**Supplementary Materials for**

**The urban built environment and adult BMI, obesity and diabetes in Latin American cities**

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**Supplementary Table 1 | Sample size by country for BMI and obesity and Type 2 Diabetes**
Sample size for each country is displayed as observations are lost due to incomplete or missing data.

| Outcomes | BMI and Obesity | | | | | Type 2 Diabetes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Country | Survey sample size | Individuals with complete sub-city unit data | Individuals selected for anthropometry module | Individuals with complete outcome data | Individuals with complete built environment data | Individuals with complete socio-demographic data (final sample size) | Individuals with complete sub-city unit data | Individuals selected for health module | Individuals with complete outcome data | Individuals with complete built environment data | Individuals with complete socio-demographic data (final sample size) |
| Argentina | 21,573 | 21,451 | 21,451 | 20,184 | 20,184 | **20,184** | 21,451 | **21,451** | 21,337 | 21,337 | **21,337** |
| Brazil | 93,113 | 67,321 | 29,353 | 25,528 | 25,528 | **25,528** | 67,321 | **67,353** | 24,966 | 24,966 | **24,966** |
| Chile | 3,146 | 3,140 | 3,140 | 2,866 | 2,866 | **2,861** | 3,140 | **3,140** | 3,107 | 3,107 | **3,106** |
| Colombia | 49,521 | 49,521 | 5,934 | 5,886 | 5,886 | **5,757** | 49,521 | **18,655** | 18,653 | 18,653 | **18,653** |
| Costa Rica | 1,427 | 0 | 0 | 0 | 0 | **0** | 0 | **0** | 0 | 0 | **0** |
| Guatemala | 1,397 | 1,397 | 1,397 | 1,040 | 1,040 | **1,040** | 1397 | **1,397** | 1382 | 1382 | **1382** |
| Mexico | 72,867 | 72,789 | 25,171 | 22,895 | 22,895 | **22,895** | 72,789 | **26,335** | 26,335 | 26,335 | **26,335** |
| Nicaragua | 1,993 | 1,993 | 1,993 | 1,693 | 1,693 | **1,692** | 1,993 | **1,993** | 1,949 | 1,949 | **1,948** |
| Panama | 11,435 | 11,394 | 0 | 0 | 0 | **0** | 11,394 | **11,394** | 11,374 | 11,374 | **11,063** |
| Peru | 11,929 | 11,929 | 11,929 | 11,831 | 11,823 | **11,821** | 11,929 | **11,929** | 11,925 | 11,917 | **11,915** |
| El Salvador | 1,546 | 1,546 | 1,538 | 1,538 | 1,538 | **1,502** | 1546 | **1,546** | 1542 | 1542 | **1506** |
| **Total** | **269,947** | **242,481** | **101,914** | **93,461** | **93,453** | **93,280** | **242,481** | **127,193** | **122,570** | **122,562** | **122,211** |

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**Supplementary Table 2 | Characteristics of the sample by country**
All variables of interest are shown by country.

