Web Services for Supporting Health Managers in the Assessment of the
Impact of Local Policies on the Health Status of the Population

C. DOMNARIU\(^1\), I. MOISIL\(^2\)

\(^1\)“Victor Papilian” Faculty of Medicine
“Lucian Blaga” University of Sibiu
\(^2\)Computer Science and Automatic Control Dept., “Hermann Oberth” Faculty of Engineering
“Lucian Blaga” University of Sibiu
10, Blvd. Victoriei, 550024 Sibiu
ROMANIA
carmen.domnariu@ulbsibiu.ro, http://medicina.ulbsibiu.ro

“Whoever wishes to investigate medicine properly should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces for they are not at all alike, but differ much from themselves in regard to their changes. Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities.”

“On Airs, Waters, and Places,” Hippocrates (400 BCE)

Abstract: In the last decades Health Impact Assessment (HIA) became an important activity in health management. Health impact assessment looks at the effects on health of polices implemented outside the healthcare sectors (environmental policies, ecosystem services, economic development, etc.). The present paper is presenting a series of concepts and suggests a feasible approach to carrying out HIA at local level and not only. Web based tools to support health managers in HIA are also discussed and one pilot study is presented.

Key-Words: Health Impact Assessment (HIA), policy, local level, web services, Microsoft SharePoint.

1 Introduction

It has been long accepted the fact that health and its determinants [1] are strongly influenced by the policies outside the healthcare sector, such as: transportation, regeneration projects and housing. There are countries that have recently introduced health impact assessment (HIA), with a view to try and ensure that the potential effects on health are taken into consideration. This involves identifying disbenefits and benefits to health, interpreting health risk and potential health gain and presenting this information in order to facilitate the decision making process at local level[2].

In a consensus paper, published by WHO Regional Office for Europe, health impact assessment is described as “a combination of procedures, methods and tools by which a policy, programme or project may be judged regarding its potential effects on the health state of a population and the distribution of these effects within that population”[3]. There are also other definitions proposed for health impact assessment. All of them generally agree to:

- health gain maximization and loss minimization;
- multidisciplinary, intersectorial and participatory character of HIA;
- focus on health inequalities;
- use both the quantitative and qualitative types;
- the fact that there are four values which are particularly important for HIA:
  - democracy, emphasizing the right of people to participate in a transparent process for the formulation, implementation and evaluation of policies that affect their life, both directly and through the elected political decision makers;
  - equity, emphasizing that HIA is not only interested in the aggregated impact of the assessed policy on the health of a population but also on the distribution of the impact within the local population,
terms of gender, age, ethnic background and socio-economic status;
- **sustainable development**, emphasizing that both short term and long term, as well as more or less impacts are taken into consideration and;
- **ethical use of evidence**, emphasizing that the use of quantitative and qualitative evidence has to be rigorous and based on different scientific disciplines and methodologies in order to get an assessment as comprehensive as possible of the expected impacts.

2 Health Impact Assessment at local level

Social, economic and other policies in both the public and private sectors are so closely interrelated that proposed decisions in one sector may have an impact; may induce changes in the objectives and decisions of other sectors. In recognition of this, specific legal and administrative rules, procedures and methods have already been developed in many countries to assess the impacts of policies. This has been done mainly for environment, employment, economic growth or competition, cultural and social factors, or ethnic groups and gender. The general objectives of an impact assessment are to improve knowledge about the potential impact of a policy or programme, to inform decision-makers and affected people and to facilitate adjustments of the proposed policy in order to mitigate the negative and maximize the positive impacts [4].

Although polices in other sectors can have a considerable influence on health and the production of prevention of illness, disability or death, this has so far only been taken into consideration to a limited degree, mainly in relation to environmental and social impact assessments. Recent attempts to take a more integrated approach to health and development has put HIA high on the agenda of some governments in Europe (at national, regional and local levels), and of international organizations including WHO and World Bank. A similar increased interest is reflected in research circles. An important step forward has been taken in the European Union through Article 152 of the Amsterdam Treaty, which says that “A high level of human health protection shall be ensured in the definition and implementation of all Community polices and activities”, and the Council Resolution of June 1999 calling for the establishment of procedures to monitor the impact of Community polices and activities on public health and health care. These developments have given a strong impetus to the need for developing common understanding about the core elements of health impact assessment and an international exchange of experience and innovations.

