

# Association of education level with diabetes prevalence in Latin American cities and its modification by city social environment

**Ariela Braverman-Bronstein** , Philipp Hessel, Catalina González-Uribe, Maria F Kroker, Francisco Diez-Canseco, Brent Langellier, Diego I Lucumi, Lorena Rodríguez Osiac, Andrés Trotta , Ana V Diez Roux

ICUH July 6th 2021



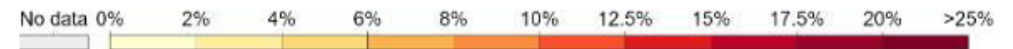
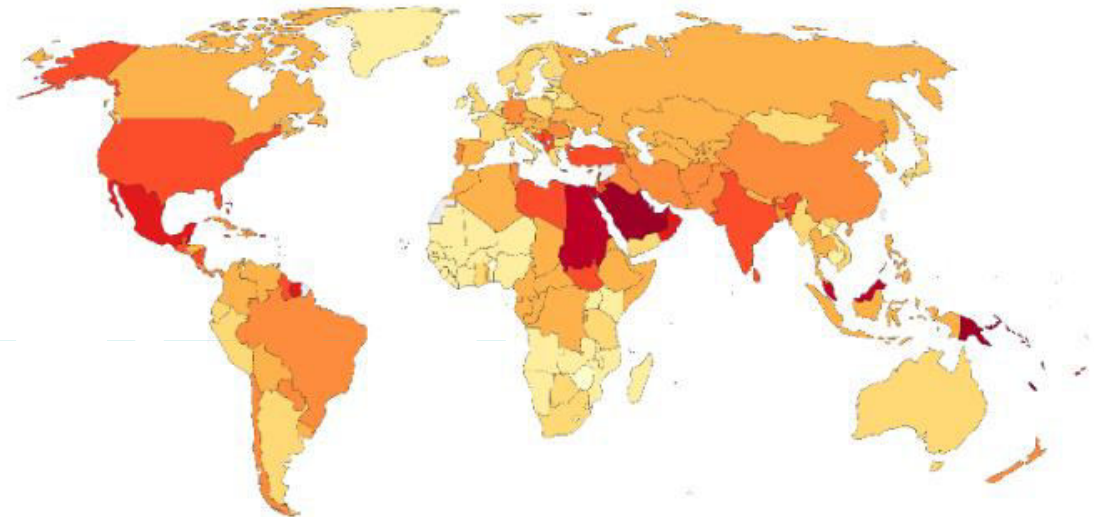
# Background

- Diabetes prevalence has doubled over the past 30 years.
- 75% of the cases occurring in low- and middle-income countries.
- 4<sup>th</sup> cause of death.
- More than 60% of the population in Latin America are overweight or obese.

## Diabetes prevalence, 2017

Diabetes prevalence refers to the percentage of people ages 20-79 who have type 1 or type 2 diabetes.

Our World  
in Data



Source: International Diabetes Federation, Diabetes Atlas

CC BY

# Background

- Urban living has been linked to several factors associated to obesity and diabetes.



- Behavioral
- Social/demographic



- City development
- City environment

INEQUALITY

# Aims

- To understand and document educational differences in diabetes prevalence in Latin American cities by gender:
  - Whether these inequities vary across countries and cities
  - The extent to which they are modified by city social environment.

# Methods

- **Harmonized survey data**
  - Diabetes status
  - Education level
- **Census data**
  - Social Environment Index
- **Eight countries, 232 cities, and 110,498 people.**

# Methods

## Sequence of two-level models (individuals nested in cities)

### Exposure term

---

Education level

City SEI

Country

Interactions:

Country\*education

Education\*SEI


---

All models were adjusted for age

All models allowed for the effect of education to vary within cities (random slope)

# Methods

## Sequence of two-level models (individuals nested in cities)

Exposure term	Model 1
Education level	
City SEI	
Country	
Interactions:	
Country*education	
Education*SEI	

All models were adjusted for age

All models allowed for the effect of education to vary within cities (random slope)

# Methods

## Sequence of two-level models (individuals nested in cities)

Exposure term	Model 1	Model 2
Education level	■	
City SEI	■	
Country	■	■
Interactions:		
Country*education		
Education*SEI		

All models were adjusted for age

All models allowed for the effect of education to vary within cities (random slope)



# Methods

## Sequence of two-level models (individuals nested in cities)

Exposure term	Model 1	Model 2	Model 3 (only male)
Education level	[Shaded]		
City SEI	[Shaded]		
Country	[Shaded]		
Interactions:			
Country*education			[Shaded]
Education*SEI			

