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

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Rosario, Argentina.

Population: 1,173,533
Latitude: -32° 56' 48.55" S
Longitude: -60° 38' 21.55" W

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Social determinants of child health

Policies & Systems
- Governance
- Economy & use Natural Resources
- Social Justice

COUNTRY

Interventions & Policy implementation
- Social & Built Environment design
- Services

CITY

CROSS-CUTTING
- Culture
- Norms

Community wealth & access
- Living conditions
- Education/ Employment
- Social cohesion

NEIGHBORHOOD

Wellness & use of goods /services
- Socioeconomic status
- Individual risk factors
- Behaviors

PARENTS AND FAMILIES

SALURBAL Infant Mortality Data Brief, July 2020

Social determinants of child health

- **Social disparities as drivers of health**

- **Act local for regional & global impact**

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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

Ortigoza AF, et al. **J Epidemiol Community Health** 2021;75:264–270

Ortigoza A, et al. **Cities & Health** 2021; DOI: 10.1080/23748834.2021.1908794

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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

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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

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Regional, national, local levels of infant mortality

IMR trends by regions (1955-2015)
Source: UNIMEG

Infant Mortality Rate by Region (1955–2015)
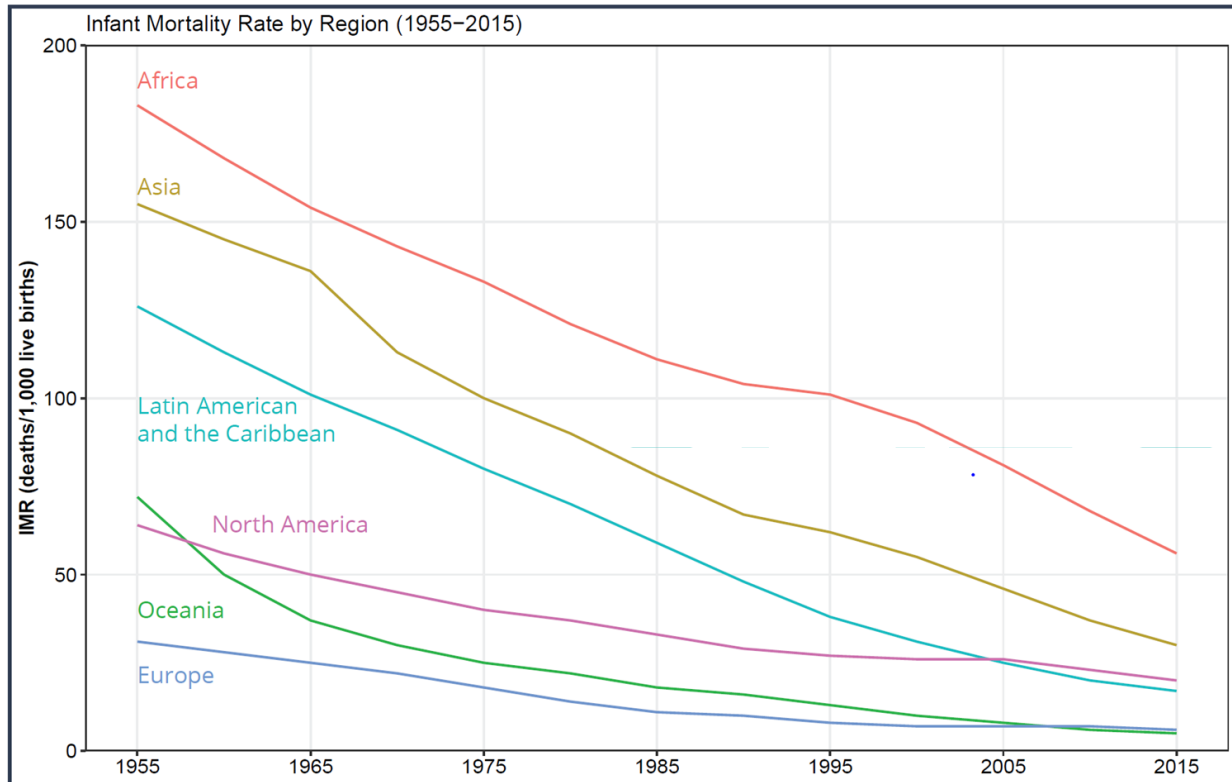
Regional, national, local levels of infant mortality

