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Small Area of Multidimensional Poverty at the Municipality Level in Mexico

Prepared by the National Council for Evaluation of Social Development Policy (CONEVAL), Mexico[1]

Abstract

In Mexico, in 2004 the General Law on Social Development (LGDS) was launched, whereby the National Council for Evaluation of Social Development Policy (CONEVAL) is created as an agency with technical autonomy, mainly formed by academic researchers, which provides its independence and methodological rigor. CONEVAL is responsible for establishing the official methodological criteria for measuring poverty in Mexico.

The LGDS provides that: a) the measurement of poverty must be multidimensional; therefore, it must consider not only households incomes, but also, and at the same time, it must take into account a number of indicators related to the fulfillment of social rights (education, health, social security, quality and basic housing and access to food) and to the territorial context (social cohesion); b) it must utilize a reliable and rigorous data source, so it uses information generated by the National Institute of Statistics and Geography (INEGI); and, c) it should be done every two years nation-wide and by state, and every five years at the municipal level, in order to assess progress and identify challenges for public policy.

To estimate poverty at national and state level, after a research process conducted between 2006-2010, the methodology for multidimensional poverty measurement was generated. During 2007-2008, in close collaboration with INEGI, the Socioeconomic Conditions Module (MCS) of the Mexican Income and Expenditure Survey was developed. This module collects all the information required to make direct multidimensional poverty estimates.

To carry out the first measurement of poverty at the municipal level for 2010, and since the MCS is not “representative” at the municipality level, in addition to the Module, CONEVAL used, on the one hand, the Population Census Sample 2010 (a sample of 2.9 million households —one out of ten in the country), that was statistically designed to have municipalities as study domains, alongside with Small Area Estimation Techniques. Using these techniques was required given that the Census sample does not provide all the necessary variables to obtain –directly–, the indicators related to income,

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social security and food access.

According to CONEVAL's literature review, no methodology for measuring poverty in a multidimensional way through small area estimation techniques was available at that time. Consequently, CONEVAL conducted a collective investigation work (2009-2011) which resulted in the adoption of a small area methodology for multidimensional estimation of poverty at the municipality level, in 2010, which is a landmark in the field and culminated with the publication of the estimates at the end of 2011.

The article proposed to be presented at the Seminar would cover two main objectives: first, to critically describe the methodology used to estimate poverty in 2010 at the municipal level, and second, to present the research work currently undertaken by CONEVAL to improve the methodology that will be used to generate the municipal poverty estimations for the 2015 round.

The methodology for 2010 municipal measurement was the result of a research process divided into three phases. In the first, preliminary step, five methodologies proposed by researchers of several academic national and international centers were explored for only one state of the country: i) a model that is a linear combination of a synthetic estimator and a direct estimator; ii) Horwitz-Thompson estimators in combination with a previous cluster grouping of municipalities; iii) a Bayesian Model (BM); iv) an Empirical Best Predictor model (EBP) and a Quantile-M; and, v) Geographically Weighted Regressions Models.

After CONEVAL academic board analyzed the comparative advantages and disadvantages of each of the methods for measuring multidimensional poverty, in the second stage the EBP and BM methodologies were implemented nation-wide. As none of these methods met the four requirements of the methodology,[2] CONEVAL implemented the EBP method and the one developed by Elbers, Lanjouw and Lanjouw (ELL) to estimate income poverty, and both methods were generalized to allow for multidimensional poverty measurement. In the third stage, the final methodology was chosen and published officially.

Currently, a project with experts in small area estimation from the University of Southampton, the Madrid Carlos III University and the Autonomous Technological Institute of Mexico is being carried out. There are three main lines of research: one is based on the Bayesian Approach; another on EBP; and a third one on quantiles microsimulation.

At the same time, CONEVAL is working on developing a methodology using EBP to estimate income and hierarchical multi-level logistic regressions to estimate access to social security deprivation and access to food deprivation, the other two variables that cannot be estimated directly from the census samples. The paper will describe the way in which all the information will be integrated in order to comply with all legal requirements and to ensure population and dimensions decomposability and that multidimensional poverty comparisons across time can be made.

[2] Estimation of incidence, depth and severity of poverty, calculation of indicators of social cohesion, and disaggregation of indicators by population and by poverty dimensions.

