

Chapter 1

Introduction

The RAKIP Markup Language (RakML) is an XML-based format for the description of model metadata.
...

Chapter 2

Technical specification

2.1 Primitive data types

The primitive data types used in RAKIP-ML are taken from the XML Schema 1.0 including: **string**, **boolean**, **int** and **date**.

2.2 General structure

Every RAKIP model involves four main metadata components: general information, scope, data background and model math. A RAKIP-ML document has one model with these components.

2.3 Common types

2.3.1 Assay

Element	Type	Min. Occurrences	Max. Occurrences
Name	string	1	1
Description	string	0	1
MoisturePercentage	string	0	1
FatPercentage	string	0	1
DetectionLimit	string	0	1
QuantificationLimit	string	0	1
LeftCensoredData	string	0	1
ContaminationRange	string	0	1
UncertaintyValue	string	0	1

Name A name given to the assay.

Description General description of the assay. Corresponds to the Protocol REF in ISA.

MoisturePercentage Percentage of moisture in the original sample.

FatPercentage Percentage of fat in the original sample.

DetectionLimit Limit of detection reported in the unit specified by the variable “Hazard Unit”.

QuantificationLimit Limit of quantification reported in the unit specified by the variable “Hazard Unit”.

LeftCensoredData Percentage of measures equal to LOQ and/or LOD.

ContaminationRange Range of result of the analytical measure reported in the unit specified by the variable “Hazard unit”.

UncertaintyValue Indicate the expanded uncertainty (usually 95% confidence interval) value associated with the measurement expressed in the unit reported in the field “Hazard unit”.

Listing 2.1: Example of Assay

```
<Name>Bradford protein assay</Name>
<Description>spectroscopic analytical procedure used to measure
the concentration of protein in a solution. It is subjective,
i.e., dependent on the amino acid composition of the
measured protein.
</Description>
<DetectionLimit>30–300</DetectionLimit>
<QuantificationLimit>5000 – 8000</QuantificationLimit>
<ContaminationRange>500–4000</ContaminationRange>
```

2.3.2 Contact

Element	Type	Min. Occurrences	Max. Occurrences
Title	string	0	1
FamilyName	string	0	1
GivenName	string	0	1
Email	string	1	1
Telephone	string	0	1
StreetAddress	string	0	1
Country	string	0	1
City	string	0	1
ZipCode	string	0	1
Region	string	0	1
TimeZone	string	0	1
Gender	string	0	1
Note	string	0	1
Organization	string	0	1

Listing 2.2: Example of Contact

```
<Title>Dr.</Title>
<FamilyName>Romanov</FamilyName>
<GivenName>Natalia</GivenName>
<Email>black_widow@marvel.com</Email>
<Telephone>030 12345</Telephone>
<StreetAddress>Nahmitzer Damm 40</StreetAddress>
<Country>Russian Federation</Country>
<City>Berlin</City>
<Region>Berlin–Brandenburg</Region>
<Organization>SHIELD</Organization>
```

2.3.3 Exposure

Element	Type	Min. Occurrences	Max. Occurrences
Type	string	1	1
UncertaintyEstimation	string	0	1
MethodologicalTreatmentOfLeftCensoredData	string	0	*
LevelOfContaminationAfterLeftCensoredDataTreatment	string	0	*
Scenario	string	0	*

Type Type of the exposure

UncertaintyEstimation Analysis to estimate uncertainty

MethodologicalTreatmentOfLeftCensoredData describe the mathematical method to replace left-censored data: recommendation of WHO (2013), distribution or others

LevelOfContaminationAfterLeftCensoredDataTreatment describe the range of of the level of contamination after left censored data treatment

Scenario describe the different scenario of exposure assessment

2.3.4 Hazard

Element	Type	Min. Occurrences	Max. Occurrences
Type	string	0	1
Name	string	1	1
Description	string	0	1
Unit	string	0	1
AdverseEffect	string	0	1
SourceOfContamination	string	0	1
BenchmarkDose	string	0	1
MaximumResidueLimit	string	0	1
NoObservedAdverseAffectLevel	string	0	1
AcceptableOperatorExposureLevel	string	0	1
AcuteReferenceDose	string	0	1
AcceptableDailyIntake	string	0	1
IndSum	string	0	1

Type General classification of the hazard for which the model or data applies.

Name Name of the hazard for which the model or data applies.

Description Description of the hazard for which the model or data applies.

Unit Unit of the hazard for which the model or data applies.

AdverseEffect Morbidity, mortality, origin.

SourceOfContamination Source of contamination, origin.

BenchmarkDose A dose or concentration that produces a predetermined change in response rate of an adverse effect (called the benchmark response or BMR) compared to background.

MaximumResidueLimit International regulations and permissible maximum residue levels in food and drinking water.

NoObservedAdverseAffectLevel Level of exposure of an organism, found by experiment or observation, at which there is no biologically or statistically significant increase in the frequency or severity of any adverse effects in the exposed population when compared to its appropriate control.

LowestObservedAdverseAffectLevel Lowest concentration or amount of a substance found by experiment or observation that causes an adverse alteration of morphology, function, capacity, growth, development, or lifespan of a target organism distinguished from normal organisms of the same species under defined conditions of exposure.

AcceptableOperatorExposureLevel Maximum amount of active substance to which the operator may be exposed without any adverse health effects. The AOEL is expressed as milligrams of the chemical per kilogram body weight of the operator.

AcuteReferenceDose An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for an acute duration (24 hours or less) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

AcceptableDailyIntake Measure of amount of a specific substance in food or in drinking water that can be ingested (orally) on a daily basis over a lifetime without an appreciable health risk.

IndSum Define if the parameter reported is an individual residue/analyte, a summed residue definition or part of a sum a summed residue definition.

Listing 2.3: Example of Hazard

```
<Type>Organic contaminants</Type>
<Name>Norovirus (Norwalk-like virus)</Name>
<Description>norovirus is described as nast and hard to get rid
of</Description>
<Unit>CFU</Unit>
<AdverseEffect>morbidity</AdverseEffect>
<SourceOfContamination>sewage</SourceOfContamination>
<MaximumResidueLimit>0.01 mg/kg</MaximumResidueLimit>
<NoObservedAdverseAffectLevel>10 mg</NoObservedAdverseAffectLevel>
<LowestObservedAdverseAffectLevel>40 mg</LowestObservedAdverseAffectLevel>
<AcceptableOperatorExposureLevel>50 mg</AcceptableOperatorExposureLevel>
<AcuteReferenceDose>80 mg</AcuteReferenceDose>
<AcceptableDailyIntake>20 mg</AcceptableDailyIntake>
```

2.3.5 Laboratory

Element	Type	Min. Occurrences	Max. Occurrences
Accreditation	string	0	1
Name	string	0	1
Country	string	0	1

Accreditation The laboratory accreditation to ISO/IEC 17025.

Name Laboratory code (National laboratory code if available) or Laboratory name

Country Country where the laboratory is placed. (ISO 3166-1-alpha-2).

Listing 2.4: Example of Laboratory

```
<Accreditation>Accredited</Accreditation>
<Name>National High Magnetic Field Laboratory</Name>
<Country>United States</Country>
```

2.3.6 ModelCategory

Element	Type	Min. Occurrences	Max. Occurrences
ModelClass	string	1	1
ModelSubClass	string	0	1
ModelClassComment	string	0	1
BasicProcess	string	0	1

ModelClass Type of model used to build-up the risk assessment structure.

ModelSubClass Sub-classification of the model given the Model Class

BasicProcess Defines the impact of the specific process on the hazard

Listing 2.5: Example of ModelCategory

```
<ModelClass>Dose-response model</ModelClass>  
<ModelClassComment>This Model Class is very special</ModelClassComment>
```

2.3.7 ModelEquation

Element	Type	Min. Occurrences	Max. Occurrences
Name	string	1	1
Class	string	0	1
ModelEquation	string	1	1
Reference	string	1	1
ModelHypothesis	string	0	*

Name A name given to the model equation

Class Information on that helps to categorize model equations

ModelEquation The pointer to the file that holds the software code (e.g. R-script)

Reference Information on the source, where the equation has been extracted from - if available

2.3.8 Parameter

Element	Type	Min. Occurrences	Max. Occurrences
Id	string	1	1
Classification	string	1	1
Name	string	1	1
Description	string	0	1
Unit	string	1	1
UnitCategory	string	0	1
DataType	string	0	1
Source	string	0	1
Subject	string	0	1
Distribution	string	0	1
Value	string	0	1
Reference	Reference	0	*
VariabilitySubject	string	0	1
MinValue	string	0	1
MaxValue	string	0	1
Error	string	0	1

Id An unambiguous and sequential ID given to the parameter. To be compatible with SBML, only letters from A to Z, numbers and “_” are accepted for ID creation.

Classification General classification of the parameter (e.g. Input, Constant, Output...).

Name A name given to the parameter.

Description General description of the parameter.

Unit Unit of the parameter.

UnitCategory General classification of the parameter unit.

DataType Information on the data format of the parameter, e.g. if it is a categorical variable, int, double, array of size x,y,z.

Source Information on the type of knowledge used to define the parameter value.

Subject Scope of the parameter, e.g. if it refers to an animal, a batch of animals, a batch of products, a carcass, a carcass skin etc.

Distribution Information on the distribution describing the parameter (e.g. variability, uncertainty, point estimate...) .

Value Numerical value of the parameter. A default value is mandatory (needs to be provided) for each of the the “Input parameters”. If the parameter value is provided in a file, the path of the file needs to be provided.

Reference Information on the source, where the value of the parameter has been extracted from - if available. The format should use that used in other “Reference” metadata. Preferably DOI.

VariabilitySubject Information “per what” the variability is described. It can be variability between broiler in a flock, variability between all meat packages sold in Denmark, variability between days, etc.

MinValue Numerical value of the minimum limit of the parameter that determines the range of applicability for which the model applies

MaxValue Numerical value of the maximum limit of the parameter that determines the range of applicability for which the model applies

Error Error of the parameter value.

Listing 2.6: Example of Parameter

```
<Id>Dose_matrix</Id>
<Classification>input</Classification>
<Name>Dose_matrix</Name>
<Description>matrix with GEC NoV for each serving (rows=servings;
  columns = number of different employee-teams that prepare food)
</Description>
<Unit>Others</Unit>
<UnitCategory>Other</UnitCategory>
<DataType>matrixOfNumbers</DataType>
<Source>Article</Source>
<Subject>Animal</Subject>
<Distribution>Bernoulli 1</Distribution>
<Value>as.matrix(read.table(file =\"Dose_matrix.csv\",sep=\",\",
  header = TRUE, row.names=1))</Value>
<VariabilitySubject>days</VariabilitySubject>
<MinValue>10000.0</MinValue>
<MaxValue>0.0</MaxValue>
<Error>0.5</Error>
```

2.3.9 PopulationGroup

Element	Type	Min. Occurrences	Max. Occurrences
Name	string	1	1
TargetPopulation	string	0	1
PopulationSpan	string	0	*
PopulationDescription	string	0	*
PopulationAge	string	0	*
PopulationGender	string	0	1
BMI	string	0	*
SpecialDietGroups	string	0	*
PatternConsumption	string	0	*
Region	string	0	*
Country	string	0	*
PopulationRiskFactor	string	0	*
Season	string	0	*

Name Name of the population for which the model or data applies

TargetPopulation population of individual that we are interested in describing and making statistical inferences about

PopulationSpan Temporal information on the exposure duration

PopulationDescription Description of the population for which the model applies (demographic and socio-economic characteristics for example). Background information that are needed in the data analysis phase: size of household, education level, employment status, professional category, ethnicity, etc.

