Public Health England

Food Standards Agency
food.gov.uk

National Diet and Nutrition Survey: Diet, nutrition and physical activity in 2020

A follow up study during COVID-19

NatCen Social Research

MRC Epidemiology Unit

UNIVERSITY OF CAMBRIDGE

NIHR | Cambridge Biomedical Research Centre

Contents

Acknowledgements

This study was funded by Public Health England (PHE) and the UK Food Standards Agency (FSA) and was carried out by a consortium comprising NatCen Social Research (NatCen) (1) and the MRC Epidemiology Unit, University of Cambridge (2).

This report was prepared by: Robert Ashford and Beverley Bates (NatCen Social Research); Caireen Roberts, David Collins, Kirsten Rennie, Toni Steer, Kate Westgate and Polly Page (MRC Epidemiology Unit, University Of Cambridge); and Gillian Swan and Jo Nicholas (Public Health England).

We would like to thank all study participants who gave up their time to take part. We would also like to acknowledge the professionalism and commitment of the Telephone Unit (TU) interviewers who worked on the study.

We would like to thank everyone who contributed to the study and the production of this report. In particular, we would like to thank:

- colleagues at NatCen – Steve Edwards, Alessio Fiacco, Tahmineh Hendron, Suzanne Hill, Rebecca Light, Katie Ridout, Katy Robertson
- former NatCen colleagues – Urszula Bankiewicz and Sarah Tipping
- colleagues at the Medical Research Council Epidemiology Unit (University of Cambridge) – Suzanna Abraham, Birdem Amoutzopoulos, Anila Farooq, Anna Harvey, Jackie Foreman, Lewis Griffiths, Steph Moore, Angela Mulligan, Tessa Strain and Kirsty Trigg
- members of the NDNS consortium Scientific Reference Group – Jean Adams, Soren Brage, Nita Forouhi, Nick Wareham and Martin White
- members of the NDNS Project Board – Adrienne Cullum, Paul Niblett (PHE), Julie Lovegrove, Hilary Powers (SACN)

The MRC Epidemiology Unit acknowledges the support of the National Institute for Health Research (NIHR) Cambridge Biomedical Research Centre (IS-BRC-1215- 20014). The NIHR Cambridge Biomedical Research Centre is a partnership between Cambridge University Hospitals NHS Foundation Trust and the University of Cambridge, funded by the NIHR.

Glossary

Term	Definition or explanation
NDNS RP	The National Diet and Nutrition Survey Rolling Programme launched in 2008 and is a continuous cross-sectional survey designed to assess the diet, nutrient intake and nutritional status of the population aged 1.5 years and over living in private households in the UK.
Issued sample	This is the sample of previous NDNS RP participants (Years 9 to 12, 2016/17 to 2019/20) who had agreed to be recontacted and for whom contact details were held, who were invited to take part in this study.
Achieved sample	This is the sample of individuals who took part in this study.
Intake24	Online 24-hour dietary recall tool used in this study and the NDNS RP from Year 12 (2019 to 2020) to collect dietary data from participants.
Dietary recall	This is a participant self-report of everything eaten and drunk over a 24-hour period (midnight to midnight), the preceding day. Participants in this study were asked to complete 4 recalls on non-consecutive days.
RPAQ	The Recent Physical Activity Questionnaire collects information on 4 activity domains: work, commuting, at home and during leisure time.
Web questionnaire reference period	This is the period from February 2020 up to the point of the participant's web questionnaire completion (between August and October 2020). The start date of February 2020 was used for the start of the impact of the coronavirus (COVID-19) outbreak in the UK.
Shielding letter	A letter from the NHS or Chief Medical Officer, first announced on 15 March 2020, informing the recipient that they had been identified as someone at risk of severe illness if they contracted COVID-19, because of an underlying disease or health condition and advising the recipient to take certain precautions to protect themselves, in addition to the rules that were in place for everyone (3). The shielding programme was paused on 31 July for Northern Ireland, 1 August for England and Scotland and 16 August for Wales.

Executive summary

This report presents the findings from a study which 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. This was a follow-up of National Diet and Nutrition Survey Rolling Programme (NDNS RP) participants; self-reported diet and physical activity data collected between August and October 2020 for around 1,000 adults and children 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.

Thirty per cent of those who were invited to take part in the study completed the web questionnaire (1,046 individuals, 567 females and 479 males) and 89% of this group (930) went on to complete at least one dietary recall.

Diets in 2020 and comparison with previous assessment

The online dietary recalls completed in August to October 2020 showed that consumption of fruit and vegetables was below the 5 A Day recommendation in all age groups (mean 2.8, 3.7 and 4.5 portion per day for children aged 11 to 18 years, adults aged 19 to 64 years and adults aged 65 years over respectively), red and processed meat consumption met the maximum recommendation for adults (mean 66g per day for men aged 19 to 94 years) but oily fish consumption was well below the recommendation. Mean intakes of saturated fat (for example 13.9% total energy in women aged 65 years and over) and free sugars (for example 12.0% total energy in children aged 11 to 18 years) exceeded maximum recommendations in all age groups while mean fibre intake was below recommendations in all age and sex groups (4% of children aged 11 to 18 years and 6 to 8% of adults met the recommendation). For micronutrients, mean intakes of folate, iron and calcium met Reference Nutrient Intakes (4) in all age and sex groups. These findings were broadly similar to previous NDNS RP assessments.

Diets reported in this study were compared with those reported when participants originally took part in the NDNS RP (between April 2016 and March 2020, on average 2 years 7 months earlier). There have been recent changes in the dietary assessment methodology used for NDNS RP, with a move from a paper food diary to an online 24-hour recall in 2019. Some of the differences observed may therefore be related to these changes. An evaluation of the method

change is being carried out and stage one has been published (5). The time gap between dietary assessments also means that it is not possible to attribute changes to the pandemic.

Fruit and vegetable consumption was 0.7 portions per day lower in adults in this study than in the previous assessment and more adults had moved from meeting to not meeting 5 A Day than had moved in the opposite direction. In contrast, 36% of all participants reported in the web questionnaire that they had eaten more fresh fruit and vegetables since the start of the pandemic while 7% reported they had eaten less.

Consumption of total fish for adults and oily fish for older adults was lower in this study than in the previous assessment. There were no clear differences for total meat or red and processed meat.

Consumption of sugar sweetened soft drinks was lower in this study than in previous assessments for most but not all age groups (for example 25g per day lower for boys (but not girls) aged 11 to 18 years). The proportion of consumers of sugar confectionery and chocolate confectionery was also lower in this study; 32% and 36% of children aged 11 to 18 years moved from consumer to non-consumer of sugar and chocolate confectionery respectively while 9% and 14% moved from non consumer to consumer. Consumption of buns, cakes and pastries was lower in this study in all age groups but there was little difference in consumption of biscuits and crisps and savoury snacks. In the web questionnaire a third of participants reported that they snacked more between main meals since the start of the pandemic although snacks were not defined.

There was no difference in reported energy intake in this study compared with previous assessments except for the 65 years and over age group for whom reported intake was lower in men. Free sugars intake was lower in this study for children aged under 11 years but differences for older children were smaller and for adults were small and inconsistent in direction. For saturated fat the percentage meeting the recommendation was higher in this study than in previous assessments. There was a mixed picture for fibre with higher intakes in this study for children aged 2 to 10 years but lower intakes for older girls and adults. There was also a mixed picture for micronutrients. Median intakes of vitamin D from food (excluding dietary supplements) were lower than in previous assessments, mean intakes of folate, iron and calcium also tended to be lower, except for children under 11 years for whom they tended to be higher.

The percentage of participants who reported consuming alcohol was higher in this study than in previous assessments for the 11 to 18 year age group and for adult men. This is in line with data from the web questionnaire in which a higher proportion of participants reported drinking alcohol more often since the start of the pandemic than reported drinking less often.
Around half of participants (52%) recorded at least one eating occasion where the food had come from the out of home sector. Less than 0.5% of participants recorded an eating occasion

in which most of the food had come from food charities or food banks or from food parcel schemes for shielding groups.

Food security and financial security

In response to questions about financial security since the start of the pandemic in the UK in 2020, 17% of participants reported that their household was just about getting by financially while a further 5% reported finding it quite difficult or very difficult (this combined group is described in this report as 'managing less well financially'). Households with children were more likely to report that they were managing less well financially (26%) or that their financial situation had worsened since the start of the pandemic (33%).

Nineteen per cent of participants reported that they, or someone in their household, had cut down or skipped meals since the start of the pandemic. The most common reason given was the food they wanted not being available in the shops (14%). Three per cent of participants reported not having enough money to buy food as a reason for cutting down or skipping meals. For those who were managing less well financially the proportion was higher at 14%.

Ten per cent of participants reported they were somewhat worried and 1% very worried about not being able to afford food in the next month (this combined group is described in this report as 'worried'). More than half (52%) of those who were worried about not being able to afford food in the next month (equivalent to about 5% of the total sample) reported cutting down or skipping meals.

Questions on food security and financial security were not previously asked in the NDNS RP so pre-pandemic comparisons cannot be made.

Changes to food shopping, preparation and consumption habits

More than two-thirds of participants (68%) said that they or their households visited grocery shops less often since the start of the pandemic. Participants from households managing less well financially were more likely than other participants to report buying items on special offer, changing where they shopped or changing types of food purchased for cheaper alternatives.

Fifty-nine per cent of households reported that they had cooked at home more since the start of the pandemic. Thirty-six per cent reported that they had eaten more fruit and vegetables and 38% reported eating fewer takeaways, while 33% said they had snacked more between meals.

Thirty-four per cent of households reported that they had used food delivery services (such as Deliveroo or Just Eat) since the start of the pandemic and 10% used them at least weekly. Households doing alright or managing less well financially were more likely to report that they

used food delivery services than those living comfortably financially. There was little difference in use of food delivery services between those who were worried about affording food in the next month and those who were not.

Variation in diets by food and financial security

Participants from households reporting lower financial or food security (since the start of the COVID-19 pandemic in the UK in February 2020) had poorer diets in some respects than participants from other households. For example, participants who reported managing less well financially or who were worried about being able to afford food in the next month consumed less fruit and vegetables, less fish, and more sugar sweetened soft drinks than participants who reported they were more financially or food secure. However, there were no differences in reported consumption of confectionery, biscuits, buns, cakes and pastries, crisps and savoury snacks. There was little difference in energy intakes between financial security categories although participants in households reporting lower food security reported lower energy intakes. Free sugars intakes tended to be higher in participants from households with lower food or financial security and fibre intakes tended to be lower. There were few clear differences in micronutrient intakes although a higher proportion of participants with low financial security reported iron and folate intakes below the Lower Reference Nutrient Intake (6) than did those who were financially secure.

Physical activity

Energy expenditure from physical activity in those aged 16 years and over, as assessed by the Recent Physical Activity Questionnaire (RPAQ) was higher on average in this study than in the previous NDNS RP assessments for women but not for men, although there was a wide individual variation. Increases in in-home physical activity (such as gardening and DIY) and leisure physical activity were the main contributors. However, data from the web questionnaire showed that a higher percentage of people reported doing less physical activity than at the start of the pandemic than reported they were doing more. For example 40% of adults aged 19 to 64 years reported a decrease in their physical activity since the start of the pandemic while 26% reported an increase.

Conclusions

Overall the findings from this follow-up study of previous NDNS RP participants during the COVID-19 pandemic show that diet and physical activity assessed between August and October 2020 were broadly similar at a population average level to that reported in the original assessments on average 2 years 7 months earlier. In common with earlier NDNS RP findings, intakes of saturated fat and free sugars exceeded recommendations while intakes of fruit and vegetables, fibre and some micronutrients failed to meet recommendations. Paired comparisons at the individual level suggest there may have been some changes in foods consumed but

interpretation of differences is complex due to the time gap between assessments and a change in the NDNS RP dietary assessment method and it is therefore not possible to attribute changes to the pandemic. However, there was no indication of a marked deterioration in diets or physical activity at the overall population level compared with data collected pre-pandemic although there was a wide range of within individual differences. There were also some apparent inconsistencies between the changes in specific food-related behaviours reported in the web questionnaire by participants since the start of the pandemic and differences identified between the current and previous dietary assessments. These may be at least partly explained by differences in the time periods assessed and methodological factors.

This study provides data on financial and food security in an NDNS sample for the first time. There was some evidence of low financial and low food security among participants in this study, but as these questions were not included in previous NDNS it was not possible to draw comparisons with pre-pandemic. Those reporting low financial or food security tended to have poorer diets in some respects. This mirrors NDNS findings of income differences in some aspects of diet.

The very low proportion of participants who reported obtaining food from food charities, food banks or food parcel schemes for shielding groups may reflect the pausing of the shielding programme in the summer months and that people who rely on food banks may be poorly represented in the NDNS sample.

There are some inconsistencies between the findings in this study and those from other surveys and data analysis (based on a range of data sources and methodologies) during the pandemic. In interpreting the results it should be borne in mind that the sample who took part cannot be described as a random and representative sample of the UK population. It is also important to note that the data collection took place during a period of relative relaxation of COVID-19 restrictions in the UK. Also, the impact of the pandemic is likely to have varied greatly between individuals and households depending on their social, financial, health and employment circumstances.

1. Introduction

This report describes the findings from Diet, Nutrition and Physical Activity in 2020: a follow up study during COVID-19. This study was carried out in the UK between August and October 2020 and was a follow-up of previous National Diet and Nutrition Survey Rolling Programme (NDNS RP) participants, carried out while NDNS RP fieldwork remained suspended due to the COVID-19 pandemic. All fieldwork was carried out remotely without face-to-face contact with participants.

