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Review

Global prevalence of basic life support training: A systematic review and meta-analysis

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Abstract

Background and Aims: Out-of-hospital cardiac arrest exerts a large disease burden, which may be mitigated by bystander cardiopulmonary resuscitation and automated external defibrillation. We aimed to estimate the global prevalence and distribution of bystander training among laypersons, which are poorly understood, and to identify their determinants.

Methods: We searched electronic databases for cross-sectional studies reporting the prevalence of bystander training from representative population samples. Pooled prevalence was calculated using random-effects models. Key outcome was cardiopulmonary resuscitation training (training within two-years and those who were ever trained). We explored determinants of interest using subgroup analysis and meta-regression.

Results: 29 studies were included, representing 53,397 laypersons. Among national studies, the prevalence of cardiopulmonary resuscitation training within two-years and among those who were ever trained, and automated external defibrillator training was 10.02% (95% CI 6.60 -14.05), 42.04% (95% CI 30.98-53.28) and 21.08% (95% CI 10.16-34.66) respectively.

Subgroup analyses by continent revealed pooled prevalence estimates of 31.58% (95%CI 18.70–46.09), 58.78% (95%CI 42.41–74.21), 18.93 (95% CI 0.00–62.94), 64.97% (95%CI 64.00–65.93), and 50.56% (95%CI 47.57–53.54) in Asia, Europe, Middle East, North America, and Oceania respectively, with significant subgroup differences ($p < 0.01$). A country's income and cardiopulmonary resuscitation training (ever trained) ($p = 0.033$) were positively correlated. Similarly, this prevalence was higher among the highly educated ($p<0.00001$).

Conclusions: Large regional variation exists in data availability and bystander training prevalence. Socioeconomic status correlated with prevalence of bystander training, and regional disparities were apparent between continents. Bystander training should be promoted, particularly in Asia, Middle East, and low-income regions. Data availability should be encouraged from under-represented regions.

Keywords: Basic life support, Cardiopulmonary resuscitation, Life-saving skills, Training, meta-analysis

Introduction

Out-of-hospital cardiac arrest (OHCA) is the loss of functional cardiac mechanical activity in association with an absence of systemic circulation, occurring at a setting outside of the hospital.[1] OHCA is a common, time-critical disease and is a major cause of mortality and morbidity globally.[2] Despite advances in healthcare, mortality in OHCA remains high, with the pooled incidence of return of spontaneous circulation at 29.7%, and survival to admission at 22.0% for patients to whom cardiopulmonary resuscitation was initiated.[3] Observed variations in OHCA outcomes are multifactorial. Contributors to OHCA outcomes include factors such as local differences in the community aspects of the chain of survival[4–6] including early bystander cardiopulmonary resuscitation (CPR) and defibrillation with an automated external defibrillator (AED). A study done in Sweden has showed that survival rates are proportional to the rates of bystander CPR, which are linked to the percentage of the population

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who are CPR trained.[7] Bystander CPR and AED use are crucial determinants of patient outcomes,[8] and prior CPR or AED training is associated with performing bystander CPR and AED.[7,9,10]

However, the prevalence of the population trained in CPR or AED training is likely to vary by geographical region and has been reported to be as low as 2.4%.[11] Worldwide, efforts have been made to improve access to CPR or AED training by various organizations, such as the American Heart Association, the Red Cross societies and the Laerdal Foundation,[12] but little is known about the effectiveness of such measures and the factors that influence training uptake.[11] These may include strategies such as incorporating basic life support (BLS) training into educational curriculum in public schools and training BLS skills at community institutions such as religious institutions or sports clubs, among other interventions.[13] Beyond in-person courses, BLS training may be offered on online platforms as well, such as an interactive website by the Resuscitation Council UK. Data regarding the prevalence of CPR or AED training across the globe and which subpopulations have poorest access to BLS training is hence urgently needed to guide targeted public health and educational initiatives that promote BLS training among laypersons.

Although various communities have individually reported the prevalence of BLS training both at the national level and for school-going populations, there has been no previous systematic review done to consolidate these. Hence, we performed a systematic review and meta-analysis to investigate the global prevalence of CPR and AED training and their determinants.

Methods

This systematic review and meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,[14] and the Joanna Briggs Institute Manual for Evidence Synthesis chapter on systematic reviews of prevalence and incidence.[15] The study protocol had been published in the International Prospective Register of Systematic Reviews (PROSPERO CRD: 42022300559).

Search strategy and study selection

We conducted a systematic literature search in Medline, Embase and Cochrane Library from database inception to March 2nd 2023. The search strategy was developed in consultation with a medical information specialist (Medical Library, National University of Singapore). The search terms included medical subject heading (MeSH) terms such as “Out-of-Hospital Cardiac Arrest”, “Cardiopulmonary Resuscitation”, “Automated External Defibrillator”, “Basic Life Support” and related synonyms. Google Scholar and the reference lists of relevant sources were hand-searched, and this process surfaced four more studies which were included in the final analysis.[16–18] Grey literature and non-English language articles were excluded. Abstracts retrieved from the search were imported into EndNote X9 (Clarivate, Philadelphia, PA) for the removal of duplicates.

Inclusion criteria

After deduplication of entries, three reviewers (TPN, SE, JT) independently screened all the abstracts using pre-defined inclusion and exclusion criteria. Article sieve was conducted using Google Sheets (Google LLC, Mountain View, CA). After identifying potentially relevant studies, the full-text articles were retrieved. Three reviewers (TPN, SE, JT) independently screened the full-texts and the reasons for exclusion were recorded. Discrepancies at any stage of the screening were resolved by discussion between the three reviewers and consensus with the senior author (AFWH).

