particularly be problematic for patients with chronic or multiple health problems.[35]

The delivery of primary care services is likely to be influenced by structural elements of a health care system, as identified in the WHO Health Systems Framework.[1] A distinction can be made between the *governance* of primary care, the primary care *workforce development*, and the *economic conditions* of primary care.

Governance is an overriding function in that it oversees all aspects of primary care. It encompasses the tasks of defining the vision and direction of health (care) policy, exerting influence through regulation and advocacy (e.g. protecting patient rights) and collecting and using information (e.g. for performance assessment or quality management).[1]

The primary care *workforce development* is shaped by the profile of primary care professionals that make up the primary care workforce in a country (e.g. type of professionals and their training requirements), and the position they occupy in the health care system (e.g. recognition and responsibilities).[16;41]

The *economic conditions* of primary care are to a great extent shaped by the method of financing health care for (the majority of) the population (e.g. taxes, health insurance or private means), total expenditures on health care and primary care, the employment status of primary care providers (salaried employed providers, or self-employed providers with/without contract(s) with health services or insurance, and income of the primary care workforce.[22;42;43]

In summary, strong primary care provides accessible, comprehensive care in an ambulatory setting to patients in their own context on a continuous basis, and coordinates the care processes of patients across the health care system, supported by an appropriate structure of primary care governance, economic conditions and a sufficiently developed primary care workforce. In this thesis, we consider primary care as a multidimensional concept. Countries are expected to vary in the degree in which they have developed the dimensions of primary care, and thereby in the strength of each of the primary care dimensions.

Research questions and hypotheses

The aim of this thesis is to get insight into the elements that form (the strength of) primary care in Europe, their determinants and their impact on health care system outcomes.

Measuring the strength of primary care

Research in primary care is often concerned with only single dimensions of primary care, such as continuity of care or accessibility.[35;44-48] Though these studies are useful and necessary for increasing our understanding of the mechanisms behind these dimensions, they do not provide insight in primary care as a multidimensional concept.

An important research area in primary care is the quality of care.[23;49;50] Due to a lack of assessment of the strength of primary care, studies can rarely relate the quality of health care to the organisation or process of services delivery in primary care.[16] Van den Hombergh et al.[51-53] have developed the European Practice Assessment instrument to assess the quality of primary care practice management in Europe. Elements from this instrument can be very useful for monitoring primary care, but the instrument itself is focussed on the quality of patient care processes at the practice level in stead of on system features such as accessibility or the coordinative capacity of primary care. The task profile study that has been performed among general practitioners in Europe by Boerma[10;21] provides a tool for measuring the comprehensiveness of care. The first attempt to measure the strength of primary care with acknowledgment of its multidisciplinary components has been performed by Barbara Starfield and her colleagues.[7;16;54-56] Starfield approaches primary care by defining 10 components which together determine the concept of primary care. These components are regulation, financing, type of primary care physician, access, longitudinality, first contact, comprehensiveness, family-centeredness and community orientation.[16;27;57;58] They are based on the multitude of definitions that exist of primary care, and have a broad acceptance in the primary care literature.[9;14;15;59-61] Though Starfield's instrument examines key dimensions of primary care, the relation between the dimensions, the operationalisation into indicators and the measurement methods are limited.[57] Furthermore, Starfield's measurement instrument of which a number of configurations exists, has been developed within specific health care

systems such as the US and other highly industrialised countries and can not automatically be translated to the European situation.[54;55]

To fill the gap of a monitoring instrument for the strength of key elements of primary care in Europe, we aim to develop a monitoring instrument that builds upon adaptations of existing instruments, the primary care research literature and current policy needs in the context of European primary care. The Monitor should reflect a robust picture of the strength of key elements of primary care that can reliably be reported across countries using comparable data.[22]

The first research question therefore is:

Research question 1: How can (the strength of) primary care be measured and compared in Europe?

In answering this research question, we also investigate the mix and intensity of types of primary care structures that are used by countries (e.g. financial resources in combination with pro-primary care policies and features that improve the workforce development) to achieve their current level of primary care process (e.g. accessibility, or comprehensiveness of primary care services), as well as the amount of primary care processes that are in place (e.g. level of coordination of care) to achieve the current levels of quality of care. This gives an idea of the technical efficiency in which countries organise primary care.

Explaining variation in primary care across countries

Based among others on Starfield's work[16] it can be expected that countries in Europe vary in the strength of key features of primary care. The reason why (sometimes neighbouring) countries differ in their accessibility of PC (e.g. use of financial thresholds for patients), achieved coordination of care (e.g. by means of a gatekeeping system), or scope of services provided within primary care, are currently unknown. Just like any other part of the health care system, strong primary care will not emerge spontaneously: it will require continuous efforts to maintain, restore or strengthen its functions to deliver high quality primary care. The second question is therefore:

Research question 2a: To what extent do countries differ in the strength of primary care?
Research question 2b: How can we explain variation between countries in the strength of primary care?

It has been argued in 1977 by Sidel and Sidel[62] that primary care is a reflection of a society's economic, social political, cultural history and the general structure of a health care system. Although empirical evidence is lacking for this statement, other authors have also indicated that strong primary care most likely will require resources, political will, public engagement and a facilitating health care system context.[63-65] We therefore explore research question 2 by testing 6 hypotheses concerning the relationship between the strength of primary care (measured by the strength of its structure and services delivery dimensions) and a country's economic development, political orientation, type of health care system, and prevailing values.

We expect that a country's economy will not only affect the amount of resources available for primary care, but also the range of options for policymakers to structure and organise the health care system. High-income countries can afford to base their health care system more on (expensive) hospital care than on primary care.[8] Although this may create inefficiencies[66], public satisfaction is often higher when health care systems offer directly accessible specialist care, as opposed to a gatekeeping system regulating access to secondary care.[67] In addition, primary care is a relatively less expensive strategy (as opposed to specialist care) to expand curative care as a response to tackle emerging non-communicable diseases, which might be particularly appealing to middle income countries, such as in Eastern Europe, as opposed to high income countries.

Hypothesis 1: Wealthier countries have a weaker primary care structure and services delivery process.

Several studies have shown that the political composition of a country's government is related to the policy priorities for the health care system.[65;68-70] Countries with a predominantly socialist or social-democratic government (e.g. Scandinavian countries) aim to achieve universalism and equity, provide a redistributive social security system, provide generous benefits, and have a strong interventionist state.[71-73] Whereas predominantly liberal governed countries (e.g. Ireland, United Kingdom) provide lower or even minimum levels of state welfare, basic levels of benefits, means tested eligibility criteria, while market forces are encouraged by subsidizing private welfare programmes.[71-73] Primary care can be seen as a health equity producing policy.[58;74;75] We therefore expect that socialist and social-democratic parties advocate strong primary care as a means to advocate equal access to health care, to ultimately optimise the health of the population.

Hypothesis 2: Countries with a predominantly left-wing government have a stronger primary care structure and services delivery process.

State-regulated health care systems (NHS systems) can relatively easily implement government initiated reforms, compared to SHI countries with a relatively weak power base of the government, as policy implementation depends on the cooperation of insurers and providers.[68;69;76-78] A study by Tenbensel et al. (2012)[65] showed that NHS systems are more likely to address health outcomes and inequalities than SHI systems, due to the strong role of the government in NHS systems. This indicates that strong primary care – as a lever to achieve these system goals – is more likely to be part of the policy agenda of NHS systems. Given the strong role of the government in funding and providing primary care services in national health service (NHS) systems, we expect that strong primary care is more likely to be part of the policy agenda of NHS systems than countries with social security-based systems or health systems in transition.

Hypothesis 3: Countries with national health care systems (compared to social security-based systems or health systems in transition) have a stronger primary care structure and services delivery process.

Several studies have shown that differences in society's values may explain variation in health care policy priorities[2;79], delivery of services (e.g. medical communication, ICT use)[80-82], health care utilisation[80] and outcomes[83]. We expect that value systems affect policy makers' decisions in determining health care system priorities (e.g. investing more in high technology based specialist care versus primary care, and regulating access via a gatekeeping system as opposed to individual responsibility of patients), medical professionals in how they approach and treat their patients (e.g. wait-and-see approach versus high intervention rates), and patients in how they use professional and informal health care (e.g. preference for informal family-based care versus professional medical care, or requesting a prescription after each doctor visit), and what they expect from health care services delivery (e.g. co-decision making versus the doctor-knows-best-belief).

Hypothesis 4: Countries where people value high government involvement (versus individual responsibility) in providing welfare have relatively strong primary care structure and services delivery process.

Hypothesis 5: Countries where people value a tight family-orientation have a relatively weak primary care structure and services delivery process.

Hypothesis 6: Countries where people value the use of science and technology to improve their health have a relatively weak primary care structure and services delivery process.

This set of hypotheses is likely to be interrelated to each other. For example, culture will closely be related to the political orientation of a government, the type of health care system will likely have its roots in cultural and political values, and wealth will likely have an impact on most aspects of society.

The importance of primary care

The current evidence base of the positive effects of pro-primary care policies is from studies that have found better performance among health care systems based on strong primary care. It was Barbara Starfield's study[7] in 1994 which showed for the first time the conducive effect of strong primary care on health outcomes, opening a worldwide scientific discussion on the potential of primary care. It was shown that countries with a more primary care (as opposed to medical specialist) oriented health care system had lower health care costs, less medication use, and better health levels. This was studied among 11 countries. Since then, several studies have provided evidence on benefits of strong primary care, in terms of better opportunities to control costs, improved quality of care, better health, and less inequality in health.[5;7;16;17] However, the available evidence should be considered with care. Firstly, because the limited generalisability of the results in the European situation. These studies have usually included only a selection of EU countries and, additionally, covered non-European OECD countries. Secondly, the available studies used primary care measurement instruments often limited in their measurement areas, geographical scope or use of indicators. The third question therefore is:

Research question 3: Do countries with a relatively strong primary care have better health care system outcomes compared to countries with relatively weak primary care?

We expect that primary care has in impact on health care expenditures, patient perceived (organisational) quality of care, avoidable hospital admissions, health outcomes, and socio-economic inequality in health. These expectations will be tested by 5 hypotheses.

Primary care serves as the basis for, and determines the efficiency of secondary and tertiary health care services through the ability of primary care physicians to treat a comprehensive scope of health problems, and by providing effective screening and filtering of health problems (avoiding unnecessary referrals to expensive secondary care).[25-27] We therefore

expect that health care systems with stronger primary care are cheaper than health care systems with weaker primary care.

Hypothesis 7: Health care expenditures are lower and increase less rapidly in countries that have stronger primary care compared to countries that have weaker primary care.

Kroneman et al. (2006) showed that countries with a gatekeeping system (often used as an indicator for the strength of primary care) have lower patient perceived quality of organisational aspects of primary care than countries with directly accessible specialist care.[67] We therefore expect that strong primary care is associated with relatively low patient satisfaction rates.

Hypothesis 8: Patient perceived organisational quality of primary care is lower in countries that have stronger primary care compared to countries that have weaker primary care.

A hospital admission is avoidable when a hospital admission for a certain condition could have been prevented by effective or accessible primary health care.[84] Such conditions, sensitive to prevention or disease management in primary care (e.g. diabetes, asthma and COPD), are called ambulatory sensitive conditions (ACSCs). Studies by Ansari et al.[85-87] showed that higher rates of ACSC admissions in geographic areas may reflect insufficiency of primary care; mal-distribution of primary care resources; evidence of the existence of barriers to accessing primary care services; problems in continuity of care; and inefficient use of resources. This positive effect of availability of primary care providers and first contact care on reduced avoidable hospitalisations was also confirmed by other studies, mostly from the USA.[88-91] Thus, when primary care provides timely and effective health care services, fewer hospitalizations are expected to occur for health problems that could be solved within the primary care context.

Hypothesis 9: Avoidable hospitalizations are lower in countries that have stronger primary care compared to countries that have weaker primary care.

Based on previous studies[43;87;92;93] that have found positive associations between aspects of strong primary care and health outcomes, we expect that population health is better in countries with relatively stronger primary care than countries with relatively weaker primary care.

Hypothesis 10: Population health is better in countries that have stronger primary care compared to countries that have weaker primary care.

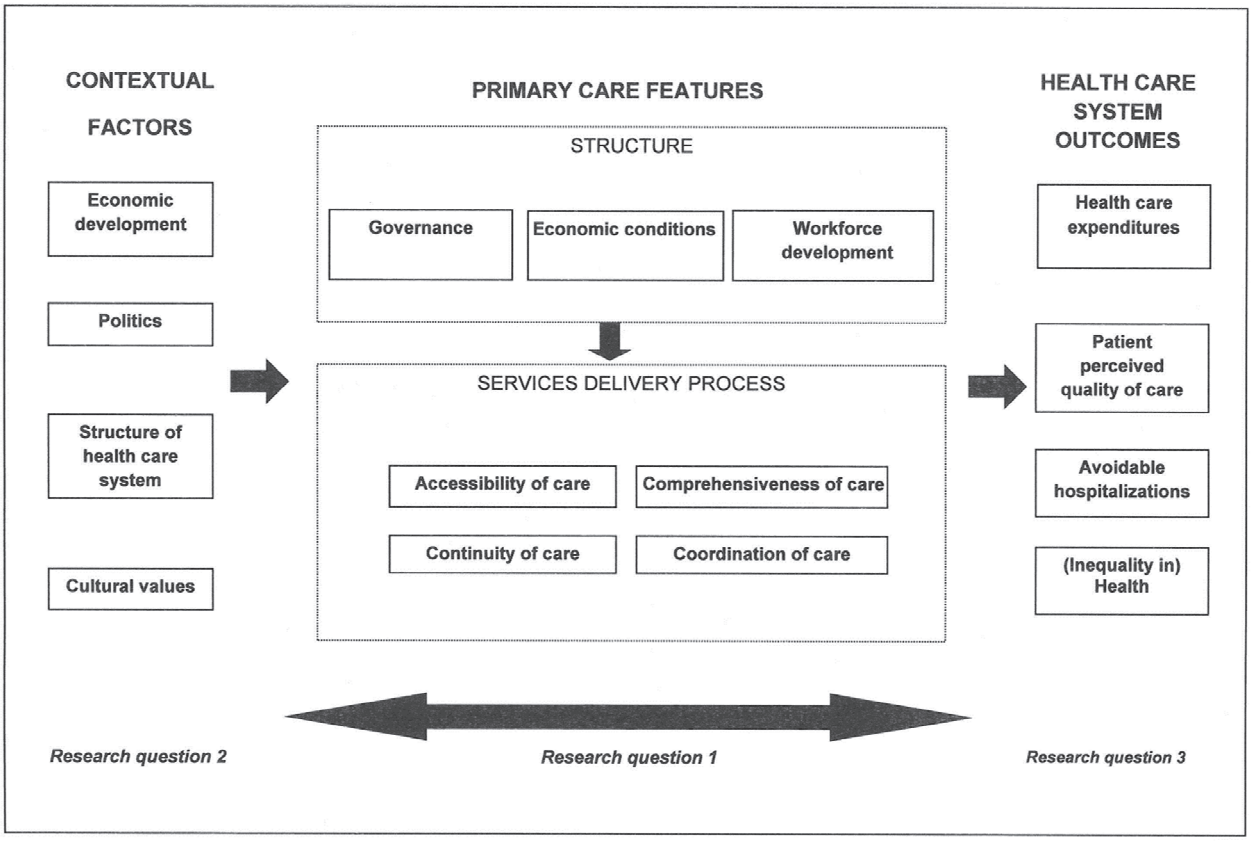
Equity in health is a relatively small but important area of research in primary care.[94] It is the absence of systematic and potentially remediable differences in health status across population groups. It is approached by the level of disparity for primary care sensitive health outcomes across population groups. A literature review by Starfield[95] found that investments in primary care produce more equity than investments in the health care system in general. However, on the whole, the evidence of a relationship between equity in health and the strength of primary care at a national level is scarce.

Hypothesis 11: Socio-economic inequalities in health are lower in countries that have stronger primary care compared to countries that have weaker primary care.

In sum, we expect that countries vary in the strength of primary care, which can be explained by variation in their political-economical, cultural and health care system contexts. Strong primary care is expected to be beneficial to important health care system outcomes.

The main research questions are summarised in figure 1:

Figure 1: Linkage between research questions



Methodology

The first steps in the conceptualisation of primary care as used in this thesis were made with the development and pilot testing of a survey based tool (the WHO Primary Care Evaluation Tool) to evaluate the structure and organisation of primary care in countries of the WHO's European region. This project aimed to develop and test a Primary Care Evaluation Tool (PCET) allowing to assess progress of primary care development over time, as well as to enable comparisons between regions or Member States. The tool consists of a checklist to gather information at the national level; a questionnaire for general practitioners; and a questionnaire for patients. The pilot tests of the (translated) tool were carried out in 2007/8

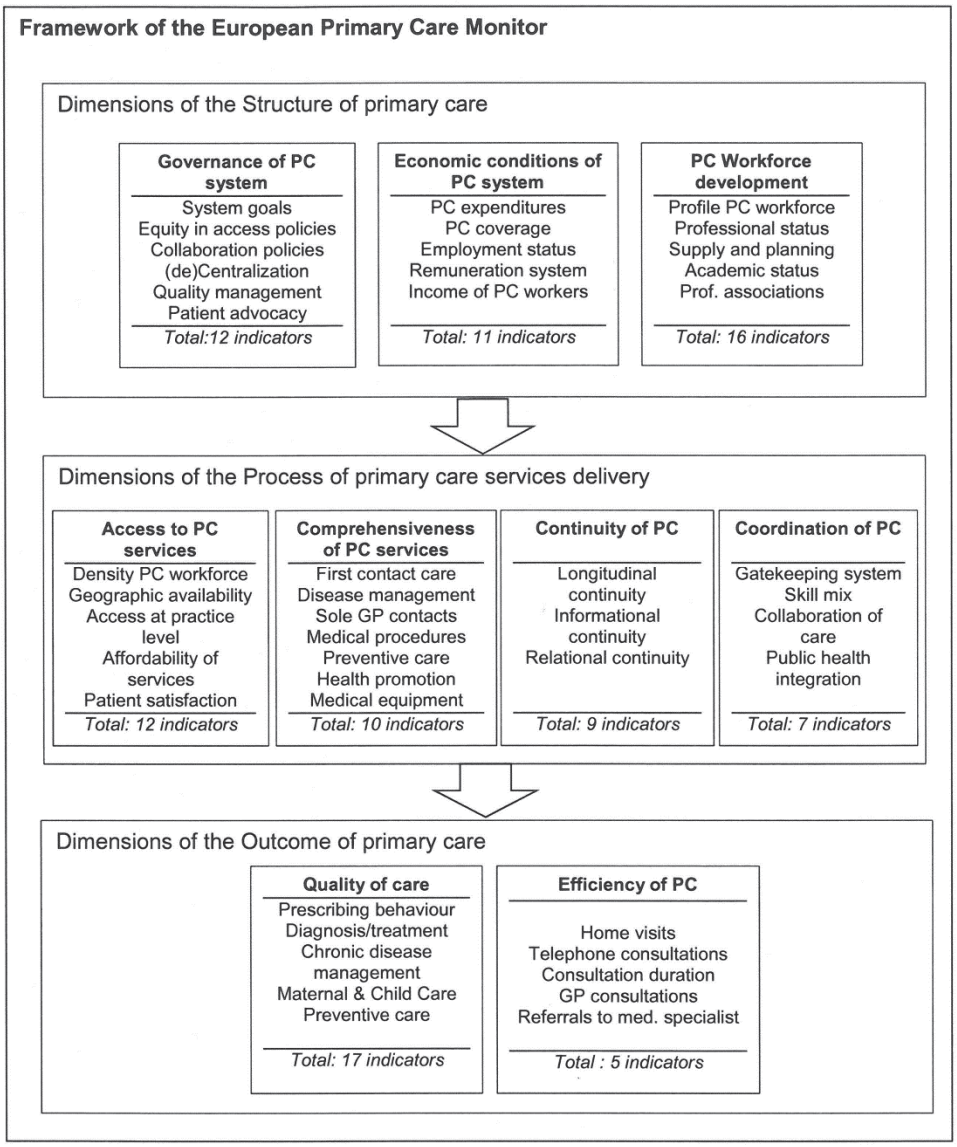
in two regions in Russia and Turkey.[96,97] It was funded by the World Health Organisation's Regional Office for Europe. This project was primarily used in this thesis to get familiar with the complexities of primary care evaluation.
The core of this thesis is based on the European Primary Care Monitor project which was concerned with the development and implementation of a European Primary Care Monitor using a different methodological approach. This project was co-funded by the European Commission, DG Health and Consumers (DG SANCO), NIVEL, and partner institutes of NIVEL.

This next part of this section explains the primary care data collection strategy as used in the PHAMEU project. Details about the performed statistical analyses and supporting additional data collection strategies are explained in the separate chapters of this thesis.

The European Primary Care Monitor
The European Commission co-financed the PHAMEU (Primary Healthcare Activity Monitor for Europe) project from 2007-2010.

Indicator development
A systematic literature review was undertaken to identify the key dimensions of primary care. Each dimension was broken down to a number of 'features'. To work out the features identified in the systematic literature review, a provisional long list of measurable indicators was made. To this end the selected publications were searched for operationalizations (indicators) of the features. Furthermore, international databases (OECD Health Data, WHO Health for All Database, Eurostat, World Bank HNPStat's, EUPHIX) were searched for 'ready-made' indicators. For features where no operationalisations were found the research team developed measurable indicators. The long list of indicators was then evaluated by a panel of primary care experts from ten countries on relevance, precision, flexibility, and discriminating power as well as for its suitability to describe and compare primary care across countries in Europe to come to a final set of indicators included in the European Primary Care Monitor. The final set of indicators describes the structure, process, and outcome of primary care by 9 dimensions, and 99 indicators. See figure 2 for an overview of the primary care dimensions, its features and total number of indicators. An overview of all indicators by dimension is provided in Chapter 3.

Figure 2: Overview of the primary care dimensions, features and total numbers of indicators



Data collection on primary care

On the basis of the set of indicators, data were collected by the PHAMEU project partners (see Acknowledgements) in 2009/10 in the 27 EU member states, as well as in Turkey, Switzerland, Norway, and Iceland. The data collection strategy followed a strict hierarchical

approach to maximise the use of available primary care data with the highest reliability and validity:

Step 1: The coordinating team (located at NIVEL, the Netherlands) collected all available international comparative data on the indicators for each of the 31 countries by searching international statistical databases (e.g. OECD, WHO Health for All, Eurostat, ECHI).

Step 2: The coordinating team complemented the search for international comparative data for all 31 countries by searching international comparative scientific publications (e.g. via PubMed and Embase), and international comparative primary care reports published by renowned international organisations (e.g. WHO, World Bank, OECD) through Google.
By giving priority to reported international comparative data, data were used that were already made comparable, reliable and valid as much as possible, given the relatively high standards applied by international statistical organisations and scientists.
As a result of Step 1 to 2, for each of the 31 participating countries there was a list of indicators with completed and missing data.

Step 3: The coordinating team at NIVEL again searched international scientific databases (e.g. Pubmed, Embase) – but this time - for national publications on each country, in an effort to fill data based on publications that were peer reviewed and as much as possible of high reliability and validity. Again, this resulted for each country in a smaller list of indicator for which data was still missing.
All completed data (from Steps 1-3) were entered in an online database accessible to the responsible national coordinators, developed by the coordinating team.

Step 4: The coordinating team at NIVEL gave each country coordinator (there were 10 country coordinators who were each responsible for data collection in their own and 2-3 surrounding countries) for each country two lists of indicators: List A contained indicators with already completed data which needed to be validated by national primary care experts (as a final step in the data collection process); List B contained indicators with missing or incomplete data. The country coordinators were given uniform instructions (during a project meeting) how to proceed to search for data on the remaining set of indicators in each country.

Step 4a: Each national coordinator searched the websites of national statistical organisations, professional associations, health inspectorates and educational institutes in their responsible countries to fill the missing data as much as possible. This resulted again, in a smaller list of

indicators with missing data. All completed data were entered in an online database, in which data were checked by the coordinating team at NIVEL for comparability in answers, and identification of potential data caveats (which were communicated back to the national coordinator).

Step 4b: Each national coordinator searched national literature databases to fill as many remaining missing data as possible. The collected data were again completed in the online database, managed by NIVEL. The coordinating team continuously gave feedback on potential issues with the data.

Step 4c: The national coordinators for each of their 2-3 responsible countries were now left with a list of missing data on different numbers of indicators (as it depends largely on the national primary care information infrastructures). Each national coordinator consulted 3-5 national primary care experts to help them identify additional sources for their missing data in the respective country.

Step 4d: As a last resort, the remaining set of missing data in each country was presented to 3-5 national experts (see step 4c) who gave an estimation of the indicator based on their expertise and extensive experience. When experts could not reach any consensus, the range of the answers was indicated and hesitations and remarks were noted in the online database, or data remained to be missing when it was not possible at all to provide an answer at national level for the respective indicator.

Step 4e: After the coordinating team at NIVEL reviewed all collected data in the online database, all national coordinators confronted their team of national experts with the collected data for their country and were asked to validate them.

As a result of this strategy, in each country exactly the same data collection approach was followed. However, since each country in Europe is in a different stage of development of their primary care information infrastructure, inevitably, some countries have a more comprehensive, up-to-date or reliable set of data than other countries.

Rating the strength of primary care

To determine the strength of primary care, country data on all indicators were transformed into scores ranging from 1 (weak primary care) to 3 (strong primary care).

The rating of qualitative indicators was based on the findings of the systematic literature review on primary care. For example, if a country indicated having a pro-primary care policy

in place, or reimbursing primary care providers by a mixture of fee-for-service, capitation and performance indicators, the country scored a "3" on the respective indicators, meaning a feature of strong primary care. The scoring of quantitative indicators was based on the literature review to determine the direction of scoring (what is strong-medium-weak primary care), and the distribution of data on the respective indicator among all 31 countries. The limits of strong (3) - medium (2) – weak (1) scores were determined by the 33% and 67% percentiles of valid country results. This way the data shows the relative strength of primary care across Europe. For example, primary care expenditure (as percentage of total health expenditure) ranged from 25.6% (in Switzerland) to 4.7% (in Czech Republic). One third of the countries had a primary care expenditure ranging from 4.7% to 9.8%, and therefore scored "1", one third of the countries had a primary care expenditure ranging from 9.8% tot 14.0%, scoring "2", and the remaining one third of the countries with expenditures of 14.0% or higher scored "3". Appendix I shows the rationale for the scoring system, and the applied scores for each included indicator.

Based on these indicators per country 9 separate dimension scores were calculated by a two level hierarchical latent regression model. The dependent variable is the scores for every country on the indicators belonging to that dimension. In the fixed part of the model the dimension average is estimated together with the indicator effects (using deviation indicator coding), to control for differences in the indicator averages. In the random part, at level one, the indicator measurement errors are modelled as separate variance terms for every indicator, this controls for differences in the indicators standard deviations. At level two the effect for every country on the dimension is modelled, this is used to calculate country dimension scores. This approach allows calculating valid dimension scores even if countries have missing indicators.

Outline of the thesis

The results of the thesis are presented in Chapter 2 through Chapter 8. The Chapters are written as separate articles and can be read independently of each other. As a consequence, the content of the chapters shows some overlap, especially with respect to the methods.

The thesis can be divided in two parts. The first part (Chapters 2 to 4) is about the pilot testing and development of an instrument to measure the strength of primary care across Europe. The second part (Chapters 5 to 8) focuses on the strength of primary care and its determinants, and the contribution of primary care to health care system outcomes.

In Chapter 2 we describe the pilot testing of a survey-based tool (the Primary Care Evaluation Tool) to evaluate the organisational model of primary care in terms of its governance, financing system, resources generation, and its delivery of care in health care systems in transition. This study was performed in close collaboration with the World Health

Organization Regional Office for Europe (WHO Europe). After the completion of the pilot test in the Russian Federation and Turkey, the Tool has been implemented in several other countries with a health care systems transition (e.g. Serbia, Belarus, Ukraine, Kazakhstan).[96-101] Given the high costs of such a survey based tool and the limited focus (on general practice in stead of primary care), a different strategy was needed to measure and compare the strength of primary care across 31 countries in Europe.

In Chapter 3, we have therefore performed a comprehensive systematic literature review to identify the core elements that make up primary care in the EU Member States plus Iceland Norway, Switzerland, and Turkey.

In Chapter 4 we have developed the European Primary Care Monitor, an instrument consisting of primary care indicators aimed to describe and compare the core elements of primary care in 31 European countries.

Chapter 5 compares the strength of primary care in Europe based on the data collection across 31 countries applying the indicators of the Primary Care Monitor.

With Chapter 6 we aim to give insight into the efficiency of the organisation of primary care, by comparing the efficiency in which countries use their PC structure to deliver primary care services, and the efficiency in which quality of care is delivered.

In Chapter 7 we explain why countries differ in their primary care structure and primary care services delivery process by means of political-economic factors, prevailing values and health care system structure.

In Chapter 8 we answer we provide evidence for the impact of strong primary care on health care expenditures, quality of care, health outcomes, and socio-economic inequality in health. Finally, an overall discussion will be presented in Chapter 9.

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2

Evaluating Primary Care in health systems in transition:

Testing a new tool in the Russian Federation and Turkey

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This article was published as:
Kringos DS, Boerma WGW, Spaan E, Pellny M. A snapshot of the organization and provision of primary care in Turkey. *BMC Health Services Research* 2011, 11:90-98.
Kringos DS, Boerma WGW, Spaan EJAM, Pellny M, Karakaya K. Evaluation of the organizational model of primary care in Turkey. A survey-based pilot project in two provinces in Turkey. Primary care in the WHO European region. WHO Regional Office for Europe, Copenhagen, 2008.
Kringos DS, Boerma W., Spaan E., M. Pellny, I. Son, A. Korotkova Evaluation of the organizational model of primary care in the Russian Federation. A survey based pilot project in two rayons in Moscow oblast. WHO Regional Office for Europe, Copenhagen, 2009.

Abstract

Objective
This WHO study aimed to develop and test a tool to evaluate the development and scope of primary care services in countries in transition.

Methods
The Tool is based on a literature study, consensus meetings with experts and country visits. It consists of three parts: a questionnaire for the organisation and financing of primary care in the country; a questionnaire for primary care physicians; and another for patients. The Tool has been tested in the Russian Federation and Turkey in 2007.

Findings
In Russia, primary care was not a high priority at federal level and initiatives to introduce newly trained GPs were fragmental. GPs were better equipped than the old-style primary care physicians. Patients had good access, but their rights were poorly defined. Practice information systems were outdated, as were premises. Nevertheless, patients were satisfied with services. In Turkey, only recently primary care has become an official priority and the geographical distribution of services is still uneven. Although general practitioners (GPs) were increasingly available, nationwide shortages of primary care staff exist. Coordination of care could be improved and quality control mechanisms were lacking. However, patients were very satisfied with the treatment by GPs.
The pilot tests facilitated policy recommendations and suggestions to improve the Tool.

Conclusion
The Tool provides information for decision makers to shape policy making for strengthening health systems through primary care.

Introduction

Backgrounds of pro-primary care reforms differ between Western Europe and the countries of Central and Eastern Europe and those formerly belonging to the Soviet Union. In the first mentioned countries emphasis on primary care (PC) is a response to rising costs and changing demand, while the second mentioned countries are struggling to improve the performance of their health care systems. PC is now being emphasized to bring responsive health services closer to the population.[1-7]
The WHO World Health Report 2008 has stressed the need to produce knowledge on PC. Health care reforms are insufficiently based on evidence of their effectiveness. Nowadays, however, policy makers and managers increasingly demand for evidence about progress of reforms and how to make services more responsive to changing patient needs and demands.[3;6-8] This implies evidence based on patient evaluations of access, coordination and convenience of services.[9]

WHO Primary Health Care Programme
As an advocate of evidence-based health policy, WHO Regional Office for Europe promotes the systematic monitoring of health systems.[10] The Division of Country Health Systems of the Regional Office for Europe has therefore taken the initiative for a Primary Care Evaluation Tool (PCET). The development and testing of the Tool was commissioned to its Collaborating Centre NIVEL. The Tool should allow to assess progress of PC reforms over time, as well as to enable comparisons between regions or Member States (MS).

Aim and locations
The aim of this paper is to present the PCET and to describe the results of its test in the Russian Federation and Turkey. The study was performed in these two MS because they had identified PC evaluation as a priority in their Biennial Collaborative Agreement (BCA) with WHO Europe.

Methods

Study design
This study was performed in 2007/08 and consisted of the following elements. First, the research team developed a conceptual evaluation framework, which was subsequently discussed with a panel of experts from five countries to optimise its applicability for health

systems in transition. Second, on the basis of the framework a draft Tool was developed, consisting of three questionnaires: one for the situation of PC at national level, one for PC physicians, and one for users of PC services. Third, these questionnaires were revised after discussions held during visits of the researchers to the selected pilot areas. Finally, the implementation of the Tool was prepared. This included the translation of the questionnaires (into Russian and Turkish); agreement on research methods with local coordinators (including the sampling procedure) and the training of local fieldworkers in both countries. Analyses and reporting were carried out by the research team in the Netherlands. The report contained results of the study as well as a description of experiences with the Tool and recommendations for its future use.[11] An international meeting was organised by WHO, with 34 PC experts from 14 countries, to review the report. The experiences described in the report and the conclusions of the review meeting resulted in a final revision of the Tool.

Pilot areas

In each country two pilot areas were selected. In Russia, two districts were selected in the Moscow region: *Stupino* and *Shatura*. The Stupino district was representative for the reformed system, whereas the Shatura district was representing the situation where features of the old system were dominant.

In Turkey, two areas were selected where the new PC model had been introduced: the provinces of *Bolu* and *Eskişehir*. Bolu province is mainly rural; Eskişehir province is more urban and industrialized.

Table 1: Study populations, sampling and data collection strategy in both countries

	Russian Federation	**Turkey**
Study population	GPs / Paediatricians / Therapists Patients National experts	GPs Patients National experts
Locations	Moscow oblast: Shatura district Stupino district	Eskişehir province Bolu province
Type of data collection	GPs/Paediatricians/Therapists: pre-structured questionnaires Patients: pre-structured questionnaires National experts: pre-structured questionnaires and expert meeting	GPs: pre-structured questionnaires Patients: pre-structured questionnaires National experts: pre-structured questionnaires and expert meeting
Sampling method	GPs: all in Stupino Paediatricians: all in Shatura Therapists: all in Shatura Patients: the first 20 patients visiting on day x National experts (selected by local coordinator)	GPs: random samples in 2 provinces Patients: the first 20 patients visiting on day x National experts (selected by local coordinator)
Sample size	GPs: Stupino: 47 Paediatricians: Shatura: 14 Therapists: Shatura: 29 Patients: Stupino: 940 Shatura: 860 National experts: 10	GPs: Eskişehir: 32 Bolu: 23 Patients: Eskişehir: 640 Bolu 460 National experts : 10

Sampling and data collection strategy

Given the different situation in both countries, different sampling procedures were required, as shown in Table 1.

Due to the limited numbers in Stupino and Shatura, all physicians were included. In Turkey, lists of physicians served as sampling frames. Trained fieldworkers visited these physicians to hand over the questionnaire. For the patient survey, with each included physician a target of 20 completed questionnaires was set. This was achieved by the fieldworkers asking every patient that visited the practice for cooperation, until the number of 20 was achieved. For the national level questionnaire, in both countries experts were identified by the national coordinator, representing the Ministry of Health, GP associations or medical chambers, health insurers, academics and consumer or patient organisations.After the experts had filled in the questionnaire individually, a joint meeting was organized to discuss and clarify answers and to reach consensus.

Data processing, analysis and reporting

A SPSS programme was developed to enter the data in the computer. Data entry of the Turkish questionnaires was done at NIVEL, while Russian data were entered by Russian counterparts, after
being instructed on the use of the programme. The analysis of the data and the reporting took place at NIVEL.

Table 2: Listing of primary care functions, dimensions and a selection of items of the Tool

Function	Dimension	Selected items of information
Stewardship	Policy development	PC policy priorities
	Professional development	(Re-) accreditation system for PC
		Quality assurance mechanisms for PC
	Conditions for the care process	Geographical distribution of PC services
		Human resources planning
Resource generation	Workforce volume	Numbers and density
	Professional development	Role and organisation of professionals
		Education of professionals
		Job satisfaction
	Professional morale	Medical and practice equipment
	Facilities and equipment	Access to external diagnostics
Financing & incentives	Health care/PC financing	PC funding
	Health care expenditures	Expenditures on PC
	Incentives for professionals	Entrepreneurship
		Mode of remuneration
	Financial access for patients	Cost sharing/co-payment for PC services
Delivery of care		
- Access to services	Geographical access	Distance to PC practice / centre
		Distribution of PC physicians
	Organizational access	Patient list size
		Services outside office hours
	Responsiveness	Convenience of services
		Timeliness of care
- Continuity of care	Informational continuity	Computerisation of the practice
		Keeping medical records
	Longitudinal continuity	Patient habits with first contact visits
		Endurance of patient-provider relationship
	Interpersonal continuity	Patient-provider relationship

Function	Dimension	Selected items of information
- Coordination of care	Cohesion within PC	PC practice management Collaboration among PC providers
	Coordination with other care levels	Referral system / gatekeeping Collaboration with secondary care level Shared care arrangements
- Comprehensiveness	Practice conditions	Premises
	Services delivery	Involvement in disease management Provision of medical technical procedures Involvement in prevention
	Community orientation	Community links Monitoring and evaluation
	Professional skills	Perceived medical skills by patients

Structure and content of the Tool

The starting point for the design of the PCET has been the WHO 2000 Health Systems framework, which specifies the relationship between health system functions and performance.[12;13] The PCET combined the four functions of the WHO framework (stewardship, resource generation, financing and service provision) with essential features of service delivery in PC, as found in the literature.[14-18] This resulted in the first column of Table 2. Each function in the table has subsequently been broken down in dimensions; and the dimensions further in items of information. For practical reasons table 2 only contains a selection of the items.

Items of information can be gathered at different levels. Therefore, the Tool consisted of the following three questionnaires: one for the situation of PC at national level, another for PC physicians, and a third for patients. Together, these questionnaires covered all items that were identified. Except for the national level questionnaire, questions could be answered by ticking a pre-structured answer.

Results

Pilot test in the Russian Federation

Respondents

The national level questionnaire was completed by a panel of 12 experts from governmental and research bodies. Statistical information was provided by the Ministry of Health.

The questionnaire for PC physicians was completed by 50 physicians in both districts. In Shatura, 14 paediatricians (100% response), and 13 therapists (45% response) participated. In Stupino, 23 GPs (49% response) participated. Three quarter of the respondents were female. In Stupino almost all GPs (91%) had completed an official postgraduate training programme, while in Shatura only 41% had done so. Since GPs on average were 5 years younger than paediatricians and therapists, respondents in Stupino were younger than those in Shatura. GPs were introduced in recent years, and therefore the work experience in Stupino was relatively short (3 to 4 years), in contrast to the situation in Shatura, where paediatricians had more than 23 years of experience and therapists 15 years.

The patient questionnaire was completed by 1229 patients; 528 in Shatura (61% response) and 701 in Stupino (75% response). Patients in Stupino were generally older and higher educated than those in Shatura. The majority of patients (64%) in Shatura lived with parents, the partner and/or children, whereas in Stupino more people lived alone or with a partner only (55%).

Primary care in the Russian Federation

Information gathered at the *Federal level* showed that PC was not a high priority. Despite strong statements of top political figures, and corresponding appearances in various basic documents of the federal ministry (conceptions, prikases), PC did not seem to be among the highest priorities as far as the implementation of health care reform is concerned. There was a lack of central coordination and little explicit PC policy. As a result, considerable regional variation existed in the way PC was provided. There had been a scattered introduction of newly trained GPs. Of all active physicians 12% was working in PC, and of these 9% were GPs. In 16% of the Russian regions, territories and republics GPs are unknown in PC, while in only 8% GPs made up more than 20% of the medical workforce in PC (see Table 3).

Stakeholders, such as provider and patient organisations were not involved in the policy process and patient rights had not been regulated explicitly. PC is predominantly funded and provided by the state, but there are also considerable numbers of private practitioners, which were usually paid out of pocket. All public PC services were free of charge, except for medicines for which co-payments existed. Even though the level of the PC providers' salaries

had improved since 2005, financial incentives for quality improvement were reported to be lacking.

Other indicators reported in table 3 result from the surveys among physicians and patients and these reveal the situation of PC in the *pilot areas*. All PC physicians in our survey were state employed. About half of the physicians worked in a PC facility with an explicit patient complaint procedure. In Shatura such procedures were more prevalent than in Stupino. Although PC services were officially free of charge, co-payments for prescribed drugs were normal.

Every month PC physicians reported to spend around 8 hours on keeping up to date. A large majority answered to frequently use clinical guidelines. GPs in Stupino were considerably better equipped and had better access to laboratory facilities than therapists and paediatricians in Shatura, but in both places access to X-ray facilities left to be desired. Around three quarters of the patients can reach their PC facility within a 20 minutes travel. In Stupino travel times were shorter than in – more rural - Shatura. Although the average number of patients per GP in Stupino was much lower than the average of therapists in Shatura (around 1700 versus 2150) other indicators of workload, such as the number of realised patient contacts and home visits and the duration of office consultations, hardly differed. Nevertheless, the total number of hours worked per week of the GPs in Stupino was much higher than that of the colleagues in Shatura (54 versus 46 hours). Regular meetings with practice nurses were much more frequently reported (especially in Stupino) than with social workers. Working relations of GPs with medical specialist were sparse. Medical records were kept on paper and as a routine as almost all physicians reported. Three composite scores, reported the comprehensiveness of the clinical task domains. Compared to therapists GPs were more involved in prevention and medical procedures (such as minor surgery). They also had a slightly stronger role as the doctor of first contact (except for women and children). In the treatment of diseases, however, therapists were more involved than GPs.

The quality of the premises could be improved, for instance the waiting rooms and the poor wheelchair access. Free choice of the doctor was exceptional; almost all patients answered they were assigned to the doctor they visited. Yet, overall, patients were satisfied with the availability of PC staff, and the services they received. They were also positive about their relationship with their physician, in terms of treatment, consultation duration, and social skills. Even though officially PC physicians held no gate-keeping role, patients preferred to first see their PC physician for new health problems. There were signs of inefficiency. Providers spent much time on travelling, nurses were strongly involved in administrative tasks and clinical records were usually kept on paper.

Finally, few links were reported between the PC facilities and the community.

Suggested areas of improvement

Although the main aim of the pilot was to test the implementation of Tool, the results allow to make some preliminary suggestions for decision makers (Box 1). The recommendations are an interpretation of the results by the authors, based on their PC experience.

Box 1: Improvement areas in PC in the Russian Federation

- To promote PC as a Federal priority
- To promote quality and efficiency at the primary level
- To actively involve patients in PC
- To more involve associations of health professionals and NGOs in PC policy development
- To take measures to reduce the shortages of GPs
- To promote and introduce modern methods of quality assurance
- To consider a more comprehensive role for nurses in PC
- To expand the task profile of GPs, in particular the GPs' role as the health care entry; the provision of family planning and paediatric services
- To improve collaboration between GPs and medical specialists
- To promote the community orientation of PC facilities.

Table 3: Selected indicators per primary care function for the pilot areas in both countries

Indicators	Russian Federation	Turkey
Stewardship & Resource generation (national)		
% regions/republics/provinces in the country	16 % *	n.a.
- without GPs	8 % *	15 % *
- with > 20% of PC physicians being GP	(N=88)	(N=81)
% of all active physicians in the country working in PC	12 % *	14 *
% of all PC physicians in the country working as GP	9 % * (N=74,572)	9 % * (N=28,796)

Indicators	Russian Federation		Turkey	
	SHATURA	STUPINO	BOLU	ESKIŞEHIR
Stewardship (regional)				
% PC physicians working in practices with patients complaint procedure in place	64 % (N=28)	48 % (N=23)	80 % (N=37)	76 % (N=41)
Financing				
Employment status of PC physicians (% state employed)	100% (N=28)	100% (N=23)	100% (N=37)	100% (N=41)
% patients reporting co-payments for drugs prescribed in PC	50 % (N=246)	53 % (N=364)	58 % (N=738)	57 % (N=810)
Resource generation (regional)				
Hours PC physicians spend on professional reading per month (mean)	9 hours (N=25)	7 hours (N=21)	7 hours (N=37)	12 hours (N=41)
% of PC physicians frequently using clinical guidelines	89 % (N=28)	83 % (N=23)	19 % (N=37)	14 % (N=41)
Items of medical equipment available to PC physicians (from a list of 30 in Russia and 29 inTurkey)	18 items	24 items	20 items	22 items
% of physicians having no or insufficient access to a laboratory	52 % (N=27)	13 % (N=23)	6 % (N=37)	2 % (N=41)
% of physicians having no or insufficient access to X-ray facility	56 % (N=27)	61 % (N=23)	36 % (N=37)	54 % (N=41)
% of PC physicians with a computer in the centre or practice	86 % (N=29)	87 % (N=23)	100 % (N=37)	95 % (N=41)
Access to services				
% of patients living within 20 minutes travel from PC facility	73 % (N=498)	81 % (N=698)	82 % (N=738)	78 % (N=810)

Indicators	Russian Federation		Turkey	
(*Access to services)*				
Mean number of patients per PC physician				
- GPs	-	1697 (N=22)	3825(N=37)	3443 (N=41)
- Therapists	2122 (N=12)	-	-	-
- Paediatrician	708 (N=14)	-	-	-
Mean number of patient consultations per day				
- GPs	-	23 (N=23)	48 (N=37)	45 (N=41)
- Therapists	23 (N=13)	-	-	-
- Paediatrician	24 (N=13)	-	-	-
Mean number of home visits per day				
- GPs	-	5 (N=23)	1 (N=37)	1(N=41)
- Therapists	5 (N=12)	-	-	-
- Paediatrician	8 (N=13)	-	-	-
Mean number of working hours per week				
- GPs	-	54 (N=13)	46 (N=37)	46 (N=41)
- Therapists	44 (N=9)	-	-	-
- Paediatrician	50 (N=6)	-	-	-
Mean length of patient consultations (minutes)	18 (N=528)	17 (N=701)	12 (N=693)	14 (N=734)
Coordination of care				
% PC physicians regularly meeting with:				
- Practice nurse	72 % (N=29)	96 % (N=23)	76 % (N=37)	73 %(N=41)
- Social worker	55 % (N=29)	52 % (N=23)	-	-
- Medical specialists	35 % (N=29)	33% (N=23)	8% (N=37)	4% (N=41)
Continuity of care				
% PC physicians keeping medical records routinely	90 % (N=29)	96 % (N=23)	35 % (N=37)	49 % (N=41)
% of patients reporting not to have chosen their PC physician (but being assigned)	90 % (N=457)	91% (N=630)	80% (N=738)	66% (N=810)

Indicators	Russian Federation		Turkey	
Comprehensiveness of care				
Provision of clinical tasks				
Role as doctor of first contact (composite score from 17 items; range 1-4)				
- GPs	-	2.68 (N=23)	2.48 (N=37)	2.43 (N=41)
- Therapists	2.54 (N=12)	-	-	-
- Paediatrician	2.08 (N=13)	-	-	-
Involvement in treatment of diseases (composite score from 18 items; range 1-4)				
- GPs	-	3.32(N=23)	2.54 (N=37)	2.62 (N=41)
- Therapists	3.55 (N=12)	-	-	-
- Paediatrician	2.34 (N=13)	-	-	-
Involvement in prevention and medical -technical procedures (composite score from 16 items; range 1-4)				
- GPs	-	2.69 (N=23)	2.46(N=37)	2.38(N=41)
- Therapists	2.14 (N=12)	-	-	-
- Paediatrician	2.16 (N=13)	-	-	-

*Data at national level

Pilot test in Turkey

Respondents

The national level questionnaire was completed by a small panel of experts from the government, university and professional association. Statistical data have been provided by the Ministry of Health.

The pilot has included 78 GPs; 37 in Bolu and 41 in Eskişehir. In both provinces most physicians were from urban practices, but in Eskişehir this proportion was greater (81%) than in Bolu (68%). In both provinces two thirds of the GPs were male and one third female. Respondents were relatively young; on average 36 years in Bolu and 41 in Eskişehir. Since Family Medicine has recently been introduced, physicians had little experience as GP (on average 1.5 and 2.5 years in Bolu and Eskişehir respectively).

In total 1548 patients filled in a questionnaire; 738 in Bolu and 810 in Eskişehir. The average age was around 40 years and the majority was women. Almost half of the patients only had primary education. Almost all respondents lived in a family setting; living alone was extremely rare.

Primary care in Turkey

Answers on the *national level* questionnaire pointed to PC as a national priority. Between 2003 and 2007 a comprehensive PC model has been implemented in 12 provinces under strong coordination of the Ministry of Health. Fourteen percent of all physicians in the country is working in PC, 9% of which are newly trained GPs. Other stakeholders had no formal role in the reform process. Only little regulation on the rights of patients was developed yet.

PC was funded and provided by the state and health care workers were salaried. First steps were being made to introduce a performance related payment for GPs. PC services were free of charge, except for medicines for which co-payments existed. Despite a continuous increase of GPs, nationally there were still severe shortages especially in eastern provinces. Quality control and improvement in PC was not well developed yet. The GP survey showed that clinical guidelines were available, but not widely used.

Table 3 shows data on the indicators derived from the GP survey and the patient survey held in Bolu and Eskişehir provinces. Family Health Centers were staffed by GPs, practice nurses and, in most cases, midwifes. Centres had good access during the day time, but outside office hours it was hardly possible to see a GP. Although patient complaint procedures were not obligatory, most GPs answered their centre had such a procedure. GPs in Eskişehir reported to spend 12 hours per month on professional reading, which was much more than the 7 hours reported in Bolu. GPs were reasonably well equipped; they had almost three quarter of the equipment at their disposal from a list of 29 items. Access to lab facilities was good, but not the access to X-rays. Practices were almost completely computerised. Indicators of access pointed to a very high workload. With more than 3500 the average list size was very high, as was the number of patient consultations (46 per day). The time per patient amounted 13 minutes. Home visits were rarely made. A majority of GPs reported not to keep medical records routinely. The total working time per week was reported to be 46 hours. Coordination of care seemed to be problematic. Multidisciplinary teamwork and coordination with the secondary level were practically absent. The gatekeeping role in PC existed, but was not well maintained. Concerning the clinical work, GPs had a strong position as doctor of first contact for women and children. The involvement of GPs in the treatment of diseases could be improved. However, compared to the situation in Turkey 15 years ago, this position was much better now.[11] GPs were moderately involved in the provision of preventive care and medical technical procedures. The embedding of the centres in the community was weak.

Although most patients reported to be assigned to their GP, they were satisfied with the treatment by the staff and the services they received.

Suggested areas of improvement

The following suggestions were made for policy action to strengthening PC (see Box 2). Similar to the recommendations made for the Russian Federation, these recommendations are an interpretation of the results by the authors, based on their PC experience.

Box 2: Improvement areas in PC in Turkey

- To involve associations of health professionals and NGOs in health policy development
- To promote and formalise the role of patients in PC Centres
- To reduce the shortages and improve the geographical distribution of GPs and nurses
- To maintain and promote the gate keeping role of GPs
- To promote integrated primary care by introducing new disciplines and supporting team approaches
- To promote the quality of PC by developing and implementing clinical guidelines, medical auditing and incentives for good performance
- To expand the task profile of GPs, in particular the role as the health care entry; the treatment of diseases; and prevention and minor surgical procedures
- To improve collaboration between GPs and the secondary level
- To stimulate the community orientation of PC Centres

Discussion

Evaluation of the Tool

Questionnaires have been revised on the basis of experiences during the pilot studies and a great deal of feed back from all involved and from reviewers.[1] The character of the national level questionnaire was changed from a questionnaire for stakeholders to a template for a background document to be prepared by experts. Questionnaires for patients and GPs have been reduced in size, by removing less relevant and not discriminating questions. The

[1] The latest version of the three questionnaires can be requested at http://www.nivel.eu/who

procedure for the expert consensus meeting with the national questionnaire was adapted. In future applications, stakeholder representatives will comment and discuss the provisional answers and backgrounds produced by a small group of experts. Furthermore, if possible, validity checks will be built in, for instance by additional documents inspection, direct observations and site visits. The Tool will be more tuned to national situations if additional questions can be added to the generic core of the Tool, which focus on local priorities.

Evaluation of the pilots

The effect of the Tool, both in terms of information and its policy impact, will benefit from a broad commitment of stakeholders, in addition to Ministries of Health. Implementation of the Tool can be more informative, if regions or settings are compared which contrast, for example, in the model of PC funding or provision.

Experience with the Tool has shown that the questionnaires had a wider impact than just collecting data. The activities at central, regional and local level implied information transfer, publicity and raising awareness for strengthening PC.

The pilots resulted in a basic version of the Tool, that in the future can be implemented in other countries, after country and system-specific adjustments have been made. Implementation in new countries can take place in the context of a BCA between the respective ministry of health and WHO.

Limitations

The Tool relies on self reported behaviour, rather than on direct observations or registrations, and this may bias results. Reducing positive answering tendencies was a major aim of revisions of the Tool. Also, implementation is time and labour intensive, and could be balanced by using more existing data sources as basic information input. Furthermore, additional observations, checks and interviews have been included in the procedure. Information from the Tool should serve policy discussions and actions. This effect has started in the Russian Federation and Turkey; but at the moment it is too early for a conclusion.

Conclusion

A Tool has been developed to monitor developing PC systems. First implementations were positive and first observations show it satisfies a need for information among decision makers. Implementation of the Tool also has an action component, since it raises the awareness at different levels of health care with the features and possibilities of PC.

Key messages

1. The presented Primary Care Evaluation Tool can be used for three purposes. Firstly, to evaluate the organizational model of a primary care system in terms of its governance, financing system, resources generation, and its delivery of care. Secondly, to facilitate the identification of improvement areas for policy makers to better inform the policy making process for strengthening health systems through primary care. Thirdly, by using a survey-based tool, it is not only generating findings – but we are also "motivating" for participation and self-assessment – and we are getting the service delivery level (GPs) and users (patients) actively involved.
2. In Russia, primary care was not a high priority, reflected in scarce relevant legislation. Rights of patients were not well defined. Practice information systems were outdated, but still suitable for monitoring and prevention. Premises and equipment were not up to date. Patients were positive about waiting times to see a doctor. Several policy recommendations have been made to strengthen primary care in Russia.
3. In Turkey, the implementation of family medicine was of recent date. There were shortages of primary care staff and the distribution of services was geographically uneven. Coordination of care was not optimal and quality control mechanisms were lacking. However, patients were very satisfied with the treatment by GPs. Several policy recommendations have been made to strengthen primary care in Turkey.
4. The Tool can be implemented in countries interested to evaluate their primary care system, in the context of a joint agreement between the ministry of health and the World Health Organization.

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3

The breadth of primary care:
A systematic literature review of its core dimensions

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This article was published as:
Kringos DS, Boerma WGW, Hutchinson A, Van der Zee J, Groenewegen PP. The breadth of primary care: a systematic literature review of its core dimensions. BMC HSR 2010, 10 (1):65-78.

Abstract

Background
Even though there is general agreement that primary care is the linchpin of effective health care delivery, to date no efforts have been made to systematically review the scientific evidence supporting this supposition. The aim of this study was to examine the breadth of primary care by identifying its core dimensions and to assess the evidence for their interrelations and their relevance to outcomes at (primary) health system level.

Methods
A systematic review of the primary care literature was carried out, restricted to English language journals reporting original research or systematic reviews. Studies published between 2003 and July 2008 were searched in MEDLINE, Embase, Cochrane Library, CINAHL, King's Fund Database, IDEAS Database, and EconLit.

Results
Eighty-five studies were identified. This review was able to provide insight in the complexity of primary care as a multidimensional system, by identifying ten core dimensions that constitute a primary care system. The structure of a primary care system consists of three dimensions: 1. governance; 2. economic conditions; and 3. workforce development. The primary care process is determined by four dimensions: 4. access; 5. continuity of care; 6. coordination of care; and 7. comprehensiveness of care. The outcome of a primary care system includes three dimensions: 8. quality of care; 9. efficiency care; and 10. equity in health. There is a considerable evidence base showing that primary care contributes through its dimensions to overall health system performance and health.

Conclusions
A primary care system can be defined and approached as a multidimensional system contributing to overall health system performance and health.

Introduction

The WHO World Health Report 2008, entitled 'Primary health care now more than ever', has clearly articulated the need to mobilize the production of knowledge on primary care.[1] Even though there is general agreement that primary care is the linchpin of effective health care delivery[2-5], to date no efforts have been made to systematically review the scientific evidence underlying this supposition.

The investment in primary care reforms by governments and international agencies such as the World Bank and the WHO has been substantial. In particular in countries with health care systems in transition, joint investment programmes between governments and non governmental organisations have been established.[6-8] Also from the wealth of charters, resolutions, and statements that continue to originate from governments and non-governmental organizations worldwide, it is evident that policymakers are concerned about improving the development of primary care systems.[1,9] The most recent example is Resolution WHA62.12 which was accepted in May 2009 at the 62nd World Health Assembly, which urges WHO member states to strengthen their health care systems through the values and principles of primary care.

Despite such significant reliance and investment in boosting primary care development, there is a lack of detail in documents regarding what constitutes an effective primary care system, and what its evidence base is. The available evidence for the importance of primary care is limited to the work of Barbara Starfield. Starfield's instrument examines essential 'components' of primary care on a general, aggregate (macro) level. Each component is measured by one indicator, using a scoring system ranging from 0 to 2. However, when the objective of a study is to capture the complexity behind the primary care components, more detailed, process-oriented, and explanatory indicators are needed for each component.
Moreover, so far little attention has been paid to systematically monitoring primary care development in Europe. This hinders identification and sharing of experiences and keeps the lessons learned scarce.[1,6-10]

Creating an effective primary care system is not a question of implementing one recipe since systems are context dependent. Their development is to a large part shaped by a country's historical background, welfare state, health problems, characteristics of the health care system, and societal values and beliefs. Therefore, the strength of a country's primary care

system is determined by the degree of development of a combination of core primary care dimensions in the context of its health care system.[11-12]

This study aims to examine the breadth of primary care systems in Europe by identifying their core dimensions and to assess the evidence for their interrelations and their relevance to outcomes at (primary) health system level.

Methods

Search strategy

The following electronic databases were searched between April and July 2008: MEDLINE, Embase, Cochrane Library, CINAHL, King's Fund Database, IDEAS Database, and EconLit. For practical reasons such as time and financial constraints, the search was limited to publications published between January 2003 and July 2008, written in English, and including an abstract. Clinical trials and editorials were excluded.

The search consisted of two stages. Stage 1 was restricted to reviews on the following topics: access, continuity, coordination, comprehensiveness, and context orientation. The topics were based on the frequently used definition by Starfield et al.[13] defining primary care as the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community. This search strategy was an efficient method to cover the extensive primary care literature area. An additional advantage of this method was that it let to an overview of key primary care study results that went beyond the 5 year time restriction. Stage 2 was an open search (due to a lack of reviews) on (primary) health system performance measurement and accountability. The search strategy included a combination of text words and Medical Subject Headings (MeSH) terms relating to these topics of interest, searched in titles and abstracts of studies. To focus the search, studies were only included if their 'Major Topic Headings' included a primary care keyword or one of the sub-topics of interest (access, etc.). The search strategy was devised for use in MEDLINE (accessed via PubMed) and adapted for other databases (see Additional file 12).

Methods of screening and selection criteria

The applied review strategy was guided by a manual for performing systematic literature reviews on a health services research topic.[14]

An initial screening of studies was based on titles, performed by one researcher. In the second screening, titles and abstracts were evaluated by two reviewers independently. Finally, the full texts of the studies were assessed for inclusion, also by two reviewers independently. Any discrepancies between reviewers were resolved through discussion. We aimed to identify studies describing, measuring, or explaining the (health or health system performance) impact of dimensions of primary care systems in Europe. We therefore excluded studies that focussed on: (a) low income countries (gross national income per capita 975 USD or less); (b) personal opinions; (c) small scale studies; (d) other topics than primary care system dimensions (functions, services, professionals, indicators); (e) (primary) health care functions without mentioning of implications for primary care structures, organization or performance. The final list of included studies was evaluated for their completeness by a panel of 10 primary care experts from 9 European countries (mostly senior researchers and general practitioners) who participate in the EC funded project Primary Health Care Activity Monitor for Europe (PHAMEU, see www.phameu.eu). This evaluation led to two additions to the publication list.[15,16]

Data extraction

The following information was abstracted from the studies that met our study criteria: setting, sample size, study design, study focus, primary care dimensions studied, identified associations between primary care dimensions and health system performance or health. The articles were grouped by the primary care dimension(s) they addressed.

The quality of the original articles was assessed by two reviewers. The articles were scored on their internal validity ranging from 1 (very strong internal validity established by approaches, very strong statistical power, solid explicit analysis of the introduction and context) to 4 (weaker internal validity supported by primarily non-experimental approach with or without explicit reference to intervention and context). The external validity of the articles were scored ranging from 1 (very strong external validity supported by a large study population, random sample, and explicit analysis of context and intervention factors for which generalization is possible) to 4 (weaker external validity based on weak or selective reference population, and weak intervention and context reference).

Given the strong reliance in this study on literature reviews, a clear distinction was made between evidence resulting from single studies and from literature reviews. The results section on evidence for the interrelations of dimensions and associations with outcomes, only reported evidence from literature reviews.

Results

Study characteristics

A total of 6537 publications were identified; of these 477 were duplicates. 2457 were selected for further scrutiny on the basis of screening the titles. Following a review of the abstracts, the full text of 472 publications were retrieved, and assessed on their fulfilment of the selection criteria. Among the end references of the remaining 83 studies, two additional studies were identified by the international panel of primary care experts that met the study criteria. 85 publications were finally included in the current evaluation (figure 1).

Additional file 1 provides a descriptive overview of the included studies. Thirty-five were cross-sectional studies[4,17-50] with on average a fairly strong internal validity (score 3.5) and a strong external validity (score 2.5). Twenty-five were literature reviews.[13,51-74] Thirteen were descriptive studies[16,75-84] with on average a weaker validity (score 4). Five were prospective cohort studies[85-89], four were retrospective cohort studies[15,90-92] with a fairly strong internal and external validity (score of 3.5 and 2.8 respectively). Three were cost-benefit studies[93-96] with a weaker validity (score 4).

Primary care was the subject of studies in a wide range of countries. There were forty-five single country studies.[15-17,19-22,24-31,34,35,37,38,40-46,57,59,75,77,82-93,95-97] Of these, twelve were situated in the United Kingdom, nine in the United States, four in Australia, four in Canada, three in Spain, two in the Netherlands, two in Norway, and the rest in Belgium, Croatia, Cyprus, Finland, Greece, New Zealand, Poland, Serbia and Switzerland. Sixteen international comparative primary care studies were included, covering forty-eight countries.[4,18,23,32,33,36,39,47-50,63,76,78,79,81] The remaining twenty-four studies had an unrestricted setting.[13,51-56,58,60-62,64-74,80,94]

The core dimensions of primary care

Primary care can be approached as a system consisting of three complex levels (structure, process and outcome) which each consist of several dimensions (figure 2).[98] Previous studies have shown the suitability of this approach for primary care systems.[83, 99, 100]

To identify the dimensions, each study was grouped according to the similarities in primary care features they studied on one or more levels of the primary care system. Each group of studies was then labelled with an appropriate dimension (see Additional file 1). A primary care dimension is a major subject area consisting of several primary care system features. Primary care system features are the key attributes of a primary care system dimension. A dimension (at a higher level) can consist of one or more features, depending on its complexity. It was taken into account that publications could focus on multiple primary care dimensions. Table 1 provides an overview of studies per dimension.

