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Health inequalities by gradients of access to water and sanitation between countries in the Americas, 1990 and 2010

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ABSTRACT

Objective. *To explore distributional inequality of key health outcomes as determined by access coverage to water and sanitation (WS) between countries in the Region of the Americas.*

Methods. *An ecological study was designed to explore the magnitude and change-over-time of standard gap and gradient metrics of environmental inequalities in health at the country level in 1990 and 2010 among the 35 countries of the Americas. Access to drinking water and access to improved sanitation facilities were selected as equity stratifiers. Five dependent variables were: total and healthy life expectancies at birth, and infant, under-5, and maternal mortality.*

Results. *Access to WS correlated with survival and mortality, and strong gradients were seen in both 1990 and 2010. Higher WS access corresponded to higher life expectancy and healthy life expectancy and lower infant, under-5, and maternal mortality risks. Burden of life lost was unequally distributed, steadily concentrated among the most environmentally disadvantaged, who carried up to twice the burden than they would if WS were fairly distributed. Population averages in life expectancy and specific mortality improved, but whereas absolute inequalities decreased, relative inequalities remained mostly invariant.*

Conclusions. *Even with the Region on track to meet MDG 7 on water and sanitation, large environmental gradients and health inequities among countries remain hidden by Regional averages. As the post-2015 development agenda unfolds, policies and actions focused on health equity—mainly on the most socially and environmentally deprived—will be needed in order to secure the right for universal access to water and sanitation.*

Key words Health inequalities; water; sanitation; environmental health; social determinants of health; Millennium Development Goals; Sustainable Development Goals; Americas.

The right to safe and clean drinking water and sanitation has been explicitly recognized by the United Nations (UN) as a human right, essential for the full enjoyment of life (1). In 2012, the World Health Organization (WHO)/UN Children's Fund (UNICEF) Joint Monitoring Programme released its global report on the current situation and trends in water, sanitation, and hygiene (WS), declaring that the Region of the Americas has reached the Millennium Development Goal (MDG) Target 7c for water and that it was on track to meet MDG Target 7c for sanitation by 2015 (2). That same year, the UN also released its Global Analysis and

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Assessment of Sanitation and Drinking Water Report (3) pointing to wide disparities in access to water and sanitation as the main challenge to extending and sustaining services in the Americas, particularly in Latin America and the Caribbean (LAC). In fact, this Region is known by its huge social and environmental disparities and health inequalities (4).

As reported in the Global Burden of Disease Study (5), in 2010 LAC saw an average of 4000 premature deaths (4.5 per million) and 323.4 disability-adjusted life years lost per million attributable to the lack of access to improved WS sources. Inadequate WS practices and services lead to a higher prevalence of waterborne diseases, such as acute diarrhea (mostly among infants and children), hepatitis, typhoid and paratyphoid enteric fevers, and intestinal parasites and other parasitic diseases (6). Furthermore, the lack of access to improved sources of sanitation may force individuals to defecate in the open—described by WHO as "the riskiest sanitation practice of all"—generating a major cause of ground water pollution, agricultural produce contamination, and disease transmission (7, 8). This context creates severe detrimental effects on the health of individuals and societies, leading to impoverishment and destitution due to decreasing economic and educational opportunities.

Access to water and sanitation can be considered the very epitome of an environmental determinant of health. The determinants of health—that is, the general conditions and circumstances in which people are born, grow, live, work, and age—play a central role in establishing and maintaining social position, thus determining the distribution of health and well-being (9). Under the eco-epidemiologic paradigm (10), social inequalities are considered "the causes of the causes" of poor health outcomes; therefore, inequalities in access to WS must drive inequalities in avoidable morbidity, mortality, and survival. Evidence on the magnitude and trends of those environmentally-determined inequalities in health is yet lacking for the Region of the Americas.

To help fill this gap, this study aimed to explore the magnitude and change-over-time of inequalities in the distribution of five core population health outcomes (total life expectancy, healthy life expectancy, infant mortality, mortality under 5 years of age, and maternal mortality) as driven by the unequal distribution of two key environmental determinants—access to drinking water and to sanitation facilities—between countries of the Americas in 1990 and 2010, i.e., the study's "MDG time window."