Small Area Estimation of Multidimensional Poverty at the Municipality Level in Mexico[1]

Gonzalo Hernández-Licona[2] – Ricardo Aparicio-Jiménez[3]

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Introduction

The General Law on Social Development (LGDS, in Spanish) was promulgated on 2004 in Mexico. Its main goal is to guarantee the full exercise of social rights, ensuring universal access to social development for the Mexican population (DOF, 2004).

The LGDS creates the National Council for the Evaluation of Social Development Policy (CONEVAL) as a public organization with technical and administrative autonomy with two main responsibilities: 1) to regulate and coordinate the evaluation of social development policies and programs, and 2) to establish guidelines and criteria for the definition, identification and measurement of poverty in the country. Being mostly integrated by academic researchers bestows CONEVAL independence and technical rigor.

The LGDS decrees the set of criteria that CONEVAL must follow to measure poverty. First, the measurement of poverty should be carried out every two and five years at the state and municipality levels, respectively. In addition, the National Institute of Statistics and Geography (INEGI) should generate the information to be used for poverty measurement. Furthermore, Article 36 determines that CONEVAL must set the guidelines and criteria for the definition, identification and measurement of poverty, which shall consider at least the following eight indicators: 1) current per capita income; 2) educational gap; 3) access to health services; 4) access to social security; 5) quality and spaces of the dwelling; 6) access to basic services in the dwelling; 7) access to food, and, in the territorial context, 8) the degree of social cohesion.

The Methodology for Multidimensional Poverty Measurement in Mexico (CONEVAL, 2010) was developed by CONEVAL between 2006 and 2010. It is the result of research, rigorous analysis and the guidance of poverty experts at national and international level, as well as the advice of several institutions and agencies.

CONEVAL identified three analytical domains: one domain which accounts for the economic wellbeing of a person; a second domain which assesses deprivations in human rights, and a third one which evaluates contextual and territorial factors. However, the multidimensional poverty definition only considers the former two domains because they are inherent to

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individuals and households, whereas contextual and territorial factors can only be analyzed by populations groups within a given territory.[4]

CONEVAL uses per capita income (Y) to identify whether a person is deprived in the wellbeing domain. A person i is deprived in this domain if the per capita income of the household to which he/she belongs (Y_i) is lower than the wellbeing threshold (*LB*),[5] that is, if $Y_i < LB$.

Six indicators are measured to define the social rights domain: educational lag, denoted by C_1; access to health services, C_2; access to social security, C_3; quality and spaces of dwelling, C_4; access to basic services in the dwelling, C_5; and access to food, C_6. If $C_{ij} = 1$ denotes that the person i is deprived in the j dimension, where $j = 1, \dots, 6$, and $C_{ij} = 0$ that the person is not deprived in the j dimension, then it is said that a person i is deprived in the social rights domain if he/she presents any of the six social deprivations. CONEVAL defines a person's total number of social deprivations as the Social Deprivation Index, which can be denoted as IP_i, being $IP_i \geq 0$, where $IP_i = \sum_{j=1}^{6} C_{ij}$.

With the foregoing variables it is possible to build multidimensional poverty quadrants[6] (Q^k: $k = 1, \dots, 4$) and assign a person i to one of them.

1. *Multidimensionally poor* (Q^1): a person i is multidimensionally poor if $Y_i < LB$ and $IP_i \geq 1$. The population in this quadrant can be divided further into two categories: 1) *Population in extreme multidimensional poverty* (Q^{1e}) or people with $Y_i < LBM$ and $IP_i \geq 3$; and 2) *Population in moderate multidimensional poverty* (Q^{1m}) where $Q^{1m} = Q^1 - Q^{1e}$ and LBM standing for the minimum wellbeing line.[7]
2. *Vulnerable in the social domain* (Q^2): people with $Y_i \geq LB$ and $IP_i \geq 1$.
3. *Vulnerable in the economic domain* (Q^3): people with $Y_i < LB$ and $IP_i = 0$.
4. *Not multidimensionally poor and not vulnerable* (Q^4): people with $Y_i \geq LB$ and $IP_i = 0$.

