Essential Health Care among Mexican Indigenous People in a Universal Coverage Context

Edson Servan-Mori, MSc; Blanca Pelcastre-Villafuerte, PhD; Ileana Heredia-Pi, DSc; Arain Montoya-Rodríguez, MSc

Objective: To analyze the influence of indigenous condition on essential health care among Mexican children, older people and women in reproductive age.

Methods: The influence of indigenous condition on the probability of receiving medical care due to acute respiratory infection (ARI) and acute diarrheal disease (ADD), vaccination coverage; and antenatal care (ANC) was analyzed using the 2012 National Health Survey and non-experimental matching methods.

Results: Indigenous condition does not influence per-se vaccination coverage (in <1 year), probability of attention of ARI's and ADD's as well as, timely, frequent, and quality ANC. Being indigenous and older adult increases 9% the probability of receiving a fulfilled vaccination schedule.

Conclusion: Unfavorable structural conditions in which Mexican indigenous live constitutes the persistent mechanisms of their health vulnerability. Public policy should consider this level of intervention, in a way that intensive and focalized health strategies contribute to improve their health condition and life. (*Ethn Dis*. 2014;24[4]:423–430)

Key Words: Health Services, Indigenous Population, Inequity, Socioeconomic Conditions

From the National Institute of Public Health, Mexico.

Address correspondence to Blanca Pelcastre-Villafuerte, PhD; Av. Universidad No. 655; Col. Santa María Ahuacatitlán; Cuernavaca, Morelos 62100 México; 52+(777)329-30-00 x5241; blanca.pelcastre@insp.mx

Introduction

Mexico has recently achieved important progress in reducing mortality for preventable causes,[1] one of the most sensitive indicators of inequity in access to health services, particularly in three sectors of the most vulnerable population: children, pregnant women and older people.[2,3]

Some strategies that have contributed to this reduction are: a) among children, existence of a universal vaccination program and interventions focused on prevention, diagnosis and timely treatment of acute diarrheal disease (ADD) and acute respiratory infections (ARI's);[4,5] b) in women, several initiatives aimed to improve the access to antenatal care (ANC); c) in older people, intensive vaccination campaigns, especially in the most economic vulnerable sectors,[6] have had a key role against infectious diseases such as pneumococcal pneumonia, seasonal influenza, diphtheria, and tetanus.[7]

Despite these achievements, there still remain population groups where high mortality rates endure. Such is the case of indigenous population (IP) (~7% of the total population in 2010).[8] Similar to other Latin-American countries[9] and around the world; in Mexico, this group is exposed to high social and health vulnerability (Table 1).[10,11] Municipalities considered indigenous (vs non-indigenous)[11] exhibit 2.2 more times illiterate population; 78.6% earn <2 minimum salaries; 83.3% are below the poverty line, 75.6% live in localities with high or very high marginalization degree;[12] 22% (vs 9.8% non-indigenous) of dwellings have an earthen floor; 26% (vs 18.0%) do not have running water and 45.6% (vs 18.2%) lack a drainage system (Table 1). Additionally, the risk of maternal mortality is 9 times higher in highly marginalized and geographically isolated indigenous municipalities than in those with better communication infrastructure;[13] child mortality rate is slightly less than twice in indigenous municipalities compared to those non-indigenous.[14] Furthermore, three out of every four elder indigenous individuals do not have medical services coverage.[15]

Some comparative studies support this context suggesting differences in the access and status of health among IP with respect to non-indigenous; nevertheless these studies attribute these differences to the ethnic condition without considering that this condition determines such differences.[16,17] Other studies suggest that these differences derive from barriers to education, limited economic resources, and the persistence of social deprivation, which in turn, impact negatively on the access to health care services.[18,19]

Universal health coverage in Mexico has been a key aim on the health agenda for reducing these inequalities, focused in three relevant aspects for the system: equity, financial protection and quality of care.[20] Seguro Popular[21] and the Arranque parejo en la vida programs,[22] are some of the strategies that have been implemented in the last decade, the IP being one of the target populations. As a result, a considerable rise of the Seguro Popular coverage has been observed on this population, scaling up from 14% in 2006 to a 61.9% in 2012.[23]

Even though there are clearly targeted efforts, universal health coverage for IP remains a pending challenge. Hence, it is necessary to discriminate the structural conditions of life or social determinants

Table 1. Characteristics of social development at the municipal level, Mexico 2010

