



## **EPA'S EXPOSURE FACTORS INTERACTIVE RESOURCE FOR SCENARIOS TOOL**

### **GLOSSARY**

This document provides definitions for many of the key terms used in an exposure assessment. Most of these definitions are taken directly from EPA's Guidelines for Exposure Assessment (U.S. EPA, 1992), EPA's Exposure Factors Handbook (U.S. EPA, 2011), or EPA's Child-Specific Exposure Scenarios Examples (U.S. EPA, 2014).

**Absorbed Dose** – The amount of a substance penetrating across the absorption barriers (the exchange boundaries) of an organism, via either physical or biological processes. This is synonymous with internal dose, which is a more general term denoting the amount absorbed without respect to specific absorption barriers or exchange boundaries. In the calculation of absorbed dose for exposures to contaminated water in bathing, showering or swimming, the outermost layer of the skin is assumed to be an absorption barrier.

**Absorption Fraction (ABS, Percent Absorbed)** – The relative amount of a substance that penetrates through a barrier into the body, reported as a percent.

**Activity (Short-Term) Inhalation Rate** – The volume of air inhaled during a specific activity, with units of volume per time (e.g. per minute, per hour, per day, etc.).

**Activity Pattern (Time Use) Data** – Information on activities in which various individuals engage, length of time spent performing various activities, locations in which individuals spend time and length of time spent by individuals within those various environments.

**Acute Dose Rate (ADR)** – Dose from a single event or average over a limited time period (e.g. 1 day).

**Adjusted Air Concentration** – An adjustment to the air concentration to account for the receptor's exposure duration. This is calculated by multiplying the air concentration by the exposure duration and dividing it by an averaging time.

**Ambient** – The conditions surrounding a person, sampling location, etc.

**Applied Dose** – The amount of a substance presented to an absorption barrier and available for absorption (although not necessarily having yet crossed the outer boundary of the organism).

**As Consumed Intake Rates** – Intake rates that are based on the weight of the food in the form that it is consumed.

**Average Daily Dose (ADD)** – Dose rate averaged over a pathway-specific period of exposure expressed as a daily dose on a per-unit-body-weight basis. The ADD is used for exposure to chemicals with non-carcinogenic non-chronic effects. The ADD is usually expressed in terms of mg/kg-day or other mass/mass-time units.

**Averaging Time (AT)** – The time period over which exposure is averaged.

**Body Weight** – The weight of a receptor.



**Bounding Dose Estimate** – An estimate of dose that is higher than that incurred by the person in the population with the highest dose. Bounding estimates are useful in developing statements that doses are "not greater than" the estimated value.

**Bulk Modify** – In the ExpoFIRST tool, bulk modify is used on the *Exposure Factors* tab to enter the same value (e.g., exposure frequency) for all age groups in one step.

**Central Tendency Dose Estimate** – An estimate of dose for individuals within the central portion (average or median) of a dose distribution.

**Chronic Intake (Exposure)** – The long term period over which a substance crosses the outer boundary, is inhaled, or is in contact with the skin of an organism without passing an absorption barrier.

**Community Water** - Includes tap water ingested from a community or municipal water supply.

**Consumer-Only** – Refers to only those individuals who reported food or water intake during the survey period.

**Consumer-Only Intake Rate** – The average quantity of food consumed per person in a population composed only of individuals who ate the food item of interest during a specified period.

**Contact Rate** – General term used to represent rate of contact with a contaminated medium. Contact may occur via ingestion, inhalation, or dermal contact.

**Contaminant Concentration** – Contaminant concentration is the concentration of the contaminant in the medium (air, food, soil, etc.) contacting the body and has units of mass/volume or mass/mass.

**Daily (Long-Term) inhalation rate** – Metabolically derived inhalation rate in volume per time calculated as the product of energy expenditure rate, oxygen uptake factor, and the ratio of minute volume to oxygen uptake (ventilatory equivalent).

**DA<sub>event</sub>** – The absorbed dose per event. Estimated based on the permeability coefficient of the media, the chemical concentration in the media, and the event duration.

**Deposition** – The removal of airborne substances to available surfaces that occurs as a result of gravitational settling and diffusion, as well as electrophoresis and thermophoresis; substances at low concentrations in the vapor phase are typically not subject to deposition in the environment.



**Direct Water** – Water ingested directly as a beverage. It does not include water used for preparing food (e.g., cake mix baby formula) or other beverages (e.g., coffee, tea).

**Distribution** – A set of values derived from a specific population or set of measurements that represents the range and array of data for the factor being studied.