The inclusion criteria were: (1) Studies with a primary or secondary aim of reporting the proportion of laypersons who have undergone CPR or AED training, (2) Studies representing a sample of a well-defined geographical population. We considered laypersons among the general population or school-going population (students enrolled in educational institutions). A small number of off-duty healthcare workers who were part of the sample may be included in this population. We did not consider self-reported knowledge on CPR or willingness to provide bystander CPR as an indication of CPR training, and likewise for AED training. Exclusion criteria were: (1) Studies with no numerical data, (2) Studies only including healthcare workers (3) Unpublished or unfinished studies, (4) Conference abstracts, (5) Articles with small sample sizes (n < 5), (6) Case reports or series, (7) Narrative reviews or systematic reviews (8) Non-English language studies.

Data extraction and outcomes

Data were extracted from the studies using a case record form by three independent investigators (TPN, SE, JT). The data extraction process was blinded, and discrepancies were resolved through discussion and consensus with the senior author (AFWH). In this study, the main variables of interest were the proportion of laypersons who had ever undergone CPR (CPR-E) or AED (AED-E) training and the proportion of laypersons who had valid CPR (CPR-V) or AED (AED-V) training, defined as possession of a valid certificate in AED and CPR administration within two years of training. We also extracted variables such as gender, age, location (population density, rural or metropolitan residents), educational level, occupation, socioeconomical status (SES), race, marital status, population who received AED and CPR training, training location, and whether the training was mandatory from the included studies.

Statistical analysis

Data analyses were performed using the *meta* 4.18–0 package in R 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria).

We conducted a single-arm meta-analysis of proportions for the primary outcomes. Nationally representative studies were selected if they fit the had a study aim was to ascertain training prevalence in a particular geographic area with the largest possible sample size. Data was transformed using the Freeman-Tukey double arcsine method[19,20] to stabilise variance before the calculation of pooled prevalence estimates using Clopper-Pearson intervals. Random effects models were used given expected heterogeneity between communities studied and the restricted maximum likelihood estimator was applied for between-study variance. Statistical heterogeneity was evaluated through the I^2 statistic, τ^2, and Cochran Q test values. I^2 values of 25%, 50%, and 75% were taken as thresholds for low, moderate, and high heterogeneity, respectively. We opted to use multiple measures of statistical heterogeneity because recent studies showed that in meta-analyses of prevalence (single-arm meta-analysis), I^2 alone is unreliable and may be misleading.[21] Comparative data exploring the effect of variables on CPR or AED training were extracted as crude odds ratios. Where possible, odds ratios were calculated using 2x2 contingency tables for binary variables of interest.

To further explore the heterogeneity between studies, we performed pre-defined subgroup analyses according to study-level variables including region (continent) and Gross National Income (GNI). Countries were categorised into subgroups based on their GNI per capita according to classification by the World Bank in the year 2021.[22,23] According to the World Bank, GNI per capita is defined as the gross national income divided by the midyear population, converted to United States Dollars at official exchange rates. We then performed univariate meta-regression to test a priori hypotheses that CPR or AED training would vary with the GNI per capita and mean age of study population. Finally, we performed conventional pairwise meta-analysis comparing the effects of binary variables (sex, education level, employment status) on CPR or AED training using Review Manager (RevMan 5.4, The Cochrane Collaboration). We used a Dersimonian-Laird random effects model and the Mantel-Haenszel method to pool the log odds ratios. Two-tailed statistical significance was set at $p < 0.05$. Quality assessment of the prevalence studies were assessed on 10 domains using the tool by Hoy et al.[24] A post-hoc analysis of studies which were identified to be of a low risk of bias was done. Publication bias was not assessed for pooled prevalence due to the lack of an appropriate test for single-arm meta-analysis of proportion,[25] whereas for comparative meta-analysis, a funnel plot was plotted and inspected for asymmetry whenever there are at least ten data-points.

Specific ethics review was not required for this review.

Results

Literature retrieval & summary of included studies

A total of 10,402 articles were retrieved from the initial search, of which 4,480 were duplicates. After the title and abstract sieve, the full texts of 209 articles were then evaluated for eligibility. 202 articles were excluded in the full text sieve. Finally, 29 studies qualified for synthesis,[12,17,18,26–50] with one study having two separate sample populations in China and India.[30] A total of 17 studies representing a national population, and two studies representing a school going population were analysed. A summary of the search strategy is illustrated in Fig. 1.

Four studies were conducted on populations in Australia,[12,28,44,51] three in Saudi Arabia,[50,52,53] two in China,[54,55] one with populations in China and India,[30] two in Hong Kong Special Administrative Region,[17,56] three in the United Kingdom,[35,49,57] two in USA,[11,43] two in Japan,[47,58] and one from each of the following countries: Canada,[59] Korea,[32] Ukraine,[60] Ireland,[48] Turkey,[61] Spain,[62] Sweden,[18] Slovenia,[37] Denmark,[74] and Singapore.[39]

There were no studies appraised to be of high risk of bias. Three studies had a moderate risk of bias, and 26 studies were low-risk. Among included studies, data was collected from 1998 to 2023. Studies included were cross-sectional studies which utilised probability or non-probability sampling methods. The characteristics of included studies can be found in supplementary material 1.

The total at-risk population from all included studies consisted of 53,397 laypersons.

Global prevalence of CPR training

A summary of pooled global prevalence results can be found in Table 1. The meta-regression and comparative analyses can be found in Table 2.

