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The Relationship Between Feasting Periods and Weight Gain: a Systematic Scoping Review

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Abstract

Purpose of Review Whilst evidence indicates that weight gain occurs over holidays, the contribution of specific festive periods and celebrations to eating behaviour and weight gain is unclear. We aimed to synthesise literature on how festive periods and celebrations contribute to population weight gain and weight-related outcomes.

Recent Findings Thirty-nine studies examining (i) body weight changes, (ii) determinants of eating behaviour or (iii) weight-gain prevention interventions during festive periods were systematically reviewed. Of the 23 observational studies examining changes in body weight during festive periods, 70% found significant increases (mean 0.7 kg). Only four studies investigated exposure to food cues and overeating during these periods, with heterogeneous results. All six intervention studies found that weight gain can be mitigated by self-weighing/self-monitoring and intermittent fasting.

Summary Interventions targeting festive periods could have a significant impact on population weight gain. The scalability and sustainability of such interventions require further investigation, as do the broader socioecological factors driving unhealthy eating during festive periods.

Keywords Obesity · Weight gain · Feasting · Holidays · Festive season

Introduction

Unhealthy diets, overweight and obesity are globally recognised as leading risk factors for chronic diseases and premature mortality [1, 2]. In 2016, 18% of children aged 5 to 19 and 52% of adults globally were overweight or obese [3, 4]. The current obesity pandemic has been primarily driven by unhealthy food environments biased towards heavily processed, energy-dense, nutrient-poor (EDNP) foods and beverages [5]. The abundant availability, low prices and constant marketing of these foods [6] have led to overconsumption, which has become socially accepted in most high-income countries.

Traditionally, festive periods such as New Year, Christmas and Thanksgiving would not have contributed to population overweight and obesity because food was scarce for most people and feasting was the domain of those with prestige, power and social status [7]. Today, far more people have access to EDNP foods and beverages over extended festive periods, which may contribute to population weight gain [5, 8]. Additionally, the targeted marketing of EDNP foods and beverages (including alcohol) for festive periods and celebrations can emotionally bind these unhealthy items to happiness and pleasure in our minds [9]. With increasing globalisation and multi-culturalism, populations are able to engage with a broader range of national, cultural and religious celebrations, increasing further the exposure to EDNP foods and beverages and opportunities for their consumption.

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Certain periods during the year have been found to carry a particularly high risk for weight gain [10–12]. A systematic review of seven studies examining seasonal changes in the weights of children suggested that the summer season is associated with weight gain, especially in US ethnic minorities and children that are already overweight [10]. Moreover, evidence from a US study published in 2000 suggested that 52% of the annual weight increase in a convenience sample of 195 individuals occurred in the 5-week period between Thanksgiving and New Year (i.e. over the winter holiday period) [11]. Four previous reviews, three of which were narrative and two broadly focusing on holiday weight gain in children, have been conducted [10, 12–14]. Whilst these narrative reviews have concluded that weight increases by a small amount during the summer or holiday periods, changes in weight and weight-related nutrition outcomes over festive periods and celebrations, specifically, remain unclear. There is thus a clear need for a comprehensive, systematic literature review of the contribution of feasting to dietary intake and population weight gain. We therefore sought to conduct a systematic scoping review to summarise the available literature on the contribution of festive periods and celebrations to weight gain and weight-related outcomes. In addition, we explored the factors or mechanisms that drive unhealthy nutrition and weight gain during festive periods and celebrations, as well as the interventions, policy recommendations and weight management guidelines that could be implemented to limit or prevent weight gain during festive periods.

Methods

The PRISMA-Scoping Review guidelines were used to guide the reporting of this review (see Supplementary Material) [15]. A scoping review was selected as the most appropriate study design given that our research question aimed to explore the extent and variety of evidence available on festive feasting and a broad array of weight-related outcomes [15]. This review therefore aimed to inform future research priorities [15]. Systematic searching methods were employed to aid the robustness of the scoping review.

Search Strategy

To identify records relevant to our research aim, a comprehensive search strategy was developed using the PEO (Population; Exposure; Outcome) format. The search terms and subject headings were derived from narrative reviews [12, 16] and landmark studies published on the topic [11, 17–19]. The three search concepts included (i) healthy populations (ii) feasting, celebrations and holidays and (iii) weight-related outcomes. Specific festive periods were also searched to align with the major global religions—Christianity, Islam, Hinduism, Buddhism and Judaism—accounting for approximately 77% of all religious beliefs [20]. Commonly celebrated Chinese holidays were also included in the search. Search limits were applied to only include peer-reviewed articles that were published in English. No year restrictions were imposed. The final search was conducted on the 20th of March 2019 and tailored to the following databases based on the Cochrane systematic review handbook recommendations [21]: MEDLINE Complete, Academic Search Complete, Global Health, Health Source Nursing/Academic Edition, CINAHL Complete, PsycINFO, EMBASE and Informit Health Collection. An example of the full (MEDLINE Complete) search strategy can be found in the Supplementary Material. Reference list and forward citation searching of each included study and relevant reviews were also conducted to further secure relevant articles.

Study Eligibility and Selection

All records retrieved from the systematic searches were assessed against pre-determined criteria for eligibility into this review. Studies were only included if they specified a primary or secondary aim that clearly focused on exploring the impact of feasting or unhealthy eating practices on overweight and obesity during festive periods and celebrations (herein simplified to 'festive periods'). Whilst weight-related outcomes (i.e. weight and BMI) were identified as the primary outcomes of interest, we also included other weight and nutrition-related mechanisms linked to weight gain (e.g. waist-circumference, percentage body fat, energy intakes, eating and purchasing behaviours, food associations) as secondary outcomes to align with the aims of our scoping review. All study designs involving primary research (i.e. case series, cross-sectional, cohort, qualitative, mixed methods, clinical trials) were eligible for inclusion provided they examined associations between festive periods and weight-related outcomes, in-depth insights on possible factors or mechanisms driving weight changes over festive periods or tested the effectiveness of interventions promoting healthy feasting and weight maintenance during festive periods. Studies in workplace, school or community settings were included.

Systematic and narrative reviews, editorials and conference abstracts were excluded. Studies were also excluded if the primary aim centred around examining the effect of fasting periods (e.g. Ramadan) on overweight and obesity as evidence indicates that fasting periods are associated with weight loss [22]. Studies exclusively focusing on sedentary behaviours, changes in exercise patterns and exercise interventions were ineligible for inclusion as our focus was on feasting practices. We additionally excluded studies that focused on seasonal trends in overweight and/or obesity (e.g. school periods vs. summer holidays) as this has been the focus of previous reviews [10, 14] and mechanisms for weight gain cannot be

extrapolated to feasting over festive periods. Finally, given that our target was the general population, studies were deemed to be ineligible if they focused on populations with chronic diseases (e.g. diabetes, cardiovascular disease, chronic kidney disease) or those residing in clinical settings.

Prior to removing duplicate records, the titles and abstracts of all search records were screened against the described criteria by the lead author. Following this, full-texts were screened by two reviewers (CZ and SN) for eligibility. Discrepancies were resolved through discussion between the two reviewers.

Data Extraction and Synthesis

Data from each included study was extracted into a standard template (including information on the authors, year, country, study design, sample size and population characteristics, exposure/intervention description if applicable, outcome measures and key findings) using Microsoft® Excel® for Office 365. The lead author extracted this information from all eligible studies, cross-checking a sub-sample of 33% with a second reviewer (ER) to pilot the template and ensure consistent extraction and interpretation of the findings. Missing information was sourced by contacting study authors ($n = 1$). The data are narratively synthesised to describe the association between exposure to feasting periods and weight-related outcomes (i.e. the strength and direction of this association), factors associated with feasting, and interventions (including type, duration, follow-up and outcomes measured). A meta-analysis was not deemed to be appropriate due to study heterogeneity and the scoping review nature of this work. For these reasons, quality appraisal of the included studies was also not conducted.

Results

Study Characteristics

The systematic search strategy retrieved 10,845 records, with 39 journal articles meeting the eligibility criteria (Fig. 1). Table 1 summarises the characteristics and key findings of each study. The publication dates of the studies spanned three decades from 1989 to 2019 and 62% were published in the last 10 years. Thanksgiving, Christmas and New Year were the most commonly studied festive periods (72%), followed by birthdays and other general celebrations (10%), Nowruz (i.e. Persian New Year, 8%), Halloween (5%), the Chilean National Holidays (5%) and Greek Easter (3%). Most studies were undertaken in the USA (62%), with the remainder conducted in Iran ($n = 3$), the UK ($n = 2$), Chile ($n = 2$), Sweden ($n = 1$), Greece ($n = 1$), the Netherlands ($n = 1$), Portugal ($n = 1$), South Africa ($n = 1$), Brazil ($n = 1$), Canada ($n = 1$) and one study spanning the USA, Germany and Japan. Study samples were all conveniently obtained, with study size varying from 19 individuals [23] to a panel of 500,000 households [24••], and participants were 32–100% female (although only six studies sampled less than 50% females). The studies represented populations of various ages from pre-school or school-aged youth (18%) to college students (18%) and other adults (64%).