| Variables<br>Individual level variables | Argentina (21,337) | Brazil (24,966) | Chile (3,106) | Colombia (18,653) | Guatemala (1,382) | México (26,335) | Nicaragua (1,948) | Panamá (11,063) | Peru (11,915) | El Salvador (15,06) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Age** | 44.7 ± 18 | 43.9 ± 16.6 | 47 ± 17.7 | 39.3 ± 14.1 | 39.7 ± 15.5 | 43.6 ± 16.1 | 40.6 ± 14.9 | 41.4 ± 16.6 | 39.7 ± 15.7 | 45.7 ± 17 |
| **Female sex** | 56.2% | 50.6% | 59.4% | 57.4% | 67.2% | 57.3% | 49.2% | 63.3% | 57.5% | 66.8% |
| **Highest educational level completed** | | | | | | | | | | |
| Less than primary | 9.3% | 21.1% | 11.3% | 17.3% | 37.1% | 20.5% | 6.2% | 8.5% | 12.8% | 33.0% |
| Primary | 36.9% | 21.1% | 34.2% | 34.7% | 45.0% | 48.8% | 33.5% | 36.2% | 17.4% | 39.4% |
| Secondary | 37.0% | 38.8% | 45.9% | 39.1% | 16.5% | 21.0% | 43.7% | 38.2% | 57.5% | 22.9% |
| University | 16.9% | 19.1% | 8.6% | 8.8% | 1.5% | 9.7% | 16.1% | 17.2% | 12.3% | 4.7% |
| **Sub-city level variables** | | | | | | | | | | |
| **Intersection density** (n/km$^2$) | 19.2 ± 28.4 | 38.1 ± 31 | 33.6 ± 53.8 | 19.8 ± 19.6 | 58.4 | 21.1 ± 31.8 | 51.6 | 35.2 ± 40.7 | 48 ± 55.2 | 38.9 ± 32.2 |
| **Greenness** (median NDVI) | 0.6 ± 0.2 | 0.7 ± 0.1 | 0.5 ± 0.3 | 0.8 ± 0.1 | 0.7 | 0.6 ± 0.2 | 0.8 | 0.7 ± 0.2 | 0.4 ± 0.3 | 0.8 ± 0.1 |
| **Population Density in built up areas** (n/km2) | 5,276 ± 3,038 | 8,312 ± 3,605 | 7,068 ± 2,845 | 1,3640 ± 4,893 | 13,154 | 5,772 ± 2,913 | 8,458 | 6,496 ± 4,722 | 11,282 ± 5,092 | 12,017 ± 5,025 |
| **Population educational attainment (Z-score)** | -0.3 ± 1.0 | 1.2 ± 0.8 | -0.5 ± 1.0 | 0.1 ± 0.8 | -1.7 | -0.2 ± 1.2 | -0.3 | 1.9 ± 2.6 | 2.2 ± 1.5 | -1.0 ± 1.3 |
| **City level variables** | | | | | | | | | | |
| **Fragmentation** [Patch density (n/100ha)] | 0.3 ± 0.3 | 0.6 ± 0.4 | 0.3 ± 0.2 | 0.4 ± 0.2 | 0.8 | 0.4 ± 0.3 | 1.2 ± 0 | 0.5 ± 0.1 | 0.2 ± 0.1 | 1.1 ± 0.3 |
| **Isolation** [Mean distance to the nearest urban patch within the geographic boundary(m)] | 88.9 ± 32.6 | 71.2 ± 10.9 | 93.5 ± 37.3 | 96.1 ± 57.2 | 67.5 | 94.3 ± 42.2 | 64.6 ± 0 | 70.2 ± 4.3 | 76 ± 14.4 | 66.7 ± 3.6 |
| **Percentage of urban area** (%) | 6.3 ± 7.2 | 11.7 ± 9.4 | 8.6 ± 11.1 | 7.9 ± 6.6 | 13.5 | 8 ± 7.2 | 12.1 ± 0 | 6 ± 1.6 | 7.7 ± 7.6 | 12.1 ± 5.5 |

**Supplementary Table 2 (Cont.) | Characteristics of the sample by country.**

| Outcomes | Argentina (21,337) | Brazil (24,966) | Chile (3,106) | Colombia (18,653) | Guatemala (1,382) | México (26,335) | Nicaragua (1,948) | Panamá (11,063) | Peru (11,915) | El Salvador (15,06) |
|---|---|---|---|---|---|---|---|---|---|---|
| **BMI** (Kg/m$^2$)* | 26.6 ± 5.4 | 26.6 ± 5.1 | 27.9 ± 5.4 | 25.3 ± 6.9 | 26.8 ± 4.9 | 28.4 ± 5.8 | 27.9 ± 5.6 | -- | 27.4 ± 4.7 | 27.8 ± 5.3 |
| **Obesity** (BMI ≥ 30 kg/m$^2$)* | 21.1% | 21.6% | 29.2% | 14.9% | 23.8% | 34.1% | 30.9% | -- | 26.0% | 30.6% |
| **Diabetes** (yes) | 8.7% | 6.7% | 8.1% | 3.8% | 5.6% | 9.8% | 5.8% | 6.4% | 3.7% | 9.5% |

