ORIGINAL ARTICLE

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The impact of living through COVID-19 pandemic on mental health, food insecurity, loneliness and health behaviours in people with obesity

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Abstract

Background: The COVID-19 pandemic has negatively impacted people living with obesity. The aim was to examine the continued impact of the COVID-19 pandemic on the mental health of people living with obesity and associations with food insecurity, loneliness and health-related behaviours.

Methods: The study recruited 1187 UK adults living with obesity who completed an online survey, which examined mental health and associations with food insecurity, loneliness and health-related behaviours from July 2020 (end of the first lockdown in the United Kingdom) to the point they completed the survey in 2021. Regression analyses were used to examine relationships between outcome variables and demographic factors, and hierarchical linear regression models were used to assess levels of loneliness, depression and well-being.

Results: Participants reported worse loneliness, depression, well-being and food insecurity compared to pre-COVID. However, participants reported attempting to lose weight, healthier food shopping, diet and increased physical activity. Quality and quantity of sleep deteriorated compared to prior to COVID-19.

Conclusions: Adults living with obesity in the United Kingdom report a continued negative impact of the COVID-19 pandemic upon their mental health together with increased loneliness and food insecurity. However, our findings suggest that UK adults living with obesity have increased their engagement in positive health behaviours and were attempting to lose weight.

KEYWORDS

COVID-19, food insecurity, loneliness, mental health, obesity

Key points

- People living with obesity are actively attempting to improve their health-related behaviours since the first COVID-19 lockdown.
- Better mental health was associated with healthier food shopping and diet, increased physical activity and better sleep.
- Food insecurity and loneliness were higher among people living with obesity than previously reported in the general population.
- The findings have implications for policymakers and healthcare professionals regarding the importance of continuing mental health support and addressing food insecurity and loneliness, both now and as the pandemic evolves.

INTRODUCTION

Substantive evidence has shown the negative impact of coronavirus disease 2019 (COVID-19) on people living with obesity.[1,2] Although earlier research focused on the increased risk of severe COVID-19, attention soon shifted to mental health, with a systematic review reporting the unprecedented impact on mental health in the general population,[3] with similar outcomes reported in people living with obesity.[1] National restrictions, including social distancing and shielding, have impacted on the way people live, leading to a focus on loneliness[4] and the long-term negative impact on health behaviours.[1] Due to greater restrictions imposed on them, people identified as 'high risk' were disproportionately impacted.[5]

Prior to COVID-19, food insecurity, including foodbank usage, was increasing, with about 2.5% of all UK households using foodbanks in 2019–2020[6] and 10% of UK adults reporting low or very low food security.[7] During COVID-19 these figures increased, with the lack of access to food in supermarkets and isolation reported as factors to explain low or very low food security.[8] Furthermore, furloughing and unemployment have also resulted in greater food insecurity and foodbank usage during the pandemic,[9] with further concerns now reported as a result of the 'cost of living crisis' in the United Kingdom,[10] although data specifically relating to people living with obesity remain sparse. Therefore, we aimed to examine the continued impact of COVID-19 on the mental health of people living with obesity and associations with food insecurity, loneliness and health-related behaviours.

METHODS

Between 20 April and 6 September 2021, 1187 UK adults living with obesity completed an online survey hosted by UCL Opinio. Eligibility criteria were people living with obesity (BMI ≥ 30 kg/m^2) and aged 16–80 years.

