

Supplementary Materials: Table S1: Elements and example measures for building environmental justice indicators

The following table lists measures within the four EJ domains described in Figure 3; *environment*, *disadvantage* (using demographic measures), *health/epidemiology* and *procedures*) that have been used in the EJ literature to create indicators. The list includes both objective and subjective measures. They can be combined strategically to create indicators capable of detecting environmental injustice. Some combinations will be informed by known or suspected local issues. Others will be created to monitor and rapidly detect emerging issues. In all cases, creation of indicators should comply with the 'Principles for building and using indicators and indicator suites' in the paper.

Notes:

Some additional measures that are commonly used in environmental and health research are also included, however these references may not focus specifically on EJ issues. References that do not focus explicitly on an EJ issue are denoted with an asterisk *.

While this list covers many useful measures and provides ideas for the ways that measures that can be combined, it is not an exhaustive list.

Environment		
Harmful Environment		
Measures	Measure definitions	Reference
Polluting sites		
Waste disposal/landfills	Forty-one georeferenced sites of landfills regulated under the EU's IPPC directive (from Scotland EPA) and a calculated exposure plume based on landfill emissions and prevailing winds	Richardson, <i>et al.</i> [1]
Licensed sites	1.0 km radial buffer around EPA-licensed polluting sites	Gunn, <i>et al.</i> [2]
	Plume-based buffers (or footprints): polygon, centroid and basic plume Circular buffers: polygon, centroid and basic radial	Chakraborty and Armstrong [3]
	Number of RCRA facilities	Morrison, <i>et al.</i> [4], Spina [5], Zhao, <i>et al.</i> [6]
Fracking sites	1.5 km buffer around each fracking well	Zwickl [7]
Air pollution		
Ambient air pollution	Respiratory hazard and neurological hazard values, derived from US EPA's NATA data modelled with reference to 187 air toxics. It applies census data,	Kweon, <i>et al.</i> [8]

	human activity patterns, ambient air quality levels, climate data, and indoor/outdoor concentration relationships to estimate an expected range of apparent inhalation exposure concentrations at the level of census tract.	
PM _{2.5}	World Health Organization standard: 10 µg/m ³ annual mean 25 µg/m ³ 24-hour mean	WHO [9] *
	Prescribed PM _{2.5} exceedance day: days on which (prescribed fire contributed to) PM _{2.5} concentrations exceeded 35 µg/m ³ (24-hour average NAAQ for PM _{2.5}) for at least one of the 4 km CMAQ grid cells.	Gaither, <i>et al.</i> [10]
	Models the outcomes of achieving 11.0 µg/m ³ , 10.6 µg/m ³ , 10.0 µg/m ³ (the WHO standard) and 4.9 µg/m ³	Morelli, <i>et al.</i> [11]
	Real time PM _{2.5} concentrations at 42 monitoring sites (Pittsburgh, USA) associated with EJ and non-EJ communities. Results ranged from 0 µg/m ³ to 110 µg/m ³	Tanzer, <i>et al.</i> [12]
	24h average PM _{2.5} concentrations for 2003 from 166 U.S EPA federal reference monitors	Hu, <i>et al.</i> [13]
	Annual averages of 24-h ambient PM _{2.5} obtained for each year between 2002 & 2006 for 1,215 PM _{2.5} monitoring locations, tract level <6.1 µg/m ³ 6.1 - 8.0 µg/m ³ 8.1 - 10.0 µg/m ³ 10.1 - 12.0 µg/m ³ 12.1 - 14.0 µg/m ³ and >14.0	Bravo, <i>et al.</i> [14]
	Annual PM _{2.5} from 36 monitoring sites interpolated to census block group level averages using land use regression. PM _{2.5} ranged from 6 to 16 µg/m ³	Zhao, Gladson and Cromar [6]
PM ₁₀	World Health Organisation standard: 20 µg/m ³ annual mean 50 µg/m ³ 24-hour mean	WHO [9] *
	Categorised ambient air pollution in 279 IGZs: 10.6 - 12.2 µg/m ³ 12.2 - 13.2 µg/m ³	Morrison, Fordyce and Scott [4]