PopulationAge describe the range of age or group of age

PopulationGender describe the percentage of gender

BMI describe the range of BMI or class of BMI or BMI mean

SpecialDietGroups sub-population with special diets (vegetarians, diabetics, group following special ethnic diets)

PatternConsumption describe the consumption of different food items: frequency, portion size

Region Spatial information (area) on which the population group of the model or data applies

Country Country on which the population group of the model or data applies

PopulationRiskFactor population risk factor that may influence the outcomes of the study, confounder should be included

Season distribution of surveyed people according to the season (influence consumption pattern)

Listing 2.7: Example of PopulationGroup

```

<Name>human consumer, no age specification</Name>
<TargetPopulation>seniors</TargetPopulation>
<PopulationDescription>
  80% are considered susceptible to infection
</PopulationDescription>

```



```

<PopulationGender>50% male</PopulationGender>
<BMI>18.5 – 24.9</BMI>
<SpecialDietGroups>love cake</SpecialDietGroups>
<Region>Madrid</Region>
<Country>Spain</Country>
<PopulationRiskFactor>low physical activity</PopulationRiskFactor>
<Season>spring</Season>

```

2.3.10 QualityMeasures

Element	Type	Min. Occurrences	Max. Occurrences
SSE	double	0	1
MSE	double	0	1
RMSE	double	0	1
RSquared	double	0	1
AIC	double	0	1
BIC	double	0	1

Listing 2.8: Example of QualityMeasures

```

<SSE>0.0</SSE>
<MSE>0.2</MSE>
<RMSE>0.3</RMSE>
<RSquared>0.9</RSquared>
<AIC>0.0</AIC>
<BIC>1.0</BIC>

```

2.3.11 Reference

Element	Type	Min. Occurrences	Max. Occurrences
IsReferenceDescription	boolean	1	1
Type	string	0	1
Date	string	0	1
Pmid	string	0	1
Doi	string	0	1
AuthorList	string	0	1
Title	string	1	1
Abstract	string	0	1
Journal	string	0	1
R Volume	int	0	1
Issue	int	0	1
Status	string	0	1
Website	string	0	1
Comment	string	0	1

IsReferenceDescription Indicates whether the publication serves as the reference description for the model.

Type Type of the publication. Takes a value from the reserved words listed at [2.1](#).

Year Temporal information on the publication date.

Pmid The PubMed ID related to this publication.

Doi The DOI related to this publication.

AuthorList Name and surname of the authors who contributed to this publication.

ABST	CHAP	DICT	GEN	MANSCPT	PCOMM	VIDEO
ADVS	CHART	EBOOK	GOVDOC	MAP	RPRT	
AGGR	CLSWK	ECHAP	GRANT	MGZN	SER	
ANCIENT	COMP	EDBOOK	HEAR	MPCT	SLIDE	
ART	CONF	EDJOUR	ICOMM	MULTI	SOUND	
BILL	CPAPER	ELECT	INPR	MUSIC	STAND	
BLOG	CTLG	ENCYC	JOUR	NEW	STAT	
BOOK	DATA	EQUA	JFULL	PAMP	THES	
CASE	DBASE	FIGURE	LEGAL	PAT	UNPB	

Table 2.1: Publication types

Title Title of the publication in which the model or the data has been described.

Abstract Abstract of the publication in which the model or the data has been described.

Journal Publication journal.

Volume Publication volume.

Issue Publication issue.

Status Publication status.

Website Publication website.

Comment Publication comment.

Listing 2.9: Example of Reference

```

<IsReferenceDescription>true</IsReferenceDescription>
<Type>PAMP</Type>
<Date>3805-07-02</Date>
<Doi>10.1111/risa.12758</Doi>
<AuthorList>Jack Bauer, Kiefer Sutherland</AuthorList>
<Title>Quantitative Risk Assessment of Norovirus Transmission in Food Establishments:
    Evaluating the Impact of Intervention Strategies and Food Employee Behavior on
    the Risk Associated with Norovirus in Foods.
</Title>
<Abstract>
    This research looks at the work of Margaret C. Anderson, the editor of the
    Little Review. The review published first works by Sherwood Anderson, James
    Joyce, Wyndham Lewis, and Ezra Pound. This research draws upon mostly primary
    sources including memoirs, published letters, and a complete collection of the
    Little Review. Most prior research on Anderson focuses on her connection to the
    famous writers and personalities that she published and associated with. This
    focus undermines her role as the dominant creative force behind one of the most
    influential little magazines published in the 20th Century. This case example
    shows how little magazine publishing is arguably a literary art.
</Abstract>
<Status>Accepted</Status>
<Website>https://nature.com</Website>
<Comment>publisher demands edits</Comment>

```

2.3.12 SpatialInformation

Element	Type	Min. Occurrences	Max. Occurrences
Region	string	0	1
Country	string	0	1

Region Spatial information (area) on which the model or data applies.

Country Country on which the model or data applies.

Listing 2.10: Example of SpatialInformation

```
<Region>Bayern</Region>  
<Country>Germany</Country>
```

2.3.13 Study

Element	Type	Min. Occurrences	Max. Occurrences
Identifier	string	0	1
Title	string	1	1
Description	string	0	1
DesignType	string	0	1
AssayMeasurementType	string	0	1
AssayTechnologyType	string	0	1
AssayTechnologyPlatform	string	0	1
AccreditationProcedureForTheAssayTechnology	string	0	1
ProtocolName	string	0	1
ProtocolType	string	0	1
ProtocolDescription	string	0	1
ProtocolURI	string	0	1
ProtocolParametersName	string	0	1
ProtocolComponentsName	string	0	1
ProtocolComponentsType	string	0	1

Identifier A user defined identifier for the study

Title A title for the Study.

Description A brief description of the study aims.

DesignType The type of study design being employed.

AssayMeasurementType The measurement being observed in this assay.

AssayTechnologyType The technology being employed to observe this measurement.

AssayTechnologyPlatform The technology platform used.

AccreditationProcedureForTheAssayTechnology Accreditation procedure for the analytical method used.

ProtocolName The name of the protocol, e.g.Extraction Protocol.

ProtocolType The type of the protocol, preferably coming from an Ontology, e.g. Extraction Protocol.

ProtocolDescription A description of the Protocol.

ProtocolURI A URI to link out to a publication, web page, etc. describing the protocol.

ProtocolParametersName The parameters used when executing this protocol.

ProtocolComponentsType The components used when carrying out this protocol.

Listing 2.11: Example of Study

```
<Identifier>Study_Generic_Sheet_1</Identifier>
<Title>Quantitative Risk Assessment of Norovirus Transmission in Food
Establishments: Evaluating the Impact of Intervention Strategies
and Food Employee Behavior on the Risk Associated with Norovirus
in Foods.
</Title>
<Description>This Study will show, whether the FSK Lab will correctly
read and run a generic and fully annotated model.
</Description>
<DesignType>Trial and Error</DesignType>
<AssayMeasurementType>It works or it doesn't</AssayMeasurementType>
<AssayTechnologyType>Anatomic-pathologic Tests</AssayTechnologyType>
<AssayTechnologyPlatform>Orbital Platform</AssayTechnologyPlatform>
<AccreditationProcedureForTheAssayTechnology>ISO/IEC17025
</AccreditationProcedureForTheAssayTechnology>
<ProtocolName>Extraction Protocol of FSK</ProtocolName>
<ProtocolType>Extraction Protocol</ProtocolType>
<ProtocolDescription>The protocol is definitely not made up</ProtocolDescription>
<ProtocolURI>https://url-for-study-protocol-location.bfr.bund.de</ProtocolURI>
<ProtocolVersion>version 1.0</ProtocolVersion>
<ProtocolParametersName>Parameter 1</ProtocolParametersName>
<ProtocolComponentsName>windows pc</ProtocolComponentsName>
<ProtocolComponentsType>hardware</ProtocolComponentsType>
```

2.3.14 StudySample

Element	Type	Min. Occurrences	Max. Occurrences
SampleName	string	1	1
ProtocolOfSampleCollection	string	1	1
SamplingStrategy	string	0	1
TypeOfSamplingProgram	string	0	1
SamplingMethod	string	0	1
SamplingPlan	string	1	1
SamplingWeight	string	1	1
SamplingSize	string	1	1
LotSizeUnit	string	0	1
SamplingPoint	string	1	1

SampleName An unambiguous ID given to the samples used in the assay.

ProtocolOfSampleCollection Additional protocol for sample and sample collection. Corresponds to the Protocol REF in ISA.

SamplingStrategy Sampling strategy (ref. EUROSTAT - Typology of sampling strategy, version of July 2009).

TypeOfSamplingProgram Indicate the type of programm for which the samples have been collected.

SamplingMethod Sampling method used to take the sample.

SamplingPlan description of data collection technique: stratified or complex sampling (several stages).

SamplingWeight description of the method employed to compute sampling weight (nonresponse-adjusted weight).

SamplingSize number of units, full participants, partial participants, eligibles, not eligible, unresolved (eligibility status not resolved)...

LotSizeUnit Unit in which the lot size is expressed.

SamplingPoint Point in the food chain where the sample was taken. (Doc. ESTAT/F5/ES/155 “Data dictionary of activities of the establishments”).

Listing 2.12: Example of StudySample

```
<SampleName>Sample 1</SampleName>
<ProtocolOfSampleCollection>SampleID.1</ProtocolOfSampleCollection>
<SamplingStrategy>Convenient sampling</SamplingStrategy>
<TypeOfSamplingProgram>Diet study</TypeOfSamplingProgram>
<SamplingMethod>According to Reg 152/2009</SamplingMethod>
<SamplingPlan>Random sampling</SamplingPlan>
<SamplingWeight>description of the method employed to compute sampling
weight (nonresponse-adjusted weight)
</SamplingWeight>
<SamplingSize>10000.0</SamplingSize>
<LotSizeUnit>log10(CFU/25g)</LotSizeUnit>
<SamplingPoint>Catering</SamplingPoint>
```

Chapter 3

GenericModel

3.1 GeneralInformation

Element	Type	Min. Ourrences	Max. Ourrences
Name	string	1	1
Source	string	0	1
Identifier	string	1	1
Author	Contact	1	1
Creator	Contact	1	1
CreationDate	date	1	1
ModificationDate	date	0	*
Rights	string	1	1
Available	string	0	1
Format	string	0	1
Reference	Reference	1	*
Language	string	0	1
Software	string	0	1
LanguageWrittenIn	string	0	1
ModelCategory	ModelCategory	0	1
Status	string	0	1
Objective	string	0	1
Description	string	0	1

Name Name given to the model or data.

Source A related resource from which the described resources is derived.

Identifier An unambiguous ID given to the model or data.

Author Person who generated the model code or generated the data set originally.

Creator The person responsible for creating the model file in the present form or the person responsible for creating the data file in the present form.

CreationDate Temporal information on the model creation date.

ModificationDate Temporal information on the last modification of the model.

Rights Information on rights held in and over the resource.

Available Availability of data or model.

Format Form of model or data (file extension).

Reference

Language Language of the resource.

Software Program in which the model has been implemented.

LanguageWrittenIn Language used to write the model, e.g. R or Matlab.

ModelCategory

Status Curation status of the model.

Objective Objective of the model or data.

Description General description of the study, data or model.

3.2 Scope

Element	Type	Min. Occurrences	Max. Occurrences
Product	Product	0	*
Hazard	Hazard	0	*
PopulationGroup	PopulationGroup	0	*
GeneralComment	string	0	1
TemporalInformation	string	0	—
1 SpatialInformation	SpatialInformation	0	1

3.2.1 Product

Element	Type	Min. Occurrences	Max. Occurrences
Name	string	1	1
Description	string	0	1
Unit	string	0	1
Method	string	0	1
Packaging	string	0	1
Treatment	string	0	1
OriginCountry	string	0	1
OriginArea	string	0	1
FisheriesArea	string	0	1
ProductionDate	date	0	1
ExpiryDate	date	0	1

Name The product-matrix (animal, food product, matrix, lab media, etc.) for which the model or data applies

Description Description of the product-matrix (animal, food product, matrix, lab media, etc.) for which the model or data applies

Unit Units of the product-matrix for which the model or data applies

Method Type of production for the product/ matrix

Packaging Describe container or wrapper that holds the product/matrix. Common type of packaging: paper or plastic bags, boxes, tinplate or aluminium cans, plastic trays, plastic bottles, glass bottles or jars.

Treatment Used to characterise a product/matrix based on the treatment or processes applied to the product or any indexed ingredient.

OriginCountry Country of origin of the food/product (ISO 3166-1-alpha-2 country code).

OriginArea Area of origin of the food/product (Nomenclature of territorial units for statistics – NUTS – coding system valid only for EEA and Switzerland).

FisheriesArea Fisheries or aquaculture area specifying the origin of the sample (FAO Fisheries areas).

