

NATIONAL DOSE ASSESSMENT WORKING GROUP

PAPER 5-07: REPORT BACK FROM SUB-GROUP ON HABIT DATA AND CRITICAL GROUPS

1. Introduction and Terms of Reference

The first meeting of the NDAWG Habits Subgroup took place on 19th March 2004. It was attended by Mike Thorne (Mike Thorne and Associates Limited – Chairman), Darren Cutts (FSA – Secretary), Mike Gaunt (Rolls Royce), John Hunt (CEFAS), Rachel Smith (NRPB), John Titley (EA) and Laura Vivian (FSA). Apologies for absence were received from David Webbe-Wood (FSA) and Peter Roche (Greenpeace). The latter provided some comments on various issues that were discussed during the meeting.

The Terms of Reference of the Habits Subgroup were slightly revised during the meeting (see minutes). The revised Terms of Reference are as set out below.

The aim of this sub-group is to consider the use of habits data in assessing individual doses and in defining critical groups. The initial emphasis will be on retrospective assessments (doses from discharges and direct shine) but prospective assessments should be considered at a later date. In particular it will consider:

- Methods for obtaining integrated habits data around particular sites
- What is meant by 'locally produced food' – how plausible is it for certain foods to be produced and consumed by individuals
- Assumptions regarding where people are assumed to live and to obtain their food in dose assessments together with the combination of pathways
- Data analysis including the relationship between the sample population and assessment of individual doses including the use of critical groups
- The adequacy of data on occupancy, e.g. general beach occupancy and time spent indoors and outdoors
- The use of national survey data and site specific data, including how regularly site specific data should be reviewed and updated
- Use of habits survey and dosimetric data for infant, child and adult

The changes of substance are at bullet point 4, which has been reworded to allow for the possibility that individual doses may be assessed using an approach other than that based on critical groups, and at bullet point 7, where the types of data and age groups of interest have been made explicit.

The NDAWG is requested to agree these revised terms of reference.

2. Forward Work Programme

The overall programme of work of the Subgroup will be structured around producing a position paper for consideration by the NDAWG. The agenda for the meeting was structured around the proposed structure of this position paper. It is anticipated that it will be no longer than about 20 pages of main text, though it will also include technical appendices, as required. The aim is to produce a top-level discussion paper and to address technical details either in the appendices or by reference to other reports and papers.

The overall structure of the position paper is envisioned to be as set out below, though this structure may be subject to some changes as the work of the Subgroup progresses.

1. Introduction
2. Current Approaches to Obtaining and Using Integrated Habits Data
3. Potential Enhancements and Feedback to Habits Surveys
4. Characteristics of Key Foodstuffs
 - 4.1 The Identification of Key Foodstuffs
 - 4.2 Approaches to Identification of the Fraction of those Key Foodstuffs that are Locally Produced
5. Characterisation of Occupancy
 - 5.1 Direct Exposure from the Facility and from Environmental Contamination, e.g. of Soils, Sediments and Fishing Gear
 - 5.2 Inhalation from a Plume
 - 5.3 Inhalation of Resuspended Material and Sea Spray
6. Definition of a Reasonably Homogeneous Critical Group by Habits or Assessed Dose
7. Specification of Potential Critical Groups using Habits Survey Data, Occupancy Data and Other Information
8. Conclusions and Recommendations

Appendix: The Audit Trail between Habits Survey Data and the Radiation Dose Estimates in the RIFE Reports

The NDAWG is requested to endorse the proposed general content of the position paper, noting that the structure may be subject to some changes as the work progresses.

The Subgroup agreed that the position paper should be completed within one year of the setting up of the Subgroup and that it should be presented at the April 2005 NDAWG Meeting.

The NDAWG is requested to endorse the proposed schedule for the work of the Subgroup.

The next meeting of the Subgroup is scheduled for Thursday 30th September 2004. It will be held at the FSA London Office.

Members of the NDAWG are invited to submit relevant comments, notes and other material for consideration at that meeting. Material should be provided to Darren Cutts, who will distribute it to members of the Subgroup.

3. Technical Issues

Various technical points were raised. These are listed below, in no particular order of importance.

Members of the NDAWG are invited to provide comments on these various issues for consideration by the Subgroup.

