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Food and Covid-19

Kevin Brewer

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orsettpsychologicalservices@phonecoop.coop

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Kevin Brewer BSocSc, MSc

An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at <http://psychologywritings.synthasite.com/>. See also material at <https://archive.org/details/orsett-psych>.

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1. INTRODUCTION

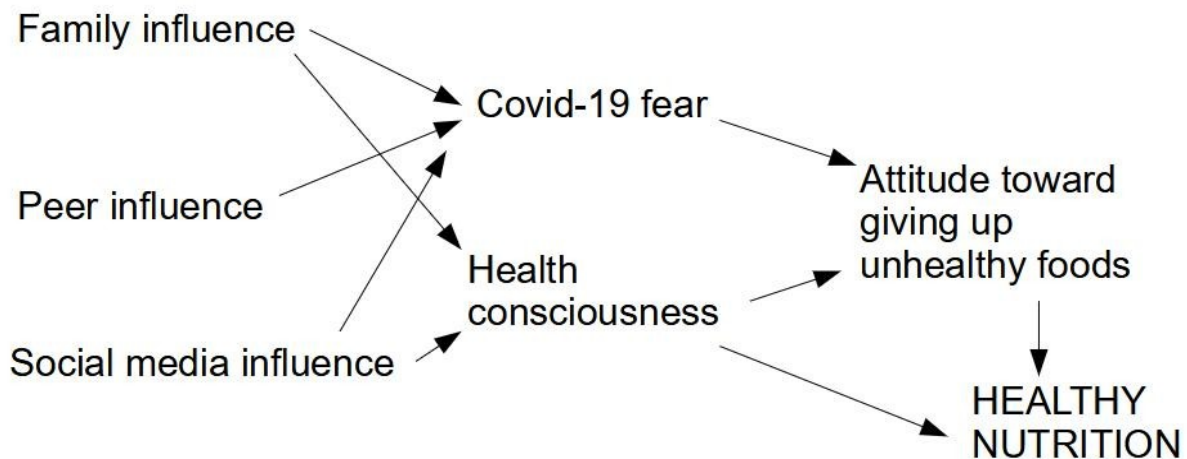
"Dietary behaviour" is "an umbrella term including three main categories: dietary intake, food choice, and eating behaviour (Jackson et al 2022 p2). Studies have also covered shopping behaviour, eating out, exercise, and body image, for example, as impacted by covid-19, as well as by lockdowns.

2. DIET CONTENT

The pandemic has unintended (or unexpected) consequences. One of which is healthy nutrition (defined as "individuals' beliefs about the healthiness of their current daily diets"; Aksoy et al 2021 p1).

Aksoy et al (2021) developed a theoretical model explaining the change involving family, peer, and social media influence, and tested it with survey data from 688 adults in Turkey in April-May 2020. The questionnaire included items on influences on food choice, attitudes towards unhealthy food, and fear of covid-19.

"Health consciousness" was influenced by family and social media (but not peers), and this was related (along with "fear of covid-19") to "attitude toward giving up unhealthy food", which in turn related to healthy nutrition (figure 1).



(Based on Aksoy et al 2021 figure 2 p7; only significant relationships shown)

Figure 1 - Theoretical model of healthy nutrition.

Aksoy et al (2021) explained: "During the covid-19 pandemic, some individuals may be afraid of this unusual and cataclysmic event, and they may start to show their reactions to it... This fear acted as a motivator in their lives..., and some people may have used this difficult and challenging time to reconsider the importance of health and well-being, and in turn made changes to the diet to improve nutrient content and healthy eating. Our research has shown that for some people, the pandemic has resulted in fearful behaviour which nonetheless has resulted in improved health focus and improved dietary intakes" (p8).

The key limitations with this study included that it was "carried out only where the pandemic was heavily observed and its effects were strong. The permanence of the effects discussed in the study is thus open to be examined further in future research" (Aksoy et al 2021 p8). Also no data were collected on the individual impact of the pandemic (eg: loss of job), and how this would have affected healthy nutrition. Finally, the sample was recruited online by a non-probability convenience sampling technique (ie: volunteers who responded to social media posts). Around 70% of respondents were female, and there was a skew towards higher educational qualifications, and income than the general population.

The pandemic, however, involved quarantine or lockdowns (ie: periods of confinement). Previous research has suggested that palatable foods (eg: high in sugar and fat) are consumed more to help with coping, as well as eating more generally (Landaeta-Diaz et al 2021).

These behaviours are associated with anhedonia (ie: the reduced ability to feel pleasure) in a phenomenon called "hedonic hunger" (ie: "an extreme response to reward, pleasure, and food drive in the absence of physiological hunger"; Landaeta-Diaz et al 2021 p2). In simple terms, extreme "comfort eating".

Landaeta-Diaz et al (2021) investigated hedonic hunger in April and May 2020 in Chile. A sample of 1725 adults were recruited via social media. The questionnaire was composed of three scales (translated into Spanish):

i) Beck Anxiety Inventory (BAI) (Beck et al 1988) - Twenty-one items (eg: "fear of worst happening"; "hands trembling"; "fear of dying"), each scored "not at all" (0) to "severely, I could hardly bear it" (3). The range of total scores are 0 to 63, and a cut-off of ≥ 26 for "severe anxiety" (while 16-25 = "moderate anxiety", and

8-15 "mild anxiety").

ii) Snaith-Hamilton Pleasure Scale for anhedonia (SHAPS) (Snaith et al 1995) - Fourteen sentences of situations or pleasant sensations (eg: "I would enjoy my favourable television or radio programme"; "I would get pleasure from helping others"; "I would enjoy a cup of tea or coffee or my favourite drink"), scored as "agree" (0) or "disagree" (1). The cut-off of >2 was classified as "anhedonic".

iii) Food Intake Questionnaire - The frequency of consumption of certain foods.

Demographic details were also recorded as well as lockdown duration, and body weight (and changes).

Overall, around one-fifth of respondents were classed as "severe anxiety" on BAI, and around one-third were "anhedonic".

In terms of food consumption, eating regularly fried food was more common among more anxious individuals, as was consumption of sugar-sweetened beverages, fast food, and pastries. These foods were also associated with anhedonia, and gaining weight during lockdown.

In summary, anxiety and anhedonia were high during lockdown, and these were associated with increased palatable food consumption, and subsequent weight gain (table 1).

- In Kosovo, the COVIDiet study began in May 2020, one week before lockdown, and lasted eight weeks. Six hundred and ninety-eight adults completed an anonymous web-based questionnaire.
- Weight gain during lockdown was significantly associated with higher cooking frequency, lower meat and fish consumption, higher fast-food consumption, and lower physical activity.

Table 1 - Sulejmani et al (2021).

The survey was online, and the volunteer sample was not representative of the population as a whole (eg: 3% of respondents older than 60 years; low number from poorer families). Data were self-reported. "Also, due to the cross-sectional study design, relationships detected must be interpreted with caution as it is not possible to conclude causal effects between them" (Landaeta-Diaz et al 2021 p6) (appendix A). The researchers continued that

the "results must be interpreted with caution since it is necessary to consider the brief quarantine time, which does not cover more than four weeks of voluntary or mandatory quarantine. The current study was conducted at the beginning of the lockdown in Chile, however, anxiety may become worse as confinement time increases" (Landaeta-Diaz et al 2021 p6).

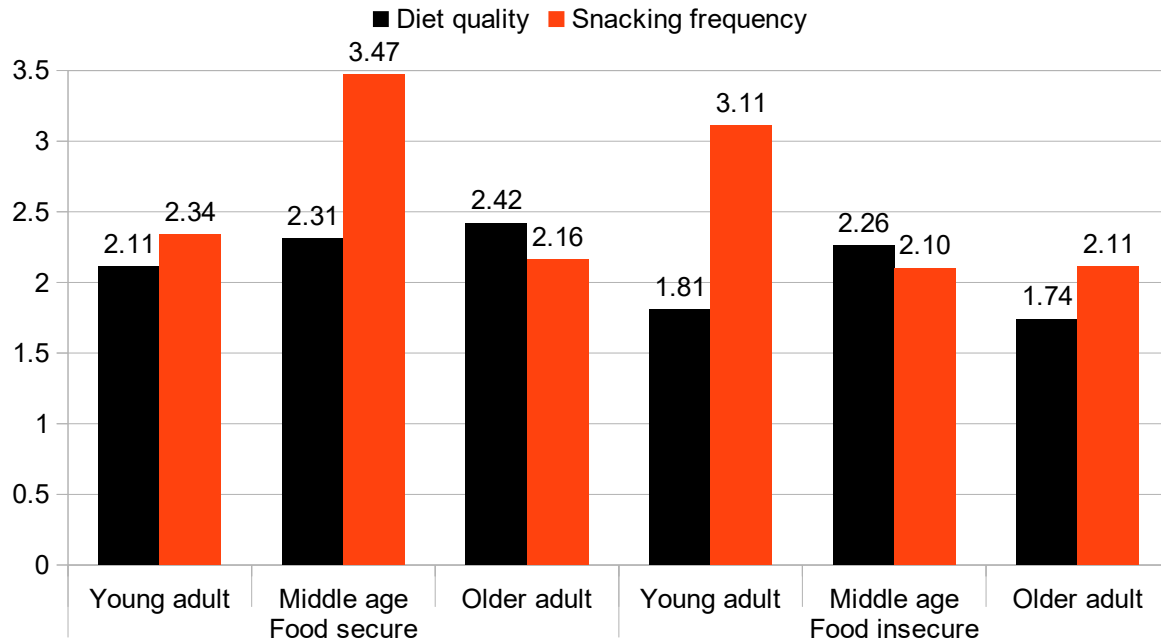
Jackson et al (2022) focused on diet quality and snacking in their US survey of 360 adults in April-May 2020. Diet quality was measured by estimated intake of different nutrients, which gave an overall score between 0 (lower diet quality) and 6 (higher diet quality). Unhealthy snacking was scored as frequency per day (from 0 to 4 or more) of crisps (chips) and sweets (candy). There were also items about social relationships, and food insecurity generally (eg: "The food we bought just didn't last, and we didn't have money to get more"; frequency in last year).

Overall, 60% of respondents were scored 0-2 for diet quality, and around one-third of the total had two or more snacks per day. Just under 40% of people were classed as food insecure (appendix B). All these variables were associated with social support in some way. For example, frequency of snacking associated with living alone, while friend support was associated with higher diet quality.

There were also age (or life stage) differences with young and older adults, who were food insecure, having low diet quality and high unhealthy snacking frequency (figure 2). Covid-19 had exacerbated these patterns. Table 2 gives examples of some of the qualitative comments.