Prevalence of CPR-E training

18 studies reported the prevalence of CPR-E training among a total of 40,066 laypersons from a national population.[11,17,18,28,30,32,37,39,50,55,58–63] The pooled prevalence of CPR-E was 42.04% (95% confidence interval [95%CI] 30.98 to 53.28, Fig. 2) and when excluding 2 studies with a moderate risk of bias,[31,63] the pooled prevalence of CPR-E slightly decreased to 40.57% (95%CI 28.46 to 53.52, Fig. 2). Two studies reported the prevalence of CPR-E training among a total of 2,577 laypersons from a school-going population.[52,54] The pooled prevalence was 12.60% (95%CI 9.18 to 16.47, Fig. 2).

Subgroup analyses by GNI per capita (Fig. 3) revealed pooled prevalence of CPR-E estimates of 46.69% (95%CI 34.12 to 59.48), 40.13% (95%CI 25.88 to 55.29), and 3.00% (95%CI 2.35 to 3.72) for GNI per capita at high-, upper middle-, and lower middle-income levels respectively, with significant difference between the subgroups ($p < 0.01$).

Subgroup analyses by continent for CPR-E (Fig. 4) revealed pooled prevalence estimates of 64.97% (95%CI 64.00 to 65.93), 50.56% (95%CI 47.57 to 53.54), 31.58% (95%CI 18.70 to 46.09), 18.93 (95%CI 0.00 to 62.94), 58.78% (95%CI 42.41 to 74.21) for the continents of North America, Oceania, Asia, Middle East, and Europe respectively, with significant difference between them ($p < 0.01$).

Prevalence of CPR-V training

Six studies reported the prevalence of CPR-V training among a total of 20,540 laypersons from a national population.[11,17,28,39,58,60] The pooled prevalence was 10.02% (95% CI 6.60 to 14.05, Fig. 5) and when excluding 1 moderate-risk study the prevalence of CPR-V training was 11.14% (95% CI 7.51 to 15.39, Fig. 5). Only one study reported the prevalence of CPR-V training among a total of 1,407 laypersons from a school-going population.[54] The reported prevalence was 5.76% (95%CI 4.60 to 7.04, Fig. 5).

Subgroup analyses by GNI per capita revealed pooled prevalence estimates of 9.54% (95% CI 5.72 to 14.21) and 12.76% (95% CI 9.60 to 16.30) for GNI per capita at high- and upper middle-income levels respectively, with no significant difference between the subgroups ($p = 0.54$).

Subgroup analyses by continent revealed pooled prevalence estimates of 8.04% (95% CI 5.13 to 11.52), 18.0% (95% CI 17.21 to 18.8), and 10.87% (95% CI 9.08 to 12.81) for the continents of Asia, North America, and Oceania respectively, with significant difference between the subgroups ($p < 0.01$).

Global prevalence of AED training

Prevalence of AED-E training

Six studies reported the prevalence of only AED-E training among a total of 13,305 laypersons from a national population.[32,39,47,55,63,74] The pooled prevalence was 21.08% (95% CI, 10.16 to 34.66) (Table 1). There were no studies which reported the prevalence of only AED-E training among laypersons from a school-going population.

Prevalence of AED-V training

One study from Singapore reported the prevalence of AED-V training among a total of 4,192 laypersons from a national population. The reported prevalence was 3.70% (95% CI, 3.15 to 4.29).[39] There were no studies which reported the prevalence of AED-V training among laypersons from a school-going population.

