D1 Workplan pyrkilo

From Beneris

D1 Workplan pyrkilo is the first version of the risk-benefit analysis method that is being developed in Beneris project. The deadline for this deliverable is the kick-off meeting. Although this is a few days late, it is still an unfinished draft. This version has now taken a shape that is not likely to substantially change. The final version number 1 of the workplan was sent to partners on 19 June, and presented in the WP2 meeting on 22 June 2006.

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Contents

Introduction

- Risk assessment is fragmented.
- There is a need for stakeholder involvement, but how?
- The current and future risks are more complex than before.
- It is not obvious, whether the focus should be on risks, benefits, or both, and how to decide.
- There is no single authority that could handle the risk.
- Cooperation, wide understanding, and long-term strategic planning and implementation is needed.
- Acceptability of a risk assessment is not obvious but must be earned by a reliable assessment and a reliable process.

  However, it is important to be able to avoid "paralysis by analysis" (decisions are postponed because no clear-cut solution has been found), and "Doubt is our product" (situations where it becomes a feasible strategy for some stakeholders to deliberately promote uncertainty and thus prevent certain kinds of decisions).
- Therefore, we started to develop a method that explicitly acknowledges the acceptability issue.
- In this paper, we draft rules for benefit-risk assessment, apply them in a some test examples, and

explore what differences the new rules made to the traditional approach.

Aims

The aim of this guidance document is to start to develop a plausible approach of benefit-risk assessment that

- gives a possibility for free stakeholder involvement;
- improves transparence
- improves comparability
- helps to see the role of each decision-maker in a complex situation.

What is the pyrkilo method?

The outcome of the pyrkilo method is

- a cumulative source of assessments, insights, and data
- a collection of links to data sources, databases, and literature
- a system to publish risk benefit analyses over the internet
- a system to collect feedback related to risk benefit analyses.

Some of the key words from the research plan warrant a brief explanation so that the main ideas of the approach become clearer.

- Top-down approach: First define focus and scope, and draft the outline of the assessment. Only then go into details where needed.
- Iterative: The process goes on in several cycles, and each cycle makes the assessment more detailed.
- Decision analysis: A scientific method based on describing things as probabilities and rules on finding optimal solutions in a given situation.
- VOI (value of information): A decision analytic measure of the cost of uncertainty, i.e. the price you should be willing to pay for reducing uncertainty.

This guidance is written in a way that the description starts from variables and goes on to describe the process and the main structure of an assessment. This is because most of the users of this guidance document are specialists on nutrition sciences and they are more familiar with the data than with the risk assessment methods or processes. However, we start by showing an example of a typical structure of an assessment.