ProductionDate date of production of food/product

ExpiryDate date of expiry of food/product

3.3 DataBackground

Element	Type	Min. Occurrences	Max. Occurrences
Study	Study	0	1
StudySample	StudySample	0	*
DietaryAssessmentMethod	DietaryAssessmentMethod	0	*
Laboratory	Laboratory	0	*
Assay	Assay	0	*

3.3.1 DietaryAssessmentMethod

Element	Type	Min. Occurrences	Max. Occurrences
CollectionTool	string	0	1
NumberOfNonConsecutiveOneDay	string	0	1
SoftwareTool	string	0	1
NumberOfFoodItems	string	0	1
RecordTypes	string	0	1
FoodDescriptors	string	0	1

CollectionTool food diaries, interview, 24-hour recall interview, food propensity questionnaire, portion size measurement aids, eating outside questionnaire

RecordTypes consumption occasion, mean of consumption, quantified and described as eaten, recipes for self-made

FoodDescriptors use foodex2 facets

3.4 ModelMath

Element	Type	Min. Ocurrances	Max. Ocurrances
Parameter	Parameter	1	*
QualityMeasures	QualityMeasures	0	1
ModelEquation	ModelEquation	0	1
FittingProcedure	string	0	1
Exposure	Exposure	0	1
Event	string	0	1

Chapter 4

DoseResponseModel

4.1 GeneralInformation

Element	Type	Min. Ourrences	Max. Ourrences
ModelName	string	1	1
Source	string	0	1
Identifier	string	0	1
Author	Contact	0	*
Creator	Contact	1	*
CreationDate	date	1	1
ModificationDate	date	0	*
Rights	string	1	1
Available	boolean	0	1
Format	string	0	1
Reference	Reference	0	*
Language	string	0	1
Software	string	0	1
LanguageWrittenIn	string	1	1
ModelCategory	ModelCategory	0	1
Status	string	0	1
Objective	string	0	1
Description	string	0	1

ModelName Name given to the model.

Source Related resource from which the described resource is derived.

Identifier Unambiguous ID given to the model.

Author Person who generated the model code originally.

Creator Person or institution who contributed to the encoding of the model in its present form by creating the model file.

CreationDate Temporal information on the model creation date.

ModificationDate Temporal information on the last modification of the model.

Rights Information on rights held in an over the resource.

Available Availability of model.

Format Form of the model (file extension).

Language Language of the resource (some data or reports can be available in French language for example).

Software Program in which the model has been implemented.

LanguageWrittenIn Language used to write the model, e.g. R or MatLab

Status Curation status of the model.

Objective Objective of the model.

Description General description of the model.

4.2 Scope

Element	Type	Min. Occurrences	Max. Occurrences
Hazard	string	1	*
PopulationGroup	PopulationGroup	0	*
GeneralComment	string	0	1
TemporalInformation	string	0	1
SpatialInformation	SpatialInformation	0	1

4.3 DataBackground

Element	Type	Min. Occurrences	Max. Occurrences
Study	Study	1	1
StudySample	StudySample	0	*
Laboratory	Laboratory	0	*
Assay	Assay	0	*

4.4 ModelMath

Element	Type	Min. Occurrences	Max. Occurrences
Parameter	Parameter	1	*
QualityMeasures	QualityMeasures	0	1
ModelEquation	ModelEquation	0	1
FittingProcedure	string	0	1
Exposure	Exposure	0	1
Event	string	0	1

.1 GenericModel

Listing 1: Example of GenericModel

```
<?xml version="1.0" encoding="UTF-8" ?>
<Document xmlns="http://www.example.org/GenericModel1.0.3">
  <GenericModel xmlns="http://www.example.org/GenericModel1.0.3">
    <GeneralInformation>
      <Name>Toy Model for Testing Purposes</Name>
      <Source>
        UNPUBLISHED STUDIES (EXPERIMENTS–OBSERVATIONS): Studies
        and surveys
      </Source>
      <Identifier>Toy_Model_Generic_01</Identifier>
      <Author>
        <Title>Dr.</Title>
        <FamilyName>Romanov</FamilyName>
        <GivenName>Natalia</GivenName>
        <Email>black_widow@marvel.com</Email>
        <Telephone>030 12345</Telephone>
        <StreetAddress>Nahmitzer Damm 40</StreetAddress>
        <Country>Russian Federation</Country>
        <City>Berlin</City>
        <Region>Berlin–Brandenburg</Region>
        <Organization>SHIELD</Organization>
      </Author>
      <Creator>
        <Title>Dr.</Title>
        <FamilyName>Romanov</FamilyName>
        <GivenName>Natalia</GivenName>
        <Email>black_widow@marvel.com</Email>
        <Telephone>030 12345</Telephone>
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        <Country>Russian Federation</Country>
        <City>Berlin</City>
        <Region>Berlin–Brandenburg</Region>
        <Organization>SHIELD</Organization>
      </Creator>
      <Creator>
        <Title>Mr.</Title>
        <FamilyName>Parker</FamilyName>
        <GivenName>Peter</GivenName>
        <Email>peter@parker.com</Email>
        <Telephone>03301 1369158</Telephone>
        <StreetAddress>Am Kleinen Wannsee 16</StreetAddress>
        <Country>United States</Country>
        <City>Potsdam</City>
        <Region>Brandenburg</Region>
        <Organization>Parker Industries</Organization>
      </Creator>
      <CreationDate>2018–04–20</CreationDate>
      <Rights>Creative Commons Attribution–NonCommercial 4.0</Rights>
      <Format>.fskx</Format>
      <Reference>
        <IsReferenceDescription>true</IsReferenceDescription>
        <Type>PAMP</Type>
        <Date>3805–07–02</Date>
        <Doi>10.1111/risa.12758</Doi>
        <AuthorList>Jack Bauer, Kiefer Sutherland</AuthorList>
        <Title>Quantitative Risk Assessment of Norovirus Transmission
        in Food Establishments: Evaluating the Impact of
        Intervention Strategies and Food Employee Behavior on the
        Risk Associated with Norovirus in Foods
        </Title>
        <Abstract>
          This research looks at the work of Margaret C. Anderson,
          the editor of the Little Review. The review published first
          works by Sherwood Anderson, James Joyce, Wyndham Lewis,
          and Ezra Pound. This research draws upon mostly primary
          sources including memoirs, published letters, and a
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complete collection of the Little Review. Most prior research on Anderson focuses on her connection to the famous writers and personalities that she published and associated with. This focus undermines her role as the dominant creative force behind one of the most influential little magazines published in the 20th Century. This case example shows how little magazine publishing is arguably a literary art.

</Abstract>
 <Status>Accepted</Status>
 <Website>https://nature.com</Website>
 <Comment>publisher demands edits</Comment>
 </Reference>
 <Reference>
 <IsReferenceDescription>>true</IsReferenceDescription>
 <Date>3805-07-07</Date>
 <Doi>10.1002/jmv.21237</Doi>
 <AuthorList>James Bond, Timothy Dalton</AuthorList>
 <Title>Norwalk virus: How infectious is it?</Title>
 <Abstract>This project involves discovering how the American Revolution was remembered during the nineteenth century. The goal is to show that the American Revolution was memorialized by the actions of the United States government during the 1800s. This has been done by examining events such as the Supreme Court cases of John Marshall and the Nullification Crisis. Upon examination of these events, it becomes clear that John Marshall and John Calhoun (creator of the Doctrine of Nullification) attempted to use the American Revolution to bolster their claims by citing speeches from Founding Fathers. Through showing that the American Revolution lives on in memory, this research highlights the importance of the revolution in shaping the actions of the United States government.
 </Abstract>
 <Status>Legal</Status>
 <Website>www.sciencemag.org</Website>
 <Comment>Publisher hates lettuce.</Comment>
 </Reference>
 <Reference>
 <IsReferenceDescription>true</IsReferenceDescription>
 <Type>DICT</Type>
 <Date>3805-07-08</Date>
 <Doi>10.1111/j.1539-6924.1999.tb01143.x</Doi>
 <Title>Dose Response Models For Infectious Gastroenteritis</Title>
 <Abstract>The purpose of this research is to identify a subtype of autism called Developmental Verbal Dyspraxia (DVD). DVD is a motor-speech problem, disabling oral-motor movements needed for speaking. The first phase of the project involves a screening interview where we identify DVD and Non-DVD kids. We also use home videos to validate answers on the screening interview. The final phase involves home visits where we use several assessments to confirm the child's diagnosis and examine the connection between manual and oral motor challenges. By identifying DVD as a subtype of Autism, we will eliminate the assumption that all Autistics have the same characteristics. This will allow for more individual consideration of Autistic people and may direct future research on the genetic factors in autism.
 </Abstract>
 <Status>Peer reviewed</Status>
 <Website>http://www.techbriefs.com</Website>
 <Comment>nerds</Comment>
 </Reference>
 <Language>English</Language>
 <Software>R</Software>
 <LanguageWrittenIn>R 3</LanguageWrittenIn>
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 <ModelClass>Dose-response model</ModelClass>
 <ModelClassComment>
 This Model Class is very special
 </ModelClassComment>

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</ModelCategory>
<Status>Uncurated</Status>
<Objective>Development of a dose–response models for Norwalk virus/
norovirus</Objective>
<Description>A norovirus dose response model is important for
understanding its transmission and essential for development of a
quantitative risk model. A new variant of the hit theory model of
microbial infection was developed to estimate the variation in
Norwalk virus infectivity, as well as the degree of virus aggregation,
consistent with independent (electron microscopic) observations.
Explicit modeling of viral aggregation was used to express virus
infectivity per single infectious unit (particle). The hit theory
model considers microbial infection as the result of a chain of
conditional events: ingestion of one or more organisms from a
Poisson–distributed suspension, followed by successful passage through
any number of defensive barriers that may be present in the host.
Individual organisms are thought to act independently, and any single
surviving organism may reach an appropriate host cell and cause
infection. Heterogeneity in the probability of individual organisms to
achieve infection is modeled as a beta distribution. Illness is an
important endpoint for risk assessment, especially for disease burden
calculations. As illness is conditional on infection
[Teunis et al.,1999], we wanted to study the probability of illness in
infected subjects as a function of the applied dose. We used an
existing model for illness dose response that is based on the concept
of illness hazard during infection [Teunis et al., 1999].
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</GeneralInformation>

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<Product>
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<Description>fresh German lettuce</Description>
<Unit>g</Unit>
<Method>Organice production</Method>
<Packaging>Packed</Packaging>
<Treatment>Freezing</Treatment>
<OriginCountry>Germany</OriginCountry>
<OriginArea>Aachen, Kreisfreie Stadt</OriginArea>
<FisheriesArea>Arctic Sea</FisheriesArea>
<ProductionDate>3911–10–30</ProductionDate>
<ExpiryDate>3911–12–01</ExpiryDate>
</Product>
<Product>
<Name>Tomatoes</Name>
<Description>not so fresh</Description>
<Unit>g</Unit>
<Method>Genetically modified</Method>
<Packaging>Cardboard – paperboard</Packaging>
<Treatment>Heating</Treatment>
<OriginCountry>Spain</OriginCountry>
<OriginArea>Lazio</OriginArea>
<FisheriesArea>Mediterranean and Black Sea</FisheriesArea>
<ProductionDate>3912–12–03</ProductionDate>
<ExpiryDate>3913–02–01</ExpiryDate>
</Product>
<Product>
<Name>
”Meat, preparations of meat, offals, blood, animal fats;
fresh, chilled or frozen, salted, in brine, dried or
smoked or processed as flours or meals; other processed
products such as sausages and food preparations based on
these
</Name>
<Description>
Pretty much any processed meat product imaginable
</Description>
<Unit>g</Unit>
<Method>Farmed domestic or cultivated</Method>
<Packaging>Vacuum package</Packaging>

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    <Treatment>Fermentation</Treatment>
    <OriginCountry>United Kingdom</OriginCountry>
    <OriginArea>East Anglia</OriginArea>
    <FisheriesArea>Atlantic Ocean</FisheriesArea>
    <ProductionDate>3913-05-01</ProductionDate>
    <ExpiryDate>3914-05-01</ExpiryDate>
  </Product>
  <Hazard>
    <Type>Organic contaminants</Type>
    <Name>Norovirus (Norwalk-like virus)</Name>
    <Description>
      norovirus is described as nast and hard to get rid of
    </Description>
    <Unit>CFU</Unit>
    <AdverseEffect>morbidity</AdverseEffect>
    <SourceOfContamination>sewage</SourceOfContamination>
    <MaximumResidueLimit>0.01 mg/kg</MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>
      10 mg
    </NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>
      40 mg
    </LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>
      50 mg
    </AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>80 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>20 mg</AcceptableDailyIntake>
  </Hazard>
  <Hazard>
    <Type>Microorganisms</Type>
    <Name>Salmonella Daarle</Name>
    <Description>
      we dont know how that got into the tomatoes but it is there
    </Description>
    <Unit>Fill</Unit>
    <AdverseEffect>mortality</AdverseEffect>
    <SourceOfContamination>air</SourceOfContamination>
    <MaximumResidueLimit>0.11 mg/kg</MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>
      5 mg
    </NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>
      50 mg
    </LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>
      80 mg
    </AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>100 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>30 mg</AcceptableDailyIntake>
  </Hazard>
  <Hazard>
    <Type>Food additives</Type>
    <Name>Monoammonium glutamate</Name>
    <Description>tastes great but bad for your beach bod</Description>
    <Unit>fg/mL</Unit>
    <AdverseEffect>obesity</AdverseEffect>
    <SourceOfContamination>rodents</SourceOfContamination>
    <BenchmarkDose>123.12</BenchmarkDose>
    <MaximumResidueLimit>
      0.25 - 0.4 mg/kg
    </MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>
      1 mg
    </NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>
      100 mg
    </LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>
      120 mg
  </Hazard>

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    </AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>140 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>90 mg</AcceptableDailyIntake>
</Hazard>
<PopulationGroup>
  <Name>human consumer, no age specification</Name>
  <TargetPopulation>seniors</TargetPopulation>
  <PopulationDescription>
    80% are considered susceptible to infection
  </PopulationDescription>
  <PopulationGender>50% male</PopulationGender>
  <BMI>18.5 – 24.9</BMI>
  <SpecialDietGroups>love cake</SpecialDietGroups>
  <Region>Madrid</Region>
  <Country>Spain</Country>
  <PopulationRiskFactor>
    low physical activity
  </PopulationRiskFactor>
  <Season>spring</Season>
</PopulationGroup>
<PopulationGroup>
  <Name>human consumer, adult</Name>
  <TargetPopulation>soldiers</TargetPopulation>
  <PopulationDescription>highly vaccinated</PopulationDescription>
  <PopulationGender>90% male</PopulationGender>
  <BMI>18.5 – 24.9</BMI>
  <SpecialDietGroups>20% muslim</SpecialDietGroups>
  <Region>Mittelburgenland</Region>
  <Country>Austria</Country>
  <PopulationRiskFactor>bullet to the head</PopulationRiskFactor>
  <Season>summer</Season>
</PopulationGroup>
<PopulationGroup>
  <Name>human consumer, men</Name>
  <TargetPopulation>millenials</TargetPopulation>
  <PopulationDescription>
    they get sick all the time
  </PopulationDescription>
  <PopulationGender>100% male</PopulationGender>
  <BMI>18.5 – 24.9</BMI>
  <SpecialDietGroups>30% vegetarians</SpecialDietGroups>
  <Region>Nottingham</Region>
  <Country>United Kingdom</Country>
  <PopulationRiskFactor>vaping</PopulationRiskFactor>
  <Season>winter</Season>
</PopulationGroup>
<GeneralComment>
  (General Comment) The Scope of this model is universal
</GeneralComment>
<TemporalInformation>1900 – 2000</TemporalInformation>
</Scope>
<DataBackground>
  <Study>
    <Identifier>Study_Generic_Sheet_1</Identifier>
    <Title>Quantitative Risk Assessment of Norovirus Transmission
      in Food Establishments: Evaluating the Impact of
      Intervention Strategies and Food Employee Behavior on the
      Risk Associated with Norovirus in Foods
    </Title>
    <Description>
      This Study will show, whether the FSK Lab will correctly
      read and run a generic and fully annotated model.
    </Description>
    <DesignType>Trial and Error</DesignType>
    <AssayMeasurementType>
      It works or it doesn't
    </AssayMeasurementType>
    <AssayTechnologyType>
      Anatomic–pathologic Tests
    </AssayTechnologyType>
  </Study>