The study was carried out by NatCen Social Research (referred to in the report as 'NatCen') and the Medical Research Council Epidemiology Unit at the University of Cambridge (referred to in the report as 'the Cambridge team'). Ethical approval for the study was obtained from the Cambridge South NRES Committee (Ref. No. 13/EE/0016).

1.1 Background, aims and rationale

The NDNS RP launched in 2008 as a continuous cross-sectional survey designed to assess the diet, nutrient intake and nutritional status of the population aged 1.5 years and over living in private households in the UK (7). The survey is designed to be representative of the UK population and around 1000 people (500 adults and 500 children) take part each year. A sample of addresses is drawn annually from the Postcode Address File and interviewers visit each selected address to recruit participants and collect data, including an interview, online dietary recalls and interviewer-measured height and weight. A nurse visit is also conducted to collect further physical measurements and a blood sample if written consent is given. Fieldwork is carried out face-to-face in participants' homes.

On 18 March 2020 NDNS RP fieldwork was suspended following UK government advice to avoid non-essential travel and contact with others due to the COVID-19 outbreak. On 23 March the government issued a 'stay at home' instruction and the first national UK lockdown began. The suspension was initially agreed for a two-month period but was eventually extended until October 2020. Other government surveys also suspended fieldwork or moved to remote data collection methods during this period.

Surveys, such as the FSA's COVID-19 Consumer tracker, carried out in the early months of the pandemic, food purchase data, and also anecdotal evidence, suggested that the national lockdown restrictions were having an impact on the diet and physical activity of the population (8). The stay at home instruction meant that many people were working from home rather than commuting, most schools were closed, as were all hospitality and entertainment venues and sports facilities. For some households there was a financial impact as workers in some sectors were made redundant or furloughed (9). As it became increasingly clear that the COVID-19 pandemic and associated restrictions would continue for some time, Public Health England (PHE) began discussions with the NDNS consortium about options to collect data on food

consumption and physical activity during this period to understand the impact of restrictions and social distancing measures.

The aim of the study was to describe, and assess the impact of the COVID-19 pandemic on, the diet and physical activity of people in the UK.

The most practical approach in the time available was considered to be following up previous NDNS RP participants who had agreed to be recontacted and for whom contact details were held. The follow-up approach would provide an opportunity to compare current (2020) diet and physical activity at the individual level with the original pre-pandemic assessments. Data on food security, financial security and changes in food shopping, preparation and consumption habits were also collected in this study (but not previously in the NDNS RP) with the aim of helping to understand the context for any changes in diet and activity.

This follow up study was designed to include 4 dietary recalls and the Recent Physical Activity Questionnaire (RPAQ), 2 key elements of the NDNS RP. Protocols were adapted to include a web questionnaire and to allow fully remote data collection, primarily online with a telephone assistance model to ensure that participants who could not complete the study online could still take part.

The original rationale for the follow-up study was to understand the impact of restrictions and social distancing measures on food consumption, nutrient intake and physical activity in the UK. Over the course of the pandemic the social distancing restrictions in place across the UK have varied. When the follow-up study fieldwork started in early August 2020, the national lockdown had been lifted and many hospitality venues had re-opened with social distancing restrictions in place. However COVID-19 rates were still high or increasing in areas throughout the UK and local lockdowns remained or came into force throughout the data collection period. Restrictions also differed to some extent between the 4 countries of the UK. The second half of the fieldwork period also coincided with schools reopening in most areas. The majority of data collection for this study had been completed by mid-October 2020 when the Tier System was introduced in England in response to an emerging second wave of the pandemic.

When interpreting the study findings it should therefore be borne in mind that the study took place during a specific time period of the COVID-19 pandemic when restrictions were relatively reduced in most areas of the UK compared to the previous and subsequent periods. Despite this there were still considerable restrictions and rising concern and life was very different to how people had been living before the pandemic. It should also be noted when interpreting the findings that there were a wide range of impacts of the pandemic on the circumstances of households and individuals. The table below summarises the restrictions in place from March 2020 to the end of this study data collection period in October 2020. See appendix B for more detailed information on the UK lockdown restrictions during the study period.

Table 1A: Summary of COVID-19 restrictions in UK countries and this study data collection period

Date (all dates 2020)	Restrictions
March	The UK public are first advised against non-essential travel and contact with others (16 March) and a week later instructed that they must stay at home, except for certain very limited purposes – shopping for basic necessities; for one form of exercise a day; for any medical need; and to travel to and from work when absolutely necessary (23 March). All schools are shut from the afternoon of Friday 20 March as well as all cafes, pubs and restaurants (except for takeaway food).
June	The first UK lockdown eases across the UK, with slightly different restrictions and dates across the 4 nations.
July	Further relaxation of measures across the UK (for example, pubs, restaurants, hotels and hairdressers reopen and 2 households allowed to meet up indoors in England on 4 July and in Scotland on 15 July).
August	The shielding programme is paused in all the UK countries. The month-long “Eat Out to Help Out” scheme begins (3 August). Data collection for this study commences (10 August).
September	The majority of schools in England, Wales and Northern Ireland reopen (from 1 September). Schools began to reopen in Scotland in August. New regulations in England and Scotland, prohibiting certain ‘restricted businesses’ (such as restaurants, bars, pubs and entertainment venues) and ‘restricted services’ from providing that service between 22.00 and 05.00 come into force (24 and 25 September).
October	New restrictions are brought in towards the end of October. In Northern Ireland hospitality businesses are limited to takeaways and schools are closed for 2 weeks from 19 October. The Welsh Government announces a short lockdown from 23 October to 9 November. Scotland announce a 5-tier COVID-19 system from 2 November. In England a new 3-tier system of restrictions takes effect from 14 October followed by the announcement (31 October) of a second national lockdown in England in November. Data collection for this study ends (31 October).

1.2 Content of this report

This report presents findings from a study of diet, nutrition and physical activity in the UK during the COVID-19 pandemic.

Chapter 1 sets out the background and aims of the study.

Chapter 2 provides detail of the methodology and study design, including the sample design and size, study stages and considerations for data interpretation. Chapter 3 covers response and weighting and Chapter 4 describes the characteristics of the study participants, providing descriptive statistics on age-sex response breakdowns, body mass index (BMI), ethnicity and household characteristics.

Chapter 5 presents data from the web questionnaire about reported changes in shopping, eating and food preparation habits, as well as the household's financial situation and food security, how well the household reported managing financially at the time and to what extent the household was worried about not being able to afford food in the next month, from the start of the COVID-19 pandemic in the UK (February 2020) up to the point of the participant's data collection (between August and October 2020).

Chapter 6 presents food and nutrient intakes and the percentage meeting dietary recommendations by age and sex based on data from the 24-hour dietary recalls collected between August and October 2020. It compares this data with participants' previous dietary data collected between April 2016 and March 2020.

Chapter 7 brings together data from the web questionnaire (chapter 5) and the dietary recalls (chapter 6) and presents food and nutrient intakes from the recalls collected between August and October 2020 in relation to data from the web questionnaire on financial and food security.

Chapter 8 presents questionnaire data on physical activity collected between August and October 2020 from participants aged 16 years and over. Data from the current study is compared with participants` previous activity data collected between April 2016 and March 2020.

Chapter 9 provides a conclusion on the report's findings.

A participant-matched statistical comparison was used to estimate the change in dietary intake and physical activity from participants' original NDNS assessment and their assessment in this study (chapters 6 and 8). Appendix A provides details of the analysis. No statistical analysis has been performed on the data presented in other chapters.

2. Methodology

This chapter provides an overview of the methodology for this study with further detail provided in the appendices. Data collection took place between August and October 2020 although the majority of data collection was completed by the end of September. Participants were asked to complete a web questionnaire about changes to their diet and activity related behaviours since the start of the COVID-19 outbreak in February 2020 and their financial and food security. They were then asked to complete 4 online 24-hour dietary recalls over a 2 to 3 week period. Participants aged 16 years and above who had completed 4 dietary recalls were also asked to complete an online questionnaire about their physical activity.

2.1 Sample design and size

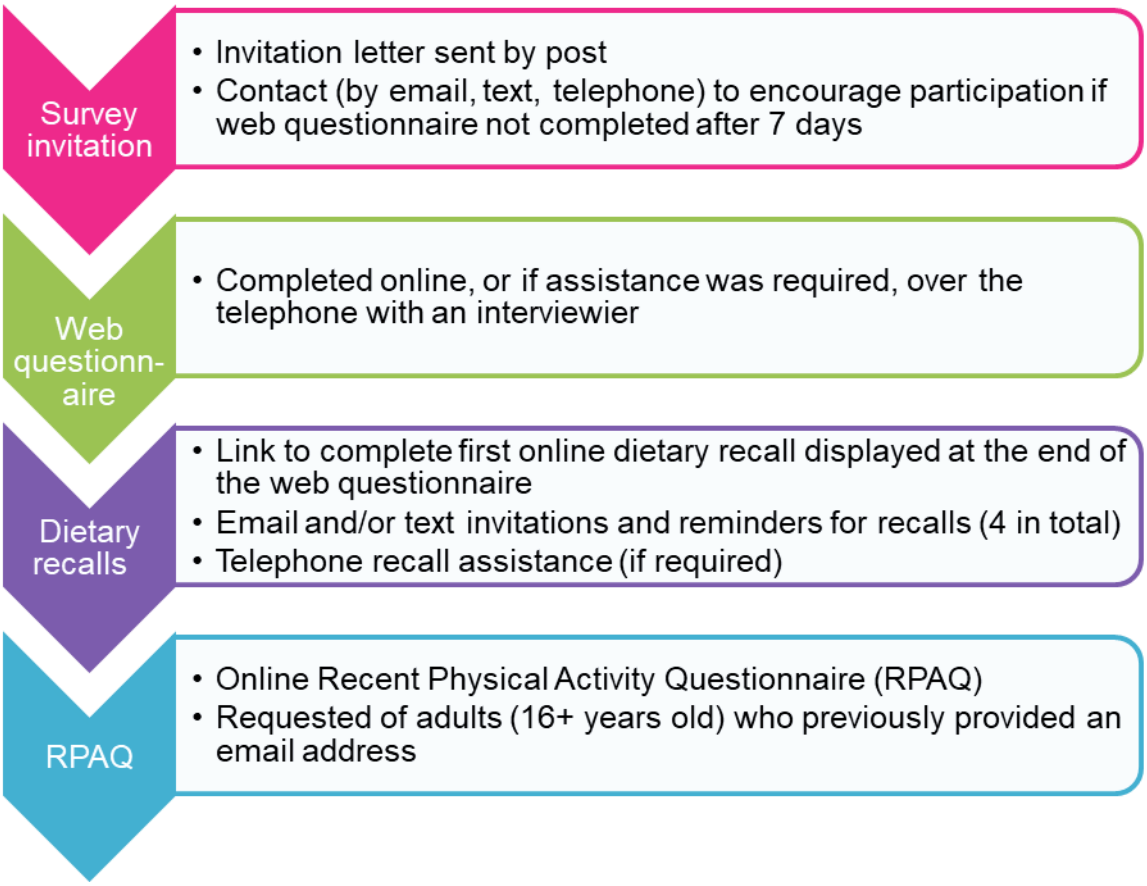
A sample of individuals who had previously taken part in the NDNS RP between 2016 and 2020 (Years 9 to 12) was selected with the aim of comparing their self-reported dietary and physical activity data obtained at the time of their original NDNS RP interview with their self-reported diet and activity data collected between August and October 2020. This issued sample included all adults (aged 19 years or over) and children (aged 2 to 18 years) who had consented to being recontacted about future research and who had provided an email address (10). The decision to recontact participants who took part in NDNS RP up to 4 and a half years earlier was to generate a sample size large enough to allow for data to be reported by age and sex, while keeping the gap between data collection periods as short as possible (11). See appendix A, section A.1 for more detail on sampling for the NDNS RP and 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 from Year 12 (2019 to 2020). The number from Year 12 was smaller than the earlier years due to fieldwork only being partly completed by interviewers prior to 18 March 2020 when NDNS RP fieldwork was paused due to the COVID-19 pandemic (table 2.1) (12).

2.2 Study stages

The study was carried out in 4 stages as illustrated in figure 2A and described in the following sections.

Figure 2A: Study stages



Fieldwork commenced on 10 August 2020 and ran until 31 October 2020. The majority of fieldwork took place during August and September 2020 with 1% of the web questionnaires, 4% of recalls and 6% of RPAQs being completed in October 2020.

2.2.1 Contacting individuals for study invitation

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 invitation letter (appendix E) contained information about the study, explained what taking part would involve, how collected information would be used and how assistance could be sought, alongside provision of the URL and participants' unique access code for the web questionnaire. The letter also informed participants that they would receive personalised dietary feedback and a £15 gift card if they completed all 4 dietary recalls and, for individuals aged 16 years and over, an additional £5 gift card if they completed the RPAQ. The fieldwork period ran from 10 August 2020 to 31 October 2020.

Seven days after dispatch of the invite letters, individuals who had not completed the web questionnaire were contacted by telephone, email or text message (dependent on the contact information held) to encourage participation in the study. See appendix A, section A.2 for more detail on the types of contact made with individuals.

2.2.2 Web 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. Questions on food shopping and food preparation habits, as well as questions on food security were taken from the Food Standards Agency's Food and You survey (which has been running since 2010) and adapted for this study, to facilitate cross survey comparisons (13). Participants could decline to answer individual questions if they wished to do so. For participants under the age of 11 years their parent or guardian was asked to answer the questions on the child's behalf. The questionnaire is included in appendix C.

See appendix A, section A.5 for information on the processing and cleaning of web questionnaire data, including the harmonisation of household-level data collected from more than one individual in multiple-participant households to allow for reporting at the household level.

