

# Reply to “Decrease in Penicillin Sales in Brazil after Over-the-Counter Restrictions”

Yared Santa-Ana-Tellez,<sup>a</sup> Aukje K. Mantel-Teeuwisse,<sup>a</sup> Hubert G. M. Leufkens,<sup>a</sup>  Veronika J. Wirtz<sup>b,c</sup>

WHO Collaborating Centre for Pharmaceutical Policy & Regulation, Utrecht Institute for Pharmaceutical Sciences (UIPS), Utrecht, the Netherlands<sup>a</sup>; Department of Global Health, Boston University School of Public Health, Boston, Massachusetts, USA<sup>b</sup>; Center for Health Systems Research, National Institute of Public Health, Cuernavaca, Mexico<sup>c</sup>

We thank Lopes-Júnior et al. (1) for their interest in our study and the opportunity to clarify a number of points from our work. We agree with Lopes-Júnior et al. that the restrictions on over-the-counter (OTC) sales of antibiotics had a positive effect by decreasing the use of antibiotics in Brazil immediately after their implementation. In a previous study, we reported these changes in the overall use of antibiotics and stratified the data by subgroups measured in defined daily doses per 1,000 inhabitants per day (DDD/TID) (2). Brazil had an overall decrease in the level of use of antibiotics of 1.35 DDD/TID (13%) and significant decreases in the level of use of sulfonamides (0.41 DDD/TID, 46%), macrolides (0.47 DDD/TID, 26%), and penicillins (0.64 DDD/TID, 15%); however, we found that overall antibiotic use continued to grow after these immediate changes.

Effects of external factors such as growth of the pharmaceutical market as a whole were adjusted for in this analysis by taking a control group (antihypertensives) into account.

Our study of the seasonal variation of penicillin use in Mexico and Brazil is a more detailed analysis of the effect of the restriction of OTC sales in these two countries (3), where we focused the analysis on the seasonal variation in penicillin use as a measure of change in self-medication patterns. The differences between the results of our study and the study by Lopes-Júnior et al. (1) may be explained by differences in data sources and analysis techniques. Whereas Lopes-Júnior et al. (1) averaged the sales pre- and postenforcement of the restriction on sales and compared the differences in percentages, we used interrupted time series analysis of longitudinal data to measure the impact of the policy on the use of antibiotics. This robust quasiexperimental method controls for most threats to internal validity by adjusting for preexisting trends in study outcomes that are unrelated to the policy (4). Nevertheless, we agree with Lopes-Júnior et al. (1) that the surveillance of

antimicrobial prescription should be a common practice, not only in Brazil but in other Latin American countries. As recommended by international organizations (5), we also urge the implementation of nationally representative standardized data collection to accurately describe and compare the utilization of medicines in Latin American countries.

## REFERENCES

1. Lopes-Júnior R, de Sá Del Fiol F, Araujo JLO, de Toledo MI, Barberato-Filho S. 2015. Decrease in penicillin sales in Brazil after over-the-counter restrictions. *Antimicrob Agents Chemother* 59:5862–5863.
2. Santa-Ana-Tellez Y, Mantel-Teeuwisse AK, Dreser A, Leufkens HGM, Wirtz VJ. 2013. Impact of over-the-counter restrictions on antibiotic consumption in Brazil and Mexico. *PLoS One* 8:e75550. <http://dx.doi.org/10.1371/journal.pone.0075550>.
3. Santa-Ana-Tellez Y, Mantel-Teeuwisse AK, Leufkens HGM, Wirtz VJ. 2015. Seasonal variation in penicillin use in Mexico and Brazil: analysis of the impact of over-the-counter restrictions. *Antimicrob Agents Chemother* 59:105–110. <http://dx.doi.org/10.1128/AAC.03629-14>.
4. Wagner AK, Soumerai SB, Zhang F, Ross-Degnan D. 2002. Segmented regression analysis of interrupted time series studies in medication use research. *J Clin Pharm Ther* 27:299–309. <http://dx.doi.org/10.1046/j.1365-2710.2002.00430.x>.
5. World Health Organization. 2012. The evolving threat of antimicrobial resistance—options for action. World Health Organization, Geneva, Switzerland.

**Citation** Santa-Ana-Tellez Y, Mantel-Teeuwisse AK, Leufkens HGM, Wirtz VJ. 2015. Reply to “Decrease in penicillin sales in Brazil after over-the-counter restrictions.” *Antimicrob Agents Chemother* 59:5864. doi:10.1128/AAC.01128-15.  
Address correspondence to Veronika Wirtz, [vwirtz@bu.edu](mailto:vwirtz@bu.edu).  
This is a response to a letter by Lopes-Júnior et al. (doi:10.1128/AAC.01030-15).  
Copyright © 2015, American Society for Microbiology. All Rights Reserved.  
doi:10.1128/AAC.01128-15