SCRAN24

Self **C**ompleted **R**ecall and **A**nalysis of **N**utrition

Product requirements document

June 2012

1   Overview

A traditional dietary recall is a method of dietary assessment based on a face-to-face interview conducted by specifically trained personnel. During the interview, an individual is asked to recall their food and beverage consumption during the previous day.

Often the interviewer will apply the multiple pass recall (MPR) approach, which consists of a free and uninterrupted recall of the food intake, followed by detailed questions such as asking about the exact quantities consumed and finally a review of things that were previously recalled. The interviewer may ask guiding questions that are not directly related to the food intake, but are meant to refresh the respondent's memory, such as the circumstances or location of consumption. This often helps the respondent to remember additional foods that could have otherwise been omitted.

The interviewer identifies the foods reported by the respondent such that an appropriate entry can be selected from the standard food database; this enables calculation of nutrient intake based on the portion size.

A single 24-hour recall is not considered to be representative of habitual diet of an individual [1]. Repeated 24-hour recalls can be used to assess a typical diet. This form of survey is known as multiple recalls. In the study conducted by Holmes et al, four 24-hour recalls were recommended to gather enough information for it to be representative. In another Australian study, eight repeat 24-hour recalls were recommended to capture the variation in macro-nutrient intake [2].

Taking into account the apparent necessity for multiple recalls, it is clear that this process may be costly for the organisation. It will still incur a large cost when working with relatively small local groups, but is even more pronounced if a need arises to conduct a nation-wide nutritional survey (i.e. thousands of respondents). Unless automated, such a survey would require regular contacts with each respondent resulting in extremely high personnel costs, which pushes the need for a flexible automated system for self-completed recall surveys.

Recent studies [3], [4] have shown that automated recall systems are able to produce satisfactory accuracy of data and are comparable to the traditional face-to-face interview

techniques, while being much less costly to support.

Advantages of an automated system include:

- Ability to repeat the recall as many times as necessary with reduced additional costs;

- Ability to conduct large scale, nation-wide studies with thousands of respondents without organisational and logistical complications;

- Possibility of having several surveys running simultaneously;

- Very high flexibility of data transformation and analysis (all data is stored in an electronic database);

- Less pressure on the respondent due to lack of privacy. In a traditional recall the respondents could feel embarrassed telling the interviewer about foods that are considered unhealthy and might deliberately omit something. This is less likely to happen in an impersonal environment. The interviewer could also inadvertently discourage the respondent with disapproving tone or facial expressions, and this possibility is also eliminated in the automatic recall.

Choosing modern Internet technologies as the base for the implementation of such an automated system gives additional advantages, such as being able to support a wide range of operating systems and devices using the latest web-standards (HTML5), easy accessibility from any Internet-enabled PC (no software installation required) and automatic centralisation and analysis of the accumulated data.

The new SCRAN24 (Self Completed Recall and Analysis of Nutrition) system is planned as a computerised, web-based 24 hour dietary recall system targeted at 11 to 24 year old respondents. The system will allow respondents to self-report their dietary intake for the previous 24 hours, assisted with image aids for identification of foods and portion sizes. The system will automatically record and store the appropriate food codes and portion sizes (weight for solid foods and volume for liquids) of each of the items chosen.

The previously existing SCRAN24 system was a prototype developed in just 9 months and on a very limited budget. It provides the basis of an excellent system and feedback from both students and teachers who have used the system so far has been positive. There are a number of key system developments, which from earlier work we believe will greatly

improve both usability of the system and the accuracy of the data collected. This will include new functionality such as the automation for enrolment of subjects, reconfiguring and updating underlying data sources (e.g. food composition tables), web-based tools for annotation and administration, and the ability to configure and deploy multiple web-studies simultaneously.

In this document we will give the requirements for the new web-based SCRAN24 dietary recall system, namely: describe the desired features of survey management and respondent enrolment (Section 2), the expected functionality of the system with respect to the user interface and user experience (Section 3), the methods of assisting the user in filling out the recall form in order to gather as detailed information about their food intake as possible (Section 4), the interface for annotators to review flagged entries (Section 3.2), an overview of advanced and experimental features to be studied (Section 5), image and video guides (Section 6), the data export and analysis capabilities of the system (Section 7), provisions for versioning and updates of relevant data, such as images and food database and the technical security and reliability considerations (Section 8).