Jackson et al (2022) commented: "Social support may be an important mechanism to promote diet quality and could reduce food insecurity. Previous research among older adults demonstrated the importance of having an established support system to reduce food insecurity... We also identified that social support from friends was associated with improved diet quality. These findings, along with a substantial number of participants reporting declines in social connection since the pandemic, indicate an important opportunity for intervention" (p8).

All data were self-reported, though the sample was nationally representative.



(Data from Table 3 Jackson et al 2022)

Figure 2 - Mean diet quality score (out of 6; where a higher score = better diet quality) and snacking frequency (out of 4) based on life stage and food insecurity.

- Don't have motivation to eat healthy.
- I'm eating more home cooked meals and healthy snacks, because junk food and takeout is more difficult to obtain.
- I have more "down" time that sometimes I find myself snacking.
- Eating more meals, more snacks too.

(Source: Table 4 Jackson et al 2022)

Table 2 - Example of comments related to covid-19 and eating behaviour collected by Jackson et al (2022).

The diet of over 10 000 young adults (15-28 years old) in China investigated in May 2020 in the Covid-19 Impact on Lifestyle Change Survey (COINLICS). The participants were recruited by online snowball sampling. The frequency of consumption of twelve major food groups commonly eaten in China was scored as "none", "daily", "4-6 days per week", or "1-3 days per week" for before and during the lockdown.

Overall, during the lockdown, "[S]ignificant

decreases were observed in the frequency of intake of rice, meat, poultry, fresh vegetables, fresh fruit, soybean products, and dairy products" (Jia et al 2021 p2). There were gender differences with women "eating rice, fresh vegetables, and fresh fruit more frequently than males, and eating meat, poultry, soybean products, and dairy products less frequently than males" (Jia et al 2021 p2). Higher educated respondents consumed all foods more frequently, except rice and other staple foods, and preserved vegetables, than other education groups.

Beverage consumption increased during the lockdown, particularly among males (eg: tea).

Jia et al (2021) commented: "Despite some modest improvements over the past few decades, diet quality in China is still sub-optimal at a population level, including excessive consumption of sodium, red meat, processed meat, and sugar sweetened beverages, and inadequate intake of fruits, nuts, marine omega-3 fatty acids, and polyunsaturated fatty acids... Young adults in China are exposed to increasing unhealthy food advertisements than before and are consuming more high-sugar, high-salt, and high-fat foods... The results of this study reflect that some changes have further aggravated the current sub-optimal dietary patterns (eg: less intake of fruits) while others seem positive (eg: less intake of meat), although compensatory eating patterns deserve further investigation for reaching a full evaluation of the effects of the lockdown on dietary patterns and quality" (p3).

The researchers accepted that the sample was not representative of the whole population, and that the data were self-reported, but stated that "this online questionnaire has unique strengths, especially at this unusual and critical time. The internet-based studies can accumulate sufficiently large numbers of participants in a broad population and in a short period to draw strong conclusions from these samples, which is of particular importance in the context of public health emergencies... Moreover, questions on each food item before and under lockdown were placed next to each other for participants to better recall with comparison. With that said, although the survey results at each time point may be subject to recall bias on its own, differences in their answers at two time points should robustly reflect changes in their diet patterns (at least, perceived changes, which are usually highly correlated with actual changes)" (Jia et al 2021 p8) (appendix C).

In a French study with 938 participants recruited online, frequency of consumption of 110 foods was surveyed in April 2020 (during lockdown) and compared to the month before covid-19 (Marty et al 2021). The motives for food choices were also measured with the Food Choice Questionnaire (Steptoe et al 1995). This has twenty-four items that cover nine motives (mood; price; convenience; weight control; health; sensory appeal; natural content; ethical concern; familiarity) (table 3).

Participants consumed significantly more food in the first month of lockdown (mean 1935 kcal per day) compared to prior (1700 kcal/day), and the nutritional quality significantly decreased. "Despite an increase in fruit and vegetables, pulses, fish and seafood consumption, the sharp increase in processed meat, sweet-tasting beverages and alcoholic beverages consumption negatively affected the [nutritional quality]" (Marty et al 2021 p3).

- Mood - "cheers me up"; "helps me relax".
- Price - "is not expensive"; "is good value for money".
- Convenience - "is easy to prepare"; "takes no time to prepare".
- Weight control - "is low in fat"; "is low in calories".
- Health - "is nutritious"; "keeps me healthy".
- Sensory appeal - "tastes good"; "smells nice".
- Natural content - "contains no artificial ingredients".
- Ethical concern - "Has the country of origin clearly marked".
- Familiarity - "is what I usually eat".

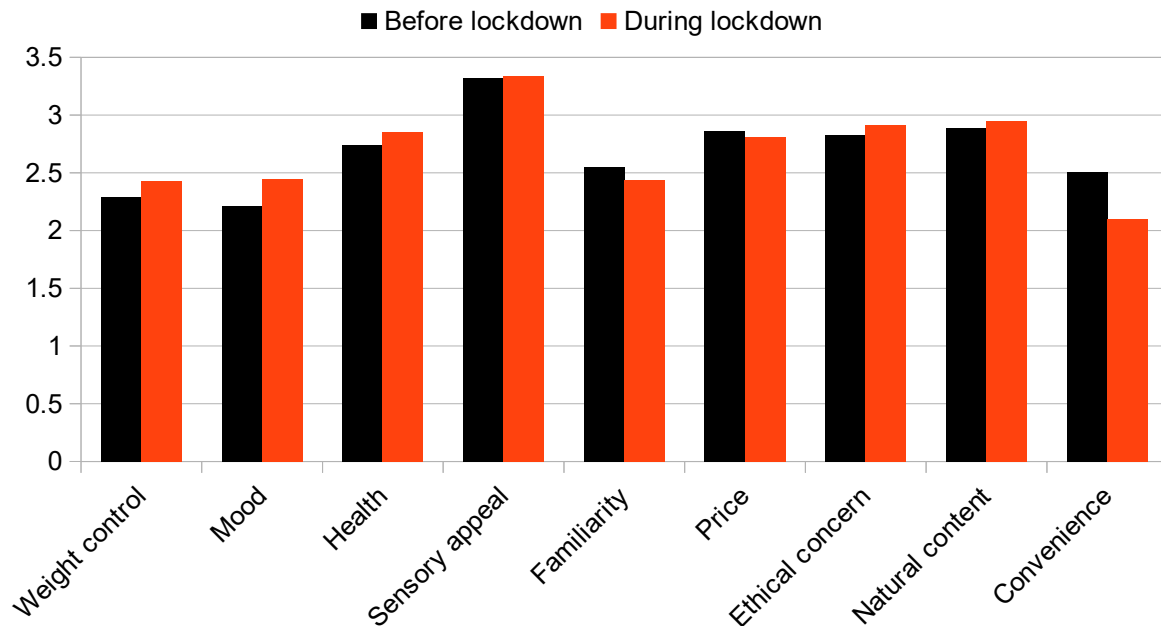
(Source: Steptoe et al 1995)

Table 3 - Example of items from Food Choice Questionnaire.

In terms of motives for food choices, mood was most important change from before to during lockdown, followed by weight control, and convenience became least important (figure 3).

The importance of mood in food choice was associated with poorer nutritional quality of food eaten. The motivation to weight control was linked to increased nutritional quality. This suggested that "participants engaging in weight management behaviour successfully stuck with their goal by managing their food intake during the first month of the lockdown" (Marty et al 2021 p4).

The data were self-reported, and retrospective for prior to lockdown. "Participants were asked to report simultaneously for each food item their consumption



(Data from Marty et al 2021 table 2 p5)

Figure 3 - Mean ratings of importance (out of 4) for different food motives before and during lockdown.

before and during the lockdown which made it easier reporting differences in consumption frequency, even if a recall bias could have affected the responses for the period before the lockdown" (Marty et al 2021 pp5-6).

As with other volunteer samples, it was not representative of the population as a whole (eg: 80% women). Furthermore, the participants were recruited via sites related to eating, and so "likely... was biased towards individuals with an interest in food" (Marty et al 2021 p6). But Marty et al (2021) defended themselves: "this can also be viewed as a strength as these individuals were more likely to have paid attention to what they ate before and during the lockdown and consequently to have cautiously reported their food consumption" (p6).

The data were collected after the first month of lockdown, so it would have been interesting to see if food choices remained stable over time.

3. HOME COOKING

Lockdowns and stay-at-home orders led to "panic buying" and disruption of the food supply system as well

as the closure of restaurants and catering facilities. Meanwhile, people at home had more time on their hands. How were cooking practices impacted?

Concentrating on France, the number of Google searches for "recipe" almost tripled between March and May 2019 (Sarda et al 2022). This is taken as a general suggestion that home cooking increased.

More specifically, Sarda et al (2022) reported data from a representative survey in June 2020 (one month after lockdown ended). Nearly 2500 adults on an online panel were included. The questionnaire focused on the changes from before to during and after the lockdown (eg: average time dedicated to preparing a meal; quality of prepared food).

Overall, 60% of respondents reported no change in diet quality, while the remainder divided around half into more or less balanced diet.

Nearly half of all respondents reported cooking more frequently during the lockdown compared to before with about two-thirds of them continuing afterwards. Increased cooking frequency was associated with being female, living in a large urban area, and having children in the household, for instance. "Overall, the cooking frequency of older respondents was subject to fewer changes. Finally, individuals in a difficult financial situation were less likely to cook more often and more likely cook less often" (Sarda et al 2022 p3).

Sarda et al (2022) ended: "Our results indicated that the lockdown unequally affected the diet and cooking practices of the French population. On the one hand, this situation represented an opportunity for some people to cook more and make healthier choices with more nutritional foods, leading to perceived improvements in diet quality. On the other hand, some individuals reported a degradation in the quality of their diet due to food supply issues or the higher consumption of unhealthy foods" (p6).

The data were self-reported via an online survey. It is estimated that "10% of French households still lack Internet access, and panel surveys tend to have a higher prevalence among women, older people, and more educated populations compared to paper-based surveys" (Sarda et al 2022 p6). The questions asked respondents to recall the recent past. "Social desirability bias and post-hoc rationalisation may have influenced the outcome, particularly in an informed and educated population" (Sarda et al 2022 p6).

4. FOOD MOTIVATIONS

Smith et al (2021) recruited 429 US adults in May-June 2020 via Amazon mTurk. Covid-19-related stress was measured as well as food motivation. In relation to the latter, participants were asked about five food categories, and three behaviours:

i) Willingness to wait - Participants were asked to imagine waiting for a delivery of the food, and to state how long was acceptable (0 to 180 minutes).

ii) Willingness to work - Participants were told that a food would be delivered in twenty minutes if they were willing to "work" for it (eg: number of finger taps to perform - 0 to 1000).

iii) Willingness to pay - For the twenty-minute delivery of the food, how much would they pay (\$0 to 100).