	Type of Municipality[a]			
	Non-indigenous (A)	Presence of Indigenous Population (B)	Indigenous (C)	(C)/(A)
N	1,593	239	624	
%	64.9	9.73	25.4	
Population Indicators, %				
Illiterate, aged ≥15 years	10.8	8.71	24.2	2.24
Receive <2 minimum salaries	57.5	46.4	78.6	1.37
With food shortage	26.3	27.5	34.6	1.31
Under poverty line	66.9	58.1	83.3	1.24
Access to health services shortage	33.1	33.0	40.1	1.21
Marginalization degree				
Low/very low	32.9	55.2	1.12	.03
Medium	46.0	28.0	23.2	.50
High/very high	21.2	16.7	75.6	3.57
House of residence, %				
With dirt floor	9.83	9.44	22.0	2.24
No running water	18.0	17.0	26.6	1.48
No drainage	18.2	14.9	45.6	2.51
No electricity	3.49	3.44	7.59	2.17
Extreme poverty population	18.6	15.7	44.2	2.38

[a] Official typology of the classification of the indigenous municipalities made by the CDI in accordance to the indigenous people existent (indigenous - ≥40%; with indigenous presence - <40%, but with important indigenous presence in absolute numbers; and non-indigenous with scattered indigenous population). National Commission for the Development of the Indigenous People.

of health,[24] and the ethnic condition that alludes to a cultural frame of beliefs and practices of ancestral tradition; where the action must place itself. The purpose of our study was to analyze patterns of socioeconomic, demographic and epidemiologic conditions, and the influence of indigenous condition on the coverage of health care of ARI's and ADD (aged <5 years), vaccination coverage (aged<1 year and older people); and ANC.

The purpose of our study was to analyze patterns of socioeconomic, demographic and epidemiologic conditions, and the influence of indigenous condition on the coverage of health care…

METHODS

Data and Study Population

A cross-sectional study was conducted using the Mexican National Health Survey (ENSANUT) 2012. The ENSANUT is a probabilistic survey designed with statistical representativeness at the national level and urban/rural strata.[25] Two percent of the respondents were excluded due to incomplete information on sociodemographic characteristics, health conditions, and health services utilization. The analytical sample included 192,434 people. Particularly, we analyzed data from specific health needs and access to health services questionnaires; this information was randomly applied to five population groups: children aged 0–9 years, women aged 12–19 and adults aged ≥20.

Main Variables

Indigenous population was defined according to the official definition in Mexico,[26] whereby a household is considered indigenous if the head of the family, a spouse and/or an ascendant self-identifies and/or is a speaker of an indigenous language. Following this official definition from ENSANUT measured this characteristic from the follow question: ''(YOU/NAME) speak any indigenous language?'' A binary variable at household level was generated: IP=1 and non-indigenous (NIP)= zero. The percentage of IP was 9.54%.

Four health care and vaccination coverages were analyzed (yes=1, not= 0): 1) in children aged <5 years, medical health care due ARI and ADD; 2) in children aged <1 year with fulfilled vaccination schedule, except pneumococcal and rotavirus vaccines (BCG, Hepatitis B and Pentavalent a-celular) according to age and to the Mexican Official Standards;[27–29] 3) among women (who received ANC) aged 12–49 years with record of timely ANC (first visit during the first trimester of last pregnancy live new born); frequent follow-up visits (≥4 visits during pregnancy), and quality of care during the follow up visits (7/8 established procedures carried out during any of the visits received and recommended by the respective Mexican Official Normative Procedures;[30,31] and 4) in those aged ≥60 years who received a fulfilled vaccination schedule (two doses of TD -tetanus and diphtheria-, and one dose of pneumococcal and influenza vaccines).[28,32,33]

Those individual or contextual covariables previously identified as associated to receiving medical care and/or utilization of health services were considered:[34–37] 1) at individual level - sex, age (years), education (years), job status, civil status, and health insurance; 2) at household level - number of members, education (years), and job status of the household's head, annual expenditure per-capita (in quantiles), receiving cash transfer from Oportunidades (formerly Progresa); and 3) at locality level - size (rural, urban, and metropolitan), and marginalization degree.[12]

Analytical Strategy

First, sociodemographic profiles of Mexican IP, contextual characteristics,

and outcome variables were described. Differences in these characteristics (between IP and NIP) were identified through *t* tests or Chi-squared bivariate statistical tests.

Secondly, given the non-random assignment of IP and due to non-experimental design of ENSANUT, the influence of indigenous condition on the outcome variables was estimated using propensity score matching, which allows the construction of a comparison group suitable for the treatment group adjusting by the selection bias and confusion for observable variables.[38,39] This methodology has been widely used on impact evaluations;[40–42] its goodness lays on the possibility of inferring causality of any type of exposition. We estimated the average treatment effects on the treated (ATT) that corresponds to the difference of percentage points of the expected value from the IP outcome variable and the one that would be obtained from the same population without this condition. In this study IP and NIP groups were matched by the previously mentioned covariates. The nearest neighbor matching algorithm 1 to 1 was used.[38] Additional analysis of the matching process suggested non-statistical differences between both groups and the correction of the mentioned biases.