After identifying the poor, it is necessary to build measures which account for the magnitude and status of poverty among the population. One of the measures considered by CONEVAL is the *incidence*[8] within the poverty quadrants which is the share of the population who belongs to each of the quadrants mentioned above. The incidence is also used to account for the

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[4] Specifically, this domain takes into account social and economic inequalities.
[5] The *wellbeing threshold* (*LB*) is the amount of income enough to purchase goods and services required to meet a person's basic needs.
[6] For further details, the reader can refer to CONEVAL (2010) and CONEVAL (2014). The English version of the later is available upon request.
[7] The minimum wellbeing line (*LBM*) is the amount of per capita income to purchase a basic food basket.
[8] CONEVAL also estimates the depth and intensity of multidimensional poverty, whose definition can be found at CONEVAL (2014). See Alkire y Foster (2007) for the methodological properties of these indicators.

occurrence of deprivations in each of the indicators within the social and economic domains. When the inference is based upon a probabilistic sample S from the population U ($S \subset U$) [9] and the sample is chosen according to a given sampling design, the incidence of the group Q^k in the population U can be estimated by the following formula:

$$\widehat{H}_{Q^k}^{U} = \frac{\sum_{i \in Q^k \cap S} w_i}{\sum_{i \in S} w_i},$$

where w_i stands for the weight or expansion factor of the person i.

In general, if $\mathcal{C}$ denotes the population set that is deprived in a given social or economic dimension, then $\widehat{H}_{\mathcal{C}}^{U} = \frac{\sum_{i \in \mathcal{C} \cap S} w_i}{\sum_{i \in S} w_i}$ estimates, based on the weighted probabilistic random sample S, the incidence of that social or economic deprivation within the population U. For example, $\widehat{H}_{\mathcal{C}^j}^{U}$ stands for the estimation of the social deprivation incidence, C_j and $\mathcal{C}^j$ is the population set who is deprived in that dimension. Likewise, if $\mathcal{LB}$ is the population set that meets the restriction $Y_i < LB$ and $\mathcal{LBM}$ is the population set that meets the restriction $Y_i < LBM$, then $\widehat{H}_{\mathcal{LB}}^{U}$ and $\widehat{H}_{\mathcal{LBM}}^{U}$ are, respectively, the estimated shares of the population whose income is below the *wellbeing threshold* and the *minimum wellbeing line* in the population U.

During 2007 and 2008, both CONEVAL and INEGI developed the Socioeconomic Conditions Module of the National Survey of Household Income and Expenditures (MCS-ENIGH in Spanish).[10] The MCS-ENIGH provides information that allows estimation of Y, C_1,…,C_6. At national and state level, the survey makes possible to generate estimates of poverty with adequate statistical precision,[11] but is not possible to make such estimations at municipal level.

In addition, in 2010, INEGI carried out the Housing and Population Census (CPV in Spanish) for each of the 2,456 municipalities that the country had then. Along with the CPV, an extended questionnaire was carried out for a sample of 2.9 million of households (approximately one in ten of the country's households). The CPV sample makes possible to generate accurate and direct municipal estimates for four of the seven indicators of the multidimensional poverty measurement (C_1, C_3, C_4, C_5), but, due to lack of information in the questionnaires, it does not allow to calculate the indicators Y, C_2, C_6. By combining both data sources, the MCS-ENIGH and the survey from the CPV, and using small area estimation techniques, it was possible to generate indirect estimates for the three indicators Y, C_2, C_6 (CONEVAL 2012).

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[9] U is any given population, for example, the Mexican population. However, it can stand for any group of interest, like, for example, people living in rural or urban areas.
[10] Since 2008, the MCS-ENIGH is carried out every two years.
[11] The sample size for each of the 32 Mexican states rounds 2,000 households. The sampling design is described in INEGI, 2011, which can be found at
http://www3.inegi.org.mx/sistemas/biblioteca/ficha.aspx?upc=702825002426.

Research project for poverty estimates corresponding to 2010

There are numerous articles and published papers dealing with the identification and measurement of multidimensional poverty (see Alkire and Binat (2009) for an excellent literature review). On the other hand, there are several works which discuss techniques for estimation in small areas, being the book written by Rao (2003) one of the most representative. Still, according with a literature review performed by CONEVAL, in 2009 there was no methodology available for estimating multidimensional poverty using small area estimation procedures. Faced with this challenge, CONEVAL coordinated a collective research between 2009 and 2011. The result was a world-wide pioneer methodology for multidimensional poverty estimation at the municipal level (small area) by 2010. Those estimates were published in 2011.

