

Factors associated with the performance of primary dental health care in Brazil

A multilevel approach

Clarice Magalhães Rodrigues dos Reis, PhD^a, Suellen da Rocha Mendes, PhD^a, Antônio Thomaz Gonzaga da Matta-Machado, PhD^b, Juliana Vaz de Melo Mambrini, PhD^c, Marcos Azeredo Furquim Werneck, PhD^{a,*}, Mauro Henrique Nogueira Guimarães de Abreu, PhD^a

Abstract

This study evaluated the factors associated with the performance of Brazilian Oral Health Teams (OHTs).

This is multilevel research that used data from 12,386 Brazilian OHTs in 2012. The OHTs performance was estimated in previous research by using Item Response Theory model, which employed 20 questions about dental procedures in Primary Care. The first level covariates were based on OHTs procedures such as: the record of pregnant woman dental appointment, provision of dentistry home care, dental appointments scheduled choices, and OHTs in charge for more than 5000 individuals. Moreover, the use of guidelines was accessed concerning delivering prostheses in primary care, referring to secondary care, referring to suspected oral cancer, and providing care towards patients with special needs. Variables included in level 2 were GINI and Human Development Index. Multilevel linear regression models were constructed, estimating linear regression coefficients, 95% confidence intervals, and *P* values.

OHTs performance was different among the 3,613 municipalities analyzed ($P < .001$), with 36.7% of the variation in the performance of the OHTs being attributed to the variability between municipalities. The adjusted model showed that higher performance OHTs reported attention to pregnant women, dentistry home care and use of dental care guidelines ($P < .001$). There were lower performance scores for those OHTs with more restricted scheduling ($P < .05$), compared to those that reported scheduling appointments at any day and time. The best OHTs and population ratio led to a better performance score ($P = .010$). At the municipal level, better socioeconomic status was associated with better performance of the OHTs ($P < .001$).

OHTs with higher performance are associated with oral health services organizations and municipalities' socioeconomic status.

Abbreviations: IRT = item response theory, OHTs = Brazilian Oral Health Teams, PHC = primary health care, PMAQ-AB = Programa Nacional de Melhoria do Acesso e Qualidade da Atenção Básica [Portuguese].

Keywords: health care evaluation, public health dentistry, primary health care

1. Introduction

In 2000, the Brazilian Ministry of Health included oral health services in primary health care (PHC) program creating oral health teams (OHTs). This was an important mark for spreading

oral health care services in Brazil. In 2004, national oral health policy was launched aimed to improve access to OHTs in PHC centers and to provide secondary care services creating the Dental Specialties Centers.^[1,2]

Editor: Fabricio Oliveira.

Keywords: Health Care Evaluation, Primary Health Care, Public Health Dentistry.

The authors thank the financial support of the Brazilian research agencies: Coordination of Superior Level Staff Improvement (CAPES, in Portuguese: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), The Brazilian National Council for Scientific and Technological Development (CNPq, in Portuguese: Conselho Nacional de Desenvolvimento Científico e Tecnológico), and Research Support Foundation of the State of Minas Gerais (FAPEMIG, in Portuguese: Fundação de Amparo à Pesquisa do Estado de Minas Gerais).

The authors would like to thank "Pró-Reitoria de Pesquisa da Universidade Federal de Minas Gerais" for their financial support.

Pró-Reitoria de Pesquisa da Universidade Federal de Minas Gerais: Mauro Henrique Nogueira Guimarães de Abreu and Marcos Azeredo Furquim Werneck.

The authors have no conflicts of interest to disclose.

^a Department of Community and Preventive Dentistry, ^b Department of Preventive and Social Medicine, School of Medicine, Universidade Federal de Minas Gerais,

^c René Rachou Research Center, FIOCRUZ, Belo Horizonte, Minas Gerais, Brazil.

* Correspondence: Marcos Azeredo Furquim Werneck, Avenida Antonio Carlos, 6627 – CEP 31270.800 Belo Horizonte, Minas Gerais, Brazil (e-mail: mfurquim52@gmail.com).

Copyright © 2020 the Author(s). Published by Wolters Kluwer Health, Inc.