Participants were recruited using Prolific, a participant pooling tool, alongside invitations disseminated via social media; professional and patient obesity organisations; and obesity services, including the Association for the Study of Obesity, the British Dietetic Association and the British Obesity and Metabolic Surgery Society (see Supporting Information for the full list). We used multiple recruitment methods to allow for snowball sampling and to increase the diversity of people living with obesity participating in the study. The Prolific participant pooling mechanism helped to ensure that we recruited sufficient and balanced numbers of participants in terms of demographic factors, including ethnicity, gender and place of residence. Prior to completing the survey, the participants were provided with an online information sheet, and they provided electronic informed consent. The participants were asked about their experiences from July 2020 (end of the first lockdown in the United Kingdom) to the point they completed the survey in 2021. The participants were asked to complete a series of questions regarding the continued impact of COVID-19 since the first national lockdown in the United Kingdom. Subsections of the survey were as follows:

1. Demographics
2. Awareness, thoughts and actions relating to COVID-19
3. Service provision
4. Impact on mental health, food insecurity and health behaviours
5. Discrimination and stigma

Validated questionnaires to assess food security, loneliness, well-being and depression were included. These questionnaires were chosen to correspond with our previous study,[1] allowing for comparisons of outcome data.

USDA Adult Food Security Questionnaire

Food security was assessed using the USDA adult food security questionnaire.[11] Participants were asked 10 questions relating to food security in the past 30 days. The questionnaire has a three-item response scale: (1) 'don't know', (2) 0 = 'only 1 or 2 days' or (3) 1 = 'almost every day'. Scores were summed and categorised into a three-level score (0 = high, 1–2 = marginal and 3–10 = low/very low food security) and used as both an ordinal outcome variable and a categorical explanatory variable.

Three-item UCLA Loneliness Scale

Participants completed the three-item UCLA Loneliness Scale,[12] involving three negatively worded questions that measure three dimensions of loneliness: relational connectedness, social connectedness and self-perceived isolation. A total score from 3 to 9 was computed by adding up the response to each question: 1 = 'hardly ever', 2 = 'some of the time' or 3 = 'often'. Loneliness was used as a continuous outcome variable and as a binary explanatory variable (3–5 = no vs. 6–9 = yes).

Warwick–Edinburgh Mental Well-Being Scale

Participants completed the 14-item Warwick–Edinburgh Mental Well-Being Scale (WEMWBS)[13] to measure mental well-being. They were asked to tick the box that best describes each of their experiences over the past 2 weeks. This comprised 14 positively worded statements, with 5 response categorise from '1' (none of the time) to '5' (all the time). The answers were then added up to give

a total score. This was then compared with the population centiles from the UK population[14] (top 15th centile: WEMWBS score 60–70; bottom 15th centile: WEMWBS score 14–42) and the remainder (16th–84th percentile: WEMWBS score 43–59). WEMWBS was used as a continuous outcome and an explanatory variable.

Patient Health Questionnaire-9

The nine-item Patient Health Questionnaire (PHQ-9)[15] was used to assess depression. Participants are asked over the past 2 weeks how often they have been bothered by any of the nine DSM-IV (*Diagnostic and Statistical Manual of Mental Disorders*, fourth edition) criteria from '0' (not at all) to '3' (nearly every day); these were then added up to give a total score. This was compared with the interpretation box to indicate depression severity from minimal depression to severe depression. PHQ-9 was used as a continuous outcome variable and an explanatory variable.

Assessment of changes in shopping, diet, physical activity, sleep and alcohol intake

Each participant was asked two questions about his or her health behaviours since the end of the first lockdown in July 2020. Participants were first asked whether the health behaviour had changed, being able to respond: 'not at all', 'a little', 'a moderate amount', 'a lot' or 'a great deal' (for sleep, participants could respond 'yes' or 'no'). Participants were then asked about the direction of change, being able to respond: 'worsened/unhealthier/ decreased', 'no change' or 'better/improved/increased'. Changes (in magnitude or direction) in shopping/diet/ physical activity/sleep/alcohol intake were used as ordinal outcome variables.

This survey was developed to explore the continued impact of the COVID-19 pandemic on people living with obesity. The survey was developed in collaboration with people living with obesity recruited from obesity advocacy groups and patients. This ensured that the length, terminology and questions were relevant and understood by people living with obesity. The study was granted ethical approval by the UCL Research Ethics Committee (REC number: 16191/004).

