Vulnerability Level of Spatial Units and Adolescent Fertility in Colombia

Vulnerability of Spatial Units for Adolescent Fertility in Colombia: an Estimation Based on Census and CRVS Data

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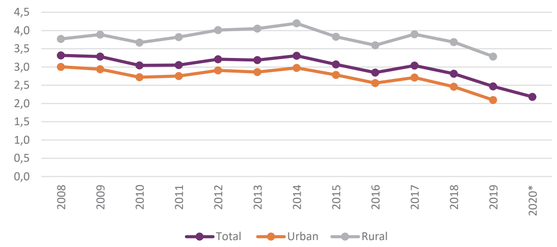
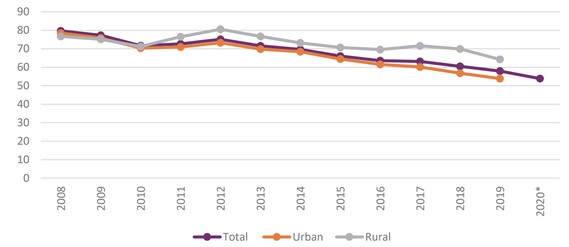
Introduction

In Colombia, adolescents who become mothers usually belong to the most vulnerable populations: living in the poorest contexts, with the lowest educational levels or as part of an ethnic minority group (indigenous or afro-descendant). For these adolescents, getting pregnant and having a child worsens their vulnerability as they face much fewer opportunities to overcome the poverty and inequity trap. **Reducing pregnancies among children and adolescents (aged 10-19) is one of the principal Sustainable Development Goals (SDG)—SDG 3.7.2—and the global 2030 Agenda.** Like many countries in the Latin American and Caribbean region and globally, Colombia has focused its efforts—from multiple stakeholders—on preventing adolescent pregnancies.

Specific fertility rate for 10-14. National total according to urban - rural. 2008 - 2020*. Source: CRVS, DANE



Specific fertility rate for 15-19. National total according to urban - rural. 2008 - 2020*. Source: CRVS, DANE



In Colombia, in the last decade there has been evidence of a reduction in adolescent and child fertility. However, when disaggregated by urban/rural, gaps in this reduction are revealed. For example, the gap has continued to widen steadily, which shows a slowing and unbalanced progress in urban areas in relation to a gap that has been systematically widening in rural areas.

This study aims to identify spatial units (residential blocks) with the highest levels of vulnerability to the occurrence of child and adolescent pregnancies. The study is based on the current knowledge that the combination of multiple associated factors present in the adolescents' environment puts them in a higher vulnerability, at the risk of becoming mothers at an earlier age.

Data

We used the **2018 Housing Census data and civil registration and vital statistics (CRVS) data between 2017 and 2019** from the National Statistics Office—NSO (DANE). The unit of analysis was "residential block" the smallest spatial unit of division for aggregated census data; they are not uniformly defined but delimited by geographical, cultural, and natural conditions. Out of the 504.738 residential blocks in the 1.122 municipalities of Colombia, we included 431.131 in the analysis based on the completeness of the information, geographical precision, and variability.

We selected the variables based on the current knowledge about the association of adolescent pregnancy with socioeconomic (education and poverty), cultural (ethnicity), and interpersonal factors (family history of adolescent pregnancies, single-parent household, and early unions). From the Housing Census we calculated eight vulnerability indicators: i) % of girls aged 10-14; ii) % of adolescent girls aged 15-19; iii) % of girls aged 5-19 not attending school; iv) % of girls under 19 years of age who are mothers; v) % of women who were adolescent mothers according to the age of their last child; vi) % of homes with early unions from girls under 14 (girls who stated their civil status as being in a union or having been united); vii) % of homes with early unions from girls under 14; viii) % of single-parent homes. And from the CRVS, we obtained data on the live births of mothers aged 10-14 and 15-19 at the residential block level.

Research methods

We conducted a multivariate analysis using k-means algorithms to measure the association between vulnerability and adolescent and childhood fertility. The k-means assigns each observation to a number of clusters predefined. In this study, the k-means algorithm grouped similar residential blocks based on the values of the vulnerability indicators. Thus, residential blocks with similar values belong to the same cluster; by analyzing the cluster centroids (indicators average values), the level of vulnerability was assigned to each cluster. Three analysis scenarios were fit to assign the vulnerability level: a) a univariate analysis with live births of adolescent mothers; b) a multivariate analysis including the eight indicators of vulnerability; c) a multivariate analysis including both the vulnerability indicators and live births of adolescent mothers. **We performed a multinomial regression model to test whether the suggested classification level was significantly associated with adolescent fertility. In this way, we were able to validate the proposed methodology and its accuracy in assigning levels of vulnerability.**