2   Survey management

The system will support multiple 24-hour recall surveys occurring both sequentially and in parallel using the same food and nutrition databases. Every participant registered in the system will be assigned to a user group associated with a particular survey. The participants will not be able to take part in several surveys at once to avoid confusion, i.e. having to choose which survey the form is applicable to.

The survey management will be done using a web interface. This interface will allow the designated support staff (the survey managers) to create and customise the individual surveys. The set of customisation options will include the time frame of the survey, frequency of form submissions, presentation (the text on the survey web page) and branding, such as the name and the logo of the organisation conducting the survey. The style of the survey page will be fully customisable, including fonts and colours. Possibility of tailoring the instruction to the respondent's age group will be investigated.

2.1 System participants and their roles

The access to the system will be organised in such a way that initially there is a single super-user account (the system administrator) that has permissions to control every aspect of the system. The set of permissions for other accounts will be very flexible; each support staff account will be able to be created with fine grained permissions (e.g., "can create surveys", "can change the text on the front page", "has access to survey data [of a particular survey]", etc.) and be controlled individually by the system administrator.

The suggested roles for support staff are outlined below, however these are only given as recommendations and it will be possible, for example, for one person to have access to both the survey management and annotation interfaces.

2.1.1 System administrator

The system administrator will need to be a person with technical (IT) skills who will have overall charge of the system. Responsibilities will include monitoring the system, keeping the underlying software up-to-date (e.g., applying patches to the OS, and the web server software), making backups of survey and participant databases, managing the import and export of the survey-related data from the system (producing snapshots of the surveys submitted by the users and reports based on that data). This may be a person based at FSAS or a contractor.

The system administrator will also be the person responsible for managing other user's accounts and rights, and introducing manual fixes to the database (amending personal data, replacing lost passwords etc.)

2.1.2 Survey manager

A person or several persons, who will be able to create, start, suspend and terminate surveys. Each of these actions will optionally require approval by the system administrator. The managers' responsibilities will also include adding new participants or removing idle ones from the system when the survey is already in progress.

The system administrator will be able to control over what data is available to the survey managers. For example, one of the managers could only have access to one particular

survey and not be able to create new ones, while another could have the possibility to create additional surveys.

This flexibility will allow the survey services to be offered to 3rd party organisations while retaining overall control of the system.

2.1.3 Annotators

People designated by the organisation conducting the survey, possibly research assistants or PhD students, who will be responsible for reviewing special cases of user input, particularly such foods that the user was unable to find in the database. In such cases, the user will be asked to identify the food approximately by answering a number of standardised questions (see Section 2.5). The annotators will be able to review this approximate coding, compare it to the original search term as entered by the user and re-code it if necessary.

2.1.4 Survey participants

People who will be able to access the form submission system using the user name and the password assigned to them during enrolment process. Their responsibility will be to submit the 24-hour recall forms at predetermined times.

2.2 Enrolment

The enrolment procedure will be arranged externally by the organisation conducting the survey. The organisation will select the participants based on the requirements for a particular survey, such as age groups and socio-economic status. Each participant will be provided with personal identification information, which will include a unique user identifier (this could be a number or a string generated from the participant's name) and a password that are easy to remember and suitable for typing. The password will be required to prevent access (accidental or intentional) to someone else's personal survey forms and will not be allowed to be changed. The personal data of the participants will be stored separately, and will not be accessible by people who have access to the survey database. This will make it possible to provide access permissions to the anonymous survey data only.

The identification will be sent to the participants by e-mail or, in case the participant

does not have an e-mail address, passed to them by telephone or post. The survey forms will then be able to be accessed by the participant using a publicly available website.

