

Measuring Overcrowding in Households with Children: Official vs. Actual Thresholds in the Ecuadorian Case

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Abstract: This paper reports an investigation that explores the official (more than three people per bedroom -ppb-) vs. actual characterization of household overcrowding using a developing country as a case of study. In that line, the aim of this paper is two-fold. First, by using Ecuadorian official housing overcrowding threshold, we explore the association between housing overcrowding and a well-being variable. Secondly, we identify and compare whether that official threshold corresponds to the actual one at which that well-being variable seems to be affected. Proposing a probit regression, in which our well-being variable, defined as early children's respiratory health, depends on household overcrowding. We find that overcrowding is positively associated with the persistence of respiratory diseases in children at a level of $\alpha=1\%$. Always using the official characterization of overcrowding (3 ppb), marginal effect indicates that for two hypothetical households with at least one 0-to-5-year-old child with average values on the other estimates, the predicted probability of having a child with a respiratory disease is .0022 greater for an overcrowded household compared to one that is not. Regarding our second objective, we find that the threshold at which household density starts to manifest respiratory incidences in children is 1,33 ppb, which is significantly different from the official characterization of more than 3 ppb. In conclusion, Ecuadorian government, as well as those that have established their household overcrowding characterization arbitrarily, may be interested in re-evaluate

its official representation considering a threshold at which household density starts to deteriorate household members' health outputs. Indeed, a refined overcrowding definition, which may include further considerations than density (i.e. a limit age for children for sharing bedroom and gender separation) may be debated and incorporated taking into account the restrictions, in this case, of a developing country. Moreover, an official characterization that is according to its social reality may allow to establish accurate policies, goals and strategies to ameliorate housing overcrowding.

Introduction

Ensuring access for all to adequate, safe and affordable housing is considered a global policy, so much so that it is one of the targets of the UN's Sustainable Development Goals (United Nations, 2020). Further, Royuela, Díaz-Sánchez, & Romaní (2019) suggest that housing overcrowding is a significant constituent element of well-being and a deterrence factor in numerous domains of personal development. Therefore, all nations ought to be interested in improving their populations living conditions by reducing household overcrowding rates. Nevertheless, as we discuss in the following section, overcrowding is not a globally standardized sill. Further, governments' official characterizations of overcrowding not necessarily match with population perception of overcrowding, that is, the number of people per area that causes detriment on health at physical and/or psychological levels. This lack of harmony between official and actual definition can lead to failures when implementing housing improvement policies, both in execution and desired results.

In that line, the aim of this paper is two-fold. First, by using an official government threshold, we explore the association between housing overcrowding and a well-being

variable. Secondly, we compare weather that official threshold corresponds to the actual one at which that well-being variable seems to be affected.

To do so, we consider Ecuador as case of study. It has a small developing economy with considerable significant levels of household overcrowding (INEC, 2019). We use a representative official data set, as collected in the 2012 National Health and Nutrition Survey (ENSANUT) to examine the effect of household overcrowding on a well-being variable defined as the prevalence of respiratory health on 0-to-5-year-old Ecuadorian children. We consider children in their early years as object of study given the importance of the immediate environment, i.e. the housing conditions, in this stage of development. Indeed, literature indicates that “the developing brain is influenced from the time the fetus is in utero and it continues to change through neuro-synaptic pruning over the first months and years of a child's life [...]. Neuropsychological research suggests that rapid growth of children's brains during this time makes them particularly susceptible to environmental stimuli both positive and detrimental to development [...]. Through a process called biological embedding, social and environmental experiences in a child's early years are theorized to shape physiological changes that have lifelong protective or detrimental effects on children's learning, behavior, health and well-being” (Minh, Muhajarine, Janus, Brownell, & Guhn, 2017).

The remainder of the paper is organized as follows. The review of the literature on household density, overcrowding and its effects on well-being is presented in second section. The case of study is presented in the third section. The methodological approach is introduced in the fourth section. The main empirical results are presented in the fifth section. Lastly, the sixth section concludes by summarizing the main findings and indicating some policy implications.

Literature Review

Density and household overcrowding

There are two important concepts in the analysis of household composition: density and overcrowding. Density is an objective measure of people per area (i.e. people per room, people per bedroom, people per square meter or feet, etc.); meanwhile, household overcrowding, which is subjective, takes place when socially accepted standards of density are surpassed. Moreover, those standards are not fixed and they differ across countries and evolve over time as socio-economic conditions change (Royuela, Díaz-Sánchez, & Romani, 2019). Additionally, they depend on cultural values and social living space requirements (Baldassare et al., 1995).

