Glossary of Exposure Science Terms

Developed by the

ES21 Federal Working Group

on Exposure Science

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Note: This Glossary was developed as a cross-Federal effort to identify common exposure science terms. The Glossary will be updated periodically to include new terms and edit existing language. Please contact an ES21 Federal Working Group member if you have questions or recommended changes.

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| ABSORPTION BARRIER | Any exposure surface that may retard the rate of penetration of an agent into a target. Examples of absorption barriers are the skin, respiratory tract lining, and gastrointestinal tract wall (cf. exposure surface).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| ACCURACY | The ability of a method to determine the “true” concentration of the environment sampled. Accuracy describes the closeness of a typical measurement to the quantity measured although it is defined and expressed in terms of the relative discrepancy of a typical measurement from the quantity measured. The special sense of accuracy for a method is embodied in the following definition and criterion: The accuracy of a method is the theoretical maximum error of measurement, expressed as the proportion or percentage of the amount being measured without regard for the direction of the error that is achieved with 0.9 probability by the method.  \*NIOSH Technical Report: Guidelines for Air Sampling and Analytical Method Development and Evaluation.  <http://www.cdc.gov/niosh/docs/95-117/pdfs/95-117.pdf> |
| ACTIVITY PATTERN DATA | Information on human activities used in exposure assessments. These may include a description of the activity, frequency of activity, duration spent performing the activity, and the microenvironment in which the activity occurs.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| AGENT | A chemical, biological, or physical entity that contacts a target.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| ANALYTE | A specific chemical moiety being measured, which can be intact drug, biomolecule or its derivative, metabolite, and/or degradation product in a biologic matrix.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| ACUTE EXPOSURE | A contact between an agent and a target occurring over a short time, generally less than a day. (Other terms, such as "short-term exposure" and "single dose," are also used).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| BACKGROUND LEVEL | The amount of an agent in a medium (e.g., water, soil) that is not attributed to the source(s) under investigation in an exposure assessment. Background level(s) can be naturally occurring or the result of human activities. (Note: natural background is the concentration of an agent in a medium that occurs naturally or is not the result of human activities).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| ATMOSPHERIC CONCENTRATION | A measure of how much mass of a constituent is in a volume of air. |
| ATMOSPHERIC DEPOSITION | The mass of a constituent that has deposited from the air onto a surface. |
| ATMOSPHERIC DISPERSION | A measure of how much a constituent disperses in ambient air. |
| BIAS | Difference between the average measured mass or concentration and reference mass or concentration expressed as a fraction of reference mass or concentration.  Source: NIOSH Manual of Analytical Methods. NIOSH Manual of Analytical Methods (NMAM®), 4th ed. DHHS (NIOSH) Publication 94-113 (August, 1994)  A systematic error inherent in a method or caused by some feature of the measurement system.  Source: Exposure Factors Handbook |
| BIG DATA | An all-encompassing term for any collection of data sets so large and complex that it becomes difficult to process using on-hand data management tools or traditional data processing applications.  Big Data is often characterized by the four V’s: Volume (scale of the data), Velocity (the frequency at which new data is generated), Variety (the different forms and formats of data), and Veracity (the quality of uncertainty of the data).  Big Data consists of extensive datasets primarily in the characteristics of volume, variety, velocity, and/or variability that require a scalable architecture for efficient storage, manipulation, and analysis.  \*(DRAFT NIST Big Data Interoperability Framework: Volume 1, Definitions, public comment April 6 to May 15, 2015: see http://bigdatawg.nist.gov/V1\_output\_docs.php ) |
| BIOAVAILABILITY | The rate and extent to which an agent can be absorbed by an organism and is available for metabolism or interaction with biologically significant receptors. Bioavailability involves both release from a medium (if present) and absorption by an organism.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| BIODEGRADATION | The chemical dissolution of materials by bacteria, fungi or other biological means. |