The enrolment data produced by the organisation will initially be uploaded into the system by the system administrator using a simple data format such as CSV before the survey is started and the 24-hour recall forms are made accessible to the participants. During the upload the system will be able to check this data for integrity (e.g., absence of duplicate or malformed user names).

For added security, the database containing the personal data of the participants will be completely separate from the database storing the survey results, which will exclude the possibility of unauthorised access to personal data even if the main database was compromised.

2.3 Activity monitoring

While the survey is ongoing, the system will be able to produce an activity report upon the survey manager's request. This report will include the list the participants who are late with their form submissions or the participants who have gone completely inactive. In the former case the survey manager will be able to produce the reminder messages asking the participants to submit their forms as soon as possible, and in the latter case the survey manager will be able to remove the inactive participants from the survey and potentially add someone new to replace them (using the same mechanism that is used to import the user data initially).

Since the survey system will not have access to any of the users' personal data such as e-mail addresses or phone numbers for privacy and security reasons, the actual sending out of the reminder messages to the participants will be performed by an external system set up by the IT team of the organisation conducting the survey. This will provide additional flexibility with regards to the method used for sending the reminders, which could be e-mail messages, SMS messages or reminder letters sent over regular post.

2.4 Annotation

The system will provide a special interface for the review of user submissions that were not able to be automatically recognised by the system and were stored as approximate descriptions (see Section 2.5). It will not be necessary to take any action to validate those cases of input; however the designated support staff (annotators) will be able to examine such entries to compare the original search terms and the approximate categorisation entered by the users, correcting the resulting encoding if needed.

2.5 Dealing with foods not on the list

Several ways of dealing with foods not on the list will be investigated, such as adding more items to the list without making it too cumbersome and time consuming to navigate. Ways of standardising input will also be investigated to minimise the amount of manual coding required.

In particular the following method will be implemented: if the respondent is unable to find an exact match in the food database, they will be asked to describe the food by answering a number of questions (e.g., "Was it a main dish, a relish or a snack?", "Did it have any meat in it?", "How was it cooked?") which will allow to put that food in a generalised category with known (approximate) nutritional composition.

In some specific cases of missing data, a composition of the nutritional data for often used ingredients, weighted by the probability of their occurrence, will be used to obtain the nutritional data. For example, if the user has described something as having meat in it, but has not specified the type of meat, the system will use the predefined data for meat type distribution (e.g., it could be pork with 30% probability, beef with 50% probability and lamb with 20% probability) and sum the nutritional data for those meat types in these proportions.

These features will allow the system to automatically produce an approximate encoding for the food most of the time. The annotators will be able to examine these encodings and compare them to the original search term entered by the user which will be stored. This will also help identify foods that are missing from the database but need to be added.

2.6 Data snapshots and final results

At any point in time after the survey has started, any person that has the corresponding permissions will be able to take snapshots of the data accumulated so far by the system, either manually or by setting up an automated script. This will allow studying trends and changes in the reported nutrient intake over time and plotting graphs of this data against time.

When the survey is complete (i.e. the end date has passed), a final snapshot will be taken regardless of whether any intermediate snapshots have been produced. This data will be subject to analysis and export for further processing as defined in Section 7

3   User interface

Considering the diversity in age and socio-economic backgrounds of the potential participants, the user interface will be designed to be as straightforward as possible. In order to meet this goal, it must be clear to the user what they are expected to do in order to start, continue, or complete the survey form at any time. The number of choices such as the number of buttons and other active elements on screen available at any given time must therefore be minimised. Standard accessibility requirements will be taken into account, e.g. designing the web pages in such a way that they are able to be read by screen reading software.

The design groups and user testing will ensure that the system is visually appealing, easy to use and suitable for use by the full range of the target age group (11 to 24 years). They will also ensure that participants can complete the system, unassisted, in a reasonable amount of time (up to 40 minutes for one recall form).

3.1 Log-in screen

The log-in screen will be the first screen that the users see when they access the publicly available web page using the address given to them. There will be some introductory text and input fields for the user name and password. When the user has entered a valid user name and password combination, they will be taken to the appropriate survey page. Note

that the system will support multiple surveys at the same time, but the user will not need to be aware of that and manually choose which survey to log into, but instead will automatically be transferred to the page of the survey they are taking part in.