IMR trends by regions (1955-2015)
Source: UNIMEG

IMR trends by SALURBAL countries (1955-2015)
Source: UNIMEG
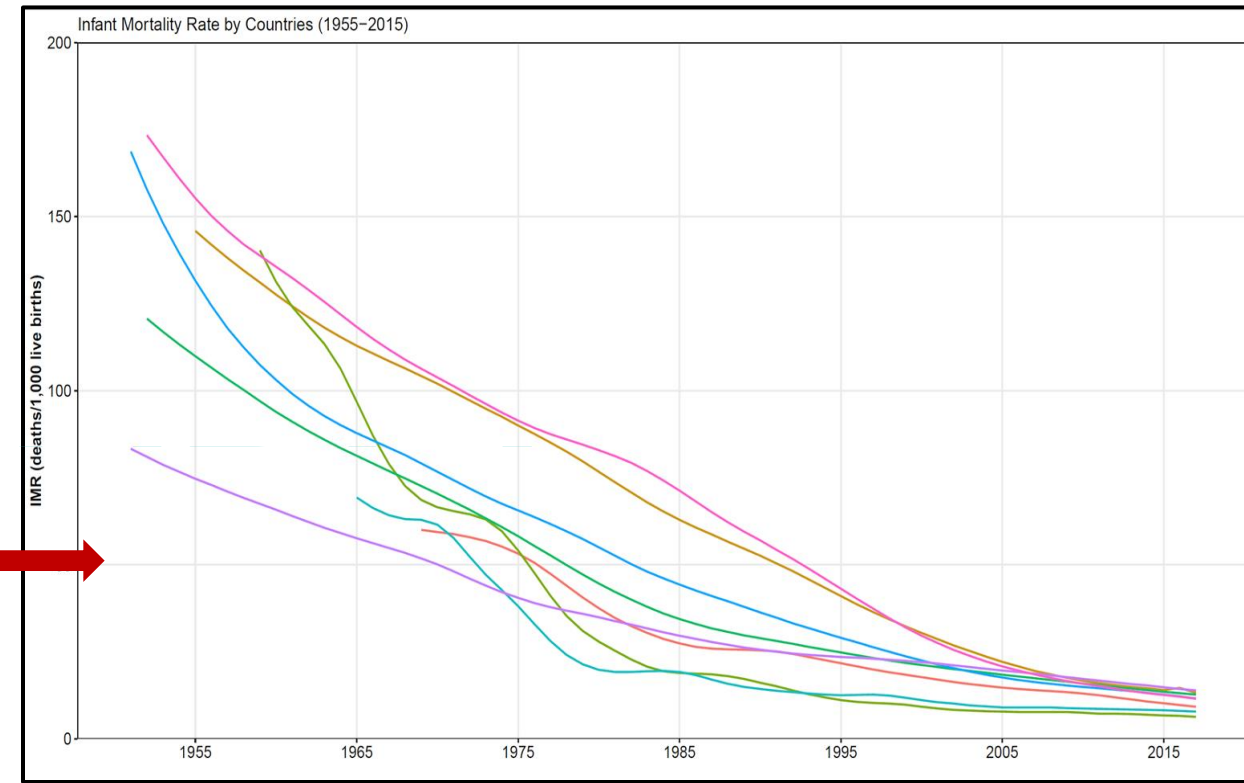
Regional, national, local levels of infant mortality