**Dose** – The amount of a substance available for interaction with metabolic processes or biologically significant receptors after crossing the outer boundary of an organism.

**Dose Metric** – The measure of a dose based on exposure duration. These include acute dose rate (ADR), average daily dose for subchronic and chronic durations ( $ADD_{\text{subchronic}}$  and  $ADD_{\text{chronic}}$ ), and lifetime average daily dose (LADD).

**Dose Rate** – Dose per unit time, for example in mg/day, sometimes also called dosage. Dose rates are often expressed on a per-unit-body-weight basis yielding such units as mg/kg/day. They are also often expressed as averages over some time period (e.g., a lifetime).

**Dry Weight** – The weight of an object after the moisture content has been removed.

**Dry-Weight Intake Rates** – Intake rates that are based on the weight of the food consumed after the moisture content has been removed.

**Event Frequency** – The number of times an event or activity occurs over a specified amount of time (e.g., events/day).

**Exposed Foods** – Those foods that are grown above ground and are likely to be contaminated by pollutants deposited on surfaces that are eaten.

**Exposure** – Contact of a chemical, physical, or biological agent with the outer boundary of an organism. Exposure is quantified as the concentration of the agent in the medium in contact integrated over the time duration of the contact.

**Exposure Assessment** – The determination of the magnitude, frequency, duration, and route of exposure.

**Exposure Concentration** – The concentration of a chemical in its transport or carrier medium at the point of contact.

**Exposure Duration (ED)** – Total time an individual is exposed to the chemical being evaluated.

**Exposure Factors** – Factors related to human behavior and characteristics that help determine an individual's exposure to an agent.

**Exposure Frequency (EF)** – How often a receptor is exposed to the chemical being evaluated.



**Exposure Group** – A group of people that have the same or similar exposure profile.

**Exposure Pathway** – The physical course a chemical or pollutant takes from the source to the organism exposed.

**Exposure Route** – The way a chemical or pollutant enters an organism after contact (e.g., by ingestion, inhalation, or dermal absorption).

**Exposure Scenario** – A set of facts, assumptions, and inferences about how exposure takes place that aids the exposure assessor in evaluating, estimating, or quantifying exposure.

**Exposure Time (ET)** – The length of time an individual engages in an activity that results in exposure.

**Fraction Absorbed Water (FA)** – The fraction of a chemical or substance that is absorbed. A fraction of the chemical or substance is lost due to desquamation.

**General Population** – The total of individuals inhabiting an area or making up a whole group.

**Geometric Mean** – The  $n$ th root of the product of  $n$  values.

**High-End Dose Estimates** – A plausible estimate of individual dose for those persons at the upper end of a dose distribution, conceptually above the 90th percentile, but not higher than the individual in the population who has the highest dose.

**Homegrown/Home Produced Foods** – Fruits and vegetables produced by home gardeners, meat and dairy products derived from consumer-raised livestock, game meat, and home caught fish.

**Indirect Water** – Water added in the preparation of food or beverages. It does not include water intrinsic to purchased foods.

**Inhalation Rate (InhR)** – Rate at which air is inhaled. Typically presented in units of  $m^3/hr$ ,  $m^3/day$  or  $L/min$ .

**Inhaled Dose** – The amount of an inhaled substance that is available for interaction with metabolic processes or biologically significant receptors after crossing the outer boundary of an organism.

**Intake** – The process by which a substance crosses the outer boundary of an organism without passing an absorption barrier (e.g., through ingestion or inhalation).

**Intake Rate (IR)** – Rate of inhalation, ingestion, and dermal contact, depending on the route of exposure. For ingestion, the intake rate is simply the amount of food containing the



contaminant of interest that an individual ingests during some specific time period (units of mass/time). For inhalation, the intake rate is the inhalation rate (i.e., rate at which air is inhaled). Factors that can affect dermal exposure are the amount of material that comes into contact with the skin, the rate at which the contaminant is absorbed, the concentration of contaminant in the medium, and the total amount of the medium on the skin during the exposure duration.

**Intensity (Light and Moderate)** – The level of energy expenditure in metabolic equivalents of work (METs) consumed during an activity. Light intensity activities are those with METs >1.5 - 3.0, moderate intensity activities are those with METs >3.0 - 6.0, and high intensity activities are those with METs >6.0.

**Internal Dose** – The amount of a substance penetrating across absorption barriers (the exchange boundaries) of an organism, via either physical or biological processes (synonymous with absorbed dose).

**Lag time** – The time during which absorption continues after the exposure has ended.

**Lifetime Average Daily Dose (LADD)** – Dose rate averaged over a lifetime. The LADD is used for compounds with carcinogenic or chronic effects. The LADD is usually expressed in terms of mg/kg-day or other mass/mass-time units.

