

# Environmental Exposures Toolkit Guideline

## v2.0

### Instruments

#### Toolkit Purpose

A collection of measures to capture essential information for biomedical research related to environmental exposures.

#### Guideline Description

The Environmental Exposures toolkit can be used to collect information pertaining to: socio-economic status, occupational history, water resources and more. The following document establishes guidelines (particularly applicable in Africa) on how to use the toolkit and collect detailed, relevant and harmonised exposure data for research.

As listed below, the Environmental Exposures toolkit consists of 7 Instruments, labelled Instruments 1 to 7:

Instrument	Phenotypes	Instrument	Phenotypes
1	Household Characteristics	5	Occupational Exposures
2	Water Resource	6	Air Contaminants
3	Sanitation	7	Personal Care Products
4	Occupational History		

#### Important Notes

1. The toolkit employs branching logic, therefore, we recommend that it is completed in order, as some variables may or may not appear OR accept input based on the input of previously listed variables.
2. Some branching logic (specifically related to date of birth/age and biological sex) affect the display of items relevant to adult or paediatric participants across multiple instruments.

3. Any addition or removal of variables may also affect branching logic so editing of variables should be carefully positioned so as not to interrupt branching logic conditions with related variables.
4. The toolkit is recommended to be used in conjunction with the Core Phenotypes toolkit (<https://github.com/h3abionet/h3aphenstds>).
5. Although not highlighted below, each instrument requires a collection date, which can be collected either manually or automatically.
6. Consistent codes are recommended for the identification of missing data, and these are incorporated into all Instruments discussed below. We recommend the use of 'Temporarily unavailable' for pending results in Instrument 2.
7. Codes for Missing Data are specified below:

Code	Value Label
-991	No information
-992	Asked but unknown
-993	Temporarily unavailable
-994	Not asked
-995	Refused
-998	Not applicable

8. We recommend that when a participant responds with an "I don't know" to a question that the interviewer firstly ensures that the participant understands the question clearly and secondly is gently encouraged to reconsider their response if possible. If "I don't know" is still the response we make use of the 'Asked but unknown' missing code. Questions where "I don't know" is a highly anticipated and valid response will have a checkbox for Unknown included - it should be noted that this will not be recognised as missing data in statistical software.

## Recommendations

### Instrument 1: Household Characteristics

The instrument enables the self-report collection of information related to socioeconomic status from research participants.

Questions	<p>What type of household does the participant live in?</p> <p><b>Response Options:</b></p>
-----------	---

	<p>Stand-alone house; House split into two apartments/flats; Apartment building; Hotel/Motel; Trailer/Mobile home; Traditional dwelling; Other</p> <p>(If Other) Specify household type: How many sleeping and living rooms are in the participant's household? How many people live in the participant's household?</p> <p>Does the participant's household have, or does the participant own, any of the following? [Arable land; Pastures and hayfields; Pets; Farm animals; Bed; Blankets; Mattress; Bicycle; Motorcycle or Scooter; Car or Truck; Electricity; Internet Connectivity; Microwave; Refrigerator; Radio; Television; Telephone; Mobile phone; Computer or laptop]</p> <p><b>Response Options:</b> Yes; No</p>
Notes	<ul style="list-style-type: none"> <li>- <b>Arable land:</b> Any land capable of being ploughed and used to grow crops.</li> <li>- <b>Pastures and hayfields:</b> land used for grazing.</li> </ul>
Questions	<p>What is the participant's household's roof made of? <b>Response Options:</b> Tile; Concrete; Wood; Natural resources (e.g. straw); Scavenged resources (e.g. cardboard); Iron; Asbestos; Aluminium; Other</p> <p>(If Other) Specify the household's primary roof material: Does the participant's household experience any leaking? <b>Response Options:</b> During heavy rain (including light rain); During light rain only; Never</p> <p>What is the participant's household's wall made of? <b>Response Options:</b> Brick; Plaster; Wood; Cardboard; Curtains; Other</p> <p>(If Other) Specify the household's primary wall material:</p> <p>What is the participant's household's floor covering made of? <b>Response Options:</b> Soil; Wood; Cement; Tile; Carpet/Rug; Other</p> <p>(If Other) Specify the household's primary floor covering material:</p>
Notes	<ul style="list-style-type: none"> <li>- <b>Scavenged resources:</b> resources collected from discarded waste.</li> <li>- <b>Asbestos:</b> a group of natural occurring mineral fibres which are strong and both heat and chemically resistant.</li> </ul>
Questions	<p>What is the main source of cooking fuel used in the participant's household? <b>Response Options:</b> Electricity; Wood; Charcoal; Gas; Kerosene; Oil; Crop waste; Other</p> <p>(If Other) Specify main source of cooking fuel used in the household:</p>