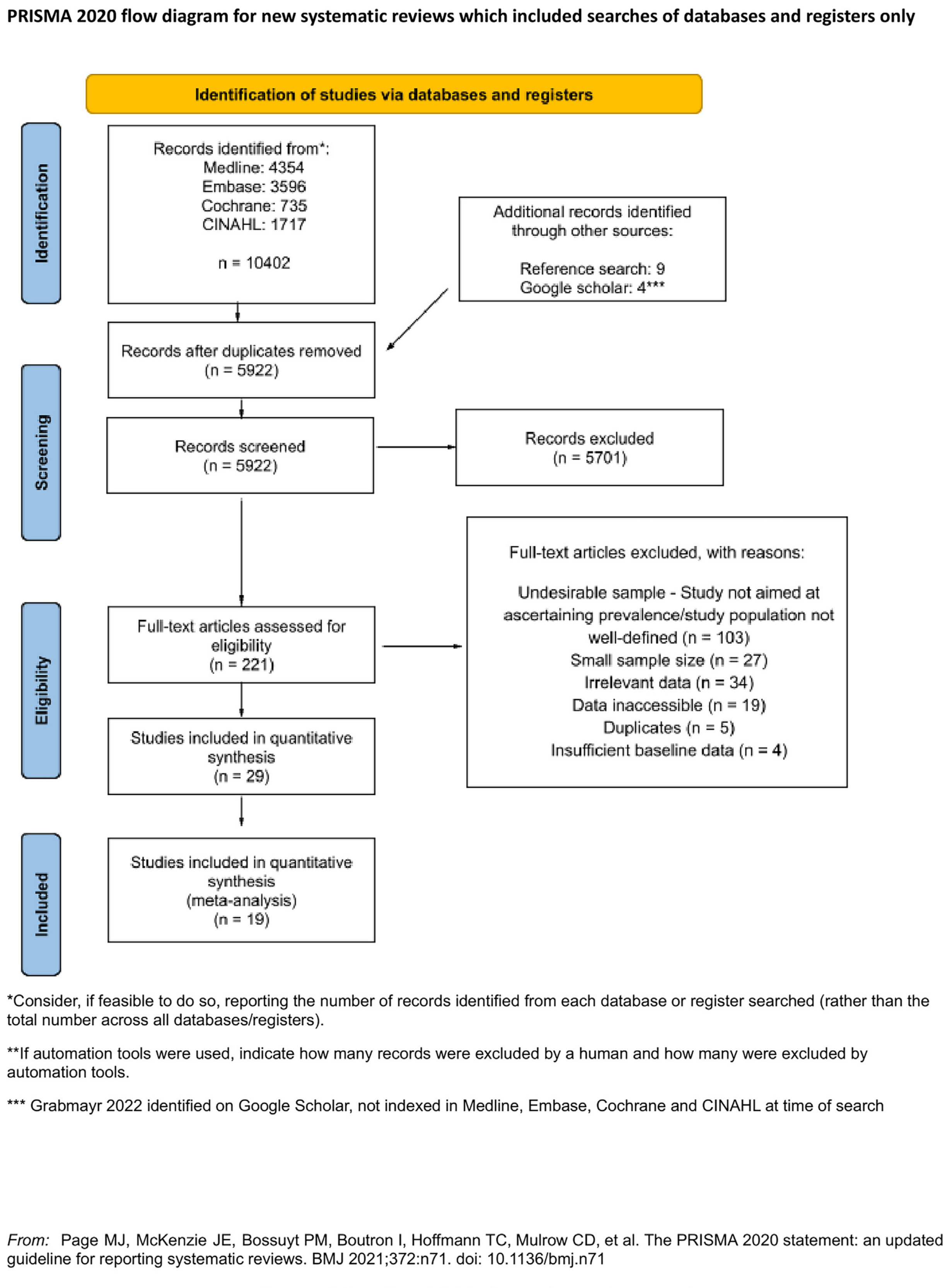

Fig. 1 – PRISMA Flowchart.

Table 1 – Summary of Pooled Global Prevalence Results.

Pooled Global Prevalence	Ever Trained				Valid Training			
	Studies representing national population		Studies representing school population		Studies representing national population		Studies representing school population	
	# of Studies (n)	*% Prevalence (95% CI)*	*# of Studies (n)*	*% Prevalence (95% CI)*	*# of Studies (n)*	*% Prevalence (95% CI)*	*# of Studies (n)*	*% Prevalence (95% CI)*
Overall prevalence of CPR training (all studies)	18 (40,066)	42.04% (30.98–52.52)	2 (2577)	12.60% (9.18–16.47)	6 (21,947)	10.02% (6.60–14.05)	1 (1407)	5.76% (4.60–7.04)
Overall prevalence of CPR training (low-risk studies only)	16 (33,129)	40.57% (28.46–53.28)	2 (2577)	12.60% (9.18–16.47)	5 (17,094)	11.14% (7.51–15.39)	1 (1407)	5.76% (4.60–7.04)
Subgroup analyses								
GNI per capita	18		0		6		0	
Lower-middle income	1 (2400)	3.00% (2.35–3.72)	0	–	–	–	–	–
Upper-middle income	4 (6785)	40.13% (25.88–55.29)	0	–	1 (384)	12.76% (9.60–16.30)	–	–
High-income	13 (30,811)	46.79% (34.12–59.48)	0	–	5 (20,156)	9.54% (5.72–14.21)	–	–
Study continent	18		0		6		0	
Asia	8 (19710)	31.58% (18.70–46.09)	0	–	4 (14,001)	8.40% (5.13–11.52)	0	–
Europe	5 (8441)	52.62% (38.40–66.63)	0	–	0	–	0	–
Middle East	2 (1389)	18.39% (0.00–62.94)	0	–	0	–	0	–
North America	2 (9450)	64.97% (64.00–65.93)	0	–	1 (9022)	18.00% (17.21–18.80)	0	–
Oceania	1 (1076)	58.78% (42.41–74.21)	0	–	1 (1076)	10.87% (9.04–12.81)	0	–
Overall prevalence of AED training (all studies)	6 (13,305)	21.08% (10.16–34.66)	0	–	1 (4192)	3.70% (3.15–4.29)	–	–

CI, 95% confidence interval; CPR, cardiopulmonary resuscitation; AED, automated external defibrillator; GNI, gross national income.

Ever trained: defined as having ever received training.

Valid Training: defined as valid training received within 2-years.

Table 2 – Meta-Regression & Comparative Meta-Analyses.

Meta-regression	Moderator	Studies	Effect size	LCI	UCI	*P* value
National prevalence of CPR-E training	Female proportion	18	β: −0.3295	−1.0816	0.4226	0.3905
	Mean age	14	β: 0.0086	−0.0040	0.0211	0.1799
	GNI group	29	β: 0.1933	0.0228	0.3638	0.0262*
	Last year of data collection	27	β: −0.0001	−0.0153	0.0152	0.9915
National prevalence of CPR-V training	Female proportion	7	β: 1.1317	−0.6306	0.1498	0.2272
	Mean age	5	β: 0.0054	−0.0014	0.0123	0.1180
	GNI group	12	β: 0.0288	−0.0973	0.1550	0.6544
	Last year of data collection	11	β: 0.0033	−0.0040	0.0105	0.3765
National prevalence of AED-E training	Female proportion	3	β: −15.3760	−22.6357	8.1163	<0.0001*
	Mean age	3	β: 0.0985	−0.1332	0.3301	0.4047
	GNI group	6	β: −0.5104	−0.3215	0.3968	0.8062
	Last year of data collection	5	β: 0.0342	−0.0033	0.0717	0.0742
Comparative Meta-analyses	**Moderator**	**Studies**	**Effect size**	**LCI**	**UCI**	***P* value**
National prevalence of CPR-E Training	Female	11	OR: 0.91	0.62	1.33	0.62
	Education (above primary)	6	OR: 4.39	3.45	5.57	<0.00001*
	Occupation (employed)	5	OR: 1.89	0.59	6.12	0.29
National prevalence of CPR-V Training	Female	3	OR: 1.00	0.93	1.07	0.98

OR, Odds ratio; LCI, Lower confidence interval; UCI, Upper confidence interval; CPR-E training, Cardiopulmonary resuscitation training (ever); CPR-V training, Cardiopulmonary resuscitation training (valid); GNI, Gross national income; GDP, Gross domestic product; GSP, Gross state product.