```



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    <AssayTechnologyPlatform>
      Orbital Platform
    </AssayTechnologyPlatform>
    <AccreditationProcedureForTheAssayTechnology>ISO/IEC17025
  </AccreditationProcedureForTheAssayTechnology>
  <ProtocolName>Extraction Protocol of FSK</ProtocolName>
  <ProtocolType>Extraction Protocol</ProtocolType>
  <ProtocolDescription>The protocol is definitely not made up
</ProtocolDescription>
<ProtocolURI>
  https://url-for-study-protocol-location.bfr.bund.de
</ProtocolURI>
<ProtocolVersion>version 1.0</ProtocolVersion>
<ProtocolParametersName>Parameter 1</ProtocolParametersName>
<ProtocolComponentsName>windows pc</ProtocolComponentsName>
<ProtocolComponentsType>hardware</ProtocolComponentsType>
</Study>
<StudySample>
  <SampleName>Sample 1</SampleName>
  <ProtocolOfSampleCollection>
    SampleID.1
  </ProtocolOfSampleCollection>
  <SamplingStrategy>Convenient sampling</SamplingStrategy>
  <TypeOfSamplingProgram>Diet study</TypeOfSamplingProgram>
  <SamplingMethod>According to Reg 152/2009</SamplingMethod>
  <SamplingPlan>Random sampling</SamplingPlan>
  <SamplingWeight>
    description of the method employed to compute sampling
    weight (nonresponse-adjusted weight)
  </SamplingWeight>
  <SamplingSize>10000.0</SamplingSize>
  <LotSizeUnit>log10(CFU/25g)</LotSizeUnit>
  <SamplingPoint>Catering</SamplingPoint>
</StudySample>
<StudySample>
  <SampleName>Sample 2</SampleName>
  <ProtocolOfSampleCollection>
    SampleID.2
  </ProtocolOfSampleCollection>
  <SamplingStrategy>Selective sampling</SamplingStrategy>
  <TypeOfSamplingProgram>Monitoring</TypeOfSamplingProgram>
  <SamplingMethod>According to Reg 333/2007</SamplingMethod>
  <SamplingPlan>Stratified sampling</SamplingPlan>
  <SamplingWeight>
    description of the method employed to compute sampling
    weight (nonresponse-adjusted weight)
  </SamplingWeight>
  <SamplingSize>1000.0</SamplingSize>
  <LotSizeUnit>mL/kg</LotSizeUnit>
  <SamplingPoint>Air transport</SamplingPoint>
</StudySample>
<StudySample>
  <SampleName>Sample 3</SampleName>
  <ProtocolOfSampleCollection>SampleID.3
  </ProtocolOfSampleCollection>
  <SamplingStrategy>Census</SamplingStrategy>
  <TypeOfSamplingProgram>Control and eradication programmes
  </TypeOfSamplingProgram>
  <SamplingPlan>Multi-stage random sampling</SamplingPlan>
  <SamplingWeight>
    description of the method employed to compute sampling
    weight (nonresponse-adjusted weight)
  </SamplingWeight>
  <SamplingSize>2000.0</SamplingSize>
  <LotSizeUnit>mL/kg</LotSizeUnit>
  <SamplingPoint>Household</SamplingPoint>
</StudySample>
<DietaryAssessmentMethod>
  <CollectionTool>Food diaries</CollectionTool>
  <NumberOfNonConsecutiveOneDay>

```

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5
</NumberOfNonConsecutiveOneDay>
<SoftwareTool>FoodWorks</SoftwareTool>
<RecordTypes>Mean of consumption</RecordTypes>
<FoodDescriptors>(Beet) Sugar</FoodDescriptors>
</DietaryAssessmentMethod>
<DietaryAssessmentMethod>
  <CollectionTool>Other observational studies</CollectionTool>
  <NumberOfNonConsecutiveOneDay>
    10
  </NumberOfNonConsecutiveOneDay>
  <SoftwareTool>Nutritics</SoftwareTool>
  <RecordTypes>Quantified and described as eaten</RecordTypes>
  <FoodDescriptors>(Beet) Sugar</FoodDescriptors>
</DietaryAssessmentMethod>
<DietaryAssessmentMethod>
  <CollectionTool>Portion size measurement aids
</CollectionTool>
  <NumberOfNonConsecutiveOneDay>20
</NumberOfNonConsecutiveOneDay>
  <SoftwareTool>Purefood</SoftwareTool>
  <RecordTypes>Recipes for self-made</RecordTypes>
  <FoodDescriptors>(Beet) Sugar</FoodDescriptors>
</DietaryAssessmentMethod>
<Laboratory>
  <Accreditation>Accredited</Accreditation>
  <Name>National High Magnetic Field Laboratory</Name>
  <Country>United States</Country>
</Laboratory>
<Laboratory>
  <Accreditation>Everest Medical Laboratory</Accreditation>
  <Name>Everest Medical Laboratory</Name>
  <Country>India</Country>
</Laboratory>
<Assay>
  <Name>Bradford protein assay</Name>
  <Description>spectroscopic analytical procedure used to
    measure the concentration of protein in a solution. It is
    subjective, i.e., dependent on the amino acid composition
    of the measured protein
  </Description>
  <DetectionLimit>30–300</DetectionLimit>
  <QuantificationLimit>5000 – 8000</QuantificationLimit>
  <ContaminationRange>500–4000</ContaminationRange>
</Assay>
<Assay>
  <Name>ELISA</Name>
  <Description>ELISA is a popular format of \”wet-lab\” type
    analytic biochemistry assay that uses a solid-phase
    enzyme immunoassay (EIA) to detect the presence of a
    substance, usually an antigen, in a liquid sample or wet
    sample.
  </Description>
  <ContaminationRange>200–800</ContaminationRange>
</Assay>
<Assay>
  <Name>Plaque-Assay</Name>
  <Description>standard method used to determine virus
    concentration in terms of infectious dose. Viral plaque
    assays determine the number of plaque forming units (pfu)
    in a virus sample, which is one measure of virus quantity.
  </Description>
  <ContaminationRange>0.5 – 400</ContaminationRange>
</Assay>
</DataBackground>
<ModelMath>
  <Parameter>
    <Id>Dose_matrix</Id>
    <Classification>input</Classification>
    <Name>Dose_matrix</Name>

```

```

<Description>matrix with GEC NoV for each serving
(rows=servings; columns = number of different
employee-teams that prepare food)
</Description>
<Unit>Others</Unit>
<UnitCategory>Other</UnitCategory>
<DataType>matrixOfNumbers</DataType>
<Source>Article</Source>
<Subject>Animal</Subject>
<Distribution>Bernoulli 1</Distribution>
<Value>as.matrix(read.table(file =\"Dose_matrix.csv\",
sep=\",\", header = TRUE, row.names=1))</Value>
<VariabilitySubject>days</VariabilitySubject>
<MinValue>10000.0</MinValue>
<MaxValue>0.0</MaxValue>
<Error>0.5</Error>
</Parameter>
<Parameter>
<Id>nInf</Id>
<Classification>output</Classification>
<Name>nInf</Name>
<Description>number of infected individuals, mean over stores
(2000 servings per store)</Description>
<Unit>Others</Unit>
<UnitCategory>Other</UnitCategory>
<DataType>double</DataType>
<Source>Model result</Source>
<Subject>Batch of animals</Subject>
<Distribution>Log-Logistic 2</Distribution>
<VariabilitySubject>hours</VariabilitySubject>
<MinValue>20000.0</MinValue>
<MaxValue>0.1</MaxValue>
<Error>0.4</Error>
</Parameter>
<Parameter>
<Id>NIll</Id>
<Classification>output</Classification>
<Name>NIll</Name>
<Description>number of ill individuals, mean over stores
(2000 servings per store)</Description>
<Unit>Others</Unit>
<UnitCategory>Others</UnitCategory>
<DataType>double</DataType>
<Source>Model result</Source>
<Subject>Batch of products</Subject>
<Distribution>Half Cauchy 1</Distribution>
<MinValue>30000.0</MinValue>
<MaxValue>0.3</MaxValue>
<Error>0.3</Error>
</Parameter>
<Parameter>
<Id>meanPos</Id>
<Classification>output</Classification>
<Name>prev18</Name>
<Description>proportion of servings with >18 NoV</Description>
<Unit>%</Unit>
<UnitCategory>Arbitrary Fraction</UnitCategory>
<DataType>double</DataType>
<Source>Model result</Source>
<Subject>Other</Subject>
<Distribution>Binomial 1</Distribution>
<VariabilitySubject>weight</VariabilitySubject>
<MinValue>50000.0</MinValue>
<MaxValue>0.2</MaxValue>
<Error>0.1</Error>
</Parameter>
<Parameter>
<Id>prev18</Id>
<Classification>output</Classification>
<Name>prev18</Name>