	<p>Where is cooking primarily conducted in the participant's household?</p> <p><b>Response Options:</b> Indoors; Outdoors (Enclosed Area); Outdoors (Open Area)</p> <p>(If Indoors) Is cooking and sleeping conducted in the same room?</p> <p><b>Response Options:</b> Yes; No</p> <p>In what type of developed settlement does the participant live?</p> <p><b>Response Options:</b> Urban; Suburban; Rural</p>
Notes	<ul style="list-style-type: none"> <li>- <b>Kerosene:</b> a combustible hydrocarbon liquid which is derived from petroleum.</li> <li>- <b>Urban:</b> A densely populated settlement, which can take the form of a town, city, metropolis, conurbation, megalopolis, or world city.</li> <li>- <b>Suburban:</b> a mixed-use or residential area, existing either as part of a city or urban area or as a separate residential community within commuting distance of a city.</li> <li>- <b>Rural:</b> A rural settlement is where displaced populations settle on land outside of cities and towns.</li> </ul>

## Instrument 2: Water Resource

The instrument enables the self-report collection and recording of information related to a research participant's primary water resource and the quality thereof, respectively.

Questions	<p>What is the participant's main source of drinking water?</p> <p><b>Response Options:</b> Borehole; Delivered water (tanker); Municipal water supply; Packaged water (bottled, sachet); Protected well; Public water tap; Rainwater collection; Surface water (e.g. river, dam); Unprotected well; Water from spring; Water vendors; Other</p> <p>(If Other) Specify drinking source:</p> <p>In which manner is water treated prior to drinking, if any?</p> <p><b>Response Options:</b> Filtered; Boiling; Chemical Treatment; Solar Water Treatment; Not treated</p>
	<p>In the last month, has there been any time when the participant's household did not have sufficient quantities of drinking water when needed?</p> <p><b>Response Options:</b> Yes - at least once; No - always sufficient</p> <p>What is the participant's main source of water for non-drinking purposes?</p> <p><b>Response Options:</b> Borehole;</p>

	<p>Delivered water (tanker);  Municipal water supply;  Packaged water (bottled, sachet);  Protected well;  Public water tap;  Rainwater collection;  Surface water (e.g. river, dam);  Unprotected well;  Water from spring;  Water vendors;  Other</p> <p>(If Other) Specify non-drinking source:  Collect a water sample to determine water quality.</p>
Notes	<ul style="list-style-type: none"> <li>- Water quality is determined by identifying the number of <i>E. coli</i> detected in 100 mL sample; measured within 30 minutes of water sample collection.</li> </ul>

### Instrument 3: Sanitation

The instrument enables the self-report collection of information related to household sanitation from research participants.

Questions	<p>Where is the participant's household's toilet facility located?</p> <p><b>Response Options:</b>  Inside the household dwelling;  In the household's yard/plot;  Outside the household plot</p> <p>What is the main type of toilet facility used by the participant's household?</p> <p><b>Response Options:</b>  Bucket; Composting toilet; Container-based sanitation; Dry pit toilet;  Flush toilet; Hanging toilet; None/Bush/Field</p> <p>Does the participant's household share this facility with others who are not members of their household?</p> <p><b>Response Options:</b> Yes; No</p> <p>Does the participant's household have a sewage connection?</p> <p><b>Response Options:</b> Yes; No</p> <p>(If No) How is the participant's household waste/rubbish removed?</p> <p><b>Response Options:</b>  Removed by service provider; Emptied by household; Other</p> <p>(If Other) Specify method of waste removal:</p>
Notes	<ul style="list-style-type: none"> <li>- Selected toilet facility descriptions: <ul style="list-style-type: none"> <li>- <b>Dry pit toilet:</b> a type of toilet that collects human faeces in a hole in the ground, also called pit latrine.</li> <li>- <b>Container-based sanitation:</b> refers to a sanitation system where toilets collect human excreta in sealable, removable containers that are transported to treatment facilities.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>- <b>Hanging toilet:</b> a basic form of a dry toilet whereby a bucket (pail) is used to collect excreta.</li> <li>- <b>Composting toilet:</b> a type of dry toilet that treats human waste by a biological process called composting</li> </ul>
--	---