This project was developed in three stages. First, between 2009 and 2010, an in-depth research was performed. CONEVAL asked for the advice of several, national and international poverty and statistical experts. In addition, CONEVAL organized seminars and workshops concerning estimation techniques in small areas (CONEVAL 2012). Such estimation methods combine information from the MCS-ENIGH (the source which provides all the required elements for estimating all the parameter of interest, but does not permit their breakdown to the desired level) with the survey from the CPV, which allows a larger level of disaggregation (Rao, 2003). CONEVAL signed an agreement with El Colegio de Mexico to gather proposals of a methodology to estimate multidimensional poverty at the municipality level. At this first stage, five small area estimations methods were proposed to CONEVAL:[12]

- Hybrid Model - Jae Kwan Kim (Iowa State University). It employs a linear combination between the direct and the synthetic estimators obtained from individual level modeling.
- Horvitz-Thompson ratio-estimators in homogeneous areas (Hortensia Moreno and Ignacio Méndez, from IIMAS-UNAM[13] y UAM-Iztapalapa,[14] respectively). Estimates are obtained for larger homogeneous areas which contain the municipalities (small areas). It is assumed that the relationships between variables to be estimated and the auxiliary variables are stable within those areas. Larger areas were selected by cluster analysis.
- Bayesian model (BM) by Luis Enrique Nieto (ITAM).[15] It simultaneously considers estimates for the share of deprivation in each of the quadrants of multidimensional poverty, and random effects specification at the municipal level counting spatial effects

[12] See Vargas (2010) for a full description of each proposal. At this stage, researchers only worked with data of municipalities from Veracruz, one of the 32 Mexican states.
[13] IIMAS is the Research Institute of Applied Mathematics and Systems of the National Autonomous University of Mexico (UNAM).
[14] Metropolitan Autonomous University (UAM), Iztapalapa, Mexico.
[15] Autonomous Technological Institute of Mexico.

based on distances between municipalities. The methodology is an extension of generalized linear mixed models based on Bayesian approaches.

- M-Quantile methods and empirical best predictor (EBP) by Nikos Tzavidis (University of Southampton). The former uses an M-Quantile regression in order to estimate area level effects. The regression is robust to the presence of outliers of the dependent variable. EBP method allows getting indirect estimates in small areas through mixed generalized linear models to estimate Y.
- Geographically weighted regressions (GWR), by Christopher Brunsdon (University of Newcastle). This method allows calibration in the regression models, where the values of coefficients vary in regard to geographical covariates communities (longitude, latitude, altitude, among other).

After analyzing the advantages and disadvantages of each method, during a second stage (2010 - 2011) CONEVAL decided to implement EBP and BM methods for all Mexican municipalities.

In order to compare the results of both methods, two types of criteria were defined: methodological and accuracy criteria. The four general requirements that the measurement methodology had to meet were: i) that incidence $(\widehat{H}_{\mathcal{C}}^{U})$, depth and intensity of poverty indicators could be calculated; ii) that indicators were consistent when disaggregating them (decomposability property) by poverty dimensions, iii) population decomposability by groups; and iv) that computing social cohesion indicators should be allowed.[16] The population decomposability property means that the weighted sum of the incidences in the subpopulations is equal to the incidence in the total population, that is,

$$\widehat{H}_{\mathcal{C}}^{U=U^1\cup U^2\cdots\cup U^K}=\frac{\sum_{i\in S^1}w_i}{\sum_{i\in S}w_i}\widehat{H}_{\mathcal{C}}^{U^1}+\frac{\sum_{i\in S^2}w_i}{\sum_{i\in S}w_i}\widehat{H}_{\mathcal{C}}^{U^2}+\cdots+\frac{\sum_{i\in S^K}w_i}{\sum_{i\in S}w_i}\widehat{H}_{\mathcal{C}}^{U^K},$$

with $S^k=S\cap U^k$ $(k=1,\dots,K)$,$U^k\cap U^l=\emptyset$ y $S^k\cap S^l=\emptyset\ \forall k\neq l$.