Figure 1: Study selection process

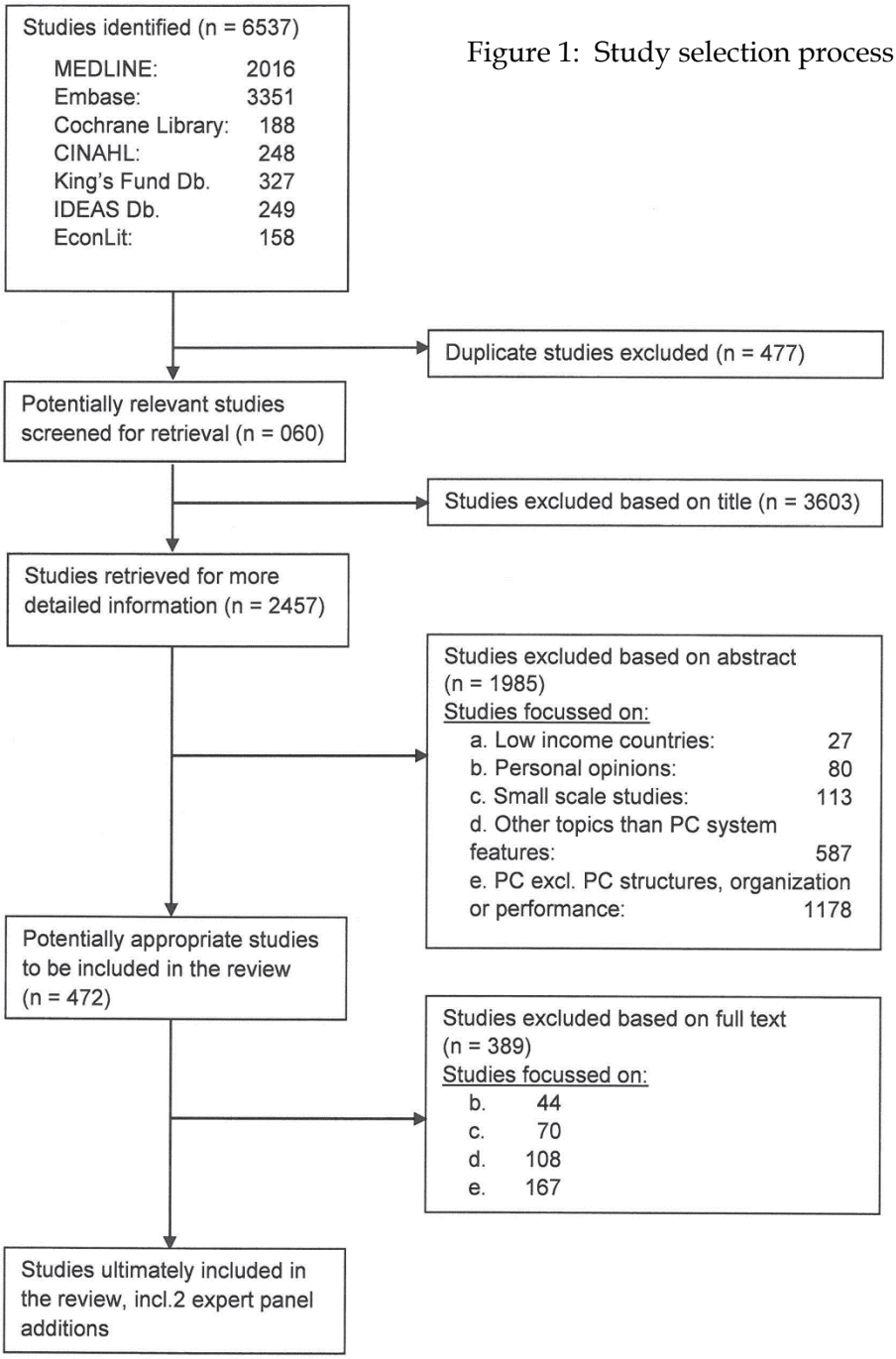


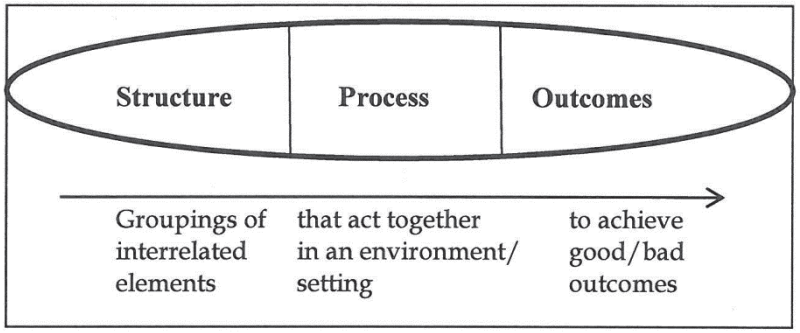
Table 1: Identified dimensions of PC systems

Dimensions of PC systems	Studied by
Level : PC Structure	
Governance of the PC system	[4,13,15,16,21,23,28,36,38,43,46,51,59,63,64,68,74,77,79,82-85,87,96,97]
Economic conditions of the PC system	[4,13,16,18,30,34,38,44,47,54,75,84,90,94]
PC Workforce development	[4,13,16,21,23,31,36,38,46,48,49,51,55,59,72,76,80-83,90]
Level: PC Process	
Access to PC services	[4,13,16,19,20,23,25,28,29,38,43,45,46,49,53,54,57,61,65,68,72,75,78,80,82,89,91,95]
Continuity of PC	[4,13,17,19,22,23,27-29,31,35,37,40,42,43,45,48,51,56,60,65-67,69-71,73,80,84,86,88]
Coordination of PC	[4,13,17,18,20,24-26,28,31-33,41-43,45,46,48,50,55,58,65,67,69,71,74,82,84,92-94]
Comprehensiveness of PC	[4,13,23,28,31,45,50,51,62,65,68,71,80,83,84]
Level: PC outcome	
Quality of PC	[4,13,16,20,23-26,28,29,32,39,51-54,62,68,72,75,80,82,91]
Efficiency of PC	[18,28,29,38,43,47,54,57,68,72,75,82,91,94]
Equity in health	[28,68,77]

The *structure* of a primary care system consists of three dimensions: 1) Governance; 2) Economic conditions; 3) Workforce development. The primary care *process* is determined by four dimensions: 4) Access; 5) Continuity of care; 6) Coordination of care; 7) Comprehensiveness of care. The *outcome* of a primary care system includes three dimensions: 8) Quality care; 9) Efficiency of care; 10) Equity in health.

The applied definitions of each of the dimensions and available evidence of their interrelations and association with (primary) health care system outcomes will be discussed separately by dimension in the next sections.

Figure 2: Framework of structure, process, outcomes



Governance of the primary care system

The governance dimension can be summarised as the vision and direction of health policy exerting influence through regulation, advocacy, collecting and using information. Eight features of primary care governance were identified:

1. *Health (care) goals:* The vision and direction of a primary care system depend on explicit health or health care goals at national level.[68,83]
2. *Policy on equity in access to primary care services:* Equity in access can be influenced by policy development and regulation on the distribution of human resources and quality of care across geographical areas, by setting policy objectives regarding the duration of waiting time for (specific) primary care services; and by assuring universal financial coverage for primary care services by a publicly accountable body.[4,13,28,46,68,82,83]
3. *(De)centralization of primary care management and service development:* This is shaped by the level (national, regional, local) at which primary care policies are determined, the degree in which standards allow for variation in primary care practices geographically, and the development of policies on community participation in primary care management and priority setting. [4,28,45,59,77,82,96]
4. *Quality management infrastructure* in primary care*:* This can consist of a number of mechanisms that need to be in place to assure adequate quality of care. These include coordination of quality management, quality assessment mechanisms, certification of providers, licensing of facilities, quality incentives, availability of quality information, availability of relevant clinical guidelines, professional competence and standardization of facility equipment.[15,16,23,28,36,38,43,49,51,59,63,64,79,83-85,87,96]
5. *Appropriate technology in primary care:* Medical technology in terms of

techniques, drugs, equipment and procedures are crucial in the delivery of primary care. Appropriate development and use can be stimulated at governmental level by developing a national policy or strategy concerning the application of ICT in primary care, and by organizing guidance to government and providers on technology appraisal on the use of new and existing medicines and treatments.[16,35,77]

6. *Patient advocacy:* This can be embedded by primary care-oriented patient organisations, and patient compliance procedures in care facilities.[28,46,83]
7. *Ownership status of primary care practices:* This provides an indication of the level of government involvement in primary care provision.[21,97]
8. *Integration of primary care in the health care system:* Integration of primary care through interdisciplinary collaboration between primary care and secondary care, and task substitution and delegation can be promoted by governmental integration programmes, or legislation.[28,59,74]

Evidence for the relevance of the primary care governance dimension

Additional file 2 provides an overview of the key findings for primary care governance and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with access, continuity, coordination, comprehensiveness, quality, equity in health, efficiency, population health, local accountability, quality of professional life, patient satisfaction, costs, and the strength of primary care systems. The evidence was based on ten single (original research) studies and one literature review.

The literature review by Starfield et al.[13] found that primary care-supportive governmental policies improve access of care, continuity and coordination of care, and the delivery of wide range of services, in particular preventive care, and achieving equity in health. Consistent governance features of strong primary care systems were pro-equity policies; universal financial coverage; and limiting patient cost sharing for primary care services.

Economic conditions of the primary care system

The economic condition of a primary care system is made up of six features:

1. *Health care funding system*: The method of financing health care for the majority of the population, such as taxes, health insurance, or private means.[4,13]
2. *Health care expenditures:* Total expenditures on health care.[16,75,84]
3. *Primary care expenditures:* Total expenditures on primary care.[16,75,84]
4. *Employment status of primary care workforce:* Such as salaried employed providers, or self-employed providers with/without contract(s) with health service or insurance.[90]
5. *Remuneration system of primary care workforce:* Such as fee-for-service payment, capitation payment, salary payment or mixed payment.[34,44,47,94]

6. *Income of primary care workforce*: Annual income of primary care workforce, also compared to specialists.[13,16,38]

Evidence for the relevance of the economic conditions of a primary care system
Additional file 3 provides an overview of the key findings for the economic conditions of a primary care system and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with access, continuity, comprehensiveness, quality, efficiency, population health, and quality of professional life. The evidence was based on seven single studies.

Primary care workforce development
The workforce development dimension can be summarised as the profile of primary care professionals that make up the primary care workforce, and the position that they take in the health care system. The following six features of this dimension were identified:

1. *Profile of primary care workforce:* The type of health care professionals that are considered to be part of the primary care workforce, and their gender balance. [4,13,31,51,55,72,76,80,82]
2. *Recognition and responsibilities:* Whether the primary care discipline is officially recognized as a separate discipline among the medical disciplines, with recognised responsebilities.[23,49,76]
3. *Education and retention:* Vocational training requirements for primary care professionals, primary care workforce supply and retention problems, and capacity planning.[4,13,36,49,81,83,90]
4. *Professional associations:* The organization of professional associations for the primary care workforce.[59]
5. *Academic status of the primary care discipline:* Reflected by academic departments of family medicine/primary care within universities.[49]
6. *Future development of the primary care workforce:* Hampering threats to the current development and expected trends in the future development of the primary care workforce, from the point of view of stakeholders.[49]

Evidence for the relevance of primary care workforce development
Additional file 4 provides an overview of the key findings for the development of the primary care workforce and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with access, continuity, comprehensiveness, and efficiency of primary care. The evidence was based on three single studies[38,48,82] and two literature reviews.[59,72]

The literature review by Wilson and Childs[72] showed that the gender balance of the primary care workforce can influence access, continuity and efficiency of care, and the scope of services delivered. Halcomb et al.[59] found that the availability of practice nurses in general practice increases the comprehensiveness of services provided.

Access to primary care services

Access to primary care services can be defined in terms of seven features:

1. *Availability of primary care services:* The volume and type of primary care services relative to population needs.[13,16,28,38,49,57,91]
2. *Geographic accessibility of primary care services:* Remoteness of services in terms of travel distance for patients.[20,91]
3. *Accommodation of accessibility:* The manner in which resources are organized to accommodate access (e.g. appointment system, after-hours care arrangements, home visits).[13,19,23,28,29,45,46,57,61,72,75,78,89,91,95]
4. *Affordability of primary care services:* Financial barriers patients experience to receive primary care services, such as co-payments and cost-sharing arrangements.[4,13,68,91]
5. *Acceptability of primary care services:* Patient satisfaction with the organization of primary care.[25,43,91]
6. *Utilisation of primary care services:* Actual consumption of primary care services.[43,57]
7. *Equality in access:* The extent to which access to primary care services is provided on the basis of health needs, without systematic differences on the basis of individual or social characteristics.[28,46,54,57]

Evidence for the relevance of access to primary care services

Additional file 5 provides an overview of the key findings for access to primary care services and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with continuity, comprehensiveness, quality, equity in health, population health, quality of professional life, patient satisfaction, costs and strength of primary care. The evidence was based on six single studies and six literature reviews.

Wilson and Childs' literature review[72] showed that the consultation length influences the continuity of care by the quality of medical recordkeeping, and patient enablement. Two reviews[13,72] found that physician supply and consultation length influence the range of services provided in primary care. The influence of access on the provided quality of care (lower hospitalization rates for ambulatory care sensitive conditions (ACSCs), prescribing quality) was confirmed by four reviews.[13,53,61,72] It was also consistently shown that access can reduce socio-economic and racial disparities in health.[13,57] Three reviews found positive associations between accessibility of care and population health.[13,53,65] Physician workload

and stress are influenced by access arrangements and consultation length.[61,72] Two reviews showed associations between patient satisfaction, and consultation length and access arrangements.[61,65] It was also shown that a greater supply of family physicians is associated with lower total costs of health services.[13] Starfield et al.[13] concluded that access was a core dimension of a strong primary care system

Continuity of primary care

The continuity of care dimension can be summarised as a hierarchy of three features:

1. *Longitudinal continuity of care:* Having a long-term relationship between primary care providers and their patients in their practice beyond specific episodes of illness or disease.[4,13,17,19,22,27,37,40,42,45,48,56,60,66,70,71,73,84,86] Some definitions also speak of personal or family continuity, where the continuity of care between a single provider or a family is stressed.[4,13,28,45,48,66,70]
2. *Informational continuity of care:* An organized collection of each patient's medical information readily available to any health care provider caring for the patient. This can be reached through medical record keeping, clinical support and referral systems.[23,28,31,35,37,45,48,51,66,67,69-71,73,88]
3. *Relational continuity of care:* The quality of the longitudinal relationship between primary care providers and patients, in terms of accommodation of patient's needs and preferences, such as communication and respect for patients.[13,28,29,37,43,45,48,66,70,73]

The existence of a consistent and coherent approach to the management of a health problem, also known as 'management continuity', is sometimes added to this list of features.[28,48,70,73] However, this shows overlap with the coordination of care dimension.

Evidence for the relevance of continuity of primary care

Additional file 6 provides an overview of the key findings for continuity of primary care and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with coordination, comprehensiveness, quality, efficiency, population health, patient satisfaction, costs, and strength of primary care. The evidence was based on six single studies and seven literature reviews.

The literature review by Cabana and Jee[56] found a positive association between continuity of care and improved care coordination. Continuity of care was consistently related to improved receipt of preventive services, as shown by four reviews.[13,56,60,73] There was also strong evidence for the relevance of continuity of care to assure receipt of high quality of care, for example in terms of decreased hospitalizations and improved early diagnoses.[13,56,60,70,73] Three reviews agreed that continuity of care is cost-effective in primary care, and ensures greater efficiency of services.[13,65,73] There was also a strong evidence-base

for the relation between continuity of care and improved patient satisfaction.[13,56,60] Starfield et al.[13] found that continuity of care is a core dimension of a strong primary care system.

Coordination of primary care

The coordination of care dimension reflects the ability of primary care providers to coordinate use of other levels of health care.[4] The following features were identified from coordination of care studies:

1. *Gatekeeping system:* The level of direct access for patients to health care providers without a referral from a primary care provider.[4,13,33,43,46,94]
2. *Primary care practice and team structure:* Such as shared practices, team premises and team size and tenure.[20,24,31,42,74]
3. *Skill-mix of primary care providers:* Diversification and substitution of primary care providers.[20,42,55,69,71,74,82,92,93]
4. *Integration of primary care-secondary care:* Care integration can be achieved through specialist outreach models and clinical protocols facilitating shared care.[25,45,46,58,67]
5. *Integration of primary care and public health:* The extent to which primary care providers collaborate with practitioners from the public health sector to provide services that influence health.[28,32]

Evidence for the relevance of coordination of primary care

Additional file 7 provides an overview of the key findings for coordination of primary care and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with access, continuity, comprehensiveness, quality, efficiency, population health, patient satisfaction, costs, and primary care strength. The evidence was based on 14 single studies and ten literature reviews.

The literature review by Chapman et al.[57] found that coordination of care through the application of skill mix can affect different features of access. Five reviews[55,67,69,71,74] found a positive association between coordination and continuity of care. Starfield et al.[13] showed that coordination of care is related to the comprehensives of primary care services, particularly preventive care and health promotion. Studies consistently found a relation between coordination of care and higher quality of care[13,58,59,67,74], and increased efficiency of care.[58,69,74] Coordination of care had mixed results with respect to health.[58,65] Stille et al.[69] found that both physicians and patient satisfaction were associated with certain features of coordination of care. Coordination of care was also associated with reduced patient costs.[67] Starfield et al.[13] found that coordination of care is positively associated with primary care strength.

Comprehensiveness of primary care services

Comprehensiveness of primary care services represents the range of services available in primary care to meet patients' health care needs.[4,13,28,45,83] A distinction can be made between:

1. *Medical equipment available:* Range of medical equipment available in primary care practices.[23,51]
2. *First contact for common health problems:* Range of health problems for which first contact care in primary care is provided.[13,45,84]
3. *Treatment and follow-up of diagnoses:* Range of diagnoses for which treatment and follow-up care is provided in primary care.[13,45,50,62,71,80,84]
4. *Medical technical procedures and preventive care:* Range of medical technical procedures and preventive care provided in primary care.[13,45,62,71,84]
5. *Mother and child and reproductive health care:* Range of mother and child and reproductive health care services provided in primary care.[45,62,71,80,84]
6. *Health promotion:* Range of health promotion activities provided in primary care.[13,31,45,62,71,80,84]

Evidence for the relevance of primary care comprehensiveness

Additional file 8 provides an overview of the key findings for primary care comprehensiveness and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with quality, efficiency, equity, population health, and primary care strength. The evidence was based on one single study[80] and four literature reviews. [13,65,68,71]

The literature study by Starfield et al.[13] consistently found that lower hospitalization rates for ACSCs are associated with a comprehensive scope of primary care services. Two reviews[13,65] found that preventive health care activities are cost-effective in the primary care setting. Early detection and prevention of progression of illness was shown to be related to reduced disparities in severity of illness.[68] The delivery of a wide range of services by primary care providers was related to improved health.[13,65,71] Comprehensiveness of care was shown to be positively associated with primary care strength.[13]

Quality of primary care

The quality of primary care resembles the degree to which health services meet the needs of patients, and standards of care.[16,28,32]

This dimension mirrors the quality of the services provided in primary care:

1. *Prescribing behaviour of primary care providers:* Such as the frequency at which providers prescribe medicine.[25,51,72]

2. *Quality of diagnosis and treatment in primary care:* For example reflected by the occurrence of avoidable hospitalization for acute ACSCs.[52,62,68,91]
3. *Quality of management of chronic diseases:* For example the prevalence of chronic diseases, receipt of treatment characteristics, and the occurrence of avoidable hospitalization for chronic ACSCs.[24-26,39,52,62,68,80]
4. *Quality of mental health care:* Such as prevalence of mental disorders, and anti-depressant medication, and continuity of mental care.[13,24-26,50]
5. *Quality of maternal and child health care:* Reflected for example by maternal mortality rates, occurrence of preventive screening for pregnant women, and infant vaccination.[4,13,62,68]
6. *Quality of health promotion:* Such as obesity, smoking or alcohol use in the population.[62,68]
7. *Quality of preventive care:* Such as the occurrence of preventable ACSCs, or cancer screening.[24,26,52,62,68,75]

Some studies also include responsiveness or patient-centeredness as a feature of quality of care, which is more subjective and dependent on patients' preferences and expectations.[28,32,54,82]

Evidence for the relevance of quality of primary care

Additional file 9 provides an overview of the key findings for quality of primary care and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with governance, access, continuity, coordination, efficiency, population health, and primary care strength. The evidence was based on two single studies and four literature reviews.

Ansari[52,53] found that reduced quality of primary care, in terms of preventable hospitalizations and ACSCs are an indication for potential inadequacies in primary care, which can be related to mal distribution of primary care resources, barriers to access, problems in continuity of care, and inefficient use of resources. There is insufficient evidence to link prescribing volume to quality of primary care, without evidence of appropriateness.[72]

Starfield et al.[13] found a positive association between quality of primary care and health, particularly for indicators in early childhood. Quality of primary care was consistently shown to be associated with primary care strength.[13]

Efficiency of primary care

Efficiency of primary care is the balance between the level of resources in the system used to treat patients to come to certain outcomes.[18,54] Primary care studies approach efficiency in different ways:

1. *Allocative and productive efficiency:* Respectively, minimizing patient's opportunity cost of time spent in treatment; maximizing the patient's outcome, minimizing the cost per patient.[28,94]
2. *Technical efficiency:* A system is technical efficient if it cannot reduce its resource use without reducing its ability to treat patients or to reach certain outcomes.[18]
3. *Efficiency in performance of primary care workforce:* Reflected by basic figures relating to the provision of care, such as number of consultations and their duration, frequency of prescription medicines (unnecessary use), and the number of new referrals to medical specialists.[38,43,47,57,72,91]

Evidence for the relevance of efficiency of primary care

Additional file 10 provides an overview of the key findings for primary care efficiency and its relation with (other) primary care dimensions and (primary) health care system outcomes. Studies found associations with economics, workforce development, access, continuity, coordination, comprehensiveness, and quality. The evidence was based on five single studies, and seven literature reviews.

The literature review by Wilson and Childs[72] found that female GPs investigate more and prescribe less than male GPs. Two reviews[13,65] agreed that continuity of care in primary care ensures greater efficiency of services. Coordination of care, in terms of team size and composition, and specialist outreach in primary care are associated with cost-effective care, and better health.[58,69,74] The reviews by Sans-Corrales et al.[65] and Starfield et al.[13] found that preventive health care activities are cost-effective in the primary care settings. Inefficient use of resources in primary care is associated with preventable hospitalizations and ACSCs.[52]

Equity in health

Equity in health seems to be a relatively small, though important area of research in primary care. It is the absence of systematic and potentially remediable differences in health status across population groups.[28,68] It is approached by the level of disparity for primary care sensitive health outcomes across population groups.[68,77]

Evidence for the relevance of equity in health

Additional file 11 provides an overview of the key findings for equity in health and its relation with (other) primary care dimensions and (primary) health care system outcomes. The evidence was limited to a literature review by Starfield[68] which found associations with governance, economics, comprehensiveness, population health, and quality. It was shown that investments in primary care produce more equity than investments in the health care system in general. A major source for many types on inequities in health lays in poor

maternal health, and infant/child infections. It was also shown that policies targeting average health are not necessarily associated with reduced inequities in health.

Discussion

Primary care as a multidimensional system

Primary care is a major research area, as shown by the high number of identified publications. A third of the studies included systematic literature reviews. This provides a sound evidence base for the reported findings. Almost half of the included studies were concerned with only single dimensions of primary care. Though these studies are useful and necessary for increasing our understanding of dimensions, they lack insight into the complexity of primary care. This review was able to provide insight in the complexity of primary care as a multidimensional system, by identifying ten core dimensions that constitute a primary care system, on three levels. The structure of primary care is determined by its governance, economic conditions, and workforce development. The process of primary care is shaped by access to primary care services, the provided scope of services (comprehensiveness), continuity, and coordination of care. A hierarchy of importance could be argued at process level. It is reasonable to assume that the primary care process starts with patients having access to the primary care system. Once a patient has the opportunity to enter the primary care process, it is important that the patient receives appropriate care (quality of care dimension). This is a question of which services are offered to patients. Consequently, the care offered to patients should be delivered in a coordinated manner, on a continuous basis. These two dimensions of coordination and continuity of care are to a great extent interrelated.

This hierarchy of process dimensions can facilitate future measurement studies of primary care process, organization or performance, for example by assigning weights to dimensions.

The outcome of a primary care system is characterized by the provided quality and efficiency of care, and the achieved equity in health. Primary care equity in health received least attention in the literature. This could be because health distribution is the result of many factors, both within and beyond the health care system.

Evidence for the relevance of primary care dimensions

There is a considerable amount of evidence showing the relevance of the governance and economic conditions of a primary care system. Both dimensions (through primary care supportive governmental policies, universal financial coverage, and low or no patient cost

sharing) are associated with the primary care process, in terms of access, continuity, coordination and comprehensiveness of care. They are also of influence for the quality and efficiency of primary care, equity in health, costs of care, and the quality of professional life of primary care providers.

Few studies focussed on the relevance of primary care workforce development. The available evidence showed associations (of gender balance and availability of nurses) with access, continuity, comprehensiveness and efficiency of primary care.

At process level, there was clear evidence that access, comprehensiveness, continuity and coordination of care are all associated with each other. Each dimension at process level is associated with quality of care, efficiency of care, health, and primary care strength. With the exception of comprehensiveness of care, they are also all associated with patient satisfaction and costs of care. Furthermore, access shows associations with equity in health, and quality in professional life of primary care providers. Comprehensiveness of care also seemed to be related to equity in health. The level of health and the distribution of health are not necessarily associated. The evidence for the relevance of equity in health could only be based on one literature review.

The evidence showed that the supply of family physicians and their geographic distribution, consultation length, type of after-hours primary care arrangement, waiting time, and targeted service provision are critical features of access that affect primary care outcomes. The duration of a patient-provider relationship and a provider's medical knowledge of a patient are influential features of continuity of care. Important features of care coordination are having a gatekeeping system (first-contact care), referral rates, task substitution, skill mix, practice size and type of specialist outreach model. For comprehensiveness of care these were the provision of a wide range of services, including particularly preventive care services. Avoidable hospitalizations and the prevalence of ambulatory care sensitive conditions are critical features of quality of care. For efficiency of primary care these were activities (time consumption) of generalists in primary care. It was shown that investments in primary care produce more equity than investments in the health care system in general. A major source for many types on inequities in health lays in poor maternal health, and infant/child infections.

Future research is particularly recommended on primary care workforce development, and possible relations with primary care structure (e.g. governance, financing) and outcome measures. Furthermore, more research is needed on strategies to improve equity in health through primary care.

Limitations

This review includes only published peer-reviewed studies, and is thus susceptible to

publication bias. It excluded hand searching, grey literature and foreign language journals, and was limited to a five year time period due to funding constraints. This may have led to relevant omissions. For reasons of efficiency, this review had a major focus on systematic reviews, assuming they provide an overview of results from other publications. As a result, original research excluded from literature reviews might have been missed. The included original studies had on average an internal validity ranging from fairly strong to weaker, and an average external validity ranging form strong to weaker. We find that the quantitative aspects of studies carried more weight in the total validity score than the qualitative aspects, while descriptive studies form a major part of the primary care research area.

The main difficulty in interpreting the included studies is the lack of proven causalities between primary care dimensions and outcome measures. The evidence is limited to associations and key findings.

Conclusions

It can be concluded that a primary care system can be defined and approached as:

a multidimensional system structured by primary care governance, economic conditions, and a primary care workforce development, facilitating access to a wide range of primary care services in a coordinated way, and on a continuous basis, by applying resources efficiently to provide high quality care, contributing to the distribution of health in the population.

Primary care contributes through its dimensions to overall health system performance and health.

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Additional Files

Additional file 1
Title: Characteristics of included studies.
Description: A description of the characteristics of the 85 included studies, including setting, sample size, study description, study focus, and primary care dimension(s) studied.

Additional file 2
Title: Primary care governance.
Description: Key findings for primary care governance and its relation with primary care dimensions and outcomes.

Additional file 3
Title: Economics of the primary care system.
Description: Key findings for economics of the primary care system and its relation with primary care dimensions and outcomes.

Additional file 4
Title: Primary care workforce development.
Description: Key findings for PC workforce development and its relation with PC dimensions and outcomes.

Additional file 5
Title: Access to primary care services.
Description: Key findings for access to primary care services and its relation with primary care dimensions and outcomes.

Additional file 6
Title: Continuity of primary care.
Description: Key findings for continuity of primary care and its relation with primary care dimensions and outcomes.

Additional file 7
Title: Coordination of primary care.
Description: Key findings for coordination of primary care and its relation with primary care dimensions and outcomes.

Additional file 8
Title: Comprehensiveness of primary care services.
Description: Key findings for comprehensiveness of primary care services and its relation with primary care dimensions and outcomes.

Additional file 9
Title: Quality of primary care.
Description: Key findings for quality of primary care services and its relation with primary care dimensions and outcomes.

Additional file 10
Title: Primary care efficiency.
Description: Key findings for primary care efficiency and its relation with primary care dimensions and outcomes.

Additional file 11
Title: Equity in health.
Description: Key findings for equity in health and its relation with primary care.

Additional file 12
Title: Search strategy
Description: The strategy used in the MEDLINE search, which was adapted for use in the other databases.

Additional file 1. Characteristics of included studies (see next pages)

Footnote additional file 1

1 GOV=Governance of the PC system; ECO=Economic conditions of the PC system; WFD=PC Workforce development; ACC=Access to PC services; COM=Comprehensiveness of PC; CON=Continuity of PC; COO=Coordination of PC; QUA=Quality of PC; EQU=Equity in health; EFF=Efficiency of PC.

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
Aakvik, Holmas [90]	2006	PC at municipality level in Norway	406 municipalities	Retrospective cohort study	The impact of employment status and access on health outcomes.	ECO, WFD
Amado, Alexandra, Dyson [51]	2008	Not restricted.	n.a.	Review of literature	Methods to compare the performance of PC providers.	GOV, WFD, COM, CON, QUA
Ansari, Barbetti, Carson et al. [91]	2003	PC and hospital care in rural and urban areas of Victoria, Australia.	All hospitals in 200 Statistical Local Areas in Victoria.	Retrospective cohort study	Analysis of Ambulatory Care Sensitive Conditions (ACSCs) as a measure of health outcomes that might vary with access to PC.	ACC, QUA
Ansari [53]	2007	Not restricted.	n.a.	Review of literature	The concept and usefulness of ACSCs as indicators for quality and access to PC.	QUA
Ansari [52]	2007	Not restricted.	n.a.	Review of literature	The meaning and concept of access in the area of PC.	ACC, QUA
Arah, Westert, Hurst et al. [54]	2006	Not restricted.	n.a.	Review of literature	The development of a conceptual framework for the OECD's Health Care Quality Indicators project.	ECO, ACC, QUA, EFF
Ashworth, Armstrong [17]	2006	General practices in the UK.	8480 general practices	Cross-sectional study	The relationship between quality of care, and social deprivation and GP practice characteristics.	COO, CON
Bhat [18]	2005	Health care delivery in 24 OECD countries.	None; macro-level data.	Cross-sectional study	The effect of institutional arrangements on efficiency of health care delivery systems.	ECO, COO, EFF
Bower, Roland, Campbell et al. [19]	2003	General practices in the UK.	21,905 patients	Cross-sectional study	Patients' views on access and continuity in general practice.	ACC, CON
Bower, Campbell, Bojke et al. [20]	2003	Primary care teams in the UK.	60 PC practices	Cross-sectional study	Relation between team structure, team climate, and the quality of care in PC.	ACC, COO, QUA
Branson, Badger, Dobbs [55]	2003	Not restricted.	n.a.	Review of literature	Skill mixes in PC that meet patients' preferences and needs.	WFD, COO
Cabana, Jee [56]	2004	Not restricted.	n.a.	Review of	The effect of sustained	CON

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
				literature	continuity of care on the quality of patient care.	
Campbell, Reeves, Kontopantelis et al. [85]	2007	PC practices in the UK.	60 PC practices	Prospective cohort study	The effect of introducing pay for performance on the quality of PC	GOV, ECO
Carmichael, Alvarez, Chaput et al. [92]	2004	A PC pharmacy system in a medical center in the Veterans Health Administration in the USA.	1300 care facilities	Retrospective cohort study	Pharmacist's contributions to drug therapy within a PC team.	COO
Chapman, Zechel, Carter et al. [57]	2004	PC in the UK.	n.a.	Review of literature	The evidence of recent innovations in service provision to improve access or equity in access to PC.	ACC
Chlabicz, Marcinowicz [21]	2005	Two PC centers in Poland.	1000 patients	Cross-sectional study	Relation between ownership status of PC and quality of care.	GOV, WFD
Christakis, Wright, Zimmerman et al. [22]	2003	A paediatric care center in the USA.	759 patients	Cross-sectional study	Relation between continuity of care and well-coordinated care.	CON
Crampton [97]	2005	PC organizations in New Zealand.	n.a.	Descriptive study	Exploration of different ownership forms, and community participation in PC.	GOV
De Maeseneer, De Prins, Gosset et al. [86]	2003	Two health insurance providers in Belgium.	4800 patients	Prospective cohort study	Relation between provider continuity in family medicine and total health care costs.	CON
Doran, Fullwood, Kontopantelis et al. [15]	2008	General practices in the UK.	7637 general practices	Retrospective cohort study	Effect of financial incentives on inequalities in the delivery of primary clinical care.	GOV
Eggli, Halfon, Chikhi et al. [75]	2006	Ambulatory health care in Switzerland.	n.a.	Descriptive study	A conceptual framework for an ambulatory health care information system.	ECO, ACC, QUA, EFF
Engels,Campbell, Dautzenberg et al. [23]	2005	General practice in Belgium, France,	21 GPs, researchers, PC experts	Cross-sectional study	A framework for general practice management made	GOV, WFD, ACC, CON, COM, QUA

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
		Germany, The Netherlands, Switzerland, UK.			up of quality indicators.	
Friedberg, Coltin, Pearson et al. [24]	2007	PC physician groups in the USA.	4358 PC providers	Cross-sectional study	Relation between group size and affiliation with networks of multiple groups with quality of care.	COO, QUA
Gené-Badia, Escaramis-Babiano, Sans-Corrales et al. [87]	2007	PC teams in Spain.	257 PC teams (3439 physicians; 3781 nurses)	Prospective cohort study	Impact of economic incentives on quality of professional life and on end-user satisfaction in PC.	GOV
Gené-Badia, Ascaso, Escaramis-Babiano et al. [25]	2007	PC teams in Spain.	213 PC teams	Cross-sectional study	Components of PC output that best serve to define the outcome of Family Medicine services.	ACC, COO, QUA
Gené-Badia, Ascaso, Escaramis-Babiano, et al. [26]	2008	PC teams in Spain.	213 PC teams	Cross-sectional study	Relation between PC team's structure and population characteristics with quality of services.	COO, QUA
Goodman, Ross, Mackenzie et al. [76]	2003	District nursing in the UK, Australia, USA, Far East.	n.a.	Descriptive study	The role and contribution of district nursing to PC.	WFD
Green, Ross, Mirzoev [77]	2007	PC in the UK.	n.a.	Descriptive study	Assessing the English health system against the Alma Ata PC principles as an evaluative framework.	GOV, EQU
Green , Fortin, Maclure et al. [88]	2006	A chronic disease management collaborative of PC physicians in Canada.	30 Community- based physicians	Prospective case study	An information system to improve and support chronic disease management in PC.	CON
Grol, Giesen, Van Uden [78]	2006	PC cooperatives in the UK, Denmark, the Netherlands.	n.a.	Descriptive study	Models used for organising after-hours care in PC.	ACC
Gruen, Weeramanthri, Knight et al. [58]	2003	Not restricted.	n.a.	Review of literature	Effectiveness of specialist outreach on health system performance and health outcomes.	COO

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
Grytten, Sorensen [27]	2007	General practice in Norway.	3355 PC physicians	Cross-sectional study	Relation of list size and per capita payment with access to PC and providers' service production.	CON
Haggerty, Burge, Levesque et al. [28]	2007	PC in Canada.	20 PC experts	Cross-sectional study	PC attributes and their operationalisation.	GOV, ACC, CON, COO, COM, QUA, EQU, EFF
Halcomb, Davidson, Daly et al. [60]	2005	General practice in Australia.	n.a.	Review of literature	The contribution of practice nurses to PC.	GOV, WFD
Hanson, Yip, Hsiao [29]	2004	Outpatient care in Cyprus.	8270 individuals	Cross-sectional study	Effect of quality on patients' choice between public and private outpatient care.	ACC, CON, QUA, EFF
Hebrang, Henigsberg, Erdeljic et al. [30]	2003	PC in Croatia.	267 general practices	Cross-sectional study	Effect of privatization on PC accessibility.	ECO
Hogg, Rowan, Russell et al.[16]	2008	PC organizations in Canada.	n.a.	Descriptive study	A framework to conceptualize the structure, organization and performance of PC.	GOV, ECO, WFD, ACC, QUA
Hollinghurst, Horrocks, Anderson et al. [93]	2006	PC in the UK.	n.a.	Economic cost analysis	The cost of PC provided by nurse practitioners compared with that of salaried GPs.	COO
Hung [31]	2007	PC practices in the USA.	124 PC practices	Cross-sectional study	The contribution of PC practices to the delivery of preventive care.	WFD, COO, CON, COM
Hutchison, Ostbye, Barnsley et al. [89]	2003	PC and emergency care in Canada.	12 walk-in clinics, 16 family practices, 13 emergency departments.	Prospective cohort study	Patient satisfaction and quality of care in walk-in clinics, family practices, emergency departments.	ACC
Jee, Cabana [60]	2006	Not restricted.	n.a.	Review of literature	Indices for continuity of care.	CON
Kerssens, Groenewegen, Sixma et al. [32]	2004	PC in 9 European countries, and Belarus, Ukraine, Israel.	5133 patients	Cross-sectional study	Patient evaluations of quality of PC.	COO, QUA
Kroneman, Maarse, Van der Zee [33]	2006	PC in 18 European countries.	36 PC experts	Cross-sectional study	Relation between direct access in PC and patient	COO

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
					satisfaction.	
Kuusela, Vainiomaki, Hinkka et al. [34]	2004	Health care centres in Finland.	81 GPs and their patients in 4 health care centres	Cross-sectional study	Comparison of the quality of GP consultations between two Finnish employment contract systems.	ECO
Lanier, Roland, Burstin et al. [79]	2003	Health care system in the UK, USA and the Netherlands.	n.a.	Descriptive study	Efforts to measure and improve doctors' performance.	GOV
Lee, Kiyu, Milman et al. [80]	2007	Not restricted.	n.a.	Descriptive study	Improving the effectiveness of PC.	WFD, ACC, CON, COM, QUA
Leibowitz, Day, Dunt et al. [61]	2003	Not restricted.	n.a.	Review of literature	The effect of different models of out-of-hours PC service on outcome.	ACC
Levaggi, Rochaix [94]	2007	Not restricted.	n.a.	Economic cost-benefit analysis	Issues that need to be addressed when access rules are being chosen or reformed, given the type of provider payment.	ECO, COO, EFF
Macinko, Starfield, Shi [4]	2003	PC in 18 wealthy OECD countries	n.a.	Cross-sectional study	The contribution of PC systems to a variety of health outcomes.	GOV, ECO, WFD, ACC, CON, COO, COM, QUA
Marshall, Klazinga, Leatherman, et al. [62]	2006	PC systems in OECD countries.	11researchers/policy makers from 9 OECD countries	Review of literature and consensus procedure	Quality indicators to assess the performance of PC systems.	COM, QUA
McDonald, Davies, Cumming et al. [81]	2007	PC in the UK, New Zealand and Australia.	n.a.	Descriptive study	The role of Divisions of General Practice and PC Partnerships in addressing Australian challenges.	WFD
McInnes, Saltman, Kidd [35]	2006	General practice in Australia.	3000 GPs	Cross-sectional study	The use of computers by GPs for clinical purposes.	GOV, CON
Meads, Iwami, Wild [36]	2005	PC in 10 countries.	n.a.	Cross-sectional study	Comparing international health systems development in relation to the advent of new PC organizations in countries with parallel 'modernizing'	GOV, WFD

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
					policies.	
Naithani, Gulliford,Morgan [37]	2006	General practices in the UK.	25 patients from 14 general practices	Cross-sectional study	Patients' experiences and values with respect to continuity in diabetes care.	CON
Nelson, Simic, Beste et al. [38]	2003	PC in Serbia	PC providers /administrators from 13 health care institutions.	Cross-sectional study	A multimodal assessment using health care in post-conflict Serbia as a model.	GOV, ECO, WFD, ACC, EFF
Nolte, Bain, McKee [39]	2006	Health systems in 29 industrialized countries.	n.a.	Cross-sectional study	Assessment of performance of health systems using diabetes as a tracer condition.	QUA
Nutting,Goodwin, Flocke et al. [40]	2003	Family practice in the USA.	4,454 outpatient visits to 138 FPs	Cross-sectional study	Association among patient and visit characteristics and continuity of care.	CON
Parchman, Noel, Lee [41]	2004	South Texas Veteran's health care system	720 patients	Cross-sectional study	The relation between attributes of PC and health care system hassles among veterans with chronic diseases.	COO
Parkerton, Smith, Straley [42]	2004	Medical clinics of single group model HMO in the USA.	194 FPs and general internists	Cross-sectional study	The influence of practice coordination and physician continuity on patient outcomes.	COO, CON
Peckham [82]	2006	PC in the UK.	n.a.	Descriptive study	The recent growth of PC in the UK, and recent developments in health care practice.	GOV, WFD, ACC, COO, QUA, EFF
Pink, Brown, Studer et al. [63]	2006	Health care systems in the UK, USA, Canada, Australia.	n.a.	Review of literature	The design and considerations of pay-for-performance programs.	GOV
Rhydderch, Edwards, Elwyn et al. [64]	2005	Not restricted.	n.a.	Review of literature	Organizational assessment in general practice and implications for quality improvement.	GOV
Sans-Corrales, Pujol-Ribera, Gene-Badia et	2006	Not restricted.	n.a.	Review of literature	Relation between the attributes of family	ACC, CON, COO, COM

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
al. [65]					medicine and the outcomes of health care provision.	
Saultz [66]	2003	Not restricted	n.a.	Review of literature	Defining and measuring interpersonal continuity of care.	CON
Schellevis, Westert, De Bakker [43]	2005	General practice in the Netherlands	104 general practices, incl. 195GPs	Cross-sectional study	The role of general practice in the Dutch health care system.	GOV, ACC, CON, COO, EFF
Scrivens [96]	2007	Health care system in the UK	n.a.	Descriptive study	The design of an effective regulatory system.	GOV
Shen, Andersen, Brook et al. [44]	2004	Family practice in the USA.	836 FPs	Cross-sectional study	Effects of payment method on clinical decision-making.	ECO
Shi, Starfield, Xu et al. [45]	2003	PC in community health centres and HMOs in the USA.	890 patients	Cross-sectional study	PC quality in Community Health Centres and Health Maintenance Organizations.	GOV, ACC, CON, COO, COM
Shield, Campbell, Rogers et al. [46]	2003	Primary mental health care in the UK.	115 panellists	Cross-sectional study	Quality indicators for PC mental health services to facilitate quality improvement.	GOV, WFD, ACC, COO
Sibthorpe, Gardner [83]	2007	PC in Australia.	n.a.	Descriptive study	A conceptual framework to underpin the potential development of a quality system for PC.	GOV, WFD, COM
Simoens, Giuffrida [47]	2004	Health care system in 18 OECD countries.	Experts in 22 OECD countries	Cross-sectional study	Policies on physician payment methods to promote an efficient deployment of physicians.	ECO, EFF
Smith, Allwright, O'Dowd [67]	2007	Not restricted.	n.a.	Review of literature	Effectiveness of shared care for chronic conditions.	CON, COO
Souliotis, Lionis [84]	2004	PC system in Greece.	n.a.	Descriptive study	Creating an integrated health care system in Greece.	GOV, ECO, CON, COO, COM
Starfield, Shi, Macinko [13]	2005	Not restricted.	n.a.	Review of literature	The contribution of PC to health systems and health.	GOV, ECO, WFD, ACC, CON, COO, COM, QUA
Starfield [68]	2006	Not restricted.	n.a.	Review of literature	Equity in health and policy recommendations.	GOV, ACC, COM, EQU, QUA, EFF

Author(s)	Year	Setting	Sample size	Study design	Study focus	PC Dimension(s) studied [1]
Stille, Jerant, Bell et al. [69]	2005	Not restricted.	n.a.	Review of literature	Coordination of care and its effectiveness.	CON, COO
Stokes, Tarrant, Mainous et al. [48]	2005	General practice in the UK, USA, and the Netherlands.	1523 GPs/FPs	Cross-sectional study	The value of personal continuity as perceived by GPs and patients in different countries.	WFD, COO, CON
Svab, Rotar Pavlic, Radic et al. [49]	2004	General practice in 14 Eastern European countries.	n.a.	Cross-sectional study	The status of family medicine in Central and Eastern European countries.	WFD, ACC
Van Servellen, Fongwa, Mockus D'Errico [70]	2006	Not restricted.	n.a.	Review of literature	Relation of continuity of care with quality care indicators.	CON
Van Uden, Ament, Voss et al. [95]	2006	Out-of-hours primary care in the Netherlands.	n.a.	Economic cost-benefit analysis	The costs of different models of GP cooperatives.	ACC
Verhaak, Brink-Muinen, Bensing et al. [50]	2004	General practice in six European countries.	190 GPs	Cross-sectional study	The effect of different health care systems on demand and supply for psychological help.	COO, COM, QUA
Wilhelmsson, Lindberg [71]	2007	Not restricted	n.a.	Review of literature	Preventive and health promotive work performed by nurses in PC.	COO, COM
Wilson, Childs [72]	2003	Not restricted	n.a.	Review of literature	Relation between consultation length, process and outcomes in general practice.	WFD, ACC, QUA, EFF
Worrall, Knight [73]	2006	Not restricted	n.a.	Review of literature	The importance of interpersonal continuity of PC for elderly people with chronic diseases.	CON
Xyrichis, Lowton [74]	2008	Not restricted	n.a.	Review of literature	Interprofessional teamworking in primary and community care.	GOV, COO

Additional file 2. Primary care governance

Key findings for PC governance and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Access

- PC supportive governmental policies are positively associated with the adequate access of care **[13]**.
- Community-governed non-profit PC practices have lower financial and cultural barriers to access, and a longer duration of visits, compared to for-profit counterparts [97].

Continuity

- PC supportive governmental policies are positively associated with the adequate continuity of care **[13]**.

Coordination

- PC supportive governmental policies are positively associated with the adequate coordination of care **[13]**.
- Community-governed non-profit PC practices are more likely to have larger and more diverse staff teams on average, compared to government-owned or for-profit PC practices [97].

Comprehensiveness

- Health policies that strengthen PC are associated with increased delivery of wide range of services, and in particular preventive care [**13**,68].
- Inadequate equipment, supplies, and medications are one of the impediments to delivery of PC services [38].
- Community-governed non-profit PC practices are more likely to serve the diverse needs of minority populations compared to government-owned or for-profit PC practices [97].

Quality

- Countries with health policies more conducive to PC practice achieve better quality of practice [68].
- Health care legislation is important to protect individuals and communities from harm, and to provide incentives for health care professionals to maintain and/or improve a certain level of service quality [96].
- Quality improvement strategies aimed at the individual doctor produce only modest effects. Professional leadership and centralised regulation of quality improvement are important in creation of a culture that values good professional practice, and might generate professional improvement more quickly than more privatised decentralised approaches [79].
- Pay for performance schemes provide financial incentives that can change professional behaviour and improve the quality of care [63,85].
- Patients receive higher quality care in geographical areas where performance measures and monitoring has been established [85].
- Private family practices provide a higher quality of care than public family practices [21].

Key findings for PC governance and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Equity in health

- Investments in PC produce more equity than investments in the health system in general [68].
- Policies directed at infants and children have much greater long term effect than policies directed at older individuals or populations, because of the influence of early health on later health [68].
- The effect of PC on improving equity on health depends on the availability of information about the patient needs in the various areas in which PC practices are located **[13]**.
- Financial incentive schemes targeting specific diseases have the potential to make a substantial contribution to the reduction of inequalities in the delivery of clinical care where inequalities are related to area deprivation [15].

Population health

- Health policies that strengthen PC are associated with better levels of health [68].

Local accountability

- ·Decentralization of power with the health care decision making system away from central government to local service delivery creates greater local accountability of services to local populations [96].

Quality of professional life

- Financial incentives related to annual quality targets may increase physicians' perception of burden and it may have a negative impact on consumer satisfaction. Incentives on long-term professional development are related to an increase in professionals' perception of support from the management structure [87].

Costs

- Rapidly rising costs may result, at least in part, from performance bonuses for physicians who are not returning a sufficient benefit in terms of outcomes and efficiency [63].

Strength of PC

- The most consistent policy characteristics in countries with a strong PC system is the government's attempts to distribute resources equitably, universal financial coverage, and low or no patient cost sharing for PC services **[13]**.

Additional file 3. Economics of the primary care system

Key findings for Economics of the PC system and its relation with PC dimensions and outcomes

Access

- Employed general practitioners (GPs) have weaker incentives to see patients when compared with contracted GPs, resulting in poorer access to care [90].
- Providers adjust the level of offered accessibility benefits according to the intensity of market competitiveness. PC providers with a capitation based contract with a national health insurance institution extend accessibility by structural improvements that are not time consuming such as offering timely appointments, scheduled visits by telephone and providing telephone advice outside working hours [30]. However, time-based (salaried) remunerated GPs provide consultations with a longer duration than capitation-based GPs do [34].

Continuity

- Capitation based group patients receive an appointment with the preferred doctor more often than patients in a time-based (salaried) group [34].

Comprehensiveness

- Poor financial investment and discouraging worker salaries are one of the impediments to delivery of PC [38].

Quality

Employed GPs provide poorer quality of care compared with contracted GPs [90].

Capitation based GPs rate their work quality higher than time-based (salaried) remunerated GPs. There are no differences between the groups in the patients' opinions on the quality of care [34].

Physicians on average tend to perform less discretionary care under capitated arrangements compared with traditional FFS. Treatment options that offer large, undeniable benefits to the patient are not affected by payment method. Treatments offering relatively small or questionable benefits to the patient are affected by payment method [44].

Efficiency

- Institutional arrangements have an impact on the efficiency of the health care system. Countries in which physicians are paid wages and salaries or capitation have higher efficiency than fee-for-service countries [18].
- Fee for service (FFS) payment creates the incentive for physicians to stimulate the provision of medical services, leading to high prices, high rates of unnecessary service use and rising expenditures, but lower rates of referral and volume of prescriptions. Under capitation or salary, physicians have an incentive to maximise their income by under-providing services by selecting or referring of patients (on their health status) or prescription of drugs. Salary payment is associated with fewer tests and referrals than both fee for service and capitation. There are also fewer patient procedures per patient, lower throughput of patients per physician, longer consultations and more preventive care when compared with FFS alone. Flexible blended payment methods based on the combination of a fixed component, through either capitation or salary, and a variable component, through FFS, may produce a desirable mix of incentives [47].

Key findings for Economics of the PC system and its relation with PC dimensions and outcomes
Population health
• An increased number of self-employed contract GPs relatively to GPs employed by the municipality on fixed salary contracts, has a positive effect on mortality rates [90].
Quality of professional life
• Physicians feel more discomfort or distressed when making clinical decisions under capitation than under FFS payment arrangements [44].

Additional file 4. Primary care workforce development

Key findings for PC workforce development and its relation with PC dimensions and outcomes *(literature review references are in bold)*
Access
• Female GPs have longer consultation compared to male GPs **[72]**.
Continuity
• Female GPs are more likely to engage in 'active and passive counselling' and place a higher value on personal continuity compared to male GPs [48,**72**].
• The wider fragmentation of range of PC providers threatens the continuity of care. A response might be the development of patient held records where patients maintain their own continuity of care [82].
Comprehensiveness
• Female GPs offer more lifestyle advice compared to male GPs **[72]**.
• An increase in practice nursing availability in general practice has been associated with the enhancement of available services in general practice, such as chronic illness management, wound care and health promotion **[59]**.
• Few opportunities for professional development, and little emphasis on or respect for PC are one of the impediments to delivery of primary care [38].
Efficiency
• Female GPs investigate more and prescribe less compared to male GPs **[72]**.

Additional file 5. Access to primary care services

Key findings for Access to PC services and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Continuity

- Faster GPs (average consultation length of less than 7 minutes) record sparser medical histories. Slower GPs arrange follow-up consultations in fewer consultations than faster GPs. Re-consultation rates within four weeks of the index consultation are also lower.**[72]**.
- Patient enablement and centeredness are positively correlated with average consultation length **[72]**.

Comprehensiveness

- A greater supply of family physicians is associated with an earlier detection of breast cancer, colon cancer, cervical cancer, and melanoma. Approaches to preventive care are more generic and result in more improvement in patients' health status than is the case in specialty-oriented practices. Having a good PC source is the major determinant of receiving even disease-focused preventive care, consisting of blood pressure screening, clinical breast exams, mammograms, and cervical smear tests **[13]**.
- GPs with an average consultation length of less than 7 minutes are less likely than slower to recognise and deal with long-term problems, and psychosocial problems, even when controlled for individual consultation length; and engage less in preventive care and health promotion **[72]**.
- There is evidence that preventive delivery in specialty practice is inequitable in that it is available preferentially to the more socioeconomically advantaged (at least in Belgium) [68].

Quality

- Lack of timely and effective care may have a significant impact on rates of admissions for Ambulatory Care Sensitive Conditions (ACSCs), especially in rural areas, and in lower socioeconomic groups **[53]**.
- Geographic areas with more family and general practitioners, have lower hospitalization rates for ACSCs, incl. diabetes mellitus, hypertension, and pneumonia **[13]**.
- ·Deputizing doctors are likely to prescribe less appropriately than doctors from practice-based or co-operative services. GPs prescribe more appropriately than junior emergency medical staff **[61]**.
- ·The number of patients seen per hour is positively associated with prescribing volume, and prescribing quality is positively associated with longer consultation length **[72]**.

Equity in health

- New contractual arrangements or diversifying modes of provision in PC can enable service provision in formerly under-served areas and populations. Also, organisation flexibility and targeting services around locally defined needs appears to be effective in improving access for marginalised groups **[57]**.
- An adequate supply of PC providers reduces disparities in health across racial and socioeconomic groups **[13]**.

Key findings for Access to PC services and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Population health

- Greater supply of PC providers are consistently associated with better health outcomes such as lower rates of all-cause, heart disease, and cancer mortalities, even in the presence of income inequality and other health determinants [**13**,80]. In contrast, a greater supply of specialty physicians is associated with higher mortality **[13]**.
- Accessibility of care and consultation time are associated with improvements in the level of population health **[65]**.
- The removal of disparities in health care access between higher and local socio-economic groups through targeted public health and health services interventions will have the potential to improve health outcomes in the population and reduce demand on hospital services **[53]**.

Quality of professional life

- GPs with a high patient-centeredness score have longer average consultations and are more stressed after a higher proportion of these than low scoring doctors. Stress scores are particularly high among slow doctors with high booking rates. No studies examined whether there is a direct association between stress and average consultation length **[72]**.
- Models of out-of-hours care have an impact on medical workload. A telephone triage and advice service for after-hours PC may reduce the medical workload. Deputizing services increase immediate medical workload because of the low use of telephone advice and the high home visiting rate. Co-operatives, which use telephone triage and PC centres and have low home visiting rate, reduce immediate medical workload. GPs working in emergency departments may reduce the subsequent medical workload **[61]**.

Patient satisfaction

- Patients find satisfactory standards of access next day appointments with GPs and a 6-10 minute wait for consultation to begin [19].
- User satisfaction is positively related to consultation time **[65]**.
- Studies consistently showed patient dissatisfaction with telephone consultations **[61]**.
- Both family practices and walk-in clinics are perceived more positively than emergency departments by patients with regard to perceptions of patient-centred communication, perceptions of the physicians attitude, and delay in the waiting room [89].

Key findings for Access to PC services and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Costs

- The supply of PC providers is associated with lower total costs of health services, possibly partly because of better preventive care and lower hospitalization rates. In contrast, the supply of specialists is associated with more spending and poorer care **[13]**.
- PC practices using telephone triage, advice centres or PC cooperatives to facilitate out-of-hours care are associated with lighter workloads for doctors, fewer face-to-face contacts, and fewer house calls, all connected to fewer costs [78].
- The costs of PC are more dependent on the size of the population the cooperative covers, than on the way the GP cooperative is organised, i.e. separated versus integrated (close to a hospital emergency department) [95].

Strength of PC

- The most consistent policy characteristics in countries with a strong PC system are the government's attempts to distribute resources equitably, universal financial coverage that was either under the aegis of the government or regulated by the government, and low or no patient cost sharing for PC services **[13]**.

Additional file 6. Continuity of primary care

Key findings for continuity of PC and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Coordination

- There a positive association between continuity of care and improved care coordination [22,**56**].
- A register of appropriate patients increases consultation follow-up and sufficient assessments [71].

Comprehensiveness

- Continuity of care improves receipt of preventive services, even after controlling for patients' age, race, health, and insurance [**13,56,60,73**,80].

Quality

- The more clinically complex or vulnerable (chronically ill, extremes of age, less education) the patient is or becomes, the higher the likelihood that a continuity-enriched program is essential to achieve quality care [40,**70**].
- Continuity of care improves quality of care by decreasing hospitalizations, decreasing emergency department use, improving patient compliance to treatment, fewer errors in diagnosis and treatment, reduced resource consumption, and improving receipt of preventive services [**13,56,60,70,73**,80,86].

Key findings for continuity of PC and its relation with PC dimensions and outcomes *(literature review references are in bold)*

- Continuity of care has been consistently documented to improve quality of care for patients with chronic conditions through improved early diagnosis such as asthma and diabetes [**56,70**].
- The length of the patient-provider relationship has been associated with accumulated knowledge of the patient from the physician, and trust in the physician. However, it is not always clear which comes first, continuity of care or quality outcomes **[70]**.
- Previous knowledge of a patient, which reflects good continuity of care, increases the doctor's ability of recognizing psychosocial problems influencing the patient's health **[13]**.
- Very short-term relationships with physicians are associated with poor outcomes, such as high rehospitalisation rates. At least two years of a relationship are generally required for patients and practitioners to get to know each other well enough to provide optimal person-focused care **[13]**.
- A freely chosen PC provider provides better assurance of a good relationship than does assigning a practitioner [13].
- The evidence is strong regarding the benefits of an ongoing relationship with a particular provider rather than with a particular place or no place at all **[13]**.
- Older people with regular physicians are less likely to be taking many prescribed drugs [80].

Efficiency

- Continuity of care has shown to be cost-effective in PC, and ensures greater efficiency of services in time saved in the consultation, less use of laboratory tests, and fewer health care expenditures **[13,65]**.

Population health

- There a positive association between continuity of care and the level of population health [4,56,65]. Continuity of care consistently shows health benefits such as reduced 5-year mortality rates; reduced deaths associated with hypertension, stroke, and lung cancer; and lower infant mortality [4].
- Patients who lack continuity of care have more sickness [86].

Patient satisfaction

- There is a positive association between continuity of care and patient satisfaction **[13,56,60]**.

Costs

- Continuity of care in children has been demonstrated to reduce later use of health care services, and to reduce health care costs **[73]**.
- Provider continuity is associated with a lower total health care costs after controlling for a wide variety of socio-demographic and other patient characteristics, including morbidity [86].

Strength of PC

- Continuity of care is a key aspect of a strong PC system [**13**,4].

Additional file 7. Coordination of primary care

Key findings for coordination of PC and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Access

- Substituting nurses for GPs, or use of telephone for face-to-face consultations may be effective in improving access where GP recruitment and retention is problematic. However, maximising the use of skill mix does not necessarily improve access, as it involves trade-offs between different sorts of access **[57]**.

Continuity

- The team size must be kept under control, otherwise communication between professionals will become more difficult **[69]**.
- Team premises (team locations) are important because they enhance information transaction, facilitate communication, and increase personal familiarity. In contrast, team members having separate bases or buildings can result in them being less integrated with the team, limiting team functioning and effectiveness **[74]**.
- Full-time and part-time status is a significant predictor for personal continuity of care, with full-time GPs having more positive attitudes to personal continuity [48].
- Skill mix could be viewed as forming a barrier between doctor and patient, but personal lists and teams where practices are divided into smaller units with shared support may help **[55]**.
- A liaison nurse was found to be of value in improving communication between the hospital and general practice. A nurse in this position is also effective in ensuring that patients visit nurse-led follow-up general practices **[71]**.
- Shared care improved the recording of risk factors **[67]**.

Comprehensiveness

- A gatekeeping system with fixed list is favourable for a broad (accessible) pathway to mental health care in PC [50].
- First-contact access and coordinated care are associated with patients' being up to date on screening, immunization, and health habit-counselling services, after controlling for patients' age, race, health, and insurance **[13]**.
- When referral rates vary widely, both across countries and within them, this suggests either differences in population needs or differences in the comprehensiveness of PC services **[13]**.
- Both medical clinic size and shared practice are associated with higher rates of cancer screening and diabetic management examinations [42].
- Nurse practitioners and allied health professionals perform services that address health risk behaviours more often than physicians [31].

Quality

- Substitution of the GP by practice nursing in some interdisciplinary tasks helps general practices to reach population-based targets for screening items such as immunisations and health screening **[59]**.

Key findings for coordination of PC and its relation with PC dimensions and outcomes *(literature review references are in bold)*

- *(Quality)* Delegation of screening, assessment and pathology tasks to the practice nurse releases the GP to spend more time with those clients who have greater complex medical needs **[59]**.
- PC providers provide at least equal high quality of clinical care as specialists in caring for specific common diseases, and they do better overall when the measures of quality are generic. For less common conditions, the care provided by PC providers with appropriate backup from specialists may be the best. For rare conditions, appropriate specialist care is undoubtedly important, as PC providers would not see such conditions frequently enough to maintain competence in managing them **[13]**.
- Specialist interventions are more appropriate (less postoperative complications and episodes) when patients are referred from PC in stead of self-referral **[13]**.
- PC team climate (in terms of decision making environment; support for innovation; team discussion; task orientation; clarity of objectives) is positively associated with superior clinical care in diabetes. Team climate is better in single handed practices than in partnerships [20].
- Group practices and teams with a greater occupational diversity are independently associated with a higher quality of care [17,**74**].
- Physician group affiliation with networks of multiple groups is associated with higher quality. Small groups (practice size) may gain more from network affiliation than larger groups, because they may gain access to quality management expertise, and information technology tools, as well as guideline and decision support tools [24]
- Evidence-based practice is often more intensive in teaching teams, in more experienced teams and in those attending population with a lower socio-economic level [26].
- Simple 'shifted outpatients' styles of specialist outreach improve access to high quality care, but there is no evidence of impact on health outcomes **[58]**.
- Specialist outreach as part of more complex multifaceted interventions involving collaboration with PC (incl. case-conferences, joint consultations, seminars and education sessions) is associated with improved guideline-consistent care (reduced duplication and unnecessary referrals and investigations), and less use of inpatient services, and improved health outcomes **[58]**.
- Shared care improves appropriate prescribing and medication adherence and use providing longer term benefits for those at an earlier stage in the disease process **[67]**.