| BIOETHICS | 1. Respect for Autonomy, This principle is a recognition of individual rights and the importance of free will. It is the basis of “informed consent” and states that from a healthcare perspective a patient who is autonomous has the capacity to act with understanding, intentionally, and free from controlling influences when making a decision.; 2. The Principle of Nonmaleficience, This principle requires that professionals never intentionally harm a patient, including harm that results from negligence (“do no harm”). There must be a standard of care designed to prevent harm to patients under different circumstances.; 3. 3. The Principle of Beneficence, This principle refers to the duty that health care providers have to help their patients (“do good”).; and 4. The Principle of Justice, This principle considers justice in health care in the form of fairness. It also implies that there should be a fair distribution of benefits and costs across all people affected by a particular ethical issue.  <http://knowgenetics.org/bioethic-considerations> |
| BIOLOGICAL MATRIX | A discrete material of biological origin that can be sampled and processed in a  reproducible manner. Examples are blood, serum, plasma, urine, feces, saliva, sputum, and various discrete tissues.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| BIOMARKER OF EFFECT / RESPONSE | A measurable biochemical, physiologic, behavioral, or other alteration in an organism that, depending on the magnitude, can be recognized as associated with an established or possible health impairment or disease (NRC, 2006).  National Research Council of the National Academies (NRC). Human Biomonitoring for Environmental Chemicals, 2006. Washington DC: The National Academies Press. <http://www.nap.edu/catalog/11700/human-biomonitoring-for-environmental-chemicals> |
| BIOMARKER OF EXPOSURE (E.G., BIOLOGIC INDICATOR OF EXPOSURE): | A chemical, its metabolite, or product of an interaction between a chemical or some target molecule or cell that is measured in and organism, such as humans (NRC, 2006).  National Research Council of the National Academies (NRC).  \*Human Biomonitoring for Environmental Chemicals, 2006. Washington DC: The National Academies Press. <http://www.nap.edu/catalog/11700/human-biomonitoring-for-environmental-chemicals> |
| BIOMARKER OF SUSCEPTIBILITY | An indicator of an inherent or acquired ability of an organism to respond to exposure to a specific chemical substance (NRC, 2006). Such an indicator may be the result of a genetic factor, nutritional status, lifestyle, or life stage that affect susceptibility to a chemical exposure (US EPA). This kind of biomarker can be used to distinguish susceptible individuals or groups; for example, a cytochrome phenotype.  \*U.S. Environmental Protection Agency (US EPA). Pesticides: Science and Policy. Defining Biomarkers. <http://www.epa.gov/pesticides/science/biomarker.html> (updated March 12, 2014)  [This page has additional definitions and categories of biomarkers of exposure and effect.] |
| BIOMONITORING | A method used to assess human exposure to chemicals by measuring a chemical, its metabolite, or a reaction product in human tissues or specimens, such as blood and urine (CDC, 2009; NRC, 2006).  National Research Council of the National Academies (NRC). Human Biomonitoring for Environmental Chemicals, 2006. Washington DC: The National Academies Press. <http://www.nap.edu/catalog/11700/human-biomonitoring-for-environmental-chemicals> |
| BOUNDING ESTIMATE | An estimate of exposure, dose, or risk that is higher than that incurred by the person with the highest exposure, dose, or risk in the population being assessed. Bounding estimates are useful in developing statements that exposures, doses, or risks are "not greater than" the estimated value.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| CHRONIC EXPOSURE | A continuous or intermittent long-term contact between an agent and a target. (Other terms, such as "long-term exposure," are also used).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| CITIZEN SCIENCE | Form of collaboration where members of the public participate in scientific research to meet real world goals. The value of citizen science for producing scientific data and educating volunteers is well-established. Citizen science is also considered a paradigm where the needs and activities of an engaged public are intertwined with professional scientific research. Related terms include public participation in scientific research, volunteer monitoring, crowdsourced science, democratized science, and participatory action research.  <http://www.wilsoncenter.org/sites/default/files/NewVisionsInCitizenScience.pdf> -- accessed 4/12/15) |