Observational studies (82%) were more common than controlled trials or interventions (18%). Most observational studies were case series (56% of all studies), following a sample over the holiday exposure. Pre/post (5%), case-control (3%) and longitudinal cohort studies (3%) were employed less frequently to examine differences between groups. Cross-sectional studies were also used to a lesser extent (15%). Long-term follow-up measures (i.e. beyond the festive periods) were used in fourteen studies [11, 25–28, 24••, 29••,30••,31,32,33,34,35,36], with durations ranging from 3 weeks to 5 years. Seventy-nine percent of all studies reported changes in body weight or BMI as a main outcome [37, 19, 38, 11, 25, 39, 18, 17, 40, 26, 41–44, 28, 29••, 45, 30••, 46–49, 31, 32, 50, 23, 35, 51, 36, 27, 24]. Other outcomes assessed included body composition and percentage body fat (33%) [17, 40, 43, 44, 29••, 30••, 47–50, 23, 35, 51], waist circumference (23%) [38, 18, 43, 30••, 46–49, 51], energy intakes (18%) [23, 33, 34, 48, 51–53], blood pressure (15%) [38, 44, 30••, 31, 23, 35], biochemistry (15%) [38, 40, 45, 30••, 23, 35], waist-to-hip ratio (10%) [18, 31, 46, 49] and hip circumference (5%) [18, 30••]. In addition to energy intake, a variety of weight-related nutrition variables (such as eating behaviours, emotional eating, food perceptions, treat consumption, prevalence of overeating and compensatory behaviours, and food purchases) were measured [26, 43, 24••, 29••, 30••, 33, 35, 36]. Only four studies investigated possible factors or mechanisms driving altered food and nutrition-related practices over festive periods [9, 54–56].

The Association Between Festive Feasting Periods and Weight-Related Outcomes

Across all observational studies examining weight-related changes pre- and post-festive periods ($n = 25$)[37, 19, 38, 11, 25, 39, 17, 18, 26, 27, 41–44, 28, 46–49, 31, 24••, 50, 35, 51], increases in at least one weight-related measure were reported, except for one study which only found an increase in energy intake [23]. Statistically significant increases were noted in 16 of 23 studies (70%) for weight (range of increase 0.25–2.30 kg) [11, 18, 28, 31, 35, 37–39, 41, 44, 46–51], 11 of 15 studies (73%) for BMI (range:0.1–1.4 kg/m^2) [41, 31, 46, 49, 38, 27, 44, 24••, 50, 35, 51], seven of 13 studies (54%) for percentage body fat (range:0.5–2.3%) [17, 35, 44, 47, 48, 50, 51], four of nine studies (44%) for waist circumference (range:0.3–1.4 cm) [38, 43, 46, 51] and three of four studies (75%) for waist-to-hip ratio (range 0.02–0.1) [31, 35, 46]. These studies included all age groups, with some evidence

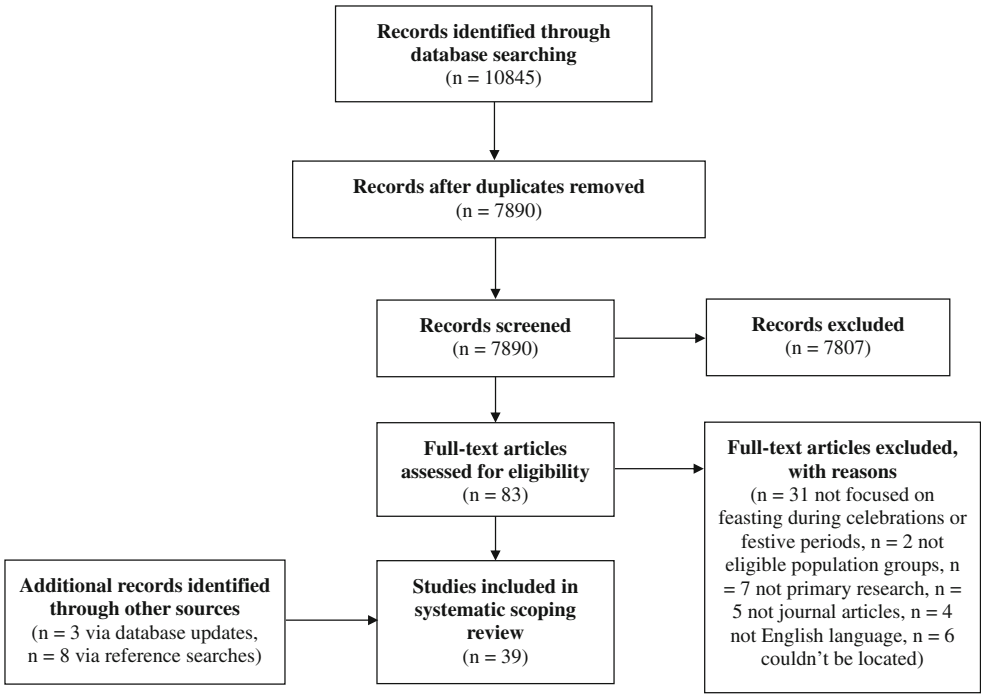

Fig. 1 PRISMA flow diagram outlining study selection for this systematic scoping review

of significant increases between pre- and post-holiday weight [41, 47, 48], BMI [27, 41] and percentage body fat [47, 48] in children. Non-significant changes in weight [17, 23, 43], BMI [27, 43], percentage body fat [23, 43] and waist circumference [47–49] were also observed. Significant decreases in weight-related outcomes were only associated with interventions (described below).

When outcomes were assessed over longer follow-up periods, studies suggested that weight increases were maintained after 1 month [26], 6 weeks [31], 1 year [50] and 14 weeks among RCT controls [30••]. However, weight was not significantly different between pre-holidays and 2 months follow-up in another study [35]. Furthermore, BMI did not significantly change over festive periods for most school children in a study conducted over 2 years [27]. With respect to annual weight changes, weight gained between Thanksgiving and New Year accounted for an estimated 52% of annual weight gain in one US study [11]. In another 5-year study in South Africa, weight gains between November and January contributed 81% and 67% of annual weight gain for males and females respectively [24••]. Helander and colleagues also estimated that body weight increased by 0.7% and 1.0% in the USA and Germany between Christmas and New Year and by 0.7% in Japan over Golden Week [28].

Factors or Mechanisms Driving Weight Gain During Festive Periods

Three studies investigating changes in weight-related nutrition mechanisms over festive periods found that energy intakes significantly increased over Thanksgiving (by 13%) [52], the Thanksgiving/Christmas/New Year period (by 36%) [23] and Nowruz (by 16%) [51]. Whilst one study reported a non-significant change in energy intakes over the holidays (Thanksgiving to New Year), a decrease in diet quality was found [34]. The average weekly energy content of purchases also increased by 440 cal (per serve) over the Christmas holiday period in the USA, mostly attributable to increased expenditure on less healthy items [33]; and unhealthy supermarket purchases made by a large consumer panel in South Africa increased by 41% in December compared to January [24••]. Finally, one study suggested that energy intakes increased more on feasting/eating holidays (e.g. Christmas) compared to civic holidays (e.g. Veterans Day) [53].

Four additional studies explored how exposure to food cues and overeating occasions influenced unhealthy eating over festive periods and compensatory practices. One of two studies investigating food cues over Halloween identified that children were just as likely to choose toys compared to sweets when trick or treating [9]. The second study found that people who were dieting tended to exhibit greater self-restraint when exposed to food cues over Halloween (compared to those not dieting), but that exposure to eating cues did not impact consumption [54]. Exposure to unhealthy foods and beverages on celebratory occasions such as birthdays was also studied in pre-school classrooms in the USA [56]. In this study, Isoldi et al. calculated that children consumed 20–35% of their energy requirements during these classroom celebrations, mostly from EDNP foods and beverages.

Table 1 Characteristics and summary findings of studies ($n = 39$) examining the contribution of festive feasting to weight gain and weight-related outcomes

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
Thanksgiving, Christmas and New Year					
Klesges RC et al. (1989); USA	Case series; Thanksgiving; 1 week (no long-term follow-up)	65; Convenience (52% F; college students)	N/A (observational); energy/dietary intake (by eating restraint and BMI status)	• Increased energy intakes from pre- Thanksgiving to Thanksgiving holiday weekend: days 1–2 (2159 kcal) vs. days 3–6 (2440 kcal), $p < 0.05$. • Overweight subjects consumed less energy than healthy weight subjects (2034 ± 701 kcal vs. 2435 ± 714 kcal, $p < 0.05$) and did not increase energy intakes during the holiday period. • 'Healthy weight, unrestrained eaters' and 'overweight, high-restrained eaters' increased energy intakes from pre- to holiday period. 'High restrained eaters' did not increase their energy intakes from pre- to holiday periods. • Dietary intake NS predictor of weight gain. Eating restraint negatively associated with dietary intake ($r = 0.25$, $p < 0.05$) but positively associated with weight gain ($r = 0.27$, $p < 0.05$). Sex associated with dietary intake ($r = -0.49$, $p < 0.001$) but not weight gain ($r = -0.17$, NS).	↑ Energy intake*
Andersson I, Rossner S (1992); Sweden	Case-control; Christmas to Epiphany (including New Year); 3 weeks (no long-term follow-up)	122; Convenience (72% F; obese cases: BMI 36.8 ± 6.6 kg/m^2, hospital staff/controls: BMI 22.9 ± 2.6 kg/m^2)	N/A (observational, cases previously received intervention); weight	• NS increase in body weight in cases with obesity (0.6 ± 2.4 kg, NS). • Increased body weight in hospital staff controls (0.4 ± 0.8 kg, $p < 0.001$). • No difference in absolute body weight changes between cases and controls.	↑ Weight in controls***, NS change in cases
Baker RC, Kirschenbaum DS (1998); USA	Pre/post; Thanksgiving, Christmas/Hanukkah, New Year's Eve; 10 weeks (no long-term follow-up)	38; Convenience (84% F; 43.6 ± 12.2 years; 57% overweight; ethnicity: 84% Caucasian, 13% African-American, 3% other; education: 21% completed high school, 21% attended high school, 29% graduate degrees; employment: 75% full-time, 13% unemployed, 3% retired, 3% homemakers, 3% part-time, 3% students; marital status: 44% married, 5% separated)	Self-monitoring index (food record, calorie counting, behavioural change guidance); weight	• 500% weight increases observed during the holiday weeks compared to non-holiday weeks (for the overall sample). • Increases in body weight were only observed in the least frequent self-monitors for holiday and non-holiday weeks. • Highly consistent self-monitors demonstrated better weight maintenance and weight loss than the comparator groups ($p < 0.05$ and $p = 0.005$, respectively; equating to an average weight loss of 10 lbs. more than the low self-monitors).	500% Weight ↑ (NR), ↓ weight in high self-monitors
Boutelle KN, et al. (1999); USA	RCT; Christmas, New Year; 8 weeks (3 weeks)	57; Convenience (72% F; BMI 35.5 ± 7.3 kg/m^2; ethnicity: 93% Caucasian, 5% African-American, 2% Hispanic; education: 9% completed high school, 14% attended some college, 35% college degree, 39% graduate degree, 4% other; marital status: 35% single,	Long-term cognitive-behavioural intervention with self-monitoring support by a therapist; weight, BMI, self-monitoring consistency	• Overall, weight significantly increased during the holiday period compared to pre-holidays (0.6 ± 1.9 lbs., $p = 0.001$). • Significant decrease in weight in the intervention group from pre-holiday ($p = 0.036$). At 8 weeks follow-up, the weight change was − 2.0 ± 5.4 lbs. in the	↑ Weight**