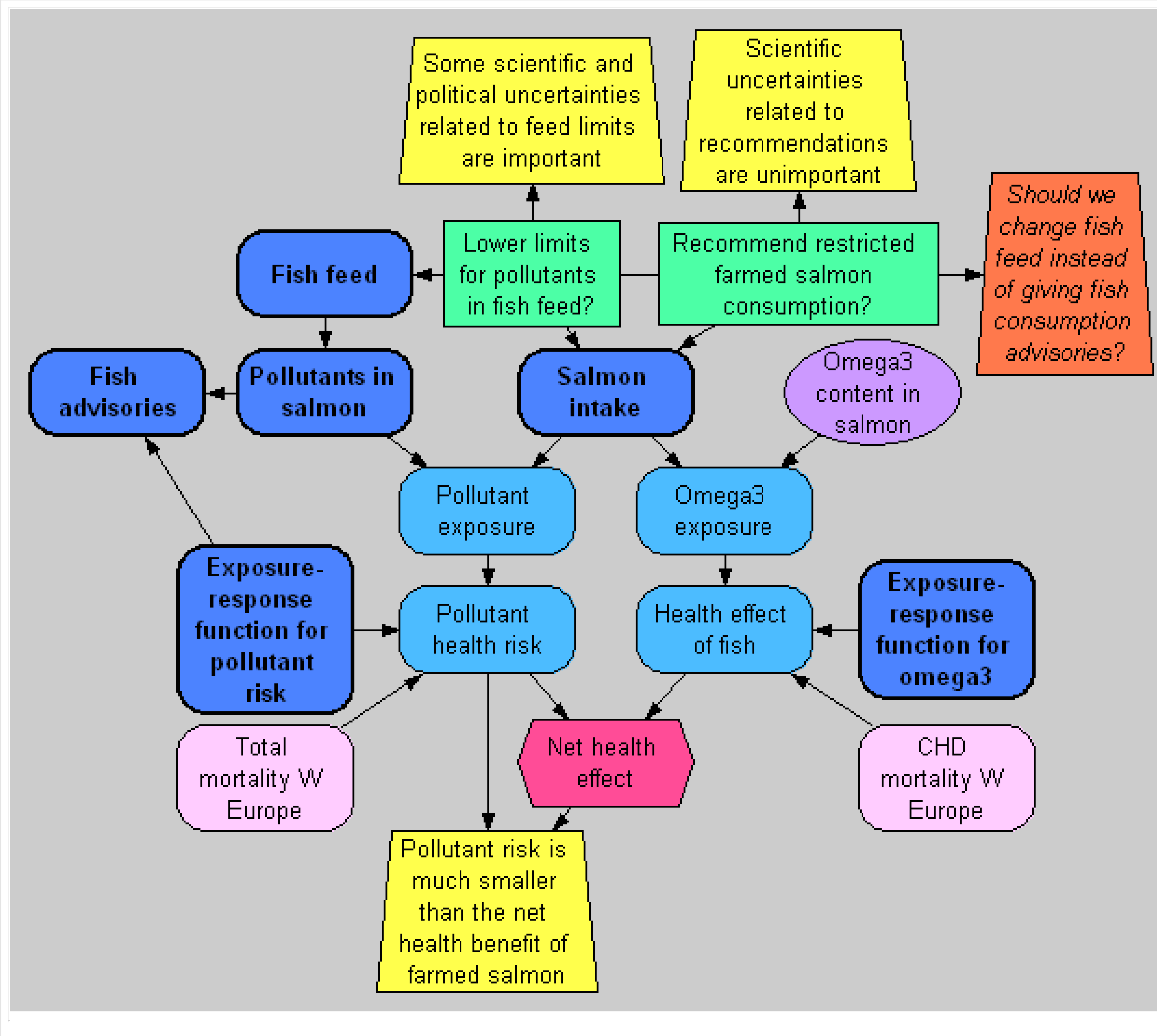

Figure 1. Outline of a benefit-risk assessment of farmed salmon. Variables are shown as nodes, and links (both causal and non-causal) are shown as arrows. Some colours and shapes have special meanings. Green boxes: decisions in the focus of the assessment; blue and light blue ovals: general variables; pink: variables with original data; purple: variables based on author judgement; red hexagon: outcome indicator; orange trapezoids: arguments; yellow trapezoids: comments based on the model results.

Methodology

General issues

Defining focus and scope

Our approach to benefit-risk analysis starts from the top overall view and goes down into more detailed and sophisticated examinations in the areas where it has proven necessary. The arguments for and against restricting the scope at a particular point can be of political or scientific nature. A crucial part of our approach is to examine and document this scope-defining process as a part of risk analysis. Often, a failure at this step is the cause of major disagreements between different stakeholders, and the problem is difficult to be identified once it has occurred.

This can be exemplified by a simple-looking question. "What is the risk of persistent pollutants in fish?" This seems to be a clear question at first, but in fact it is very ambiguous when looked at more carefully.

A scientific risk assessment cannot answer the question before the scope has been restricted in several ways: risk to whom; at what place and time; average or highest individual risk; which alternatives are compared; which endpoints are included; are only risks included or also the possible benefits of the food? It is very difficult to see from a final risk assessment all the restrictions to the scope that had to be made before it was possible to assess a clear-cut estimate. And it is very difficult to explicitly report all the restrictions that were made. The proposed iterative process helps in this important task.