3 Elements of Health Impact Assessment:

Health Impact Assessment includes the following elements:

- consideration of evidence about the anticipated relationships between a policy, programme or project and the health of a population;
- considerations of the opinions, experience and expectations of those who may be affected by the proposed policy, programme or project;
- provision of more informed understanding by decision makers and the public concerning the effects of the policy, programme or project of health;
- proposals for adjustments in order to maximize the positive and minimize the negative health impacts.

HIA should be an integral part of the policy process. HIA process begins in the moment when there is a proposal or intention to continue or to make changes in the existing policy, or to launch a new project or policy. It should be preferable to be implemented early enough for any recommendations to be considered before critical choices are already made. The results of retrospective HIA are however, valuable in informing future prospective health impact assessments.

HIA first step is to explore which policies or programmes could have an impact on health, as well as the type of impact (screening process). If there is need for further information, a scoping process is carried out for determining what further work should be accomplished, by whom and how. Irrespective of the type of approach, this will be followed by reporting on findings, appraisal and adequacy of the report and by the action necessary to adjust the proposed policy, programme and project accordingly.

Health Impact Assessment process comprises six main stages: screening, scoping, appraisal or risk assessment, preparation of report and recommendations, submission of report and recommendations to decision makers, monitoring and evaluation[2].
3.1 The first and essential step in HIA is screening. Screening aims primarily to filter out proposals that do not require HIA, so that scare resources can be targeted on proposals that will benefit from formal assessment. It means searching for potential linkages between policy, programme and project and health, as well as the health aspects that might be affected. This is made systematically, based on the available information. In case, screening indicates a negligible potential health impact, either positive or negative, or in case health impact is well known, this is reported and the report made available for appraisal by the decision makers and those affected by the proposed policy, programme or project. If screening indicates that more information is needed, the second stage comes in, that is the scope.

3.2 Scoping (sometimes called “terms of reference”) gathers the elements or aspects of the proposal to be assessed, the proposal’s non-negotiable aspects, HIA aims and objectives, values supporting HIA; geographical area covered by the proposal implementation; the affected populations or communities, possible vulnerable, marginalized or disadvantaged groups, HIA stakeholders and the nature of their involvement; available resources (human, material and financial), the methods to be used.

3.3 Appraisal or risk assessment is the stage in which health impacts (positive or negative) of a proposal are detected. There are a lot of methods that can be used, depending on the model of HIA used, as well as on timescale or resources constraints. This stage defines the length of the process, from rapid appraisal (also called mini-HIA [5] – the use of the information and evidence already available or easily accessible) to comprehensive appraisal (also called maxi HIA – the collection of new data, that unusually requires a prolonged and substantial time commitment from a number of people and is resource intensive – unpublished data).

3.4 Preparation of report is the main output of HIA. It comprises the information gathered from stakeholders during the appraisal stage, findings from other HIAs regarding similar proposals, background information based on the local community and the relevant geographical area. Recommendations should also be tested to ensure that they address the impacts identified and that the interventions they suggest are effective.

3.5 Submission of reports and recommendations is the fifth stage of HIA and represents the main mechanism by which the outputs from the appraisal/risk assessment influence proposal development. It is necessary that the reports and recommendations submission should be made within the schedule set for the relevant decision making process. It is important that the information should be presented in an accessible format and comprehensible language as the target audience is seldom public health experts.

3.6 Monitoring and evaluation. Although a specific HIA ends here, there are several components that should be taken into consideration:

- Process evaluation – it shows how successful HIA was in practice. This is important as a source of learning, for quality improvement or quality assurance.
- Impact evaluation – monitors the acceptance of recommendation and implementation of the accepted recommendations.
- Outcome evaluation – monitors the indicators and health outcomes after the implementation of the proposal [6, 7, 8].

4 Web Services for HIA

Health impact assessment is a multidisciplinary process as the aim is to assess or predict the combined impact of one or more interventions (e.g. policies) on multiple health outcomes. These impacts can be measured using different metrics, as: number of prevented deaths, years of life gained (or lost) (YLL), quality-adjusted years of life gained (e.g. QALYs and DALYs), cost-effectiveness ratio (e.g. Euro per QALY) and net monetary benefit (benefits - costs). If the assessor wants to do more than a bureaucratic report, she/he can use several approaches. The retrospective approach uses data mining technologies to discover the impact of former interventions/policies on the health status of the population. This approach is feasible if historical health and policies data are available. Other approach can be based on longitudinal studies following in time changes in the health status of a target population. Prognostic models can be built and an assessment issued based on computer simulation. No matter the approach used, the assessors’ team must have sound knowledge of epidemiology and statistics.