The description of the population was made at population level considering the survey design effects. For the ATT estimation the command psmatch2 of STATA 12.1 was used.[43]

RESULTS

Table 2 shows the sociodemographic profile of the Mexican population from ENSANUT 2012 data. Of the IP, 64.8% had <6 years of education, compared to 44.4% in the NIP. Of the IP, 37.9% reported having a job compared to 43.9% of the NIP. Regarding health insurance, 13.0% of the indigenous were members of Social Security; 59.1% were members of Seguro Popular and 27.1% reported no health insurance.

Table 2. Sociodemographic profile of the Mexican indigenous population[a]

	Non-indigenous	Indigenous	Difference Test *P*
n	168,329	24,105	
N	102,600,000	10,818,956	
%	90.5	9.54	
Men, %	48.9 (48.6, 49.1)	48.9 (48.2, 49.6)	.83
Age (years) %			
<1	1.77 (1.68,1.86)	1.97 (1.72, 2.27)	.00
1–4	7.66 (7.47, 7.86)	8.46 (7.96, 8.98)	
5–9	9.84 (9.62, 10.1)	11.5 (10.9, 12.1)	
10–19	19.5 (19.2, 19.8)	23.3 (22.4, 24.2)	
20–29	17.2 (16.9, 17.5)	15.6 (14.7, 16.5)	
30–39	14.4 (14.1, 14.7)	12.4 (11.8, 13.0)	
40–49	11.8 (11.5, 12.1)	10.0 (9.45, 10.6)	
50–59	8.72 (8.47, 8.99)	8.08 (7.55, 8.64)	
≥60	9.19 (8.84, 9.55)	8.78 (8.07, 9.54)	
Schooling (years), aged ≥5 years, %			
0	10.6 (10.3, 10.9)	21.9 (20.7, 23.2)	.00
1–6	33.8 (33.3, 34.4)	42.9 (41.7, 44.2)	
7–9	26.4 (26.0, 26.9)	20.8 (19.8, 21.8)	
10–12	17.8 (17.4, 18.2)	10.1 (9.22, 11.0)	
≥13	11.4 (10.8, 12.0)	4.27 (3.66, 4.98)	
Works, aged ≥8 years, %	43.9 (43.4, 44.3)	37.9 (36.9, 39.0)	.00
Civil status, aged ≥12 years, %			
Married/free union	53.9 (53.4, 54.4)	54.8 (53.6, 56.1)	.00
Separated/divorced	5.37 (5.18, 5.57)	2.94 (2.55, 3.38)	
Widow	4.37 (4.20, 4.54)	4.35 (3.97, 4.76)	
Married	36.4 (36.0, 36.8)	37.9 (36.8, 39.0)	
Health insurance, %			
Social Security	38.0 (37.0, 39.0)	13.0 (11.5, 14.7)	.00
Seguro Popular	34.6 (33.7, 35.5)	59.1 (56.3, 61.9)	
More than one	1.51 (1.37, 1.67)	.66 (.44, .98)	
Private	.48 (.39, .59)	.08 (.03, .19)	
None	25.4 (24.8, 26.1)	27.1 (25.0, 29.4)	

[a] Estimations were made considering the effect of the survey design. CI 95% in parenthesis.

Indigenous households had, on average, more inhabitants than those non-indigenous (5.40 vs 4.73) (Table 3). In 73.5% of the indigenous households, the head of the household had <6 years of education; 69.2% of these households are located in the first two quintiles of the annual expenditure per household resident; 58.4% are Oportunidades beneficiaries, 53.6% lived in rural localities and 71.5% in those of high or very high marginalization degree.

Table 4 shows the principal health outcomes analyzed. A low coverage was identified in the IP for 3 of the 5 proposed indicators. 54.3% of the IP with <1 year registered a fulfilled vaccination schedule compared to 65.9% in NIP. 53.4% of the children in IP aged <5 years that presented an ARI's in the 15 days previous to the survey received medical care compared to 62.8% of the children in NIP. Among IP women 64.8% received timely, frequent, and quality ANC vs 73.1% in NIP. In contrast, different results were found for the health care outcomes before an ADD and older adult's vaccination schedule. Over 55% of the IP children aged <5 years that had an ADD in the 15 days previous to the survey received medical

Table 3. Contextual characteristics of the Mexican indigenous population[a]