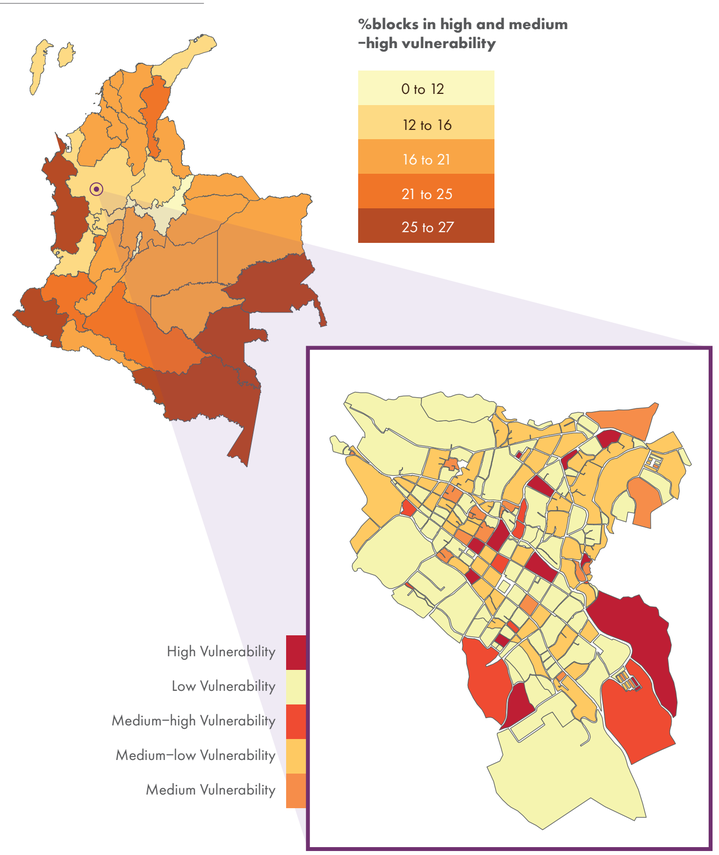
Results

The chosen vulnerability indicators take values between 0 and 1, all showing an asymmetrical distribution where most of the blocks usually take lower values. In the maps it is possible to visualize spatially how the variable proportion of young mothers live births behave in the departments and municipalities in Colombia. With these maps it is possible to identify some of the areas that are most concerning.

This mapping is available on the NSO website (https://visor01.dane.gov.co/visor-vulnerabilidad/) for stakeholders to consult as a friendly way to improve self-care and interventions regarding this public health and rights matter.

Three scenarios are fit to visualize the vulnerability of adolescent and child fertility. First, the indicator of young women live births is considered as the most updated and closely related observed indicator to the vulnerability that is intended to visualize, thus this single indicator is analyzed as a univariate approximation. Secondly, the vulnerability classification is made with the eight census indicators following the methodology described before.

Percentage of residential blocks with high and medium high vulnerability by department



Percentage of females under 15 years old currently or ever in union vs. EFT 10-14 years old.

Third and final, the vital events indicator is combined with the census information to build a third vulnerability classification. **The second and third scenarios consider multiple indicators that complement and develop a more robust measurement of vulnerability.** Comparing the last two classifications shows than including the vital events information significantly improves the distribution of the blocks showing more variability in the levels and highlights as more vulnerable those blocks who have higher values in mothers live births.

Level	Intercept	Coeficient (std error) % adolescent births	p-value
High vulnerability	-2,59 (0,01)	2,79 (0,03)	0,00
Medium - high vulnerability	-0,71 (0)	2,62 (0,02)	0,00
Medium vulnerability	-0,91 (0,01)	1,83 (0,03)	0,00
Medium - low vulnerability	-0,08 (0)	0,75 (0,02)	0,00

A multinomial regression model is fitted to explain the vulnerability classification using the indicator proportion of adolescent births from vital events as the explanatory variable. Setting the lowest level of vulnerability as the reference category, **the model shows that increasing the percentage of adolescent births increases the probability of being in a higher level of vulnerability.** Being this effect stronger in the highest levels. At a significance level of 0.05, the observed indicator is significantly correlated to the classification made.

Conclusion and recommendations

The study provides a tool for decision-makers at different levels (national, regional, local) to plan and propose actions to reduce the vulnerability of girls and adolescents by ensuring access to sexual and reproductive healthcare services even in the most remote and inaccessible places in the country. This will have a significant impact not only on the lives of women but also in the social and economic situation of their families and communities, as women who delay their pregnancies until young adulthood achieve higher levels of education which also impacts their incomes; for instance, in Colombia women with masters or doctoral degrees earn 7.3 times more than those with primary education (ref milena).

Even though poverty indicators are not included in the analysis, the vulnerability map of the country shows a strong spatial correlation with poverty measures (DANE, 2019). This reinforces the theory that the most vulnerable girls and young women living in the most impoverished environments are also most likely to become mothers before planned.

The tool should be used to identify the most vulnerable areas to understand who they are and how to target the policies accordingly with the local actors and institutions.

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