```

```

    <Description>proportion of servings with >18 NoV</Description>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Other</Subject>
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    <MaxValue>0.2</MaxValue>
    <Error>0.1</Error>
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  <Parameter>
    <Id>prev100</Id>
    <Classification>output</Classification>
    <Name>prev100</Name>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Feces</Subject>
    <Distribution>Discrete distribution</Distribution>
    <VariabilitySubject>color</VariabilitySubject>
    <MinValue>60000.0</MinValue>
    <MaxValue>0.12</MaxValue>
    <Error>0.01</Error>
  </Parameter>
  <Parameter>
    <Id>prev1000</Id>
    <Classification>output</Classification>
    <Name>prev1000</Name>
    <Description>proportion of servings with >1000 Nov</Description>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Feces</Subject>
    <Distribution>Geometric 1</Distribution>
    <VariabilitySubject>shape</VariabilitySubject>
    <MinValue>70000.0</MinValue>
    <MaxValue>0.142</MaxValue>
    <Error>0.02</Error>
  </Parameter>
  <Parameter>
    <Id>alpha</Id>
    <Classification>input</Classification>
    <Name>alpha</Name>
    <Description>Alpha parameter in dose response model related
      to probability of infection (shape of beta distribution)
    </Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Expert opinion</Source>
    <Subject>Carcass skin</Subject>
    <Distribution>Half-normal 1</Distribution>
    <Value>0.04</Value>
    <VariabilitySubject>age</VariabilitySubject>
    <MinValue>80000.0</MinValue>
    <MaxValue>0.01</MaxValue>
    <Error>0.03</Error>
  </Parameter>
  <Parameter>
    <Id>beta</Id>
    <Classification>input</Classification>
    <Name>beta</Name>
    <Description>Beta parameter in dose response model related to
      probability of infection (scale of beta distribution)
    </Description>
    <Unit>Others</Unit>

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    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Estimate</Source>
    <Subject>Product</Subject>
    <Distribution>Negative Binomial 1</Distribution>
    <Value>0.055</Value>
    <MinValue>900000.0</MinValue>
    <MaxValue>0.002</MaxValue>
    <Error>0.4</Error>
  </Parameter>
  <Parameter>
    <Id>eta</Id>
    <Classification>input</Classification>
    <Name>eta</Name>
    <Description>Eta parameter in dose response model related to
      probability of illness (scale parameter for gamma distribution)
    </Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Assumption</Source>
    <Subject>Package</Subject>
    <Distribution>Arcsine 2</Distribution>
    <Value>0.00255</Value>
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    <MinValue>100000.0</MinValue>
    <MaxValue>0.01</MaxValue>
    <Error>0.5</Error>
  </Parameter>
  <Parameter>
    <Id>r</Id>
    <Classification>input</Classification>
    <Name>r</Name>
    <Description>
      R parameter in dose response model related to probability
      of illness (shape parameter for gamma distribution)
    </Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Not applicable</Source>
    <Subject>Belly</Subject>
    <Distribution>Multivariate Gaussian 2</Distribution>
    <Value>0.086</Value>
    <VariabilitySubject>species</VariabilitySubject>
    <MinValue>110000.0</MinValue>
    <MaxValue>0.1</MaxValue>
    <Error>0.05</Error>
  </Parameter>
  <QualityMeasures>
    <SSE>0.0</SSE>
    <MSE>0.2</MSE>
    <RMSE>0.3</RMSE>
    <RSquared>0.9</RSquared>
    <AIC>0.0</AIC>
    <BIC>1.0</BIC>
  </QualityMeasures>
</ModelMath>
</GenericModel>
</Document>

```

.2 DoseResponseModel

Listing 2: Example of DoseResponseModel

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<?xml version="1.0" encoding="UTF-8" ?>
<Document xmlns="http://www.example.org/GenericModel1.0.3">
  <DoseResponseModel>

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<GeneralInformation>
  <ModelName>Toy Model for Testing Purposes</ModelName>
  <Source>UNPUBLISHED STUDIES (EXPERIMENTS–OBSERVATIONS): Studies and surveys</Source>
  <Identifier>Toy_Model_Generic_01</Identifier>
  <Author>
    <Title>Dr.</Title>
    <FamilyName>Romanov</FamilyName>
    <GivenName>Natalia</GivenName>
    <Email>black_widow@marvel.com</Email>
    <Telephone>030 12345</Telephone>
    <StreetAddress>Nahmitzer Damm 40</StreetAddress>
    <Country>Russian Federation</Country>
    <City>Berlin</City>
    <Region>Berlin–Brandenburg</Region>
    <Organization>SHIELD</Organization>
  </Author>
  <Creator>
    <Title>Dr.</Title>
    <FamilyName>Romanov</FamilyName>
    <GivenName>Natalia</GivenName>
    <Email>black_widow@marvel.com</Email>
    <Telephone>030 12345</Telephone>
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    <Country>Russian Federation</Country>
    <City>Berlin</City>
    <Region>Berlin–Brandenburg</Region>
    <Organization>SHIELD</Organization>
  </Creator>
  <Creator>
    <Title>Mr.</Title>
    <FamilyName>Parker</FamilyName>
    <GivenName>Peter</GivenName>
    <Email>peter@parker.com</Email>
    <Telephone>03301 1369158</Telephone>
    <StreetAddress>Am Kleinen Wannsee 16</StreetAddress>
    <Country>United States</Country>
    <City>Potsdam</City>
    <Region>Brandenburg</Region>
    <Organization>Parker Industries</Organization>
  </Creator>
  <CreationDate>2018–04–20</CreationDate>
  <Rights>Creative Commons Attribution–NonCommercial 4.0</Rights>
  <Format>.fskx</Format>
  <Reference>
    <IsReferenceDescription>true</IsReferenceDescription>
    <Type>PAMP</Type>
    <Date>3805–07–02</Date>
    <Doi>10.1111/risa.12758</Doi>
    <AuthorList>Jack Bauer, Kiefer Sutherland</AuthorList>
    <Title>Quantitative Risk Assessment of Norovirus Transmission in Food Establishments: Evaluating the
      Impact
      of Intervention Strategies and Food Employee Behavior on the Risk Associated with Norovirus in Foods
    </Title>
    <Abstract>
      This research looks at the work of Margaret C. Anderson,
      the editor of the Little Review. The review published
      first works by Sherwood Anderson, James Joyce, Wyndham
      Lewis, and Ezra Pound. This research draws upon mostly
      primary sources including memoirs, published letters, and
      a complete collection of the Little Review. Most prior
      research on Anderson focuses on her connection to the
      famous writers and personalities that she published and
      associated with. This focus undermines her role as the
      dominant creative force behind one of the most influential
      little magazines published in the 20th Century. This case
      example shows how little magazine publishing is arguably a
      literary art
    </Abstract>
    <Status>Accepted</Status>
    <Website>https://nature.com</Website>
  </Reference>

```

```

    <Comment>publisher demands edits</Comment>
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<Reference>
  <IsReferenceDescription>true</IsReferenceDescription>
  <Date>3805-07-07</Date>
  <Doi>10.1002/jmv.21237</Doi>
  <AuthorList>James Bond, Timothy Dalton</AuthorList>
  <Title>Norwalk virus: How infectious is it?</Title>
  <Abstract>
    This project involves discovering how the American
    Revolution was remembered during the nineteenth century.
    The goal is to show that the American Revolution was
    memorialized by the actions of the United States
    government during the 1800s. This has been done by
    examining events such as the Supreme Court cases of John
    Marshall and the Nullification Crisis. Upon examination
    of these events, it becomes clear that John Marshall and
    John Calhoun (creator of the Doctrine of Nullification)
    attempted to use the American Revolution to bolster their
    claims by citing speeches from Founding Fathers. Through
    showing that the American Revolution lives on in memory,
    this research highlights the importance of the revolution
    in shaping the actions of the United States government.
  </Abstract>
  <Status>Legal</Status>
  <Website>www.sciencemag.org</Website>
  <Comment>Publisher hates lettuce.</Comment>
</Reference>
<Reference>
  <IsReferenceDescription>true</IsReferenceDescription>
  <Type>DICT</Type>
  <Date>3805-07-08</Date>
  <Doi>10.1111/j.1539-6924.1999.tb01143.x</Doi>
  <Title>Dose Response Models For Infectious Gastroenteritis</Title>
  <Abstract>
    The purpose of this research is to identify a subtype of
    autism called Developmental Verbal Dyspraxia (DVD). DVD is
    a motor-speech problem, disabling oral-motor movements
    needed for speaking. The first phase of the project involves
    a screening interview where we identify DVD and Non-DVD kids.
    We also use home videos to validate answers on the screening
    interview. The final phase involves home visits where we use
    several assessments to confirm the child's diagnosis and
    examine the connection between manual and oral motor
    challenges. By identifying DVD as a subtype of Autism, we will
    eliminate the assumption that all Autistics have the same
    characteristics. This will allow for more individual
    consideration of Autistic people and may direct future
    research on the genetic factors in autism.
  </Abstract>
  <Status>Peer reviewed</Status>
  <Website>http://www.techbriefs.com</Website>
  <Comment>nerds</Comment>
</Reference>
<Language>English</Language>
<Software>R</Software>
<LanguageWrittenIn>R 3</LanguageWrittenIn>
<ModelCategory>
  <ModelClass>Dose-response model</ModelClass>
  <ModelClassComment>This Model Class is very special</ModelClassComment>
</ModelCategory>
<Status>Uncurated</Status>
<Objective>Development of a dose-response models for Norwalk virus/ norovirus</Objective>
<Description>A norovirus dose response model is important for understanding its transmission and essential
  for
  development of a quantitative risk model. A new variant of the hit theory model of microbial infection
  was
  developed to estimate the variation in Norwalk virus infectivity, as well as the degree of virus
  aggregation, consistent with independent (electron microscopic) observations. Explicit modeling of viral
  aggregation was used to express virus infectivity per single infectious unit (particle). The hit theory

```

model considers microbial infection as the result of a chain of conditional events: ingestion of one or more organisms from a Poisson–distributed suspension, followed by successful passage through any number of defensive barriers that may be present in the host. Individual organisms are thought to act independently, and any single surviving organism may reach an appropriate host cell and cause infection. Heterogeneity in the probability of individual organisms to achieve infection is modeled as a beta distribution. Illness is an important endpoint for risk assessment, especially for disease burden calculations. As illness is conditional on infection [Teunis et al.,1999], we wanted to study the probability of illness in infected subjects as a function of the applied dose. We used an existing model for illness dose response that is based on the concept of illness hazard during infection [Teunis et al., 1999].

```

</Description>
</GeneralInformation>

<Scope>
  <Hazard>
    <Type>Organic contaminants</Type>
    <Name>Norovirus (Norwalk–like virus)</Name>
    <Description>norovirus is described as nast and hard to get rid of</Description>
    <Unit>CFU</Unit>
    <AdverseEffect>morbidity</AdverseEffect>
    <SourceOfContamination>sewage</SourceOfContamination>
    <MaximumResidueLimit>0.01 mg/kg</MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>10 mg</NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>40 mg</LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>50 mg</AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>80 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>20 mg</AcceptableDailyIntake>
  </Hazard>
  <Hazard>
    <Type>Microorganisms</Type>
    <Name>Salmonella Daarle</Name>
    <Description>we dont know how that got into the tomatoes but it is there</Description>
    <Unit>Fill</Unit>
    <AdverseEffect>mortality</AdverseEffect>
    <SourceOfContamination>air</SourceOfContamination>
    <MaximumResidueLimit>0.11 mg/kg</MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>5 mg</NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>50 mg</LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>80 mg</AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>100 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>30 mg</AcceptableDailyIntake>
  </Hazard>
  <Hazard>
    <Type>Food additives</Type>
    <Name>Monoammonium glutamate</Name>
    <Description>tastes great but bad for your beach bod</Description>
    <Unit>fg/mL</Unit>
    <AdverseEffect>obesity</AdverseEffect>
    <SourceOfContamination>rodents</SourceOfContamination>
    <BenchmarkDose>123.12</BenchmarkDose>
    <MaximumResidueLimit>0.25 – 0.4 mg/kg</MaximumResidueLimit>
    <NoObservedAdverseAffectLevel>1 mg</NoObservedAdverseAffectLevel>
    <LowestObservedAdverseAffectLevel>100 mg</LowestObservedAdverseAffectLevel>
    <AcceptableOperatorExposureLevel>120 mg</AcceptableOperatorExposureLevel>
    <AcuteReferenceDose>140 mg</AcuteReferenceDose>
    <AcceptableDailyIntake>90 mg</AcceptableDailyIntake>
  </Hazard>
  <PopulationGroup>
    <Name>human consumer, no age specification</Name>
    <TargetPopulation>seniors</TargetPopulation>
    <PopulationDescription>80% are considered susceptible to infection</PopulationDescription>
    <PopulationGender>50% male</PopulationGender>
    <BMI>18.5 – 24.9</BMI>
    <SpecialDietGroups>love cake</SpecialDietGroups>
    <Region>Madrid</Region>
    <Country>Spain</Country>
    <PopulationRiskFactor>low physical activity</PopulationRiskFactor>
  </PopulationGroup>

```