Data analysis

Normally distributed variables were assessed using means and standard deviations, whereas medians and interquartile ranges were used for nonparametric variables. Categorical variables were assessed using counts (percentages) and compared using χ^2 tests. Statistical analyses were performed using SPSS (version 27.0).

Statistical significance was defined as $p < 0.05$. Data quality was assessed prior to analysis.

Due to insufficient numbers in other categories (transgender and other), only participants reporting 'male' or 'female' gender were included in the regression analyses. Ethnicity was not included as an explanatory variable due to insufficient numbers in the ethnic categories other than 'White ethnicity'.

Ordinal outcome variables (health behaviours and food security) were assessed using ordinal logistic regression. Three models were constructed for each outcome variable, with the following explanatory variables: (1) age (continuous), gender (male vs. female), BMI (continuous), number of additional risk factors for COVID-19 (categorical: 0, 1 or 2+) and food security (categorical: very low/low, marginal or high food security); (2) model 1 + loneliness (categorical, yes vs. no); and (3) model 2 + well-being (continuous WEMWBS) and depression (continuous PHQ-9). For food security, models 2 and 3 were assessed. For change in sleep (yes vs. no), a binary regression model was used, with the same explanatory variables.

Stigma (yes ['yes', 'no, I felt stigmatised during the first lockdown and before the COVID-19 outbreak'] vs. no ['no', 'no, I feel less discriminated against compared to the end of the first lockdown in July 2020']) was assessed using a binary regression model with the following explanatory variables: (1) age (continuous), gender (male vs. female), BMI (categorical [continuous variable violated assumption linearity]: <40 vs. ≥40 kg/m^2), well-being (continuous WEMWBS) and depression (continuous PHQ-9).

Continuous outcome variables (loneliness, depression and well-being) were assessed using hierarchical linear regression models. Four models were constructed for each outcome variable, with the following explanatory variables: (1) age (continuous), gender (male vs. female), BMI (continuous) and number of additional risk factors for COVID-19 (categorical: 0, 1 or 2+); (2) model 1 + perceived stigma (yes vs. no), self-reported mental health since the end of the first lockdown (categorical: much worse, worse, neither, better or much better); (3) model 2 + food security (categorical: very low/low, marginal or high food security) + loneliness (categorical: yes vs. no); and (4) model 3 + well-being (continuous WEMWBS) and depression (continuous PHQ-9). The assumptions of each model were checked and met.