2.2.3 Dietary recalls

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 (14). Intake24 is an online 24-hour dietary recall tool based on multiple-pass dietary assessment methodology (15, 16). 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').

A unique URL was displayed at the end of the web questionnaire, routing the participant directly to the Intake24 webpage to complete their first dietary recall. At the start of Intake24, participants were prompted to watch a video showing them how to use the tool. 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) (17). Participants received the invite to complete their next dietary recall 1 to 3 days (randomly allocated) after completion of their previous dietary recall (18). If a participant did not complete their first dietary recall immediately

after the web questionnaire, or complete a subsequent dietary recall on the day they received the invitation, up to 3 reminders were sent over the next 4 days to prompt completion of the dietary recall, with a maximum period of 25 days over which all 4 dietary recalls could be completed (19).

Participants who did not have internet access, or who did not feel comfortable or confident completing the dietary recalls independently, could request assistance for their dietary data collection. Assistance with completing dietary recalls was carried out by the Cambridge team over the telephone or via Zoom video conferencing. See appendix A, section A.3.3.1 for detail on the assistance protocol.

On completion of all 4 dietary recalls, Intake24 provided participants with the option to view on-screen dietary feedback. The feedback provided an average daily personal intake for key foods and nutrients compiled from the 4 dietary recalls combined. Participants were also sent a thank you message via email or text. All participants completing 4 dietary recalls received a £15 token of appreciation, either emailed as an e-code or posted as a gift card. See appendix E for the invite, reminders and thank you message templates and dietary feedback.

The NDNS RP moved to using Intake24 as its dietary data collection tool in October 2019 with the start of Year 12 fieldwork. The survey previously used a paper-based food diary with estimated portion weights, collected over 4 consecutive days during Years 1 to 11 (2008/09 to 2018/19). Therefore, whilst participants in this study from NDNS RP Year 12 had previously used the online Intake24 tool, participants from Years 9 to 11 had not. See section 2.3.2 and appendix A, section A.3 for more details on the dietary assessment method and change in dietary data collection tools used for the NDNS RP.

2.2.4 Recent physical activity questionnaire (RPAQ)

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) (20, 21). Participants received 2 reminders, one day and 3 days after the initial invite, if the RPAQ had not been completed. The RPAQ has been included in the NDNS 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. See appendix A, section A.4 for more detail and appendix G for a copy of the RPAQ.

Participants completing the RPAQ received a thank you email and a £5 token of appreciation, either emailed as an e-code or posted as a gift card.

2.3 Considerations for data interpretation

2.3.1 Timing of data collection in relation to the status of the COVID-19 pandemic and associated restrictions

Chapter 1, section 1.1 describes the restrictions in place in the UK at the time of data collection for this study. Appendix B provides a more detailed timeline for the introduction and easing of lockdown restrictions and other social distancing measures. When interpreting the study findings it should be noted that data collection started in August 2020 during a period of the pandemic when restrictions were relatively relaxed in most areas of the UK compared to the previous and subsequent period. Despite this there were still considerable restrictions in place which, coupled with rising levels of concern about infection levels, meant that life in the UK over this period was very different to that pre-pandemic.

There was also some variation between UK countries and between areas in England in the level of restrictions in place and these changed over the course of the data collection period. By mid-September restrictions began to be tightened across the country in response to rising infections. It should also be noted that the pandemic had a wide range of impacts on the circumstances of households and individuals.

2.3.2 Change in dietary assessment method in the NDNS RP

Participants from Years 9 to 11 (2016/17 to 2018/19) of the NDNS RP reported their original dietary data using a paper food diary and their follow-up data using Intake24. Participants from NDNS RP Year 12 (2019 to 2020) reported both their original and follow-up data using Intake24. In the NDNS RP, an interviewer introduced the dietary assessment instrument (food diary or Intake24) in the home and provided support including during food diary data collection through a mid-week check, and were present and available to provide support for all participants when completing their first dietary recall. This study, by necessity, used remote (online and telephone) survey methods and did not involve any home visits or direct interviewer contact (except for those participants who requested assistance).

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 and interpretation of the time series.

The evaluation of the dietary assessment method change has been impeded by the COVID-19 pandemic and resulting suspension of all NDNS RP fieldwork in March 2020. Year 12 data

collection was terminated at this point with interviewer fieldwork approximately 50% complete. Fieldwork for Year 13 of the RP began in October 2020 following a 3-month delay using a remote data collection model. However further disruption to survey fieldwork over the subsequent months has resulted in a delay to the availability of data. The full evaluation will therefore be carried out over a longer time period and, in a staged approach in order to provide an early understanding of the implications of the method change and identify any amendments required in a timely way.

The stage one evaluation report provides a set of interim comparison analyses to aid interpretation of the findings from this study and is based on all available data from Year 12 (October 2019 to March 2020). The initial findings of the evaluation indicate differences for some foods in some age groups between Year 12 and previous NDNS RP Years 1 to 11 that may be due to the dietary assessment method change and therefore impact on the interpretation of findings in this study. These include 5 A Day fruit and vegetable portions, sugar and chocolate confectionery and soft drinks. The initial findings do not indicate that the method change has impacted the reporting of nutrient intakes but there is some evidence that dietary supplements are not being adequately captured in Intake24. For full details please refer to the Evaluation of changes in the dietary methodology in the National Diet and Nutrition Survey Rolling Programme from Year 12 (2019 to 2020): Stage 1 (5).

The misreporting of energy intake (EI) is known to be an issue for all dietary surveys and studies. The NDNS RP is unique among large-scale population surveys in its inclusion of doubly labelled water (DLW) as an objective biomarker to validate EI estimated from reported food consumption. Estimates of EI from the food diary have been compared with measurements of total energy expenditure (TEE) using the DLW technique in 2 separate sub-samples of survey participants taken from 2008 to 2009, 2010 to 2011 and 2013 to 2015 (22). The evaluation of the dietary assessment method change will also include an assessment of the degree of misreporting by comparing EI using the online dietary tool with TEE measured by DLW and a comparison of differences in EI:TEE between Intake24 and the previous diary method. The energy and nutrient intakes presented in this report have not been adjusted to take account of misreporting.

2.3.3 Comparing web questionnaire data and dietary and physical activity data

Some of the findings from the web questionnaire (chapter 5), the dietary data from Intake24 (chapter 6) and the physical activity data from the RPAQ (chapter 8) show differing results. This may result from differences in the data collection methods and time reference periods. For example in the web questionnaire participants were asked to assess how their behaviour had changed in specific respects since the start of the pandemic, whereas the dietary assessment entailed a series of detailed recalls of diet (collected for the previous day) compared with similar assessments of diet carried out over 4 days on average more than 2 years earlier. It should also be noted that the sample size for the RPAQ is much smaller than for the web questionnaire or

the dietary data as only adults aged 16 years and over who had completed 4 dietary recalls were invited to complete it.

2.3.4 Other considerations

The issued sample for this study is individuals who had already participated in the NDNS RP and who agreed to be recontacted for further research. The NDNS RP is designed to be representative of the UK population. During NDNS RP Years 9 to 11 (the period from which the majority of the issued sample for this study was drawn) response rates ranged between 45% to 50% for participants providing dietary data. However, not all NDNS RP participants will have agreed to be recontacted for further research and less than half the participants who did agree and who were subsequently contacted for this study actually took part. Hence, those participants who took part in this study, having already taken part in the NDNS RP, may be regarded as more willing than the general population to take part in surveys of their food consumption, physical activity and health. Participants taking part in this study cannot therefore be seen as a random, representative sample of the UK population. However, weights were applied to the study data to minimise bias in the observed results (see appendix A, section A.6 for full detail of the weighting strategy).

For dietary and physical activity data which compares an individual's previous NDNS RP assessment (obtained between April 2016 and March 2020) with their assessment from this study (obtained between August and October 2020) there may have been changes to individual circumstances during the gap between assessments which impact the data but are not related to the COVID-19 pandemic. Adjustments have been made to account for seasonality (month of completion) and number of years (and therefore age progression) between the first and second time point. Details of these adjustments can be found in appendix A, section A.7. Changes seen in the dietary data between this study and previous NDNS RP assessments should also be considered in the context of wider trends in food consumption and nutrient intakes (22).

Questions on food shopping and food preparation habits, as well as questions on food security were taken from the Food Standards Agency's Food and You survey and adapted for this study (13). These questions had not previously been included in NDNS RP but the decision was taken to include them in this study as the impact of the pandemic on food security was of interest (23). Thus comparisons of the web questionnaire data with pre-pandemic levels were not possible.

3. Response and weighting

3.1 Response

The issued sample comprised 3,465 individuals (in 2,834 households) who had previously participated in NDNS RP Years 9 to 12 (2016/17 to 2019/20). These individuals were sent a letter inviting them to take part in the study.

Seven days after the dispatch of invitation letters, interviewers from NatCen's Telephone Unit (TU) attempted to contact individuals who had not yet completed the web questionnaire to encourage participation in the study. Despite repeated attempts, the TU were unable to contact 1,722 (50%) of the issued sample. The TU further established that 27 individuals (around 1%) were ineligible to take part in the study as they were either deceased, pregnant or breastfeeding or too ill or physically or mentally incapable to take part.

Of those successfully contacted by the TU and confirmed as eligible to take part (1,716 individuals), 655 (38%) declined to do so. A further 15 individuals (~1%) did not refuse to take part at this point but did not go on to complete the web questionnaire.

In total, 1,046 individuals (30% of the issued sample) completed the web questionnaire. There was little difference in completion rates between males and females (both 30% of the issued sample), although a higher number of females (567) than males (479) completed the web questionnaire (most likely due to a higher number of females taking part in NDNS RP and therefore appearing in the issued sample). Adults (aged 19 years and over) were more likely to complete the web questionnaire than children (aged 1.5 to 18 years) (33% and 27% respectively). See chapter 4, section 4.1 for more detail of the age sex split of the achieved sample. Of those completing the web questionnaire, 866 (83%) completed it online, while 180 (17%) completed it over the telephone with assistance from a TU interviewer (tables 3.1.1 and 3.1.2).

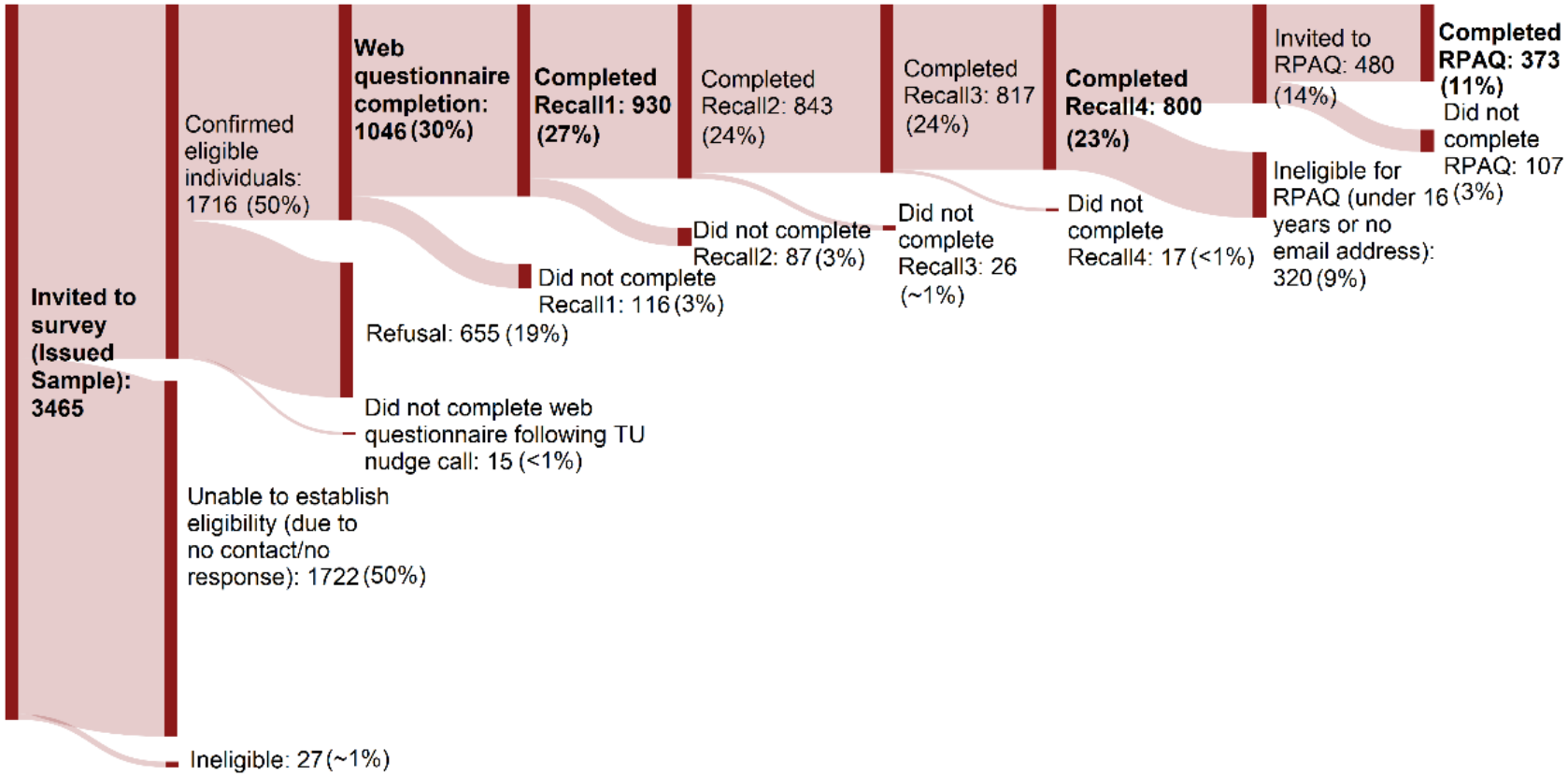
The 1,046 individuals who completed the web questionnaire were from 902 households. In total, 801 households were included in the household-level analysis as responses from the 101 households where the only participant was a child aged 11 to 15 years were excluded from this analysis. This was due to the concern that some of these household-level questions (such as those on financial and food security) may have been answered by children without parent or guardian support, and given the nature of these questions it was not considered appropriate to include responses from children. See appendix A, section A.5 for more detail.

