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Insights from the ACTION Teens study: a survey of adolescents living with obesity, their caregivers and healthcare professionals in the UK

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ABSTRACT

Objectives: ACTION Teens explored the attitudes, behaviours, perceptions and barriers to effective obesity care among adolescents living with obesity (ALwO), caregivers and healthcare professionals (HCPs).

Design: Cross-sectional online survey study.

Setting: Study across 10 countries; here, we report data from UK respondents.

Participants: Overall, 416 ALwO (aged 12 to <18 years; body mass index ≥95th percentile for age and sex [WHO charts]), 498 caregivers and 250 HCPs in the UK completed the survey (August–December 2021).

Primary and secondary outcome measures: Survey questions addressed key aspects of obesity management for ALwO.

Results: Overall, 46% of ALwO perceived their weight as normal or below normal and 86% believed their health was at least good; 56% and 93% of caregivers responded similarly for their ALwO. Despite this, most ALwO (57%) had attempted to lose weight in the past year and 34% felt highly motivated to lose weight. YouTube and social media were most often used by ALwO for information about weight management (41% and 39%); few ALwO and caregivers sought information from a doctor (13% and 22%). Among ALwO who had discussed weight with an HCP (n=122), 49% trusted their weight-management advice. Only 10% of ALwO and 8% of caregivers were told by a doctor that they/their child had obesity. For HCPs, obesity-related comorbidities were the most common reason for initiating weight conversations with ALwO (73%), while short appointment times were the most common barrier (46%). Overall, 30% of ALwO and 11% of caregivers did not feel comfortable bringing up weight with an HCP.

Conclusions: Improved education and communication are needed among ALwO, caregivers and HCPs in the UK to help improve awareness of obesity, its aetiology and its impact on

health, and to support HCPs to proactively initiate weight-related conversations and build trust with ALwO and caregivers.

Trial registration: ClinicalTrials.gov (NCT05013359).

STRENGTHS AND LIMITATIONS OF THIS STUDY

- The first systematic quantitative examination of the experiences of adolescents living with obesity (ALwO) in the UK.
- Three key stakeholder groups were surveyed: ALwO, caregivers and healthcare professionals.
- Stratified sampling and demographic weighting of caregivers mitigated selection bias.
- The cross-sectional design may have limited the ability to determine cause and effect.
- Surveys were hosted online in English; therefore, respondents without internet access or who were unable to read English were, by default, excluded.

INTRODUCTION

There has been a rise in the prevalence of obesity in young people throughout the UK [1]. Data from the 2021/2022 National Child Measurement Programme showed that in England 10% of children aged 4–5 years were living with obesity and 12% were living with overweight [2]. In the same year, 23% of those aged 10–11 years were living with obesity and 14% with overweight [2]. Across the UK, disparities in the prevalence of obesity also exist, with those living in more deprived areas facing a greater likelihood of developing obesity than those living in less deprived areas [2, 3].

Obesity during adolescence will likely continue into adulthood, which may lead to lifelong health complications [4–6]. Of note, obesity is associated with mental health issues among children and adolescents living with obesity (ALwO) [7, 8], and there is increasing evidence suggesting a bidirectional relationship between the two [9–11]. Furthermore, socioeconomic disadvantage may increase the risk of comorbidity between obesity and poor mental health, and this risk increases with age [9]. However, intervention during early childhood can lead to long-term improvements in body mass index (BMI) [12].

Lifestyle and behaviour interventions are the cornerstones of treatment for ALwO and there is a growing body of literature on the effectiveness of multidisciplinary team intervention [13]. The National Institute for Health and Care Excellence recognises, among others, the role of primary care providers – often perceived as 'gatekeepers' – in managing obesity among children and adolescents, including by raising awareness and making referrals to weight-management services [14, 15]. There is currently no nationwide approach in the UK to commission weight-management services for young people, and when provided, these services and the data they collect are inconsistent [16]. However, a pilot scheme of Complications from Excess Weight clinics in England recently began to deliver on the long-term plan for the

National Health Service (NHS), which envisages a holistic, multidisciplinary approach for treating severe obesity-related complications in young people [17].

Considering the rising prevalence of obesity in young people and the current healthcare environment and capacity within the UK, research on the lived experiences, needs and challenges of ALwO, caregivers and healthcare professionals (HCPs) is lacking. The Awareness, Care and Treatment In Obesity maNagement (ACTION) Teens survey study explored attitudes, behaviours, perceptions and barriers to effective obesity care among ALwO, caregivers and HCPs from 10 countries; here, we present data from the UK participants.

METHODS

Study design and participants

ACTION Teens (NCT05013359) was a cross-sectional survey study conducted in Australia, Colombia, Italy, Mexico, Saudi Arabia, South Korea, Spain, Taiwan, Turkey and the UK; the full methods have been published previously [18]. Data from the UK were collected between August 2021 and December 2021 via an online survey.

Eligible adolescents were aged 12 to <18 years, living in the UK and had a BMI – calculated from self-reported weight, height, age and sex – ≥95th percentile for age and sex based on World Health Organization charts [19]. Eligible caregivers were ≥25 years of age, lived with their ALwO for ≥50% of the time, were based in the UK and were involved in healthcare decisions for their adolescent. Eligible HCPs were practising in the UK, had worked in clinical practice for ≥2 years, cared directly for patients for ≥50% of their time and were visited by ≥10 ALwO in a standard month.

