



INPHET Working Party 2: “Science of relevance to EPHT”

May 14th and 15th, City of Modena, Italy.

Working Party Report

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Chairs

The working party was chaired by Jan C. Semenza, of the European Centre for Disease Control, and Giovanni Leonardi from Public Health England. The rapporteur was Kees de Hoogh from Imperial College London (now Swiss Tropical & Public Health Institute, Basel, Switzerland).

Objective:

The objective of the working party was to discuss the science of relevance to Environmental Public Health Tracking (EPHT). In particular, aspects focused on identifying the main constraints in especially in relation to EPHT exposure data and modelling, plus presenting an overview of available tools and initiatives which may help overcome these problems.

Attendees

The following participants attended the workshop:

Giovanni Leonardi (GL), Public Health England, United Kingdom
Jan Semenza(JS), European Centre for Disease Control, Sweden
Kees de Hoogh (KdH), Imperial College London, UK (now Swiss Tropical & Public Health Institute, Basel, Switzerland)
Paola Angelini (PA), USL, Regione Emilia Romagna, Bologna, Italy
Ferdinando Luberto (FL), USL, Regione Emilia Romagna, Bologna, Italy
Rebecca Ghosh (RG), Imperial College London, UK
Federico Fabbri (FF), Imperial College London, UK
Andrea Ranzi (AR), ARPA Emilia Romagna, Italy
Tom De Smedt (TDS), Scientific Institute of Public Health, Belgium
Stefano Zauli Sajani (SZS), ARPA Emilia Romagna, Italy
Nunzia Linzalone, CNR Pisa, Italy
Alice Casari (AC), ARPA Emilia Romagna, Italy
Michele Cordioli (MC), ARPA, Italy
Bianca Gherardi (BC), ARPA, Italy
Federica Parmagnani (FP), ARPA, Italy
Giulia Tommaso (GT), ARPA, Italy
Lucia Borsari (LB), Università di Modena – Specializzanda, Italy
Flavia Baldacchini (FB), AUSL RE, Italy
Laura Bonvicini (LBo), AUSL RE, Italy
Serena Broccoli (SB), AUSL RE, Italy
Agnese Veronesi (AV), Nuovo Ospedale Civile S.Agostino Estense, Italy
Federica Piccoli (FP), CMNS, Italy



Questions to consider

Participants were asked to consider scientific and technical principles and current issues in relation to environmental public health tracking examples, such as environmental and health surveillance in relation to vector-borne disease and waste management, and scope for European-wide work on these issues. The following five questions were offered to the participants to help structure the discussion.

- what regional (European, but could be other regions) data has been used in your country?
- how are you going to work with the INSPIRE standards for geo-referenced data?
- are any other standards of relevance to environmental health data across Europe?
- what kind of analytical methods do you use for environmental health research?
- what kind of analytical methods do you use for environmental health routine information systems?

Presentations

Jan C. Semenza. Linking Environmental with Epidemiological Data: The ECDC Experience

To introduce the session, Jan C. Semenza provided an overview on ECDC experience on these themes, focusing on risk models for precursors of infectious and vector-borne disease and their application to public health information systems. Globalization and environmental change; social and demographic determinants; and health system capacity are significant drivers of infectious diseases which can also be epidemic precursors of disease. Thus, monitoring changes in these drivers can help anticipate, or even forecast, an upsurge of disease. The European Centre for Disease Prevention and Control (ECDC) has recognized the strategic importance of such capabilities and has developed an information infrastructure coined the European Environment and Epidemiology (E3) Network¹, aimed at monitoring environmental conditions related to infectious disease threats. Data on disease drivers in the E3 Network have been applied to a number of infectious disease scenarios in Europe with the aim to build early warning systems. 1) The environmental suitability of malaria transmission in Greece was mapped in order to target epidemiological and entomological surveillance and vector control activities. Malaria transmission in these areas was interrupted in 2013 through such integrated preparedness and response activities. 2) Tick-borne encephalitis (TBE) is a serious public health concern in North/central Europe. The TBE risk in southern Sweden for late fall was quantified through the use of vegetation indices and early spring temperature and mapped spatially. This information can be used for vaccination and prevention campaigns. 3) Since 2010, recurrent West Nile fever outbreaks have occurred in South/eastern Europe. Temperature deviations from a thirty year average proved to be associated with the 2010 outbreak. Drivers of subsequent outbreaks were computed through multivariate logistic regression models and included monthly temperature anomalies for July and a normalized water index. 4) *Vibrio* spp. is a waterborne pathogen that can cause gastrointestinal diseases or wound infections. The environmental suitability for *Vibrio* spp. in coastal waters was computed with remotely sensed sea surface temperature and salinity data. A global risk map is available on the E3 Geoportal. 5) Climate

¹ <https://e3geoportal.ecdc.europa.eu/SitePages/Home.aspx>



change and food and waterborne diseases. ECDC has developed a quantitative microbial risk assessment to assess the impact of climatic variables (such as temperature and precipitation) in infection risk.