Since there is not a specific threshold at which household density becomes overcrowding, it is possible to find several conceptions of housing overcrowding in literature. For instance, UK, Canada and New Zealand consider that a household is overcrowded if there are more than two people per bedroom. In the USA and Western Europe, Koebel & Renneckar (2003) suggest that overcrowding appears above 1.5 people per room. In Latin America, including Ecuador, the majority of countries consider that a household is overcrowded if there are more than three people per bedroom (PNUD, 2014) which definition is provided by ECLAC.

Literature indicates that density is a measure which has no ready interpretation in normative terms; for example, it is not clear that the lower the density the better (Royuela, Díaz-Sánchez, & Romani, 2019). In that venue, Díaz-Sánchez, Lanchimba, & Obaco (2020) have shown that higher levels of household density are negatively associated with teenage pregnancy in such household. On the contrary, household overcrowding implies negative connotations. For instance, housing overcrowding is positively related to academic failure (Evans, Lepore, Shejwal, & Palsane, 1998; Goux & Maurin, 2005), psychological decay and

stress (W. R. Gove, Hughes, & Galle, 1979; Jacob, Ludwig, & Miller, 2013; Wells & Harris, 2007), troublesome familiar relationships (Evans et al., 1998); and a decrease of physical well-being specially in children (Solari & Mare, 2012). Moreover, overcrowding is usually related to the physiological sensation of feeling uncomfortable in one's own dwelling (Royuela, Díaz-Sánchez, & Romani, 2019), lacking privacy, and an increase in no wanted social interactions into the dwelling (Goux & Maurin, 2005; Gove, Hughes, & Galle, 1979).

To the best of our knowledge, there is not any quantitative research that contrasts a governmental official threshold of overcrowding to an actual one, that is to say, the point at which household density starts to become a health issue neither at physical nor psychological levels. Therefore, this article aims to do so by applying Ecuador's official overcrowding definition (more than three people per bedroom, *ppb*) as case of study and also identifying the actual threshold. We will measure the effect of overcrowding on a welfare variable: respiratory health prevalence in 0-to-5-year-old Ecuadorian children, taking into account the negative association between overcrowding and household members' outputs deeply revised in the following subsection.

Overcrowding and well-being

Overcrowding is prone to affect household members' health not only at physical level, but also at psychological and emotional levels. In the first case, there is empirical evidence showing that overcrowding is a vehicle for disease transmission since people living in dwellings with little space are more susceptible to becoming ill and if they are already ill, they will have fewer possibilities to rest and heal. For instance, short and long-term gastrointestinal problems, mainly caused by *Helicobacter pylori*, might be derived from overcrowding (Galpin et al., 1920; McCallion et al., 1996). Specifically, overcrowding is considered one of the main risk factors that affects the health and well-being of children

(Goux & Maurin, 2005; W. R. Gove et al., 1979; Sandel, Sharfstein, & Shaw, 1999). Additionally, another set of studies shows the significant relationship between precarious housing conditions and childhood injuries (Evans & English, 2002; Krieger & Higgins, 2002; Shenassa, Stubbendick, & Brown, 2004). Additionally, overcrowding has been associated with respiratory problems in children (Baker, Taylor, & Henderson, 1998; Mann, Wadsworth, & Colley, 1992). As a matter of fact, children's asthma is highly correlated with poor air quality and exposure to germs (Wu & Takaro, 2007) as well as the presence of mold and moisture at home (Fisk, Lei-Gomez, & Mendell, 2007) and noise exposure (Hohmann et al., 2013). Furthermore, crowded and disorganized households have a strong impact on the sleep quality of minors (Quist et al., 2016) and encourage unhealthy eating habits in the behavior of younger children (Lumeng et al., 2014). All these factors generate a stress load for the child which increases the risk of inflammation and obesity at early ages (McCurdy et al, 2010).

On the side of physiological effects, literature suggest that people living in overcrowded housing are more likely to have psychological decay and stress (W. R. Gove et al., 1979; Jacob et al., 2013; Wells & Harris, 2007). Due to their vulnerability compared to the other household members, the study of children in overcrowded spaces has focused the interest of researchers. For instance, literature shows that reduced spaces at home diminish children's creativity and ability to play (Maitland et al., 2013; Marino et al., 2012).