	Non-indigenous	Indigenous	Difference Test *P*
n	168,329	24,105	
N	102,600,000	10,818,956	
%	90.5	9.54	
Residence household			
Number residents, average	4.73 (4.67, 4.77)	5.40 (5.28, 5.52)	0
Schooling (years), head of household %			
0	9.69 (9.21, 10.2)	25.1 (23.1, 27.1)	0
1–6	35.2 (34.3, 36.2)	48.4 (46.1, 50.6)	
7–9	26.7 (25.9, 27.5)	16.9 (15.3, 18.8)	
10–12	15.9 (15.3, 16.6)	5.79 (4.80, 6.96)	
≥13	12.4 (11.6, 13.3)	3.82 (3.04, 4.80)	
Household head work, %	75.5 (74.7, 76.3)	76.0 (73.9, 77.9)	.67
Quintile of annual expenditure, %			
I	17.0 (16.2, 17.9)	48.5 (45.1, 51.8)	0
II	19.9 (19.3, 20.6)	20.7 (18.9, 22.7)	
III	20.5 (18.9, 21.2)	15.0 (13.4, 16.9)	
IV	21.1 (20.4, 21.8)	9.79 (8.54, 11.2)	
V	21.5 (20.6, 22.4)	6.02 (5.08, 11.2)	
Beneficiary of Oportunidades, %	22.0 (21.1, 22.8)	58.4 (55.5, 61.1)	0
Residence locality, %			
Rural	19.5 (18.6, 20.3)	53.6 (48.2, 58.8)	0
Urban	18.6 (17.9, 19.3)	23.0 (18.6, 28.0)	
Metropolitan	61.9 (61.0, 62.9)	23.5 (19.5, 28.0)	
Marginalization degree, %			
Very low/low	71.7 (70.0, 73.3)	21.0 (18.0, 24.4)	0
Medium	11.4 (9.92,13.0)	7.47 (5.04, 10.9)	
High/very high	17.0 (15.6, 18.4)	71.5 (67.0, 75.6)	
Geographic/economic region, %			
North-West	13.4 (13.0, 13.9)	4.77 (3.41, 6.63)	0
North-East	10.3 (9.9, 10.8)	1.05 (.72, 1.53)	
Central North	12.0 (11.6, 12.4)	4.49 (3.18, 6.31)	
East	14.6 (13.9, 15.4)	22.7 (17.5, 28.8)	
West	13.0 (12.5, 13.5)	3.10 (1.73, 5.49)	
Central-South	23.8 (23.1, 24.6)	13.4 (10.1, 17.6)	
South-West	8.09 (7.49, 8.73)	35.9 (31.1, 41.0)	
South-East	4.71 (4.49, 4.94)	14.6 (12.5, 16.9)	

[a] Estimations were made considering the effect of the survey design. CI 95% in parenthesis.

care compared to 51.5% of the NIP. Finally, 52.8% of the IPS aged ≥60 years had a fulfilled vaccination schedule vs 40.2% in NIP.

Table 5 shows the influence of IP on all outcomes. In similar socioeconomic and demographic conditions, statistically significant differences were not identified, except for vaccination coverage in older adults, IP increase 9 percentage points the likelihood of having a fulfilled vaccination schedule ($P<.01$).

DISCUSSION

In the context of an imminent universalization of health coverage in Mexico,[20] our study contributes robust evidence that suggest major challenges in the field of social protection of the IP. Our results show the persistency of social and economic deprivation in the Mexican IP; however when we matched by those conditions, the health indicators analyzed revealed no significant differences. Contextual conditions and no-indigenous condition itself are associated with the presence of inequalities in the health indicators analyzed. Literature documents this context and its consequences mainly from a sociodemographic-descriptive point of view.[18,44] Nonetheless, little research has been carried out to explore the relative weight of the structural conditions vs the ethnic differences in Latin American countries, particularly in health issues.[45,46]

We focused particularly on analyzing the influence of the indigenous condition on four proxies of inequalities in the access to health services:[47] 1) medical health care for ARI's and ADD in children aged <5 years; 2) receiving a fulfilled vaccination schedule in populations aged <1 year or ≥60 years; and 3) antenatal care.[31] Based in quasi-experimental propensity score matching method,[48] this study showed that indigenous condition does not affect the likelihood of occurrence of this outcomes. These results support the hypothesis that, in socioeconomic, demographic and similar health needs settings, indigenous condition per-se is not the cause of disadvantages observed in complete vaccination coverage in children aged <1 year (65.9 vs 54.3%), ARI's health care (62.8 vs 53.4%), and receiving timely, frequent and high quality of ANC (73.1 vs 64.8%). Unfavorable living conditions of IP explain these differences, (ie, the environment characterized by poverty and constrained access to public services together delineate the determinants of the health of this population).[24]

These results support the hypothesis that, in socioeconomic, demographic and similar health needs settings, indigenous condition per-se is not the cause of disadvantages observed…

Table 4. Health care and vaccination coverage of the Mexican indigenous population[a]