IMR trends in SALURBAL countries (1955-2015) Source: UNIMEG
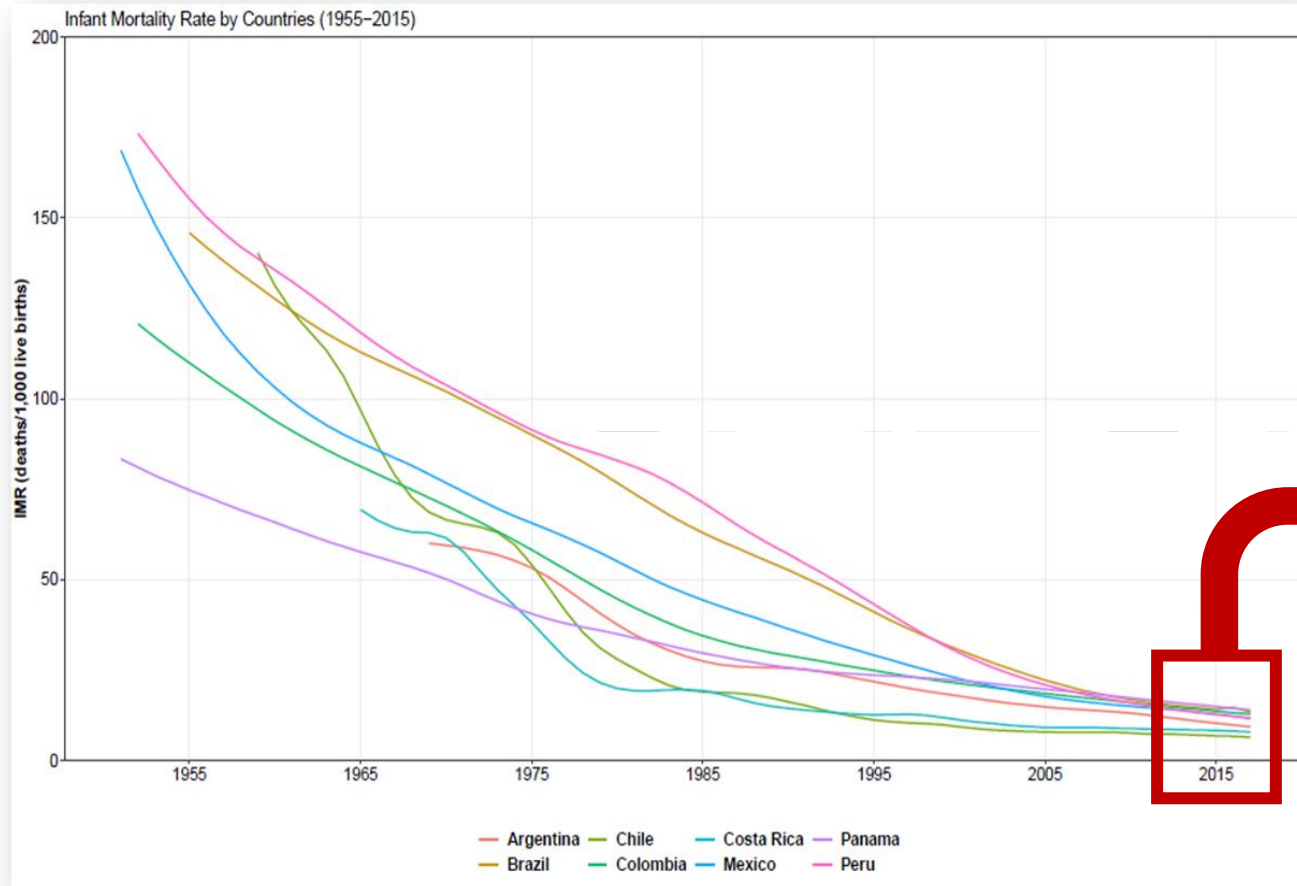
IMR in SALURBAL cities