Additionally, two quantitative criteria, named accuracy criteria, to compare the methodologies were established. These criteria refer to the degree of proximity between state-level estimates obtained under each methodology, denoted by $\widetilde{H}_{\mathcal{C}}^{T}$ ($T=1,\dots,32$ correspond to the state) due to the fact that Y, C_2, C_6 have to be estimated, and those directly calculated (without estimates of Y, C_2, C_6) from the MCS-ENIGH 2010, $\widehat{H}_{\mathcal{C}}^{T}$, previously publicated by CONEVAL. The first criterion compared the number of states for which the estimate under each methodology $(\widetilde{H}_{\mathcal{C}}^{T})$

[16] Some of the indicators within this domain are a) Gini coefficient and b) income ratio of the population living in extreme multidimensional poverty relative to the population that is not multidimensionally poor and not vulnerable (see CONEVAL 2010).

lied in the confidence intervals for the poverty estimations at state level, $\widehat{H}_{\mathcal{C}}^{T}$.[17] The second criterion compared the mean size of the 32 absolute differences $\left|\widehat{H}_{\mathcal{C}}^{T} - \widetilde{H}_{\mathcal{C}}^{T}\right|$.[18]

EBP was the most accurate method according to these two criteria (see Table A). However, in the application made it did not allow to calculate the social cohesion indicators and the depth of poverty indicators, and also it did not enable population decomposition. The BM had the advantage that it could simultaneously estimate the incidence indicators. However, since the distribution was estimated at municipal level, it could not be disaggregated by population groups; moreover, it was less precise than the EBP in terms of both quantitative criteria.

As none of these methods met all the four requirements of the Methodology, CONEVAL designed and implemented the Best Empirical Predictor method (Molina and Rao, 2010), generalized to multidimensional poverty measurement (EBPG), and Elbers, Lanjouw and Lanjouw method, ELL (Elbers *et al.*, 2002, 2003), generalized to multidimensional poverty measurement (ELLG) as well.

Both, the EBP as well as the ELL, assume a superpopulation that follows a linear regression model with nested errors, which relates the logarithm of income of the person i that belongs to a given area m, in this case the municipalities, (Y_{mi}^{*}), with a vector of *p* explanatory variables ($\boldsymbol{x}_{mi}'$), a random area effect (u_m), and an idiosyncratic error (e_{mi}) at the individual level.

$$Y_{mi}^{*} = \boldsymbol{x}_{mi}'\boldsymbol{\beta} + u_m + e_{mi},\ u_m \sim iid\ N(0, \sigma_u^2),\ \ e_{mi} \sim iid\ N(0, \sigma_e^2)$$

where u_m and e_{mi} are independent random variables.

The generalized methods made a simulation of Y_{mi}^{*} with one of the ELL or EBP models. In each simulation, it is possible to identify if $i \in \mathcal{LB}$ and if $i \in \mathcal{LBM}$. If a fixed number of deprivations (IP_i) is considered, it is possible to identify the quadrant of poverty to which the person i in simulation l $(l = 1, \dots, L)$ belongs to, $Q^{k(l)}$; once all individuals in the municipality m, are classified in a poverty quadrant, poverty incidence indicators in each quadrant are calculated, $\widetilde{H}_{Q^{k(l)}}^{m}$, $l = 1, \dots, 100$. Finally, for each municipality $m = 1, \dots, 2456$, the incidence estimate for each multidimensional poverty quadrant is the estimated value of the percentages obtained from the $L = 100$ replications, $\widetilde{H}_{Q^{k}}^{m} = \sum_{l=1}^{100} \widetilde{H}_{Q^{k(l)}}^{m} / 100$.

The virtue of these generalized methods to the multidimensional poverty measurement is that they met the four general requirements. In a third phase of the project, and in order to choose between the two methodologies two types of comparisons were performed: a) the EBP and ELL models were compared by the absolute relative errors (ARE) of the estimates the percentage of population below the LB and LBM, $\left|\widetilde{H}_{\mathcal{C}}^{T} - \widetilde{H}_{\mathcal{C}}^{T}\right| / \widetilde{H}_{\mathcal{C}}^{T}$, $\mathcal{C} = \mathcal{LB}, \mathcal{LBM}$. In this application, the ELL method proved to be more accurate (see Table B); b) the EBPG and

[17] It was stipulated that for each group $\mathcal{C}$ the estimates of at least twenty one of the Mexican states should be in the confidence intervals.

[18] The decision was that differences should not be greater than three percentage points.