| COMMUNITY | Community refers to target populations that may be defined by: geography; race; ethnicity; gender; sexual orientation; disability, illness, or other health condition; or to groups that have a common interest or cause, such as health or service agencies and organizations, health care or public health practitioners or providers, policy makers, or lay public groups with public health concerns. Community-based organizations refer to organizations that may be involved in the research process as members or representatives of the community. (NIH <http://grants.nih.gov/grants/guide/pa-files/PA-08-074.html> -- accessed 4/12/2015)  Within the context of CBPR, community is defined as a unit of identity. Units of identity refer to membership in, for example, a family, social network, or geographic neighborhood, and are socially created dimensions of identity ([Steuart 1993](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b44-ehp0113-001463)). Community, as a unit of identity, is defined by a sense of identification and emotional connection to other members, common symbol systems, values and norms, shared interests, and commitment to meeting mutual needs ([Steuart 1993](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b44-ehp0113-001463)). Communities of identity may be geographically bounded, for example, a neighborhood, or may be geographically dispersed, sharing a common identity (e.g., ethnic group, gays and lesbians). A city, town, or geographic area may include multiple overlapping communities of identity or may be an aggregate of individuals who do not have a common identity. (Israel B. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/> -- accessed 4/12/2015) |
| COMMUNITY-BASED PARTICIPATORY RESEARCH | (CBPR in public health is a partnership approach to research that equitably involves, for example, community members, organizational representatives, and researchers in all aspects of the research process, in which all partners contribute expertise and share decision making and responsibilities ([Israel et al. 1998](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b22-ehp0113-001463), [2003](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b23-ehp0113-001463)). The aim of CBPR is to increase knowledge and understanding of a given phenomenon and integrate the knowledge gained with interventions and policy change to improve the health and quality of life of community members ([Israel et al. 1998](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b22-ehp0113-001463), [2003](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/#b23-ehp0113-001463)).  <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1281296/> -- accessed 4/12/2015) |
| COMMUNITY-ENGAGED RESEARCH | …the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the wellbeing of those people. It is a powerful vehicle for bringing about environmental and behavioral changes that will improve the health of the community and its members. It often involves partnerships and coalitions that help mobilize resources and influence systems, change relationships among partners, and serve as catalysts for changing policies, programs, and practices (CDC, 1997, p. 9).  (<http://www.atsdr.cdc.gov/communityengagement/pce_what.html> -- accessed 4/12/2015) |
| COMMUNITY-LED RESEARCH | On the continuum of community-engaged research, this approach is the next logical step beyond community-based participatory research. It is a research approach in which the community-based organization develops, leads, and manages the research project. Community-owned and managed research is an example of this approach. (<http://www.ncbi.nlm.nih.gov/pubmed/20208213>) |
| CROWDMAPPING (ALSO CALLED VOLUNTEERED GEOGRAPHIC INFORMATION) | A process where public volunteers create, assemble, and distribute geographic knowledge. Contributors to VGI projects may be volunteers who submit or modify data hosted by open-source mapping platforms, such as OpenStreetMap.183 Related terms include, but are not limited to, neogeography, counter-mapping, participatory mapping, participatory geoweb, and public participation geographic information systems (PPGIS). (Wilson Center document -- accessed 4/12/15 <http://www.wilsoncenter.org/sites/default/files/NewVisionsInCitizenScience.pdf>) |
| CROWD SOURCING | Process where individuals or organizations solicit contributions from a large group of unknown individuals (“the crowd”) or, in some cases, a bounded group of trusted individuals or experts. Contributors to crowdsourcing projects may or may not be domain experts, and may or may not be paid for their efforts. Crowdsourcing often occurs online, and employs a piecemeal approach where different individuals contribute small portions to a final project or product (“microtasking”).  <http://www.wilsoncenter.org/sites/default/files/NewVisionsInCitizenScience.pdf> -- accessed 4/12/15) |
| CUMULATIVE ASSESSMENT | The U.S. Council on Environmental Quality (1997, Executive Summary page v) defines cumulative effects assessment (CEA) as follows: “the impact on the environment which results from the incremental impact of the action when added to their past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action.” |
