

Proposal for 2009 New Zealand Total Diet Study

Introduction:

The primary focus of the New Zealand Total Diet Study¹ (NZTDS) is to assess exposure to chemical residues, contaminant elements and selected nutrients, from approximately 120 representative foods, across the average diet of different age-sex groups within the New Zealand population. By its very nature, the NZTDS is relatively large and complex, and is thus carried out only on a periodic basis.

A distinguishing characteristic of total diet studies, including the NZTDS, is that foods are analysed on an 'as consumed' basis (i.e. banana, peeled; meat, cooked). Thus providing an assessment of any potential risk to the consumer at the point of consumption of the food. As such, the NZTDS contrasts with commodity based surveillance or monitoring programmes, which analyse foods as they are available for sale or 'as produced' i.e. bananas, whole chicken with skin; meat, raw.

The TDS is also different from the National Nutrition Surveys (NNS). The TDS simulated diets are developed to represent an average New Zealand dietary pattern using the foods in the food list. This differs from the NNS where individual actual food intakes are surveyed and the nutrient intake is calculated from food composition data. Food contributions to the nutrient intake data within the NNS are in the thousands rather than the representative 120 odd foods used in the TDS.

A feature of TDSs is that they should be undertaken on an on-going and regular basis, which enables monitoring of trends of exposures and levels of contaminants (and selected nutrients) in the food supply, some of which can vary significantly over time. By monitoring trends, appropriate management strategies can be implemented and their effectiveness assessed.

There have been six NZTDSs, the first in 1974/75. The first five were undertaken by the New Zealand Ministry of Health (MoH). The responsibility for the NZTDS transferred to the New Zealand Food Safety Authority (NZFSA) with its establishment in 2002. The 2003/04 NZTDS was the first undertaken by NZFSA. Following the completion of the 2003/04 NZTDS, NZFSA agreed that future NZTDSs would be undertaken at approximately 5-yearly intervals. It was also agreed that the general structure and content of future NZTDSs will be based on that of the 2003/04 NZTDS, which was agreed through the public consultation process undertaken in 2002 – i.e. core components and 'add-on' components – with review of specific components and features as relevant and necessary.

The NZTDS contributes to international networks and standard-setting organisations, such as the World Health Organization Global Environmental Monitoring Systems Food

¹ The NZTDS has in the past been known as the New Zealand Total Diet Survey, however internationally the term 'Study' is more usually used. It is suggested that in the future the NZTDS also be referred to as a 'Study' rather than a 'Survey' to more accurately reflect the nature of the TDS in that the 'survey' component (the sampling and analysis of foods) is only one contributing element to the 'study' which has the primary aim of estimating dietary exposure using both analysis data from food samples and consumption information from the national nutrition surveys.



programme (WHO GEMS/Food), the WHO/FAO Joint Expert Committee on Food Additives (JECFA), and WHO/FAO Joint Meeting on Pesticide Residues (JMPR). The NZTDS is of international standing, and is recommended by WHO as a template for countries initiating their first TDSs.

The NZTDS also provides valuable information that can contribute to the review of Maximum Permissible Concentration's in food with Food Standards Australia New Zealand and the setting of food standards by the NZFSA.

Time table (by calendar year):

It is proposed that the next NZTDS be undertaken on the following timetable and be known as the 2009 NZTDS.

- 2008 Planning and contact with interested stakeholders
Pre-testing of procedures, as necessary
Update of Food List
- 2009 Collection of food samples
Commencement of analysis of samples
- 2010 Completion of analysis of samples
Simulated diets completed
Dietary exposures estimated
Report prepared and peer reviewed
Publication of results – initial release at 2010 NZFSA conference

This timetable will allow the costs of sampling and analysis (the most expensive components of the NZTDS) to be spread over two financial years. Collecting food over a single calendar year will allow the NZTDS to have a single year focus and allow for the agreed five year intervals between NZTDSs to be clearly forecast.

This timetable was also intended to allow the information from the upcoming Ministry of Health Adult Nutrition Survey (15+ years) to be used in the dietary exposure estimates. The original timeline for the Adult Nutrition Survey forecast that data was to be available early – mid 2009. Unfortunately the timeline for the survey has slipped significantly, and current indications are that data will not now be available until late 2010 or early 2011. The impact of this on the 2009 NZTDS is discussed further later in this paper.

Goals:

The goals for the 2003/04 NZTDS were:

- agree in consultation with stakeholders the design and content of the NZTDS;
- estimate dietary exposure for selected chemical residues, contaminants and nutrient elements in the New Zealand food supply, compare this with internationally recognised acceptable exposures or recommended levels, and identify trends in New Zealand over time;
- compare dietary exposure estimates with those in other countries, where comparable data is available;

- ensure that the outcomes of the NZTDS complement data on chemical residues, contaminants and nutrient elements generated from other sources in New Zealand;
- where appropriate, provide data on selected chemical residues, contaminants and nutrient elements for incorporation into other databases including the World Health Organization (WHO) Global Environmental Monitoring System (GEMS) and the New Zealand Food Composition Database; and
- communicate findings in a timely and transparent manner.

It is proposed that these goals are still appropriate and should be agreed as the goals for the 2009 NZTDS.

Food List:

The Food List for the 2003/04 NZTDS was extensively revised using information from: the Ministry of Health 1997/98 Adult National Nutrition Survey (15 years plus); the pilot work for the 2002 National Children's Nutrition Survey (5 – 14 years); retail sales data; and advice from industry and nutrition experts.

The 2003/04 Food List contained 121 foods made up of:

- 110 foods which represent just over 70% of the foods most commonly consumed by New Zealanders and 90% of foods consumed by weight;
- three foods known to be high sources of contamination, if it is present, being oysters, mussels, and liver; and
- several foods that are specific favourites with infants and children, such as baby food, snack bars, and flavoured drinks.

A copy of the 2003/04 Food List is available at:

<http://www.nzfsa.govt.nz/science/research-projects/total-diet-survey/food-list-2003/index.htm>

It is proposed that the 2009 NZTDS Food List be developed from the 2003/04 Food List, with amendments as necessary following a review to take account of the latest available information. This information will be drawn from: recent retail sales data; advice from industry and nutrition experts; and the final report of the 2002 National Children's Nutrition Survey (5 – 14 years). Given the timeline for the planned 2008 Adult Nutrition Survey it is acknowledged that information from this source will not be available to update the food list for the 2009 NZTDS as it relates to food preferences for those 15 years and older.

The availability of limited up to date information in respect of food preferences for those 15 years and older is not considered to be a significant impediment for the 2009 NZTDS. Expert advice and current retail sale data should provide sufficient information to identify if there has been a change in the diet of adult New Zealanders significant enough to warrant changes to the Food List. Further, it is proposed that any change so identified be catered for by adding a further food to the list but not deleting any of the current foods.

In suggesting this approach it is recognised that the NZFSA Food List is made up of representative foods and as such is not intended to capture every food eaten but rather those that make up the majority of the diet. Further, given that it is the simulated diets

derived from the foods on the Food List that is used to calculate the dietary exposures, it is these diets that are the most critical factor. The simulated diets are calculated using the data for all the related or similar foods identified in the National Nutrition Surveys. Therefore it is possible to capture changes in the diet through the simulated diets without the need to specifically amend the Food List.

Population Groups:

The 2003/04 NZTDS estimated dietary exposure for eight population groups, being:

- Adult Male 25+ years
- Adult Female 25+ years
- Young Male 19-24 years
- Adolescent Male 11-14 years
- Adolescent Female 11-14 years
- Child 5-6 years
- Young Child 1-3 years
- Infant 6-12 months

The initial proposal is that the 2009 NZTDS estimate dietary exposures for these same groups. NZFSA is considering the possibility of estimating dietary exposures for other populations groups and this is discussed below under Simulated Diets. A decision to include other groups may, therefore, have an impact on this initial group.

Simulated diets / dietary exposures:

The 2003/04 NZTDS estimated dietary exposures for average New Zealanders were based on a separate simulated two week diet for each of the population groups identified above. The simulated diets were made up using foods from the Food List, with quantities and energy intakes based on the data from the 1997/98 Adult National Nutrition Survey; the 2002 National Children's Nutrition Survey; and a number of smaller surveys of infants and toddlers consumption patterns. The same approach will be used for the development of simulated diets for the 2009 NZTDS.

It was intended to use information from the upcoming Ministry of Health Adult Nutrition Survey in the development of the simulated diets for the three NZTDS adult age groups (young male 19-24 years; adult female 25+ years; and adult male 25+ years) so as to have the most up to date data when calculating the dietary exposure estimates. Unfortunately the timeline for the Adult Nutrition Survey has slipped significantly, and current indications are that data will not now be available until late 2010 or early 2011.

Waiting for the availability of data from the Adult Nutrition Survey would have a significant impact on the 2009 NZTDS timeline delaying completion of the final report by up to 12 months, or longer if the Adult Nutrition Survey timeline slips further. While it would be possible to complete the simulated diets and calculate the dietary exposures for the other age groups, none of the work for the three adult population groups could be commenced until the Adult Nutrition Survey data was available.

The alternative to waiting for the Adult Nutrition Survey data is to use the data from the 1997/98 Adult National Nutrition Survey for the three NZTDS adult age groups. This would mean that the 2009 NZTDS would be completed and the results available in accordance with the timeline set out earlier in this paper. It may also be possible to

undertake a subsequent analysis for the three NZTDS adult age groups once the Adult Nutrition Survey data is available, with the expectation that the revised estimates of dietary exposure would be available around mid to late 2011, if this approach is taken.

Adolescent 11-14 years

NZFSA is also giving consideration to developing only one simulated diet for Adolescents 11-14 years for the 2009 NZTDS. This is because it was found that when developing a simulated diet, based on the Food List for each of these two groups for the 2003/04 NZTDS the diets basically contained the same foods but the one for female adolescent had smaller quantities, i.e. girls eat less. Dietary exposures for each group will, however, still be calculated for both male and female adolescents using 100% of the exposure from the simulated diet for the Adolescent Male 11-14 years and a lesser percentage for the Adolescent Female 11-14 years (the exact percentage to be identified from the information available in the 2002 National Children's Nutrition Survey).

Maori

The 1997/98 Adult National Nutrition Survey (15 years plus) captured consumption data on Maori (n=704) and NZFSA is proposing to look at this information to determine if it is statistically valid enough to allow development of simulated diets for the average New Zealand Maori consumer across the NZTDS adult age groups from which conclusions about potential dietary exposure could be confidently drawn.

It should be noted that such diets, should they be developed, will not be a traditional Maori diet but are expected to contain a similar range of foods as that of other average New Zealanders, however, the quantities of some foods are expected to differ. The main reason for this is that traditional Maori foods tend to be eaten on special occasions rather than as the normal diet of the average Maori person. As such data on a traditional Maori diet is not captured in the New Zealand national nutrition surveys which are based on an individuals' recall of the food eaten in the previous 24 hours. On this basis it is expected that the most commonly consumed foods will be represented in the current Food List for the TDS.

In respect of children the 2002 National Children's Nutrition Survey included approximately equal numbers of Maori, Pacific Island, and New Zealand European children across the various age groups surveyed (5 – 14 years). Therefore the estimated dietary exposures for the Child 5-6 years and Adolescent Male and Adolescent Female 11-14 years made in the NZTDS are representative of the entire New Zealand population. NZFSA proposes to investigate the ethnic components of the data available from the 2002 National Children's Nutrition Survey to determine if there is sufficient variation to warrant the estimation of separate dietary exposures by ethnic group.

Pacific Island

Although the 1997/98 Adult National Nutrition Survey (15 years plus) captured some data on Pacific Island New Zealanders the sample size was quite limited. NZFSA does not believe that the data available is sufficient to allow a robust estimate of dietary exposure and on this basis does not propose to include any separate Pacific Island adult population groups within the 2009 NZTDS. It is noted, however, that the upcoming 2008 Adult Nutrition Survey intends to over-sample Pacific Island people and therefore sufficient information may be available for Pacific Island adults 15+ years to be included in future NZTDSs.

Asian

Currently there is little or no consumption information available for Asian New Zealanders, further there is no one 'Asian' group, rather a wide range of peoples and dietary styles that could fall into such a category. On this basis NZFSA does not believe it is possible, or appropriate, to include an Asian population group in the NZTDS.

Distributional Modelling

NZFSA is also considering using 'Simple Distributional Modelling' as part of the analysis of data from the 2009 NZTDS. Such an analysis would provide probabilistic estimates of dietary exposures at the 5th and 95th percentiles. This would then provide information relating to those sections of the New Zealand population that are very high or very low consumers of some foods. Such an approach may therefore provide information relevant to different age or ethnic population groups without the need to develop specific simulated diets.

Analytes:

The NZTDS has the following core analytes, which it was agreed in 2002 would be included in all future NZTDSs, unless a specific decision is made to amend them:

- Agricultural Compound Residues – two screens:
 - Pesticide multi-residue screen
 - Dithiocarbamate screen (analysed as CS2)
- Nutrient Elements: Iodine and Selenium
- Contaminant Elements: Arsenic; Lead; Cadmium; Mercury

It is proposed that for the 2009 NZTDS the core analytes remain unchanged.

The additional analytes proposed to be included in the 2009 NZTDS are:

- Sodium – given mandatory iodine fortification of salt in all breads has been introduced, and high sodium intake was also identified for all population groups in the last NZTDS.
- Moisture analysis for iodine – this additional iodine analysis has been undertaken in the last two NZTDSs given the deficiency across all populations groups and it is appropriate to continue this.

It is also possible that other elements (either contaminants or nutrients e.g. calcium, zinc, copper, magnesium, manganese, phosphorus, potassium, tin) could be included in an analysis 'package'. While the cost of each would not be substantial there is limited justification to including a large number of these other elements given that the Ministry of Health nutrition surveys (adult and child) analyse for these across a much larger range of foods than the NZTDS. There may however be benefit in considering the addition of a few extra elements where there is sufficient justification and if the additional cost is marginal. A final decision on the inclusion of other elements will be made at the time the contract with the analytical laboratory(s) is negotiated.

There is also a number of one-off analytes, listed below, that have previously been identified for possible inclusion in an NZTDS. The major reason these have not been

included is the significant cost of the analysis (ranging between \$1,000 and \$2,000 per sample per compound). This remains the case; unless specific additional funding becomes available none of these additional analytes will be added to the 2009 NZTDS:

- Polychlorinated dibenzo-p-dioxins (PCDDs)/ polychlorinated diibenzofurans (PCDFs)/ Polychlorinated biphenyls (PCBs). These environmental contaminants are fat soluble and extremely stable, thus can accumulate up the food chain. Over 90% of exposure to dioxin-like compounds is through the diet. All are included in the WHO GEMS/Food priority list of analytes.
- Polycyclic aromatic hydrocarbons (PAHs) - These compounds are ubiquitous in the environment and are formed during normal combustion processes. They are the main carcinogenic (cancer forming) compounds found in cigarette smoke, automobile emissions, and domestic and industrial fire emissions. They are also formed during cooking of foods.
- Acrylamide: This chemical can form in certain foods during common high temperature cooking practices such as frying, roasting or baking. Acrylamides are a family of chemicals known to cause damage to the nervous system in animals and humans, when exposed to very high levels. Acrylamides are also potential human carcinogens. A specific report on dietary intakes of acrylamide was published by NZFSA in March 2006².

Other potential additional analytes that were considered but which NZFSA does not propose to include are:

- Vitamin D – to match work being planned by Australia. However this would be an additional cost as it would involve separate analysis. It is also questionable that the NZTDS is the most appropriate study for this analysis as the range of foods that would need to be sampled and analysed is relatively restricted. A separate one-off study may be a better option if a decision is made to do this work;
- Folic Acid – Fortification of breads with folate will be mandatory from September 2009. Unfortunately this would mean that only one sampling round and therefore only about half the foods would be sampled and analysed after fortification was mandatory. Of more significance, however, is that analysis for folic acid is technically difficult and until a more reliable analytical method is available inclusion within the NZTDS is not considered appropriate.

Sample size, collection and preparation:

The NZTDS aims to estimate dietary exposure – that is what are New Zealanders exposed to through what they eat. Foods are therefore analysed on an 'as consumed' basis, meats are cooked, banana peeled etc as part of the sample analysis preparation. This will continue to be the practice for the 2009 NZTDS. Other NZFSA monitoring and surveillance programmes look at foods at the point of import or immediately after harvest or processing.

Foods from the Food List for the NZTDS are made up of regional foods (collected in four locations around New Zealand) and national foods for which four brands available

² Available on the NZFSA website, under Key Projects at:
<http://www.nzfsa.govt.nz/science/research-projects/index.htm>



nationwide are collected from one location. The regional locations for the last three NZTDSs have been:

- Auckland – largest population in North Island
- Napier – regional agricultural and horticultural growing area
- Christchurch – largest population in South Island
- Dunedin – Otago is known to have low natural iodine

It is proposed that the regional locations remain the same for the 2009 NZTDS.

Samples for the NZTDS are traditionally collected twice for each food over a 12 month period. To manage the amount of food to be collected and prepared for analysis, as well as to ensure seasonal variation is captured the sampling has been undertaken over four quarters of the year – two sampling rounds for regional foods and two for national foods. It is proposed that this continue for the 2009 NZTDS. Although the introduction of a third sampling round for each food has been considered this would increase the cost of sampling and analysis by 50%.

The 2003/04 NZTDS approximately doubled the number of samples analysed for each food and all the samples from the four regions and each of the four brands collected for the national foods were individually analysed. It is proposed that the number of samples analysed be maintain at this increased level for the 2009 NZTDS and also that individual analysis of the samples from the four regions and four national brands continue.