All models were adjusted for age

All models allowed for the effect of education to vary within cities (random slope)

# Methods

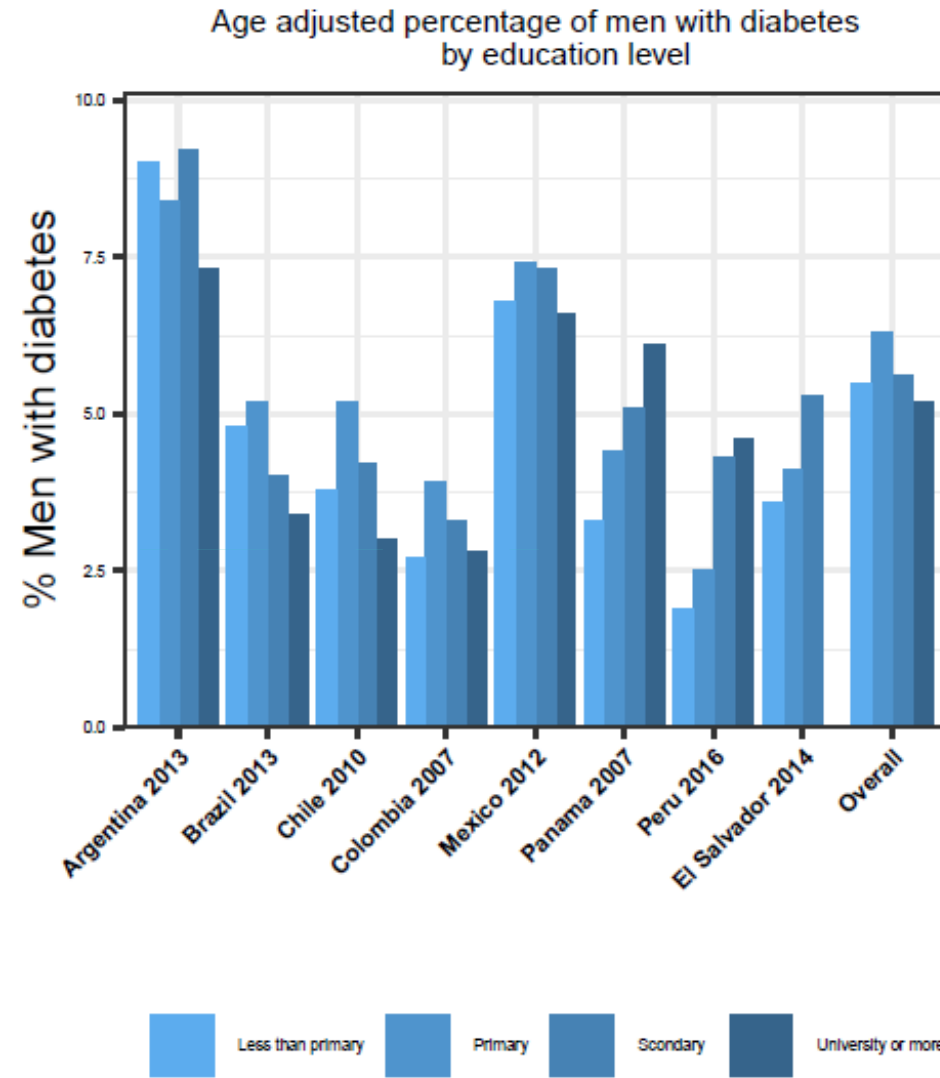
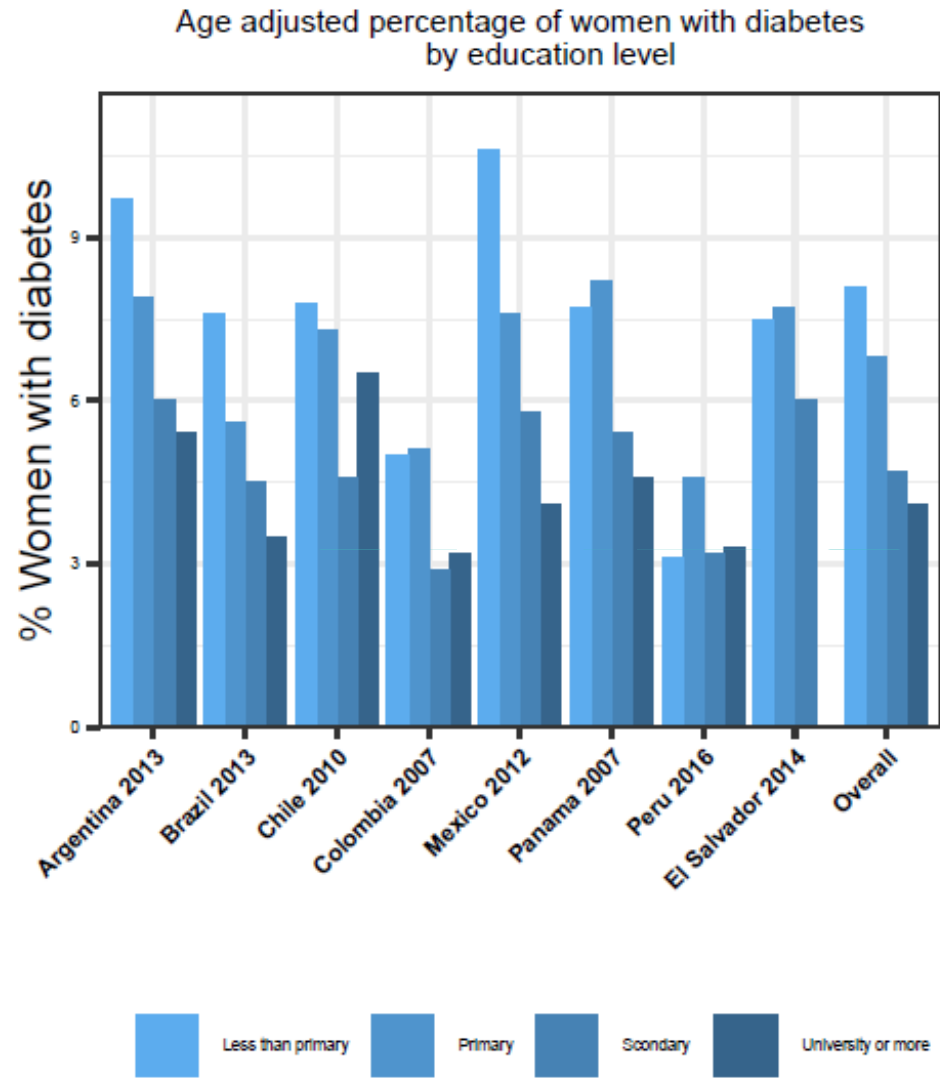
## Sequence of two-level models (individuals nested in cities)