Drawing on experiences it was expected to discuss some issues which would be useful to clarify for the INPHET network going forward. Delegates were invited to give a 10 minute presentation or brief overview of relevant case studies where scientific and technical aspects played a key role in tracking projects.

Kees de Hoogh. Overview of exposure assessment and GIS related issues concerning industrial sites

Kees gave an overview of waste-related research conducted at the Small Area Health Statistics Unit (SAHSU) at Imperial College London, UK, and in particular the role of exposure assessment. Studies about landfill sites and municipal waste incinerator were discussed. Examples of different exposure metrics were also shown; e.g. the use of buffering in GIS and dispersion modelling.

The discussion focused on data quality, linkage with health data, the importance of data checking, socio-economic status, and what to do when you do not have sufficient data.

Paola Angelini. Overview of environmental drivers influencing the epidemiological risk of vector borne diseases

Paola presented a Tiger mosquito surveillance system to prevent the spread of Chikungunya and Dengue. An example was shown of a Chikungunya outbreak in Emilia-Romagna (Italy) in the summer of 2007. A website is operational (<http://www.zanzaratigreonline.it/>) giving up-to-date information to the public. Next, Paola presented work done in the Emilia-Romagna region about mosquito surveillance in rural areas and the risk of West Nile virus transmission. The West Nile virus, transmitted by Culex pipiens mosquito, is particularly difficult to model as certain bird species function both as primary blood hosts of the Culex pipiens and as reservoir-competent virus hosts.

The example of an early warning system was given; can you adopt an early warning of an outbreak when you spot the first case? The aim of an early warning system is to prevent an outbreak of a vector borne disease and an example of the existing Dengue fever protocol was presented.

To prevent the West Nile virus from spreading the preventive measure is to control for example the Tiger mosquito. An example was given where the preventive measure was to spray the location of open air fares/festivals (places where people gather and where an outbreak of vector borne diseases could potentially start), before the event happens.

Rebecca Ghosh and Federico Fabbri. Visualize, explore and analyse spatially linked health data.

The recently developed Environmental Health Atlas for England and Wales (online version: <http://www.envhealthatlas.co.uk/homepage/>) was presented. It shows some environmental exposures plus a number of related health outcome data at a census area level (wards). The online version allows the user to zoom in to areas of interest, for example the ward they live in.

The Rapid Inquiry Facility (RIF) at Imperial College is currently being redeveloped in an open-source software (PostGRESQL) with the intention to freely distribute. The application allows risk analysis and disease mapping at a small area level.



Discussion: Could the atlas tool be turned into a surveillance tool? It would need a spatial temporal component. The Atlas could be the first step to more future work in this area.

Again the question asked was: “Is tracking surveillance or research? Or is it a mix of both?”

Andrea Ranzi. Environmental and health monitoring in urban areas and near waste treatment plants.

Andrea presented a surveillance tool/software for drinking water quality exposures (RAIMS system) purposely build by ARPA for use in Poland. The key questions which need to be answered before building the tool were: 1) what are the most important water-related diseases which should be put into a surveillance system? 2) which data on water supply and related environmental pressures are needed to assess the risk for water-related diseases?, and 3) how can these data be integrated into a surveillance system? The RAIMS system is built using GIS software, a RDMS engine and a web application server.

The second example Andrea presented was the SESPIR project, to provide methodologies and operational tools for the implementation of surveillance systems on waste and health and to assess the impact of the municipal solid waste management on health of exposed population, according to different regional settings.

Lastly Andrea showed details about the Supersite project – a detailed study of chemical, physical and toxicological parameters and on health, epidemiological and environmental assessment by interpretative models, in the atmosphere of Emilia-Romagna (Italy). The main objective is to improve knowledge about environmental and health aspects of fine and ultrafine particulates, in primary and secondary components, in the atmosphere.

Stefano Zauli. Real time tracking of emergency ambulance dispatches and heat wave warning system.

Stefano outlined the Heatwave warning system in use in Emilia-Romagna, Italy (www.arpa.emr.it/disagio) and gave an example of an air pollution early warning system. A website plus news flashes can warn people to stay inside and close the windows, thus avoiding possible morbidity and mortality.