	Population Group				
	Aged <1 Year	Aged <5 Years		Aged ≥60 Years	Women Aged 14-49 Years
N	1,291,416	10,799,474		10,459,498	7,913,328
n	1,588	13,479		8,706	5,571
Indicator	Complete vaccination schedule coverage[b]	Medical care of ARI's in the last 15 days[cd]	Medical care of diarrheal disease in the last 15 days[d]	% Complete vaccination schedule coverage	% Timely, frequent and quality[e] antenatal care
% Cases	100	44.8 (43.4, 46.1)	11.0 (10.3, 11.8)	100	100
Non indigenous	88.4 (86.1, 90.4)	42.3 (43.8, 46.8)	10.9 (10.1, 11.8)	91.3 (90.4, 92.1)	91.1 (89.6, 92.3)
Indigenous	11.6 (6.64, 13.9)	40.5 (37.2, 44.0)	12.2 (10.2, 14.6)	8.72 (7.88, 9.64)	8.95 (7.70, 10.4)
% Coverage/attention	64.5 (61.0, 67.9)	61.9 (60.0, 63.7)	51.9 (48.3, 55.5)	41.3 (39.6, 43.0)	72.4 (70.5, 74.3)
Non indigenous	65.9 (62.0, 69.5)	62.8 (60.8, 64.7)	51.5 (47.6, 55.4)	40.2 (38.4, 42.0)	73.1 (71.1, 75.1)
Indigenous	54.3 (45.4, 62.9)	53.4 (48.2, 58.4)	55.3 (48.2, 62.1)	52.8 (49.2, 56.3)	64.8 (59.6, 69.6)

[a] Estimations were made considering the effect of the survey design. CI 95% in parenthesis.
[b] Do not consider rotavirus or pneumococcal vaccine.
[c] Acute respiratory infection.
[d] This event occurred during the 2 previous weeks to the survey.
[e] Timely antenatal attendance – first visit during the first trimester of pregnancy, frequent – at least four visits during the entire pregnancy and quality – 7/8 procedures recommended by the Mexican Official Standard.[30]

Prior studies suggest the validity of this hypothesis,[46] nevertheless the goodness of this propensity score matching method (against other traditional regression methods) related to bias reduction due to specification problems; the consequent reduction of multidimensionality of the phenomenon of study,[49] and the identification of similar population groups in the characteristics widely related to the indigenous population, allows a more accurate the contrast of this hypothesis. Additionally, the result supposes that the relation between the ethnic condition and inequalities in accessing health services is a wrongly focused issue. If the indigenous condition were responsible for the vulnerability of this group, its causes should be looked for in what defines and differentiates indigenous population. There is an agreement on two main characteristics in defining a person as indigenous, the consciousness of identity[50] and the linguistic criterion, meaning that an individual speaks an indigenous language.[51]

The results of our study point to a different direction, namely, that identity, culture and language do not make a person vulnerable or explain the inequality on access to health care services. Its causes are seen in other conditions such as living in rural areas, with no access to basic services and inadequate support of social programs. These

Table 5. Influence of indigenous condition on children, mother and older people health care and vaccination coverage

	Complete Vaccination Schedule Coverage (<1 Year)[a]	Children <5 Years		Complete Vaccination Schedule Coverage Aged ≥60 Years	Women Aged 15-49 Years
		ARI's[bc]	Diarrhoeal Disease[c]		Timely, Frequent and Quality Antenatal Care[d]
ATT – Indigenous	.65	.57	.51	.56	.67
ATT – Non indigenous	.58	.55	.47	.47	.69
ATT – Difference	.07 (.06)	.02 (.03)	.04 (.06)	.09 (.02)[e]	−.01 (.03)
Observations					
Sample (A)	1,588	6,127	1,455	8,706	5,571
Matched (B)	278	1,170	310	1,718	998
[(B)/(A)]×100	17.5	19.1	21.3	19.7	17.9

ATT, treated. Standard errors in parenthesis.
[a] Do not consider rotavirus or pneumococcal vaccine.
[b] Acute Respiratory Infection.
[c] This event occurred during the 2 previous weeks to the survey.
[d] Timely antenatal attention – first visit during the first trimester of pregnancy, frequent – at least four visits during the entire pregnancy and quality – 7/8 recommended procedures by the Mexican official standard.[30]
[e] $P<.01$.

conditions are independent to indigenous condition. It is necessary to restart the conceptual discussion about the ethnical condition,[52] to reflect its significance when it is used as a comparison variable in epidemiologic studies and other kind of studies.