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Rodrigues dos Reis CM, da Rocha Mendes S, Gonzaga da Matta-Machado AT, Vaz de Melo Mambrini J, Werneck MAF, Guimaraes de Abreu MHN. Factors associated with the performance of primary dental health care in Brazil: a multilevel approach. *Medicine* 2020;99:17(e19872).

Received: 15 July 2019 / Received in final form: 11 March 2020 / Accepted: 11 March 2020

<http://dx.doi.org/10.1097/MD.00000000000019872>

Table 1
Multilevel analysis showing the association of individual and municipal variables according to IRT score performance.

Variables	Null model	Model 1*	Model 2†	Model 3‡
	β (CI 95%)	β (CI 95%)	β (CI 95%)	β (CI 95%)
Intercept	-0.144 (-0.167 to -0.121)	-0.533 (-0.568 to -0.499)	-1.493 (-1.816 to -1.170)	-0.763 (-1.034 to -0.492)
Dental appointment for a pregnant woman		0.148 (0.121 to 0.176)		0.149 (0.122 to 0.176)
Provision of dentistry home care		0.175 (0.148 to 0.203)		0.166 (0.014 to 0.194)
How dental appointments are scheduled				
Anyday, anytime		1		1
Anyday, specific time		-0.054 (-0.095 to -0.013)		-0.042 (-0.083 to -0.001)
Fixed d - up to 3 d		-0.128 (-0.164 to -0.092)		-0.099 (-0.135 to -0.063)
Fixed days - more than 3 d		-0.241 (-0.290 to -0.191)		-0.206 (-0.259 to -0.191)
Others		-0.243 (-0.278 to -0.209)		-0.225 (-0.259 to -0.191)
Are there guidelines for providing prosthesis in primary care?		0.344 (0.309 to 0.380)		0.338 (0.303 to 0.373)
Are there guidelines for referral for secondary care?		0.193 (0.157 to 0.228)		0.177 (0.142 to 0.212)
Are there guidelines for referral for checking oral cancer?		0.249 (0.213 to 0.285)		0.229 (0.194 to 0.265)
Are there guidelines for providing care for individuals with special needs?		0.121 (0.086 to 0.156)		0.118 (0.083 to 0.153)
OHT in charge for more than 5000 individuals		-0.056 (-0.102 to -0.010)		-0.060 (-0.106 to -0.014)
MHDI			2.908 (2.598 to 3.226)	1.183 (0.909 to 1.457)
Gini Index			-1.151 (-1.524 to -0.778)	-1.092 (-1.034 to -0.491)
Variance partition				
Level 1	0.474	0.414	0.474	0.412
Level 2	0.275	0.134	0.219	0.124

IRT = item response theory, OHTs = Brazilian oral health teams, MHDI = municipal human development index.

* Model with variables at Level 1.

† Model with variables at Level 2.

‡ Model with variables at Level 1 and 2.

MHDI coefficients were positively associated with OHTs performance (Table 1).

Homoscedasticity and normality were not violated as checked by residuals analysis. VIF values were lower than two for all level 1 variables indicating no multicollinearity problems.

4. Discussion

This research showed that Brazilian OHTs with higher performance were positively associated with better oral health care organizational and better socioeconomic status. The OHT structural factors positively associated with higher performance were a recording of pregnant women’s dental appointment, provision of dentistry home care, and the use of guidelines for guiding the work process. At the municipal level, the MHDI was positively associated.

The Brazilian Oral Health Policy emphasizes the need to provide dental care according to an individual’s life condition such as during pregnancy and facing special needs conditions. Thus, the results that linked OHTs higher performance with dental care provided to pregnant women and individuals with

special needs are in concordance with the Oral Health Policy.^[17,18] Providing home dentistry care has been shown as an important device to promote health care.^[19] This study shows that higher performance OHTs tend to provide more than service which indicates an improvement in the OHTs work process.