NDVI: Normalized Difference Vegetation Index. BMI: Body mass index. * Calculated from the obesity data set.  Values are show as percentage or Mean ± Standard Deviation

| Variables | Low<br>Q1 (n = 30,615)<br>[1,024.1 - 4,740.2] | Mid-low<br>Q2 (n = 30,944)<br>[4,772.6 - 6,735.8] | Mid-high<br>Q3 (n = 30,491)<br>[6,736.0 - 10,512.2] | High<br>Q4 (n = 30,111)<br>[10,517.3 - 39,498.7] |
|---|---|---|---|---|
| **Individual level variables** | | | | |
| **Age** | 43.3 ± 16.9 | 42.9 ± 16.6 | 42.2 ± 16.2 | 42 ± 16.1 |
| **Sex** | | | | |
| Female | 57.6% | 58.6% | 58.8% | 59.1% |
| Male | 42.4% | 41.4% | 41.2% | 41.0% |
| **Highest educational level completed** | | | | |
| Less than primary | 16.5% | 15.2% | 16.8% | 16.5% |
| Primary | 39.3% | 37.1% | 28.9% | 30.3% |
| Secondary | 31.9% | 32.5% | 39.7% | 41.1% |
| University or higher | 12.4% | 15.2% | 14.6% | 12.1% |
| **Sub-city level variables** | | | | |
| **Intersection density** (n/km$^2$) | 6.3 ± 11.9 | 19.5 ± 23 | 36.2 ± 34.4 | 56.1 ± 42.9 |
| **Greenness** (median NDVI) | 0.6 ± 0.2 | 0.7 ± 0.2 | 0.7 ± 0.2 | 0.6 ± 0.2 |
| **Population Density in built up areas** (n/km$^2$) | 3,724 ± 649 | 5,618 ± 544 | 8,410 ± 1,185 | 15,376 ± 3,943 |
| **Population educational attainment (Z-score)** | -0.1 ± 1.4 | 0.5 ± 1.6 | 0.9 ± 1.7 | 0.8 ± 1.4 |
| **City level variables** | | | | |
| **Fragmentation** [Patch density (n/100ha)] | 0.3 ± 0.3 | 0.4 ± 0.2 | 0.5 ± 0.3 | 0.6 ± 0.3 |
| **Isolation** [Mean distance to the nearest urban patch within the geographic boundary(m)] | 98 ± 38.6 | 83.3 ± 31.5 | 77 ± 19.4 | 77 ± 44.2 |
| **Percentage of urban area** (%) | 4.3 ± 5.5 | 6.3 ± 4.8 | 8.0 ± 5.9 | 15.2 ± 9 |
| **Outcomes** | | | | |
| **BMI** (Kg/m$^2$)* | 27.4 ± 5.5 | 27.3 ± 5.6 | 27.1 ± 5.5 | 26.8 ± 5.5 |
| **Obesity** (BMI ≥ 30 kg/m$^2$)* | 26.6% | 26.4% | 24.1% | 22.9% |
| **Diabetes** (yes) | 8.3% | 7.6% | 6.3% | 5.7% |

NDVI: Normalized Difference Vegetation Index. BMI: Body mass index. * Calculated from the obesity data set. Values are show as percentage or Mean ± Standard Deviation

**Supplementary Table 4a | Sensitivity analysis**
Associations between sub-city and city exposures and BMI. Different sensitivity analyses are presented.