The study was approved for the UK by the Institutional Review Board of WCG, Puyallup, WA, USA (tracking number: 20212733; approval date: 27 July 2021). Informed consent was provided by all participants, including a parent/legal guardian of the ALwO. The study was conducted according to the EphMRA Code of Conduct, the principles of the Declaration of Helsinki and applicable laws/regulations related to management of personal information.

Survey development

Separate yet overlapping surveys were created for the ALwO, caregivers and HCPs. An international steering committee that included content experts, as well as HCPs, developed/approved the survey materials; the members of the steering committee authored the global ACTION Teens study manuscript, in which the full surveys were published [18].

Patient and public involvement

A person living with obesity was involved in the design and dissemination plans for the ACTION Teens study.

Procedures

KJT Group Inc., Rochester, NY, USA, carried out data collection. Data were collected via an online survey that was programmed with Decipher Survey Software (FocusVision Worldwide Inc.). Online panels/databases were used to recruit caregivers and ALwO by targeting/screening adults from a stratified general population sample. To increase the number of 'matched pairs' of caregivers and ALwO, caregivers were asked if their ALwO would like to participate; after recruitment of matched pairs reached a maximum, recruitment of ALwO and caregivers continued with a view to increasing the number of respondents to meet the target sample size. Physician panels/databases (online) were used for recruiting HCPs. All surveys were provided in English. ALwO and caregivers received nominal honoraria/panel credit from the online panel company and HCPs were compensated at fair market value for the UK and their specialty type.

Outcomes

As previously described [18], the surveys investigated key aspects of obesity management for ALwO, including: attitudes towards obesity/people living with obesity, and beliefs regarding the impact that obesity has; weight-loss efforts in the past year, motivations/barriers for weight-loss efforts and how successful weight loss/management is defined; history/frequency of discussions about weight and initiator of/responsibility for starting weight discussions between caregivers/ALwO and HCPs; interactions between ALwO, caregivers and HCPs, reasons why obesity might not be talked about and frequency of obesity being diagnosed and follow-up appointments; and information sources used to learn about weight loss, weight management, obesity and healthy lifestyles. These outcomes were assessed using Likert scales, numeric

responses, no/yes responses or multiple/single item selection (response options dependant on question). To ensure there were no missing responses, participants were required to answer all survey questions.

Sample size

The target sample size for the UK was 675 completed surveys from ALwO, 675 from caregivers and 250 from HCPs. Sample sizes were chosen based on the population size of ALwO in the UK and to balance recruitment feasibility and statistical power.

Statistical analysis

The full analysis set comprised all ALwO, caregivers and HCPs who completed the survey. De-identified data were analysed by KJT Group using Stata (StataCorp LLC, version IC 14.2), Excel (Microsoft 365) and SPSS (IBM, version 23.0). Data were described using univariate descriptive statistics (proportions, means and medians). If appropriate, continuous variable outliers were removed from the data set and a reduced base size reported. Data for caregivers were weighted based on representative demographic targets within the UK (for sex, age, education, household income and region) for generalizability and to mitigate selection bias. The full statistical methods have been published previously [18].

RESULTS

Demographics and characteristics

A total of 416 ALwO, 498 caregivers and 250 HCPs completed the survey in the UK, representing 36%, 43% and 22% of all UK respondents, respectively (**online supplemental figure 1**). The demographics and characteristics of respondents are summarised in **table 1**. Most participants were from England. Among ALwO and caregivers, there were more female respondents than male; 30% of ALwO were living with Class III obesity and over a third of caregivers had obesity (Class I, II or III) (**table 1**). Most HCPs (60%) were primary care practitioners and 26% of HCPs reported receiving advanced training in weight management or obesity following medical school.

Table 1 Demographics and characteristics

Demographics and characteristics	ALwO	Caregivers	HCPs
Full UK sample, N	416	498	250
Matched pair (ALwO and caregiver), n (%)	21 (5)	21 (4)	N/A
Unmatched, n (%)	395 (95)	477 (96)	N/A
Country of residence, n (%)			
England	348 (84)	425 (85)	220 (88)
Northern Ireland	12 (3)	6 (1)	9 (4)
Scotland	31 (7)	40 (8)	13 (5)
Wales	25 (6)	27 (5)	8 (3)
Age, years, mean (SD)	15.3 (1.7)	41.4 (8.3)	44.9 (9.3)
Female, n (%)	246 (59)	288 (58)	89 (36)
BMI classification of ALwO*			
Obesity Class I	49% (n=204)	55% (n=276)	60% (SD: 21)
Obesity Class II	21% (n=86)	22% (n=112)	26% (SD: 14)
Obesity Class III	30% (n=126)	22% (n=110)	13% (SD: 11)
BMI classification of caregivers and HCPs,† n (%)			
Underweight (<18.5 kg/m^2)	N/A	42 (8)	6 (3)
Healthy weight (18.5–24.9 kg/m^2)	N/A	139 (28)	123 (63)
Overweight (25.0–29.9 kg/m^2)	N/A	132 (27)	54 (28)
Obesity Class I–III (≥30.0 kg/m^2)	N/A	185 (37)	13 (7)
Primary medical specialty, n (%)			
Primary care practitioner	N/A	N/A	150 (60)
General paediatrician	N/A	N/A	40 (16)
Other specialty‡	N/A	N/A	60 (24)

*BMI classification for ALwO participants, the ALwO of caregiver participants and the ALwO patients of HCP participants (Obesity Class I = BMI ≥95th percentile for age and sex; Obesity Class II = BMI ≥120% of 95th percentile for age and sex; Obesity Class III = BMI ≥140% of 95th percentile for age and sex). ALwO and caregiver data represent the proportion (number) of ALwO; HCP data represent the mean proportion (SD) of ALwO patients.

