

Variability and determinants of infant mortality in 286 cities in Latin America

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Rosario, Argentina.

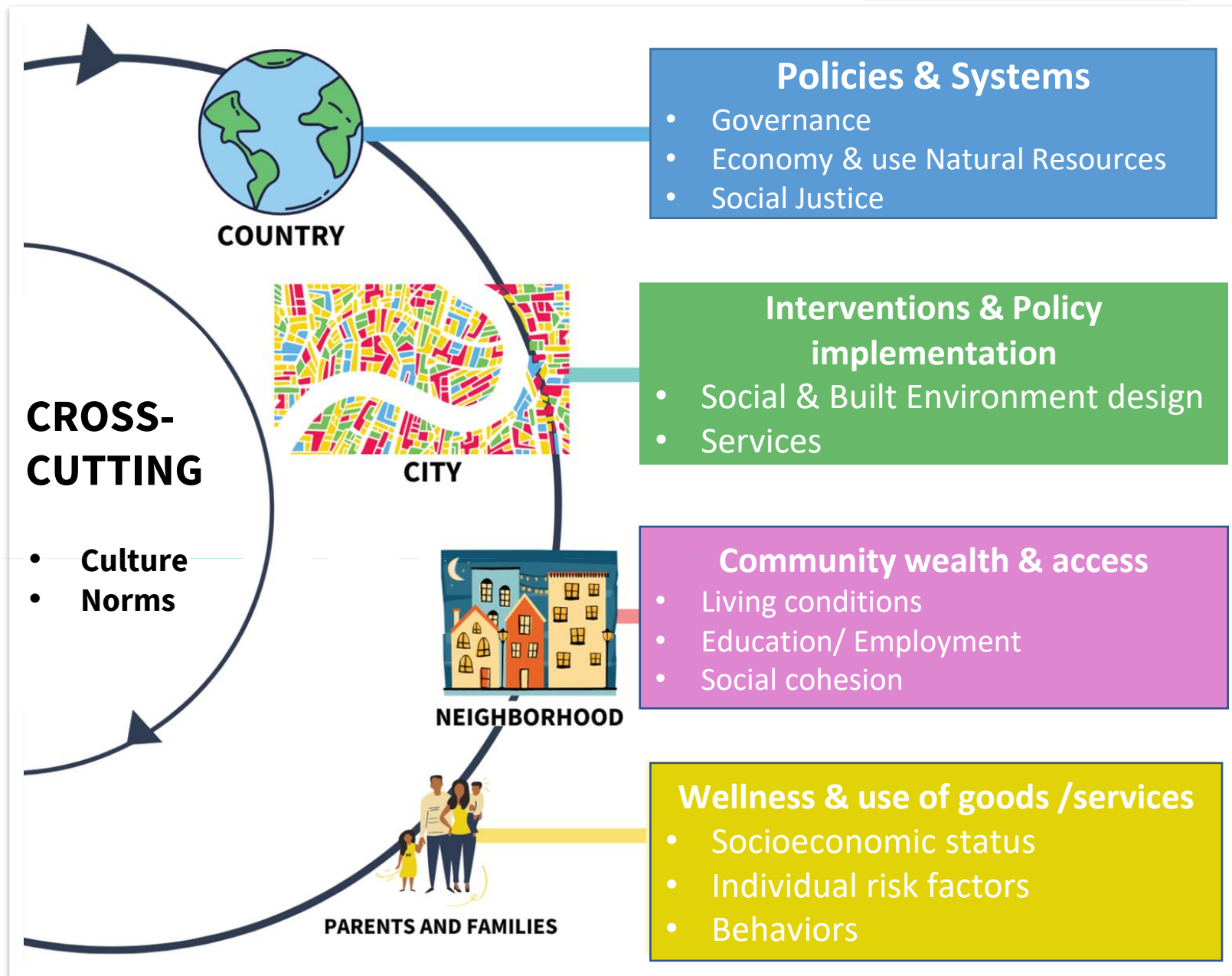


Population: 1,173,533

Latitude: $-32^{\circ} 56' 48.55''$ S

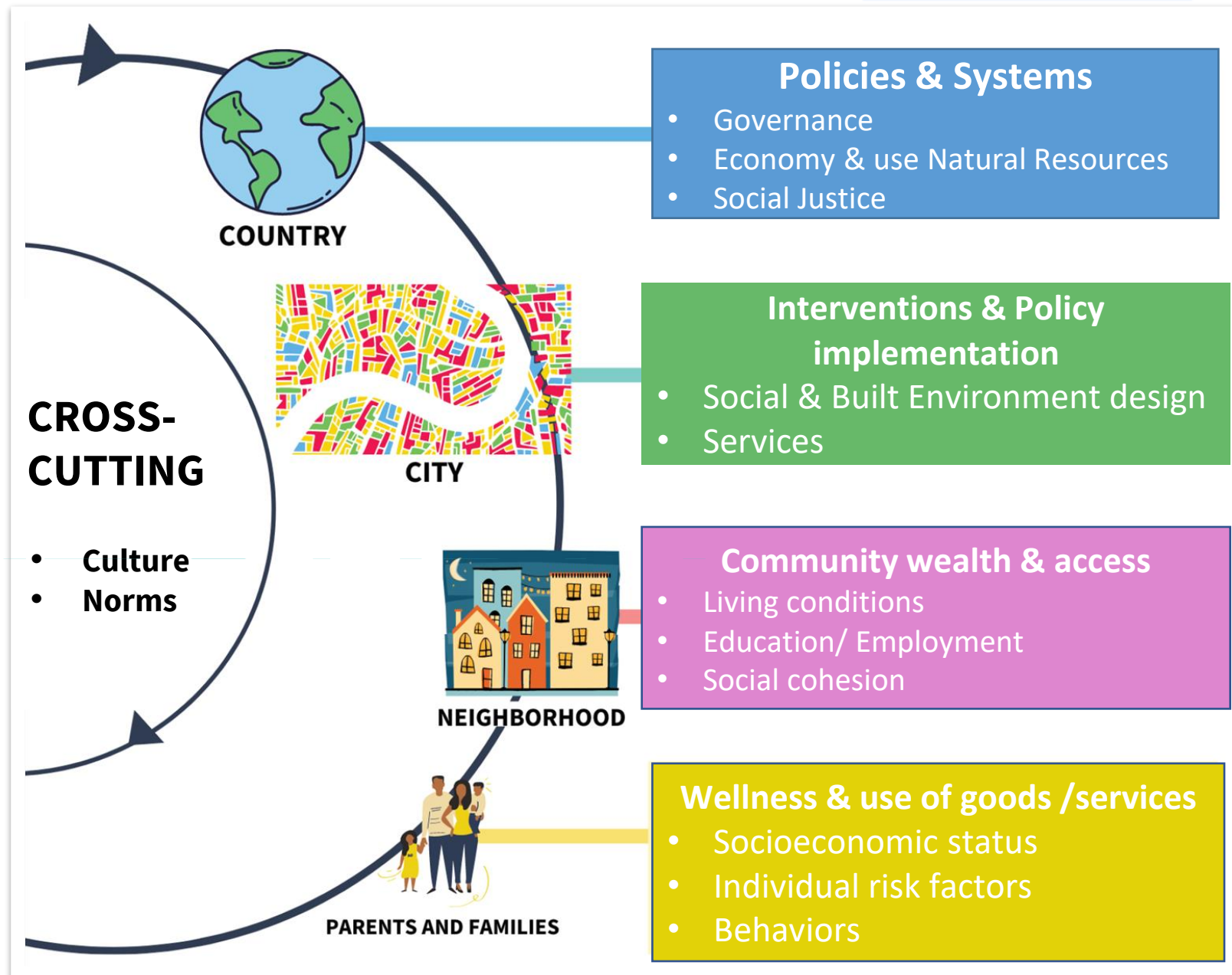
Longitude: $-60^{\circ} 38' 21.55''$ W

Social determinants of child health



Social determinants of child health

- **Social disparities as drivers of health**
- **Act local for regional & global impact**



Urban context in Latin America



Heterogenous urbanization process

Jaitman, 2015



Great economic development & access to services in cities

MacMichael, 2000



High population density in cities

- Increased levels of hazardous pollution
- Great % population living under poverty
- Gender & socioeconomic inequalities

UN Habitat, 2016



Vulnerable environment for infants

- Poorer access to care
- Greater exposure to social & environmental conditions hazardous to health

Mahabir et al, 2016

Urban Context & Infant Mortality

Original research



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Characterising variability and predictors of infant mortality in urban settings: findings from 286 Latin American cities

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ABSTRACT

Background Urbanisation in Latin America (LA) is heterogeneous and could have varying implications for infant mortality (IM). Identifying city factors related to IM can help design policies that promote infant health in cities.

Methods We quantified variability in infant mortality rates (IMR) across cities and examined associations between urban characteristics and IMR in a cross-sectional design. We estimated IMR for the period 2014–2016 using vital registration for 286 cities above 100 000 people in eight countries. Using national censuses, we calculated population size, growth and three socioeconomic scores reflecting living conditions, service provision and population educational attainment. We included mass transit availability of bus rapid transit and subway. Using Poisson multilevel regression, we estimated the per cent difference in IMR for a one SD (1SD) difference in city-level predictors.

Results Of the 286 cities, 130 had <250 000 inhabitants and 5 had >5 million. Overall IMR was 11.2 deaths/1000 live births. 57% of the total IMR variability across cities was within countries. Higher population growth, better living conditions, better service provision and mass transit availability were associated with 6.0% (95% CI –8.3 to 3.7%), 14.1% (95% CI –18.6 to –9.2),

other regions since 2005.³ This stagnation in the decrease of mortality rates could result from the fact that once easily preventable causes of death are tackled, achieving further reductions requires addressing drivers of mortality related to social inequalities in the population.

