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NDNS: Diet and physical activity – a follow-up study during COVID-19

User Guide

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NatCen Social Research that works for society

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Contents

1 Background

This study was a follow-up of National Diet and Nutrition Survey Rolling Programme (NDNS RP) participants and aimed to describe, and assess the impact of the COVID-19 pandemic on, the diet and physical activity of people in the UK in 2020. Self-reported diet and physical activity data was collected between August and October 2020 for around 1,000 adults and children which was compared with their diet and activity data obtained at the time of their original NDNS RP interview. Data on food security, financial security and changes in dietary and health-related behaviours since the start of the COVID-19 pandemic in the UK in February 2020 were also collected in this study (but not previously in the NDNS RP) through a web questionnaire with the aim of helping to understand the context for any changes in diet and activity. Participants were also asked to complete 4 online dietary recalls over a 2 to 3 week period to assess their current diet. This was compared with their reported diet when originally assessed in the NDNS RP (on average 2 years 7 months earlier). Adults were also asked to complete a Recent Physical Activity Questionnaire (RPAQ), again to compare with their reported physical activity when originally assessed in the NDNS RP.

Further information on NDNS and the follow-up study can be found in the published reports below.

Please note: This study is referred to as DNAC in datasets and variable naming.

1.1 NDNS RP and COVID-19 follow up study reports

The full report for this follow-up study during COVID-19 can be found at: https://www.gov.uk/government/statistics/ndns-diet-and-physical-activity-a-follow-up-study-during-covid-19

Further information about the NDNS collection and the published reports can be found on the gov.uk site: https://www.gov.uk/government/collections/national-diet-and-nutrition-survey or the NDNS website (natcen.ac.uk/taking-part/studies-in-field/national-diet-andnutrition-survey). The latest NDNS RP report, published in December 2020 presents an overview of food consumption, nutrient intake and nutritional status for the UK in NDNS RP Years 9 to 11 (2016/17-2018/19) and trends in time for Years 1 to 11 (2008/09-2018/19).

2 Survey design

2.1 Sample design

The sample drawn for this study comprised adults and children who had previously taken part in Years 9 to 12 (2016/2017 to 2019/2020) of the NDNS RP and who had consented to being recontacted regarding future research. A total of 69 NDNS RP Year 12 participants were not included in the sample for this study as their NDNS RP data was still being processed and cleaned at the time the sample was drawn. Of those who participated in NDNS RP Years 9 to 12, 84% were sent a letter inviting them to take part in this study.

In total, 3,465 individuals across 2,834 households were invited to take part in this study (issued sample). The issued sample included 1,085 individuals from NDNS RP Year 9 (2016 to 2017), 1,034 from Year 10 (2017 to 2018), 939 from Year 11 (2018 to 2019) and 407[i] from Year 12 (2019 to 2020).

2.2 Study structure

The study fieldwork period ran from 10 August to 31 October 2020. The 3,465 individuals sampled from NDNS RP Years 9 to 12 were sent a letter by post inviting them to take part in the study.

The study had 3 stages:

1. Web questionnaire
2. Dietary recalls
3. Recent Physical Activity Questionnaire.

All invited participants were asked to complete the web questionnaire. The questionnaire was programmed so that it was compatible for both web completion by the participant and telephone completion with an interviewer. Participants who did not have internet access or who did not feel comfortable or confident completing the web questionnaire independently were able to request assistance, either by phoning the study Freephone number or when a NatCen Telephone Unit (TU) interviewer telephoned them. The web questionnaire asked about changes in shopping, eating and physical activity habits as well as changes in the household's financial situation and food security during the period of the COVID-19 pandemic from February 2020 up to the point of web questionnaire completion.

At the end of the web questionnaire all participants were invited to complete the first of 4 dietary recalls using Intake24 via an embedded individual link.[1] Intake24 is an online 24-hour dietary recall tool based on multiple-pass dietary assessment methodology.[2,3] The method involves participants providing information about everything they have eaten and drunk over a 24-hour period (midnight to midnight), the preceding day (called a dietary 'recall'). Following completion of their first dietary recall, participants were invited via email or text message to complete their subsequent dietary recalls (2, 3 and 4).

After completing their fourth and final dietary recall, participants aged 16 years and over and who had provided an email address were invited to self-complete a Recent Physical Activity Questionnaire (RPAQ).[4] The RPAQ has been included in the NDNS

[i] Y12 fieldwork ended early in March 2020 due to the Covid-19 pandemic, resulting in a smaller achieved sample than previous years.

RP since Year 2 (2009 to 2010) and asks about physical activity in and around the home, travel to and activity at work, leisure and recreation.