†BMI classification of participating caregivers/HCPs (n=196 for HCPs).

‡Includes nutrition specialists, paediatric endocrinologists, paediatric gastroenterologists, obstetricians and gynaecologists.

ALwO, adolescents living with obesity; BMI, body mass index; HCP, healthcare professional; N/A, not applicable; SD, standard deviation.

Table adapted from [18].

Perceptions of obesity

Among ALwO, 46% perceived their weight as either normal or below normal, 86% believed their health was at least good and 50% believed their health was at least very good (**figure 1A and 1B**). Similarly, most caregivers (56%) perceived their ALwO's weight as either normal or below normal, 93% believed their ALwO's health was at least good and 71% believed their ALwO's health was at least very good (**figure 1A and 1B**).

Few ALwO (15%) were extremely or very worried about their weight and a similar proportion of caregivers (12%) believed this to be the case for their child (**figure 1C**). Less than a fifth of ALwO (19%) and only 13% of caregivers worried a lot about how their/their child's weight could impact their future health (**figure 1D**). Among ALwO and caregivers, 31% and 41%, respectively, were not worried at all about the impact of the adolescent's weight on their future health (**figure 1D**).

Weight-loss attempts, barriers, motivators and attitudes

Overall, 57% of ALwO had made at least one weight-loss attempt in the past year and 28% reported being very likely to make a weight-loss attempt within 6 months; fewer caregivers responded similarly for their ALwO (27% and 20%, respectively).

Lack of motivation was the barrier to weight loss most often reported by ALwO (selected by 46%), whereas caregivers most often reported that none of the specified response options were keeping their child from losing weight (**online supplemental figure 2A**). ALwO and caregivers also reported barriers related to the cost (selected by 17% of ALwO and 10% of caregivers) and availability (selected by 20% of ALwO and 5% of caregivers) of healthy food

and the cost of weight-management programmes (selected by 11% of ALwO and 5% of caregivers). For HCPs, 94% agreed that both unhealthy eating habits and lack of exercise were barriers to their adolescent patients losing weight (**online supplemental figure 2B**). ALwO's top motivators for losing weight were wanting to be more confident/feel better about themselves (selected by 50%) and wanting to be fitter/in better shape (selected by 44%); 20% of ALwO had no desire to lose weight (**online supplemental figure 3**). These data differed to those for caregivers and HCPs: caregivers most commonly believed their child had no desire to lose weight (selected by 35%) and HCPs believed wanting to be more confident/improve self-esteem, wanting to improve social life and wanting to look like peers were the top motivators for ALwO (selected by 70%, 69% and 66%, respectively) (**online supplemental figure 3**).

Regarding attitudes towards weight loss, approximately one-third (34%) of ALwO felt highly motivated to lose weight and three-quarters of ALwO (75%) felt weight loss was completely their responsibility. In comparison, 45% of caregivers and 55% of HCPs disagreed that weight loss was completely the ALwO's responsibility. More than half of caregivers (58%) thought their child would naturally slim down as they got older and taller, and 45% felt that following a successful weight-loss attempt, it would be easy for their child to keep the weight off; 21% and 35% of HCPs, respectively, responded similarly for their adolescent patients.

Information sources

ALwO most often reported that they seek information about weight management from YouTube (41%) and social media (39%); caregivers often used YouTube as well (24%), alongside search engines (26%) and family and friends (24%) (**figure 2**). Few ALwO (13%) and caregivers (22%) sought information from a doctor.

Conversations about weight

A small proportion of adolescents (10%) and caregivers (8%) had been informed by a doctor that they or their child were living with obesity. Among ALwO and caregivers who had discussed weight with an HCP (n=122 and n=192, respectively) and HCPs, all groups most frequently reported bringing up the topic of weight themselves during HCP appointments (44%, 41%, 49%, respectively) (**online supplemental figure 4A**). Additionally, among all ALwO and caregivers, most ALwO (63%) felt they were responsible for initiating weight discussions with an HCP; 43% of caregivers thought that their child should bring it up (**online supplemental figure 4B**). Concerningly, most HCPs (66%) felt responsibility varied depending on the patient and 7% thought it was the adolescent's responsibility to initiate weight discussions; only a minority felt it was their own responsibility (18%) (**online supplemental figure 4B**). HCPs reported the presence of obesity-related comorbidities (73%), the adolescent patient's weight (64%) and the patient's mental/emotional state (64%) as the most common reasons for initiating weight-related discussions with ALwO; the patient's unhealthy lifestyle was selected by 50% of HCPs.

ALwO who had discussed weight with an HCP reported a mixture of positive and negative feelings after their most recent discussion; 29% of ALwO felt supported and 25% felt motivated, although a similar proportion felt ashamed (29%) and depressed (23%) (**online supplemental figure 5**). Caregivers who had discussed their child's weight with an HCP tended to have more positive feelings after the last discussion, with hopeful (47%), supported (44%) and motivated (41%) among the most common feelings described. Fifteen percent of ALwO and 11% of caregivers felt surprised (**online supplemental figure 5**). Among the ALwO and caregivers who had discussed their/their child's weight with an HCP, 49% of ALwO and 68% of caregivers trusted the HCP's weight-management advice, and 43% of ALwO and 61% of caregivers felt the HCP understood the difficulties of weight loss.