Besides the negative immediate effects that overcrowding causes on people's health, it also affects other dimensions of their lives in forthcoming years. For example, there is empirical evidence that housing overcrowding constitutes an important limitation for the performance of the members of such a household especially in education and labor activities

(Goux & Maurin, 2005). In that sense, household overcrowding is associated with school absenteeism and low performance (Goux & Maurin, 2005).

The case of study

Ecuador is a small South American developing economy lying on the Pacific coast. The surface of this country reaches 283,561 km² and it is inhabited by 17 million people. According to Royuela et al. (2019), 64% (36%) of households lie in urban (rural) areas and the average household size is 3.8 people. The country is politically and administrative divided in twenty-four provinces. Economically speaking, Ecuador has a dollarized economy since 2000, and its GDP has grown constantly in such way that the World Bank (2019) considers it a medium-high income level country.

Using the ECLAC characterization of overcrowding, which is also adopted by the Ecuadorian government, that is more than three people per bedroom, 17.5% of Ecuadorian households are overcrowded in 2010 (Díaz-Sánchez & Romani, 2016), showing a declining trend over time (34.5% in 1990 and 27% in 2001) (SIISE, n.d.). Further, these authors also indicate that overcrowding is more of a rural than an urban matter: “64% (36%) of households live in urban (rural) areas, with 57% (43%) of overcrowded households living in these areas” (Royuela et al., 2019).

Methodological Approach

Our empirical model comprises a probit regression, in which children’s respiratory health (well-being) depends on household overcrowding, together with a large set of controls:

$$\Pr(Y = 1|OC_i, X_i) = \varphi(\beta X_i + OC_i) \quad (1)$$

Where:

φ is the cumulative distribution function of the standard normal distribution;

OC_i is a measure proxying the concept of overcrowding in household I ;

X_i is a vector of control variables. It includes information about the householder, the dwelling, geographical characteristics, household structure and observable environmental factors.

Firstly, we define our dependent variable as discrete. It takes the value of 1 if the household with 0-to-5-year-old children presents any respiratory disease -i.e. cough, flu, runny nose, shortness of breath- in the last 15 days or 0 otherwise. By doing so, we are able to capture the factors that affect the probability of having a child with a respiratory disease in a given household.

In the same vein, we approach overcrowding by means of a discrete measure, using a dichotomy variable that takes the value of 1 if the household is overcrowded or 0 otherwise, as Díaz-Sánchez & Romaní (2016) do in their study.

Additionally, we are aware that endogeneity may arise as a result of an omitted variable problem in this relationship. We pursue to avoid this by employing a wide series of controls. Thus, we consider a list of household variables, including ethnic self-identification, as well as age and its quadratic form of the mother of the household. We also consider mother's education (measured in years of formal education), which can also be considered as a proxy of income. We also include variables related to the child: age (in months) and dewormed in the last semester (yes/no), which we consider as proxy of care. We also control for the type of the dwelling (house, apartment, rooms, and local dwelling conceptions), its location (urban/rural) and natural region (Highlands, Coast, Amazon, and Galapagos). The descriptive statistics of these quantitative and qualitative variables are presented in Tables 1 and 2, respectively.

Table 1. Descriptive statistics of continuous variables

Variable	Mean	Q1	Median	Q3	Std. Dev.	Min.	Max.
Age of the mother	28,62	23	28	34	6,94	13	49
Education of the mother (years)	10,81	7	12	13	4,04	0	22
Age of the child (in months)	29,92	15	30	45	17,15	0	59

Table 2. Descriptive statistics of categorical variables

Variable	Category	%
Overcrowding	Yes	20,5
	No	79,5
Ethnics of the mother	Indigenous	14,51
	Afro Ecuadorian	3,94
	Meztizo	76,35
	White	1,31
	Montubio and others	3,88
Deworming	Yes	38,73
	No	61,27
Type of dwelling	House	69,67
	Apartment	13,13
	Room	2,34
	Mediagua	8,73
	Rancho	5,23
	Choza	0,69
	Covacha	0,21
Area	Rural	39,6
	Urban	60,4
Natural region	Highlands	39,41
	Coast	36,06
	Amazon	22,7
	Galapagos	1,84

The data source used in this analysis is the national survey ENSANUT for 2018, conducted by the Ecuadorian National Institute for Statistics and Censuses (INEC). The cross-section survey contains information on the health at individual and household level.