| CUMULATIVE DOSE | The total dose resulting from repeated exposures of ionizing radiation to an occupationally exposed worker to the same portion of the body, or to the whole body, over a period of time (see 10 CFR 20.1003). [USDOE, 2000: RAIS Glossary]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| CUMULATIVE EXPOSURE | The sum of exposures of an organism to a pollutant over a period of time. [USEPA, 1997a: EPA Terms of Environment]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| CUMULATIVE RISK ASSESSMENT | An analysis, characterization, and possible quantification of the combined risks to health or the environment from multiple agents or stressors. [EPA Framework for Cumulative Risk Assessment Glossary EPA/630/P-02/001F May 2003 EPA Risk Assessment Forum at oaspub.epa.gov/eims] |
| DATA | A collection of information resulting from a direct observation. Also see “Research Data” |
| DATA QUALITY | The agreement of information (or collection of individual datum) with an objective standard defined for the intended purpose or use. |
| DETECTOR | The part of the monitor that sees and/or measures and/or quantifies and/or  ascertains the dimensions, quantity, or concentration of the gas or vapor of interest.  Source: NIOSH Report: Components for Evaluation of Direct-Reading Monitors for Gases and Vapors) |
| DETECTOR LIFE | Detector life describes, in general, the time over which a detector can operate within acceptable parameters. As a detector reaches the end of its useful life, its performance degrades beyond acceptable limits.  (source: NIOSH Report: Components for Evaluation of Direct-Reading Monitors for Gases and Vapors) |
| DIRECT READING INSTRUMENTS | Direct-reading instruments are valuable tools for detecting and measuring worker exposure to gases, vapors, aerosols, and fine particulates suspended in air. These instruments permit real-time or near real-time measurements, and their use is specifically required by some OSHA standards. There are many types of instruments available, each of which is designed for a specific monitoring purpose. Proper operation of direct-reading instruments is essential to ensure that accurate information is obtained when evaluating air contaminants.  <https://www.osha.gov/SLTC/directreadinginstruments/index.html> |
| DISSOLUTION | The process of dissolving a solid substance into a solvent to make a solution. |
| DOSE | The amount of agent that enters a target after crossing an exposure surface. If the exposure surface is an absorption barrier, the dose is an absorbed dose/uptake dose (see uptake); otherwise it is an intake dose (see intake).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| DOSIMETER | A dosimeter is an instrument capable of reliably collecting, logging, processing and communicating valid real-time exposure-rate and dose-rate information. Modern real-time radiation dosimeters translate ionizing radiation, a physical entity, into an electrical signal using a variety of technologies. The electrical signal is then translated into a dose-rate by applying well-established biological models of internal radiation dose. Similarly, real-time chemical dosimeter accurately measure exposure-rate, and calculates a corresponding human dose-rate from well-established biological models of internal dose. In this context, it is interesting to read the many different definitions of "radiation dosimeter". Many of the definitions don't make the connection to radiation biology and models of internal dose. As we work to develop and transfer chemical dosimeter technologies into the marketplace, it behooves us to make the link between exposure monitoring and dosimetrics.  **a.** Instrument to measure dose; many so-called dosimeters actually measure exposure rather than dose. [USEPA, 1992: GL for Exposure Assessment] [USEPA, 1992a: Dermal Exposure Assessment]; **b.** An instrument to measure dosage; many so called dosimeters actually measure exposure rather than dosage.  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| DOSIMETRY | Dosimetry is the process or technology of measuring and/or estimating dosage. [USEPA, 1997a: EPA Terms of Environment]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| EULERIAN | A way of looking at fluid motion that focuses on specific locations in the space through which the fluid flows as time passes. |
| ENVIRONMENTAL EDUCATION | A process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions. The components of environmental education are:   * Awareness and sensitivity to the environment and environmental challenges * Knowledge and understanding of the environment and environmental challenges * Attitudes of concern for the environment and motivation to improve or maintain environmental quality * Skills to identify and help resolve environmental challenges * Participation in activities that lead to the resolution of environmental challenges   Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills. |
| ENVIRONMENTAL HEALTH DISPARITIES | The contribution of environmental factors to the persistence of health disparities. <https://www.niehs.nih.gov/research/supported/dert/programs/justice/index.cfm> |