Exposure term	Model 1	Model 2	Model 3 (only male)	Model 4
Education level	Yes			
City SEI	Yes			
Country	Yes			
Interactions:				
Country*education			Yes	Yes
Education*SEI			Yes	Yes

All models were adjusted for age

All models allowed for the effect of education to vary within cities (random slope)

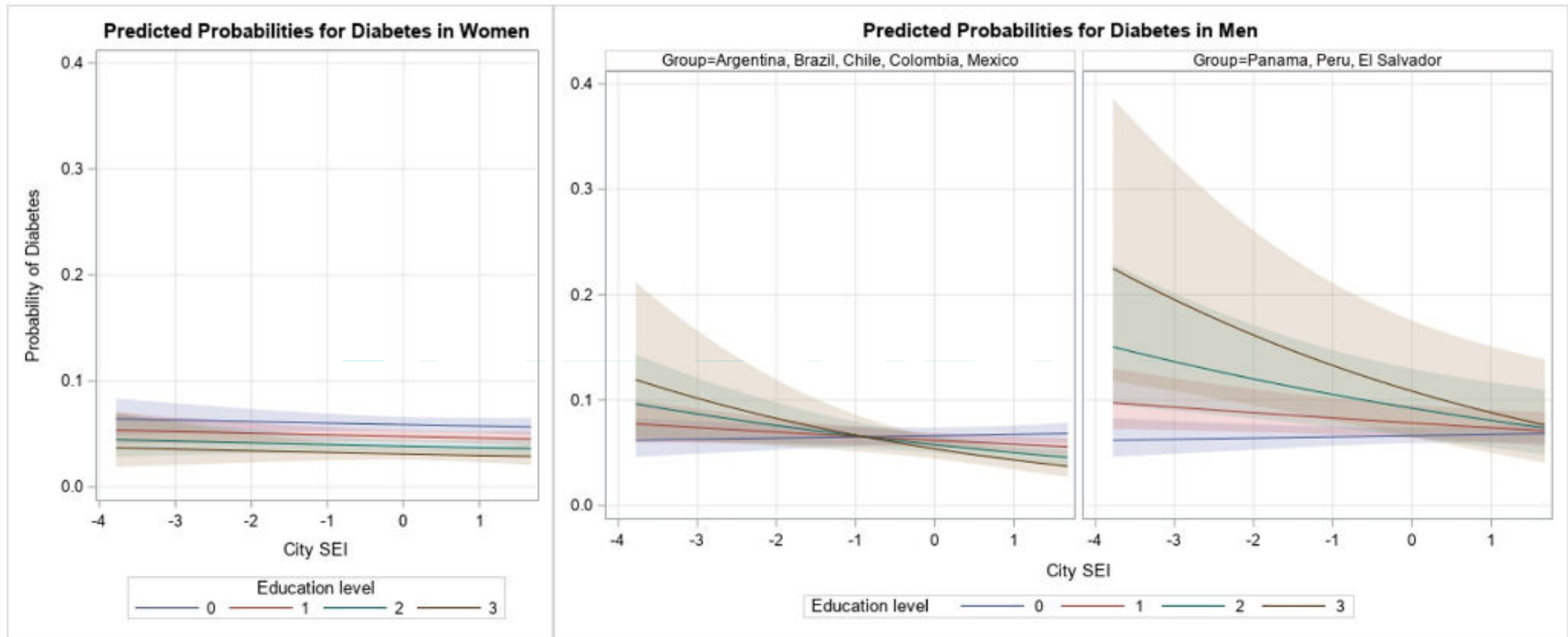
# Age-adjusted percentage of people with diabetes by country and gender according to their individual education level