* *P* value < 0.05.

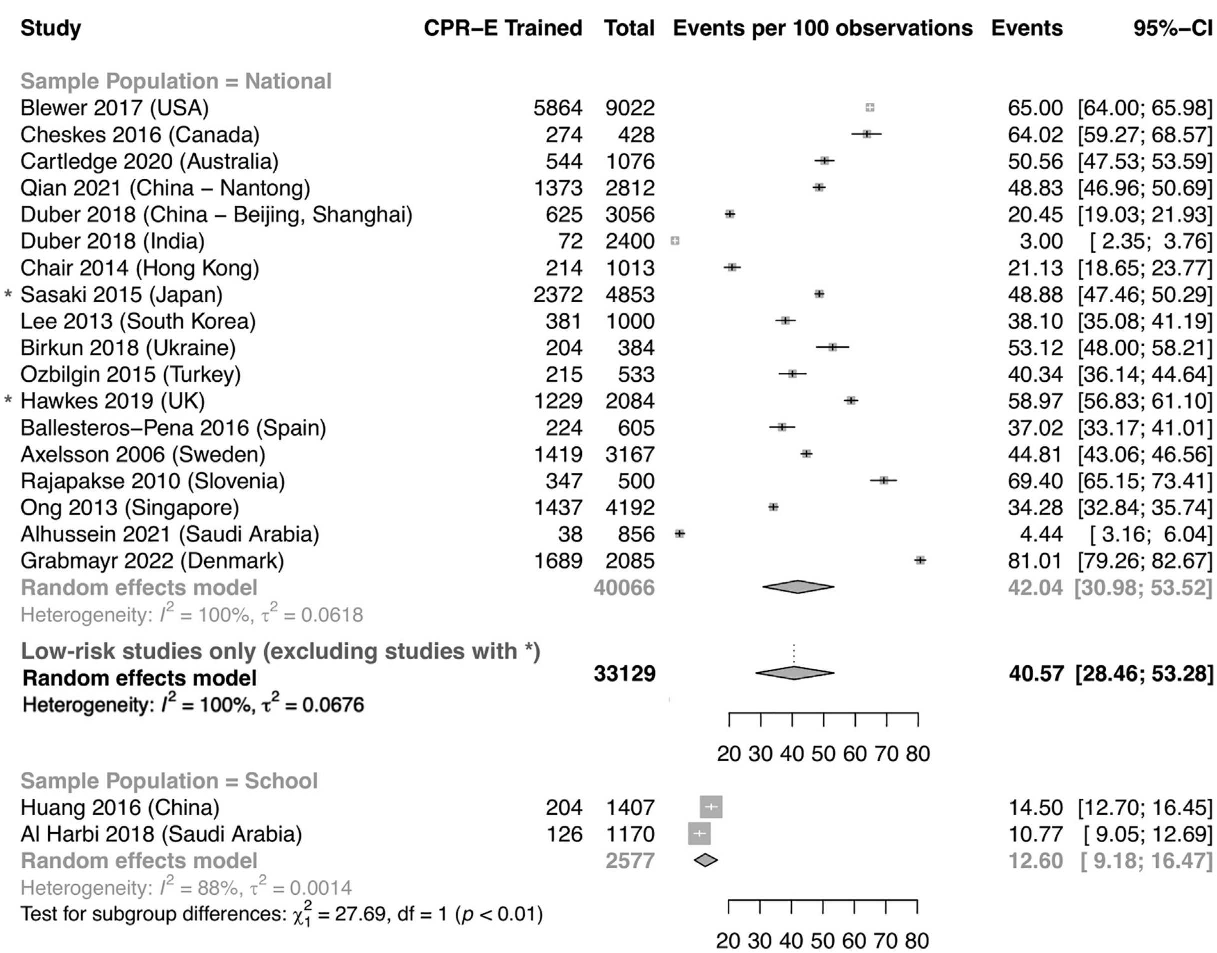

Fig. 2 – Overall CPR-E Prevalence.