#### Instrument 4: Occupational History

The instrument enables the self-report collection of information related to a research participant's occupational history.

Questions	<p>Participant's employment status?</p> <p><b>Response Options:</b>  Self employed;  Formal full-time employment by someone else;  Part-time employment by someone else;  Informal employment (dependent on availability of work) ;  Unemployed</p> <p>If employed, what kind of industry do you work in?</p> <p><b>Response Options:</b> See Notes (Fields)</p> <p>(If Other) Specify work industry:</p> <p>(If Employed) Does the participant ever wear personal protective equipment on the job?</p> <p><b>Response Options:</b> Yes; No</p>																		
Notes	<p>- Some <b>Examples</b> of professions in each work field:</p> <table border="1"> <thead> <tr> <th>Field</th><th>Examples</th></tr> </thead> <tbody> <tr> <td>Agriculture</td><td>Farmer, Agricultural Engineer, Food Scientist, Agronomist, Agricultural Operations Manager.</td></tr> <tr> <td>Chemical</td><td>Chemical Engineer, Chemical Analyst, Chemical Production Operator</td></tr> <tr> <td>Communications / IT</td><td>Human Resources Specialist, Social Media Manager, Business Reporter, Web Developer, Systems Analyst , IT Technician.</td></tr> <tr> <td>Financial Services</td><td>Customer Service, financial adviser, Banker, Accountant, Insurance Agent.</td></tr> <tr> <td>Healthcare</td><td>Doctor, Nurse, Psychiatrist, Paramedic.</td></tr> <tr> <td>Infrastructure</td><td>Architect, Builder, Civil Engineer, Electrical Engineer</td></tr> <tr> <td>Manufacturing</td><td>Mechanical Engineer. Draughtsman, Quality Control Inspector, Assembly ne Worker, Machine Operator.</td></tr> <tr> <td>Mining</td><td>Geologist, Electricians, Contract Miner, Diamond Driller, Environmental Coordinator</td></tr> </tbody> </table>	Field	Examples	Agriculture	Farmer, Agricultural Engineer, Food Scientist, Agronomist, Agricultural Operations Manager.	Chemical	Chemical Engineer, Chemical Analyst, Chemical Production Operator	Communications / IT	Human Resources Specialist, Social Media Manager, Business Reporter, Web Developer, Systems Analyst , IT Technician.	Financial Services	Customer Service, financial adviser, Banker, Accountant, Insurance Agent.	Healthcare	Doctor, Nurse, Psychiatrist, Paramedic.	Infrastructure	Architect, Builder, Civil Engineer, Electrical Engineer	Manufacturing	Mechanical Engineer. Draughtsman, Quality Control Inspector, Assembly ne Worker, Machine Operator.	Mining	Geologist, Electricians, Contract Miner, Diamond Driller, Environmental Coordinator
Field	Examples																		
Agriculture	Farmer, Agricultural Engineer, Food Scientist, Agronomist, Agricultural Operations Manager.																		
Chemical	Chemical Engineer, Chemical Analyst, Chemical Production Operator																		
Communications / IT	Human Resources Specialist, Social Media Manager, Business Reporter, Web Developer, Systems Analyst , IT Technician.																		
Financial Services	Customer Service, financial adviser, Banker, Accountant, Insurance Agent.																		
Healthcare	Doctor, Nurse, Psychiatrist, Paramedic.																		
Infrastructure	Architect, Builder, Civil Engineer, Electrical Engineer																		
Manufacturing	Mechanical Engineer. Draughtsman, Quality Control Inspector, Assembly ne Worker, Machine Operator.																		
Mining	Geologist, Electricians, Contract Miner, Diamond Driller, Environmental Coordinator																		