2.3 Response

In total, 1,046 individuals (30% of the issued sample) completed the web questionnaire. The 1,046 individuals who completed the web questionnaire were from 902 households. Households where the only participant was a child aged 11 to 15 years were excluded from household-level analysis; as such 101 households were excluded from this analysis and 801 households were included.

Of the 1,046 participants who completed the web questionnaire, 89% (930) went on to complete at least one dietary recall and 76% (800) completed all 4 dietary recalls. 81% (843) completed at least 2 dietary recalls and 78% (817) completed at least 3 dietary recalls).

Of the 480 participants invited to complete the RPAQ, 78% (373) did so.

See the full report for more details regarding the survey design. https://www.gov.uk/government/statistics/ndns-diet-and-physical-activity-a-follow-up-study-during-covid-19.

3 Dietary assessment method

Dietary data for this study (August to October 2020) was collected using Intake24 on up to 4 non-consecutive days. Intake24 is an online automated self-administered 24-hour dietary recall tool based on the multiple pass method and has been validated against doubly labelled water (DLW) in adults. [5,6,7] Participants completing Intake24 are asked to record everything they ate and drank the previous day (midnight to midnight). Participants are guided through webpages in the following order:

1. Meal-based quick list (captures time, and lists foods)
2. Detail pass (foods selected, portion details provided)
3. Meal gap review
4. Last chance review

The tool displays pre-defined meal and snack times (for example, breakfast at 08:00) which are displayed in chronological order. However, the user can choose to complete entries in any order they wish, change the time and can delete or add more eating occasions. The multiple pass method means that foods and drinks are first entered as free text in the 'quick list' phase of the dietary recall. This is to collect a list of foods and drinks consumed during the previous day. The participant is then taken through the 'quick list' and for each item reported is asked to select from a list of matching food descriptions linked to a food code within Intake24. Participants can add or delete foods in a meal. Once a food is selected, participants are presented with portion size estimation options appropriate to the particular food or drink. The majority of foods in Intake24 have a range of portion-size photo images that the participant can review and select for their portion size. If there is no photo, there is the option to report portion size as household measures such as individual items, different spoon sizes, or small, medium or large servings. Some foods offer both photos and household measures.

For those participants who originally took part in the NDNS RP in Year 12 (2019 to 2020) their previous dietary data was also collected using Intake24.

For participants who originally took part in the NDNS RP in Years 9 to 11 (2016/17 to 2018/19) their previous dietary data was collected over 4 consecutive days using a paper food diary. Details of the food diary methodology can be found in appendix A of the NDNS RP Years 9 to 11 report.[8]

Further information on the sample design for NDNS RP Years 9, 10 and 11 can be found in appendix B of the NDNS RP Years 9 to 11 report.[8]

See the full report for more details regarding the changes to NDNS RP that impact on the use of this data. https://www.gov.uk/government/statistics/ndns-diet-and-physical-activity-a-follow-up-study-during-covid-19.

4 Physical Activity Assessment method

Physical Activity data for this study was collected using the Recent Physical Activity Questionnaire (RPAQ).[9] Participants aged 16 years and over who had completed all 4 dietary recalls were invited to complete the RPAQ.

The RPAQ is a self-completion questionnaire developed by the MRC Epidemiology Unit, Cambridge to assess an individual's physical activity over the previous 4 weeks. It contains questions about physical activity in 4 domains: at home, at work, during commuting and during leisure time. Questions are closed rather than open-ended to facilitate completion, large-scale data entry and analysis.

Participants who originally took part in the NDNS RP in Years 9 to 11 (2016/17 to 2018/19) completed a paper RPAQ. From NDNS RP Year 12 (2019 to 2020) the RPAQ moved from a paper questionnaire used in previous NDNS RP years to an online version. The online version of RPAQ was used for this study.

Minor wording and question changes were made between the paper and online versions. Separate questions on television watching and computer use were included in the paper version whereas in the online version a single question was asked about overall screen time as this reflects current screen use habits. During NDNS RP Year 12 participants completed the online version during the interviewer visit, whereas for this study, participants were sent by text or email (after completing their fourth recall) a unique web link to self-complete the RPAQ online with no interviewer present.

5 Archive documentation and using the data

5.1 Documentation

Data related documents include:

- NDNS DNAC19 Variable List - this contains a list of the variables on each dataset and the survey year to which it applies.
- NDNS DNAC19 Derived Variables – this contains the syntax specification for each of the derived variables included in the data.

For survey and supporting documents please see the published report and NDNS RP year specific archived data.

5.2 Datasets

Data collected during the survey are contained in different data files described below. The NDNS Y9-12 datasets include data from original NDNS dietary and physical activity assessments, and are included to enable analysis of change between NDNS and DNAC. They are limited datasets for the purposes of comparison.

Name of Dataset	No. of records	Description of Dataset
NDNSDNAC19_indiv	1,046	Individual-level questionnaire data
NDNSDNAC19_hhold	801	Household-level questionnaire data
NDNSDNAC19_Food-Level_DietaryData	63,567	Dietary data from Intake24 – food level
NDNSDNAC19_Day-Level_DietaryData_Foods	3,390	Dietary data from Intake24 – foods at day level
NDNSDNAC19_Day-Level_DietaryData_Nutrients	3,390	Dietary data from Intake24 – nutrients at day level
NDNSDNAC19_Person-Level_Dietary_Data	930	Dietary data from Intake24 – person level
NDNSDNAC19_Person-Level_PhysicalActivity_Data	373	Physical Activity data from RPAQ – person level
NDNS_Y9-12_Person-Level_Dietary_Data	930	Dietary data from paper diaries (Y9-11) and Intake24 (Y12) – person level
NDNS_Y9-12_Person-Level_PhysicalActivity_Data	320	Physical Activity data from RPAQ – NDNS Y9-12, person level

5.3 UK Nutrient Databank (NDB)

For Years 1 to 11 of the NDNS RP, the UK Nutrient Databank (NDB) has been saved as a survey year specific file i.e NDNS_Y11_NutrientDatabank. With the change in diet method from a paper diary to Intake24 at the start of Year 12 and the disruption of fieldwork for some survey years as a result of the COVID-19 pandemic, the NDB datasets are now given a version number and can be cross-referred to the dates of data collection in the NDNS RP. This means a version of the NDB may apply to more than one survey year. The file UK_NDB_pre1 is the version of the NDB used for data collected in the NDNS RP between October 2019 and October 2020. This includes all of the data for this study and the NDNS RP Year 12

Details about the NDB and its use can be found in the separate Nutrient Databank Pre-Version 1 User Guide.

5.4 Variables in the datasets

The individual and household datasets contain questionnaire variables (excluding variables used for administrative purposes), demographic information and derived variables.

The dietary datasets contain variables coded from the paper diaries or Intake24 recalls at food, day and person levels, plus dietary reference values and derived variables.

The variables included in all the datasets are detailed in the “NDNS DNAC19 UK Variable list” document in the data section of the documentation. This document is the best place to look in order to plan your analysis. It includes:

- Major categories of variables (e.g. general health, blood sample, day-level dietary nutrients)
- Sub-categories of variables (e.g. longstanding illness (within general health), energy in kcals)
- Source of each variable (e.g. Individual questionnaire, dietary recall, RPAQ, derived variable etc.)

Details of the question wording relating to a variable in the household and individual datasets is provided in the appendices of the DNAC report. The “NDNS DNAC19 UK Derived Variables” document provides information on how the variables were derived.

5.5 Missing values conventions

Missing value conventions are applied to most of the derived variables as well as the original questionnaire variables. The “NDNS DNAC19 UK Derived Variables” specification should be consulted for details.

-1	This code is used to signify that a particular variable did not apply to a given participant because of internal routing (e.g. questions for children only) or because the participant did not participate in a particular element of the survey (e.g. refused a nurse visit).
-4	Question not applicable to survey year. This code indicates that that particular question was not asked/or element was not in a survey year.
-8	Don't know/Can’t say
-9	No answer/Refusal

The above conventions apply to the majority of the variables on the data, however some variables have been attributed specific missing value codes, for example blood and urine results on the individual dataset, and “5 A Day” variables on the dietary data files.

The description for each of the missing value codes are specified in the variable value label. For a full list of variables on the dataset and to which survey they apply see the “NDNS DNAC19 UK Variable list”.

5.6 Merging datasets

As various data are contained in different datasets, users may need to merge several datasets together for the purposes of their analysis. Individual serial number, survey year, age (in groups), sex and country variables are included in all the datasets for consistency.

5.7 Serial number composition

Serial numbers on the data consist of the following:

Variable name	Definition	Composition	File/files included
SERIALH	Household serial number	8 digits. The same number is allocated to each member of the same household. The first number corresponds to the survey year	Household and individual files
SERIALI	Individual serial number for each productive individual	9 digits SERIALH + PERSNO (coded 1 for adult and 2 for child for Y9-11 cases, and is coded 1 or 2 for adult and 3 or 4 for child for Y12)	Household, Individual, all Dietary and RPAQ files

6 Web questionnaire data

The questionnaire for this study, included some questions about the individual and some questions about the household as a whole. Each NDNS RP participant was invited to complete the entire questionnaire. The resulting data was split into an individual level dataset and a household level dataset.

6.1 Household splits

Participants were asked whether their address had changed since their original NDNS RP participation. Three households had disbanded since their NDNS participation and not all NDNS RP participants in these households still lived together. These participants were treated as living in separate households for analysis but were excluded from the archived household data due to risk of disclosure. As such numbers in analysis may differ slightly between reported results and the archived data.

6.2 Creating household data

In this study, each participant was asked the same set of questions, including questions about their household, as it was not possible with the remote study design to identify and select an HRP nor anticipate which (if any) of the invited participants would take part.

Therefore, household-level data collected from more than one individual in multiple-participant households was harmonised to allow for reporting at the household level. For single response code questions, the responses of the oldest participant were used to represent the household (as age is a factor used in determining HRP in the NDNS RP). For household-level multicode (that is, 'select all that apply') questions, all response codes selected by household participants were included in the household response, such that if any participant in the household selected an answer option, that response was included for the household as a whole. This process resulted in 14 households reporting conflicting information, for example, one participant reporting the household 'cooked at home more' while another participant reporting the household 'cooked at home less'. In these scenarios, the responses cancelled each other out, resulting in both responses being set as 'not selected' for the household.

Participants aged 11 to 15 years were asked to complete the web questionnaire themselves but were prompted to ask their parent or carer for support answering the household-level data. Due to the concern that some of these household-level questions may have been answered by children without parent or carer support, and given the nature of these questions, these data were excluded from the analysis and reporting of household-level questions (participants aged 11 to 15 years were still included in individual-level reporting). Household-level data from these participants were therefore excluded prior to the harmonisation process described above. In total, 101 households were excluded from household-level analysis and reporting as they contained participants aged 11 to 15 years only (and no adult participant).

Household-level data from participants aged 2 to 10 years was included as the parent or carer was directed to complete the whole questionnaire for these young participants. Three households contained participants aged 2 to 10 years and 11 to 15 years (and no adult participant). The household-level response of the younger child was included in the analysis as the questionnaire was completed by their parent or carer.

7 Dietary data

Data collected during the survey are contained in different data files. The food level file contains each individual food consumed by each participant; the day level contains the sum of the foods and nutrients consumed within each day for each participant and the person level contains the average intake for each participant.
All foods consumed have a base unit of grams that is, the amount consumed is described in grams. The exceptions are dietary supplements and artificial sweeteners. These have a base unit based on their form i.e. tablet, teaspoon. To avoid errors when calculating consumption, these have only been included in the food level dietary data file. When using this file, it should be noted that, for dietary supplements and artificial sweeteners, the value in the Total_Grams column is not a value in grams but a value in terms of the base unit, i.e. 0.5 for a granulated artificial sweetener would refer to 0.5 of a teaspoon not 0.5 grams.

7.1 5 A Day calculations

Appendix A of the NDNS RP Years 9-11 report[8] provides full details of:

- the methods used for the disaggregation of meat, fish, fruit and vegetables
- the variables/methodology used for 5 A Day calculations

7.2 Comparing this survey data to previous NDNS data

The NDNS RP dietary assessment method change, from a paper diary in Years 1 to 11 (2008 to 2019) to Intake24 in Year 12 and this study, represents a substantial change in the way food consumption data are collected and processed in the survey. This method change may have potential implications that need to be taken into consideration when comparing results from this study with results from previous years of the NDNS RP. A formal evaluation of the dietary assessment method change is being carried out within the NDNS RP in parallel with the introduction of Intake24. A primary aim of the evaluation is to describe how the new dietary method is performing in the NDNS RP and to identify any aspects of data discontinuity and implications for continuation of the time series.
The stage 1 evaluation report provides a set of interim comparison analyses to aid interpretation of the findings from this study and is available at:
https://www.gov.uk/government/publications/evaluation-of-change-in-dietary-methodology-in-ndns-rolling-programme-stage-1

8 Physical Activity data

The Recent Physical Activity Questionnaire (RPAQ) data was cleaned and processed using the MRC Epidemiology Unit Syntax/Code which can be found in Appendix A for data collected years 9-11 and Appendix B for year 12 and this study.

8.1 Physical Activity Energy Expenditure (PAEE)

The RPAQ data was used to calculate physical activity energy expenditure (PAEE). Total PAEE was calculated by summing up PAEE for all activities across all domains. Total PAEE and PAEE in each domain (at home, at work, during commuting and during leisure time) were expressed in kJ per kg per day where one metabolic equivalent (MET) equates to 71.2 J per min per kg (3.5 ml O2 per min per kg).