- Currently, habits surveys do not collect information on a random sample of the population local to each site. Rather, the surveys are targeted at individuals who may be members of the critical group. This means that sophisticated analyses of the habits recorded, e.g. the selection of specific percentiles of consumption rates, cannot be justified on statistical grounds. Rather, the data from habits surveys should be used to inform judgments on critical group characteristics.
- Individuals are invited to take part in surveys, but there is no requirement to participate. Individuals involved in illegal or doubtfully legal operations may be substantially under-represented.
- Because each of the surveys is targeted in a different way, depending on the particular characteristics of each site and its local environment, it is difficult to justify aggregating data from several surveys of different sites. However, it may be legitimate to aggregate data from several surveys of a particular site made at different times in order to capture a wider range of habits and achieve greater stability of habits data.
- The targeting of surveys could usefully be emphasised by adding a preamble to the survey reports setting the local environmental context. This would be a description of aspects such as the types of food produced, the sizes and types of human communities, and the food distribution network.
- It would be difficult to go beyond the current surveys in obtaining physiological data (height, body mass) on the individuals surveyed. There would be a risk of reduced participation and the degree of refinement to assessed doses would be of limited value in the context of the low doses usually assessed as being received.
- There is a substantial issue relating to the small numbers of infants and children included in the habits surveys. This means that it is difficult to achieve stable estimates of doses to these age groups. If critical groups were to be defined in terms of reasonable homogeneity with respect to dose, it might be possible to include individuals of all ages within a single reasonably homogeneous critical group.
- There is a potential mismatch between the detailed information available with respect to consumption of foodstuffs and the more limited information on radionuclide concentrations in samples of those foodstuffs. This can result in ineffective aggregation of the habits data for radiological assessment purposes.
- There is a need to make clear, e.g. in the RIFE reports, that the full range of potential exposure pathways is considered for assessment purposes, even though results may only be reported for the most important pathways at each site. Also, it should be made clear that non-food pathways, such as occupancy for inhalation of sea spray, are addressed in habits surveys, as appropriate.
- There is extensive feedback from the current habits surveys. This addresses concerns raised by individuals and includes repeat ascertainties. The existence of feedback and follow-up activities is important in ensuring the continuing applicability of the survey. In

particular, feedback and follow-up activities are important for identifying particular new pathways that may arise, or substantial changes in habits relative to existing pathways.

- The degree of consumption of locally produced food is currently addressed mainly by tracing back from the consumer. However, the consumer may not be fully aware of whether food is locally produced, e.g. that purchased from farm shops. There may be merit in also tracing forward from the producer.
- The approach to defining the cut-off between the critical group and other members of the surveyed group requires reconsideration. This is somewhat outside the remit of the Subgroup, but it does have potential implications for the scope of surveys that need to be conducted. One possibility is to rank order assessed consumption rates (or doses) and to look for a substantial change of slope in consumption rate or dose as a function of rank.
- In principle, surveyed habits could be affected by knowledge that particular foods are likely to be contaminated. However, evidence that this has occurred is in practice rare, and where it has been observed it has been said to be due to the presence of non-radioactive contaminants and from other sources than the site under survey
- It would be useful to have information on the number of people resident in the different annular radii considered around each site.

4. Conclusions

Overall, the first meeting of the Subgroup was considered to have been very useful. The scope of work was considered to be well defined. Considerable progress was made toward structuring and timetabling a position paper, and various technical issues relating to that position paper were discussed in depth. Actions were put in place to forward the drafting of that position paper.

Minute of the NDAWG Habits Subgroup

19th March 2004, FSA London

Present:

Mike Thorne – MT (Mike Thorne & Associates, Chair)
Darren Cutts – DC (FSA, Secretary)
Mike Gaunt – MG (Rolls Royce)
John Hunt – JH (CEFAS)
Rachel Smith – RS (NRPB)
John Titley – JT (EA)
Laura Vivian – LV (FSA)

Apologies:

David Webbe-Wood – (FSA)
Peter Roche – (Greenpeace)

1. Agreement of the Agenda

After MT welcomed everyone to the group, the Agenda were changed slightly to meet the criteria of the group. Item 3 would be 'Obtaining and using integrated habits data' and Item 4 'Potential enhancements and feedback to habits surveys'. Item 6 would now have three subheadings, 'direct', 'inhalation', 'plume'. Finally, item 9 to be given the subheading 'suggestions and recommendations for other groups'.

2. Introduction

• Work of the Group

MT set out what was hoped to be achieved by the NDAWG habits subgroup. Each agenda item was reviewed and a general discussion followed on the main points to be discussed during the meeting. This discussion highlighted the questions the position paper should seek to answer.

Agenda Item 9: *Position paper.* MT stated that it was important to produce an outline for the position paper by the end of the meeting. JH would welcome independent views regarding this paper, this would prevent the paper being inward looking. MT stated that trying to produce a top level discussion paper to inform NDAWG may not get full agreement of the group and there was the possibility of a minority opinion being presented.

Agenda Item 4: *Habits enhancements.* Was it right to use a particular survey for a site or use a mix from various sites when determining critical group dose? JH stated that it had been shown with aquatic foodstuffs that there are distinct localised consumption rates of food making site specific data essential.

Key questions were asked about the ICRP definition of critical groups. How do we interpret the definition of the critical group? How would this effect dose? Should we make such groups homogeneous regarding habits or dose. Groups that are homogeneous with respect to dose may be highly heterogeneous with respect to habits and may include individuals of different ages, from infants to adults.

Should the surveys be made more directed and include additional supplementary information. MT, could we obtain the physiological information of persons interviewed. MT had shown in a study of the Marshall Islands, that this information could be beneficial and may improve accuracy when making dose estimates. JH stated that getting personal information would be difficult and may reduce the number of people willing to participate in the surveys. JT said that the extra effort and costs would not be justified in particular around sites where doses are low.

Agenda Item 5: *Retrospective dose assessments.* There is not too much concern over these at the moment as the assessments are data driven. However, there is an issue with prospective doses. Estimates of dose are driven by literature values of concentration and transfer factors, but there is a lack of information on many of the foodstuffs of interest. Generally there is detailed information on food consumption and habits but surveillance of concentrations is generally limited to a few generic items of food. This raised the question, is the surveillance fit for purpose? Should surveillance concentrate on areas identified in the habits surveys? There is an issue of relative resourcing and the targeting of high dose pathways.

Agenda Item 6: *Direct radiation, plume and inhalation.* There was concern that not all relevant types of individual were identified in the surveys. The critical group may be determined more by external exposure than by consumption pathways. However it was noted that although not explicitly described, complete surveillance of occupancy pathways was implicitly done.

Agenda Item 7: *Critical groups.* The way in which critical groups are chosen is established, however, there are other ways of looking at these. Why do we ignore, other methods of distinguishing groups? Why do we group by age and not by dose especially as the choice of age groups can limit sample size?

Item 8: Both Habits surveys and the RIFE report do not document how the detailed habit survey results link to the critical group habits given in RIFE. Where did the information come from for a critical group, how much judgement is involved? How is it done now, in which direction should it go in the future? The Retrospective group is currently looking at the best approach for total doses (retrospective) and there may be areas of overlap. Retrospective group to be made aware of the work of the habits subgroup.

Action 1/01: All, To agree a record of each Habits Subgroup meeting to be freely disseminated to other NDAWG subgroups.

- **Review of the draft terms of reference**

The draft terms of reference were announced at the 4th NDAWG meeting held on the 17th November 2003. JH noted that all references to '*habit*' data should now read '*habits*'.

Point 2: The question was raised, should 'locally produced food' target personal habits or the distribution process? To be discussed.

Point 4: MG, thought that the way the document was written pre-disposes the use of critical groups rather than any other method. Bullet point 4 to be changed to incorporate this, it will now read.

'Data analysis including the relationship between the sample population and assessment of individual doses including the use of critical groups'.

Point 6: should read. *'The use of national survey data and site specific data, including how regularly site specific data should be reviewed and updated.'*

Point 7: Possible change to: *'Use of habits survey data and dosemetric data for infant, child and adult.'*

It was noted that there were generally low numbers of individuals surveyed in the 1 year and 10 year age groups making assessment of doses for these groups difficult.

3. Obtaining and using integrated habits data

JH gave a presentation on the methods used in producing the triparty (EA, FSA, NII) combined habits surveys. During the presentation a number of questions were raised.

Purposes of Surveys

MT asked what was the potential for follow up of those surveyed. JH said that CEFAS has an active follow up.

People may be contacted at a suitable time after the initial survey for clarification and if necessary to obtain assurance that habits have not altered significantly from those reported due eg. to seasonal factors. 'Diary studies' are also used in obtaining information to reduce the chance that the survey was merely a 'snap shot' of habits at one time. Other assurance methods have been used, eg TLDs on houseboat dwellers and whole body counting of fish eaters. It was generally agreed that this was an important point and needs to be formally noted. The habits surveys target the most exposed people in the area, they are not random, a point which also should be noted formally.

Past and Current Surveys

MT asked about how habits surveys had been performed in the past and how current surveys are carried out.

In the past, surveys were site specific and not necessarily location specific. Aquatic and terrestrial surveys were performed separately, direct

radiation was first surveyed in 1993 and in an integrated way in 2002. The current triparty programme combines aquatic, terrestrial and external pathways in a single report. External pathways include direct shine from the site and fishermen handling gear etc. The surveys target those who are likely to be most exposed. However, habits of workers on the site are not surveyed as this is outside the remit of the survey. The surveys are targeted at assessing public dose.

In light of this information, MT suggested that a preamble should be added to the surveys describing the local landscape, including what food is produced there, sizes of towns, and other information which may be relevant. JH noted that more detailed information had been included in some reports in the past. A compromise of a brief description of the area around the site may be possible. JH also referred to a CEFAS paper published in the JRP which is a review of potential methods of dose integration. He had also sent another paper to JRP on the subject of homogeneity within critical groups and this was currently with referees. These should be referred to in the new position paper to remove repetition.

Methods Used before Fieldwork

MT asked whether there was any local feedback from the habit surveys. JT said that he liaises internally with the EA nuclear site inspectors. This involves asking which sites should be surveyed, and once selected what local issues there are that might need to be considered in the survey. This is to ensure that no pathways are missed in the survey even though they may not be of importance to assessing critical group dose. MT added that it was still important to note this in the position paper. JH added that CEFAS contact local sports clubs, windsurfers, divers etc, so that dose to their members or employees of organisations offering lessons can also be assessed. Other factors such as seasonal variations are also included in the calculations of occupancy, so as not to overestimate exposure rates.

Classifying pathways.

MT suggested other ways of choosing the cut off rate used in the CEFAS habits surveys. At the moment an interpretation of the ICRP (1984) principle is used. This determines the critical group by only including those with a rates observed within a factor of 3 of the maximum value in the pathway. But it was suggested that if there was a definite 'break' point between the highest rates and the next highest rates, that would best specify exposure/dose. Presenting graphs to show this was also put forward. RS said that this may be beneficial as it would show whether the dose was based on, for example, two extreme cases, or fifty people with similar habits.

MT asked whether CEFAS records habits relating to the non-local food supply. JH stated that, for traceability, people are asked whether the produce they eat is local, farm grown or home grown. Locally grown food constitutes the data for the habits survey.

It was accepted that there is need to produce a statement of how surveys are being performed from 2002 onwards as there has been no publicity about the change to joint integrated surveys. People should be made aware of the background of the survey. The statement also needs to include interactions with the local community and be written with an emphasis on the independence of the work. The broad principles behind the surveys should be added as an appendix in the position paper.

MT raised the issue of targeting surveys, was this right to do? By doing so removes the chance of aggregating information from all sites or performing statistical analyses. Caution should be taken if thinking about mixing such data.

Action 1/02: MT, Once minutes have been produced, MT to produce a brief list of bullet points of issues raised.

Action 1/03: JH, To review action 1/02 and liase with JT regarding the information.

Position paper should be produced within 1 year of the group set up and is proposed to be presented at the NDAWG meeting to be held in April 05.

4. Potential enhancements to habit surveys and feedback

Many of the points relevant to this item were also raised under the previous discussion of items 2 & 3. MT, how accurate is the data on 'locally produced food stuffs'. Can the group obtain the parish returns held by MAFF, (now the responsibility of defra?).

Action 1/04: MT, To obtain a list of the 'MAFF' Parish surveys and present the information to the group.

RS asked whether habits surveys should relate to land use in the survey area. However this was thought to be outside the remit of the group. Surveys should look where produce is being sent, outside of the local area, we need to follow the source pathway approach to analysis as well as the pathway-receptor approach. Produce such as milk and grain are grouped from various sources, therefore are we overestimating dose?

DC, it is still important to look at food eaten locally as any locally produced food exported is likely to be mixed with food from other sources (e.g. milk, cereals) and 'diluted' throughout the system whereas if produced and consumed locally it is not.

The e-mail contribution from Peter Roche was discussed.

Was there any evidence that people were changing habits due to the knowledge that certain foodstuffs were contaminated?

The consensus was that there was no direct evidence for this. Economic issues are a major factor regarding changes plus natural changes in people's habits. Information has been published to this effect. JH stated

that habits surveys had not revealed significant changes in consumption of sea foods around the Sellafield area as a direct result of any food scare there may have been.

People not appearing in the survey, e.g. Solway Coast family. People choose whether to be included in a survey or not and may wish not to be included. An example of this could be the Morecambe Bay cocklers who were working illegally. Are illegal fishermen consumers or collectors? MT considered that we can only consider legal pathways. This may be a policy document issue. JH stated that every effort is made to invite people to take part in a survey; it is their choice whether they accept or decline. Specific information received by CEFAS would be followed up to attempt to include relevant data; as usual identities of individuals would be protected.