Overall, 46% of the ALwO who had discussed weight felt comfortable talking to an HCP about their weight; a greater proportion (66%) of caregivers who had discussed their ALwO's weight with an HCP felt comfortable. However, in terms of barriers to discussing weight, 30% of all ALwO and 11% of all caregivers did not feel comfortable bringing up their/their child's weight with an HCP (**figure 3**). In addition, 20% of HCPs did not feel comfortable discussing weight with their adolescent patients with obesity (**figure 3**). Other barriers selected by ALwO and caregivers included the ALwO already knowing how to manage their weight (selected by 25% and 18%, respectively), not seeing the ALwO's weight as a significant medical issue (selected by 24% and 22%, respectively) and not wanting to discuss weight with either the caregiver or adolescent being in the room for the respective group (selected by 20% of ALwO and 12% of caregivers) (**figure 3**).

Most HCPs (82%) felt they had a responsibility to actively contribute to their adolescent patients' weight-loss efforts and 76% of HCPs felt motivated to help with these efforts. HCPs often regarded appointment times not being long enough (46%) and having more important health issues to discuss (36%) as barriers to initiating weight-loss discussions with ALwO (**figure 3**).

DISCUSSION

Results from the UK analysis of the ACTION Teens study suggest there is misalignment among ALwO, caregivers and HCPs, and highlight areas where improvements in communication and education are required to enhance obesity care for ALwO in the UK. A summary of the barriers identified for ALwO and caregivers is shown in **figure 4.**

A large proportion of adolescents did not recognise they are living with overweight or obesity, despite nearly a third of ALwO having Class III obesity. In turn, few ALwO were very or extremely worried about their weight and few worried a lot about the consequences of their weight on their future health. There was also a high proportion of caregivers in this analysis with overweight or obesity. In areas of high obesity prevalence, people's perception of 'normal' weight can shift, leading to a distorted perception of their body [20]. Additionally, only a small proportion of ALwO and caregivers (10% and 8%, respectively) had been informed by a doctor that they or their child were living with obesity, far fewer than those in the global ACTION Teens study (44% and 29% of ALwO and caregivers, respectively), which may have contributed to the underestimation of ALwO's weight by themselves and their caregivers in this analysis [18].

Most ALwO believed weight loss is solely their responsibility, indicating signs of self-blame and internalised weight stigma. Apparent attitudes of caregivers could partly drive these beliefs; many caregivers believed it would be easy for their ALwO to keep weight off after losing it, and only approximately half of caregivers disagreed that weight loss was entirely their child's responsibility. Additionally, most HCPs agreed that unhealthy eating habits and lack of exercise are barriers to their ALwO losing weight, and only half of HCPs disagreed that weight loss is entirely the ALwO's responsibility. These attitudes feed the misconception that weight is a personal choice, and although weight stigma was not directly assessed in our study, these views may be linked to weight stigma and biased attitudes towards ALwO. Obesity should be recognised as a complex, relapsing, long-term condition with multiple causes, including

genetics, behavioural and social determinants of health [21, 22]. Of note, attitudes among HCPs may impact the level of care provided to people with obesity [23]. Increasing education on the causes of obesity and ensuring interactions with patients are positive may help to reduce weight stigma among HCPs – such training is needed for those working with ALwO [24].

ALwO reported mixed feelings following weight-related discussions with an HCP; 48% reported negative feelings, including ashamed, depressed and blamed, and 30% did not feel comfortable bringing up weight with their HCP. Continued negative experiences and conversations can contribute to depression, anxiety and low self-esteem, and may reinforce feelings of personal responsibility [25]. Taken together, these findings highlight the complexity and sensitivity of these interactions and suggest a need to improve ALwO's interactions with HCPs. This is also despite policy recommendations and consensus statements outlining the importance of respectful communication about weight, including the use of non-stigmatising language, following evidence of weight bias in healthcare [22, 26]. A recent review exploring perspectives of young people who access support for mental health found that they need a trusting relationship to discuss sensitive issues – they wanted their HCP to listen to their concerns with empathy and make them feel comfortable [27]. Continuity of care, unhurried consultations and a long-term patient–doctor rapport all contributed towards a positive relationship [27].

We found that ALwO primarily used social media and YouTube for information about weight. A small proportion of ALwO had sourced information about weight from a doctor, and among those who had discussed weight with an HCP, less than half trusted the advice from HCPs, suggesting an urgent need for HCPs to review communication and engagement strategies for adolescents. A greater understanding of the type and impact of weight-management content that ALwO are viewing on social media could help improve engagement. ALwO may believe accessing information from an HCP is more difficult than social media due to

perceived barriers such as appointment times and few HCPs initiating weight-related discussions. The rapid availability and diversity of information from social media may also be appealing to young people [28]. Of note, reliance on online/digital health technologies increased rapidly during the COVID-19 pandemic [29, 30]. To better communicate with ALwO about weight-management interventions, HCPs should consider a more proactive approach that utilises digital communications and technology.

Although HCPs in this analysis generally recognised they have an obligation to help ALwO manage weight, the presence of obesity-related comorbidities was the most frequently selected reason for initiating weight-loss discussions. Few HCPs (18%) believed they were responsible for initiating these conversations; the majority believed it varies depending on the patient, which calls for further research into who they believe is responsible. Delaying these weight-related conversations and any potential intervention that the ALwO requires may hinder the ALwO's health in the long-term by putting them at greater risk of developing obesity-related comorbidities [12, 16]. Additionally, short appointment times were identified by HCPs as the main barrier to initiating weight-related conversations with ALwO. The time available for consultations in primary care (on average 9.2 minutes) is generally limited by a lack of capacity and competing priorities, such as administrative burdens [31]. A meta-analysis found that insufficient appointment times were an organisational barrier to HCPs having weight-related discussions with the caregivers of adolescents [32]. Furthermore, HCPs felt they had few contact opportunities due to limited routine contact appointments and potential long gaps [32]. Difficulties accessing primary care consultations can make it challenging for adolescents to build a relationship with their primary care practitioner [33, 34]. Professional stakeholders in a UK adolescent weight-management programme echoed that longer-term support was needed for ALwO, although they recognise the current restraints on resources [35]. There is a need to address appointment time constraints, the lack of available resources, the importance of

adequate training and promotion of healthy lifestyles among ALwO and caregivers when considering future interventions within the UK.