LA is one of the most urbanised regions in the world.⁴ While cities have been seen as places of economic opportunities and better access to services such as education and healthcare,⁵ many aspects of life in cities can negatively affect infant and child health. The accelerated urban population growth that occurred over the last three decades resulted in rapid expansion of many cities with inadequate urban planning.⁶ Cities can have hazardous levels of air pollution,⁷ which has been linked to premature birth, and higher morbidity and mortality among infants.^{8–9} In addition, almost 20% of the population currently lives in poverty.^{6–10} This creates a particularly vulnerable environment for infants as a result not only of poorer access to care but also because of greater exposure to social and environmental conditions hazardous to health.¹⁰ This heterogeneity in urban environment observed within and across urban areas in LA challenges the idea of ‘urban advantage’, by which cities

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Women’s empowerment and infant mortality in Latin America: evidence from 286 cities

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ABSTRACT

Levels of women’s empowerment (WE) can contribute to differences in infant mortality rates (IMRs) across cities. We used a cross-sectional multilevel study to examine associations of WE with IMRs across 286 cities in seven Latin American countries. We estimated IMRs for 2014–2016 period and combined city socioeconomic indicators into factors reflecting living conditions and service provision. WE was operationalized: (1) in cities, by using scores for women’s labor force participation (WLFP) and educational attainment among women derived from education and employment indicators disaggregated by sex; (2) in countries, by including a scale of enforcements of laws related to women’s rights. We estimated adjusted percent differences in IMRs associated with higher WE scores across all cities and stratified by country GDP. We found substantial heterogeneity in IMRs and WE across cities. Higher WLFP was associated with lower IMRs. Higher women’s educational attainment was associated with lower IMRs only in cities from countries with lower GDP. Poorer national enforcement of laws protecting women’s rights was associated with higher IMRs in all countries. Women’s empowerment could have positive implications for population health. Fostering women’s socioeconomic development and girls’ education should be part of strategies to reduce IMRs in cities of Global South.

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What we try to understand?

- To what extent **city-level variations** in IMR explain country-level differences infant mortality
- Which **characteristics of the urban environment** are linked to infant mortality in cities
- What these results suggest about **actions at the local level** that could achieve further reductions in infant mortality in Latin America

Technical notes

Sample

- **286 cites 100K+** : AR (33); BR (143); CL(21); CO (16); CR (1); MX (61); PA (3); PE(8)

Exposures

- City population size
- City population growth (2010-2015)
- Score of living conditions
- Score of services provision
- Score of population educational attainment
- Mass transit availability
- MMR1 coverage

Outcome

- **IMR** =deaths less than 1 year of age per 1,000 live births for the period **2014-2016**

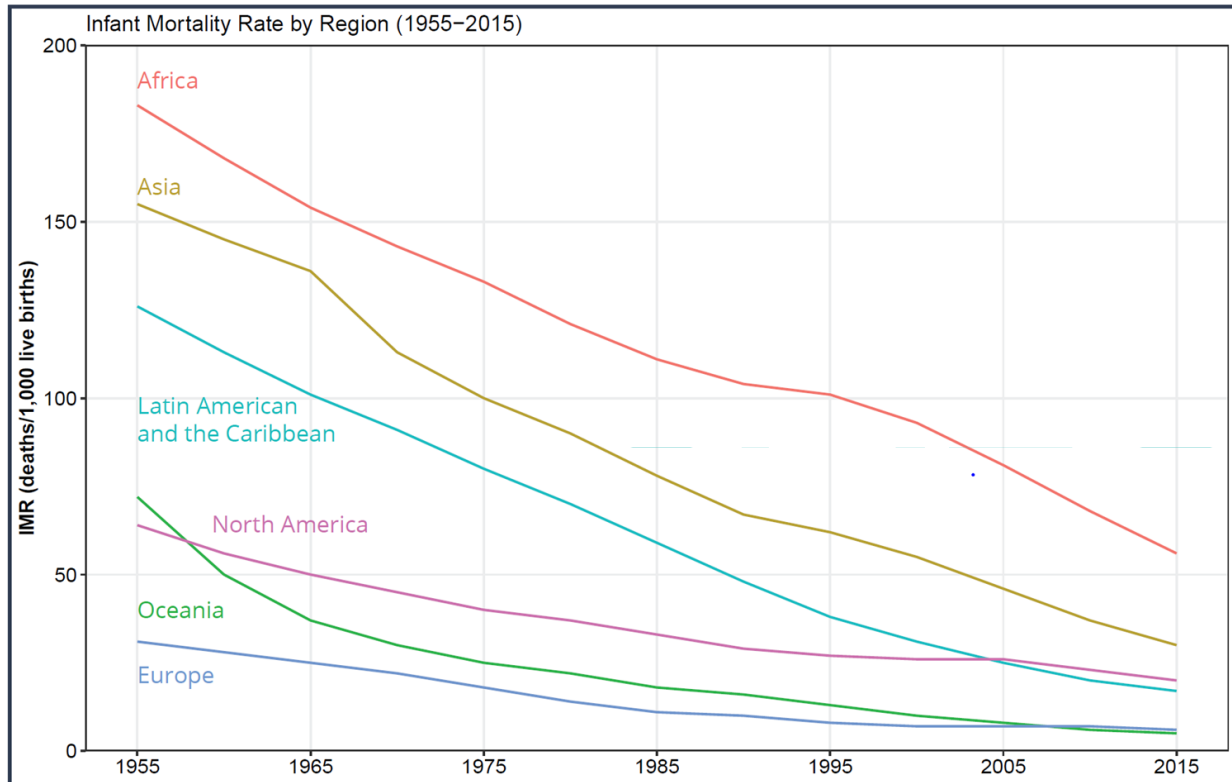
Methodological Approach

- Linear mixed models -> to assess variability between cities and between countries
- Multi-level Poisson regression -> to assess urban determinants of IMR

Regional, national, local levels of infant mortality

IMR trends by regions (1955-2015)

