Health inequalities in Latin America and the Caribbean: a sample of 182,596 workers from 15 countries.

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Abstract
Background: Latin America and the Caribbean (LAC) is the world’s most inequitable region. The full scale of social inequalities in health has been hidden by the lack of reliable data. This study aimed to measure and compare health inequalities in the working population within and between 15 countries of LAC.

Methods: A sample of 182,596 workers over 17 years old was drawn from the most recent national surveys of working conditions or health in 15 LAC countries. Poor self-perceived health (P-SPH) was used as a health indicator, and age, education level, and occupational category as inequality stratifiers. We calculated four measures: absolute and relative population-attributable risks, the Kuznets and weighted Keppel indexes.

Results: P-SPH prevalence ranged from 9% in men from Uruguay to 50% in women from Nicaragua. It was higher in women than in men in most countries. A clear gradient was shown, in which young people in non-manual skilled jobs and high education had the lowest prevalence. Nearly 42% of cases that reported P-SPH among men and 36% among women could be avoided if all the groups received a higher level of education. Also, approximately 35% of P-SPH reported by men and 30% by women could be avoided if they all shared the working and employment conditions of non-manual skilled jobs.

Conclusions: We found that land borders generate more occupational health inequality than any other variable, with urgent intervention needed in countries where prevalence of poor self-perceived health is high. Monitoring of occupational health inequity is essential to inform public policies.

Introduction
The economic and social growth of Latin America and the Caribbean (LAC) has been hampered by enormous social inequalities in the last decades. As reported, LAC is the most inequitable region in the world in terms of wealth distribution (1,2). The size of these gaps is much bigger than is perceived by the population in general (3), and examination of the full impact of this inequity in the population's health in the region has been limited by the lack of reliable data (4).

According to a growing body of scientific evidence, there is a significant association between poor
social, economic, and political conditions and social inequalities in health (5). Despite this knowledge, inequality worldwide has not been reduced but has risen over the last three decades, across and especially within countries, and continues to grow (6).

The working population is the main producer of goods and services and contributes to the economic growth of the countries. Furthermore, paid work is the principal income source for the overwhelming majority of people and is the main means of both wealth redistribution (7) and access to social protections. In LAC, 280 million people (40% of them women) work, and 53.1% of them have informal employment (8).

Occupational risk factors related to workplace environment, job tasks, psychosocial demands, and other conditions directly affect workers’ health and contribute significantly to health inequality (9,10), especially in low- and middle-income countries (11), where failure to enforce regulations has resulted in poor working and employment conditions. Annually, worldwide, 2.02 million people die due to work-related diseases and 318,000 people due to occupational injuries (12). Globalization’s reliance on “labor flexibility” and outsourcing has transferred worker health costs from high-income to low- and middle-income countries (13,14), increasing the health gap across countries and world regions. In LAC, fatal and non-fatal occupational injury rates are five times higher than the world’s average (15).

Therefore, the objective of this study was to measure and compare the health inequalities in working populations within and between 15 countries in LAC.

Methods

Population and data Source

This study is based on the most recent national surveys of health or working conditions from a representative sample of 15 countries in LAC: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Mexico, Panama, Peru, Puerto Rico, and Uruguay.

The micro-data, methodology, and details of each survey were downloaded from the official website when they were available online or requested from the organization in charge in the country when they were not. Sources and the population’s general characteristics from each survey are described in Supplementary Table A.
For the purposes of this study, we selected only working individuals (who affirmed having worked at least one hour in the week prior to the interview) over 17 years old, since most surveys use this age as a minimum for inclusion. The final sample under analysis included 182,596 workers engaged in the formal or informal economy, and from all economic sectors with the exception of armed forces occupations. The representation by country was as follows: Argentina, 20,060; Brazil, 92,188; Chile, 36,48; Colombia, 16,812; Costa Rica, 1,502; Ecuador, 33,554; El Salvador, 1,507; Guatemala, 1509; Honduras, 1,507; Mexico, 996; Nicaragua, 1,500; Panama, 1,503; Peru, 3,102; Puerto Rico, 1,518; and Uruguay, 1,691.

Health indicators
Self-perceived health (SPH) was selected as a health indicator. It was collected using a four-point Likert scale in Colombia and Mexico, and a five-point Likert scale in the rest of the countries studied. The response categories for each survey were dichotomized, so that a response of "fair" or less indicated poor SPH (P-SPH) (Supplementary Table B).