by countries (2014-2016) Source: SALURBAL project
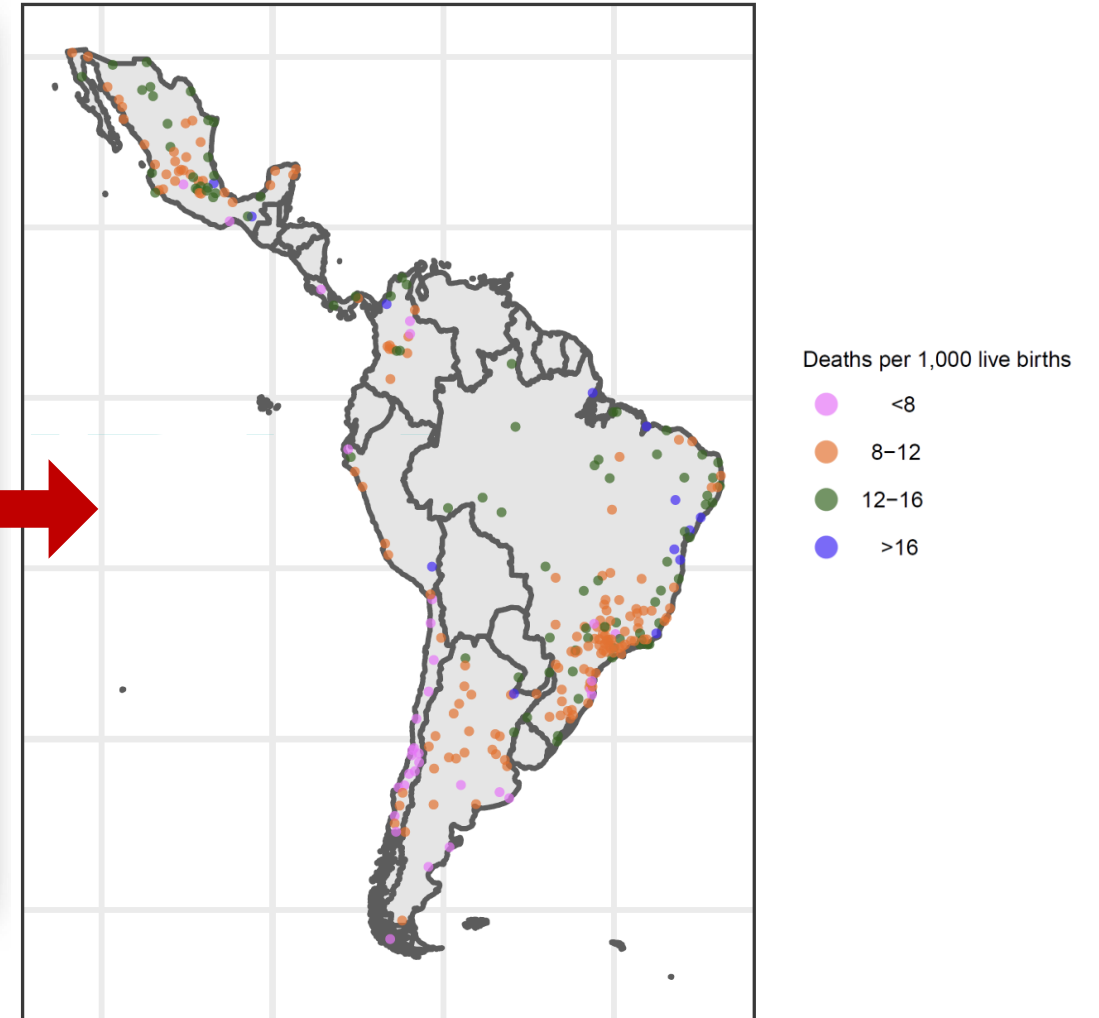
Variations in city-levels of IMR