This study has many strengths, including the involvement of three respondent groups (ALwO, their caregivers and HCPs involved in obesity management/treatment) and the stratified sampling and weighting of caregivers' data to mitigate selection bias. Limitations include the cross-sectional study design, limiting the ability to determine cause and effect; the reliance on self-reported data (height and weight), which could have led to an inaccurate BMI and does not provide data on body composition; few ALwO and caregivers being matched; and the possibility of response bias, such as the potential bias towards digitally active participants due to the online nature of the survey. Furthermore, in the UK, the survey was available in English only, limiting respondents to those who could understand English. Future studies may also consider involving adolescents or ALwO in the design of questionnaires and studies.

In conclusion, the rising prevalence of adolescent obesity and data from this study highlight a need to improve education and communication among ALwO, caregivers and HCPs in the UK. It is also important to improve trust in HCPs among ALwO to encourage uptake of health services. Additional training for HCPs could help reduce weight stigma and increase understanding of the complexity of obesity, thus empowering HCPs to initiate potentially challenging weight-related conversations with ALwO and caregivers. Recognition of obesity may also improve perceptions of weight among ALwO and caregivers. A whole-system approach to obesity is needed to improve care, including close collaboration with local authorities [36]. On an institutional level, the NHS and health sector should consider establishing additional support and education for ALwO, caregivers and HCPs, to increase recognition of obesity as a chronic disease and to reinforce the importance of appropriate weight-related discussions throughout its workforce. Although resources are stretched, adequate consultation times are required to ensure ALwO receive the care, sensitivity and attention necessary, and to allow HCPs to

address their concerns and build a trusting relationship with ALwO. Weight-related communication strategies in the future should consider using social media and digital technology to improve ALwO's access to high-quality and trusted information about weight.

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Contributors

JCGH is a member and Chair of the ACTION Teens Steering Committee and thus contributed to the design of the study. All authors participated in interpretation of the data and in drafting and revising the manuscript. All authors reviewed and approved the final submitted version. JCGH is the guarantor for this work.

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Competing interests

JCGH reports consultancy fees from Novo Nordisk for his role as a member of the ACTION Teens Steering Committee during the conduct of the study, consultancy fees from Boehringer Ingelheim and Dupont (paid to the University of Leeds), honoraria from Novo Nordisk (paid to the University of Leeds), support from Novo Nordisk for attending meetings and financial support from Dupont for participation in an advisory board (paid to the University of Leeds). AB reports honoraria from Johnson and Johnson, Novo Nordisk, Obesity UK and the Office for Health Improvement and Disparities, outside the submitted work; he is also on the Medical

Advisory Board of, and a shareholder of, Reset Health Clinics. KC reports speaker fees from Apollo Endosurgery and Ethicon and participation in advisory boards for Boehringer Ingelheim and Eli Lilly; he is also the Chair of Trustees for the patient charity WLSinfo and for the European Coalition for People living with Obesity. LJE receives funding from the Medical Research Council and National Institute for Health and Care Research and is a member of the Office for Health Improvement and Disparities National Child Measurement Programme board and the NHS Complications from Excess Weight Clinics E-board. AG is a full-time employee of Novo Nordisk. DG reports honoraria, speaker fees and support for meeting attendance from Novo Nordisk. CH reports consultancy fees from Ethicon and Novo Nordisk. SS reports honoraria from Merck, Novo Nordisk, Pfizer and Sandoz.

Patient and public involvement

A person living with obesity was involved in the design and dissemination plans for the ACTION Teens study.

Patient consent for publication

Not applicable.

Ethics approval

The study was approved for the UK by the Institutional Review Board of WCG, Puyallup, WA, USA (tracking number: 20212733; approval date: 27 July 2021). Informed consent was provided by all participants, including a parent/legal guardian of the ALwO. The study was conducted according to the EphMRA Code of Conduct, the principles of the Declaration of Helsinki and applicable laws/regulations related to management of personal information.

Data availability statement

Data will be shared with bona fide researchers submitting a research proposal approved by the independent review board. Individual participant data will be shared in data sets in a de-

identified and anonymised format. Data will be made available after research completion. Information about data access request proposals can be found at novonordisk-trials.com.

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FIGURE LEGENDS

Figure 1 Perceptions of: A) ALwO's current weight; B) ALwO's health; C) ALwO's worry about weight; D) worry about ALwO's weight impacting future health.

Data are the proportions of respondents who chose each prespecified option, among all UK ALwO (left bars) or UK caregivers (right bars). Numbers may not sum to 100% due to rounding.

ALwO, adolescents living with obesity.

Figure adapted from [18].

Figure 2 Information sources used by ALwO and caregivers to learn about healthy lifestyles, weight loss and weight management.

Data are the proportions of respondents who reported having used each information source, among all UK ALwO (top bars) and UK caregivers (lower bars).

ALwO, adolescents living with obesity.

Figure adapted from [18].

Figure 3 Barriers to discussing weight with HCPs: A) barriers reported by ALwO and caregivers; B) barriers reported by HCPs.