RESULTS

Participants had a mean age of 38.3 years (standard deviation [SD]: 12.0); 734 (61.8%) were female, with a median BMI of 36.2 kg/m^2 (interquartile range [IQR]: 33.1–41.2); 935 (78.8%) identified as White British, Irish or other ethnicity; 828 (69.8%) lived in England; and 464 (39.1%) ≥1 additional risk factors related to severe illness from COVID-19 (Supporting Information, Table S1).
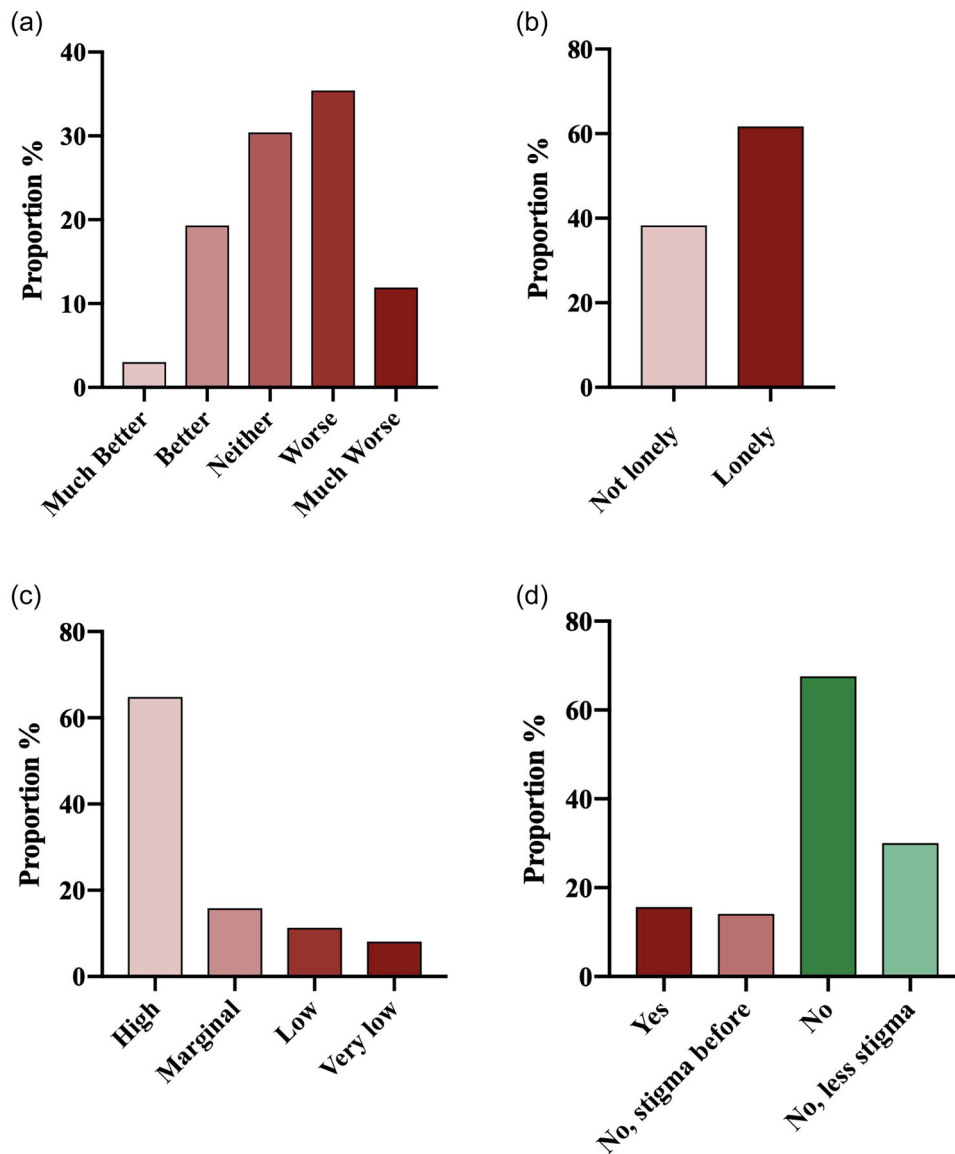
FIGURE 1 Reported changes in mental health, stigma and loneliness since the end of the first COVID-19 lockdown in people living with obesity. (a) Changes in mental health since the end of the first COVID-19 lockdown. (b) Loneliness, assessed using the three-item UCLA Loneliness Scale. (c) Food security, assessed using the USDA adult food security survey. (d) Reported experiences of weight stigma since the end of the first COVID-19 lockdown.

Nearly half of the participants (47.3%, 561) reported their mental health had become worse or much worse since the first COVID-19 lockdown (Figure 1a). Mean depression score (PHQ-9) was 11.3 (SD: 6.8), with 32.4% (384) reporting moderately severe to severe depression (Supporting Information, Figure S1A). Mean well-being score (WEMWBS) was 40.7 (SD: 10.5), with 58.5% (694) reporting low well-being (Supporting Information, Figure S1B; Table S2). Nearly one-third (32.6%, 387) reported seeking medical support for their mental health since July 2020. Higher BMI, having two or more risk factors, reporting much worse mental health and being lonely were associated with higher depression, whereas higher well-being, high food security and old age were associated with lower depression (model 4, Supporting

Information, Table S3). Greater loneliness, worse mental health and higher depression were associated with lower well-being (model 4, Supporting Information, Table S3).

