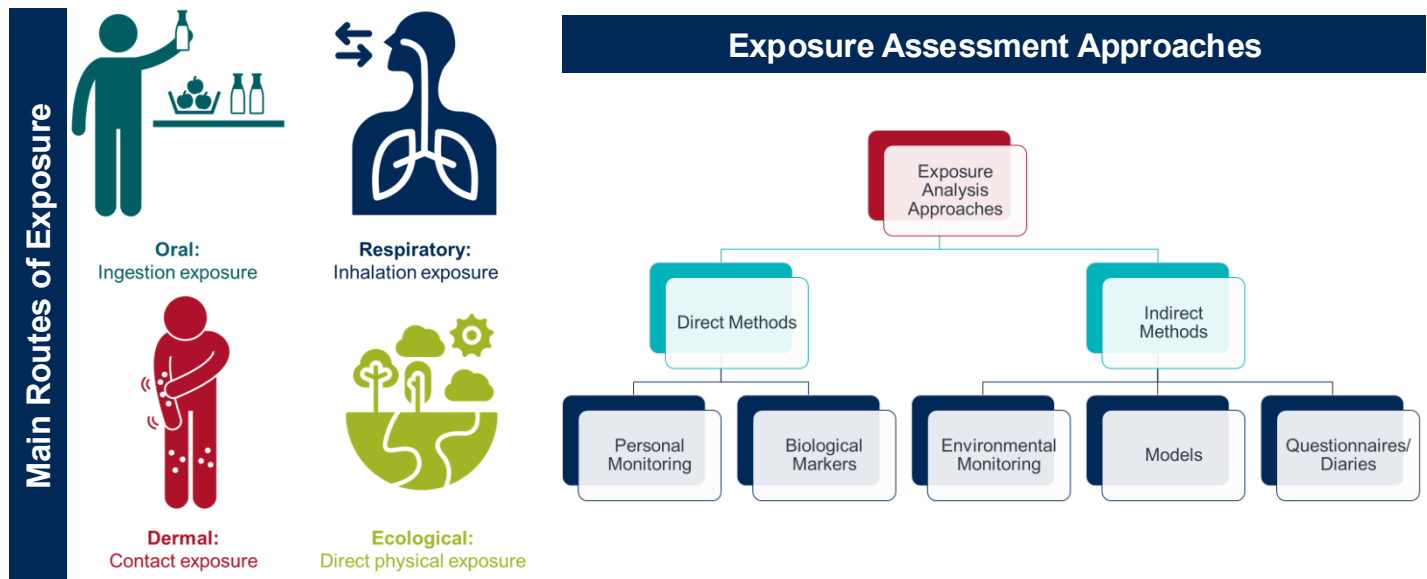


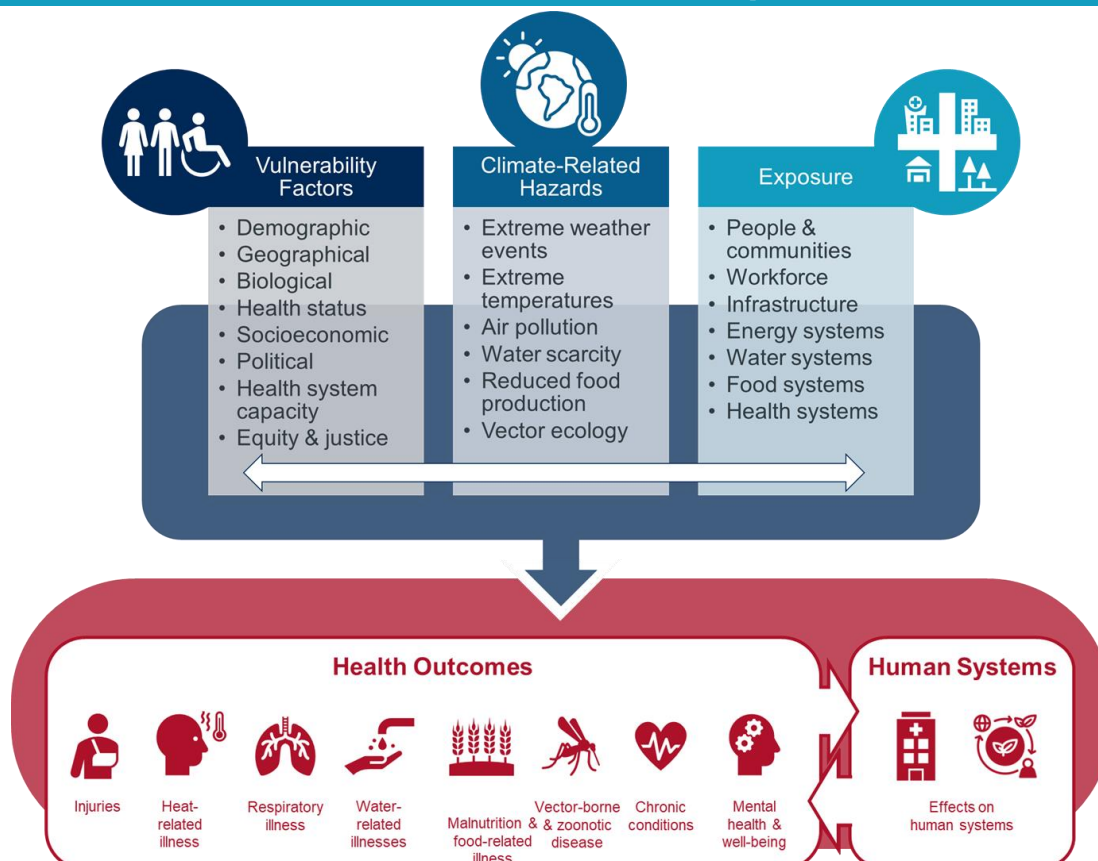
Using Devices to Measure the Environment & Implement Change