	13.2 - 14.3 µg/m ³ 14.3 - 15.8 µg/m ³ 15.8 - 18.9 µg/m ³	
	24-hour averages of city-wide levels calculated by averaging data across all monitoring stations from CETESB, the environmental agency in São Paulo	Gouveia, <i>et al.</i> [15]
NO ₂	40 µg/m ³ (annual mean) 200 µg/m ³ (1-hour mean)	WHO [9] *
	Categorised ambient air pollution in 279 IGZs: 5.9 - 14.3 µg/m ³ 14.3 - 19.4 µg/m ³ 19.4 - 24.0 µg/m ³ 24.0 - 30.7 µg/m ³ and 30.7 - 43.2 µg/m ³	Morrison, Fordyce and Scott [4]
	Modelled and weighted analyses of PM _{2.5} for each of 34,000 (approx.) Lower-layer Super Output Areas (LSOAs) (≈700 households). Results ranged from 0 µg/m ³ to 25 µg/m ³	Barnes, <i>et al.</i> [16]
O ₃	World Health Organisation standard: 100 µg/m ³ (8-hour mean)	WHO [9] *
	Annual averages of 8h maximum concentrations for 2002 -2006, for 1,043 O ₃ monitoring locations at census tract level: < 34.1 ppb 34.1 - 42.0 ppb 42.1 - 46.0 ppb 46.1 - 50.0 ppb 50.1 - 54.0 ppb and > 54.0	Bravo, Anthopolos, Bell and Miranda [14]
SO ₂	World Health Organisation standard: 20 µg/m ³ (24-hour mean) 500 µg/m ³ (10-minute mean)	WHO [9] *
	24-hour averages city-wide levels calculated by averaging data across all monitoring stations from CETESB, the environmental agency in São Paulo	Gouveia, Bremner and Novaes [15]

NMVOCs	Average concentration in bulk air samples (pptv), in this case, samples (n=187) pressurized into individual 2L evacuated electro-polished stainless-steel canisters to 20 psi using a metal bellows pump.	Guo, <i>et al.</i> [17] *
	A Surrogate method: active photoionization detector (PID) for NMVOCs with ionization potentials below 10.6 eV estimates NMVOCs in terms of ppbv	Zielinska, <i>et al.</i> [18] *
NO _x	Modelled exposure using an emission database (EDB) containing information on emissions from 24,000 sources. Categories for nitrous oxides (NO _x) were a) 2.5-8.9 Hg/m ³ (mean, 6.8 µg/m ³), the reference category; b) 9.0-14.1 pg/m ³ (mean, 11.4 µg/m ³); c) 14.2-22.6 µg/m ³ (mean, 18.2 pg/m ³); and d) > 22.7 µg/m ³ (mean, 29.6 µg/m ³).	Malmqvist, <i>et al.</i> [19]
	Hourly mean concentrations of NO ₂	Turner, <i>et al.</i> [20]
Pollen count	Grains per cubic metre using a seven-day Hirst-type volumetric pollen and spore trap located (e.g. on rooftops) between 2 and 14 m above the ground	Haberle, <i>et al.</i> [21] *
	Grains per cubic metre using a seven-day Intermittent Cycling Rotorod sampler	Haberle, Bowman, Newnham, Johnston, Beggs, Buters, Campbell, Erbas, Godwin and Green [21] *
Toxic releases and hazardous air pollution	E.g. Toxic releases in tons per year, obtained from <i>Pollutant Release and Transfer Register (PRTR) Information</i> system (South Korea)	Yoon, <i>et al.</i> [22]
	Estimated plume extent of TRI facilities, estimated using the <i>ALOHA</i> model	Chakraborty and Armstrong [3]
	Industry estimates of 90 toxic substances, each with a toxicity rating, provided to the National Pollution Inventory (Australia)	Chakraborty and Green [23]
	26-years of US TRI data = 1,483,463 individual instances of an emitter releasing toxic substances into the air.	Luo and Hendryx [24], Luo, <i>et al.</i> [25]
Plume measurement	Plume-based buffers (or footprints): polygon, centroid and basic plume Circular buffers: polygon, centroid and basic radial	Chakraborty and Armstrong [3]
Road vehicle density	The number of vehicles per unit length of a road. Several methods are reviewed in this paper, including induction loops, GPS trackers and cloud computing methods	Darwish and Bakar [26] *

