

Data standards and ontologies for exposomics: The value of common language, addressing gaps and the way forward

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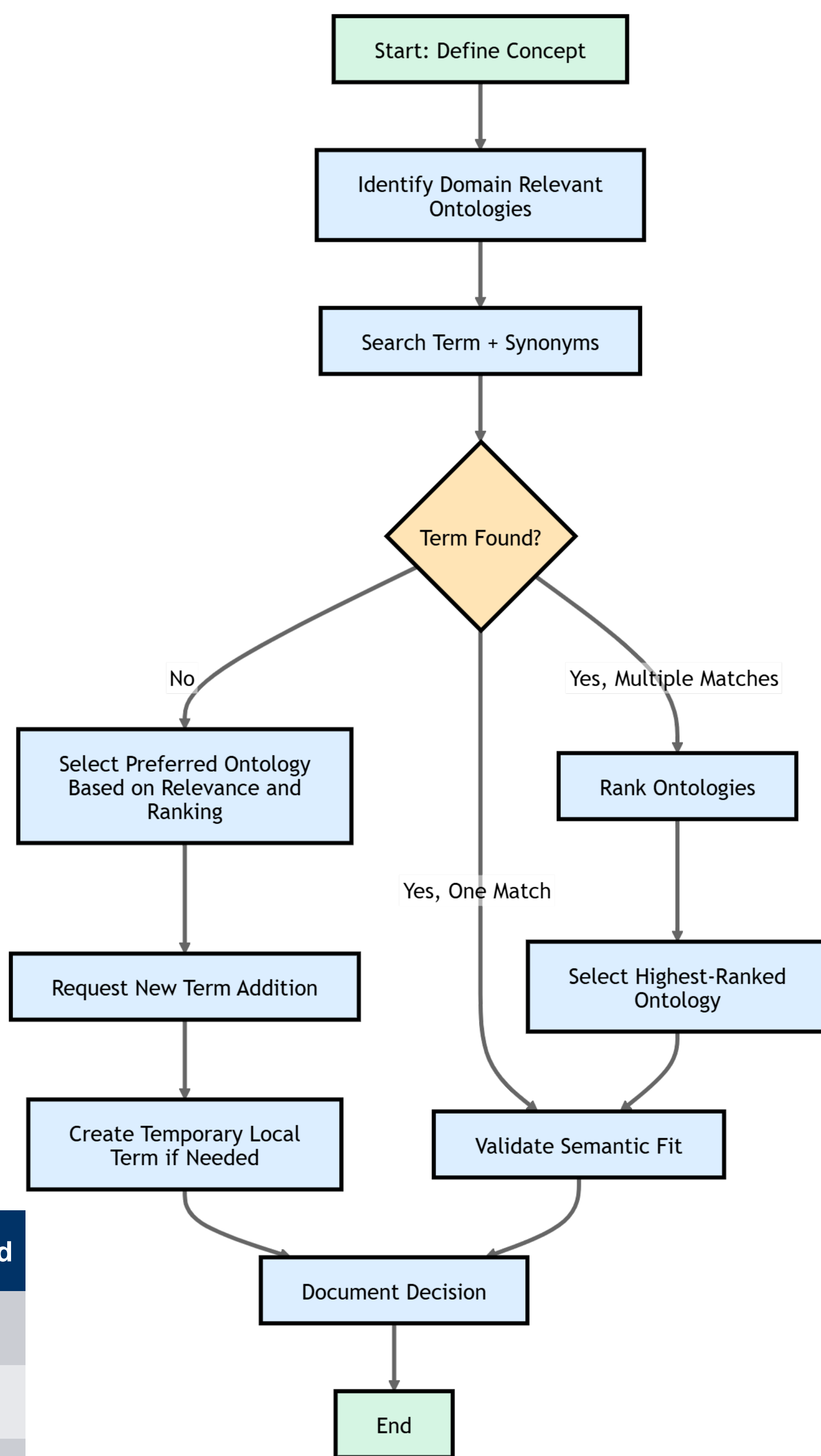
Search Process for Ontology Term (SPOT)

We recommend considering the following criteria when choosing an ontology for data annotation:

- **The ontology has clear textual definition**
- **The ontology is active**
- **The ontology is in machine-readable format**
- **The ontology has been used by other repositories or studies**
- **The ontology has been reused by other ontologies**

Each ontology can be ranked by compliance with these criteria (1 point per criterion, or they can be weighted differently).

Criteria	FoodOn	OntoFood
The ontology has clear textual definition	1	0
The ontology is active	1	0
The ontology is in machine-readable format	1	1
The ontology has been used by other repositories or studies	1	0
The ontology has been reused by other ontologies	1	1
Total	5	2



← **Example:** You are looking for a BREAD term. The term is present in *two* FOOD ontologies, OntoFood (OF) and The FoodOn Food Ontology (FOODON). Based on the SPOT criteria, which ontology's term should be used?

Resources for Exposomics & EHS Researchers

DOMAIN	SUGGESTED ONTOLOGY	SUPPLEMENTAL RESOURCE
POPULATIONS OF INTEREST	HANCESTRO: Human Ancestry Ontology PATO: Phenotypic Quality Ontology OMRSE: Ontology of Medically Related Social Entity	–
HUMAN ENDPOINTS/OUTCOMES	DOID: Human Disease Ontology HPO: Human Phenotype Ontology CMO: Clinical Measurement Ontology	PROMIS® (Patient-Reported Outcomes Measurement Information Systems) OECD Harmonized Templates/IUCLID PhenX (consensus measures for Phenotypes and eXposures) Toolkit
CHEMICALS	ChEBI: Chemical Entities of Biological Interest PubChem	CompTox Chemicals Dashboard
EXPOSURE SOURCES AND CHARACTERIZATION	EXO: Exposure Ontology ECTO: Environmental Conditions, Treatments and Exposures Ontology ENVO: The Environment Ontology	–
LAB INSTRUMENTATION	OBI: Ontology of Biomedical Investigation	–
BIO PROCESSES	BioPax: Biological Pathway Exchange EFO: Experimental Factor Ontology RXNO: Name Reaction Ontology/Molecular Process Ontology GENO: Genotype Ontology	–
SAMPLE MATRICES	Uberon: Uber-Anatomy Ontology	–
CONFOUNDERS	NCIT: NCI Thesaurus FOODON: Food Ontology	PhenX (consensus measures for Phenotypes and eXposures) Toolkit
STATISTICAL ANALYSIS	STATO: The Statistical Methods Ontology EDAM: The Ontology of Data Analysis and Management UO: Unit Ontology	–
STUDY DESIGN	OBI: Ontology of Biomedical Investigation ICO: Informed Consent Ontology NCIT: NCI Thesaurus EFO: Experimental Factor Ontology	OECD Harmonized Templates/IUCLID
QUALITY CONTROL	SEVCO: Scientific Evidence Code System** ECO: Evidence and Conclusion Ontology	–

**Limited adoption

Feedback request

Please provide your feedback and suggestions for included resources and gaps in EHS ontologies using this form:



Gaps in EHS Ontologies

DOMAIN	SUBDOMAIN	ONGOING EFFORTS
EXPOSURE SOURCES AND CHARACTERIZATION	Detailed description of stressors/exposures including dosimetry, time since exposure, dose-response relationships and uncertainty in risk estimates	--
EXPOSURE SOURCES AND CHARACTERIZATION	Reporting place-based measurements of environmental exposures	ESIP GeoData4Health GA4GHEnvironmental Exposure and Human Health Working Group
CONFOUNDERS	Representation of concepts related to social determinants of health	--
QUALITY CONTROL	Measures of study quality	--