Restricting and expanding examination

There are methods available to obtain and analyse arguments used for restricting the assessment scope. Stakeholder involvement is necessary for obtaining political arguments, while value-of-information assessment is needed for obtaining scientific arguments. These methods are described below.

Value-of-information analysis measures, how much the decision is expected to improve, if a particular uncertain variable is known better, or in other words, how much it is worth to pay to reduce a particular uncertainty (Morgan, MG and Henrion, M: Uncertainty. A guide to dealing with uncertainty in quantitative risk and policy analysis. Cambridge University Press, Cambridge, 1990). It assesses which parts of the model and which uncertainties are critical for the outcome. Less important parts of the model can then be kept as simple as possible, while more emphasis is placed on the important parts, and those are developed further. This information is very important, as it can be used to direct decision-making, model development, and further research.

Examining new potential aspects

In addition to decisions under planning, benefit-risk analysis should examine new, potential decisions. This is necessary to widen the scope of discussion. Too often scientists do not consider some aspects because they think they are politically impossible to implement, and politicians do not consider them because they have not seen scientific or other evidence implying benefits from them. Our iterative top-down approach can reduce this inertia. It is easy to take new aspects into consideration at a superficial level, and if they have merit, more detailed analysis is warranted. If the idea is shot down, the reason must be explicitly expressed and recorded. Although a simple thing, this record is a large improvement to the common practice of ignoring potentially interesting but suspect ideas.

Approaches for benefit-risk assessment

There are at least three different approaches a benefit-risk assessment may take. All of these can be and have been used separately, but it would be very beneficial, if the assessor undertands all of them and maybe applies several or all approaches in his or her assessment. The approaches can be described as the modeller's approach, the policy-maker's approach, and the procedural approach. These are described in brief, in a way that tries to emphasize the theoretical differences between them rather than trying to cover all the different kinds of assessments that are performed in practice. In Beneris, we have a challenging aim to enable all of these approaches within one coherent methodology.

- Modeller's approach focuses on finding numerical estimates to specific indicators. These are usually decided by the modeller himself, and there is little if any stakeholder involvement.
- Policy-maker's approach focuses on efforts to offer specific information and a useful interface for defined policy-makers in a particular situation. The policy-makers are often involved in this process.
- Procedural approach focuses on questions like "What kind of a process should we use to reach an acceptable risk assessment?" The key task is to analyse understanding related to the issue, and make the relevant statements explicit.

Defining variables

Variable is the basic building block of a benefit-risk assessment. Variable means a statement about particular properties of the world, including both physical properties [what is?] and value judgements [what should be?]. Often, but not always, it can be expressed as a measurable entity with a particular measurement units (e.g. concentration of a contaminant in a particular food, or average intake of a nutrient in a particular population). Variables can be connected with causal or non-causal **links** that describe the relationships between the variables. Together variables and and links are called **statements**. Each statement has a focus and a scope.

A variable consists of a description of the variable, its quantity, and the causal or non-causal links upstream (towards the causes). Important information (i.e., attributes) of a variable include

- a description of the variable
- the unit of the variable
- what variables it is dependent on and how (causality)
- what can be said about its value based on indirect data (prior)
- what data exist about the variable (data, likelihood)
- what the current estimate of the variable is based on all of the above (posterior)
- references to the sources of the information above
- categorization to semantic categories.

The information related to a variable may have a simple or complicated structure. This is an example of a simple variable:

> *The average intake of oily fish is 24 g per day in the adult population of Denmark in ca. 2000 (Riboli, Lambert: Nutrition and lifestyle. Opportunities for cancer prevention. IARC Scientific Publications No 156, IARC Press, Lyon, 2002).*

It contains a focus (oily fish intake), a scope (adult Danish population around 2000), an estimate (24), unit of measurement (g per day), and validation (a reference to a scientific report with an implicit argument that the source is reliable). The structure and content of the variable could also be much more detailed, and it could e.g. fill a scientific article.