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
		53% married, 12% separated, divorced or widowed)		intervention group and 2.0 ± 7.7 lbs. in the comparison group. Decreases in weight were greater for the intervention vs. comparison groups (− 0.2 ± 0.6 lbs. vs. 0.2 ± 0.9 lbs., $p = 0.026$). • Self-monitoring was more consistent during the pre-holiday vs. holiday and post-holiday periods ($p < 0.0001$). Over the holidays, self-monitoring was more consistent among the intervention vs. comparison group ($p = 0.021$). • Self-monitoring consistency was negatively associated with weight change ($r = -0.35$, $p = 0.007$).	
Reid R, Hackett AF (1999); UK	Case series; Christmas; 16 days (no long-term follow-up)	26 (96% response rate); convenience (58% F; 39.5 ± 14.1 years; BMI 20.5 ± 3.3 kg/m^2; university staff: library, technical, clerical, auxiliary, academics)	N/A (observational); weight, BMI, anthropometry, biochemistry, blood pressure	• Significant increases in weight (0.93 ± 1.2 kg, 95% CI 0.45, 1.42 kg), BMI (0.20 ± 0.38 kg/m^2, 95% CI 0.05, 0.35 kg/m^2), waist circumference (1.20 ± 2.16 cm, 95% CI 0.36, 2.11 cm), biceps skinfold (0.45 ± 0.93 mm, 95% CI 0.08,0.83 mm) and diastolic blood pressure (6.3 ± 14.79 mmHg, 95% CI 0.33,12.28 mmHg). • NS changes in triceps skinfold, systolic blood pressure and cholesterol.	↑ Weight*, BMI* and waist circumference*
Yanovski JA et al. (2000); USA	Longitudinal cohort; Thanksgiving, Christmas, New Year; 6–8 weeks (1 year)	195 (98% follow-up rate); convenience (51% F; 39.0 ± 12.0 years; 28% overweight, 21% obese; ethnicity: 17% Black, 10% Asian, 67% White, 6% Hispanic; SEP: median IV[¥]; 88% government employees)	N/A (observational); weight	• Significant increases in weight during the holiday period (0.37 ± 1.52 kg, $p < 0.001$). Significant increases in weight from pre-holiday period were also observed at follow-up in February/March (0.48 ± 2.22 kg, $p = 0.003$). • NS change from February/March to 1-year follow-up (0.21 ± 2.3 kg, $p = 0.13$), resulting in an annual increase in weight of 0.62 ± 3.03 kg ($p = 0.01$). • NS difference between weight loss attempters and those not trying to lose weight (0.13 ± 1.73 kg vs. 0.42 ± 1.49 kg; $p = 0.35$). NS differences by sex, race/ethnicity or SEP. Physical activity ($p = 0.01$) and hunger ($p < 0.001$) were associated with weight change. • Weight gain perceptions exceeded objectively determined weight gain (1.57 ± 1.47 kg vs. 1.12 ± 1.79 kg, $p < 0.001$).	↑ Weight***
Gillis L et al. (2004);	Case series (retrospective);		Participants received behavioural intervention 2 months prior to data	• Increases in weight over summer months (July to August) exceeded weight increases over any	↑ Weight (NR)

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
Canada	Christmas; 1 year (1 year)	73; Convenience (55% F; 10.5 ± 2.8 years; 64.0 ± 23.0 kg; youth attending a weight management clinic)	collection (goal setting, self-monitoring, positive reinforcement, nutrition/physical activity education); weight, BMI	other period ($p < 0.05$) but not compared to Halloween and Christmas.	
Gomes P, Soares de Araújo CD (2004); Brazil	Case series (retrospective); New Year; 8 weeks (no long-term follow-up)	53; Convenience (32% F; 64.0 ± 10.0 years)	N/A (observational); weight	• Seventy percent of participants' weight increased over the New Year holiday. Weight increases were significant between pre- and post-New Year (74.3 ± 1.7 kg vs. 74.9 ± 1.7 kg, $p < 0.001$) and greater for males and heavier individuals.	↑ Weight***
Hull HR et al. (2006A); USA	Case series; Thanksgiving; 1–2 weeks (no long-term follow-up)	94 (94% follow-up rate); Convenience (53% F; 23.0 ± 4.6 years; 72.1 ± 14.0 kg; Ethnicity: 75% Caucasian, 5% African-American, 4% Asian, 10% Hispanic, 6% Native American; college students)	N/A (observational); weight, anthropometry	• Significant increases in weight between pre- and post- Thanksgiving overall (72.1 kg vs. 72.6 kg, $p < 0.05$), equating to a 0.5 kg increase in body weight. • Weight increases were greater in overweight and obese individuals. • Waist circumference and waist-to-hip ratio decreased between pre- and post-Thanksgiving ($p < 0.05$). NS difference in hip circumference.	↑ Weight*
Hull HR et al. (2006B); USA	Case series; Thanksgiving, Christmas, New Year; 6–9 weeks (no long-term follow-up)	82 (82% response rate); Convenience (55% F; 23.0 ± 5.0 years; 34% overweight or obese; ethnicity: 73% Caucasian, 7% African-American, 4% Asian, 12% Hispanic, 4% Native American; college students: 25% freshman, 8% sophomore, 11% junior, 26% senior, 30% graduate)	N/A (observational); weight, body composition	• Thirty-eight percent of participants' weight increased, 39% lost weight and 23% were weight stable. NS change in mean weight from pre-Thanksgiving to post-New Year (71.3 ± 14 kg vs. 71.2 ± 15 kg, $p = 0.71$). • Significant increases in % body fat (25.9 ± 9% vs. 27.0 ± 9%, $p < 0.01$), total fat mass, trunk and leg fat mass ($p < 0.01$), but not total fat free mass. • Weight decreased in healthy weight individuals pre-Thanksgiving to post-New Year ($p < 0.05$). NS changes were observed for individuals that were overweight and obese ($p = 0.14$). • Percentage body fat significantly increased regardless of BMI category ($p < 0.05$).	NS weight change, ↑ % body fat**
Costa C et al. (2007); Portugal	Case series; Christmas; 1 year (1 year)	54 (39% response rate); Convenience (100% F; 19.5 ± 1.6 years; college students)	N/A (observational); weight, BMI, body composition	• Significant increases in weight (55.21 ± 6.3 kg vs. 56.61 ± 6.7 kg), BMI (21.10 ± 2.0 kg/m^2 vs. 21.61 ± 2.1 kg/m^2) and % body fat (21.08 ± 4.2% vs. 23.34 ± 4.5%) from pre- to post-Christmas (all, $p < 0.05$). • Weight, BMI and % body fat changes significantly increased from pre-holidays to 1-year follow-up ($p < 0.05$). Annual weight increases were estimated to be 0.74 kg, although weight at 1-year follow-up was NS different from post-holidays.	↑ Weight*, BMI* and % body fat*