The five food categories were sweet snacks, fruit, savoury snacks, vegetables, and fast food. The covid-19-related stress covered sixteen items (eg: "not being able to pay for basic needs [rent/mortgage/food etc]"; "losing my job"; "I will be unable to access medical care for myself or my family").

Willingness to wait was longest for preferred sweet foods (mean: 100 minutes), and to perform more finger taps for fast food (mean: 150 taps), sweet snacks, or fruit. "Participants with the highest reported stress were willing to perform more finger taps for a preferred food than those reporting the lowest stress" (Smith et al 2021 p4).

Participants were willing to pay more for preferred fast food (mean: \$6), or sweet snack, and this relationship was stronger with increased stress. Stress had no impact on willingness to wait. Vegetables scores lowest on all three measures of food motivation.

Smith et al (2021) used a "novel self-report instrument" for food motivation, which was developed from work with rodents. This has shown that increased stress is associated with increased motivation for foods high in fat and sugar (Smith et al 2021).

There was no baseline (pre-pandemic) measures of food motivation in the Smith et al (2021) study. Also the "measures of food motivation were hypothetical and may not accurately reflect real life food decisions" (Smith et al 2021 p10).

Buckland et al (2021) investigated factors that may explain a susceptibility to increased intake of high energy dense (HED) sweet and savoury foods during lockdown. The participants recruited online in May-June 2020 (n = 588) were mostly resident in the UK.

General questions were asked about food intake behaviour before and during lockdown, and coping strategies for stress. Eating behaviour traits were measured by the Adult Eating Behaviour Questionnaire (AEBQ) (Hunot et al 2016), Three Factor Eating Questionnaire (TFEQ) (Karlsson et al 2000), and the Control of Eating Questionnaire (CoEQ) (Dalton et al 2015) (table 4).

- AEBQ - covers food responsiveness, enjoyment of food, emotional over- and under-eating, and satiety responsiveness. Items eg: "I love food"; "I refuse new foods at first"; "If I miss a meal I get irritable".
- TFEQ - 6 items on control of food intake to manage weight. Item eg: "When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal"; "Sometimes when I start eating, I just can't seem to stop".
- CoEQ - 21 items on food cravings in the last week. Item eg: "How strong was your desire to eat sweet foods"; "How difficult has it been to resist any food cravings".

Table 4 - Details of the measures of eating behaviour traits.

Around half the respondents reported increased food intake during lockdown. The researchers thus divided the sample into two groups for analysis purposes (increased intake vs no change/reduced intake).

Increase in HED sweet and savoury snacks accounted for much of the general increase in food intake, though fruit and vegetable intake did increase also. The increase in HED foods was predicted by the following eating behaviour traits:

- Low craving control (CoEQ score)
- Low control of food intake (TFEQ score).

High acceptance coping strategies mediated the above relationships for sweet but not savoury foods.

Unexpectedly, for the researchers, the behaviours measured by the AEBQ were not significantly related to HED foods intake. Buckland et al (2021) offered this

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explanation: "The AEBQ used a 5-point response scale and it is possible that in this study, this restricted range of responses did not allow sufficient variability in scores in detect variability between participants" (p9).

Concerning acceptance coping, that was a "unique finding", and Buckland et al (2021) suggested that "adopting an acceptance coping response may have minimised psychological distress and therefore reduced drives to eat and consume sweet foods" (p9). Reframing and active coping strategies had no impact on HED food intake.

The study was not able to quantify the increase in food intake, and only used a scale of 0-100 to describe the change (ie: subjective rating).

The sample was mostly female (70%), White, educated, and with higher household income than the general population.

In summary, individuals low in control of the desire to eat and actual eating behaviour consumed more food, particularly HED food, during lockdown.

5. EMOTIONAL EATING

"Emotional eating" (EE) is "(over)-eating in response to negative emotions" (McAtamney et al 2021 p1). Concentrating on the UK, binge eating behaviours among individuals with no history of eating disorders have been reported by a number of respondents during lockdown. Is this due to EE? McAtamney et al (2021) investigated.

This has been found in studies in Spain, Greece, and Italy, for instance (McAtamney et al 2021). Explanations for EE include an inability to recognise hunger and satiety signals resulting in eating in response to emotional arousal, or as a means to alleviate negative emotions (ie: as escapism). Alexithymia and emotion dysregulation are also relevant. The former involves "(a) difficulty identifying feelings and distinguishing these from other bodily sensations; (b) difficulty describing feelings to others; (c) constricted imaginal processes; and, (d) a stimulus-bound, externally-oriented cognitive style" (McAtamney et al 2021 p2).

McAtamney et al (2021) recruited 136 adults in the UK via social media in mid-July 2020. As well as questions about covid-19 and general eating behaviour, there were a number of established psychometric scales used, including:

- i) Depression, Anxiety and Stress Scale (DASS-21)

(Lovibond and Lovibond 1985) - 21 items: eg: "I couldn't seem to experience any positive feelings at all"; "I tend to over-react to situations".

ii) Toronto Alexithymia Scale (TAS-20) (Bagby et al 1994) - 20 items: eg: "I am often confused about what I feel exactly"; "I would rather talk to people about their daily routines than their feelings".

iii) Difficulties in Emotion Regulation Scale Short Form (DERS-SF) (Kaufman et al 2016) - 18 items: "When I'm upset, I become irritated at myself for feeling that way"; "When I'm upset, I lose control over my behaviour".

iv) Emotional Eating Scale (EES) (Arnouk et al 1995) - The urge to eat in response to 25 negative emotions.

v) Salzburg Emotional Eating Scale (SEES) (Meule et al 2018) - Actual eating behaviour in response to 20 positive and negative emotions.

Around one-tenth of respondents scored above the cut-off of the TAS-20. Overall, 60% of respondents reported no change in the amount eaten in the previous week as compared to before the pandemic, and one-quarter were eating more (and the remainder less).

Change in the amount eaten (increase or decrease) was significantly associated with depression, and difficulties in emotion regulation. Also these individuals had higher EES and SEES scores (ie: eating to cope with negative emotions). Emotion dysregulation was found to mediate the relationship between difficulty identifying and describing feelings, and EE. There was no direct relationship between difficulty with emotions and EE.

The DERS-SF score was key. Individuals feeling negative emotions due to covid-19 who could recognise those feelings and their source were less likely to change their eating behaviour, whereas individuals who could not identify and describe their feelings (high DERS-SF score) were more likely to EE.

"Limitations stemming from data collection include the self-report of perceived changes in how much individuals are eating and how healthful they perceive their diet to be, which are subject to bias and inaccurate recall. Similarly, self-report measures of alexithymia have been criticised due to the level of introspection required to respond to the items... [] Whilst other research designs are suited to mixed

assessments of alexithymia via observer-reported alongside self-reported measures, online questionnaires can only make use of self-report measures. Furthermore, the emotional eating construct is multi-faceted and influenced by context meaning it is not fully captured by questionnaire measures... The present study utilised the EES and SEES which measure self-reported emotional eating urges and behaviours respectively, to garner a wider measurement of the emotional eating construct" (McAtamney et al 2021 p8).

A similar study was conducted in Italy with 365 adults recruited anonymously online in May 2020. The key questionnaires were the TAS-20, the seven-item Binge Eating Disorder Screener (BEDS-7) (Herman et al 2016), and the Dutch Eating Behaviour Questionnaire (DEBQ) (van Strien et al 1986) (EE sub-section with items like "Do you have a desire to eat when you are irritated?").

EE and binge eating were the outcome measures. The main predictor variables were alexithymia, BMI, and perceived stress.

It was found that increased EE was associated with higher depression and anxiety, lower perceived quality of relationships and life, higher TAS-20 score, and higher BMI. Most importantly, the study confirmed the link between EE and higher level of negative emotions. Binge eating was associated with higher perceived stress, and higher BMI.

The difference in the number of significant associations between EE and binge eating suggested to the researchers that "factors that were not investigated in the study may be involved in binge eating. As binge eating is a clinical disorder, this result may indicate the role of deeper psychological factors, such as trauma, attachment patterns, and significant relationships with caregivers, in the development of an eating disorder" (Cecchetto et al 2021 p6).

Cecchetto et al (2021) asserted: "To our knowledge, this is one of the few reports... of emotional eating and binge eating on individuals without eating disorders during the lockdown and, even though more investigations and additional data are needed for comparisons, these data suggest that the negative feelings that individuals had to face during the lockdown may have increased dysfunctional eating behaviour" (p6).

As with so many of these studies the sample was not representative (eg: three-quarters female), and the data were self-reported. "This aspect could have been particularly problematic for the binge eating

questionnaire which was adapted from the structured interview of DSM [Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association]; however, this procedure was imposed by the exceptionality of the moment and the lockdown restrictions" (Cecchetto et al 2021 p7).

Coulthard et al (2021) examined EE in another UK sample (n = 620) recruited online, mostly living in the English Midlands, focusing on lockdown in April-May 2020.

Changes in consumption of ten food categories (eg: crisps and savoury snacks; fruit and vegetables (FV)) were self-reported for before and during the lockdown. The Three-Factor Eating Questionnaire - Revised 18-item version (TFEQ-R18) (de Lauzon et al 2004) was used to measure behaviours like EE (eg: "When you feel lonely, do you console yesterday by eating?"), and uncontrolled eating (eg: "Sometimes when you start eating, do you feel you just can't seem to stop?"). Strategy for coping with stress was measured by the Brief Coping Inventory (Carver 1997), which covers fourteen techniques (eg: self-distraction; positive reframing). Food insecurity, and health anxiety were also measured by standardised questionnaires.

Higher EE scores were more likely for women (vs men), and individuals isolating at home (vs those not). EE was also associated with higher BMI (body mass index), and higher consumption of "unhealthy foods"/lower consumption of FV.

Combining the different variables, EE pre-lockdown was important. This was associated with increased consumption of snacks and less FV during lockdown. EE pre-lockdown was linked to EE during lockdown suggesting "some continuity in this behaviour over time" (Coulthard et al 2021 p7). Coulthard et al (2021) pointed out: "Although there was a change in EE behaviour across the sample as a whole, it was not in the expected direction, with many participants reporting a decrease in EE after the implementation of lockdown compared to their behaviour prior to lockdown" (p7).

The sample was not representative (eg: 88% female), and the data were self-reported with no verification. Financial/economic stress was not measured, and the data were collected early in the lockdown period.