MATERIALS AND METHODS

Study design

An observational, ecological, country-level, secondary data-based study was designed to explore both the magnitude of and change-over-time in core environmentally-determined health inequalities in the Region of the Americas in 1990, and in 2010.

Data acquisition

Country data were obtained from a number of institution-based, internally-consistent, publicly-available data sources, including the WHO/UNICEF Joint Monitoring Programme (2), PAHO Regional Core Health Data Initiative (11) (which, in turn, contains several interagency-derived, MDG-related indicators, as well as UN population estimates), the World Bank databank, and from the Global Burden of Disease 2010 Study (5), available at the Institute for Health Metrics and Evaluation's Global Health Data Exchange.

The study variables selected for the study were survival and mortality indicators of public health relevance with high quality data available. The independent variables were two environmental determinants/social stratifiers: access to drinking water and access to improved sanitation, according to the standard definitions of WHO/UNICEF (2). The dependent variables were five public health outcomes: life expectancy at birth, healthy (disability-free) life expectancy at birth, infant mortality rate, under-5 mortality rate, and maternal mortality ratio.

The units of analysis (n = 35) were aggregated at the country level and corresponded to: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States, Uruguay, and Venezuela. Collectively, these account for 99.5% of the current estimated population of the Region of the Americas (11).

Data analysis

This study followed Tukey's principle for exploratory data analysis: it aimed at pattern extraction rather than causal association (12). Standard inequality analyses (13) were performed using both abridged and unabridged distributions of each health outcome. The former was used to explore absolute and relative gap inequality, captured in range-based, Kuznets-like metrics by subtracting and dividing, respectively, the unbiased (population weighted) health outcome estimators of the bottom (least advantaged) from the top (most advantaged) WS country quartiles. The absolute gap inequality index retains the units of the health variable and has zero as its equity reference; the relative gap inequality index is dimensionless and has the unity as its equity reference.

The unabridged distribution of each health outcome was used to generate more robust summary measures of gradient inequality. Absolute gradient inequality was captured by the slope index of inequality (SII), which corresponds to the slope of the regression line obtained by regressing country-level health outcome rates on a relative scale of WS-related social position (ridit), as defined by the cumulative class interval midpoint of the population ranked by the equity stratifier. To account for intrinsic heteroskedasticity of aggregated data, the Maddala's weighted least-squares regression model was applied, as described elsewhere (14). Logarithmic data transformation was also tested to account for equity stratifier-health status relationship skewness or non-linearity, when indicated. As an absolute measurement of inequality, the SII retains the units of the health variable and has zero as its equity reference.

Relative gradient inequality was captured by the health concentration index (HCI), a summary measure of disproportionality between population and health shares. It was computed by fitting, by non-linear optimization, a Lorenz concentration curve equation (15) to the observed cumulative relative distributions of the population ranked by the equity stratifier and the health outcome across the countries studied, and numerically integrating the area under the curve. As a relative

measurement of inequality, the HCI is dimensionless and has zero as its equity reference.

Uncertainty was ascertained by computing 95% confidence intervals (95%CI) for all summary measures of health inequality. To assess health inequality change-over-time, the average rate of change in the magnitude of a given health inequality metrics between the two time-points was computed. To characterize Regional scenarios of population health in the period studied, health changes in mean population trends and social gap/gradients were simultaneously assessed, based on an analytical framework derived from Minujin and Delamonica's approach (16). Four possible scenarios were discriminated, based on whether the Regional average was improving or worsening and the social gap/gradient was narrowing or widening.

All statistical analyses were performed in MS Excel™ Solver and ToolPak add-ins (Microsoft Corp., Redmond, Washington, United States) using a semi-automated analytical template tool developed by PAHO for the exploratory data analysis of social inequalities in health (available upon request).

RESULTS

All four summary measures of health inequality (gap/gradient and absolute/relative) with their 95%CI, along with the Regional average level for each of the five health outcomes across the two equity stratifiers at the two points in time (1990 and 2010) are shown in Table 1. Of a total of 80 measurements of health inequality computed, 73 (+91%) systematically, and non-trivially, departed from their equity reference.