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
Watras AC et al. (2007); USA	RCT; Christmas, New Year; 6 months (no long-term follow-up)	40 (83% follow-up rate); Convenience (intervention: 77% F, 34.0 ± 8.0 years; placebo: 83% F, 32.0 ± 7.0 years; overweight)	3.2 g/day Conjugated linoleic acid vs. 4 g/day placebo; weight, body composition, biochemistry, dietary intake	• Significant increases in weight, BMI and % body fat for the placebo group compared to intervention (1.1 ± 3.2 kg vs. − 0.6 ± 2.5 kg, $p = 0.01$; 0.4 ± 1.1 kg/m^2 vs. − 0.2 ± 0.9 kg/m^2, $p = 0.05$; 0.2 ± 2.3% vs. − 1.0 ± 1.8%, $p = 0.02$). NS changes in fat free mass and abdominal fat mass. Intervention did not change physical activity or diet compared to placebo. Biochemistry was within normal ranges pre and post.	↑ Weight**, BMI* and % body fat* for placebo (compared to intervention)
Phelan S et al. (2008); USA	Pre/post (prospective); Winter holidays (including Christmas); 3 months (1-month)	279 (92% follow-up rate); Convenience (75% F; group 1 'Successful weight losers': 47.5 ± 11.5 years; group 2 'healthy weight': 45.5 ± 13.9 years; lifetime BMI 37.4 ± 9.4 kg/m^2, current BMI 25.5 ± 6.4 kg/m^2; ethnicity: 96% Caucasian; 73% attended college or above)	NA (observational); weight, BMI, weight control strategies, meal frequency, attention to weight and eating	• Increases in weight were observed for both groups pre- to post- holiday: 'Successful weight losers' gained 0.7 ± 1.8 kg and 'Healthy weight' gained 0.2 ± 1.0 kg. These weight increases were maintained at one-month follow-up (0.4 ± 1.6 kg vs. 0.2 ± 1.0 kg). NS differences in absolute weight changes between the two groups. • Increases in weight were more common among individuals classified as 'Successful weight losers' than 'Healthy weight' (39% vs. 17%). • 'Successful weight losers' were less likely to be weight stable between pre- and post- holidays compared to the 'Healthy weight' group (51% vs. 74%, $p = 0.001$) and return to pre-holiday weight (OR 10.6, 95% CI 1.2,90.2, $p = 0.04$). • Weight was positively associated with decreased attention to weight and eating ($p = 0.005$) and increased perceived difficulty in controlling weight ($p = 0.0001$). • 'Successful weight losers' were more likely than 'Healthy weight' individuals to report dietary restraint pre- (35.4% vs. 15.8%, $p = 0.0001$) and during holidays (38.9% vs. 23.3%, $p = 0.0001$), and breakfast consumption pre- (6.4 vs. 5.6 days/week) and during holidays (6.4 vs. 5.7 days/week, $p = 0.006$).	↑ Weight (NR)
Smith DT et al. (2009); USA	Repeat cross-sectional; Christmas, New Year; 2 school years (2 years)	251(42% follow-up rate); Convenience (62% boys, 57% girls ≥ 85% BMI percentile; third, fourth, fifth, seventh and eighth grade boys and girls)	N/A (observational); BMI	• NS change in BMI for third, fourth, seventh and eighth graders but significant increase in BMI for fifth graders ($p = 0.02$); the BMI z-score of fifth grade girls increased 1.28 ± 0.91 to 1.33 ± 0.88, $p < 0.001$ (or by 1.5 lbs. in absolute terms).	↑ BMI*** (fifth grade girls)

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
Branscum P et al. (2010); USA	Case series; Christmas to New Year; 5 weeks (no long-term follow-up)	91; Convenience (46% F; 9.18 ± 0.93 years; 48% overweight or obese; ethnicity: 45% Caucasian, 39% African-American, 6% Hispanic, 10% Other; third, fourth and fifth graders)	N/A (observational); weight, BMI	• Significant increases in weight by 0.56 kg ($p < 0.001$) and BMI by 0.28 kg/m^2 ($p < 0.001$). NS differences by sex. • Significant interaction by BMI category; weight and BMI increases were greater in children that were overweight compared to healthy weight (weight, $p = 0.007$; BMI, $p = 0.013$).	↑ Weight*** and BMI***
Cook CM et al. (2012); USA	Case series; Thanksgiving to New Year; 107 days (normalised over 90 days; no long-term follow-up)	443; Convenience (45% F; males: 36% 40–49 years, 33% 50–59 years, 31% 60–69 years; females: 39% 40–49 years, 38% 50–59 years, 24% 60–69 years; males: 49% overweight and 28% obese, females: 33% overweight and 28% obese)	N/A (observational); weight	• Greater increases in body weight were observed for males 0.9 ± 1.4 kg compared to females 0.6 ± 1.3 kg ($p < 0.05$). This translated to a relative weight change of 1.0 ± 1.5% for males and 0.9 ± 1.8% in females (NS differences by sex). • Sixty-five percent of males and 58% of females gained more than 0.5 kg. Weight increases exceeded 2.0 kg for 17% of males and 12% of females. Weight increased by ≥ 1% for half of the sample. • By BMI category, NS differences in weight increases > 2.0 kg, and absolute weight changes for males and females were observed. Weight increases were greater for males than females with obesity ($p < 0.005$). Females with obesity gained relatively less weight than females of a healthy weight ($p < 0.005$).	↑ Weight (NR)
Wagner DR et al. (2012); USA	Case series; Thanksgiving, Christmas, New Year; 6 weeks (no long-term follow-up)	37; Convenience (59% F; 23–61 years)	N/A (observational); weight, BMI, body composition, anthropometry, dietary habits	• NS difference in weight, BMI and % body fat pre- and post-holiday period (weight 74.0 ± 17.8 kg vs. 73.9 ± 18.1 kg, $p = 0.876$; BMI 25.3 ± 5.3 kg/m^2 vs. 25.3 ± 5.4 kg/m^2, $p = 0.857$; % body fat 25.4 ± 9.0% vs. 25.4 ± 8.9%, $p = 0.974$). • Significant increase in waist circumference (82.0 ± 12.6 cm vs. 82.9 ± 12.5 cm, $p = 0.013$), decrease in vegetable intake (8.6 ± 8.3 vs. 6.2 ± 4.0 cups/week, $p = 0.034$), increase in soft drink intake (1.5 ± 2.2 vs. 2.2 ± 2.6 cans/week, $p = 0.028$), increase in 'splurging' (1.6 ± 1.9 vs. 2.5 ± 2.1 days/week, $p = 0.019$), increase in social events (1.6 ± 1.5 vs. 2.2 ± 1.7 days/week, $p = 0.044$). • NS changes by BMI category or sex. • Positive association between over-eating and weight ($r = 0.48$, $p = 0.004$) and BMI change ($r = 0.50$, $p = 0.003$).	NS weight, BMI and % body fat change, ↑ waist circumference*

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
Kim K et al. (2012); USA	Case series; Thanksgiving, Christmas, New Year; 2 months (no long-term follow-up)	19 (96% follow-up rate); Convenience (58% F; BMI 28.22 ± 1.25 kg/m^2)	N/A (observational); weight, BMI, body composition, blood pressure, biochemistry, diet intake (calories, % energy from macronutrients)	• NS differences in weight, % body fat, blood pressure and blood glucose from pre- to post-holidays. Statistical significance of changes in other measures not reported. • Significant increases in daily intakes of calories (2326 ± 228 kcal vs. 1707 ± 139 kcal), total fat (54.6 ± 5.8 g vs. 74.7 ± 8.4 g), cholesterol (223 ± 31 mmol/L vs. 322 ± 42 mmol/L), sodium (2574 ± 292 mg vs. 2990 ± 239 mg), potassium (1757 ± 176 mg vs. 2110 ± 186 mg) and Vitamin A (925 ± 149 mcg vs. 1465 ± 202 mcg) from pre- to post-holidays (all, $p < 0.05$).	NS weight and % body fat change (NR), ↑ energy*
Stevenson JL et al. (2013); USA	Case series; Thanksgiving, Christmas, New Years; 57 days (no long-term follow-up)	148 (70% follow-up rate); Convenience (68% F; 33.5 ± 1.1 years; 26% overweight and 17% obese; ethnicity: 80% Caucasian, 12% Hispanic, 4% Asian, 3% African-American)	N/A (observational); weight, BMI, body composition, blood pressure	• Significant increases in weight pre- to post-holidays (0.78 ± 0.1 kg, $p < 0.001$, 95% CI 0.57,0.99 kg). • BMI significantly increased by 0.3 ± 0.0 kg/m^2 ($p < 0.05$). • Significant increases in % body fat (0.5 ± 0.2%, $p = 0.007$, 95% CI 0.12,0.77%), systolic blood pressure (2.3 ± 1.2 mmHg, $p = 0.048$, 95% CI 0.01,4.63 mmHg) and diastolic blood pressure (1.8 ± 0.8 mmHg, $p = 0.028$, 95% CI 0.20,3.49 mmHg). • NS differences in changes by sex. • By BMI category, % body fat increased more in individuals that were obese compared to healthy weight (1.6 ± 0.5% vs. 0.2 ± 0.2%, $p < 0.05$). • Changes in weight ($r = 0.203$, $p = 0.013$) and % body fat ($r = 0.333$, $p < 0.001$) were associated with baseline body weight, but not sex.	↑ Weight***, BMI* and % body fat**
Martins CM, Vallen B (2014); USA (Study 2)	RCT; Thanksgiving; 1 day (no long-term follow-up)	110; Convenience (53% F; 20.15 ± 3.13 years; college students)	Food cue (Thanksgiving foods) vs. non-food cue (history of Thanksgiving) vs. control; dieting behaviour and self-restraint	• NS association between dieting and dietary restraint ($p = 0.86$). • Significant association between exposure to food cue and dietary restraint ($p < 0.01$). • Significant increases in dietary restraint in high dieters exposed to the Thanksgiving food cue vs. non-food cue ($p < 0.001$). NS differences for low dieters ($p = 0.61$).	N/A (mechanisms related to weight gain–food cues)
Pope L et al. (2014); USA	Case series; Thanksgiving, Christmas, New Year; 7 months (9–10 weeks)	207 households; convenience (main household shoppers)	N/A (observational); weekly energy content of purchases per serve, financial expenditure	• Weekly energy content of purchases (per serve) increased by 440 kcal from the pre-holiday to holiday periods ($p < 0.003$). Ninety-one percent of the increase was attributable to less healthy food and beverage purchases. This increase in the weekly energy content of purchases	↑ Energy (of purchases)**