Overall, this study found that poor eating habits pre-lockdown (like EE or over-eating) continued during lockdown, and maladaptive coping strategies for stress (eg: self-blame; denial) were associated with an increase in EE. Adaptive coping strategies (eg: planning; positive

reframing) were associated with increased home cooking, and consumption of FV.

Coulthard et al (2021) ended: "It is clear that certain individuals, who already have problematic eating and high BMI may need to be supported more to adopt healthy coping practices" (p9).

6. WEIGHT MANAGEMENT

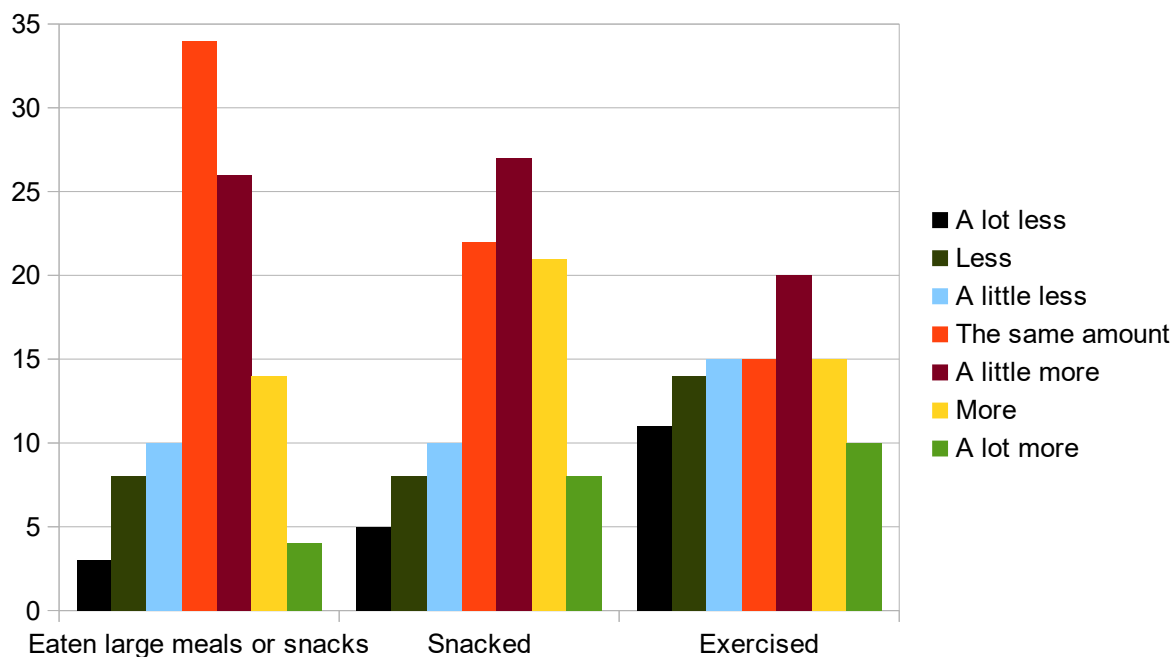
With an UK sample (n = 2002), in April and May 2020, Robinson et al (2021) focused on weight. The researchers deliberately recruited participants classed as obese (BMI \geq 30 kg/m²) (over 30% of the sample) (appendix D). The participants were asked: "Compared to before the covid-19 lockdown in UK, I have..." for eleven weight management behaviours (eg: exercise; snacking), and nineteen behaviours related to healthy eating and physical activity (eg: "had time to exercise"). A seven-point response scale was used.

Participants also completed the International Physical Activity Questionnaire (IPAQ) (Craig et al 2003), which asks about vigorous (eg: aerobics), moderate (eg: cycling), and low activity (eg: sitting) in the last week. The data were converted into METS-mins-week (MMW). There were also questions about food frequency, and disordered eating behaviours.

Concentrating on the eleven weight management behaviours, variable numbers of respondents reported changes. For example, for snacking, 8% replied "a lot more", 21% "more", and 27% "a little more" compared to 25% reporting less to some degree (figure 4). While 40% had exercised less versus 45% more. Significant predictors of negative changes in weight were lower education, being White, having a psychiatric diagnosis, a high-risk medical condition, and being class II obese (ie: BMI \geq 35 kg/m²). Other variables were not significant (eg: overweight and class I obesity (BMI 30-34.9 kg/m²)).

However, higher BMI generally was independently linked to over-eating during lockdown, having a poor quality diet, and less physical activity.

Further analysis produced three group of factors that linked to negative weight change - "difficulties in accessing healthy food", "lack of healthy eating motivation and control", and "lack of social support". Individuals with higher BMI were significantly more likely to report factors from all three of the groupings. "The covid-19 crisis may have had a disproportionately large and negative influence on weight-related behaviours



(Data from Robinson et al 2021 table 2)

Figure 4 - Percentage of responses to selected weight management items compared to before the covid-19 lockdown.

among adults with higher BMI" (Robinson et al 2021 p1).

As with other studies, the volunteer sample was unrepresentative (ie: over 60% female and two-thirds had a degree-level education). "The numbers of participants reporting having ever been diagnosed with a psychiatric condition (33%) or having a high-risk medical condition for covid-19 (24%) were also relatively high, although the sample did include a wide BMI range and this is a strength" (Robinson et al 2021 p6). The questions asked about perceived changes rather than actual changes.

The Toronto Bariatric Surgery Psycho-social (Bari-PSYCH) cohort study showed the impact of bariatric surgery on obese individuals who had undergone such treatment. It is a longitudinal began in 2014 in Canada, and Youssef et al (2021) focused specifically on the impact of the pandemic on this cohort. They interviewed by telephone 23 post-surgery patients in mid-2020. Four over-riding themes were drawn from the interviews:

1. Coping with covid-19 - The disruption of the pandemic produced a "weird mindset" (p2), which included EE, and "end-of-World eating", for example (table 5).

- "P [participant] 5" (female; 1.5 years since surgery): "I have found myself in particular emotionally eating, which is what I used to do. But I'm aware of it. It's not that I've been eating terrible food, but maybe I'm not spacing my food out as best as I could. Maybe I'm not hydrating as much as I could. So, I'm aware of that. This current global situation I think may be causing challenges that I may not have had otherwise" (p3).
- "P8" (female; 4 years): "I found that the last little while in the whole covid situation, I thought... if this is the apocalypse, I might as well enjoy myself. I might as well eat the cupcake. It was like, what's the point? But now seven or eight weeks into this, reality dawns and you feel like doing what we're supposed to do, whatever, we're not going to get sick, there's a really low probability of getting ill. So, you have to get yourself healthy, and that means getting more of that weight off" (p3).

Table 5 - Two quotes related to theme 1.

2. Vulnerability and isolation - Loss of routines, social support, and usual work/life activities caused stress which challenged adherence to dietary guidelines.

For example, "P13" (female; four years since surgery) said: "I do a lot more grazing. Now with covid-19, the whole pandemic, meal prepping is definitely difficult. I don't work, so it's easy for me to go into the fridge, anytime. So, I have to really be a little bit more stringent and prep what foods I use to make containers. I don't anymore" (p4).

3. Resilience - "Some participants perceived quarantine as a minimal burden with respect to maintaining their lifestyle and self-management. These patients reported being able to maintain social support and connection virtually and to adhere to regular routines and maintain lifestyle changes despite the disruptions of the pandemic. Exploring factors promoting successful self-management, participants reported a greater sense of financial security, felt well-supported, and did not have any pre-existing mental health conditions" (Youssef et al 2021 pp4,6).

4. Virtual support - The value of this was described by "P9" (female; nine months): "I had a phone appointment with the bariatric clinic. The [psychiatrist] was able to reduce my anxiety and panic attacks by giving me medication, it was taking a while for the community psychiatrist. I've been on a waiting list for them to call me. So, I was able to call the social worker who put me in touch with the psychiatrist at the programme, and

the bariatric team got me on the proper medication to help me start feeling better" (p7).

The participants experienced many of the problems generally felt during covid-19 and lockdown, but with an extra burden of psycho-social distress, for many, in relation to their weight self-management. "For example, while some patients found baking to be soothing and a means of staying connected, others found cooking and being self-isolated at home to be a triggering environment for emotional eating and grazing" (Youssef et al 2021 p7).

7. NUANCED PATTERNS

Eating and drinking in response to covid-19 stress was investigated by Cummings et al (2021) with participants recruited via Amazon's Mechanical Turk platform (n = 1038) in March 2020. The answers were compared to a cohort in February 2019 answering similar questions.

The standardised questionnaires used included the Palatable Eating Motives Scale (PEMS) (Burgess et al 2014) (which has twenty items covering motivation to eat highly palatable foods), the Drinking Motives Questionnaire-revised (DMQ-R) (Cooper 1994), and the Modified Yale Food Addiction Scale 2.0 (mYFAS 2.0) (Schulte and Gearhardt 2017) (item eg: "I had such strong urges to eat certain foods that I couldn't think of anything else").

The researchers investigated four research questions:

i) Did the March 2020 cohort eat more to cope, and eat more sugary foods? The only difference between the two cohorts was that the March 2020 group ate more added sugars. So, no difference in eating to cope.

ii) Did covid-19 stress positively associated with eating to cope, and so forth? "There were large positive associations between covid-19 stress and eating to cope, food addiction symptoms, and drinking to cope. There were small positive correlations between covid-19 stress and added sugars intake and drinking frequency" (Cummings et al 2021 p4).

iii) What variables influenced the associations in (ii)? Individuals undergoing stay-at-home orders had a

strong relationship between covid-19 stress and drinking frequency only. While all associations were increased by perceived vulnerability to disease. The associations were mostly weaker among older adults.

iv) What about gender differences? "Associations between covid-19 stress and eating to cope and food addiction symptoms were weaker among women compared to men. The association between covid-19 stress and drinking to cope was stronger among men compared to women. Associations between covid-19 stress and added sugars intake and drinking frequency did not differ by gender" (Cummings et al 2021 p5).

Overall, then, eating to cope did not increase between the two cohorts, though intake of added sugars did. Covid-19 stress was related to certain behaviours as noted above.

The study compared two cohorts of different individuals which avoided recall of prior to the pandemic. "The samples were recruited with a near-identical sampling procedure; however, demographic differences between samples emerged. Although these differences were controlled for in analysis, unaccounted differences between the samples may have impacted the results. Moreover, drinking to cope and drinking frequency were not measured in both cohorts, and associations between covid-19 stress and variables of interest were cross-sectional. Thus, conclusions about shifts in drinking behaviour after the emergence of covid-19 pandemic in the US, and causal conclusions about the effect of covid-19 stress on eating and drinking behaviours, cannot be inferred from this study" (Cummings et al 2021 p7).