| ENVIRONMENTAL HEALTH LITERACY | The Patient Protection and Affordable Care Act of 2010, Title V, defines health literacy as the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions. (from website accessed 4/8/2015, http://www.cdc.gov/healthliteracy/learn/index.html) |
| ENVIRONMENTAL JUSTICE | Based on Executive Order 12898 (issued February 11, 1994) EPA defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” |
| ENVIRONMENTAL MONITOR | Device used to measure to ambient concentrations of environmental contaminants in various media. |
| ENVIRONMENTAL SAMPLE PROCESSOR (ESP) | An autonomous, electromechanical fluidic system capable of collecting discrete water samples (milliliters to liters), concentrating particulates, and conducting end-to-end molecular biological analyses (e.g., molecular probe assays, qPCR, immunoassays) to detect target analytes (e.g., toxic algae, bacterial pathogens, toxins/metabolites). Data are made available in near real-time via radio, cell phone, or satellite, and are archived onboard. Two-way communications provide for adaptive, ‘on-the-fly’ changes to mission configuration. ESP deployments can be sub-surface or land-based, with sampling depth determined by application. |
| EXPOSURE | Contact between an agent and a target. Contact takes place at an exposure surface over an exposure period.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSURE ASSESSMENT | The process of estimating or measuring the magnitude, frequency and duration of exposure to an agent, along with the number and characteristics of the population exposed. Ideally, it describes the sources, pathways, routes, and the uncertainties in the assessment.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSURE CONCENTRATION | The exposure mass divided by the contact volume or the exposure mass divided by the mass of contact volume depending on the medium.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSURE DURATION | The length of time over which continuous or intermittent contacts occur between an agent and a target. For example, if an individual is in contact with an agent for 10 min a day, for 300 days over a 1-year time period, the exposure duration is 1-year.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSURE PATHWAY | The course an agent takes from the source to the target  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSURE ROUTE | The way an agent enters a target after contact (e.g., by ingestion, inhalation, or dermal absorption).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| EXPOSOME | As a complementary approach to the genome, the totality of exposures over a lifetime, which predispose and predict health effects in an individual. This assumes that exposure begins in utero, encompasses environmental  (including occupational) sources of injuries, irritations, and other stressors including lifestyle and diet, and is dependent upon characteristics of the individual. The exposome is the record of all exposures both internal and external that people receive throughout their lifetime. |
| GEOGRAPHIC INFORMATION SYSTEM (GIS) | **a.** A computer hardware and software system designed to collect, manipulate, analyze, and display spatially referenced data for solving complex resource, environmental, and social problems. [ATSDR, 1999: Online Glossary]; **b.** Computer programs linking features commonly seen on maps (such as roads, town boundaries, water bodies) with related information not usually presented on maps, such as type of road surface, population, type of agriculture, type of vegetation, or water quality information. A GIS is a unique information system in which individual observations can be spatially referenced to each other. [NCSU, 1997: Watersheds  Glossary]; **c.** organized collections of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information. GIS is being used by many researchers in the environmental field to view a number of different indicators simultaneously as data layers on a geographic grid. By associating data of all kinds with points on a map, GIS can illustrate patterns and trends that might otherwise be incomprehensive. For example, using GIS, a researcher can map multiple health indicators at and around a specific toxic waste site. [RFF, 2000: Glossary of Terms and Concepts]; **d.**A computer system designed for storing, manipulating, analyzing, and displaying data in a geographic context. See SADA. [USDOE, 2000: RAIS Glossary]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| HYDROLYSIS | The cleavage (separation) of chemical bonds by the addition of water. |
| INFORMATION | Data that has been processed to give it relational context and meaning. This means any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms. ([OMB Circular A-130, Management of Federal Information Resources](https://www.whitehouse.gov/omb/circulars_a130_a130trans4/#6)) |
| LAGRANGIAN | A way of looking at fluid motion where the observer follows an individual fluid parcel as it moves through space and time. |