| Sub-city and city characteristics (z-scores) | Full Model for BMI | Excluding Argentina | Excluding pop.dens >3SD | Recent surveys only | Excluding BMI outliers | Including interaction terms between country and individual educational level |
|---|---|---|---|---|---|---|
| | Coeff [95% CI] | Coeff [95% CI] | Coeff [95% CI] | Coeff [95% CI] | Coeff [95% CI] | Coeff [95% CI] |
| **Sub-city intersection density (**n/km2) | 0.10 [0.02 ; 0.19] | 0.09 [0.02 ; 0.16] | 0.08 [-0.00 ; 0.17] | 0.09 [-0.00 ; 0.18] | 0.09 [0.01 ; 0.18] | 0.09 [0.02 ; 0.17] |
| **Sub-city greenness** (median NDVI) | -0.04 [-0.15 ; 0.06] | -0.07 [-0.17 ; 0.04] | -0.05 [-0.15 ; 0.05] | -0.03 [-0.14 ; 0.07] | -0.04 [-0.15 ; 0.07] | -0.05 [-0.14 ; 0.05] |
| **Sub-city population density in built up areas (**n/km2) | -0.03 [-0.14 ; 0.08] | 0.02 [-0.08 ; 0.12] | -0.01 [-0.11 ; 0.09] | 0.00 [-0.12 ; 0.12] | -0.03 [-0.14 ; 0.09] | -0.01 [-0.11 ; 0.08] |
| **City fragmentation** [Patch density (n/100ha)]♯ | -0.13 [-0.29 ; 0.04] | -0.13 [-0.30 ; 0.04] | -0.12 [-0.28 ; 0.04] | -0.12 [-0.29 ; 0.04] | -0.14 [-0.30 ; 0.01] | -0.12 [-0.27 ; 0.04] |
| **City isolation** [Mean distance to the nearest urban patch within the geographic boundary(m)] | 0.04 [-0.07 ; 0.16] | 0.04 [-0.09 ; 0.17] | 0.04 [-0.07 ; 0.16] | 0.00 [-0.11 ; 0.10] | 0.05 [-0.08 ; 0.17] | 0.04 [-0.07 ; 0.16] |

The description of the sample for each sensitivity analysis are as follows:

Full model: Model presented in the main text. Excluding Argentina: data sub-set excluding all observations from Argentina as weight and height was self-reported for this country. Excluding population density >3SD: data sub-set excluding observations with population density higher than its 3 standard deviations (SD). Recent surveys: only survey data from 2010 onwards were included in this data sub-set. Excluding BMI outliers: observations with body mass index (BMI) lower that 12 Kg/m2 and higher that 70 Kg/m2 were excluded in this data sub-set. Including interaction terms between Country and individual educational level: as education could modified the association between the built environment characteristics and our health outcomes, we included in this model the interaction terms for this country and individual education level.

**Supplementary Table 4b | Sensitivity analysis**
Associations between sub-city and city exposures and obesity

| Sub-city and city characteristics (z-scores) | Full Model for Obesity | Excluding Argentina | Excluding pop.dens >3SD | Recent surveys only | Excluding BMI outliers | Normal weight vs Overweight + Obese | Including interaction terms between country and individual educational level |
|---|---|---|---|---|---|---|---|
| | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] |
| **Sub-city intersection density** (n/km2) | 1.04 [1.00 ; 1.08] | 1.04 [1.00 ;  1.08] | 1.03 [0.99 ; 1.07] | 1.03 [0.99 ; 1.07] | 1.04 [1.00 ;1.08] | 1.01 [0.98 ; 1.05] | 1.04 [1.00 ; 1.08] |
| **Sub-city greenness** (median NDVI) | 0.97 [0.93 ; 1.01] | 0.96 [0.91 ; 1.01] | 0.97 [0.93 ; 1.01] | 0.97 [0.93 ; 1.02] | 0.97 [0.93 ;1.01] | 0.98 [0.94 ; 1.03] | 0.97 [0.93 ; 1.01] |
| **Sub-city population density in built up areas** (n/km2) | 1.00 [0.95 ; 1.04] | 1.01 [0.96 ; 1.06] | 1.02 [0.98 ; 1.06] | 1.01 [0.97 ; 1.05] | 1.00 [0.95 ;1.04] | 1.00 [0.96 ; 1.05] | 1.010 [0.96 ; 1.04] |
| **City fragmentation** [Patch density (n/100ha)]♯ | 0.95 [0.88 ; 1.02] | 0.94 [0.87 ; 1.01] | 0.95 [0.89 ; 1.02] | 0.96 [0.90 ; 1.03] | 0.95 [0.88 ;1.02] | 1.01 [0.94 ; 1.08] | 0.96 [0.89 ; 1.03] |
| **City isolation** [Mean distance to the nearest urban patch within the geographic boundary(m)] | 1.01 [0.96 ; 1.06] | 1.01 [0.96 ; 1.06] | 1.01 [0.96 ; 1.06] | 0.99 [0.95 ; 1.03] | 1.01 [0.97 ;1.06] | 1.02 [0.96 ; 1.07] | 1.01 [0.96 ; 1.06] |