Efficiency

- Health care systems in which PC physicians act as gatekeeper are found to be more efficient than systems without gatekeepers [18].
- When providers behave as 'perfect agents' to patients; no matter the type of provider payment (information symmetry), gatekeeping always dominates in terms of minimizing financial cost since specialist care is only used when needed. When patients have different time preferences under information symmetry, efficiency can be enhanced in gatekeeping by giving the patient the option to seek a specialist directly, provided he/she bears the extra cost. Under information asymmetry (patient information is imperfect), direct access is shown to be more cost effective. This is due to patients' ability to constrain the providers' opportunistic behaviour by 'voting with their feet' [94].

Key findings for coordination of PC and its relation with PC dimensions and outcomes *(literature review references are in bold)*

- Larger teams have lower levels of participation compared with smaller sized teams, which is correlated with team effectiveness. Teams with a high proportion of full-time staff and those who have been working together for longer as a team, are also more effective **[74]**.
- Specialist outreach in PC usually requires additional investment on the part of providers and health care systems when compared with hospital based care, although the additional costs of outreach may be balanced by improved health outcomes **[58]**.
- Close involvement of generalist clinicians in specialty care leads to more cost-effective care and better health. The generalist should therefore be involved in the care process as more than just a gatekeeper to specialty care **[69]**.

Population health

- PC practice coordination is positively associated with patient outcomes [42].
- Specialist outreach as part of more complex multifaceted interventions involving collaboration with PC is associated with improved health outcomes **[58]**.
- The coordination of care has mixed results with respect to health outcomes **[65]**.

Patient satisfaction

- If patients have freedom of choice for the type of HC provider, they evaluate the organizational aspects of GP-services more positively. The existence of a gatekeeping system does not influence patient's judgements about the quality of the actual care provided by their GP [33].
- PC team climate (in terms of decision making environment; support for innovation; team discussion; task orientation; clarity of objectives) is positively associated with patient evaluations of practice [20].
- Nurse practitioner consultations (task substitution) are associated with improved patient satisfaction [93].
- Many studies in adults and children report that patients and clinicians prefer shared generalist-specialist care **[69]**
- PC coordination of care is positively associated with patient satisfaction, particularly for patients with multiple chronic conditions [41].

Costs

- Task substitution, by employing a nurse practitioner (NP) in PC is likely to cost much the same (or slightly more) as employing a salaried GP. NPs have a higher number of return consultations compared to GPs. There is considerable variability of qualifications and experience of NPs, which suggests that skill-mix decisions should depend on the full range of roles and responsibilities rather than cost [93].
- Patient direct costs are lower when comparing shared care with hospital outpatient care, mainly due to reduced travel costs **[67]**.

PC strength

- Coordination of care is positively associated with PC strength [4,**13**].

Additional file 8. Comprehensiveness of primary care services

Key findings for comprehensiveness of PC services and its relation with PC dimensions and outcomes *(literature review references are in bold)*
Quality
• Studies consistently found that lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with the receipt of a comprehensive scope of PC services **[13]**.
Efficiency
• The wider the range of services provided by PC providers the better are health outcomes, at lower costs [80].
• Preventive health care activities are cost-effective in the PC setting **[13,65]**.
Equity in health
• Effective health services directed at early detection and prevention of progression are likely to have a considerable impact in reducing disparities in severity of illness, whereas interventions outside the health sector are likely to have relatively greater impact on occurrence of illness **[68]**.
Population health
• PC can influence birth outcomes by essential interventions such as antenatal care, professional care of deliveries, well baby control, immunizations, and common disease treatment [80].
• The provision of a wide range of services provided by PC providers is associated with better objective, as well as self-reported health outcomes [**13**,80].
• Preventive health care activities (particularly when they are not related to any one disease or organ system) are associated with improvements in the level of population health [**13,65,71**].
Strength of PC
• Comprehensiveness of PC is positively associated with PC strength in a country [4,**13**].

Additional file 9. Quality of primary care

Key findings for quality of PC services and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Governance

- Preventable hospitalizations and ambulatory care sensitive conditions are an indication of potential inadequacies in PC services, which can be related to mal distribution of PC resources **[52,53]**.

Access

- Preventable hospitalizations and ACSCs are an indication for potential inadequacies in PC services, which can be related to the existence of barriers to accessing PC services **[52,53]**.

Continuity

- Preventable hospitalizations and ACSCs are an indication for potential inadequacies in PC services, which can be related to problems in continuity of care **[52]**.

Coordination

- PC teams that rely on good technical quality (such as the % of hypertensive drugs prescribed) do not necessarily have good outputs in terms of inter-personal relationships with patients, or with respect to team coordination [25].

Efficiency

- Although there is a view that some prescribing in general practice is unnecessary, crude rates are difficult to link to quality without evidence of appropriateness. Similarly, investigation, referral, and re-consultation rates may conceal differences that really matter, such as appropriateness of these actions **[72]**.
- Preventable hospitalizations and ACSCs are an indication for potential inadequacies in PC services, which can be related to inefficient use of resources **[52]**.

Population health

- The conditions bronchitis, asthma emphysema ischemic heart disease pneumonia influenza are particularly sensitive to PC since their population prevalence and severity depend on prevention, early diagnosis, continuous care, and coordination among different levels of care [4].
- Countries with a low quality of PC have poorer health outcomes, most notably for indicators in early childhood, particularly low birth weight and postneonatal mortality, indicating the focus of PC on prevention and early identification of disease [4,**13**].

Strength of PC

- Studies consistently show a relationship between PC strength and quality of care (in terms of health outcomes studied), regardless of the year, level of analysis, or type of outcome measured [4,**13**].

Additional file 10. Primary care efficiency

Key findings for PC efficiency and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Economics of the PC system

- Countries in which physicians are paid wages and salaries or capitation have higher efficiency than fee-for-service countries [18].
- Fee for service (FFS) payment creates the incentive for physicians to stimulate the provision of medical services, leading to high prices, high rates of unnecessary service use and rising expenditures, but lower rates of referral and volume of prescriptions. Under capitation or salary, physicians have an incentive to maximise their income by under-providing services by selecting or referring of patients (on their health status) or prescription of drugs. Salary payment is associated with fewer tests and referrals than both fee for service and capitation. There are also fewer patient procedures per patient, lower throughput of patients per physician, longer consultations and more preventive care when compared with FFS alone. Flexible blended payment methods based on the combination of a fixed component, through either capitation or salary, and a variable component, through FFS, may produce a desirable mix of incentives [47].

Workforce development

- Female GPs investigate more and prescribe less compared to male GPs **[72]**.

Access

- Efficiency in general practice can be achieved by a decrease in the number of home visits, and by a higher number of telephone contacts. However, when there is still a high variation between practices in this respect, this indicates that there is still room for more efficient practice organization [43].

Continuity

- Continuity of care has shown to be cost-effective in PC, and ensures greater efficiency of services in time saved in the consultation, less use of laboratory tests, and fewer health care expenditures **[13,65]**.

Coordination

- Health care systems in which PC physicians act as gatekeeper are found to be more efficient than systems without gatekeepers [18].
- ·When providers behave as perfect agents to patients; no matter the type of provider payment (information symmetry), gatekeeping always dominates in terms of minimizing financial cost since specialist care is only used when needed. Under information asymmetry (patient information is imperfect), direct access is shown to be more cost effective [94].
- Larger teams have lower levels of participation compared with smaller sized teams, which is correlated with team effectiveness. Teams with a high proportion of full-time staff and those who have been working together for longer as a team, are also more effective **[74]**.
- Specialist outreach in PC usually requires additional investment on the part of providers and health care systems when compared with hospital based care, although, the additional costs of outreach may be balanced by improved health outcomes **[58]**.

(Coordination)

- Close involvement of generalist clinicians in specialty care leads to more cost-effective care and better health. The generalist should therefore be involved in the care process as more than just a gatekeeper to specialty care **[69]**.
- Efficiency in general practice can be achieved by delegating more tasks to the practice support staff. However, when there is still a high variation between practices in this respect, this indicates that there is still room for more efficient practice organization [43].

Comprehensiveness

- The extent to which a wide range of services are provided by PC providers is associated with better health outcomes at lower costs [80].
- Preventive health care activities are cost-effective in the PC setting **[13,65]**.
- When referral rates vary widely, both across countries and within them, this suggests either differences in population needs or differences in the comprehensiveness of PC services [43].

Quality

- Although there is a view that some prescribing in general practice is unnecessary, crude rates are difficult to link to quality without evidence of appropriateness. Similarly, investigation, referral, and re-consultation rates may conceal differences that really matter, such as appropriateness of these actions **[72]**.
- Preventable hospitalizations and ACSCs are an indication for potential inadequacies in PC services, which can be related to inefficient use of resources **[52]**.

Additional file 11. Equity in health

Key findings for equity in health and its relation with PC dimensions and outcomes *(literature review references are in bold)*

Governance

- Policy decisions to improve average levels of health will not necessarily improve equity in health and may even decrease it. Moreover, policy to increase equity in health and resulting in both relative and absolute changes may have little practical impact because of the frequency of the problem addressed is rare in the population **[68]**.

Economics

- Investments in PC produce more equity than investments in the health system in general **[68]**.
- The influence of income inequality on health in particular areas is widely debated. Consensus is emerging that it is place specific and more salient as an influence on health in the US than in most other industrialized countries **[68]**.

Comprehensiveness

- The basis for many types on inequities in health lies in early life. The two main areas of influence involve poorer maternal health prior to pregnancy and infant/child infections, both of which are more common in socially disadvantaged populations. These early childhood manifestations of poor health have correlates in health at older ages. Social disadvantage is damaging at any stage in life but is especially harmful when experienced early in life. Thus, other things being equal, priority should be given to effective interventions at younger ages **[68]**.

Population health

- Improving average health is not necessarily associated with better distribution of health (equity). On the whole, the areas in which inequities in health primarily exist are in common manifestations of ill health and in the severity and progression of common illnesses **[68]**.

Quality

- There is a clear role for appropriate health services in reducing inequities in health, for example, by attacking severity of illness and preventing co-morbidity **[68]**.

Additional file 12. Search strategy

The strategy used in the MEDLINE search is given below. This was adapted for use in the other databases.

Search (((((((("Review "[Publication Type:noexp] OR "Review Literature as Topic"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND ((((("Primary Health Care"[Mesh:noexp] OR "Family Practice"[Mesh]) OR "Physicians, Family"[Mesh]) OR "Ambulatory Care"[Mesh:noexp]) OR "Ambulatory Care Facilities"[Mesh:noexp]) OR "Home Care Services"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) AND ((((((((((("Health Services Accessibility"[Majr:noexp] OR "Continuity of Patient Care"[Majr]) OR "Delivery of Health Care"[Majr:noexp]) OR "Delivery of Health Care, Integrated"[Majr:noexp]) OR "Comprehensive Health Care"[Majr:noexp]) OR "Professional Role"[Majr]) OR "Patient-Centered Care"[Majr]) OR "Social Environment"[Majr]) OR "Social Conditions"[Majr:noexp]) OR "Family Health"[Majr] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR ((coordinat* AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (((((("Review "[Publication Type:noexp] OR "Review Literature as Topic"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND ((((("Primary Health Care"[Majr:noexp] OR "Family Practice"[Majr]) OR "Physicians, Family"[Majr]) OR "Ambulatory Care"[Majr:noexp]) OR "Ambulatory Care Facilities"[Majr:noexp]) OR "Home Care Services"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) AND ((((((((((("Health Services Accessibility"[Mesh:noexp] OR "Continuity of Patient Care"[Mesh]) OR "Delivery of Health Care"[Mesh:noexp]) OR "Delivery of Health Care, Integrated"[Mesh:noexp]) OR "Comprehensive Health Care"[Mesh:noexp]) OR "Professional Role"[Mesh]) OR "Patient-Centered Care"[Mesh]) OR "Social Environment"[Mesh]) OR "Social Conditions"[Mesh:noexp]) OR "Family Health"[Mesh] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR ((coordinat* AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR ((((((((((((((("Primary Health Care"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR (("Family Practice"[Mesh] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Physicians, Family"[Mesh] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Ambulatory Care"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Ambulatory Care Facilities"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Home Care Services"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Delivery of Health Care"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("National Health Programs"[Mesh:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Health Care Sector"[Mesh] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND (((((((("Systems Analysis"[Majr:noexp] OR "Models, Organizational"[Majr]) OR "Outcome and

Process Assessment (Health Care)"[Majr:noexp]) OR "Outcome Assessment (Health Care)"[Majr:noexp]) OR "Process Assessment (Health Care)"[Majr]) OR "Benchmarking"[Majr]) OR "Quality Indicators, Health Care"[Majr:noexp]) OR "Social Responsibility"[Majr] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR ((((((((((("Primary Health Care"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) OR (("Family Practice"[Majr] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR (("Physicians, Family"[Majr] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR (("Ambulatory Care"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))))) OR (("Ambulatory Care Facilities"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Home Care Services"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Delivery of Health Care"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("National Health Programs"[Majr:noexp] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) OR (("Health Care Sector"[Majr] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND ((((((((("Systems Analysis"[Mesh:noexp] OR "Models, Organizational"[Mesh]) OR "Outcome and Process Assessment (Health Care)"[Mesh:noexp]) OR "Outcome Assessment (Health Care)"[Mesh:noexp]) OR "Process Assessment (Health Care)"[Mesh]) OR "Benchmarking"[Mesh]) OR "Quality Indicators, Health Care"[Mesh:noexp]) OR "Social Responsibility"[Mesh] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh])))))) NOT ("Clinical Trial "[Publication Type] AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))) AND (("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]))) AND (hasabstract[text] AND ("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]) AND (English[lang])) AND (hasabstract[text] AND ("2003"[PDat] : "2008"[PDat]) AND (Humans[Mesh]) AND (English[lang]))

4

The European Primary Care Monitor:
structure, process and outcome indicators

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This article was published as:
Kringos DS, Boerma WGW, Bourgueil Y, Cartier T, Hasvold T, Hutchinson A, Lember M, Oleszczyk M, Rotar Pavlic D, Svab I, Tedeschi P, Wilson A, Windak A, Dedeu T and Wilm S. The European Primary Care Monitor: structure, process and outcome indicators. BMC Family Practice 2010,11:81-89.

Abstract

Background
Scientific research has provided evidence on benefits of well developed primary care systems. The relevance of some of this research for the European situation is limited.
There is currently a lack of up to date comprehensive and comparable information on variation in development of primary care, and a lack of knowledge of structures and strategies conducive to strengthening primary care in Europe. The EC funded project Primary Health Care Activity Monitor for Europe (PHAMEU) aims to fill this gap by developing a Primary Care Monitoring System (PC Monitor) for application in 31 European countries. This article describes the development of the indicators of the PC Monitor, which will make it possible to create an alternative model for holistic analyses of primary care.

Methods
A systematic review of the primary care literature published between 2003 and July 2008 was carried out. This resulted in an overview of: (1) the dimensions of primary care and their relevance to outcomes at (primary) health system level; (2) essential features per dimension; (3) applied indicators to measure the features of primary care dimensions. The indicators were evaluated by the project team against criteria of relevance, precision, flexibility, and discriminating power. The resulting indicator set was evaluated on its suitability for Europe-wide comparison of primary care systems by a panel of primary care experts from various European countries (representing a variety of primary care systems).

Results
The developed PC Monitor approaches primary care in Europe as a multidimensional concept. It describes the key dimensions of primary care systems at three levels: structure, process, and outcome level. On structure level, it includes indicators for governance, economic conditions, and workforce development. On process level, indicators describe access, comprehensiveness, continuity, and coordination of primary care services. On outcome level, indicators reflect the quality, and efficiency of primary care.

Conclusions
A standardized instrument for describing and comparing primary care systems has been developed based on scientific evidence and consensus among an international panel of experts, which will be tested to all configurations of primary care in Europe, intended for producing comparable information. Widespread use of the instrument has the potential to improve the understanding of primary care delivery in different national contexts and thus to create opportunities for better decision making.

Introduction

A need for up-to-date comparable primary care information

Primary care is the first level of professional care in Europe where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied. Therefore primary care services should be available close to where people are living with no obstacles to access. Primary care is generalist care, focused on the person with a felt health problem in his or her social context, rather than on the optional diseases. The mix of disciplines which make up the primary care workforce may differ from country to country, but general practice or family practice is often considered as the core of primary care. Besides family practitioners, the most common primary care providers in Europe are general internists, general paediatricians, pharmacists, primary care nurses, physiotherapists, speech therapists, and mental health care workers.[1,2]

Scientific research, both international comparative and within the United States, has provided evidence on benefits of well developed primary care systems, in terms of better coordination and continuity of care and better opportunities to control costs.[2-7] However, since the relevance of some of this research for the European situation is limited, more in-depth analyses are needed to corroborate these findings. The variety of models of organisation and provision of health care services found in Europe, are favourable circumstances to undertake sound and comprehensive studies on the merits of primary care for health care systems in general.[8] The rich diversity of regulatory mechanisms, funding schemes and modes of financial and non-financial incentives for providers as well as users of services makes Europe a laboratory for comparative research and a pool of good practices.[9]

Getting insight in variation and effect of elements of primary care is not an academic exercise. The WHO World Health Report 2008, titled 'Primary health care now more than ever', has clearly articulated the need to mobilize the production of knowledge on primary care.[10] Despite the broad agreement about the merits of well organised primary care systems, current knowledge about its active ingredients is inconclusive. Better international comparative data and analyses of good practices will produce information to policy makers and those responsible for provision of services about the drivers of strong primary care.[10-13]

Health reforms in many European countries share the aim to further develop the first level of care, and as a result there is a demand for comparative information and a growing tendency to learn from foreign experiences.[14-17]

An instrument for a multidimensional system

Primary care is a multi-dimensional (sub)system in which structural elements should facilitate access and utilisation of a range of coordinated services that aim to contribute to a population's health. The structural elements consist of regulation, economic conditions and human and material resources. The services provided together form the care process. Better health is a major outcome of the system but efficiency and equity are also considered as such. In a recent review of the literature on primary care, we identified ten dimensions, including governance; economic conditions; workforce development; access to services; continuity of care; coordination of care; comprehensiveness of care; quality of care; efficiency of care; and equity in health.[8] Each dimension was further broken down to a number of key attributes, which were called features (see Table 1).

Table 1: Result from the systematic literature review: identified primary care dimensions and features

PC Dimension	Feature
Governance of the PC system	1. Health (care) goals; 2. Policy on equity in access; 3. (De)centralization of PC management and service development; 4. Quality management infrastructure; 5. Appropriate technology in PC; 6. Patient advocacy; 7. Ownership of PC practices; 8. Integration of PC in the health care system.
Economic conditions of the PC system	1. Health care expenditure; 2. PC expenditures; 3. Health care funding system; 4. Employment status of PC workforce; 5. Remuneration system of PC workforces; 6. Income of PC workforce.
PC workforce development	1. Profile of PC workforce; 2. Recognition and responsibilities of PC disciplines; 3. Education and retention; 4 Professional associations; 5. Academic status of PC disciplines; 6. Future development of PC workforce.
Access to PC services	1. Availability of PC services; 2. Geographic access of PC services; 3. Accommodation of accessibility (incl. physical access); 4. Affordability of PC services; 5. Acceptability of PC; 6. Utilisation of PC services; 7. Equality in access.
Continuity of care	1. Longitudinal continuity of care; 2. Informational continuity of care; 3. Relational continuity of care; 4. Management continuity of care.
Coordination of care	1. Gatekeeping system; 2. PC practice and team structure; 3. Skill-mix in PC; 4. Integration of PC-secondary care; 5. Integration of PC and public health.

PC Dimension	Feature
Comprehensiveness of PC	1. Medical equipment available; 2. First contact for common health problems; 3. Treatment and follow-up of diseases; 4. Medical technical procedures and preventive care; 5. Mother/child/ reproductive health care; 6. Health promotion.
Quality of PC	1. Prescribing behaviour of PC providers; 2. Quality of diagnosis and treatment in PC; 3. Quality of chronic disease management; 4. Quality of mental health care; 5. Quality of maternal and child health care; 6. Quality of health promotion; 7. Quality of preventive care; 8. Effectiveness; 9. Practice safety.
Efficiency of PC	1. Allocative and productive efficiency; 2. Technical efficiency; 3. Efficiency in performance of PC workforce.
Equity in health	1. Equity in health

Objective

This article aims to describe the development of measurable indicators on the basis of characteristics (called dimensions and features) of primary care systems identified in the literature. This set of indicators and its underlying structure of dimensions and features will be referred to as the Primary Care Monitoring System (in short: PC Monitor). The PC Monitor is meant to produce comparable information of the variation of primary care systems across Europe. The study is part of the EC funded project Primary Health Care Activity Monitor for Europe (PHAMEU), that aims to describe and compare primary care systems in 31 European countries.[18]

Methods

The PC Monitor is developed in four steps: (1) a systematic literature review to identify dimensions and features of primary care; (2) development of indicators on the basis of results of the systematic literature review; (3) an evaluation among primary care experts of these indicators; and (4) testing the feasibility of the PC Monitor by implementing it in 31 European countries. This paper focuses on the first three steps. The results of step 4 will be described in a separate paper.

Systematic literature review

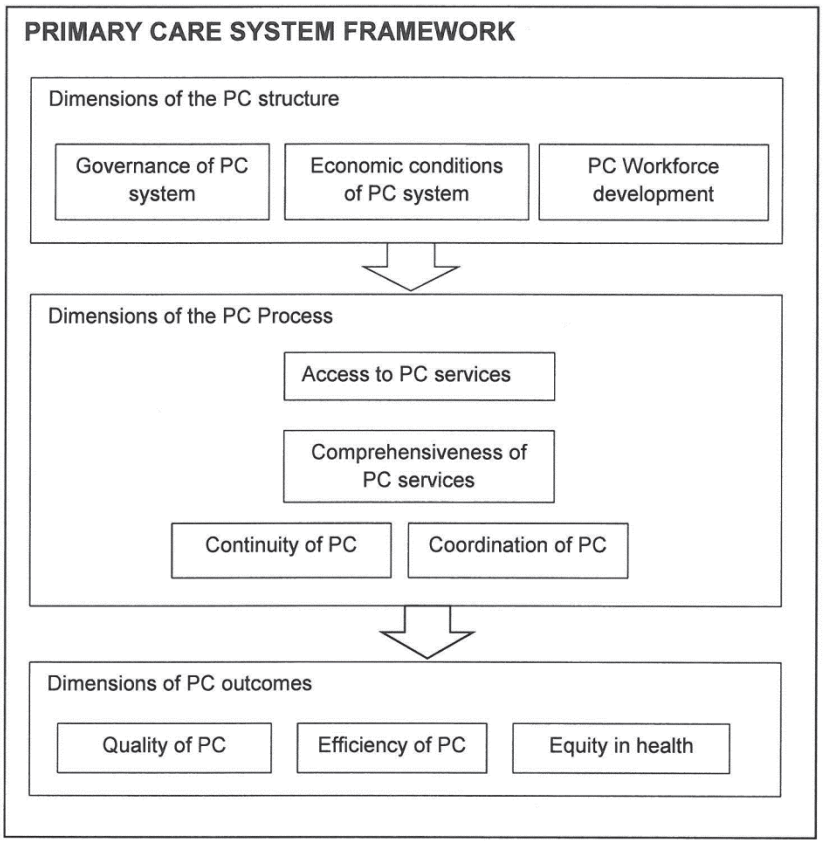
A systematic literature review on original research and systematic reviews published between 2003 and July 2008 has been the basis of this study.[8] For practical reasons, such as

time and financial constraints, the review was limited to this 5 year period. This review used a framework for primary care consisting of three levels: structure, process and outcome (see Figure 1); inspired by Donabedian's health system analysis approach.[19] Previous studies have shown the suitability of this approach for primary care systems.[20-22]

The *structure* of a primary care system consisted of three dimensions: 1) governance; 2) economic conditions; and 3) workforce development. Four dimensions were related to the primary care *process*: 4) access; 5) continuity of care; 6) coordination of care; and 7) comprehensiveness of care. Three dimensions applied to its *outcome*: 8) quality of care; 9) efficiency of care; and 10) equity in health.

Subsequently each of the dimensions was detailed in specific features, which have been listed in Table 1. The strategy and results of the systematic literature review have been published elsewhere.[8]

Figure 1: Primary Care System Framework



Development of indicators

To work out the features identified in the systematic literature review measurable indicators were collected in a provisional list as follows. Firstly, the publications included in the literature review were searched for measurable descriptions. Secondly, a number of international databases (OECD Health Data, WHO Health for All Database, Eurostat, World Bank HNPStat's, EUPHIX) were searched for 'ready-made' indicators. Where these were not available, the research team developed measurable indicators.

In a first elimination round the researchers evaluated the indicators on the provisional list against four criteria:

- *Relevance*: covering an essential aspect of a dimension;
- *Precision:* precise formulation assuring easy-to-fill data (preferably numerical);
- *Flexibility:* likely to fit in various health systems in Europe;
- *Discriminating power:* yielding a range and variety of possible answers.

As it turned out that some indicators were specifications of other, more general indicators, in the long list that resulted from this first elimination a hierarchy was made in core indicators and indicators addressing additional information items.

Further reduction of the long list of indicators

The long list of indicators was evaluated by the authors and eight other experts from various countries (including academics in family medicine, family practitioners and health services researchers). The aim was to arrive at a feasible and balanced set of essential indicators. The evaluators were asked to examine each indicator (and its additional information item) for its suitability to describe and compare primary care systems across countries. Indicators and items were scored on a four-point scale, ranging from zero ('not useful for primary care system comparison') to four ('essential for primary care system comparison'). In addition, they were asked to comment on the indicators (in terms of the criteria) and to provide possible suggestions for improvement. For each indicator the average score of the expert evaluation was calculated and this score was used in a procedure to reduce the long list. The following criteria were applied:

- A written comment by any evaluator that the indicator should be excluded by lack of compliance to criteria resulted in exclusion;
- Indicators more than 0.5 points below the average score of all indicators of that dimension were excluded;
- If there were more than 10 indicators on a feature, only 10 with the highest scores were included.

Evaluators could suggest to rephrase indicators or to include new ones. These were subjected to a consensus procedure during a meeting with all evaluators.

Results

Evaluation of provisional indicators

The selection process from the literature review via the long list of indicators to the final set of the PC Monitor has been summarised in figure 2.

On the basis of the systematic literature review (which included 85 publications) a provisional set of 55 features and 864 provisional indicators were collected. After the first elimination round 51 features, 400 indicators and 151 additional information items were left which were subsequently screened by the authors and eight other evaluators. This resulted in the final set of 41 features, 99 indicators and 44 additional information items, which together make the PC Monitor. No separate feature on equity remained, however, a number of indicators of governance, economic conditions and access also covered equity.

Table 2 provides an impression of the selection process by showing, for each of the 10 dimensions the three indicators with the highest scores and the three indicators with the lowest scores (and which, subsequently, were removed).

In diminishing order, indicators/items for continuity, coordination, efficiency, comprehensiveness, accessibility, and governance were rated as very important. Indicators for economic conditions, workforce development and quality of care received a somewhat lower rating. The answers among evaluators were most similar for the indicators of the equity dimension, which received the lowest average score.

Equity in health

Equity in health is the absence of systematic and potentially remediable differences in health status across population groups.[8] Indicators on the equity dimension were relatively scarce and all received very low scores in the evaluation. Suitability of the equity in health indicators was rated low because they were not or just partially amenable to primary care (for example, equality in mortality of infectious diseases). With indicators on disparities in health the major difficulty was that they were influenced by various other factors than disparities in (primary) health care access and use; also social conditions in which people live and work played a role.[23] As a consequence, equity in health was not included in a monitor dealing with primary care. This does not mean, however, that equity in health, as an important health system outcome, is not represented in the PC Monitor, as will explained in the next section.

Figure 2: Successive steps in the development of features and indicators for the PC Monitor

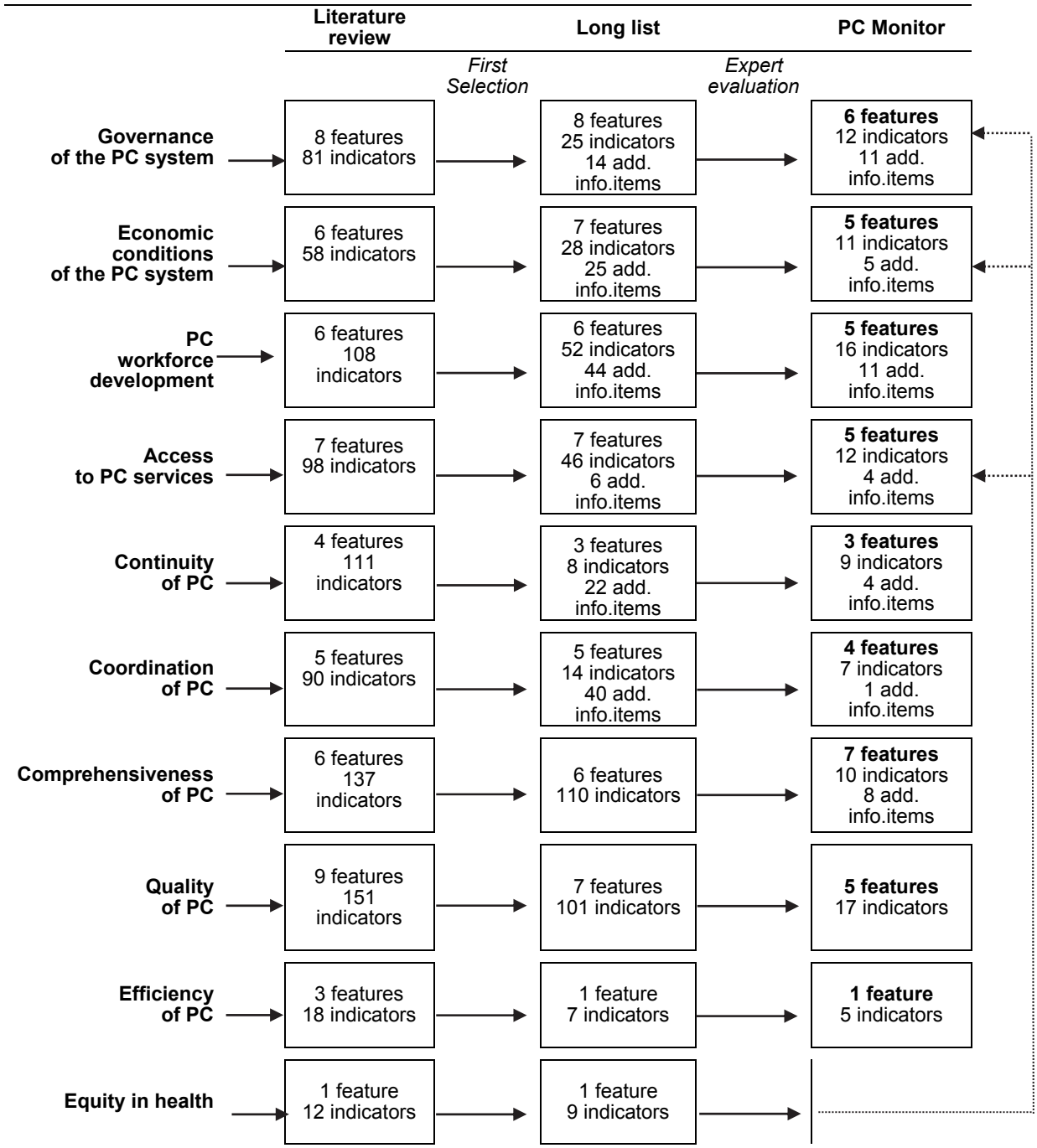


Table 2: Evaluation of suitability of long list indicators; selected results

Dimension	Results of evaluation: selected indicators with the highest (H) and lowest (L) average score*	
Governance of the PC system	H	Is (near) universal financial coverage for PC services guaranteed by a publicly accountable body (government, or government-regulated insurer)? (3.42); Has a national primary care policy been formulated? (3.30); Is a national survey system or surveillance systems in place for monitoring the performance of the PC system (e.g. morbidity, mortality and process features)? (3.21)
	L	Provide a summary of the content of national standards on PC service delivery that allow PC practices to develop differently in their services delivery (1.63); Tasks and professionals included in legislation on possibilities of task substitution or delegation in PC (2.00); PC-oriented patient organisations currently being active (name, purpose, and number of members) (2.01)
Economic conditions of the PC system	H	Payment methods used for general practitioners?(Fee-for-service; Capitation payment; Salary; Mixed) (3.58); % of population covered for out-patient medical care by soc. health insurance (3.40); Method of health care financing for majority of (3.16)
	L	Public expenditure on dental services as % of GDP (1.42); Private expenditure on dental services as % of GDP (1.50); Public expenditure on over-the-counter medicines as % of GDP (1.68)
PC workforce development	H	Vocational training for general practice/family medicine in place? (3.55); Status of vocational training for general practice/family medicine (obligatory or voluntary) (3.57); Total nr. of active GPs as a ratio to total nr. of active specialists (3.39)
	L	% of (re)trained PC professionals (other than general practitioners, physiotherapists, pharmacists, dentists or midwives) active in their profession of training (1.26); Total number of posts of PC professionals (other than the previously listed PC professions) currently vacant per 1000 inhabitants (1.42); % of active female PC professionals (other than the previously listed PC professions) (1.49)

Dimension	Results of evaluation: selected indicators with the highest (H) and lowest (L) average score*	
Access to PC services	H	Number of general practitioners per 100,000 population (3.74); Number of PC nurses per 100,000 population (3.56); Number of general practice consultations per capita per year (3.32)
	L	Differences in dentist visits by income quintile (or education) (1.73); Number of consultations with PC professionals (other than general practitioners, physiotherapists, pharmacists, dentists, midwives) per capita per year (1.76); Differences in physiotherapy visits by income quintile (or education) (1.86)
Continuity of care	H	Population/patients registered with a general practitioner (3.51); Average PC practice list size (3.45); Items normally recorded in patients' medical file for every encounter (reason of visit; problem and/or diagnosis; supporting data; treatment plan; medication details) (3.43)
	L	Usual Provider Continuity Index: proportion of visits to one's own PC physician relative to the total nr. of visits to all physicians in the past year (1.91); Average length of PC provider-patient relationship (2.08); Average practice list turnover: Nr. of new patients in a period divided by the nr. of registered patients at the end of the period (2.16)
Coordination of care	H	Patients having the possibility to directly access hospital based specialists (3.62); Patients having possibility to directly access emergency departments? (3.54); Patients having the possibility to directly access general practitioners? (3.49)
	L	Predominant PC-Public Health Collaboration models in place (1.85); Specialist outreach models available for specific (chronic) conditions (2.18); If no direct access to speech therapists, can these be consulted if paid out of pocket (2.21)
Comprehensiveness of PC	H	(Estimated) % of PC facilities usually carrying out immunizations for flu or tetanus (3.15); (Est.) % of PC providers usually providing first contact care to a man aged 28 with a first convulsion (3.09); (Est.) % of PC facilities usually involved in influenza vaccination for high-risk groups (3.08)

Dimension	Results of evaluation: selected indicators with the highest (H) and lowest (L) average score*	
(Comprehensiveness of PC)	L	(Est.) % of PC providers that regularly pay attention to social services (1.81); (Est.) % of PC facilities involved in blood typing and antibody screening for prenatal patients (1.90); (Est.) % of PC facilities involved in school health care (1.92)
Quality of PC	H	% of infants vaccinated against hepatitis B (2.99); % of infants vaccinated against invasive disease due to Haemophilius influenza type b (2.99); % of women aged 21-64 yrs who had at least 1 Pap test in the past 3 yrs (2.99)
	L	Mortality for persons with severe psychiatric disorders per 100,000 (1.24); % of pregnant women having received a hepatitis B screening during their pregnancy (1.28); Potential life years lost of premature mortality from bronchitis (1.35)
Efficiency of PC	H	Number of GP consultations per capita per year (3.34); Average consultation length (in minutes) of GPs (2.83); Number of new referrals from GPs to medical specialists per 1000 listed patients per year (2.82)
	L	Nr. of GP consultations in the surgery as % of all GP-patient contacts (2.24); Nr. of home visits as % of all GP-patient contacts (2.63); Nr. of telephone consultations as % of all GP-patient contacts (2.72)
Equity in health	H	Relative inequality (ratio between the rate of mortality in lowest and highest educational group) for avoidable mortality (2.34); Relative inequality for cardio-respiratory conditions (2.29); Relative inequality for mortality of infectious diseases (2.17)
	L	Relative inequality for mortality of tuberculosis (1.73); same for pneumonia and influenza (1.73); same for asthma (1.92)

* Judgement of evaluators: 0= 'not useful', 1= 'less important', 2= 'important', 3= 'very important', 4= 'essential for PC comparison'.

Outcome of the process: the European PC Monitor

The final set of indicators included in the PC Monitor resulted from the exclusion procedure as described in the methods section. Sometimes indicators were included after being rephrased. In addition to the many exclusions, a number of new indicators and additional information items have been added resulting from comments made by the evaluators. Before

inclusion these new items, their relevance, precision, flexibility and discriminating power were discussed at a consensus meeting with the project partners.
The European PC Monitor describes the structure, process, and outcome of a primary care system by 9 dimensions, 41 features, 99 indicators, and 11 additional information items (see Additional file 1, for a full overview of the PC Monitor). The *structure* of a primary care system is described by its governance, economic conditions, and workforce development. The *process* of a primary care system is described by its access, comprehensiveness, continuity, and coordination of care. The *outcome* of a primary care system is described by its quality of care, and efficiency of care.
Aspects that influence equity in use of primary care services are included in the Monitor. Commonly applied structure and process indicators of inequalities in primary care access and use, have been integrated into several dimensions.[8,24] For example, policy on equality in access (governance), primary care coverage (economic conditions), geographic availability of primary care services (access), and affordability of primary care services (access) are all related to equity.

Discussion

Strength and limitations of the indicators

Strength
The strength of the PC Monitor is that it builds on well-known frameworks for health care system analysis (such as the structure-process-outcome approach) and primary care research.[8,19] The identified dimensions, features, and indicators are based on the systematic primary care literature review and supported by consensus among primary care experts. Another strength is that in most countries the majority of indicators can be measured by using existing data sources, such as statistics, scientific literature, and policy documents. Some indicators will need an expert opinion for implementation. Furthermore, due to the applied consensus procedure, the Monitor is intended to be applicable to different configurations of primary care (e.g. the different disciplines involved in the provision of primary care).

Limitations
The selection and prioritization of dimensions, features and indicators were subject to decisions on several levels. Starting with the search strategy for the systematic literature

review, the review process of publications, the data extraction from publications, and finally the evaluation of indicators by the involved primary care experts. Every step of the development process was conducted in agreement with the PHAMEU project partners from ten countries, to safeguard the importance, scientific soundness, and feasibility of the resulting PC Monitor. However, the application of the PC Monitor by the PHAMEU project in the 31 participating countries will ultimately show its feasibility.

The PC Monitor is not exhaustive. Only dimensions marked as important in the systematic literature review are included in the Monitor. Nevertheless, even though the systematic literature review indicated health equity as an important primary care dimension (because primary care can be a means to achieve equity), it was excluded as a dimension in the Monitor because of a lack of health equity indicators that are valid, feasible and measurable, and subject to primary care. However, aspects that influence equity in use of primary care services are included in the Monitor. It is recommended that future research should focus on the development of suitable equity indicators for primary care research.

The reliance on existing data sources is both a strength and a limitation. It can be a limitation because it could reduce the comparability of the resulting primary care information. The comparability would be optimal when data from uniform international surveys are used.

Application of the PC Monitor

Application of the PC Monitor can be seen as a first test of evaluating what politicians have been 'advertising' about primary care for a while now. The best test of the PC Monitor is to start data collection, as planned in the PHAMEU project. The PC Monitor will be applied in 31 countries by a network of 10 partners. Partners are responsible for data collection in their own and two or three other countries based on their expertise and affinity. Details of the data collection will be tuned to the local situations and availability of sources. For some indicators data can be found in international databases, such as from the OECD, Eurostat, or the WHO Health for All Database. Another source of information are the regularly updated publications in the series 'Health Systems in Transition' (HiT) published by the European Observatory on Health Systems and Policies. Relevant sources can be found via European organisations and networks in primary care (for instance WONCA, EGPRN, EURACT, and EQuiP. Furthermore country information can be found in the international literature. These relatively easy sources will only partly contribute to the data collection for each country. The remainder needs to be found from national sources. As far as national sources can be accessed electronically and in a known language, data can be collected relatively easy by desk research. Websites of national statistical bureaus, professional associations, health inspectorates, educational institutes and national literature databases may be useful. National experts may be needed to get access to grey literature or papers in a foreign

language, to help identify sources of missing information, or to deliver 'consensus information'. It is likely that there will be strong heterogeneity of data sources and data. In some countries high quality data for the indicators may be easily available, while in others quality and availability may be low. The network of partners will need to decide about 'softness' criteria for the collected data. If no hard data (e.g. statistics) are available softer data will be applied. For example, in the absence of written sources it may be decided to include consensus among experts. The general principle is to aim for the best available data. This approach is justified as long as the origin of the data is recorded with the data.
It is very likely that not all countries will be able to provide data for each indicator. However, pinpointing gaps in information will also be a valuable result. It will be important that the indicators are evaluated after the PC Monitor has been implemented. This evaluation will result in a final, improved version of the Monitor to be used for future applications.

Expected impact
Europe-wide application of the PC Monitor is expected to result in up-to-date information on the structure, process and outcome of primary care systems, variation in primary care systems across Europe and knowledge about primary care oriented policy strategies (e.g. related to accessibility or integration). The PC Monitor also offers countries the opportunity to evaluate their primary care system in the context of their policy aims. If the PC Monitor were to be implemented on a structural basis (e.g. every 5 years) it would result in knowledge of trends in primary care.
By creating a basis for routine data collection, the PC Monitor could serve the need of various stakeholder groups for reliable and comparable information. Application of the Monitor will provide European and national decision makers with comprehensive comparisons of primary care policies and models of provision that may enable them to improve the effectiveness of primary care. For the research community, application of the PC Monitor could considerably contribute to the base of evidence and thus advance the state of the art of (primary) health services research. It can also serve future actions in this area, such as health system impact assessments.

Conclusions
Based on scientific evidence and consensus among experts, an instrument for standardised description and comparison of primary care systems has been developed. Implementation of the instrument in the configurations of primary care in Europe will show the feasibility for producing comparable information. Widespread use of the instrument has the potential to improve the understanding of primary care delivery in different national contexts and thus to create opportunities for better decision making.

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Additional file 1 The European Primary Care[1] Monitor

Dimension: **Governance of the PC system** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
GOV1. Primary care goals	Primary care goals	GOV1.1 Have policy documents (by government or important stakeholders) been issued that reflect a clear vision on current and future PC (e.g. for the next 5 years)? [Yes/No]	*GOV1.1a If Yes: In which year? What does this vision entail? What is the status of these documents (e.g. policy paper, law, formal public statement); Which stakeholder?*
GOV2. Policy on equality in access	Policy on distribution of human resources	GOV2.1 Is there an explicit governmental policy to regulate the distribution of PC providers and facilities more evenly? [Yes/No]	*GOV2.1a If yes: Please describe the content of these pro-equality measures (e.g. they may be focused on improved working conditions or on obligations for young doctors to work in rural areas?).*
GOV3. (De)centralization of PC management & service development	PC within the Ministry of Health	GOV3.1 Does PC has its own department or unit within the Ministry of Health? [Yes/No]	*GOV3.1a Does PC have a budget that can be distinguished from other sectors, such as specialist care? [Yes/No] If yes, please explain at which level this budget is established (e.g. national, regional).*
	PC policy development at regional or local level	GOV3.2 Have responsibilities for PC been decentralized to regional or local level? [Yes/No]	*GOV3.2a If yes, please explain which responsibilities have been decentralized to which levels (for instance, setting priorities; aspects of service provision).*
	Stakeholder involvement in PC policy development	GOV3.3 Do organisations of stakeholders contribute to PC policy development? (e.g. health insurers, medical professionals, or representatives of patients or consumers). [Yes/No]	*GOV3.3a If yes, please explain in which way they contribute to PC policy development (e.g. in regular formal consultations or incidentally and informal).*
	(De)centralization of PC service delivery	GOV3.4 Has community influence on the provision of PC services been organised on a national or regional level? [not applicable, it is not used/ yes, on a national level/ yes in some regions/ yes, incidentally at local level].	*GOV3.4a If yes, which of the following forms apply:* *1. Via ownership of PC facilities by authorities:* *a. State; b. Region; c. Local.* *2. (Voluntary) patient councils with PC facilities.* *3. Local/regional/national PC satisfaction surveys;* *4. Volunteer work in PC facilities;* *5. Other [Please fill in]…..*

[1] Primary care is defined as the first level of professional care where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied

Dimension: **Governance of the PC system** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	Licensing of facilities	GOV4.3 Do formal requirements exist for PC practices or facilities to operate? [Yes/No]	*GOV4.3a If yes, What are the requirements for PC practices or facilities to operate?*
			GOV4.3b Please mention important voluntary mechanisms to maintain and improve the quality of care. (e.g. clinical guidelines, voluntary peer-review mechanisms).
	Development of clinical guidelines	GOV4.4 Have evidence based clinical guidelines been produced for specific use by GPs? [Yes/No]	*GOV4.4a If yes: What is the usual mode of production of these guidelines?* *1. Issued by a national agency such as the Ministry of Health [yes / no];* *2. Issued by a college or association of GPs [yes / no];* *3. Adapted foreign guidelines [yes / no];* *4. Developed by medical specialists [yes / no] ;* *5. Other:……[fill in]*
GOV4. PC Quality Management Infrastructure	Coordination of quality management	GOV4.1 If state inspection on health care exists, does it have a specific unit for PC? [Yes/No/Not applicable]	-
	Certification of providers	GOV4.2 Do formal requirements exist for physicians (such as GPs/Family doctors) to work in PC? [Yes/No]	*GOV4.2a If yes, what are the obligatory professional requirements for physicians to practice in PC? (e.g. Having completed postgraduate specialisation or obligatory CME). Please specify for GPs/FDs and possible other specialists working in PC*
GOV5. Patient advocacy	Patient rights	GOV5.1 Have any laws/regulation pertaining to the following patients' rights in PC been implemented? 1. Informed consent [Yes/No]; 2. Patient access to own medical files [Yes/No]; 3. Confidential use of medical records [Yes/No]; 4. Availability of a procedure to process patient complaints in PC facilities [Yes/No].	-
GOV6. Multidiscipli-nary collaboration	Multidiscipli-nary collaboration	GOV6.1 Has a governmental policy on cooperation or integration of PC services been laid down in a law or policy paper? [Yes/No/ Not applicable, because no such policy exists]	*GOV6.1a If yes, what is the core of this policy and which PC providers are targeted?*

Dimension: **Economic conditions of the PC system** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
ECO1. Primary care expenditure	Total PC expenditure	ECO1.1 Total expenditure on PC as % of total expenditure on health	-
	Expenditure on prevention and public health	ECO1.2 Total expenditure on prevention and public health as % of total expenditure on health.	-
ECO2. Primary care coverage	Total PC coverage	ECO2.1 % of the population fully covered or insured for PC costs.	-
	GP services coverage	ECO2.2 % of the population covered or insured for costs of GP services (office and at home) .	ECO2.2a If copayment applies, please explain the volume of copayment
	Medicines coverage	ECO2.3 % of the population covered or insured for medicines prescribed in primary care / GP.	ECO2.3a If copayment applies, please explain the volume of copayment
	Uninsured population	ECO2.4 % of the population uninsured for medical expenses (this may be an estimation)	-
	Out-patient medical care coverage by social insurance	ECO2.5 Social health insurance coverage for out-patient medical care by % of population.	-
ECO3. Employment status of PC workforce	Employment status of GPs	ECO3.1 % of GPs that are: 1a. Salaried with national, regional or local authorities; 1b. Salaried with other physicians; 2a. Self-employed with contract to health insurance fund(s) or health authority; 2b. Self-employed without contract (paid by patients out-of-pocket).3. Other mode	-
ECO4. Remuneration system of PC workforce	Remuneration system for salaried GPs	ECO4.1 How are salaried GPs paid? 1. Flat salary; 2. salary related to the number of their patients; 3 Salary related to both the number of their patients and indicators of performance	*ECO4.1a If they receive a performance-related salary: please explain which elements are taken into account.*
	Remuneration system for self-employed GPs	ECO4.2 How are self-employed GPs paid? 1. Fee-for-service payment; 2. Capitation payment; 3. Mix of capitation and fee-for-service payment. 4. Mix of capitation and fee-for-service and other specific components (e.g. bonus for working in disadvantaged areas etc.).	*ECO4.2a If they receive a payment consisting of other components than capitation or fee-for service, please explain to what targets or situations these are related.*
ECO5. Income of PC workforce	Income of GPs	ECO5.1 What is the (estimated) gross annual income (in Euros) of a 'mid-career' GP (about 10 years experience and with an average size of practice)?	*ECO5.1a Does this income include costs for running the practice (premises; equipment; care; employed staff)?*

Dimension: **PC Workforce Development** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
WFD1. Profile of PC workforce	Type of PC professionals	WFD1.1 To which of the following medical, para-medical and nursing disciplines people have direct access (which means without referral or intervention by another medical provider)? Please, indicate on the list and add disciplines if applicable. Also indicate with each discipline whether they exclusively work in PC or also provide services on referral (for instance in another setting, such as a hospital) - GP /Family physician - Gynaecologist/obstetrician - Paediatrician - Specialist of Internal medicine - Ophthalmologist - ENT specialist - Cardiologist Neurologist - Surgeon - Primary care / GP practice nurse - Specialised nurse (eg. on diabetes) - Home care nurse - Physiotherapists (ambulatory) - Midwife (ambulatory) - Occupational therapist - Speech therapist - Dentist - Other:, namely: …… ……	-
	Age distribution GPs	WFD1.2 Average age of practicing GPs.	*WFD1.2a What is the age distribution among practicing GPs? Please fill in the % of GPs that are: <35 years of age; 35-45 years of age; 45-55 years of age; 55+ years of age.*
	Workload GPs	WFD1.3 Average number of working hours per week of GPs (including: hours for keeping up to date and for administration; excluding: hours on call (in evening, weekends etc.)	-
WFD2. Status & Responsibi-lities of PC disciplines	Recognition / responsibilities of GPs	WFD2.1 Have tasks/duties of GPs or family doctors been described in a law or policy document? [Yes/No]	*WFD2.1a If yes, please fill in the name of the documents, who issued it, and year of issue.*

Dimension: **PC Workforce Development** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	Financial status of GPs compared to a specialist	WFD2.2 How does the gross annual income (in Euros) of a mid-career GP (about 10 yrs experience with average size of practice) relate to the gross annual income of the following medical, para-medical and nursing disciplines of the same age? Please give an estimation whether a GP's income is [Much lower / lower / equal / higher / much higher]. - Gynaecologist/obstetrician - Paediatrician - Specialist of Internal medicine - Ophthalmologist - ENT specialist - Cardiologist - Neurologist - Surgeon - Primary care / GP practice nurse - Specialised nurse (eg. on diabetes) - Home care nurse - Physiotherapists (ambulatory) - Midwife (ambulatory) - Occupational therapist - Speech therapist - Dentist	-
	Attractiveness of FM among medical students	WFD2.3 What % of all medical graduates chooses to enrol in postgraduate training in family medicine (within 1 year after graduation)? (use the most recent available year, and fill this in) [...%, with reference year:..)	-
WFD3. PC Workforce supply and planning	Development of workforce supply	WFD3.1 Please indicate the % by which the supply (total number) of directly accessible medical, para-medical and nursing disciplines has increased [+....%] or reduced [-....%] over the most recent available 5 year period. Please also indicate the years applied [Years ....-....]. - GP /Family physician - Gynaecologist/obstetrician - Paediatrician - Specialist of Internal medicine - Ophthalmologist - ENT specialist - Cardiologist - Neurologist - Surgeon - Primary care / GP practice nurse - Specialised nurse (eg. on diabetes) - Home care nurse - Physiotherapists (ambulatory); - Midwife (ambulatory) - Occupational therapist; - Speech therapist; - Dentist; - Other:, namely:	-

Dimension: **PC Workforce Development** *(Structure)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	GP-Specialist ratio	WFD3.2 Total nr. of active GPs as a ratio to total nr. of active specialists.	-
	Workforce planning	WFD3.3 Are data available from studies on PC workforce capacity needs and development in the future? [Yes/No]	*WFD3.3a If yes, for which PC disciplines and what was the latest date of publication?*
WFD4. Academic status of PC	Academic status of FM/ general practice	WFD4.1% of medical universities (or universities with a medical faculty) with a postgraduate programme in family medicine.	*WFD4.1a In what year was postgraduate training in family medicine first introduced?*
			WFD4.1b How many departments of family medicine are there at medical universities (or universities with medical faculties) in this country?
	FM/ general practice education	WFD4.2 Is family medicine subject in the undergraduate medical curriculum? [Yes/No]	*WFD4.2a What is the duration of a postgraduate programme in family medicine in this country, and how many months do trainees spend in a PC setting?*
	Education of nurses in PC	WFD4.3 Is there professional training specifically for: - district- or community nurses? [Yes/No] - PC/GP practice nurses [Yes/No]	*WFD4.3a If yes, what is its duration?*
WFD5. Medical associations	Professional association of GPs	WFD5.1 Do national associations or colleges of GPs exist in this country? [Yes/No]	*WFD5.1a If yes, please provide the name(s), number of GPs being a member, and indicate which of the following activities the association/organization undertakes: 1. Defending financial/material interests; 2. Professional development (e.g. guideline development); 3. Education; 4. Scientific activities.*
	Professional Journal on GP	WFD5.2 Is a journal on family medicine/general practice being published in this country? [Yes/No]	*WFD5.2a Please provide its name, number of issues per year, and the number of subscriptions. Also indicate for each journal a characterisation of its content [primarily; about 50/50; minor importance]: News; opinions; popular articles; scientific articles (peer reviewed; with abstract in English)*
	Professional association of PC nurses	WFD5.3 Do national associations or organisations of PC nurses exist in this country? [Yes/No]	*WFD5.3a If yes, please provide the name(s), number of nurses being a member, and indicate which of the following activities the association/organization undertakes: 1. Defending financial/material interests; 2. Professional development (e.g. guideline development); 3. Education; 4. Scientific activities.*
	Professional Journal on PC nursing	WFD5.4 Is a professional journal on PC nursing being published in this country? [Yes/No]	*WFD5.4a Please provide its name, number of issues per year, and the number of subscriptions.*

Dimension: **Access to PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
ACC1. National Availability of PC services	Density available PC workforce	ACC1.1 Please provide the total number of directly accessible medical, para-medical and nursing disciplines available per 100,000 population: - GP /Family physician: ..... - Gynaecologist/obstetrician: ..... - Paediatrician: ..... - Specialist of Internal medicine: ..... - Ophthalmologist: ..... - ENT specialist: ..... - Cardiologist: ..... Neurologist: ..... - Surgeon: ..... - Primary care / GP practice nurse: ..... - Specialised nurse (eg. on diabetes) : ..... - Home care nurse: ..... - Physiotherapists (ambulatory) : ..... - Midwife (ambulatory) : ..... - Occupational therapist: ..... - Speech therapist: ..... - Dentist: ..... - Other:, namely: .....: ....:	-
ACC2. Geographic availability of PC services	Availability of GPs by region	ACC2.1 Difference between region, province or state with highest and with lowest density of GPs (per 100,000 population).	*ACC2.1a Availability of GPs by region, province or state per 100,000 population.*
	Urban-Rural availability of GPs	ACC2.2 Difference between average urban density of GPs (per 100,000 population) and average rural density of GPs.	-
	Shortage of GPs	ACC2.3 Do (regional or national) shortages exist of GPs according to usual national norms? [No shortage / Shortage in some regions / Modest shortage nation wide / Severe shortage nation wide/ Not applicable, because no norms exist]	-
	Shortage of community pharmacists	ACC2.4 Do problems exist in the availability of medicines in rural areas du to lack of pharmacies? [Yes/No]	-
ACC3. Accommodation of accessibility	Opening hours	ACC3.1 Are GP practices or PC centres obliged to have a minimum number of opening hours or days?	*ACC3.1a If yes, how many hours or days?*

Dimension: **Access to PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	Home visits	ACC3.2 Average nr. of home visits per week per GP.	-
	Organizational access arrangements	ACC3.3 To what extent do the following organizational arrangements commonly exist in GP practices or PC centres? [(almost) always present / usually present / occasionally present / seldom or never present]: 1. Telephone consultations; 2. E-mail consultations; 3. Practices having a website; 4. Offering special sessions or clinics for certain patient groups (e.g. diabetics, pregnant women, hypertensive patients etc) 5. Appointment systems for the majority of the patient contacts.	-
	After-hours PC	ACC3.4 To what extent are the following models for the provision of after-hours PC commonly used? [(almost) always used / usually used / occasionally used / seldom or never used]: 1) Practice-based services: GPs within one practice or organized in a group of practices look after their patients on out-of-hours schedules; 2) PC cooperatives: GPs in a region from several groups, supported by additional personnel, provide after-hours PC mostly in non-profit, large-scale organizations, which include telephone triage and advice, office for face-to-face contact, and house calls. 3) Deputizing services (outsourcing): companies employing doctors take over the provision of after-hours care; 4) Hospital emergency departments provide PC by taking care of health problems after office hours; 5) After-hours PC centres: These are (walk-in) centres for face-to-face contact with a GP or nurse; 6) Other out-of-hours PC/GP service schemes in place.	*ACC3.4a Please explain if this scheme has been implemented uniformly all over the country or do significant regional differences exist? If 'other schemes' are in place shortly explain services and providers.*
ACC4. Affordability of PC services	Cost-sharing for GP care	ACC4.1 Do patients normally need to pay for [no payment / some payment / payment of the full amount]: 1. A visit to their GP; 2. Medicines or injections prescribed by their GP; 3. A visit to a specialist prescribed by their GP; 4. A visit of their GP at the patient's home.	*ACC4.1a Please explain if exemptions exist for certain groups of patients (which groups; for which services).*
	Patient dissatisfaction with PC prices	ACC4.2 % of patients that rate GP care as not very or not at all affordable.	-
ACC5. Acceptability of PC services	Patient satisfaction with access of PC in general	ACC5.1 % Patients that find it easy to reach and gain access to GPs.	-

Dimension: **Continuity of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
CON1. Longitudinal continuity of care	Patient list system	CON1.1 Do GPs have a patient list system? [Yes/No]	*CON1.1a Average population size per GP.*
	Stability of Patient-Provider relationship	CON1.2 % of patients reporting to visit their usual PC provider for their common health problems.	-
CON2. Informational continuity of care	Medical record keeping	CON2.1 % of GPs keeping (or reporting to keep) clinical records for all patient contacts routinely.	-
	Electronic clinical support systems	CON2.2 To what extent do GPs have a computer at their disposal in their office? [(almost) always / usually / occasionally / seldom or never].	*CON2.2a For which of the following purposes are GPs usually using a computer in their practice?: [answer options per category: yes/no] 1.Booking appointments with patients; 2.Writing bills/financial administration; 3. Prescription of medicines; 4. Keeping medical records of patients; 5. Searching expert information on the internet; 6. Communicating patient information to specialists; 7. Communicating prescriptions to pharmacists.*
			CON2.2b Are clinical record systems in PC/GP able to generate lists of patients by diagnosis or health risk? (e.g. patients with asthma or diabetes, or smokers)
	Referral system	CON2.3 To what extent are GPs using referral letters (including relevant information on diagnostics and treatment performed) when they refer to a medical specialist? [(almost) always / usually / occasionally / seldom or never].	-
	Incoming clinical information procedures	CON2.4 Do PC practices receive information within 24 hours about contacts that patients have with out of hours services? [(almost) always / usually / occasionally / seldom or never].	-
	Specialist-GP communica-tion	CON2.5 To what extent do specialists communicate back to referring GP after an episode of treatment? [(almost) always / usually / occasionally / seldom or never].	-

Dimension: **Continuity of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
CON3. Relational continuity of care	Physician choice	CON3.1 Are patients free to choose the PC centre and GP they want to register with? [Yes, patients can freely choose any centre or GP / Patients are free to choose a centre, but they are assigned to a GP in that centre / Patients are assigned to a centre in their area, but they are free to register with any GP in that centre / No, patients are assigned to a PC centre in their area, and they are assigned to a GP in that centre].	*CON3.1a Please explain if in reality the situation is not as it is intended to e (except for the usual limited choice in rural areas).*
	Patient satisfaction	CON3.2 % of patients who are satisfied with: - their relation with their GP/PC physician - with the available time during consultations with their GP/PC physician - their trust in their GP/PC physician - the explanation their GP or PC physician gives of problems, procedures and treatments	-

Dimension: **Coordination of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
COO1. Gatekeeping system	Gatekeeping system	COO1.1 Do patients need a referral to access the following medical, para-medical and nursing disciplines? [1. Yes, a referral is normally required 2. No they have direct access 3. Direct access is possible if costs of the visit are paid privately (out of pocket or refunded from a complementary insurance)] - Gynaecologist/obstetrician - Paediatrician - Specialist of Internal medicine - Ophthalmologist - ENT specialist - Cardiologist - Neurologist - Surgeon - Primary care / GP practice nurse - Specialised nurse (eg. on diabetes) - Home care nurse - Physiotherapists (ambulatory) - Midwife (ambulatory) - Occupational therapist - Speech therapist - Dentist	-
COO2. Skill-mix of PC providers	Shared practice	COO2.1 % of PC practices that are: - Single handed (solo); - 2 or 3 GPs in the same building without medical specialists; - 4 or more GPs in the same building without medical specialists; - Mixed practice with GPs and medical specialists.	-
	Cooperation within PC	COO2.2 Is it common for GPs to have regular face-to-face meetings (at least once per month) with the following professionals? [Yes, it often occurs / Yes, it usually occurs / No, it occasionally occurs / It seldom or never occurs]. Please explain. - Other GP(s) - Practice nurse(s) - Nurse practitioner(s) - Home care nurse(s) - Midwife/birth assistant(s) - PC physiotherapist(s) - Community pharmacist(s) - Social worker(s) - Community mental health workers	-

Dimension: **Coordination of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	Substitution	COO2.3 How usual are the following modes of care by nurses in PC/GP? [very common / usual/ rare/ uncommon] 1. Nurse-led diabetes clinics in PC/GP 2. Nurse-led health education (e.g. for stop smoking or pregnant women)	-
COO3. Collaboration of PC-Secondary care	Specialist outreach	COO3.1 How common are the following forms of cooperation between GP/PC and medical specialists? [very common / usual/ rare/ uncommon] 1. Medical specialists visiting a PC practice to provide specialist care normally provided in hospital (replaced specialist care). 2. Medical specialists visiting a PC practice to provide joint care with a GP (joint consultations). 3. Clinical lessons by a medical specialist for GPs.	*COO3.1a How common is it that GPs ask (telephone) advice from the following medical specialists?[very common / usual/ rare/ uncommon]* *1. Paediatricians; 2. Internists; 3. Gynaecologists; - Surgeons; 4.Neurologists; 5. Dermatologists; 6. Geriatrists.*
COO4. Integration of public health in PC	Epidemiological data set	COO4.1 Are clinical patient records from GP/PC used at regional or local level to identify health needs or priorities for health policy? [routinely (health statistics) / incidentally / seldom or never used]	-
	Community health surveys	COO4.2 Are community health surveys conducted to improve the quality and responsiveness of PC? [Regularly nationwide / incidentally nationwide / regularly at local or regional level / incidentally at local or regional level]	-