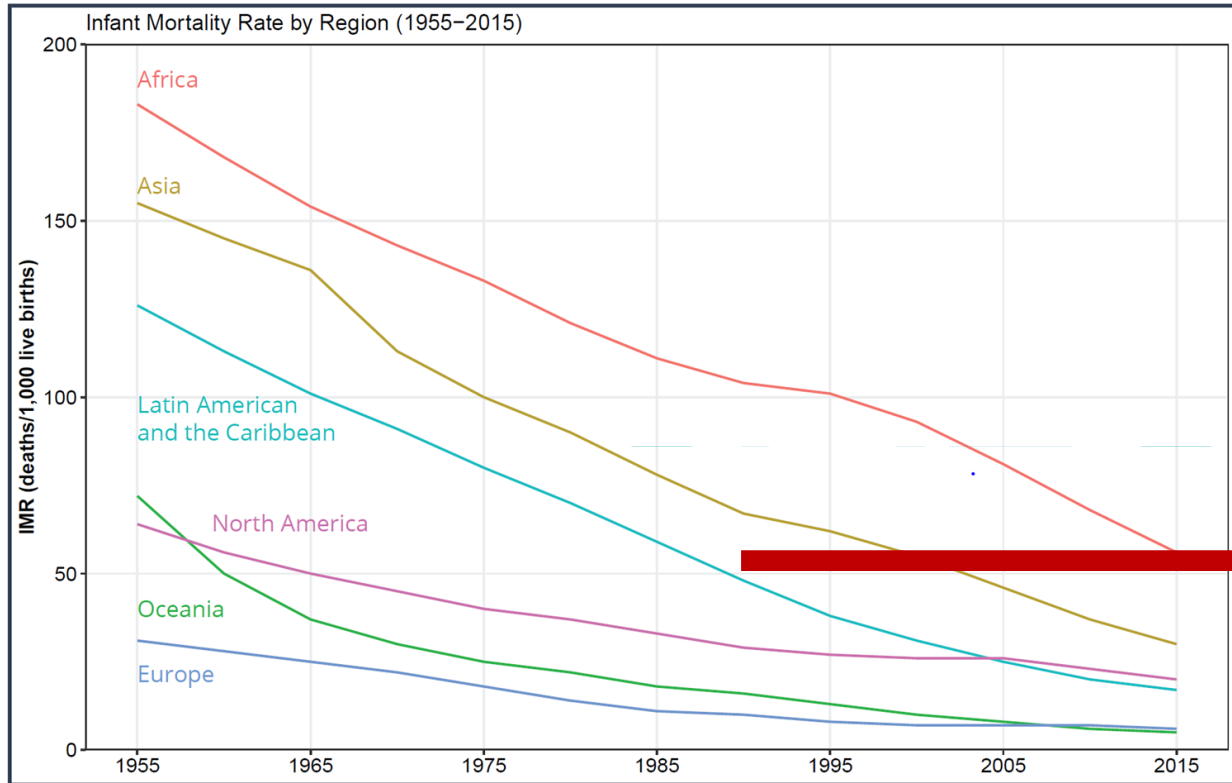
Source: UNIMEG



Regional, national, local levels of infant mortality

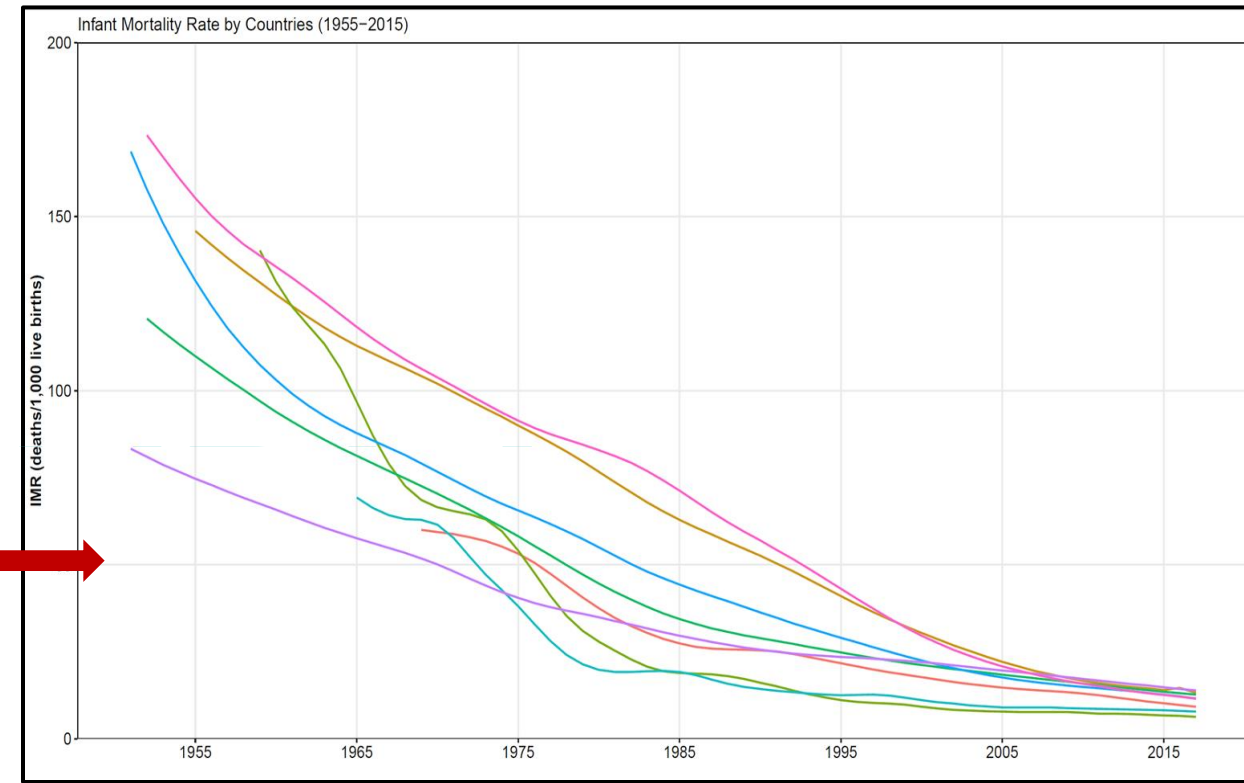
IMR trends by regions (1955-2015)