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				(per serve) increased further in the post- compared to pre-holiday period (by 890 kcal; $p < 0.001$). • Financial expenditure increased from $105.74 pre-holidays to $121.83 post-holidays ($p < 0.001$). Seventy-five percent ($12.11) of increased expenditure was on less healthy foods and beverages (significant increase compared to pre-holidays; $p < 0.001$). Expenditure continued to increase post-holidays compared to the pre-holiday period ($25.01; $p < 0.001$). The increased expenditure on less healthy items was comparable to the holiday period ($11.77) but expenditure was higher for healthier foods ($13.24; $p < 0.001$ compared to holiday period).	
Helander EE et al. (2016); USA, Germany and Japan	Case series; Thanksgiving (USA), Christmas (Germany), Golden Week (Japan); 1 year (2–6 months)	2924 (1781 in the USA, 760 Germany, 383 Japan); Convenience (USA: 34% F, 42.4 years, 24% obese; Germany: 34% F, 42.9 years, 19% obese; Japan: 26% F, 41.6 years, 11% obese)	N/A (observational); weight	• Significant increases in weight pre- and post-Christmas across all three countries (0.4% in the USA, $p < 0.001$; 0.6% in Germany, $p < 0.001$; 0.5% in Japan, $p = 0.005$). • Significant increases in weight occurred over Thanksgiving in the USA (0.2%, $p < 0.00$), Golden Week in Japan (0.3%, $p < 0.001$) and Easter in Germany (0.2%, $p < 0.001$). • Annual weights increased by 0.7% (0.6 kg) in the USA and 1.0% (0.8 kg) in Germany over the Christmas-New Year period, and 0.7% (0.5 kg) in Japan over Golden Week.	↑ Weight**
Jahns L et al. (2016); USA	Case series; Thanksgiving, Christmas, New Year; 1 year (6 months)	52 (96% follow-up rate); Convenience (100% F; 49.4 ± 0.8 years; BMI 26.5 ± 0.6 kg/m^2)	N/A (observational); energy, % energy from macronutrients, diet quality index score (HEI-2010), fruit and vegetable consumption	• Diet quality index score was significantly lower from Thanksgiving to New Year compared to other periods throughout the year (53.2 ± 1.8 vs. 60.8 ± 1.4, $p < 0.001$). • NS differences between energy intakes ($p = 0.228$) and % energy from fat ($p = 0.241$), carbohydrates ($p = 0.729$) or alcohol ($p = 0.404$) over the holidays compared to other periods throughout the year. • The % energy contributions of protein, total fruit, total vegetables, greens and beans, dairy, seafood, plant proteins, fatty acids and empty calories were significantly lower during the holidays vs. other periods throughout the year ($p < 0.05$).	↓ Diet quality***, NS change in energy intake

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				• NS differences in whole grains, total protein foods, refined grains and sodium consumed over the year.	
Sturm R et al. (2016); South Africa	Repeat cross-sectional; Christmas, New Year; 5 years (5 years)	500,000 households (supermarket purchases); Convenience (people with private health insurance)	Calendar month (exposure); prevalence of food group purchases (group outcomes), BMI (individual outcomes)	• Annual BMI increases of 0.13 kg/m^2 (or 0.43 kg for males and 0.30 kg for females) were observed from 2009 to 2013. Most of this increase in BMI occurred from November to January (Males: 0.10 kg/m^2 or 0.35 kg, Females: 0.80 kg/m^2 or 0.20 kg). • Unhealthy food purchases increased by 41% in December compared to January.	↑ BMI (NR) and unhealthy food purchases (NR)
Mason F et al. (2018); UK	RCT; Christmas; 2 years (2 years)	272 (98% follow-up rate); Convenience (78% F; 43.9 ± 11.7 years; 37% overweight and 31% obese; ethnicity: 78% White, 13% South Asian, 4% Black Caribbean, 0.4% Black African, 3% Mixed, 1% Other Asian; SEP: 25% most deprived, 23% second quartile, 19% third quartile, 33% least deprived; employment: 79% paid employment, 8% self-employed, 1% unemployed, 2% student; marital status: 56% married, 44% single)	Regular self-weighing and recording and weight management information (intervention); weight, body composition, eating restraint, emotional eating, uncontrolled eating	• Weight increases were lower in the intervention (− 0.13 kg, 95% CI − 0.4, 0.15 kg) than comparator groups (0.37 kg, 95% CI 0.12, 0.62 kg). The adjusted difference between the groups was − 0.49 kg (95% CI − 0.85, − 0.13 kg, $p = 0.008$), although the association between group and weight increases of ≤ 0.5 kg was NS ($p = 0.44$). • NS changes were observed between the intervention and comparison groups for percentage body fat ($p = 0.95$), emotional eating ($p = 0.73$) and uncontrolled eating ($p = 0.20$). • The intervention group demonstrated significantly higher cognitive restraint (0.64, 95% CI 0.08, 1.20, $p = 0.03$).	↑ Weight in comparator vs. intervention group**
Hirsh SP et al. (2019); USA	RCT; Thanksgiving, Christmas, New Year; 6 weeks (no long-term follow-up)	22 (55% follow-up rate); Convenience (42% F; 41.0 years; overweight)	Nutrient-supported intermittent energy restriction (intervention) vs. control; weight, biochemistry	• Significant decrease in weight pre- to post-holiday in intervention group (76.3 ± 9.8 kg vs. 75.0 ± 9.8 kg, $p < 0.05$). NS weight change in controls. • In the intervention group, significant increases in HDL-cholesterol (13%, $p = 0.0245$) and decreases in triglycerides (23%, $p = 0.0416$) were observed. • In the controls, significant increases in fasting insulin (43%, $p = 0.0256$), updated homoeostasis model assessment (43%, $p = 0.025$), LDL-cholesterol (8%, $p = 0.0426$) and total cholesterol (7%, $p = 0.0154$) were observed. • Changes in insulin ($p = 0.0227$), total cholesterol: HDL-cholesterol ratio ($p = 0.0419$) and updated homoeostasis model assessment	↓ Weight in intervention group*, NS weight change in comparator group

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				($p = 0.0210$) were significantly different between groups.	
Kaviani S et al. (2019); USA	RCT; Thanksgiving, Christmas, New Year; 19–20 weeks (14 weeks)	111 (94% follow-up rate); Convenience (74% F; controls: 28.3 ± 10.6 years, intervention group: 30.5 ± 12.1 years; BMI controls: 23.9 ± 3.5 kg/m^2, intervention group: 23.6 ± 2.9 kg/m^2; occupation: 32% college aged, 24% graduate students, 42% past or present university staff and non-university adults)	Daily self-weighing with graphical feedback (intervention) vs. control; weight, body composition, anthropometry, blood pressure, biochemistry, eating habits, fat preferences, food perceptions	• NS change in weight throughout the study for the intervention group. • By BMI category, individuals that were overweight/obese lost weight and individuals that were healthy weight were weight stable, pre- and immediately post-holidays (− 1.46 ± 0.62 kg vs. 0.33 ± 0.27 kg, $p = 0.01$). At 14 weeks follow-up, the healthy weight group lost more weight than individuals that were overweight/obese (− 1.72 ± 0.50 kg vs. 0.25 ± 0.75 kg, $p = 0.04$). • Significant increases in weight from pre-Thanksgiving to post-New Year in controls (intervention − 0.13 ± 0.27 kg vs. controls: 2.65 ± 0.33 kg, $p < 0.001$); increase in weight from baseline was still significant at 14 weeks follow-up (66.65 ± 1.60 kg vs. 67.78 ± 1.89 kg, $p < 0.001$). That is, 57% of the weight increase from baseline was maintained at 14 weeks follow-up (1.51 ± 0.39 kg, $p < 0.001$). • By BMI category, NS weight changes were observed for controls pre- and immediately post-holidays, but weight increases were greater in individuals that were overweight or obese compared to healthy weight at 14 weeks follow-up (2.99 ± 0.80 kg vs. 0.87 ± 0.41 kg, $p = 0.02$). At 14 weeks, weight increases were only significant for female controls (females 2.09 ± 0.48 kg vs. males 0.10 ± 0.63 kg, $p = 0.02$). • Significant decreases in % body fat in intervention group vs. control from baseline to follow-up (− 0.87 ± 0.37% kg vs. 0.45 ± 0.26% kg, $p = 0.01$). Decreases in total and LDL-cholesterol were also observed for the intervention group at follow-up ($p = 0.02$ and $p = 0.02$, respectively).	↑ Weight in comparator group***
Wilson MG et al. (2019); USA	Pre/post (intervention); Halloween to New Year; 10 weeks over 2 years (1 year in sub-sample, $n = 36$)	239 (28% follow-up rate); Convenience (90% F; 47.1 ± 10.5 years; ethnicity: 71% African-American, 24% white, 5% others; state government employees)	Team program, self-monitoring and self-weighing, organisational support, encouraged energy deficit; weight, eating behaviours	• Intervention significantly decreased weight from baseline to 8 weeks (89.2 kg vs. 87.2 kg, $p < 0.001$). Weight decreases were observed at all five time points.	↓ Weight in intervention group***