	Self-reported: (1) <i>How often do trucks pass through your residential street on weekdays?</i> (Never/Seldom/Frequently/Constantly); and (2) <i>During the day, is the traffic noise in your residential street so intense that you have to close the windows in order not to be disturbed?</i> (Yes, constantly/Yes, frequently/Yes, seldom/No, never).	Duhme, <i>et al.</i> [27]
Road network density	Miles per square mile	Zwickl [7]
Distance to major road	Sites (childcare in this case) within 60 metres of a major road	Walter, <i>et al.</i> [28]
Number of days when pollution concentration exceeds NEPM guidelines	Number of days when pollution concentration exceeds NEPM guidelines	Wiseman, <i>et al.</i> [29]
Proportion of households using solid fuel as a source for home heating	U.S. Census <i>Public Use Microdata Sample</i> (PUMS) for the <i>American Community Survey</i> (ACS) question 13, 'Which FUEL is used MOST for heating this house, apartment, or mobile home?' Answer 5 or 6	Rogalsky, <i>et al.</i> [30]
Cooking fuels	Energy source for cooking using the ISAAC <i>International Study of Asthma and Allergies in Childhood</i> questionnaire	Duhme, Weiland, Keil, Kraemer, Schmid, Stender and Chambless [27]
Bushfires and planned burns	Permits for planned burns – obtained from State forest services: Georgia Forestry Commission (GFC) and the Florida Forest Service	Gaither, Afrin, Garcia-Menendez, Odman, Huang, Goodrick and Ricardo da Silva [10]
	All 2003 fire detections in study area of SE USA (800 x 1200 km ²) by NASA	Hu, Waller, Lyapustin, Wang, Al-Hamdan, Crosson, Estes Jr, Estes, Quattrochi and Puttaswamy [13] *
Locations of schools (measuring those exposed)	State-wide data for school location geo-referenced and with parcels added (California)	CEHTP [31]
Number of schools and childcare centres in proximity to major roads	Straight line distance between each school and the nearest <i>limited access highway</i> .	Kweon, Mohai, Lee and Sametshaw [8]
	Proximity of childcare centres to a major road	Walter, Schneider-Futschik and Irving [28]

Number of schools / childcare centres in proximity to polluting facilities	Straight line distance measured between each school and the nearest Toxic Release Inventory (TRI) industrial facility.	Kweon, Mohai, Lee and Sametshaw [8]
Pollution reports	Pollution reports where emissions exceeded a specific threshold of the European Pollutant Release and Transfer Register (E-PRTR) (Germany)	Rüttenauer [32]
Waterway pollution		
Ocean waterways	Weekly summer recreational (i.e. enterococci) water quality assessment at 36 Port Phillip Bay beaches: Good - Suitable for swimming; Fair - May not be suitable for swimming; Poor - Not Suitable for swimming; N/A - Forecast data unavailable	EPAV [33] *
Polluted groundwater	Nitrite levels in community water systems; mg/L NO ₃ -N	Schaider, <i>et al.</i> [34]
Water quality	Turbidity (Secchi depth), lead, Chlorophyll-a and denitrification levels compared to site-specific SEPP (or possible new, future) objectives	CES [35] * See also EPA data
Suitability for swimming	Weekly summer recreational (i.e. enterococci) water quality assessment at 36 Port Phillip Bay beaches: Good - Suitable for swimming; Fair - May not be suitable for swimming; Poor - Not Suitable for swimming; N/A - Forecast data unavailable	EPAV [33] *
Stormwater drains	Map of open, closed stormwater drains and stormwater canals	Boyd, <i>et al.</i> [36] *
Floods	<p>Areas identified by the (UK) Environment Agency:</p> <ul style="list-style-type: none"> • Areas of little or no risk (Zone 1: less than a 1-in-a-1,000-year chance of any flooding), • Low to medium risk (Zone 2: more than a 1-in-a-1,000-year chance of river or sea flooding), and • High risk areas (Zone 3: those with a more than a 1-in-a-100-year chance of river flooding and/or more than a 1-in-a-200-year chance of sea flooding). <p>Flood vector data was rasterised to UK census output areas (OAs)</p>	Fielding [37]
	Cyclone Harvey Inundation Footprint, from US Federal Emergency Management Agency	Chakraborty, <i>et al.</i> [38]
Odour pollution		
Odour complaints	Three years of complaints to State environment protection authority; the EPAV. 4517 geo-referenced complaints in Victoria	Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]
Soil pollution		