A total of 732 (61.7%) participants reported feeling lonely, with a mean loneliness score of 6.0 (SD: 2.0); 27.4% (325) reported high loneliness, which was greater than that reported in the general population (Figure 1b; Supporting Information, Table S2).[16] Greater loneliness was associated with experiencing weight stigma, lower food security, lower well-being and higher depression (model 4, Supporting Information, Table S3).

Very low food security was reported by 96 (8.1%) participants, 2.7 times greater than that reported by Pool and Dooris[17] in a sample of UK adults in 2019 (Figure 1c). Overall, 160 (13.5%) participants reported

eating less than they should, 125 (10.5%) were hungry but did not eat and 46 (3.9%) did not eat for a whole day due to insufficient money or food. This indicates greater food insecurity in our sample compared with the UK general population.[18] Further analysis showed those experiencing very low and low food security were more likely to be lonely and have higher depression (odds ratio [OR]: 1.49, 95% confidence interval [CI]: 1.11–2.01, $p = 0.009$; OR: 1.06, 95% CI: 1.03–1.09, $p < 0.001$) (Supporting Information, Table S4), whereas older participants and those with no additional risk factors were less likely to report food insecurity (OR: 0.96 per additional year in age, 95% CI: 0.95–0.97, $p < 0.001$; OR: 0.62, 95% CI: 0.40–0.96, $p = 0.031$) (Supporting Information, Table S4), in agreement with Pool and Dooris.[17]

Since July 2020, 183 (15.6%) reported experiencing more weight stigma, 793 (67.6%) did not feel stigmatised, 165 (14.1%) felt stigma had not changed due to feeling stigmatised before July 2020 and 32 (2.7%) felt less stigmatised (Figure 1d). Those reporting feeling stigmatised were more likely to be female and have a higher BMI and higher depression (OR: 2.24, 95% CI: 1.65–3.04, $p < 0.001$; 2.86 per additional BMI point, 95% CI: 2.15–3.80, $p < 0.001$; 1.06 per additional point in depression, 95% CI: 1.03–1.09, $p < 0.001$), whereas those with higher well-being were less likely to report feeling stigmatised (OR: 0.97 per additional point in well-being, 95% CI: 0.95–0.99, $p = 0.006$) (Supporting Information, Table S5).

Most participants reported a change in health-related behaviours (Figure 2a), with the majority reporting healthier or positive changes, with 945 (79.6%) reporting actively attempting to lose weight (Supporting Information, Table S6). Food shopping behaviour became healthier for 432 (43.5%) participants, and over half reported a healthier diet or greater physical activity (550, 52.8%; 503, 50.2%, respectively) (Figure 2b). Alcohol intake did not change in 744 (63.1%) (Figure 2a), and of those who did report a change, 197 (45.1%) reported a lower intake (Figure 2b). However, 796 (67.2%) reported using food to manage their emotions. Sleep was negatively impacted (587, 49.7%), with 454 (77.5%) reporting that their sleep worsened (Figure 2b). Compared with those with very low and low food security, participants with high food security were more likely to report their food shopping and diet becoming healthier (*shopping*: OR: 1.60, 95% CI: 1.17–2.18, $p = 0.003$; *diet*: OR: 1.40, 95% CI: 1.03–1.92, respectively) (model 1, Supporting Information, Table S7). In addition, those with high food security had a higher likelihood of increased physical activity and better sleep (OR: 1.53, 95% CI: 1.10–2.12, $p = 0.011$; OR: 1.92, 95% CI: 1.14–3.24, $p = 0.015$, respectively). When adding loneliness as a predictor, higher food security continued to predict healthier food shopping and increased physical activity (model 2, Supporting Information, Table S7). However, when well-being and depression were added, food insecurity no
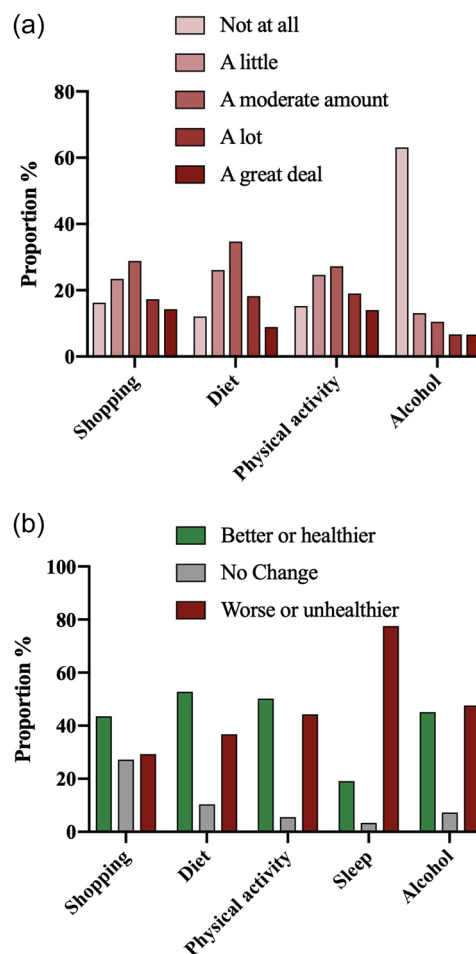