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). A small number of participants (4% of participants completing one dietary recall) required telephone assistance

completing their dietary recalls; 41 participants requested and had assistance with the first recall and 37 of these required assistance with all 4 dietary recalls. Two participants were able to complete subsequent recalls independently after assistance with the first recall and 2 participants dropped out following the first recall.

Participants aged 16 years and over who completed all 4 dietary recalls and provided an email address (17) were invited to self-complete an online Recent Physical Activity Questionnaire (RPAQ). Of the 480 participants invited to complete the RPAQ, 78% (373) did so (table 3.1.2).

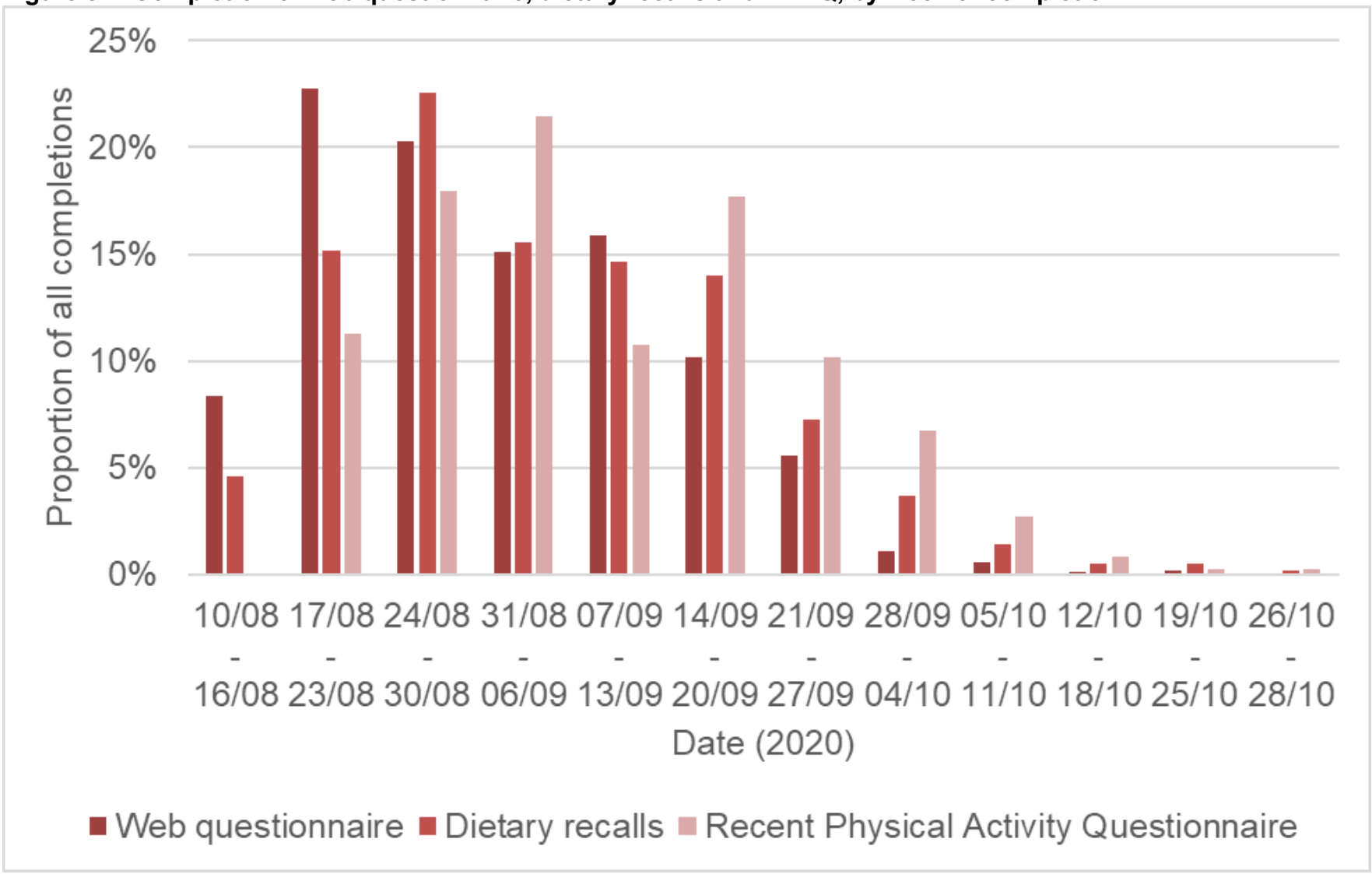
Figure 3A: Individual response numbers to the stages of this study



All (%) figures are a percentage of the Issued Sample

All individuals were invited to take part in the study in August or early September, with the fieldwork period open until the end of October to allow participants sufficient opportunity to complete all elements of the study. Almost all web questionnaires were completed in August (52%) and September (46%). Similarly, most dietary recalls were completed in August (45%) and September 2020 (51%), with a small number being completed throughout October 2020 (4%). The majority of RPAQs were completed in August (33%) and September 2020 (61%), with a small number being completed in October (6%). It should therefore be noted that, despite the study period being August to October 2020, most of the data points reflect the period of August to September (figure 3B and table 3.1.3).

Figure 3B: Completion of web questionnaire, dietary recalls and RPAQ, by week of completion



3.2 Weighting

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:

1.1 A set of weights for the 1,046 individuals who had completed the web questionnaire;
1.2 A set of weights for the 930 individuals who had completed at least one dietary recall;
1.3 A set of weights for the 373 individuals (aged 16 years and over) who had completed the RPAQ, and
1.4 A set of household-level weights for the 801 households included in the household-level web questionnaire reporting.

See appendix A, section A.6 for detail of the weighting strategy.

4. Characteristics of study participants

This study was designed to enable reporting by age and sex, similar to the NDNS RP. Other characteristics such as BMI and ethnicity were collected and reported for the purpose of describing the study sample but analysis of diet and activity by BMI and ethnicity was considered out of scope for this study due to limitations of sample size.

4.1 Age and sex profile of participants

The issued sample of this study had a higher number of females than males due to a higher number of females taking part in NDNS RP Years 9 to 12 (1,872 females and 1,593 males) (table 2.1.1). There was little difference in completion rates between males and females in this study (both 30% of the issued sample), although a higher number of females (567) than males (479) completed the web questionnaire. The completion rates for dietary recalls and RPAQ were slightly higher amongst females than males (77% of females completed all 4 dietary recalls compared to 76% of males, and 79% of females invited to complete the RPAQ did so, compared to 75% of males) (table 3.1.2).

The NDNS RP is designed to interview an equal number of adults and children each fieldwork year to allow for reporting by age groups (1.5 to 3 years, 4 to 10 years, 11 to 18 years, 19 to 64 years and 65 years and over). Both the issued and achieved sample for this study included a smaller proportion of participants in the youngest age groups (1.5 to 3 years and 4 to 10 years) compared to the profile of the overall NDNS RP achieved sample. The issued sample had 1,496 children (aged 1.5 to 18 years) and 1,969 adults (aged 19 years and over) (table 2.1.1) (24). This is due to participants moving up age groups between their NDNS RP participation and data collection for this study. Adults were also more likely to complete the web questionnaire than children (33% and 27% respectively). As a result, a higher number of adults (640) than children (406) completed the web questionnaire. The completion rates for dietary recalls and RPAQ were slightly higher amongst adults than children (79% of adults completed all 4 dietary recalls compared to 73% of children, and 78% of adults invited to complete the RPAQ did so, compared to 73% of children aged 16 to 18) (table 3.1.2).

The above figures are unweighted (representing the actual number of individuals who took part in this study). Differences in the age and sex breakdown between the achieved sample and the UK general population were corrected for in the weighting.

4.2 Body Mass Index (BMI) of participants

Self-reported height and weight measurements, from which body mass index (BMI) (25) was calculated, were collected in the web questionnaire. The self-reported height and weight measurements for adults (aged 19 years and over) were adjusted using an approach developed by PHE ('Self-report adjustment for PHOF 2.12 excess weight in adults') (26) to take into

account the tendency of people to underestimate their weight and overestimate their height. For the average man BMI increases by 2 units when the self-reported data are adjusted by this method; for the average woman the difference is one unit of BMI. The child (aged 18 years and under) self-reported height and weight measurements were not adjusted as the PHE adjustment method was developed only for adult data (see chapter 4, section 4.2.2) (27).

4.2.1 Adults

Table 4.2.1 shows adjusted mean BMI and corresponding BMI status, in adults, by age group and sex, defined according to the World Health Organization (WHO) BMI classification as shown in table 4A below:

Table 4A: BMI classification

BMI (kg per m2)	Description
Less than 18.5	Underweight
18.5 to less than 25	Healthy weight
25 to less than 30	Overweight
30 to less than 40	Obese (excluding morbidly obese)
40 or more	Morbidly obese

There were no differences in mean adjusted BMI by sex, with men aged 19 years and over having a mean adjusted BMI of 27.5 and women 27.3. However, men aged 65 years and over had a much higher mean adjusted BMI (29.4) than men aged 19 to 64 years (26.9) or than women aged 65 years and over (27.4). A higher percentage of men were living with overweight, including obesity and morbid obesity (67% in men and 58% in women). Amongst men, a higher percentage of men aged 65 years and over (87%) than men aged 19 to 64 years (61%) were living with overweight, including obesity and morbid obesity. Amongst women, a similar proportion of women aged 19 to 64 years (58%) and women aged 65 years and over (59%) were living with overweight, including obesity and morbid obesity (table 4.2.1).

After adjusting for self-reported height and weight measurements, adults mean BMI figures in this study were similar to Health Survey for England (HSE) 2019 figures based on interviewer-measured heights and weights. The interviewer-measured mean BMI of men in 2019 from HSE 2019 data was 27.6 compared to adjusted BMI of 27.5 in this study. A similar percentage of men were living with overweight, including obesity and morbid obesity (68% in HSE 2019 and 67% in this study). Adjusted BMI figures were similar amongst women, if not slightly lower in this study, with the percentage of women that were living with overweight, including obesity and morbid obesity in HSE 2019 being 60% compared to 58% in this study and the percentage living with obesity, including morbid obesity, being 29%% in HSE 2019 and 25% in this study (28).

4.2.2 Children

The child (ages 18 years and under) self-reported height and weight measurements were not adjusted as the PHE method was developed only for adults. The unadjusted data are reported in table 4.2.2.

4.3 Ethnicity

Eighty-six per cent of participants in the study were White, 9% were Asian, 2% Black and 2% Mixed or Multiple ethnic background (table 4.3.1). These figures are broadly similar to the latest England and Wales 2011 Census figures (86% White, 8% Asian, 3% Black, 2% Mixed or Multiple ethnic groups and 1% Other ethnic groups) (29).

4.4 Household characteristics

4.4.1 Household size: number of household members

Of the 801 households included in the household-level analysis, 16% were single member households. Twenty-eight per cent of households contained 2 people, 17% contained 3 people, 26% contained 4 people, and 13% contained 5 or more people (table 4.4.1).

4.4.2 Households containing children

Of the 801 households included in the household-level analysis, 52% contained children (defined as up to 18 years old) (table 4.4.2).

The proportion of larger households and households containing children in this study are higher than the national average as NDNS RP is designed to oversample households containing children (30).

4.4.3 Sources of household income

In the web questionnaire participants were asked about the sources of income received by household members. Sixty-eight per cent of households reported being in receipt of earnings from employment or self-employment and 40% reported being in receipt of benefits or tax credits. Almost a quarter of households reported being in receipt of a state pension or other pensions (that is a former employer or personal pension) (24% for both). A further 15% of households reported other sources of income and 1% reported no source of income (table 4.4.3).

The study did not collect more detailed information on household characteristics (for example, actual household income or detailed information about job status from which socioeconomic status could be derived) as there were concerns around the ability to reliably collect detailed household information under the study design and in a web questionnaire format. Analysis of

financial security in this report is based on responses to the web questionnaire about how well the household is managing financially and change in financial situation since the start of the pandemic, rather than on sources of income.

5. Eating, shopping and food preparation habits during the web questionnaire reference period of the COVID-19 pandemic

This chapter presents data from the web questionnaire (completed August to October 2020) about reported changes in shopping, eating and food preparation habits as well as the household's financial situation and food security since the start of the COVID-19 pandemic in the UK (February 2020) (31). This is referred to as 'the questionnaire reference period' in this chapter and encompasses the start of the COVID-19 pandemic in the UK, the first national lockdown (between March and June 2020) and the period of less stringent restrictions in the summer and early autumn of 2020. As noted previously, 99% of the web questionnaires were completed in August and September and only 1% in October. Food and financial security questions in this chapter had not previously been included in NDNS RP but the decision was taken to include them in this study as the impact of the pandemic on food security was an area of interest.

This chapter also includes information on the proportion of food obtained from in home and out of home sources from the Intake24 dietary data collected between August and October 2020 (32).

No statistical testing has been performed for reported differences in this chapter (33).

More detail about the timeline of restrictions in relation to data collection for this study is provided in chapter 1, section 1.1 and appendix B.

