Challenges in managing uncertainty of low dose effects in chronic public exposure situations: Social aspects, stakeholder engagement and expectations

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Introduction

• Public chronic exposures to ionizing radiations are numerous
  • Planned exposure situation (around nuclear installations, in the medical field…)  
  • Existing exposure situation (radon and natural radiation, legacy sites, post-accident,…) 
• Experiences demonstrate the need to address social and ethical issues together with scientific issues, including uncertainties in risk estimates
Content

• What is at stake?
• Some experiences and initiatives to cope with public concern
• Social values and ethical considerations
• Challenges in engaging stakeholders
• Chronic exposure situations associated with radioactivity impacting everyday life of populations
• More or less legitimacy related to the presence of radioactivity in the environment
• Large population involved and low to very low doses
• Observation of health effects: how far is it related to exposure to radiation?
What is at stake? (2/4)

- Large scientific developments on effects associated with ionizing radiation, allowing to:
  - Estimate the risk associated with exposure
  - Take into account a variety of effects (deterministic/stochastic; cancers/non cancer effects…)
  - Identify a variety of risks depending on dose levels
What is at stake? (3/4)

• Nevertheless, no clear statements from science on individual risk associated with low doses
  • Uncertainties associated with long-term radiation-induced health effects
  • Implication of LNT assumption at low doses
  • Challenges for determining and applying quantitative criteria to assess the situation
What is at stake? (4/4)

- Situations generally characterised by multi-factorial dimensions
  - Main concern on possible effects to children and future generations
  - Multi-exposure considerations
  - Influence of the social and economic context
- Need to combine scientific knowledge and social values to deal with these situations
Some experiences and initiatives to cope with public concern

- Radon exposure and health issues in France
- North Cotentin radioecology group
- Post-accident situation: Chernobyl and Fukushima
Radon exposure at home in Franche-Comté (1/2)

- Exposure to radon in dwelling is the largest part of average individual exposure to ionizing radiation in France
- Franche-Comté identified as one sensitive region for radon
- Estimate of lung cancer risk associated with average indoor radon concentration and average smoking habits
- Radon exposure presented as the second cause of lung cancer after smoking
Radon exposure and health issues

Radon exposure at home in Franche-Comté (2/2)

• Failure to establish cost-benefit indicators for assessing effectiveness of remediation plan
• Information provided to develop awareness on cancer risk associated with radon but then action plan focusses on improvement of indoor air quality (radon and other indoor pollutants)
• Concern of population for young generation notably at school
• Challenges between public health concern (i.e. Collective risk due to radon exposure) and individual decision (remediation relies on owners’ decision)
Radon exposure and health issues

Radon exposure due to uranium mine residues (1/2)

- Identification of one house with concentration levels in the range of 10,000 Bq/m³
- Individual risk estimate for several exposure scenarios:
  - Owners and children living in the house since more than 15 years: lifetime risk of lung cancer = 4% (same as regular smoker)
  - Children in nursing activity in the house: lifetime risk for lung cancer below 1%
Radon exposure and health issues

Radon exposure due to uranium mine residues (2/2)

- Debate on the need for an individual medical follow up
- Efforts to explain the meaning of the lifetime risk estimates to local medical physicians and to each person involved
- Face-to-face discussion with all families to answer questions about potential future risks
- Capability to consider the latency period and the duration of expression of the risk
- Interpretation on link with smoking habits
North Cotentin radioecology group (1/4)

• Publication of epidemiological studies by Pr Viel and his team (1995 & 1997):
  • Suggestion of an excess of leukaemia among children and young adults around La Hague reprocessing plant (4 cases observed versus 1.4 cases expected)
  • Proposal of causal relationships with behavioural factors
• Strong reactions among the local population and national debate on this publication
• Creation by the Ministries of Health and Environment in July 1997 of a pluralist expert group (academic experts + NGOs) to assess exposures and associated leukaemia risk
## Main results of GRNC

<table>
<thead>
<tr>
<th>Exposure sources</th>
<th>Nb of estimated cases of radiation induced leukaemia</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURAL</td>
<td>0.62</td>
<td>74%</td>
</tr>
<tr>
<td>MEDICAL</td>
<td>0.2</td>
<td>24.3%</td>
</tr>
<tr>
<td>NUCLEAR TESTS &amp; CHERNOBYL</td>
<td>0.01</td>
<td>1.5%</td>
</tr>
<tr>
<td>NUCLEAR INSTALLATIONS</td>
<td>0.0019*</td>
<td>0.2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.83</td>
<td></td>
</tr>
</tbody>
</table>