| LIFE COURSE | The life course health development (LCHD) model as a conceptual frame-work suggests that one’s health pathways are established over their lifetime, through early or critical experiences, cumulative or interactive exposures, and a host of risk-oriented or protective factors. (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3984896/pdf/nihms566423.pdf> -- accessed 4/12/15)   The life course health development (LCHD) framework organizes research from several fields into a conceptual approach explaining how individual and population health develops and how developmental trajectories are determined by interactions between biological and environmental factors during the lifetime. This approach thus provides a construct for interpreting how people's experiences in the early years of life influence later health conditions and functional status. By focusing on the relationship between experiences and the biology of development, the LCHD framework offers a better understanding of how diseases occur. (<http://www.ncbi.nlm.nih.gov/pubmed/?term=12233246> – accessed 4/12/15) |
| LIMIT OF DETECTION ( LOD) | The lowest concentration of an analyte that the bioanalytical procedure  can reliably differentiate from background noise.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf>  Smallest amount of analyte which can be distinguished from background. A good estimate for unbiased analyses, with media blanks not distinguishable from background, is three times the standard error of the calibration graph for low concentrations, divided by the slope (instrument reading per unit mass or per unit concentration of analyte).  Source: NIOSH Manual of Analytical Methods. NIOSH Manual of Analytical Methods (NMAM®), 4th ed. DHHS (NIOSH) Publication 94-113 (August, 1994) |
| LIMIT OF QUANTIFICATION  ( LOQ) | Mass of analyte equal to 10 times the standard error of the calibration graph divided by the slope; approximately the mass of analyte for which relative standard deviation, r, equals 0.10.  Source: NIOSH Manual of Analytical Methods. NIOSH Manual of Analytical Methods (NMAM®), 4th ed. DHHS (NIOSH) Publication 94-113 (August, 1994) |
| LOCAL KNOWLEDGE | Local knowledge is the knowledge that people in a given community have developed over time, and continue to develop. It is:   * Based on experience * Often tested over centuries of use * Adapted to the local culture and environment * Embedded in community practices, institutions, relationships and rituals * Held by individuals or communities * Dynamic and changing   Local knowledge is not confined to tribal groups or to the original inhabitants of an area. It is not even confined to rural people. Rather, all communities possess local knowledge - rural and urban, settled and nomadic, original inhabitants and migrants. There are other terms, such as traditional knowledge or indigenous knowledge, which are closely related, partly overlapping, or even synonymous with local knowledge. The term local knowledge seems least biased in terms of its contents or origin. As it embraces a larger body of knowledge systems, it includes those classified as traditional and indigenous. [FAO Definition] |
| LOWER LIMIT OF QUANTIFICATION (LLOQ) | The lowest amount of an analyte in a sample that can be  quantitatively determined with suitable precision and accuracy.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| METABOLITE | Chemical compound that results from a chemical reaction in the body. Often, a chemical that enters the body is rapidly metabolized or otherwise difficult to measure or distinguish from external contamination. A metabolite may be more stable and also may be eliminated in urine, making it more accessible and easier to measure.  A substance produced directly by a biotransformation of a chemical. For example, phenol in urine is a metabolite of benzene and is representative of benzene absorption in the worker.  Source: NIOSH Manual of Analytical Methods. NIOSH Manual of Analytical Methods (NMAM®), 4th ed. DHHS (NIOSH) Publication 94-113 (August, 1994) |
| MICROBIOME | Collection of all microbes living in and on us. (NIH -- [http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-12-009.html -- accessed on 4/12/15](http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-12-009.html%20--%20accessed%20on%204/12/15))  The collective microbiota (e.g., bacterial populations) present in and on a host, or other macro-organisms, or a larger environmental setting. Our bodies are covered, inside and out, with a great number and diversity of microorganisms — organisms too small to be seen by the naked eye. The sum of all these organisms, which vastly outnumber the cells in the human body, is collectively called the “microbiome”. Research shows that under healthy, normal conditions, the microbes living in or on our stomachs, skin, and even noses play critical roles in a variety of processes including digestion, nutrition, and immunity. |