	Public Services	Teacher, Librarian, Firefighter, Police Officer, Lawyer, Education Consultant.
	R&D	Researchers, Scientists, Project Managers, Marketing Experts.
	Restaurant / Food	Chef, Baker, Butcher, Restaurant Manager, Dietitian, Nutritionist, Server, Busser.
	Retail / Wholesale	Store Manager, Cachier , Inventory Control Specialist , Electrical Goods Supplier Wholesale, Driver, Sales Workers.
	Textile	Print Designer, Production Equipment Operator, Fabric Development Specialist, Design Technician.

### Instrument 5: Occupational Exposures

The instrument enables the self-report collection of information related to a research participant's occupational exposure history.

Questions	<p>Has the participant ever worked...</p> <p>[In a quarry? In a foundry? In a pottery? In a cotton, flax, or hemp mill? With asbestos? With diesel or diesel exhaust? In sandblasting? In tunnelling? In drilling? In any other dusty jobs?]</p> <p><b>Response Options:</b> Yes; No</p>
Notes	<ul style="list-style-type: none"> <li>- Workplace Descriptions: <ul style="list-style-type: none"> <li>- <b>Quarry:</b> a place, typically a large, deep pit, from which stone or other materials are or have been extracted.</li> <li>- <b>Foundry:</b> a workshop or factory for casting metal.</li> <li>- <b>Pottery:</b> a factory or workshop where pottery is made.</li> <li>- <b>Cotton, flax, or hemp mill:</b> a factory or workshop which processes cotton, flax or hemp.</li> </ul> </li> <li>- <b>Asbestos:</b> a group of natural occurring mineral fibres which are strong and both heat and chemically resistant.</li> <li>- <b>Sandblasting:</b> operation of forcibly propelling a stream of abrasive material against a surface under high pressure to smooth a rough surface, roughen a smooth surface, shape a surface or remove surface contaminants.</li> <li>- <b>Tunnelling:</b> Digging tunnels</li> </ul>
Questions	<p>Has the participant ever been exposed to gas or chemical fumes in their work?</p> <p><b>Response Options:</b> Yes; No</p>

	<p>(If Yes) Was the chemical/gas exposure...</p> <p><b>Response Options:</b> Mild; Moderate; Severe</p> <p>Has the participant ever worked with insecticides or pesticides?</p> <p><b>Response Options:</b> Yes; No</p> <p>If yes, how many years has the participant worked with insecticides or pesticides?</p>
Notes	<ul style="list-style-type: none"> <li>- <b>Insecticides:</b> substances used to kill insects. They include ovicides and larvicides used against insect eggs and larvae, respectively. Insecticides are used in agriculture, medicine, industry and by consumers.</li> <li>- <b>Pesticides:</b> any toxic substance used to kill animals, fungi, or plants that cause economic damage to crop or ornamental plants or are hazardous to the health of domestic animals or humans.</li> </ul>

### Instrument 6: Air Contaminants

The instrument is optional and enables the self-report collection of information related to a research participant's exposure to household air contaminants.

Questions	<p><b>Exposures during the last year:</b></p> <p>[In the past year has there been a major renovation to this house or apartment? Within the last six months were rugs, drapes, or furniture professionally cleaned? In the past year, was the inside of this house or apartment painted? In the past year were new carpets or rugs installed? Did you go to the dry cleaners during the past week? Did you bring home any items from the cleaners that were dry-cleaned during the past week?]</p> <p><b>Response Options:</b> Yes; No; Don't know</p>
Questions	<p><b>Short-term Exposure:</b></p> <p>In the last 48 hours, have you or someone near you used any of the following:</p> <p>[Paints or solvents? Glues and adhesives? Gasoline lawn mower? Chain saw or other gasoline equipment? Sander and/or saw? Pesticides sprayed? Vacuuming? Sweeping indoors? Dusting? Did you use or were you near somebody else who used cleaning solutions? Gardening? Woodworking?</p>



	<p>Metal working/welding?          Broiling, smoking, grilling or frying inside the house?          Broiling, smoking, grilling, or frying outside the house?]</p> <p><b>Response Options:</b>          Yes; No</p>
Notes	<p>- <b>Pesticides:</b> any toxic substance used to kill animals, fungi, or plants that cause economic damage to crop or ornamental plants or are hazardous to the health of domestic animals or humans.</p>

### Instrument 7: Personal Care Products

The instrument is optional and enables the self-report collection of information related to a research participant's use of personal care products.