Rules for benefit-risk assessment

The basic philosophical question

> (1) *Risk assessment science* is a discipline that answers to the following question: "When should I, as a rational critic who judges reasonably, regard a risk assessment as acceptable?" (modified from van Eemeren and Grootendorst, 2004)
>
> > This rule emphasises the statement that the whole issue about benefit-risk assessment is about the acceptability of the assessment in the eyes of stakeholders. If the end user thinks that the assessment is not acceptable due to any reason, it does not matter what it contains or does not contain. Therefore, acceptability is everything. However, the rule also sets criteria for the stakeholders: they must be rational and reasonable, and thus the non-acceptance must also be clearly argumented.

Before we can start answering the question in rule 1, we must define what we mean by *risk* and *risk assessment*. In this text, we use *risk assessment science* as a wider concept for the whole discipline, and *benefit-risk assessment* as the part of risk assessment discipline that also involves explicit assessment of benefits. Philosophically, it should be the other way round, but due to historical reasons, risk assessment science already does exist as a discipline, while benefit-risk assessment only is developing.

> (2) *Risk* is such a property of a situation that tells that two or more outcomes are possible, the particular outcome that will occur is unknown, and at least one of the possibilities is undesired (modified from Covello and Merkhofer, 1993) ...and there is a need to affect the outcome (Tuomisto 2006).
>
> > This rule emphasises to subjectivity of risk. Because there is the addition "a need to affect..." in the definition, the same situation may be a risk to someone but not to someone

else (who thinks that no action is needed).

(3) *Risk assessment* is a process of developing a rational and reasonable description of a particular risk (and related benefits). The aim of the description is to increase understanding and reduce the need to affect the outcome.

This rule emphasises that the main target of a risk assessment is not a decision to reduce the probability of harm; nor is it information about how to reduce it. It is about how to reduce the **need** for further actions. This may of course involve some actions to reduce harm, but the assessment may also conclude that there is no need to act, which, by definition, means that the risk disappears.

Rules for structure

(4) A risk assessment consists of *statements* that are either *variables* (statements about particular properties of the world, including both physical properties [what is?] and value judgements [what should be?]) or *links* (statements about the relationships between variables). Each statement has a focus and a scope. Statements may be structured hierarchically.

Rules for process

(5) A statement in risk assessment is regarded *validated* if and only if it holds against critical *argumentation* about the content and relevance (according to van Eemeren and Grootendorst). The argumentation must be based on accepted premises and discussion rules. *Falsification* (according to Popper) is a special case of argumentation, where the validation is based on the consistence between the statement and existing data. The validation process and its result are parts of the statement.

(6) Scientific statements, value judgements, and validation rules in a risk assessment must all be internally coherent and consistent. If an assessment contains conflicting statements, there must be a rule for determining which of the statements is used in a particular situation.

This rule can be for example that all conflicting statements are evaluated one at a time, and the outcome is a combination of several separate assessments.

(7) Rule of relevance: all statements in a risk assessment must be relevant. *Relevance* means that it is linked directly or indirectly to the focus of the assessment via causal or other relationships.

(8) There must be a period for drafting focus and scope, and they are fixed after the drafting period. The fixed focus and scope of a statement must not be changed. This is because a statement may be used in several assessments, and the statement may lose its relevance, if its focus or scope is changed. However, the attributes (see above) may change as new information appears.

(9) The rule of efficiency: A new statement must not be created, if there already exists a statement with the same focus and scope.

Rules for participation:

(10) Anyone who accepts and follows these rules and the accepted premises and discussion rules may fully contribute.