Equity stratifiers
Data were disaggregated separately for women and men in the three equity stratifiers: age (grouped as 15–24 years, 25–44 years, 45–65 years, and over 65 years); education level (less than low being "less than elementary school", low being "elementary school", middle being "high school", and high being "more than high school"); and occupational categories, where the nine major categories of the International Standard Classification of Occupations (ISCO) (16) were collapsed into four categories: skilled non-manual (managers, professionals, technicians, and associate professionals), non-manual non-skilled (clerical support workers, service and sales workers), skilled manual (skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators, and assemblers), and non-skilled manual (elementary occupations).

Inequality measures and data analysis
First, we calculated the prevalence and 95% confidence intervals (95% CIs) of P-SPH for each of the three equity stratifiers for every country (Supplementary Table C). Then, following the recommendations of the WHO Handbook on health inequality monitoring (17), we calculated four measures of inequality (18). For all, the reference category used was the healthiest group: 15–24 for
age, high educational level for education, and non-manual skilled jobs for the occupational category. Of the four measures, the first two estimate the magnitude of difference and the proportional difference between the healthiest group and the country’s mean. These are the population-attributable risk (PAR), and the population-attributable risk percentage (PAR%), with respect to the country’s mean prevalence (the percentage of the population that would not declare P-SPH if the entire working population shared the condition of the most privileged group). The third measure, the relative Kuznets index, is the ratio between each group’s P-SPH prevalence and the reference group’s, and was calculated for each equity stratifier. The fourth measure was the weighted Keppel index. This is the absolute difference between the P-SPH prevalence of each group and the country’s average: the absolute value of these differences is multiplied by the population weight of each group, and the sum of these weighted differences is divided by the country’s P-SPH prevalence and multiplied by 100 (19). The 95% CIs were calculated for the P-SPH prevalence and for the Kuznets index (Supplementary Table D).

Results
Prevalence of poor self-perceived health
Among the different countries, P-SPH prevalence ranged from 9.2% in men from Uruguay to 50.3% in women from Nicaragua. It was consistently higher in women than in men, except in Guatemala and Honduras, where it was similar for the two sexes. A clear gradient was observed with both age and educational level, as P-SPH increased with age and decreased with years of study (Fig. 1). Regarding occupational categories, non-manual skilled workers had the lowest prevalence of P-SPH in all countries, while manual skilled and manual non-skilled had the highest.

Measures of inequity
Overall, the widest gap was found among the age groups, followed by the educational levels and occupational categories. Regarding the PAR (Table 1), women from Chile (22.1%) and men from Honduras (24.0%) showed the highest magnitude by age. The PAR% had a wide range among countries: the lowest magnitude by age was found in men from Uruguay (19.8%) and the highest in women from Chile (83.1%). Stratified by educational level, the PAR% ranged from 10.9% in women from Puerto Rico to 58.2% in men from Chile; by occupational category, it ranged from 12.3% in
women from Nicaragua to 49.2% in men from Colombia. The relative difference according to educational level and occupational category was higher in men, with some clear exceptions, as Mexico and Costa Rica showed the opposite tendency.

The P-SPH prevalence in the highly educated group (the reference group) ranged from 5.8 in women from Colombia to 38.0 in women from Nicaragua (Fig. 1.1). In the occupational categories, the P-SPH prevalence of the non-manual skilled group (reference group) ranged from 6.9% in men from Uruguay to 38% in women from Nicaragua (Fig. 1.2).

In regard to the Kuznets index, the highest value was associated with the variable age in men from Chile (8.7), followed by education level in women from Costa Rica (6.1). In some countries, the category groups on the extremes had wide confidence intervals, due to the small sizes of these groups. Overall, the Kuznets values were slightly higher in women than in men. A clear gradient was observed in the three dimensions. By occupation, manual non-skilled workers presented the highest Kuznets index in most countries, reaching 2.8 in women from Chile and Uruguay (Fig. 1).

The weighted Keppel index was higher for men than for women. The largest gap among countries was observed between occupational categories, where the index ranged from 6.1 for women from Honduras to 44.5 for men from Chile. By age, Ecuador had the lowest values (14.0 for women and 18.9 for men), while Colombia had the highest (38.3 for women and 46.7 for men). By level of studies, Ecuador and Nicaragua were the countries with the lowest index values (15.8 and 17.2 for women, and 21.4 and 21.8 for men), and Argentina and Colombia had the highest (39.8 and 37.6 for women and 44.0 and 45.5 for men, respectively) (Fig. 2).