Panel A: data are the proportions of respondents who chose each statement as a reason for not discussing their/their child's weight with the ALwO's HCP, among all UK ALwO and UK caregivers.
Panel B: data are the proportions of respondents who chose each statement as a reason they may not discuss weight with an ALwO patient, among all UK HCPs.

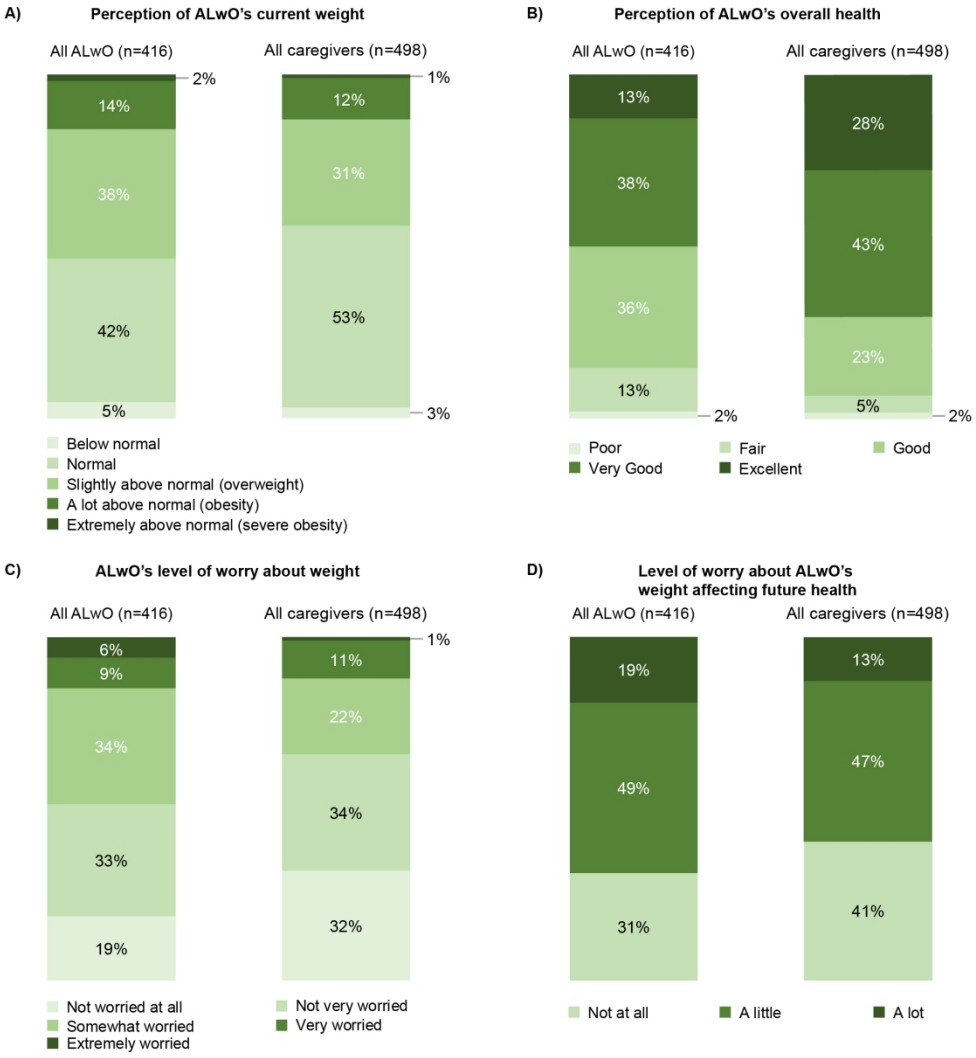
ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [18].

Figure 4 Summary of key barriers to adolescent obesity management identified for ALwO and caregivers in the ACTION Teens UK study.

Barriers have been grouped into three overarching themes: environmental, personal and HCP consultation-based barriers. Barriers in the middle section (red boxes) apply to both ALwO and caregivers.

ALwO, adolescents living with obesity; HCP, healthcare professional.



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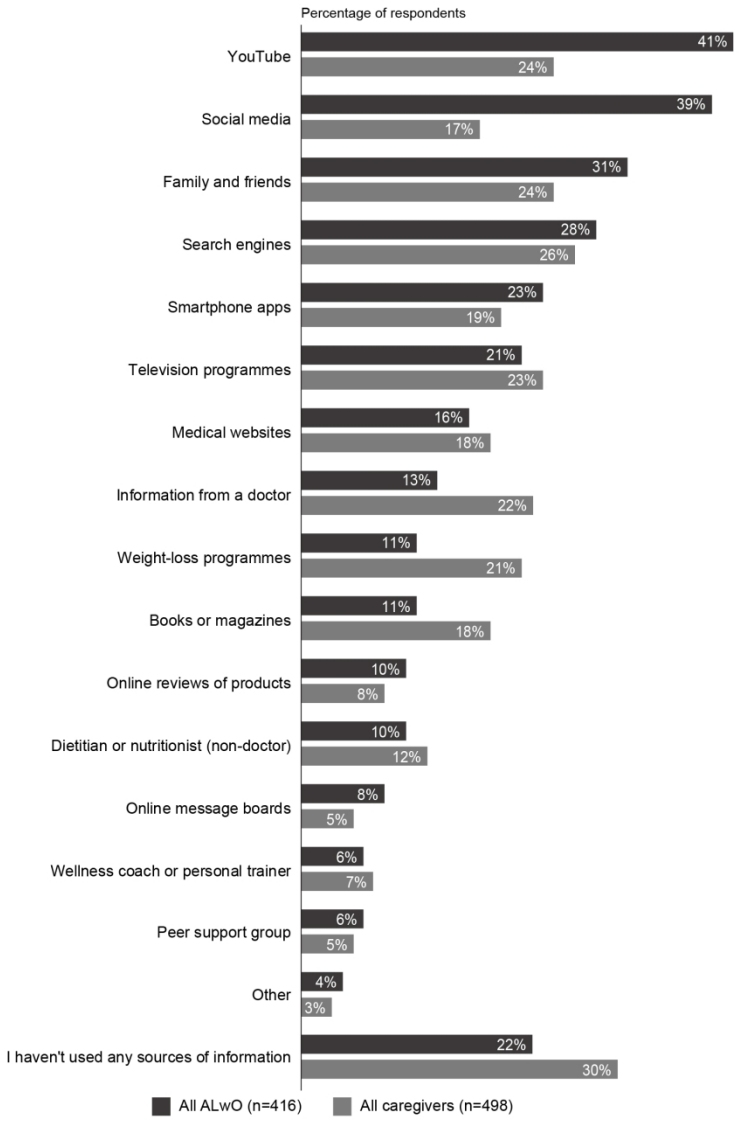

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ALwO, adolescents living with obesity.
Figure adapted from [18].

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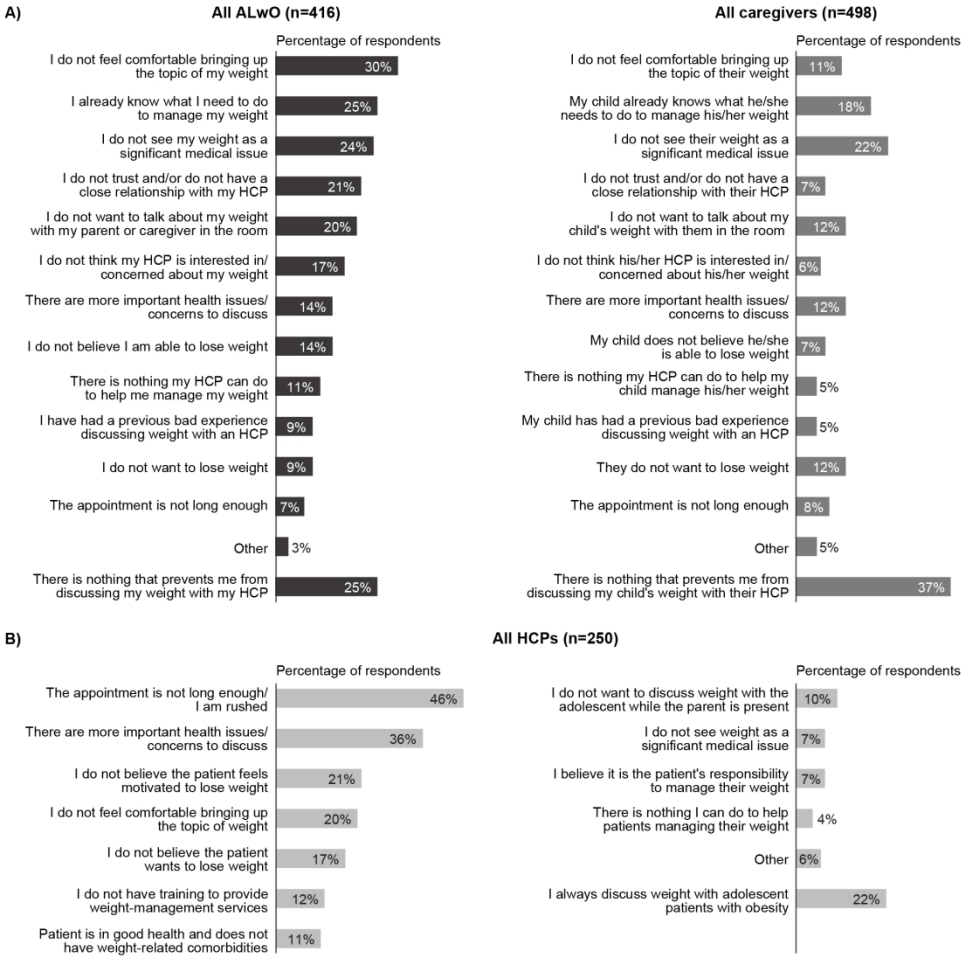

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ALwO, adolescents living with obesity; HCP, healthcare professional.
Figure adapted from [18].