Table 2 shows the summary distribution of each health outcome across quartiles of each equity stratifier, both in 1990 and in 2010, exposing—unrelentingly—the presence and persistence of the health gradient: albeit auspiciously lessened lately, the lesser the access to water and/or sanitation, the poorer the health outcomes across countries.

WS-related inequalities in life expectancy

The study found a 5-year average rise in life expectancy between 1990 and 2010 (from 71.2 to 76.2 years of age) in the Region as a

TABLE 1. Change-over-time in health inequalities across environmental gradients, as defined by access to water and sanitation services, countries of the Americas (*n* = 29–35), 1990 and 2010

		Access to drinking water							Access to sanitation facilities						
		1990			2010			Average rate of change in inequality[b]	1990			2010			Average rate of change in inequality
			95%CI[a]			95%CI				95%CI			95%CI		
Health outcome	Summary metrics	Point value	Lower	Upper	Point value	Lower	Upper		Point value	Lower	Upper	Point value	Lower	Upper	
Life expectancy at birth	Regional mean, years	71.2	69.7	72.7	76.2	75.0	77.4								
	Absolute gap index	−11.0	−13.8	−8.1 §[c]	−6.3	−9.8	−2.8 §	42.7	−11.6	−14.8	−8.4 §	−7.7	−10.2	−5.3 §	33.6
	Relative gap index	0.85	0.74	0.97 §	0.92	0.79	1.05	−8.2	0.85	0.73	0.97 §	0.90	0.81	0.99 §	−5.9
	Slope index of inequality	12.8	9.3	16.2 §	8.9	5.7	12.1 §	30.5	13.1	9.7	16.4 §	10.8	8.4	13.1 §	17.4
	Health concentration index	−0.31	−0.44	−0.17 §	−0.50	−0.38	−0.12 §	−61.3	−0.37	−0.51	−0.22 §	−0.37	−0.52	−0.23 §	0.0
Healthy life expectancy at birth	Regional mean, years	61.6	60.5	62.8	64.2	62.9	65.6								
	Absolute gap index	−7.6	−10.9	−4.3 §	−6.1	−13.0	0.7	19.7	−8.1	−11.5	−4.7 §	−5.7	−11.6	0.3	30.4
	Relative gap index	0.88	0.74	1.03	0.91	0.61	1.20	−3.4	0.87	0.72	1.02	0.91	0.66	1.17	−4.6
	Slope index of inequality	8.5	5.6	11.3 §	6.2	1.5	10.8 §	27.5	8.6	5.8	11.4 §	7.3	2.9	11.6 §	15.6
	Health concentration index	−0.33	−0.47	−0.18 §	−0.29	−0.43	−0.14 §	12.1	−0.38	−0.54	−0.23 §	−0.38	−0.53	−0.22 §	0.0
Infant mortality rate	Regional mean, per 1 000 LB[d]	29.0	28.6	29.4	13.2	13.0	13.5								
	Absolute gap index	49.2	48.0	50.3 §	16.3	15.5	17.1 §	66.8	51.5	50.3	52.7 §	17.7	17.0	18.4 §	65.7
	Relative gap index	6.29	5.99	6.61 §	2.56	2.45	2.69 §	59.3	6.54	6.23	6.87 §	3.73	3.53	3.94 §	43.0
	Slope index of inequality	−59.7	−73.0	−46.4 §	−19.6	−27.9	−11.4 §	67.1	−59.8	−73.1	−46.6 §	−22.2	−29.5	−14.8 §	62.9
	Health concentration index	−0.32	−0.43	−0.22 §	−0.22	−0.33	−0.12 §	31.3	−0.38	−0.49	−0.27 §	−0.28	−0.38	−0.17 §	26.3
Under-5 mortality rate	Regional mean, per 1 000 LB	36.1	35.7	36.6	16.3	16.1	16.6								
	Absolute gap index	69.6	68.3	70.9 §	30.6	29.7	31.4 §	56.1	73.8	72.5	75.1 §	28.9	28.1	29.7 §	60.9
	Relative gap index	7.24	6.93	7.56 §	3.58	3.44	3.73 §	50.6	7.61	7.29	7.95 §	4.87	4.64	5.11 §	36.0
	Slope index of inequality	−79.3	−97.0	−61.5 §	−29.7	−48.7	−10.8 §	62.5	−79.3	−97.0	−61.5 §	−32.2	−50.6	−13.7 §	59.4
	Health concentration index	−0.34	−0.45	−0.24 §	−0.29	−0.40	−0.18 §	14.7	−0.39	−0.50	−0.28 §	−0.32	−0.43	−0.21 §	17.9
Maternal mortality ratio	Regional mean, per 100 000 LB	86.7	80.0	93.7	58.9	54.1	64.1								
	Absolute gap index	289.7	267.6	311.8 §	97.8	81.9	113.8 §	66.2	277.5	255.9	299.0 §	93.4	79.4	107.4 §	66.3
	Relative gap index	16.75	12.49	22.47 §	3.75	2.97	4.72 §	77.6	23.36	16.31	33.47 §	5.00	3.83	6.55 §	78.6
	Slope index of inequality	−251.9	−344.3	−159.5 §	−118.6	−153.3	−83.8 §	52.9	−244.2	−339.7	−148.6 §	−102.0	−144.2	−59.8 §	58.2
	Health concentration index	−0.44	−0.58	−0.31 §	−0.30	−0.43	−0.17 §	31.8	−0.48	−0.62	−0.35 §	−0.28	−0.41	−0.14 §	41.7