Data is needed for surveillance of heatwaves: 1) mortality data is most reliable, but there is a delay in getting this, so possibly not so ideal 2) hospital admissions and 3) emergency ambulances data. Stefano gave more information about the idea of using data on emergency ambulance dispatches. The strength of using this data were that they are available in real-time, are collected in regional databases with uniform procedures and that they are an indicator of pressures on the health system. Disadvantages are that the emergency ambulance dispatch data are not reliable in establishing the cause of disease and that it is not linkable with other databases.

Ferdinando Luberto. The experience of the Italian asbestos cohort study.

The occupational setting for this work highlighted the importance of building a comprehensive network of stakeholders to achieve a comprehensive and representative selection of the population to follow up. EPHT could learn from occupational experiences about the need to build a network.

Discussion.

TDS (Belgium) – highlighted the particular interest in linking exposures from nuclear sites to cancer cases – better statistical methods are needed for this, and questions arose on how to do the exposure assessment, considering dispersion modeling was one answer.

The INSPIRE Directive² and its implications was not well known in this group – this directive concerns making georeferenced data available to the public under the “right to know”. RG (UK): This is particularly relevant to public institutions with several original spatial datasets containing routine data such as SAHSU, academic institutions, local and national governments and health and environment agencies.

NL (Italy) raised the issue of Health Impact Assessment and its possible use of EPHT-like data. The problem in Italy is the presence of different quality of data where only a few regions conform to certain standards via National Statistics and National Assurance Institute. Therefore the problem of defining common standards and parameters can be expected to be even more severe across Europe.

Parma (Italy)- A prominent current topic is health aspects of waste management. A surveillance plan has been started for municipal solid waste incinerators, sampling human and environmental metrics – both before and after operation. Not many people live around the incinerators, the idea is to match samples with other studies around the world to increase sample size.

RG (UK)– SAHSU has routine data on health and environmental exposures. In compiling the Environmental Health Atlas, the scarcity of nationwide environmental data was identified in comparison with health data.

FF (UK): the Rapid Inquiry Facility (RIF) could be a tool for EPHT. On a European scale, an atlas could be compiled for Europe. The UK atlas points the way to what tools we could use.

AR (ARPA, Italy): the requirement for a hypothetical EPHT across Europe will be affected by the level of data precision required. Exposure is the most important step in environmental epidemiology and requires a lot of precision, not typically available as part of routine data such as considered by EPHT.

GL agreed, and suggested that EPHT has related but different aims from etiologic studies in epidemiology, therefore a lower level of precision could be sufficient for that aim. Tracking is an application of epidemiology research, but can also facilitate new research by providing the public health rationale and motivation from tracking stakeholders.

Bio-monitoring can open the door to a more valid EPHT system as it will provide a more direct and accurate measure of exposure, thus giving more weight to subsequent analysis.

Current heatwave warning systems show how EPHT-like approach could have relevance to public health interventions.

JS (Sweden): supported the use of scenarios to capture the several current and expected dimensions of environmental change and therefore guide the development of public health information systems relevant to the questions that will arise.

² <http://inspire.ec.europa.eu/>

Summary:

There was consensus that EPHT includes steps from science to public health benefits, therefore it is focused on applications of the science.

Four areas emerged from the discussion:

1. Themes to focus EPHT studies on were highlighted:

- a. Polluter-focus
- b. Pollutant-focus: waste, climate change/vectors, specific pollutants including their change over time
- c. Disease focus: a broader range of topics emerged.

2. What level of precision is required needs to be defined

Different aggregation of environmental data are possible, such as:

- a. Address
- b. Postcode
- c. Census area
- d. Region

In particular in relation to environmental and exposure data, the aim of data collected/used may be:

- a. Production of risk estimates, as part of etiologic research
- b. Public health surveillance/exploratory research/planning of interventions.

Therefore, an EPHT programme has a different aim compared to etiologic research, and is likely to require a lower level of precision/aggregation of data over larger areas.

3. Scenarios

There are several drivers of environmental change, not limited to climate change but including use of water, type of energy production, and changes in environment related to all human activities. Therefore an EPHT international activity would need to consider this broad “change” agenda, and scenarios may drive some of the planned work.

4. Tools

Common tools might support EPHT developments and therefore they may be a key aspect for taking joint work forward. Tools may include:

- an Atlas summarizing comparable information on preventable environmental hazards to health
- rapid enquiry methods such as RIF used in England may be of value in several countries.

Report prepared by Kees de Hoogh, Giovanni Leonardi and Jan C. Semenza.

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