We take as sample households with at least one 0-to-5-year-old child; then, the final sample of the analysis contains 18,996 households. In addition, we use the weights specified by the INEC as expansion factors, consequently there are 1,332,197 households analysed.

Results

Using official Ecuador's official definition of overcrowding

In Table 3, columns (1) to (4) report the probit results of the estimation. We find that, using the official characterization, overcrowding is positively associated with the persistence of respiratory diseases in children at the 1% -estimations (1), (2), and (3)- and 5% -estimation (4)-. The estimated coefficient in column (1) indicates that a household that is overcrowded is more likely to have children with respiratory diseases in the past 15 days compared to a household that is not overcrowded. The sign of overcrowding persists even after controlling for other observables of respiratory disease probability in children (columns 2 to 4); therefore, we conclude that our results are robust.

Marginal effects of the estimation with all covariates are presented in column (5). In the case of the variable overcrowding, its marginal effect indicates that for two hypothetical households with at least one 0-to-5-year-old child with average values on the other estimates, the predicted probability of having a child with a respiratory disease is .0022 greater for an overcrowded household compared to one that is not.

In addition, the other estimated coefficients also present interesting results. For instance, those household mothers that identify themselves as afro Ecuadorian, mestizo, white or montubio are more likely to have children with respiratory incidences at home compared to indigenous ones. Further, those households located in rural environments are more prone to have children with respiratory incidences compare to those in urban areas.

Table 3. Probit results and marginal effects

	(1)	(2)	(3)	(4)	(5)
Dep. Var. Respiratory diseases					
Overcrowding (OC = 0,1)	0.0359*** (0.00281)	0.0310*** (0.00287)	0.0161*** (0.00304)	0.00622** (0.00308)	0.00227** (0.00112)
Ethnics of the mother (Indigenous as base)					
Afro Ecuadorian		0.130*** (0.00664)	0.125*** (0.00667)	0.0952*** (0.00692)	0.0345*** (0.00252)
Mestizo		0.0921*** (0.00408)	0.0928*** (0.00411)	0.0709*** (0.00437)	0.0255*** (0.00155)
White		0.340*** (0.0100)	0.343*** (0.0100)	0.318*** (0.0102)	0.119*** (0.00392)
Montubio and Others		0.114*** (0.00634)	0.0993*** (0.00642)	0.0554*** (0.00678)	0.0199*** (0.00244)
Age of the mother		0.0180*** (0.00131)	0.0188*** (0.00132)	0.0193*** (0.00132)	0.00705*** (0.000482)
Age2 of the mother		-0.000447*** (2.19e-05)	-0.000456*** (2.19e-05)	-0.000461*** (2.20e-05)	-0.000168*** (8.00e-06)
Education of the mother		-8.18e-05 (0.000291)	-0.000412 (0.000292)	0.000970*** (0.000306)	0.000499*** (0.000111)
Age of the child (in months)		0.00220*** (7.09e-05)	0.00223*** (7.09e-05)	0.00230*** (7.10e-05)	0.000837*** (2.59e-05)
Deworming (Yes=1)		-0.0176*** (0.00258)	-0.0168*** (0.00258)	-0.0213*** (0.00259)	-0.00779*** (0.000946)
Type of dwelling (House as base)					
Apartment			-0.0162*** (0.00310)	-0.00774** (0.00320)	-0.00281** (0.00116)
Room			0.154*** (0.00752)	0.170*** (0.00757)	0.0636*** (0.00291)
Mediagua^			-0.0115** (0.00492)	0.000442 (0.00496)	0.000161 (0.00180)
Rancho^			0.124*** (0.00514)	0.110*** (0.00522)	0.0410*** (0.00197)
Choza^			-0.0164 (0.0166)	-0.0167 (0.0167)	-0.00604 (0.00603)
Covacha^			0.374*** (0.0234)	0.367*** (0.0234)	0.141*** (0.00929)
Area (Rural=1)				0.00792*** (0.00278)	0.00289*** (0.00101)
Natural region (Highlands as base)					
Coast				0.0549*** (0.00257)	0.0200*** (0.000936)
Amazon				-0.00976* (0.00498)	-0.00351** (0.00179)
Galapagos				-0.0720* (0.00498)	-0.0256** (0.00179)

N	1,332,197	1,332,197	1,332,149	(0.0372)	(0.0130)
% correctly classified	0,66	0,66	0,66	0,66	0,66
Log-Likelihood:	-853863	-851344	-850687	-850431	
Chi-squared	163.6	5185	6456	6937	
Prob Wald:	0	0	0	0	

Note: Standard robust errors in parentheses. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively. ^ indicates a housing unit representation with no translation to English. These types of dwellings are characterized by deprivation of basic services and they usually are located in rural or urban marginal areas.