5.1 Households' food and financial security status by household size and whether household contains children

Participants were asked if they or anyone in their household had cut down the size of their meals or skipped meals during the questionnaire reference period because they did not have enough money to buy food, were not well enough to shop or cook, had no means of getting to the shops, were unable to get delivery or obtain food in other ways or the food they wanted was not available from shops. Most participants (81%) did not report household members cutting down the size of or skipping meals for any of the reasons listed. However, 19% of participants reported their household had cut down the size of meals or had skipped meals, for which the most common reason reported was due to the food they wanted being unavailable from the shops (14%). Between 2% and 4% reported cutting down the size of meals or skipping meals for any of the other reasons listed. There was little difference in reporting of these behaviours by household size or whether the household contained children (tables 5.1.1 and 5.1.2).

Participants were asked to what extent their household was worried about not being able to afford food in the next month. The majority reported they were not at all worried (71%) or not very worried (18%) but 10% reported they were somewhat worried and 1% reported they were very worried. There was no clear pattern of participants reporting they were very or somewhat worried across households of different sizes (number of household members) . However, participants from households with children were more likely to report they were very or somewhat worried about being able to afford food in the next month (15% compared with 9% of participants from adult-only households) (tables 5.1.3 and 5.1.4).

Participants were asked how well they thought their household was managing financially at that time. Most participants reported living comfortably (38%) or doing alright financially (40%). The remaining 22% of participants reported their household was either just about getting by (17%), finding it quite difficult (4%) or finding it very difficult financially (1%). These latter 3 response options have been grouped into one category termed ‘managing less well financially’ in the rest of this report.

There was little difference in how well the household was managing financially by household size. However, participants from households with children were more likely to report they were managing less well financially (26%) compared with participants living in adult-only households (19%) (tables 5.1.5 and 5.1.6).

Participants were asked whether their household’s financial situation had changed during the questionnaire reference period. Two-thirds of participants (66%) reported no change in their household’s financial situation, 28% reported it had worsened and 6% reported an improvement. Participants living in larger households were more likely to report their financial situation had worsened compared with those living in smaller households (34 to 37% of participants living in households containing at least 3 people reported their financial situation had worsened, compared with 26% of participants living in two-person households and 14% of those living alone). Participants living in households with children were more likely to report their household’s financial situation had worsened (33% compared with 24% of adult-only households) (tables 5.1.7 and 5.1.8).

Sections 5.2 to 5.5: Food habits by household food and financial security indicators and receipt of a shielding letter

The following sections present data on different food habits (cutting down or skipped meals, shopping habits, preparation and consumption habits and food delivery service use) by 3 household food and financial security indicators presented in the preceding section (managing financially, financial situation change, worried about being able to afford food) and receipt of a shielding letter.

Participants in 11% of households reported that they, or someone else in their household, had received a shielding letter (table 5.2.4). From NHS Digital data, individuals who received a shielding letter tended to be older: 74% of individuals on the Shielding Patient List (as of 7 July

2021) were over the age of 50 and 43% were over the age of 70 (34). Differences presented below between households in receipt of a shielding letter and other households may therefore be confounded by age; however the study did not collect the data needed about other household members to investigate this. The shielding programme was paused on 31 July 2020 for Northern Ireland, 1 August for England and Scotland and 16 August for Wales.

5.2 Cut down or skipped meals

The proportion of participants reporting their household had cut down the size of meals or had skipped meals during the questionnaire reference period differed according to how well the participant reported their household was managing financially.

Participants reporting their household was managing less well financially were more likely to report cutting down the size of or skipping meals for one or more of the listed reasons (38% compared with 17% of those doing alright financially and 10% of those living comfortably). Of participants reporting their household was managing less well financially, 14% reported cutting down on the size of or skipping meals due to not having enough money to buy food, compared with less than 0.5% of those from households living comfortably or doing alright financially. Participants reporting their household's financial situation had not changed or had worsened in the questionnaire reference period were more likely to report cutting down the size of or skipping meals for any of the reasons listed (19% and 23% respectively), compared with participants from households whose financial situation had improved (3%) (tables 5.2.1 and 5.2.2).

Participants reporting their household was worried about being able to afford food in the next month were more likely to report cutting down the size of or skipping meals for one or more of the listed reasons (52% (equivalent to about 5% of the total sample) compared with 25% of those who were not very worried and 12% of those who were not at all worried). Thirty-three per cent of participants reporting their household was worried about being able to afford food in the next month reported cutting down on the size of or skipping meals due to food they wanted not being available from the shops, 24% due to not having enough money to buy food and 20% due to them being unable to get a delivery or obtain food in other ways (table 5.2.3).

Households containing someone who had received a shielding letter were more likely to report cutting down the size of or skipping meals for one or more of the listed reasons (33% compared with 17%) (table 5.2.4).

5.3 Food shopping habits

Participants were asked about changes to their household food shopping habits during the questionnaire reference period. Sixty-eight per cent of participants reported their household physically went to grocery shops less often during this period. A smaller proportion of participants reported their household did more grocery shopping online (34%), changed to more

local alternatives for their grocery shopping (29%) or more often bought items that were on special offer (18%). Thirteen per cent of participants reported that none of the changes to shopping habits listed applied to their household during the questionnaire reference period.

The proportion of households reporting food shopping habit changes differed by how well the household was managing financially. Participants in households managing less well financially were more likely to report they more often bought items that were on special offer (32%), changed where they shopped (27%) or changed what food they bought for cheaper alternatives (27%) than those living comfortably financially (10%, 3% and 2% respectively). This pattern was similar for participants in households reporting their financial situation had worsened during the questionnaire reference period (for example, 21% of participants reported their household changed the food bought for cheaper alternatives, compared with 5% of those whose financial situation had improved). Similarly, participants who reported that their household were somewhat or very worried about not being able to afford food in the next month were more likely to report their household changed where they bought food for cheaper alternatives (34% compared with 6% of those who were not at all worried) (tables 5.3.1, 5.3.2 and 5.3.3).

Participants in households containing someone who had received a shielding letter were more likely to report they did more grocery shopping online (50%) than households where no one had received a shielding letter (32%). They were also more likely to report they obtained food from government or local authority food schemes (10% compared with less than 0.5%) (table 5.3.4).

5.4 Food preparation and consumption habits

Participants were asked about changes to their household's food preparation and consumption habits during the questionnaire reference period. The majority of participants (59%) reported their household had cooked at home more since February 2020 (2% reported they cooked at home less). Thirty-eight per cent of participants reported their household ate fewer takeaways (11% reported they ate more takeaways), and 36% of households reported they ate more fruit and vegetables (7% reported they ate less fruit and vegetables) over this period. Thirty-three per cent of participants reported that their household snacked more between main meals, or more frequently prepared food that could be kept as leftovers (28%) over this period (table 5.4.1).

Participants in households managing less well financially were more likely to report they prepared food that could be kept as leftovers more frequently (40%) than those living comfortably (23%) or doing alright (25%) financially. These participants were also more likely to report their household snacking more often between meals (43%) than those living comfortably (26%). Participants in households whose financial situation improved during the questionnaire reference period were more likely to report they ate more takeaways (33%) than those who reported their financial situation had worsened (13% and 9% respectively). There was little difference in reporting other changes in food preparation and consumption habits by how well the household was managing financially (tables 5.4.1 and 5.4.2).

Participants that reported their household were very or somewhat worried about not being able to afford food in the next month were more likely to report they prepared food that could be kept as leftovers more frequently (48%) or snacked more between main meals (47%) than those not very worried (35% and 35% respectively) or not at all worried (22% and 30% respectively) about not being able to afford food in the next month. There was little difference in reporting other changes in food preparation and consumption habits by levels of worry about not being able to afford food in the next month (table 5.4.3).

Participants in households containing someone who had received a shielding letter were more likely to report they ate more fruit and vegetables during the questionnaire reference period (44% compared with 35% of households who had not received a shielding letter), while participants in households not in receipt of a shielding letter were more likely to report they snacked more between main meals (35% compared with 21% of households in receipt of a shielding letter). Patterns of food preparation and consumption habit changes were similar across the other response option categories regardless of whether or not the household was in receipt of a shielding letter (table 5.4.4).

5.5 Use of food delivery services

When participants were asked about changes to their household's food preparation and consumption habits during the questionnaire reference period (from February 2020 up to the point of web questionnaire completion), 38% of participants reported that their household ate fewer takeaways and 11% reported that their household ate more takeaways (table 5.4.1). Fifteen percent of participants reported that their household had ordered meals online more (such as UberEats, Just Eat, Deliveroo); this increased to 34% of households whose financial situation had improved during the questionnaire reference period.

Participants were also asked if their household had used food delivery services (such as UberEats, Just Eat, Deliveroo) during the questionnaire reference period and, if so, how often (35). One-third of participants (34%) reported their household used food delivery services during this period and 10% reported doing so at least weekly (table 5.5.1).

Participants in households reporting that they were doing alright or managing less well financially were more likely to report that they used food delivery services (38% and 36% respectively) than those living comfortably financially (28%). However, in contrast, participants who reported their household's financial situation had improved during the questionnaire reference period were more likely to report they used food delivery services (56%) than those who reported no change (32%) or a worsening (34%) in their household's financial situation (tables 5.5.1 and 5.5.2).

The proportion of participants reporting their household used food delivery services during the questionnaire reference period was similar across different levels of worry about not being able to afford food in the next month. Participants in households in which a household member had

received a shielding letter were less likely to report using food delivery services than participants in households not in receipt of a shielding letter (28% compared with 35%) (tables 5.5.3 and 5.5.4).

5.6 Sources of food consumed

Information on sources of food is taken from the Intake24 dietary recall data collected on up to 4 days from each participant between August and October 2020. For each eating occasion recorded in Intake24, participants were asked to record where they had bought or obtained most of the food for that occasion (see appendix F). Almost all participants (99%) recorded at least one eating occasion across all the recall days they completed where most of the food had been purchased as part of the household shopping. Around half of participants (52%) recorded at least one eating occasion where the food had come from the out of home sector, including 22% reporting an eating occasion with food from a fast food or take-away outlet, 18% from a sit-down restaurant or pub and 16% from a café, coffee shop, sandwich bar or deli. Those aged 65 years and over were least likely to have eaten food from the out of home sector (34%) (table 5.6.1).

When looking at the number of eating occasions by sources of food, food that had been mostly purchased as part of the household shopping accounted for 89% of all eating occasions while food purchased from the out of home sector (including food delivery services and takeaways) accounted for 8% of all eating occasions (table 5.6.2). Eating occasions in which most of the food came from food charities, food banks or food parcel schemes accounted for less than 0.5% of eating occasions in all age groups.

6. Changes in food consumption and nutrient intake

This chapter describes changes in dietary intake from participants' previous NDNS RP assessment (obtained between April 2016 and March 2020) and their assessment for this study (obtained between August and October 2020) (32). More detail about the timeline of restrictions in relation to data collection for this study is provided in chapter 1, section 1.1 and appendix B. Each participant completed a dietary assessment during both time periods and a matched participant comparison was performed by calculating the change in dietary intake between the 2 time periods. The average gap between the original NDNS RP assessment and the assessment for this study was 2 years and 7 months, with the gap ranging from a minimum of 7 months to a maximum of 4 years and 5 months. It is important to take into consideration that several factors may account for differences observed including the change in dietary assessment method (see chapter 2, section 2.3). This applies particularly to fruit and vegetable consumption data where initial evaluation suggests some impact of the method change on estimates. Therefore it is not possible to attribute differences seen to any single factor, including the impact of the pandemic. Adjustments were made to account for factors such as number of years (and therefore age progression) between the first and second data time point and for seasonality (month of completion). Details of these adjustments can be found in appendix A, section A.7.

Food consumption, presented as g per day and percentage of consumers, and nutrient intakes and the percentage meeting recommendations based on the dietary assessment for this study are presented by age and sex. The tables also present differences observed when compared to the participants' previous NDNS RP Years 9 to 12 assessment.

For vitamin D intake data, which showed a skewed distribution, a log-transformation was applied before statistical analysis and differences are reported as a percentage change. Confidence intervals (CIs) for the change estimates are also presented in the tables except for fish, sugar-sweetened soft drinks, sugar and chocolate confectionery, buns, cakes and pastries, and crisps and savoury snacks where the number of consumers in the study was too low to reliably present these (36). Commentary in this chapter takes into account whether the difference is nutritionally meaningful and also takes into account statistical significance where appropriate (as indicated by the confidence intervals set out in brackets in the text). It should be noted that for changes in proportions that is percentage of consumers or percentage meeting recommendations, confidence intervals are presented in the tables to indicate the level of precision, but they are not being used as an indication of statistical significance. Instead, the focus for interpretation is on the net shift in percentage of consumers or percentage meeting recommendations.

6.1 Foods

Differences seen for some foods may reflect the change in the dietary assessment method rather than genuine changes in consumption. Please refer to chapter 2, section 2.3.

5 A Day

The number of 5 A Day portions (37) consumed are presented in the tables for the age groups 11 to 18 years, 19 to 64 years and 65 years and over (38). Mean consumption was below the recommendation in all age or sex groups: 2.8, 3.7 and 4.5 portions per day for children aged 11 to 18 years, adults aged 19 to 64 years and adults aged 65 years over respectively. For adults aged 19 to 64 years, the mean number of 5 A Day portions was 0.7 portions per day (CI 0.5, 1.0) lower in this study than in the previous assessment (from NDNS RP Years 9 to 12). More adults in this age group moved from achieving 5 A Day to not achieving (18%) than moved from not achieving to achieving 5 A Day (7%). A similar pattern was seen in children aged 11 to 18 years and adults aged 65 years and over although the differences were smaller (table 6.1.1).

Total meat

Across the age or sex groups there were no significant differences in mean consumption of total meat between previous assessments and this study and most observed differences were small and not in a consistent direction. There was a decrease in the percentage of consumers in children aged 11 to 18 years with 8% moving from consumer to non-consumer and only 1% moving from non-consumer to consumer between previous assessments and this study. For other age or sex groups there was little change in the percentage of consumers (table 6.1.2).

