PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Association between Hospitalization for Ambulatory Care Sensitive Conditions and Primary Health Care physician specialization: a cross-sectional ecological study in Curitiba (Brazil)
AUTHORS	Afonso, Marcelo; Shimizu, Helena; Merchan-Hamann, Edgar; Ramalho, Walter; Afonso, Tarcisio

VERSION 1 - REVIEW

REVIEWER	Juan Gérvas National School of Public Health, Madrid, Spain None declared. Please note that I have read the manuscript before be sent to the BMJ Open.
REVIEW RETURNED	10-Dec-2016

GENERAL COMMENTS	Title. Please, without question mark. Be assertive. Abstract. Please, mention Brazil (municipality of Curitiba, Paraná state (PR) Brazil). Also in Methodology and Conclusion. Introduction. Try to re-writte as : "ACSCs are conditions of needed hospitalization that can be avoided through the provision of timely and qualified PHC services". Please, use Family Medicine as it. You use (ACSC) and later on, and in the whole paper HACSC, please use always HACSC Methodology. What is Family Medicine and what is the difference with Family Physician? (... in the fields of 1) Family Medicine (FM); 2) Internal Medicine, Pediatrics or Gynecology and Obstetrics...). Change the phrase in "variables were presentedas “number equivalent to physicians with a 40-hour work week per 10,000 inhabitants” (“Equivalents”)". Juan Gérvas, MD, PhD, visiting professor, National School of Public Health, Madrid, Spain

REVIEWER	Gustavo Gusso University of São Paulo, Brazil
REVIEW RETURNED	31-Dec-2016

GENERAL COMMENTS	-Small typing errors as "HASSC" (line 18 - It needs english review: for ex, "an FHS..." (abstract) - "The MHU model and doctors’ working hours were used as predictor variables. Doctors were classified as 1) Family Physicians (FP); 2) Basic Specialty Physicians (BSP); or 3) Subspecialty Physicians (SUBP)" - what about those who didn´t do any residency; why do not consider them another cathegory?

	- This concept “number equivalent to physicians with a 40-hour work week per 10,000 inhabitants” should be replaced by Full Time Equivalent - Why just bacterial pneumonia (BP), angina andheart failure (HF)? - "...whose working hours were 15 times higher at FHS model MHUs than conventional (EAB) units" - 15 times higher? How was 15 times higher in working hours?

REVIEWER	Hongyue Wang Department of Biostatistics and Computational Biology University of Rochester Medical Center USA
REVIEW RETURNED	21-Mar-2017

GENERAL COMMENTS	The statistical analysis is inappropriate. It says that "model 1 included the variable income and, among the socioeconomic variables exhibiting high collinearity, the variable with the greatest beta value in simple regression for the dependent variable under study. Variables with p-value lower that 0.20 were maintained and fixed for model 2. " There are two issues in this statement. First, the about value of the regression coefficient beta cannot used as an indicator of the strength of colinearity. Second, selecting covariate to the multiple regression through univariatre regression is an invalid method. This was discussed in a recent paper published in Shanghai Archives of Psychiatry (2016, vol 28, no. 6 pp-355-360).

VERSION 1 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:
Reviewer: 1
Reviewer Name: Juan Gérvas
Institution and Country: National School of Public Health, Madrid, Spain

Comment	Answer
Title. Please, without question mark. Be assertive.	Comment accepted. Please read in Page 1 of the manuscript.
Abstract. Please, mention Brazil (municipality of Curitiba, Paraná state (PR) Brazil). Also in Methodology and Conclusion.	Comment accepted. Please read in Pages 1, 3, 12 and 15 of the manuscript.
Introduction. Try to re-writte as : "ACSCs are conditions of needed hospitalization that can be avoided through the provision of timely and qualified PHC services ".	Comment accepted. Please read in Page 3 of the manuscript.
Please, use Family Medicine as it.	Comment accepted. Please read in Pages 1, 3 and 15 of the manuscript.
You use (ACSC) and later on, and in the whole paper HACSC, please use always	Comment accepted. Please read in Pages 3, 5, 8-11, 13 and 14 of the manuscript.

HACSC.	
Methodology. What is Family Medicine and what is the difference with Family Physician? (... in the fields of 1) Family Medicine (FM); 2) Internal Medicine, Pediatrics or Gynecology and Obstetrics...).	In Brazil, designation for the Primary Health Care physician as Family Physician is frequent because the main work field for these physicians is the Family Health Strategy, where there is no obligation for specialization. The authors decided to emphasize the concept that Family Physicians are the specialized doctors in this area for the purpose of this study to avoid misinterpretation.
Change the phrase in "variables were presented as “number equivalent to physicians with a 40-hour work week per 10,000 inhabitants” (“Equivalents”)".	Comment accepted. Please read in Pages 4, 8, 11 and 12 of the manuscript.

