MUNICIPAL AND DEPARTMENTAL PREDICTORS ASSOCIATED WITH THE PREVALENCE OF DIABETES MELLITUS IN COLOMBIA: A CROSS-SECTIONAL ANALYSIS

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Background and objective

Scientific evidence on contextual predictors of diabetes related to different levels of geographic location in Colombia is scant. Therefore, the objective of the study was to analyze the municipal and departmental factors associated with the prevalence of diabetes in Colombia.

Methodology

Study design: Cross-sectional and ecological analytical study of secondary sources at the population level.

Dependent variable and source of information:

- Prevalence of diabetes mellitus at the municipal level collected from the Colombian High-Cost Account database.

Independent variables and sources of information:

- Proportion of households with experience of self-consumption of food at the departmental level collected from the National Nutritional Situation Survey (ENSIN 2015).
- Percentage of general population patients with a Body Mass Index (BMI) of 20-25 Kg/m2 at the municipal level collected from the Colombian High- Cost Account database.
- Proportion of individuals aged 60 years or older and the proportion of women for each municipality was estimated from the 2018 National Census population projections.

Statistical analysis plan

Statistical model: We developed a two-level data structure, level 1 (municipalities) and level 2 (departments). We fit a multilevel linear regression model with random intercepts. We report the regression coefficients with 95% CI, the variances of both levels and the intraclass correlation coefficient (ICC).

Null model:

$$\boldsymbol{Diabetes\ prevalence_{ij}} = \beta_{0_{ij}} + u_{0_j} + e_{0_{ij}}$$

$i = Level\ 1\ (municipalities)$

$j = Level\ 2\ (departments)$

$\beta_{0_{ij}} = Intercept\ value$

$u_{0_j} = Variance\ of\ level\ 2\ residuals$

$e_{0_{ij}} = Variance\ of\ level\ 1\ residuals$

Model with municipality predictors:

$$\boldsymbol{Diabetes\ prevalence_{ij}} = \beta_{0_{ij}} + BMI_{ij} + Age_{ij} + Female_{ij} + u_{0_j} + e_{0_{ij}}$$

Model with municipality and department predictors:

$$\boldsymbol{Diabetes\ prevalence_{ij}} = \beta_{0_{ij}} + BMI_{ij} + Age_{ij} + Female_{ij} + Self\ consumption_j + u_{0_j} + e_{0_{ij}}$$

Results

- The ICC of the null model was 25.52%. The level 1 predictors statistically associated with diabetes prevalence were the proportion of patients with adequate BMI control (beta coefficient -0.007 (-0.013 to -0.001)), the proportion of individuals aged 60 years or older (beta coefficient 0.016 (0.001 to 0.031)), and the proportion of women (beta coefficient 0.202 (0.168 to 0.236)) with an ICC of 20.66%.

- After adjusting for level 1 predictors, the proportion of households with experience of self-consumption of food* was the contextual predictor (level 2) associated with diabetes prevalence (beta coefficient -0.027 (-0.044 to -0.011)) with an ICC of 16.67%.

- That is, the greater the proportion of households that produce food at home at the departmental level, the lower the prevalence of diabetes at the municipal level.

Table 1. Multilevel linear regression model results

	Null model	Model with municipality predictors	Model with municipality and department predictors
Fixed effects	**Coefficients (95% IC)**	**Coefficients (95% IC)**	**Coefficients (95% IC)**
Intercept	1.404 (1.171 to 1.635)	-9.791 (-12.028 to -7.535)	-9.141 (-11.385 to -6.878)
Level 1 (municipalities)			
Proportion of BMI 20-25 kg/m²	---	-0.007 (-0.013 to -0.001)	-0.007 (-0.013 to -0.001)
Proportion 60 years or more	---	0.016 (0.001 to 0.031)	0.017 (0.002 to 0.032)
Female proportion	---	0.202 (0.168 to 0.236)	0.200 (0.167 to 0.234)
Level 2 (departments)			
Proportion of self-consumption of food*	---	---	-0.027 (-0.044 to -0.011)
Random effects	**Variance**	**Variance**	**Variance**
Level 1 (municipalities)	1.077	0.957	0.954
Level 2 (departments)	0.371	0.250	0.189
Intracluster correlation coefficient (ICC)	25.621%	20.712%	16.535%
Relative change variances			
Level 1 (municipalities)	---	11.142%	11.420%
Level 2 (departments)	---	32.614%	49.056%
Relative change ICC	---	19.160%	35.463%
Goodness of fit			
Akaike	3346.585	3199.075	3198.477

***Proportion of self-consumption of food:** Percentage of households that implemented protective factors for food security based on self-Consumption, such as gardening for food production or animal husbandry and ways other than purchasing to obtain food (ENSIN Survey 2015).

Intracluster correlation coefficient (ICC):

$$\boldsymbol{ICC} = \frac{Variance\ level\ 2}{(Variance\ level\ 1 + Variance\ level\ 2)} * 100$$

Relative change variances:

$$\boldsymbol{Relative\ change} = \frac{Null\ model\ variance\ - Current\ model\ variance}{Null\ model\ variance} * 100$$

Conclusions

This study suggests that food sovereignty explained by the higher proportion of departments with households that prepare their own food and have local production of fruits, vegetables and animals for human consumption, have lower proportions of diabetes at the municipal level. Contributing to the hypothesis that contextual factors, related to individual, demographic and social determinants, as well as diets low in industrialized foods, may partly explain the prevalence of diabetes at the municipal level in Colombia.