FIGURE 2 Reported changes in health-related behaviours in people living with obesity. (a) Magnitude of change in health-related behaviours since the end of the first COVID-19 lockdown. (b) Direction of change in health-related behaviours since the end of the first COVID-19 lockdown

longer predicted a change in health-related behaviour (model 3, Supporting Information, Table S7). When looking at loneliness, participants who reported being lonely had a lower likelihood of healthier food shopping and diet, increased physical activity and better sleep compared with those who reported not being lonely (OR: 0.52, 95% CI: 0.41–0.67, $p < 0.001$; OR: 0.57, 95% CI: 0.44–0.74, $p < 0.001$; OR: 0.64, 95% CI: 0.50–0.83, $p = 0.001$; OR: 0.46, 95% CI: 0.31–0.70, $p < 0.001$, respectively). Again, when well-being and depression were added to the models, loneliness no longer predicted a change in health-related behaviour (Supporting Information, Table S7).

DISCUSSION

This study shows the COVID-19 pandemic has continued to impact negatively on the mental health of people living with obesity, alongside higher levels of loneliness

and food insecurity compared with the general population.[16]

Unlike previous studies reporting that among people living with obesity, health-related behaviours have become worse and weight had increased,[1,19] these data show the opposite. A greater percentage of people living with obesity are actively attempting to lose weight compared with prior to the COVID-19 pandemic,[20] and during the first lockdown,[1] healthy behaviours have increased. Most participants reported healthier food shopping, diet and increased physical activity, although alcohol intake did not change as much, and sleep continued to worsen. Further research exploring the reasons for these changes is needed; these might reflect the wide-scale messaging regarding the increased risk of severe illness in people living with obesity from COVID-19[2] and greater national focus, such as the UK government's 2020 Obesity Strategy.

Food insecurity and loneliness were substantially higher than that previously reported in the general populations both before and during the first COVID-19 lockdown and later.[16,17] Research reported that financial vulnerability during COVID-19 explained between 5% and 25% of reporting food insecurity.[8,21] Therefore, the impending 'cost of living crisis' has the potential to further increase health inequalities and negatively impact food availability, access and choice.[22] The relationship between obesity (and indeed other long-term health conditions, e.g., type 2 diabetes, depression) and level of deprivation, indicates higher prevalence of obesity in more deprived communities.[23] This suggests that the government's decision to scale back the UK government's 2020 Obesity Strategy may mean that the impact of COVID-19, 'cost of living crisis' and reduced government intervention is likely to have a long-term impact on the health of the nation, and greater impact on people in the most vulnerable category.