ELLG were also compared in terms of the two precision criteria. The second one was more precise under both criteria (see Table B).

Since the empirical implementation of ELLG proved to be more accurate, according to the previously defined criteria, it was selected as the methodology for estimating poverty in the municipalities of Mexico for 2010 (CONEVAL, 2012).

In both ELLG and EBPG methods, homogeneous groups of municipalities (strata) were defined in order to find poverty covariates according to the social and economic profiles of the different groups of municipalities. The strata were formed using latent class analysis through nineteen variables related to income, education, health, social security, housing, food and ethnicity.

Research project for 2015 poverty estimates

As a follow-up for the results of the multidimensional poverty measurement at the municipal level in Mexico 2010, CONEVAL has continued exploring the various existing methodologies in order to assess their statistical advantages, statistical precision of the estimates and consistency of results. In August 2014, CONEVAL signed an agreement with the National Autonomous University of México (UNAM),[19] to discuss and propose an update of the methodology used in 2010 for measuring poverty at municipal level. The goal is to develop a tool that joins recent theoretical developments in both the wellbeing domain (income) and the social rights domain (social deprivations). As a result of the agreement, national and international small area estimation experts work on two lines of research:

- Bayesian model proposed by Luis Enrique Nieto (ITAM).
- Empirical best predictor (EBP) by Nikos Tzavidis (University of Southampton).[20]

Additionally, Isabel Molina, from la Universidad Carlos III, Madrid, provides critical reviews of the methodologies developed to implement better models for small areas.

At the same time, CONEVAL works on a methodology that proposes using empirical best predictor to estimate income and logistic models for the deprivations. To have the best possible predictors of Y, C_2, C_6, CONEVAL developed a detailed conceptual framework that includes the dimensions that explain these variables.

Another aspect to consider in municipal estimates is calibration. With calibration, total results of poverty indicators have to be adjusted. Therefore, CONEVAL will evaluate the best method to reduce the effect of calibrating estimates over the population structure of the municipalities.

[19] On behalf of the UNAM, the project is coordinated by the University Program of Developmental Studies (PUED).

[20] In addition, it is being analyzed the method of Microsimulation via Quantiles which is a proposal of Nikos Tzavidis and TimoXchmid (FreieUniversität Berlin).

In August 2015, the researchers will present their final methodological proposals, along with their estimates for the 2,456 municipalities of Mexico. CONEVAL will discuss the proposals and will define evaluation criteria in order to perform the comparison of methodologies. As a result, the methodology to be used to estimate the 2015 municipal poverty will be defined, once the MCS-ENIGH 2015[21] and the 2015 Intercensal Survey are released.[22] This, in compliance with normative regulations and considering that the method to be chosen should allow comparability across time and that decomposability properties should be simultaneously met.

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[21] Since 2008, the survey is only carried out every two years. However, it will be carried out in 2015 for the sake of estimating multidimensional poverty at municipal level.

[22] INEGI will carry out the Intercensal Survey on March, 2015. The survey allows disaggregation at municipal level.

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Appendix

Table A
Comparison of methodologies for measuring poverty in the municipalities of Mexico, 2010

	EBP	BM	ELLG	EBPG
General methodological requirements				
Posibility to calculate:				
Incidence of multidimensional poverty	Yes	Yes	Yes	Yes
Depth of multidimensional poverty (average number of social deprivations)	**No**	Yes	Yes	Yes
Decomposability by population groups	**No**	**No**	Yes	Yes
Decomposability by poberty dimentions	**No**	Yes	Yes	Yes
Social cohesion measurement	**No**	**No**	Yes	Yes
Accuracy criteria				
Number of states for which the estimation from the models falls within the confidence interval of the MCS-ENIGH (must be greater than or equal to 21)				
Poverty	26	**10**	26	**18**
Extreme poverty	31	**20**	26	**1**
Income below the LB	30	**12**	23	**11**
Income below the LBM	26	**17**	22	**2**
Deprivation in access to social security	28	**11**	26	**25**
Deprivation in access to food	22	**16**	24	**20**
	6 of 6	**0 of 6**	**6 of 6**	**1 of 6**
Average of the differences between estimates from models and MCS-ENIGH 2010 (must be less than or equal to 3 percentage points)				
Poverty	2.2	**8.1**	2.6	**4.0**
Extreme poverty	0.8	3.0	1.2	**16.6**
Income below the LB	2.5	**7.8**	**3.2**	**7.9**
Income below the LBM	1.7	**3.8**	2.4	**13.3**
Deprivation in access to social security	1.6	**4.5**	2.0	2.1
Deprivation in access to food	2.9	**3.7**	2.6	**3.3**
	6 of 6	**1 of 6**	**5 of 6**	**1 of 6**

Table B

Comparison of estimated incidences of population below the wellbeing threshold, by state. Mexico, 2010.