Cummings et al (2021) continued reflecting on the limitations of their study: "The crowdsourced sampling procedure introduces potential sampling bias. There may be under-representation of certain groups in the US (eg: Republicans, individuals with less education) in the current study sample, so future research with US nationally representative or at-risk samples is warranted. The current study also exclusively focused on eating and drinking behaviours in response to stress from the covid-19 pandemic; however, people cope with stress in several ways not examined here, and the pandemic may impact other health-related behaviours (eg: smoking cigarettes, sleep). For instance, Italian adults showed reduced sleep quality and increased body mass index after 40 days of quarantine (Barrea et al 2020)" (p7).

A study in the Netherlands (Poelman et al 2021) also showed nuances in changes in eating behaviours during lockdown. The researchers stated: "Although the results confirm the persistence of dietary routines, profound socio-demographic differences were observed for those that did report changes. Especially for individuals with overweight and obesity, the lockdown has taken its toll on healthy dietary choices" (Poelman et al 2021 p1).

Poelman et al (2021) analysed data collected by the Dutch government from a nationally representative sample (n = 1030) in April 2020. The key issues were:

i) Making healthy food choices - The vast majority of respondents (82%) reported that this was no more difficult or easier than pre-lockdown, but 11% said it was more difficult. This latter group was 2-3 times more likely to be overweight or obese. Also there were more women in this group.

ii) Diet content - Over 80% of the sample reported not changing their diet during lockdown, but 7% admitted eating more unhealthily. The latter group was again more likely to be overweight or obese, but the pattern was not as clear-cut as (i) with a number of overweight individuals indicating that they were eating more healthily. The main reasons given for unhealthy eating were unhealthy temptations at home, more leisure-time, and being bored at home, while the main reason for eating healthily was more time to think about and prepare healthy meals.

iii) Amount eaten - Around 9% of respondents reported eating more during lockdown, while the vast majority had no change. Overweight and obese individuals, and women generally were more likely to be eating more.

Young respondents showed a negative pattern for these three issues more than older ones. In terms of educational level, a slightly confused picture emerged that "those with a high educational level more frequently reported to eat less healthy and to purchase more sweet snacks (pastries, chocolate) during lockdown compared to those with a low educational level, and to purchase more alcoholic beverages during lockdown compared to those with a middle educational level. In general, those with a higher educational level eat healthier and drink more alcoholic beverages than individuals with a lower educational level" (Poelman et al 2021 p7).

Poelman et al (2021) summed up: "Most noticeable was

that participants with overweight and obesity were more likely to indicate to find it more difficult to make healthy choices, ate unhealthier, ate more and purchased or ordered more unhealthy products and meals than usual during lockdown, compared to those with a healthy weight" (p6).

The data were collected in Week 5 of a lockdown, but the Dutch lockdown was "less constraining" than other countries (Poelman et al 2021). Validated questionnaires were not used, and all outcome measures were self-reported. "This may have caused bias by expressing participants' ideas rather than their actual behaviour. For example, the participants may have had different perceptions of healthy food and a healthy diet rather than their actual behaviour, which may have caused bias as well" (Poelman et al 2021 p7). Generally, studies show that perceptions of healthy eating is different to official recommendations (eg: daily vegetable intake).

More widely, in a UK survey, Robertson et al (2021) explored eating, exercise, and body image during the lockdown in June 2020. This study recruited 264 adults (mostly female) via social media. Questions were asked about mental health, perceived changes in eating, exercise, and body image.

Around 60% of respondents reported being more pre-occupied with food and eating during lockdown than before it, and finding it more difficult to control or regulate eating. Around half were exercising more, and were more concerned about they way they looked. Significantly more women than men reported these changes, as did individuals with self-reported eating disorders. Perceived changes in body image and eating were associated with psychological distress.

Robertson et al (2021) concluded that their study suggested "a more complex picture, with large individual differences in perceived impact, and differential rates of perceived change based on demographic characteristics and pre-existing mental health conditions, particularly eating disorders" (p5). As well as the negative changes, the amount of exercise increased for many respondents.

While in Russia, an online survey conducted in October and November 2020 recruited 1297 adults (Ben Hassen et al 2021). The questionnaire included twenty-four questions covering the impact of covid-19 on food-related behaviours, including food buying, food preparation, and waste.

Compared to pre-pandemic, there was less eating out,

take-aways or fast-food deliveries, and fewer grocery shopping trips (but the stockpiling of non-perishable products). Ordering groceries online increased in a small way, but such shopping was not widely accepted in Russia. Ben Hassen et al (2021) explained why: "Firstly, Russian still believe that purchasing food is a concrete process requiring checking the markets and products personally. Secondly, Russians prefer checking the quality and freshness of food, which cannot be done online... Third,... before the pandemic, the spread of modern eating and drinking habits, and particularly fast-food consumption, mainly in larger cities, people increasingly tend to eat in restaurants and fast-food instead of spending time in grocery stores and cooking at home" (p4).

The awareness of food waste increased. The changes may have been due to job losses and reduced incomes.

More home prepared/cooked meals were taken, and snack consumption between meals increased. However, there was an overall "shift toward healthier diets" (Ben Hassen et al 2021 p1).

Ben Hassen et al (2021) believed that their study was the first on the impacts of covid-19 on food-related behaviours in Russia. They stated: "The final outcomes of the covid-19 pandemic will probably differ from a country to another, depending not only on the epidemiological situation but also, among others, on the baseline situation and resilience to shocks... In this context, the study results are valuable country-specific inputs for designing evidence-based policies during the post-pandemic recovery phase in Russia. For instance, some positive effects of the crisis (eg: adoption of more sustainable diets, reduction of food wastage) can be seized to foster the transition towards more sustainable consumption patterns in the country" (Ben Hassen et al 2021 p6).

8. EATING DISORDERS

Individuals with eating disorders are particularly vulnerable to the effects of covid-19 and lockdowns on eating behaviours. "While there may be potential for some protective consequences - eg: reduced interpersonal triggers such as face-to-face body-based social comparisons..., increased opportunity of support from loved ones..., or services embracing new technology in the delivery of psychological therapies... - the overwhelming concern within the field is the potential

for severe, adverse impacts" (Brown et al 2021 p1).

Studies early in the pandemic in 2020 suggested a deterioration in mental health and in symptoms (eg: increased restricting, binge eating, purging, and exercise behaviours in an Australian study; Phillipou et al 2020).

Rodgers et al (2020) proposed three pathways of the pandemic impacting already-disordered eating behaviours:

i) Via the public health response (eg: lockdown and restrictions on access to food). "This includes public restrictions on exercise, grocery shopping and concerns around scarcity of specific foods which may be highly provoking for individuals with rigid and inflexible exercise or eating patterns, for example, by increasing the perceived need to stockpile food, and associated risk of binge episodes... This pathway also highlights the potential for reduced social support, including restrictions in access to treatment as a consequence of limitations placed on traditional face-to-face treatment as a result of social distancing... and restructuring and reorientation of health services to prioritise the management of covid-19" (Brown et al 2021 p2).

ii) Via increased use of social media during lockdown (eg: exposure to appearance-related content).

iii) Fear of contagion, "which may in turn lead to an increase in restrictive eating patterns and orthorexia-based cognitions, alongside increased levels of general stress and emotional distress, increasing the risk of disordered eating patterns" (Brown et al 2021 p2).

Brown et al (2021) provided qualitative data on the subject via interviews with ten adults in the UK who self-identified as having an eating disorder. The individual interviews were performed via Skype in May and June 2020 (ie: towards the end of full lockdown).

Analysis of the transcriptions identified three main themes related to lockdown:

a) Social restrictions - Social isolation/loneliness was reported by interviewees, and "[T]houghts about food became prominent as they could take up time and mental space which previously would have been spent on social interactions and activities" (Brown et al 2021 p3). Summed up by, for example, "Evelyn": "Whereas, since lockdown, because I live alone... I'm on my own in the

house because there's nobody else around and I've got my house full of food, I have more and more preoccupied thoughts about food" (p3).

Working from home meant changes in accountability. "Camila", for instance, was "free" to not eat: "No one else is here! This is the dream!... Which is very dysfunctional! But it was absolutely... 'This is all I've ever wanted!' with my 'eating disorder brain'" (p4). On the other hand, "Ava" felt different pressures: "I'm very busy at work. And no one pays any attention to what I am eating, in my job. Whereas when I am at home with my partner, erm... and we eat together, it's much more difficult for me to not eat" (p4).

b) Functional restrictions - This included a lack of routine and structure which challenged the rigid behaviour associated with disordered eating. "Ava" described "Worry about not getting food that I feel comfortable eating" (p5).

Fear of being recognised in supermarkets was mentioned by "Isabella", for instance, and that people would know about the disordered eating. She said: "The fear of being recognised is what has made me feel very anxious about going to the shops, so I tend to switch stores every two or three days just to make sure that people don't recognise me and they don't know who I am and I can be free to purchase whatever I want to purchase! It's a bit of an awkward concept" (p6) (appendix E).

c) Restrictions in access to professional support.

Brown et al (2021) felt that their findings supported Rodgers et al's (2020) first pathway above in particular.

The participants were White females, who mostly reported anorexia nervosa. There was no independent verification of clinical diagnosis.

9. CHILDREN'S EATING

Philippe et al (2021) investigated children's (3-12 year-olds) eating behaviours during the lockdown in France via an online survey of 498 parents in May 2020. The key questionnaires were the Children's Eating Difficulties Questionnaire (CEDQ) (Rigel et al 2012), and the Children's Eating Behaviour Questionnaire (CEBQ) (Wardle et al 2001). The CEDQ measures children's level

of appetite (eg: "My child eats small quantities (even if the food is liked)'), and food pickiness (eg: "My child only eats a small variety of foods"). The CEBQ measures emotional over-eating (eg: "My child eats more when anxious"), and food responsiveness (eg: "My child is always asking for food").

Just under two-thirds of parents reported some change in their children's eating behaviour between before and during the lockdown. In particular, emotional over-eating, and food pickiness had the largest increases. Snacking frequency also increased, particularly for unhealthy foods. These changes were significantly associated with the child being bored.

Parental behaviour changed also with increased "soothing with food", for example, and a reduction of rules and limits around unhealthy foods. "When asked if the lockdown and the accompanying emotions (eg: boredom, stress, anxiety) induced parents to have more, the same or less desire to eat during the lockdown than before, 46% of parents answered that they felt more like eating than before, 41% of parents reported no change, and 14% of parents reported feeling less like eating than before" (Philippe et al 2021 pp5-6). Parental stress linked to their behaviour towards the children's eating.

