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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurren
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: recommandation of WHO (2013), distribution or ohters

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. Ocurrences	Max. Ocurrences
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 tahta 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>morbitity</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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurrences
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-cassification 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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurrences
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 acepted 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 categorial 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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurrences
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>
```

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

2.3.11 Reference

Element	Type	Min. Ocurrences	Max. Ocurrences
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.

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. Ocurrences	Max. Ocurrences
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. Ocurrences	Max. Ocurrences
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
AcreditationProcedureForTheAssayTechnology	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, 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>
```

2.3.14 StudySample

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

3.3.1 DietaryAssessmentMethod

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

4.3 DataBackground

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

4.4 ModelMath

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

Appendix A

Examples

A.1 GenericModel

Listing A.1: Example of StudySample

```
<?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>
                <StreetAddress>Nahmitzer Damm 40</StreetAddress>
                <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>
    <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>
<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>
    <Product>
        <Name>Lettuce</Name>
        <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>
        <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>morbitity</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>
<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>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>
        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>
    <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 illnes (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>
    </GenericModel>
</Document>
```