Identification of the actual overcrowding threshold

As we said previously, the threshold at which density becomes overcrowding depends on social conventions, becoming a subjective consideration. Nevertheless, we propose to identify the threshold of household density at which respiratory incidences on children start to appear, which is an objective matter. Thus, we run our model in subsamples defined by percentiles¹. In these regression, we also propose to consider household density (people per bedroom) instead of the dichotomy definition of overcrowding used above. Results of these regressions are presented in Table 4.

Each column from (1) to (12) in Table 4 considers cumulative subsamples by percentiles. As it is possible to observe in (1), the estimated parameter of household density is statistically significant at 1% and presents a negative sign which suggest that, in a household density interval from 0 to 1,33 people per bedroom (ppb), there is no positive association between the household members and respiratory disease incidences on children.

¹ We propose to keep in this subsample estimation strategy those households which density is between 0 and 8 people per bedroom, eliminating the 1% extremely right values of the distribution. Therefore, we keep, using weights, 1,323,477 observations.

In other words, household density is not harmful for children until 1,33 ppb. Nevertheless, the scenarios presented from (2) to (12) indicate that there is a positive and significant relationship between household density and respiratory diseases on children when household density is higher than 1,33 people per bedroom.

In addition to establishing the threshold at which household density causes health problems on children, estimations presented in Table 4 also work as robustness checks. In our main model, the overcrowding measure was defined as a dichotomy variable ($OC = 0, 1$); nevertheless, in Table 4 regressions, the overcrowding measure, household density, is a continuous variable that can take values from 0 to 8 representing the number of people per bedroom. The fact that the sign and significance of the parameter of interest persist adding several subsamples once the threshold has been surpassed, makes us infer that the relation between overcrowding and persistence of respiratory diseases in children is robust.