There are many devices available for measuring our local environments that can tell us what we are exposed to in our daily activities. These devices can provide accurate and rapid, or even real-time, data that can be used to understand our risks and introduce personal adaptations or implement larger interventions for change. Common devices measure environmental parameters such as temperature, humidity, and air quality.

Environmental Exposure Measurement



Environment & Health Impacts



Environmental Health Research Methods

Design	Notes	Simple Analysis	More Information
Ecologic study	Can use environmental and public health data that are publicly available and aggregated to a specific geographic unit (e.g., county)	Correlation analysis, geographic information systems (GIS) can be used for spatial analysis	https://sph.unc.edu/wp-content/uploads/sites/112/2015/07/nciph_ERIC9.pdf
Cross-sectional study	Snapshot of exposure and health outcome at the same point in time	2 x 2 tables, prevalence, odds ratios	https://sph.unc.edu/wp-content/uploads/sites/112/2015/07/nciph-ERIC8-rev.pdf
Case-control study	Choose people with and without the outcome of interest and determine past exposure	2 x 2 tables, prevalence of exposure, odds ratios	https://sph.unc.edu/wp-content/uploads/sites/112/2015/07/nciph_ERIC5.pdf
Cohort or longitudinal study	Choose people with and without the exposure of interest and follow for health outcome	2 x 2 tables, incidence, risk or rate ratios, time to event (survival analysis)	https://sph.unc.edu/wp-content/uploads/sites/112/2015/07/nciph_ERIC6.pdf
Qualitative study	Can use participant observation, interviews, and focus groups to collect in-depth information	Analysis methods can include content or thematic analysis and can be guided by theory	https://course.ccs.neu.edu/is4800sp12/resources/qualmethods.pdf
Photo voice	Visual research methodology with the goal of empowering marginalized people and implement social change	Content analysis	https://www.betterevaluation.org/methods-approaches/methods/photovoice

Environmental Measurement Devices

Direct Assessment Methods: Personal Monitoring Devices

Device	Parameters Measured (range; accuracy)	Cost	Website
iButton Hydrochron	Temperature (-20–85°C; ±0.5°C) Relative humidity (%; ±5%)	\$196	https://www.analog.com/en/products/ds1923
Fitbit (or similar)	Heart rate SpO2 Stress management score Sleep duration/stages/quality	\$100	https://www.fitbit.com/global/us/products/trackers/inspire3

Indirect Assessment Methods: Environmental Monitoring Devices

Device	Parameters Measured (range; accuracy)	Cost	Website
iButton Hydrochron	Temperature (-20–85°C; ±0.5°C) Relative humidity (%; ±5%)	\$196	https://www.analog.com/en/products/ds1923
PurpleAir Flex Air Quality Monitor (outdoor)	Temperature (-40°C–85°C; ?) Relative humidity (%; ±3%) Air pressure (300–1,100 hPa; ?) Fine particulate matter (PM2.5; 0–500 µg/m³; ±10µg/m³)	\$289+	https://www2.purpleair.com/products/purpleair-flex
Awair Element (indoor)	Temperature (0–90°C; ±0.2°C) Relative humidity (%; ±2%) Carbon dioxide (CO ₂ ; 400–5,000 ppm; ±75ppm, 10%) PM2.5 (0–1,000 µg/m³; ±15 µg/m³, 15%) Volatile organic compounds (TVOC; 20–36,000 ppb; ±15%)	\$147	https://www.getawair.com/products/element
ATMO Tube Pro (indoor & outdoor)	Temperature (-40–85°C; ±1°C) Relative humidity (%; ±3%) Air pressure (300–1100 hPa; ±1 hPa) PM1, PM2.5, PM10 (0–1,000 µg/m³; ±10 or 25 µg/m³) TVOC (0–60,000 ppb; ±1–32 ppb)	\$159	https://atmotube.com/
FLIR ONE PRO Thermal imaging (iOS or Android)	Object temperature (-20–400°C; ±3°C) • Coldest, hottest, and 3 spots • Resolution: 160 x 120 (thermal) and 1440 x 1080 (visual)	\$400	https://www.flir.com/products/flir-one-pro