Those results might represent an improvement in the access to vulnerable populations into dentistry primary care services access, which is important to minimize disparities among population subgroups. For Starfield, reducing inequalities is a key goal of primary care facilities.^[10]

The use of guidelines was positively associated with OHTs higher performance. Guidelines are developed to support health care providers in the diagnosis and treatment of patients. In dental care, those guidelines reinforce dentists’ continuing education to improve clinical practice. The scientific support provided by using guidelines may reduce the gap between the dentistry research and clinical practice, and contribute to enhancing the quality of care provided.^[20,21] At the municipal level, better socioeconomic status was associated with OHT higher performance. This result shows that contextual factors^[11] as MHDI might contribute to higher OHTs performance. The

assessment of enabling contextual factors on dental services utilization has identified the association between some contextual variables with dental services utilization.^[12,22] The “Inverse Care Law” proposed by Hart (1971)^[23] says that “the availability of good medical care tends to vary inversely with the need for it in the population served.” This statement is also applied to the Brazilian National Health System. In fact, municipalities with better socioeconomic status tend to deliver better oral health care services counting with more structured health care units, and more qualified OHTs. Thus, usually, those municipalities provide more dental appointments and a variety of procedures.^[24,25] On the contrary, municipalities facing worse socioeconomic status tend to present oral health care services in worse conditions. Besides the quality of the services provided, the patient-dental professional communication tends to be worse in economically disadvantaged areas.^[25]

As a Ministry of Health mandate, the 2012 PMAQ-AB was limited to evaluate only 50% of the Brazilian OHTs, and the municipal managers were responsible for selecting those teams. This could have caused selection bias. Also, information bias might be considered, as PMAQ-AB is a pay for performance program, which could lead to positive responses. The strengths of this study are that the results are based on a large dataset and in an innovative analysis, based on the psychometric properties of dental questions of PMAQ-AB through the IRT application and multilevel analyses. Future studies should evaluate other covariables that may be influencing the performance of OHTs and are encouraged, especially in other PMAQ-AB evaluation cycles.

Author contributions

Conceptualization: Clarice Magalhães Rodrigues dos Reis, Juliana Vaz de Melo Mambrini, Marcos Azeredo Furquim Werneck, Mauro Henrique Nogueira Guimarães de Abreu.

Data curation: Clarice Magalhães Rodrigues dos Reis, Antonio Thomaz Gonzaga Matta-Machado, Mauro Henrique Nogueira Guimarães de Abreu.

Formal analysis: Clarice Magalhães Rodrigues dos Reis, Suellen da Rocha Mendes, Juliana Vaz de Melo Mambrini, Mauro Henrique Nogueira Guimarães de Abreu.

Funding acquisition: Clarice Magalhães Rodrigues dos Reis, Mauro Henrique Nogueira Guimarães de Abreu and Marcos Azeredo Furquim Werneck.

Investigation: Clarice Magalhães Rodrigues dos Reis, Antonio Thomaz Gonzaga Matta-Machado, Juliana Vaz de Melo Mambrini, Marcos Azeredo Furquim Werneck, Mauro Henrique Nogueira Guimarães de Abreu.

Methodology: Clarice Magalhães Rodrigues dos Reis, Suellen da Rocha Mendes, Antonio Thomaz Gonzaga Matta-Machado, Juliana Vaz de Melo Mambrini, Marcos Azeredo Furquim Werneck, Mauro Henrique Nogueira Guimarães de Abreu.

Software: Juliana Vaz de Melo Mambrini.

Supervision: Marcos Azeredo Furquim Werneck.

Writing – original draft: Clarice Magalhães Rodrigues dos Reis, Suellen da Rocha Mendes, Antonio Thomaz Gonzaga Matta-Machado, Juliana Vaz de Melo Mambrini, Marcos Azeredo Furquim Werneck, Mauro Henrique Nogueira Guimarães de Abreu.

Writing – review and editing: Clarice Magalhães Rodrigues dos Reis, Antonio Thomaz Gonzaga Matta-Machado, Juliana Vaz de Melo Mambrini, Marcos Azeredo Furquim Werneck, Mauro Henrique Nogueira Guimarães de Abreu.

