Public Health England comments on the ICRP report: Radiological Protection of People and the Environment in the Event of Large Nuclear Accident

Overall the document is a good summary of the main issues and principles and is clear to read and understand. It will be a welcome addition to the collection of ICRP documents and addresses a number of points identified over the past few years as experience develops from the Fukushima accident.

It should be made clear that there may be a number of options to consider when determining the process and steps to take in choosing options in response and recovery. There is unlikely to be one preferable option but a range that will need to be considered in light of a number of factors and a choice made.

Overall the report focuses too much on the assumption that the emergency involves an operational nuclear reactor and some referral to the potential for a much wider range of emergencies should be made. Should there be a section that differentiates "large nuclear accidents" from other sorts of incidents involving radiation, i.e. to justify why a separate document is needed and to describe what is different about the effects of a large accident as opposed to a small one.

Whilst it provides a summary of the main issues/principles, it does not go into more depth in certain areas. In particular the health and societal impacts of evacuation and the difficulties surrounding evacuation of those in need of constant care. This is a significant learning area from Fukushima that needs in-depth analysis and discussion.

There is little detail included on the workers and what the consequences are on them. They could well receive the largest doses, and even those workers who escape without a dose may suffer other consequences, for example losing their jobs, be blamed for the accident, feel guilty for not preventing the accident, and therefore suffer the attendant economic and psychological harm.

Below are specific points…

Lines 82-25…
(d) A large release of radioiodine in the case of a nuclear accident can result in high thyroid exposures due to inhalation or ingestion. Specific efforts should be made to avoid, or at least reduce, intakes of radioiodine, and radioiodine levels in the thyroid should be monitored, particularly in children and pregnant women.

Two points here. First there should be recognition that nuclear accidents can occur at facilities other than operational NPPs. This is also the case in line 199. Second the use of stable iodine is not to avoid intake, it is to reduce the uptake into the thyroid as a result of intake. Sheltering may be of little benefit from the vapour iodine hazard and evacuation is not a 'specific effort' so this appears to be referring to stable iodine.

Line 270

Section 2.2. All the consequences described appear very negative. For the economic consequence, there is potential for some aspects that may be turned into something positive in the longer term. For example as businesses move away, this may create a gap in the market that entrepreneurs could develop, and potentially bring new economic activity to the area. In contaminated/remediated

areas, house prices may drop. This could allow those previously priced-out of a house to buy one. For those rehoused from a contaminated area, there may be opportunities to "start-over" and make a fresh start, especially if the area from which they moved had few opportunities before the accident.

Lines 293-294

(*17) Severe tissue/organ damage is directly attributable to radiation exposure, irreversible 293 in nature, and severely impairs the quality of life of exposed individuals.*

I would suggest that it *may* severely impair quality of life but it's not an absolute.

Line 331

Section 2.2.1.2 (line 331) says that heritable effects have been seen in animals but there is no direct evidence that exposure to humans leads to excess heritable disease. But Section 2.3: "… manage human exposure so that …tissue damage is prevented, and cancer and heritable diseases are reduced". And section 3.1 (line 916) says that protective actions will reduce exposures that would cause heritable diseases". The basis behind these apparently contradictory sentences should be clarified.

Line 494

Section 2.3 (line 494). "Management of the situation requires interaction between countries… notably to address trade issues and protection of nationals". I think it would be better to write this the other way round. Surely the protection of nationals should come before trade issues.

Section 2.3, consequences for the environment. Perhaps some positives ought to be mentioned, e.g. removal of the humans allows other fauna and flora to flourish, as seen around Chernobyl.

Line 710

(68) Once the emergency response is over and the radiological situation has been characterised

I suggest that this should be '…*sufficiently* characterised…' as it may never be possible to fully characterise the radiological situation.

Line 815: "It should be noted that maintaining exposure below or in the range of 100 mSv effective dose is no guarantee of the absence of excess incidence of thyroid cancer in a population when there has been intake of radioiodine". This is strangely worded. Firstly, 100mSv isn't a range And if the use of 100mSv might not stop thyroid cancers, wouldn't it be better to choose a different number?

Section 2.3.3 (lines 826 – 847). This needs more explanation on how to pick the reference level <=20 mSv.

> "…taking into account the actual distributions of doses in the population": how does this help you choose a number? It could help to explain the process when many of the population receive low doses for example.

When calculating doses to compare against reference levels, what are people's habits? Do you assume they are outside during the emergency, and "normal living" during recovery? How do you

handle background radiation? Do the reference levels include background or not? If not, how do you know the contribution to dose from the accident from the contribution from background (especially if you didn't know what the background was beforehand)? If people are receiving an average of 2mSv from the environment, is the 1 or 20 mSv on top of that? If you set your reference level to 1 mSv, it might be very hard to reduce doses towards that level, if the background is higher than it. It may be helpful to include some discussion of how to handle reference levels in comparison to background radiation and how to practically do the calculations.

Line 914

(87) Urgent protective actions taken before any significant release will avoid the occurrence of direct serious injuries

Suggest that *radiological* is added here as it is not possible to categorically state that direct serious injuries from any other cause will not occur.

Line 962

(92) In the case of an accidental atmospheric release, it is likely that initial exposures will be at a relatively high level due to the inhalation of short-lived radioactive products present in the plume.

Again this is making the presumption that all nuclear emergencies only occur at operational nuclear reactors. This line is followed by several others talking about radio-iodine and caesium.

Lines 980-988

In para 94, it doesn't mention drinking water (it is covered in para 91 but I thought it relevant here too) – a deliberate omission because it is typically a less significant contributor, or a mistake?

Lines 1027-29

(100) In the intermediate phase, detailed environmental monitoring is essential for understanding the radiological situation of widespread contaminated areas, and for terminating the urgent protective actions implemented during the early phase.

Whist true for sheltering and evacuation (if considering the return of people to the affected area) but not necessarily the case for stable iodine where the need for a second dose may lead to a decision to evacuate thus terminating the need for the protective action.