This is not the case of vaccination coverage in older people, where the difference of 12.6% favorable to IP, observed, prior to the matching is reduced to 9% considering similar socioeconomic conditions. A plausible explanation of this outcome might be that it is a direct consequence of the recent extension and focalization of the Mexican health system to expand vaccination coverage to this age group and the population located in the less favored sectors in Mexico.[53] It is important to note that the evaluated vaccination schedule considered the current vaccine schedule in order to ensure that the evaluation included immunizations without problems due to new vaccines adoption.

These results suggest that health coverage among Mexican population is a pending issue for its health system. It is necessary to reinforce health protection structures that increase demand for health services considering the multicultural context that characterizes the country.[54,55] Universal coverage in health should mean access and timely use of effective and high quality services when necessary, for the entire population,[56,57] and other actions promoting equity and effective achievement of the right to health,[57] where intercultural perspectives play an important role.

The results of this study have some limitations that should be noted: First, although the ENSANUT is a high-quality, population-based survey, it may have sampled a non-representative group of indigenous population, which would limit the generalizability of our results to the larger population. We used a self-reported measure of outcome variables, IP exposure, and covariables. Second, this analysis is subject to the limitations of all observational studies, such as potential omitted variables bias; so, the conclusions reached here do not have the same causal inference strength as those obtained from a true experimental design.

Third, it is important to note the definition used for IP. In Mexico the identification of the indigenous populations has not been uniform over the years. Official statistics had traditionally defined the indigenous population using criteria based on language, which many have argued largely underestimated this increasingly urban population for example. Only, since the 2000 population census, a question based on self-identification was included. Additionally, The National Commission for the Development of Indigenous People has marked out the limitations of using both criteria (at individual level), while the identity had a dynamic character, linguistic criteria leaves out people who have not developed speaking competencies (children aged <5 years, a main analytical group in this study), and make no distinction between speaking, understanding or being fluent in the language.[58] Following this official definition of IP at household level, in our study a household (and its members) is considered indigenous if the head of the family, a spouse and/or an ascendant speaks an indigenous language.

In conclusion, our study contributes to the literature by the identification and analysis of inequalities in access to health care among IP pointed out by different authors.[59] We believe that a clear identification of the cultural and structural constrains of health services should allow the development or strengthening of focalized actions to improve these inequalities.

REFERENCES

1. Pan American Health Organization. Health in the Americas: 2012 edition. Regional Outlook and Country Profiles. 2012;636.
2. Secretaría de Salud. Sexto informe de labores. Dirección general de evaluación del desempeño. 2012.
3. SINAVE/DGE/SALUD. Panorama epidemiológico y estadístico de la mortalidad en México 2010.
4. Secretaría de Salud. Programa de acción específico 2007–2012: Prevención de la mortalidad infantil. 2008.
5. Engle PL, Black MM, Behrman JR, et al. Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *The Lancet*. 2007;369 (9557):229–242.
6. Trejo-Valdivia B, Mendoza-Alvarado LR, Palma-Coca O, Hernández-Ávila M, Téllez-Rojo Solís MM. Encuesta nacional de cobertura de vacunación (influenza, neumococo y tétanos) en adultos mayores de 60 años en México. *Salud Pública de México*. 2012;54(1): 39–46.
7. Michel J, ed. *Vaccine Programme for Life.* World Health Organization. Report of the Ad-Hoc Consultation on Ageing and Immunization. Geneva, Switzerland: WHO; 2011.
8. INEGI. Censo general de población y vivienda. 2010.
9. Montenegro RA, Stephens C. Indigenous health in Latin America and the Caribbean. *The Lancet*. 2006;367(9525):1859–1869.
10. Gracey M, King M. Indigenous health part 1: Determinants and disease patterns. *The Lancet*. 2009;374(9683):65–75.
11. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. *Regiones indígenas de méxico.* 1st ed. México DF: Comisión Nacional para el Desarrollo de los Pueblos Indígenas; 2006.
12. Consejo Nacional de Población. *Índice de marginación por localidad 2010.* 1st ed. México DF: CONAPO; 2010. conapo.gob.mx/es/CONAPO/Indice_de_Marginacion_por_Localidad_2010.
13. CDI/PNUD. La mortalidad materna indígena y su prevención. comisión nacional para el desarrollo de los pueblos indígenas. 2010.
14. PNUD. Informe sobre el desarrollo humano de los pueblos indígenas en México. El reto de la desigualdad de oportunidades. 2010;2.
15. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. *Diagnóstico sociodemográfico de los adultos mayores indígenas de México.* 1st ed. CDI/PNUD; 2006. cdi.gob.mx/index.php?option=com_content&task=view&id=247&Itemid=54. Accessed July 22, 2014.
16. Shone LP, Dick AW, Brach C, et al. The role of race and ethnicity in the state children's health insurance program (SCHIP) in four states: Are there baseline disparities, and what do they mean for SCHIP? *Pediatrics*. 2003; 112(Supplement E1):e521–e532.
17. Harawa N, Leng M, Kim J, Emery W. Racial/ethnic and gender differences among older adults in nonmonogamous partnerships, time spent single, and HIV testing. *Sex Transm Dis*. 2011;38(12):1110–1117.