References

- Junqueira SR, Pannuti CM, Rode SM. Oral health in Brazil—Part I: public oral health policies. *Braz Oral Res* 2008;22(Spec Iss 1):8–17.
- Pucca GA Jr, Costa JFR, Chagas LD, et al. Oral health policies in Brazil. *Braz Oral Res* 2009;23(Spec Iss 1):9–16.
- Godoi H, Mello ALSF, Caetano JC. An oral health care network organized by large municipalities in Santa Catarina state, Brazil [Portuguese]. *Cad Saude Publica* 2014;30:318–32.
- Santos AM, Assis MMA. From fragmentation to integrality: constructing and reconstructing the practice of buccal health in the Alagoinhas (BA) Family Health Program [portuguese]. *Cien Saude Colet* 2006;11:53–61.
- Martins RC, Reis CM, Matta Machado AT, et al. Relationship between primary and secondary dental care in public health services in Brazil. *PLoS One* 2016;11:e0164986.
- Reis CM, Matta-Machado AT, Amaral JH, et al. Describing the primary care actions of oral health teams in Brazil. *Int J Environ Res Public Health* 2015;12:667–78.
- Reis CMR, Mambrini JVM, Matta-Machado ATG, et al. Primary dental care evaluation in Brazil: an item response theory approach. 2017. *J Public Health Dent* 2017;77:317–24.
- Turci MA, Lima-Costa MF, Macinko J. The influence of structural and organizational factors on the performance of primary health care in Belo Horizonte, Minas Gerais State, Brazil, according to nurses and managers. *Cad Saude Publica* 2015;31:1941–52.
- Nunes BP, Thumé E, Tomasi E, et al. Socioeconomic inequalities in the access to and quality of health care services. *Rev Saude Publica* 2014;48:968–76.
- Starfield B. Primary care: an increasingly important contributor to effectiveness, equity, and efficiency of health services. *SESPAS report* 2012. *Gac Sanit* 2012;26:20–6.
- Andersen RM, Davidson PL, Kominski GF. Improving access to care in America: individual and contextual indicators. *Changing the US Health Care System: key issues in health services policy and management* 4th ed. San Francisco: Jossey-Bass; 2014;3–1. Volume 1.
- Rebello Vieira JM, Rebello MAB, Martins NMO, et al. Contextual and individual determinants of non-utilization of dental services among Brazilian adults. *J Public Health Dent* 2019;79:60–70.
- Herkrath FJ, Vettore MV, Werneck GL. Contextual and individual factors associated with dental services utilization by Brazilian adult: a multilevel analysis. *PLoS One* 2018;13:e0192771.
- Muirhead VE, Quinónez C, Figueiredo R, et al. Predictors of dental care utilization among working poor Canadians. *Community Dent Oral Epidemiol* 2009;37:199–208.
- Baldani MH, Rocha JS, Fadel CB, et al. Assessing the role of appropriate primary health care on the use of dental services by Brazilian low-income preschool children. *Cad Saude Publica* 2017;33:e00158116201.
- Samejima FA. Estimation of latent ability using a response pattern of graded scores. *Psychometrika Monograph* 1968;34:100.
- Brasil. Ministério da Saude. Diretrizes da política nacional de saude bucal, Brasília: Ministerio da Saude, 2004. www.saude.gov.br/bucal, Accessed Jul 2 2018.
- Fernandes LS, Peres MA. Association between primary dental care and municipal socioeconomic indicators. *Rev Saude Publica* 2005;39:930–6.
- Komulainen K, Ylostalo P, Syrjala AM, et al. Preference for dentist's home visits among older people. *Community Dent Oral Epidemiol* 2012;4:89–95.
- Van der Sanden WJM, Mettes DG, Plasschaert AJM, et al. Clinical practice guidelines in dentistry: opinions of dental practitioners on their contribution to the quality of dental care. *Qual Saf Health Care* 2003;12:107–11.
- Faggion CM Jr. The development of evidence-based guidelines in dentistry. *J Dent Educ* 2013;77:124–36.
- Herkrath FJ, Vettore MV, Werneck GL. Contextual and individual factors associated with dental services utilization by Brazilian adults: a multilevel analysis. *Plos One* 2018;13:e0192771.
- Hart JT. The inverse care law. *Lancet* 1971;1:405–12.
- Baumgarten A, Hugo FN, Bulgarelli AF, et al. Curative procedures of oral health and structural characteristics of primary dental care. *Rev Saude Publica* 2018;52:35.
- Harris RV. Do 'poor areas' get the services they deserve? The role of dental services in structural inequalities in oral health. *Community Dent Health* 2016;33:164–7.