**Lipid Weight (LW)** – The weight of lipid content.

**Mean Value** – The arithmetic average of a set of numbers.

**Media** – The route in which people may be exposed to contaminants, these may include air, water and sediment, soil and dust, food, aquatic biota, or consumer products.

**Median Value** – The value in a measurement data set such that half the measured values are greater and half are less.

**Moisture Content** – The portion of foods made up by water. The percent water is needed for converting food intake rates and residue concentrations between whole weight and dry weight values.

**Monte Carlo Technique** – As used in exposure assessment, repeated random sampling from the distribution of values for each of the parameters in a generic (exposure or dose) equation to derive an estimate of the distribution of (exposures or doses in) the population.

**Occupational Tenure** – The cumulative number of years a person worked in his or her current occupation, regardless of number of employers, interruptions in employment, or time spent in other occupations.

**Per Capita Intake Rate** – The average quantity of food consumed per person in a population composed of both individuals who ate the food during a specified time period and those that did not.

**Permeability Coefficient (Kp)** – A coefficient associated with the diffusion of molecules through a membrane or interface, with units of length per time.

**Pica** – Deliberate ingestion of non-nutritive substances such as soil.

**Population Mobility** – An indicator of the frequency at which individuals move from one residential location to another.

**Potential Dose (PD)** – The amount of a chemical which could be ingested, inhaled, or deposited on the skin.

**Preparation Losses** – Net cooking losses, which include dripping and volatile losses, post cooking losses, which involve losses from cutting, bones, excess fat, scraps and juices, and other preparation losses which include losses from paring or coring.

**Probabilistic Uncertainty Analysis** – Technique that assigns a probability density function to one or more input parameters, then randomly selects values from the distributions and inserts them into the exposure equation. Repeated calculations produce a distribution of predicted values, reflecting the combined impact of variability in each input to the calculation. Monte Carlo is a common type of probabilistic technique.

**Protected (Fruits or Vegetables)** – Fruits or vegetables that have an outer protective coating that is typically removed before consumption.

**Receptor/Receptor Population** – The population of interest, also known as the receptor population and may be described by specific age ranges or other characteristics (e.g., gender, ethnicity, geographic location).

**Recreational/Sport Fishermen** – Individuals who catch fish as part of a sporting or recreational activity and not for the purpose of providing a primary source of food for themselves or for their families.

**Representativeness** – The degree to which a sample is, or samples are, characteristic of the whole medium, exposure, or dose for which the samples are being used to make inferences.



**Residential Occupancy Period** – The time (years) between a person moving into a residence and the time the person moves out or dies.

**Screening Level Assessments** – Typically examine exposures that would fall on or beyond the high end of the expected exposure distribution.

**Serving Sizes** – The quantities of individual foods consumed per eating occasion. These estimates may be useful for assessing acute exposures.

**Soil Adherence Factor** – A factor that describes the quantity of soil that adheres to the skin per unit of surface area and from which chemical contaminants are available for uptake at the skin surface.

**Soil and Dust** – A combination of soil, outdoor settled dust, and indoor settled dust. Soil is unconsolidated mineral and/or organic matter from the earth's surface that are located outdoors, or are used indoors to support plant growth. Outdoor settled dust includes particles that have settled onto outdoor objects and surfaces due to either wet or dry deposition. It may not be possible to distinguish between soil and outdoor settled dust, since outdoor settled dust generally would be present on the uppermost surface layer of soil. Indoor settled dust includes particles in building interiors that have settled onto objects, surfaces, floors, and carpeting. These particles may include soil particles that have been tracked or blown into the indoor environment from outdoors as well as organic matter.

**Stratum Corneum** – The thin outermost layer of skin, considered to be the main barrier to skin adsorption of most chemicals.

**Subchronic Intake** – A period over which intake occurs that is less than or equal to 7 years in duration.

**Subsistence Fishermen** – Individuals who consume fresh caught fish as a major source of food.

**Transfer Fraction (TF)** – The fraction of chemical that is transferred to the skin from contaminated surfaces in contact with that surface.

**Upper-Percentile Value** – The value in a measurement data set that is at the upper end of the distribution of values.

**Uptake** – The process by which a substance crosses an absorption barrier and is absorbed into the body.

**Wet Weight (WW)** – As consumed, or precooked weight.



**Wet-Weight Intake Rates** – Intake rates that are based on the wet (or whole) weight of the food consumed. This is in contrast to dry-weight intake rates.