Different sensitivity analyses are presented. The description of the sample for each sensitivity analysis are as follows: Full model: Model presented in the main text. Excluding Argentina: data sub-set excluding all observations from Argentina as weight and height was self-reported for this country. Excluding pop.dens >3SD: data sub-set excluding observations with population density higher than its 3 standard deviations (SD). Recent surveys: only survey data from 2010 onwards were included in this data sub-set. Excluding BMI outliers: observations with body mass index (BMI) lower that 12 Kg/m2 and higher that 70 Kg/m2 were excluded in this data sub-set. Normal weight vs Overweight + Obese: this dataset compares subjects with normal weight <25 kg/m2) vs. overweight and obesity (≥25 kg/m2) Including interaction terms between Country and individual educational level: as education could modified the association between the built environment characteristics and our health outcomes, we included in this model the interaction terms for this country and individual education level.

**Supplementary Table 4c | Sensitivity analysis**
Associations between sub-city and city exposures and Type 2 Diabetes

| Sub-city and city characteristics (z-scores) | Full Model for Type 2 Diabetes | Excluding Panama | Excluding pop.dens >3SD | Recent surveys only | Including interaction terms between country and individual educational level |
|---|---|---|---|---|---|
| | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] | OR [95% CI] |
| **Sub-city intersection density** (n/km2) | 1.04 [0.98 ; 1.10] | 1.06 [1.01 ; 1.11] | 1.04 [0.98 ; 1.10] | 1.07 [1.01 ; 1.13] | 1.03 [0.97 ; 1.10] |
| **Sub-city greenness** (median NDVI) | 0.98 [0.94 ; 1.02] | 0.99 [0.95 ; 1.03] | 0.98 [0.94 ; 1.02] | 0.99 [0.95 ; 1.04] | 0.98 [0.93 ; 1.02] |
| **Sub-city population density in built up areas** (n/km2) | 0.96 [0.92 ; 1.00] | 0.96 [0.91 ; 1.01] | .99 [0.93 ; 1.05] | 0.99 [0.95 ; 1.04] | 0.97 [0.92 ; 1.01] |
| **City fragmentation** [Patch density (n/100ha)]♯ | 0.98 [0.92 ; 1.04] | 0.98 [0.92 ; 1.05] | 0.98 [0.92 ; 1.04] | 0.97 [0.92 ; 1.03] | 0.99 [0.93 ; 1.06] |
| **City isolation** [Mean distance to the nearest urban patch within the geographic boundary(m)] | 0.99 [0.96 ; 1.03] | 0.99 [0.96 ; 1.03] | 0.99 [0.96 ; 1.03] | 1.00 [0.96 ; 1.04] | 0.99 [0.95 ; 1.03] |

Different sensitivity analyses are presented. The description of the sample for each sensitivity analysis are as follows:

Full model: Model presented in the main text. Excluding Panama: data sub-set excluding all observations from Panama as the original survey did not distinguish gestational diabetes from Type 2 Diabetes. Excluding pop.dens >3SD: data sub-set excluding observations with population density higher than its 3 standard deviations (SD). Recent surveys: only survey data from 2010 onwards were included in this data sub-set. Including interaction terms between Country and individual educational level: as education could modified the association between the built environment characteristics and our health outcomes, we included in this model the interaction terms for this country and individual education level.

All exposures were scaled based on the mean and standard deviation (SD) and therefore the unit of contrast is the SD. Each model includes all built environment exposures, adjusted for age, sex, education, population educational attainment at sub-city level, percentage of urban area, and country as a fixed effect. BMI: Body mass index: NDVI: Normalized Difference Vegetation Index.