18. Hall G, Patrinos HA, eds. *Indigenous Peoples, Poverty and Human Development in Latin America*. Houndmills, U.K. and New York: Palgrave Macmillan; 2006;xix.
19. Mejía-Mejía A, Sánchez-Gandur AF, Tamayo-Ramírez JC. Equidad en el acceso a servicios de salud en antioquia, colombia. *Revista de Salud Pública*. 2007;9(1):26–38.
20. Knaul FM, González-Pier E, Gómez-Dantés O, et al. The quest for universal health coverage: Achieving social protection for all in Mexico. *Lancet*. 2012;380(9849):1259–1279.
21. Frenk J, Gómez-Dantés O, Knaul FM. The democratization of health in Mexico: Financial innovations for universal coverage. *Bull World Health Organ*. 2009;87(7):542–548.
22. Secretaría de Salud. Programa de acción específico 2007–2012. Arranque parejo en la vida. 2008.
23. Leyva-Flores R, Infante-Xibille C, Gutiérrez-Reyes JP, Quintino-Pérez F. Inequidad persistente en salud y acceso a los servicios para los pueblos indígenas de México, 2006–2012. *Salud Publica Mex*. 2013;55(supl 2):s123–s128.
24. Marmot M. Social determinants of health inequalities. *The Lancet*. 2005;365(9464):1099–1104.
25. Romero-Martínez M, Shamah-Levy T, Franco-Núñez A, Villalpando S, Cuevas-Nasu L, Gutiérrez JP, Rivera-Dommarco JA. Encuesta nacional de salud y nutrición 2012: Diseño y cobertura. *Salud Publica Mex*. 2013;55(supl 2):S332–s340.
26. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. Los hogares y la población indígena. 2009.
27. Secretaría de Salud, ed. *Esquema nacional de vacunación 2008.* 1st ed. México DF: Secretaría de Salud; 2008. Consejo Nacional de Vacunación, ed.
28. Centro Nacional para la Salud de la Infancia y la Adolescencia, ed. *Manual de vacunación 2008–2009.* 1st ed. México DF: Consejo Nacional de Vacunación; 2008. Secretaría de Salud, ed.
29. Secretaría de Salud, ed. *Vacunación universal y semanas nacionales de salud: Lineamientos generales 2007.* 1st ed. México DF: Secretaría de Salud; 2007.
30. Secretaría de Salud. Norma oficial mexicana, NOM-007-SSA2-1993, atención a la mujer durante el embarazo, parto y puerperio a recién nacidos. criterios y procedimientos para la prestación del servicio. 1993.
31. Heredia-Pi I, Serván-Mori E, Reyes-Morales H, Lozano R. Brechas en la cobertura de atención continua del embarazo y el parto en México. *Salud Publica Mex*. 2013;55(supl 2):s249–s258.
32. Secretaría de Salud. Norma oficial Mexicana NOM-036-SSA2-2002, prevención y control de enfermedades. aplicación de vacunas, toxoides, sueros, antitoxinas e inmunoglobulinas en el humano. 2002.
33. Organización Panamericana de la Salud. Plan de acción para la documentación y verificación de la eliminación de sarampión, rubéola y síndrome de rubéola congénita en la región de las Américas. 2009;580.
34. Lopez-Cevallos D, Chi C. Health care utilization in Ecuador: A multilevel analysis of socio-economic determinants and inequality issues. *Health Policy Plan*. 2010;25(3):209–218.
35. Glei DA, Goldman N, Rodríguez G. Utilization of care during pregnancy in rural Guatemala: Does obstetrical need matter? *Soc Sci Med*. 2003;57(12):2447–2463.
36. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? *J Health Soc Behav*. 1995;(1):1.
37. Valdivia M. Public health infrastructure and equity in the utilization of outpatient health care services in peru. *Health Policy Plan*. 2002;17 Suppl:12–19.
38. Dehejia RH, Wahba S. Propensity score-matching methods for nonexperimental causal studies. *Rev Econ Stat*. 2002;84(1):151–161.
39. Caliendo M, Kopeinig S. Some practical guidance for the implementation of propensity score matching. *J Econ Surv*. 2008;22(1):31–72.
40. Wirtz VJ, Santa-Ana-Tellez Y, Servan-Mori E, Avila-Burgos L. Heterogeneous effects of health insurance on out-of-pocket expenditure on medicines in Mexico. *Value Health*. 2012;15(5):593–603.
41. Sosa-Rubí SG, Salinas-Rodríguez A, Galárraga O. Impacto del seguro popular en el gasto catastrófico y de bolsillo en el México rural y urbano, 2005–2008. *Salud Pública de México*. 2011;53:425–435.