Rules derived from previous rules:

- To be able to compare risk assessments, they must be based on coherent premises and discussion rules. Thus, there is a need to develop systematic sets of standardized premises and discussion rules that will be used. (Based on rule 5)

- The risk assessor must be explicit about which version of the statement he refers to, otherwise it will be difficult to follow the reasoning. This is because the validation process of a statement may change the content of the attributes (but not the scope and focus) of the statement. (Based on rules 5 and 8)
- A risk assessor may expand and add details in any part of the assessment if it is necessary for the validation process.
- A statement that does not hold up against attacks must be invalidated.
- All statements in a risk assessment must be within the scope and directly or indirectly connected to the focus.

Process

The description of the benefit-risk assessment process is a collection of tasks that are needed during the work. Although we tried to organise them in a rough timewise order, we do not claim that there is a strict ordering of tasks. Merely, the process is designed in a way that most tasks can be performed in any order. This is due to the nature of the process: because we aim at open participation, the process must be very flexible with the ordering of events.

The process in the pyrkilo method starts from an overview, and relevant items are explained in more and more detail during the process. Thus, they form buds that get larger during the process of expanding the assessment. The buds form branches and larger entities as necessary.

Scoping

- Define a draft focus of the assessment. Is it driven by e.g. a decision at hand, or a particular outcome whose causes are assessed?
- Define a draft scope of the assessment. What is to be assessed and what is to be excluded from the assessment? Describe the value judgements that you use to defend your selection.
- Define draft indicators that will be looked at, and select one as the main output indicator. As *indicators* we simply mean variables that are selected to be of special importance for the endpoint of the assessment. Think explicitly about both risks and benefits. The indicator list should preferably contain indicators from each of the following groups (or reasoning why a group was ignored) (grouping modified from Lebret, 2006).
    - Policy target indicators (how far is the target)
    - Impact indicators (health, cost)
    - Public acceptability indicators (equity, perception)
    - Appraisal indicators (cost-benefit analysis, multicriteria analysis)
- Describe the dimensions and properties of the indicators. Does it represent average, a random individual, or a certain fractile? Describe uncertainty bounds around the estimate. Especially describe the different kinds of indicators
- Define draft links between the indicators and the focus within the scope. All variables must connect to the focus directly or indirectly.

- Do the things above allowing stakeholder involvement and contribution.
- When no new issues come up, fix the focus, scope, and indicators.

Assessment

- Build the causal chain from the focus to the indicators within the scope.
- Check for existing statements that have the same (or similar) focus and scope as what you need in this assessment. Use them when possible.
- Define the variables along the causal chain.
- Define the premises (the statements that have been agreed upon before or independent of the assessment).
- Describe the main assumptions used in the assessment

- Estimate the relationships between the variables.
- Estimate the values of the variables.
- Estimate the values of the indicators.
- Defend the estimates using systematic argumentation (including stakeholder involvement).
- If possible, compare the importance of each uncertain variable to the output indicator. (e.g. value-of-information analysis or importance analysis).

- Remove everything that is not linked to the causal chain of the assessment, because it is irrelevant.
- Describe the value judgements that relate to the causal chain of the assessment.

Deliberation

- Present the draft assessment structure to the stakeholders.
- Based on the deliberation, revise the assessment as needed.
- Add and improve statements (variables and links) that are relevant, i.e. linked to the focus and within the scope.
- Let stakeholders criticise your work using the discussion rules of critical argumentation. Stakeholders may also be imaginary.
- If any statement is not convincing for a rational and reasonable critique, add more argumentation to defend it. If unsuccessful, invalidate the statement. (Invalidating means that they are labeled invalid and they are not used for argumentation; however they must stay parts of the assessment anyway to show that they cannot be used.)
- Stakeholders may add statements to the assessment. These must be added unless they can be invalidated.
- When no further critique is presented, label the risk assessment as finished (until additional argumentation is presented).

Reporting

- Most of the reporting has been already done during the previous stages, if you have documented the work done.
- Describe the main conclusion derived from the output indicator in respect to the focus.
- Describe other conclusions.