Total red and processed meat

Consumption of red and processed meat met the current maximum recommendation for adults of 70g per day with mean intakes ranging from 38g per day for women aged 19 to 64 years to 66g per day for men aged 19 to 64 years (39). There were no significant differences in mean intake of red and processed meat between previous assessments and this study and observed differences were small and not in a consistent direction. There was a decrease in the proportion of consumers aged 11 to 18 years with 10% moving from consumer to non-consumer and 3% moving from non-consumer to consumer between previous assessments and this study. For other age or sex groups there was little change in the percentage of consumers (table 6.1.3).

Total fish

Mean consumption of total fish in all age groups was 12g per day in children aged 11 to 18 years, 15g per day in adults aged 19 to 64 years, 25g per day in adults aged 65 years and over, well below the recommendation of at least 2 portions per week (one portion is around 140g cooked weight). For adults, across age or sex groups, mean total fish consumption was lower in this study compared with previous assessments although the decrease was small (3 to 5g per day). For children, changes were small and not in a consistent direction. Between previous assessments and this study, the proportion of consumers fell for both adults and children. The

largest drop was seen in boys aged 11 to 18 years where 25% moved from consumer to non-consumer while 16% moved from non-consumer to consumer (table 6.1.4).

Oily fish

Mean consumption of oily fish in all age groups was 2g per day in children aged 11 to 18 years, 6g per day in adults aged 19 to 64 years, 11g per day in adults aged 65 years and over, well below the recommended one portion per week (one portion is around 140g cooked weight). For adults aged 65 years and over, mean oily fish consumption was 6g per day lower in this study. There were smaller or no changes seen in the other age or sex groups. Across all age or sex groups the proportion of consumers fell between previous assessments and this study. The largest drop was seen in adults aged 65 years and over where 21% moved from consumer to non-consumer while 7% moved from non-consumer to consumer (table 6.1.5).

Sugar-sweetened soft drinks

In children aged 2 to 10 years, boys aged 11 to 18 years and adults aged 19 to 64 years, consumption of sugar-sweetened soft drinks was 40g per day, 136g per day and 79g per day respectively. This was 44g per day lower in this study than in previous assessments for children aged 2 to 10 years, 25g per day lower for boys aged 11 to 18 years and 22g per day lower for adults aged 19 to 64 years. This is consistent with a downward trend in sugar-sweetened beverage intake seen in children and adults aged 19 to 64 years in the NDNS RP 2008 to 2019 (22). However, for girls aged 11 to 18 years, mean consumption was 24g per day higher in this study. Across all age or sex groups there was a small decrease in the proportion of consumers between previous assessments and this study. The largest drop was seen in boys aged 11 to 18 years where 24% moved from consumer to non-consumer while 14% moved from non-consumer to consumer (table 6.1.6).

Sugar confectionery

Differences in mean consumption of sugar confectionery between previous assessments and this study were small and not in a consistent direction. However, for children and for adults aged 19 to 64 years, the proportion of consumers was lower in this study. The largest difference was seen in children aged 11 to 18 years. Between their previous assessment and this study, 32% moved from consumer to non-consumer while 9% moved from non-consumer to consumer (table 6.1.7).

Chocolate confectionery

Little difference was observed in mean consumption of chocolate confectionery between previous assessments and this study but similar to sugar confectionery, the proportion of consumers in this study was lower in children and adults aged 19 to 64 years. For children aged 11 to 18 years, 36% moved from consumer to non-consumer while 14% moved from non-consumer to consumer (table 6.1.8).

Biscuits (sweet and savoury)

For boys aged 11 to 18 years, mean consumption of biscuits was 13g per day higher in this study compared with previous assessments but there was little difference in the proportion of

consumers. Differences across the other age or sex groups were smaller and not in a consistent direction. Generally, the proportion of consumers was lower in this study compared with previous assessments. However in men aged 65 years and over the opposite was seen: 9% moved from consumer to non-consumer while 19% moved from non-consumer to consumer (table 6.1.9).

Buns, cakes and pastries

Across all age or sex groups mean consumption of buns, cakes and pastries was lower in this study compared with previous assessments. In children aged 11 to 18 years and men aged 19 to 64 years, mean intake was 11 to 12g per day lower in this study. Generally, the proportion of consumers was lower in this study than in previous assessments except in women aged 65 years and over where 10% moved from consumer to non-consumer while 25% moved from non-consumer to consumer (table 6.1.10).

Crisps and savoury snacks

Little difference was observed in mean intake of crisps and savoury snacks between previous assessments and this study. For girls aged 11 to 18 years, 27% moved from consumer to non-consumer while 8% moved from non-consumer to consumer. There were smaller differences in the proportion of consumers in the other child age or sex groups. For adults aged 65 years and over there was a small increase in the proportion of consumers (table 6.1.11).

6.2 Energy and macronutrients

Total energy

Mean daily intakes for total energy were 1471 kcal for children aged 2 to 10 years, 1683 kcal for children aged 11 to 18 years, 1953 kcal for men aged 19 to 64 years, 1599 kcal for women aged 19 to 64 years, 1742 kcal for men aged 65 years and over and 1508 kcal for women aged 65 years and over. Differences in total energy intake between previous assessments and this study were not statistically significant. For men aged 65 years and over mean total energy intake was 153 kcal per day lower in this study, although the difference did not reach statistical significance either (CI -6,313). The same pattern was seen for food energy intake (that is excluding energy from alcohol) for all age or sex groups (table 6.2.1).

Free sugars (40)

The government recommendation is that free sugars provide no more than 5% of daily total energy intake (41). In all age or sex groups, mean intake of free sugars exceeded the recommendation and was highest in children aged 11 to 18 years (12.0% of total energy). In children aged 2 to 10 years, mean intake of free sugars as a percentage of total energy was 1.6 percentage points (CI 0.7, 2.5) lower in this study than in previous assessments. A downward trend in free sugars intake has been seen in children in the NDNS RP 2008 to 2019 (20). The proportion of participants in this study meeting the recommendation was low in all age or sex groups (8 to 19%). For children, the percentage meeting the recommendation increased between previous assessments and this study with 8 to 9% moving from not meeting to meeting

the recommendation compared with 2% moving from meeting the recommendation to not meeting it. For adults, changes were seen in women only with the percentage meeting the recommendation increasing for those aged 19 to 64 years and decreasing for those aged 65 years and over (table 6.2.3).

Total fat

The government recommendation for total fat is that the population average contribution should be reduced to no more than 33% of total energy (42). This recommendation applies to adults and children aged 5 years and older. Mean intake of total fat in this study exceeded the recommendation in all age or sex groups except men aged 65 years and over. Mean intakes were 34.5% of total energy in children aged 11 to 18 years, 34.7% in adults aged 19 to 64 years, 32.4% in men aged 65 years and over and 34.8% in women aged 65 years and over. Across the age or sex groups there was no consistent pattern in direction of change in total fat intake as a percentage of total energy. In children aged 2 to 10 years, mean intake was 1.7 percentage points (CI 0.6, 2.7) lower in this study compared with previous assessments (table 6.2.4).

Saturated fatty acids

The government recommendation for saturated fatty acids is that the population average contribution should be reduced to no more than 10% of total energy. This recommendation applies to adults and children aged 5 years and older (43). Mean intake of saturated fatty acids in this study exceeded the recommendation in all age or sex groups and was highest in women aged 65 years and over (13.9% of total energy). Mean intake for adults aged 19 to 64 years was 12.4% of total energy. In boys aged 2 to 10 years, mean intake of saturated fatty acids as a percentage of total energy was 1.1 percentage points (CI 0.2, 2.1) lower in this study compared with previous assessments. No statistically significant changes were seen in the other age or sex groups. The proportion of participants in this study meeting the recommendation ranged from 8% of boys aged 11 to 18 years to 19% of girls aged 11 to 18 years in children, and 14% of women aged 65 years and over to 27% of men aged 65 years and over in adults. In most age or sex groups, the percentage meeting the recommendation had increased between previous assessments and this study. The largest increase was seen in men aged 65 years and over where 20% moved from not meeting to meeting the recommendation compared with 11% moving from meeting the recommendation to not meeting it (table 6.2.5).

Fibre (44)

Fibre intakes in all age or sex groups in this study were below current recommendations (from 15g per day for children aged 2 to 5 years up to 30g per day for adults): mean intakes were 15.7g per day and 15.8g per day for children aged 2 to 10 years and 11 to 18 years respectively and 18.0g per day and 19.1g per day for adults aged 19 to 64 and 65 years and over respectively (45). In children aged 2 to 10 years mean fibre intake was 1.7g per day (CI 0.6, 2.7) higher in this study than in previous assessments and a higher proportion of this age group were meeting the recommendation. For girls aged 11 to 18 years mean fibre intake was 2.1g per day (CI 0.6, 3.5) lower in this study compared with previous assessments. Fibre intake was also significantly lower for adults: by 2.1g per day (CI 1.3, 2.9) for those aged 19 to 64 years

and 1.8g per day (CI 0.5, 3.1) for those aged 65 years and over. The proportion of participants in this study meeting the recommendation was low in children aged 11 to 18 years (4%) and adults (6 to 8%) and for most age or sex groups there was little change in the proportion meeting recommendations compared with previous assessments. In women aged 65 years and over 1% moved from not meeting to meeting the recommendation compared with 11% moving from meeting the recommendation to not meeting it (table 6.2.7).

Alcohol

Seven per cent of children aged 11 to 18 years, 49% of adults aged 19 to 64 years and 51% of adults aged 65 years and over reported consuming alcohol on at least one recall day. In children aged 11 to 18 years and men aged 19 to 64 years the percentage consuming alcohol was higher in this study compared with previous assessments. This is the opposite of trends seen in the NDNS RP where the percentage of consumers has been falling (46). Seventeen per cent of men aged 19 to 64 years moved from not consuming alcohol to consuming compared with 9% who moved from consuming to not consuming. In adults aged 65 years and over the percentage consuming alcohol decreased between previous assessments and this study with 7% moving from not consuming alcohol to consuming compared with 20% who moved from consuming to not consuming. In the adult age groups, for those who consumed alcohol, intake as a percentage of total energy was higher in this study compared with previous assessments and this was statistically significant for adults aged 19 to 64 years (2.1 percentage points, CI 1.1, 3.1) (table 6.2.8) .

Participants aged 16 years and over were also asked in the web questionnaire if they ever drink alcohol (including drinks they brew or make at home) and, if so, whether their frequency of drinking alcohol had changed from the start of the COVID-19 pandemic in the UK (February 2020) up to the point of their data collection (between August and October 2020). Twenty-eight per cent of participants reported that they never drank alcohol (and this was unchanged during COVID-19 period) and 38% reported their alcohol consumption level remained the same. Twenty-two per cent of participants reported they were drinking alcohol more often than usual and 13% reported they were drinking alcohol less often than usual (including those who had stopped drinking alcohol during the COVID-19 period). Patterns were similar across males and females. Participants aged 16 to 64 years were more likely to report drinking alcohol more often than usual (26%) than those aged 65 years and over (8%) (table 6.2.9).

Protein and carbohydrate

For protein and total carbohydrate intake as a percentage of total energy, the differences between this study and previous assessments were small and not in a consistent direction (tables 6.2.2 to 6.2.6).

6.3 Micronutrients

In this section, differences between intakes in this study and previous assessments are in relation to absolute intakes and not in terms of meeting dietary recommendations.

Vitamin D

The data for vitamin D intake (from foods only) were skewed and so were log-transformed before analysis. Differences are reported as a percentage change. Intakes were low across all age or sex groups in this study. Median intake of vitamin D (47) from foods was significantly lower in this study compared with previous assessments in girls aged 11 to 18 years (36% decrease, CI 15, 52), women aged 19 to 64 years (23% decrease, CI 7, 35) and men aged 65 years and over (30% decrease, CI 10, 45). Differences in other age or sex groups were smaller and not statistically significant. The contribution of supplements to vitamin D intakes have not been presented here due to inadequate capture of supplement use in Intake24 (table 6.3.1) .

Folate

Mean folate intakes from food in this study were close to or above the RNI (4) in all age or sex groups except for girls aged 11 to 18 years (86% of RNI). In children aged 2 to 10 years mean folate intake was 27µg per day (CI 12, 41) higher in this study compared with previous assessments. Mean folate intake was 23µg per day lower in women of childbearing age (aged 16 to 49 years) and men aged 65 years and over in this study compared with previous assessments although this was only statistically significant for women of childbearing age (CI 7, 40). Differences in other age or sex groups were smaller and not statistically significant (table 6.3.2).

Iron

Mean iron intakes from food in this study were above the RNI in all age or sex groups except for girls aged 11 to 18 years (54% of RNI) and women aged 19 to 64 years (78% of RNI). In boys aged 2 to 10 years mean iron intake was 1.1mg per day (CI 0.2, 2.0) higher in this study compared with previous assessments. Differences in other age or sex groups were smaller and not statistically significant (table 6.3.3).

Calcium

Mean calcium intakes from food in this study were above the RNI in all age or sex groups except for boys and girls aged 11 to 18 years (90% and 86% of RNI respectively). For women aged 19 to 64 years, calcium intake was 54mg per day (CI 9, 99) lower. No change was seen in adults aged 65 years and over (table 6.3.4) and differences in children were not statistically significant.

Sodium

Mean sodium intake was significantly lower in this study compared with previous assessments for women aged 19 to 64 years (decrease 174mg per day, CI 55, 294) and men aged 65 years and over (decrease 211mg per day, CI 38, 385). Differences in other age groups did not reach statistical significance. Sodium intake estimates are based on the sodium content of foods

consumed. They do not fully take account of salt added during cooking or salt added at the table (table 6.3.5).