## ORs of diabetes associated with individual-level education and city-SEI by sex

Individual and city characteristics	Model 1 OR (95%CI)	Model 2 OR (95%CI)	Model 3 OR (95%CI)
<b>Women (n=51,903)</b>			
City-SEI	1.00 (0.95,1.06)	0.96 (0.91,1.02)	..
Education level	<del>0.78 (0.73,0.83)</del>	<del>0.80 (0.75,0.85)</del>	..
<b>Random effects</b>			
Intercept Variance (std. Error)	0.0798 (0.0197)	0.0364 (0.0135)	..
Education Slope variance (std.error)	0.0262 (0.0155)	0.0259 (0.0142)	..
<b>Men (n= 37,246)</b>			
City SEI	1.02 (0.96,1.09)	0.97 (0.92,1.03)	0.98 (0.92,1.05)
Education level	0.93 (0.87,1.00)	0.95 (0.89,1.02)	
Argentina, Brazil, Chile, Colombia, Mexico	..	..	<del>0.92 (0.86,0.99)</del>
Peru, Panama, El Salvador	..	..	<del>1.24 (1.04,1.49)</del>
<b>Random effects</b>			
Intercept Variance (std. Error)	0.1004 (0.0240)	0.0201 (0.0117)	0.0210 (0.0117)
Education Slope variance (std.error)	0.0346 (0.0168)	0.0209 (0.0127)	0.0163 (0.0124)

## Predicted probabilities of diabetes based on the multilevel logistic regression models to assess the effect modification of education level by city-Social Environment Index (SEI)



# Summary of results



As education level increases, the odds of diabetes decrease regardless of city or country characteristics.



The association between education and diabetes is affected by country and city characteristics.

- In Argentina, Brazil, Colombia, Chile y México there is an inverse association between education level and diabetes.
- In Peru, Panama, and El Salvador there is a positive association between education level and diabetes.

This association was modified by city-SEI such that an inverse association emerged (or a positive association weakened) as the city-SEI improved.

# Strengths and Limitations



- Harmonized data for 232 cities in 8 Latin American countries
- Use of city-specific information
- Multilevel models



- Self reported diabetes
- Different years for surveys and census
- Cross-sectional data

# Conclusions

- Need for local policies
- City and country context matters when targeting diabetes
- It's important to reduce educational inequalities
- Reducing socioeconomic and gender inequalities is critical to reduce diabetes in Latin America.



# Aknowledgments

- The SALURBAL project team members
- This study was funded by the Wellcome Trust.

**Thank you!**

---

Email: [ab4257@drexel.edu](mailto:ab4257@drexel.edu)

Twitter: [@aribravs](https://twitter.com/aribravs)

# LEARN MORE AND CONTACT US



*LACURBANHEALTH.ORG*  
*SALURBAL@DREXEL.EDU*

**FOLLOW US**

*@LACURBANHEALTH*