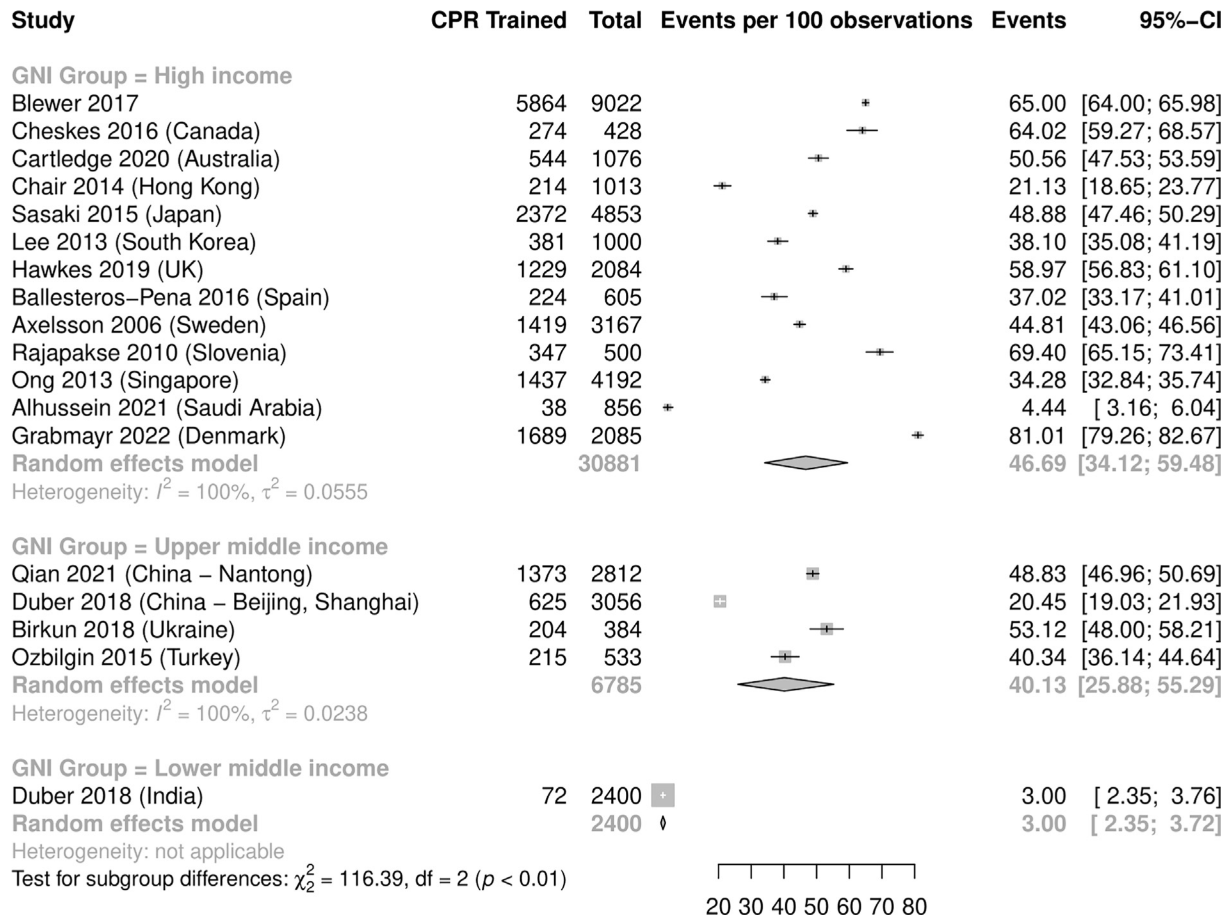

Fig. 3 – National CPR-E Prevalence by GNI Group.

Meta-regression & comparative Meta-analyses

Meta-regression

On univariate meta-regression of all 29 studies, the higher a country's GNI group, (β: 0.1933, 95%CI 0.0228 to 0.3638, p = 0.0262) the higher the national prevalence of CPR-E training (Table 2). This bubble plot can be found in Supplementary Material 3: Bubble Plot for CPRE/GNI Group Regression. However, proportion of females and mean age did not significantly influence the national prevalence of CPR-E training. On univariate meta-regression, proportion of females and GNI per capita did not significantly influence the national prevalence of CPR-V training. The last year of data collection did not influence the prevalence of CPR-E or CPR-V training. Meta-regression for other moderators was not attempted due to an insufficient number of studies.

Comparative Meta-analyses

On comparative meta-analysis, education above the primary school level (OR: 4.39, 95%CI 3.45 to 5.57, p <0.00001) significantly influenced the national prevalence of CPR-E training based on six studies. Female gender and being employed in an occupation did not significantly influence the national prevalence of CPR-E training. On comparative meta-analysis, female gender did not significantly influence the national prevalence of CPR-V training. On visual inspection, funnel plot for the comparative meta-analyses for sex (female and male) revealed no publication bias for comparative meta-analysis. This funnel plot can be found in Supplementary Material 2: Funnel Plot for Comparative Meta-analyses (Female).

Discussion

In this study, we found that the prevalence of ever having been trained in CPR in the general population globally ranged from 3% to 65%, with a pooled prevalence of 42.04%. This prevalence was lower, at 10.02%, when using a stricter definition of CPR training (valid training within 2-years). We found evidence of differences in prevalence between continents, a positive correlation with a country's income, and positive correlations with employment rate and education level. As compared to CPR training, the data surrounding prevalence of AED training is much scarcer. This is, to our knowledge, the most updated systematic review, and the only meta-analysis addressing this research question.

Contemporary guidelines, including the 2020 American Heart Association Guidelines for CPR and Emergency Cardiovascular Care,[64] advocate for the promotion of CPR mass training and awareness campaigns in the community. Having a sizeable proportion of the general population as layrescuers can increase the chance of an OHCA victim receiving bystander CPR. A Singaporean study has showed that public health interventions such as dispatch-assisted CPR, CPR and AED training, and a first responder mobile application (myResponder) were associated with increased bystander training, increasing CPR frequency and improving survival to hospital discharge after OHCA, compared with the preintervention time period.[65] However, large-scale programs to train and influence large groups of the population are resource-intensive, and an understanding of the global baseline, regional differences and disparities