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				• Significant decrease in fast food consumption (food frequency questionnaire scores: 2.1 ± 1.5 vs. 1.5 ± 1.3, $p = 0.001$) and significant increase in fruit and vegetable consumption (3.0 ± 1.3 vs. 3.3 ± 1.3, $p = 0.006$) between pre- and post-intervention periods. NS changes in sugar-sweetened beverage or water consumption. • Follow-up in a sub-sample after 1-year indicated that an average of 4.0 kg was regained during the non-holiday period with a total weight loss of 1.1 kg over 2 years.	
Easter					
Hourdakis M et al. (2010); Greece	Case series; Greek Easter; 1–2 weeks (no long-term follow-up)	138; Convenience (55% F; males: 21.0 ± 1.3 years, females: 21.2 ± 1.9 years; BMI males: 24.3 ± 4 kg/m^2, females: 21.3 ± 2.1 kg/m^2; college students)	N/A (observational); weight, BMI, anthropometry	• Significant increases in weight (69.2 ± 15.3 kg vs. 71.5 ± 15.1 kg, $p = 0.001$), BMI (22.6 ± 3.4 kg/m^2 vs. 24 ± 3.1 kg/m^2, $p = 0.001$), waist circumference (82.7 ± 10.8 cm vs. 84.1 ± 9.2 cm, $p = 0.001$) and waist-to-hip ratio (0.88 ± 0.07 cm vs. 0.90 ± 0.03 cm, $p = 0.001$) between pre- and post-holidays. • By BMI category, weight increases were greater in individuals who were overweight or obese (2.6 ± 3.5 kg, $p < 0.05$). Increases in weight observed for males (1.5 ± 2.4 kg) and females (1.7 ± 1.3 kg; both, $p < 0.001$).	↑ Weight**, BMI**, waist circumference** and waist-to-hip ratio**
National Holidays					
Cristi-Montero C et al. (2014); Chile	Case series; Chilean national holidays; 9 days (no long-term follow-up)	363; Convenience (60% F; 11.8 ± 1.2 years; SEP: medium (Adimark 2000 application manual))	N/A (observational); weight, % body fat, waist circumference	• Significant increase in weight (overall 0.60 kg, $p < 0.0001$; boys 0.60 kg, $p < 0.0001$; girls 0.59 kg, $p < 0.0001$) and % body fat (overall 0.51%, $p < 0.0013$, boys 0.56%, $p < 0.0493$; girls 0.47%, $p < 0.0097$) pre- and post-holidays. • NS changes in waist circumference (overall 0.15 cm, $p < 0.3325$; boys 0.01 cm, $p < 0.6567$; girls 0.26 cm, $p < 0.1181$).	↑ Weight*** and % body fat**
Cristi-Montero C et al. (2015); Chile	Case series; Chilean national holidays; 9 days (no long-term follow-up)	46; Convenience (48% F; 10.5 ± 0.5 years; 24% overweight, 26% obese)	N/A (observational); weight, body composition, anthropometry, energy intake	• Significant increases in weight by 0.250 kg or 0.51% ($p = 0.012$), % body fat by 2.20% ($p = 0.008$) and energy intake by 1733.3 kcal or 44.09% ($p < 0.001$). • NS changes in waist circumference ($p = 0.307$).	↑ Weight*, % body fat** and energy intake***
Halloween					
Schwartz MB et al. (2003); USA	Cross-sectional; Halloween; 1 day (no follow-up)	7 Households; Convenience (children 3–14 years)	Children offered toy vs. candy when trick or treating; choice of toy or candy	• NS difference in choice of toy vs. candy ($n = 135$ vs. 148, $p = 0.44$).	N/A (mechanisms related to weight

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				• NS differences by sex ($p = 0.66$) or age ($p = 0.10$).	gain–treat availability)
Martins CM, Vallen B (2014); USA (Study 1)	Quasi-experimental; Halloween; 1 day (no long-term follow-up)	152; Convenience (50% F; 22.57 ± 3.79 years; BMI 24 ± 4 kg/m^2; college students)	Dieting and exposure to eating cue on holiday vs. non-holiday; consumption of M&Ms.®	• NS independent associations between dieting ($p = 0.14$) or eating cues ($p = 0.68$) and candy consumption. • Significant interaction between dieting and eating cue ($p < 0.05$) whereby frequent dieters consumed less candy on an ordinary day vs. Halloween ($p = 0.65$).	N/A (mechanisms related to weight gain–food cues)
Nowruz (Persian New Year)					
Payab M et al. (2015); Iran	Case series; Nowruz (Persian New Year); 45 days (no long-term follow-up)	66 (76% follow-up rate); Convenience (80% F; 39.5 ± 9.7 years; employment: 20% worker, 15% secretary, 17% nurse, 18% researcher, 27% government employee, 3% doctor; education: 11% completed school, 35% diploma, 33% bachelor, 21% master and medical degree; marital status: 23% single, 71% married, 6% divorced/widowed)	N/A (observational); weight, BMI, body composition, anthropometry	• Significant increases in weight by 0.58 kg ($p < 0.001$), BMI by 0.19 kg/m^2 ($p < 0.001$) and fat free mass by 0.73 kg ($p < 0.001$). • NS changes in waist circumference ($p = 0.194$), hip circumference ($p = 0.685$), waist-to-hip ratio ($p = 0.123$) and fat mass ($p = 0.230$).	↑ Weight*** and BMI***
Pasdar Y et al. (2016); Iran	Case series; Nowruz; 11 weeks (2 months)	125 (63% follow-up rate); Convenience (50% F; 41.1 ± 8.9 years; 72.4 kg; education: 15% less than diploma, 34% diploma, 9% associate degree, 19% bachelor's degree, 16% above bachelor degree and 6% PhD)	N/A (observational); weight, BMI, body composition, anthropometry, biochemistry, blood pressure, food intakes	• Weight significantly increased from pre- to post-holiday periods (72.38 ± 13.73 kg vs. 73.19 ± 13.95 kg, $p = 0.001$) but NS differences from pre- to 2 months follow-up. • Significant increases from pre- to post- holiday periods were also noted for BMI (26.59 ± 4.83 kg/m^2 vs. 27.36 ± 4.91 kg/m^2, $p = 0.001$), % body fat (29.02 ± 7.31% vs. 30.12 ± 7.02%, $p = 0.001$) and waist-to-hip ratio (0.88 ± 0.07 vs. 0.98 ± 0.07, $p = 0.03$). • Systolic and diastolic blood pressures significantly decreased from pre- to 2 months post-holidays (both, $p < 0.05$). • Total triglycerides significantly increased from pre- to 2 months post-holidays (131.32 ± 61.62 mg/dL vs. 153.96 ± 79.11 mg/dL, $p = 0.001$). • Snack consumption (chocolate, candy, ice cream, traditional sweets, nuts and seeds) increased significantly from pre- to post-Nowruz ($p = 0.001$).	↑ Weight**, BMI**, % body fat** and waist-to-hip ratio*
Gholampour Z et al. (2019); Iran	Case series; Nowruz; 4 weeks (no long-term follow-up)	433 (96% follow-up rate); Convenience (82% F; 23.9 ± 4.2 years; BMI 22.8 ± 3.2 kg/m^2; college students: 32% freshman, 19% sophomore, 17% junior, 16% senior, 15% graduate; marital status: 81% single, 19% married)	N/A (observational); weight, BMI, body composition, anthropometry, dietary intakes	• Significant increases in weight (0.4 kg or 0.6% relative increase), BMI (0.1 kg/m^2 or 0.6%), % body fat (0.6% or 3.3%) and waist circumference (0.3 cm or 0.3%); all, $p < 0.001$. Increases in weight and BMI were greater in males than females.	↑ Weight***, BMI***, % body fat***, waist circumference*** and energy***

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				• Significant increases in energy (16%, $p < 0.001$), carbohydrates (16%, $p = 0.011$), total fat (25%, $p < 0.001$), cholesterol (4%, $p < 0.001$), polyunsaturated fats (6%, $p = 0.034$) and sugar (23%, $p = 0.005$). Increased energy and sugar intakes were greater in males than females. Fibre intakes significantly decreased (by 8.2%, $p = 0.004$).	
Birthdays and other celebrations					
Wammes B et al. (2007); The Netherlands	Cross-sectional; general celebrations; 4 weeks (no long-term follow-up)	857 (77% response rate); Convenience (52% F; 27.0 ± 5.3 years; 34% overweight; ethnicity: 91% Dutch; education: 68% university or higher training qualification)	N/A (observational); prevalence of overeating, compensatory behaviours for overeating, use of weight gain prevention strategies	• Forty-nine percent of participants overate ≥ once per week; 16% of participants attributed overeating with a day off or holiday (individuals with a BMI < 25 kg/m^2: 13%, BMI > 25 kg/m^2: 23%) and 12% with parties or celebrations (BMI < 25 kg/m^2: 10%, BMI > 25 kg/m^2: 15%). • Overeating was more likely in females (vs. males; OR = 1.50, 95% CI 1.28,4.35) and individuals that were overweight (vs. healthy weight; OR = 1.79, 95% CI 1.28–4.35). • Forty-five percent of participants employed compensatory behaviours; dietary restriction (42%) was more frequently employed than physical activity changes (24%). Only 21% altered both diet and physical activity. Energy restricting was more likely in individuals that were overweight or obese (vs. healthy weight; OR = 3.09, 95% CI 1.54,6.19). • Seventy-three percent of participants frequently used diet or physical activity strategies to prevent weight gain; diet strategies were more common (70%) than physical activity strategies (35%) or using both types of strategies (32%). The use of a variety of these strategies was typically higher in females and individuals that were overweight.	N/A (mechanisms related to weight gain–frequency of overeating and compensatory responses)
Khare A and Inman JJ. (2009); USA	Cross-sectional; Eating (Thanksgiving, Christmas) vs. other holidays; 2 years (no follow-up)	262; Convenience (heads of households reporting on household dietary intakes)	N/A (observational); energy intakes per meal	• Significant increase in daily energy intakes on holidays vs. non-holidays (by 174 kcal, $p < 0.05$). Significant energy increases were observed at lunch and dinner ($p < 0.01$). • Increased energy intakes on eating vs. civic holidays (339 kcal vs. 49 kcal, $p < 0.01$). Energy intakes on eating holidays vs.	↑ Energy intake*

Table 1 (continued)