Have non-food pathways been considered. Non-food pathways have been considered in the habits survey and are clearly documented. Sea spray is sometimes a particular concern, but generally leads to low doses and is not targeted in every survey. However, this pathway can be easily taken into consideration if necessary using occupancy data.

MT, suggested that it might be an idea for RIFE to include a schematic of the pathways to show all pathways considered in dose assessment calculations. This would hopefully remove any confusion regarding pathways, particularly non-food.

5. Key foodstuffs

Due to the nature of the discussion, this agenda item had already been discussed under items 2, 3 and 4.

6. Characterisation of Occupancy. Direct, Inhalation, plume.

As with item 5, due to the nature of the discussion, this agenda item had already been discussed. However, to add, the group was happy that the information available in each survey gave data in a form suitable for dissemination. Since 2002 information on occupancy within the 0.25, 0.5, 1km concentric rings around each site has been available. MT noted that CEDA had suggested that direct shine dose rate contour maps should be provided. However if the habit data were broken down into quadrants to improve the match with refined direct radiation data it might become possible to identify individuals. It is important that people who live in such areas could not be identified from such information. JT noted that groups/individuals most exposed to the plume (external, inhalation) are also likely to be within 1 km of the site. Therefore the direct radiation survey approach will provide enough information for these other pathways.

Action 1/05: MT. To draft a few lines about occupancy, direct, inhalation and plume, etc.

7. Reasonable homogeneity of critical groups in terms of: habits and occupancies, age, assessed dose.

There is an issue about homogeneity with age. The numbers of observations in the child and infant age groups is small and may result in an age group that is inhomogeneous with respect to habits. Homogeneity with dose may be a way of resolving this problem by aggregating infants and children with adults into a single larger group. To make such a change, work has to be performed into how this would affect the current methods used in performing a survey and presenting its results. The current approach produces a substantial amount of useful data. Would changing the approach affect this?

MT raised the issue of making the surveys more randomised regarding subject selection. This would make statistics such as the 97.5th percentile more meaningful when presenting such information. However it was generally agreed that this would cost a lot more but achieve very little. We should, however, be answering the question how in the past, the habits survey results were used to calculate doses, in particular the creation of habit data groups, as given in RIFE. It was suggested that this may be added to the appendix of the position paper. This will not overlap with the work of the total dose group. The total dose group is currently considering the best way to calculate total dose in future using the new integrated habit survey results.

JT raised the question of when do you switch between using localised habits and national when you have a lack of site specific data. It would be useful if this issue was addressed by the habits group.

The question of critical group definition was again raised. How were these chosen. JH stated that the methodology is written in all individual habit reports. It would be possible to trace the results in the RIFE report back to the local habits survey, but at the moment this is not transparent. However due to confidentiality there is always a problem in making such information available.

Action 1/06: DC. Write a short statement describing how the critical groups given in RIFE are determined from the habits surveys.

Action 1/07: JH to review DC's statement on critical groups

8. Specification of potential critical groups using habit survey data, occupancy data and other information.

It was decided to move this agenda item to a later date. The next RIFE report should include information derived from the next combined habits surveys.

9. Approach for development of a position paper, suggestions and recommendations for other groups.

Due to the nature of the meeting this item was discussed throughout the meeting and is recorded in the above minutes.

10. AOB.

Action1/08: MT, to write paper for the 5th NDAWG meeting from the minutes of this habits subgroup meeting.

11. Date and venue of the next meeting.

The next meeting is planned for Thursday 30th September 2005 to be held at the FSA's London office.

**Dr Darren A Cutts
Radiation Protection and Research
Management Division**

Summary of actions

Action number	Action
Action 1/01:	All, To agree a record of each Habits Subgroup meeting to be freely disseminated to other NDAWG subgroups.
Action 1/02:	MT, Produce a brief list of bullet points of issues raised related to methods of obtaining habit data.
Action 1/03:	JH, To review action 1/02 and liase with JT regarding the information.
Action 1/04:	MT, To obtain a list of the 'MAFF' Parish surveys and present the information to the group.
Action 1/05:	MT. To draft a few lines about occupancy, direct, inhalation and plume, etc.
Action 1/06:	DC. Write a short statement describing how the critical groups given in RIFE are determined from the habits surveys results.
Action 1/07	JH to review DC's statement on critical groups.
Action1/08:	MT, to write paper for the 5 th NDAWG meeting from the minutes of this habits subgroup meeting.