```

    <Season>spring</Season>
  </PopulationGroup>
  <PopulationGroup>
    <Name>human consumer, adult</Name>
    <TargetPopulation>soldiers</TargetPopulation>
    <PopulationDescription>highly vaccinated</PopulationDescription>
    <PopulationGender>90% male</PopulationGender>
    <BMI>18.5 – 24.9</BMI>
    <SpecialDietGroups>20% muslim</SpecialDietGroups>
    <Region>Mittelburgenland</Region>
    <Country>Austria</Country>
    <PopulationRiskFactor>bullet to the head</PopulationRiskFactor>
    <Season>summer</Season>
  </PopulationGroup>
  <PopulationGroup>
    <Name>human consumer, men</Name>
    <TargetPopulation>millenials</TargetPopulation>
    <PopulationDescription>they get sick all the time</PopulationDescription>
    <PopulationGender>100% male</PopulationGender>
    <BMI>18.5 –24.9</BMI>
    <SpecialDietGroups>30% vegetarians</SpecialDietGroups>
    <Region>Nottingham</Region>
    <Country>United Kingdom</Country>
    <PopulationRiskFactor>vaping</PopulationRiskFactor>
    <Season>winter</Season>
  </PopulationGroup>
  <GeneralComment>(General Comment) The Scope of this model is universal</GeneralComment>
  <TemporalInformation>1900 – 2000</TemporalInformation>
</Scope>
<DataBackground>
  <Study>
    <Identifier>Study_Generic_Sheet_1</Identifier>
    <Title>Quantitative Risk Assessment of Norovirus Transmission in Food Establishments: Evaluating the
      Impact
      of Intervention Strategies and Food Employee Behavior on the Risk Associated with Norovirus in Foods
    </Title>
    <Description>This Study will show, wether the FSK Lab will correctly read and run a generic and fully
      annotated model
    </Description>
    <DesignType>Trial and Error</DesignType>
    <AssayMeasurementType>It works or it doesn't</AssayMeasurementType>
    <AssayTechnologyType>Anatomic–pathologic Tests</AssayTechnologyType>
    <AssayTechnologyPlatform>Orbital Platform</AssayTechnologyPlatform>
    <AccreditationProcedureForTheAssayTechnology>ISO/IEC17025</AccreditationProcedureForTheAssayTechnology>
    <ProtocolName>Extraction Protocol of FSK</ProtocolName>
    <ProtocolType>Extraction Protocol</ProtocolType>
    <ProtocolDescription>The protocol is definitely not made up</ProtocolDescription>
    <ProtocolURI>https://url-for-study-protocol-location.bfr.bund.de</ProtocolURI>
    <ProtocolVersion>version 1.0</ProtocolVersion>
    <ProtocolParametersName>Parameter 1</ProtocolParametersName>
    <ProtocolComponentsName>windows pc</ProtocolComponentsName>
    <ProtocolComponentsType>hardware</ProtocolComponentsType>
  </Study>
  <StudySample>
    <SampleName>Sample 1</SampleName>
    <ProtocolOfSampleCollection>SampleID_1</ProtocolOfSampleCollection>
    <SamplingStrategy>Convenient sampling</SamplingStrategy>
    <TypeOfSamplingProgram>Diet study</TypeOfSamplingProgram>
    <SamplingMethod>According to Reg 152/2009</SamplingMethod>
    <SamplingPlan>Random sampling</SamplingPlan>
    <SamplingWeight>description of the method employed to compute sampling weight (nonresponse–adjusted
      weight)
    </SamplingWeight>
    <SamplingSize>10000.0</SamplingSize>
    <LotSizeUnit>log10(CFU/25g)</LotSizeUnit>
    <SamplingPoint>Catering</SamplingPoint>
  </StudySample>
  <StudySample>
    <SampleName>Sample 2</SampleName>
    <ProtocolOfSampleCollection>SampleID_2</ProtocolOfSampleCollection>

```

```

    <SamplingStrategy>Selective sampling</SamplingStrategy>
    <TypeOfSamplingProgram>Monitoring</TypeOfSamplingProgram>
    <SamplingMethod>According to Reg 333/2007</SamplingMethod>
    <SamplingPlan>Stratified sampling</SamplingPlan>
    <SamplingWeight>description of the method employed to compute sampling weight (nonresponse-adjusted
weight)
    </SamplingWeight>
    <SamplingSize>1000.0</SamplingSize>
    <LotSizeUnit>uL/kg</LotSizeUnit>
    <SamplingPoint>Air transport</SamplingPoint>
</StudySample>
<StudySample>
    <SampleName>Sample 3</SampleName>
    <ProtocolOfSampleCollection>SampleID_3</ProtocolOfSampleCollection>
    <SamplingStrategy>Census</SamplingStrategy>
    <TypeOfSamplingProgram>Control and eradication programmes</TypeOfSamplingProgram>
    <SamplingPlan>Multi-stage random sampling</SamplingPlan>
    <SamplingWeight>description of the method employed to compute sampling weight (nonresponse-adjusted
weight)
    </SamplingWeight>
    <SamplingSize>2000.0</SamplingSize>
    <LotSizeUnit>uL/kg</LotSizeUnit>
    <SamplingPoint>Household</SamplingPoint>
</StudySample>
<Laboratory>
    <Accreditation>Accredited</Accreditation>
    <Name>National High Magnetic Field Laboratory</Name>
    <Country>United States</Country>
</Laboratory>
<Laboratory>
    <Accreditation>Everest Medical Laboratory</Accreditation>
    <Name>Everest Medical Laboratory</Name>
    <Country>India</Country>
</Laboratory>
<Assay>
    <Name>Bradford protein assay</Name>
    <Description>spectroscopic analytical procedure used to measure the concentration of protein in a
solution.
    It is subjective, i.e., dependent on the amino acid composition of the measured protein
    </Description>
    <DetectionLimit>30–300</DetectionLimit>
    <QuantificationLimit>5000 – 8000</QuantificationLimit>
    <ContaminationRange>500–4000</ContaminationRange>
</Assay>
<Assay>
    <Name>ELISA</Name>
    <Description>ELISA is a popular format of \”wet-lab\” type analytic biochemistry assay that uses a
solid-phase enzyme immunoassay (EIA) to detect the presence of a substance, usually an antigen, in a
liquid sample or wet sample.
    </Description>
    <ContaminationRange>200–800</ContaminationRange>
</Assay>
<Assay>
    <Name>Plaque-Assay</Name>
    <Description>standard method used to determine virus concentration in terms of infectious dose. Viral
plaque
assays determine the number of plaque forming units (pfu) in a virus sample, which is one measure of
virus quantity.
    </Description>
    <ContaminationRange>0.5 – 400</ContaminationRange>
</Assay>
</DataBackground>
<ModelMath>
    <Parameter>
        <Id>Dose_matrix</Id>
        <Classification>input</Classification>
        <Name>Dose_matrix</Name>
        <Description>matrix with GEC NoV for each serving (rows=servings; columns = number of different
employee-teams that prepare food)
        </Description>

```

```

    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>matrixOfNumbers</DataType>
    <Source>Article</Source>
    <Subject>Animal</Subject>
    <Distribution>Bernoulli 1</Distribution>
    <Value>as.matrix(read.table(file = \"Dose_matrix.csv\", sep = \",\", header = TRUE, row.names=1))</Value>
    <VariabilitySubject>days</VariabilitySubject>
    <MinValue>10000.0</MinValue>
    <MaxValue>0.0</MaxValue>
    <Error>0.5</Error>
</Parameter>
<Parameter>
    <Id>nInf</Id>
    <Classification>output</Classification>
    <Name>nInf</Name>
    <Description>number of infected individuals, mean over stores (2000 servings per store)</Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Batch of animals</Subject>
    <Distribution>Log-Logistic 2</Distribution>
    <VariabilitySubject>hours</VariabilitySubject>
    <MinValue>20000.0</MinValue>
    <MaxValue>0.1</MaxValue>
    <Error>0.4</Error>
</Parameter>
<Parameter>
    <Id>NIll</Id>
    <Classification>output</Classification>
    <Name>NIll</Name>
    <Description>number of ill individuals, mean over stores (2000 servings per store)</Description>
    <Unit>Others</Unit>
    <UnitCategory>Others</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Batch of products</Subject>
    <Distribution>Half Cauchy 1</Distribution>
    <MinValue>30000.0</MinValue>
    <MaxValue>0.3</MaxValue>
    <Error>0.3</Error>
</Parameter>
<Parameter>
    <Id>meanPos</Id>
    <Classification>output</Classification>
    <Name>prev18</Name>
    <Description>proportion of servings with >18 NoV</Description>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Other</Subject>
    <Distribution>Binomial 1</Distribution>
    <VariabilitySubject>weight</VariabilitySubject>
    <MinValue>50000.0</MinValue>
    <MaxValue>0.2</MaxValue>
    <Error>0.1</Error>
</Parameter>
<Parameter>
    <Id>prev18</Id>
    <Classification>output</Classification>
    <Name>prev18</Name>
    <Description>proportion of servings with >18 NoV</Description>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Other</Subject>
    <Distribution>Binomial 1</Distribution>

```

```

    <VariabilitySubject>weight</VariabilitySubject>
    <MinValue>50000.0</MinValue>
    <MaxValue>0.2</MaxValue>
    <Error>0.1</Error>
</Parameter>
<Parameter>
    <Id>prev100</Id>
    <Classification>output</Classification>
    <Name>prev100</Name>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Feces</Subject>
    <Distribution>Discrete distribution</Distribution>
    <VariabilitySubject>color</VariabilitySubject>
    <MinValue>60000.0</MinValue>
    <MaxValue>0.12</MaxValue>
    <Error>0.01</Error>
</Parameter>
<Parameter>
    <Id>prev1000</Id>
    <Classification>output</Classification>
    <Name>prev1000</Name>
    <Description>proportion of servings with >1000 Nov</Description>
    <Unit>%</Unit>
    <UnitCategory>Arbitrary Fraction</UnitCategory>
    <DataType>double</DataType>
    <Source>Model result</Source>
    <Subject>Feces</Subject>
    <Distribution>Geometric 1</Distribution>
    <VariabilitySubject>shape</VariabilitySubject>
    <MinValue>70000.0</MinValue>
    <MaxValue>0.142</MaxValue>
    <Error>0.02</Error>
</Parameter>
<Parameter>
    <Id>alpha</Id>
    <Classification>input</Classification>
    <Name>alpha</Name>
    <Description>Alpha parameter in dose response model related to probability of infection (shape of beta
distribution)
</Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Expert opinion</Source>
    <Subject>Carcass skin</Subject>
    <Distribution>Half-normal 1</Distribution>
    <Value>0.04</Value>
    <VariabilitySubject>age</VariabilitySubject>
    <MinValue>80000.0</MinValue>
    <MaxValue>0.01</MaxValue>
    <Error>0.03</Error>
</Parameter>
<Parameter>
    <Id>beta</Id>
    <Classification>input</Classification>
    <Name>beta</Name>
    <Description>Beta parameter in dose response model related to probability of infection (scale of beta
distribution)
</Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Estimate</Source>
    <Subject>Product</Subject>
    <Distribution>Negative Binomial 1</Distribution>
    <Value>0.055</Value>
    <MinValue>900000.0</MinValue>

```

```

    <MaxValue>0.002</MaxValue>
    <Error>0.4</Error>
  </Parameter>
  <Parameter>
    <Id>eta</Id>
    <Classification>input</Classification>
    <Name>eta</Name>
    <Description>Eta parameter in dose response model related to probability of illness (scale parameter for
      gamma distribution)
    </Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Assumption</Source>
    <Subject>Package</Subject>
    <Distribution>Arcsine 2</Distribution>
    <Value>0.00255</Value>
    <VariabilitySubject>difficulty</VariabilitySubject>
    <MinValue>100000.0</MinValue>
    <MaxValue>0.01</MaxValue>
    <Error>0.5</Error>
  </Parameter>
  <Parameter>
    <Id>r</Id>
    <Classification>input</Classification>
    <Name>r</Name>
    <Description>R parameter in dose response model related to probability of illness (shape parameter for
      gamma
      distribution)
    </Description>
    <Unit>Others</Unit>
    <UnitCategory>Other</UnitCategory>
    <DataType>double</DataType>
    <Source>Not applicable</Source>
    <Subject>Belly</Subject>
    <Distribution>Multivariate Gaussian 2</Distribution>
    <Value>0.086</Value>
    <VariabilitySubject>species</VariabilitySubject>
    <MinValue>110000.0</MinValue>
    <MaxValue>0.1</MaxValue>
    <Error>0.05</Error>
  </Parameter>
  <QualityMeasures>
    <SSE>0.0</SSE>
    <MSE>0.2</MSE>
    <RMSE>0.3</RMSE>
    <RSquared>0.9</RSquared>
    <AIC>0.0</AIC>
    <BIC>1.0</BIC>
  </QualityMeasures>
</ModelMath>
</DoseResponseModel>
</Document>

```

Appendix A

RAKIP 1.0.3

In FSKML the implementation of the metadata is based on EMF and the following simple EMF types:
* *EString* * *EBoolean* * *EDate* * *EInt*

A.1 General structure

Every RAKIP model involves four main metadata components: general information, scope, data background and model math. In FSKML a JSON object contains four key-value pairs with the classes described in this document.

Key	Class
generalInformation	GeneralInformation
scope	Scope
dataBackground	DataBackground
modelMath	ModelMath

This translate to a JSON object with these four attributes:

Listing A.1: Example of GeneralInformation