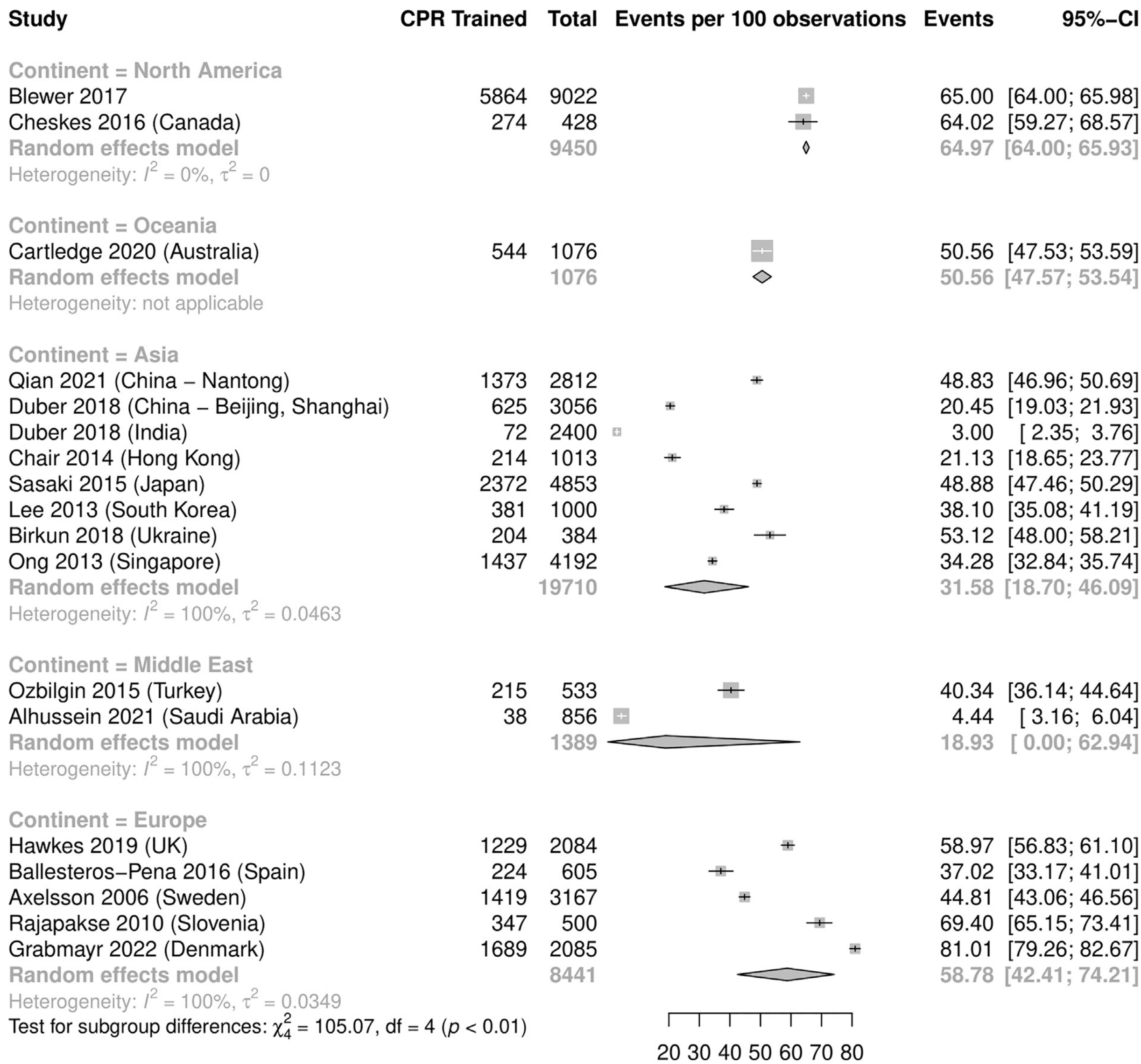

Fig. 4 – National CPR-E Prevalence by Continent.

are essential to guide resource allocation, design and implementation of such programs. Our study found a wide range of prevalence of CPR training across communities, which partially explains the large regional variation in bystander CPR rates observed in previous studies.[66] These findings suggest inequity in access to life-saving training globally, and by corollary, a gap in governmental and non-governmental funding priority in this area. Our study also provides a possible explanation of reduced bystander CPR rates observed in socioeconomically disadvantaged communities in some regions.[67–70]

The Hoy. et al [25] tool for quality assessment of prevalence studies was used to identify studies which had a lower risk of bias. Such studies possessed qualities such as having a sample with a close representation of the national population in relevant variables, a sampling frame with a true or close representation of the target population, or the usage of a census or random selection to select the sample, among other factors. When restricting our analysis to the highest quality studies, our estimate of the global prevalence of CPR-E training was 40.57%, and the estimate of global CPR-V training prevalence was 11.14%. Since several studies reported that a high percentage of bystanders are receptive to CPR training and that CPR training predicts bystander CPR, these low estimates suggest that global efforts to provide CPR training remain inadequate to maximise the performance of bystander CPR. Furthermore, the prevalence of CPR-E training was significantly different between countries of different GNI levels, with CPR prevalence at 46.79%, 40.13%, and 3.00% for high-, upper middle-, and lower middle-income levels respectively, hence suggesting a correlation between higher SES and higher CPR training.[71–73] On the national level, high GNI countries may have the financial capability to place a larger emphasis on CPR training, resulting in better national measures and resource allocation regarding CPR training applied across all states, regardless of individual state income. On the individual level, lower SES may create barriers such as financial barriers, information barriers, and barriers which lower personal motivation which discourage individuals from seeking CPR education.[68,69] As a result, the lower middle-income countries should be prioritised when it comes to BLS training.