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IMR (deaths per 1,000 live births)
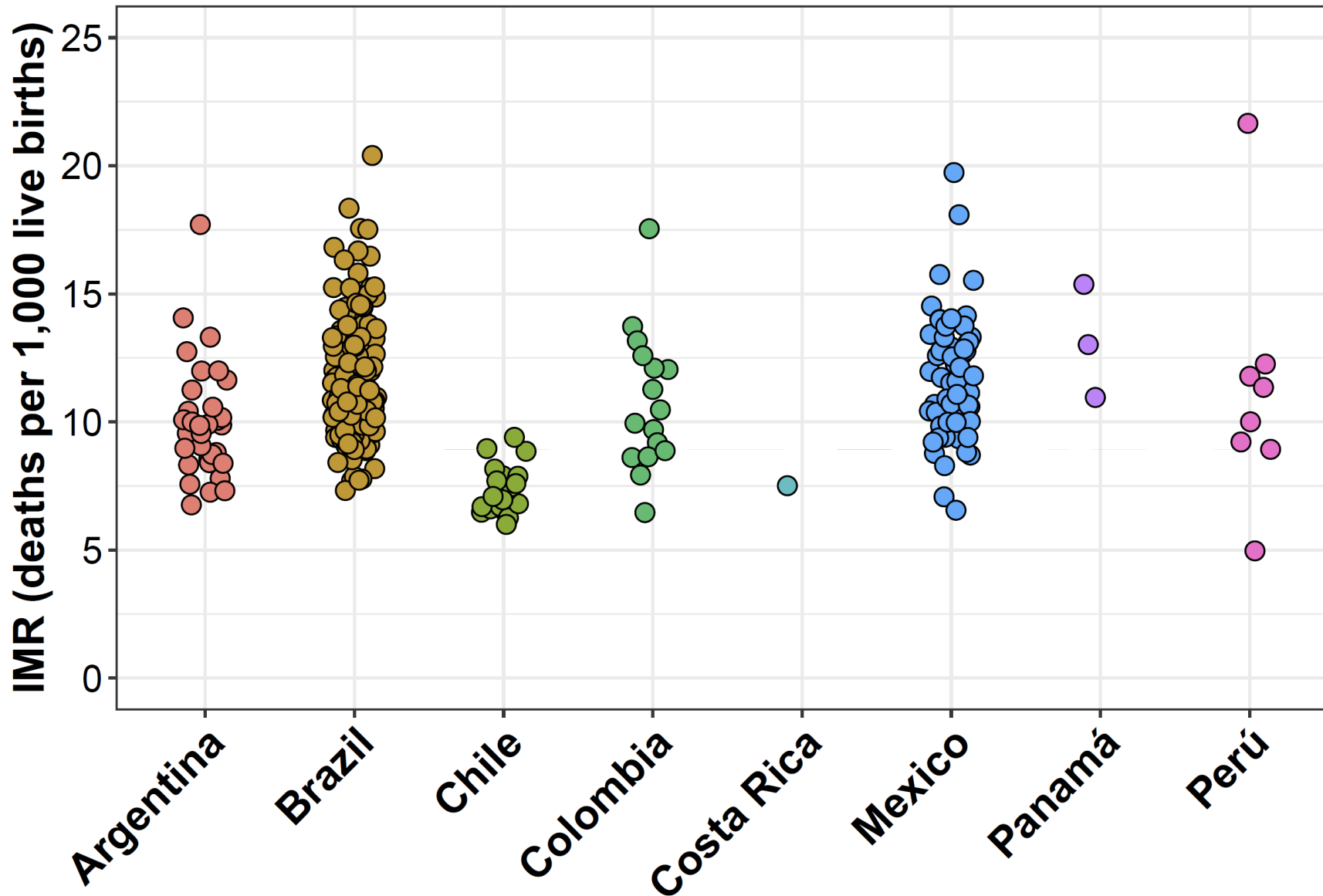
57% variability city- level IMR is within countries