6.4 Contribution of food groups to energy intake

In this study, cereals and cereal products was the main source of total energy intake for all age groups, contributing 42 to 43% to energy intake for children and 36% for adults. The apparent increase in the contribution of cereals and cereal products for this study compared with previous assessments is at least partly due to change to reporting of sandwiches (including fillings) under this group for this study. Meat and meat products and milk and milk products were the next largest contributors to energy intake providing 11 to 15% and 8 to 13% respectively. For all age groups there was little change in the proportion of energy derived from these and other food groups between previous assessments and this study (table 6.4.1).

7. Food consumption and nutrient intake in relation to financial security and food security

This chapter presents data on food and nutrient intakes from the Intake24 dietary data, in relation to financial security and food security questions (how well the household was managing financially at the time and to what extent the household was worried about not being able to afford food in the next month) from the web questionnaire (both collected August to October 2020). Financial and food security data is analysed at the household level and so is not split by age or sex. No statistical testing has been performed between the financial or food security categories. It should be noted that there was a higher proportion of children in the group of households that were worried about not being able to afford food in the next month and the group of households that were managing less well financially compared with groups of households that were not worried about affording food or were financially comfortable or doing alright. This age difference could explain some of the food consumption and nutrient differences observed between these groups.

7.1 Foods

The mean number of 5 A Day portions (37) was lower for participants in households who reported managing less well financially (2.7 portions per day) compared with those in households who reported living comfortably or doing alright financially (4.3 and 4.0 portions per day respectively). Thirteen per cent of participants in households managing less well financially met the 5 A Day recommendation whereas the proportion was more than double this in households living comfortably or doing alright financially (33% and 28% respectively). The pattern was similar for participants in households reporting that they were worried about not being able to afford food in the next month with 14% meeting the 5 A Day recommendation compared with 30% in households reporting they were not worried at all and 22% in households not very worried.

Mean consumption of total meat was higher in those living in households managing less well financially (96g per day) than in households doing alright (83g per day) or living comfortably (72g per day). A similar pattern was seen in red and processed meat consumption.

Mean consumption of total fish and oily fish was lowest in those households managing less well financially (12g per day and 3g per day respectively compared with 21g per day and 9g per day for those in households living comfortably. Mean consumption of total fish and oily fish was also lowest in households who were worried about not being able to afford food in the next month (9g per day and 1g per day respectively compared with 18g per day and 7g per day for those in households not worried at all).

Participants living in households managing less well financially consumed on average 108g per day of sugar-sweetened soft drinks compared with 68g per day and 43g per day for those in households doing alright and households living comfortably. Participants in households reporting that they were worried about not being able to afford food in the next month consumed on average 104g per day of sugar-sweetened soft drinks compared with 81g per day in households reporting they were not very worried and 58g per day in households not worried at all.

In contrast, mean consumption of sugar and chocolate confectionery, biscuits, buns, cakes and pastries, and crisps and savoury snacks was similar across the financial security and food security categories (tables 7.1.1 and 7.1.2).

7.2 Energy and macronutrients

There was little difference in mean daily total energy intake between household financial security categories. For food security, participants in households reporting that they were worried about not being able to afford food in the next month had a lower mean total energy intake than households that were not at all worried (1607kcal per day and 1721kcal per day respectively).

Mean intakes of total carbohydrate, protein, fat and saturated fatty acids as a percentage of total energy were similar across the financial security and food security categories.

Mean intake of free sugars as a percentage of total energy was higher for participants in households who reported managing less well financially (11.7% of total energy) compared with those in households living comfortably or doing alright financially (9.5% and 10.4% respectively). The government recommendation is that free sugars provide no more than 5% of total energy intake (41) Adherence to this recommendation was low in all financial security categories with 13 to 18% meeting the recommendation. Mean free sugars intake as a percentage of total energy was lowest for those in households who were not at all worried about not being able to afford food in the next month (10.0% of total energy). However 24% of participants in households reporting that they were worried about not being able to afford food in the next month met the recommended daily intake of free sugars compared with 13% of those in households who were not very worried and 16% of those not at all worried.

Mean fibre intake was lower for those living in households managing less well financially (15.8g per day) compared with those in households living comfortably or doing alright financially (19.1g per day and 17.5g per day respectively) but there was little difference in the proportions meeting recommendations, being low in all financial security categories (9 to 10%). Mean fibre intake was also lowest in those living in households who were worried about not being able to afford food in the next month with 6% meeting recommendations compared with 10 to 11% of those living in households who were not very worried or not at all worried.

Around half of participants in households who were living comfortably financially (50%) or doing alright (49%) reported consuming alcohol on at least one of their recall days compared with 39% of those in households who were managing less well. Similarly, 50% of participants in households who were not worried at all about not being able to afford food in the next month reported consuming alcohol with 39% and 43% of consumers in households who were not very worried or worried respectively (tables 7.2.1 and 7.2.2).

7.3 Micronutrients

There was little difference in median daily intake of vitamin D (from foods only) (49) between household financial security categories. For food security, participants in households reporting that they were worried about not being able to afford food in the next month had median vitamin D intakes of 1.4µg per day compared with 2.4µg per day for households that were not at all worried. The contribution of supplements to vitamin D intakes collected in the dietary recall have not been presented here due to inadequate capture of supplement use in Intake24.

Mean folate intakes were similar across the financial security categories, however 10% of those living in households managing less well financially had intakes below the Lower Reference Nutrient Intake (LRNI) (50) compared with 2 to 5% of those in households living comfortably or doing alright financially.

There was little difference in mean daily intake of iron between household financial security categories, but 18% of those in households managing less well financially had iron intakes below the LRNI compared with 9 to 11% of those in households who were households living comfortably or doing alright financially. Similarly, 21% of those in households who were worried about not being able to afford food in the next month had iron intakes below the LRNI compared with 10 to 11% of those in households who were not at all or not very worried.

Mean intakes of calcium and sodium were similar across the household financial security and food security categories (tables 7.3.1 and 7.3.2).

7.4 Contribution of food groups to energy intake

For most food groups, differences in their contribution to average daily total energy intake between household financial security and food security categories were small, except for sandwiches. Sandwiches (both homemade and purchased) contributed 10% of total energy for those living in households managing less well financially and 12% for those living in households who were worried about their ability to afford food over the next month, around twice as much as the contribution to energy intake for those in households living comfortably or doing alright financially (4 to 5%) or those in households who were not at all or not very worried about affording food over the next month (5 to 6%) (tables 7.4.1 and 7.4.2).

8. Changes in physical activity

In this study, physical activity data was collected for participants aged 16 years and over who completed 4 dietary recalls and therefore analysis in this chapter is based on smaller numbers than for previous chapters. This section describes changes in physical activity from participants' previous NDNS RP assessment (obtained between April 2016 and March 2020) and their assessment for this study (obtained between August and October 2020). More detail about the timeline of restrictions in relation to data collection for this study is provided in chapter 1, section 1.1 and appendix B. The average gap between the original NDNS RP assessment and the assessment for this study was 2 years and 8 months, with a minimum of 6 months and maximum of 4 years and 6 months. Participants completed the Recent Physical Activity Questionnaire (RPAQ) at both assessments.

The RPAQ estimates the energy expenditure from physical activity (PAEE) measured in kJ per kg body weight per day (51). It does not assess total energy expenditure. There are no UK guidelines or recommendations for PAEE to make comparisons with, therefore the focus was on the change in PAEE between the this study and participants' original NDNS RP assessment. A participant matched comparison was undertaken by calculating the change in PAEE (total and for 4 activity domains – work, commuting, at home and during leisure time) from the 2 time periods. It is important to take into consideration that although the methodology was the same in both assessments, there may have been changes to personal circumstances between assessments that were not due to COVID-19 (see chapter 2, section 2.3). Adjustments were made to account for seasonality (month of completion) and number of years between the first and second time point. Details of these adjustments can be found in appendix A, section A.7.

Total PAEE from the assessment for this follow up study is presented in adults, in men and women and for the age groups 16 to 54 years and 55 years and over (52). Also presented are differences in total PAEE by activity domain and changes in those when compared to the previous NDNS RP Years 9 to 12 assessment. Confidence intervals for the change estimates for the small sample are also presented (Table 8.1.1).

In this study, the mean total PAEE was 30 kJ per kg per day. The highest mean total PAEE was amongst men aged 55 years and over (35 kJ per kg per day) and the lowest amongst women aged 16 to 54 years (24 kJ per kg per day).

There was an average increase in total PAEE of 4kJ per kg per day between the previous assessment and this study, but with considerable variation at the individual level. The increase was highest in women, particularly those aged 55 years and over (10 kJ per kg per day, CI 1, 20), but there was little change among men.

In the work domain, there was a consistent small decrease from the previous to the latest assessment in PAEE at work across all age or sex groups (range of mean decrease: 1 to 2 kJ per kg per day). However, there was no discernible change in commuting, possibly due to the

low participation in active commuting (cycling or walking) at either time point. There was overall an increase in energy expended in home activities (such as gardening and DIY) for most age or sex groups compared with the previous assessment (mean increase 4 kJ per kg per day, CI 2, 6). This was particularly true in women aged 55 years and over where PAEE increased by 11 kJ per kg per day (CI 2, 19). For leisure activities, the changes over time were not consistent across all age or sex groups. Women aged 16 to 54 years had a notable increase in leisure-time PAEE (5 kJ per kg per day, CI 1, 9) whilst other age or sex groups had minimal mean differences (table 8.1.1).

All participants, including children, were asked in the web questionnaire if their physical activity had changed from the start of the COVID-19 pandemic in the UK (February 2020) up to the point of their data collection (between August and October 2020). A higher proportion of participants in all age groups reported that their activity had decreased than had increased but the difference was more marked for children than for adults. Fifty-four per cent of the 11 to 18 age group reported a decrease in their activity and 15% an increase, while for the 19 to 64 age group 40% reported a decrease and 26% an increase (table 8.1.2).

9. Conclusion

This study aimed to describe the diet and physical activity of people in the UK in 2020, to compare on an individual level with data collected up to 4 years earlier and to provide contextual information to help assess the impact of the COVID-19 pandemic on diet and activity. The study provides information on the diet and physical activity of around 1,000 adults and children as assessed between August and October 2020 and provides a comparison with their reported diet and physical activity when they originally took part in the NDNS RP (on average 2 years 7 months earlier). The study also provides information on changes in the food-related behaviours of the participants and the food and financial security of their households between the start of the pandemic in the UK in February 2020 and their participation in the study between August and October 2020.

Overall the diet and nutrient intakes reported in this follow up study between August to October 2020 were broadly similar to intakes reported in the NDNS RP before the COVID-19 pandemic. In common with earlier NDNS RP findings, intakes of saturated fat and free sugars exceeded recommendations while intakes of fruit and vegetables, fibre and some micronutrients failed to meet recommendations. Paired comparisons at the individual level suggest there may have been some changes in foods consumed, however given a number of potentially confounding factors, it is not possible to attribute changes to the restrictions associated with COVID-19. Participants took part in this study on average 2 years 7 months after their original participation in the NDNS RP so dietary differences seen at the individual level may have been brought about by a number of factors over that timeframe, such as changes to personal circumstances that pre-dated or were unrelated to the pandemic. There was also a change in the NDNS RP dietary assessment method which moved from a paper diary to an online 24-hour recall in October 2019. Evaluation of the dietary method change is ongoing (5). Overall the indications from the first stage of evaluation are that the 2 methods produce consistent results at the nutrient level but there is evidence of step changes for some foods which may be due to the differences in data collection methods. Further data is needed to assess potential differences more fully. This means it is difficult to assess whether observed differences in the dietary data reflect actual changes in diet since the last assessment.

In interpreting the results of this follow up study it should be borne in mind that the sample who took part cannot be seen as a random and representative sample of UK population. Although the original NDNS sample was designed to be UK representative, there was substantial non response both to the original survey and to this the follow up study. Participants in this study may have more interest in taking part in studies related to diet and health than the general population and so may differ from the general population in related characteristics.

Despite these limitations, the data collected provide some reassurance that UK population-level diets in late summer and autumn 2020, while remaining poor in many respects, have not deteriorated markedly and appear very similar to the findings in the most recent NDNS RP report (2016/17 to 2018/19) (22).

Since the start of the pandemic, many surveys and other data sources have been published on the impact of the restrictions on the diet, activity and other health characteristics of the UK population. These vary considerably in the methods used and the timing of data collection and not surprisingly results are not always consistent. Similarly the results of this study are not in all cases consistent with other data sources such as food purchasing data. For example, analysis of purchasing data since 2015 has shown increases in sugar sold from both chocolate and sugar confectionery (53, 54) and PHE published data showed an 18.8% increase in volume sales of savoury carbohydrates and snacks in the year to 21 June 2020 compared with the previous year (9). Respondents in the FSA COVID-19 consumer tracker between April and July 2020, reported eating snacks (such as cakes, biscuits, confectionery and savoury snacks) more often in the last month (55), while data from the dietary assessment in this study carried out from August to October 2020, does not reflect this. The reported increase in alcohol intake both from the dietary assessment and the web questionnaire was consistent with other data sources on alcohol sales and consumption during the pandemic (56).