Dimension: **Comprehensiveness of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
COM1. Medical equipment available	Medical equipment available	COM1.1 How common is it that PC facilities have the following equipment available at the premises: [(almost) always available / usually available / occasionally available / seldom or never available] 1. infant scales; 2. glucose tests; 3. dressings/bandages; 4. otoscope; 5.ECG; 6. urine strips; 7. instruments for stitching wounds; 8. gynaecological speculum; 9. peak flow meter	-
COM2. First contact for common health problems	First contact care	COM2.1 To what extent will patients with the following health problems visit a GP for first contact care? [(almost) always / usually / occasionally / seldom or never]. - child with severe cough - child aged 8 with hearing problem - woman aged 18 asking for oral contraception - woman aged 20 for confirmation of pregnancy - woman aged 35 with irregular menstruation - woman aged 35 with psychosocial problems - woman aged 50 with a lump in her breast - man aged 28 with a first convulsion - man with suicidal inclinations - man aged 52 with alcohol addiction problems	*COM2.1a Please indicate for each health problem to which other specialty(ies) (other than a GP) these patients may (also) address for first the contact? (please list 1 or 2, if applicable)* - child with severe cough - child aged 8 with hearing problem - woman aged 18 asking for oral contraception - woman aged 20 for confirmation of pregnancy - woman aged 35 with irregular menstruation - woman aged 35 with psychosocial problems - woman aged 50 with a lump in her breast - man aged 28 with a first convulsion - man with suicidal inclinations - man aged 52 with alcohol addiction problems
COM3. Treatment and follow-up of diseases	Treatment and follow-up of diseases	COM3.1 To what extent will patients with the following diseases receive treatment / follow up care from their GP? [(almost) always / usually / occasionally / seldom or never]. - Chronic bronchitis - Peptic ulcer - Congestive heart failure - Pneumonia - Uncomplicated diabetes type II - Rheumatoid arthritis - Mild depression - Cancer (in need for palliative care) - Patients admitted to a nursing home/convalescent home	*COM3.1a Which specialties (besides a GP) are (also) treating in the below mentioned cases? (please list 1 or 2, if applicable)* - Chronic bronchitis - Peptic ulcer - Congestive heart failure - Pneumonia - Uncomplicated diabetes type II - Rheumatoid arthritis - Mild depression - Cancer (in need for palliative care) - Patients admitted to a nursing home/convalescent home
	GP contacts without referral	COM3.2 % of total patient contacts handled solely by GPs without referrals to other providers.	-

Dimension: **Comprehensiveness of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
COM4. Medical technical procedures	Medical technical procedures	COM4.1To what extent do GPs or GP/PC practice nurses carry out the following activities if one of their patients would need so? [(almost) always / usually / occasionally / seldom or never]. - Wedge resection of ingrown toenail - Removal of sebaceous cyst from hairy scalp - Wound suturing - Excision of warts - Insertion of IUD - Removal of rusty spot from the cornea - Fundoscopy - Joint injection - Strapping an ankle - Setting up an intravenous infusion	*COM4.1a Which specialties (besides GPs or* GP/PC practice nurses) would *(also) provide the procedure? (please list 1 or 2, if applicable)* - Wedge resection of ingrown toenail - Removal of sebaceous cyst from hairy scalp - Wound suturing - Excision of warts - Insertion of IUD - Removal of rusty spot from the cornea - Fundoscopy - Joint injection - Strapping an ankle - Setting up an intravenous infusion
COM5. Preventive care	Preventive care	COM5.1 To what extent do GPs carry the following preventive activities? [(almost) always / usually / occasionally / seldom or never]. - Immunization for tetanus - Allergy vaccinations - Testing for sexually transmitted diseases - Screening for HIV/AIDS - Influenza vaccination for high-risk groups - Cervical cancer screening - Breast cancer screening - Cholesterol level checking	*COM5.1a Which specialties (besides GPs)* would *(also) provide the preventive activity? (please list 1 or 2, if applicable)* - Immunization for tetanus - Allergy vaccinations - Testing for sexually transmitted diseases - Screening for HIV/AIDS - Influenza vaccination for high-risk groups - Cervical cancer screening - Breast cancer screening - Cholesterol level checking
COM6. Mother and child & Reproductive health care	Mother and child & Reproductive health care	COM6.1 To what extent do GPs provide the following health services to their patients who need so? [(almost) always / usually / occasionally / seldom or never]. - Family planning / contraceptive care - Routine antenatal care (in line with national scheme) - Routine paediatric surveillance to children up to 4 years	*COM6.1a If not the GP, which other specialty(ies) would provide this health service? (please list 1 or 2, if applicable)* - Family planning / contraceptive care - Routine antenatal care (in line with national scheme) - Routine paediatric surveillance to children up to 4 years
		COM6.2 To what extent are GPs (or practice nurses) involved in infant vaccination on: [(almost) always / usually / occasionally / seldom or never]. - diphtheria - tetanus - pertussis - measles - hepatitis B - mumps - rubella	*COM6.2a If not the GP or practice nurse, which other specialty(ies) would provide this health service? (please list 1 or 2, if applicable)* - diphtheria - tetanus - pertussis - measles - hepatitis B - mumps - rubella

Dimension: **Comprehensiveness of PC services** *(Process)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
COM7. Health promotion	Health promotion	COM7.1 To what extent do GPs provide the following individual counselling if this would be needed in the practice population? [(almost) always / usually / occasionally / seldom or never]. - Counselling in case of obesity - Counselling in case of poor physical activity - Counselling in case of smoking cessation - Counselling in case of problematic alcohol consumption	*COM7.1a If not the GP, which other specialty(ies) would provide this counselling? (please list 1 or 2, if applicable)* - Counselling in case of obesity - Counselling in case of poor physical activity - Counselling in case of smoking cessation - Counselling in case of problematic alcohol consumption
	Health education (groupwise)	COM7.2 To what extent are GPs (alone or with others) involved in groupwise health education to their patients (on topics like healthy diet; physical activity; smoking; use of alcohol etc).? [usual task of GPs / incidental task / rarely or never provided by GPs]	*COM7.2a If not the GP, which other specialty(ies) would provide this groupwise health education? (please list 1 or 2, if applicable*

Dimension: **Quality of PC** *(Outcome)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
QUA1. Prescribing behaviour of PC providers	Annual prescriptions	QUA1.1 The average number of prescriptions annually provided by GPs per 1000 contacts and/or per 1000 registered patients. (Please use latest available data, and indicate the year).	-
	Antibiotics consumption	QUA1.2 The defined daily doses of antibiotics use in ambulatory care per 1000 inhabitants per day	-
QUA2. Quality of diagnosis and treatment in PC	Avoidable hospitalization	QUA2.1 The number of hospital admissions for people with the following conditions per 100.000 population per year. Please use the latest available data, and indicate the year. - diagnosis of dehydration/gastroenteritis *(ICD-10 codes: E86, K52.2, K52.8, K52.9)* - diagnosis of kidney *infection (ICD-10 codes: N10, N11, N12, N13.6)* - diagnosis of perforated ulcer *(ICD-10 codes: K25.0–K25.2, K25.4–K25.6, K26.0–K26.2, K26.4–K26.6, K27.0–K27.2, K27.4–K27.6, K280–282, K284–K286)* - diagnosis of pelvic inflammatory disease *(ICD-10 codes: N70, N73, N74)* a diagnosis of ear, nose and throat (ENT) infections *(ICD-10 codes: H66, H67, J02, J03, J06, J31.2)*	-
QUA3. Quality chronic diseases management	Diabetes care	QUA3.1 Crude percentage of the diabetic population aged >25 with cholesterol 5>mmol/ll (crude percentage; use latest available year; please indicate the year)	-
		QUA3.2 Crude percentage of diabetic population aged >25 years with blood pressure above 140/90 mm Hg measured in the last 12 months.(crude percentage; use latest available year; please indicate the year)	-
		QUA3.3 Crude percentage of diabetic population aged >25 years with HbA1C > 7,0%. (crude percentage; use latest available year; please indicate the year)	-
		QUA3.4 Crude percentage of diabetic population aged >25 years with overweight and obesity and BMI measured in the last 12 months. (crude percentage; use latest available year; please indicate the year)	-
		QUA3.5 Crude percentage of diabetic population aged >25 years with eye fundus inspection in the last 12 months (crude percentage; use latest available year; please indicate the year)	-

Dimension: **Quality of PC** *(Outcome)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
	COPD care	QUA3.6 Percentage of individuals with COPD which have ever had a lung function measurement during the last year. (use latest available year; please indicate the year)	-
		QUA3.7 Percentage of individuals with COPD that have had a follow-up visit in primary care during the last year. (use latest available year; please indicate the year)	-
	Asthma care	QUA3.8 Percentage of individuals with wheeze in the last 12 months or diagnosed with asthma which have had a lung function measurement during the last year. (use latest available year; please indicate the year)	-
		QUA3.9 Proportion of individuals having had wheeze in the last twelve months with a diagnosis of asthma that have had a follow-up visit in primary care during the last year. (use latest available year; please indicate the year)	-
		QUA3.10 The number of hospital admissions for people with a diagnosis of asthma per 100.000 population per year (in the most recent year-please indicate the year). (use latest available year; please indicate the year)	-
QUA4. Quality of Maternal and Child health care	Infant vaccination	QUA4.1 % of infants vaccinated within PC against: [% or not applicable because outside PC] - diphteria. - tetanus. - pertussis - measles. - hepatitis B. - mumps - rubella	-
QUA5. Quality of preventive care	Vaccine preventable ambulatory care sensitive condition	QUA5.1 % population aged 60+ vaccinated against flu. [% or not applicable because outside PC]	-
	Breast cancer screening	QUA5.2 % of women aged 52-69 yrs who had at least 1 mammogram in the past 3 yrs. [% or not applicable because outside PC]	-
	Cervical cancer screening	QUA5.3 % of women aged 21-64 yrs who had at least 1 Pap test in the past 3 yrs. [% or not applicable because outside PC]	-

Dimension: **Efficiency of PC** *(Outcome)*			
Feature	**Indicator title**	**Indicator**	**Additional information item**
EFF1. General practice efficiency	Home visits	EFF1.1 Nr. of home visits as % of all GP-patient contacts. (use latest available year; please indicate the year)	-
	Telephone consultations	EFF1.2 Nr. of telephone consultations as % of all GP-patient contacts. (use latest available year; please indicate the year)	-
	Duration of GP consultation	EFF1.3 Average consultation length (in minutes) of GPs. (use latest available year; please indicate the year)	-
	GP consultations	EFF1.4 Number of GP consultations per capita per year (use latest available year; please indicate the year)	-
	Referrals to medical specialists	EFF1.5 Number of new referrals from GPs to medical specialists per 1000 listed patients per year. (use latest available year; please indicate the year)	-

5

The strength of primary care in Europe:
an international comparative study

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This article has been submitted for review

Abstract

Objective
To evaluate the strength of PC structures and key aspects of the PC services delivery process across Europe.

Design
International comparative cross-sectional study performed in 2009/10. Data sources included (inter)national literature, governmental publications, statistical databases, and consulting national experts.

Setting
27 EU member states, plus Turkey, Switzerland, Norway, and Iceland.
Outcome measures: 3 dimensions of a country's PC structure: PC governance, PC workforce development, and economic conditions of PC. 4 dimensions of a country's PC services delivery process: accessibility, continuity, coordination, and comprehensiveness of PC. The PC dimensions were operationalized by a total of 77 indicators.

Results
Countries with relatively strong PC are Belgium, Denmark, Estonia, Finland, Lithuania, the Netherlands, Portugal, Slovenia, Spain, and the United Kingdom. Countries either have many PC policies and regulations in place, combined with good financial coverage and resources, adequate PC workforce conditions, or have consistently only little or few of these PC structures in place. There is no correlation between the access, continuity, coordination, and comprehensiveness of PC of countries. Accessibility is positively associated with all three PC structure dimensions, and coordination of PC is positively associated with PC governance and workforce development.

Conclusions
This study shows variation in PC strength across Europe, indicating a discrepancy in the responsibility given to PC in (inter)national policy initiatives and the needed investments in PC to solve e.g. future shortages of workforce. Countries are consistent in their PC focus on all important structure dimensions. To improve PC performance management there is a need for countries to improve their PC information infrastructure.

Introduction

Health care systems can contribute to the achievement of the United Nation's Millennium Development Goals (MDGs), such as reducing maternal and child mortality and promoting socio-economic equality in health by 2015. Evidence is needed for the impact of strategies to do so.[1-4] One critical strategy as called upon by the World Health Assembly 2009 and the World Health Report 2008, is to strengthen primary care (PC), as an important level of health care systems.[5-8] PC is the first level of professional care where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied.[1] All health care systems are faced with new infectious, environmental and behavioural risks, ageing populations, increasingly complex needs and inequities in health on the demand side, and rising health care expenditures, technological advancement and a threatening gap in human resources on the supply side.[9-12] PC has been given a vital role in addressing these challenges and achieving responsive, equitable, high quality and cost-effective health care systems.[13] It was Barbara Starfield's study in 1994[14] which showed for the first time the conducive effect of strong PC on health care system outcomes, opening a worldwide scientific discussion on the potential of PC.

Many of the ills of developed health care systems reflect a 'mono-approach', ranging from single diseases (rather than multi-morbidity), mono-disciplinary (rather than multidisciplinary), individual (rather than population), episodic encounter (rather than continuous care) and mono-dimensional (rather than multidimensional) approaches.[15-18] For example, reforms in England are raising concerns about separating public health from individual health care functions.[19] Based on its location, identity, professionals and functioning within most health care systems, PC can integrate curative, health promotion, preventive, palliative, rehabilitative, social, and psychological health services. It connects formal with informal care, individual with population based care, and integrates and coordinates the care of all health professionals for patients on a continuous, and accessible basis.[19;20] To avoid the creation of unbalanced PC in terms of structures, services delivery processes, and ultimately outcomes, it is therefore important to prioritise multi-dimensionality in PC information infrastructures, research, and policies.[7;21;22]

One cannot expect European health care systems to move forward and contribute to global aims such as the MDGs, and realise the new European policy for health - Health 2020 - without measuring and evaluating the current state of PC to overcome potential system constraints.[3;4;23] Though several studies have performed PC evaluations of single countries[24;25] or international comparisons of one or two functions of PC[26;27], they are outdated, have a limited geographical coverage, or do not take the complexity of PC into

account. So far, little attention has been paid to systematically monitoring PC strength in Europe.

Advantage should be taken of the scale and diversity of Europe by benchmarking strategies to facilitate improvements in the structure of PC and key functions of the services delivery process. Measurement is a necessity to achieve PC performance management. Health services research can play a role in supporting decision makers in the organisation of PC; facilitating researchers to unravel good practices in PC; and providing evidence-based practices to PC providers to support quality management and improvement.[28-32]

This article reflects the work of the Europe-wide project PHAMEU - Primary Health Care Activity Monitor for Europe, co-funded by DG SANCO of the European Commission, to present an evaluation of the strength of PC structures and the services delivery process, as a first step in improving the capacity of PC to optimise their impact on health care system outcomes. The development of the European PC Monitor in 2008/09 by the PHAMEU project and its data collection in 31 European countries has made it possible to compare and analyse the key dimensions (or functions) of PC, in a standardised way.[1;33] The instrument was developed on the basis of scientific evidence and consensus among an international panel of experts. It represents the dimensions of PC at structure and services delivery process level (which, at least partly, affect system outcomes in terms of quality and efficiency of care), which are operationalized by a total of 77 indicators (see figure 1, next page).[1;33] This article will address the question: How advanced are European countries in strengthening the structure of PC and key functions of the PC services delivery process?

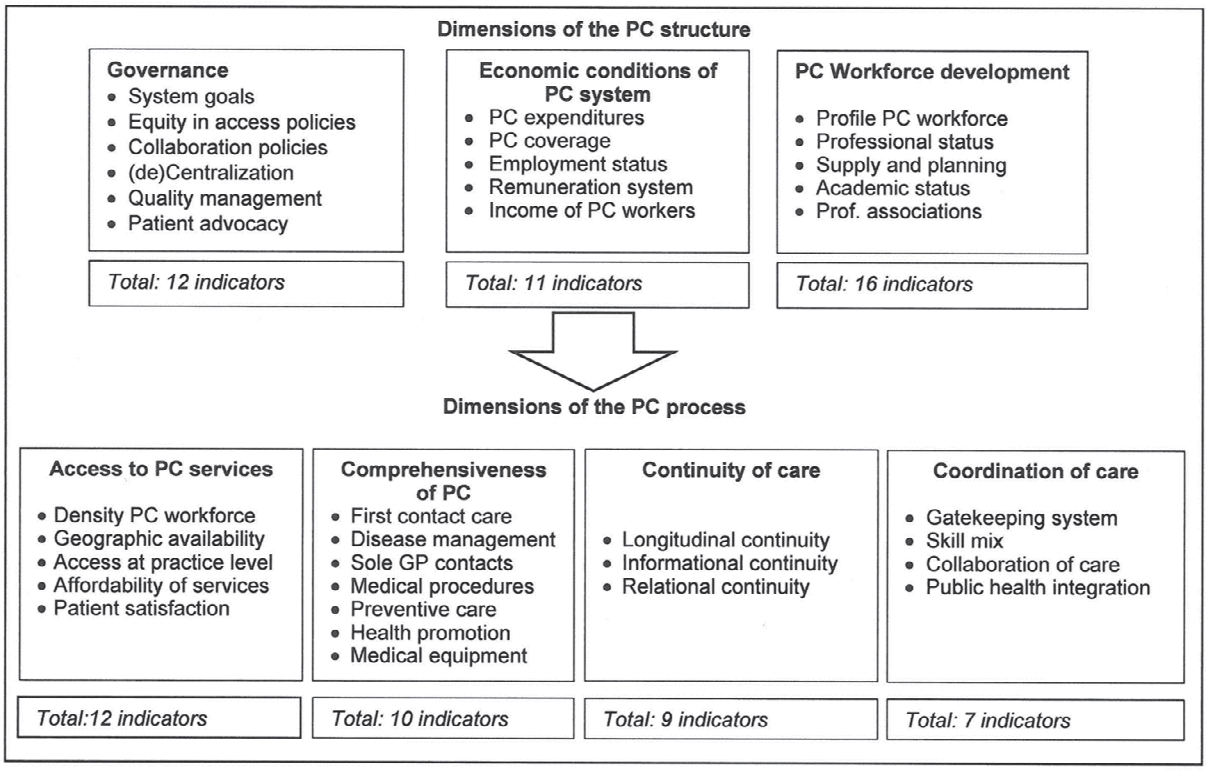
Methods

Data collection

On the basis of the indicator set of the European PC Monitor (described in detail by Kringos et al.[33]), data were collected by the PHAMEU project partners (consisting of all authors) in 2009/10 in the 27 EU member states, plus Turkey, Switzerland, Norway, and Iceland. Partners were responsible for data collection in their own country and two or three other countries based on their expertise and affinity. Details of the data collection have been tuned to the local situations and availability of sources. The general strategy was to use the best available data. For some indicators data could be found in international databases, such as from the OECD and WHO. Relevant sources were found via European organisations and networks in PC, such as the regularly updated 'Health Systems in Transition' publications of the European Observatory on Health Systems and Policies, and other international scientific

publications. These international sources were complemented by national sources. As far as national sources (e.g. literature databases or websites of national statistical offices and important health care stakeholders) could be accessed in a language known by the project team, data was collected by desk research. National experts were consulted to get access to grey literature or articles in a language unknown to the members of the project team, to help identify sources of missing information or to deliver 'consensus information', and to validate the country results. All sources (and differences in data definitions) used were closely registered, to be able to map the current PC information infrastructure across Europe. The detailed results on indicator level for all countries will be published in a book in 2012.[34]

Figure 1: Primary care structure and process dimensions



Measuring PC strength

To determine the strength of PC, country data on all indicators were transformed into scores indicating the PC strength of countries, ranging from 1 (weak) to 3 (strong). This is a frequently used approach by Starfield et al. (see box 1 for further details).[27] Based on these indicators per country 7 separate dimension scores were calculated. This was done using a two level hierarchical latent regression model (see box 2 for further details). An important advantage of using such a model is that it gives valid dimension scores per country even if that country has missing indicators. MLWiN 2·02 and SPSS/PASW 18·0 software were used.

Box 1: Scoring qualitative & quantitative indicators

The European PC Monitor consisted of a mix of quantitative and qualitative indicators. The scoring of qualitative indicators were based on the findings of the systematic literature review on PC.[1] For example, if a country indicated having a pro-PC policy in place, or reimbursing PC providers by a mixture of fee-for-service, capitation and performance indicators, the country scored a "3" on the respective indicators, meaning a feature of strong PC. The scoring of quantitative indicators was based on the literature review[1] to determine the direction of scoring (what is strong-medium-weak PC), and the distribution of data on the respective indicator among all 31 countries. The limits of strong (3)-medium (2)-weak (1) scores were determined by the 33% and 67% percentiles of valid country results. This way the data shows the relative levels of PC strength across Europe. For example, PC expenditure (as percentage of total health expenditure) ranged from 25.6% (Switzerland) to 4.7% (Czech Republic). One third of the countries had a PC expenditure ranging from 4.7% to 9.8%, and therefore scored "1", one third of the countries had a PC expenditure ranging from 9.8% tot 14.0%, scoring "2", and the remaining one third of the countries with expenditures of 14.0% or higher scored "3". The only indicator of the European PC Monitor that was excluded from scoring was the Employment Status of general practitioners, due to lack of evidence of its effect on health care system outcomes.

Box 2: Calculating dimension scores

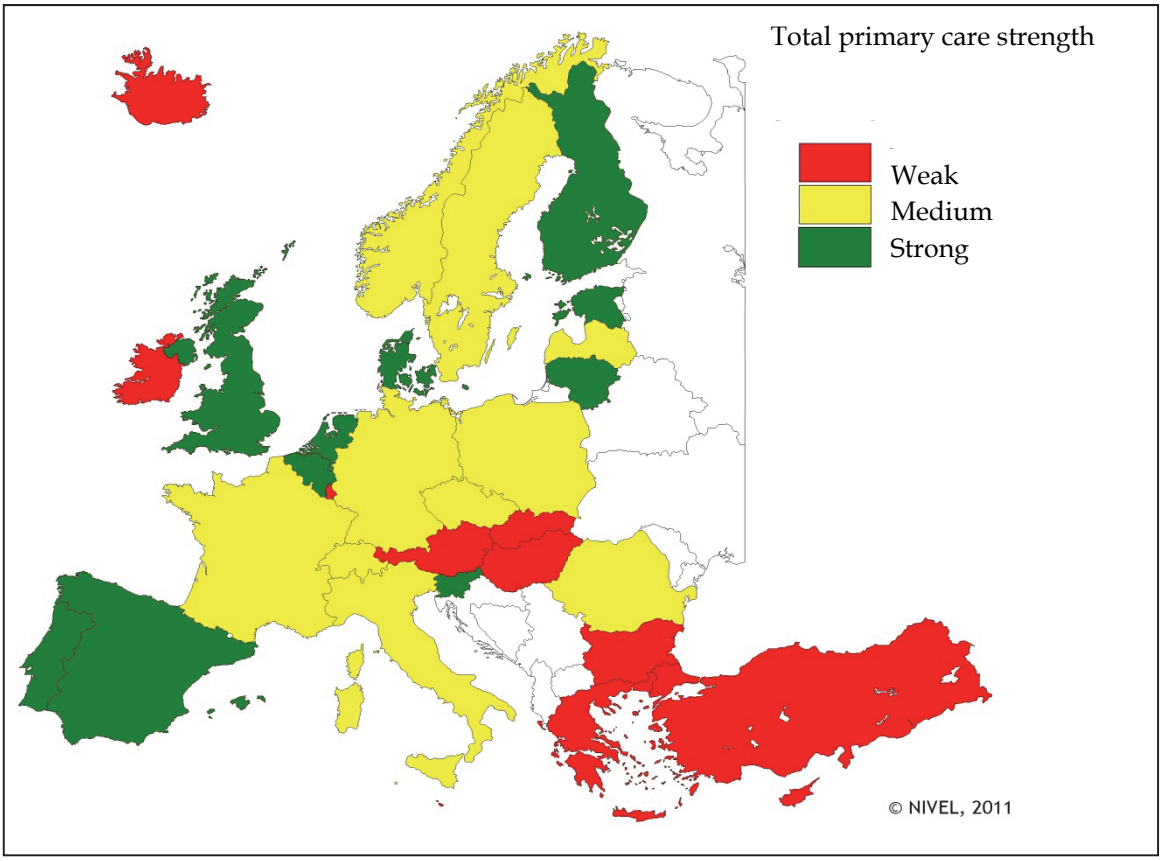
A two level hierarchical latent regression model was used to calculate 7 separate dimension scores based on the indicators per country.[28] The dependent variable is the scores for every country on the indicators belonging to that dimension. In the fixed part of the model the dimension average is estimated together with the indicator effects (using deviation indicator coding), to control for differences in the indicator averages. In the random part, at level one, the indicator measurement errors are modelled as separate variance terms for every indicator, this controls for differences in the indicators standard deviations. At level two the effect for every country on the dimension is modelled, this is used to calculate country dimension scores. The reliability coefficients (ranging from 0.53 to 0.57) were well within the acceptable range for the scales to be considered reliable. Only two scales (economic conditions and continuity of care) had a low reliability coefficient (0.26; 0.35 respectively), which indicates relatively many missing data.

Results

Primary care strength

Taking the performance on all PC structure dimensions (incl. PC governance, economic conditions, workforce development) and services delivery process dimensions (inc. access, continuity, coordination, and comprehensiveness of PC) into consideration, figure 2 shows the overall PC strength of countries.

Figure 2: Countries with strong, medium and weak primary care, considering PC structure and key aspects of PC services delivery

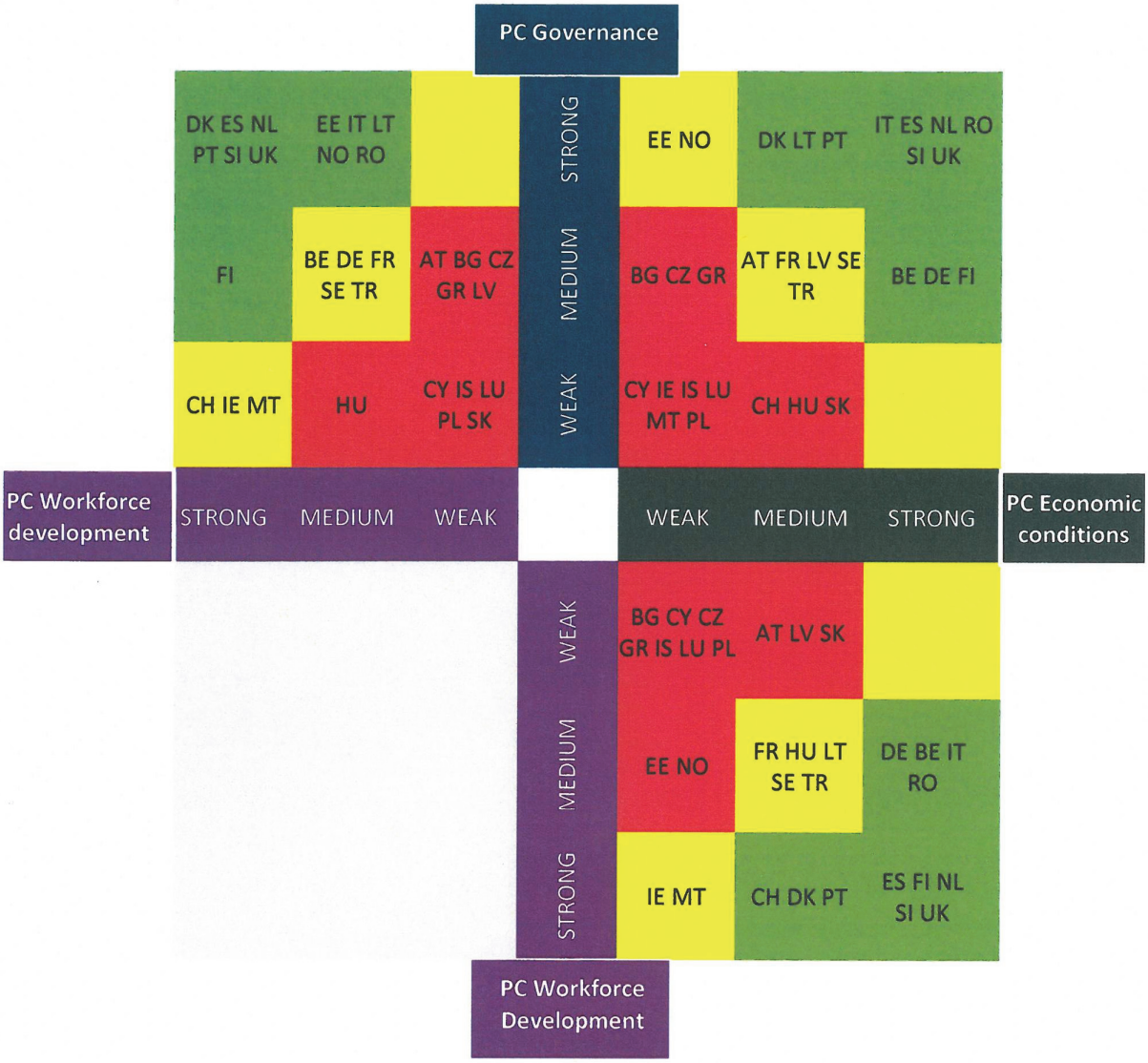


Structure of primary care

Figure 3 shows the strength of countries' PC structure. Countries with a relatively strong PC structure, considering all 3 dimensions (Governance, Economic conditions, and Workforce development) are Denmark, Finland, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain, and the United Kingdom. France, Sweden, and Turkey have a consistent relatively medium PC structure. Countries with a relatively weak PC structure considering all 3 dimensions are Bulgaria, Cyprus, Czech Republic, Greece, Iceland, Luxembourg, Poland, and Slovakia. The most inconsistent scores on the 3 dimensions of PC structure are shown in Estonia, Norway, and Switzerland.

Overall, the scores of all PC structure dimensions are positively associated with each other (Spearman's correlation values were 0.49 for Governance and Workforce development with Economic conditions (p-value 0.01) and 0.55 (p-value 0.00) for Governance–Workforce development).

Figure 3: The strength of countries' PC structure



The next 3 sections will discuss the main results by PC structure dimension.

PC Governance: Countries do not always have a clear governmental vision on the future direction of PC. Important PC governance functions (e.g. priority setting, supply planning) have been decentralised to regional or local authorities in the majority of countries. Quality of care is safeguarded by minimum standards in most countries, including professional education, clinical guidelines, and patient rights. However, exceptions to official training policies are incidentally applied in countries allowing non-specialised physicians to work in PC, rules for continuous medical education are often absent, and general practice guidelines are often made by medical specialists, the ministry of health or adapted from foreign guidelines. The depth, quality and effective implementation of policies can therefore be largely improved in many countries.

Economic conditions of PC: Countries have great difficulties in reporting their PC expenditures as a % of the total health care expenditures. There is a clear East-West divide in the relative level of expenditures and income. The income of PC providers in Eastern Europe is often much lower than the income of medical specialists, limiting both the financial capacities and the (relative) professional status of PC providers. PC providers' remuneration systems are often topped up by various performance related financial incentives to influence physician behaviour. Self-employment with a contract is the predominant employment status of GPs in Europe.

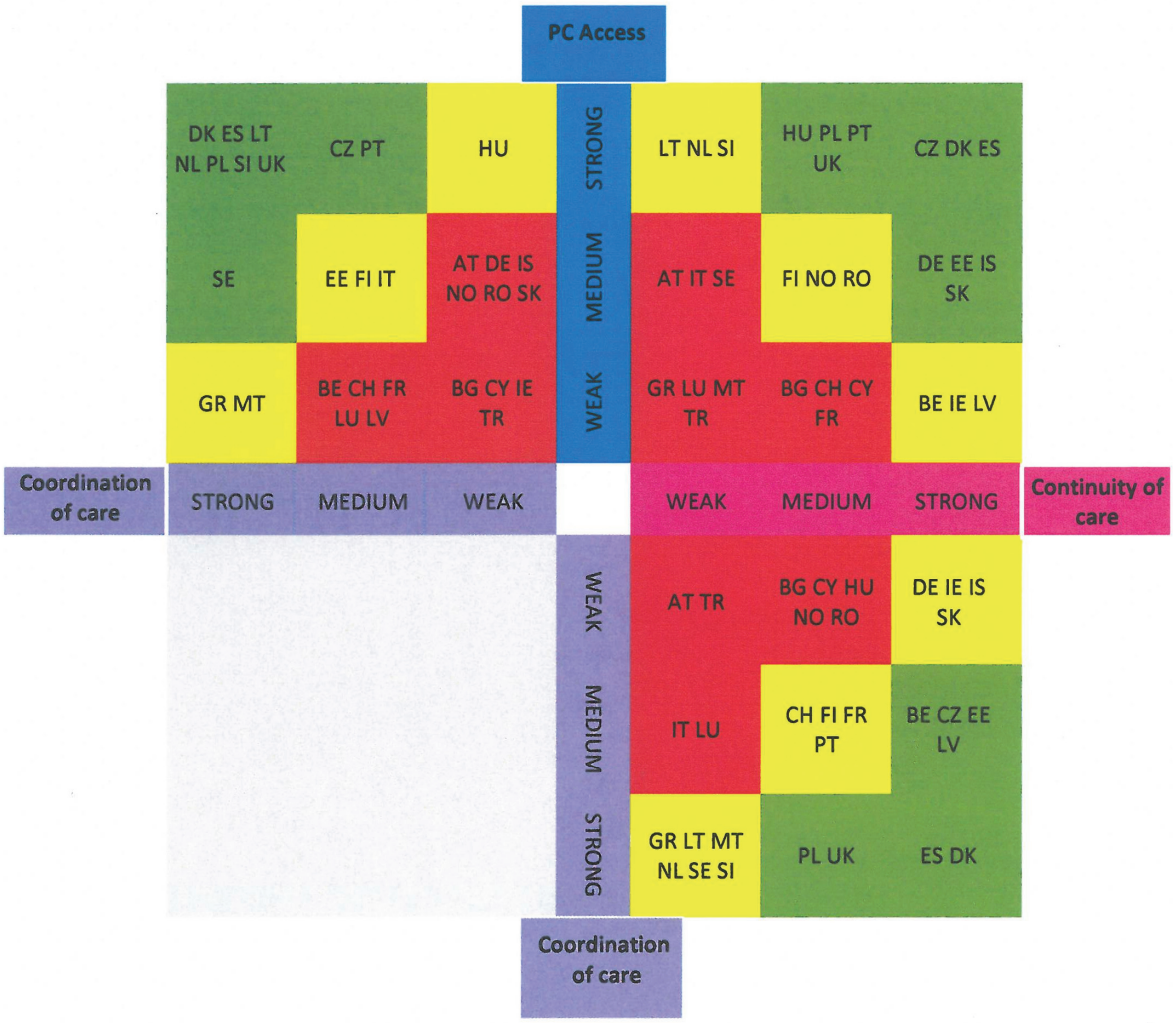
PC workforce development: The most common PC physician profile consists of GPs and some directly accessible medical specialties. All countries are faced with an ageing PC workforce, together with potential shortages within 10 years time. Only half of the countries have data available from studies on PC workforce capacity needs and development in the future. On average, one fifth of all medical graduates choose to enrol in postgraduate training in Europe. Though national organisations for GPs exist in all countries (except Iceland), this is rarely the case for PC nurses.

Primary care services delivery process

Figure 4 shows the strength of countries' PC services delivery process. Denmark, Spain, and the United Kingdom have a relatively high accessibility of PC, provide a relatively high level of continuity and coordination of PC, and provide the most comprehensive scope of PC services. Countries where the accessibility, continuity, coordination, and comprehensiveness of PC is somewhat inconsistent (strong or medium) are Estonia, Lithuania, Portugal, and to a lesser degree (medium level dominates) Czech Republic, Finland, and Poland. Austria and

Cyprus have a relatively weak PC services delivery process (considering all 4 dimensions). More inconsistent (weak/medium) are Bulgaria, Italy, Luxembourg, Romania, Turkey, and to a lesser degree (medium level dominates) Greece, Ireland, Malta, Switzerland. The remaining eleven countries are highly inconsistent in the strength of their PC services delivery process.

Figure 4: The strength of countries' primary care services delivery process



Overall, the scores of the 4 PC services delivery process dimensions show no associations with each other. Each of the PC structure dimensions is positively associated with PC accessiblity (Spearman's correlation values range from 0.37 (p-value 0.04) for Access –

Economic conditions to 0.54 (p-value 0.00) for Access – Governance. In addition, coordination of PC is positively associated with PC governance and PC workforce development (Spearman's correlation values of 0.38 (p-value 0.03) and 0.41 (p-value 0.02) respectively).

The next 4 sections will discuss the main results by PC services delivery dimension.

Accessibility of PC: High geographical inequalities in availability of GPs within countries exist across Europe. In almost half of the countries, patients often need to pay part of the costs of a GP contact. Organisational arrangements to facilitate access leave ample room for improvement, particularly considering telephone and email consultations, appointment systems, and offering consultations for special patient groups. Also, the chance of receiving a GP home visit differs largely across Europe. In many countries, after-hours PC services are organised through different (sometimes mutual among GPs) arrangements and in a few countries hospital emergency departments have the sole responsibility for after-hours PC services.

Continuity of PC: Though longitudinal continuity of care is relatively high in most countries some countries have relatively large patient lists (e.g. Austria, Finland, Germany, the Netherlands). Improvements can be made in informational and interpersonal continuity of care. For example, by offering PC providers adequate software and training to use it. Practice computers can be used for multiple purposes, such as supporting public health functions, information exchange with peers and medical record keeping. The facilities are often lacking. Where data exist, patients are least satisfied with PC providers' communication skills and consultation duration (e.g. in Germany, United Kingdom, Lithuania).

Coordination of PC: There are 3 types of referral (gatekeeping) systems in place across Europe. Countries where patients:

1. have direct access to most types of physicians (Austria, Belgium, Cyprus, Germany, Luxembourg, Switzerland, Turkey);
2. have direct access to most types of physicians if costs of the visit are paid privately (Czech Republic, Denmark, Finland, France, Greece, Iceland, Ireland, Malta, Poland, Slovak Republic), but usually few people opt for that;
3. need a referral for a selection/most of physicians (Hungary, Latvia, Sweden, Bulgaria, Estonia, Italy, Lithuania, the Netherlands, Norway, Portugal, Romania, Slovenia, Spain, United Kingdom).

GPs do not use a patient list system in Austria, Belgium, Cyprus, France, Germany, Ireland, Luxembourg, Malta, Sweden, and Switzerland. Almost half of the countries in Europe are dominated by solo practices in PC. GPs working in shared practices have more face-to-face meetings with PC colleagues and offer special clinical sessions more frequently than do single-handed practices. Cooperation and coordination between primary and secondary care is problematic in many countries. In general, nurses have limited tasks in PC although there are some notable exceptions, for example the UK and Spain.

Comprehensiveness of PC: PC facilities are generally well equipped across Europe. The intensity of the role of GPs as first contact care provider is highest in all gatekeeping countries. GPs often provide follow-up care for a broader scope of conditions in countries with more solo practices. PC nurses carry out medical technical procedures in only a few countries. Preventive care activities are provided by a large variety of providers in the majority of countries, including GPs. Overall, the most comprehensiveness scope of PC services is offered in Belgium, Bulgaria, Finland, France, Lithuania, Norway, Portugal, Spain, Sweden, and the United Kingdom.

Availability of primary care information

On average, countries had data available on 94% of the PC structure indicators; and 93% of the PC services delivery process indicators. At PC structure level, there was less data (91%) on economic conditions; and at PC services delivery process level on continuity of care (87%). Countries vary much more on data availability on PC services delivery process indicators, than PC structure indicators (see Table 1). Though not included in this article, most countries had alarmingly little data available on PC outcome indicators such as quality and efficiency of care.

Table 1: Data availability on primary care indicators by country

Ranking of countries on dat availability for indicators by level of primary care system

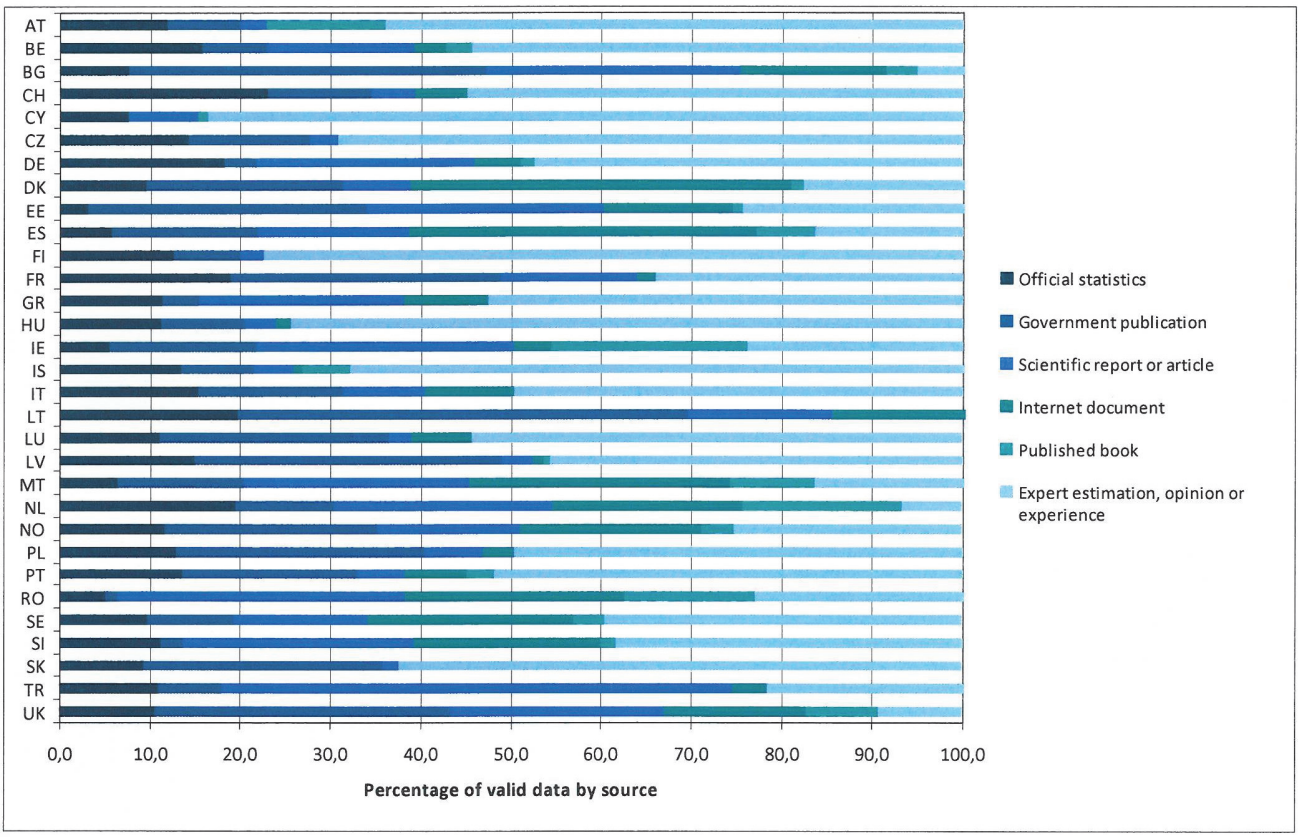
(1=No missing values; 2= 2nd country with least missing values…31-31th country with most missing values)

Indicators at level:	**AT**	**BE**	**BG**	**CH**	**CY**	**CZ**	**DE**	**DK**	**EE**	**ES**	**FI**	**FR**	**GR**	**HU**	**IE**	**IS**
Structure of PC system	3	1	1	1	13	1	3	4	1	2	7	1	14	1	4	12
Process of PC system	9	4	1	18	19	11	1	3	3	5	6	3	**21**	1	14	16
Average total ranking	6	3	1	10	16	6	2	4	2	4	7	2	**18**	1	9	14

Indicators at level:	**IT**	**LT**	**LU**	**LV**	**MT**	**NL**	**NO**	**PL**	**PT**	**RO**	**SE**	**SI**	**SK**	**TR**	**UK**
Structure of PC system	2	1	6	1	**15**	1	5	5	4	8	10	9	1	11	1
Process of PC system	15	1	17	2	20	1	10	8	1	12	13	7	1	4	4
Average total ranking	9	1	12	2	**18**	1	8	7	3	10	12	8	1	8	3

Figure 5 shows the type of sources used by country. On average, 12% of all data was based on official (inter)national statistics, 17% on governmental publications, 15% on scientific reports or articles, 11% on internet documents or websites, 4% on published books, and 41% on expert estimations, opinions or experiences.

Figure 5: Type of data sources used by country



Discussion

Improving the strength of primary care

Barbara Starfield and colleagues measured the PC strength of 14 European OECD countries in 1995.[27] Although the results of our study are not fully comparable due to differences in methodology, we see that in 2009/10 the PC strength of Denmark, Greece, Italy, the Netherlands, Norway, Spain, Sweden, and United Kingdom has remained constant, whereas this has improved in Belgium, Finland, France, Germany, Portugal, and Switzerland. Moreover, it is safe to assume that the Central and Eastern European countries have improved their PC strength since the early 1990's when they started to transform their health care systems. Many of these countries have retrained district doctors and policlinic specialists into GPs and introduced gatekeeping.[35]

Considering the structure of PC, countries either have many PC policies and regulations in place, combined with good financial coverage and resources, adequate PC workforce conditions, or have consistently only little or few of these PC structures in place. Countries differed the most in their PC workforce development and the least in their economic conditions of PC.

Considering key aspects of the process of services delivery, the PC strength of countries is much more diverse. Countries differed the most in their coordination of PC which includes the important gatekeeping indicator, and the least in the provided continuity of PC. Countries with a high accessibility and coordination of PC, generally also have a strong PC structure. The lack of correlation among process dimensions suggests that each of the PC services delivery process dimensions can independently be targeted for policy improvement actions. It is questionable, however, whether each of the PC services delivery process dimensions are equally important in contributing to health care system outcomes. For example strengthening coordination of care while access to PC is insufficient, or improving continuity in absence of coordination of PC, might not be very appropriate nor effective for health outcomes. Future research could address the appropriateness of using a weighing system for PC dimensions to answer this question.

If countries aim to improve their PC strength, there are a number of common issues that would need to be addressed across Europe. For example, it is worrisome that there is not always a clear governmental vision on the future direction of PC, particularly because most countries have decentralised important PC functions. Although decentralisation can increase the responsiveness of PC at regional or local level, there is a risk of interregional inequities in access, financing, quality of care and, ultimately health.

Countries should learn from the effectiveness of various remuneration (e.g. pay-for-performance) systems. There is also an urgent need for countries to take appropriate

measures to tackle the threatening workforce shortages. These could include a regular system of workforce capacity planning, raising the (financial) attractiveness of the profession and increasing possibilities for task substitution. Perhaps the highest gains in access can be made by reducing the level of PC co-payments to increase to affordability for patients. Countries should make a clear choice between demand regulation via well-accessible (gatekeeping) GPs or via co-payments. Cooperation and coordination between primary and secondary care might benefit from the creation of multidisciplinary professional education, teamwork, and multidisciplinary practices.

Primary care information infrastructure

The degree and quality of PC data availability shows the potential capacity of a country to evaluate and monitor the state of its PC, identify improvement areas, and be accountable and transparent on system performance. In almost all countries high quality PC information on comprehensive aspects were lacking. If we continue to give PC a vital role in achieving health care system outcomes, there is an urgent need to invest more in improving the PC information infrastructures, both at national and international level. At the moment, information infrastructures differ too much in completeness, quality, and availability, to accurately measure the contribution of strong PC on health care system outcomes.

Limitations

By depending on the availability of data, the quality of data in terms of completeness and timeliness differs across Europe. Though this might be seen as a limitation, this also raises awareness of PC information infrastructures in Europe. The results for some countries may not seem obvious. However, countries may have strong PC on paper, but practice may need time to implement this or catch up, and vice versa. In addition the availability and quality of information influenced the results. These are complications and dynamics within a system that are difficult to measure.

The geographical boundaries of countries might be becoming less important considering the increasing decentralisation of governmental systems of countries (e.g. Italy, Spain, and the United Kingdom), creating autonomous regions or counties. It is possible there is more variation in the structure and services delivery process of PC than this study was able to capture, by using the country level as unit of analysis in stead of, for example regions.

Conclusion

This study shows current variation in the PC strength in Europe. Countries are consistent in the strength of their PC structures, but less so in the strength of their PC services delivery

process. There is a discrepancy between the responsibility given to PC in (inter)national policy initiatives and the weakness of investment in PC in the face of future shortages of the workforce. There is a need for all countries to improve their PC information infrastructure to facilitate PC performance management in comparative perspective. As long as there is no conclusive evidence for the benefits of strong PC on health care system outcomes, our high expectations of PC may be true-until-proven-otherwise. Additional research is therefore urgently needed to develop outcome indicators that are valid, feasible, measurable, and subject to PC; that is currently often lacking.[33] This study offers a valuable baseline measurement of PC, but it will lose its value if this is not used as a basis for PC management and routine data collection.

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6

How to achieve optimal organization of primary care service delivery at system level:
lessons from Europe

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This article has been submitted for review

Abstract

Objective
Policy makers are in need of evidence to improve the sustainability of their health care systems through primary care (PC). This article aims to measure the relative efficiency of PC in turning their structures into services delivery, and turning their services delivery into quality outcomes.

Methods
Data on 22 European countries were analysed by using the 2009/10 dataset of the PHAMEU (Primary Health Care Activity Monitor for Europe) project. Two Data Envelopment Analysis models were run to compare the relative technical efficiency. Model one included data on governance, workforce development, and economic conditions as inputs; and access, coordination, continuity and comprehensiveness of care as outputs. Model two included the previous process dimensions as inputs, and indicators of quality of care as outputs. A sensitivity analysis of the resulting efficiency scores was performed by means of bootstrapping.

Findings
There is relatively reasonable efficiency in all countries at delivering as many as possible PC processes at a given level of PC structure. It is particularly important to invest in economic conditions to achieve an efficient structure-process balance. Only five countries have fully efficient PC systems in turning their services delivery into high quality of care outcomes, using a similar combination of access, continuity and comprehensiveness, while they differ on the adoption of coordination of PC services. There is a large variation in efficiency levels obtained by countries with inefficient PC systems in turning their services delivery into quality outcomes.

Conclusion
Maximizing the individual functions of PC without taking into account the coherence within the health care system, is not sufficient from a policymakers point of view when aiming to achieve efficiency.

Introduction

The main goals of health care systems are to improve population health and health equity.[1] All health care systems in developed countries are facing common challenges including aging population, increases in chronic and lifestyle related diseases, and rising health care costs. Increasingly it is argued that primary care (PC) is an important part of the answer to these challenges.[1-3] The potential of PC is based on its role as first contact care for curative, preventive, public, social, and mental health problems and providing services in an accessible setting near people's homes on a continuous basis.[4] Health care systems that have optimized the performance of these key PC dimensions can reduce unnecessary use of expensive specialized care[5-8], and seem to have healthier populations, fewer health-related disparities and lower overall costs for health care, though the evidence is not conclusive yet, particularly for the European setting.[7-10] Recently, countries were encouraged to orient their health care systems toward PC in the World Health Report of 2008.[3]

The importance of PC both in terms of population health and use of resources amply motivates research on PC performance.[11,12] Policymakers are in need of evidence to help them prioritise PC. Priority setting should be based on evidence of the optimal balance of PC dimensions to achieve their intended effects.
The application of a PC Monitor by the PHAMEU (Primary Healthcare Activity Monitor for Europe) project in 31 European countries in 2009/10 has made it possible to compare and analyse the key dimensions of PC in a standardised way.[4,13] PC can be described as a sub-system of the overall health care system when taking into account its complexity (hereafter referred to as 'PC system'). A country's PC system is structured by its governance, economic conditions and workforce development. The process of a country's PC service delivery is determined by the comprehensiveness of PC services, accessibility of PC, and coordination and continuity of PC. Both the PC structure and PC services delivery process seem to affect its outcomes in terms of quality of care (see figure 1).[13] Although all of these dimensions are important for population health, it is unknown which combination(s) of dimensions will achieve the best (i.e. most efficient) quality of care outcomes.

In the last three decades, a number of analytical methods have been advanced in order to foster efficiency analysis within the context of PC, mainly with the purpose of offering policymakers useful tools to measure the extent to which certain levels of outcome are reached in relation to the resources deployed.[14-17]

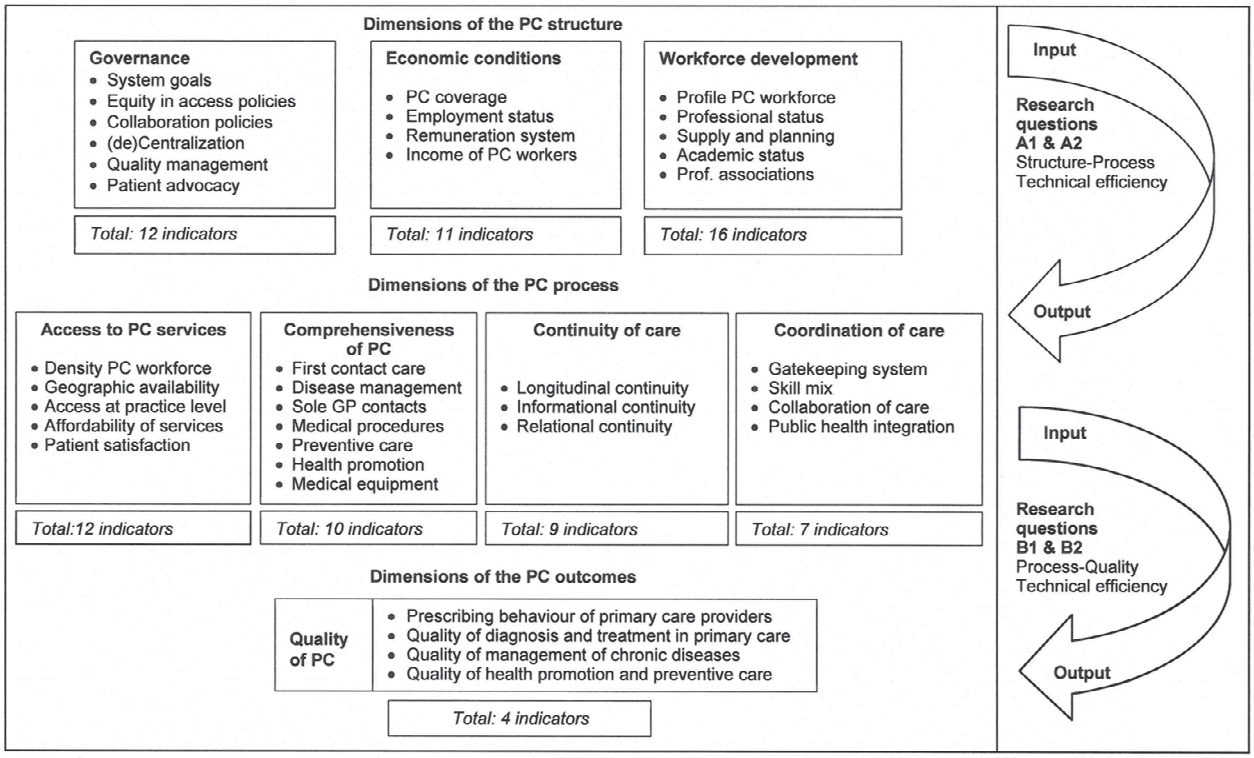
In this article, "efficiency" is defined as technical efficiency from a policy-maker's point of view. Therefore, PC efficiency is defined as the extent to which PC achieves its objectives in relation to its structure and organization of processes.
This article aims to identify the optimal way of organizing PC services delivery at system level. The following research questions will be answered:

A1) What is the optimal (most technically efficient) relationship between the structure of PC (in terms of PC governance, economic conditions, and workforce development) and the PC processes delivered (in terms of comprehensiveness, access, continuity and coordination of care)?
A2) Is there variation among European countries in their technical efficiency at PC Structure- Process level (considering the relation between the PC structure arrangements and PC processes delivered)?
B1) What is the optimal (most technically efficient) relationship between the process dimensions of PC services delivery (in terms of comprehensiveness, access, continuity and coordination of care) and quality of care?
B2) Is there variation among European countries in their technical efficiency at PC Process-Outcome level (considering the relation between the PC processes delivered and quality of care outcomes)?

Methods

Figure 1 shows the study design, based on the PC Framework developed by Kringos et al.[4,13]

Figure 1: Study design



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Setting and data collection

Data were derived from the PHAMEU project, which were collected on the basis of 94 PC indicators in 27 EU Member States, Switzerland, Turkey, Norway, Iceland in 2009/10. The indicators were developed based on a systematic literature review and expert consultations, measuring the existing PC structures and aspects of PC services delivery and the quality of PC services of countries.[4,13] The indicator set for which data was collected and the data collection approach has been described in detail by Kringos et al..[4,13]

For the purpose of this article, we excluded 9 countries because of a relatively high number of missing data (Cyprus, Greece, Iceland, Malta, Romania, Slovak Republic, Slovenia, and Turkey).

As for the quality dimension, we considered a limited set of PHAMEU indicators to minimize missing values including:

- Defined daily doses of antibiotic use in ambulatory care/1000 inhabitants/day;
- Crude percentage of diabetic population aged >25 years with HbA1C > 7.0%;
- Number of hospital admissions for people with a diagnosis of asthma/100,000 population/year;
- % of infants vaccinated within PC against: diphtheria, tetanus, pertussis, measles, mumps, rubella.

Together, this indicator set represents four important areas of quality of PC (see figure 1).

Data on the strength of PC were derived from Kringos et al.[18] in which country data on all indicators were translated into scores indicating the PC strength of countries, ranging from 1 (weak) to 3 (strong). Based on these indicators per country 8 separate dimension scores were calculated, as reported in table 1 (column 'current value'), using MLWiN 2.02 software. The dependent variable is the combination of scores for every country on the indicators belonging to that dimension. In the fixed part of the model the dimension average is estimated together with the indicator effects (using deviation indicator coding), to control for differences in the indicator averages. In the random part, at level one, the indicator measurement errors are modelled as separate variance terms for every indicator; this controls for differences in the standard deviation of indicators. At level two the effect for every country on the dimension is modelled, this is used to calculate country dimension scores.[19,20] The resulting scores were used in the analysis of this study.

Variables of the Data envelopment analysis (DEA)

We carried out our efficiency analysis by applying DEA in two steps using 'DEA excel solver' software[21]: firstly we ran a DEA model considering the three structure dimensions as inputs and the four process dimensions outputs, followed by another DEA model considering the four process dimensions as inputs and the quality of PC as output (see figure 1).
In both models, the countries with the highest output/input ratios are acknowledged as optimal performers, and the frontier efficiency is built up by joining these observations into input-output space. In DEA, inefficient countries are "enveloped" by the efficiency frontier. The statistical and methodological background of DEA has been illustrated in a number of articles.[17,22-24]

Empirical specifications of the DEA models

Technical efficiency (TE) in our analysis has a dual definition:
1. Producing the highest amount of processes from a given level of structure;
2. Producing the highest quality outcomes from a given combination of processes.

We made three assumptions. Firstly, we ran our DEA model under the assumption of constant returns to scale, aiming to analyze TE in the provision of PC services in each country by focusing on their 'productivity' regardless of the 'scale of operations'.[25]
Secondly, we ran an output-orientation DEA model to explore the potential expansion in the output provided while keeping input mixes invariable.[26]
In DEA, weights of the performance criteria are endogenously determined in the model without the need for subjective judgments, assigning to each country its best attainable efficiency score. Therefore, no weight restrictions were made.[26]

The empirical model for the efficiency of a county's PC system (PCo) can be formulated as follows[22]:

$$\text{Maximise } E_{PCo} = \frac{\sum_{s=1}^{S} u_s \times y_s o}{\sum_{m=1}^{M} v_m \times x_m o}$$

Subject to:

$$\frac{\sum_{s=1}^{S} u_s \times y_{si}}{\sum_{m=1}^{M} v_m \times x_{mi}} \leq 1 \qquad i = 1, \ldots, 31$$

Where:
E_{PCo}= efficiency of PC zero
$y_s o$ = quantity of outputs *s* of PCo
$x_m o$ = quantity of inputs *m* of PCo
u_s = weight attached to the output *s* - generated from the model- , $u_s > 0$, *s* =1,…, S
v_m= weight attached to the input *m* - generated from the model- $v_m > 0$, *m* =1,…, M
This mathematical problem is to maximise the efficiency of PCo by generating a set of weights (i.e. u_s and v_m) to be attached to its inputs and outputs, subject to the constraints that, when applied to the other PC systems (PCSs) under scrutiny, no one can assume efficiency

scores greater than unity. Furthermore, such a set of weights cannot assume a negative value.

A core aspect of DEA is the calculation of a set of input-output targets that would turn a country with inefficient PC into an efficient one. Other useful parameters provided by DEA, which will be used in this article to investigate potential causes of inefficiency are the slacks. Slacks are values attached to the different variables, indicating the underproduction of outputs or the overuse of inputs. Furthermore, DEA seeks out these values for each country's PC system, taking into account other countries with PC systems that use similar input-output ratios (peer systems), but at a more efficient level.

Addressing the uncertainty in modelling DEA

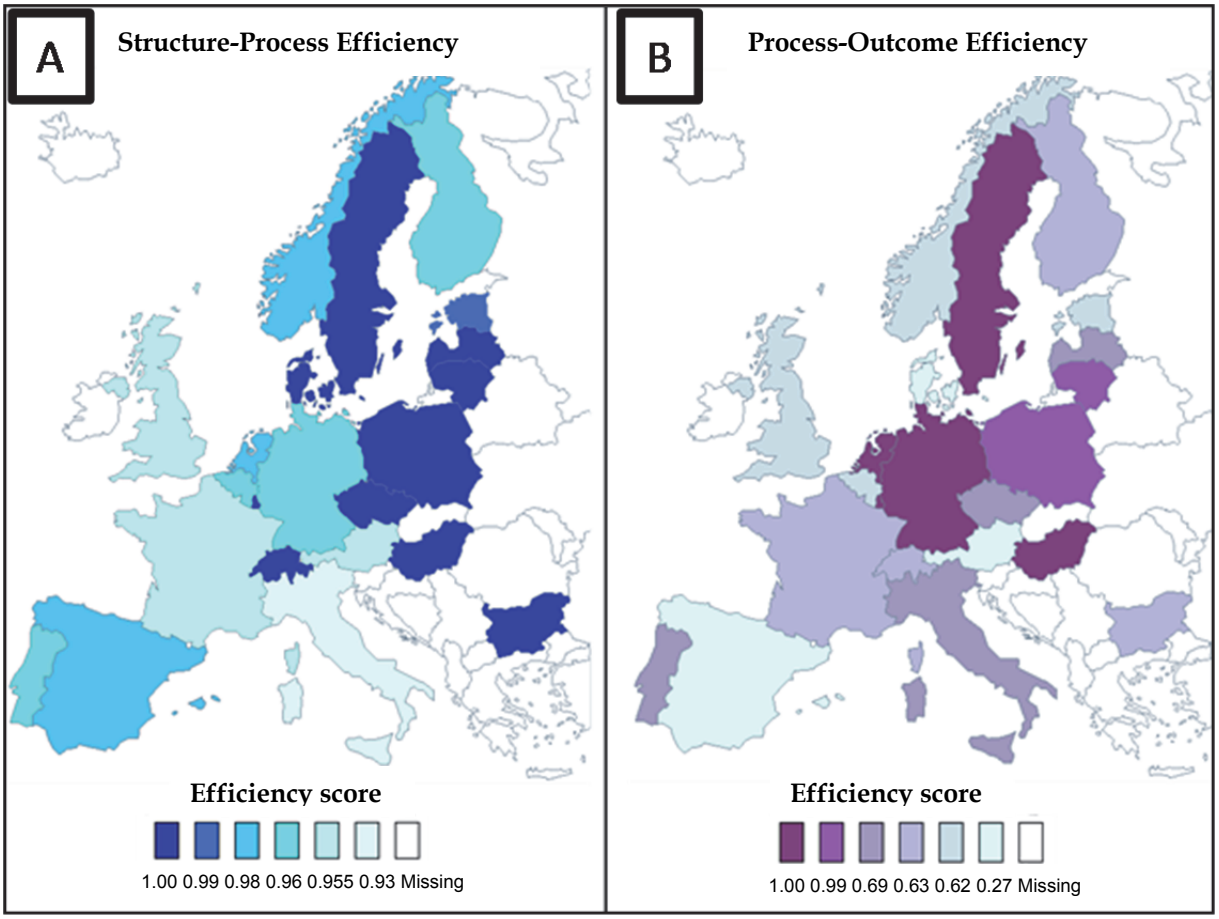
Since DEA measures efficiency relative to an estimate of the frontier, we used the bootstrap approach proposed by Similar and Wilson (2000), to estimate the bias-corrected measure of TE as well as confidence intervals for efficiency scores, by running 2000 bootstrap replications using 'FEAR' software.[27]

Results

Data envelopment analysis and efficiency scores

Figure 2 summarizes the efficiency scores of all 22 countries for both applied models. The average efficiency for Structure-Process is 0.98, and for Process-Outcome is 0.80. The former efficiency scores range between 0.93 (93%) to 1 (100%), whereas the latter's show a greater variation (standard deviation 0.233), ranging from 0.28 (28%) to 1.0 (100%).