```
{  
  "generalInformation" : {},  
  "scope" : {},  
  "dataBackground" : {},  
  "modelMath" : {}  
}
```

FSKML defines a number of metadata classes:

- Assay
- Contact
- DataBackground
- DietaryAssessmentMethod
- GeneralInformation
- Hazard
- Laboratory
- ModelCategory
- ModelMath
- Parameter
- ParameterClassification

- ParameterType
- PopulationGroup
- Product
- Reference
- PublicationType
- SpatialInformation
- Scope
- Study
- StudySample

A.2 Assay

Property	Type	Cardinality
assayName	EString	1..1
assayDescription	EString	0..1
percentageOfMoisture	EString	0..1
percentageOfFat	EString	0..1
limitOfDetection	EString	0..1
limitOfQuantification	EString	0..1
leftCensoredData	EString	0..1
rangeOfContamination	EString	0..1
uncertaintyValue	EString	0..1

Listing A.2: Example of GeneralInformation

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Assay",
  "assayName" : "Bradford protein assay",
  "assayDescription" : "spectroscopic analytical procedure ...",
  "limitOfDetection" : "30–300",
  "limitOfQuantification" : "5000 – 8000",
  "rangeOfContamination" : "500–4000"
}
```

A.2.1 Mapping to RAKIP Assay

RAKIP	FSKML
Assay name	assayName
Assay description	assayDescription
Percentage of moisture	percentageOfMoisture
Percentage of fat	percentageOfFat
Limit of detection	limitOfDetection
Limit of quantification	limitOfQuantification
Left-censored data	leftCensoredData
Range of contamination	rangeOfContamination
Uncertainty value	uncertaintyValue

A.3 Contact

Property	Type	Cardinality
title	EString	0..1
familyName	EString	0..1
givenName	EString	0..1
email	EString	1..1
telephone	EString	0..1
streetAddress	EString	0..1
country	EString	0..1
city	EString	0..1
zipCode	EString	0..1
region	EString	0..1
timeZone	EString	0..1
gender	EString	0..1
note	EString	0..1
organization	EString	0..1

Listing A.3: Example of Contact

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/Contact",
  "title" : "Dr.",
  "familyName" : "Romanov",
  "givenName" : "Natalia",
  "email" : "black_widow@marvel.com",
  "telephone" : "030 12345",
  "streetAddress" : "Nahmitzer Damm 40",
  "country" : "Russian Federation",
  "city" : "Berlin",
  "region" : "Berlin-Brandenburg",
  "organization" : "SHIELD"
}
```

A.4 DataBackground

Property	Type	Cardinality
study	Study	1
studySample	StudySample	0
dietaryAssessmentMethod	DietaryAssessmentMethod	0
laboratory	Laboratory	0
assay	Assay	0

Listing A.4: Example of DataBackground

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/DataBackground",
  "study" : { ... },
  "studysample" : [...],
  "dietaryassessmentmethod" : [...],
  "laboratory" : [...],
  "assay" : [...],
}
```


A.4.1 Mapping to RAKIP to DataBackground

RAKIP	FSKML
Study	study
Study Sample	studySample
Dietary assessment method	dietaryAssessmentMethod
Laboratory	laboratory
Assay	assay

A.5 DietaryAssessmentMethod

Property	Type	Cardinality
collectionTool	EString	0..1
numberOfNonConsecutiveOneDay	EString	0..1
softwareTool	EString	0..1
numberOfFoodItems	EString	0..1
recordTypes	EString	0..1
foodDescriptors	EString	0..1

Listing A.5: Example of DietaryAssessmentMethod

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/DietaryAssessmentMethod",
  "collectionTool" : "food diaries",
  "numberOfNonConsecutiveOneDay" : 5,
  "softwareTool" : "FoodWorks",
  "recordTypes" : "Mean of consumption",
  "foodDescriptors" : "(Beet) Sugar"
}
```

A.5.1 Mapping to RAKIP DietaryAssessmentMethod

RAKIP	FSKML
Methodological tool to collect data	collectionTool
Number of non-consecutive one-day	numberOfNonConsecutiveOneDay
Dietary software tool	softwareTool
Number of food items	numberOfFoodItems
Type of records	recordTypes
Food descriptors	foodDescriptors

A.6 GeneralInformation

Property	Type	Cardinality
name	EString	1..1
source	EString	0..1
identifier	EString	1..1
author	Contact	1
creators	Contact	0
creationDate	EDate	1..1
modificationDate	EDate	0
rights	EString	1..1
available	EBoolean	0..1
format	EString	0..1
reference	Reference	1
language	EString	0..1
software	EString	0..1
languageWrittenIn	EString	0..1
modelCategory	ModelCategory	0
status	EString	0..1
objective	EString	0..1
description	EString	0..1

Listing A.6: Example of GeneralInformation

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/GeneralInformation",
  "name" : "Toy Model for Testing Purposes",
  "source" : "UNPUBLISHED STUDIES (EXPERIMENTS—OBSERVATIONS): Studies and surveys",
  "identifier" : "Toy_Model_Generic_01",
  "creationDate" : "2018-04-20T00:00:00",
  "rights" : "Creative Commons Attribution—NonCommercial 4.0",
  "format" : ".fskx",
  "language" : "English",
  "software" : "R",
  "languageWrittenIn" : "R 3",
  "status" : "Uncurated",
  "objective" : "Development of a dose—response models for Norwalk virus/ norovirus",
  "description" : "A norovirus dose response model is important for ...",
  "modelCategory" : [...],
  "creators" : [...],
  "reference" : [...]
}
```

A.6.1 Mapping to RAKIP GeneralInformation

RAKIP	FSKML
Study/Data/Model name	name
Source	source
Identifier	identifier
Author	author
Creator	creators
Creation date	creationDate
Last modified date	modificationDate
Rights	rights
Availability	available
URL	
Format	format
Reference	reference
Language	language
Software	software
Language written in	languageWrittenIn
Model category	modelCategory
Status	status
Objective	objective
Description	description

A.7 Hazard

Property	Type	Cardinality
hazardType	EString	0..1
hazardName	EString	1..1
hazardDescription	EString	0..1
hazardUnit	EString	0..1
adverseEffect	EString	0..1
sourceOfContamination	EString	0..1
benchmarkDose	EString	0..1
maximumResidueLimit	EString	0..1
noObservedAdverseAffectLevel	EString	0..1
lowestObservedAdverseAffectLevel	EString	0..1
acceptableOperatorExposureLevel	EString	0..1
acuteReferenceDose	EString	0..1
acceptableDailyIntake	EString	0..1
hazardIndSum	EString	0..1

Listing A.7: Example of Hazard

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#//Hazard",
  "hazardType" : "Organic contaminants",
  "hazardName" : "norovirus (Norwalk-like virus)",
  "hazardDescription" : "novovirus is described as nast and hard to get rid of",
  "hazardUnit" : "CFU",
  "adverseEffect" : "morbidity",
  "sourceOfContamination" : "sewage",
  "maximumResidueLimit" : "0.01 mg/kg",
  "noObservedAdverseAffectLevel" : "10 mg",
  "lowestObservedAdverseAffectLevel" : "40 mg",
  "acceptableOperatorExposureLevel" : "50 mg",
  "acuteReferenceDose" : "80 mg",
  "acceptableDailyIntake" : "20 mg"
}
```

A.7.1 Mapping to RAKIP Hazard

RAKIP	FSKML
Hazard type	hazardType
Hazard name	hazardName
Hazard description	hazardDescription
Hazard unit	hazardUnit
Adverse effect	adverseEffect
Source of contamination	sourceOfContamination
Benchmark Dose (BMD)	benchmarkDose
Maximum Residue Limit (MRL)	maximumResidueLimit
No Observed Adverse Effect Level (NOAEL)	noObservedAdverseAffectLevel
Lowest Observed Adverse Effect Level (LOAEL)	lowestObservedAdverseAffectLevel
Acceptabnle Operator Exposure Level (AOEL)	acceptableOperatorExposureLevel
Acute Reference Dose (ARfD)	acuteReferenceDose
Acceptable Daily Intake (ADI)	acceptableDailyIntake
Hazard ind/sum	hazardIndSum

A.8 Laboratory

Property	Type	Cardinality
laboratoryAccreditation	StringObject	0..1
laboratoryName	EString	0..1
laboratoryCountry	EString	0

Listing A.8: Example of Laboratory

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#//Laboratory",
  "laboratoryName" : "National High Magnetic Field Laboratory",
  "laboratoryCountry" : "United States",
  "laboratoryAccreditation" : [ {
    "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#//StringObject",
    "value" : "Accredited"
  } ]
}
```

A.8.1 Mapping to RAKIP Laboratory

RAKIP	FSKML
Laboratory accreditation	laboratoryAccreditation
Laboratory name	laboratoryName
Laboratory country	laboratoryCountry

A.9 ModelCategory

Property	Type	Cardinality
modelClass	EString	1
modelSubClass	StringObject	0
modelClassComment	EString	0..1
basicProcess	EString	0..1

Listing A.9: Example of Laboratory

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#//ModelCategory",
  "modelClass" : "Dose-response model",
  "modelClassComment" : "This Model Class is very special"
}
```

A.9.1 Mapping to RAKIP ModelCategory

RAKIP	FSKML
Model class	modelClass
Model Sub-Class	modelSubClass
Model Class comment	modelClassComment
Basic process	basicProcess

A.10 ModelMath

Property	Type	Cardinality
parameter	Parameter	1
qualityMeasures	StringObject	0
modelEquation	ModelEquation	0
fittingProcedure	EString	0..1
exposure	Exposure	0
event	StringObject	0

Listing A.10: Example of ModelCategory

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/ModelMath",
  "parameter" : [...],
  "qualityMeasures" : [ {
    "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/StringObject",
    "value" : "{ \"SSE\":0.0, \"MSE\":0.2, \"RMSE\":0.3, \"Rsquared\":0.9, \"AIC\":0.0, \"BIC\":1.0}"
  } ]
}
```

A.10.1 Mapping to RAKIP ModelMath

RAKIP	FSKML
Parameter / Factor / Input / Output / "Data column"	Parameter
Quality measures	qualityMeasures
Model equation	modelEquation
Fitting procedure	fittingProcedure
Exposure	exposure
Events	event

A.11 Parameter

Property	Type	Cardinality
parameterID	EString	1..1
parameterClassification	ParameterClassification	1..1
parameterName	EString	1..1
parameterDescription	EString	0..1
parameterUnit	EString	1..1
parameterUnitCategory	EString	0..1
parameterDataType	ParameterType	1..1
parameterSource	EString	0..1
parameterSubject	EString	0..1
parameterDistribution	EString	0..1
parameterValue	EString	0..1
reference	Reference	0
parameterVariabilitySubject	EString	0..1
parameterValueMin	EString	0..1
parameterValueMax	EString	0..1
parameterError	EString	0..1

A.11.1 Mapping to RAKIP Parameter

RAKIP	FSKML
Parameter ID	parameterID
Parameter classification	parameterClassification
Parameter name	parameterName
Parameter description	parameterDescription
Parameter unit	parameterUnit
Parameter unit category	parameterUnitCategory
Parameter data type	parameterDataType
Parameter source	parameterSource
Parameter subject	parameterSubject
Parameter distribution	parameterDistribution
Parameter value	parameterValue
Parameter Reference	reference
Parameter variability subject	parameterVariabilitySubject
Parameter value min	parameterValueMin
Parameter value max	parameterValueMax
Parameter error	parameterError

A.12 ParameterClassification

Literal	Name	Value
null	null	-1
Constant	Constant	0
Input	Input	1
Output	Output	2

A.13 ParameterType

Property	Type	Cardinality
null	null	-1
Integer	Integer	0
Double	Double	1
Number	Number	2
Date	Date	3
File	File	4
Boolean	Boolean	5
Vector[number]	VectorOfNumbers	6
Vector[string]	VectorOfStrings	7
Matrix[number,number]	MatrixOfNumbers	8
Matrix[string,string]	MatrixOfStrings	9
Object	Object	10
Other	Other	11
String	String	12

Listing A.11: Example of Parameter

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/Parameter",
  "parameterID" : "Dose_matrix",
  "parameterClassification" : "Input",
  "parameterName" : "Dose_matrix",
  "parameterDescription" : "matrix with GEC NoV ...",
  "parameterUnit" : "Others",
  "parameterUnitCategory" : "Other",
  "parameterDataType" : "Matrix[number,number]",
  "parameterSource" : "Article",
```