In order to support the assessors of the district of Sibiu we have used web technologies to provide them with the needed resources.

4.1 Web services

As the name is indicating, a web service is aimed
to provide some functionality on behalf of its owner
(an individual or an organization). There are several
definitions for a web service [9]. A simple one,
reflecting the end-user point of view, is the one that
considers that a web service is an interface
accessible via a network that enables the user to
access different applications using standard internet
technologies. Other definition considers that a web
service is a software system designed to support
interoperable machine-to-machine interaction over a
network. The web service has an interface described
in a format (WSDL) that can be processed by a
machine and interacts with other systems according
to its description and using standard web protocols.
Usually the implementation of a web service is by a
concrete agent. A Web service is an abstract notion
that must be implemented by a concrete agent. The
general architecture of a web service (SOA) is
presented in figure 1. The provider entity is an
internet node that provides an appropriate agent to
implement a particular service. This is the owner of
the service, i.e. the platform that hosts the access to
the service. The requester entity – the client wishes
to make use of a provider entity’s Web service. It
will use a requester agent to exchange messages
with the provider entity’s provider agent. The
mechanics of the message exchange are documented
in a Web service description (WSD). There is a
register that records information about services
providers and where the requester can find also
binding information. An application can use a web
service if the description of the service has been
published, if a find operation has been designed and
implemented, and if it is capable to call the service.

4.2 HIA Application
Our application has three components:

- web services that collect data on weather
  characteristics, air, water, and soil pollution,
  economic aspects, food, agriculture and
  nutrition policies, life-style statistics, new
general regulations (fig.2).

- a web service that provides data on the
  population health status in our district. Health
data at the level of the Sibiu district are
collected by the Sibiu Centre of Public Health
in a data warehouse that is the resource for
the web service.

- a set of references of statistical and
  epidemiological procedures that can be used
  for HIA, and a tutorial. This is a classical web
  site (fig.3).

For developing our application we used
Microsoft
Technologies for web services: .Net Framework
3.5 and SharePoint. As programming language we
used C# [10].
the impact of air pollution on the population in 2008, using resources from our application. They had also to make a prognosis for the first semester of 2009. As data concerning air pollution were not accessible for online processing, we had extracted them from the reports available at the address of the National Agency for Monitoring of Air Quality (http://www.calitateaer.ro/) and organized them in a data base. So the web services used this data base as resource. Data on air pollution had to be correlated with the weather status and health reports. In conducting the study, the investigators had to follow the recommendations of the tutorial. The prognosis for 2009 was validated with data obtained from the monitoring points in Sibiu.

76% of the investigators found our application very useful and relatively easy to use. 21 % considered that they do not have the basic knowledge in epidemiology and statistics for carrying out this kind of study, and though the tutorials were useful, they need more training in the field. 3% abandoned the study.

From our point of view the most important problem was that for the moment, with the exception of data about weather conditions, data on environment and health status are not available online in a format suitable for web services and that we need to develop some tools for extracting and pre-processing data from pdf and doc documents before using RDF. This is needed because data warehouses for the fields of interest are not yet operational.

5. Conclusion

HIAs are similar in some ways to environmental impact assessments (EIAs), which are mandated processes that focus on environmental outcomes such as air and water quality. However, unlike EIAs, HIAs can be voluntary or regulatory processes that focus on health outcomes such as obesity, physical inactivity, asthma, injuries, and social equity. An HIA encompasses a heterogeneous array of qualitative and quantitative methods and tools. Rapid HIAs can be completed in a few days or weeks; full HIAs may require months to complete. The decision to conduct a rapid or a full HIA is often determined by the available time and resources. In our paper we have proposed and design an application that uses web services for two main purposes. First, web services are used to collect data on weather characteristics, air, water, and soil pollution, economic aspects, food, agriculture and nutrition policies, life-style statistics, new general regulations. Secondly, we have designed a web service that provides data on the population health status in our district. The application offers also a set of references of statistical and epidemiological procedures that can be used for HIA. The first evaluations have been made by physicians participating at a master degree program in health management (impact of air pollution on the health status of the population) and have been encouraging. As future developments we want to make the application available for all health managers from our district and to train them to use it.

References: