



2016 New Zealand Total Diet Study

Final Project Outline

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EXECUTIVE SUMMARY

This document describes the 2016 New Zealand Total Diet Study (NZTDS) being undertaken by the Ministry for Primary Industries (MPI). The preliminary document was distributed to interested parties as a consultation paper on 14 September 2015 and evaluation of those comments resulted in changes in content where appropriate.

INTRODUCTION

There have been seven NZTDSs to-date, starting in 1974/75. The first five of which were undertaken by the New Zealand Ministry of Health (MoH). The responsibility for the NZTDS then transferred to the New Zealand Food Safety Authority (NZFSA) with its establishment in 2002. The 2003/04 NZTDS and 2009 NZTDSs were undertaken by NZFSA.

The 2016 NZTDS is the first to be undertaken by MPI and will follow a similar design to the 2009 NZTDS. It will focus on the assessment of dietary exposure to chemical residues of agricultural compounds, contaminant elements and selected nutrients from representative foods across the average diet of different age-sex groups within the New Zealand population. The design of the NZTDS provides data that is complementary with data on agricultural compounds, contaminants and nutrient elements generated from other sources in New Zealand.

2016 NEW ZEALAND TOTAL DIET STUDY

The 2016 NZTDS will sample 132 foods over four sampling rounds during the 2016 calendar year. The foods will be analysed for approximately 260 agricultural compounds; the contaminant elements arsenic, cadmium, lead, and mercury (total and methyl); and the nutrient elements fluoride, iodine, selenium and sodium. Foods will be prepared as for consumption prior to analysis. Results for each sampling round will be made available as soon as practical after the analysis is completed. Dietary exposure assessments for a range of age-sex population groups will be estimated once all food samples have been analysed.

Goals

The goals for the 2016 NZTDS are:

- Determine the estimated dietary exposure for selected agricultural compounds, contaminants and nutrient elements in the New Zealand food supply through collecting and analysing foods that represent the diet of New Zealanders.
- Compare estimated dietary exposure with internationally recognised acceptable exposures or recommended levels.
- Identify dietary exposure trends in New Zealand over time and compare these estimates with those in other countries.

- Implement appropriate risk management measures if any potential dietary risks to human health are identified.
- Where appropriate, provide data on selected agricultural compounds, contaminants and nutrient elements for incorporation into other databases including the WHO Global Environmental Monitoring System (GEMS).
- Engage with key interested stakeholders in the development of methodology, and communicate findings to interested parties in a timely and transparent manner.

Timeline:

The 2016 NZTDS will be undertaken on the following timeline.

Dates	Activity
2015	
December	Finalise 2016 NZTDS plans based on consultation and pilot study evaluation
2016	
January - March	1 st quarter collection and analysis of food samples*
April - June	2 nd quarter collection and analysis of food samples*
July - September	3 rd quarter collection and analysis of food samples*
October - December	4 th quarter collection and analysis of food samples*
2017	
January - July	Complete data analysis and conduct dietary exposure estimates
July - November	Finalisation of report
December	Publication of full report online

* Quarterly results reported and published online once analysis completed.

Stakeholder consultation

The 2016 NZTDS consultation paper was released on 14 September 2015 with submissions closing on 12 October 2015. MPI received a total of 14 submissions. Two submissions were from the food industry, two from research institutions, and one from a public health agency, and the remainder from individual submitters and advocacy groups.

The consultation paper, which presented a draft plan for the 2016 NZTDS, sought feedback on five questions relating to the proposed analytes, key foods list, simulated diet approach as well as other general feedback.

Details of the submissions, and MPI's response, can be found in the "Response to submissions on the Study Proposal Consultation" document at.

<https://www.mpi.govt.nz/news-and-resources/consultations/2016-nz-total-diet-study/>

DESIGN OF THE 2016 NZTDS

Food List:

The food list for the 2016 NZTDS will comprise 132 foods. The foods will continue to be divided into Regional and National foods. Regional foods are those that can be expected to demonstrate variation in residue, contaminant or nutrient level depending on the location in which the food is produced. National foods are those not expected to demonstrate such variation and should be uniform throughout New Zealand.

The majority of the foods are the same as those included in the 2009 NZTDS. This facilitates trend analysis. Any changes to the 2016 NZTDS food list were made based on consumption data from the 2008/09 Adult Nutrition Survey (ANS). In addition to this, market research data was used to ensure the most popular brands of each particular food were included.

The full food list is included in the table in Appendix 1.

Sample size, collection and preparation:

The NZTDS estimates exposure to specified chemicals and chemical compounds as a result of food consumption. Foods are therefore analysed on an 'as consumed' basis; meats are cooked, bananas peeled etc as part of the sample preparation prior to being sent for laboratory analysis.

Foods sampled for the NZTDS are made up of Regional foods (collected in four locations around New Zealand) and National foods collected from one location. Regional foods will be sampled in Auckland, Napier, Christchurch and Dunedin. These locations are the same as for the previous four NZTDSs. Each region will sample the same foods and the samples from each region will be kept separate for analysis. National foods will be sampled in Christchurch with four nationally available brands being sampled for each food.

Sampling will occur over five or six weeks in four sampling rounds during the 2016 calendar year. There will be two sampling rounds for Regional foods and two for National foods, meaning each food will be sampled twice so that seasonal variation can be captured. Sampling for Regional foods will commence in January and July; and in April and October for National foods.

Analytes:

The 2016 NZTDS will analyse the food samples as follows:

- Agricultural Compound Residues – three screens:
 - Pesticide multi-residue screen, including the analysis of quaternary ammonium disinfectants
 - Dithiocarbamate screen (analysed as CS₂)
 - Phenoxy and aromatic acid herbicides
- Nutrient Elements; fluoride; iodine; selenium, sodium and zinc;
- Contaminant Elements; aluminium; arsenic; lead; cadmium; mercury and tin.

In addition a selection of samples will be analysed for the following analytes

- Methyl mercury – various seafood samples.
- Inorganic Arsenic – any sample with a total arsenic level above 20 ppb

The combination of tests for each food is attached as Appendix 1.

A list of the specific compounds included in the Agricultural Compound Residues screen is attached as Appendix 2.

Population Groups:

The 2016 NZTDS will estimate dietary exposure for the following ten population groups:

- 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
- Pacific Females 15+ years
- Pacific Males 15+ years

Simulated diets / dietary exposures:

The 2016 NZTDS will estimate dietary exposures for each of the population groups identified above based on a simulated two week diet for each group, except the adolescent 11-14 years male and adolescent 11-14 years female. These will be derived using a single diet, with 100% being used for the adolescent male and a lesser proportion used for the adolescent female.

All the simulated diets will be made up using foods from the Food List with quantities and energy intakes based on the data from the 2008/09 Adult National Nutrition Survey, the 2002 National Children's Nutrition Survey; and a number of smaller surveys of infant and toddler consumption patterns.

REPORTING

Once all results are available for each sampling round, the results of all analyses for each food sampled and each test undertaken will be compiled into a report and published on the MPI website.

A final report on the dietary exposure estimates will be prepared once all the analytical results are available. This report will be internationally peer-reviewed. It is anticipated that the initial release of the final results will be available in early 2018, including a

summary document of the final report. Copies of the full final report are expected to be available shortly thereafter.

RISK MANAGEMENT

MPI will evaluate any analytical results that are unusual or unexpected to determine if follow-up risk management action is needed.

Food / Analyte Combinations

R = Regional food	N = National food
MR = multi residue screen	DTC = dithiocarbamate fungicides
Elements = aluminum, arsenic*, cadmium, iodine, lead, mercury selenium, sodium and zinc. *Any sample with >20ppb Arsenic will be analysed for inorganic arsenic	PH – Pheoxy and aromatic acid herbicides

The 'Total No of samples' relates to the sample for analysis and is derived from:

- Four (4) brands of each National food sampled in each of two seasons;
- Each Regional food sampled in four (4) regions in each of two seasons

Food (132 foods)	Type	Total No. of samples	MR	DTC	Elements	Fluoride	Methyl mercury	PH
Grains (18)								
Biscuits, chocolate	N	8	√	NA	√	NA	NA	√
Biscuits, cracker	N	8	√	NA	√	√	NA	√
Biscuits, plain sweet	N	8	√	NA	√	NA	NA	√
Bran flake cereal	N	8	√	NA	√	√	NA	√
Bread, mixed grain	R	8	√	NA	√	√	NA	√
Bread, wheatmeal	R	8	√	NA	√	√	NA	√
Bread, white	R	8	√	NA	√	√	NA	√
Cakes and slices	R	8	√	NA	√	NA	NA	√
Cornflakes	N	8	√	NA	√	√	NA	√
Muesli	N	8	√	NA	√	√	NA	√
Muffins and scones	R	8	√	NA	√	√	NA	√
Noodles, instant	N	8	√	NA	√	√	NA	√
Oats, rolled	N	8	√	NA	√	√	NA	√
Other cereals	N	8	√	NA	√	√	NA	√
Pasta, dried	N	8	√	NA	√	√	NA	√
Rice, white	N	8	√	NA	√	√	NA	√
Spaghetti in sauce canned	N	8	√	NA	√	√	NA	√
Wheat biscuits cereals	N	8	√	NA	√	√	NA	√
Dairy products (7)								
Cheese	R	8	√	NA	√	NA	NA	NA
Dairy dessert	N	8	√	NA	√	NA	NA	NA
Ice cream	N	8	√	NA	√	NA	NA	NA

Milk (0.5% fat)	R	8	√	NA	√	NA	NA	NA
Milk (3.25% fat)	R	8	√	NA	√	NA	NA	NA
Milk (flavoured)	R	8	√	NA	√	NA	NA	NA
Yoghurt	N	8	√	NA	√	NA	NA	NA
Oil (1)								
Oil	N	8	√	NA	√	NA	NA	NA
Chicken, eggs, fish, and meat (14)								
Bacon	R	8	√	NA	√	NA	NA	NA
Beef (mince)	R	8	√	NA	√	NA	NA	NA
Beef (rump)	R	8	√	NA	√	NA	NA	NA
Chicken	N	8	√	NA	√	NA	NA	NA
Corned beef	R	8	√	NA	√	NA	NA	NA
Egg	R	8	√	NA	√	NA	NA	NA
Fish in batter	R	8	√	NA	√	NA	√	NA
Fish canned	N	8	√	NA	√	NA	√	NA
Fish fingers	N	8	√	NA	√	NA	√	NA
Fish fresh	R	8	√	NA	√	NA	√	NA
Ham	R	8	√	NA	√	NA	NA	NA
Lamb/mutton	R	8	√	NA	√	NA	NA	NA
Pork roast	R	8	√	NA	√	NA	NA	NA
Sausages	R	8	√	NA	√	NA	NA	NA
Vegetables (26)								
Baked beans, canned	N	8	√	√	√	√	NA	√
Beetroot, canned	N	8	√	√	√	√	NA	√
Broccoli/cauliflower	R	8	√	√	√	√	NA	√
Cabbage	R	8	√	√	√	√	NA	√
Capsicum	R	8	√	√	√	√	NA	√
Carrot	R	8	√	√	√	√	NA	√
Celery	R	8	√	√	√	√	NA	√
Corn frozen	N	8	√	√	√	√	NA	√
Courgette	R	8	√	√	√	√	NA	√
Cucumber	R	8	√	√	√	√	NA	√
Kumara	R	8	√	√	√	√	NA	√
Lettuce	R	8	√	√	√	√	NA	√
Mixed vegetables, frozen	N	8	√	√	√	√	NA	√
Mushrooms	R	8	√	√	√	√	NA	√
Onion	R	8	√	√	√	√	NA	√
Peas, frozen	N	8	√	√	√	√	NA	√
Potatoes hot chips	R	8	√	√	√	√	NA	√
Potatoes peeled	R	8	√	√	√	√	NA	√
Potatoes with skin	R	8	√	√	√	√	NA	√

Pumpkin	R	8	√	√	√	√	NA	√
Silverbeet	R	8	√	√	√	√	NA	√
Soup, vegetable	N	8	√	√	√	√	NA	√
Taro	N	8	√	√	√	√	NA	√
Tofu	R	8	√	√	√	√	NA	√
Tomatoes canned in juice	N	8	√	√	√	√	NA	√
Tomato	R	8	√	√	√	√	NA	√
Fruits (16)								
Apples	R	8	√	√	√	√	NA	NA
Avocado	R	8	√	√	√	NA	NA	NA
Banana	N	8	√	√	√	√	NA	NA
Grapes	R	8	√	√	√	√	NA	NA
Kiwifruit	R	8	√	√	√	√	NA	NA
Mandarins	R	8	√	√	√	√	NA	NA
Melons	R	8	√	√	√	√	NA	NA
Mixed berries frozen	N	8	√	√	√	√	NA	NA
Nectarines	R	8	√	√	√	√	NA	NA
Orange	R	8	√	√	√	√	NA	NA
Peaches, canned	N	8	√	√	√	√	NA	NA
Pear	R	8	√	√	√	√	NA	NA
Pineapple canned	N	8	√	√	√	√	NA	NA
Prunes	N	8	√	√	√	√	NA	NA
Raisins/ sultanas	N	8	√	√	√	√	NA	NA
Strawberries	R	8	√	√	√	√	NA	NA
Spreads and sweets (5)								
Chocolate	N	8	√	NA	√	NA	NA	NA
Confectionery	N	8	√	NA	√	NA	NA	NA
Jam	N	8	√	NA	√	NA	NA	NA
Honey	N	8	√	NA	√	NA	NA	NA
Sugar	N	8	√	NA	√	NA	NA	NA
Alcohol (3)								
Beer	N	8	√	NA	√	√	NA	NA
Wine, still red	N	8	√	NA	√	√	NA	NA
Wine, still white	N	8	√	NA	√	√	NA	NA
Composite Foods (8)								
Chicken takeaway	R	8	√	NA	√	NA	NA	NA
Fish cakes	R	8	√	NA	√	NA	√	NA
Hamburger plain	R	8	√	NA	√	NA	NA	NA
Meat pie	R	8	√	NA	√	NA	NA	NA
Noodle dish	R	8	√	NA	√	NA	NA	NA
Pizza	R	8	√	NA	√	NA	NA	NA
Rice dish	R	8	√	NA	√	NA	NA	√
Sushi	R	8	√	NA	√	NA	√	NA

Nuts (4)								
Almonds, whole	N	8	√	√	√	√	NA	NA
Coconut cream, canned	N	8	√	√	√	√	NA	NA
Peanut butter	N	8	√	√	√	NA	NA	NA
Peanuts, whole	N	8	√	√	√	NA	NA	NA
Beverages, non-alcoholic (11)								
Apple-based juice	N	8	√	√	√	√	NA	NA
Caffeinated beverage	N	8	√	NA	√	√	NA	NA
Carbonated drink	N	8	√	NA	√	√	NA	NA
Chocolate beverage	N	8	√	NA	√	NA	NA	NA
Coffee (instant)	N	8	√	NA	√	√	NA	NA
Coffee beans (ground)	R	8	√	NA	√	√	NA	NA
Fruit drink	N	8	√	√	√	√	NA	NA
Orange juice	N	8	√	√	√	√	NA	NA
Tea	N	8	√	NA	√	√	NA	NA
Water (bottled)	N	8	√	NA	√	√	NA	NA
Water (tap)	R	8	√	NA	√	√	NA	NA
Additional meat and shellfish (4)								
Lamb's liver	R	8	√	NA	√	NA	NA	NA
Mussels	R	8	√	NA	√	NA	√	NA
Oysters	R	8	√	NA	√	NA	√	NA
Prawns and shrimps	N	8	√	NA	√	NA	√	NA
Infant foods (4)								
Infant and follow-on formula	N	8	√	NA	√	NA	NA	NA
Infant weaning food, cereal based	N	8	√	NA	√	NA	NA	NA
Infant weaning food, custard, fruit	N	8	√	NA	√	NA	NA	NA
Infant weaning food, savoury meat/veg	N	8	√	NA	√	NA	NA	NA
Butter and table spreads (2)								
Butter	R	8	√	NA	√	NA	NA	NA
Table spreads	N	8	√	NA	√	NA	NA	NA
Dairy substitutes(1)								
Soy milk	N	8	√	√	√	√	NA	√

Savoury sauces, condiments and other (5)								
Hummus	N	8	√	NA	√	NA	NA	NA
Salad dressing	N	8	√	NA	√	NA	NA	NA
Simmer sauce, bottled	N	8	√	NA	√	NA	NA	NA
Tomato sauce	N	8	√	√	√	√	NA	√
Yeast extracts	N	8	√	NA	√	NA	NA	NA
Snack foods (3)								
Potato crisps	N	8	√	√	√	√	NA	√
Snack bars	N	8	√	NA	√	NA	NA	NA
Snacks (flavoured)	N	8	√	NA	√	NA	NA	NA

Agricultural Compounds Screen

Agricultural compound

2,4'-DDD
2,4'-DDE
2,4'-DDT
4,4'-DDD
4,4'-DDE
4,4'-DDT
Abamectin
Acephate
Acetamiprid
Acetochlor
Acrinathrin
Alachlor
Aldicarb
Aldicarb sulfone
Aldicarb sulfoxide
Aldrin
alpha-BHC
Ametryn
Anilazine
Atrazine
Atrazine-desethyl
Atrazine-desisopropyl
Azaconazole
Azinphos-methyl
Azoxystrobin
Benalaxyl
Bendiocarb
Benodanil
Benoxacor
Benzalkonium Chloride (C12)
Benzalkonium Chloride (C14)
Benzalkonium Chloride (C16)
beta-BHC
Bifenox
Bifenthrin
Bitertanol
Bixafen
Boscalid
Bromacil

Agricultural compound

Fluvalinate
Fluxapyroxad
Folpet
Fonofos
Furalaxyl
Furathiocarb
gamma-BHC (Lindane)
Halfenprox
Haloxypop-methyl
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexaconazole
Hexazinone
Hexythiazox
Imazalil
Imidacloprid
Indoxacarb
Iodofenphos
Iprobenfos
Iprodione
Isazophos
Isofenphos
Isoprocarb
Kresoxim-methyl
Leptophos
Linuron
Lufenuron
Malathion
Mepronil
Metalaxyl (Mefenoxam)
Metconazole
Methabenzthiazuron
Methacrifos
Methamidophos
Methidathion
Methiocarb
Methomyl
Methoxychlor

Bromophos-ethyl	Methoxyfenozide
Bromopropylate	Metolachlor
Bupirimate	Metribuzin
Buprofezin	Mevinphos
Butachlor	Milbemectin
Butamifos	Molinate
Cadusafos	Monocrotophos
Captafol	Myclobutanil
Captan	Naled
Carbaryl	Napropamide
Carbendazim (including Benomyl and Thiophanate)	Nitrofen
Carbofenothion	Nitrothal-isopropyl
Carbofuran	Norflurazon
Carboxin	Omethoate
Carfentrazone-ethyl	Oryzalin
Chlorantraniliprole	Oxadiazon
Chlorfenapyr	Oxadixyl
Chlorfenvinphos	Oxamyl
Chlorfluazuron	Oxychlordane
Chloridazon	Oxyfluorfen
Chlorobenzilate	Paclobutrazol
Chlorothalonil	Parathion-ethyl
Chlorpropham	Parathion-methyl
Chlorpyrifos	Penconazole
Chlorpyrifos-methyl	Pencycuron
Chlorthal-dimethyl	Pendimethalin
Chlortoluron	Permethrin
Chlozolate	Phenthoate
cis-chlordane	Phorate
Clethodim	Phosalone
Clofentezine	Phosmet
Clomazone	Phosphamidon
Coumaphos	Piperonyl-butoxide
Cyanazine	Pirimicarb
Cyanophos	Pirimiphos-methyl
Cyantraniliprole	Prochloraz
Cyflufenamid	Procymidone
Cyfluthrin	Profenofos
Cyhalothrin	Prometryn
Cypermethrin	Propachlor
Cyproconazole	Propamocarb
Cyprodinil	Propanil

delta-BHC	Propaphos
Deltamethrin (including Tralomethrin)	Propargite
Demeton-S-methyl	Propazine
Diazinon	Propetamphos
Dichlobenil	Propham
Dichlofenthion	Propiconazole
Dichlofluanid	Propoxur
Dichloran	Propyzamide
Dichlorvos	Prothiofos
Dicofol	Pyraclufos
Dicrotophos	Pyraclostrobin
Didecyldimethylammonium chloride (DDAC)	Pyrazophos
Dieldrin	Pyrazoxyfen
Diethofencarb	Pyrethrin
Difenoconazole	Pyridaphenthion
Diflubenzuron	Pyrifenox
Diflufenican	Pyrimethanil
Dimethenamid	Pyriproxyfen
Dimethoate	Quinalphos
Dimethomorph	Quintozene
Dimethylvinphos	Quizalofop-ethyl
Dioxabenzofos	Sethoxydim
Diphenylamine	Simazine
Disulfoton	Simetryn
Diuron	Spinetoram
Dodine	Spinosad
Edifenphos	Spiromesifen
Emamectin	Spirotetramat
Empenthrin	Spirotetramat-cis-enol
Endosulfan I	Spirotetramat-cis-keto-hydroxy
Endosulfan II	Spirotetramat-enol-glucoside
Endosulfan sulfate	Spirotetramat-mono-hydroxy
Endrin	Sulfentrazone
Endrin aldehyde	Sulfotep
Endrin ketone	Sulfoxaflor
EPN	Tebuconazole
Epoxiconazole	Tebufenozide (Mimic)
EPTC	Tebufenpyrad
Esprocarb	Teflubenzuron
Ethion	Tefluthrin
Ethoprophos	Terbacil
Etoxazole	Terbufos
Etridiazole	Terbumeton

Etrimfos	Terbutylazine
Famphur	Terbutylazine-desethyl
Fenamiphos	Terbutryn
Fenarimol	Tetrachlorvinphos
Fenchlorphos	Tetraconazole
Fenhexamid	Tetradifon
Fenitrothion	Thenylchlor
Fenobucarb	Thiacloprid
Fenoxaprop-ethyl	Thiamethoxam
Fenoxycarb	Thifluzamide
Fenpiclonil	Thiobencarb
Fenpropathrin	Thiometon
Fenpropimorph	Thiophanate-methyl
Fenpyroximate	Tolclofos-methyl
Fensulfothion	Tolyfluanid
Fenthion	trans-chlordane
Fenvalerate (including Esfenvalerate)	Triadimefon
Fipronil	Triadimenol
Fluazifop-butyl	Triallate
Flucythrinate	Triazophos
Fludioxonil	Trichlorfon
Flufenoxuron	Trifloxystrobin
Flumioxazin	Triflumuron
Fluometuron	Trifluralin
Flusilazole	Uniconazole
Flutolanil	Vinclozolin
Flutriafol	

Dithiocarbamates - expressed as CS₂

Ferbam	Propineb
Mancozeb	Thiram
Maneb	Zineb
Metiram	Ziram
Nabam	

Acidic Herbicides

1-Naphthylacetic acid (NAA)	Fluazifop
2,4-Dichlorophenoxyacetic acid (24D)	Fluroxypyr
2,4,5-Trichlorophenoxyacetic acid (245T)	Haloxypop
2,4,5-Trichlorophenoxypropionic acid (245TP)	loxynil

Acibenzolar acid
Aminopyralid
Bentazone
Clopyralid
Dicamba
Dichlorprop

MCPA
MCPB
Mecoprop
Picloram
Quizalofop