This study included questions on household financial and food security for the first time in an NDNS sample and this provides a unique opportunity to link food security to diet and nutrient intake. However it should be borne in mind that this study was designed primarily as a diet and nutrition survey and not as a survey of food or financial security, and as noted above the sample cannot be described as a random representative sample of the UK population so results should be interpreted with caution. There was evidence of low household financial and food security in some study participants based on responses to the web questionnaire completed in August to October 2020. Households with children were more likely to report low financial and food security. It is not possible to make direct comparisons with the situation before the pandemic as these questions were not asked in the NDNS RP. Neither is it possible to compare reported financial and food security with participants' actual socioeconomic status due to limitations of the study methodology. However, the findings here are consistent with other surveys prior to and during the COVID-19 pandemic. For example, the Family Resource Survey (FRS) 2019 to 2020 (pre-pandemic) reported similar levels of food insecurity and a higher proportion of households with children being classed as food insecure compared with other households (although the assessment of food security in the FRS was different to that in this study) (57).

In this study, almost a fifth of households (19%) reported cutting down or skipping meals since the pandemic started, the most common reason given for this was non-availability of the food they wanted in the shops. This is similar to the Food Foundation's findings where 16.2% of adults reported experiences of food insecurity in the first 3 weeks of lockdown in March and April 2020, and "a lack of food in shops alone explained about 40% of food insecurity experiences" (58). One explanation for this could be that it is related to food shortages or panic buying, particularly in the early weeks of the pandemic. A much smaller proportion of participants (3%) cited lack of money as the reason for cutting down or skipping meals. The Food Standards Agency's (FSA) COVID-19 consumer tracker reported a higher proportion of respondents cutting meal sizes or skipping meals due to not having enough money (16 to 18%

between April and July 2020), but also found that households with a child were more likely than other households to report cutting meal sizes or skipping meals due to not having enough money (8).

The very low proportion of participants who reported obtaining food from food charities, food banks or food parcel schemes for shielding groups may reflect the pausing of the shielding programme in the summer months and that people who rely on food banks may be poorly represented in the NDNS RP sample.

In the web questionnaire, study participants reported changes to their shopping, food preparation and eating habits since the start of the pandemic although the changes reported were not in a consistent direction and most changes were reported by less than half of participants. This may reflect the wide range of impacts the pandemic has had on the circumstances of households and individuals.

Some changes to shopping, food preparation and eating habits were more likely to be reported by participants from households that reported lower food security or financial security. For example, households managing less well financially were more likely to report they more often bought items that were on special offer, changed where they shopped or changed what food they bought for cheaper alternatives. Similarly, households that reported they were somewhat or very worried about not being able to afford food in the next month were more likely to report their household changed where they shopped or changed what food they bought for cheaper alternatives. Households doing alright or managing less well financially were more likely to report that they used food delivery services than those living comfortably financially. Participants from these households also had poorer diets in many although not all respects, mirroring income differences in diets reported in previous NDNS RP reports (46).

In this study, for those aged 16 years and over, findings on physical activity are different for the RPAQ, which found an average increase in total PAEE, and the web questionnaire, which found a higher proportion of people reported doing less physical activity than pre-pandemic than reported doing more physical activity pre-pandemic. Similar to the dietary data, there was on average a 2 year 8 month gap between the original and current physical activity assessment so changes in the RPAQ assessment may have been driven by a number of factors that may have pre-dated or been unrelated to the pandemic. The changes shown by the RPAQ are small on average with a wide individual variation. Findings from the web questionnaire, are consistent with other data sources reporting a decline in the proportion of adults doing at least 30 minutes of physical activity on 5 or more days a week. This is in line with expectations given the closure of most physical activity facilities and the restriction on being outside the home during lockdown (8) (59).

The apparent similarity of the findings on diet and nutrient intakes and physical activity in this study during the COVID-19 pandemic to pre-pandemic data may seem surprising given the anecdotal and other evidence from the early months about the impact of COVID-19 restrictions

on diets and lifestyles. It is important to note that the first part of the fieldwork period coincided with a relative relaxation of some restrictions in most parts of the UK, including encouragement to eat out of the home through the Eat Out to Help Out scheme. Part of the explanation may also be that there was no single common experience of the pandemic restrictions in the UK. Experiences are likely to have varied greatly between individuals and households depending on their social, financial and health circumstances pre-pandemic and a number of other factors including whether adults in employment were key workers who attended the workplace, worked from home, were made redundant or furloughed. Social attitudes to health and well-being are also likely to have differently impacted the responses of individuals in the population and may have impacted on reporting. The age of any children in the household and whether they were in the classroom or being home schooled, housing conditions and access to green space may also have had an impact as well as whether the household included people who were vulnerable to COVID-19 or who were advised to shield. It is likely that the average figures presented in this report reflect a wide range in both directions.

References

1. NatCen has led the consortium since the beginning of the RP
2. The MRC Epidemiology Unit, University of Cambridge joined the consortium in November 2017
3. PHE and DHSC (2020). 'COVID-19: guidance on protecting people defined on medical grounds as extremely vulnerable' (viewed on 13 August 2021)
4. The RNI for a vitamin or mineral is the amount of the nutrient that is sufficient for 97.5% of people in the group. If the average intake of the group is at the RNI, then the risk of deficiency in the group is judged to be very small. However, if the average intake is lower than the RNI then it is more likely that some of the group will have an intake below their requirement
5. 'Evaluation of changes in the dietary methodology in the National Diet and Nutrition Survey Rolling Programme from Year 12 (2019 to 2020): Stage 1'
6. The adequacy of vitamin or mineral intake can be expressed as the proportion of individuals with intakes below the LRNI. The LRNI for a vitamin or mineral is set at the level of intake considered likely to be sufficient to meet the needs of only 2.5% of the population. An intake below the LRNI is only considered a problem if sustained over a period of time
7. Dietary data collection for NDNS RP fieldwork years runs on a 12 month cycle from April to March. Fieldwork for Year 9 data collection ran from April 2016 to March 2017, Year 10 from April 2017 to March 2018 and Year 11 from April 2018 to March 2019. Following a dress rehearsal to test the new dietary methodology, year 12 fieldwork began in October 2019 and had been due to run until June 2020, but was suspended in March 2020 due to the COVID-19 pandemic
8. Food Standards Agency (2020). 'Covid-19 Consumer Tracker Waves 1 and 2' (viewed on 13 August 2021)
9. Public Health England (2021). 'Wider impacts of COVID-19 on health monitoring tool' (viewed on 13 August 2021)
10. The weighting strategy, designed and conducted following fieldwork, included an adjustment to account for differences in the likelihood that NDNS RP Years 9 to 12 participants were eligible for this study (that is refused permission to be recontacted for future research). See appendix A, section A.6 for more detail
11. NDNS RP Year 9 (2016 to 2017) fieldwork commenced in April 2016. The average gap between NDNS RP interview date and this study web questionnaire completion was 2 years and 7 months, with a minimum of 5 months and maximum of 4 years and 5 months
12. A total of 69 NDNS RP Year 12 (2019 to 2020) participants were not included in the issued sample of this study as their NDNS RP data was still being processed and cleaned at the time the sample was drawn
13. Food Standards Agency (2019). 'Food and You – Wave Five' (viewed on 13 August 2021)
14. Intake24 (viewed on 13 August 2021)

15. 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. 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
17. This was via an email or text message invitation and reminder system which used contact information provided at the end of the questionnaire
18. To balance the number of weekday and weekend dietary recalls, the Recall 3 invitation was scheduled to be sent on a weekend day if the previous 2 dietary recalls were completed on a weekday. If Recalls 1-3 were all completed on a weekday, the Recall 4 invitation was scheduled to be sent on a weekend day
19. Dietary recall invitations were sent in the morning at 7:30am. If the requested dietary recall was not completed by late afternoon, a reminder was sent on the same day. Further reminders were sent on the day after the initial invitation and 4 days after the initial invitation if the requested dietary recall was still not completed
20. 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
21. For practical reasons, participants having dietary recall assistance were not asked to complete the RPAQ
22. 'National Diet and Nutrition Survey: Results from Years 9 to 11 (combined) 2016/2017 to 2018/2019' (viewed on 13 August 2021)
23. The food security questions used were based on a longer set of questions developed in the US and have not been validated in the UK
24. Sampled age was set as participant's age on 31 July 2020
25. NHS. 'What is the body mass index (BMI)?' (viewed on 13 August 2021)
26. Public Health England. 'Self-report adjustment for PHOR 2.12 excess weight in adults' (viewed on 13 August 2021)
27. No comparison was made with the measurements recorded in the participants original NDNS RP interview which are based on interviewer measured height and weight
28. NHS Digital (2020). 'Health Survey for England 2019' (viewed on 13 August 2021)
29. Gov.uk (2018). 'Population of England and Wales' (viewed on 13 August 2021)
30. Office for National Statistics (2021). 'People in households by type of household and family, regions of England and UK constituent countries' (viewed on 13 August 2021)
31. The start date of February 2020 was used for the start of the impact of the COVID-19 outbreak in the UK
32. Despite the study period being August to October 2020, the majority of the data reflects the period of August to September. See Chapter 3, Figure 3B for more detail

33. No statistical testing has been performed for reported differences in chapter 5 due to the multi-category nature of the tables. There are many potential hypotheses that could be tested for each table, with little understanding of the statistical power of each, that any statistical findings would not be beneficial to the interpretation of the results
34. NHS Digital. 'Coronavirus Shielded Patient List open data set, England' (viewed on 7 July 2021)
35. Food delivery services and takeaways were never restricted in the UK over the COVID-19 pandemic.
36. Once there are fewer than 75% consumers, more than a quarter of the values are zero. The impact of this is to artificially reduce the population estimate of variation (because a quarter of the values do not vary from each other at all) and so the CI's are artificially narrow which results in statistical significance for very small changes. The assumption of a 'Normal' distribution including these zero's is not valid
37. Department of Health and Social Care 5 A Day programme. '5 A Day: what counts?' (viewed on 13 August 2021)
38. For adults and older children 5 a Day is based on 5 x 80g portions of fruits and vegetables to give a minimum target of 400g per day. Details on how 5 A DAY portions are calculated in the NDNS RP for adults and children aged 11 to 18 are provided in appendix A of the 'National Diet and Nutrition Survey: Results from Years 9 to 11 (combined) 2016/2017 to 2018/2019)' (viewed on 13 August 2021). 5 A Day is still recommended for children under 11 but the portion size varies with age and has not been calculated
39. The Department of Health has advised that people who eat a lot of red and processed meat a day (more than 90g cooked weight) cut down to 70g
40. The definition of free sugars includes: all added sugars in any form including honey and syrups; all sugars naturally present in fruit and vegetable juices, spreads, purees and pastes, and similar products in which the structure has been broken down; all naturally occurring sugars in drinks (except for dairy-based drinks) and lactose and galactose added as ingredients. The sugars naturally present in milk and dairy products, fresh and most types of processed fruit and vegetables and in cereal grains, nuts and seeds are excluded from the definition
41. The Scientific Advisory Committee on Nutrition (SACN). 'Carbohydrates and Health' London: TSO (2015) (viewed on 13 August 2021)
42. Report on Health and Social Subjects 41 'Dietary Reference Values (DRVs) for Food Energy and Nutrients for the UK', Report of the Panel on DRVs of the Committee on Medical Aspects of Food Policy (COMA) 1991. The Stationery Office. London
43. The Scientific Advisory Committee on Nutrition (SACN). 'Saturated fats and health (2019)' (viewed on 13 August 2021)
44. Fibre values reported are for AOAC fibre. This is the term used to describe fibre measured by the American Association of Analytical Chemists (AOAC) methods. AOAC fibre includes resistant starch and lignin in the estimation of total fibre in addition to non-starch polysaccharides

45. Fibre recommendations: 30g per day for adults; 25g per day for older children aged 11 to 16 years, 20g per day for children aged 5 to 11 years and 15g per day for children aged 2 to 5 years
46. 'National Diet and Nutrition Survey Years 1 to 9 of the Rolling Programme (2008/2009 to 2016/2017): Time trend and income analyses' (viewed on 13 August 2021)
47. Vitamin D intakes were skewed and so medians have been described rather than the arithmetic means
49. Vitamin D intakes were skewed and so medians have been described rather than the arithmetic means
50. The adequacy of vitamin or mineral intake can be expressed as the proportion of individuals with intakes below the Lower Reference Nutrient Intake. The LRNI for a vitamin or mineral is set at the level of intake considered likely to be sufficient to meet the needs of only 2.5% of the population. An intake below the LRNI is only considered a problem if sustained over a period of time. As diet is recorded for up to 4 days in this study, estimated intake values may not represent intakes over the longer term for micronutrients that are not widely distributed in foods such as vitamin D
51. A 10 KJ per kg per day change in PAEE is equivalent to a 30 minute brisk-paced walk
52. These age groups were chosen to ensure there were at least 50 participants within each age or sex group for the participant matched comparison (the minimum number required to give confidence in the results) and since there was no scientific rationale why physical activity data should be grouped differently
53. Public Health England (2020). 'Sugar reduction: report on progress between 2015 and 2019' (viewed on 13 August 2021)
54. Public Health England (2019). 'Sugar reduction: progress between 2015 and 2018' (viewed on 19 August 2021)
55. Food Standards Agency (2020). 'Covid-19 Consumer abetwTracker Waves 1-4' (viewed on 13 August 2021)
56. Public Health England (2021). 'Monitoring alcohol consumption and harm during the COVID-19 pandemic: summary'
57. Department for Work and Pensions (2021). 'Family Resources Survey: financial year 2019 to 2020' (viewed on 13 August 2021)
58. Food Foundation (2020). 'Vulnerability to food insecurity since the COVID-19 lockdown' (viewed on 13 August 2021)
59. Sport England covid tracker

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

Public Health England
Wellington House
133-155 Waterloo Road
London SE1 8UG
Tel: 020 7654 8000

www.gov.uk/phe
Twitter: @PHE_uk
www.facebook.com/PublicHealthEngland

For queries relating to this document, please contact: phe.enquiries@gov.uk

Published September 2021
PHE gateway number: GOV-9714

PHE supports the UN Sustainable Development Goals