How to use the pyrkilo method in practice

The theorethical framework described above is called the pyrkilo method. The practical implementation of this method is performed using several computer platforms and programs. Each of them have been designed for different purposes, and none of them is capable of doing everything that is needed to implement the method. Three programs will be briefly described here.

Mediawiki

Mediawiki is the same program that is used to develop, write, and publish the open encyclopedia. Its content is structured as articles that anyone can edit. They have a strict version control to prevent vandalism. The interface is simple, and the basic formatting can be learned within a quarter of an hour. Everything in Mediawiki can be done with a computer that has a web browser and an Internet connection.

In Beneris, Mediawiki is the main tool for collecting data, writing benefit-risk assessments, discussing issues related to the assessments, and writing reports. Everyone in Beneris should have basic capabilities to read and use this program. Mediawiki is described in more detail below. There is also a special help page for editing#CHECK THE NAME in Mediawiki.

Analytica

Analytica is a Monte Carlo simulation program that is based on intuitive graphical interface. Variables can be shown as nodes (ovals, boxes or other shapes), and links can be shown as arrows. hierarchical structures are easy to develop. It can be used for complicated and large computing (in the order of million cells per table), but not huge tasks such as dispersion modelling. It is a commercial software, and a licence is needed for a full version. However, [a free browser (http://www.lumina.com)] can be downloaded, which can be used for computing but not for editing the models. Figure 1. has been created with Analytica, and it is a true screenshot from an operational model.

UNINET

UNINET is a Bayesian belief network that is based on a method developed in TUDelft. The causal connections between variables are described as pairwise rank-order correlations, which is a rather simple way of describing complicated probability structures (especially compared with all other possibilities). UNINET is a research tool and available for Beneris project, but full functionalities can be achieved by viewing the results with Netica, which is a commercial Bayesian belief network program.

About the structure of information

A page is the basic building block in Mediawiki environment, which is the computer program that is the most extensively used in Beneris project. All contents of the Mediawiki system are handled as pages (or "articles" in Wikipedia terminology). Each page has an own version history, and a talk page about the issues related to the contents and developing of the page. These properties are fully utilised with the pyrkilo method as well. However, it should be remembered that the building blocks of a risk assessment are variables and links, and pages are the technical way to locate them in the Mediawiki environment. The difference is similar as with a book, where the content is divided into paragraphs and chapters based on substance but pages based on technicalities.

There are three basic possibilities to locate a statement (a variable or a link) on pages.

1. The information of a statement is placed as a part of a page, referred here as a *main page*, using subheadings if needed.
2. An own page is created for the statement, and the information is placed there. The main page contains a summary and a link to the statement page.
3. The statement page itself contains links to more detailed sub-pages that are used to define the statement more thoroughly. This growth may go on as needed.

Formats for data entry

A major bulk of data produced in Beneris is related to food, nutrient, and contaminant intakes, and the respective concentrations. Therefore this kind of data is used as example in the following description. Data is usually and when possible expressed at group, not individual, level. Variability and uncertainty is described within the group whenever possible. Typically variables are on national level, possibly divided into the following subcategories:

- Sex
- Age group
- Some selected special groups such as high exposure (e.g. due to lifestyle) or vulnerability (due to disease).

The values of variables are typically expressed as distributions. Normal, lognormal, or user-defined distributions are typical examples. When possible, distributions should be defined using simple parameters such as mean or median and standard deviation.

How to use categories

Categories are needed to classify statements into useful groups. Categories are handled per page, so a page should be categorised to all categories that are relevant for any of the variables described on that page. The categorisation is at the moment not well developed, and this will be a major development task before the next version of workplan pyrkilo. However, at least the following categories at probabliy needed.