**Supplementary Table 5 | General information of the health surveys used for individual level data, i.e., BMI, obesity and type 2 diabetes, as well as, demographic information (age, sex, and highest educational level completed)**

| Country / Year | Survey | Age Range Sampled | Sampling Strategy | Geographic coverage | Over-sampling | Representation |
|---|---|---|---|---|---|---|
| **Argentina 2013** | Encuesta Nacional de Factores de Riesgo, ENFR (National Risk Factors Survey) | ≥18 years | Multistage [Aglomerado censal; área (groups of radio censales); household; person 18 years or older]<br><br>Stratified [population size; education level of head of household] | *Localidades* with over 5,000 population | None | National, four *localidades* groups based on size, 6 regions, 23 provinces, Ciudad Autonoma de Buenos Aires, and 8 metropolitan areas >500,000 population. |
| **Brasil 2013** | Pesquisa Nacional de Saúde, PNS (National Health Survey) | ≥18 years | Multistage [census tracts or groups of census tracts; households; person 18 years or older]<br><br>Stratified [capital city, metropolitan region, or integrated economic development region, then rest of municipalities; Urban/rural; total household income] | Regions (5) States or federation units (27), state capitals (27) | None | Regions (5) States or federation units (27), state capitals (27), urban and rural, metropolitan areas and development integrated areas |
| **Chile 2010** | Encuesta Nacional de Salud, ENS (National Health Survey) | ≥15 years | Multistage [Comunas; Segments within comunas; household; person 15 years or older]<br><br>Stratified [urban/rural with three groups of population sizes] | National | Adults ≥65, regions distinct to Metropolitan Region, rural areas | National, Regions (15), urban/rural |
| **Colombia 2007** | Encuesta Nacional de Salud, ENS (National Health Survey) | 0 – 69 years | Multistage [Municipalities or combination of municipalities if small; Manzanas; household; person adults 18-69 and all children 17 and under]<br><br>Stratified [region; urbanization of municipal seats; urban/rural municipal population; unsatisfied basic needs] | National | None | Region, department, subregion, urban area of municipal capitals, urban/rural, by poverty level |

| Country / Year | Survey | Age Range Sampled | Sampling Strategy | Geographic coverage | Over-sampling | Representation |
|---|---|---|---|---|---|---|
| **Guatemala 2002** | Encuesta Multinacional de Diabetes Mellitus y Factores de Riesgo, CAMDI (Multinational Survey of Diabetes Mellitus & Risk Factors, Central American Diabetes Initiative) | ≥20 years | Multistage [Segmento censal, groups of dwellings (compacto); all household members 20 years and older] | Villa Nueva Municipio, a part of metropolitan Guatemala City | None | Villa Nueva Municipio |
| **Mexico 2012** | Encuesta Nacional de Salud y Nutricion, ENSANUT (National Survey for Health and Nutrition) | All ages | Multistage [AGEB; Manzana (urban) or pseudo-manzanas withig localidades (rural); Households; 1 person within each of the groups (0-4 years, 5-9 years, 10-19 years, 20 years and older, recent medical service user)] Stratified [socioeconomic status of AGEB at the state level] | National | AGEB with the highest index of poor socioeconomic conditions | National, state, metropolitan areas, urban/rural, high/low SES |
| **Nicaragua 2003** | Encuesta Multinacional de Diabetes mellitus y Factores de Riesgo, CAMDI (Multinational Survey of Diabetes Mellitus & Risk Factors, Central American Diabetes Initiative) | ≥20 years | Multistage [Urban districts divided into 50 strata, groups of households (compacto); all family members living together 20 years and older] | Municipality of Managua | None | Municipality of Managua |
| **Panama 2007** | Encuesta Nacional de Salud y Calidad de Vida ENSCAVI (National Survey of Health and Quality of Life) | ≥18 years | Multistage [Census segments; Dwellings; People ≥18 years] Stratified [Indigenous population in province; Urban/rural] | National | None | National, District |