The first page that the user sees will depend on the status of the survey and the user's submissions:

- If the survey has finished, the user will be told that and will not be allowed to submit any further recall forms;

- If the survey is still in progress and the user has already submitted the required number of recall forms, they will be notified of that fact, but will not be prevented from completing any additional forms while the survey is still in progress;

- If the survey is still in progress and the user is late submitting the recall form (or if the user takes more than 24 hours to complete a form), they will also be notified of that and requested to submit the subsequent forms on time, but will not be discouraged from completing the form;

- If the survey is still in progress, and if the user has logged in at the correct time, or otherwise after they have been shown the messages described above, they will be directed to the recall form interface (Section 4) to begin to enter their survey data. Before the user is redirected, the system will notify the user that they are expected to submit the form within a certain time period (this will be flexible and set as a parameter for each individual survey).

- If the user is starting to fill out the form for the first time, they will be asked if they would like to view the introduction video. If they say "no" at this stage they will still be able to view the video later if they get stuck during the recall by using the "help" button.

3.2 Annotator interface

The annotators will log into the system the same way as the participants, but instead of the recall form interface they will see the annotator interface. The annotators will be able to browse all flagged user responses or request the system to choose an issue for them to work on.

They will be able to review flagged entries where the user was unable to find the exact food, leading to an approximate match being entered. Annotators can compare these matches to the user's original search term and re-code if necessary.

To prevent the possibility of duplicate or lost work, once an annotator chooses to resolve an issue that issue will be locked by the system and will no longer be accessible to other annotators. If for any reason an issue that has been locked is left unresolved for a set period of time (e.g., if the annotator opened an issue and then closed the interface without marking it as resolved) it will be automatically unlocked and returned to the pool of annotator tasks.

## 3.3 Survey manager interface

Like annotators, the survey managers will be able to log into the system the same way as the participants, but instead of the recall form interface they will see the survey management interface. The interface will allow them to create, start, suspend and stop individual surveys and change the survey parameters (submission frequency, time frames, text content on the survey page and its styling, such as logo pictures).

3.4 System administrator interface

Using the system administrator interface, an administrator will be able to create backup copies of the survey databases and restore the database from such copies.

This interface will also include the user management page, allowing the administrator to create and remove user accounts and manage their permissions.

4   The multi-pass recall form interface
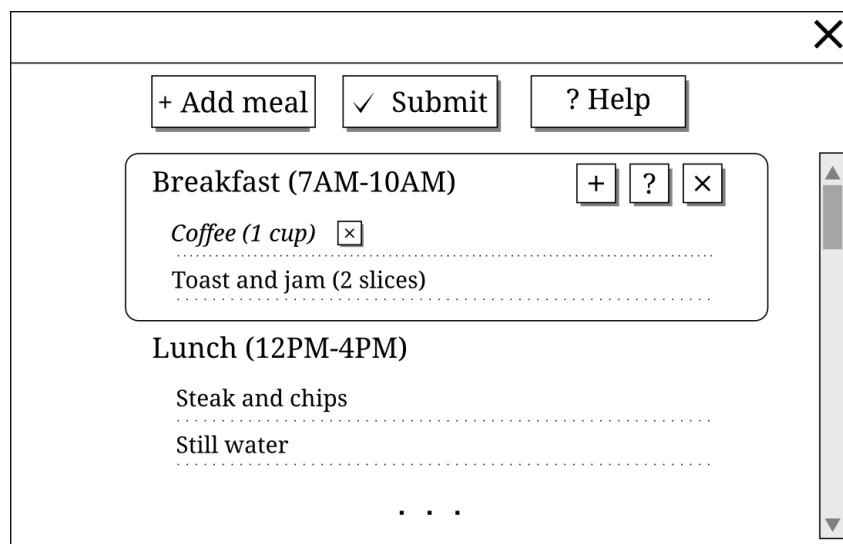
Drawing 1: Sketch of the recall form user interface

The recall form will be the main part of the user interface. This screen will show the form as it is being filled out by the user, giving the user the ability to review everything that they have entered so far. The form will be sectioned into blocks related to the individual meals (breakfast, lunch etc.).