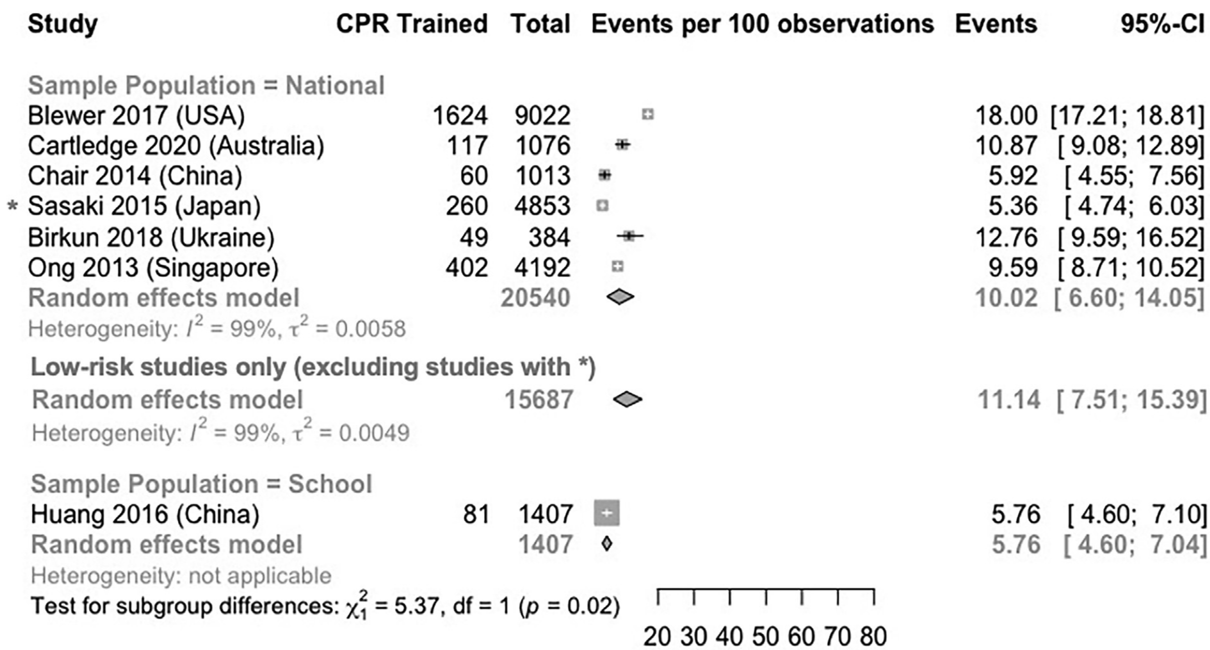

Fig. 5 – Overall CPR-V Prevalence.

In schools, the prevalence of CPR-E training was 12.60%, and the prevalence of CPR-V training was 5.76%. The “Kids Save Lives” Statement 2015, which highlights the importance of teaching CPR to school children worldwide, recommends two hours of CPR training annually from the age of twelve in schools worldwide, especially since children are responsive to instructions and learn easily.[70] However, our study revealed a gap in knowledge on CPR and AED training in schools despite the potential benefit of such training among younger age groups, which should be explored in future research.

Overall, the paucity of studies investigating the prevalence of only AED training although bystander AED intervention improves survival and functionally-favourable outcomes.[71] suggests that more research is needed in this area. Internationally, resources should be channeled towards establishing CPR training guidelines, which may eventually involve training locals to become CPR trainers themselves, working with local policymakers, healthcare professionals and experts to come up with CPR guidelines specific to their countries’ needs and culture, and the provision of training resources tailored to the country’s local languages. At a national level, governmental policies aiming to increase the reach of CPR training could be instituted. These measures could include the creation of a combined self-instruction and instructor-led courses with hands-on training, alternatives for self-directed training,[64] mandatory CPR training for workplaces, those applying for a drivers’ license, and as a prerequisite for school graduation,[72] and CPR training which is provided at low or subsidised rates at accessible locations.[68] Finally, individuals may be motivated at a personal level to pick up CPR as a life skill if there is greater education about the value of CPR in improving survival in cardiac arrest,[68] so greater public education is required especially among countries with a low prevalence of CPR training. This is particularly relevant among geographic regions which have a lower prevalence of CPR training, such as the Middle East and Asia.

For future research, we recommend that stakeholders in each geographical region conduct robust studies to estimate the proportions of the general population trained in CPR and AED. Data from these studies would serve as the basis for comparison to assess trends and evaluate public health programs and policies aimed at improving access to life-saving skills training. These studies need to employ probability sampling methods, and have clearly-stated definitions of what it means for someone to be trained. We also recommend that the prevalence of the general population trained in key life-savings skills such as CPR, be monitored as a metric when characterizing health systems, with community bystander interventions being an important component of an emergency care system.

Strengths and Limitations

This study is the first study to date which investigates the prevalence of CPR and AED training in populations worldwide. The limitation of this study is the high heterogeneity observed in the statistical analysis. This may be attributed to many factors, such as the lack of South American and African papers, the different methods in which data was collected and analysed, and the different ways CPR or AED training was defined. Additionally, the selection of only English language papers further limits the number of studies from non-English speaking countries, which are already underrepresented in our analysis. There was also no limitation on the year of publication, and the inclusion of older studies may have affected our current estimates of the global prevalence of CPR and AED training. Finally, there is a risk of misclassifying individual persons’ socioeconomic statuses using GNI, which is a regional-level indicator of socioeconomic status[73] However, we note that the finding of a significant, positive correlation was invariant even in our comparative meta-analysis of individual-level socioeconomic indicators (education level, employment status).

Conclusions

This systematic review and meta-analysis found that large regional variation exists in the data availability, and prevalence of CPR and AED training amongst laypersons. Socioeconomic status correlated with prevalence of CPR training and regional disparities were apparent between continents. As such, community bystander training should be promoted, particularly in Asia, Middle East and low-income regions, while data availability should be encouraged from under-represented regions.

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Conflicts of Interest

So Yeon Joyce Kong is an employee of Laerdal Medical, but has no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resuscitation.2023.109771.

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