Source: UNIMEG



IMR trends by SALURBAL countries (1955-2015)

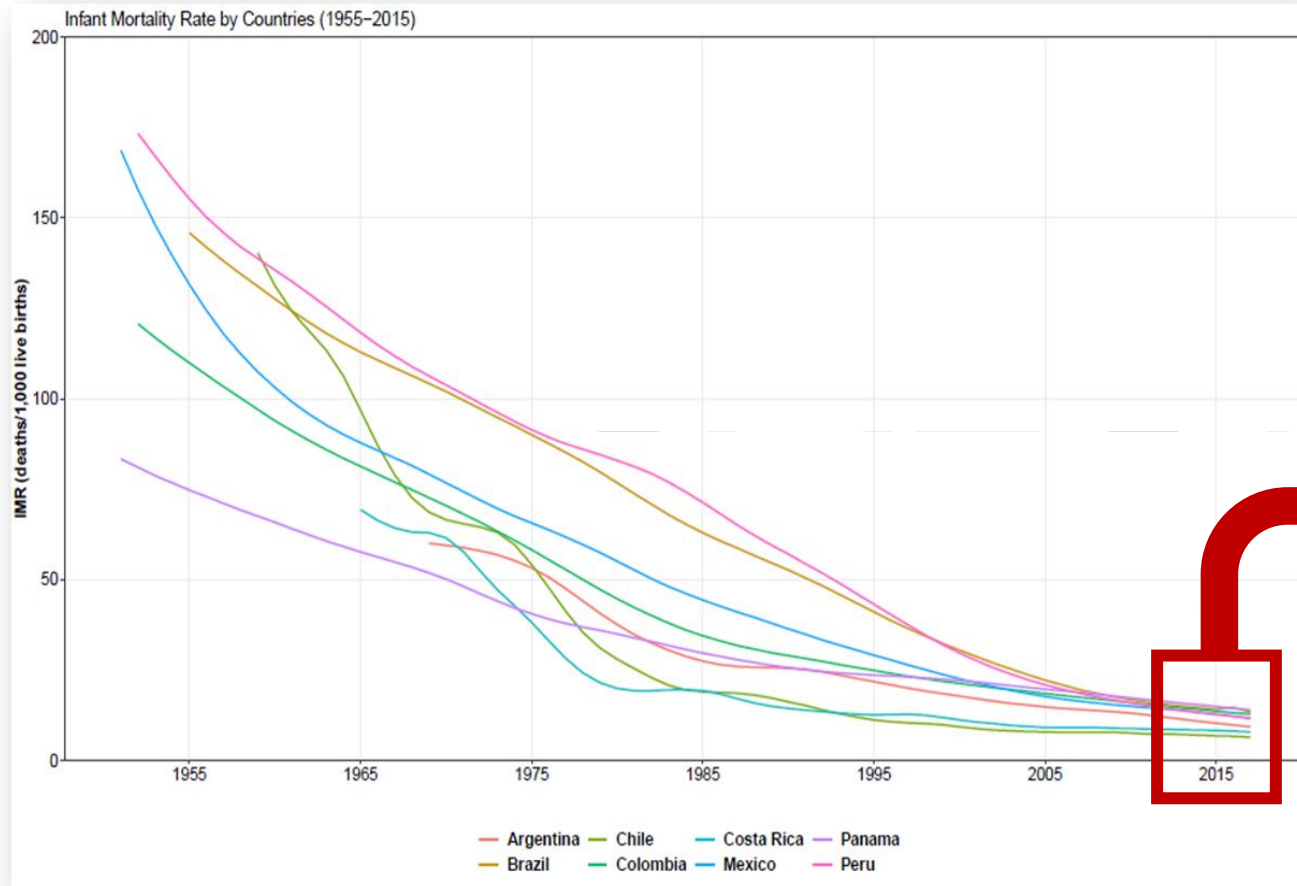
Source: UNIMEG



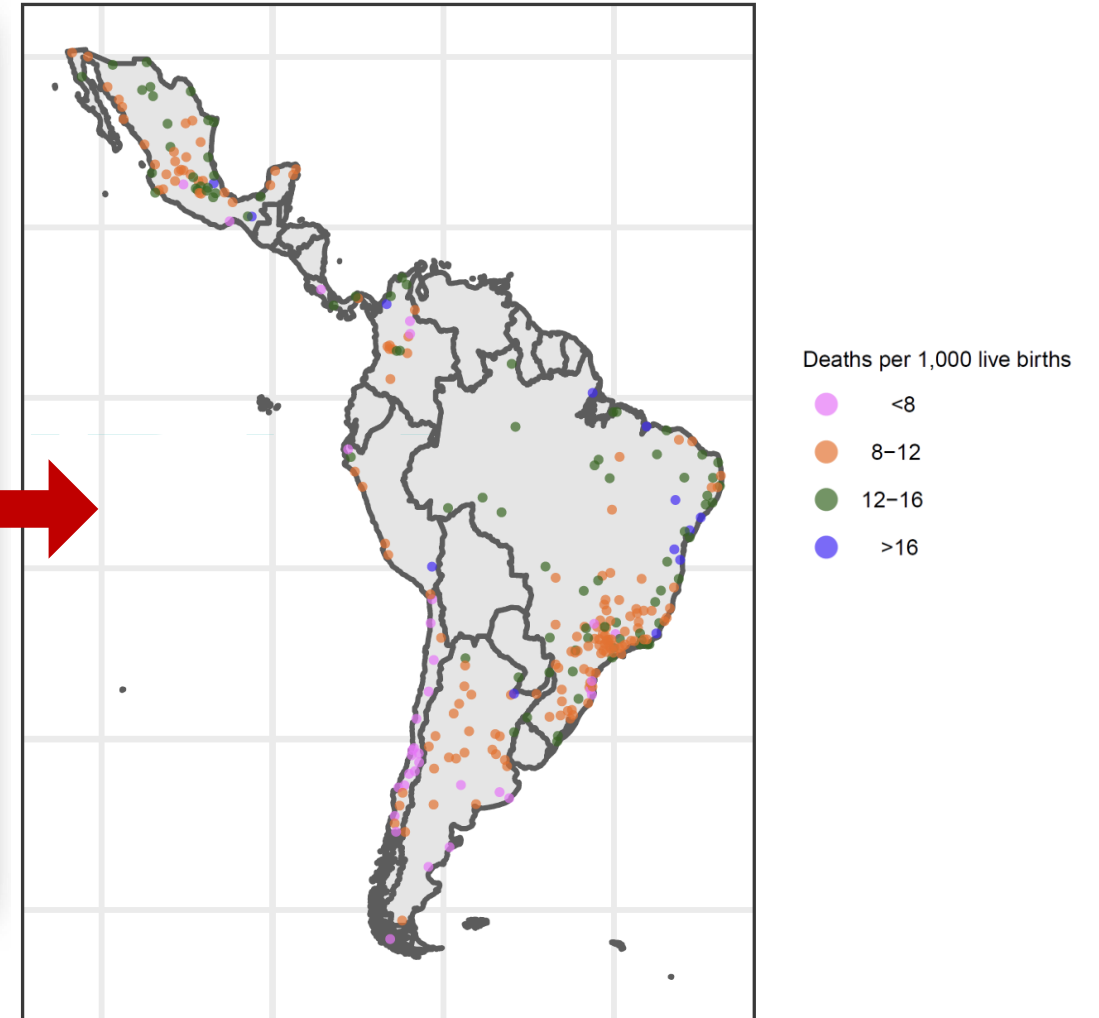
— Argentina — Chile — Costa Rica — Panama