Soil contamination	UK Contaminated Land Exposure Assessment (CLEA) standards	Morrison, Fordyce and Scott [4]
	A derived Soil Metal Index. See the reference for its derivation	Morrison, Fordyce and Scott [4]
Noise pollution		
Noise reports	Self-reported: <i>During the day, is the traffic noise in your residential street so intense that you have to close the windows in order not to be disturbed?</i> (Yes; constantly/Yes; frequently/Yes; seldom/No; never).	Duhme, Weiland, Keil, Kraemer, Schmid, Stender and Chambless [27]
Ambient noise	Modelled noise data using EASYMAP which integrates (1) the environmental noise prediction software MITHRA (Scientific and Technical Centre for Building, Grenoble, France), (2) the geographical information system ArcGIS (ESRI, Redlands, California, USA) and (3) the environmental management information system Drag & Fly (SIRIATECH, Roubaix, France) to generate noise calculations and noise mapping in two or three dimension	Havard, <i>et al.</i> [39]
	Aircraft traffic increase (aircraft movements, total passengers and passengers per movement) and number of households in geo-referenced noise contour area as a proxy for exposure to noise	Sobotta, <i>et al.</i> [40]
	Road traffic, above-ground subway, tram, air and railway traffic noise data between 10pm and 6am for every 10m x 10m grid derived from strategic noise maps generated according to the Berlin Noise Mapping Decree, ranging from 7db(A) to 93db(A)	Lakes, <i>et al.</i> [41]
Pesticide use		
Pesticide use	State-wide application of 201 pesticides (inc. type & persistence), in 'pounds per year' in 15 counties, as reported by pesticide users, under the California Pesticide Use Reporting (PUR) program, as required by the California Dept. of Pesticide Regulation	CEHTP [31], Richardson, <i>et al.</i> [42], Tolhurst, <i>et al.</i> [43]
Stockpiling		
Stockpiling of hazardous materials	Usually defined as sites (with or without processing capability) into which waste flows, or has flowed in the past, but does not emerge, due to intractable waste problems attributable to infrastructure, technology, regulatory or market-economic shortcomings. Also called legacy wastes, they remain in volumes that	Blue Environment [44] *

	dwarf annual waste generation figures. Recent history shows that processing facilities can become stockpile sites.	
	*VAGO, although noting that stockpiles have increased in Victoria, also note that Currently reported state waste data ... excludes information on the nature and extent of stockpiles -permitted or otherwise - across the state (i.e. data is not collected)	VAGO [45] *
Waste		
Waste treatment	* see licensed facilities	

Environment		
Liveable Environment		
Liveability		
Various measures: EPAV summaries for LGAs	EPAV Data Analytic Product: For consideration as a set of measures:	(EPAV dataset)
RMIT liveability reports:	RMIT liveability reports: For consideration as a set of measures.	Arundel, <i>et al.</i> [46]*
Various measures are available relating to: <ul style="list-style-type: none"> • Walkability • Public Open Space • Public Transport • Housing Affordability • Employment • Social infrastructure • Food • Alcohol 	Please see the original report for specific definitions. Note: some of these measures are restated in the list below because of their importance.	
Climate		
Urban heat island effect	Average maximum daily summer temperature >35°C in urban areas	Navi, <i>et al.</i> [47]