**Discussion**

This study revealed that, on average, around 42% of men and 36% of women workers that reported P-SPH from the 15 countries could avoid it if all the groups received a high level of education, and that around 35% of men and 30% of women could avoid P-SPH if they had the working and employment conditions of the workers with non-manual skilled jobs. This magnitude of inequity among groups indicates the scale of the possible improvement in the countries, and demonstrates what is feasible for other social groups to attain.
The most privileged group had the best health and it would be desirable for the other groups to be equally healthy. Nevertheless, the results show that the widest range of P-SPH observed is among the reference (healthiest) groups in the different countries. Hence, it would also be desirable to lessen the gap between countries. For example, in education level, the most privileged group of women in Nicaragua (those whose level of education was high) showed a higher prevalence of P-SPH than the worst groups of women in Argentina, Colombia, Chile, Guatemala, and Uruguay (whose level of education was less than low). Likewise, by occupation, the most privileged group of women in Nicaragua and Honduras had a higher prevalence of P-SPH than the worst category in most of the countries in this study. This means that most of the workers in the least-favored occupational category in Uruguay or Chile are in better health than most of the workers in the most-favored occupational category in Honduras or Nicaragua.

Actually, the fact that some countries have low inequity indexes should not obscure the results since, overall, the higher the prevalence of P-SPH, the lower the inequity index. For example, Nicaragua’s and Honduras’ Keppel index values related to occupation are under 7% for women, and these two countries show the highest prevalence of P-SPH in the region, while Uruguay’s Keppel index is over 34% in the same category, even though it has the lowest P-SPH prevalence. In general, this means that inequity across social groups is low, but this is mainly because most of the working population reports P-SPH. Therefore, health conditions in those countries where more than one-third of the total working population reported P-SPH demand urgent intervention, with special focus on the most vulnerable groups, which in some countries reach a P-SPH prevalence of over 60%.

The worker’s health gaps among countries were bigger than those associated with differences in sex, age, education level, or occupation, suggesting that workers’ health is determined to a greater extent by the country where they work. Similar patterns of inequity are observed with diverse health indicators among the general population worldwide (20), supporting the idea that borders generate more inequality than any other variable and could be related to social, economic, and political factors but, most essentially, to international differences in regulations and laws (21). An alternative explanation could be ascribed to the methodologies used in the various countries’ surveys. It is known
that there are differences among working-condition surveys (4), while health surveys are more standardized (22). However, in Central America, where the methodology was the same, we found a wide difference among countries’ prevalence of P-SPH, ranging from 19.5 in women from Guatemala to 50.4 in women from Nicaragua.

Regarding gender inequity, as many studies have shown (23), the prevalence of P-SPH in the overwhelming majority of the countries was higher in women (29% of women and 24% of men in LAC as a whole). This has also been found in Europe, where women over 16 years old reported 3.7% more P-SPH than men (30% of women and 26.3% of men). Regardless, the inequity gap was larger among men in the three equity stratifiers. The highest relative differences by sex were found in Chile, in which the prevalence in women was 85% higher than in men and the lowest differences were in Mexico, where P-SPH was 4.4% higher in women. Guatemala and Honduras were an exception; nevertheless, the prevalence of P-SPH was almost the same for both sexes. These results are probably influenced by cultural factors that these neighboring countries (Mexico, Guatemala, and Honduras) share and that are mainly linked to the beliefs and behavior related to gender roles (24).

The patriarchal culture still predominates and exposes men to risk behaviors that could be detrimental to their health (25). Another possible explanation could be the high index of criminal violence and drug trafficking in these countries, which mainly affects men. The SPH could be influenced by differences in culture, ethnicity, and sex (26). To better understand these results, more studies of these possible influences are needed.

This study, as any other, has limitations, mainly related to the comparability of the data. The most recent national surveys on working conditions and health were used. We consider them to have the best and most reliable data available on SPH in each country. However, as the data come from different countries and therefore from different sources, the education categories may vary slightly between countries, as may the scale used to collect the SPH data. Thus, the comparison between countries must be made with caution. Though not all countries were included in this study because no data were found for Bolivia, Paraguay, Venezuela and others, the sample analyzed does represent most of the working population in the region. Finally, ethnic group was not used as an equity stratifier
because the data were not included in all the countries’ surveys. Nevertheless, to our knowledge, this is the first study to use large national datasets from LAC countries to study health inequity and provide the first cross-country comparisons of the health status in the working population. SPH has been shown to be a strong and independent predictor of mortality and strongly associated with morbidity (27), even demonstrating better reliability than objective measures of morbidity and psychological well-being in some studies (28).