Table 4. Threshold analysis

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Overcrowding rate	-0.184*** (0.0207)	0.130*** (0.0101)	0.0819*** (0.00514)	0.0819*** (0.00514)	0.0417*** (0.00457)	0.0346*** (0.00347)	0.0388*** (0.00232)	0.0214*** (0.00207)	0.0211*** (0.00154)	0.0172*** (0.00127)	0.0172*** (0.00106)	0.0077*** (0.000978)
Ethnic self-identification (Indigenous=0)												
Afro Ecuatorian	0.298** (0.0245)	-0.191*** (0.0144)	-0.106*** (0.0109)	-0.106*** (0.0109)	-0.0875*** (0.0105)	-0.0478*** (0.00949)	0.0461*** (0.00822)	0.0261*** (0.00801)	0.106*** (0.00731)	0.119*** (0.00714)	0.107*** (0.00699)	0.0995*** (0.00694)
Mestizo	0.186*** (0.0170)	-0.228*** (0.00909)	-0.0570*** (0.00664)	-0.0570*** (0.00664)	-0.0368*** (0.00642)	-0.000762 (0.00588)	0.0344*** (0.00507)	0.0280*** (0.00492)	0.0655*** (0.00452)	0.0791*** (0.00444)	0.0845*** (0.00444)	0.0783*** (0.00439)
White	0.663*** (0.0338)	0.222*** (0.0205)	0.309*** (0.0141)	0.309*** (0.0141)	0.325*** (0.0138)	0.329*** (0.0130)	0.386*** (0.0115)	0.395*** (0.0113)	0.367*** (0.0107)	0.330*** (0.0103)	0.325*** (0.0102)	0.322*** (0.0102)
Montubio and Others	0.922*** (0.0297)	-0.338*** (0.0153)	-0.240*** (0.0107)	-0.240*** (0.0107)	-0.170*** (0.0103)	-0.0827*** (0.00931)	0.00352 (0.00809)	0.0277*** (0.00782)	0.0505*** (0.00709)	0.0932*** (0.00709)	0.0971*** (0.00689)	0.0553*** (0.00680)
Age of the child (in months)	0.00214*** (0.000228)	0.00487*** (0.000142)	0.00409*** (0.000104)	0.00409*** (0.000104)	0.00418*** (0.000100)	0.00223*** (9.14e-05)	0.00238*** (8.22e-05)	0.0024*** (8.02e-05)	0.00257*** (7.51e-05)	0.00257*** (7.38e-05)	0.00232*** (7.25e-05)	0.00224*** (7.12e-05)
Age of the mother	0.0117** (0.00490)	0.0262*** (0.00265)	-0.00469*** (0.00196)	-0.00469*** (0.00196)	0.00304 (0.00188)	0.00134 (0.00169)	0.0137*** (0.00150)	0.0114*** (0.00147)	0.0125*** (0.00139)	0.0121*** (0.00135)	0.0148*** (0.00133)	0.0148*** (0.00132)
Age2 of the mother	-0.000249*** (7.71e-05)	-0.00056*** (4.31e-05)	-1.49e-05 (3.19e-05)	-1.49e-05 (3.19e-05)	-0.00014*** (3.07e-05)	-0.00011*** (2.77e-05)	-0.00033*** (2.49e-05)	-0.00031*** (2.43e-05)	-0.00032*** (2.31e-05)	-0.00034*** (2.25e-05)	-0.00034*** (2.21e-05)	-0.00044*** (2.20e-05)
Education of the mother	0.00183* (0.000640)	0.00472*** (0.000640)	0.00163*** (0.000454)	0.00163*** (0.000454)	0.00356*** (0.000438)	0.00487*** (0.000400)	0.00625*** (0.000355)	0.00490*** (0.000347)	0.00532*** (0.000327)	0.00362*** (0.000319)	0.00259*** (0.000313)	0.00147*** (0.000311)
Deworming (Yes=1)	0.187*** (0.00796)	0.0876*** (0.00502)	-0.00363 (0.00376)	-0.00363 (0.00376)	-0.0148*** (0.00364)	0.00483 (0.00334)	0.00605** (0.00297)	-0.00854*** (0.00290)	-0.0220*** (0.00274)	-0.0210*** (0.00266)	-0.0263*** (0.00261)	-0.0229*** (0.00260)
Type of dwelling (Apartment=0)												
House	0.175*** (0.00937)	0.0621*** (0.00559)	0.0527*** (0.00429)	0.0527*** (0.00429)	0.0646*** (0.00420)	0.0126*** (0.00386)	-0.00274 (0.00349)	0.00741** (0.00345)	0.0152*** (0.00329)	0.00964*** (0.00325)	0.0136*** (0.00322)	0.0108*** (0.00320)
Room	-0.270*** (0.0636)	0.344*** (0.0350)	0.217*** (0.0151)	0.217*** (0.0151)	0.220*** (0.0150)	0.154*** (0.0141)	0.227*** (0.0101)	0.238*** (0.00997)	0.165*** (0.00853)	0.150*** (0.00811)	0.163*** (0.00792)	0.173*** (0.00791)
Mediagua	0.475*** (0.0411)	0.175*** (0.0162)	0.175*** (0.0162)	0.175*** (0.0162)	0.209*** (0.0161)	-0.0322*** (0.0139)	0.0497*** (0.00804)	0.0719*** (0.00789)	0.0288*** (0.00638)	-0.00532 (0.00591)	-0.0260*** (0.00570)	-0.000641 (0.00566)
Rancho	-0.188*** (0.0471)	-0.0577*** (0.0218)	0.103*** (0.0126)	0.103*** (0.0126)	0.117*** (0.0121)	0.153*** (0.0102)	0.106*** (0.00798)	0.121*** (0.00771)	0.172*** (0.00680)	0.138*** (0.00642)	0.123*** (0.00615)	0.140*** (0.00608)
Choza	0 (0)	0 (0)	0.672*** (0.0586)	0.672*** (0.0586)	0.712*** (0.0586)	-0.0655 (0.0422)	0.0139 (0.0314)	-0.00333 (0.0307)	0.00922 (0.0216)	-0.0626*** (0.0189)	-0.0233 (0.0173)	-0.0228 (0.0171)
Covacha			2.418*** (0.204)	2.418*** (0.204)	2.454*** (0.205)	2.408*** (0.206)	1.049*** (0.0530)	1.053*** (0.0525)	0.825*** (0.0444)	0.0356 (0.0297)	0.0840*** (0.0273)	0.393*** (0.0239)
Area (Rural=1)	0.00348 (0.00920)	-0.137*** (0.00578)	-0.0494*** (0.00410)	-0.0494*** (0.00410)	-0.0465*** (0.00397)	-0.0358*** (0.00361)	-0.0264*** (0.00318)	-0.0237*** (0.00311)	-0.0140*** (0.00292)	0.0127*** (0.00283)	0.00373 (0.00279)	0.00454 (0.00278)
Natural region (Highlands=0)												
Coast	-0.0735*** (0.00804)	-0.0363*** (0.00488)	0.0474*** (0.00362)	0.0474*** (0.00362)	0.0535*** (0.00351)	0.0593*** (0.00322)	0.0159*** (0.00288)	0.0286*** (0.00283)	0.0334*** (0.00269)	0.0475*** (0.00262)	0.0501*** (0.00259)	0.0531*** (0.00258)
Amazon	-0.260*** (0.0182)	-0.0809*** (0.0107)	-0.0455*** (0.00773)	-0.0455*** (0.00773)	-0.0407*** (0.00746)	-0.0399*** (0.00678)	-0.0724*** (0.00590)	-0.0544*** (0.00570)	-0.0103*** (0.00533)	-0.0103*** (0.00515)	-0.00565 (0.00504)	-0.0145*** (0.00501)
Galapagos	0.163* (0.0922)	0.0813 (0.0616)	-0.108** (0.0516)	-0.108** (0.0516)	-0.0645 (0.0495)	-0.0784* (0.0461)	-0.127*** (0.0411)	-0.105** (0.0409)	-0.101*** (0.0380)	-0.0771** (0.0372)	-0.0739** (0.0370)	-0.0730** (0.0372)
Density (people per bedroom)	1.33 p10	1.66 p20	2 p30	2 p40	2.333 p50	2.5 p60	3 p70	3.66 p80	4 p90	5 p95	7 p99	8 p100
Observations	140,914	356,451	643,655	643,655	689,109	818,495	1,022,453	1,068,865	1,200,925	1,270,220	1,312,986	1,323,477
Percent of correctly classified	69.51	67.40	66.63	66.63	66.84	66.77	66.20	66.28	66.04	65.96	65.90	65.95