In conclusion: "Children showed significant increases in 'food approach' behaviours during the lockdown (behaviours involving a movement toward or a desire for foods: ie: food enjoyment, emotional overeating, food responsiveness" (Philippe et al 2021 p8). This was due to a combination of the children being bored, but also stressed parents being more permissive about palatable snacks and food. Parents admitted buying more palatable foods for themselves and their children.

The main limitation was that "parental practices and behaviours were self-reported in this study and may be subject to social desirability bias even though the questionnaires were anonymous. The children's eating behaviours and level of boredom were also parent-reported and thus reflected the parent's perception" (Philippe et al 2021 p9). Data on the pre-lockdown period were retrospective with the possibility of recall bias. Philippe et al (2021) reported that "the time gap in this study was very small (max. eight weeks), we think the recall bias was limited here. Here, we also want to note that we did not define 'the period before the lockdown' for the parents. It is therefore possible that parents interpreted this period in different ways (more or less broad) and thus responded differently based on their own interpretation, with possible corresponding effects on

our results" (p9).

Jansen et al (2021) found further evidence of parental stress and children snacking in a US sample. An online survey was completed in May-June 2020 by 318 parents of 2-12 year-olds in fourteen states. The main areas of questioning were:

i) Parental covid-19-related stress (eg: "How stressed are you about losing my job in relation to the covid-19 crisis?").

ii) "Food parenting practices" (eg: "Does your child have a regular time to eat dinner?").

iii) Children's diet (eg: frequency of intake of "cookies").

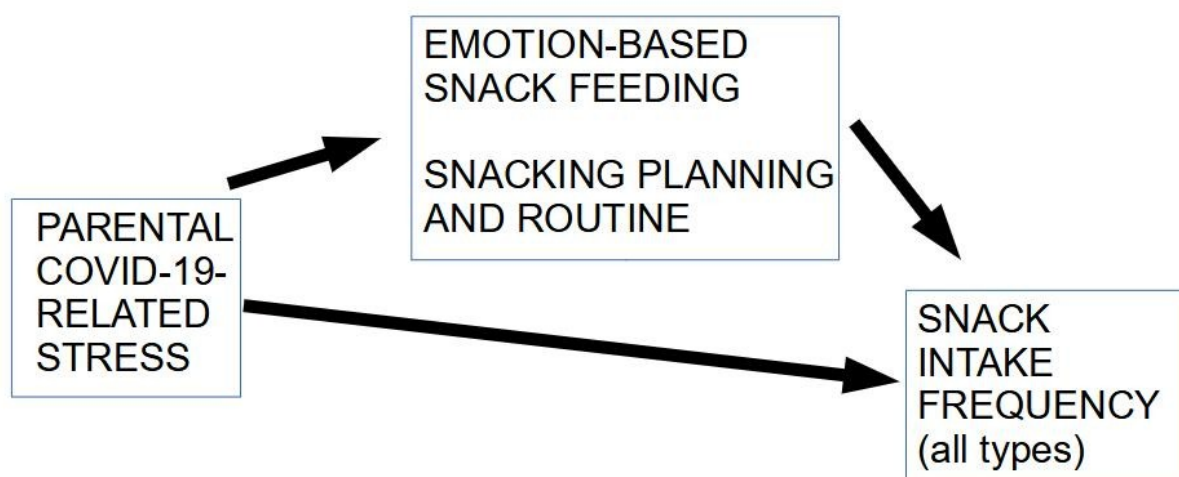
Around 70% of parents reported higher stress levels during the pandemic as compared to pre-covid-19, and the mean overall stress score rose from 3.93 to 4.97 (out of 10).

Some of the food parenting practices were stable (eg: regular meal-times), while others had worsened (eg: "emotion-based snacking feeding").

Parental stress score was positively associated with frequency of intake of all seven sweet and savoury snack food types. However, stress was also associated with "greater efforts to plan and create routines around meals or snacks, and with positive interactions during eating occasions" (eg: parents eating meals with children) (Jansen et al 2021 p6) (figure 5). Jansen et al (2021) explained: "Taken together, our results suggest that parents experiencing high levels of covid-19 stress implement different snack parenting practices; they use snacks to manage children's emotions, and they (newly) create a snack schedule and set up a routine" (p7).

The researchers described an interesting finding: "Differences between pre-school and school-aged children were seen for several food parenting measures. School-aged children were more likely to help prepare foods at mealtimes, likely reflecting their greater autonomy and skills in comparison with pre-school-aged children. As younger children require more guidance, parents of the pre-school-aged group were more likely to eat with their child, provide more structure around meals in general and snacks specifically, and restrict snacks. Additionally, parents in the current study reported higher scores of

instrumental feeding ¹ and emotion-based snack feeding for this age group, which may reflect the increased risk of behavioural problems observed in pre-school children during the pandemic" (Jansen et al 2021 p7).



(Based on figure 1 Jansen et al 2021)

Figure 5 - Significant relationships between variables found by Jansen et al (2021).

The relationships of variables may have been influenced by unmeasured factors, like child's stress and boredom, craving for "hyper-palatable comfort food", and emotional eating.

Jansen et al (2021) outlined some of the other limitations including that the "data were cross-sectional and based on parental self-report and therefore may be biased by subjective recollection about change compared with pre-covid-19. Reliance on an online survey method did not allow for verification of data (eg: respondents actually caring for children in the target age group), and indirectly added 'having internet access' to the eligibility criteria. Although financial hardship was present, our sample was weighted towards wealthier, more educated families (mostly college graduates), and the majority of respondents were white. Our findings may be less applicable to racial and ethnic minorities of low SES [socio-economic status] families living in different geographic regions. Finally, we did not ask families

¹ "Instrumental feeding", for example, could be using food to console a crying child, or to reward good behaviour with food.

detailed questions about their current as well as pre-covid-19 childcare arrangements or children's school attendance. Therefore, we were not able to determine the specific impact of changes in school attendance, for instance, to families' meal routines" (p8).

The "Covid-19 New Mum Study" in the UK showed the impact of the pandemic and lockdown on new mothers and their feeding practices. The anonymous survey ran from May to the end of 2020. The responses of 1865 women in the first week were analysed by Vazquez-Vazquez et al (2021).

Overall, 13% of mothers who had given birth before or during lockdown changed their mode of infant feeding (ie: from breast to formula) in response to the lockdown. The impact of the pandemic depended on factors like the context, and access to support. "Of mothers who delivered during the lockdown, 45% felt they were not getting enough support with feeding (beyond hospital assistance), whilst 57% of those who delivered before lockdown had experienced a decrease in infant feeding support during this period" (Vazquez-Vazquez et al 2021 p6).

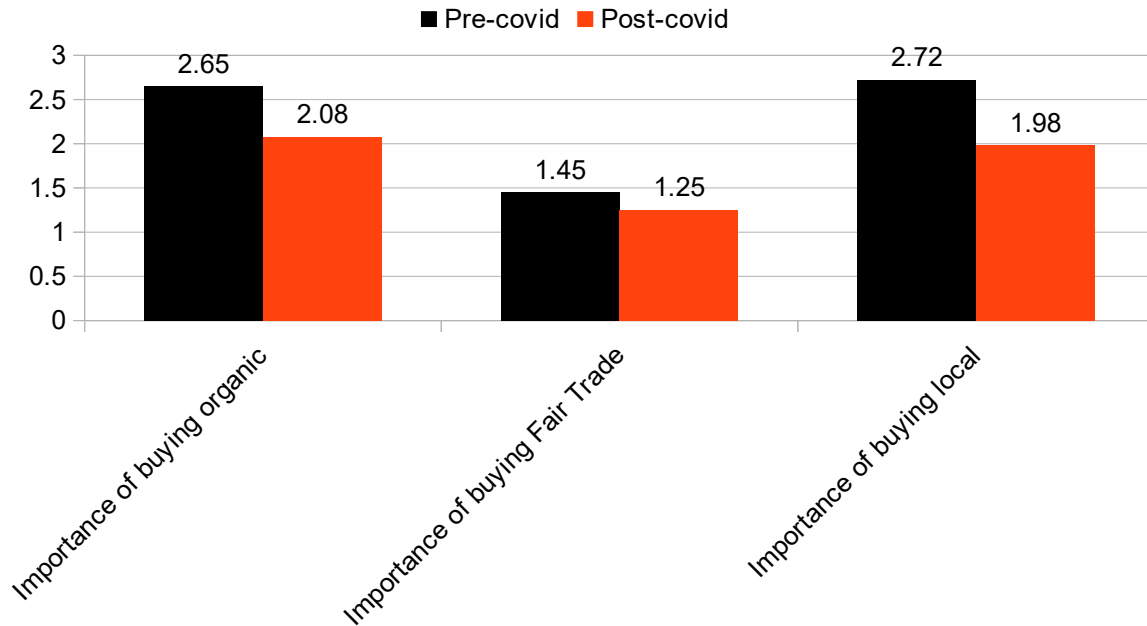
Around one-tenth of mothers reported mental health problems as a result of the lockdown.

10. MISCELLANEOUS

Carolan (2021) explored "ethical consumption" (also known as "political consumption", "conscientious consumption" or "green consumption") in the time of the pandemic. The participants were 221 residents of Denver, Colorado, surveyed pre-outbreak in 2019, and post-outbreak in the summer of 2020. Fifty-eight detailed interviews were also performed (appendix F).

"In almost every case, whether involving organic, Fair Trade, or particular expressions of buying locally, the pandemic reduced the importance ascribed to, and the purchases of, these items" (Carolan 2021 p4) (figure 6).

A quotation from a mother of two young children represented the change in attitudes: "I was definitely more interested in wanting to make a difference before the pandemic – buying the right foods, donating to causes, occasionally volunteering. With Covid, I'm realising those commitments were not as much a priority as I had thought. [...] I don't find myself as interested in wanting to make a difference with my money and time. The craziness with covid definitely had something to do with that" (p7).



(1 = not important; 4 = very important)

(Data from Carolan 2021 table 3)

Figure 6- Mean scores (out of 4) for selected statements pre- and post-covid-19 outbreak.

11. APPENDIX A - LONGITUDINAL STUDY AND STUDENTS

Among the few longitudinal studies is one from Spain (Martinez-de-Quel et al 2021). University students completed the survey in mid-March 2020 (just at the beginning of lockdown), and again in April and May when restrictions were eased. The first round involved 693 participants and the second one hundred and sixty-one.