Reviewer(s)' Comments to Author:
Reviewer: 2
Reviewer Name: Gustavo Gusso
Institution and Country: University of São Paulo, Brazil

Comment	Answer
Small typing errors as "HASSC" (line 18).	Comment accepted. Please read in Pages 1 and 3 of the manuscript.
It needs english review: for ex, "an FHS..." (abstract).	Comment accepted. Please check the attached document “Translation_Certificate”.
"The MHU model and doctors’ working hours were used as predictor variables. Doctors were classified as 1) Family Physicians (FP); 2) Basic Specialty Physicians (BSP); or 3) Subspecialty Physicians (SUBP)" - what about those who didn´t do any residency; why do not consider them another cathegory?	We didn’t expect any positive effect associated by non-specialized physicians, but we did have doubts whether specializations other than Family Medicine associate to positive effects in PHC. So, we didn’t consider relevant create a separated category for non-specialized physicians. Moreover, those without residency were 46.7% of total, so their impact was evaluated in the categories “Average supply” and “Total of Physicians at the same MHU for 12 months”.
This concept “number equivalent to physicians with a 40-hour work week per 10,000 inhabitants” should be replaced by Full Time Equivalent	Comment accepted. Please read in Pages 4, 8, 11 and 12 of the manuscript.
Why just bacterial pneumonia (BP), angina andheart failure (HF)?	Bacterial pneumonia (BP), angina and heart failure (HF) were respectively the main ambulatory care sensitive conditions per age group - childhood (0-14 years), adulthood (15-64 years) and elderly (65 years

	and older). It was presented in Page 4 of the manuscript.
"...whose working hours were 15 times higher at FHS model MHUs than conventional (EAB) units" - 15 times higher? How was 15 times higher in working hours?	The differences of working hours between FHS model MHUs and conventional model MHUs were presented in Table 1 (page 8). The difference reported is related only to Family Physicians. The mean of Full Time Equivalents of **Family Physicians** per 10.000 inhabitants in FHS model MHUs were 0.89 while in conventional model MHUs were 0.06. This was the greatest difference noted between the two models of MHUs.

Reviewer(s)' Comments to Author:
Reviewer: 3
Reviewer Name: Hongyue Wang
Institution and Country: Department of Biostatistics and Computational Biology, University of Rochester Medical Center, USA

Comment	Answer
The statistical analysis is inappropriate. It says that "model 1 included the variable income and, among the socioeconomic variables exhibiting high collinearity, the variable with the greatest beta value in simple regression for the dependent variable under study. Variables with p-value lower that 0.20 were maintained and fixed for model 2. " There are two issues in this statement. First, the about value of the regression coefficient beta cannot used as an indicator of the strength of colinearity.	We agree that Beta coefficient can't be used as an indicator of the intensity of the collinearity. Nevertheless, we reassure that the factor VIF - Factor of Inflation of Variance - was adequately used to measure the intensity of multicollinearity in the models used, as presented in "Data Analysis" (page 5): "*Calculation of the variance inflation factor (VIF) identified high collinearity (VIF>5) between the socioeconomic variables Lit.Rt, Pop.Perc and Perc.House, preventing their concomitant use in the analysis, but not between variables related to physician working hours*." The VIF factor is used to describe how much multicollinearity (correlation between predictors) exists in a regression analysis. Multicollinearity is problematic because it can increase the variance of the regression coefficients making them unstable and difficult to interpret. The following guidelines are used to interpret the VIF: (VIF = 1 : Not correlated), (1 < VIF < 5 : Moderately correlated) and (VIF > 5 : Highly correlated).
Second, selecting covariate to the multiple regression through univariatre regression is an invalid method. This was discussed in a recent paper published in Shanghai Archives of Psychiatry (2016, vol 28,	The selection of socioeconomic variables as explanatory variables of health conditions was not based on the results of univariate regression, but rather on the explicit knowledge that these socioeconomic conditions have an important effect on the health conditions of the population (Page 4 of

no. 6 pp-355-360).	the manuscript). However, as might be expected, it was found, through the VIF factor, that there is high collinearity among some of the socioeconomic variables, namely: 1) literacy rate in the population aged 10 years or older (Lit.Rt); 2) percentage of blacks, mulattos and native Brazilians (Pop.Perc); and 3) percentage of households with per capita income below the minimum wage (Perc.House) (Page 5 of the manuscript). As the presence of socioeconomic variables is part of the model construction, but these could not be considered together, due to the presence of severe multicollinearity, only one of these three socioeconomic variables should be included in the equation. Only as a criterion for selection among them were the correlation intensities between each socioeconomic variable and the hospitalization rate considered appropriately used. In the univariate linear regression there exists direct relationship between the correlation coefficient r and the value of beta (b): $r = b.(\sigma x / \sigma y)$. Therefore, the above criterion for selection among socioeconomic variables was adequately based on the correlation intensities between the socioeconomic variables and the hospitalization rate considered, considering that the selection of the presence of these variables in the model had already been planned based on the assumptions of the model.[1] [2]

VERSION 2 – REVIEW

REVIEWER	Juan Gérvas National School of Public Health, Madrid, Spain
REVIEW RETURNED	30-Apr-2017

GENERAL COMMENTS	This version is much better than the previous one. Just, please delate in the Abstract, Results:...both results were statistically significant at 5%.

[1] Kleinbaum, D., Kupper, L., Nizam, A., & Rosenberg, E. (2013). *Applied regression analysis and other multivariable methods*. Nelson Education.
[2] Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7). Upper Saddle River, NJ: Pearson.

VERSION 2 – AUTHOR RESPONSE

We also accepted Dr Gervas' suggestion and deleted the phrase "both results were statistically significant at 5%" in the "Abstract".