 — Brazil — Colombia — Mexico — Peru

Regional, national, local levels of infant mortality

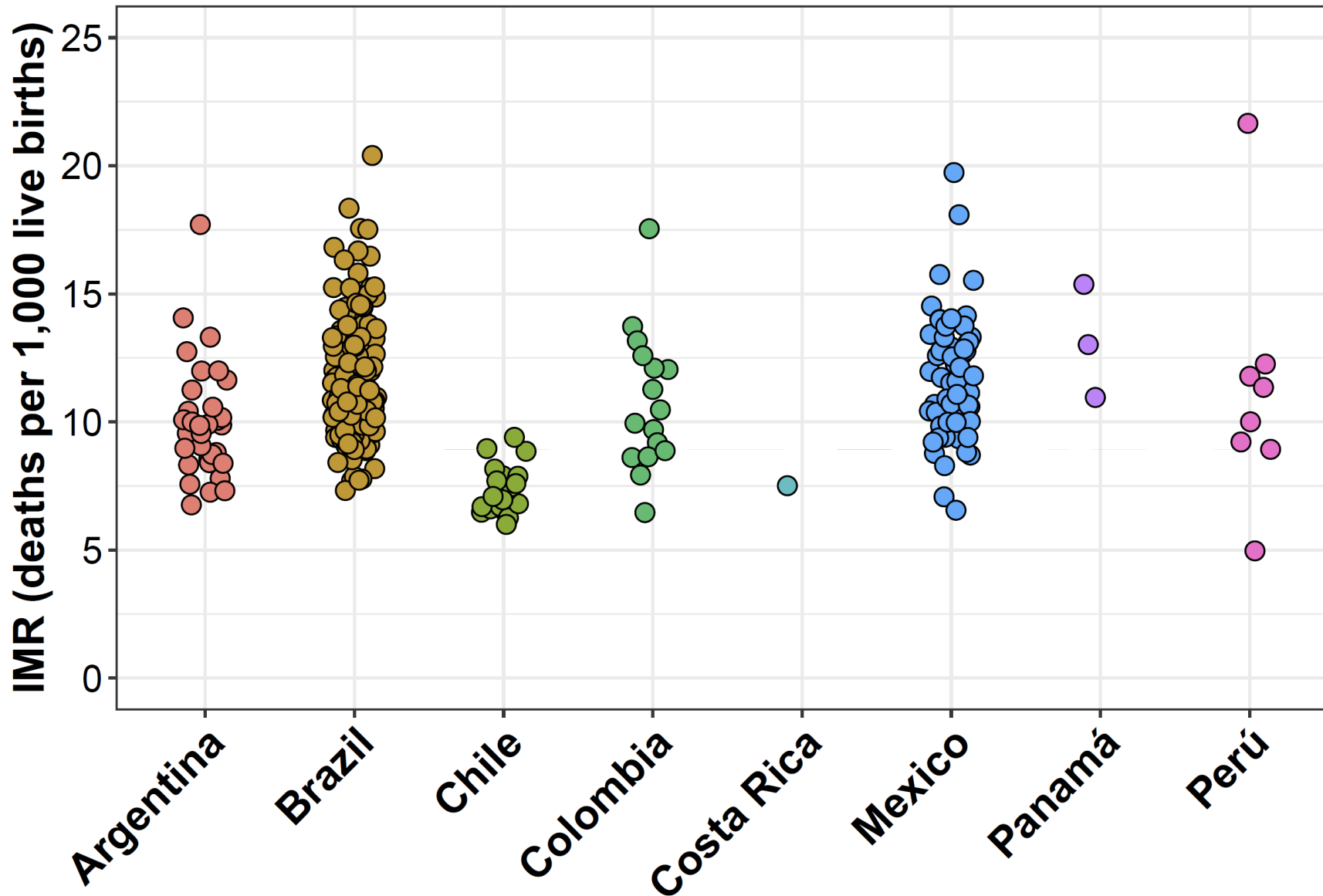
**IMR trends in SALURBAL countries
(1955-2015)** Source: UNIMEG