To compute PAEE from the RPAQ, reported time spent on activities was multiplied by the metabolic cost of each activity (in metabolic equivalents, METs) obtained from the physical activity compendium (16,17) minus one MET for resting metabolic rate, to provide activity specific PAEE estimates.[10]

8.2 Occupational Activity Modifications

Modifications to this scoring regime were made for occupational activity which was quantified according to the approach outlined by Golubic and others [11] (15) and derived from a cohort of 12,435 UK adults in the Fenland Study who had completed the RPAQ concurrently with objective assessment of PAEE, which was estimated from individually calibrated combined heart rate and movement sensing. [12] The average intensity estimates for reported work duration were 1.54 METs for sedentary occupations, 1.74 METs for standing occupations, 1.93 METs for manual work, and 2.20 METs for heavy manual work.

8.3 Sleep

If total reported time spent across all activities was greater than 18 hours per day (assuming 6 hours sleep), all reported durations of activity were scaled back to 18 hours for that person.[10]

9 Weighting variables

The study data was weighted to minimise bias in the observed results that may be due to differences in the selection probabilities, and the likelihood that an individual would participate in the various stages of the study.

Four sets of weights were required:

1. A set of weights for the 1,046 individuals who had completed the web questionnaire; *wti_DNAC*
2. A set of weights for the 930 individuals who had completed at least one dietary recall; *wtd_DNAC*
3. A set of weights for the 373 individuals (aged 16 years and over) who had completed the RPAQ; *wtr_DNAC*
4. A set of household-level weights for the 801 households (796 in the archived data) included in the household-level web questionnaire reporting (note that this weight *should not* be used for individual level analysis); *wth_DNAC*

9.1 Selecting the appropriate weight variable

Analysis should use the weight related to that element of the study. Web questionnaire analysis should use *wti_DNAC*, dietary data analysis should use *wtd_DNAC*, and physical activity analysis should use *wtr_DNAC*. The weightings from the later stage should be used when analysing data from more than one dataset. For example if looking at diet and web questionnaire data, the appropriate weight is *wtd_DNAC;* if looking at physical activity data and any other dataset together, the appropriate weight is *wtr_DNAC.* Household level analysis should use *wth_DNAC*.

References

[1] Intake24 (viewed on 13 August 2021)
[2] Bradley J and others. 'Comparison of INTAKE24 (an Online 24-h Dietary Recall Tool) with Interviewer-Led 24-h Recall in 11-24 Year-Old' Nutrients 2016: volume 8 issue 6, page 358 16.
[3] Foster E and others. 'Validity and reliability of an online self-report 24-h dietary recall method (Intake24): a doubly labelled water study and repeated-measures analysis' Journal of Nutritional Science 30 August 2019: volume 8 e29 1
[4] Only participants who provided an email address were invited to complete the RPAQ as the questionnaire was not compatible for completion on small screens, that is mobile devices. For practical reasons, participants having dietary recall assistance were not asked to complete the RPAQ.
[5] Rowland MK and others. 'Field Testing of the Use of Intake24 – An Online 24-Hour Dietary Recall System' Nutrients 2018: volume 10, page 1,690 (viewed 16 August 2021).
[6] Bradley J and others. 'Comparison of INTAKE24 (an Online 24-h Dietary Recall Tool) with Interviewer-Led 24-h Recall in 11-24 Year-Old' Nutrients 2016: volume 8 issue 6, page 358 (viewed 16 August 2021)
[7] Foster E and others. 'Validity and reliability of an online self-report 24-h dietary recall method (Intake24): a doubly labelled water study and repeated-measures analysis' Journal of Nutritional Science 2019: volume 8, e29 (viewed 16 August 2021)
[8] 'National Diet and Nutrition Survey: Results from Years 9 to 11 (combined) 2016/2017 to 2018/2019' (viewed on 13 August 2021)
[9] Physical Activity downloads
[10] Besson H and others. 'Estimating physical activity energy expenditure, sedentary time, and physical activity intensity by self-report in adults' American Journal of Clinical Nutrition 2010: volume 91 issue 1, pages 106-14 (viewed 16 August 2021)
[11] Golubic R and others. 'Validity of Electronically Administered Recent Physical Activity Questionnaire (RPAQ) in Ten European Countries' PLoS ONE 2014: volume 9 issue 3, e92829 (viewed 16 August 2021)
[12] Lindsay T and others. 'Descriptive epidemiology of physical activity energy expenditure in UK adults (The Fenland study)' International Journal of Behavorial Nutrition and Physical Activity 2019. 9;16(1):126 (viewed 12 August 2021)