The online survey covered three main areas:

i) Physical activity (PA) - measured by the Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ) (Elosua et al 1994). This allowed the calculation of total energy expended in a week which was converted into metabolic equivalents (MET-min-wk; MMW). A cut off of 2100 MMW was used to distinguish physical inactivity (ie: below the cut-off). An estimate was also made of a typical week pre-pandemic.

ii) Eating disorders - measured by the Eating Attitudes Test-26 (EAT-26) (Garner et al 1982), which has twenty-six items about bulimia, dieting, and food

control. It is scored 0-78 in total, and a score greater than 20 was used to categorise as an eating disorders case.

iii) Sleep quality - measured by the 18-item Pittsburgh Sleep Quality Index (PSQI) (Buysse et al 1989). The total score ranged from 0 to 21, and five and above was classed as "poor sleeper".

All the variables, except eating disorders, significantly worsened between the two rounds of the survey (ie: an average of 29 days of lockdown in between). The average MMW was 8515 prior to lockdown, but 5053 by May 2020. The PSQI score rose from a mean of 6.2 to 7.2.

Martinez-de-Quel et al (2021) explained the findings further: "No increased risk of developing eating disorders was found in the present study, probably due to their low prevalence, since it has been speculated that those who already showed eating disorders beforehand are the ones that are particularly at risk of being affected by the lockdown... Nevertheless, we observed a significant albeit small, increase in the participants' body weight, which could be due to reductions in PA levels or even to modifications on dietary habits" (pp3-4).

Another distinction was observed in "the fact that the lockdown had a significantly greater impact on those participants who were leading an active lifestyle before the confinement. When comparing data obtained at baseline and once the restrictions began to be eased, physically active participants experienced significant reductions not only in the amount of PA performed, but also on their sleep quality and their self-perceived well-being. On the other hand, no significant changes were observed in the physically inactive group" (Martinez-de-Quel et al 2021 p4).

The negative impact of the lockdown was also greater in larger households living together during lockdown.

The number of participants who completed both rounds of the survey was quite low (around one-quarter). Martinez-de-Quel et al (2021) offered these explanations for the high dropout rate: "To begin with, the first online survey was sent very quickly, just after the state of emergency was issued and no study of this kind had been conducted yet. However, a number of investigations using similar online surveys and targeting the same population began to show up two or three weeks later in

our country. Thus, it could be hypothesised that participants in our study received a fair number of online surveys and refused to answer the same questions again. Additionally, it should also be considered that the first online survey was sent when people were confined; therefore, they had plenty of time to fulfil it. On the contrary, when they were asked to answer the online survey for the second time, the first relief measures in response to the lockdown situation had been established, so it is plausible to think that most of the participants devoted their increasing free time to other activities" (p4).

Furthermore, it was accepted that "the online survey was long and exhaustive and some of the questions were not easy to answer, specifically those related to the amount of PA performed that appeared at the beginning of the online survey, which might have negatively affected the response rate" (Martinez-de-Quel et al 2021 pp4-5).

Students

In another study with students, Powell et al (2021) performed nine online focus groups with thirty students at the University of Maryland (UMD) in April 2020. Usually the students had eaten at the university dining halls. Analysis of the transcripts produced a number of themes including:

a) Food choices - Overall, poorer nutrition and increased caloric content during covid-19.

b) Food availability - eg: one female student said of her experience during covid: "My options are more limited, so I don't have as much fresh food. So, I'll be eating a lot of canned soups and stuff like that" (p4).

c) Perceived healthiness of available food - eg: one female student described the change: "On campus, I made it a goal of mine to put something nutritious in each meal I have. Whether it be like fruits and vegetables or something, just have a sizeable portion of that, to kind of balance out what I'm doing for the day. That was nice. And just being at home, I'm not necessarily doing that as much. I think it's because of what's going on with this whole pandemic... we have more foods that are not sustainable, non-perishable foods at home... So, I'm not really eating the necessarily nutritious stuff" (p4).

d) Food routines - Two changes in particular were noted: cooking at home, and increased snacking. The latter was described by a female student thus: "I think the biggest thing is that I'm snacking a lot more. I'm not really sitting down or eating three meals a day. I'm eating one big meal and then just snacking through the day. Really because I'm bored, not because I'm hungry" (p5). In relation to cooking, half did and half did not do so at home.

Powell et al (2021) summed up: "University students in this study reported significant, and often negative, changes in food choices during the pandemic compared to when previously on campus" (p5). Where the students lived during covid-19, when the UMD had closed, was important. "When students resided with family during covid-19, parents performed leadership roles, such as purchasing and preparing foods for household consumption. Most students adopted passive roles, particularly by not participating in grocery shopping, and less than half of the students were involved in any meal preparation, even though they were aware that these activities shaped their food choices. Whereas, students living outside of the family home, either alone or with others, assumed responsibility for grocery shopping and cooking meals, suggesting greater autonomy outside of the family dynamic" (Powell et al 2021 p6).

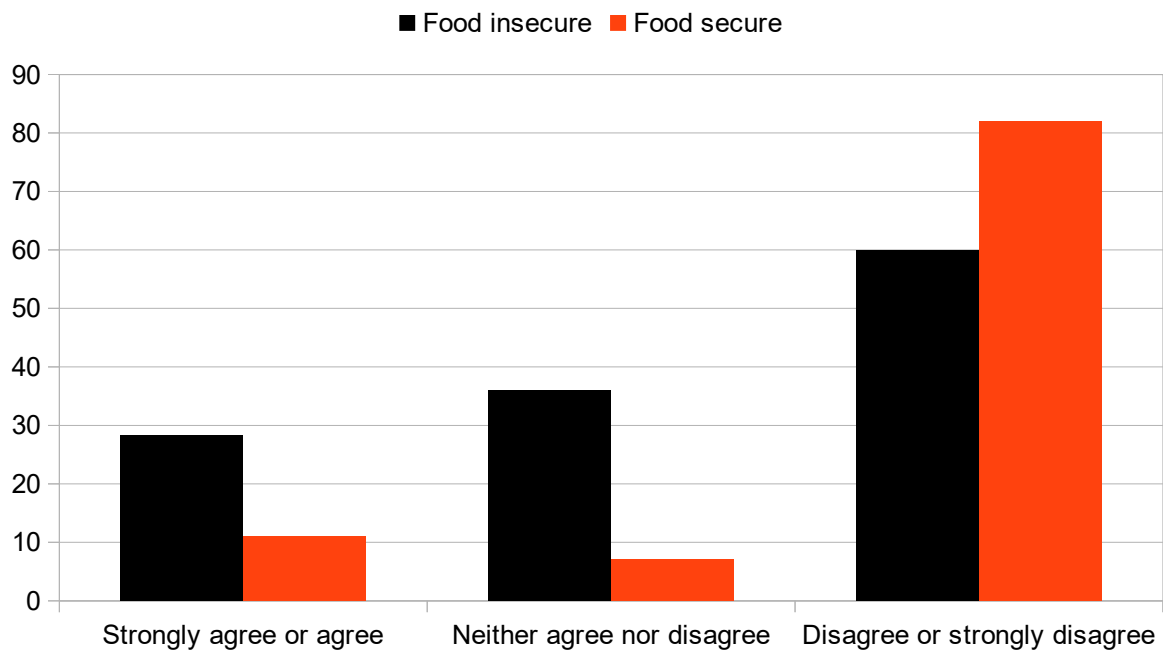
12. APPENDIX B - FOOD INSECURITY VERSUS STOCKPILING

Kent et al (2022) concentrated on the changes in diet between food insecure (FI) and food secure (FS) households. Over 1000 individuals in Tasmania, Australia, were recruited online in May-June 2020. The US Household Food Security Survey Module (HFSSM) was used to measure FI. The short version has six items related to the last month (eg: "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more"). There were also twenty statements about changes in cooking and eating habits since covid-19.

One quarter of respondents were classed as FI ². This group was more likely to be Aboriginal and/or Torres Strait Islander, living with a disability, in a rural area, to be unemployed, single parent household, low educational qualifications, and low income households. They were consuming less fresh food during covid-19

² Official data for Tasmania had a pre-pandemic estimate of 6%, but this used a single-item screening tool (Kent et al 2022).

(figure 7), and the quality of food was poorer.



(Data from Kent et al 2022 table 2 pp5-6)

Figure 7 - Food security/insecurity and responses to the statement, "I am consuming less fresh food" during the lockdown (%).

Also, "food insecure respondents were significantly more likely to agree that their access to food had been impacted by the covid-19 pandemic in comparison to food secure respondents" (Kent et al 2022 p6).

Generally, there was increasing interest in learning how to grow or catch/hunt food during the pandemic.

In summary, the lockdown, Kent et al (2022) explained, had "a disproportionate impact on food insecure households in our sample in relation to the availability of food, their ability to access food and an impact on their cooking and eating habits resulting from the social and physical distancing restrictions of the covid-19 pandemic" (p6).

This study included three statements about food self-sufficiency (eg: "I am growing more of my own food"), which recognised the rural nature of Tasmania. Other studies, which tend to be urban-based, ignore such items.

The sample, though not representative of the

population, was quite large (ie: 1000 out of 500 000 population of Tasmania). Kent et al (2022) accepted that "[P]articipation in this survey was limited to those who spoke fluent English, those with internet access, and those with relatively high literacy given the length of the survey, which may not be representative of all population groups, and the likelihood of participating in the survey may be associated with food insecurity, which may bias the survey results" (p9).

Stockpiling

Stockpiling can be defined as "an accumulation of goods predominantly motivated by a desire to minimise the loss of, or the risk of losing access to, certain products, and may arise due to a belief that a product is in short supply, will soon no longer be available" (Power et al 2020 quoted in Benker 2021). Benker (2021) investigated this behaviour with online interviews of nineteen adults responsible for food procurement in their household in the UK during lockdown. The interviews took place in April 2020.

Media images of empty shelves in the supermarket at the time had presented stockpiling as an irrational and selfish behaviour. Benker (2021) did not find this in her interview: "Stockpiling that occurred within this sample is actually one arm of a multi-faceted resilience strategy enacted by households to manage the shortages in supermarkets during the beginning of lockdown" (p4).