Figure 2: Summary of Efficiency score. A) Structure-Process DEA model; B) Process-Outcome DEA model



The Structure-Process DEA model shows that 10 countries (Bulgaria, Czech Republic, Denmark, Hungary, Latvia, Lithuania, Luxembourg, Poland, Sweden, Switzerland) are relatively efficient in delivering their processes by using the best mix of structure dimensions, with efficiency scores equal to the unity or 100% relative to the other PC systems. The most inefficient country on structure-process level was Italy with an efficiency score of 0.93. These results point to a relatively high efficiency in all countries in delivering the maximum processes of PC at the given values of the structure dimensions.

It is possible that PC systems with low levels of structure dimensions (e.g. Hungary, Bulgaria, Latvia) are maximally efficient due to their relatively high values on PC process delivery dimensions; in other words these PC systems are delivering the best quantity of

processes they can with their moderate levels of structural resources, if compared to other PC systems in the dataset.

In the Process-Outcome DEA model only 5 countries (Germany, Hungary, Luxembourg, the Netherlands, Sweden) were found to be relatively efficient.

Figure 3: Best performers input-output combinations. A) Structure- Process DEA model; B) Process- Outcome DEA model

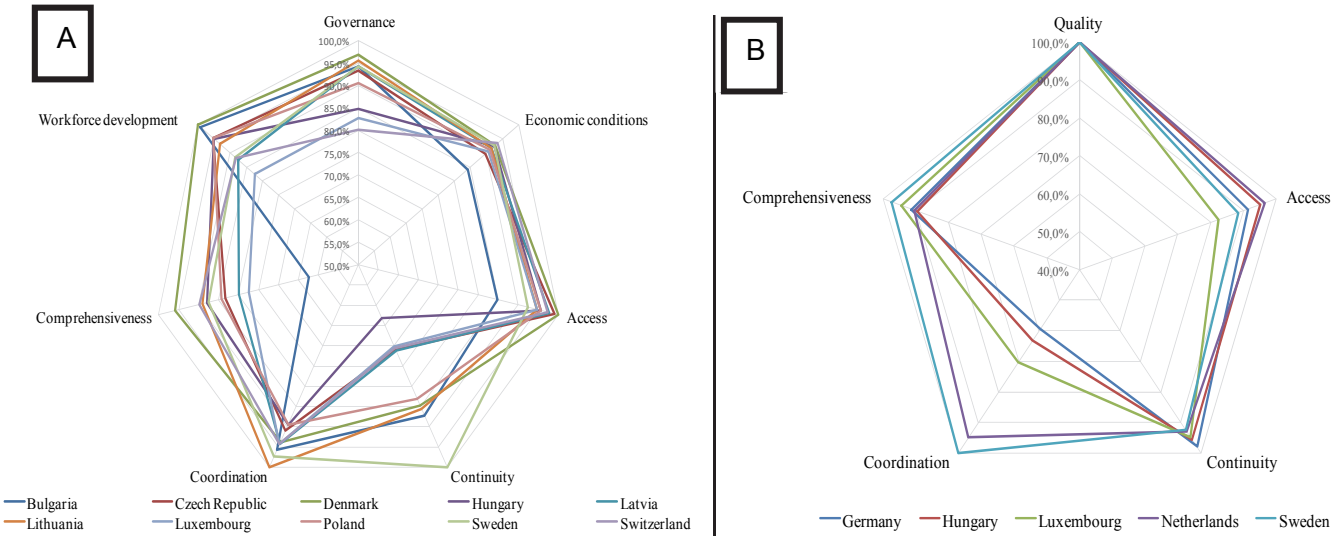


Figure 3 shows the optimal mix of input-output ratios for both DEA models. As for the Structure-Process DEA model, the 10 best performing countries are quite different in their structure inputs: each of these PC systems differ from the others both in terms of workforce development and governance features, whereas they seem to converge on their values for the economic condition dimension. As for the most efficient PC systems with regard to the Process-Outcome TE, our results suggest that while there are different degrees of coordination of care among countries, it is necessary to have a high level of PC access, comprehensiveness and continuity of care to provide the highest amounts of quality.

Analysis of the sources of inefficiency

Table 1 summaries the set of current values by PC dimension and country, efficiency targets (indicating room for improvement of a country's value on a certain PC dimension based on the performance of peer countries), efficiency gaps (the difference between the current values and the targets as percentage of the current values) and slacks for each country's PC system as regard to both of our DEA models. For example it shows that Italy's PC system was the worst performer in using its structure dimensions to deliver processes. The results indicate that a little expansion in all the outputs (i.e. comprehensiveness, coordination, access, and coordination), by maintaining the current level of input (governance, workforce development and economic conditions) would be necessary in order to reach the efficiency of Italy's peer benchmarks. However, the results of Italy's Process-Outcome DEA exercise suggest that in order to be truly efficient, Italy would need to increase quality level by roughly 44% while maintaining its levels of processes of care fixed.

Supplementary file 1 gives a graphical example of the results shown in Table 2 for a selection of countries (i.e. Denmark, Italy, and Spain) for both the Structure-Process DEA model (A, on the left) and for Process-Outcome DEA model (B, on the right).

Table 1: Efficiency analysis: the current value, efficiency target, and slacks of PC systems by country

Country Efficiency scores: DEA a DEA b	DEA model (A): Structure- Process						DEA model (B): Process-Outcome					
	Peer Benchmarks	Outputs Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV	*Peer Benchmarks*	Outputs Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV
Austria	*Czech R.*	Acc	2,27	0,00	2,36	3,97	*Germany*	Qua	0,82	0,00	2,65	225,25
	Latvia	Con	2,19	0,19	2,47	12,63	*Hungary*	Acc	2,27	0,06	2,20	-2,82
TEa= 96,2%	*Luxembourg*	Coo	1,38	0,26	1,70	23,00		Con	2,19	0,00	2,19	0,00
		Com	2,33	0,00	2,43	3,98		Coo	1,38	0,00	1,38	0,00
TEb= 30,7%		Gov	2,48	0,00	2,48	0,00		Com	2,33	0,17	2,16	-7,33
		Eco	2,12	0,02	2,10	-0,76						
		Wfd	1,98	0,00	1,98	0,00						
Belgium	*Bulgaria*	Acc	2,13	0,00	2,20	3,57	*Sweden*	Qua	1,82	0,00	2,91	60,30
	Sweden	Con	2,38	0,01	2,48	3,99	*Luxembourg*	Acc	2,13	0,03	2,10	-1,18
TEa= 96,6%	*Switzerland*	Coo	1,70	0,00	1,76	3,59		Con	2,38	0,00	2,38	0,00
	Luxembourg	Com	2,53	0,00	2,62	3,56		Coo	1,70	0,00	1,70	0,00
TEb= 62,4%		Gov	2,37	0,00	2,37	0,00		Com	2,53	0,02	2,50	-0,95
		Eco	2,19	0,00	2,19	0,00						
		Wfd	2,04	0,06	1,98	-2,84						
Bulgaria		Acc	2,15	0,00	2,15	0,00	*Germany*	Qua	1,82	0,00	2,78	53,08
		Con	2,33	0,00	2,33	0,00	*Luxembourg*	Acc	2,15	0,00	2,15	0,00
TEa= 100%		Coo	1,44	0,00	1,44	0,00		Con	2,33	0,00	2,33	-0,04
		Com	2,55	0,00	2,55	0,00		Coo	1,44	0,00	1,44	0,00
TEb= 65,3%		Gov	2,46	0,00	2,46	0,00		Com	2,55	0,21	2,34	-8,25
		Eco	1,90	0,00	1,90	0,00						
		Wfd	1,98	0,00	1,98	0,00						
Czech R.		Acc	2,35	0,00	2,35	0,00	*Hungary*	Qua	2,82	0,00	2,85	1,28
		Con	2,41	0,00	2,41	0,00	*Luxembourg*	Acc	2,35	0,00	2,35	0,00
TEa= 100%		Coo	1,65	0,00	1,65	0,00		Con	2,41	0,06	2,36	-2,32
		Com	2,33	0,00	2,33	0,00		Coo	1,65	0,15	1,49	-9,24
TEb= 98,7%		Gov	2,43	0,00	2,43	0,00		Com	2,33	0,00	2,33	0,00
		Eco	2,03	0,00	2,03	0,00						
		Wfd	1,95	0,00	1,95	0,00						
Denmark		Acc	2,46	0,00	2,46	0,00	*Hungary*	Qua	1,82	0,00	2,95	62,39
		Con	2,43	0,00	2,43	0,00	*Netherlands*	Acc	2,46	0,01	2,45	-0,41
TEa= 100%		Coo	1,96	0,00	1,96	0,00		Con	2,43	0,00	2,43	0,00
		Com	2,40	0,00	2,40	0,00		Coo	1,96	0,39	1,58	-19,61
TEb= 61,6%		Gov	2,53	0,00	2,53	0,00		Com	2,40	0,00	2,40	0,00
		Eco	2,10	0,00	2,10	0,00						
		Wfd	2,24	0,00	2,24	0,00						

Country / Efficiency scores: DEA a, DEA b	DEA model (A): Structure- Process							DEA model (B): Process-Outcome						
	Peer Benchmarks	Outputs / Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV		*Peer Benchmarks*	Outputs / Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV
Estonia	*Bulgaria*	Acc	2,21	0,15	2,38	7,84		*Hungary*	Qua	1,82	0,00	2,88	58,37
	Czech R	Con	2,42	0,00	2,45	0,95		*Luxembourg*	Acc	2,21	0,00	2,21	0,00
TEa= 99,1%	*Denmark*	Coo	1,71	0,00	1,73	0,93			Con	2,42	0,06	2,37	-2,39
		Com	2,42	0,02	2,45	1,61			Coo	1,71	0,12	1,59	-7,24
TEb= 63,1%		Gov	2,52	0,00	2,52	0,00			Com	2,42	0,00	2,42	0,00
		Eco	2,06	0,00	2,06	0,00							
		Wfd	2,10	0,01	2,09	-0,43							
Finland	*Bulgaria*	Acc	2,20	0,00	2,28	3,72		*Sweden*	Qua	1,82	0,00	2,85	56,83
	Sweden	Con	2,32	0,06	2,47	6,41		*Luxembourg*	Acc	2,20	0,13	2,07	-5,90
TEa= 96,4%	*Switzerland*	Coo	1,74	0,00	1,81	3,73			Con	2,32	0,00	2,32	0,00
	Luxembourg	Com	2,51	0,00	2,61	3,74			Coo	1,74	0,00	1,74	0,00
TEb= 63,8%		Gov	2,38	0,00	2,38	0,00			Com	2,51	0,06	2,46	-2,23
		Eco	2,18	0,00	2,18	0,00							
		Wfd	2,22	0,06	2,17	-2,48							
France	*Bulgaria*	Acc	2,06	0,05	2,19	6,57		*Germany*	Qua	1,82	0,00	2,84	56,33
	Denmark	Con	2,33	0,00	2,43	4,16		*Luxembourg*	Acc	2,06	0,00	2,06	0,00
TEa= 96,0%	*Sweden*	Coo	1,63	0,00	1,69	4,18			Con	2,33	0,01	2,33	-0,26
	Switzerland	Com	2,47	0,00	2,57	4,17			Coo	1,63	0,00	1,63	0,00
TEb= 64,0%	*Luxembourg*	Gov	2,37	0,00	2,37	0,00			Com	2,47	0,04	2,43	-1,46
		Eco	2,12	0,00	2,12	0,00							
		Wfd	1,99	0,00	1,99	0,00							
Germany	*Czech R*	Acc	2,25	0,00	2,33	3,56			Qua	2,82	0,00	2,82	0,00
	Hungary	Con	2,38	0,00	2,47	3,53			Acc	2,25	0,00	2,25	0,00
TEa= 96,6%	*Luxembourg*	Coo	1,38	0,26	1,69	22,28			Con	2,38	0,00	2,38	0,00
		Com	2,34	0,04	2,46	5,26			Coo	1,38	0,00	1,38	0,00
TEb= 100%		Gov	2,41	0,00	2,41	0,04			Com	2,34	0,00	2,34	0,00
		Eco	2,15	0,02	2,13	-0,88							
		Wfd	1,99	0,00	2,00	0,05							
Hungary		Acc	2,34	0,00	2,34	0,00			Qua	2,82	0,00	2,82	0,00
		Con	2,33	0,00	2,33	0,00			Acc	2,34	0,00	2,34	0,00
TEa= 100%		Coo	1,46	0,00	1,46	0,00			Con	2,33	0,00	2,33	0,00
		Com	2,29	0,00	2,29	0,00			Coo	1,46	0,00	1,46	0,00
TEb= 100%		Gov	2,21	0,00	2,21	0,00			Com	2,29	0,00	2,29	0,00
		Eco	2,09	0,00	2,09	0,00							
		Wfd	2,06	0,00	2,06	0,00							
Italy	*Czech R*	Acc	2,27	0,01	2,46	8,24		*Hungary*	Qua	1,82	0,00	2,62	44,11
	Denmark	Con	2,31	0,00	2,49	7,74			Acc	2,27	0,09	2,18	-4,14
TEa= 92,8%	*Poland*	Coo	1,73	0,00	1,86	7,75			Con	2,31	0,15	2,16	-6,53
	Sweden	Com	2,13	0,15	2,45	14,77			Coo	1,73	0,37	1,36	-21,45
TEb= 69,4%		Gov	2,54	0,00	2,54	0,00			Com	2,13	0,00	2,13	0,00
		Eco	2,14	0,00	2,14	0,00							
		Wfd	2,08	0,00	2,08	0,00							

Country	DEA model (A): Structure- Process						DEA model (B): Process-Outcome					
Efficiency scores:												
DEA a= DEA b=	*Peer Benchmarks*	Outputs Inputs	Current value (*CV*)	Slacks	Efficiency target (*ET*)	GAP % (CV-ET)/CV	*Peer Benchmarks*	Outputs Inputs	Current value (*CV*)	Slacks	Efficiency target (*ET*)	GAP % (CV-ET)/CV
Latvia		Acc	2,15	0,00	2,15	0,00	*Hungary*	Qua	2,82	0,00	2,86	1,42
		Con	2,38	0,00	2,38	0,00	*Luxembourg*	Acc	2,15	0,00	2,15	0,00
TEa= 100%		Coo	1,65	0,00	1,65	0,00		Con	2,38	0,04	2,35	-1,47
		Com	2,41	0,00	2,41	0,00		Coo	1,65	0,05	1,60	-3,03
TEb= 96,8%		Gov	2,46	0,00	2,46	0,00		Com	2,41	0,00	2,41	-0,04
		Eco	2,07	0,00	2,07	0,00						
		Wfd	1,87	0,00	1,87	0,00						
Lithuania		Acc	2,29	0,00	2,29	0,00	*Sweden*	Qua	2,82	0,00	2,85	1,17
		Con	2,30	0,00	2,30	0,00	*Luxembourg*	Acc	2,29	0,17	2,12	-7,37
TEa= 100%		Coo	1,98	0,00	1,98	0,00		Con	2,30	0,00	2,30	0,00
		Com	2,56	0,00	2,56	0,00		Coo	1,98	0,00	1,98	0,00
TEb= 98,9%		Gov	2,50	0,00	2,50	0,00		Com	2,56	0,08	2,48	-3,16
		Eco	2,07	0,00	2,07	0,00						
		Wfd	2,08	0,00	2,08	0,00						
Luxembourg		Acc	2,03	0,00	2,03	0,00		Qua	2,82	0,00	2,82	0,00
		Con	2,31	0,00	2,31	0,00		Acc	2,03	0,00	2,03	0,00
TEa= 100%		Coo	1,63	0,00	1,63	0,00		Con	2,31	0,00	2,31	0,00
		Com	2,42	0,00	2,42	0,00		Coo	1,63	0,00	1,63	0,00
TEb= 100%		Gov	2,16	0,00	2,16	0,00		Com	2,42	0,00	2,42	0,00
		Eco	2,05	0,00	2,05	0,00						
		Wfd	1,81	0,00	1,81	0,00						
Netherlands	*Denmark*	Acc	2,38	0,00	2,41	1,51		Qua	2,82	0,00	2,82	0,00
	Sweden	Con	2,26	0,14	2,44	7,83		Acc	2,38	0,00	2,38	0,00
TEa= 98,5%		Coo	2,20	0,00	2,23	1,55		Con	2,26	0,00	2,26	0,00
		Com	2,32	0,20	2,55	9,96		Coo	2,20	0,00	2,20	0,00
TEb= 100%		Gov	2,61	0,01	2,60	-0,50		Com	2,32	0,00	2,32	0,00
		Eco	2,18	0,00	2,18	0,00						
		Wfd	2,30	0,07	2,23	-2,96						
Norway	*Bulgaria*	Acc	2,25	0,00	2,29	1,73	*Germany*	Qua	1,82	0,00	2,87	57,93
	Czech R.	Con	2,36	0,05	2,45	3,85	*Hungary*	Acc	2,25	0,00	2,25	0,00
TEa= 98,3%	*Hungary*	Coo	1,56	0,00	1,58	1,74	*Luxembourg*	Con	2,36	0,00	2,36	0,00
	Poland	Com	2,55	0,00	2,59	1,73		Coo	1,56	0,00	1,56	0,00
TEb= 63,3%	*Luxembourg*	Gov	2,52	0,00	2,52	0,00		Com	2,55	0,16	2,39	-6,28
		Eco	2,05	0,00	2,05	0,00						
		Wfd	2,06	0,00	2,06	0,00						
Poland		Acc	2,35	0,00	2,35	0,00	*Hungary*	Qua	2,82	0,00	2,82	0,00
		Con	2,33	0,00	2,33	0,00	*Netherlands*	Acc	2,35	0,01	2,34	-0,38
TEa= 100%		Coo	1,92	0,00	1,92	0,00		Con	2,33	0,00	2,33	0,00
		Com	2,30	0,00	2,30	0,00		Coo	1,92	0,46	1,47	-23,76
TEb= 99,9%		Gov	2,37	0,00	2,37	0,00		Com	2,30	0,00	2,30	0,00
		Eco	2,06	0,00	2,06	0,00						
		Wfd	1,97	0,00	1,97	0,00						

Country Efficiency scores: DEA a DEA b	DEA model (A): Structure- Process						DEA model (B): Process-Outcome					
	Peer Benchmarks	Outputs Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV	*Peer Benchmarks*	Outputs Inputs	Current value (CV)	Slacks	Efficiency target (ET)	GAP % (CV-ET)/CV
Portugal	*Bulgaria*	Acc	2,34	0,00	2,41	3,12	*Hungary*	Qua	2,82	0,00	2,87	1,74
	Denmark	Con	2,35	0,05	2,48	5,40	*Luxembourg*	Acc	2,34	0,22	2,12	-9,27
TEa= 97,0%	*Hungary*	Coo	1,62	0,06	1,73	6,84		Con	2,35	0,00	2,35	0,00
		Com	2,48	0,00	2,55	3,15		Coo	1,62	0,00	1,62	0,00
TEb= 98,3%		Gov	2,55	0,00	2,55	0,00		Com	2,48	0,04	2,44	-1,62
		Eco	2,11	0,00	2,11	0,00						
		Wfd	2,24	0,04	2,20	-1,97						
Spain	*Bulgaria*	Acc	2,44	0,00	2,50	2,21	*Hungary*	Qua	0,82	0,00	2,97	264,22
	Denmark	Con	2,43	0,04	2,52	3,96	*Netherlands*	Acc	2,44	0,18	2,27	-7,28
TEa= 97,8%	*Hungary*	Coo	1,84	0,00	1,88	2,23	*Luxembourg*	Con	2,43	0,00	2,43	0,00
	Lithuania	Com	2,51	0,00	2,57	2,19		Coo	1,84	0,00	1,84	0,00
TEb= 28,5%	*Poland*	Gov	2,57	0,00	2,57	0,00		Com	2,51	0,00	2,51	0,00
		Eco	2,20	0,00	2,20	0,00						
		Wfd	2,20	0,00	2,20	0,00						
Sweden		Acc	2,18	0,00	2,18	0,00		Qua	2,82	0,00	2,82	0,00
		Con	2,25	0,00	2,25	0,00		Acc	2,18	0,00	2,18	0,00
TEa= 100%		Coo	2,32	0,00	2,32	0,00		Con	2,25	0,00	2,25	0,00
		Com	2,49	0,00	2,49	0,00		Coo	2,32	0,00	2,32	0,00
TEb= 100%		Gov	2,46	0,00	2,46	0,00		Com	2,49	0,00	2,49	0,00
		Eco	2,09	0,00	2,09	0,00						
		Wfd	2,05	0,00	2,05	0,00						
Switzerland		Acc	2,17	0,00	2,17	0,00	*Hungary*	Qua	1,82	0,00	2,86	57,71
		Con	2,37	0,00	2,37	0,00	*Luxembourg*	Acc	2,17	0,00	2,17	0,00
TEa= 100%		Coo	1,63	0,00	1,63	0,00		Con	2,37	0,02	2,35	-0,68
		Com	2,42	0,00	2,42	0,00		Coo	1,63	0,04	1,60	-2,26
TEb= 63,4%		Gov	2,09	0,00	2,09	0,00		Com	2,42	0,00	2,42	0,00
		Eco	2,12	0,00	2,12	0,00						
		Wfd	2,10	0,00	2,10	0,00						
UK	*Bulgaria*	Acc	2,40	0,00	2,51	4,59	*Sweden*	Qua	1,82	0,00	2,91	60,19
	Denmark	Con	2,37	0,11	2,58	9,26	*Luxembourg*	Acc	2,40	0,26	2,14	-10,81
TEa= 95,6%	*Lithuania*	Coo	1,88	0,00	1,97	4,57		Con	2,37	0,00	2,37	0,00
	Switzerland	Com	2,52	0,00	2,64	4,60		Coo	1,88	0,00	1,88	0,00
TEb= 62,4%		Gov	2,56	0,00	2,56	0,00		Com	2,52	0,00	2,52	-0,16
		Eco	2,26	0,00	2,26	0,00						
		Wfd	2,34	0,01	2,33	-0,26						

Qua: Primary care (PC) quality
Acc: PC access; **Con**: PC continuity; **Coo**: PC coordination; **Com**: PC comprehensiveness
Gov: PC governance; **Eco**: PC economic conditions; **Wfd**: PC workforce development

Bias-corrected efficiency results

Initial structure-process DEA model results for the 22 countries gave an average uncorrected TE score of 0.98, while the bootstrap model generated an average bias corrected score of 0.97 (see table 2). The minimum uncorrected score was 0.93 and the maximum was 1, while the minimum bias corrected score was 0.92 and the maximum was 0.99. Further analysis showed the original scores had a mean bias of -0.01, which was relatively low. With regard to the process-outcome DEA model, results reported in table 2 show trends going in the same direction of the original DEA model; the difference between the average of the original efficiency scores (0.77) and the average of the bias-corrected TE scores (0.71) is relatively small (0.06) and the average bias estimated is acceptable (0.06).[28]

Table 2: Bootstrapped technical efficiency results by country

DEA model (A): Structure-Process

	Original DEA efficiency scores	Bootstrap bias-corrected efficiency scores	*CI 95%*		Bootstrap BIAS estimate	Bootstrap variance (σ) estimate
			Lower bound	*Upper bound*		
Austria	0.962	0.952	*0.935*	*0.961*	0.010	5.960
Belgium	0.966	0.956	*0.94*	*0.965*	0.009	4.897
Bulgaria	1.000	0.979	*0.941*	*1.000*	0.021	0.000
Czech Republic	1.000	0.981	*0.956*	*0.999*	0.019	0.000
Denmark	1.000	0.982	*0.959*	*0.999*	0.018	0.000
Estonia	0.991	0.981	*0.967*	*0.990*	0.009	3.808
Finland	0.964	0.955	*0.942*	*0.963*	0.009	3.634
France	0.96	0.950	*0.935*	*0.959*	0.010	4.528
Germany	0.966	0.955	*0.940*	*0.965*	0.010	5.471
Hungary	1.000	0.980	*0.950*	*0.999*	0.020	0.000
Italy	0.928	0.919	*0.902*	*0.928*	0.010	5.088
Latvia	1.000	0.985	*0.962*	*0.999*	0.015	0.000
Lithuania	1.000	0.984	*0.964*	*0.999*	0.016	0.000
Luxembourg	1.000	0.980	*0.953*	*0.999*	0.020	0.000
Netherlands	0.985	0.974	*0.954*	*0.985*	0.011	7.851
Norway	0.983	0.973	*0.954*	*0.982*	0.010	6.214
Poland	1.000	0.980	*0.949*	*0.999*	0.020	0.000
Portugal	0.97	0.961	*0.950*	*0.969*	0.009	2.883
Spain	0.978	0.970	*0.960*	*0.978*	0.008	2.346
Sweden	1.000	0.979	*0.938*	*1.000*	0.021	0.000
Switzerland	1.000	0.979	*0.938*	*0.999*	0.021	0.000
United Kingdom	0.956	0.948	*0.938*	*0.956*	0.008	2.213

DEA model (B): Process-Outcome

	Original DEA efficiency scores	Bootstrap bias-corrected efficiency scores	*CI 95%*		Bootstrap BIAS estimate	Bootstrap variance (σ) estimate
			Lower bound	*Upper bound*		
Austria	0.307	0.277	*0.257*	*0.305*	0.031	0.000
Belgium	0.624	0.568	*0.534*	*0.619*	0.055	0.001
Bulgaria	0.653	0.580	*0.545*	*0.645*	0.073	0.001
Czech Republic	0.987	0.913	*0.861*	*0.976*	0.074	0.002
Denmark	0.616	0.575	*0.544*	*0.611*	0.040	0.000
Estonia	0.631	0.588	*0.556*	*0.626*	0.043	0.001
Finland	0.638	0.600	*0.565*	*0.633*	0.038	0.001
France	0.64	0.578	*0.544*	*0.633*	0.062	0.001
Germany	1.000	0.845	*0.806*	*0.979*	0.155	0.006
Hungary	1.000	0.882	*0.833*	*0.983*	0.118	0.003
Italy	0.694	0.651	*0.613*	*0.690*	0.043	0.001
Latvia	0.986	0.911	*0.856*	*0.976*	0.075	0.002
Lithuania	0.989	0.939	*0.891*	*0.980*	0.050	0.001
Luxembourg	1.000	0.931	*0.886*	*0.985*	0.069	0.001
Netherlands	0.633	0.581	*0.541*	*0.625*	0.052	0.001
Norway	1.000	0.935	*0.884*	*0.994*	0.065	0.001
Poland	0.983	0.924	*0.862*	*0.974*	0.059	0.002
Portugal	0.275	0.259	*0.246*	*0.271*	0.015	7.779
Spain	1.000	0.930	*0.886*	*0.984*	0.070	0.001
Sweden	0.634	0.585	*0.550*	*0.627*	0.049	0.001
Switzerland	0.624	0.595	*0.564*	*0.620*	0.029	0.000
United Kingdom	1.000	0.899	*0.848*	*0.988*	0.101	0.003

Discussion

Variation of PC efficiency at different levels

The results show variation among the 22 countries in how they structure and organize PC services delivery at system level, as well as in their relative efficiency in terms of processes delivered and quality outcomes achieved. Only a few countries (Sweden, Hungary, Luxemburg) are efficient at turning both their PC structures into PC processes, and their PC processes into quality outcomes. The majority of efficient PC systems (Switzerland, Poland, Czech Republic, Latvia) in terms of transforming their PC structures into processes were inefficient at turning their processes into quality outcomes. The Dutch and German PC systems both have an optimal relationship between their PC process dimensions and quality of care, but are inefficient at turning their structure dimensions into an optimal mix of PC services delivery dimensions.

PC system strength versus efficiency

Kringos et al.[18] investigated the strength of PC across countries in terms of maximizing their PC orientation at both structure and services delivery level. When comparing the strength of countries' PC systems with their relatively efficiency, we see that some of the countries with relatively strong PC (i.e. United Kingdom, Spain, Denmark, Belgium) are not among the most efficient systems, in relative terms. Among the countries with relatively strong PC that are also relatively efficient are the Netherlands, Portugal, Finland, Lithuania, Estonia. The same is true for countries with relatively weak PC (i.e. Luxembourg, Bulgaria, Hungary) which turn out to be relatively efficient throughout their PC system. This may suggest that maximizing the individual functions of PC without taking into account the coherence within the system is not sufficient from a policymakers' point of view when aiming to achieve both efficiency and strong PC.

Achieving efficiency

There is not one optimal way to organize PC to achieve efficiency in terms of Structure-Process and Process-Quality ratios. Instead, it is relative to each PC system and can be set only by establishing comparative benchmarks.

Our findings on Structure-Process efficiency indicate a low variation among the 22 PC systems considered. Each of the ten most efficient PC systems adopts its own structure-process combination while sharing two features:

1. They commonly focus on access and coordination of care while differing in their levels of comprehensiveness and continuity;

2. They diverge both on their governance arrangements, and workforce development features, while they invest a similar level of economic resources in PC.

This suggests that it is particularly important to invest in economic conditions to achieve an efficient structure-process balance.

Interestingly, only five PC systems are fully efficient on Process-Outcome levels, with a large variation in the efficiency levels obtained by the inefficient PC systems. The 5 best performers use a similar combination of access, continuity and comprehensiveness, while they differ on the adoption of coordination of PC services. The results indicate an extreme variability among the eighteen inefficient PC systems in turning their process dimensions into quality outcomes.

The results help policymakers to monitor the quality of their primary care systems and set achievable standards aimed to improve the quality of their PC system.

Strengths and limitations

This is the first DEA study in PC applying a traditional economic method in adapted version for health services research purposes. It approaches PC in its full complexity, using a comparable and comprehensive European dataset. Because each PC system was compared to its peers to set up standards that identify pragmatic targets, policymakers can directly use the results to develop strategies to improve the current efficiency levels.

However, the composite scores on countries' PC dimensions could include some errors, depending on the data sources used.[18] DEA does not account for stochastic events (i.e. measurement error) in the data. We therefore adopted a bootstrap procedure, computing bias-corrected efficiency scores controlling for the robustness of the DEA scores. Furthermore, we excluded from the original study sample 9 countries, and a number of quality indicators to minimize the potential impact of missing values.

Recommendation for future research

We recommend future research to fine-tune the application of DEA in PC. This would require improvement of the development of sound quality of care indicators, and other outcome indicators that are valid, measurable, and subject to PC. In addition, it is recommended that the influence of factors outside the influence of policymakers on PC system efficiency are also investigated (e.g. technological advancement, demographic features).

Conclusion

This article provides policymakers with a measurement technique for improving the quality management of their PC system, starting from the assumption that the quality of a PC

system is not the sum of its functions, but rather it is based on the coherence of its structure, process and outcomes. To improve evidence-based policymaking for health system performance, there is a clear need for improvement of the PC information infrastructure of countries, particularly in the domain on quality of care.

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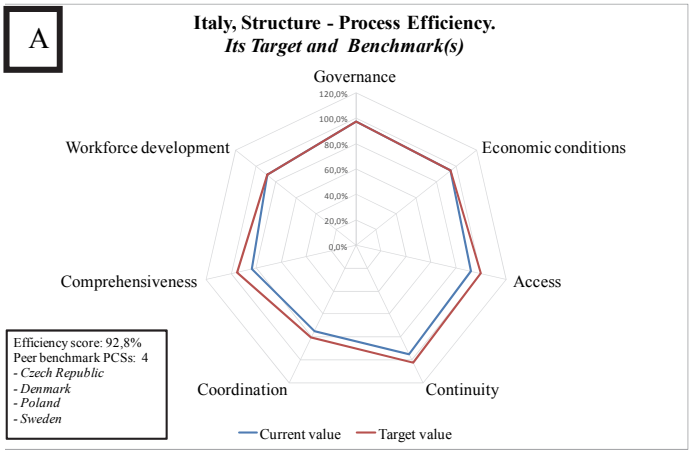
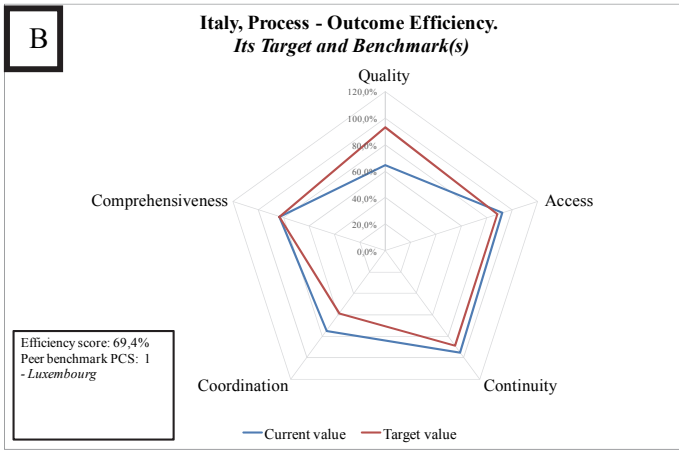
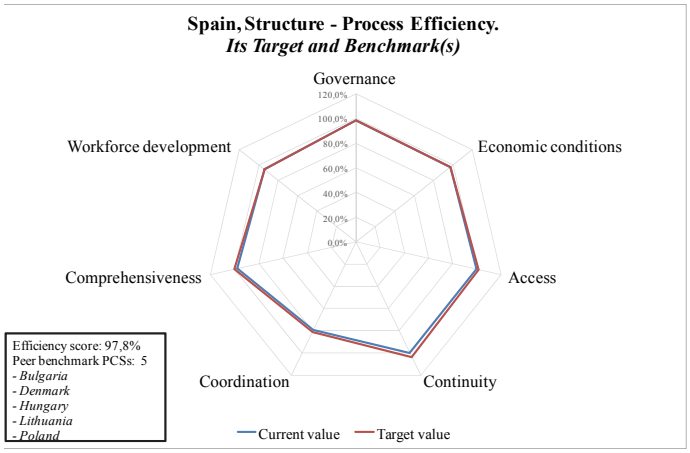
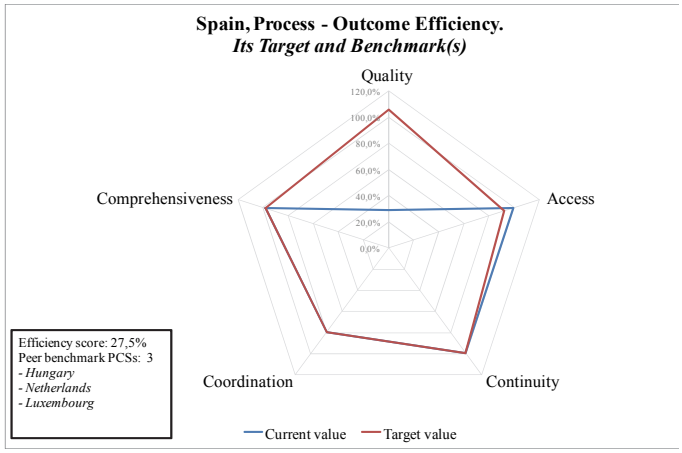
Supplementary file 1 (see next page)

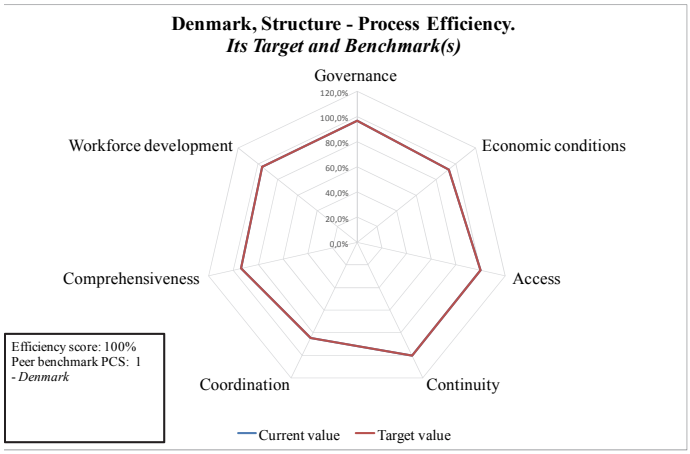
Selection of country results on Structure, Process, Outcome Efficiency scores and (benchmark) targets: A) Structure-Process DEA model; B) Process-Outcome DEA model

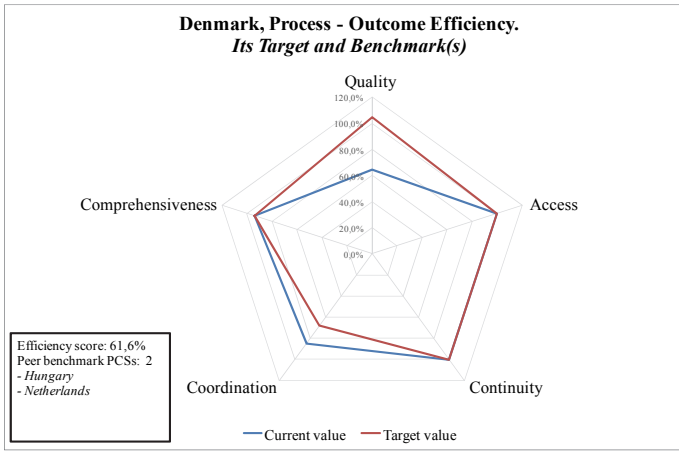












** Current and target values in the spider graphs are in % of maximum observed data (please see Table 1)*

7

Political, cultural and economic foundations of primary care:
a comparative study

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This article has been submitted for review

Abstract

Objective
Strong primary care (PC) is supposed to improve a country's capacity to achieve a responsive, equitable, high quality and cost-effective health care system. European countries differ in their PC strength. This article aims to explain why countries differ in their PC structure and PC services delivery process by means of political-economic factors, cultural values and the type of health care system.

Methods
Data on the strength of PC were collected on the basis of the European PC Monitor indicators applied in 31 European countries in 2009/10 by the Primary Health Care Activity Monitor for Europe project. Dependent variables included PC structure (e.g. available PC policies/regulations, resources), accessibility, continuity, coordination and comprehendsiveness of PC. Data on independent variables used were collected from international statistical databases and studies. They included (growth in) national income, political orientation of a country's government, prevailing values among inhabitants, and type of health care system. Simple and multivariable regression analyses were applied.

Results
The results show that wealthier countries have a weaker PC structure and lower PC accessibility. Transitional countries in Eastern Europe have used their growth in national income to strengthen the accessibility and continuity of PC. Countries that have been governed by a predominantly left-wing government over the past years have a stronger PC structure, accessibility and coordination of PC. Countries with a social-security based system have a lower accessibility and continuity of PC; the opposite is true for transitional systems. Cultural values affect all aspects of PC.

Conclusion
It can be concluded that the national political agenda, economy, prevailing values, and type of health care system are all important factors that can both favour and hamper the development of strong PC. Strengthening PC is in the end a political decision which can only be taken if it is in line with prevailing values in a country.

Introduction

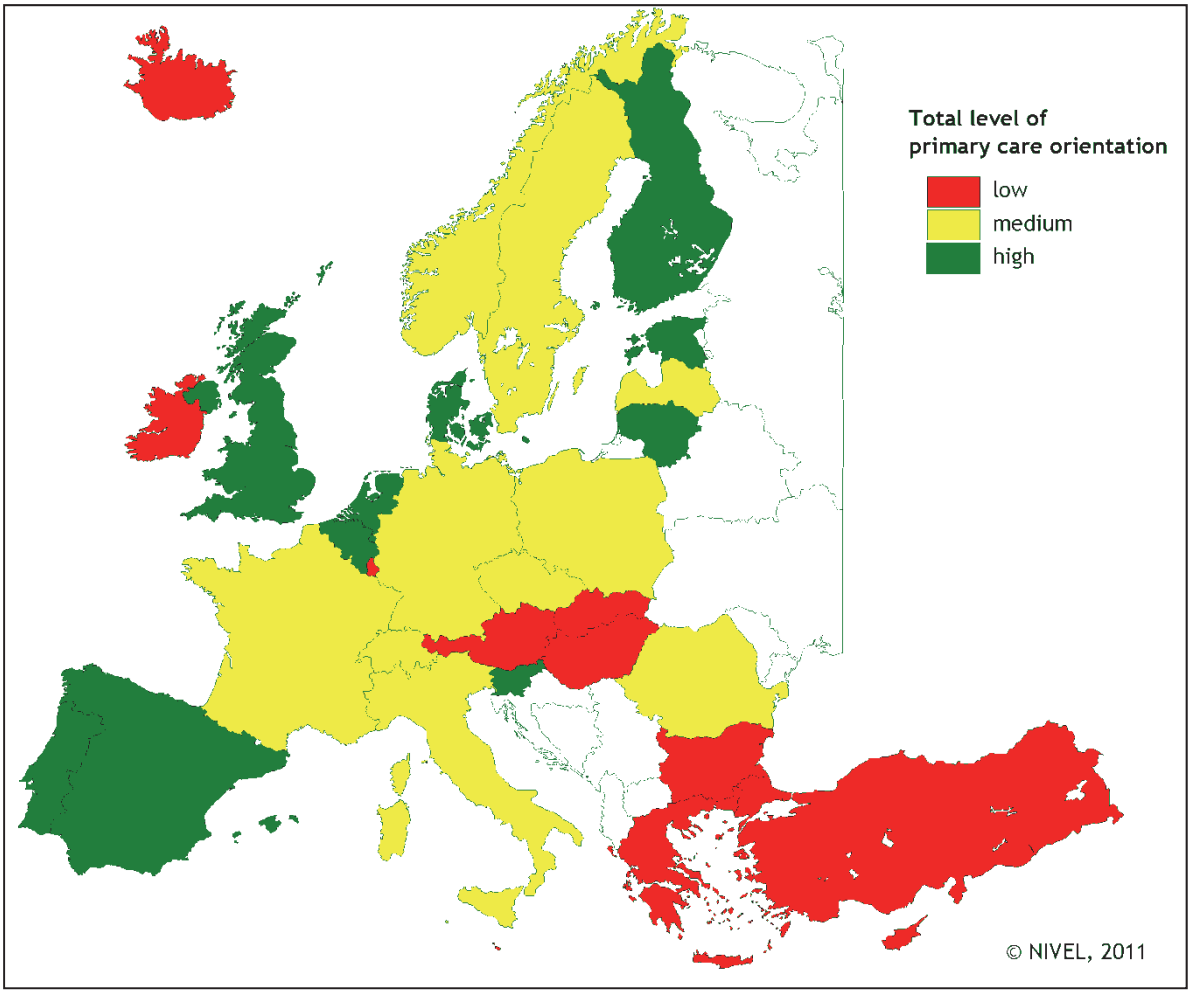
Measuring and managing the strength of primary care

Countries across Europe vary in their primary care (PC) strength.[1,2] Suboptimal delivery of PC services threatens the achievement of important health care system goals such as responsiveness, equity in access and health, and effectiveness of care.[3-6]

PC is the first level of professional care where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied.[5,7] The reason why PC in some countries is more accessible, provides more fine-tuned care with other parts of the health care system, and offers a broader scope of health care services compared to other –sometimes neighbouring– countries, is currently unknown. Effective PC does not emerge spontaneously. Just like any other part of a health care system, PC requires continuous efforts to maintain, restore or strengthen its functions to deliver high quality professional care. It is a continuous PC management process that most likely requires resources, political will, public engagement and a facilitating health care system context.[8,9] In 1977, Sidel and Sidel[10] argued in a position paper that PC is a reflection of a society's economic, social political, cultural history and the general structure of the health care system. Empirical evidence for this statement is however lacking. There are two primary reasons for the absence of a scientific explanation for variation in the strength of PC. Firstly, measuring and monitoring the development of PC is not common practice, and is therefore only incidentally used by policymakers as a tool for health care system management and improvement. Secondly, existing PC measurement instruments are often limited in their measurement domains[11-14], geographical scope[15-17] or use of indicators.[6] This reduces the possibilities for international comparative research on the factors potentially influencing the strength of PC. However, this situation recently improved with the development of the European Primary Care Monitor Instrument (in short 'PC Monitor') by the PHAMEU (Primary Health Care Activity Monitor for Europe) project in 2008/09. The PC Monitor was developed based on a systematic literature review and expert consultations.[18,19] It facilitates the comparison and analysis of the key functions of PC in a standardised way. It consists of 77 indicators capturing the complexity of PC by measuring the existing PC structures and aspects of primary care services delivery of countries. At structure level, the existing PC policies and regulations, financing and coverage arrangements, and characteristics of the PC workforce (e.g. supply, planning and education) were measured. At process level, the accessibility, continuity and coordination of PC were measured, in addition to the scope of PC services delivered (for a full list of indicators see Kringos et al.[19]). Application of the PC Monitor based on the (inter)national literature, governmental publications, statistical databases, and national expert consultations, showed variation in the strength of PC across

Europe in 2009/10.[1] The strength PC was determined by the development of each of the key PC functions both at structure and process level.[18;19] Among the five countries with the relatively strongest PC were (in diminishing order) the United Kingdom, Spain, Denmark, the Netherlands, Slovenia; the 5 countries with the relatively weakest PC were (in diminishing order) Cyprus, Luxembourg, Bulgaria, Malta and Greece (see figure 1).

Figure 1: Variation in primary care strength across Europe



Results indicated that countries either have many PC policies and regulations in place, combined with a good financial coverage and resources, and adequate PC workforce conditions, or have consistently only little or few of these PC structures in place. When

looking at the organisation of PC services delivery, countries vary in their accessibility of primary care, continuity of care (e.g. having long term doctor-patient relationships), coordination of care (e.g. collaboration between primary and secondary care), and scope of services offered within PC.[1]

With the availability of the comparative data set on the strength of PC of 31 European countries, it is now possible to answer the question whether factors of which we think have an impact really matter for improving the strength of PC. This article aims to explore the relationship between the strength of PC and a country's economic development, political orientation, type of health care system, and prevailing values, to identify the conditions favouring the development of strong PC. A number of hypotheses will be tested, as discussed in the following sections.

Economic development

The state of a country's economy not only determines the extent to which resources can be generated for its health care system, but also the options policymakers have to structure and organise the health care system.[20] High-income countries can afford to base their health care system more on (expensive) hospital care than on PC.[21] Although this may create inefficiencies[22], public satisfaction is often higher when health care systems offer directly accessible specialist care, as opposed to a gatekeeping system regulating access to secondary care.[23] In such directly accessible systems, cost sharing arrangements are commonly introduced to control the demand of patients, reducing the possibilities to access the health care system, and thus PC.[24]

PC requires fewer financial resources as opposed to specialist care, providing a more affordable solution to common health problems.[3;25;26] In addition, policymakers in middle-income countries are often dealing with the funding and organisation of expanding curative care as a response to the industrialisation of societies and emerging non communicable diseases. Policymakers in high-income countries are looking for solutions to increasing chronic diseases and more complex health needs and are faced with increased public expectations in more and more individualised societies.[20] It is therefore not surprising that PC has been a central strategy for expanding health services, particularly in many middle income countries, such as in Eastern Europe.[26]

The following hypothesis will therefore be tested:

Hypothesis 1: Countries with a higher (growth in) economic development have a weaker PC structure and services delivery process.

Role of politics

Countries with similar levels of economic development vary in the degree they take responsibility for securing basic levels of health care for their citizens.[27] This is for an important part determined by the political composition of a country's government and the underlying principles and policy priorities.[28-30] Countries with a predominantly left-wing (socialist or social-democratic) government (e.g. Scandinavian countries) aim to achieve universalism and equity, provide a redistributive social security system, provide generous benefits, and have a strong interventionist state.[27;29;31] Whereas predominantly right-wing (liberal) governed countries (e.g. Ireland, United Kingdom) provide lower or even minimum levels of state welfare, basic levels of benefits, means tested eligibility criteria, while market forces are encouraged by subsidizing private welfare programmes.[27;29;31]

Several studies have shown that the political composition of a country's government is related to policy priorities for the health care system.[32-34] Westert and Groenewegen[35] found that countries which have been governed for a longer time by a left-wing government achieved a higher reduction in regional disparities in health care supply than countries with central or right-wing governments. This was confirmed by a similar study[36] in Germany, showing a more equal distribution of hospital beds in federal states dominated by left-wing governments. Right-wing governments showed less interference in hospital planning. A possible explanation for these findings is the preference of left-wing parties to advocate equal access to health care to optimise the health of the population.

Tenbensel et al. (2012)[34] found that the reduction of health inequalities is more likely to be part of the policy agenda of centre-left governments. PC can be seen as a health equity producing policy.[37-39] Although the empirical evidence is still inconclusive, there are indications that access for people with low socioeconomic status (e.g. migrants) is better in health care systems with strong PC, contributing to equity in health.[40;41]

The following hypothesis will therefore be tested:

Hypothesis 2: Countries that for a longer period have been governed by left-wing parties have a stronger PC structure and services delivery process (e.g. better financial and geographical accessibility and more comprehensiveness scope of service provision).

Structure of health care systems

There are basically three types of health care systems in Europe: social security-based systems (SHI), national health service systems (NHS), and health care systems in transition (in the former Soviet Union and its satellite countries).[42] Following the fall of communism in Eastern Europe, the health care systems in Eastern Europe are mostly in transition from their Soviet Union's system (the so-called Semashko systems) to social security-based systems. SHI and NHS systems differ in terms of the role of government (stronger in NHS systems as

owner and central planner of the system), financing (earmarked health insurance funding in SHI systems versus taxation based NHS systems), health care providers (state employed providers and owned hospitals in NHS systems versus self-employed providers and private hospitals in SHI systems), and users of care (more freedom of choice and co-payments in SHI systems).[42;43] In Europe, health care system reforms were broadly discussed particularly in the second half of the 1980s and in the 1990s.[44] NHS systems were decentralising their health care planning function by separating health care provision from commissioning, introducing market elements, and SHI systems were moving towards increased competition among health insurers, and among health care providers.[9;43;45] State-regulated health care systems (NHS systems) can relatively easily implement government initiated reforms, compared to SHI countries with a relatively weak power base of the government, as policy implementation depends on the cooperation of insurers and providers.[32;33;42;43;46] A study by Tenbensel et al. (2012)[34] showed that NHS systems are more likely to address health outcomes and inequalities than SHI systems, due to the strong role of the government in NHS systems. This indicates that strong PC – as a lever to achieve these system goals – is more likely to be part of the policy agenda of NHS systems.

Despite the (often) incremental changes health care systems undergo over time, their structures have a certain path dependence making them relatively stable in their founding principles regardless of contextual changes in for example politics or the economy.[44;47]

The following hypothesis will therefore be tested:

Hypothesis 3: Countries with national health care systems (compared to social security-based systems or health care systems in transition) have a stronger PC structure and services delivery.

Values

Countries differ considerably in the prevailing values of their inhabitants. The political orientation of a country's government is often a resemblance of the values of the majority of the citizens (e.g. family-oriented countries often have a conservative government).[27;31] Several studies have shown that differences in society's values may explain variation in health care policy priorities[24;44], delivery of services (e.g. medical communication, ICT use)[48-50], health care utilisation[48] and outcomes.[51] Value systems affect policy makers' decisions in determining health care system priorities (e.g. investing more in high technology based specialist care versus PC, and regulating access via a gatekeeping system as opposed to individual responsibility of patients), medical professionals in how they approach and treat their patients (e.g. wait-and-see approach versus high intervention rates), and patients in how they use professional and informal health care (e.g. preference for informal family-based care versus professional medical care, or requesting a prescription after each doctor

visit), and what they expect from health care services delivery (e.g. co-decision making versus the doctor-knows-best-belief).
The following hypotheses will therefore be tested:
Hypothesis 4: Countries where people value high government involvement (versus individual responsibility) in providing welfare have a relatively strong PC structure and services delivery process.
Hypothesis 5: Countries where people value a tight family-orientation have a relatively weak PC structure and services delivery process.
Hypothesis 6: Countries where people value the use of science and technology to improve their health have a relatively weak PC structure and services delivery process.

Methods

Countries
Our database covers 31 European countries (27 EU Member States, Switzerland, Turkey, Norway, and Iceland). Depending on data availability one or more countries had to be excluded from some analyses.
As the creation of strong PC is a long term process, there is likely to be a time-lag between changes in political, economic, values or health care system contexts to have an effect on the strength of PC. This article will therefore take into account the strength of PC, and all relevant external factors for the period 1993-2010, which marks the period when most Central-Eastern European countries had gained independence and started major health care system reforms.

Table 1 provides an overview of all variables, the sources used, and coverage of countries and years.

Dependent variables
The following five dependent variables for the strength of PC will be used[1]:
1. Structure of PC;
2. Accessibility of PC;
3. Continuity of PC;
4. Coordination of PC;
5. Comprehensiveness of PC.

Variable 1 indicates the strength of PC structures of countries. It reflects the existence of PC policies and regulations (e.g. on equal distribution of PC providers and facilities), the

availability of financial resources for PC and coverage for PC services, and the development of the PC workforce (e.g. workload and age distribution of general practitioners, training and education options, and work of medical associations). Since these aspects of PC structure are positively associated with each other they can be summarized by one variable indicating the overall strength of a country's PC structure.[1]
Variables 2-5 reflect the strength of important aspects of the PC services delivery process. These process functions are not strongly associated with each other and therefore four separate dependent variables will be used.[1] See Kringos et al. (2010)[19] for the list of indicators from which the dependent variables are constructed.
All five dependent variables are continuous, ranging from 0 (relatively weak PC) to 3 (relatively strong PC). The calculation of values has been explained in detail elsewhere.[1]

Independent variables
Seven independent variables were used to test the hypotheses.
The wealth of a country is measured by[52]:
1. Gross domestic product (real) in PPP USD per capita in 1993;
2. Development of gross domestic product (real) in PPP USD per capita in the period 1993-2009.

The political composition of a country's government is measured by[53]:
3. The weighted number of years social-democrats or socialists were in power in the period 1993-2008.

There is a time-lag between the coming to power of a government and the effects on the priorities (e.g. primary or secondary care focus) of the health care system. Given the time it takes to develop and implement health policy agenda's, the duration of left-wing needs to be taken into account. To account for the different influence of purely left-wing (social-democrats or socialists) governments versus coalition governments (with centre and/or right wing parties), years were counted as 1, 0.75, 0.5, 0.25, or 0 respectively when left wing parties held 100%, 66.6%>, 33.3-66.6%, <33.3%, 0% of the total cabinet posts, weighted by the number of days the government was in office in a given year.

The structure of a health care system is identified by the three major types[47]:
4. National health service system (NHS; yes=1 / no=0), social-security based system (SHI; yes=1 / no=0), transitional system (TRANS; yes=1 / no=0).

The prevailing values of the inhabitants of country are measured by:

5. % of population that agree (score 7-10 on a scale of 1-10) with the statement "The government should take more responsibility to ensure that everyone is provided for".[54] For each country, the oldest available data in the period 1993-2010 were taken, since the statement includes a time element (a desired future change in government action).
6. % of population that prefers children to take care of an elderly father or mother who lives alone and can no longer manage to live without regular help because of her or his physical or mental health condition, in stead of other solutions (incl. professional care).[55]
7. Prevailing values are relatively stable, and therefore recent data (2007) are appropriate to use. % of population that agree with the statement "Science and technology are making our lives healthier".[56] The time span of the data provides us with insight into the current (and potential past) value given to science and technology for health, which may have had an impact on health policy decisions.

In addition, as a possible confounding factor to all hypotheses, the strength of PC in 1993 was measured by:

8. The involvement of general practitioners (GPs) in first contact care for various health problems in 1993.

This is the best available indicator for the strength of PC in 1993 for which the most comprehensive data set was available, measured by Boerma et al. in 1993/4.[57] GPs' position in first contact care is a continuous variable ranging from 1 (low involvement) to 4 (high involvement). It is based on information on GPs' involvement in health problems of children, women's health problems, psychosocial problems and acute health problems, and has a high total scale reliability (Cronbach's $\alpha = 0.94$).

Statistical analyses

The association between dependent and independent variables was evaluated in simple linear regression analyses and multivariable regression analyses. In the simple linear regression analyses one dependent and one independent variable were used. This analysis was performed for all five dependent variables in combination with all independent variables. In the multivariable regression analyses, one dependent variable and only two independent variables were used. Three types of multivariable regression analyses were performed. In model I, all simple linear regression analyses were corrected for a historical difference in the strength of PC of countries, which will partly explain the current strength of PC of a country by including a baseline measurement of the strength of PC in 1993. In model II, all simple linear regression analyses were corrected for Gross Domestic Product (real) in PPP USD per capita in 1993. Pearson's correlation of national income and all other independent variables, showed it is likely to be a confounding factor to all hypotheses (even more so than the growth in national income) (see Appendix 1). In model III, all simple linear

regression analyses were corrected for health care systems in transition. This was done to investigate the existence of sub-populations among countries, affecting the relation between the strength of PC and independent variables.
An association was termed significant if the p value was <0.05 or <0.1. This high p value was used because of the small number of observations. In addition, all scatter plots of dependent and independent variables were examined on relationships with health care system type.
SPSS/PASW Statistics 18.0 was used.

Table 1: Overview of variables by country

	PC structure strength[1] (2009/10)	Access: PC Process strength[1] (2009/10)	Continuity of care: PC Process strength[1] (2009/10)	Coordination of care: PC Process strength[1] (2009/10)	Comprehen-siveness: PC Process strength[1] (2009/10)	GPs' involvement first contact care[2] (1993)	GDP per capita (PPP USD) (1993)
Austria	2.22	2.27	2.19	1.38	2.33	2.95	21563.30
Belgium	2.21	2.13	2.38	1.70	2.53	3.01	20482.00
Bulgaria	2.14	2.15	2.33	1.44	2.54	1.74	5030.37
Cyprus	1.91	2.11	2.32	1.49	2.19	n.a.	13683.20
Czech Rep.	2.14	2.35	2.41	1.64	2.33	2.28	10500.20
Denmark	2.38	2.46	2.43	1.96	2.40	3.49	20439.60
Estonia	2.29	2.21	2.42	1.71	2.41	2.06	5645.03
Finland	2.31	2.20	2.32	1.74	2.51	3.00	16868.40
France	2.16	2.06	2.33	1.63	2.47	3.08	18715.10
Germany	2.20	2.25	2.38	1.38	2.34	2.82	20756.00
Greece	2.10	2.08	2.25	1.96	2.17	2.47	13738.30
Hungary	2.08	2.34	2.33	1.46	2.29	2.75	8066.11
Iceland	1.77	2.28	2.40	1.60	2.42	3.10	21764.60
Ireland	2.20	1.96	2.38	1.57	2.36	3.48	14973.70
Italy	2.33	2.27	2.31	1.73	2.13	3.08	19283.90
Latvia	2.14	2.15	2.38	1.65	2.41	1.96	4910.72
Lithuania	2.27	2.29	2.30	1.98	2.56	1.71	6292.90
Luxembourg	1.90	2.03	2.31	1.63	2.42	2.63	36469.70
Malta	2.12	2.17	2.17	1.82	2.38	2.80	13052.30
Netherlands	2.50	2.38	2.26	2.20	2.32	3.67	19703.20
Norway	2.27	2.25	2.36	1.56	2.55	3.28	20901.90
Poland	2.12	2.35	2.33	1.92	2.29	2.27	5795.92
Portugal	2.41	2.34	2.35	1.62	2.47	3.22	12342.70
Romania	2.31	2.26	2.33	1.55	2.20	2.36	4611.19
Slovak Rep.	2.02	2.27	2.39	1.39	1.98	n.a.	7191.46
Slovenia	2.36	2.47	2.30	1.84	2.32	2.87	11168.20
Spain	2.43	2.44	2.43	1.84	2.51	3.20	14652.40
Sweden	2.23	2.17	2.25	2.32	2.49	2.83	19642.20
Switzerland	2.04	2.17	2.37	1.63	2.42	2.88	25667.10
Turkey	2.27	2.05	2.15	1.61	2.36	2.02	5072.25
United Kingdom	2.52	2.40	2.37	1.88	2.52	3.51	17692.70
Source:	Kringos et al., 2012	Kringos et al., 2012	Kringos et al., 2012	Kringos et al., 2012	Kringos et al., 2012	Boerma et al., 1997; Sciortino, 2002 (for Malta)	WHO Regional Office for Europe, 2011

[1]Scale ranges from 1 (low PC orientation) to 3 (high PC orientation).
[2]Scale ranges from 1 (low involvement) to 4 (high involvement).