Source: prepared by authors from the study results.
[a] 95%CI = 95% confidence interval.
[b] Average rate of change in inequality = (1990 pv – 2010 pv) / 1990 pv × 100.
[c] § = non-trivially departed from its equity reference.
[d] LB = live births.

TABLE 2. Health outcome distribution across quartiles of access to water and sanitation services, countries of the Americas (*n* = 29–35), 1990 and 2010

Health outcome, units	Year assessed	Access to drinking water				Access to sanitation facilities			
		Lowest	Second	Third	Highest	Lowest	Second	Third	Highest
Life expectancy at birth, years	1990	64.6	70.4	68.3	75.6	63.9	67.9	72.4	75.5
	2010	71.1	73.6	76.8	77.4	72.0	74.2	75.5	79.7
Healthy life expectancy at birth, years	1990	56.6	61.2	59.5	64.2	56.1	59.7	62.3	64.2
	2010	58.8	62.9	65.0	65.0	60.5	62.3	64.9	66.1
Infant mortality, rate per 1 000 LB[a]	1990	58.5	44.4	25.2	9.3	60.8	43.6	21.5	9.3
	2010	26.8	18.4	12.6	10.4	24.2	16.7	13.2	6.5
Under-5 mortality, rate per 1 000 LB	1990	80.8	54.4	30.1	11.2	85.0	53.4	25.3	11.2
	2010	42.4	22.0	15.0	11.8	36.3	19.3	15.1	7.5
Maternal mortality, rate per 100 000 LB	1990	308.1	100.2	117.9	18.4	289.9	122.8	71.0	12.4
	2010	133.4	90.3	74.9	35.6	116.7	71.3	79.7	23.3

Source: prepared by authors from the study results.
[a] LB = live births.

whole. Life expectancy was directly correlated to social position defined by access to improved sources of WS. Whereas absolute inequality—as assessed by both gap and gradient metrics—improved systematically and non-trivially between 1990 and 2010, relative inequality did not. This pattern was noted in the environmental hierarchy defined by access to water, as well as in that by access to sanitation. Figure 1 depicts the case for the former: the SII went down from 12.8 years (95%CI: 9.3 – 16.2) to 8.9 years (95%CI: 5.7 – 12.1), and the health concentration index (HCI) went up from –0.31 (95%CI: –0.44 – –0.17) to –0.50 (95%CI: –0.38 – –0.12). In 2010, around 40% of all expected years of life lost (to premature death) remained concentrated in the quartile of countries with least access to water (and 50% in those with least access to sanitation).