Urban environment & infant mortality in cities

SOCIOECONOMIC SCORES
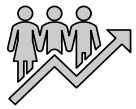
Population growth

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
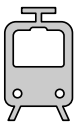
Mass transit availability

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

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Women's empowerment & infant mortality

WOMEN'S EMPOWERMENT SCORES

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.
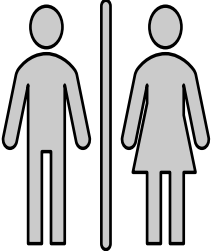
Women's labor force participation

- 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
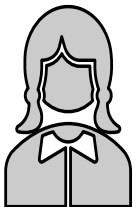
Educational attainment among women

- 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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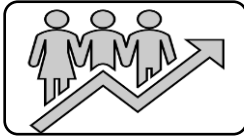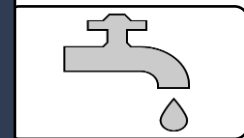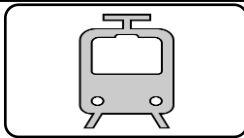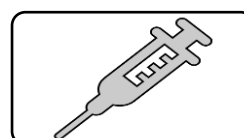
Estimates for 1 SD higher scores

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

SOCIOECONOMIC SCORES

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

How is women's empowerment linked to infant mortality?

WOMEN'S EMPOWERMENT SCORES

Women's labor force participation

6% lower IMR

Educational attainment among women

4% lower IMR in countries with lower GDP per capita

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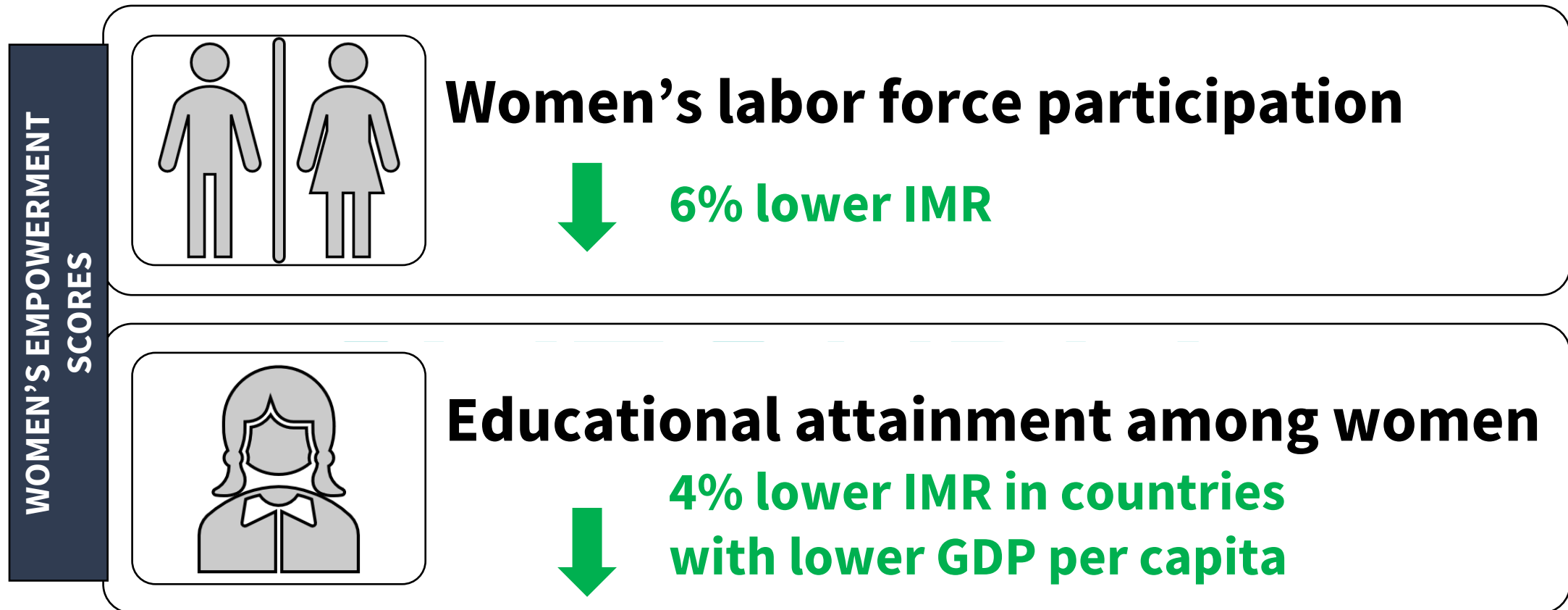
Interventions in the urban context should also be considered maternal and child health interventions

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

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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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Acknowledgements

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