Table 1: Overview of variables by country - *continued*

	% growth in GDP per capita (PPP USD) 1993-2009	**Yrs left party government dominance 1993-2008**	**Type of health care system (2010)**	**% pop. agree government should take more responsibility providing welfare *(N;Year)***	**% pop. prefers children to take care of parent(s) in case of ill health *(N) 2007***	**% pop. agree healthy impact science & technology *(N) 2010***
Austria	80.02	4.75	SHI	n.a.	46.06 *(1003)*	64.80 *(517)*
Belgium	77.29	7.75	SHI	n.a.	37.95 *(1033)*	57.84 *(529)*
Bulgaria	175.72	5.14	TRANS	53.24 *(971;1997)*	79.59 *(1014)*	44.36 *(505)*
Cyprus	125.45	4.25	NHS	51.58 *(1043;2006)*	65.43 *(486)*	56.80 *(250)*
Czech Rep.	143.62	6.25	TRANS	55.97 *(1147;1998)*	65.04 *(1027)*	39.12 *(524)*
Denmark	84.55	6.25	NHS	n.a.	21.97 *(1006)*	64.23 *(520)*
Estonia	248.86	4.75	TRANS	63.80 *(1011;1996)*	59.52 *(1003)*	52.86 *(490)*
Finland	109.06	6.50	NHS	31.49 *(975;1996)*	31.12 *(1041)*	64.62 *(537)*
France	79.93	5.25	SHI	28.06 *(998;2006)*	37.32 *(1096)*	63.57 *(516)*
Germany	75.07	8.50	SHI	46.97 *(2014;1997)*	53.78 *(1523)*	36.02 *(769)*
Greece	115.58	10.50	NHS	n.a.	86.26 *(1012)*	46.88 *(529)*
Hungary	151.82	9.00	TRANS	65.99 *(638;1998)*	70.18 *(1006)*	49.52 *(523)*
Iceland	69.06	2.00	NHS	n.a.	n.a.	64.41 *(236)*
Ireland	171.79	2.75	NHS	n.a.	41.74 *(1011)*	65.08 *(504)*
Italy	68.17	5.07	NHS	44.11 *(984;2005)*	50.89 *(1067)*	41.47 *(516)*
Latvia	234.72	4.50	TRANS	61.41 *(1192;1996)*	70.55 *(1012)*	41.77 *(486)*
Lithuania	175.04	8.50	TRANS	50.90 *(998;1997)*	74.17 *(1026)*	46.33 *(518)*
Luxembourg	129.84	5.50	SHI	n.a.	45.28 *(360)*	68.00 *(250)*
Malta	90.11	2.00	NHS	n.a.	54.34 *(495)*	58.61 *(244)*
Netherlands	106.44	5.50	SHI	36.41 *(1041;2006)*	22.81 *(1004)*	54.60 *(522)*
Norway	168.94	8.75	NHS	29.95 *(1122;1996)*	n.a.	65.34 *(479)*
Poland	226.18	7.25	TRANS	41.94 *(1111;1997)*	84.38 *(1031)*	43.55 *(535)*
Portugal	101.90	8.75	NHS	n.a.	57.96 *(1068)*	45.42 *(513)*
Romania	209.64	8.75	TRANS	47.77 *(1187;1998)*	78.62 *(1043)*	53.28 *(533)*
Slovak Rep.	218.18	4.50	TRANS	68.12 *(1076;1998)*	74.91 *(1084)*	40.08 *(499)*
Slovenia	142.95	8.00	TRANS	52.86 *(997;1995)*	45.21 *(1033)*	47.72 *(505)*
Spain	119.42	8.25	NHS	51.38 *(1162;1995)*	57.80 *(993)*	62.98 *(497)*
Sweden	90.29	12.00	NHS	12.85 *(1004;1996)*	14.82 *(985)*	76.83 *(492)*
Switzerland	76.19	4.00	SHI	16.34 *(1181;1996)*	n.a.	60.00 *(490)*
Turkey	169.46	4.00	SHI	45.93 *(1868;1996)*	81.92 *(1001)*	66.10 *(472)*
United Kingdom	98.70	11.50	NHS	27.23 *(1032;2006)*	44.58 *(1283)*	61.39 *(663)*
Source:	WHO Regional Office for Europe, 2011	Armingeon et al., 2010; Akman, 2011 (for Turkey)	European Observatory on Health Systems and Policies, 2011	World Values Survey Association, 2009	TNS Opinion & Social & TNS, 2007	TNS Opinion & Social, 2010

Results

PC strength in 1993 and 2009/10

Countries that had stronger PC in 1993 (indicated by the GPs' involvement in first contact care), also had a significantly stronger PC structure and higher accessibility of PC in 2009/10, after correcting for differences in wealth (see table 2). Regarding the type of health care systems, there is no significant relationship among transitional countries between the strength of PC in 1993 and PC structure in 2009/10, but there is a significantly positive relationship among SHI and NHS countries combined. Transitional countries have a separate significantly positive relationship from NHS and SHI countries between their PC strength in 1993, and their accessibility and continuity of PC (see table 2). Overall, the improvement in the strength of PC on all aspects measured in 2009/10 compared to the strength of PC in 1993, is highest among transitional countries (see table 1).

Wealth and PC strength

The simple regression analyses show no significant linear association between national wealth and PC structure or any aspects of the PC services delivery process (see table 2). The results of multivariable model I show that after correcting for the strength of PC of countries in 1993, wealthier countries had a significantly weaker PC structure and lower accessibility of PC. Multivariable model III shows that the national income for transitional countries has a significantly positive relationship with the continuity of PC (see table 2).

The growth in wealth only showed a significant linear association with the accessibility of PC (see table 2). The growth of GDP per capita has an opposite relationship with accessibility of PC in transitional countries compared to SHI and NHS countries. In transitional countries, the growth in national income is associated with a higher accessibility of PC; whereas this is associated with a lower accessibility of PC in SHI and NHS countries. Multivariable models I and II show no significant association between GDP growth and PC structure or any aspects of PC services delivery, after correcting for the strength of PC of countries in 1993 or the absolute level of GDP per capita in 1993.

Government composition and PC strength

The weighted number of years countries had a left-wing government has a significantly positive association with PC structure, and accessibility and coordination of PC (see table 2). After correcting for differences among countries in GDP and the strength of PC in 1993, these associations remain. This relationship is strongest with the structure of PC.

Countries with a NHS or SHI system that have been governed by a longer period of left-wing governments have a stronger PC structure, and a higher accessibility and coordination of PC. This was not the case for transitional countries, separately.

Health care system type and PC strength

Countries with a SHI system have a lower accessibility of PC, also after correcting for differences in the strength of PC in 1993 (see table 2). When correcting for the differences in GDP per capita across countries, the relationship between SHI systems and accessibility of PC is much weaker, and no longer significant (p-value 0.111).

Countries with a health care system in transition have a higher accessibility and better continuity of PC compared to other countries, after correcting for differences in the strength of PC in 1993. Having a SHI system has a negative association with continuity of PC, when taking into account differences in wealth across countries. The structure, accessibility, coordination and comprehensiveness of PC show no association with health care system type.

Table 2: Regression of primary care strength and contextual factors

		PC structure				Access to PC			
		Simple model	Multiv. model I	Multiv. model II	Multiv. model III	Simple model	Multiv. model I	Multiv. model II	Multiv. model III
PC system strength 1993	Standard. B	**0.327****		**0.737***	**0.539***	0.258		**0.545***	**0.834***
	(p-value)	*(0.084)*		*(0.001)*	*(0.042)*	*(0.177)*		*(0.021)*	*(0.001)*
	R^2 *(N)*	0.107 *(29)*		0.383 *(29)*	0.154 *(29)*	0.066 *(29)*		0.202 *(29)*	0.411 *(29)*
TRANS (=0/1)	Standard. B				0.303				**0.823***
	(p-value)				*(0.241)*				*(0.001)*
GDP per capita 1993	Standard. B	-0.144	**-0.667***		-0.435	-0.129	**-0.467***		0.125
	(p-value)	*(0.438)*	*(0.002)*		*(0.109)*	*(0.488)*	*(0.046)*		*(0.643)*
	R^2 *(N)*	0.021 *(31)*	0.383 *(29)*		0.095 *(31)*	0.017 *(31)*	0.202 *(29)*		0.073 *(31)*
TRANS (=0/1)	Standard. B				-0.398				0.348
	(p-value)				*(0.141)*				*(0.202)*
Growth GDP per capita 1993-2009	Standard.B	-0.045	0.365	-0.301	0.043	-0.060	0.140	-0.310	**-0.635**
	(p-value)	*(0.812)*	*(0.123)*	*(0.258)*	*(0.885)*	*(0.750)*	*(0.571)*	*(0.245)*	*(0.021)*
	R^2 *(N)*	0.002 *(31)*	0.186 *(29)*	0.065 *(31)*	0.007 *(31)*	0.004 *(31)*	0.078 *(29)*	0.064 *(31)*	0.230 *(31)*
TRANS (=0/1)	Standard. B				-0.114				**0.746**
	(p-value)				*(0.703)*				*(0.008)*
Government composition	Standard. B	**0.454***	**0.394***	**0.451***	**0.460***	**0.362***	**0.339****	**0.358***	**0.349***
	(p-value)	*(0.010)*	*(0.027)*	*(0.012)*	*(0.010)*	*(0.046)*	*(0.068)*	*(0.050)*	*(0.050)*
	R^2 *(N)*	0.206 *(31)*	0.262 *(29)*	0.224 *(31)*	0.217 *(31)*	0.131 *(31)*	0.181 *(29)*	0.145 *(31)*	0.187 *(31)*
TRANS (=0/1)	Standard. B				-0.105				0.238
	(p-value)				*(0.535)*				*(0.173)*
Health care system	Standard. B	0.127	0.009	0.173		0.040	-0.075	0.076	
NHS (=0/1)	*(p-value)*	*(0.495)*	*(0.966)*	*(0.371)*		*(0.832)*	*(0.742)*	*(0.697)*	
	R^2 *(N)*	0.016 *(31)*	0.107 *(29)*	0.049 *(31)*		0.002 *(31)*	0.070 *(29)*	0.022 *(31)*	
SHI (=0/1)	Standard. B	-0.058	-0.170	0.021		**-0.319****	**-0.382***	-0.341	
	(p-value)	*(0.758)*	*(0.364)*	*(0.925)*		*(0.080)*	*(0.039)*	*(0.111)*	
	R^2 *(N)*	0.003 *(31)*	0.135 *(29)*	0.021 *(31)*		0.102 *(31)*	0.210 *(29)*	0.103 *(31)*	
TRANS (=0/1)	Standard. B	-0.081	0.303	-0.398		0.257	**0.823***	0.348	
	(p-value)	*(0.667)*	*(0.241)*	*(0.141)*		*(0.163)*	*(0.001)*	*(0.202)*	
	R^2 *(N)*	0.006 *(31)*	0.154 *(29)*	0.095 *(31)*		0.066 *(31)*	0.411 *(29)*	0.073 *(31)*	
NHS (=0/1)	Standard. B		0.132				-0.161		
	(p-value)		*(0.549)*[a]				*(0.439)*[a]		
SHI (=0/1)	Standard. B		0.008				**-0.400****		
	(p-value)		*(0.969)*[b]				*(0.061)*[b]		
	R^2 *(N)*		0.016 *(31)*				0.121 *(31)*		
Government responsibility	Standard. B	-0.241	0.244	-0.229	-0.115	0.182	**0.609***	0.444	0.032
	(p-value)	*(0.279)*	*(0.322)*	*(0.502)*	*(0.715)*	*(0.418)*	*(0.014)*	*(0.193)*	*(0.919)*
	R^2 *(N)*	0.058 *(22)*	0.311 *(20)*	0.058 *(22)*	0.075 *(22)*	0.033 *(22)*	0.403 *(20)*	0.088 *(22)*	0.056 *(22)*
TRANS (=0/1)	Standard. B				-0.182				0.214
	(p-value)				*(0.563)*				*(0.501)*
Children caring for ill parents	Standard. B	**-0.384***	0.051	**-0.772***	**-0.406****	-0.108	0.201	-0.381	-0.374
	(p-value)	*(0.044)*	*(0.852)*	*(0.003)*	*(0.081)*	*(0.586)*	*(0.504)*	*(0.163)*	*(0.103)*
	R^2 *(N)*	0.147 *(28)*	0.243 *(26)*	0.309 *(28)*	0.148 *(28)*	0.012 *(28)*	0.086 *(26)*	0.091 *(28)*	0.165 *(28)*
TRANS (=0/1)	Standard. B				0.039				**0.474***
	(p-value)				*(0.864)*				*(0.042)*
Healthy impact Science/Technology	Standard. B	0.016	-0.210	0.122	-0.051	-0.263	**-0.453***	-0.266	-0.169
	(p-value)	*(0.930)*	*(0.305)*	*(0.577)*	*(0.830)*	*(0.153)*	*(0.024)*	*(0.220)*	*(0.462)*
	R^2 *(N)*	0.000 *(31)*	0.143 *(29)*	0.032 *(31)*	0.008 *(31)*	0.069 *(31)*	0.234 *(29)*	0.069 *(31)*	0.084 *(31)*
TRANS (=0/1)	Standard. B				-0.112				0.154
	(p-value)				*(0.641)*				*(0.502)*

$^{*}p < 0.05$; $^{**}p < 0.1$
Multivariate Model I: Adjusted value for the involvement of GPs in first contact care for various health problems in 1993
Multivariate Model II: Adjusted value for the GDP in PPP USD per capita in 1993
Multivariate Model III: Includes as independent variables health care system in transition (0/1) and each of the other listed independent variables.
[a]Adjusted value for social health insurance system (0/1)
[b]Adjusted value for national health service system (0/1)

Table 2: Regression of primary care strength and contextual factors - *continued*

		Aspects of primary care services delivery:											
		Continuity of PC				**Coordination of PC**				**Comprehensiveness of PC**			
		Simple model	Multiv. model I	Multiv. model II	Multiv. model III	Simple model	Multiv. model I	Multiv. model II	Multiv. model III	Simple model	Multiv. model I	Multiv. model II	Multiv. model III
PC system strength 1993	Standard. B	0.169		0.212	**0.579***	0.161		0.234	0.178	0.036		-0.061	-0.104
	(p-value)	*(0.382)*		*(0.394)*	*(0.026)*	*(0.403)*		*(0.347)*	*(0.516)*	*(0.853)*		*(0.805)*	*(0.706)*
	R^2 *(N)*	0.028 *(29)*		0.032 *(29)*	0.203 *(29)*	0.026 *(29)*		0.035 *(29)*	0.026 *(29)*	0.001 *(29)*		0.017*(29)*	0.02 *(29)*
TRANS (=0/1)	Standard. B				**0.585***				0.025				-0.199
	(p-value)				*(0.025)*				*(0.928)*				*(0.470)*
GDP per capita 1993	Standard. B	0.032	-0.071		0.397	0.077	-0.119		-0.050	0.203	0.158		0.111
	(p-value)	*(0.864)*	*(0.774)*		*(0.137)*	*(0.679)*	*(0.632)*		*(0.857)*	*(0.274)*	*(0.527)*		*(0.685)*
	R^2 *(N)*	0.001 *(31)*	0.032 *(29)*		0.118 *(31)*	0.006 *(31)*	0.035 *(29)*		0.020 *(31)*	0.041 *(31)*	0.017 *(29)*		0.049 *(31)*
TRANS (=0/1)	Standard. B				**0.500****				-0.174				-0.126
	(p-value)				*(0.064)*				*(0.529)*				*(0.049)*
Growth GDP per capita 1993-2009	Standard.B	0.150	0.372	0.352	-0.030	-0.155	0.019	-0.202	-0.119	-0.181	-0.028	-0.074	-0.053
	(p-value)	*(0.421)*	*(0.133)*	*(0.189)*	*(0.918)*	*(0.406)*	*(0.941)*	*(0.453)*	*(0.688)*	*(0.330)*	*(0.911)*	*(0.781)*	*(0.856)*
	R^2 *(N)*	0.022 *(31)*	0.111 *(29)*	0.062 *(31)*	0.045 *(31)*	0.024 *(31)*	0.026 *(29)*	0.026 *(31)*	0.025 *(31)*	0.033 *(31)*	0.002 *(29)*	0.044 *(31)*	0.044 *(31)*
TRANS (=0/1)	Standard. B				0.233				-0.047				-0.166
	(p-value)				*(0.428)*				*(0.875)*				*(0.571)*
Government composition	Standard. B	0.053	0.063	0.054	0.042	**0.388***	**0.339****	**0.390***	**0.396***	0.190	0.089	0.195	0.201
	(p-value)	*(0.776)*	*(0.747)*	*(0.776)*	*(0.821)*	*(0.031)*	*(0.074)*	*(0.033)*	*(0.029)*	*(0.307)*	*(0.652)*	*(0.291)*	*(0.276)*
	R^2 *(N)*	0.003 *(31)*	0.032 *(29)*	0.004 *(31)*	0.046 *(31)*	0.150 *(31)*	0.140 *(29)*	0.158 *(31)*	0.176 *(31)*	0.036 *(31)*	0.009 *(29)*	0.079 *(31)*	0.083 *(31)*
TRANS (=0/1)	Standard. B				0.208				-0.159				-0.218
	(p-value)				*(0.270)*				*(0.362)*				*(0.240)*
Health care system NHS (=0/1)	Standard. B	0.046	-0.024	0.041		0.273	0.295	0.270		0.112	0.129	0.067	
	(p-value)	*(0.804)*	*(0.918)*	*(0.835)*		*(0.138)*	*(0.199)*	*(0.161)*		*(0.548)*	*(0.585)*	*(0.729)*	
	R^2 *(N)*	0.002 *(31)*	0.029 *(29)*	0.003 *(31)*		0.074 *(31)*	0.087 *(29)*	0.075 *(31)*		0.013 *(31)*	0.013 *(29)*	0.045 *(31)*	
SHI (=0/1)	Standard. B	-0.277	-0.295	**-0.393****		-0.160	-0.245	-0.267		0.095	0.006	-0.010	
	(p-value)	*(0.132)*	*(0.125)*	*(0.066)*		*(0.390)*	*(0.207)*	*(0.218)*		*(0.612)*	*(0.978)*	*(0.962)*	
	R^2 *(N)*	0.077 *(31)*	0.114 *(29)*	0.116 *(31)*		0.026 *(31)*	0.085 *(29)*	0.059 *(31)*		0.009 *(31)*	0.001 *(29)*	0.041 *(31)*	
TRANS (=0/1)	Standard. B	0.210	**0.585***	**0.500****		-0.138	0.025	-0.174		-0.207	-0.199	-0.126	
	(p-value)	*(0.256)*	*(0.025)*	*(0.064)*		*(0.459)*	*(0.928)*	*(0.529)*		*(0.264)*	*(0.470)*	*(0.643)*	
	R^2 *(N)*	0.044 *(31)*	0.203 *(29)*	0.118 *(31)*		0.019 *(31)*	0.026 *(29)*	0.020 *(31)*		0.043 *(31)*	0.022 *(29)*	0.049 *(31)*	
NHS (=0/1)	Standard. B		-0.123				0.257				0.213		
	(p-value)		*(0.559)*[a]				*(0.231)*[a]				*(0.327)*[a]		
SHI (=0/1)	Standard. B		-0.339				-0.031				0.202		
	(p-value)		*(0.116)*[b]				*(0.883)*[b]				*(0.354)*[b]		
	R^2 *(N)*		0.088 *(31)*				0.075 *(31)*				0.043 *(31)*		
Government responsibility	Standard. B	0.286	0.400	**0.741***	0.223	**-0.476***	-0.366	**-0.705***	**-0.673***	**-0.438***	-0.438	**-0.665***	**-0.555****
	(p-value)	*(0.196)*	*(0.158)*	*(0.023)*	*(0.476)*	*(0.025)*	*(0.182)*	*(0.027)*	*(0.024)*	*(0.041)*	*(0.120)*	*(0.040)*	*(0.067)*
	R^2 *(N)*	0.082 *(22)*	0.117 *(20)*	0.246 *(22)*	0.086 *(22)*	0.226 *(22)*	0.167 *(20)*	0.268 *(22)*	0.267 *(22)*	0.192 *(22)*	0.137 *(20)*	0.233 *(22)*	0.206 *(22)*
TRANS (=0/1)	Standard. B				0.090				0.282				0.166
	(p-value)				*(0.771)*				*(0.318)*				*(0.567)*
Children caring for ill parents	Standard. B	-0.065	-0.002	-0.189	-0.317	**-0.414***	-0.474	**-0.612***	**-0.457***	**-0.355****	**-0.670***	**-0.483****	-0.379
	(p-value)	*(0.742)*	*(0.995)*	*(0.500)*	*(0.169)*	*(0.028)*	*(0.112)*	*(0.020)*	*(0.048)*	*(0.064)*	*(0.024)*	*(0.072)*	*(0.105)*
	R^2 *(N)*	0.004 *(28)*	0.017 *(26)*	0.021 *(28)*	0.143 *(28)*	0.171 *(28)*	0.147 *(26)*	0.213 *(28)*	0.175 *(28)*	0.126 *(28)*	0.203 *(26)*	0.143 *(28)*	0.127 *(28)*
TRANS (=0/1)	Standard. B				**0.449****				0.076				0.043
	(p-value)				*(0.055)*				*(0.731)*				*(0.849)*
Healthy impact Science/Technology	Standard. B	-0.224	-0.327	-0.325	-0.152	0.241	0.153	0.272	0.248	**0.433***	**0.455***	**0.446***	**0.487***
	(p-value)	*(0.226)*	*(0.121)*	*(0.135)*	*(0.514)*	*(0.192)*	*(0.477)*	*(0.212)*	*(0.291)*	*(0.015)*	*(0.030)*	*(0.032)*	*(0.030)*
	R^2 *(N)*	0.050 *(31)*	0.116 *(29)*	0.079 *(31)*	0.059 *(31)*	0.058 *(31)*	0.045 *(29)*	0.061 *(31)*	0.058 *(31)*	0.188 *(31)*	0.171 *(29)*	0.188 *(31)*	0.193 *(31)*
TRANS (=0/1)	Standard. B				0.118				0.012				0.088
	(p-value)				*(0.613)*				*(0.958)*				*(0.684)*

*$p < 0.05$; **$p < 0.1$

Multivariate Model I: Adjusted value for the involvement of GPs in first contact care for various health problems in 1993

Multivariate Model II: Adjusted value for the GDP in PPP USD per capita in 1993

Multivariate Model III: Includes as independent variables health care system in transition (0/1) and each of the other listed independent variables.

[a]Adjusted value for social health insurance system (0/1)

[b]Adjusted value for national health service system (0/1)

Cultural values and PC strength

Countries where people value a stronger involvement of the government to ensure that everyone is provided for, have a higher accessibility of PC, after correcting for differences in the strength of PC in 1993 (see table 2). These countries also have a better continuity of PC, when taking into account differences in wealth across countries. However, in terms of coordination and comprehensiveness of care, the relationship works in the opposite direction: countries where people value more government involvement have a weaker coordination of PC and a lower comprehensiveness of PC services, when taking into account differences in wealth across countries. Particularly, countries with a NHS or SHI system have a significantly negative relationship between desired government involvement and coordination and comprehensiveness of PC. This is not the case for transitional countries.

Countries where people value ill parents being taken care of by their children, have a significantly weaker PC structure and coordination of PC, and provide a smaller scope of PC services (see table 2). When differences in the strength of PC in 1993 are taken into account, this relationship holds only for the comprehensiveness of PC. When only correcting for differences in wealth across countries, this relationship remains valid for both PC structure, and the coordination and comprehensiveness of PC (see table 2). Particularly in countries with a health care system in transition, family values are strong (see table 1). As a result, transitional countries show a significantly positive relationship between children preferring to care for ill parents and the accessibility and continuity of PC (see table 2). When looking at NHS and SHI countries, they show instead, a significantly negative relationship between children preferring to care for ill parents and PC structure and coordination of PC.

Countries where people value the use of science and technology to improve their health, provide more comprehensive PC services. This was particularly true among NHS and SHI countries. Even after correcting for differences in the strength of PC in 1993 or wealth, this association remained for all countries (see table 2). However, the accessibility of PC showed a different association: countries where people valued the use of science and technology to improve their health more had a lower accessibility of PC after correcting for differences in the strength of PC in 1993. Overall, people in countries with a health care system in transition, valued the use of science and technology to improve their health the least, but this had no significant relationship with PC structure or any aspect of the PC services delivery process.

Discussion

Mixed impact of wealth on PC strength

The hypothesis that countries with a higher (growth in) economic development have a weaker PC structure and services delivery process was to a great extent supported by the findings. Countries that were wealthier in 1993, currently have a weaker PC structure and lower accessibility of PC, after correcting for their PC strength in 1993. This was probably because they could afford to gear their governance, development and planning of health care workforce, and funding arrangements towards expensive specialised care to satisfy public expectations. Although this occurred both at the expense of the structure of PC and its accessibility, the growth in GDP only had a negative effect on accessibility of PC among NHS and SHI countries. This might be the result of the introduction of co-payments to limit health care utilisation, which can have a big impact on access. Wealth had a different impact on PC in transitional countries. It boosted both the accessibility of PC, for example by increasing the availability of PC services, and the continuity of PC, for example by introducing personal physicians. Wealth probably had a positive impact on PC in transitional countries because PC was relatively weak in the early nineties, and every extra investment therefore had a relatively big impact. The (growth in) national income did not have an effect on the coordination or comprehensiveness of PC. This could be explained by the fact that coordination of PC requires the streamlining of processes, skill-mix and teamwork which need other types of incentives to facilitate this (such as multidisciplinary guidelines, culture of collaboration), and all health care systems should provide at least a minimum scope of basic care services in PC regardless their wealth.

Left-wing governments foster strong PC

The most evident impact on the strength of PC was the government composition of countries. Our hypothesis that countries that for a longer period have been governed by left-wing parties have a stronger PC structure and PC services delivery process (particularly regarding accessibility and comprehensiveness of PC) was supported by our findings except for its lack of impact on comprehensiveness of care. Moreover, government composition also affects the coordination of PC, but not continuity of PC. The political agenda of left-wing parties is based on principles of social equity (e.g. equity in health and access to care), solidarity, broad levels of benefits, and state intervention to achieve these principles. These priorities clearly impact the structure of PC by implementing PC supportive policies, ensuring financial coverage for all inhabitants, and investing in the development of the PC workforce, since PC can be seen as an equity improving part of the health care system. At process level, left-wing parties probably affect access to PC by for example reducing financial

barriers to care and warranting an equal geographical distribution of PC services. Coordination of care is most likely affected by streamlining care processes around patients (e.g. disease management programmes), and introducing gatekeeping systems to limit possible over-consumption of care. Perhaps continuity of PC is not influenced by a country's government composition because it is more related to the organisation of care at practice level and traditions of the medical professions (e.g. medical record keeping, the use of electronic support systems, communicating medical information) which are not directly related to political principles. It is surprising that the comprehensiveness of PC is not affected by government composition, as we expected left-wing governed countries to advocate a more comprehensive scope of PC services to be offered. Perhaps, because the tasks and duties of PC professionals are often laid down in regulations and laws, this is something that is not easily changed by political parties.

The relevance of the type of health care system

We hypothesised that countries with NHS systems have a stronger PC structure and services delivery process due to the stronger power base of the government than countries with a SHI or health care system in transition. This hypothesis was not fully supported by our findings. Interestingly, the findings do indicate that the different types of health care systems have a different relationship with the strength of PC. Firstly, countries with a SHI system have a weaker accessibility and continuity of PC. This could be the result of a lack of gatekeeping system, and use of co-payments to control health care use in most SHI systems, which both affect continuity (e.g. absence of patient lists) and access (e.g. affordability of care) to PC. Secondly, Central and Eastern European countries with a health care system in transition show often different outcomes from NHS and SHI countries in Europe. Transitional countries have a higher accessibility and better continuity of PC, and have used the growth of national income to the benefit of the strength of PC, unlike NHS and SHI countries. This is likely the result of a difference in history, coming from a highly centralized system influenced by communism, with a strong focus on specialists and hospital care, and PC provided by gynaecologists, paediatricians and therapists with a low professional status. This created a sense of an urgency among these countries to implement major reforms to strengthen the overall health care system, which some countries implemented sooner and more successfully than others.[58;59]

Values affect all aspects of PC strength

We operationalised countries' value systems by looking at the desired government (as opposed to individual) responsibility to distribute welfare, preference of family members caring for each other over professional health care utilisation, and the perceived impact of

science and technology on health. When combining the results for all three values, we see that these values affect both PC structure, and all aspects of PC services delivery. Moreover, it is the only independent variable that has a significant impact on the comprehensiveness of PC services offered (all three values mattered).

We hypothesised that countries where people want a high government involvement (vs. individual responsibility) in providing welfare among the population have a stronger PC structure and services delivery process. This was only partly supported by the findings. Countries where people wanted more government involvement in the early nineties achieved in 2009/10 a stronger accessibility and continuity of PC, but a weaker coordination and comprehensiveness of care (the latter two, particularly among NHS and SHI countries). One may speculate that perhaps governments were under pressure to act upon prevailing values, and therefore prioritised investments in access and continuity of PC because these are often more directly visible to the public (e.g. through reductions of out-of-pocket payments and introducing patient list systems creating a personal doctor-patient relationship), neglecting other important –less visible– aspects of the services delivery process, such as coordination and comprehensiveness of PC. This could have been a strategy to satisfy the general public, and at the same time limit expenditures by reducing for example the scope of services offered.

Regarding the second value, we hypothesised that countries where people are very family-oriented have a weaker PC structure and services delivery process. This hypothesis was only partly supported by the findings. It is true that more family oriented countries have a weaker PC structure, less coordination of PC, and provide a smaller scope of PC services. This may be the result of a lack of political need to strengthen these elements of PC, since the population prefers informal care over the use of professional care. However, transitional countries which have a strong family orientation, show a higher accessibility of PC and better continuity of PC.

Finally, we hypothesised that countries where people rely more on science and technology to improve their health have a weaker PC structure and services delivery process. This was only true with regard to access to PC. Countries with a strong science and technology focus have a lower accessibility of PC, probably because more human resources are made available for secondary care at the expense of PC. However, no effect was seen on PC structure. Apparently this value does not affect PC policies, education systems or coverage schemes for PC. More so, it has increased the comprehensiveness of PC, probably because it has made more medical technical procedures and applications possible in PC.

Strength and limitation

This article was based on a rich, comparable, up-to-date data set on PC in 31 European countries. This provided a unique opportunity to study the external factors that influence the strength of PC, which have never been studied on such a scale before. However, from a methodological point of view 31 countries is still very limited, and it would be desirable to add more OECD countries.[60] But, the more countries are added to the mix, the more diverse their historical, political and cultural backgrounds will be, which will limit the comparability of countries. It is a strong feature of this study that is has corrected its analyses on important confounding factors, and was able to show the existence of sub-populations in the European region.

Conclusion

We can conclude that countries differ in their PC strength due to differences in wealth, political composition of their government, prevailing values, and type of health care system. If national policymakers want to improve their PC strength, it will be relatively challenging (and perhaps undesirable) to change the national income, prevailing values or health care system type. This implies that strengthening PC is in the end a political decision which can only be taken if it is in line with prevailing values in a country.

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Appendix 1 - Correlation matrix

Pearson correlation matrix of dependent and independent variables

	Access of PC	Continuity of PC	Coordination of PC	PC Compre-hensiveness	First contact care 1993	GDP per capita	Growth in GDP	Government composition	NHS system	SHI system	TRANS system	Government action	Family orientation	Science & technology
PC structure strength	**0.49****	-0.01	**0.43***	0.26	0.33	-0.14	-0.05	**0.48****	0.13	-0.06	-0.08	-0.24	**-0.38***	0.02
Access (PC process strength)		0.28	0.27	-0.00	0.26	-0.13	-0.06	0.33	0.04	-0.32	0.26	0.18	-0.11	-0.26
Continuity (PC process strength)			-0.18	0.13	0.17	0.03	0.15	-0.04	0.05	-0.28	0.21	0.29	-0.07	-0.22
Coordination (PC process strength)				0.23	0.16	0.08	-0.16	**0.38***	0.27	-0.16	-0.14	**-0.48***	**-0.41***	0.24
Comprehensiveness (PC process strength)					0.04	0.20	-0.18	0.19	0.11	0.10	-0.21	**-0.44***	-0.36	**0.43***
GPs' involvement first contact care 1993						**0.62****	**-0.64****	0.01	**0.55****	0.12	**-0.70****	**-0.54***	**-0.74****	**0.43***
GDP per capita							**-0.71****	-0.07	0.24	**0.51****	**-0.73****	**-0.75****	**-0.70****	**0.51****
% Growth in GDP per capita								-0.03	**-0.40***	**-0.38***	**0.77****	**0.63****	**0.62****	-0.34
Yrs left party government dominance									0.12	-0.19	0.05	-0.32	-0.06	-0.05
NHS system										**-0.50****	**-0.59****	-0.42	-0.31	**0.38***
SHI system											**-0.41***	-0.36	-0.27	0.22
Transition system												**0.70****	**0.56****	**-0.61****
% pop. agree government should take more responsibility provide welfare													**0.70****	**-0.68****
% pop. prefers children take care of diseased parents														**-0.58****

**Statistically significant at $\alpha < 0.01$
*Statistically significant at $\alpha < 0.05$

8

The contribution of primary care to health care system performance in Europe

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This article has been submitted for review

Abstract

Background
The available evidence-base supporting pro-primary care (PC) policies originates from studies with a limited geographical scope, narrow use of dimensions to measure the strength of PC, and use relatively old data. It is therefore questionable whether the available evidence on the positive impact of strong PC on health care system outcomes is applicable to the European setting. With the recent availability of data (2009/10) on the strength of key PC dimensions in Europe it is now possible to improve this evidence base. This article therefore aimed to test the association of five key PC dimensions with important health care system outcomes in Europe.

Methods
Hypotheses were tested in an ecological analysis covering 31 European countries. Dependent variables included (growth in) total health care expenditure; patient perceived quality of PC; avoidable hospitalization rates for ambulatory care sensitive conditions (ACSCs); potential years of life lost due to ACSCs; socio-economic inequality in self-assessed health. Confounding variables included national income, the prevalence of ACSCs, risk factors, total hospitalization rates. Independent variables included the PC dimensions: PC structure, accessibility, continuity, coordination and comprehensiveness of PC. Data originated from international statistical databases and surveys and the PHAMEU project.

Results
Currently, countries with relatively strong PC have higher total health care expenditures than countries with relatively weak PC in Europe. The results confirm that strong PC has a positive impact on population health, reducing disparity in health, and avoiding unnecessary hospitalizations. Patient perceived quality of care is not related to the strength of PC.

Conclusion
In the beginning of the twenty-first century strong PC in Europe seems to be conducive to reaching important health care system goals. In financially flourishing times, the total health care expenditures will increase despite strong PC.

Introduction

Primary care (PC) is the first level of professional care where people present their health problems and where the majority of the population's curative and preventive health needs are satisfied.[1] Strong PC is believed to positively contribute to the objectives of health care systems. This trust in the potential of PC is evident from the investments in PC reforms made by governments, and from the wealth of charters and statements from non-governmental organizations worldwide.[2;3] Several studies, both internationally comparative and within the United States, have provided evidence on benefits of strong PC, in terms of better opportunities to control costs, improved quality of care, better health, and less inequality in health.[1;4-6] However, the currently available evidence should be considered with care. Firstly, because of the limited generalisability of the results to the European situation. These studies have usually included only a selection of EU countries and, additionally, covered non-European OECD countries. Secondly, evidence is often based on relatively old data. Thirdly, currently available studies used PC measurement instruments often limited in their dimensions, geographical scope or use of indicators. This situation has recently improved.
In 2009/10 the EU-funded PHAMEU (Primary Health Care Activity Monitor for Europe) project developed a set of 77 indicators measuring the five key dimensions of PC: PC structure, access, coordination, continuity and comprehensiveness of PC. This approach was based on a systematic literature review and PC expert consultations and covers the complexity of PC by addressing it as a multidimensional system.[7;8] PC data were collected in 31 countries based on the (inter)national literature, governmental publications, statistical databases, and national expert consultations. To determine the strength of each PC dimension in a country, the data on all indicators were transformed into scores ranging from 1 (weak) to 3 (strong), inspired by Starfield's approach.[5;9]
This article aims to test the relationship between the strength of key PC dimensions (i.e. PC structure, PC access, coordination, continuity and comprehensiveness of PC) and health care system performance in terms of health care expenditures, patient perceived quality of care, avoidable hospitalizations, and (inequality in) health in 31 European countries.

Hypothesized benefits of primary care

There is evidence that health care systems with strong PC spend less and are better able to contain the rising health care costs. Gerdtham et al.[10] showed that the overall cost of health care is generally lower in countries where PC performs a gatekeeper function. Delnoij et al. (2000)[4] showed that health care systems with gatekeeping general practitioners (GPs) had a less strong increase of ambulatory care costs, but not of total health care costs.[11]

Kroneman et al. (2006)[12] showed that countries with a gatekeeping system have lower patient perceived quality of organisational aspects of PC than countries with directly accessible specialist care. Accessibility had no effect on patient ratings of the quality of the actual medical care received in PC.
The positive effect of availability of PC providers and first contact care on reduced avoidable hospitalizations was confirmed by various studies, predominantly from the USA.[13-15] A hospital admission is avoidable when it could have been prevented by effective or accessible PC.[16] Conditions, sensitive to prevention or disease management in PC, are called ambulatory care sensitive conditions (ACSCs).
Several literature reviews found positive associations between accessibility of PC and population health.[17-19] Mostly research in the USA has shown that regions with a higher PC physician density (but not a higher specialist density) have a healthier population.
Another important research area in PC is equity in health, which is the absence of systematic and potentially remediable differences in health status across population groups. The evidence of a relationship between equity in health and the strength of PC at a national level is scarce. Until now, studies primarily from the USA, have shown that access can reduce socio-economic and racial disparities in health[19;20], but no such effects have been clearly demonstrated in international studies.[21;22]

The following hypotheses will therefore be tested in this article:

1. Health care expenditures are lower and increase less rapidly in countries that have relatively strong PC compared to countries that have relatively weak PC, after adjusting for national income.
2. Patient perceived quality of PC is lower in countries that have relatively strong PC compared to countries that have relatively weak PC.
3. Avoidable hospitalizations are lower in countries that have relatively strong PC compared to countries that have relatively weak PC, after adjusting for disease prevalence and the availability of hospital beds.
4. Population health is better in countries that have relatively strong PC compared to countries that have relatively weak PC, after adjusting for risk factors.
5. Socio-economic inequalities in health are lower in countries that have relatively strong PC compared to countries that have relatively weak PC, after adjusting for inequalities in risk factors.

Methods

Countries

The database covered 31 European countries (27 EU Member States, Switzerland, Turkey, Norway, and Iceland). Depending on the availability of data, one or more countries had to be excluded from some analyses. For all variables, the most recently available data were used (see Table 1).

Table 1 shows the descriptive statistics and sources of all included variables.

Dependent variables and their confounding factors

1. Health care expenditures

The total health care expenditures were measured by the percentage of the Gross Domestic Product (GDP) spent on health care in 2009, and its development was measured over the period 2000-2009.[23]

The (growth in) wealth of a country is an important confounding variable, and was measured by the GDP in PPP USD per capita in 2009 and its development in the period 2000-2009.[23]

2. Patient perceived quality of PC

The patient perceived quality of PC was measured by the age-sex standardized percentage of people who rated the quality of care received from family doctors (FDs)/GPs as very/fairly good (as opposed to fairly/very bad).[24]

3. Avoidable hospitalizations

Age-standardised hospital admission rates per 100,000 population by gender for: asthma, COPD, and diabetes (short-term complications) were used.[25]

The prevalence of diabetes[26], asthma, and chronic bronchitis/emphysema[27] (age-standardized, by gender and total) and total number of available hospital beds per 100,000 population[23] were used as confounding variables.

4. Health

Health was measured by the Potential Years of Life Lost (PYLL) due to diabetes mellitus, ischaemic heart disease, cerebrovascular disease, and obstructed airway conditions (including bronchitis, asthma and emphysema), by gender. [25] PYLL is a summary measure of premature (preventable) deaths that weighs deaths occurring at younger ages more highly than those occurring at later ages, age-standardized per 100,000 population (aged 0-69 years).

The percentage of obese/overweight population (BMI of 25 or higher), by gender and age (15-54 and 55+ years) was used as a confounding variable for diabetes.[28] The age-sex-standardized hypertension prevalence was used as a confounding variable for both ischaemic heart disease and cerebrovascular disease.[27] Data on the percentage of the population aged 15+ who report that they are daily smokers was used as a confounding variable for bronchitis, asthma and emphysema.[25]

5. Inequality in health

We measured the level of socio-economic inequality by (highest attained) educational level in having a (very) bad self-perceived health status; asthma; and diabetes by calculating the age-sex-standardized concentration index for each country.[27] This quantifies the degree of education-related inequality by condition, ranging from 1 to -1; indicating that the condition is more concentrated among persons with a higher (when positive value) or lower (when negative value) educational background.[29] When the concentration index equals zero, it indicates equality.

We included as confounding variables the age-sex-standardized concentration index for obesity[24] (related to diabetes) and daily smokers[27] (related to asthma and self-perceived health).

Independent variables

PC strength

Data on the strength of PC were derived from the PHAMEU project.[9] The following five independent variables were used for the strength of PC:

1. Structure of PC;
2. Accessibility of PC;
3. Continuity of PC;
4. Coordination of PC;
5. Comprehensiveness of PC.

Variable 1 indicates the strength of the PC structure of countries, consisting of the existence of PC policies and regulations (e.g. on equal distribution of PC providers and facilities), the availability of financial resources for PC and coverage for PC services, and the development of the PC workforce (e.g. workload, age and training of GPs).[7;8] Since these aspects of PC structure are positively associated with each other they can be summarized by one variable indicating the overall strength of a country's PC structure.[9]

Variables 2-5 reflect the strength of important aspects of the PC services delivery process.[7;8] These process functions are not strongly associated with each other and therefore four separate dependent variables were used.[8]

All five dependent variables are continuous, ranging from 1 (relatively weak PC) to 3 (relatively strong PC). Table 2 provides an overview of the primary care scores by country.

Statistical analyses

The association between dependent and independent variables was evaluated in simple (Pearson correlation) and multivariable regression analyses. In the simple linear regression analyses only one dependent and one independent variable were used, while in the multivariable analysis we also added one confounding variable (to prevent over-determination). Both analyses were performed for all hypotheses by using each of the five PC strength measures as independent variables in separate analyses. SPSS/PASW Statistics 18·0 was used.

Table 1: Description of all dependent and independent variables (see next 2 pages)

Dependent variables		N	Excluded countries	Mean (range)	S.D.	Year*	Source
Health expenditure	Total health expenditure (% GDP)	31	-	8·95 *(5·4-11·8)*	1·9	2009	WHO HFA Database[23]
	% change total health expenditure 2000-9 (% GDP)	31	-	20·15 *(-16·0-58·6)*	15·1	2000-9	WHO HFA Database[23]
Patient perceived quality of care	% pop. rating quality of GPs /FDs as 'good' (age-sex-stand.; 2007)	27	IS, NO, CH, TR	82·07 *(62·3-96·1)*	9·7	2007	Eurobarometer survey[24]
Avoidable hospitalizations	Asthma admission rate per 100.000 pop. (age-sex-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	51·18 *(15·1-166·8)*	35·0	2007-9	OECD Health Data[25]
	Asthma admission rate per 100.000 pop.: Male (age-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	36·93 *(9·7-115·9)*	27·7	2007-9	OECD Health Data[25]
	Asthma admission rate per 100.000 pop.: Female (age-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	64·23 *(20·0-216·0)*	43·5	2007-9	OECD Health Data[25]
	COPD admission rate per 100.000 pop. (age-sex-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	184·45 *(71·3-363·9)*	74·5	2007-9	OECD Health Data[25]
	COPD admission rate per 100.000 pop.: Male (age-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	242·38 *(107·5-436·6)*	83·7	2007-9	OECD Health Data[25]
	COPD admission rate per 100.000 pop.: Female (age-stand.)	23	BG, CY, EE, GR, LT, LU, RO, TR	144·76 *(43·0-324·3)*	83·7	2007-9	OECD Health Data[25]
	Diabetes admission rate per 100.000 pop(age-sex-stand.)	20	BG, CY, EE, FR, GR, HU, LT, LU, RO, SK, TR	19·87 *(7·3-44·1)*	9·6	2007-9	OECD Health Data[25]
	Diabetes admission rate per 100.000 pop.: Male (age-stand.)	20	BG, CY, EE, FR, GR, HU, LT, LU, RO, SK, TR	21·87 *(8·4-52·4)*	11·2	2007-9	OECD Health Data[25]
	Diabetes admission rate per 100.000 pop.: Female (age-stand.)	20	BG, CY, EE, FR, GR, HU, LT, LU, RO, SK, TR	17·93 *(6·3-36·6)*	8·6	2007-9	OECD Health Data[25]
Health	Diabetes PYLL per 100.000 pop. aged (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	36·16 *(14·1-66·5)*	14·4	2005-9	OECD Health Data[25]
	Diabetes PYLL per 100.000 pop.: Male (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	49·24 *(17·8-93·4)*	20·4	2005-9	OECD Health Data[25]
	Diabetes PYLL per 100.000 pop.: Female (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	23·46 *(9·0-49·0)*	9·7	2005-9	OECD Health Data[25]
	Ischaemic heart disease PYLL per 100.000 pop. (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	232·38 *(107·1-589·0)*	129·3	2005-9	OECD Health Data[25]
	Ischaemic heart disease PYLL per 100.000 pop.:Male (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	386·41 *(181·3-959·5)*	218·1	2005-9	OECD Health Data[25]
	Ischaemic heart disease PYLL per 100.000 pop.: Female (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	85·96 *(9·3-261·6)*	57·0	2005-9	OECD Health Data[25]
	Cerebrovascular disease PYLL per 100.000 pop. (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	106·65 *(46·6-232·1)*	52·5	2005-9	OECD Health Data[25]
	Cerebrovascular disease PYLL per 100.000 pop.: Male (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	138·74 *(52·5-336·1)*	83·1	2005-9	OECD Health Data[25]
	Cerebrovascular disease PYLL per 100.000 pop.: Female (age-stand.)	24	BG, CY, LT, LV, MT, RO, TR	76·69 *(40·8-141·7)*	27·9	2005-9	OECD Health Data[25]
	Bronchitis, Asthma and Emphysema PYLL per 100.000 pop. (age-stand.)	23	BG, CH, CY, LT, LV, MT, RO, TR	12·41 *(0·5-54·5)*	10·6	2005-9	OECD Health Data[25]
	Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Male (age-stand.)	23	BG, CH, CY, LT, LV, MT, RO, TR	15·44 *(0·6-75·7)*	15·4	2005-9	OECD Health Data[25]
	Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Female (age-stand.)	23	BG, CH, CY, LT, LV, MT, RO, TR	9·59 *(0·5-35·6)*	7·5	2005-9	OECD Health Data[25]
Inequality in health	Concentration Index (very) bad self-rated health (age-sex-stand.)	27	CH, IS, NO, TR	-0·16 *(-0·4-0·4)*	0·2	2006	Eurobarometer Survey[27]
	Concentration Index asthma prevalence (age-sex-stand.)	27	CH, IS, NO, TR	-0·03 *(-0·3-0·4)*	0·1	2006	Eurobarometer Survey[27]
	Concentration Index diabetes prevalence (age-sex-stand.)	27	CH, IS, NO, TR	-0·12 *(-0·35-0·1)*	0·1	2006	Eurobarometer Survey[27]

Independent variables		N	Excluded countries	Mean (range)	S.D.		
PC strength	Structure of PC	31	-	2·20 *(1·8-2·5)*	0·2	2009/10	PHAMEU Project[9]
	Accessibility of PC	31	-	2·24 *(2·0-2·5)*	0·1	2009/10	PHAMEU Project[9]
	Continuity of PC	31	-	2·33 *(2·1-2·4)*	0·1	2009/10	PHAMEU Project[9]
	Coordination of PC	31	-	1·70 *(1·4-2·3)*	0·2	2009/10	PHAMEU Project[9]
	Comprehensiveness of PC	31	-	2·38 *(2·0-2·6)*	0·1	2009/10	PHAMEU Project[9]

Table 1: Description of all dependent and independent variables *(Continued)*

	Confounding variables	N	Excluded countries	Mean (range)	S.D.	year	Source
National income	GDP per capita (PPP USD)	31	-	31578·48 *(13668-83820)*	14068	2009	WHO HFA Database[23]
	% growth in GDP per capita 2000-2009 (PPP USD)	31	-	158·78 *(126·7-252·2)*	31·5	2000-9	WHO HFA Database[23]
Health	% of pop. aged 15+ with asthma (age-sex-stand.)	27	CH, IS, NO, TR	6·50 *(2·6-16·0)*	3·3	2006	Eurobarometer Survey[27]
	% of male pop. aged 15+ with asthma (age-sex-stand.)	27	CH, IS, NO, TR	5·98 *(1·8-17·4)*	3·5	2006	Eurobarometer Survey[27]
	% of female pop. aged 15+ with asthma (age-sex-stand.)	27	CH, IS, NO, TR	7·00 *(3·0-14·7)*	3·4	2006	Eurobarometer Survey[27]
	% of pop. aged 15+ with chronic bronchitis/emphysema (age-sex-stand.)	27	CH, IS, NO, TR	5·00 *(1·9-10·6)*	2·3	2006	Eurobarometer Survey[27]
	% of male pop. aged 15+ with chronic bronchitis/emphysema (age-sex-stand.)	27	CH, IS, NO, TR	4·43 *(0·7-10·3)*	2·4	2006	Eurobarometer Survey[27]
	% of fem. pop. aged 15+ with chronic bronchitis/emphysema (age-sex-stand.)	27	CH, IS, NO, TR	5·52 *(2·2-10·9)*	2·4	2006	Eurobarometer Survey[27]
	% of pop. aged 20-79 yrs with diabetes	31	-	7·98 *(3·9-12·7)*	1·8	2011	IDF Diabetes Atlas[26]
	% of male pop. with diabetes	31	-	8·65 *(5·2-19·5)*	2·8	2011	IDF Diabetes Atlas[26]
	% of female pop. with diabetes	31	-	7·62 *(2·7-11·3)*	2·1	2011	IDF Diabetes Atlas[26]
Hospital beds	Total number of hospital beds per 100,000 population	31	-	529·35 *(247·6-824·2)*	160·3	2007-10	WHO HFA Database[23]
Risk factors	% total pop. with overweight/obesity	29	LU, TR	46·66 *(31·5-61·0)*	6·7	2004	Eurostat Statistics[28]
	% male pop. with overweight/obesity	29	LU, TR	53·33 *(37·7-66·7)*	7·4	2004	Eurostat Statistics[28]
	% female pop. with overweight/obesity	29	LU, TR	40·64 *(25·5-56·6)*	7·6	2004	Eurostat Statistics[28]
	% total pop. aged 55+ yrs with hypertension (age-sex-stand.)	27	CH, IS, NO, TR	17·88 *(11·2-25·8)*	4·1	2006	Eurobarometer Survey[27]
	% male pop aged 55+ yrs with hypertension (age-sex-stand.)	27	CH, IS, NO, TR	16·28 *(9·4-23·5)*	3·8	2006	Eurobarometer Survey[27]
	% female pop. aged 55+ yrs with hypertension (age-sex-stand.)	27	CH, IS, NO, TR	19·45 *(12·5-30·9)*	5·1	2006	Eurobarometer Survey[27]
	% total pop. aged 15+ who are daily smokers	25	BG, CY, LT, LV, MT, RO	22·62 *(14·3-39·7)*	5·3	2006-10	OECD Health Data[25]
	% male pop. aged 15+ who are daily smokers	25	BG, CY, LT, LV, MT, RO	27·16 *(13·5-46·3)*	7·9	2006-10	OECD Health Data[25]
	% female pop. aged 15+ who are daily smokers	25	BG, CY, LT, LV, MT, RO	18·51 *(11·0-33·5)*	4·8	2006-10	OECD Health Data[25]
	Concentration Index daily smoking (age-sex-stand.)	27	CH, IS, NO, TR	-0·05 *(-0·21-0·14)*	0·1	2006	Eurobarometer Survey[24]
	Concentration Index overweight prevalence (age-sex-stand.)	27	CH, IS, NO, TR	0·02 *(-0·1-0·2)*	0·1	2006	Eurobarometer Survey[24]

Table 2: The strength of key primary care aspects: scores by country in 2009/10 (ranging from 1 (weak primary care) to 3 (strong primary care)

	PC structure	Accessibility of PC	Continuity of PC	Coordination of PC	Comprehensiveness of PC
Austria	2·22	2·27	2·19	1·38	2·33
Belgium	2·21	2·13	2·38	1·70	2·53
Bulgaria	2·14	2·15	2·33	1·44	2·54
Cyprus	1·91	2·11	2·32	1·49	2·19
Czech Rep·	2·14	2·35	2·41	1·64	2·33
Denmark	2·38	2·46	2·43	1·96	2·40
Estonia	2·29	2·21	2·42	1·71	2·41
Finland	2·31	2·20	2·32	1·74	2·51
France	2·16	2·06	2·33	1·63	2·47
Germany	2·20	2·25	2·38	1·38	2·34
Greece	2·10	2·08	2·25	1·96	2·17
Hungary	2·08	2·34	2·33	1·46	2·29
Iceland	1·77	2·28	2·40	1·60	2·42
Ireland	2·20	1·96	2·38	1·57	2·36
Italy	2·33	2·27	2·31	1·73	2·13
Latvia	2·14	2·15	2·38	1·65	2·41
Lithuania	2·27	2·29	2·30	1·98	2·56
Luxembourg	1·90	2·03	2·31	1·63	2·42
Malta	2·12	2·17	2·17	1·82	2·38
Netherlands	2·50	2·38	2·26	2·20	2·32
Norway	2·27	2·25	2·36	1·56	2·55
Poland	2·12	2·35	2·33	1·92	2·29
Portugal	2·41	2·34	2·35	1·62	2·47
Romania	2·31	2·26	2·33	1·55	2·20
Slovak Rep·	2·02	2·27	2·39	1·39	1·98
Slovenia	2·36	2·47	2·30	1·84	2·32
Spain	2·43	2·44	2·43	1·84	2·51
Sweden	2·23	2·17	2·25	2·32	2·49
Switzerland	2·04	2·17	2·37	1·63	2·42
Turkey	2·27	2·05	2·15	1·61	2·36
United Kingdom	2·52	2·40	2·37	1·88	2·52

Results

The results show that strong PC is associated with higher (growth in) health care expenditures, reduced avoidable hospitalisation rates, improved health outcomes and reduced socio-economic inequality in self-assessed health. This will be further explained in the next sections supported by Tables 3 and 4.

Total health care expenditures and the strength of PC
Total health care expenditures are higher in countries with a stronger PC structure (B=0·31), also after adjusting for national income (standardised Beta coefficient (B)=0·39). The structure of PC is the only aspect of PC that shows a significant association with the growth of total health care expenditures (B=0·52): countries with a stronger PC structure have a more rapid growth in total health care expenditures, also after adjusting for the growth in national income (B=0·51).

Patient perceived quality of care and the strength of PC
The quality of care provided by FDs/GPs as perceived by patients is not associated with any aspect of strong PC.

Avoidable hospitalizations and the strength of PC
Countries with a stronger PC structure have lower hospital admission rates for asthma, both for the total population and for males (B= -0·45 and -0·51 respectively), after adjusting for the prevalence of asthma. Countries with a more comprehensive PC have lower hospital admission rates for asthma, both for the total population and for women (B=-0·36 and -0·37 respectively). After adjusting for the prevalence of asthma or total hospital beds the negative association with PC comprehensives remained the same.
The COPD admission rates of men were significantly lower in countries with a stronger coordination of care, after adjusting for the prevalence of COPD.
Countries with better access to PC have significantly lower hospital admission rates for diabetes, both for the total population (B=-0·40) and for males (B=-0·46). After adjusting for the total hospital beds or the prevalence of diabetes in the respective groups, these associations were even stronger. Hospital admission rates for women with diabetes were not associated with the strength of PC.

Health and the strength of PC
Countries with a stronger PC structure have a lower number of years of life lost due to ischaemic heart disease among the total, male and female population, after adjusting for the

prevalence of the condition (B ranges between 0·28 and 0·43). Also the comprehensiveness of PC matters: people with ischaemic heart disease living in countries with more comprehensive PC have a better health (B=-0·50 for men and -0·53 for women). However, after adjusting for the prevalence of hypertension among the respective groups, all associations became less strong (B=-0·35, -0·28 respectively).
Comprehensiveness of PC also had a positive effect on the total and male population with cerebrovascular disease (B=-0·42 and -0·43 respectively). Again, this association became less strong after adjusting for the prevalence of hypertension among the respective groups (B=-0·10 and -0·23 respectively). However, the association between PC structure and the PYLL of men due to cerebrovascular disease became stronger after adjusting for hypertension prevalence (B= -0·36).
The structure and coordination of PC were associated with reduced years of life lost due to bronchitis, asthma and emphysema. Countries with a stronger structure of PC have less years of life lost among women due to obstructive airway conditions. This association remained stable after adjusting for smoking behaviour of women (B=-0·37). The coordination of PC has a positive impact, both for men and women with obstructive airway conditions. This association remained stable or was even stronger after adjusting for smoking behaviour by gender (B=-0·43 for the total population and men; B=-0·36 for women).
No association was found between the strength of PC and PYLL due to diabetes.

Socio-economic inequality in health and the strength of PC
Countries with a better continuity of PC have a significantly lower socio-economic inequality in self-assessed health (B=-0·43). After adjusting for the socio-economic inequality in smoking this association was even stronger (B=-0·52). This is the only aspect of PC with a significant association with socio-economic inequality in self-assessed health.
Socio-economic inequality in the prevalence of asthma or diabetes showed no significant association with the strength of PC.

Table 3**:** Pearson correlation matrix of dependent and independent variables

	Structure of PC	Accessibility of PC	Continuity of PC	Coordination of PC	Comprehensiveness of PC
Total health expenditure (% GDP)	**0·31***	0·08	0·11	0·16	0·20
% change total health expenditure 2000-9 (% GDP)	**0·52****	-0·09	0·08	0·26	0·03
% pop. rating quality of GPs /FDs as 'good'	-0·05	-0·06	-0·04	-0·14	0·04
Asthma admission rate per 100.000 pop.	-0·23	-0·13	0·05	-0·24	**-0·36***
Asthma admission rate per 100.000 pop.: Male	-0·27	-0·16	0·03	-0·26	-0·35
Asthma admission rate per 100.000 pop.: Female	-0·21	-0·10	0·07	-0·22	**-0·37***
COPD admission rate per 100.000 pop.	-0·15	-0·11	0·13	-0·28	-0·09
COPD admission rate per 100.000 pop.: Male	-0·15	-0·13	0·02	-0·34	-0·24
COPD admission rate per 100.000 pop.: Female	-0·12	-0·09	0·19	-0·17	0·04
Diabetes admission rate per 100.000 pop.	-0·01	**-0·40***	-0·11	-0·10	0·25
Diabetes admission rate per 100.000 pop.: Male	-0·13	**-0·46****	-0·14	-0·12	0·20
Diabetes admission rate per 100.000 pop.: Female	0·14	-0·33	-0·07	-0·07	0·30
Diabetes PYLL per 100.000 pop. aged	0·07	0·16	0·12	-0·09	-0·02
Diabetes PYLL per 100.000 pop.: Male	0·02	0·16	0·09	-0·11	-0·03
Diabetes PYLL per 100.000 pop.: Female	0·15	0·15	0·17	-0·07	-0·00
Ischaemic heart disease PYLL per 100.000 pop.	-0·27	-0·00	0·07	-0·25	**-0·52****
Ischaemic heart disease PYLL per 100.000 pop.: Male	-0·28	-0·00	0·10	-0·25	**-0·50****
Ischaemic heart disease PYLL per 100.000 pop.: Female	-0·17	0·02	0·03	-0·24	**-0·53****
Cerebrovascular disease PYLL per 100.000 pop.	-0·21	0·20	0·17	-0·15	**-0·42****
Cerebrovascular disease PYLL per 100.000 pop.: Male	-0·25	0·18	0·17	-0·18	**-0·43****
Cerebrovascular disease PYLL per 100.000 pop.: Female	-0·04	0·23	0·18	-0·06	-0·33
Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.	-0·23	0·08	0·05	**-0·43****	0·02
Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Male	-0·15	0·05	-0·03	**-0·43****	0·00
Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Female	**-0·37***	0·13	0·22	**-0·35***	0·03
Concentration Index (very) bad self-rated health	-0·27	-0·26	**-0·43****	0·05	-0·02
Concentration Index asthma prevalence	0·11	0·32	0·04	0·01	0·06
Concentration Index diabetes prevalence	0·05	0·02	0·11	0·12	-0·01

Statistically significant at ***p* < 0·05 ; **p* < 0·1

Table 4: Regression analysis of dependent variables with a significant association with the strength of primary care

Health Expenditure:			**Total health expenditure (% GDP; 2009)**		**% change total health expenditure 2000-9 (% GDP)**	
			Simple model	Multiv. model: National Income	Simple model	Multiv. model: Growth in national income
	Structure of PC	Standard. B	0·307	0·393	0·522	0·513
		(p-value)	*(0·093)*	*(0·017)*	*(0·003)*	*(0·004)*
		R^2 *(N)*	0·094 *(31)*	0·343 *(31)*	0·272 *(31)*	0·280 *(31)*
	National income / Growth in nat. income	Standard. B		0·506		-0·086
		(p-value)		*(0·003)*		*(0·596)*

Avoidable hospitalizations			**Asthma admission rate per 100.000 pop.**			**Asthma admission rate per 100.000 pop.: Male**			**Asthma admission rate per 100.000 pop.: Female**		
			Simple model	Multiv. model: Asthma prev.	Multiv. model: Hosp. beds	Simple model	Multiv. model: Asthma prev.	Multiv. model: Hosp. beds	Simple model	Multiv. model: Asthma prev.	Multiv. model: Hosp. beds
	Structure of PC	Standard. B	-0·235	-0·454	-0·146	-0·270	-0·508	-0·132			
		(p-value)	*(0·281)*	*(0·078)*	*(0·575)*	*(0·213)*	*(0·041)*	*(0·603)*			
		R^2 *(N)*	0·055 *(23)*	0·190 *(20)*	0·075 *(23)*	0·073 *(23)*	0·229 *(20)*	0·119 *(23)*			
	Asthma prevalence / Hospital beds	Standard. B		0·047	0·165		0·103	0·257			
		(p-value)		*(0·849)*	*(0·524)*		*(0·661)*	*(0·315)*			
	Comprehensiveness of PC	Standard. B	-0·360	-0·369	-0·315				-0·365	-0·340	-0·338
		(p-value)	*(0·092)*	*(0·171)*	*(0·162)*				*(0·087)*	*(0·217)*	*(0·137)*
		R^2 *(N)*	0·129 *(23)*	0·127 *(20)*	0·149 *(23)*				0·133 *(23)*	0·137 *(20)*	0·140 *(23)*
	Asthma prevalence / Hospital beds	Standard. B		0·026	0·147					-0·053	0·089
		(p-value)		*(0·920)*	*(0·504)*					*(0·843)*	*(0·686)*

			COPD admission rate per 100.000 pop.: Male		
			Simple model	Multiv. model: COPD prev.	Multiv. model: Hosp. beds
	Coordination of PC	Standard. B	-0·338	-0·443	-0·178
		(p-value)	*(0·115)*	*(0·075)*	*(0·497)*
		R^2 *(N)*	0·114 *(23)*	0·178 *(20)*	0·156 *(23)*
	COPD prevalence / Hospital beds	Standard. B		-0·082	0·266
		(p-value)		*(0·729)*	*(0·313)*

			Diabetes admission rate per 100.000 pop.			**Diabetes admission rate per 100.000 pop.: Male**		
			Simple model	Multiv. model: Diabetes prev.	Multiv. model: BEDS	Simple model	Multiv. model: Diabetes prev.	Multiv. model: Hosp. beds
	Access to PC	Standard.B	-0·402	-0·448	-0·442	-0·460	-0·497	-0·489
		(p-value)	*(0·079)*	*(0·064)*	*(0·067)*	*(0·041)*	*(0·041)*	*(0·040)*
		R^2 *(N)*	0·162 *(20)*	0·190 *(20)*	0·186 *(20)*	0·212 *(20)*	0·224 *(20)*	0·225 *(20)*
	Diabetes prevalence / Hospital beds	Standard. B		0·174	-0·162		0·119	-0·118
		(p-value)		*(0·452)*	0·484		*(0·602)*	*(0·598)*

Table 4 - *continued*

Health:			**Ischaemic heart disease PYLL per 100.000 pop.**		**Ischaemic heart disease PYLL per 100.000 pop.: Male**		**Ischaemic heart disease PYLL per 100.000 pop.: Female**	
			Simple model	Multiv. model: Hypert. prev.	Simple model	Multiv. model: Hypert. prev	Simple model	Multiv. model: Hypert. prev
Structure of PC	Standard. B *(p-value)*		-0·269 *(0·203)*	-0·366 *(0·033)*	-0·279 *(0·187)*	-0·425 *(0·023)*	-0·171 *(0·425)*	-0·280 *(0·092)*
	R^2 *(N)*		0·073 *(24)*	0·570 *(21)*	0·078 *(24)*	0·479 *(21)*	0·029 *(24)*	0·595 *(21)*
Hypertension prevalence	Standard. B *(p-value)*			0·581 *(0·002)*		0·496 *(0·010)*		0·641 *(0·001)*
Comprehensiveness of PC	Standard. B *(p-value)*		-0·523 *(0·009)*	-0·297 *(0·107)*	-0·501 *(0·013)*	-0·348 *(0·081)*	-0·528 *(0·008)*	-0·277 *(0·108)*
	R^2 *(N)*		0·273 *(24)*	0·519 *(21)*	0·251 *(24)*	0·412 *(21)*	0·279 *(24)*	0·589 *(21)*
Hypertension prevalence	Standard. B *(p-value)*			0·557 *(0·005)*		0·451 *(0·028)*		0·616 *(0·001)*
			Cerebrovascular disease PYLL per 100.000 pop.		**Cerebrovascular disease PYLL per 100.000 pop.: Male**			
			Simple model	Multiv. model: Hypert. prev	Simple model	Multiv. model: Hypert. prev		
Structure of PC	Standard. B *(p-value)*				-0·254 *(0·231)*	-0·363 *(0·035)*		
	R^2 *(N)*				0·064 *(24)*	0·554 *(21)*		
Hypertension prevalence	Standard. B *(p-value)*					0·606 *(0·001)*		
Comprehensiveness of PC	Standard. B *(p-value)*		-0·419 *(0·042)*	-0·104 *(0·521)*	-0·433 *(0·035)*	-0·226 *(0·222)*		
	R^2 *(N)*		0·175 *(24)*	0·606 *(21)*	0·187 *(24)*	0·471 *(21)*		
Hypertension prevalence	Standard. B *(p-value)*			0·735 *(0·000)*		0·587 *(0·004)*		

Table 4 – *continued*

(Health)			**Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.**		**Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Male**		**Bronchitis, Asthma and Emphysema PYLL per 100.000 pop.: Female**	
			Simple model	Multiv. model: Smoking prev.	Simple model	Multiv. model: Smoking prev.	Simple model	Multiv. model: Smoking prev.
	PC Structure	Standard. B					-0·371	-0·371
		(p-value)					*(0·081)*	*(0·089)*
		R^2 *(N)*					0·138 *(23)*	0·138 *(23)*
	Daily smoking prevalence	Standard. B						0·018
		(p-value)						*(0·932)*
	Coordination of PC	Standard. B	-0·429	-0·429	-0·431	-0·432	-0·354	-0·363
		(p-value)	*(0·041)*	*(0·046)*	*(0·040)*	*(0·047)*	*(0·098)*	*(0·101)*
		R^2 *(N)*	0·184 *(23)*	0·184 *(23)*	0·186 *(23)*	0·186 *(23)*	0·125 *(23)*	0·129 *(23)*
	Daily smoking prevalence	Standard. B		-0·003		-0·004		0·064
		(p-value)		*(0·987)*		*(0·985)*		*(0·765)*
Inequality in health:			**Concentration Index (very) bad self-rated health**					
			Simple model	Multiv. model: CI_smoking				
	Continuity of PC	Standard. B	-0·430	-0·522				
		(p-value)	*(0·025)*	*(0·001)*				
		R^2 *(N)*	0·185 *(27)*	*0·346* (27)				
	Concentration index Daily Smoking	Standard. B		-0·412				
		(p-value)		*(0·023)*				

Discussion

This article showed that countries with relatively stronger PC dimensions in Europe have a better health system performance with regard to avoidable hospitalizations, and (disparity in) health, but higher health care expenditures than countries with relatively weaker developed PC dimensions.