- Substantive categories (DPSEEA categorization [Driving force-pressure-state-exposure-effect-action]; age grouping; pathways etc.)
- Functional categories (HOW IMPORTANT ARE THESE?)
  - Assessment (describing relevant properties of the world)
  - Tasks (about performing the assessment)
  - Methodological (about pyrkilo method)

Version history

For the acceptability of an assessment, it is important to be able to see, how the assessment has evolved in time. As the contents of a variable may change dramatically, the stakeholders may want to see whether their original contribution was handled in a proper way. It must also be possible to revert back to the previous version of a page, if there is a case of vandalism.

A risk assessment is always conditional to the data existing at the time. (In MediaWiki environment this means that when a referred page changes, the risk assessment is based on a non-current version. To avoid confusion, permanent links should be used so that links always point to the version that actually was used to deduce the conclusions of the assessment).

Notation used with the structure (and how to do it in Mediawiki)

Most of a benefit-risk assessment can be described using simple text descriptions. However, there are a few special things that have a specific notation, and there should be followed (and if that is not possible, the notation must be developed).

Hierarchical structures are described by using indenting.

> ":" in the beginning of line indents the paragraph by one unit,
>> "::" with two units and so on.

Subitems are listed using bullets ("*" in the beginning of the line).

- Sub-items.
- More sub-items.

Statement that is defended by

> ← an argument are connected with a simple arrow.

Statement that is attacked by

> ⇤ an argument are connected with an arrow with a bar.

An effect is connected to

- ⇐ its cause by a double arrow.

Structure of a benefit-risk assessment

The following is an example of a draft of a benefit-risk assessment of salmon consumption. It does not yet contain numerical estimates of any variables, but it shows the outcome indicator and several critical variables that are needed to estimate the indicator. Each row contains one variable, and links are shown as arrows. The notation used here is explained in detail later.

Net health effect of salmon (outcome variable)

- ⇐ Health risks caused by pollutants
  - ⇐ Pollutant potency
  - ⇐ Pollutant exposure
    - ← Farmed salmon contains more toxins than wild salmon
      - ← Feed given to farmed salmon contains more toxins than wild salmon's food
        - ⇤ 90% of contamination comes from the water
          - ⇤ Organochlorines are not very water soluble
    - ← European salmon contains more toxins than USA salmon
      - ← European feed contains more toxins than USA feed
- ⇐ Health benefits caused by nutrients in fish
  - ← Eating salmon reduces CAD deaths
    - ⇤ The benefit involves only those with CAD while risk involves everyone
    - ← Together the following
      - Salmon contains omega-3 fatty acids
        ⇤ There are other sources of omega-3 fatty acids with less or no toxins such as flaxseed, walnut and canola oils
      - Omega-3 fatty acids help reduce CAD deaths

Utilising Bayesian properties

Bayesian techniques will be in a central role in benefit-risk assessments performed in Beneris project. However, this first guidance document will not deal with those issues yet, as the methods to link these issues in the overall pyrkilo method is only under planning at this stage. This will be a major issue of development before the next version of this guidance document.

Case studies

The method briefly described here will be tested with the two case studies, fish and vegetables. This chapter is merely a placeholder, and it will be developed before the next version of the workplan pyrkilo.

The main aims of the case studies is to a) show how the case is structured, and b) Show what pieces are included that are not otherwise parts of the traditional assessment.

Advanced tools for Mediawiki work

This chapter is, as the name says, "advanced" in the sense that most people participating in a benefit-risk assessment (e.g. in the form of the two case studies) do not need to know about these details. However, because the method should be able to handle also complicated structures and relationships, these issues are included in this guidance document.

An *alternative variable* consists of several items that are exclusive alternatives. This means that if one of the items is true or chosen, the others are not. With alternative variables, there must be a rule how to determine which of the statements holds in a particular situation (see rule 6). It is useful to distinguish three different kinds of alternative variables.