	Heat wave: Two or more consecutive days with a daily maximum temperature at or above 37°C	Turner, Connell and Tong [20]
Rainfall	24-hour 0901 – 0900 daily rainfall in mm, collected using a standard 203 mm rain gauge	BOM [48]*
Access to green space		
Public Open Space access	Having access to a park of at least 1.5 ha within 400 m	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
	Park availability: number of parks whose boundaries intersected the boundary of each census tract, total amount of park space in each census tract, park features using CPAT	Vaughan, <i>et al.</i> [49]*
	Greenness: Normalized Difference Vegetation Index (NDVI) from Landsat. NDVI provides an indication of the presence and condition of green vegetation with values typically ranging from -1 to +1. Values of -1 generally represent water, while values close to zero (-0.1 to 0.1) correspond to bare surfaces such as rock, sand, rooftops and roads. Higher values (0.2 to 0.4) represent grassland or bush land and values of +1 represent healthy green vegetation.	Pereira, <i>et al.</i> [50]*
	Greenness: High resolution SPOT satellite imagery (5 × 5 m grid), using the NDVI	Lakes, Brückner and Krämer [41]*
Access to Public Transport		
PT access	Access within 400m of a public transport stop with a 30 minute or wait time or less	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
	Network distance to the nearest bus stop with Four categories: 0–200 m, 200–500 m, 600– 900 m and 10 km or more	Wilson, <i>et al.</i> [51]
Commuting	Journey to work by mode	(ABS Census of Population and Housing)*
Walkability		

Walkability measure	Composite measure combining access to destinations, population density and street connectivity	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
Access to destinations	Degree to which there is a mix of land use within a 1 km radius, divided into quintiles – where quintile 1 represents the least dense	Wilson, Giles-Corti and Turrell [51] *
	Location of childcare centres/nursing homes	Walter, Schneider-Futschik and Irving [28], Claudio, <i>et al.</i> [52]*
	Access to social infrastructure	Davern, <i>et al.</i> [53]*
Population density	Dwelling density: dwellings per hectare	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
Street/road connectivity	Number of 3 or 4-way streets within a 1.6km radius of a residential home	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
	Count of four-way or more intersections within a 1 km radius, divided into five quintiles; quintile 5 represents the most connected	Wilson, Giles-Corti and Turrell [51] *
Housing		
Affordable housing	Households in the bottom 40% of income that spend 30% of their total income on housing	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
Employment		
Employment	Percentage of employed people living in an SA2 and working in a broader SA3	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
Food Environment		
Supermarket access	Percentage of residences within 1 km of a supermarket	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*

Health food ratio	Percentage of health food outlets as a proportion of all food outlets	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*
Alcohol Environment		
Alcohol access	Percentage of residences without access to off-license outlets (bottle-shops, take-away alcohol)	Arundel, Lowe, Hooper, Roberts, Rozek, Higgs and Giles-Corti [46]*

Health / Epidemiology		
Measures	Measure definitions	Reference
Respiratory illness		
Self-reported asthma	270,000 inhabitants of Munster, Germany using the ISAAC <i>International Study of Asthma and Allergies in Childhood</i> questionnaire: '(1) Have you had wheezing or whistling in the chest in the last 12 months? (Yes/No); (2) A positive response to at least one of the first three video scenes regarding wheezing during the last year; and (3) In the past 12 months, have you had a problem with sneezing, or a runny, or a blocked nose when you did not have a cold or the flu?' (Yes/No).	Duhme, Weiland, Keil, Kraemer, Schmid, Stender and Chambless [27]
Asthma hospitalisations	Hospitalization rates per 10,000 residents using hospital discharge data for all New York state zip codes	Claudio, Tulton, Doucette and Landrigan [52]*
Asthma cases	(somewhat ambiguous) geo-referenced ambulance attendance data	Turner, Connell and Tong [20]
COPD	Patients diagnose with COPD coded as R91 (chronicbronchitis) or R95 (pulmonary emphysema/COPD) according to the International Classification of Primary Care.	Smit, <i>et al.</i> [54]
Mortality		
All-cause non-accidental mortality	Daily mortality of people of a defined area coded using the International Classification of Diseases Revision 10 (IDC-10) as non-accidental mortality (A00 – R99)	Navi, Pisaniello, Hansen and Nitschke [47]
	Re IDC-11, may be defined as the daily mortality of people of a defined area coded as all of 1A00 – MH2Y	See WHO [55]