Questions	<p>How often do you use...</p> <p>[Waterless hand sanitizer?          Liquid soaps that are not antibacterial?          Antibacterial liquid soaps?          Deodorant or antiperspirant?          Bug repellent?          Hair shampoo?          Hair conditioner?          Hair dye?          Hair spray?          Gels, mousse, or other hair styling products?          Anti-aging or overnight creams?          Facial cleansers, facial masks or deep cleansers?          Hand or body creams?          Commercial sunscreen?          Foundation makeup?          Mascara?          Chapstick, lip balm, or lipstick?          Nail polish?          Bath oil or gel?          Aftershave (lotion, balm, or cologne)?          Fragrances, such as perfume?          Contact lens solutions or eye drops?          Nasal sprays?          Ear drops or ear wax removal products?          Feminine hygiene products (e.g. sanitary pads; tampons)?]</p> <p><b>Response Options:</b>          Usually (&gt;4 days a week);          Sometimes (1-4 days a week);          Rarely (&lt; 3 days a month);          Never</p>
-----------	--

Notes	- To accurately collect information for this instrument, it may be useful to provide local examples of each personal care product.
-------	--

## Abbreviations

E.coli: *Escherichia coli*

IT: Information technology

R&D: Research and development

## Mode of Administration

	Instruments						
	1	2	3	4	5	6	7
Interview OR Self-administered questionnaire	X	X	X	X	X	X	X
Clinical assessment							
Bioassay/Lab- based assessment		X					

## Life Stage

	Instruments						
	1	2	3	4	5	6	7
Infancy (0 - 12 months)	X	X	X			X	X
Toddler (13 - 24 months)	X	X	X			X	X
Childhood (2-11 years)	X	X	X			X	X
Adolescence (12 - 18 years)	X	X	X			X	X
Adult (18 and older)	X	X	X	X	X	X	X

## Personnel and Training Required

**Instruments 1 to 7** may be implemented as either self-reported questionnaires or interviewer-administered questionnaires. If interviewer-administered, interviews should be conducted by trained or study coordinators or data collectors who speak the native/local language of the target population. Information recorded in **Instrument 2** needs to be gained from qualified medical laboratory facilities, with trained and qualified laboratory staff.

## References

The Environmental Exposures toolkit is based on and aligned with several existing standards, to facilitate data harmonisation. These resources are listed below:

1. H3Africa Case Report Form Instruments
2. Instrument - Occupation/Occupational History  
(<https://www.phenxtoolkit.org/protocols/view/60501>)
3. Instrument - Air Contaminants in the Home Environment  
(<https://www.phenxtoolkit.org/protocols/view/61101>)
4. Instrument - Personal Care Products (<https://www.phenxtoolkit.org/protocols/view/61501>)
5. Instrument - Home and Workplace Exposures to Floor and Wall Materials  
(<https://www.phenxtoolkit.org/protocols/view/61401>)
6. WHO Core questions on drinking water and sanitation for household surveys  
([https://www.who.int/water\\_sanitation\\_health/monitoring/household\\_surveys/en/](https://www.who.int/water_sanitation_health/monitoring/household_surveys/en/))

## Contributors

Phenotype Harmonisation WG - H3Africa  
Joint Phenotype Harmonisation Project - H3ABioNet  
Phenotype Standardisation Project - H3ABioNet  
Judit Kumuthini  
Lyndon Zass  
Melek Chaouch

## Contact Us

For queries related to this standard and guideline, users can log a ticket to the Phenotypes Standards queue in the [H3ABioNet Helpdesk](#). User feedback and improvements on the current toolkit are welcome and encouraged. These can also be submitted through the Helpdesk, or on our [GitHub Issues page](#).