* plus 0.0003 for in utero exposure non included
North Cotentin radioecology group (3/4)

- An extremely low number of leukaemia cases attributable to radiation exposure due to discharges from nuclear installations
- Best risk estimate but associated uncertainty not quantified in the first study
- Several members of the Group persisted in the opinion that local nuclear installations might be at the origin of the observed cases of leukaemia
North Cotentin radioecology group (4/4)

- GRNC acknowledged as an important step to obtain information on nuclear installations
- Participation of local NGOs in GRNC’s conclusions recognised as key to social trust
- Remaining uncertainties call for some stakeholders to continue investigations
- Statistical approach still questioned for understanding the health issues in the region
The Chernobyl and Fukushima accidents have caused significant social and economic disruptions affecting the local populations.

Effects extending over years or even decades, inevitably impacting their health and welfare.

Large concern of affected populations about health consequences of living in a contaminated area.

However, they generally lack information, support and basic knowledge to cope with the radioactivity in their daily environment.
Post-accident situation (2/5)

- CORE programme in Belarus (2002-2008)
  - Some concerns of the parents
    - Why do our children have higher contamination levels than their friends who live in the same village?
    - Why are we seeing a lot of musculoskeletal disorders? Could this be caused by strontium contamination?
    - What has caused the large number of cases of anaemia in the district?
    - Is it safe (or dangerous) to eat foodstuff if their concentration is a bit less (or more) than the regulatory limits?
Post-accident situation (3/5)

• **European Research Project SHAMISEN – OPERRA project (2015-2017)**

• Some topics addressed during the Fukushima workshop (March 2016)
  - During and after the emergency phase, mistrust caused by confusion in risk communication (*lack of information, lack of measurements*…)
  - Thyroid screening: Difficulties to understand the background incidence and to organise the dialogue with people
  - Key role of the dosimetric criteria but difficulties to understand their rationale (*reference level, evacuation*)
  - How to deal with values above non detectable level from monitoring?
Some conclusions from CORE and SHAMISEN projects

- Development of innovative approaches aiming to:
  - Respond to concerns of populations affected by long-lasting contamination of their environment
  - Improve their living conditions with a focus on well-being
  - Recognition of the important role of medical staff, public health practitioners, nurses as communicators / interpreters
Listening about concerns of villagers
ETHOS Project, Olmany, Belarus, 1996-2001
Some conclusions from CORE and SHAMISEN projects

- Issues at stake:
  - Define quantitative and qualitative criteria for assessing the well-being
  - Improve and adapt the health care system
  - Develop participatory process
  - Organise the sustainable support (experts and means) to local communities
  - Promote risk governance process ensuring fair and sustainable informed decision
Social values and ethical considerations (1/2)

- Beneficence and non-maleficence:
  - Adapt health surveillance to the overall benefit of the exposed population
  - For example: Thyroid screening – not only a scientific issue

- Addressing prudence:
  - Role of science to deal with uncertainties together with value judgement to define protection programme embarking social expectations and concerns
  - Specific issue of hereditary effects (large uncertainty, key concern)
Social values and ethical considerations (2/2)

• Considering justice
  • Coping with all affected populations
  • Adapting the follow up according to available financial and human resources

• Considering dignity
  • Addressing the quality of life and the overall well-being of the people

• Transparency and accountability
  • Access to information, plurality of information
  • Organisation of long-term vigilance and integration of evolution of scientific knowledge
Challenges in engaging stakeholders (1/2)

• Difficulties for interpreting risk estimates
• Pitfalls of risk communication approach
• Co-expertise process including ethical considerations concerning the role of the experts
• Largely focussed on radiological exposure and radiological protection culture
• Developing health surveillance programme responding/addressing the concerns of exposed populations
Challenges in engaging stakeholders (2/2)

• Towards involvement of stakeholders in the optimisation process
  • First step: Organising the joint assessment of the situation involving stakeholders and experts
  • Second step: Favouring the participation of stakeholders to decision-making process for adopting protection plan
  • Third step: Maintaining the stakeholders participation in the long-term follow up of public health issues
Measuring and sharing information together
Fukushima Prefecture, Suetsugi village, 2013
Conclusions

• Improving the management of chronic exposure situations requires:
  • Considering ethical issues in addition to scientific issues
  • Taking into account the specific situation to better address health issues together with socio-economic considerations
  • Opening the dialogue with the public, especially when the presence of radioactivity in the environment is at stake
  • Engaging RP experts in the development of the radiological protection culture
Thank you for your attention