Note: Standard robust errors in parentheses. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

Conclusion and discussion

Using information from the 2018 ENSANUT survey conducted in Ecuador and its official threshold of housing overcrowding (3 ppb), we have explored the association between housing overcrowding and a well-being variable. In addition, we also have compared whether that official threshold corresponds to the actual one at which that well-being variable seems to be affected. In our strategy of sample selection, we have chosen Ecuadorian households with children in 0-to-5-year-old in order to estimate a probit regression model. It seems to be confirmed a significant relation between household overcrowding and respiratory diseases in children. As a matter of fact, the predicted probability of having a child with a respiratory disease is .0022 greater for an overcrowded household compared to one that is not.

In the pursue of the identification of the threshold at which household density starts to manifest respiratory incidences in children, we have found that this number is 1,33 ppb, which is significantly different from the official characterization of more than 3 ppb.

From a public policy perspective, Ecuadorian government may be interested in re-evaluate its official overcrowding perspective considering an inferior threshold. Indeed, a refined overcrowding definition, which may include further considerations than density (i.e. a limit age for children for sharing bedroom and gender separation) may be debated and incorporated taking into account the restrictions of a developing country. Moreover, an official characterization that is according to its social reality may allow to establish accurate policies, goals and strategies to ameliorate housing overcrowding.

Moreover, this research also suggests that Ecuadorian and all developing economies have to improve and guaranty access to adequate living conditions, especially for those in their early years. In words of Silver & Singer (2014), 'Not getting the early years "right" is

linked to violent behavior, depression, higher rates of non-communicable disease, and lower wages, and it negatively affects a nation's gross domestic product. Unless early child development is addressed effectively [...], countries will be locked into poverty, and sustainable development will not be achieved.'

Finally, this research is not free of limitations. Here, we have compared official and actual overcrowding definition by using a solely measure of well-being in a specific population segment. Therefore, further research can usefully be target at identifying differences, if they exist, in other key aspects of personal development such as quantity/quality of sleep or measures of psychological well-being in other populations of interest.

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