Health care expenditures and PC

We hypothesised that health care expenditures are lower and increase less rapidly in countries with relatively strong PC compared to countries with relatively weak PC. The opposite was the case: countries with a stronger PC structure have both higher total health care expenditures, and a higher growth. This may be explained by the fact that Western European countries with strong PC (e.g. the United Kingdom, the Netherlands) were spending relatively little on health care in the eighties and nineties, and purposely increased health care expenditures in later years, e.g. to reduce waiting lists. As a result, the implied cost increasing effect of PC may be more related to the national health policy agenda of countries, then to the performance of PC. During financially flourishing years, all aspects of society will grow financially including health care, regardless the strength of PC, whereas in (current) times of recession, this will shrink again based on budget cuts. The fact that previous studies till now found no effect or even cost reducing effects of strong PC on total health expenditures, is likely caused by the timing of these studies (e.g. state of the economy) and their context (mix of OECD countries).[4;10]

Patient perceived quality of care and PC

We hypothesised that patient-reported quality of PC is lower in countries with relatively strong PC compared to countries with relatively weak PC. This was not confirmed, as PC strength was not associated with patient ratings of the quality of PC. This result is in line with the findings of Kroneman et al.[12] showing that patient ratings of the actual medical care received in PC was not related to the gatekeeping role of PC (while this was the case for organisational aspects of quality of care).

Avoidable hospitalizations and PC

This is the first internationally comparative study confirming that the positive effects of strong PC on avoidable hospitalizations found in other studies.[13-15] The results indicate that PC structure, accessibility to PC, the coordination and comprehensiveness of PC are all critical aspects of PC that reduce unnecessary hospitalizations for conditions that can also be

treated within PC. By focusing PC policies on these aspects, not only the quality of care for patients can be increased, but also unnecessary use of highly expensive care may be avoided.

Health and PC

The hypothesis that population health is better in countries with relatively stronger PC compared to countries with relatively weaker PC was confirmed. Both the structure of PC, and the coordination and comprehensiveness of PC have a positive impact on the health of persons with ischaemic heart disease, cerebrovascular disease, and asthma, bronchitis and emphysema. People suffering from these conditions, loose less years of their total life expectancy due to these conditions when they are treated in health care systems with a strong PC structure, good coordination of PC, and comprehensive services delivery. Only for people with diabetes, such an association was not evident. These findings are in line with earlier results from the USA, for example found by Starfield et al.[5]

Socio-economic inequality in health and PC

We hypothesised that countries with relatively strong PC have lower socio-economic inequalities in health. This was confirmed for the association between PC strength and inequality in self-assessed health but not for asthma or diabetes. This indicates that patients having a long term relationship with a PC provider, a good continuity in medical information, and a satisfactorily doctor-patient relationship is conducive to lower socio-economic inequalities in self-health. This confirms the results of previous studies, showing the disparity reducing effect of PC.[21] We cannot explain why this relationship was not shown for asthma or diabetes.

Strength and limitations

This is the first European comparative study showing the contribution of PC to the performance of health care systems. Where other studies were only able to measure aspects of PC strength with a very limited number of indicators – often also outdated – this study used a comprehensive set of indicators, measuring the complexity of PC in a recent time period (2009/10). However, the strength of PC was measured at one moment in time, and based on sources with varying levels of reliability across the 31 countries. Nevertheless, the best available data at the time of the study were used for all countries, combined with the best available data from international statistical databases and surveys. This study is limited to 31 countries, which is from a statistical point of view not ideal. Some analyses could only be performed for less countries, due to limited data availability. As a result, we were not able to include the impact of potentially important context factors (e.g. culture, politics, health care system type) on the dependent variables. This would be recommended for future

studies. This study should be used as a starting point for more in-depth studies on each of the complex outcome areas, preferably by also using micro level data.

Conclusion

This study was able to confirm that strong PC has a positive impact on improving population health, reducing disparity in health, and avoiding unnecessary hospitalizations in Europe. However, health expenditures are currently higher in countries with relatively stronger PC, which is likely the result of flourishing economies in the eighties and nineties. Overall, it can be concluded that in the beginning of the twenty-first century strong PC in Europe seems to be conducive to reaching important health care system goals.

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9

General Discussion

This thesis aimed to get insight into the elements that constitute (the strength of) primary care in Europe, its determinants and its impact on health care system outcomes. The following research questions were examined:

- Research question 1: How can (the strength of) primary care be measured and compared in Europe?
- Research question 2a: To what extent do countries differ in the strength of primary care?
- Research question 2b: How can we explain variation between countries in the strength of primary care?
- Research question 3: Do countries with a relatively strong primary care have better health care system outcomes compared to countries with relatively weak primary care?

In this final chapter, the main findings are interpreted, the implications of the results are discussed, a reflection of the applied methodology is given, and recommendations for future research are provided.

Interpretation of findings

Research question 1: *How can (the strength of) primary care be measured and compared in Europe?*

Chapter 2 provided a useful starting point for the performance of a systematic literature review on the core elements of primary care. Based on the results of the literature review in Chapter 3 we identified that strong primary care consists of ten core dimensions at the structure, process (service delivery), and outcome level of primary care.
The structure of primary care consists of three dimensions:
1. primary care governance;
2. economic conditions of primary care; and
3. primary care workforce development.

The primary care process is determined by four dimensions:
4. access to primary care;
5. continuity of primary care;
6. coordination of primary care; and
7. comprehensiveness of primary care.

The outcome of primary care includes at least three dimensions:
8. quality of primary care;
9. efficiency of primary care care; and
10. equity in health.

For each of these dimensions, the currently available literature provided an evidence base showing that primary care contributes through these dimensions to overall health system performance and population health. The strength of primary care is therefore determined by the degree in which dimensions 1 to 7 are developed in a health care system. The literature review therefore concluded that primary care can be defined and approached as a multidimensional phenomenon. To measure and compare the identified dimensions of primary care across countries, indicators are needed that are relevant (covering an important aspect of a dimension), precise (precise formulation), flexible (likely to fit in various European health care systems) and with discriminating power (yielding a range and variety of possible answers). Based on the systematic literature review and expert consultations we developed indicators to measure the identified primary care dimensions in Chapter 4. Each of the dimensions are complex concepts on their own, which can only be measured by a group of indicators each representing an important aspect of the respective dimension. This is an important improvement of earlier studies, for example performed by Starfield[1;2] in which the complexities of related concepts were measured by only one or two indicators. Although we were able to identify indicators for nine out of ten dimensions, it became clear that with the current state of knowledge, it is not possible yet to develop health equity indicators that are valid, feasible and measurable, and (proven to be) affected by primary care. As a result we developed the Primary Care Monitoring Instrument measuring the strength of 9 primary care dimensions with in total 99 (qualitative and quantitative) indicators. By applying all indicators in 31 countries Chapter 5 showed that the notion of 'primary care strength' cannot be captured by one (summary) measure or score, as done in earlier studies.[1;2] The results indicated that countries differ in their primary care orientation at structure level, compared to their primary care orientation at process level. We have shown that countries tend to have a consistent (high, medium or low) primary care orientation (or focus) on all 3 structure dimensions (governance, economic conditions and workforce development). It makes sense that countries that prioritise primary care supportive policies, also invest more in primary care and the development of its workforce, and vice versa. Therefore, it is possible to summarize the strength of primary care at structure level by one score for each country. But when looking at how countries organise their primary care service delivery process, a much more heterogeneous (and less obvious) picture is identified. There is no strong correlation between the access, continuity, coordination, and comprehensiveness of primary care of countries. Countries can have a high accessibility of primary care, but at the same time a low coordination of primary care, and comprehensive set of primary care services (and other combinations). We did see that countries with a high accessibility and coordination of primary care, generally also have a strong primary care structure; and countries with a high coordination of primary care

generally also have a strong primary care governance and workforce development in place. The lack of correlation among process dimensions implies that the strength of primary care at process level can only by measured, by analysing each of the 4 process dimensions separately.

The implications of these findings are to approach the strength of primary care as a multidisciplinary phenomenon, consisting of three dimensions at structure level that can be summarised by one score (although separate scores will likely be more informative to identify areas for improvement); and four separate dimensions at primary care service delivery level (i.e. access, continuity of care, coordination of care, comprehensiveness of care). Our findings show a gap in knowledge on equity in health related to primary care, and efficiency of primary care in terms of primary care outcomes. The currently identified outcome measures in the PC Monitoring Framework are intermediate (process related) outcome measures related to the quality of care. Therefore, when making an effort to relate the structure and process of primary care services delivery to health care system outcomes, effort should be made to use real outcomes measures such as ambulatory care sensitive health outcomes, and health care expenditures (as we have done in Chapter 8).
When approaching primary care as a multidimensional concept, awareness should be raised about the changes that each of the primary care dimensions may undergo through time. For example, with the increasing prevalence of chronic diseases and multimorbidity, the coordination of care dimension is gaining importance. As a result, countries may have weak primary care at structure level, or not a very comprehensive scope of primary care services, but can have at the same time a strong coordination of care dimension, given the urgency of integrating health care services and guiding patients with multiple conditions through the health care system. This makes it important to consider the context of primary care when trying to understand the state of primary care in countries at a certain point in time.

Research question 2a: *To what extent do countries differ in the strength of primary care?*

Chapter 5 showed that a distinction can be made between countries with strong, medium, and weak primary care. This distinction was based on variation in the data on each of the primary care dimensions, and the scientific evidence base for what is considered to be a strong, medium or weaker feature of primary care. For each of dimension, we were able to show variation between countries on their primary care orientation. For example, countries with a relatively strong primary care structure, considering all 3 dimensions (governance, economic conditions, and workforce development) are Denmark, Finland, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain, and the United Kingdom. Another

example: Denmark, Spain, and the United Kingdom have a relatively high accessibility of primary care, provide a relatively high level of continuity and coordination of primary care, and provide the most comprehensive scope of primary care services.

In Chapter 6 we studied the relationship between the three structure dimensions of primary care and the 4 dimensions of primary care processes delivered; and the relationship between the 4 process dimensions of primary care service delivery and quality of care, by performing a technical efficiency analysis including a selection of countries (22). In other words: we studies the mix and type of structure dimensions used by countries to obtain their achieved level of process dimensions. When comparing the strength of countries' primary care (which is based on maximising each of the primary care dimensions) with their relative efficiency (in organising primary care as a whole), we saw that some of the countries with strong primary care are not among the most efficient systems, in relative terms; few countries with relatively strong primary care were also relatively efficient (Netherlands, Portugal, Finland, Lithuania, Estonia); the same is true for countries with relatively weak primary care (i.e. Luxembourg, Bulgaria, Hungary) which turned out to be relatively efficient throughout their primary care system. This suggests that maximizing the individual functions of primary care without taking into account the coherence within the system is not sufficient from a policymakers' point of view when aiming to achieve both efficiency and strong primary care.

Research question 2b: *How can we explain variation between countries in the strength of primary care?*

In Chapter 7, we examined why countries differ in the strength of primary care. We found that the primary care orientation of a country is determined by various contextual factors that influence the policy priorities of a country.

The results show that wealthier countries have a weaker primary care structure and lower primary care accessibility. This was probably because they could afford to gear their governance, development and planning of health care workforce, and funding arrangements towards expensive specialised care to satisfy public expectations.

Transitional countries in Eastern Europe have used their growth in national income to strengthen the accessibility and continuity of primary care. This was probably the case because their primary care was relatively weak in the early nineties, and every extra investment therefore had a big impact.

Countries that have been governed by a predominantly left-wing government over the past years have a stronger primary care structure, accessibility and coordination of primary care. The political agenda of left-wing parties is based on principles of social equity (e.g. equity in health and access to care), solidarity, broad levels of benefits, and state intervention to achieve these principles. These priorities clearly impact the structure of primary care by

implementing primary care supportive policies, ensuring financial coverage for all inhabitants, and investing in the development of the primary care workforce, since primary care can be seen as an equity improving part of the health care system. At process level, left-wing parties probably affect access to primary care by for example reducing financial barriers to care and warranting an equal geographical distribution of primary care services. Coordination of care is most likely affected by streamlining care processes around patients (e.g. disease management programmes), and introducing gatekeeping systems to limit possible over-consumption of care.

We also found that countries with a social-security based system have a lower accessibility and continuity of primary care than NHS systems. This could be the result of a lack of gatekeeping system, and use of co-payments to control health care use in most SHI systems. The opposite is true for transitional systems. This is likely the result of a difference in history, coming from a highly centralized system influenced by communism, with a strong focus on specialists and hospital care, and primary care provided by gynaecologists, paediatricians and therapists with a low professional status. This created a sense of urgency among these countries to implement major reforms to strengthen the overall health care system, which some countries implemented sooner and more successfully than others.[3]

Finally, we found that cultural values affect all aspects of primary care. We operationalised countries' value systems by looking at the desired government (as opposed to individual) responsibility to distribute welfare, preference of family members caring for each other over professional health care utilisation, and the perceived impact of science and technology on health. When combining the results for all three values, we see that these values affect both primary care structure, and all aspects of primary care service delivery.

The results provide insight in why countries vary in the development of key primary care dimensions. It contributes to the evidence-base that primary care is in the end a reflection of a country's economic, social political, cultural history and the general structure of a health care system.[4-7] Given the character of these contextual factors (all difficult to influence and change), they provide limited possibilities (e.g. for policy makers) to improve the strength of primary care (a more useful starting point for this would be the country results on each primary care dimension).

Research question 3: *Do countries with a relatively strong primary care have better health care system outcomes compared to countries with relatively weak primary care?*

In Chapter 8, we found that strong primary care is indeed (as hypothesized) conducive to reaching important health care system goals. The structure of primary care, access, coordination and comprehensiveness of primary care are all aspects of primary care that

reduce unnecessary hospitalizations for conditions that can also be treated in primary care. We also found that population health is better in countries with relatively stronger primary care compared to countries with relatively weaker primary care: people suffering from primary care sensitive conditions (e.g. ischaemic heart disease, cerebrovascular disease, and asthma, bronchitis and emphysema) loose fewer years of their total life expectancy due to these conditions when they are treated in health care systems with a strong primary care structure, good coordination of primary care, and comprehensive service delivery. Only for people with diabetes such an association was not evident, which we cannot explain. We also found that countries with relatively strong primary care have lower socio-economic inequalities in self-assessed health. This could not be shown for asthma or diabetes. The results indicate that patients having a long term relationship with a primary care provider, a good continuity in medical information, and a satisfactorily doctor-patient relationship is conducive to lower socio-economic inequalities in self-health. We cannot explain why this relationship was not shown for asthma or diabetes. We hypothesised that patient-reported quality of primary care is lower in countries with relatively strong primary care compared to countries with relatively weak primary care. This was not confirmed, as primary care strength was not associated with patient ratings of the quality of primary care. Contrary to other studies[8,9], we found that countries with a stronger primary care structure have both higher total health care expenditures, and a higher expenditure growth. This may be explained by the fact that Western European countries with strong primary care (e.g. the United Kingdom, the Netherlands) were spending relatively little on health care in the eighties and nineties, and purposely increased health care expenditures in later years, e.g. to reduce waiting lists. As a result, the implied cost increasing effect of primary care may be more related to the national health policy agenda of countries, then to the performance of primary care. During financially flourishing years, all aspects of society will grow financially including health care, regardless the strength of primary care, whereas in (current) times of recession, this will shrink again based on budget cuts.

This is the first internationally comparative study in Europe confirming the positive effects of strong primary care on avoidable hospitalizations, health outcomes, and socio-economic inequality in self-assessed health. It confirms expectations on the importance of strong primary care for the overall performance of health care systems, as found in other studies.[1;2;10-13]This would form a good basis to perform more in depth studies to further develop and test theories on how primary care features at system level (e.g. decentralisation of responsibilities for the provision of primary care or financial incentives) influence the organisation of primary care at meso (practice) level, and affect the behaviour and experiences of patients (e.g. perceived financial access and experiences with the care they

receive). The potential cost saving effect of strong primary care should be further investigated by studies that are more focussed on the complexity of measuring health care and primary care expenditure, that compare expenditures of primary care with other health care sectors, and take into account the influence of macro level economic policies.

Methodological reflections

Classical health care system research approach

International comparative primary care research is an important area of health system research. A strong feature of this thesis was that it approached the research questions by applying the classical types of health system research, as described by Delnoij and Groenewegen (2007)[14]:

- Type 1: "Studies in which the development of the system is central (health care system as dependent variable)";
- Type 2: "Studies in which the outcomes of the system – in terms of health, costs and quality – are central (health care system as independent variable)".

To answer research questions 1 and 2, the development of primary care was the central focus, and therefore the dependent variable (type 1 health care system research). In answering research question 1, we explored and compared the functioning of primary care across 31 countries by measuring the development of the key primary care features at macro level and thereby describing the roles of important actors (i.e. government, primary care providers, insurers or other financiers, and patients). By developing a primary care system framework consisting of a set of key indicators for each primary care dimension which was applied in all countries, we systematically mapped the structure and organisation of primary care across Europe. The development of a web-based tool in which the indicators were pre-structured (including guidelines for each indicator) supported the uniformity of the data collection process. The country specific results provide a rich source of information for policy makers, researchers, and students interested in primary care in one or more countries. The descriptive results will therefore be published by the European Observatory on Health Systems and Policies in 2012/3.[15] In answering research question 2, we tested hypotheses to answer our question why countries develop their primary care features in a certain direction. The underlying assumption was that primary care requires a process of continuous management to shape and maintain its key functions (dimensions). Based on results from other studies we explored the relationship between primary care functions and wealth, politics, culture, and health care system structure. This provided new insights in why some countries focus their health care system more on primary care than others. To answer research question 3, we focussed our analyses to understanding the relationship between

(strong) primary care and health care system outcomes, in terms of (socio-economic inequality in) health, quality of care, avoidable hospitalizations, and costs. By ending the thesis with the classical type 2 health care system research approach, we were able to complete the circle of understanding primary care as a phenomenon (what is it, how can it be measured), how is it influenced by external factors, and what it contributes to health care system outcomes, at macro level?

The WHO Primary Care Evaluation Tool

The starting point of this thesis was the development and pilot testing of the WHO Primary Care Evaluation Tool. It helped gaining experience with understanding the complexities of primary care as a phenomenon, and measuring it in multiple countries.

Experience with the Primary Care Evaluation Tool has shown it to be very useful to include the policy level, provider level, and patient views when measuring the functioning of primary care. However, when aiming to measure the full scope of primary care, it is useful not to limit this to general practice. Therefore, the PC Monitor took a broader perspective as much as possible. The use of questionnaires (which were part of the Tool) had a wider impact than just collecting data. The activities at central, regional and local level implied information transfer, publicity and raising awareness for strengthening primary care. This was an important result of the project. The effect of the Primary Care Evaluation Tool, both in terms of the broad scope of primary care information that was collected and its policy impact will benefit from a broad commitment of stakeholders, in addition to Ministries of Health. A limitation of the WHO Primary Care Evaluation Tool was that it relies on self reported behaviour, rather than on direct observations or registrations, and this may bias results. Also, implementation is time and labour intensive, and could be balanced by using more existing data sources as basic information input. This is a major advantage of the PC Monitoring instrument approach: the use of available information as much as possible. Efforts are currently made, to evaluate the achieved impact of the Tool in countries where it has been applied.

Content of the PC Monitor

A strength of the PC Monitor is that it builds on well-known frameworks for health care system analysis (such as the structure-process-outcome approach) and primary care research. A major building stone in its development was a systematic literature review on primary care. This provided a comprehensive overview of the scientific evidence-base for the importance of primary care functions. The results were used for multiple purposes: to identify the key dimensions of primary care, indicators to measure them , and a scoring system for the strength of primary care. The foundation of this thesis relies therefore to a

great extent on the results of the systematic literature review, which were complemented and validated through expert consultation rounds (including all PHAMEU project partners).
In its current shape, all dimensions and indicators of the PC Monitor are of equal importance. Now that we know that primary care is indeed important for health care system outcomes, it may be worthwhile investigating whether it is reasonable to assume that all primary care dimensions are equally important. For example, the process of primary care is shaped by access to primary care services, the provided scope of services (comprehensiveness), continuity, and coordination of care. A hierarchy of importance could be argued at process level. It is reasonable to assume that the primary care process starts with patients having access to the primary care system. Once a patient has the opportunity to enter the primary care process, it is important that the patient receives appropriate care. This is a question of which services are offered to patients. Consequently, the care offered to patients should be delivered in a coordinated manner, on a continuous basis. These two dimensions of coordination and continuity of care are expected to be interrelated. Following this reasoning, access should perhaps be given more weight than any other process dimension. Also within dimensions, it could be further investigated if certain indicators are more important for a dimension than others. The results from Chapter 5 showed that the 4 primary care service delivery process dimensions were not strongly correlated with each other. With did find that each of the primary care structure dimensions was positively associated with primary care accessibility. In addition, we found that coordination of primary care was positively associated with primary care governance and workforce development. Therefore, access and coordination of primary care are much more influenced by the structure of primary care than all other process dimensions, and are critical aspects of primary care, particularly for patients with chronic conditions and multimorbidity. Based on this one can consider to prioritise access and coordination of care over the other process dimensions of primary care.
The PC Monitor provides a very comprehensive (snapshot) overview of the key elements of primary care. By using both quantitative and qualitative indicators, we were able to measure a diverse combination of aspects involved in the structure, organisation and performance of primary care. Given the complexity of primary care, the PC Monitor cannot be exhaustive. For example, very limited outcome dimensions could be represented. Currently, quality and efficiency of care are used, which each have a limited set of indicators, due to a weak evidence-base for their suitability as primary care outcome indicators. Also, equity in health is an important health system outcome which could not be represented in the PC Monitor due to a lack of suitable indicators (see also section "recommendations for future research). Nevertheless, aspects that influence equity in use of primary care services are included in the PC Monitor. Commonly applied structure and process indicators of inequalities in primary

care access and use, have been integrated into several dimensions. For example, policy on equality in access (governance), primary care coverage (economic conditions), geographic availability of primary care services (access), and affordability of primary care services (access) are all related to equity. In addition, in Chapter 8 we were able to use a number of additional outcome indicators related to primary care as much as possible (that were not in the PC Monitoring Framework as this included more intermediary outcome measures), including (socio-economic inequality in) health outcomes for ambulatory care sensitive conditions, health care expenditures, and patient perceived quality of care.

A major strength of the PC Monitor is that it is applicable to different configurations of primary care across Europe. For practical reasons (e.g. availability of data), still a sizable number of indicators (e.g. to measure comprehensiveness of primary care) are focussed on general practitioners. This is not surprising when considering general practitioners appear as primary care providers in every of the 31 studied European countries, which facilitates international comparisons. But, this does limit the applicability of certain dimensions of the PC Monitor, given the multitude of other primary care disciplines engaged in the delivery of primary care.

Quality and availability of primary care information

This thesis has shown the potential and feasibility of collecting primary care information across Europe. By using existing data, we were able to take advantage of the investments made to date by statistical agencies, international organizations, researchers, and primary care professionals in collecting primary care information. This was a major advantage of our study design. There is a strong heterogeneity of data sources and data on primary care in the various countries. In some countries high quality data for the indicators are more easily available, while in others the quality and availability of data is very low. On average, 12% of all data was based on official (inter)national statistics, 17% on governmental publications, 15% on scientific reports or articles, 11% on internet documents or websites, 4% on published books, and 41% on expert estimations, opinions or experiences. The reliance on expert consultations may have limited the reliability of some results, but allowed us to complete the 'primary care map' for each country as much as possible. The general principle for data collection was to aim for the best available data. This approach is justified as long as the origin of the data is recorded with the data, which was done in the web based data entry tool.

Although we managed to complete a rather comprehensive primary care data set for all included countries, inevitably, not all countries were able to provide data for each indicator. Countries vary much more on data availability on process indicators, than structure indicators. Most countries had alarmingly little data available on primary care outcome

indicators such as quality and efficiency of care. When scoring the data for all countries on the primary care strength, missing data was estimated based on sophisticated statistics. This is a very pragmatic solution, but does reduce the validity of some of the data for certain countries.
Furthermore, we identified a number of indicators that are very sensitive to variation of definitions of the data. For example, the comparability of the data on primary care expenditures is very limited. Primary care expenditure varies a great deal between countries –partly– as a result of what services are included in primary care expenditure. Thus costs for community nursing, mental health care, dentistry, emergency care or medicines may also be included in primary care costs for some countries. Though several organisations are currently working on improving the comparability of health care expenditure data (e.g. OECD) it currently still is a challenge to collect comparable expenditure data in the field of primary care.

Scoring primary care information
The calculation of aggregated scores by primary care dimension for each country facilitated our analyses. See Appendix I for the scoring system of the indicators. The scoring of qualitative indicators was based on the findings of the systematic literature review on primary care. For example, if a country indicated having a pro-primary care policy in place, or reimbursing primary care providers by a mixture of fee-for-service, capitation and performance indicators, the country scored a "3" on the respective indicators, meaning a strong primary care feature (or high primary care orientation). The scoring of quantitative indicators was based on the literature review to determine the direction of scoring (what is high-medium-low primary care orientation), and the distribution of data on the respective indicator among all 31 countries. The limits of high (3)-medium (2)-low (1) scores were determined by the 33% and 67% percentiles of valid country results. This way the data shows the relative levels of the strength of primary care across Europe. However, the limits of what is a medium primary care feature (2), and a strong primary care feature (3) can be contested, due to a lack of evidence, where to set the boundaries.

Results by county
This thesis covered 31 countries (27 EU member states, Switzerland, Norway, Iceland, and Turkey). From a policy, practice and scientific point of view this is very comprehensive study providing many opportunities to compare and explore commonalities and difference across countries. But, from a pure methodological point of view 31 countries is still somewhat limited. It would be desirable to add more developed (e.g. OECD) countries, to allow for more sophisticated statistical analyses. However, the more countries that are added to the

mix, the more diverse their historical, political and cultural backgrounds will be, which will limit the comparability of countries. In addition, data collection in more than 31 countries would require substantial (human and financial) investments and a cunning data collection strategy.

This is the first time, we are able to provide up to date insight information on the full scope of primary care across Europe. For various reasons thinkable, the results for some countries may not seem obvious. The availability and quality of information, and the scoring system influenced the results. It may also be the case that countries have strong primary care on paper, but in practice may need time to implement this or catch up, and vice versa. These are complications and dynamics within a system that are difficult to measure. In addition, the geographical boundaries of countries might be becoming less important considering the increasing decentralisation of governmental systems of countries (e.g. Italy, Spain, and the United Kingdom), creating autonomous regions or counties. It is possible there is more variation in the structure and process of primary care than this study was able to capture, by using the country level as unit of analysis instead of for example regions.

Evidence base for strengthening primary care

This thesis has showed the positive effect of strong primary care to the performance of health care systems in Europe at macro level. This is the first international comparative study able to show this for the European setting. Naturally some limitation can be identified to our applied approach. For example, the strength of primary care was measured at one moment in time, and based on sources with varying levels of reliability across the 31 countries, and some analyses could only be performed for less than 31 countries. It should also be noted that due to the limited number of countries included in the analysis, we were not able to include the impact of potentially important context factors (e.g. culture, politics, health care system type) on the dependent variables. These limitations should all be considered, when reviewing the results of this thesis.

Implications for health policy

Given the macro (health care system) level character of this thesis, the implications for primary care practitioners are limited, and instead more relevant for policy makers.

Evaluating and benchmarking country results

This thesis strengthens the evidence-base for policymakers to prioritise primary care strengthening on the health policy agenda, for funding agencies to invest in primary care research, for researchers to further improve our understanding of the functioning of primary care at meso and micro level, and for primary care professionals for the importance of their

work for improving (socio-economic inequality) in health and reducing (expensive) avoidable hospitalizations.

If countries aim to improve the strength of primary care, there are a number of common issues that would need to be addressed across Europe. For example, it is worrisome that there is not always a clear governmental vision on the future direction of primary care, particularly because many countries have decentralised important primary care functions. Although decentralisation can increase the responsiveness of primary care at regional or local level, there is a risk of interregional inequities in access, financing, quality of care and ultimately health.

Countries could learn from the effectiveness of various remuneration (e.g. pay-for-performance) systems. There is also an urgent need for countries to take appropriate measures to tackle the threatening future workforce shortages. These could include a regular system of workforce capacity planning, raising the (financial) attractiveness of the primary care professions and increasing possibilities for task substitution. Perhaps the highest gains in access can be made by reducing the level of primary care co-payments to increase to affordability for patients. Countries should make a clear choice between demand regulation via well-accessible (gatekeeping) general practitioners or via co-payments. Cooperation and coordination between primary and secondary care might benefit from the creation of multidisciplinary professional education, teamwork, and multidisciplinary practices.

The country specific results (which will be published in a book in 2012/13)[15] provide for each country a comprehensive description of the structure, organisation and outcomes of primary care in their country, also in comparison with others. This could be a suitable starting point for policymakers, primary care providers in each of the countries (and researchers) to further zoom in on certain (strong or weak) aspects to explore the causes and contemplate the need for improvement actions.

Monitoring primary care

Policy makers would be better capable of monitoring the impact of their policies on primary care, and evaluate the development of aspects of primary care if they would apply a primary care monitoring instrument on a regular basis (e.g. every 2-4 years). The Primary Care Monitoring Instrument provides a sound tool for monitoring and benchmarking the strength in primary care, and to evaluate primary care in the context of their policy aims. However, in it its current form the PC Monitor is very comprehensive. Depending on the monitoring goals, it would be thinkable to measure the development of only one or more primary care dimensions on set time-intervals (resulting in knowledge of trends in primary care), and perform a complete primary care evaluation exercise at less frequent, but regular time intervals. Europe-wide application of the PC Monitor has shown to result in up-to-date

information on the structure and process (and to a much less degree on outcome) of primary care, variation in primary care systems across Europe and knowledge about primary care oriented policy strategies (e.g. related to accessibility or integration). By creating a basis for routine data collection, the PC Monitor could serve the need of various stakeholder groups for reliable and comparable information. Application of the Monitor will provide European and national decision makers with comprehensive comparisons of primary care policies and models of provision that may enable them to improve the effectiveness of primary care.
The Organisation for Economic Cooperation and Development (OECD) is currently using for the first time a small selection of primary care indicators from the PC Monitor in their Second Wave Health System Characteristics Survey. The data from OECD countries will be collected in the course of the year 2012. The resulting information will be available to the general public in 2013, and might be the first step towards a regular European information basis for primary care (through the OECD Health Data). Such more generic measurement, would form an excellent starting point for countries to benchmarking aspects of primary care, and select features that require a further in depth national analysis, for which the PC Monitor indicators can be used.

Improving the primary care data infrastructure
The availability and quality of primary care data show the potential capacity of a country to evaluate and monitor the state of primary care, identify improvement areas, and be accountable and transparent on system performance. In almost all countries high quality primary care information on comprehensive aspects of the system are lacking. If policymakers and international health care organizations continue to give primary care a vital role in achieving health system outcomes, there is an urgent need to invest more in improving the primary care information infrastructures, both at national and international level. At the moment, information infrastructures differ too much in completeness, quality, and availability, to fully accurately measure the contribution of strong primary care on health care system outcomes.
International organisations that are currently investing in health system overviews should also focus more on including essential information on primary care in these descriptions. The results of this thesis provide justification, to invest more in collecting comparable information on the essential features of primary care. For example, the current Health System in Transition publications of the European Observatory on Health Systems and Policies and their future Living HiT Tool (currently in development) could be expanded by up to date and comparable information on all dimensions or primary care (e.g. abstracted from (inter)national databases).

Strengthening primary care

The fact that this thesis has shown a positive association between strong primary care and health system performance with regard to avoidable hospitalizations, and (disparity in) health provides policymakers across Europe an important piece of the needed evidence to advocate further strengthening of primary care, while taking into account the limitations of the analysis. However, they will not be able to use the argument that primary care reduces health care expenditures. This may still be the case, but this thesis was not able to proof this (in fact, it showed higher total health care expenditures in countries with strong primary care). It can be argued that when strong primary care reduces avoidable hospitalisation rates, this is a clear cost saving. In addition, it may also be plausible that the implied cost increasing effect of primary care may be more related to the national health policy agenda of countries (boosting health care expenditures), then to the performance of primary care. But this requires further investigation.

If policymakers aim to improve primary care in their country, there are a number of country specific aspects to be addressed, but also some common issues that need to be addressed across Europe (see "implications for primary care").

Our efficiency analysis has shown that policymakers can identify areas to improve the efficiency of primary care by using the results of our Data Envelopment Analysis, and comparing their country with suitable benchmarks. Overall, the results suggest, to improve primary care efficiency, it is particularly important to focus on strengthening access and coordination of care, and economic resources available for primary care. However, it is not necessarily the case, that when policymakers strengthen all aspects of primary care, this will also increase efficiency of the system. The integration of primary care dimensions within the health care system as a whole should be well considered when attempting to strengthen primary care, or increase efficiency.

This thesis has shown that countries differ in their primary care strength due to differences in wealth, political composition of their government, prevailing values, and type of health care system. The fact that an increasing number of countries in Europe are governed by liberal governments, forms a potential threat to the development of strong primary care. Only when primary care is part of the political agenda of the government, facilitated by a culture believing in the added value of features of strong primary care (e.g. having a gatekeeping system), and when governments are willing to spend a sizeable part of their national income on primary care, primary care has a chance to be strengthened at system level in country. The results imply that strengthening primary care is in the end a political decision which can only be taken if it is in line with prevailing values in a country.

Recommendations for future research

Policy development

It is important that future research pays attention to shaping effective health policy agenda's that address important primary care issues. An example at primary care structure level, is the prospect of alarming future shortages in primary care professionals. Future research is particularly recommended on primary care workforce development , for example focussed on developing strategies to increase the attractiveness of primary care professions, increase the quality of professional life, and research to further develop and implement manpower planning strategies in primary care.

Primary care in its full scope

Since primary care is provided not only by general practitioners but also by, for example, gynaecologists, paediatricians and ophthalmologists, specialists of internal medicine, ENT specialists, primary care nurses, dentists, and midwives, these disciplines should be fully represented by any primary care measurement instrument at system level. Therefore, further research is needed to develop measures to incorporate a broader view in primary care in measurement instruments.

Outcome measures

Very few outcome measure are currently available for primary care. It is highly recommended that future research is dedicated to further develop outcome measure reflecting for example the quality and efficiency of primary care, equity in health, costs of care, and the quality of professional life of primary care providers, to develop strategies to improve outcomes through primary care.

More specifically, given the positive impact that primary care seems to have on self assessed health, it is recommended that future research is dedicated to improve the measurement of equity in health and its association with primary care arrangements. The systematic literature review showed that indicators on the equity dimension were relatively scarce and not very suitable to be used in the PC Monitor because they were not or just partially amenable to primary care (for example, equality in mortality from infectious diseases). With indicators on disparities in health the major difficulty was that they were influenced by various other factors than disparities in (primary) health care access and use; also social conditions in which people live and work played a role. As a consequence, equity in health was not included in a monitor dealing with primary care.

Prioritising aspects of primary care

The process of primary care is shaped by access to primary care services, the provided scope of services (comprehensiveness), continuity, and coordination of care. A hierarchy of importance could be argued at process level. It is reasonable to assume that the primary care process starts with patients having access to the primary care system. Once a patient has the opportunity to enter the primary care process, it is important that the patient receives appropriate care (quality of care dimension). This is a question of which services are offered to patients. Consequently, the care offered to patients should be delivered in a coordinated manner, on a continuous basis. These two dimensions of coordination and continuity of care are to a great extent interrelated. This hierarchy of process dimensions can facilitate future measurement studies of primary care process, organization or performance, for example by assigning weights to dimensions. It is recommended that future studies investigate the suitability and the consequences of prioritising certain aspects of primary care. This may also help policy makers to prioritise primary care areas to focus policy on.

Efficiency (and cost) analysis

Given the rising health care costs, and shortages of primary care professionals, efficiency research could advance strategies for policymakers to optimise the benefits of primary care given the available resources. This thesis made a first attempt by applying a traditional economic method in adapted version for health services research purposes. Further research can advance the application of Data Envelopment Analysis in primary care. Given to positive effect that strong primary care has on avoidable hospitalisations, it may be worthwhile investigating the effect on potential cost savings this may have. Our results could not show that strong primary care actually results in reduced health care expenditures. It is recommends that future research is dedicated to further investigate this, given the need to find strategies to reduces costs increased in health care.

Unit of analysis

Various analyses in this thesis, sometimes covered less than 31 countries due to a lack of data availability. It is recommended that future studies perform similar analysis with an improved methodology, including adding more developed countries to the analysis to increase the statistical power. Caution is however warranted for the comparability of the countries: the more countries are added to the mix, the more diverse they will be (e.g. historically, politically etc.). Furthermore, given the increasing decentralisation of governmental systems of countries, it is recommended that future primary care research is careful in approaching a country at central level, without considering within-country variations. It may be much more suitable to use autonomous regions as unit of analysis

instead of the country level. An additional benefit will be that this increases the statistical power of analyses.

The influence of primary care context factors

It is recommended that future studies that have data on a sufficient number of countries, should investigate the impact of potentially important context factors (e.g. culture, politics, health care system type) on health care system outcomes, when investigating the association with primary care. This thesis should be used as a starting point for more in-depth studies on each of the complex outcome areas (equity in health, health care expenditures, patient perceived quality of care, avoidable hospitalisations), preferably by also using micro level data.

Combing the macro, meso and micro levels of primary care

We studied the strength of primary care, its relationship with context factors, and health care system outcomes at macro level. To take this work forward it is recommended to investigate how the macro level features of primary care that we identified and measured, are related to the organisation and functioning of primary care at meso level (e.g. behaviour of primary care professionals), and affect the experiences of patients at micro level. This is currently done by the EU-funded QUALICOPC (Quality and Costs in Primary Care) project which aims to evaluate primary care in Europe against criteria of quality, equity and costs, by using a three level approach of data collection: the system, practice and patient. "The organisation of primary care at general practice level and national structures for primary care will be related to overall health care system goals, to indicators of the process quality of primary care service provision, and to indicators of the quality of primary care as perceived by the users of services."[16] The strength of primary care is determined based on the conceptualisation (and part of the collected data) resulting from this thesis.

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Summary

Strengthening the primary care level of health care systems has increasingly been considered to be of great importance to dealing with specific health care system challenges (e.g. rising costs, multimorbidity) and improving the overall performance of a health care system, despite the absence of a sound scientific evidence-base for this. This thesis aimed to get insight into the elements that form (the strength of) primary care in Europe, their determinants and their impact on health care system outcomes.

The first steps in the conceptualisation of primary care as used in this thesis were made with the development and pilot testing of a survey based tool (the WHO Primary Care Evaluation Tool) to evaluate the structure and organisation of primary care in countries of the WHO's European region. It was funded by the World Health Organisation's Regional Office for Europe. The tool focuses on health care system features as well as primary care service delivery and experiences of patients. It consists of a questionnaire and checklist to gather information at the national level; a questionnaire for general practitioners; and a questionnaire for patients visiting general practices. The pilot testing of the (translated) tool was carried out in two areas in Russia (Stupino and Shatura) and Turkey (Bolu and Eskişehir) in 2007/8. The project was primarily used in this thesis to get familiar with the complexities of primary care evaluation. The core of this thesis is based on the European Primary Care Monitor project which was concerned the development and implementation of a European Primary Care Monitor using a different methodological approach. It concerned the identification of the key dimensions of primary care in the European setting, the development of indicators to measure the dimensions, data collection in 31 European countries, and the development and application of a scoring system to measure to degree in which countries have strong or weak dimensions of primary care. This project was co-funded by the European Commission, DG Health and Consumers (DG SANCO), NIVEL and its partner institutes, in the period 2007/11.

This chapter summarizes the results for the three research questions that were central to this thesis.

Research question 1: How can (the strength of) primary care be measured and compared in Europe?

Primary care can be defined and approached as a multidimensional concept. The strength of primary care is determined by ten core dimensions at the structure, process (services delivery), and outcome level of primary care. The strength of primary care is determined by the degree in which each of these dimensions are developed in a health care system.

The structure of primary care consists of three dimensions:
1. primary care governance;
2. economic conditions of primary care; and
3. primary care workforce development.

The primary care process is determined by four dimensions:
4. access to primary care;
5. continuity of primary care;
6. coordination of primary care; and
7. comprehensiveness of primary care.

The outcome of primary care includes at least three dimensions:
8. quality of primary care;
9. efficiency of primary care; and
10. equity in health.

To measure and compare the identified dimensions of primary care across countries, indicators are needed that are relevant (covering an essential aspect of a dimension), precise (precise formulation assuring easy-to-fill data), flexible (likely to fit in various European health care systems) and with discriminating power (yielding a range and variety of possible answers). Based on the systematic literature review and expert consultations we developed indicators to measure the identified primary care dimensions. Each of the dimensions are complex concepts on their own, which can only be measured by a group of indicators each representing an essential aspect of the respective dimension. Although we were able to identify indicators for nine out of ten dimensions, it became clear that with the current state of knowledge, it is not possible yet to develop health equity indicators that are valid, feasible and measurable, and subject to primary care. As a result we developed the Primary Care Monitoring Instrument measuring the strength of 9 primary care dimensions with in total 99 (qualitative and quantitative) indicators. By applying all indicators in 31 countries it became clear that the theoretical notion of 'primary care strength' cannot be captured by one (summary) measure or score. The results indicated that countries act differently in their primary care orientation at structure level, compared to their primary care orientation at process level. We have shown that countries tend to have a consistent (high, medium or low) primary care orientation (or focus) on all 3 structure dimensions (governance, economic conditions and workforce development). Therefore, it is possible to summarize the strength of primary care at structure level by one score for each country. But when looking at how countries organise their primary care services delivery process, a much more heterogeneous (and less obvious) picture is identified. There is no correlation between the access, continuity, coordination, and comprehensiveness of primary care of countries. We did find that countries with a high accessibility and coordination of primary care, generally also have a

strong primary care structure; and countries with a high coordination of primary care generally also have a strong primary care governance and workforce development in place. The lack of correlation among process dimensions implies that the strength of primary care at process level can only by measured, by analysing each of the 4 process dimensions separately.

Research question 2(a-b): To what extent do countries differ in the strength of primary care, and how can we explain this?

A distinction can be made between countries with strong, medium, and weak primary care (structure and process). This distinction was based on variation in the data on each of the primary care dimensions, and the scientific evidence base for what is considered to be a strong, medium or weaker feature of primary care. For each of dimension, we were able to show variation between countries on their primary care orientation. For example, countries with a relatively strong primary care structure, considering all 3 dimensions (governance, economic conditions, and workforce development) are Denmark, Finland, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain, and the United Kingdom. We also studied the relationship between the three structure dimensions of primary care and the 4 dimensions of primary care processes delivered; and the relationship between the 4 process dimensions of primary care services delivery and quality of care, by performing a technical efficiency analysis including a selection of countries (22). When comparing the strength of countries' primary care with their relatively efficiency, we saw that some of the countries with relatively strong primary care are not among the most efficient systems, in relative terms; few countries with relatively strong primary care were also relatively efficient (Netherlands, Portugal, Finland, Lithuania, Estonia); the same is true for countries with relatively weak primary care (i.e. Luxembourg, Bulgaria, Hungary) which turned out to be relatively efficient throughout their primary care system. This may suggest that maximizing the individual functions of primary care without taking into account the coherence within the system is not sufficient from a policymakers' point of view when aiming to achieve both efficiency and strong primary care.

In almost all countries high quality primary care information on comprehensive aspects of the system are lacking. There is an urgent need for policymakers and international health care organizations to invest more in improving the primary care information infrastructures, both at national and international level.

We examined why countries differ in the strength of primary care. We found that the primary care orientation (or focus) of a country is determined by various contextual factors that influence the policy priorities of a country. The results show that wealthier countries have a weaker primary care structure and lower primary care accessibility compared to less

wealthy countries. Transitional countries in Eastern Europe have used their growth in national income to strengthen the accessibility and continuity of primary care. Countries that have been governed by a predominantly left-wing government over the past years have a stronger primary care structure, accessibility and coordination of primary care. We also found that countries with a social-security based system have a lower accessibility and continuity of primary care than NHS systems. This could be the result of a lack of gatekeeping system, and use of co-payments to control health care use in most SHI systems. The opposite is true for transitional systems. This is likely the result of a difference in history, coming from a highly centralized system influenced by communism, with a strong focus on specialists and hospital care, and primary care provided by gynaecologists, paediatricians and therapists with a low professional status. Finally, we found that cultural values affect all aspects of primary care. We operationalised countries' value systems by looking at the desired government (as opposed to individual) responsibility to distribute welfare, preference of family members caring for each other over professional health care utilisation, and the perceived impact of science and technology on health. When combining the results for all three values, we see that these values affect both primary care structure, and all aspects of primary care services delivery.

Research question 3: Do countries with a relatively strong primary care have better health care system outcomes compared to countries with relatively weak primary care?

We found that strong primary care is indeed (as hypothesized) conducive to reaching important health care system goals. The structure of primary care, access, coordination and comprehensiveness of primary care are all critical aspects of primary care that reduces unnecessary hospitalizations for conditions that can also be treated in primary care. We also found that population health is better in countries with relatively stronger primary care compared to countries with relatively weaker primary care: people suffering from primary care sensitive conditions (e.g. ischaemic heart disease, cerebrovascular disease, and asthma, bronchitis and emphysema) loose less years of their total life expectancy due to these conditions when they are treated in health care systems with a strong primary care structure, good coordination of primary care, and comprehensive services delivery. Only for people with diabetes, such an association was not evident, which we cannot explain. We also found that countries relatively strong primary care have lower socio-economic inequalities in self-assessed health. This could not be shown for asthma or diabetes. We cannot explain why this relationship was not found for asthma or diabetes. We hypothesised that patient-reported quality of primary care is lower in countries with relatively strong primary care compared to countries with relatively weak primary care. This was not confirmed, as primary care strength was not associated with patient ratings of the quality of primary care. Contrary to

other studies, we found that countries with a stronger primary care structure have both higher total health care expenditures, and a higher growth. This may be explained by the fact that Western European countries with strong primary care (e.g. the United Kingdom, the Netherlands) were spending relatively little on health care in the eighties and nineties, and purposely increased health care expenditures in later years, e.g. to reduce waiting lists. As a result, the implied cost increasing effect of primary care may be more related to the national health policy agenda of countries, then to the performance of primary care. During financially flourishing years, all aspects of society will grow financially including health care, regardless the strength of primary care, whereas in (current) times of recession, this will shrink again based on budget cuts.

The country specific results of this thesis (which will be published in a book in 2012/13) provide for each country a comprehensive description of the structure, organisation and outcomes of primary care in their country, also in comparison with others. This could be a suitable starting point for policymakers, primary care providers and researchers in each of the countries to identify and further zoom in on certain (strong or weak) aspects of primary care to explore the causes and contemplate the need for improvement actions.
The results of this thesis strengthens the evidence-base for policymakers to prioritise primary care strengthening on the health policy agenda and invest in improving the quality and completeness of primary care information infrastructures, for funding agencies to invest in primary care research, for researchers to further improve our understanding of the functioning of primary care at both macro, meso and micro level, and for primary care professionals for the importance of their work for improving population health, reducing socio-economic inequality in self-assessed health and reducing (expensive) avoidable hospitalizations.

Samenvatting

Het versterken van de positie en organisatie van de eerste lijn in de gezondheidszorg is in toenemende mate onderwerp van discussie en van beleidsagenda's zowel internationaal als nationaal in diverse landen wereldwijd. Ondanks dat er nog onvoldoende wetenschappelijk bewijs is voor de meerwaarde van een sterke eerste lijn voor de prestatie van de gezondheidszorg, wordt er veelal vanuit gegaan (door beleidsmakers en onderzoekers) dat een sterke eerste lijn leidt tot bevordering van de gezondheid, verminderde sociaal-economische ongelijkheden in gezondheid, kostenbesparingen en verbeterde kwaliteit van zorg. Het doel van dit proefschrift was om onderzoek te doen naar de sterkte van de eerste lijn in 31 Europese landen, om te verklaren waarom landen verschillen in de structuur en organisatie van de eerste lijn, en het belang van de eerstelijnsgezondheidszorg voor uitkomsten van de gezondheidszorg te onderzoeken.

De eerste stappen van dit proefschrift waren gezet met de uitvoering van een door de Wereld Gezondheidsorganisatie ('WHO' in het Engels) gefinancierd project, genaamd de 'Primary Care Evaluation Tool'. Doel van dit project was om drie vragenlijsten te ontwikkelen en testen voor beleidsmakers, huisartsen en patiënten, die samen inzicht kunnen geven in het functioneren van de eerste lijn in een land. De ontwikkeling en het testen van deze vragenlijsten in twee regio's in Rusland en Turkije in 2007/8 hebben bijgedragen aan het conceptualiseren van de eerstelijnsgezondheidszorg voor dit proefschrift en waren een belangrijke ervaring met de complexiteit van het doen van internationaal vergelijkend onderzoek naar de eerste lijn. Het leeuwendeel van dit proefschrift is echter gebaseerd op de 'European Primary Care Monitor' project; een internationaal vergelijkend onderzoek dat als doelstelling had om de sterkte van de eerste lijn in 31 Europese landen in kaart te brengen, waarbij we een andere aanpak volgden dan in het eerder genoemde WHO project. Het project was medegefinancierd door de Europese Commissie, Directoraat-generaal Gezondheid en Consumenten (DG SANCO), NIVEL en samenwerkingspartners van het NIVEL gedurende 2007/11.

Dit hoofdstuk biedt u een samenvatting van de resultaten voor de drie onderzoeksvragen die centraal stonden in dit proefschrift.

Onderzoeksvraag 1: Hoe kan de (sterkte van de) eerste lijn op een vergelijkbare wijze gemeten worden in Europa?

De eerstelijnsgezondheidszorg is in dit proefschrift gedefinieerd en benaderd als een multi-dimensionaal concept. De sterkte van de eerste lijn in een land wordt bepaald door de mate van aanwezigheid van tien dimensies (ook wel 'functies' genoemd) op structuur, (zorg-verlenings) proces, en uitkomst niveau van de eerste lijn. De structuur van de eerste lijn wordt bepaald door de volgende drie dimensies:

1. Sturing van de eerste lijn;
2. Economische randvoorwaarden van de eerste lijn;
3. Professionele ontwikkeling van de eerstelijns beroepsgroepen.

Het (zorgverlening)proces van de eerste lijn wordt bepaald door de volgende vier dimensies:

4. Toegankelijkheid van de eerste lijn;
5. Continuïteit van de zorg;
6. Coördinatie van de zorg;
7. Breedte van het eerstelijns zorgaanbod.

De uitkomsten van de eerste lijn worden bepaald door de volgende drie dimensies:

8. Kwaliteit van zorg;
9. Efficiëntie van de eerste lijn;
10. Sociaaleconomische ongelijkheid in gezondheid.

Deze dimensies kunnen op vergelijkbare wijze gemeten worden door gebruik te maken van indicatoren die relevant (een belangrijk aspect van een dimensie meten), accuraat (een nauwkeurige formulering), en flexibel (van toepassing in diverse gezondheidszorgsystemen) zijn, en een onderscheidend vermogen (variatie kunnen meten) hebben. Op basis van een systematisch literatuuronderzoek en expert consultaties is een indicatorenset ontwikkeld voor het meten van de eerstelijns dimensies. Elke dimensie is op zichzelf een complex concept en wordt daardoor door een beperkt aantal indicatoren - die allen deelaspecten van de dimensie meten - in kaart gebracht. Hoewel we in staat waren om voor de eerste negen dimensies passende indicatoren te ontwikkelen, hebben we moeten concluderen dat het met de huidige stand van de wetenschap nog niet mogelijk om betrouwbare en valide indicatoren te ontwikkelen die sociaaleconomische ongelijkheden door toedoen van de eerstelijnsgezondheidszorg kunnen meten. Het ontwikkelde Primary Care Monitoring Instrument denkt daarom 9 dimensies van de eerste lijn met behulp van 99 (kwalitatieve en kwantitatieve) indicatoren. Op basis van de dataverzameling in 31 landen en de bijbehorende analyses werd het duidelijk het niet juist is om de sterkte van de eerste lijn als geheel uit te drukken in één (samenvattende) maat of score. De resultaten toonden aan dat landen verschillende mate hun gezondheidszorgsysteem richten op de eerste lijn wat betreft de structuurdimensies ten opzichte van de (zorgverlening)procesdimensies. We hebben aangetoond dat landen een consistent zwakke, milde of sterke nadruk leggen op alle drie de

dimensies van de structuur van de eerstelijnsgezondheidszorg (sturing; economische randvoorwaarden; professionele ontwikkeling van de eerstelijns beroepsgroepen). Het is daarom mogelijk om de sterkte van de structuur van de eerste lijn uit te drukken in één (samenvattende) score voor elk land. Dit is echter niet mogelijk voor de wijze waarop landen hun eerstelijnszorg processen inrichten. De meeste landen in Europa verschillen in de nadruk die zij leggen op de eerste lijn voor elk van de (zorgverlening)procesdimensies. Zo kan een land een toegankelijke eerste lijn hebben, en geen/weinig zorgprocessen vanuit de eerste lijn coördineren, en een matig eerstelijnszorg aanbod leveren. Door dit diffuse beeld, is er geen tot weinig samenhang tussen de (zorgverlening)procesdimensies van de eerste lijn. Wel is het zo dat landen met een toegankelijke eerste lijn en een sterke mate van coördinatie van zorg, meestal ook een sterke eerstelijns structuur hebben; en landen met een sterke coördinatie van zorg meestal ook een sterke sturing en goede professionele ontwikkeling van de eerstelijns beroepsgroepen hebben. Door het gebrek aan samenhang tussen de (zorgverlening)procesdimensies moeten we concluderen dat de sterkte van de zorgverlening van de eerste lijn alleen gemeten kan worden door elk van de procesdimensies afzonderlijk in kaart te brengen.

Onderzoeksvraag 2 (a-b): In welke mate verschillen landen in de sterkte van de eerste lijn en hoe kan dit verklaard worden?

We kunnen onderscheid maken tussen landen met een sterke, milde en zwakke eerste lijn(s structuur en zorgverleningsproces). Dit onderscheid is gebaseerd op de aangetoonde variatie tussen landen op elk van de gemeten eerstelijns dimensies, en wetenschappelijke onderbouwingen voor elementen van sterke, milde en zwakke kenmerken van de eerste lijn. We hebben voor elke dimensie verschillen en overeenkomsten tussen landen aangetoond. Bijvoorbeeld, landen met een sterke eerstelijns structuur (de drie structuurdimensies acht nemend) zijn: Denemarken, Finland, Italië, Nederland, Portugal, Roemenië, Slovenië, Spanje en het Verenigd Koninkrijk. We hebben ook gekeken naar de onderlinge verbanden tussen de drie structuurdimensies, de vier (zorgverlening)procesdimensies en de geleverde kwaliteit van zorg in de eerste lijn, door een efficiëntie analyse uit te voeren voor een selectie (22) van de landen. Om precies te zijn, hebben we onderzocht welke combinaties (en intensiteit) van structuurdimensies landen gebruikten, om bepaalde combinaties (en intensiteit) van procesdimensies te realiseren. Ook hebben we gekeken welke combinaties (en intensiteit) van procesdimensies landen gebruikten om bepaalde maten van kwaliteit van zorg te behalen. Wanneer we de resultaten van de sterkte van de eerste lijn van landen vergeleken met hun efficiëntie scores, zagen we dat landen met een sterke eerste lijn niet noodzakelijk ook een relatieve efficiënte organisatie van de eerste lijn hebben. Dit was slechts voor weinig landen het geval, waaronder Nederland, Portugal, Finland, Litouwen en

Estland. Ook zijn er landen met een relatieve zwakke eerste lijn met een relatieve efficiënte organisatie, zoals Luxemburg, Bulgarije en Hongarije. Dit lijkt erop te wijzen dat het vanuit beleidsperspectief niet afdoende is om alleen maximalisatie van de individuele dimensies van de eerste lijn te ambiëren, zonder de onderlinge samenhang en integratie in acht te nemen, wanneer het doel is om een sterke en efficiënte eerste lijn te realiseren of behouden.
In bijna alle landen is er een gebrek aan betrouwbare en valide eerstelijnszorg gegevens die van hoogstaande kwaliteit zijn. Het is dan ook van belang dat beleidsmakers, en gezondheidszorgorganisaties en betrokkenen, zowel nationaal als internationaal meer investeren in het ontwikkelen, opzetten en onderhouden van informatievoorzieningen voor en over de eerste lijn.
We hebben onderzocht waarom landen verschillen in de wijze waarop ze de eerste lijn structuren en organiseren. De resultaten toonden aan dat deze verschillen in ieder geval deels verklaard kunnen worden door context factoren die van invloed zijn op de beleidsprioriteiten in een land. Bijvoorbeeld: rijkere landen in Europa hebben een zwakkere eerstelijns structuur en een minder toegankelijke eerste lijn dan minder welvarende landen. Zo laten de resultaten zien dat Oost-Europese landen met een gezondheidszorgsysteem in transitie de groei in hun nationaal inkomen van de afgelopen jaren onder meer gebruikt hebben ter versterking van de toegankelijkheid en continuïteit van de eerstelijnszorg. Ook zien we dat landen die voor een langere perioden geregeerd zijn door een links georiënteerde regering een sterkere eerstelijns structuur hebben, betere toegankelijkheid en meer coördinatie van zorg bieden, dan landen met die juist voor een langere perioden geregeerd zijn door een rechts georiënteerde regering. Landen met een ziektekosten-verzekering systeem hebben een minder toegankelijke eerste lijn die in mindere mate continuïteit van zorg levert, dan nationale gezondheidszorgsystemen. Dit zou verklaard kunnen worden door de afwezigheid van een poortwachtersysteem, en het gebruik van eigen bijdragen in de eerste lijn om de zorgkosten te beheersen in de meeste landen met een ziektekostenverzekering systeem. Het tegenovergestelde was het geval in Oost-Europese landen met een gezondheidszorgsysteem in transitie: hoge mate van toegankelijkheid en continuïteit van zorg in de eerste lijn. Dit verschil kan verklaard worden door de historie van deze landen, met wortels in een sterk gecentraliseerd communistisch systeem, met een sterke focus op medisch specialistische en ziekenhuiszorg; waarbij de eerstelijnszorg door gynaecologen, kinderartsen en therapeuten geleverd werd; beroepen met een laag aanzien.
We hebben de invloed van de cultuur van een land op het eerstelijns gezondheidszorgbeleid onderzocht door te kijken naar de gewenste mate van overheidsbemoeienis met de zorg; voorkeuren om door familieleden verzorgt te worden ten opzichte van professionele zorg; en het vertrouwen in een positieve bijdrage van wetenschap en technologie aan de gezondheid van mensen. De resultaten toonden aan dat al deze drie culturele waarden van invloed zijn

op de sterkte van de structuur van de eerste lijn in een land, en de vier dimensies van het eerstelijns zorgverleningsproces.

Onderzoeksvraag 3: Hebben landen met een relatief sterkere eerste lijn betere uitkomsten dan landen met een relatief zwakke eerste lijn?

De resultaten toonden aan dat landen met een sterkere eerste lijn beter in staat waren om belangrijke doelstellingen van het gezondheidszorgsysteem te behalen. Alle dimensies van een sterke eerste lijn (sturing; economische randvoorwaarden; professionele ontwikkeling van de eerstelijns beroepsgroepen; toegankelijkheid; continuïteit en coördinatie van de zorg en de breedte van het eerstelijns zorgaanbod) dragen bij aan het verminderen van vermijdbare ziekenhuisopnamen voor aandoeningen die in de eerste lijn behandeld kunnen worden. Ook is de volksgezondheid beter in landen met een relatief sterkere eerste lijn: mensen met een aandoening die in de eerste lijn behandeld zou kunnen worden (bijvoorbeeld ischemische hartziekte, cerebrovasculaire ziekte, astma, bronchitis en longemfyseem) verliezen minder levensjaren van hun totale levensverwachting door deze aandoeningen wanneer zij behandeld zijn in een land met een sterke eerstelijns structuur, goede coördinatie van zorg en een breed eerstelijns zorgaanbod tot hun dienst hebben. Om onduidelijke redenen, kon dit verband voor diabetes niet aangetoond worden. Tevens konden we aantonen dat er minder sociaaleconomische ongelijkheid in ervaren gezondheid is in landen met een relatief sterke eerste lijn. Om onduidelijke redenen kon dit niet aangetoond worden voor diabetes en astma. De sterkte van de eerste lijn had geen relatie met de ervaren kwaliteit van de eerste lijn in een land. In tegenstelling tot eerdere resultaten van andere studies, toonden wij aan dat landen met een sterkere eerstelijns structuur hogere totale gezondheidszorguitgaven hebben, en een sterkere groei in uitgaven. Dit was een verassend resultaat, die mogelijk verklaard kan worden het feit dat Westers Europese landen met een sterke eerste lijn (zoals het Verenigd Koninkrijk en Nederland) in de jaren tachtig en negentig te weinig uitgaven aan de gezondheidszorg, en daarom bewust beleid voerden om de kosten op te voeren (bijvoorbeeld door wachtlijsten weg te werken). Dit kan ertoe geleid hebben dat het kostenstijgende effect van een sterke eerste lijn dat wij gemeten hebben, eerder het resultaat is van de nationale beleidsagenda's van deze landen, dan van de prestatie van de eerste lijn. Wanneer de economie van een land bloeit, dan heeft dit financieel stijgende effecten op alle sectoren in een land inclusief de gezondheidszorg, ongeacht de sterkte van de eerste lijn; terwijl in tijden van economische recessie alle sectoren in een land financieel zullen inkrimpen.