Author/s (year); Country	Study design; holiday studied; study duration (follow-up)	Sample size; sampling method (population characteristics)	Intervention or exposure; outcomes	Key findings	Change in weight-related outcome (↑, ↓, NS, NR)
				mixed-holidays (339 kcal vs. 133 kcal) were also higher but NS different ($p < 0.06$).	
Isoldi KK et al. (2012); USA	Cross-sectional; birthdays; 4 observations (no follow-up)	2 classrooms; Convenience (low-income community, pre-kinder and kinder classes with 13–21 students each)	N/A (observational); foods and beverages offered and consumed during school classroom celebrations, energy intake	• One slice of cake and one pouch of fruit punch were consumed during pre-kinder classroom celebrations (class A: mean energy intake of 344 kcal, class B: 259 kcal). • One slice of cake with one scoop of ice cream and one serve of fruit punch were consumed during kinder classroom celebrations (crisps were also offered in one class: mean total energy intake of 455 kcal, candy offered in the second class: 405 kcal). • One in two celebrations offered fruit, whereby one serve was consumed on average. • The estimated energy intakes during classroom celebrations comprised 20–35% of total daily energy requirements for children. Moreover, the empty calories consumed exceeded the USDA's recommendations.	↑ Energy intake (NR) (mechanisms related to weight gain–EDNP festive foods)
Cooper JA, Tokar T (2016); USA	Case series; vacations; 8–10 weeks (6 weeks)	122 (90% follow-up rate); Convenience (65% F; 32.3 ± 13.0 years; 38% overweight, 16% obese)	N/A (observational); weight, BMI, anthropometry, blood pressure	• Significant increase in weight from pre- to post-vacation (0.32 ± 0.08 kg, $p < 0.05$), which was still evident at 6 weeks follow-up (0.41 ± 0.11 kg, $p < 0.05$). NS difference by BMI category. • Vacation duration significantly predicted weight gain ($r = 0.29$, $p < 0.01$). • Significant increases were observed for BMI (25.8 ± 0.3 kg/m^2 vs. 26.1 ± 0.3 kg/m^2, $p < 0.05$) and waist-to-hip ratio (0.81 ± 0.01 vs. 0.84 ± 0.01, $p < 0.05$), although these changes were NS at 6 weeks follow-up. • Significant decreases in systolic blood pressure were observed and maintained at 6 weeks follow-up (117.5 ± 0.8 mmHg vs. 114.9 ± 0.7 mmHg, $p < 0.05$).	↑ Weight*, BMI* and waist-to-hip ratio*

Means and SDs are presented unless otherwise described

↑ increase, ↓ decrease, *NS* not statistically significant, *NR* not reported, *BMI* body mass index, *EDNP* energy-dense, nutrient-poor foods, *F* female, *N/A* not applicable, *RCT* randomised controlled trial, *SEP* socioeconomic position, *USDA* United States Department of Agriculture

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ levels of statistical significance

¥ Hollinghead Four-factor Index of Socioeconomic Status, from II to IV

One cross-sectional survey of 857 Dutch participants aged 27.0 ± 5.3 years broadly investigated the notion of 'overeating', revealing that 49% of the sample overate at least once a week [55]. Only 13% and 12% of individuals attributed overeating to holidays and parties or celebrations, respectively, with no specific festive events reported [55]. Moreover, 45% reported compensating for overeating occasions by modifying their diet or physical activity practices [55].

Interventions to Prevent Weight Gain over Festive Periods

Five randomised controlled trials were included in this review, testing diverse strategies to prevent weight gain in adults between Thanksgiving and New Year. These included conjugated linoleic acid (CLA) supplementation [40], regular self-weighing and behaviour change education [29••], self-weighing with graphical feedback [30••], diet self-monitoring and counselling [32] and intermittent energy restriction [45]. One additional non-randomised intervention studied the effect of a social support program (including self-weighing and team-based activities) on weight gain over the 10 weeks between Halloween and New Year [36]. Intervention groups consistently maintained [29••, 30••] or lost weight; reductions of 0.6 kg with CLA supplementation [40], 1.3 kg with intermittent energy restriction [45], 2.0 lbs. with diet self-monitoring [32] and 2 kg with a team-based social program and self-weighing [36]. Placebo or comparator groups increased weight by 0.2 lbs. [32], 0.4 kg [29••] and 1.1 kg [30••, 40] or did not significantly change weight [45]. In relation to self-weighing, the observational study by Baker et al. noted that weight increased most in the least frequent self-monitors compared to highly consistent self-monitors during Christmas and New Year [19]. In addition to weight changes, regular self-weighing was also found to improve cognitive restraint [29••] and decrease total and LDL cholesterol [30••]. Multiple biochemical markers also improved post-festive period following 6 weeks of intermittent energy restriction (see Table 1) [45].

Nonetheless, an average weight regain of 4.0 kg was observed during the non-holiday period in a sub-sample of 36 participants who participated twice in the social program with self-weighing (despite a net decrease in weight of 1.1 kg over 2 years) [36].

Sub-group Analyses

Whilst some studies assessed ethnicity and socioeconomic demographics, only one from the USA reported that differences in weight-related outcomes according to these variables were not statistically significant [11]. Analyses were more likely to be stratified by sex and BMI category. Increases in weight-related outcomes over festive periods were greater for females than males in one study [30••], greater for males than females in two studies [39, 51] and not significantly different in six studies [11, 41–44, 52]. Increases were greater for individuals who were classified as overweight or obese in six studies [39, 18, 41, 44, 30••, 46], compared to individuals that were classified as a healthy weight (excluding intervention groups); otherwise, non-significant differences were observed [17, 31, 43]. Significant increases in weight-related outcomes were observed in both children [27, 41, 47, 48] and adults (see Table 1 for details).

Discussion

This systematic scoping review of 39 studies has summarised the available literature on how festive feasting periods and celebrations (namely Thanksgiving, Christmas, New Year, Halloween, National Holidays, Easter, Persian New Year and birthdays) contribute to population weight gain. The findings provide consistent evidence of significant weight gain during festive periods (70% of studies measuring this outcome). Whilst the magnitude of weight increase varied from 0.25 to 2.30 kg (mean: 0.7 kg) in the observational studies, two studies equated this to more than 50% of annual weight gain [11, 24••]. Few studies investigated weight-related nutrition outcomes, with only three finding increases in energy intakes over Thanksgiving, Christmas and Nowruz, and two estimating that unhealthy food and beverage purchases increased (by as much as 41%) over Christmas in the USA and South Africa. Easter ($n = 1$), birthdays ($n = 3$), national public holidays ($n = 2$), weekend celebrations and other regular festivities such as weddings were relatively understudied, as were the environmental and sociocultural determinants of festive feasting. In the absence of broader evidence on these determinants, the intervention studies reviewed ($n = 6$) only tested behavioural change interventions (weight/self-monitoring and intermittent energy restriction; one of which included a social support program) and CLA supplementation. Whilst the intervention groups either lost or maintained weight, there is a clear need to better understand how population weight gain can be effectively mitigated and healthy eating can be promoted during festive periods.

Four narrative reviews have previously identified holidays as periods of weight gain [12–14, 16]. Using systematic scoping methodology, we have been able to confirm this finding and broaden the evidence-base to other weight-related measures including BMI, percentage body fat, waist circumference and waist-to-hip ratio. Furthermore, although previous narrative reviews broadly examined holiday periods (including school and summer holidays) that often include festive periods, we focused only on the festive periods themselves. Thus, contrary to conclusions made by previous reviews [12, 16], weight gain over festive periods was observed in children

Table 2 Case studies from Australia, Fiji and Mexico describing festive periods and mechanisms via which they may contribute to unhealthy eating

Festive period	Description of festive period	Mechanisms via which festive period promotes unhealthy diets and weight gain
Australia		
Christmas	Originating from a Christian celebration of the birth of Jesus Christ, but now observed on December 25th by many Christians and non-Christians in Australia and around the world. Many Australians take holidays between Christmas and New Year (which falls 1 week after Christmas and marks the celebration of a new calendar year and new beginnings).	Extended celebration period: • In modern times, the Christmas period has extended, with festivities spreading beyond the few days around Christmas Day to multiple weeks in December and January. • Multiple celebrations are held for family, work and friendship groups. Food transition: • Traditional Christmas foods remain based on British colonial traditions; including several cooked meats (e.g. ham, turkey, prawns), accompanied with assorted vegetables [63]. • Dessert options traditionally include Christmas (fruit) pudding and Christmas (fruit) cake. • Australian barbeques (including processed meats such as sausages) are increasingly incorporated into popular Christmas traditions. Increased alcohol consumption: • Alcohol intakes increase (and may even triple) over the Christmas period [64].
Easter	The Christian celebration of Easter follows a 40-day period of Lent (during which some Christians fast) leading up to Good Friday and Easter Sunday. Public holidays extend from Good Friday to the Monday after Easter. Easter Day occurs between March 22 and April 25 depending on the lunar cycle.	Festive food marketing and increased availability of EDNP festive foods: • Traditionally 'hot cross buns' were consumed during the period of Lent as a plain fruit bun with a cross on top. Recent years have seen the expansion of marketing of hot cross buns commencing in December and January (several months prior to the official period of Easter) [65]. • Traditional hot cross buns have also expanded in range to include chocolate chips and other less healthy recipes. • 'Easter eggs' (and a range of other Easter themed chocolate) are heavily marketed and consumed over several weeks prior to Easter, with almost AU$210 million spent on chocolate over the Easter period [66]. • Consumption of both hot cross buns and Easter eggs is widespread among both Christians and non-Christians in Australia.
Fiji		
Indigenous feasts	Traditionally, Indigenous feasts comprised a wide array of seasonal products, including bush animals, plants and berries [67, 68]. The celebration of food is very much embedded in Indigenous feasting. In Fijian and Tongan culture, communal gatherings centred around religious, political, economic or social activities are always accompanied by an abundance of traditional foods and beverages [69, 70].	Westernisation of eating and feasting: • Traditional Indigenous diets and feasts were centred around healthy foods but in large part have been replaced by less healthy Western dietary patterns.
Diwali	Diwali is the five-day festival of lights (occurring in October), celebrated by millions of Hindus, Sikhs and Jains across the world, including in Fiji.	Increased availability of festive foods: • Sweets and savoury dishes are usually prepared and shared with neighbours and friends. Festive food marketing: • Businesses use this festive period to market their products and certain items are sold at reduced prices.
Christmas	Pacific Island countries including Fiji plan most of their traditional rights (such as taking their children to the village for the first time) during this festive season. This often calls for more celebrations throughout the holidays.	Family gatherings, gift giving and marketing:

Table 2 (continued)

Festive period	Description of festive period	Mechanisms via which festive period promotes unhealthy diets and weight gain
		• Christmas holiday breaks include gathering with extended family for feasts and gift giving. Businesses use marketing tactics to increase purchases during the Christmas holidays. Ceremonies and traditions: • Traditional lovo food and kava ceremonies are popular in Fiji and the consumption of alcohol is usually high towards the New Year celebration.
Eid	Islam celebrates: 1. Eid-ul-Fitr (Feast of Fast-breaking) during the first 3 days of the month of Shawwal. This feast marks the completion of the month of fasting (Ramadan). Eid-ul-Fitr is a manifestation of joy and thankfulness for the opportunities which Allah has given Muslims to fulfil their obligation of fasting and perform other good deeds during the month of Ramadan. 2. Eid-ul-Adha is celebrated on the tenth day of the month of Dhul-Hijjah every year. Many Muslims congregate in Mecca, Saudi Arabia, for the performance of pilgrimage (Hajj) in this month. The sacrifice of an animal on the tenth day of Dhul-Hijjah marks the completion of the pilgrimage.	Increased feasting and marketing of festive foods: • Foods eaten include a spicy beef dish and rice dishes with meat, spices and sago. • Businesses use this festive period to market their products, including sweets, and certain items are sold at reduced prices.
Hibiscus Festival	Hibiscus Festival is organised annually in the capital city of Fiji and is referred to as the "mother of all festivals"—scheduled in August during the second school term holidays. Similar festivals are now being organised by all the municipalities in Fiji.	Increased availability of festive foods: • Foods stalls sell a variety of foods, ranging from traditional foods, to barbequed items and different cultural foods and drinks. Festive food marketing: • Businesses use this festival to market their products, including less healthy options, and sell certain items at reduced prices.
Mexico		
"Guadalupe-Reyes Marathon" (Festive period surrounding Christmas)	In Mexico, Christmas is surrounded by many festivities within a 26-day period; colloquially termed "Guadalupe-Reyes Marathon". Beginning on December 12th with the celebration of Our Lady of Guadalupe—an additional nine daily Mexican holiday parties ("posadas") occur in addition to Christmas and New Year's eve—ending on January 6th with the Three Kings' Day ("día de Reyes") [71]. The "posadas" originated during colonial times as a way to replace Aztec celebrations with Christmas-related Catholic traditions [72]. Nowadays, in many towns and neighbourhoods, "posadas" are still celebrated daily within this 9-day period, but even if not celebrated daily or without the Catholic elements, holiday parties or "posadas" are numerous during this period.	Festive foods are EDNP: • These festivities are accompanied by energy- and sugary-dense foods and drinks, such as "buñuelos", which are traditional sweet pastries consumed at this time of the year. • Traditional beverages include "atole" and "punch" which are corn-based or fruit-based sugary drinks; sodas are also widely consumed. • The "posadas" include "piñatas" and "bolos/aguinaldos" that are filled with candies, peanuts and cookies. • Three Kings' Day is celebrated with a traditional oval shape cake. • Alcoholic beverages are also heavily consumed over this holiday period [71]. Extended celebration period: • Given the type of foods and beverages consumed during these holiday parties and their frequency over the 26-day period, weight gain is a concern for the general population [73]. Recommendations to consume unhealthy foods in moderation during this period have been released by the Ministry of Health in Mexico [74].

EDNP energy-dense, nutrient-poor

[25, 41, 47, 48]. We also found evidence of greater weight gain over festive periods for those that are classified as overweight and obese, compared to healthy weight.

Even though it is may appear obvious that festive periods and celebrations are associated with increased provision of EDNP foods and beverages, the limited literature quantifying the impact of this on weight gain, and the factors that influence it, is concerning. The absence of qualitative studies exploring the lived experiences of individuals during festive periods and celebrations, and leverage points for creating healthier festive and celebratory environments, is also somewhat surprising but highlights an area for future research. It would appear as though unhealthy eating and weight gain during festive periods and celebrations represents the status quo, even among researchers, to the extent that festive food environments have not been sufficiently challenged to date or determinants interrogated enough to offer solutions [57]. As such, few national dietary guidelines advise on how healthy eating can be promoted in festive and feasting environments [58]. Nevertheless, the Ministry of Health in Chile provide one example of tailored eating and drinking recommendations for the national holidays [59]. To lay the groundwork for future research in this area, we provide several case studies in Table 2 to illustrate the factors or mechanisms that may drive unhealthy eating and weight gain during various multi-cultural festive periods and celebrations around the world.

Despite our limited understanding of where to best intervene to promote healthier food environments during festive periods and celebrations, emerging intervention studies (four of which were published in the 12 months prior to our systematic search [30••, 45, 29••, 36]) recognise the need to act. Whilst CLA supplementation and intermittent energy restriction were shown to result in weight loss in intervention participants over Thanksgiving, Christmas and New Year [40, 45], the scalability and sustainability of these approaches is questionable. A recent systematic review further suggests that although short-term energy restriction during Ramadan fasting can produce weight-related benefits (including decreases in weight, BMI and percentage body fat), these benefits are not generally sustained, diminishing 2 to 5 weeks post-Ramadan [22]. By comparison, the collective finding that self-weighing results in weight maintenance (compared to a weight increase in controls) [29••, 30••] points to a simpler public health intervention that is likely to be more cost effective and may be effective for many people [60]. Behavioural interventions such as this, which target individuals and promote personal responsibility for weight maintenance, are only likely to be effective amongst those motivated to make change. They may be stigmatising and ineffective on a population level compared to interventions that aim to address structural barriers to healthy eating by changing the food environment.

Implications for Policy and Future Research

Minimal evidence was identified to inform policy actions to promote healthy eating and ameliorate weight gain over festive periods and celebrations. Nonetheless, it is likely that evidence-based actions to promote healthy food environments across governments, workplaces, schools and communities will be important, including the implementation of widely endorsed structural obesity-prevention policies such as marketing restrictions [61] and fiscal policies [62]. Given the associations between festive feasting celebrations and unhealthy foods and beverages, these policies may need to be strengthened and tailored at these times of the year.

In terms of the research priorities stemming from this review, there is a clear need for longer term studies of the impact of feasting during festive periods on weight gain [24••]. This systematic scoping review further illustrates how more solutions-oriented research is required in this area. In particular, there is a need to elucidate (i) where public health interventions should be focused over festive periods (and how this differs across countries and socioeconomic contexts), (ii) how we can challenge social norms around unhealthy feasting, (iii) the cost-effectiveness of preventing weight gain over festive periods, (iv) whether self-weighing can be incorporated into a comprehensive population approach to prevention and (vi) the health benefits arising from festivals and feasting (e.g. stress release, social cohesion and networks) and whether interventions can reduce unhealthy weight gain without affecting the beneficial aspects of festive periods. Indeed, researchers should also seek to better understand how the barriers to healthy eating may be heightened during festive periods and how these periods collectively constitute another aspect our food environments that should to be addressed.

Strengths and Limitations

The systematic scoping review design of this research enabled us to broadly summarise the impact of festive periods and celebrations on weight-related health, thus identifying theoretical gaps to guide future research. However, as with all reviews, the conclusions are limited by the underlying quality of the evidence. In this case, identified observational studies were mostly case series and employed convenience samples—known to be prone to selection bias. Nonetheless, as convenience samples may be more health conscious than the general population, our synthesis may underestimate the true effect of festive periods and celebrations on weight gain. Additionally, limiting our search to only English publications potentially prevented the inclusion of a variety of culturally diverse celebrations. Given that most studies were also conducted in the USA, the sociocultural and environmental differences in festive periods require more comprehensive consideration, including further emphasis on low- and middle-

income countries. Whilst our outcome search terms were restricted to obesity, weight gain and BMI, we comprehensively searched reference lists and citations of included articles to maximise the identification of literature focused on other weight and nutrition-related factors.

Conclusions

Consistent evidence suggests that weight gain occurs during festive periods associated with feasting. Importantly, if festive and celebratory food environments can be changed to prevent or limit weight gain, the population health benefits may be substantial. Despite this potential, effective public health interventions to encourage healthier festive food environments and celebrations remain largely uncharted.

Compliance with Ethical Standards

Conflict of Interest CZ was supported by the School of Health and Social Development, Deakin University. SN and JW are researchers within the National Health and Medical Research Council (NHMRC) funded Centre of Research Excellence in Food Retail Environments for Health (RE-FRESH) (APP1152968). The opinions, analysis, and conclusions in this paper are those of the authors and should not be attributed to the NHMRC. The funding sources had no role in the design or execution of this study.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- •• Of major importance

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