Non-communicable diseases		
Overweight and obesity	Self-reported height and weight obtained from the Health and Wellbeing Survey to calculate BMI. Participants aged 18 years and over were classified as <i>obese</i> if their BMI (weight (kg)/height (meters) ²) exceeded 30, and as <i>overweight-or-obese</i> if the BMI was above 25.	Pereira, Christian, Foster, Boruff, Bull, Knuiman and Giles-Corti [50]
	Self-reported height and weight participants “how tall are you without shoes on?” and were able to respond in either centimetres or feet and inches; and “how much do you weigh without your clothes or shoes on?”. BMI was calculated as weight in kilograms, divided by height in meters squared.	Rachele, <i>et al.</i> [56]*
Diabetes Type 2	Self-reported: “Have you ever been told by a doctor or nurse that you have any of the long-term health conditions listed below?” Type 2 diabetes and heart/coronary disease were two of eight listed conditions.	Rachele, <i>et al.</i> [57]*
Lung cancer rates	Age-adjusted lung cancer incidence between 1992 and 2007 at county level from 13 counties via the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute (NCI)	Luo and Hendryx [24], Luo, Hendryx and Ducatman [25]
Self-reported health	Survey to 11,307 households: “In general, would you say your health is...?” Response options were: excellent, very good, good, fair, and poor. Census collection district level.	Badland, <i>et al.</i> [58]*
	SF-36: 36-item short-form health survey.	c.f. Richardson, <i>et al.</i> [59], Ware, <i>et al.</i> [60]
Self-reported mental health	The Index includes subjective ratings of satisfaction across seven domains of their personal lives: standard of living, health, achievements in life, community connection, personal relationships, safety, and future security. Has been used in Australia since 2001 with a large sample of established normative data results.	Cummins, <i>et al.</i> [61], Davern [62] *
Low birth weight (full term)	Babies who are born weighing less than 2,500 grams	WHO [63]
	Birthweight of 196,978 babies born in Sao Paulo in 1997 from the Birth Information System (SINASC) of the Ministry of Health (Brazil)	Gouveia, Bremner and Novaes [15]
Behavioural Epidemiology		
Physical activity	Three questions from the Active Australia Survey to categorise participants’ walking, moderate activity, and vigorous activity. E.g. walking, was defined as “continuous walking 10 minutes in the previous week for recreation, exercise, or	Turrell, <i>et al.</i> [64]*

	to get to or from places'' and categorised as none/negligible (<30 minutes), very low (>30 to <90 minutes), low (>90 to <150 minutes), moderate (>150 to <300 minutes) and high (>300 minutes)	
	Modified question from the Australian National Heart Foundation Risk Factor Prevalence Study (National Heart Foundation of Australia, 1989). Participants were asked, "Which one of the following best describes your cigarette smoking" and the following response categories were provided: I smoke daily, I smoke occasionally, I don't smoke now but used to, and I have never smoked. For analysis, smoking status was re-coded into [1] smoker (I smoke daily), and [0] non-smoker (I smoke occasionally, I don't smoke now but used to, and I have never smoked). Census collection district level	Rachele, <i>et al.</i> [65]*
Smoking status	Active smoking, passive smoking, no smoking	Duhme, Weiland, Keil, Kraemer, Schmid, Stender and Chambless [27]*