42. Diaz JJ, Handa S. An assessment of propensity score matching as a nonexperimental impact estimator: Evidence from Mexico's PROGRESA program. *J Hum Resour*. 2006;(2):319.
43. Stata Corp LP. Stata/SE 12.1 for windows XP 64 bits. 2011.
44. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. *Informe sobre desarrollo humano de los pueblos indígenas de México 2006.* 1st ed. Mexico DF: CDI/PNUD; 2006.
45. Mayer-Foulkes D, y Larrea C. Racial and ethnic health inequities: Bolivia, Brazil, Guatemala, and Peru. In: AntonioGiuffrida ed. *Racial and Ethnic Disparities in Health in Latin America and the Caribbean.* 1st ed Inter-American Development Bank, Social Protection And Health Division, Country Department, Andean Group; 2007;131–135.
46. Handa A. Indigenous health in Mexico. In: Antonio Giuffrida, ed. *IADB Workshop on Racial and Ethnic Disparities in Health in Latin America and The Caribbean.* 1st ed Inter-American Development Bank, Social Protection And Health Division, Country Department, Andean Group; 2007;65–92.
47. Arteaga O, Thollaug S, Nogueira AC, Darras C. Información para la equidad en salud en Chile. *Revista Panamericana de Salud Pública*. 2002;11(5–6):374–385.
48. Rubin DB, Rosenbaum PR. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *Am Statistician*. 1985.
49. Black DA, Smith JA. How robust is the evidence on the effects of college quality? evidence from matching. *J Econ*. 2004;121(1–2):99–124.
50. Navarrete-Linares Fedrico. *Los pueblos indígenas de México.* 1st ed. México DF: CDI; 2008.
51. Comisión Nacional para el Desarrollo de los Pueblos Indígenas. Los hogares y la población indígena. cdi.gob.mx/index.php?id=211&option=com_content&task=view,%202009. Accessed July 22, 2014.
52. Ford CL, Harawa NT. A new conceptualization of ethnicity for social epidemiologic and health equity research. *Soc Sci Med*. 2010;71(2):251–258.
53. Fondo de las Naciones Unidas para la Infancia, ed. *Progreso para la infancia: Lograr los objetivos de desarrollo del milenio con equidad.* 1st ed. USA NY: Organización de las Naciones Unidas; 2010. Organización de las Naciones Unidas, ed.
54. Gómez-Arias RD, Nolasco Bonmatí A, Pereyra-Zamora P, Arias-Valencia S, Rodríguez-Ospina FL, Aguirre DC. Diseño y análisis comparativo de un inventario de indicadores de mortalidad evitable adaptado a las condiciones sanitarias de colombia. *Revista Panamericana de Salud Pública*. 2009;26(5):385–397.
55. Montero Mendoza E. Percepción de los habitantes indígenas de áreas rurales respecto al primer nivel de atención médica: El caso del sureste de veracruz, méxico. *Salud colectiva*. 2011;7(1):73–86.
56. Carvalho de Noronha J. Cobertura universal de saúde: Como misturar conceitos, confundir objetivos, abandonar principios. *Cad. Saúde Pública*. 2013;29(5):847–849.
57. Organización Mundial de la Salud. Informe sobre la salud en el mundo 2013: Investigaciones para una cobertura sanitaria universal. 2013;84.6.

58. Fernández Ham P, ed. *Indicadores con perspectiva de género para los pueblos indígenas: México.* 1st ed. México, DF.: Comisión Nacional para el Desarrollo de los Pueblos Indígenas; 2006. No 1. cdi.gob.mx/index.php?option=com_content&task=view&id=244&Itemid=54. Accessed July 22, 2014.
59. Consorcio EUROsociAL Salud. *Retos para la extensión de la protección social en salud a trabajadores agrícolas y pueblos indígenas.* 1st ed. España: Consorcio EUROsociAL Salud; 2008.

AUTHOR CONTRIBUTIONS

Design and concept of study: Servan-Mori
Acquisition of data: Servan-Mori, Montoya-Rodríguez
Data analysis and interpretation: Servan-Mori, Pelcastre-Villafuerte
Manuscript draft: Servan-Mori, Pelcastre-Villafuerte, Heredia-Pi, Montoya-Rodríguez
Statistical expertise: Servan-Mori, Montoya-Rodríguez
Administrative: Servan-Mori, Pelcastre-Villafuerte, Heredia-Pi, Montoya-Rodríguez
Supervision: Servan-Mori