Benker (2021) presented findings under the following themes:

i) Risk and anxiety - "Visiting the supermarket became a particularly conflicted activity - both necessary and potentially lethal" (Benker 2021 p4). For example, "Jenny" said: "being in a supermarket unable to control what other people are doing I find a half an hour shop I would come home and feel like I was infected and I wanted to come home and clean and put everything into quarantine and just be very kind of anxious about there being virus everywhere" (p4).

ii) Stockpiling or not - "Modest extra procurement" was a better description of behaviour rather than stockpiling or "panic buying". For example, "Kathryn" said: "I normally buy a nine pack of toilet rolls, and a couple of weeks before lockdown maybe and I went to the shop and I bought two packs of nine rolls" (p5).

iii) "Resilience strategies" - Five strategies as well as extra procurement were found:

a) Earlier, unusual procurement - eg: "Naomi" said: "I wasn't leaving it until we were completely out of food... but we were shopping a few days before that because if there's no food we've got to make sure that we've got a few days' worth here for the kids" (p5).

b) Use of alternative outlets - Seventeen of the interviewees had had a specific supermarket that was used pre-pandemic, but this changed.

c) Use of informal economy - eg: buying food for friends and family when at the supermarket.

d) "Changes in the ordering of the domestic food economy" - eg: an awareness of food wasted.

e) Presentation and planning - eg: "David" described the importance of the freezer: "so, these are the big freezers I wheeled them out the garage and I put all the fresh food that I could freeze in there safely and they are full vegetables that you can freeze and beans, they're in the freezer... milk, we over-ordered on milk and I froze that. We had to move our diet over to frozen food so kiev's and pizzas" (p7).

Benker (2021) commented: "Although no interviewees said that they had missed meals due to a lack of food, there was loss of access to food and particularly for shielding participants securing food was very difficult" (p7).

She summed up: "Households in this sample demonstrated significant flexibility in where and how they shopped, storage methods and disposal, all of which required significant mental and logistical thought work. Lockdown and the resultant food shortages have been nothing short of a complete change in terms of the domestic food system, taken on as an individualised task to manage their own food supply" (Benker 2021 p8).

The timing of the interviews in the middle of the lockdown was a strength, but the sample was self-selected. Benker (2021) admitted that more research was needed with "groups who are likely to have found food procurement during shortage much harder. For example, those with pre-existing illness and disability..., BAME groups [Black and Minority Ethnicity], elderly groups..., and those with lower incomes... The resilience strategies

highlighted above are harder to achieve if you fall into these categories. This is due to limited capacity to physically investigate other options, lack of space to store extra food, and the time and financial flexibility to buy extra food. For elderly groups, digital literacy and access to an internet connection is likely to have an impact on food access during this time" (pp8-9).

13. APPENDIX C - PRE-PANDEMIC DATA

Having pre-pandemic or pre-lockdown data, rather than depending on recall, is rare. But Poskute et al (2021) were involved in an ongoing intervention study at a supermarket in New York City began in 2018. "Healthy foods" were discounted in this study to see if demand increased over an eight-month period. A two-month baseline measure of food intake was included.

Thirty-one of the participants were contacted three times unannounced and asked about diet in the previous 24 hours in early 2020. Trained interviewers contacted the individuals by telephone.

There was a significant increase in energy density of food (kcal per gram), overall, between pre-covid and during lockdown. But this pattern hid a decrease for males and a larger increase for females. Poskute et al (2021) explained: "Women are more likely to have intakes exceeding recommendations for total sugar, saturated fat, and total fat than men... and more likely to eat such foods in response to stress... The significant increase in the average energy density of solid foods consumed by participants was not reflected in changes in fruit and vegetable intake, expected to decrease, or snack food intake, expected to increase. However, intakes from other food categories that we did not analyse might have changed, including breads, pasta, meats, and prepared salads. Thus, it is likely that a combination of changes in the amounts of various high and low energy-dense foods contributed to the observed change in energy density" (p3).

14. APPENDIX D - BMI

The body mass index (BMI) is a "highly contested measure", yet "it remains the most commonly used measure for defining and diagnosing overweight and obesity and forms the basis for obesity policy projections and targets" (Evans and Colls 2009 p1052).

BMI is part of "the complicit power of numbers" (Barnes and Hannah 2001), which assumes that it is "capable of revealing truths about bodies through measurement" (Evans and Colls 2009 p1052). Power (or biopower) in this context is the Foucauldian idea of "the set of mechanisms through which the basic biological features of the human species became the object of a political strategy" (Foucault 2007 quoted in Evans and Colls 2009). It is not the control of the individual body, but the population as a whole. So, "while the mechanisms of biopolitics may involve the adoption of techniques of control which may discipline individual bodies (such as surveillance), disciplinary techniques rule a population by reducing it to individuals subject to surveillance, punishment and training" (Evans and Colls 2009 pp1054-1055). Medicine is a "power knowledge" that is able to do this.

Returning to BMI, there are categories of "normality" and "abnormality" associated with it, like underweight and overweight, which discipline the population. Put very simply, an individual with a certain BMI that is in the category classed as "obese" is "abnormal" (ie: not just a particular weight). Or at a population level, individuals in that category can be labelled as problematic. Monaghan (2007) observed that "Anglophone culture, is largely fatphobic or sizist comprising prejudice and discrimination towards people who are seen as fat in everyday life" (p68).

A critical approach to obesity (based on Foucault's work) would "question the 'regimes of truth' underlying dominant accounts of fatness as unhealthy, ill and diseased" (Evans and Colls 2009 p1057). Evans and Colls (2009) made three criticisms of the BMI in this context:

i) It is a measure of body mass not fatness, and so can only be a proxy measure of obesity etc. BMI was originally used in Norway to correlate underweight with tuberculosis, but later insurance companies in the USA used it in life insurance premium estimates (Evans and Colls 2009). "Its continued use has... been attributed to its low cost (the measurement of height and weight requiring simple and widely available equipment) and ease of use (individuals are encouraged to monitor their own BMI) in comparison to more direct measures of adiposity which require expensive technology (such as DEXA body scanners) or invasive and technically difficult measurement procedures (eg: the use of callipers to measure skin folds)" (Evans and Colls 2009 p1058).

ii) Simplistic links that are made between BMI and health. The relationship between weight and disease is complex (eg: life expectancy and BMI is a U-shaped curve), and depends on "the arbitrariness of the cut-off points at which one is defined as overweight and obese on BMI scales (which for overweight was lowered from 29 to 25 in 1999, making millions of people who were previously 'normal' weight instantly overweight)" (Evans and Colls 2009 p1058).

iii) The uncertainty of biomedical knowledge is reproduced as "simple, universal obesity truth claims" (Evans and Colls 2009 p1059) often with a moral element. Within a "cultural black box" (Boero 2007) "complexities in scientific knowledge are obscured via association with simplistic 'common sense' knowledges about fatness. These 'knowledges' draw upon a limited range of aesthetic, embodied and emotional registers of fatness that serve to deny the possibility of a positive and healthy obese subject position" (Evans and Colls 2009 p1059).

Monaghan (2007) commented that "obesity science is equivocal at best... and includes non-conforming evidence on, for example, the fat, fit and healthy... Also, even if they are willing, most people are unable to achieve a weight that medicine deems 'healthy' and sustain that over time" (pp70-71).

McDonaldisation of Bodies

Ritzer (2004) coined the term "McDonaldisation" to describe particular changes in business organisation in recent years, and Monaghan (2007) applied the term to bodies. McDonaldisation can be described in four processes (Monaghan 2007 p69):

- Efficiency - "the ability to perform many simplified tasks quickly and on schedule".
- Calculability - "gauging success through large numbers rather than quality".
- Predictability - "eliminating surprises".
- "Obviating human judgment" - "an emphasis upon rules, regulations and controlling structures or technologies".

Taking these processes, Monaghan (2007) applied them

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to a nine-month ethnographic study of thirty-seven men with weight-related issues at mixed-sex classes of a commercial slimming organisation in north-east England. "Constructing fatness as a correctable problem entails calculability, efficiency, predictability and technological control" (Monaghan 2007 p70).

Calculability is seen in, for example, the use of BMI, and in "calorie-counting", while efficiency is the quickest way to a goal (eg: low-calorie foods to help weight loss). The commercial organisation's marketing material emphasised that their programme would produce predictable weight loss (predictability), while those do not succeed can use technology (eg: bariatric surgery).

Together these processes are involved in "manufacturing fatness as a correctable problem" (Monaghan 2007 p88). Monaghan (2007) continued that the "economy of the body is not only financially profitable but politically expedient for various 'stakeholders' committed to tackling obesity. Stated crudely, the orthodox medicalised view is such: many people, and especially the increasing numbers of obese people from lower socio-economic groups, are in poor health because of their fatness. And, if they are not ill and/or dying, they can expect to be so in the not too distant future. One of the irrational consequences of being blinded by fat in this way is that it legitimates and perpetuates a society where many people are dissatisfied with their bodies, are blamed for 'their' problems and are willing to pursue individualised 'solutions' that may be physiologically, if not emotionally, detrimental. A degree of body-authorship, control and healthfulness may be experienced by the few who successfully lose weight and keep it off (even while perhaps remaining at a BMI that medicine classes as 'excessive'), but such is the exception rather than the rule. And, in the process, public and private efforts to streamline bodies reproduce fat phobia and obfuscate larger social determinants of health" (p91).

15. APPENDIX E - FOOD TABOOS

"Food taboos" are often associated in the Western mind with "exotic" behaviours in other cultures, but Wong (2021) pointed out a modern idea gathering pace in the West, namely that seedless fruits are not only non-nutritious but "dangerous". It is assumed that seedless fruits have been manipulated by industrial agriculture, and so are inferior to "natural" fruits with seeds.

But seedless fruits are not always the product of human interference. "In some cases, perfectly fertile plants will produce seedless fruit in the absence of pollination" (Wong 2021 p26).

More relevant is increased fruit consumption. Wong (2021) explained: "While the nutritional difference between seeded and seedless is minimal, we know that the consumption of grapes and citrus fruits has greatly increased since seedless forms were introduced. So when seen in this crucial, wider context, rather than being a net loss for nutrition in our diets, seed-free fruits have been a net gain" (p26).

16. APPENDIX F - DIET CONSEQUENCES

It has been established that diet influences the gut microbiota's composition, and its activity (eg: intestinal gas/flatulence), while the eater reports subjective responses, like satiety/fullness and "digestive well-being"/mood, towards a meal (Barber et al 2021).

Barber et al (2021) investigated microbiota and subjective responses to two types of diet - Western (WD) (high-fat/low-fibre) and fibre-enriched Mediterranean diet (FMD) (low-fat/high-fibre). Twenty healthy male volunteers in Spain spent two weeks on each diet with a two-week gap in between (ie: usual diet). Questionnaires were completed on flatulence (eg: daily number of evacuations), and subjective responses to the meals, while samples of stools, urine, and gas were collected.

The FMD was associated with significantly higher scores of sensations of flatulence and number of evacuations, and with larger and more frequent stools (and of a softer consistency). The presence of higher number of particular microbes in the gut explained these differences. Analysis of the stools and urine showed "clearly distinctive patterns" (Barber et al 2021 p16) for the two diets.

The FMD led to more microbes that produced intestinal gas. Put simply, a healthy gut is evidenced in flatulence and larger stools. These are "side effects" that may have social consequences (eg: increased anal gas evacuations).

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