| NEXT GENERATION AIR MEASUREMENT (NGAM) | A suite of new approaches and advance technologies, ranging widely in cost and capabilities; substantially different than traditional air quality monitoring practices (e.g., FRM/FEM). NGAM increases the pace of data collection through real-time pollutant detection, increases the spatial resolution of air monitoring data and provides flexibility to detect air pollution in new ways. NGAM includes sensors, stand-alone measurement instrumentation (SAMI), mobile measurement, aerial systems and remote sensing. |
| OXIDATION | The loss of electrons or an increase in oxidation state by a molecule, atom, or ion. |
| PERSONAL EXPOSURE MONITOR | Device used to measure an individual’s personal exposure to environmental contaminants or other stressors.  - A device worn on or near the contact boundary that measures concentration [Zartarian, et al., 1997: Quant. Def. of Exp. & Related Concepts]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| PERSONAL MEASUREMENT | A measurement collected from an individual's immediate environment using active or passive devices to collect the samples. [USEPA, 1992a: Dermal Exposure Assessment]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| PHOTOLYSIS / PHOTODEGRADATION | A chemical reaction in which a chemical compound is broken down by photons  ( light) |
| PLUME | A column of one fluid moving through another. |
| PRECISION | The relative variability of measurements on replicate samples about the mean of the population of measurements. Precision is expressed by the relative standard deviation of a series of measurements. It reflects the ability of a method to replicate measurement results.  NIOSH Technical Report: Guidelines for Air Sampling and Analytical Method Development and Evaluation. <http://www.cdc.gov/niosh/docs/95-117/pdfs/95-117.pdf> |
| QUANTIFICATION RANGE | The range of concentration, including ULOQ and LLOQ, that can be reliably  and reproducibly quantified with accuracy and precision through the use of a concentration-response relationship.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| RECEPTOR | Definition from the NAS ES 21 Report |
| RECOVERY | The extraction efficiency of an analytical process, reported as a percentage of the known amount of an analyte carried through the sample extraction and processing steps of the method.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| REMOTE SENSING | Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites.  (source: <http://oceanservice.noaa.gov/facts/remotesensing.html>) |
| REPEATABILITY | The variation in measurements taken under the same conditions |
| REPORT BACK OF RESULTS | Providing personal exposure results back to study participants in a culturally appropriate manner. See Brody J (2014) for a table that outlines guidance for reporting personal exposure results. (<http://www.ehjournal.net/content/13/1/40/table/T1> -- accessed 4/12/15) |
| REPRODUCABILITY | The precision between two laboratories. It also represents precision of the method under the same operating conditions over short period of time.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| RESEACRH DATA | The recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This  ‘‘recorded’’ material excludes physical objects (e.g., laboratory samples). Research data also do not include: (i) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and (ii) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study. [[2 C.F.R. §200.315 (e)(3)](http://www.gpo.gov/fdsys/granule/CFR-2014-title2-vol1/CFR-2014-title2-vol1-sec200-315)] |
| SELECTIVITY | The ability of the bioanalytical method to measure and differentiate the analytes in the presence of components that may be expected to be present. These could include metabolites, impurities, degradants, or matrix components.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| SENSITIVITY | The smallest change in the measured analyte concentration that will produce a reproducible change in a monitor’s readout. (source: NIOSH Report: Components for Evaluation of Direct-Reading Monitors for Gases and Vapors) |
| SENSITIVITY ANALYSIS | **a.** In uncertainty analysis, comparison of risk estimates based on the means and upper bounds of the probability distributions of the input variables. [AIHA, 2000: Risk Assessment Principles for the Industrial Hygienist]; **b.** A technique that tests the sensitivity of an output variable to the possible variation in the input variables of a given model. The purpose of sensitivity analysis is to quantify the influence of input variables on the output variable and develop bounds on the model output. The sensitivity of the output variable of a given mathematical model depends on the nature of the mathematical relationship of the model (and plausible values of its input variables). For a given model, the sensitivity of the output variable with respect to each input variable is computed, and the sensitivities of all input variables are compared. When computing the sensitivity with respect to a given input variable, all other input variables are held fixed at their nominal vales. Sensitivity can be calculated for a point estimate of an input variable or over a range of an input variable. Varying several input parameters at the same time will often highlight interaction effects in the model which are not obvious during "one at a time" variation. [REAP, 1995: Residential Exposure Assessment Project]; **c.