| Country / Year | Survey | Age Range Sampled | Sampling Strategy | Geographic coverage | Over-sampling | Representation |
|---|---|---|---|---|---|---|
| **Peru 2016** | Encuesta Nacional de Demografía y Salud, ENDES (National Survey of Demographics and Health) | All ages | Multistage [Conglomerado (set of census blocks – urban) or Empadronamiento (set of households – rural); Households; One person within each of the groups (>15 years, females 15-49 years, children <5 years, children <12 years)]<br><br>Stratified [Department; Urban/Rural] | National | None | National, Urban National, Rural National, Natural Region: Lima Metropolitan area, coast/mountain/jungle |
| **El Salvador 2004** | Encuesta Multinacional de Diabetes mellitus y Factores de Riesgo, CAMDI (Multinational Survey of Diabetes Mellitus & Risk Factors, Central American Diabetes Initiative) | ≥20 years | Multistage [Segmento censal, groups of dwellings (compacto); all household members 20 years and older] | Municipio of Santa Tecla | Unknown | Municipio of Santa Tecla |

**Supplementary Table 6 | Description of exposure and covariates variables used**
Variables included in the analysis are listed, as well as their roles, level of measurement, data source, definition and interpretation, and year of data collection.

| Role | Level | Variable | Data Source | Definition and interpretation | Year of data collection |
|---|---|---|---|---|---|
| **Exposure** | **Sub-city** | **Intersection density (n/km²)** | Shapefiles for each unit were provided by the SALURBAL data & methods core. The underlying street network was then obtained from OpenStreetMap. Each intersection (a point where more than 2 streets meet) becomes a node of the network and each street segment connecting two intersections becomes an edge in the network. | Measures the amount of intersections per km² of area. Sub-city units with higher values have a lot of intersections (and thus streets) by unit of area. | 2018 |
| | | **Greenness (median NDVI)** | NDVI is from a MODIS vegetation product, MOD13Q1.006 (https://lpdaac.usgs.gov/products/mod13q1v006/), which computed vegetation indices from atmospherically corrected bidirectional surface reflectance that had been masked for water, clouds, heavy aerosols, and cloud shadows. The temporal and spatial resolution of this NDVI product is 16 days and 250 m, respectively. The images are taken twice daily and aggregated every 16 days, by taking the highest NDVI value per image pixel. For the annual value, the 16-days NDVI value, was combined into a single image, by taking the maximum value per image pixel from all available 16-day observations. The NDVI data has a global coverage from year 2000 to the present. For the purpose of the analyses, we used the zonal median of annual maximum NDVI in urbanized areas for the district unit (sub-city level), as a summary measure, where, for each image pixel, we calculate the maximum from all observations in a year. Then, we took the area-level median of these maximums as the NDVI for a given geography. Seasonal greenness is | Zonal median of annual maximum NDVI in urbanized area (excluding water and vegetation). NDVI is an indicator of vegetation 'greenness'. NDVI ranges from -1 to 1, with higher values indicating more vegetated areas that are also greener. | We selected the data to match the year of the survey where the outcome was assessed (ie: if survey is in 2010, then, we use NDVI from 2010). |