The questionnaires used in each national survey were administered in face-to-face interviews at the workers’ homes (except in Puerto Rico, where the interviews were conducted by telephone), and the final datasets and results will ultimately be made available to the scientific community for future, high-quality studies, useful to researchers and policy makers alike. The micro-data used for this analysis are a small portion of the information available from the countries’ surveys. These data are not always accessible and, in many cases, the shift to open access takes several years. So, given the relevance of this information to the region, it is essential to allow access to this data to researchers from different fields and countries, as well to find mechanisms to ensure the comparability of questions and methodology among the countries’ surveys to allow comparison and monitoring of changes over time. The dissemination of these findings may contribute to planning, implementing, monitoring, and evaluating public policies.

This analysis may be a first step in monitoring occupational health inequity in the region, but periodic updates to track changes in working conditions over time and the progress of health improvements in closing the gaps among social groups will be essential. In this regard, strong national health monitoring systems are fundamental. To face this encouraging challenge, international and regional collaboration will be necessary.

Table
Table 1. Population-attributable risk of inequality by age, education level, and occupational categories.
| Country      | Women Age groups | Women Education Level | Women Occupationa l categories | Men Age groups | Men Education Level | Men Population-attributable risk (%) |
|-------------|------------------|-----------------------|-------------------------------|---------------|---------------------|-------------------------------------|
| Argentina   | 10.4 58.2        | 8.6 47.8              | - -                           | 8.5 60.5      | 7.6 53.6             |
| Brazil      | 10.7 40.4        | 12.2 46.1             | 10.4 39.4                     | 11.7 50.6     | 10.4 39.4            |
| Chile       | 21.9 81.5        | 7.3 27.6              | 6.6 25.0                      | 8.4 58.2      | 7.7 57.0             |
| Colombia    | 7.8 43.0         | 7.9 43.6              | 7.6 41.6                      | 11.1 49.9     | 11.1 49.9            |
| Costa Rica  | 18.5 67.2        | 14.2 51.7             | 11.3 41.2                     | 13.4 39.7     | 13.4 39.7            |
| Ecuador     | 12.5 31.9        | 13.0 33.3             | 13.4 34.1                     | 14.4 34.1     | 13.4 34.1            |
| El Salvador | 17.3 60.4        | 6.5 22.7              | 6.5 22.7                      | 8.4 37.6      | 8.4 37.6             |
| Guatemala   | 6.5 33.4         | 6.1 31.2              | 5.2 26.6                      | 9.7 45.6      | 9.7 45.6             |
| Honduras    | 16.3 36.7        | 19.7 44.3             | 7.4 16.8                      | 19.2 42.6     | 19.2 42.6            |
| Mexico      | 13.3 55.3        | 14.1 58.9             | 17.3 72.2                     | 12.0 52.3     | 12.0 52.3            |
| Nicaragua   | 14.9 29.7        | 12.3 24.5             | 6.2 12.3                      | 14.4 34.1     | 14.4 34.1            |
| Panama      | 12.8 44.8        | 7.2 25.1              | 3.8 13.1                      | 5.7 26.5      | 5.7 26.5             |
| Peru        | 14.4 33.0        | 11.6 26.5             | 2.2 5.1                       | 8.6 24.8      | 8.6 24.8             |
| Puerto Rico | 18.1 73.7        | 2.7 10.9              | - -                           | 5.5 30.6      | 5.5 30.6             |
| Uruguay     | 10.4 68.2        | 5.9 38.8              | 5.5 36.4                      | 2.3 24.8      | 2.3 24.8             |

Population-attributable risk = Population mean prevalence of SPH minus healthiest-group prevalence of SPH
Population-attributable risk(%) = Population attributable risk divided by the population mean x 100

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Declarations

Authors’ contributors MS-P and FGB contributed to the conception and design of the study, data analyses, interpretation of data and drafting of the work. PM-S, MLR and AGG made substantial contributions to the interpretation of results and review of the manuscript. All coauthors critically revised the article for important intellectual content and final approval of the version to be published.

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Ethics approval and consent to participate Not applicable

Consent for publication Not applicable

Availability of data and materials The datasets that support the findings of this study are available from the organization in charge in any of the 15 countries or available online in the country official website. Data are however available from the authors upon reasonable request.

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Figures
1.1. Prevalence of poor self-perceived health (%) and Kuznets Relative index in occupational categories stratified by sex (women)

1.2. Prevalence of poor self-perceived health (%) and Kuznets Relative index in occupational categories stratified by sex (men)
Figure 2

Health inequality in the working populations according to age, education level, and occupational category, stratified by sex (weighted Keppel index)

Supplementary Files
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