Disadvantage (using demographics)		
Measures	Definitions	Reference
Age	year age categories:<1, 1–4, 5–9, 10–14, 15–19, 20–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, 85+	Barnes, Chatterton and Longhurst [16]
Vulnerable age	People less than 15 or older than 65	Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]
	Percentage less than 18 and more than 65	Spina [5]
	Less than 17 years	Claudio, Tulton, Doucette and Landrigan [52]*
	Percentage of people over 65	Navi, Pisaniello, Hansen and Nitschke [47]
	Poor children: the share of children under 18 years old residing in households which	Tolhurst, Goodhue, DeMars and Zhang [43]

	received Supplemental Security Income (SSI), cash public assistance income, or Food Stamps/SNAP in the past 12 months (US Census <i>American Community Survey</i> data) at (US) block level	
Gender	Percentage male or female	Spina [5], Luo, Hendryx and Ducatman [25]. Also Badland, Turrell and Giles-Corti [58], Turrell, Haynes, Burton, Giles-Corti, Oldenburg, Wilson, Giskes and Brown [64], Rachele, Wood, Nathan, Giskes and Turrell [65], Kamruzzaman, <i>et al.</i> [66] *
SES status	Index of Relative Socio-economic Disadvantage (IRSD)	ABS [67] cited in for example Chakraborty and Green [23],[68] and Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]
	Percentage of low-income families	Navi, Pisaniello, Hansen and Nitschke [47]
Language proficiency	25% or more of the residents are not fluent in the English language	Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]
Ethnicity	Proportion of SA1 respondents self-reporting as Indigenous in the Australian ABS Census of Population and Housing	Chakraborty and Green [23],[68]
	Percentage of the population belonging to a minority group (a 'deprivation' proxy)	Tanzer, Malings, Hauryliuk, Subramanian and Presto [12], Greife, <i>et al.</i> [69]
	Non-Hispanic white, Non-Hispanic Black, Hispanic and other. Plus 'Racial isolation'; measuring non-Hispanic black groups' exposure to itself compared to other groups	Bravo, Anthopolos, Bell and Miranda [14]

	% Hispanic residents, % non-Hispanic Black residents in area covered by community water system	Schaider, Swetschinski, Campbell and Rudel [34]
	Census tract percentages of White, non-white and Hispanic white residents. Data from the American Community Survey; ACS	Vaughan, Kaczynski, Wilhelm Stanis, Besenyi, Bergstrom and Heinrich [49]
	Percentage Hispanic (US Census <i>American Community Survey</i> data) at block level	Tolhurst, Goodhue, DeMars and Zhang [43]
	Percentage Black or Hispanic by county	Spina [5]
Education	No high school, high school, college	Bravo, Anthopolos, Bell and Miranda [14], Luo, Hendryx and Ducatman [25]
	Up to year 12 Diploma/certificate Graduate and over	Kamruzzaman, Shatu, Hine and Turrell [66]*
	Self-reported via survey into 1 of 4 categories: (1) bachelor degree or higher (including postgraduate diploma, master's degree, or doctorate), (2) diploma (associate or undergraduate), (3) vocational (trade or business certificate or apprenticeship), and (4) no postschool qualifications.	Rachele, Giles-Corti and Turrell [57]*
School performance	Percentage of students in a school who did not meet the Michigan Educational Assessment Program score standard	Kweon, Mohai, Lee and Sametshaw [8]
School characteristic	Percent of free lunch as a proxy for school socio-economic status	Kweon, Mohai, Lee and Sametshaw [8]
Urbanicity	Categorization of tracts into one of four categories based on commuting flows: metropolitan; micropolitan; small town; and rural.	Bravo, Anthopolos, Bell and Miranda [14]
Income	Percentage of the population living below poverty line (deprivation)	Tanzer, Malings, Hauryliuk, Subramanian and Presto [12]
	Percentage of households living in poverty (deprivation) based on the 'Breadline Britain Index'	Barnes, Chatterton and Longhurst [16]
	Schools where X % of students are eligible for free and reduced-cost meals	Collins, <i>et al.</i> [70]
	Vulnerable income: the percentage of household incomes in the lowest 3 deciles for Victoria corresponding to between \$A400 (\$A20,800 annually) and \$A799 per week (\$A41,599 annually).	Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]