On this screen (Drawing 1), the user will be able to take the following actions (using buttons on the top of the page):

- Add a new meal section;

- Mark the form as completed and submit it;

- Request help (this will show the general help related to the functionality of the form entry screen).

Next to the active meal section additional buttons will be shown (a section is made active by clicking on it):

- Delete this whole section (a confirmation dialog will be shown);

- Add another food item to this section;

- Delete a particular food item (a confirmation dialog will be shown);

- Request help (this will show the help messages relevant to the current context).

The general process of filling out the survey form will consist of several passes as outlined below.

4.1 Free recall pass

During this pass the user will be encouraged to enter the foods and drinks that they had had during the full previous calendar day. The entry method at this stage will consist of simply typing in all the food items the user is able to remember, one item per line. The user interface will optionally present the user with guiding questions (e.g., "Was it a working day?" or "Who were you having your breakfast with?") to help them refresh their memory, however the interface will not interrupt the user as they type with any pop-up messages, specifically any error messages (e.g., in case the system is unable to recognise a particular food item entered by the user) or suggestions (food suggestions appearing as the user types may be helpful to reduce the time required to complete the form, but maintaining the no-distractions phase might be more preferable, therefore the influence of this feature will need to be studied with user groups). The user will then confirm that they have entered all the foods they could remember and will be taken to the second pass.

The responses to the guiding questions will be recorded for potential related studies.

4.2 Correction and identification pass

During this pass the system will attempt to match the foods that the user has entered with known food entries in the database. This pass will have two phases. To identify possible spelling errors or typos, the unknown words will be matched against the dictionary both using the edit distance method (Levenshtein distance) and phonetic similarity (Double Metaphone algorithm). The user will be prompted to choose the most suitable replacement for each unrecognised word.

The system will link the items entered by the user with the entries in the food database. The user will be prompted to confirm that the system has identified each item

correctly (in particular when the system recognises the user's input as a synonym of a known entry). If the system is unable to identify a particular item, the user will be asked to assist the system by choosing the closest match from the database.

4.3 Refinement pass

After each user entry has been classified, the system will attempt to gather as much additional information as possible by applying predefined food patterns. For example, if the user has stated that they had toast, the system will apply the predefined "toast" pattern and ask if there was any spread on the toast (if the user has already entered something that matches an often encountered pattern, e.g., "toast and jam", the system will recognise that and that question will not be asked) . For sandwiches, the system will ask the type of bread and the filling used. For meat or fish dishes, the system will ask about any sauces or condiments used and so on. When the patterns are exhausted, the system will ask the user about the quantity of each item eaten. This will include identifying the serving size (assisted with pictures) and the amount of food left over.

The user will be given an option to say that they do not know the answer to some of the refinement questions.

4.4 Reminder pass

During this pass the system will try to ask guiding questions based on the information gathered so far to remind the user to add any food items they could have missed. For example, if the user has not entered any drinks together with a meal, the system will ask if they are sure that they have not had any drinks with that meal. Additionally, the system will ask about any food supplements.

4.5 Validation

During this final pass the system will try to identify any items that violate the predefined "common sense" conditions. Some foods will be tagged with "reasonable amounts", and if the user has reported an amount much greater than the "reasonable" amount (e.g., drinking five litres of vodka or having several bottles of ketchup) the system will prompt the user to confirm that. The system will also check for the obvious omissions,

such as no drinks reported or unusually large gaps of time between meals.

A possibility of checking the calorie amount in the reported food will be investigated to detect incomplete or incorrect submissions (this would require fetching the data from the nutrient database which is usually not done during the recall).

4.6 Interaction mode during recall passes

To make the identification and refinement passes less frustrating, it will be organised as follows. The items that need the user's attention (misspelled words or unrecognised foods) will be marked in the interface with an exclamation mark icon ("needs user attention"), which when clicked will display the dialogue that resolves that issue.