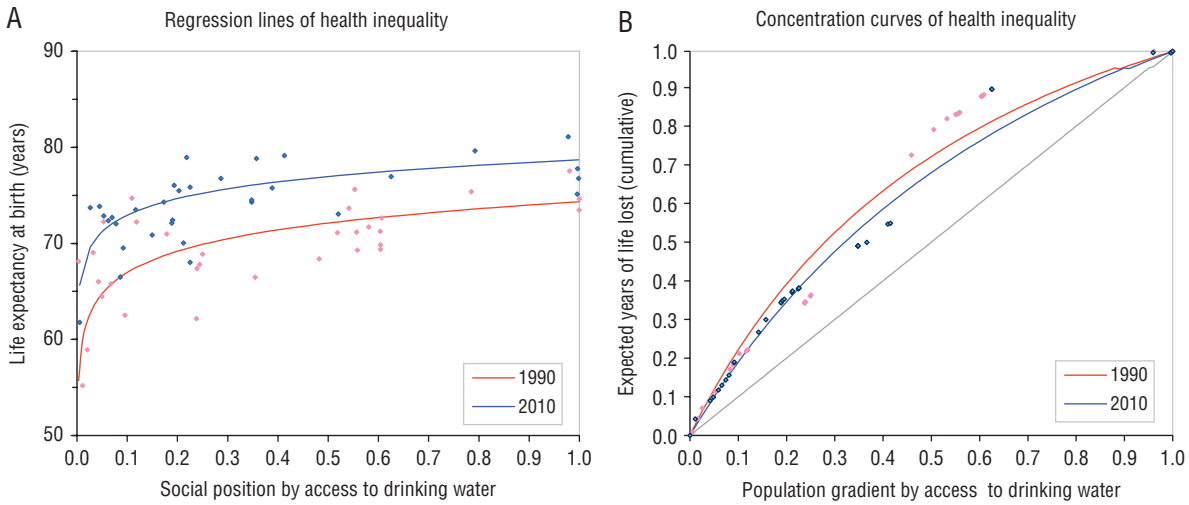
WS-related inequalities in healthy life expectancy

Disability-free life expectancy also improved, from 61.6 years in 1990 to 64.2 years in 2010—implying that, on average, over 50% of the gain in life expectancy accrued by the Region in that period stood for life lived with disability. The magnitude of inequality in healthy life expectancy among countries across the environmental gradients defined by access to water and sanitation was less prominent than that of total life expectancy, but so was the rate of change in the period assessed. The absolute gap in healthy life expectancy between extreme quartiles of water access narrowed by around 20% (from –7.6 years in 1990 to –6.1 in 2010), as compared to a +40% reduction in the total life expectancy gap—an indication that disability concentrated disproportionately among those with the least access to WS. The conforming rate of change between extreme quartiles of access to sanitation was around 30% in both life expectancy measurements. Relative gaps remained invariant as well; overall, around 50% of all potential years of life lost (to disability) stayed concentrated in the quartile of countries with the least access to WS.

WS-related inequalities in infant mortality

The study found significant improvement in both the Regional mean level and the extent of WS-related inequalities

FIGURE 1. Absolute (A) and relative (B) gradient inequalities in life expectancy at birth by access to water services, countries of the Americas (*n* = 33), 1990 and 2010



Source: prepared by authors from the study results.

in the risk of dying before 1 year of age. The infant mortality rate declined from 29.0 (95%CI: 28.6 – 29.4) per 1000 live births in 1990 to 13.2 (95%CI: 13.0 – 13.5) in 2010. Absolute inequality, as measured by the SII, improved from –59.7 (95%CI: –73.0 – –46.4) infant deaths per 1000 live births in 1990 to –19.6 (95%CI: –27.9 – –11.4) in 2010 in the population gradient defined by access to water, and from –59.8 (95%CI: –73.1 – –46.6) infant deaths per 1000 live births in 1990 to –22.2 (95%CI: –29.5 – –14.8) in 2010 in the population gradient defined by access to sanitation. Relative inequality, as captured in the HCI, declined by 31% in the water access gradient and by 26% in the sanitation access gradient, reaching –0.22 (95%CI: –0.33 – –0.12) and –0.28 (95%CI: –0.38 – –0.17), respectively, in 2010.