- Decision: One decision situation consists of several options, one of which will be chosen by a decision-maker.
- Dispute: A situation where there are different scientific hypotheses about the same variable or link.
  - Probability distributions: Only one value is possible in each particular situation, and random sampling is the rule how to determine which one. Correlation matrices are also this kind of rules.
- Disagreement: A situation where there are different value judgements about the same variable or link.
  - The selection rule may be e.g. that all values are evaluated one at a time, or that premises are used to determine which statement to select. The latter may require an update of the premises.

There are three possible ways to describe an alternative variable. The first two are similar to description of any variable.

1. The alternatives are described directly as a part of a main page.
2. The alternatives are described on one own page, with a summary and a link on the main page.
3. If the description of all alternatives requires more than one page (e.g., one page per alternative), The following rules apply.
   - A category page is created for describing the alternative variable.
   - Alternatives are described on pages linked to this category by using categorization.
   - The main page is linked to the category page using a link (NOT categorization).
     In this way, the existing data concerning decisions forms a consistent pattern: the current situation is a special decision option in the sense that it is the only option from which there exists direct data. All other alternatives are hypothetical and must be analysed using what-if analyses.
   - In the case of a decision, the current situation (or the 'do nothing' alternative) is located on the category page, not on a separate page.

Defining causal and non-causal links

All links are described upstream, which means that the description of a causal link is located as the definition of the effect variable, not the cause variable. There are three possible ways to describe causal links.

1. The causal link is fully described as a part of the main (effect) page.
2. The causal link is described as a part of the main page, but the causes are separete pages, and the main page contains links to them.
3. The causal link is described separately as a *template*. A template is a page that is used as a part of several pages in the same form. This makes it possible to have a coherent description of several links that share the same properties.

One cause-effect relationship may have several causes. The causes may have interactions.

A template may typically contain

- a cause-effect function
- parameters for the function but not values of the parameters. Values are defined on the main page as values or as links to pages that contain the values.
- plausibility of the existence of the cause-effect relationship
- the units used
- description, scope and other relevant properties of the relationship

Non-causal links are described in the same way as cause-effect relationships. These include value judgements, argumentation, and conclusions.

Value judgements cannot be linked **to** physical variables; they must always be linked **from** them. This becomes clear when one thinks about the link as if it was causal: my opinion about adolescent smoking does not affect the smoking, but the smoking does affect my opinion.

Variable hierarchy

Many variables are hierarchically related in such a way that one variable is a special case of another. Thus, they share common properties, such as common cause-effect relationships. This is a way to apply general links in a specific case in a coherent manner. The hierarchy is performed using *substantive categories*. They are technically typical categories in the same way as in Wikipedia. Variables are linked to categories, and categories are linked hierarchically to other categories.

However, there is a more specific interpretation with a hierarchy category than with a regular category. A category is defined as a subcategory of another category if all the members of the former share all the properties in the definition of the latter. It is therefore very important that categories are very clearly defined. Properties may be inherited using the following rules.

- Inheritable properties are defined as templates.
- A property may be attached to a category as an inheritable property if all its members share this property.
- An inheritable property may be given (copied) to a subcategory or a variable belonging to the category.
  - For subcategories, a link to the respective template is written under the subheading "Inheritable properties".
  - For variables, the respective template is used in the appropriate place in the definition.

See also

References

- van Eemeren, Grootendorst: A systematic theory of argumentation. Cambridge, 2004.
- Lebret E: Intarese assessment framework, 2006.

Links to other Wiki pages

- Category:Pyrkilo categories
- Help:Defining the scope of a page
- 'Dis-pages'
  - Category:Disambiguation
  - Category:Disagreement
  - Category:Dispute

Further reading related to risk characterisation (the links don't currently work without a password to INTARESE project)

- intarese:Environmental health planner for policy
- intarese:Bayesian hierarchical modeling review
- intarese:Feedback about Intarese method
- intarese:D17 Risk characterisation protocol
- Integration of policy WPs: intarese:D18 Risk characterisation methodology report
- intarese:Guidance for Subproject 3

Categories: Deliverable

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