**IMR in SALURBAL cities by countries
(2014-2016)** Source: SALURBAL project

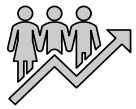


Variations in city-levels of IMR



57% variability
city-level IMR is
within countries

Urban environment & infant mortality in cities



Population growth

City population growth 2010-2015



Housing and living conditions

% households with piped water in the house
% of households with overcrowding conditions (3+/room)
% population 15-17 age attending school



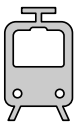
Service provision

% of households with water connected to municipal network
% of households with sewage system connected to municipal network



Population education

% population 25+≥ high school level
% population 25+≥ university level



Mass transit availability

Presence of either subway or bus rapid transit (BRT) networks



Access to healthcare

% of MMR1 vaccines coverage among infants

Urban environment & infant mortality in cities

	Univariate	Fully adjusted
	% diff (95%CI)	% diff (95%CI)
Population size	-0.01 (-0.9; 0.8)	0.3 (-0.4; 0.9)
Population growth	-2.9 (-5.7; 0.1)	-5.0 (-6.8; -3.3)
'Living conditions' score	-18.6 (-27.4; -8.6)	-14.7 (-21.8; -6.9)
'Services provision' score	-15.0 (-18.9; -10.4)	-12.1 (-18.0; -5.8)
'Pop. Education' score	-10.3 (-17.3; -3.0)	-0.7 (-3.3; 2.0)
Mass transit availability	-3.9 (-11.2; 4.0)	-6.7 (-9.2; -4.2)
% MMR coverage		-0.1 (-0.2; 0.03)

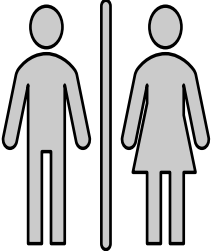
Estimates for 1 SD higher population size, growth, and scores and for 1% higher vaccine coverage

Women's empowerment & infant mortality



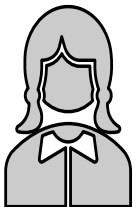
Country Enforcement of laws related to Women's rights (scale by Women Stat Project)

- 0: Laws well enforced by the government; high priority for the government
- 1: Laws mostly enforced; government fairly proactive.
- 2: Spotty enforcement of laws; neutral interest by government
- 3: Little effective enforcement; low priority for the government.
- 4: Virtually no enforcement of laws, or such laws do not even exist.



Women's labor force participation

- Ratio of female/male population over age 25 with more than **high school** level education
- Ratio of female/male population over age 25 with more than **university** level education
- Labor force participation among women
- Ratio of female/male population participating in the labor force



Educational attainment among women

- Percent of the female population over age 25 with more than **high school** level education
- Percent of the female population over age 25 with more than **university** level education

Women's empowerment & infant mortality

	Total Sample	Countries below median GDP/capita (n= 168)	Countries above median GDP/capita (n= 118)
	% diff (95%CI)	% diff (95%CI)	% diff (95%CI)
'Country Enforcement of WR laws' scale	16.6 (3.6; 31.4)	34.0 (-13.9; 108.5)	13.7 (-29.0; 82.0)
'Women's labor participation' score	-6.1 (-11.1; -0.8)	-5.8 (-10.0; -1.4)	-14.6 (-17.6; -11.5)
'Women's education attainment' score	-0.7 (-7.0; 6.2)	-3.6 (-6.3; -0.9)	7.8 (-3.1; 20.0)
'Living conditions' score	-11.9 (-18.5; -4.9)	-15.1 (-22.0; -7.4)	-12.9 (-16.7; -9.0)
'Services provision' score	-10.6 (-15.8; -5.2)	-12.6 (-13.5; -11.7)	4.9 (-5.1; 16.0)
% MMR coverage	-0.1 (-0.2; 0.1)	-0.1 (-0.1; 0.01)	-0.2 (-0.9; 0.6)