** Process of changing one variable while leaving the others constant to determine its effect on the output. This procedure fixes each uncertain quantity at its credible lower and upper bounds (holding all others at their nominal values, such as medians) and computes the results of each combination of values. The results help to identify the variables that have the greatest effect on exposure estimates and help focus further information gathering efforts. [USEPA, 1997b: Exposure Factors Handbook]  “Glossary of Exposure Assessment Related Terms: A Compilation”. Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals, November 1, 2001 |
| SENSOR | A sensor is a technology that includes small, portable, autonomous, low-cost, real-time devices. Sensors are air or water monitoring technologies supporting very large numbers of measurement locations, including wearable, mobile (e.g., on autonomous/robotic platforms), or stationary applications. Key traits of sensor devices include: direct measurement of one or more pollutants, toxins, and/or pathogens; portability; low power draw; turnkey operation; market price supporting large numbers to be purchased by the public as individuals or community groups (e.g., hundreds to low thousands of US dollars). |
| SOURCE | The origin of an agent for the purposes of an exposure assessment  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| STAKEHOLDERS | Stakeholders are organizations who have an interest in the proposed research, who may use the results of the proposed research, or who may be impacted by the research findings, but may not necessarily be actively involved in NIOSH research projects. (from NIOSH Project Planning Guidance, 2015) |
| STRESSOR | Any entity, stimulus, or condition that can modulate normal functions of the organism or induce an adverse response (e.g., agent, lack of food, drought).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| TARGET | Any biological entity that receives an exposure or a dose (e.g., a human, human population, or a human organ).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| TIME AVERAGED EXPOSURE | The time-integrated exposure divided by the exposure duration. An example is the daily average exposure of an individual to carbon monoxide. (Also called time-weighted average exposure).  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| TIME INTEGRATED EXPOSURE | The integral of instantaneous exposures over the exposure duration. An example is the area under a daily time profile of personal air monitor readings, with units of concentration multiplied by time.  Valerie Zartarian, Tina Bahadori and Tom McKone. Adoption of an official ISEA glossary. Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 1–5. doi:10.1038/sj.jea.7500411 Published online 24 November 2004 |
| TRIBAL ECOLOGICAL KNOWLEDGE | “traditional knowledge [that], like Western science, is based on accumulation of observation. It is knowledge that is transmitted through generations…and beliefs about how people fit into ecosystems” (Berkes, 2000) |
| UNCERTAINTY | A limited knowledge of the agreement between data, information, or outcomes relative to an unknown truth. The uncertainty of a measurement is the parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand (the quantity being measured). (Taylor and Kuyatt, 1994, Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, [NIST Technical Note 1297](http://www.nist.gov/pml/pubs/tn1297/index.cfm)). |
| UPPER LIMIT OF QUANTIFICATION (ULOQ) | The highest amount of an analyte in a sample that can be quantitatively determined with precision and accuracy.  <http://www.fda.gov/downloads/Drugs/Guidances/ucm070107.pdf> |
| VALIDATION | confirmation that an observation meets a defined standard or objective reference |
| VALIDATED METHOD | A method which meets or exceeds certain sampling and measurement performance criteria;, "Development and Evaluation of Methods," or Guidelines for Air Sampling and Analytical Method Development and Evaluation (NIOSH Technical Report). |
| VOLATILIZATION | The evaporation or sublimation of a volatile compound. |

**ADDITIONAL RESOURCES**

1. **GLOSSARY OF EXPOSURE ASSESSMENT-RELATED TERMS: A COMPILATION:**

Source: Prepared by the Exposure Terminology Subcommittee of the IPCS Exposure Assessment Planning Workgroup for the International Programme on Chemical Safety Harmonization of Approaches to the Assessment of Risk from Exposure to Chemicals

<http://www.who.int/ipcs/publications/methods/harmonization/en/compilation_nov2001.pdf>

1. **US EPA, Exposure Factors Handbook (September 2011)**

<http://www.epa.gov/ncea/efh/pdfs/efh-glossary.pdf>