De resultaten voor elk van de 31 landen (die in een boek gepubliceerd zullen worden in de loop van 2012/13) bieden een uitgebreide beschrijving van de structuur, organisatie en uitkomsten van de eerste lijn per land, en tevens vergelijkingen tussen de landen. Dit kan een handzaam startpunt voor beleidsmakers, managers, zorgverleners en onderzoekers in de landen zijn om sterke en minder sterke aspecten van de eerste lijn te identificeren, verklaren en verder exploreren en de noodzaak tot verbeteracties te overwegen.
De bevindingen in dit proefschrift versterken de wetenschappelijke onderbouwing voor beleidsmakers om het versterken van de eerste lijn tot beleidsprioriteit te maken en om te investeren in de kwaliteit en compleetheid van informatievoorzieningen in en over de eerste lijn; voor financieringsprogramma's om te investeren in onderzoek naar de eerste lijn; voor onderzoekers om onderzoek te doen naar het functioneren van de eerste lijn op zowel macro, meso en micro niveau om de inzichten naar de onderlinge relaties te vergroten; en voor eerstelijns zorgverleners ter ondersteuning van het belang van hun werk voor de volksgezindheid, het verkleinen van sociaaleconomische verschillen in ervaren gezondheid, en het verminderen van vermijdbare ziekenhuisopnamen.

Appendix 1

Scoring system of the European Primary Care Monitor indicators

Dimension: Governance of the PC System

PC System Score Features and Indicators

Component	Indicator	Rationale	Scoring
Primary care goals (GOV1)	**Have policy documents (by government or important stakeholders) been issued that reflect a clear vision on current and future PC (e.g. for the next 5 years)?** [Yes/No] (GOV1.1)	PC supportive governmental policies are positively associated with adequate access, continuity and coordination of care, the delivery of a wide range of services (in particular preventive care), and better levels of health [1;2].	1= No policy documents with clear PC vision 3= Yes policy documents with clear PC vision are available
Policy on equality in access (GOV2)	**Is there an explicit governmental policy to regulate the distribution of PC providers and facilities more evenly?** [Yes/No] (GOV2.1)	One of the most consistent policy characteristics in countries with a strong PC system is the government's attempts to distribute resources equitably [1].	1= No policy on distribution of PC providers 2= Limited policy on distribution of PC providers available 3= Yes policy on distribution of PC providers available
(De)centralization of PC management & service development (GOV3)	**Does PC have its own department or unit within the Ministry of Health?** [Yes/No] (GOV3.1)	The creation of a separate PC department within the Ministry of Health improves the role of the government to lead and participate in an effective system of primary care governance (e.g. it gives PC a higher priority within the ministry, can improve relations with other ministries, and provides more systematic, integrated and less fragmented working arrangements) [3].	1= No PC department at MoH 3= Yes PC department at MoH
	Does PC have a budget that can be distinguished from other sectors, such as specialist care? [Yes/No] If yes, please explain at which level this budget is established (e.g. national, regional). (GOV3.1a)		1= No separate PC budget 3= Yes separate PC budget
	Have responsibilities for PC been decentralized to regional or local level? [Yes/No] (GOV3.2)	Decentralization of power with the health care decision making system away from central government to local service delivery creates greater local accountability of services to local populations [4].	1= No decentralised PC responsibilities 3= Yes decentralised PC responsibilities

(De)centralization of PC management & service development (GOV3)- *continued*	**Do organisations of stakeholders contribute to PC policy development? (e.g. health insurers, medical professionals, or representatives of patients or consumers).** [Yes/No] (GOV3.3)	To achieve a broad acceptance of PC reforms, it is important to involve stakeholders into the policy process and its implementation, including NGOs and representatives of patients [3].	1= No stakeholder involvement in PC policy development 2= Yes limited stakeholder involvement in PC policy development 3= Yes stakeholder involvement in PC policy development
	Has community influence on the provision of PC services been organised on a national or regional level? [not applicable, it is not used/ yes, on a national level/ yes in some regions/ yes, incidentally at local level]. (GOV3.4)	Community-governed PC practices are more likely to serve the diverse needs of minority populations compared to government-owned PC practices [5].	1= No community influence on provision of PC services 2= Yes community influence on provision of PC services in some regions or incidentally at local level 3= Yes community influence on provision of PC services on national level or regular at local level
PC Quality Management Infrastructure (GOV4)	**Does state inspection on health care exist?** (GOV4.1a)		1= No state inspection on health care 3= Yes there is state inspection in health care
	If state inspection on health care exists, does it have a specific unit for PC? [Yes/No/Not applicable] (GOV4.1a)	The creation of a separate PC department within the Ministry of Health improves the role of the government to lead and participate in an effective system of primary care governance [3].	1= No PC unit at state inspection 3= Yes PC unit at state inspection
	Do formal requirements exist for physicians (such as GPs/Family doctors) to work in PC? [Yes/No] (GOV4.2)	(Re)accreditation schemes are a key measure for quality improvement of a health care system. They provide systematic incentives for physicians to keep up certain standards of quality and provide assurance to the public of a physician's basic competence to practice [6-8].	1= No PC provider requirements to practice 2= Yes PC provider requirements to practice exist but exceptions are currently in use 3= Yes PC provider requirements to practice exist

Dimension: Governance of the PC System			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
	Do formal requirements exist for PC practices or facilities to operate? [Yes/No] (GOV4.3)	Specification of requirements for licensing of primary care facilities provides assurance to the public of a minimum quality level of primary care facilities [9].	1= No requirements for PC facilities to operate 3= Yes requirements for PC facilities to operate
	Have evidence based clinical guidelines been produced for specific use by GPs? [Yes/No] (GOV4.4)	Developing standards and guidelines to match the needs of general practice is one of the crucial tools in achieving high quality care [10]. Guidelines are more likely to be appropriately applied when they are the product of one's own profession [11].	1= No specific guidelines for GPs 3= Yes specific guidelines for GPs
Patient advocacy (GOV5)	**Have any laws/regulation pertaining to the following patients' rights in PC been implemented?** **1. Informed consent** [Yes/No]; (GOV5.1.1)	Health care legislation is important to protect individuals and communities from harm, and to provide incentives for health care professionals to maintain and/or improve a certain level of service quality [4].	1= No informed consent is not regulated 3= Yes informed consent is regulated
	Have any laws/regulation pertaining to the following patients' rights in PC been implemented? **2. Patient access to own medical files** [Yes/No]; (GOV5.1.2)	Health care legislation is important to protect individuals and communities from harm, and to provide incentives for health care professionals to maintain and/or improve a certain level of service quality [4].	1= No patient access to own medical files is not regulated 3= Yes patient access to own medical files is regulated
	Have any laws/regulation pertaining to the following patients' rights in PC been implemented? **3. Confidential use of medical records** [Yes/No]; (GOV5.1.3)	Health care legislation is important to protect individuals and communities from harm, and to provide incentives for health care professionals to maintain and/or improve a certain level of service quality [4].	1= No confidential use of medical records is not regulated 3= Yes confidential use of medical records is regulated
	Have any laws/regulation pertaining to the following patients' rights in PC been implemented? **4. Availability of a procedure to process patient complaints in PC facilities** [Yes/No] (GOV5.1.4)	Health care legislation is important to protect individuals and communities from harm, and to provide incentives for health care professionals to maintain and/or improve a certain level of service quality [4].	1= No PC complaint procedures is not regulated 3= Yes PC complaint procedures is regulated

Multidisciplinary collaboration (GOV6)	**Has a governmental policy on cooperation or integration of PC services been laid down in a law or policy paper?** [Yes/No/ Not applicable, because no such policy exists] (GOV6.1)	PC supportive governmental policies are positively associated with adequate access, continuity and coordination of care, the delivery of a wide range of services (in particular preventive care), and better levels of health [1;2].	1= No multidisciplinary collaboration policy in place 2= Limited multidisciplinary collaboration policy in place 3=Yes a multidisciplinary collaboration policy is in place

Dimension: Economic conditions of the PC System

PC System Score Features and Indicators

Component	Indicator	Rationale	Scoring
Primary care expenditure (ECO1)	**Total expenditure on PC as % of total expenditure on health** (ECO1.1)	Poor financial investment is one of the impediments to delivery of PC [12].	1= < 9.80% 2= 9.80 - 14.00% 3= 14.00% > *(Percentiles used: 33,3% and 66.67% observations)*
	Total expenditure on prevention and public health as % of total expenditure on health. (ECO1.2)	Poor financial investment is one of the impediments to delivery of PC [12].	1= < 2.10% 2= 2.10 – 3.50% 3= 3.50% > *(Percentiles used: 33,3% and 66.67% observations)*
Primary care coverage (ECO2.)	**% of the population fully covered or insured for PC costs.** (ECO2.1)	One of the most consistent policy characteristics in countries with a strong PC system is universal financial coverage [1].	1= 0 - 50% covered 2= 51 - 74% covered 3= 75 - 100% covered *(Little/no variation)*
	% of the population covered or insured for costs of GP services (office and at home) (ECO2.2) If copayment applies, please explain the volume of copayment (ECO2.2a)	One of the most consistent policy characteristics in countries with a strong PC system is universal financial coverage [1].	1= 0 - 50% covered 2= 51 - 74% covered 3= 75 - 100% covered *(Little/no variation)*
	% of the population covered or insured for medicines prescribed in primary care / GP (ECO2.3) If copayment applies, please explain the volume of copayment (ECO2.3a)	One of the most consistent policy characteristics in countries with a strong PC system is universal financial coverage [1].	1= 0 - 50% covered 2= 51 - 74% covered 3= 75 - 100% covered *(Little/no variation)*

Primary care coverage (ECO2.) - *continued*	**% of the population uninsured for medical expenses (this may be an estimation)** (ECO2.4)	One of the most consistent policy characteristics in countries with a strong PC system is universal financial coverage [1].	1= 50 -100% uninsured 2= 26 - 49% uninsured 3= 0 - 25% uninsured *(Little/no variation)*
	Social health insurance coverage for out-patient medical care by % of population (ECO2.5)	One of the most consistent policy characteristics in countries with a strong PC system is universal financial coverage [1].	1= 0 - 50% covered 2= 51 - 74% covered 3= 75 - 100% covered *(Little/no variation)*
Remuneration system of PC workforce (ECO4.)	**How are salaried GPs paid?** **1. Flat salary; 2. salary related to the number of their patients; 3 Salary related to both the number of their patients and indicators of performance** (ECO4.1)	Flexible blended payment methods based on the combination of a fixed component, through either capitation or salary, and a variable component, through FFS, produces a desirable mix of incentives that can change professional behaviour, improve the quality of care and reduce inequalities in the delivery of clinical care [13-16].	1= Flat salary 2= Salary related to patient list 3= Salary related to patient list and performance indicators
	How are self-employed GPs paid? **1. Fee-for-service payment; 2. Capitation payment; 3. Mix of capitation and fee-for-service payment. 4. Mix of capitation and fee-for-service and other specific components (e.g. bonus for working in disadvantaged areas etc.).** (ECO4.2) If they receive a payment consisting of other components than capitation or fee-for service, please explain to what targets or situations these are related. (ECO4.2a)	Flexible blended payment methods based on the combination of a fixed component, through either capitation or salary, and a variable component, through FFS, produces a desirable mix of incentives that can change professional behaviour, improve the quality of care and reduce inequalities in the delivery of clinical care [13-16].	1= FFS or capitation 2= Mix of capitation and FFS 3= Mix of capitation and FFS and performance indicators
Income of PC workforce (ECO5)	**What is the (estimated) gross annual income (in Euros) of a 'mid-career' GP (about 10 years experience and with an average size of practice)?** (ECO5.1) Does this income include costs for running the practice (premises; equipment; care; employed staff)? (ECO5.1a)	Poor financial investment and discouraging worker salaries are one of the impediments to delivery of PC [12].	1= < 37,430.24 EUR 2= 37,430.24 – 75,789.64 EUR 3= 75,789.64 EUR *(Percentiles used: 33,3% and 66.67% observations)*

Dimension: PC Workforce Development			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
Profile of PC workforce (WFD1)	**To which of the following medical, para-medical and nursing disciplines people have direct access (which means without referral or intervention by another medical provider)?** (WFD1.1) Also indicate with each discipline whether they exclusively work in PC or also provide services on referral (for instance in another setting, such as a hospital) : GP /Family physician; Gynaecologist/obstetrician; Paediatrician; Specialist of Internal medicine; Ophthalmologist; ENT specialist; Cardiologist; Neurologist; Surgeon; Primary care / GP practice nurse; Specialised nurse (eg. on diabetes); Home care nurse; Physiotherapists (ambulatory); Midwife (ambulatory); Occupational therapist; Speech therapist; Dentist.	Having a medical generalist such as a GP, rather than a specialist as a regular source of care has been associated with better health outcomes and lower health care costs [1;17-19]. Greater supply of PC providers as opposed to a greater supply of specialty physicians, are consistently associated with better health outcomes [1;19]. Nursing disciplines and allied health professionals perform services that address health risk behaviours more often than physicians [20].	1= PC providers include various medical specialists 2= PC providers are GPs, OB/GYN and PAED, excluding other medical specialists 3= PC providers are GPs excluding medical specialists
	Average age of practicing GPs (WFD1.2) What is the age distribution among practicing GPs? Please fill in the % of GPs that are: <35 years of age; 35-45 years of age; 45-55 years of age; 55+ years of age (WFD1.2a)	The key to maintaining a sufficient workforce, in the face of the impending retirement of the "baby boom" generation, is to educate, recruit and retain young practitioners while reinvesting in mature workforce [21].	1= Average age of GPs are 55 years > 2= Majority of GPs are 45-55 years 3= Average age ≤ 45 years
	Average number of working hours per week of GPs (including: hours for keeping up to date and for administration; excluding: hours on call (in evening, weekends etc.) (WFD1.3)	When GPs' workload reached too high a level, this causes a shortage of GP care [22].	1= 48.01 hours > 2= 40.00 - 48.01 3= < 40.00 hours *(Percentiles used: 33,3% and 66.67% observations)*
Status & Responsibilities of PC disciplines (WFD2)	**Have tasks/duties of GPs or family doctors been described in a law or policy document?** [Yes/No] (WFD2.1)	Legal reference to the tasks/duties of GPs/FDs gives formal recognition to the profession as a specific discipline and influences the position it takes in a health care system [23].	1= No GP task profile is not formally described 3= Yes GP task profile is formally described

Status & Responsibilities of PC disciplines (WFD2) - *continued*	**How does the gross annual income (in Euros) of a mid-career GP (about 10 yrs experience with average size of practice) relate to the gross annual income of the following medical, para-medical and nursing disciplines of the same age?** (WFD2.2) Please give an estimation whether a GP's income is [Much lower / lower / equal / higher / much higher].: Gynaecologist/obstetrician; Paediatrician; Specialist of Internal medicine; Ophthalmologist; ENT specialist; Cardiologist; Neurologist; Surgeon; Primary care / GP practice nurse; Specialised nurse (eg. on diabetes); Home care nurse; Physiotherapists (ambulatory); Midwife (ambulatory); Occupational therapist; Speech therapist; Dentist.	Poor financial investment and discouraging worker salaries are one of the impediments to delivery of PC [12]. Comparable levels of remuneration within primary care and between primary care and secondary care are supportive for a shared care approach which is necessary for the achievement of coordinated care [24].	1= (Much) lower or compared to the majority of specialists 3= Equal or higher compared to the majority of specialists
	Which % of all medical graduates chooses to enrol in postgraduate training in family medicine? (use the most recent available year, and fill this in) [...%, with reference year:..) (WFD2.3)	Greater supply of PC providers as opposed to a greater supply of specialty physicians, are consistently associated with better health outcomes [1;19].	1= < 10.0% 2= 10.0-25.0% 3= 25.0% > *(Percentiles used: 33,3% and 66.67% observations)*
PC Workforce supply and planning (WFD3)	**Please indicate the % by which the supply (total number) of directly accessible medical, para-medical and nursing disciplines has increased [+....%] or reduced [-....%] over the most recent available 5 year period.** (WFD3.1) Please also indicate the years applied [Years ....-....]. (WFD3.1): GP /Family physician; Gynaecologist/obstetrician; Paediatrician; Specialist of Internal medicine Ophthalmologist; ENT specialist; Cardiologist; Neurologist; Surgeon; Primary care / GP practice nurse; Specialised nurse (eg. on diabetes); Home care nurse; Physiotherapists (ambulatory); Midwife (ambulatory) Occupational therapist; Speech therapist; Dentist.	Greater supply of PC providers as opposed to a greater supply of specialty physicians, are consistently associated with better health outcomes [1;19].	1= On average, the PC professions have reduced in supply or increased <6.12% 2= On average, the PC professions have increased in supply 6.12 – 11.64 % 3= On average, the PC professions have increased in supply 11.64% > *(Percentiles used: 33,3% and 66.67% observations)*
	Total nr. of active GPs as a ratio to total nr. of active specialists (WFD3.2)	Greater supply of PC providers as opposed to a greater supply of specialty physicians, are consistently associated with better health outcomes [1;19].	1= <0.25 2= 0.25-0.50 3= >0.50 *(Percentiles used: 33,3% and 66.67% observations)*
	Are data available from studies on PC workforce capacity needs and development in the future? [Yes/No] (WFD3.3)	Workforce planning is an important prerequisite for having an efficient and effective workforce [25].	1= No workforce data available 3= Yes workforce data available

Academic status of PC (WFD4)	**% of medical universities (or universities with a medical faculty) with a postgraduate programme in family medicine** (WFD4.1)	Few opportunities for professional development is one of the impediments to delivery of primary care [12]. The establishment of family medicine/general practice university departments and postgraduate training reflect the recognition as an academic discipline and as a profession in health care, and contribute to the development of the profession [7;26].	1= <66.43 % 2= 66.43-90.00% 3= 90.00% > *(Percentiles used: 33,3% and 66.67% observations)*
	Is family medicine subject in the undergraduate medical curriculum? [Yes/No] (WFD4.2)	The development of a primary care system starts with setting up a vocational training programme for primary care [26]. The availability of skilled and qualified health care providers is a key quality determinant [25].	1= No not subject in undergraduate medical curriculum 3= Yes subject in undergraduate medical curriculum
	Is there professional training specifically for: district- or community nurses? [Yes/No]; (WFD4.3a)	The availability of skilled and qualified health care providers is a key quality determinant [25].	1= No professional training for district- or community nurses 3= Yes professional training for district- or community nurses
	Is there professional training specifically for PC/GP practice nurses? [Yes/No] (WFD4.3b)	The availability of skilled and qualified health care providers is a key quality determinant [25].	1= No professional training specifically for PC/GP practice nurses 3= Yes professional training specifically for PC/GP practice nurses
Medical associations (WFD5)	**Do national associations or colleges of GPs exist in this country?** [Yes/No] (WFD5.1)	The establishment of organised associations or colleges for primary care providers is important for the development of the profession and the quality of primary care delivery [11;27].	1= No national associations or colleges of GPs exist 3= Yes associations or colleges of GPs exist
	Is a journal on family medicine/general practice being published in this country? [Yes/No] (WFD5.2)	The existence of a peer reviewed journal is an important condition for the successful scientific progress of primary care [27].	1= No journal on family medicine/ general practice is available 3= Yes a journal on family medicine/ general practice is available

Geographic availability of PC services (ACC2) - *continued*	**Do national norms exist on the (regional or national) supply of GPs?** [Yes/No] (ACC2.3a)	The capacity of the primary care workforce for a large part determines the accessibility of care, as it reflects the availability of PC services [32].	1= No national norms on the supply of GPs 3= Yes national norms exist on the supply of GPs
	Do (regional or national) shortages exist of GPs according to usual national norms? [No shortage / Shortage in some regions / Modest shortage nation wide / Severe shortage nation wide (ACC2.3b)	The capacity of the primary care workforce for a large part determines the accessibility of care, as it reflects the availability of PC services [32].	1= Severe or modest shortage nationwide 2= Shortage in some regions 3= No shortage
	Do problems exist in the availability of medicines in rural areas due to lack of pharmacies? [Yes/No] (ACC2.4)	The capacity of the primary care workforce for a large part determines the accessibility of care, as it reflects the availability of PC services [32].	1= Yes problems exist in the availability of medicines in rural areas due to lack of pharmacies 3= No problems exist in the availability of medicines in rural areas due to lack of pharmacies
Accommodation of accessibility (ACC3)	**Are GP practices or PC centres obliged to have a minimum number of opening hours or days?** (ACC3.1)	A minimum number of opening hours or days gives primary care a certain predictability for patients as well as physicians [33].	1= No minimum opening hours 2= Yes limited minimum opening hours (advise but not obligatory) 3= Yes minimum opening hours is obligatory
	Average nr. of home visits per week per GP (ACC3.2)	Efficiency in general practice can be achieved by a decrease in the number of home visits, and by a higher number of telephone contacts [34].	1= < 2,30 home visits per week per GP 2= > 8,73 home visits per week per GP 3= 2,30 – 8,73 home visits per week per GP *(Percentiles used: 33,3% and 66.67% observations)*
	To what extent do *telephone consultations* commonly exist in GP practices or PC centres? [(almost) always present / usually present / occasionally present / seldom or never present] (ACC3.3a)	Timely access to care when it is needed is one of the hallmarks of a high quality primary care system. This can be assured through several organizational arrangements [32;35-39].	1= Telephone consultations are seldom or never present 2= Telephone consultations are occasionally present 3= Telephone consultations are (almost) always or usually present

Accommodation of accessibility (ACC3) - *continued*	**To what extent do *E-mail consultations* commonly exist in GP practices or PC centres?** [(almost) always present / usually present / occasionally present / seldom or never present] (ACC3.3b)	Timely access to care when it is needed is one of the hallmarks of a high quality primary care system. This can be assured through several organizational arrangements [32;35-39].	1= E-mail consultations are seldom or never present 2= E-mail consultations are occasionally present 3= E-mail consultations are (almost) always or usually present
	To what extent do GP practices or PC centres commonly have a *website*? [(almost) always present / usually present / occasionally present / seldom or never present] (ACC3.3c)	Timely access to care when it is needed is one of the hallmarks of a high quality primary care system. This can be assured through several organizational arrangements [32;35-39].	1= PC Practice websites are seldom or never present 2= PC Practice websites are occasionally present 3= PC Practice websites are (almost) always or usually present
	To what extent do GP practices or PC centres commonly *offer special sessions or clinics for certain patient groups (e.g. diabetics, pregnant women, hypertensive patients etc)*? [(almost) always present / usually present / occasionally present / seldom or never present] (ACC3.3d)	Timely access to care when it is needed is one of the hallmarks of a high quality primary care system. This can be assured through several organizational arrangements [32;35-39].	1= Special sessions or clinics are seldom or never offered 2= Special sessions or clinics are occasionally offered 3= Special sessions or clinics are (almost) always or usually offered
	To what extent do GP practices or PC centres commonly use *appointment systems for the majority of the patient contacts*? [(almost) always present / usually present / occasionally present / seldom or never present] (ACC3.3e)	Timely access to care when it is needed is one of the hallmarks of a high quality primary care system. This can be assured through several organizational arrangements [32;35-39].	1= Appointment systems are seldom or never used 2= Appointment systems are occasionally used 3= Appointment systems are (almost) always or usually used

Accommodation of accessibility (ACC3) - *continued*	**To what extent are the following models for the provision of after-hours PC commonly used?** [(almost) always used / usually used / occasionally used / seldom or never used]: **1) Practice-based services: GPs within one practice or organized in a group of practices look after their patients on out-of-hours schedules;** **2) PC cooperatives: GPs in a region from several groups, supported by additional personnel, provide after-hours PC mostly in non-profit, large-scale organizations, which include telephone triage and advice, office for face-to-face contact, and house calls.** **3) Deputizing services (outsourcing): companies employing doctors take over the provision of after-hours care;** **4) Hospital emergency departments provide PC by taking care of health problems after office hours;** **5) After-hours PC centres: These are (walk-in) centres for face-to-face contact with a GP or nurse;** **6) Other out-of-hours PC/GP service schemes in place. (ACC3.4)**	When primary care providers are not accessible for patients at irregular hours, this affects the quality of care appropriate for first-contact health problems. Out-of-hours health care arrangements should therefore be made [32;36;37;40;41].	1= Hospital emergency departments (almost) always or usually provide PC after office hours 2= After hours care is occasionally provided within PC 3= After hours care is (always or usually) provided within PC
Affordability of PC services (ACC4)	**Do patients normally need to pay for *a visit to their GP*?** [no payment / some payment / payment of the full amount] (ACC4.1a)	One of the most consistent policy characteristics in countries with a strong PC system is low or no patient cost sharing for PC services [1].	1= Payment of the full amount for a visit to their GP 2= Some payment for a visit to their GP 3= No payment for a visit to their GP
	Do patients normally need to pay for *medicines or injections prescribed by their GP?* [no payment / some payment / payment of the full amount] (ACC4.1b)	One of the most consistent policy characteristics in countries with a strong PC system is low or no patient cost sharing for PC services [1].	1= Payment of the full Amount for medicines or injections prescribed by their GP 2= Some payment for medicines or injections prescribed by their GP 3= No payment for medicines or injections prescribed by their GP
	Do patients normally need to pay for *a visit to a specialist prescribed by their GP*? [no payment / some payment / payment of the full amount] (ACC4.1c)	One of the most consistent policy characteristics in countries with a strong PC system is low or no patient cost sharing for PC services [1].	1= Payment of the full Amount for a visit to a specialist prescribed by their GP

			2= Some payment for a visit to a specialist prescribed by their GP 3= No payment for a visit to a specialist prescribed by their GP
Affordability of PC services (ACC4) - *continued*	**Do patients normally need to pay for *a visit of their GP at the patient's home*?** [no payment / some payment / payment of the full amount] (ACC4.1d)	One of the most consistent policy characteristics in countries with a strong PC system is low or no patient cost sharing for PC services [1].	1= Payment of the full Amount for a visit of their GP at the patient's home 2= Some payment for a visit of their GP at the patient's home 3= No payment for a visit of their GP at the patient's home
	% of patients that rate GP care as not very or not at all affordable (ACC4.2)	Financial access to PC services is a key feature of a strong PC system [1].	1= 16.0% > of patients that rate GP care as not very or not at all affordable 2= 6.0 – 16.0% of patients that rate GP care as not very or not at all affordable 3= < 6.0% of patients that rate GP care as not very or not at all affordable *(Percentiles used: 33,3% and 66.67% observations)*
Acceptability of PC services (ACC5)	**% Patients that find it easy to reach and gain access to GPs** (ACC5.1)	The acceptability of PC services determines the extent to which the PC service accommodates the patient and the community served, and influences the accessibility of care [42-44].	1= < 82.7% 2= 82.7 – 92.0% 3= 92.0% > *(Percentiles used: 33,3% and 66.67% observations)*

Dimension: Continuity of PC services

PC System Score Features and Indicators

Component	Indicator	Rationale	Scoring
Longitudinal continuity of care (CON1)	**Do GPs have a patient list system?** [Yes/No] (CON1.1)	Having a defined practice population by means of a patient list system gives incentives for primary care providers as well as patients to provide and receive services on a continuous basis. This is beneficial for the provision of primary care services in every aspect [32;45;46].	1= No patient list system 2= Formal, optional list system 3= Yes patient list system
	Average population size per GP (CON1.1a)	Having a defined practice population by means of a patient list system gives incentives for primary care providers as well as patients to provide and receive services on a continuous basis. This is beneficial for the provision of primary care services in every aspect [32;47;48].	1= 1774.37 > patients 2= < 1542.66 patients 3= 1542.66 – 1774.37 patients *(Percentiles used: 33,3% and 66.67% observations)*
	% of patients reporting to visit their usual PC provider for their common health problems (CON1.2)	The existence of an ongoing relationship of a patient with a particular provider rather than with a particular place or no place at all, is beneficial for the quality of care [1;49].	1= < 77.8% 2= 77.8 – 85.0% 3= 85.0% > *(Percentiles used: 33,3% and 66.67% observations)*
Informational continuity of care (CON2)	**% of GPs keeping (or reporting to keep) clinical records for all patient contacts routinely** (CON2.1)	Systematically keeping medical records is an important measure to achieve informational continuity of care and to facilitate personalised care provision. Both are important for the quality of care [1;50-52].	1= < 75% 2= 75 - 85% 3= 85% > *(Little/No variation)*
	To what extent do GPs have a computer at their disposal in their office? [(almost) always / usually / occasionally / seldom or never]. (CON2.2) **For which of the following purposes are GPs usually using a computer in their practice?**: [answer options per category: yes/no] 1.Booking appointments with patients; 2.Writing bills/financial administration; 3. Prescription of medicines; 4. Keeping medical records of patients; 5. Searching expert information on the internet; 6. Communicating patient information to specialists; 7. Communicating prescriptions to pharmacists. (CON2.2a) Are clinical record systems in PC/GP able to generate lists of patients by diagnosis or health risk? (e.g. patients with asthma or diabetes, or smokers) (CON2.2b)	Computerisation of practices is becoming increasingly important in primary care for the practice of evidence-based medicine, learning and knowledge management, and quality improvement processes. Effective use of computerisation applications is beneficial for the efficiency and quality of care [1;53-55].	1= GPs seldom or never (have or) use computers in their office* 2= GPs occasionally use computers in their office for various purposes* 3= GPs almost always or usually use computers in their office for various purposes* **Calculate the average score of all items by applying: 1= 1 OR SELDOM/NEV COMP* *2= 2-4 SCORES YES* *3= 5-7 SCORES YES*

Informational continuity of care (CON2) - *continued*	**To what extent are GPs using referral letters (including relevant information on diagnostics and treatment performed) when they refer to a medical specialist?** [(almost) always / usually / occasionally / seldom or never] (CON2.3)	The delivery of cohesive health care depends on the accessibility and exchange of patient information among those involved in the care of a certain patient. The use of referral letters are a necessity to achieve this [56-59].	1= GPs seldom or never use referral letters 2= GPs occasionally use referral letters 3= GPs almost always or usually use referral letters
	Do PC practices receive information within 24 hours about contacts that patients have with out of hours services? [(almost) always / usually / occasionally / seldom or never]. (CON2.4)	To safeguard the quality of care it is important that the regular provider of care receives feedback on patient results of the visits to other care providers, during or after office hours. Besides the necessity for PC providers to stay up to date on the progress of their patients, patients find it easier to obtain information from their regular source of care compared to a specialist [56;58;60].	1= PC practices receive seldom or never information within 24 hours about contacts that patients have with out of hours services 2= occasionally 3= almost always or usually
	To what extent do specialists communicate back to referring GP after an episode of treatment? [(almost) always / usually / occasionally / seldom or never]. (CON2.5)	To safeguard the quality of care it is important that the regular provider of care receives feedback on patient results of the visits to other care providers, during or after office hours. Besides the necessity for PC providers to stay up to date on the progress of their patients, patients find it easier to obtain information from their regular source of care compared to a specialist [56;58;60].	1= Specialists seldom or never communicate back to referring GP after an episode of treatment 2= occasionally 3= almost always or usually
Relational continuity of care (CON3)	**Are patients free to choose the PC centre and GP they want to register with?** [Yes, patients can freely choose any centre or GP / Patients are free to choose a centre, but they are assigned to a GP in that centre / Patients are assigned to a centre in their area, but they are free to register with any GP in that centre / No, patients are assigned to a PC centre in their area, and they are assigned to a GP in that centre]. (CON3.1)	A freely chosen PC provider provides better assurance of a good relationship than does assigning a practitioner. The evidence is strong regarding the benefits of an ongoing relationship with a particular provider rather than with a particular place or no place at all [1].	1 = No, patients are assigned to a PC centre, and a GP 2= Patients are free to choose a centre, but assigned to a GP or they are assigned to a centre, but free to choose a GP 3= Yes, patients can freely choose any centre or GP
	% of patients who are satisfied with their relation with their GP/PC physician (CON3.2a)	The delivery of high quality of care to a large degree depends on the quality of the personal relationship between patients and their primary care provider, which ideally is characterized by a sense of responsibility for the delivery of coordinated and comprehensive care, and a mutual feeling of trust and loyalty [52;61-65].	1= On average < 75% of patients are satisfied with their relationship with their GP/PC provider 2= On average 75-90% of patients are satisfied with their relationship with their GP/PC provider

			3=On average 90% > of patients are satisfied with their relationship with their GP/PC provider
Relational continuity of care (CON3) - *continued*	**% of patients who are satisfied the available time during consultations with their GP/PC physician** (CON3.2b)	The delivery of high quality of care to a large degree depends on the quality of the personal relationship between patients and their primary care provider, which ideally is characterized by a sense of responsibility for the delivery of coordinated and comprehensive care, and a mutual feeling of trust and loyalty [52;61-65].	1= On average < 75% of patients are satisfied with the available time during consultations with their GP/PC physician 2= On average 75-90% of patients are satisfied with the available time during consultations with their GP/PC physician 3=On average 90% > of patients are satisfied with the available time during consultations with their GP/PC physician
	% of patients who are satisfied with the explanation their GP or PC physician gives of problems, procedures and treatments (CON3.2d)	The delivery of high quality of care to a large degree depends on the quality of the personal relationship between patients and their primary care provider, which ideally is characterized by a sense of responsibility for the delivery of coordinated and comprehensive care, and a mutual feeling of trust and loyalty [52;61-65].	1= On average < 75% of patients are satisfied with the explanation their GP or PC physician gives of problems, procedures and treatments 2= On average 75-90% of patients are satisfied with the explanation their GP or PC physician gives of problems, procedures and treatments 3=On average 90% > of patients are satisfied with the explanation their GP or PC physician gives of problems, procedures and treatments

Dimension: Coordination of PC services			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
Gatekeeping system (COO1)	**Do patients need a referral to access the following medical, para-medical and nursing disciplines?** [1. Yes, a referral is normally required 2. No they have direct access 3. Direct access is possible if costs of the visit are paid privately (out of pocket or refunded from a complementary insurance)]: Gynaecologist/obstetrician; Paediatrician; Specialist of Internal medicine; Ophthalmologist; ENT specialist; Cardiologist; Neurologist; Surgeon; Primary care / GP practice nurse; Specialised nurse (eg. on diabetes); Home care nurse; Physiotherapists (ambulatory); Midwife (ambulatory); Occupational therapist; Speech therapist; Dentist (COO1.1)	Gatekeeping systems have multiple positive effects on health care systems. Most importantly gatekeeping has been associated with cost containment, increased responsiveness to patients' needs and enhanced quality of care [1;66-68].	1= No gatekeeping system in place (they have direct access to the majority of listed physicians) 2= No gatekeeping, but there are incentives in place (Direct access to the majority of listed physicians is possible if costs of the visit are paid privately); 2.5= Yes, partially gatekeeping system in place (referral for some specialists needed) 3= Yes, there is a gatekeeping system (a referral is normally required to the majority of listed physicians)
Skill-mix of PC providers (COO2)	**% of PC practices that are:** **- Single handed (solo);** **- 2 or 3 GPs in the same building without medical specialists;** **- 4 or more GPs in the same building without medical specialists;** **- Mixed practice with GPs and medical specialists.** (COO2.1)	Group practices and teams with a greater occupational diversity are independently associated with a higher quality of care [69;70]. Close involvement of generalist clinicians in specialty care leads to more cost-effective care and better health [55].	1= Majority of practices are single handed 2= Majority of practices are group practices of GPs 3= Majority of practices are mixed practices of GPs and specialists

Skill-mix of PC providers (COO2) - *continued*	**Is it common for GPs to have regular face-to-face meetings (at least once per month) with the following professionals?** [Yes, it often occurs / Yes, it usually occurs / No, it occasionally occurs / It seldom or never occurs]. Please explain: Other GP(s); Practice nurse(s); Nurse practitioner(s); Home care nurse(s); Midwife/birth assistant(s); PC physiotherapist(s); Community pharmacist(s); Social worker(s); Community mental health workers. (COO2.2)	Close collaboration between different primary care providers optimises the treatment of patients, and therefore increases the strength of primary care. Regardless of the mode of teamwork that is applied, there should be some form of structural communication among primary care providers treating mutual patients [32;33;71;72].	1= GPs seldom or never have regular face-to-face meetings with various PC providers* 2= GPs occasionally have regular face-to-face meetings with various PC providers* 3= GPs often/usually have regular face-to-face meetings with various PC providers* **Calculate the average score of all professions by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
	How usual are *nurse-led diabetes clinics* in PC/GP? [very common / usual/ rare/ uncommon] (COO2.3a)	Efficiency in general practice can be achieved by delegating more tasks to the practice support staff [34;43;73]. Nursing disciplines perform services that address health risk behaviours more often than physicians [20]	1= Nurse-led diabetes clinics in PC/GP occurs Seldom 3= Nurse-led diabetes clinics in PC/GP is common
	How usual are *nurse-led health education (e.g. for stop smoking or pregnant women)* in PC/GP? [very common / usual/ rare/ uncommon] (COO2.3b)	Efficiency in general practice can be achieved by delegating more tasks to the practice support staff [34;43;73]. Nursing disciplines perform services that address health risk behaviours more often than physicians [20]	1= Nurse-led health education in PC/GP occurs seldom 3= Nurse-led health education in PC/GP is common
Collaboration of PC-Secondary care (COO3)	**How common are the following forms of cooperation between GP/PC and medical specialists?** [very common / usual/ rare/ uncommon] 1. Medical specialists visiting a PC practice to provide specialist care normally provided in hospital (replaced specialist care). 2. Medical specialists visiting a PC practice to provide joint care with a GP (joint consultations). 3. Clinical lessons by a medical specialist for GPs. (COO3.1)	Shared care arrangements between primary and secondary care providers stimulates mutual education, promotes cooperation across levels, improves guideline-consistent care, reduces the use of inpatient services, and improves appropriate prescribing and medication adherence. It thereby improves health outcomes [40;55;59;74-79].	1= GPs/PC providers rarely collaborate with specialists* 2= Various forms of cooperation between GP/PC and specialists usually exist* 3= Various forms of cooperation between GP/PC and specialists are very common* **Calculate the average score of the 3 questions by applying:* *1= rare or uncommon* *2= usual* *3= very common*

Collaboration of PC-Secondary care (COO3) - *continued*	**How common is it that GPs ask (telephone) advice from the following medical specialists?**[very common / usual/ rare/ uncommon] 1. Paediatricians; 2. Internists; 3. Gynaecologists; - Surgeons; 4.Neurologists; 5. Dermatologists; 6. Geriatrists. (COO3.1a)	Shared care arrangements optimise patient care and improve health outcomes. Regardless of the mode of cooperation that is applied, there should be some form of structural communication among primary care providers treating mutual patients [32;33;71;72].	1= GPs rarely ask (telephone) advice from various specialists* 3= It is common for GPs to ask (telephone) advice from various specialists* **Calculate the average score of the 6 professionals by applying:* *1= rare or uncommon* *3= usual* *("very common" does not occur)*
Integration of public health in PC (COO4)	**Are clinical patient records from GP/PC used at regional or local level to identify health needs or priorities for health policy?** [routinely (health statistics) / incidentally / seldom or never used] (COO4.1)	The effect of PC on improving equity on health depends on the availability of information about the patient needs in the various areas in which PC practices are located [1]. Targeting services around locally defined needs is effective in improving the quality and responsiveness of PC [43].	1= seldom or never used 2= incidentally 3= routinely (health statistics
	Are community health surveys conducted to improve the quality and responsiveness of PC? [Regularly nationwide / incidentally nationwide / regularly at local or regional level / incidentally at local or regional level] (COO4.2)	The effect of PC on improving equity on health depends on the availability of information about the patient needs in the various areas in which PC practices are located [1]. Targeting services around locally defined needs is effective in improving the quality and responsiveness of PC [43].	1= incidentally at local or regional level 2= Regularly at local or regional level 3= Regularly or incidentally nationwide

Dimension: Comprehensiveness of the PC services			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
Medical equipment available (COM1)	**How common is it that PC facilities have the following equipment available at the premises:** [(almost) always available / usually available / occasionally available / seldom or never available] 1. infant scales; 2. glucose tests; 3. dressings/ bandages; 4. otoscope; 5.ECG; 6. urine strips; 7. instruments for stitching wounds; 8. gynaecological speculum; 9. peak flow meter (COM1.1)	Inadequate equipment and supplies are one of the impediments to delivery of PC services [12].	1= PC facilities have little equipment available at the premises 2= PC facilities have a limited set of equipment available 3= PC facilities usually have a comprehensive set of equipment available **Calculate the average score of the 9 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
First contact for common health problems (COM2)	**To what extent will patients with the following health problems visit a GP for first contact care?** [(almost) always / usually / occasionally / seldom or never]: child with severe cough; child aged 8 with hearing problem; woman aged 18 asking for oral contraception; woman aged 20 for confirmation of pregnancy; woman aged 35 with irregular menstruation; woman aged 35 with psychosocial problems; woman aged 50 with a lump in her breast; man aged 28 with a first convulsion; man with suicidal inclinations; man aged 52 with alcohol addiction problems (COM2.1)	First contact care by primary care providers is essential to address the wide variety and often very basic needs existing in the community [33;56;80-82].	1= GPs rarely provide first contact care for new health problems 2= GPs occasionally provide first contact care for new health problems 3= GPs usually provide first contact care for new health problems **Calculate the average score of the 10 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*

Treatment and follow-up of diseases (COM3)	**To what extent will patients with the following diseases receive treatment / follow up care from their GP?** [(almost) always / usually / occasionally / seldom or never]: Chronic bronchitis; Peptic ulcer; Congestive heart failure; Pneumonia; Uncomplicated diabetes type II; Rheumatoid arthritis; Mild depression; Cancer (in need for palliative care); Patients admitted to a nursing home/convalescent home. (COM3.1)	The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the treatment and follow-up of diseases in their practice population 2= GPs are occasionally involved in the treatment and follow-up of diseases in their practice population 3= GPs are usually involved in the treatment and follow-up of diseases in their practice population **Calculate the average score of the 9 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
	% of total patient contacts handled solely by GPs without referrals to other providers (COM3.2)	First contact care by primary care providers is essential to address the wide variety and often very basic needs existing in the community [33;56;81-83]. Having a medical generalist such as a GP, rather than a specialist as a regular source of care has been associated with better health outcomes and lower health care costs [1;17-19].	1= < 80.0% 2= 80.0 – 92.50% 3= 92.50% > *(Percentiles used: 33,3% and 66.67% observations)*
Medical technical procedures (COM4)	**To what extent do GPs or GP/PC practice nurses carry out the following activities if one of their patients would need so?** [(almost) always / usually / occasionally / seldom or never]. Wedge resection of ingrown toenail; Removal of sebaceous cyst from hairy scalp; Wound suturing; Excision of warts; Insertion of IUD; Removal of rusty spot from the cornea; Fundoscopy; Joint injection; Strapping an ankle; Setting up an intravenous infusion. (COM4.1) Which specialties (besides GPs or GP/PC practice nurses) would (also) provide the procedure? (please list 1 or 2, if applicable) (COM4.1a)	The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs or GP/PC practice nurses are rarely involved in the provision of medical-technical procedures 2= GPs or GP/PC practice nurses are occasionally involved in the provision of medical-technical procedures 3= GPs or GP/PC practice nurses are usually involved in the provision of medical-technical procedures **Calculate the average score of the 10 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*

Preventive care (COM5)	**To what extent do GPs carry the following preventive activities?** [(almost) always / usually / occasionally / seldom or never]. Immunization for tetanus; Allergy vaccinations; Testing for sexually transmitted diseases; Screening for HIV/AIDS; Influenza vaccination for high-risk groups; Cervical cancer screening; Breast cancer screening Cholesterol level checking (COM5.1) Which specialties (besides GPs) would (also) provide the preventive activity? (please list 1 or 2, if applicable) (COM5.1a)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. In general, the provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the provision of preventive care 2= GPs are occasionally involved in the provision of preventive care 3= GPs are usually involved in the provision of preventive care **Calculate the average score of the 8 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
Mother and child & Reproductive health care (COM6)	**To what extent do GPs provide the following health services to their patients who need so?** [(almost) always / usually / occasionally / seldom or never]. - Family planning / contraceptive care - Routine antenatal care (in line with national scheme) - Routine paediatric surveillance to children up to 4 years (COM6.1) If not the GP, which other specialty(ies) would provide this health service? (please list 1 or 2, if applicable) (COM6.1a)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. In general, the provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the provision of mother and child and reproductive health care 2= GPs are occasionally involved in the provision of mother and child and reproductive health care 3= GPs are usually involved in the provision of mother and child and reproductive health care **Calculate the average score of the 3 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*

Mother and child & Reproductive health care (COM6)- *continued*	**To what extent are GPs (or practice nurses) involved in infant vaccination on:** [(almost) always / usually / occasionally / seldom or never]. - diphtheria - tetanus - pertussis - measles - hepatitis B - mumps - rubella (COM6.2)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. In general, the provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the provision of infant vaccination 2= GPs are occasionally involved in the provision of infant vaccination 3= GPs are usually involved in the provision of infant vaccination **Calculate the average score of the 7 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
Health promotion (COM7)	**To what extent do GPs provide the following individual counselling if this would be needed in the practice population?** [(almost) always / usually / occasionally / seldom or never]. - Counseling in case of obesity - Counselling in case of poor physical activity - Counselling in case of smoking cessation - Counselling in case of problematic alcohol consumption (COM7.1) If not the GP, which other specialty(ies) would provide this counselling? (please list 1 or 2, if applicable) (COM7.1a)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. In general, the provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the provision of individual counselling for health promotion 2= GPs are occasionally involved in the provision of individual counselling for health promotion 3= GPs are usually involved in the provision of individual counselling for health promotion **Calculate the average score of the 4 items by applying:* *1= seldom or never* *2= occasionally* *3= often/usually*
	To what extent are GPs (alone or with others) involved in group wise health education to their patients (on topics like healthy diet; physical activity; smoking; use of alcohol etc).? [usual task of GPs / incidental task / rarely or never provided by GPs] (COM7.2)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. In general, the provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= GPs are rarely involved in the provision of group wise health education 2= GPs are incidentally involved in the provision of group wise health education 3= GPs are usually involved in the provision of group wise health education

Dimension: Quality of PC			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
Prescribing behaviour of PC providers (QUA1)	**The average number of prescriptions annually provided by GPs per 1000 contacts and/or per 1000 registered patients.** (Please use latest available data, and indicate the year). (QUA1.1)	High prescribing volumes can influence the quality of care. The number of patients seen per hour is positively associated with prescribing volumes [85].	1= 3,450.74 > per 1000 contacts 2= < 1,199.81 per 1000 3= 1,199.81 – 3,450.74 per 1000 contacts contacts *(Percentiles used: 33,3% and 66.67% observations)*
	The defined daily doses of antibiotics use in ambulatory care per 1000 inhabitants per day (QUA1.2)	Too high amounts of antibiotics use effects the antimicrobial resistance of people and is a sign of inappropriate prescribing [86].	1= 23.07 DDD per 1000 inhabitants > 2= < 17.07 DDD per 1000 inhabitants 3= 17.07 – 23.07 DDD per 1000 inhabitants *(Percentiles used: 33,3% and 66.67% observations)*
Quality of diagnosis and treatment in PC (QUA2)	**The number of hospital admissions for people with *diagnosis of dehydration/gastroenteritis (ICD-10 codes: E86, K52.2, K52.8, K52.9)* per 100.000 population per year.** Please use the latest available data, and indicate the year. [QUA2.1a]	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 132.80 per 100.000 population per year > 2= 39.22 – 132.80 per 100.000 population per year 3= < 39.22 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*
	The number of hospital admissions for people with *diagnosis of kidney infection (ICD-10 codes: N10, N11, N12, N13.6)* per 100.000 population per year. Please use the latest available data, and indicate the year. [QUA2.1b]	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 117.01 per 100.000 population per year > 2= 42.99 – 117.01 per 100.000 population per year 3= < 42.99 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*

Quality of diagnosis and treatment in PC (QUA2) - *continued*	**The number of hospital admissions for people with *diagnosis of perforated ulcer (ICD-10 codes: K25.0–K25.2, K25.4–K25.6, K26.0–K26.2, K26.4–K26.6, K27.0–K27.2, K27.4–K27.6, K280–282, K284–K286* per 100.000 population per year.** Please use the latest available data, and indicate the year. QUA2.1c]	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 61.00 per 100.000 population per year > 2= 24.00 – 61.00 per 100.000 population per year 3= < 24.00 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*
	The number of hospital admissions for people with *diagnosis of pelvic inflammatory disease (ICD-10 codes: N70, N73, N74)* per 100.000 population per year. Please use the latest available data, and indicate the year. [QUA2.1d]	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 23.01 per 100.000 population per year > 2= 6.06 – 23.01 per 100.000 population per year 3= < 6.06 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*
	The number of hospital admissions for people with *a diagnosis of ear, nose and throat (ENT) infections (ICD-10 codes: H66, H67, J02, J03, J06, J31.2)* per 100.000 population per year. Please use the latest available data, and indicate the year. [QUA2.1e]	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 172.03 per 100.000 population per year > 2= 74.58 – 172.03 per 100.000 population per year 3= < 74.58 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*
Quality chronic diseases management (QUA3)	**Crude percentage of the diabetic population aged >25 with cholesterol 5>mmol/l** (crude percentage; use latest available year; please indicate the year) (QUA3.1)	Diabetes is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= 47.00% > 2= 30.00 – 47.00% 3= < 30.00% *(Percentiles used: 33,3% and 66.67% observations)*
	Crude percentage of diabetic population aged >25 years with blood pressure above 140/90 mm Hg measured in the last 12 months.(crude percentage; use latest available year; please indicate the year) (QUA3.2)	Diabetes is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 29.33% 2= 29.33 – 50.70% 3= 50.70% > *(Percentiles used: 33,3% and 66.67% observations)*
	Crude percentage of diabetic population aged >25 years with HbA1C > 7,0%. (crude percentage; use latest available year; please indicate the year) (QUA3.3)	Diabetes is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= 60.00% > 2= 46.90– 60.00% 3= < 46.90% *(Percentiles used: 33,3% and 66.67% observations)*

Quality chronic diseases management (QUA3) - *continued*	**Crude percentage of diabetic population aged >25 years with overweight and obesity and BMI measured in the last 12 months**. (crude percentage; use latest available year; please indicate the year) (QUA3.4)	Diabetes is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 69.13% 2= 69.13 – 86.67% 3= 86.67% > *(Percentiles used: 33,3% and 66.67% observations)*
	Crude percentage of diabetic population aged >25 years with eye fundus inspection in the last 12 months (crude percentage; use latest available year; please indicate the year) (QUA3.5)	Diabetes is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 50.00% 2= 50.00 – 77.44% 3= 77.44% > *(Percentiles used: 33,3% and 66.67% observations)*
	Percentage of individuals with COPD which have ever had a lung function measurement during the last year. (use latest available year; please indicate the year) (QUA3.6)	COPD is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 30.00% 2= 30.00 – 58.00% 3= 58.00% > *(Percentiles used: 33,3% and 66.67% observations)*
	Percentage of individuals with COPD that have had a follow-up visit in primary care during the last year. (use latest available year; please indicate the year) (QUA3.7)	COPD is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 50.00% 2= 50.00 – 80.00% 3= 80.00% >
	Percentage of individuals with wheeze in the last 12 months or diagnosed with asthma which have had a lung function measurement during the last year. (use latest available year; please indicate the year) (QUA3.8)	Asthma is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 50.00% 2= 50.00 – 80.00% 3= 80.00% >
	Percentage of individuals having had wheeze in the last twelve months with a diagnosis of asthma that have had a follow-up visit in primary care during the last year. (use latest available year; please indicate the year) (QUA3.9)	Asthma is a PC sensitive condition. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 50.00% 2= 50.00 – 80.00% 3= 80.00% >
	The number of hospital admissions for people with a diagnosis of asthma per 100.000 population per year (in the most recent year-please indicate the year). (use latest available year; please indicate the year) (QUA3.10)	Lower rates of hospitalization for ambulatory care sensitive conditions are strongly associated with an adequate PC system in terms of the receipt of timely, comprehensive and effective PC services [31;87].	1= 103.61 per 100.000 population per year > 2= 43.33 – 103.61 per 100.000 population per year 3= < 43.33 per 100.000 population per year *(Percentiles used: 33,3% and 66.67% observations)*

Quality of Maternal and Child health care (QUA4)	**% of infants vaccinated <u>within PC</u> against *Diphteria*:** [% or not applicable because outside PC] (QUA4.1a)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
	% of infants vaccinated <u>within PC</u> against *tetanus*: [% or not applicable because outside PC] (QUA4.1b)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
	% of infants vaccinated <u>within PC</u> against *pertussis*: [% or not applicable because outside PC] (QUA4.1c)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
	% of infants vaccinated <u>within PC</u> against *measles:* [% or not applicable because outside PC] (QUA4.1d)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
	% of infants vaccinated <u>within PC</u> against *hepatitis B*: [% or not applicable because outside PC] (QUA4.1e)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
	% of infants vaccinated <u>within PC</u> against *mumps:* [% or not applicable because outside PC] (QUA4.1f)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >

	% of infants vaccinated <u>within PC</u> against *rubella*: [% or not applicable because outside PC] (QUA4.1g)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 90 % 2= 90 – 95% 3= 95% >
Quality of preventive care (QUA5)	**% population aged 60+ vaccinated against flu**. [% or not applicable because outside PC] (QUA5.1)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= <29.12 % 2= 29.12 – 54.07% 3= 54.07% > *(Percentiles used: 33,3% and 66.67% observations)*
	% of women aged 52-69 yrs who had at least 1 mammogram in the past 3 yrs. [% or not applicable because outside PC] (QUA5.2)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 47.62 % 2= 47.62 – 65.03% 3= 65.03 % > *(Percentiles used: 33,3% and 66.67% observations)*
	% of women aged 21-64 yrs who had at least 1 Pap test in the past 3 yrs. [% or not applicable because outside PC] (QUA5.3)	Preventive health care activities are cost-effective in the PC setting, and result in improved levels of population health [1;84]. The provision of a wide range of services provided by PC providers is associated with better health outcomes at lower costs [1;19].	1= < 46.40 % 2= 46.40 - 69.60% 3= 69.60% > *(Percentiles used: 33,3% and 66.67% observations)*

Dimension: Efficiency of PC			
PC System Score Features and Indicators			
Component	**Indicator**	**Rationale**	**Scoring**
General practice efficiency (EFF1)	**Nr. of home visits as % of all GP-patient contact** (use latest available year; please indicate the year) (EFF1.1)	Efficiency in general practice can be achieved by a decrease in the number of home visits, and by a higher number of telephone contacts [34].	1= > 6.45% or < 2.83% 3= 2.83 – 6.45% *(Percentiles used: 33,3% and 66.67% observations and mean observation used)*
	Nr. of telephone consultations as % of all GP-patient contact (use latest available year; please indicate the year) (EFF1.2)	Efficiency in general practice can be achieved by a decrease in the number of home visits, and by a higher number of telephone contacts [34].	1=< 6.87 2= > 19.93% 3= 6.87 – 19,93% *(Percentiles used: 33,3% and 66.67% observations)*
	Average consultation length (in minutes) of GPs. (use latest available year; please indicate the year) (EFF1.3)	Compared to slower GPs, faster GPs record sparser medical histories, arrange follow-up consultations in more consultations, are less likely to recognise and deal with long-term problems and psychosocial problems, engage less in preventive care and health promotion. Patient enablement and centeredness are positively correlated with average consultation length. Prescribing quality, user satisfaction and the level of population health are positively associated with longer consultation length [85].	1= 15.00> minutes or < 10 minutes 3= 10.00 – 15.00 minutes *(Percentiles used: 33,3% and 66.67% observations)*
	Number of GP consultations per capita per year (use latest available year; please indicate the year) (EFF1.4)	The consumption of care (in terms of consultations) are an indication of accessibility of care which is associated with improvements in the level of population health [84].	1= 4.34> 2= <3.30 3= 3.30 – 4.34 *(Percentiles used: 33,3% and 66.67% observations)*
	Number of new referrals from GPs to medical specialists per 1000 listed patients per year. (use latest available year; please indicate the year) (EFF1.5)	First contact care by primary care providers is essential to address the wide variety and often very basic needs existing in the community [33;56;81;82;88]. Having a medical generalist such as a GP, rather than a specialist as a regular source of care has been associated with better health outcomes and lower health care costs [1;17-19].	1= > 362,64 per 1000 listed patients per year 2= <184.33 per 1000 listed patients per year 3= 184.33 - 362,64 per 1000 listed patients per year *(Percentiles used: 33,3% and 66.67% observations)*

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Acknowledgements

This thesis could not have been realised without the guidance, contributions and enthusiasm of many primary care experts and colleagues across Europe.
My gratitude goes first to Peter Groenewegen and Jouke van der Zee who supported the idea to apply for European Commission funding for a European primary care study (the PHAMEU study) and trusted me to realise this. As supervisors of this PhD thesis Peter and Jouke provided me intellectual guidance and creativity during all phases of the completion of this thesis. They taught me valuable research skills and qualities, and provided me with support in all my activities at NIVEL.
Special thanks go to Wienke Boerma whom I have worked closely with from day one at NIVEL. Wienke, I am glad you are my PhD co-supervisor and particularly grateful for the fun we had coordinating the PHAMEU project, and many other projects we worked on together. Your mentorship has shaped me as a researcher.
I am very grateful to the important work Barbara Starfield has done in this field, and the valuable conversations we have shared, particularly in Pisa, Italy in 2010.
I would like to acknowledge the time and work of my doctoral committee members: Pieter Hooimeijer, Niek Klazinga, Theo Verheij, Chris van Weel, and Sara Willems.
I particularly would like to acknowledge the partners of the PHAMEU project, whom made major contributions to all steps of the PHAMEU project, and were responsible for the data collection across Europe, and therefore also to the foundation of this thesis: Yann Bourgueil (France), Thomas Cartier (France), Toni Dedeu (Spain), Toralf Hasvold (Norway), Allen Hutchinson (United Kingdom), Margus Lember (Estonia), Marek Oleszczyk (Poland), Danica Rotar Pavlič (Slovenia), Igor Švab (Slovenia), Paolo Tedeschi (Italy), Stefan Wilm (Germany), Adam Windak (Poland), and Andy Wilson (United Kingdome). I have enjoyed every step in our joint work, and hope to continue working with each of you in the future.
Besides his many contributions to the PHAMEU project, I would also like to thank Allen Hutchinson for the time I spent at the School of Health and Related Research (ScHARR) of Sheffield University (UK) in 2008. It was not only a very productive, but also a very pleasant time.
I would also like to acknowledge the national collaborators for supporting the PHAMEU partners in collecting primary care data in various countries: M. Akman (Turkey), M. Aubart (Luxembourg), A. Balan (Romania), B. Bolibar (Spain), R. Brinovec Pribaković (Slovenia), B. Christensen (Norway), J. Cornuz (Switzerland), Z. Farkas Pall (Romania), C. Fonseca (Portugal), J. Gené (Spain), A. Gouveia (Portugal), E. Jurgova (Slovakia), V. Kasiulevičius (Lithuania), M. Kroneman (Netherlands), J. Leners (Luxembourg), C. Lionis (Greece), R. Miftode (Romania), C. Pareja (Spain), L. Pisco (Portugal), K. Põlluste (Estonia), M. Redaèlli

(Germany), J. van Riet Paap (Netherlands), I. Rurik (Hungary), L. Ryssaert (Belgium), P. Salchev (Bulgaria), M. Sammut (Malta), G. Samoutis (Cyprus), A. Saridaki (Greece), B. Seifert (Czech Republic), N. Senn (Switzerland), D. Simic (Austria), J. Soler (Malta), M. Sprenger (Austria), R. Stein (Luxembourg), P. Vajer (Hungary), S. Veide (Latvia), C. Violan (Spain), K. Winell (Finland).

I would like to acknowledge the co-sponsors of this thesis: DG SANCO (European Commission; funding the PHAMEU project), NIVEL, the partner institutes of NIVEL in the PHAMEU project, the World Health Organisation Regional Office for Europe (funding the WHO PC Evaluation Tool), and the Dutch Ministry of Education, Culture and Science (funding part of this thesis).

I am very grateful to Roel Otten and Harm Wouter Snippe for developing the online PHAMEU database which turned out to be an important instrument to store the collected primary care information across Europe and to facilitate the coordination of the PHAMEU project.

I would like to thank Ferruccio Pelone for working together with me on Chapter 6, and on all our publications that followed. Who knew working on economic analyses could be this much fun?

I am thankful to Ernst Spaan for his activities in the pilot tests of the Primary Care Evaluation Tool in the Russian Federation and Turkey.

I am also grateful to Diederik Aarendonk (European Forum for Primary Care), Dineke Zeegers-Paget (European Public Health Association), Martina Pellny and Valentina Baltag (World Health Organization) for supporting and disseminating the results of this thesis.

Erna Brok, Baiba Hermanns-Vagule and Machteld Roos supported me in coordinating the PHAMEU project with their financial expertise and knowledge and great working spirit.

My gratitude also goes to Mieke van Leeuwe supporting me in the layout of this book and in various other activities at NIVEL.

I thank all my colleagues at NIVEL for having created such a pleasant working environment, and am grateful to my new colleagues at the Department of Social Medicine of the Academic Medical Centre – University of Amsterdam for welcoming me to the Department.

I am particularly grateful to Niek Klazinga and Karien Stronks for giving me the time to complete this PhD thesis, while we already started working together at the AMC-UvA. I cannot imagine a smoother and better transition from being a PhD candidate to a postdoctoral researcher. I look forward to all our future work.

Finally, I would like to thank my dear family for everything. Two PhD's – and so much more – in the family…very nice!

About the author

Dionne Sofia Kringos was born on February 12th, 1982 in Utrecht, the Netherlands. She holds a B.Sc. degree in Health Policy and Management, a M.Sc. degree in International Health Economics, Policy and Law, as well as a M.Sc. degree in Health Services Research. From 2005 till February 2012 she worked as an International Health Services Researcher at the Netherlands Institute for Health Services Research (NIVEL). During these years she, among others, specialized in international comparative primary care studies, worked in close collaboration with the World Health Organization (WHO), the European Commission, and the Organization for Economic Co-operation and Development (OECD), contributed to several EU-funded projects and performed various health care system evaluation pilot studies in Eastern and Southern European countries. The red thread that runs through all her research projects is to contribute to evidence-informed health policy. As such, her research ranges from providing scientific support for the Health Information Strand of DG SANCO, to developing a Health Information and Knowledge System in Europe. Kringos has successfully written several international research proposals and papers, is a frequently asked lecturer at conferences and courses, is an active reviewer for various relevant international scientific journals and holds strong links with many internationally active health services research groups. In November 2012 she successfully defended her PhD thesis on the Strength of Primary Care in Europe and in 2013 her book on "Building primary care in a changing Europe" will be published in collaboration with the European Observatory on Health Systems and Policies (WHO Europe). Kringos is currently working as a postdoctoral Health Systems Researcher at the Department of Social Medicine of the Academic Medical Center of the University of Amsterdam in the Netherlands.

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