Alternatively, the user will be able to choose the "just ask me questions" mode, where they will not have to click on the individual items (which may be frustrating as there could be a lot). In this mode, the system will go over each issue in sequence and ask the user questions. Examples of questions related to various stages of form completion are as follows:

- I think this word is misspelled: maybe you meant _ or _?
- I don't know what _ is, did you mean _?
- Did you have any milk with your tea?
- How many slices of pizza did you eat?
- Did you have any sauces (for example: ketchup) with your meal?

and so on.

4.7 Session management

The user will be able to interrupt their filling out of the survey form at any time and return to complete it later, however the user will be asked to complete the form within a specified amount of time (up to 24 hours) in order to maintain the consistency of the 24 hour recall. The users will be notified of this time period when they are about to start filling out a survey form.

The user will be able to mark the form as complete and submit it to the system using a special button. Regardless of the submission status of the form the user will still be able to

make additions or corrections to their form within 24 hours after starting the recall. In this case the form data will be updated and tagged with the latest update time on the server.

When a user submits a completed form, they will be shown an encouragement message. For example: "Thank you! You have only one survey left to complete. Remember that when you submit all four surveys, you will receive a reward".

5 Advanced features

5.1 Same as before

A "same as before option" option will be provided to the respondents which can be used to duplicate either an individual food or an entire meal. The ability to duplicate a food will speed up the process of an individual recall where the same food or drink is consumed several times throughout the day (e.g., slices of bread, cups of tea). This option will allow using the same food and portion size or the same food but a new estimate of portion size.

The duplicate meal option will be especially useful for multiple 24-hour recalls where the respondent regularly consumes the same food at a particular meal e.g. toast, butter, jam and cup of coffee for breakfast. The choice of foods to be duplicated will be given as a list of most recently entered foods and will show foods used both in the current recall and in the previously completed recall forms.

5.2 Ready meals

Innovative ways of recording information on ready meals and packaged foods will be investigated, including the potential for using bar code scanners.

5.3 Tailoring the questions to the respondent's level of food knowledge

Within the target population of 11-24 year olds there will be a great deal of variation in level of interest in food and knowledge of food preparation. We will investigate whether it is possible to tailor the questions asked by the system to the respondent's level of food

knowledge. This may include options for increasing or decreasing the amount of on-screen help and the use of images to help with identification of types of food, brand and also cooking method. For example for a selected number of foods there could be an "I'm not sure, show me a picture" option to display photographs of the different types of that food. (By food knowledge we mean the amount of information the person knows about the foods they consume, including food type (margarine vs flora pro-active buttery), brand and cooking methods (Mashed potato vs Potato mashed with butter and semi-skimmed milk).

5.4 Capture of brand data

The system will be able to include food brand data in addition to the food type. Different methods of capturing brand data will be explored during early design groups and usability testing. This will include an additional question on brand during the refinement stage that will use photographs to aid identification.

For non-priority foods brand information could be linked via metadata to facilitate look up. For example, Shape/Activia/Muller Light and Ski could appear as individual items in the search return but would bring back 'low fat yoghurt' nutrient data.

Brand specific nutrient data will not be added individually, but rather each brand will be linked with the most appropriate code in the nutrient bank database.

6 Image and video guides

A large number of images will be used throughout the system to assist with the identification of foods and serving sizes.

6.1 Images for estimation of portion size

The SCRAN24 system currently includes over 2000 photographs of over 100 foods for portion size estimation. The portion sizes depicted are based on the amount of foods served to children taking part in the National Diet and Nutrition Survey [5].

The photographs have been extensively validated in a feeding study with 200 children aged 4-16 years and a relative validation against concurrent weighed intakes in 300 children

aged 1½-16 years. Children aged 11 years and over were found to be as accurate and precise in their estimates of portion size as their parents.