WS-related inequalities in under-5 mortality

Patterns of magnitude and change-over-time in Regional mean level and gap and gradient inequalities analogous to those observed in infant mortality were found as well in under-5 mortality. At the Regional level, the risk of dying before reaching 5 years of age dropped from 36.1 (95%CI: 35.7 – 36.6) per 1000 live births in 1990 to 16.3 (95%CI: 16.1 – 16.6) in 2010. Likewise, across the water access gradient, absolute inequality shrunk from –79.3 (95%CI: –97.0 – -61.5) per 1000 live births in 1990 to –29.7 (95%CI: –48.7 – –10.8) in 2010, and relative inequality shrunk from –0.34 (95%CI: –0.45 – –0.24) to –0.29 (95%CI: –0.40 – –0.18). Similar changes were also observed across the sanitation access gradient, as shown in Table 1.

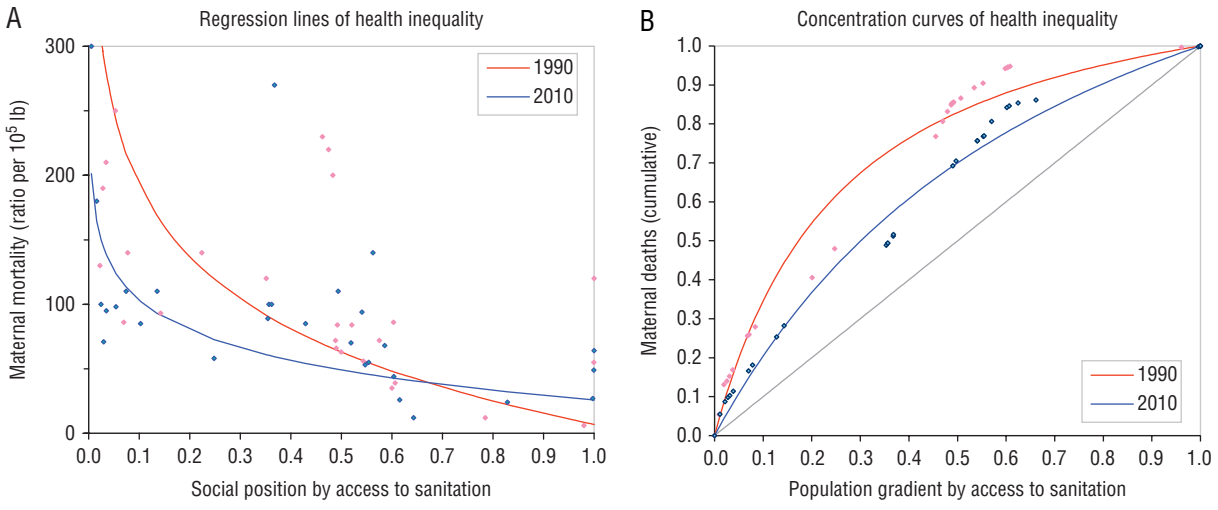
WS-related inequalities in maternal mortality

Like the two other mortality outcomes studied, maternal mortality and social position defined by access to WS were found strongly inversely correlated. On average, the Regional maternal mortality ratio decreased from 86.7 (95%CI: 80.0 – 93.7) maternal deaths per 100000 live births in 1990 to 58.9 (95%CI: 54.1 – 64.1) in 2010; i.e., a mere one-third reduction. Drops in absolute and relative inequality, both gap and gradient, were more pronounced — the SII fell from –244.2 (95%CI: –339.7 – –148.6) maternal deaths per 100000 live births in 1990 to –102.0 (95%CI: –144.2 – –59.8) in 2010 across the sanitation access gradient, and the HCI went down from –0.48 (95%CI: –0.62 – –0.35) to –0.28 (95%CI: –0.41 – –0.14]. Figure 2 illustrates the changes in absolute (SII) and relative (HCI) inequalities in maternal mortality across the environmental gradient defined by access to improved sanitation facilities. In 2010, roughly 44% of all maternal deaths accrued in the Region remained disproportionately concentrated in the population quartile with the least access to sanitation, down from approximately 62% in 1990.