| | | | | | |
|---|---|---|---|---|---|
| | | | accounted for by selecting the highest NDVI value of the year. Additionally, we selected the data to match the year of the survey where the outcome was assessed (i.e.: if survey is in 2010, then, we use NDVI from 2010). | | |
| | | Population density (n/km$^2$) | Calculated as population divided by build-up area. Population data was calculated as the sum of Global Urban Footprint (GUF) and Facebook's Population Density Maps both in 30m x 30m grid cells). Built-up area for sub-city units were calculated by adding the area of all 30m grid cells within the sub-city unit from both products. | Population per km2 in all the urban patches inside the geographic boundary. Population is adjusted for United Nations' country-level population projections. A higher value indicates a denser urban development pattern. | 2010 |
| | City | Fragmentation [Patch density (n/100ha)] | The urban footprint data (in 30m x 30m grid cells) comes from the "hole-filled" Global Urban Footprint (GUF). This variable is calculated based on 30m x 30m grid cells using the FRAGSTATS 4.2 software package, as follows: total number of urban patches of the city divided by the area of 30m x 30m grid cell within the city. | Number of urban patches divided by the total area of the geographic unit (in 100 hectares). Higher patch density reflects fragmentation of urban expansion, when the variable percentage of urban area is included as covariate. | 2012 |
| | | Isolation [Area-weighted Mean Nearest Neighbor Distance (m)] | The urban footprint data (in 30m x 30m grid cells) comes from the "hole-filled" Global Urban Footprint (GUF). This variable is calculated based on 30m x 30m grid cells using the FRAGSTATS 4.2 software package, as follows: the sum of the nearest neighbor distance of urban parch in a city divided by the number of urban patches of the city. | Mean distance (in meters) to the nearest urban patch within the geographic boundary. This value is weighted by the area of each patch. Indicator of how spread out are urban settlements within the geographic. A higher value indicates higher level of isolation. | 2012 |
| Covariates | Individual | Age | Health survey | Self-reported age assessed by respondent age in years or calculated using respondent birthday. For Multi-level regression/logistic models, age in units of 10. | Argentina (2013) Brazil (2013) Chile (2010) Colombia (2007) Guatemala |
| | | Sex | Health survey | A survey participant is defined as male if they have a response of "varón," | |

| | | | | |
|---|---|---|---|---|
| | | | "masculino," or "hombre." A survey participant is defined as female if they have a response of "mujer" or "femenino." | (2002) Mexico (2012) Nicaragua (2003) Panama (2007) Peru (2016) El Salvador (2004) |
| Sub-city | **Highest educational level completed** | Health survey | Four categories are defined: less than primary, primary, secondary and university or higher. | |
| | **Population educational attainment (Z-score)** | Health survey | A summary score of sub-city education (summed Z score for the percentage of population age 25 or above that has completed high school level or above, and the percentage of population age 25 or above that completed university level or above) as a marker of socioeconomic context. | |
| City | **Percentage of urban area (%)** | The urban footprint data (in 30m x 30m grid cells) comes from the "hole-filled" Global Urban Footprint (GUF). This variable is calculated based on 30m x 30m grid cells using the FRAGSTATS 4.2 software package, as follows: total urban area (built up area) divided by the total area of the city, and multiplied by 100. | Ranges from 0 to 100. It is used as an adjustment variable for fragmentation in order to account for some surrounding non-built up areas sub-city units, which could introduce measurement error due to the heterogeneity in urbanized areas. Large value indicates a higher level of built-up areas within the geographic unit. | 2012 |

NDVI: Normalized Difference Vegetation Index

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**Supplementary Table 7 | Correlation matrix among variables of interest**
Correlations between exposure variables using Pearson. The highest correlation was seen between city percentage of urban area with city fragmentation (r= 0.7); however, the former variable is used for adjustment in order to account for some surrounding non-built up areas sub-city units used in the fragmentation calculation, which could introduce measurement errors due to the heterogeneity in urbanized areas

| | Sub-city Intersection density | Sub-city Greenness | Sub-city Population Density in built up areas | City Fragmentation | City Isolation | Sub-city Population educational attainment | City Percentage of urban area |
|---|---|---|---|---|---|---|---|
| **Sub-city Greenness** | -0.4563 | | | | | | |
| **Sub-city Population Density in built up areas** | 0.4897 | -0.1288 | | | | | |
| **City Fragmentation** | 0.4134 | 0.0990 | 0.2765 | | | | |
| **City Isolation** | -0.3396 | 0.0260 | -0.2107 | -0.4354 | | | |
| **Sub-city Population educational attainment** | 0.3552 | -0.2217 | 0.1512 | 0.0780 | -0.2092 | | |
| **City Percentage urban area** | 0.6164 | -0.1941 | 0.4777 | 0.7068 | -0.4217 | 0.1362 | |
| **Age** | 0.0415 | -0.0373 | -0.0365 | 0.0527 | -0.0127 | -0.0041 | 0.0482 |