	Not in poverty, in poverty, using US American Community Survey (ACS) census data defined levels	Bravo, Anthopolos, Bell and Miranda [14], Luo, Hendryx and Ducatman [25], Schaidler, Swetschinski, Campbell and Rudel [34], Greife, Stretesky, Shelley and Pogrebin [69]
	Block groups (US) with annual median household levels below US\$54,357 (the county average) as measured by the 2012 to 2016 American Community Survey (ACS)	Zhao, Gladson and Cromar [6]
	Self-estimate of total pre-tax annual household income using a single question comprising six categories: (1) AU \$130,000; (2) AU \$129,999 - \$72,800; (3) AU \$72,799 - \$52,000, (4) AU \$51,999 - \$26,000, (5) AU \$25,999 and "Don't know" / "Don't want to answer this"	Rachele, Giles-Corti and Turrell [57]*
	Household income in dollars	Claudio, Tulton, Doucette and Landrigan [52]
Employment	Percentage >16yo who are employed, unemployed, using US census data	Bravo, Anthopolos, Bell and Miranda [14]
	Part time or Full-time	Kamruzzaman, Shatu, Hine and Turrell [66]*
	Proportion unemployed (US county level)	Luo, Hendryx and Ducatman [25]
Job accessibility	Mobility index defining the number of jobs available within a set commuting time for census block level	Zhao, Gladson and Cromar [6]
Car ownership	Proportion of households with availability of 0, 1, 2, 3, and 3+ cars/vans.	Barnes, Chatterton and Longhurst [16]
Marital status / isolation	Living alone, no children Single parent with ≥ 1 children Single and living with friends/relatives Couple living with no children Couple living with 1+ children Other	Kamruzzaman, Shatu, Hine and Turrell [66]*

	Numbers of people living alone, one-parent families with dependent children, and couples with no dependent children	Navi, Pisaniello, Hansen and Nitschke [47]
Composite measures	Australian SEIFA IRSD, IER and IEO for 8781 Statistical Area Level 1 (SA1)	Gunn, Greenham, Davern, Mavoa, Taylor and Bannister [2]
	Australian SEIFA IRSD for 200 Census collection districts	Rachele, Giles-Corti and Turrell [57]*
	IRSD for 200 ABS census collection districts	Turrell, Haynes, Burton, Giles-Corti, Oldenburg, Wilson, Giskes and Brown [64]*
	Carstairs Score at Continuous Areas Through Time (CATT) level	Richardson, Shortt and Mitchell [1]
	Scottish index of Multiple Deprivation	Richardson, Shortt and Mitchell [1]
	Vulnerability to climate change: derived from 39 different variables – see reference	Wilson, <i>et al.</i> [71]
	Social disorganization index	Spina [5]
	Social Development Index, the <i>Berlin Senate Department of Urban Development</i> , which contains 12 social status and social development figures assessed at block-level, resulting in: high-; medium-; low-; and very-low-social development.	Lakes, Brückner and Krämer [41]

Organisational Procedures

Measures	Measure definition	Reference
Inspections		
	State patterns of inspections of the Resource Conservation and Recovery Act (RCRA) nationwide from 2002 to 2011 from the US EPA's Integrated Database for Enforcement Analysis (factored against county-years' minority and income)	Spina [5], Spina, <i>et al.</i> [72]
Infringements		
	Criminal prosecutions (conviction or guilty pleas) in Ireland from 2004 to 2014 from I-EPA Prosecutions website, 12 categories of fine amounts	Lynch, <i>et al.</i> [73]

	Criminal prosecutions of environmental corporate crimes that occurred in the United States between 2005 and 2010 (n=245) via a FOI Act request from the (US) EPA	Greife, Stretesky, Shelley and Pogrebin [69]
Abatement		
Noise	Spatial distribution of noise barriers	Potvin, <i>et al.</i> [74], Potvin [75], Carrier, <i>et al.</i> [76]
Government investment		
	Funding for, and selection of sites for urban regeneration	Ruá, <i>et al.</i> [77]*
	Government investment in community engagement	Bond [78]*

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