The range of photographs will be expanded to cover foods and drinks commonly consumed by the 17-24 year old age range. In addition data collected during the validation of the Young Person's Food Atlas and IPSAS for use with 11-16 year olds will be used to identify those foods which are least accurately estimated and National Diet and Nutrition Survey (NDNS) data [6] will be used to identify which of these foods are the biggest contributors to intakes of energy and key nutrients in the target group. The optimum way in which to present each food in the portion size assessment aid will then be investigated; this will run above and beyond user testing, with approximately 50 participants. For example, milk on cereal could be presented in a milk bottle, a milk jug, a glass, a glass bowl over cereal, a glass bowl containing milk only etc. The accuracy and precision of estimates made using each presentation method will be explored and the optimum method of presentation of each food will be determined by testing participant's ability to estimate the amount of known quantities of food on a plate in front of them. This will be conducted for up to 20 key foods; identified as those least accurately estimated and having the biggest contribution to energy intakes, in this age group.

6.2 Images to assist in identification of foods

For a selected number of commonly consumed items the user will be given the option to view images to assist in identification of the food or drink type. This may include for example photographs of different types of bread (as a user may not be familiar with the term granary bread but may be able to identify it from an image), and also images of packaging (which may help in identifying margarine/spreads as low fat/olive oil based etc. and may be really useful where information on brand is required.)

6.3 Video guide

The system will provide an introductory video tutorial to help the less experienced users. In this tutorial, a complete form will be filled out by a demonstrator to give the user a basic idea of what they will be expected to do and how to do it. The users will be guided to this tutorial when completing the form for the first time, but will be able to skip it in

subsequent recalls.

7   Data export and analysis

The survey data gathered by the system will be stored in a centralised database. This data will be organised by individual surveys and will contain the foods and the drinks with the corresponding weights or volumes as entered by the respondents and/or annotators.

The system will be able to convert this data into detailed nutritional information using the nutritional database. This conversion will be done upon request and will not destroy the original data (i.e. the foods and amounts as entered by the user), which can be used later to re-calculate the nutritional data if, for example, the nutritional database is updated.

The survey data will be able to be exported from the system using any date that falls within the survey time frame as the reference time. This will allow generating a series of data points to analyse the changes in the reported intake over time.

Additionally, the system will be able to provide the following analysis reports:

- Daily intakes of energy and key nutrients (including NMES)

  - On an individual basis;
  - For selected groups (e.g. males or females, people within a given age range).

- Daily intakes of key food groups (fruit, vegetables, meat and fish)

  - On an individual basis;
  - For selected groups. The system will include the main food groups, e.g. fruit & vegetables, however if a new food group is required for a specific study, e.g. fruit juice only, this group will need to be added by the particular study team.

The base format for exported data will be CSV. The detailed description of the field meanings for each report type will be given in the documentation.

8 Implementation considerations

8.1 Version management for underlying data sources

Options will be explored to facilitate updating the master food list and food composition tables to ensure future proofing of the final product. This will include updating of other underlying data sources, such as spelling dictionaries, guide images, and nutritional data.

8.2 Web browser compatibility

The client-side software will be implemented using HTML5 and JavaScript and will not use any third party plug-ins such as Adobe Flash. This will ensure compatibility with the majority of modern browsers and operating systems. The browser usage statistics in Scotland will be investigated to make sure that the most popular browsers are well supported.

The client will include checks for compatibility, such as verifying that the window size is adequate, and JavaScript and cookies are enabled (if they are not the user will be asked to enable them before using the software).

Possible accessibility enhancements will be investigated, such as using alternative text for images and the possibility of controlling the UI using the keyboard.

8.3 Security and privacy

The server side will use low maintenance, proven and secure technologies (Linux-based OS, MySQL or PostgreSQL database server and Java). Sensitive data such as user passwords will not be stored explicitly, but rather use a salted hash value representation. The system will be thoroughly tested for known vulnerabilities such as cross-site scripting. A possibility of deploying the whole system using secure HTTP (https) will be explored.

The participants' personal data will be stored separately from the survey database for additional security.

8.4 Documentation

The following documentation will be supplied with the final product:

- User guide for respondents (including a video guide)

- User guide for annotators

- User guide for survey managers

- Technical documentation for administrators

- Programming guide for developers

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