Countries below the median GDP/capita: Brazil, Colombia, Costa Rica, and Peru
 Countries above the median GDP/capita: Argentina, Chile, Mexico, and Panama

Estimates for 1 SD higher scores

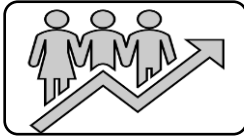

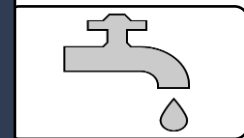

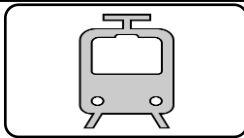
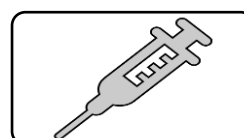
Women's empowerment & infant mortality

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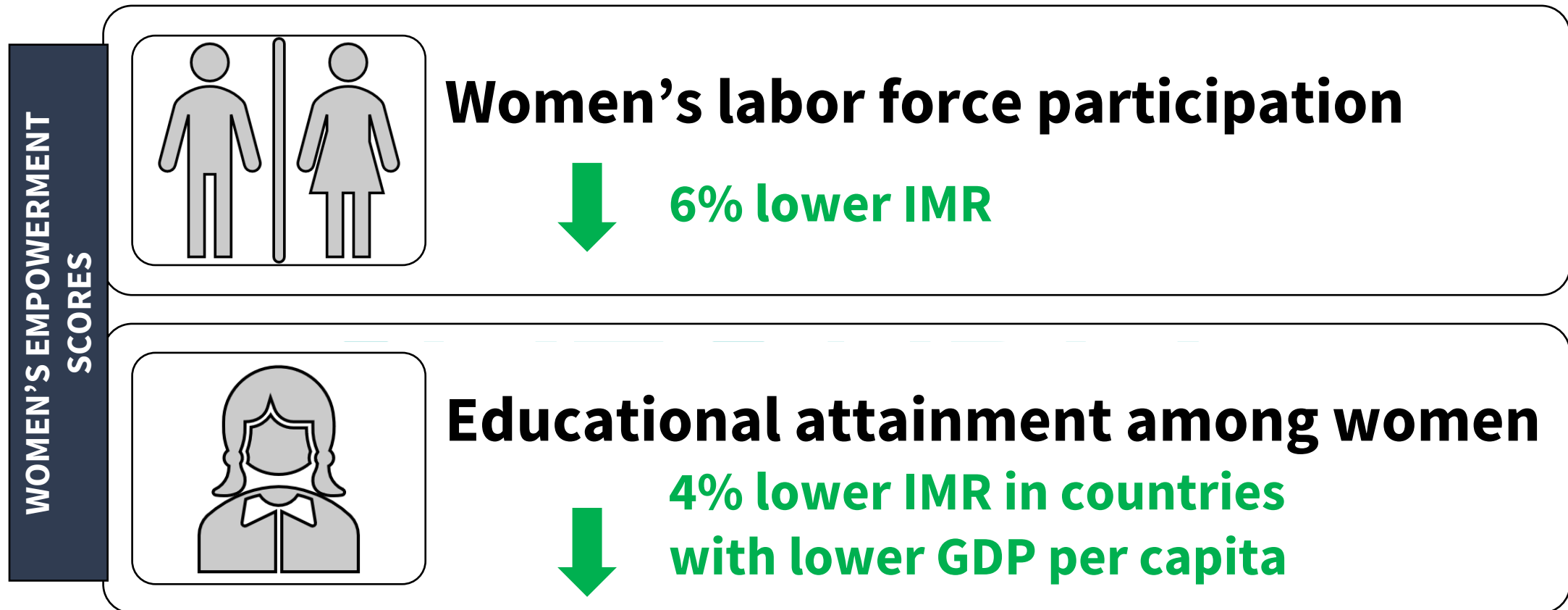
Estimates for 1 SD higher scores

Which characteristics of the urban environment are linked to infant mortality in cities?

	Population growth	↓	5% lower IMR
	Housing and living conditions	↓	14% lower IMR
	Service provision	↓	12% lower IMR
	Population education		NO ASSOCIATION
	Mass transit availability	↓	10% lower IMR
	Healthcare coverage		NO ASSOCIATION

SOCIOECONOMIC
SCORES

How is women's empowerment linked to infant mortality?



Interventions in the urban context should also be considered maternal and child health interventions



Living conditions

- Urban redevelopment in slums
- Housing improvement programs



Service Provision

- Affordable water & sanitation services
- Sanitation design & expansion in cities



Mass Transit

- Network expansion
- Accessible & affordable public transportation



Women's empowerment

- Foster women's social & economic development
- Girls' education

Maternal and infant mortality prevention programs

Breastfeeding education
Prenatal care & skilled birth
Vaccine delivery

Nutritional supplements
Oral rehydration & antibiotic therapy

Key Messages

Cities are key to reducing infant mortality rates in Latin America



Local strategies to prevent infant deaths need to be **comprehensive**



Adequate city services and ensuring women's social participation are important parts of infant-targeted health interventions

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- Tonatiuh Barrientos Gutierrez

Universidad Peruana Cayetano Heredia, Peru

- Jaime Miranda
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