State	Population with income below the wellbeing threshold Absolute relative error (%)[1]		Population with income below the minimum wellbeing threshold Absolute relative error (%)[1]	
	ELL	**EBP**	**ELL**	**EBP**
Aguascalientes	2.4	1.1	15.9	33.8
Baja California	6.2	8.0	0.5	21.3
Baja California Sur	0.0	7.0	27.6	0.3
Campeche	3.1	1.2	7.2	24.6
Coahuila	11.3	14.7	0.1	63.3
Colima	6.2	4.5	30.1	58.6
Chiapas	3.5	4.2	4.0	8.5
Chihuahua	11.9	9.5	17.3	23.4
Distrito Federal	4.7	1.2	30.3	94.7
Durango	8.9	7.7	15.2	23.5
Guanajuato	2.4	4.9	13.1	46.1
Guerrero	5.8	1.7	9.6	14.1
Hidalgo	0.7	4.0	3.4	23.8
Jalisco	5.9	0.3	13.3	21.5
México	6.6	2.9	12.4	49.3
Michoacán	6.5	3.5	21.9	33.8
Morelos	2.3	0.5	20.2	58.2
Nayarit	6.6	3.2	4.1	27.1
Nuevo León	23.1	22.2	26.7	109.0
Oaxaca	4.1	2.6	10.1	28.5
Puebla	0.5	3.3	20.5	33.1
Querétaro	0.1	5.0	8.9	19.8
Quintana Roo	26.4	2.8	43.7	39.8
San Luis Potosí	1.7	1.8	4.9	22.0
Sinaloa	6.2	5.4	3.9	42.0
Sonora	5.4	0.5	1.2	41.7
Tabasco	9.4	11.8	1.6	18.1
Tamaulipas	2.6	2.8	9.1	33.9
Tlaxcala	10.6	4.4	18.0	26.3
Veracruz	3.6	5.7	0.2	13.9
Yucatán	5.7	3.0	34.7	53.8
Zacatecas	12.3	8.5	25.6	13.7
National	***1.6***	***1.3***	***3.3***	***30.2***

Source: CONEVAL estimates based on the MCS-ENIGH 2010.

1/The absolute relative error is the ratio of the absolute value of the difference between the estimate under the model (EBP, ELL) and the estimate with the MCS-ENIGH 2010 divided by the value obtained for the estimator with the MCS-ENIGH 2010 .

Table C

Municipal measuring poverty, México 2010
Percentage, number of people and average deprivations per poverty indicator
Ometepec, Guerrrero

Indicator	Percentage	Number of people	Average deprivations
Poverty			
Population living in poverty	75.4	46,273	4.0
Population living in moderate poverty	28.7	17,599	3.3
Population living in extreme poverty	46.7	28,674	4.4
Population vulnerable due to social deprivations	18.8	11,531	2.3
Population vulnerable due to income	0.7	425	0.0
Population not poor and not vulnerable	5.1	3,148	0.0
Social deprivation			
Population with at least one social deprivation	94.2	57,804	3.6
Population with at least three social deprivations	74.8	45,890	4.2
Indicators of social deprivation			
Educational gap	27.2	16,718	4.6
Deprivation in access to health services	52.6	32,271	4.2
Deprivation in access to social security	82.7	50,754	3.9
Deprivation due to quality and spaces of the dwelling	48.4	29,732	4.5
Deprivation in access to basic services in the dwelling	80.2	49,203	4.0
Deprivation in access to food	52.5	32,215	4.5
Wellbeing			
Population with income below the minimum wellbeing threshold	49.5	30,398	4.2
Population with income below the wellbeing threshold	76.1	46,698	3.9

Source: CONEVAL estimates based on the MCS-ENIGH 2010 and the sample of the Population Census 2010.