DISCUSSION

Recent debate on the social determinants of health has stressed the unequal distribution of health as a major challenge for national development and public health governance, as well as a matter of environmental justice (9, 17, 18). This study contributes to that debate, showing the fundamental role that access to water and sanitation—as environmental determinants of health—has on the production and the perpetuation of health inequality among countries of the Americas. Access to drinking water and improved sanitation facilities correlated with survival and mortality, and during the period from 1990 – 2010, strong gradients were seen: the closer to universal the access to WS, the higher the total and healthy life expectancies, and the lower the infant, under-5, and maternal mortality. The burden of total and healthy life lost was unequally distributed across the population of the Region, being disproportionately concentrated among the most environmentally disadvantaged, who carried twice the burden than they would in a society with fairly distributed access to WS. In spite of the great strides made toward improving Regional averages while narrowing health inequality (largely absolute inequality) in life expectancies and maternal and child mortalities since 1990, this study suggests that socioeconomically deprived populations in the Americas persistently suffer a steadily higher exposure to environmental

FIGURE 2. Absolute (A) and relative (B) gradient inequalities in maternal mortality by access to sanitation services, countries of the Americas (*n* = 29), 1990 and 2010



Source: prepared by authors from the study results.

hazards and/or greater vulnerability to their adverse effects on health.

A growing concern on the environmental production of health inequality is reflected in recent research and policy literature, although a focused interest of inquiry on water and/or sanitation as determinants of health inequalities has been rather limited. In the international context, some studies have found life expectancy, infant mortality, and maternal mortality significantly associated with lack of water or sanitation facilities at the household level (19, 20). A systematic review of the evidence in Europe concluded that socioeconomic inequalities in the living environment are major contributing factors to health inequalities, and called for more and better research to quantify the magnitude of such environmental inequalities (21). A recent WHO/EURO-led European review also concluded that environmental health inequalities are ever-present in all subregions and countries, and are most often endured by disadvantaged population groups (22). Said review emphasized interactions between lack of access to WS and income (poverty), household type (single-parent), and location (rural populations); nevertheless, it stated that while the health impact of environmental and social conditions are documented in some countries, the number of relevant studies is still low.

There have been even fewer studies on this issue in the Americas, particularly in LAC. In 2002, Soares and colleagues studied microdata from multipurpose household surveys and showed the extent and ubiquity of inequalities in access to and spending on drinking water services: poorer and rural families had less access to water supply and higher costs and time consumed; however, no assessment of the impact on health inequality was reported (23). Two more recent studies found a significant association between higher sanitation (and water supply) coverage and lower mortality in children, (24) as well as improvements in public health infrastructure investments, including the provision of treated water and sewerage services, and positive trends in life expectancy (25).

Limitations

To the best of our knowledge, this is the first study that reports on the magnitude and changes over time of environmentally-determined health inequalities in the Region of the Americas, albeit from an ecological perspective. Ecological studies have several limitations, including the fact that no causal or individual-level inferences can be made. To the extent that the generation of evidence in our study was grounded on exploratory data analysis, i.e., oriented to pattern extraction rather than confirmatory causal claims, we might have avoided the ecological fallacy (12). Because of this focus on pattern extraction, its analyses also privileged a bivariate rather than a multivariate approach, albeit acknowledging that exposure and vulnerability to lack of access to WS are influenced by, and interact with, other determinants of health, such as age, gender, ethnicity, income, location, neighborhood infrastructure, and living conditions (17–19, 21–26). Moreover, since the study was based on secondary data sources, the validity of its results are contingent on the quality and reliability of those data sources (5, 27, 28)

CONCLUSIONS

Despite its limitations, some general conclusions can be drawn from the study to inform public policy. Even if the Region as a whole is on track to meet MDG-7 on water and sanitation, there are large inequalities among countries hidden by Regional averages. Not only is progress towards the target on sanitation the most off-track of all the MDGs (29), but since the advances made are not equally distributed throughout the population, inequity—in the form of unjust, unfair, and avoidable inequalities—needs to be addressed along with improving gross averages so as to attain universal access to water and sanitation. Priority attention, therefore, should be given to socially disadvantaged population groups, particularly through interventions aimed at decreasing exposure and vulnerability (18).