```

    "parameterSubject" : "Animal",
    "parameterDistribution" : "Bernoulli 1",
    "parameterValue" : "as.matrix(read.table(file = \"Dose_matrix.csv\"))",
    "parameterVariabilitySubject" : "days",
    "parameterValueMin" : "10000.0",
    "parameterValueMax" : "0.0",
    "parameterError" : "0.5"
}

```

A.14 PopulationGroup

Property	Type	Cardinality
populationName	EString	1..1
targetPopulation	EString	0..1
populationSpan	StringObject	0
populationDescription	StringObject	0
populationAge	StringObject	0
populationGender	EString	0..1
bmi	StringObject	0
specialDietGroups	StringObject	0
patternConsumption	StringObject	0
region	StringObject	0
country	StringObject	0
populationRiskFactor	StringObject	0
season	StringObject	0

Listing A.12: Example of PopulationGroup

```

{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/PopulationGroup",
  "populationName" : "human consumer, no age specification",
  "targetPopulation" : "seniors",
  "populationGender" : "50% male ",
  "populationDescription" : [ {
    "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/StringObject",
    "value" : "80% are considered susceptible to infection"
  }
}

```

A.14.1 Mapping of RAKIP PopulationGroup and FSKML PopulationGroup

RAKIP	FSKML
Population name	populationName
Target population	targetPopulation
Population Span (years)	populationSpan
Population description	populationDescription
Population age	populationAge
Population gender	populationGender
BMI	bmi
Special diet groups	specialDietGroups
Pattern consumption	patternConsumption
Region	region
Country	country
Risk and population factors	populationRiskFactor
Season	season

A.15 Product

Property	Type	Cardinality
productName	EString	1..1
productDescription	EString	0..1
productUnit	EString	1..1
productionMethod	EString	0..1
packaging	EString	0..1
productTreatment	EString	0..1
originCountry	EString	0..1
originArea	EString	0..1
fisheriesArea	EString	0..1
productionDate	EDate	0..1
expiryDate	EDate	0..1

Listing A.13: Example of Product

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Product",
  "productName" : "Lettuce",
  "productDescription" : "fresh german lettuce",
  "productUnit" : "g",
  "productionMethod" : "Organic production",
  "packaging" : "Packed",
  "productTreatment" : "Freezing",
  "originCountry" : "Germany",
  "originArea" : "Aachen, Kreisfreie Stadt",
  "fisheriesArea" : "Arctic Sea",
  "productionDate" : "3911-10-30T00:00:00",
  "expiryDate" : "3911-12-01T00:00:00"
}
```

A.15.1 Mapping of RAKIP Product and FSKML Product

RAKIP	FSKML
Product/matrix name	productName
Product/matrix description	productDescription
Product/matrix unit	productUnit
Method of production	productionMethod
Packaging	packaging
Product treatment	productTreatment
Country of origin	originCountry
Area of origin	originArea
Fisheries area	fisheriesArea
Date of production	productionDate
Date of expiry	expiryDate

A.16 Reference

Property	Type	Cardinality
isReferenceDescription	EBoolean	1..1
publicationType	PublicationType	0..1
publicationDate	EDate	0..1
pmid	EString	0..1
doi	EString	0..1
authorList	EString	0..1
publicationTitle	EString	1..1
publicationAbstract	EString	0..1
publicationJournal	EString	0..1
publicationVolume	EInt	0..1
publicationIssue	EInt	0..1
publicationStatus	EString	0..1
publicationWebsite	EString	0..1
comment	EString	0..1

A.16.1 Mapping of RAKIP Reference and FSKML Reference

RAKIP	FSKML
<i>Is_reference_description?</i>	isReferenceDescription
Publication type	publicationType
Publication year	publicationDate
PubMed ID	pmid
Publication DOI	doi
Publication Author List	authorList
Publication Title	publicationTitle
Publication Abstract	publicationAbstract
Publication Journal	publicationJournal
Publication Volume	publicationVolume
Publication Issue	publicationIssue
Publication Status	publicationStatus
Publication website	publicationWebsite
Comment	comment

A.17 PublicationType

Enumeration of publication types in FSKML taken from RIS.

Literal	Name	Value
null	null	-1
Abstract	ABST	0
Audiovisual material	ADVS	1
Aggregated Database	AGGR	2
Ancient Text	ANCIENT	3
Art Work	ART	4
Bill	BILL	5
Blog	BLOG	6
Whole book	BOOK	7
Case	CASE	8
Book chapter	CHAP	9
Chart	CHART	10
Classical Work	CLSWK	11
Computer Program	COMP	12
Conference proceeding	CONF	13
Conference paper	CPAPER	14
Catalog	CTLG	15
Data file	DATA	16
Online Database	DBASE	17
Dictionary	DICT	18
Electronic Book	EBOOK	19
Electronic Book Section	ECHAP	20
Edited Book	EDBOOK	21
Electronic Article	EJOUR	22
Web Page	ELECT	23
Encyclopedia	ENCYC	24
Equation	EQUA	25
Figure	FIGURE	26
Generic	GEN	27
Government Document	GOVDOC	28
Grant	GRANT	29
Hearing	HEAR	30
Internet Communication	ICOMM	31
In Press	INPR	32
Journal	JOUR	33
Journal (full)	JFULL	34
Legal Rule or Regulation	LEGAL	35
Manuscript	MANSCPT	36
Map	MAP	37
Magazine article	MGZN	38
Motion picture	MPCT	39
Online Multimedia	MULTI	40
Music score	MUSIC	41
Newspaper	NEWS	42
Pamphlet	PAMP	43
Patent	PAT	44
Personal communication	PCOMM	45
Report	RPRT	46
Serial publication	SER	47
Slide	SLIDE	48
Sound recording	SOUND	49
Standard	STAND	50
Statute	STAT	51
Thesis/Dissertation	THES	52
Unpublished work	UNPB	53
Video recording	VIDEO	54

Listing A.14: Example of Reference

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Reference",
  "isReferenceDescription" : true,
  "publicationType" : "Pamphlet",
  "publicationDate" : "3805-07-02T00:00:00",
  "doi" : "10.1111/risa.12758",
  "authorList" : "Jack Bauer, Kiefer Sutherland",
  "publicationTitle" : "Quantitative Risk Assessment of Norovirus Transmission in ...",
  "publicationAbstract" : "This research looks at the work of Margaret C. Anderson, ...",
  "publicationStatus" : "Accepted",
  "publicationWebsite" : "https://www.nature.com",
  "comment" : "publisher demanded edits"
}
```

A.18 SpatialInformation

Property	Type	Cardinality
Region	StringObject	0
Country	StringObject	0

Listing A.15: Example of SpatialInformation

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/SpatialInformation",
  "region" : "Bayern",
  "country" : "Germany"
}
```

A.18.1 Mapping to RAKIP SpatialInformation

RAKIP	FSKML
Region	region
Country	country

A.19 Scope

Property	Type	Cardinality
product	Product	0
hazard	Hazard	0
populationGroup	PopulationGroup	0
generalComment	EString	0..1
temporalInformation	EString	0..1
spatialInformation	SpatialInformation	0

Listing A.16: Example of Scope

```
{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Scope",
  "generalComment" : "(General Comment) The Scope of this model is universal",
  "temporalInformation" : "1990 - 2000",
  "product" : [ {
    "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Product",
    "productName" : "Lettuce",
    "productDescription" : "fresh german lettuce",
    "productUnit" : "g",
    "productionMethod" : "Organic production",
    "packaging" : "Packed",
    "productTreatment" : "Freezing",
  } ]
}
```

```

    "originCountry" : "Germany",
    "originArea" : "Aachen, Kreisfreie Stadt",
    "fisheriesArea" : "Arctic Sea",
    "productionDate" : "3911-10-30T00:00:00",
    "expiryDate" : "3911-12-01T00:00:00"
  }
}

```

A.19.1 Mapping to RAKIP

RAKIP	FSKML
Product/Matrix	product
Hazard	hazard
Population Group	populationGroup
General comment	generalComment
Temporal information	temporalInformation
Spatial information	spatialInformation

A.20 Study

Property	Type	Cardinality
studyIdentifier	EString	0..1
studyTitle	EString	1..1
studyDescription	EString	0..1
studyDesignType	EString	0..1
studyAssayMeasurementType	EString	0..1
studyAssayTechnologyType	EString	0..1
studyAssayTechnologyPlatform	EString	0..1
accreditationProcedureForTheAssayTechnology	EString	0..1
studyProtocolName	EString	0..1
studyProtocolType	EString	0..1
studyProtocolDescription	EString	0..1
studyProtocolURI	URI	0..1
studyProtocolVersion	EString	0..1
studyProtocolParametersName	EString	0..1
studyProtocolComponentsName	EString	0..1
studyProtocolComponentsType	EString	0..1

Listing A.17: Example of Study

```

{
  "eClass" : "http://BfR/bund/de/knime/model/metadata.V1.0.3#/Study",
  "studyIdentifier" : "Study_Generic_Sheet_1",
  "studyTitle" : "Quantitative Risk Assessment of Norovirus Transmission in Food Establishments: Evaluating the Impact of Intervention",
  "studyDescription" : "This Study will show, whether the FSK Lab will correctly read and run a generic and fully annotated model",
  "studyDesignType" : "Trial and Error",
  "studyAssayMeasurementType" : "It works or it doesn't",
  "studyAssayTechnologyType" : "Anatomic-pathologic Tests",
  "studyAssayTechnologyPlatform" : "Orbital Platform",
  "accreditationProcedureForTheAssayTechnology" : "ISO/IEC17025",
  "studyProtocolName" : "Extraction Protocol Of FSK",
  "studyProtocolType" : "Extraction Protocol",
  "studyProtocolDescription" : "The protocol is definitely not made up",
  "studyProtocolURI" : "https://url-for-study-protocol-location.bfr.bund.de",
  "studyProtocolVersion" : "version 1.0",
  "studyProtocolParametersName" : "Parameter 1",
  "studyProtocolComponentsName" : "windows pc",
  "studyProtocolComponentsType" : "hardware"
}

```

A.20.1 Mapping to RAKIP Study

RAKIP	FSKML
Study Identifier	studyIdentifier
Study Title	studyTitle
Study Description	studyDescription
Study Design Type	studyDesignType
Study Assay Measurement Type	studyAssayMeasurementType
Study Assay Technology Type	studyAssayTechnologyType
Study Assay Technology Platform	studyAssayTechnologyPlatform
Accreditation procedure for the assay technology	accreditationProcedureForTheAssayTechnology
Study Protocol Name	studyProtocolName
Study Protocol Type	studyProtocolType
Study Protocol Description	studyProtocolDescription
Study Protocol URI	studyProtocolURI
Study Protocol Version	studyProtocolVersion
Study Protocol Parameters Name	studyProtocolParametersName
Study Protocol Components Name	studyProtocolComponentsName
Study Protocol Components Type	studyProtocolComponentsType

A.21 StudySample

Property	Type	Cardinality
sampleName	EString	1..1
protocolOfSampleCollection	EString	1..1
samplingStrategy	EString	0..1
typeOfSamplingProgram	EString	0..1
samplingMethod	EString	0..1
samplingPlan	EString	1..1
samplingWeight	EString	1..1
samplingSize	EString	1..1
lotSizeUnit	EString	0..1
samplingPoint	EString	0..1

Listing A.18: Example of StudySample

```

{
  "eClass" : "http://BfR/bund/de/knime/model/metadata_V1.0.3#/StudySample",
  "sampleName" : "Sample 1",
  "protocolOfSampleCollection" : "SampleID_1",
  "samplingStrategy" : "Convenient sampling",
  "typeOfSamplingProgram" : "Diet study",
  "samplingMethod" : "According to Reg 152/2009",
  "samplingPlan" : "Random sampling",
  "samplingWeight" : "description of the method employed to compute sampling weight (nonresponse—adjusted weight)",
  "samplingSize" : "10000.0",
  "lotSizeUnit" : "log10(CFU/25g)",
  "samplingPoint" : "Catering"
}

```

A.21.1 Mapping to RAKIP StudySample

RAKIP	FSKML
Sample Name (ID)	sampleName
Protocol of sample collection	protocolOfSampleCollection
Sampling strategy	samplingStrategy
Type of sampling program	typeOfSamplingProgram
Sampling method	samplingMethod
Sampling plan	samplingPlan
Sampling weight	samplingWeight
Sampling size	samplingSize
Lot size unit	lotSizeUnit
Sampling point	samplingPoint