Our study is limited by its cross-sectional nature. However, in agreement with our findings, a longitudinal study by Chao and colleagues[24] in older adults living with overweight or obesity and type 2 diabetes showed that worse depression and loneliness increased during the COVID-19 pandemic compared to before the pandemic. Both food insecurity and loneliness being predictors of worse depression and well-being highlights their importance on mental health. Moreover, previous studies have shown that loneliness and isolation are associated with increased risk of various health conditions and all-cause mortality.[25,26] Therefore, policymakers need to address strategies to reduce people experiencing food insecurity and loneliness, particularly if restrictions continue or there are ongoing economic impacts of the pandemic and the 'cost of living crisis'.

Better mental health (higher well-being and lower depression) appeared to be the main driver of both likelihood of reporting healthier and less change in health-related behaviours. Our data suggest that mental health has continued to be disproportionately impacted in people living with obesity compared with data from the general population[16] and during the first lockdown.[1]

Encouragingly, the current study findings show that people living with obesity are seeking medical support for their mental health. Although the number is only one-third, this is higher than reports from the general population.[27] However, this might represent a greater number of people with a pre-existing mental health condition in our cohort but also that the pandemic continues to disproportionately impact the mental health of people living with obesity.

Our findings need to be interpreted after considering the following limitations. As previously mentioned, these data are cross-sectional, and online recruitment may have limited the response from those with digital poverty. In addition, as participants were surveyed about over a 5-month period of easing restrictions and also asked to recall on their experiences from the first lockdown, this may have influenced responses and been prone to recall bias. However, as the majority (95%) replied during August, this is unlikely to have had an impact.

CONCLUSION

The findings of this study have implications for policy-makers and healthcare professionals who are involved with supporting people living with obesity, notably the continued impact on mental health, and need to address food insecurity and loneliness, both now and as the pandemic evolves.

for the British Dietetic Association, University College London and University College NHS Trust. Novo Nordisk provided sponsorship to University College London to cover the costs associated with participant recruitment to complete this survey. Novo Nordisk had no influence over the selected participants or the creation, development or content of this survey, and editorial control remains the full responsibility of the authors of this survey.

AUTHOR CONTRIBUTIONS

Adrian Brown conceived the study. Adrian Brown, Stuart W. Flint, Rachel L. Batterham, Simon Williams, Mary O'Kane and Anastasia Z. Kalea contributed to the study and survey design and methodology. Adrian Brown was responsible for the oversight of the study. Adrian Brown, Stuart W. Flint, Rachel L. Batterham, Simon Williams, Mary O'Kane, Erika Wong and Anastasia Z. Kalea contributed to the recruitment of participants. Samuel J. Dicken, Adrian Brown, Stuart W. Flint and Rachel L. Batterham were responsible for data analysis. Adrian Brown, Stuart W. Flint, Rachel L. Batterham and Samuel J. Dicken contributed to initial data interpretation and the writing of the first draft. All authors contributed to critical revision of the manuscript and gave final approval.

CONFLICT OF INTEREST

Adrian Brown reports support grant from Novo Nordisk in relation to this submitted work and honoraria from Novo Nordisk, PHE and Obesity UK outside the submitted work; Adrian Brown is on the medical advisory board and a shareholder of Reset Health Clinics Ltd. Rachel L. Batterham reports personal fees from Novo Nordisk; others from Novo Nordisk; and personal fees from Pfizer, International Medical Press, Boehringer Ingelheim, and ViiV outside the submitted work. Stuart W. Flint reports research grants and support for attendance at academic meetings from Johnson & Johnson and Novo Nordisk, research grants from Public Health England, and honoraria from Public Health England and the Royal College of General Practitioners outside the submitted work. Mary O'Kane reports consulting fees from Novo Nordisk and honoraria from Novo Nordisk and Johnson & Johnson outside the submitted work. Samuel J. Dicken is funded via a Medical Research Council grant (MR/N013867/1). Anastasia Z. Kalea, Simon Williams and Erika Wong have nothing to disclose. There are no other declarations of interest.

TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with STROBE guidelines. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1111/jhn.13120

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.