Even though evidence of successful strategies for tackling environmental inequalities is scarce (17, 30), a PAHO systematic review on the effectiveness of WS interventions in improving population health (31) identified some principles for multisectoral action, namely:

(i) Policies ensuring universal access to safe water and sanitation, especially for children under 5 years of age living in low- and middle-income areas, are critical;
(ii) Improving the quality of water in the home to have the greatest impact on the reduction of diarrhea in all age groups;
(iii) Basic sanitation improvement, especially excreta disposal, to effectively lower morbidity and mortality from diarrhea by 30% – 40%, notably when it is linked to community-level interventions to promote proper hygiene;
(iv) Sustainability and effectiveness of initiatives to improve WS conditions depend on behavioral changes in the population, such as hand washing;
(v) Available economic analyses show that improvements in access to WS are cost-effective. Time savings are the main reason for the economic benefits obtained, contributing at least 80% of the gain (32).

In addition, strengthening national statistical information systems and institutional capacities to effectively monitor social and environmental inequalities in health—and exposures to environmental hazards by equity stratifiers—should be regarded as a priority and a core component of environmental equity and justice in itself (18).

As the Region prepares to engage in the transformative challenges for "people, planet, prosperity, peace, partnership" that were posed by the 2030 agenda for sustainable development (33), water and sanitation must be recognized as core elements of human dignity. Water and sanitation should be defended as fundamental human rights and as global public goods. The principle of equity (34) must, therefore, govern the actions on social inclusion that are required to attain universal access to water and sanitation by 2030.

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Gradientes de acceso a agua y saneamiento y desigualdades en salud entre los países de la Región de las Américas, 1990 y 2010

RESUMEN

Objetivo. Explorar la desigualdad distributiva de resultados clave en salud determinada por la cobertura de acceso a agua y saneamiento (AS) entre países en la Región de las Américas.

Métodos. Se diseñó un estudio ecológico para explorar la magnitud y el cambio en el tiempo de métricas estándar de brecha y gradiente de desigualdades ambientales en salud a nivel país en 1990 y 2010 entre los 35 países de las Américas. El acceso a agua potable y el acceso a instalaciones sanitarias mejoradas fueron seleccionados como estratificadores de equidad. Las cinco variables dependientes fueron: expectativa de vida al nacer total y saludable, mortalidad infantil, en menores de cinco años y materna.

Resultados. El acceso a AS se correlacionó con la supervivencia y mortalidad y se observaron intensos gradientes tanto en 1990 como en 2010. Un acceso a AS más alto se correspondió con más alta expectativa de vida al nacer total y saludable y con más bajos riesgos de muerte infantil, en menores de 5 años y materna. La carga de vida perdida se distribuyó inequitativamente, concentrándose de manera sostenida entre los más desaventajados ambientalmente, quienes acarrearon hasta dos veces la carga que hubieran acarreado si el acceso a AS hubiese estado equitativamente distribuido. Los promedios poblacionales en la expectativa de vida y la mortalidad específica mejoraron pero, mientras que las desigualdades absolutas se redujeron, las desigualdades relativas se mantuvieron esencialmente invariantes.

Conclusiones. Aún cuando la Región está en curso para alcanzar el ODM 7 sobre agua y saneamiento, los promedios regionales siguen ocultando grandes gradientes ambientales y desigualdades en salud entre países. A medida que se despliega la agenda de desarrollo post-2015, serán necesarias políticas y acciones orientadas a la equidad en salud —principalmente hacia aquellos con mayor privación social y ambiental— a fin de asegurar el derecho por el acceso universal al agua y saneamiento.

Palabras clave Desigualdades en la salud; agua; saneamiento; salud ambiental; determinantes sociales de la salud; Objetivos de Desarrollo del Milenio; Objetivos de Desarrollo Sostenible; Américas.