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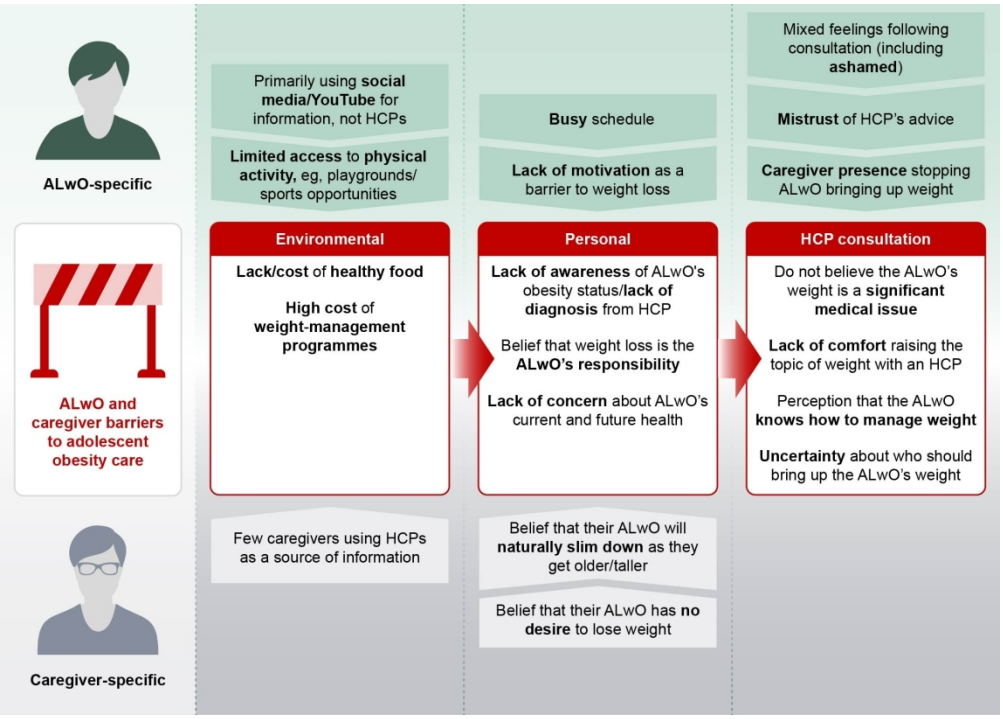

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ALwO, adolescents living with obesity; HCP, healthcare professional.

180x127mm (300 x 300 DPI)

ONLINE SUPPLEMENTAL MATERIAL

This document contains supplemental material for:

Insights from the ACTION Teens study: a survey of adolescents living with obesity, their caregivers and healthcare professionals in the UK

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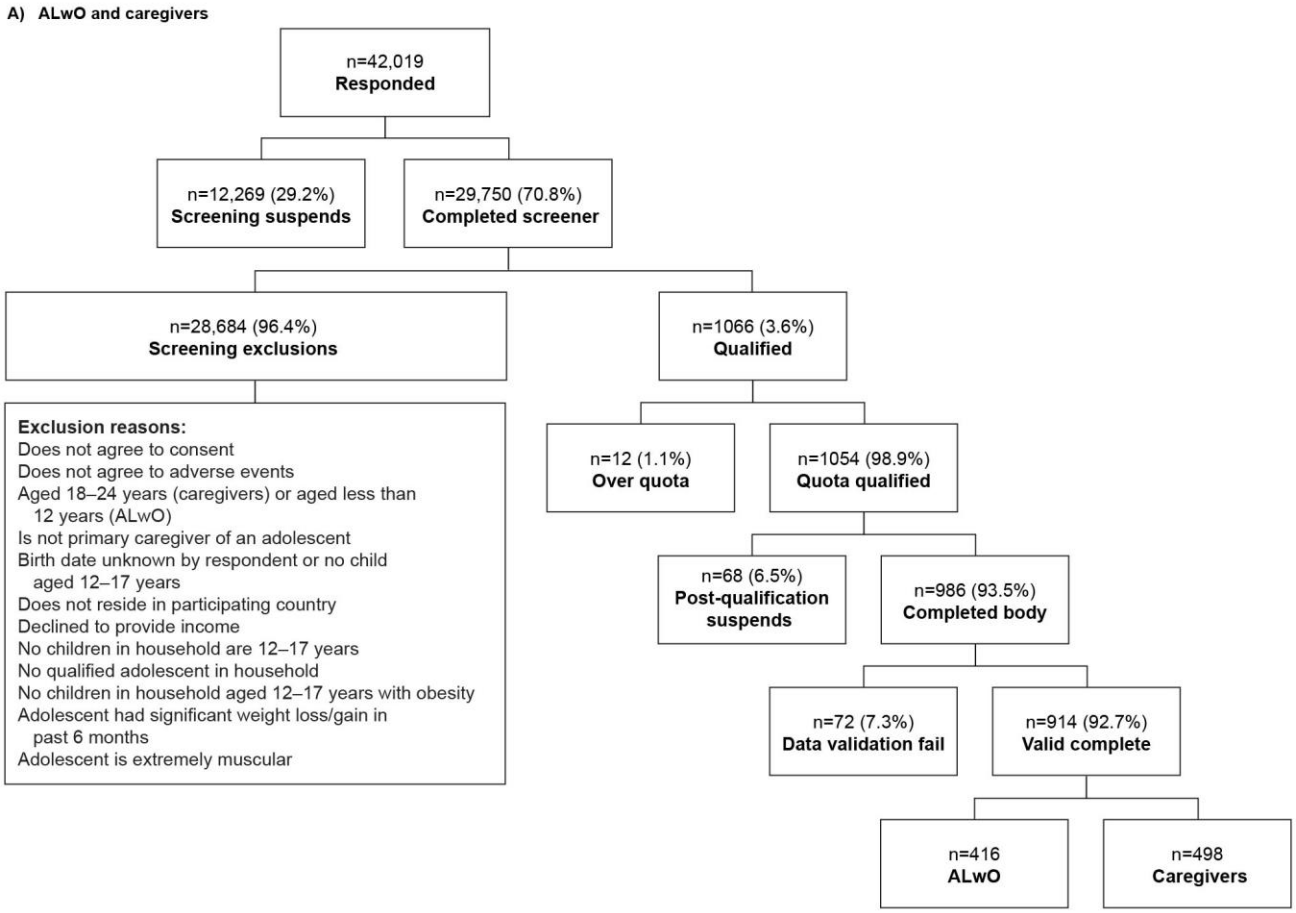
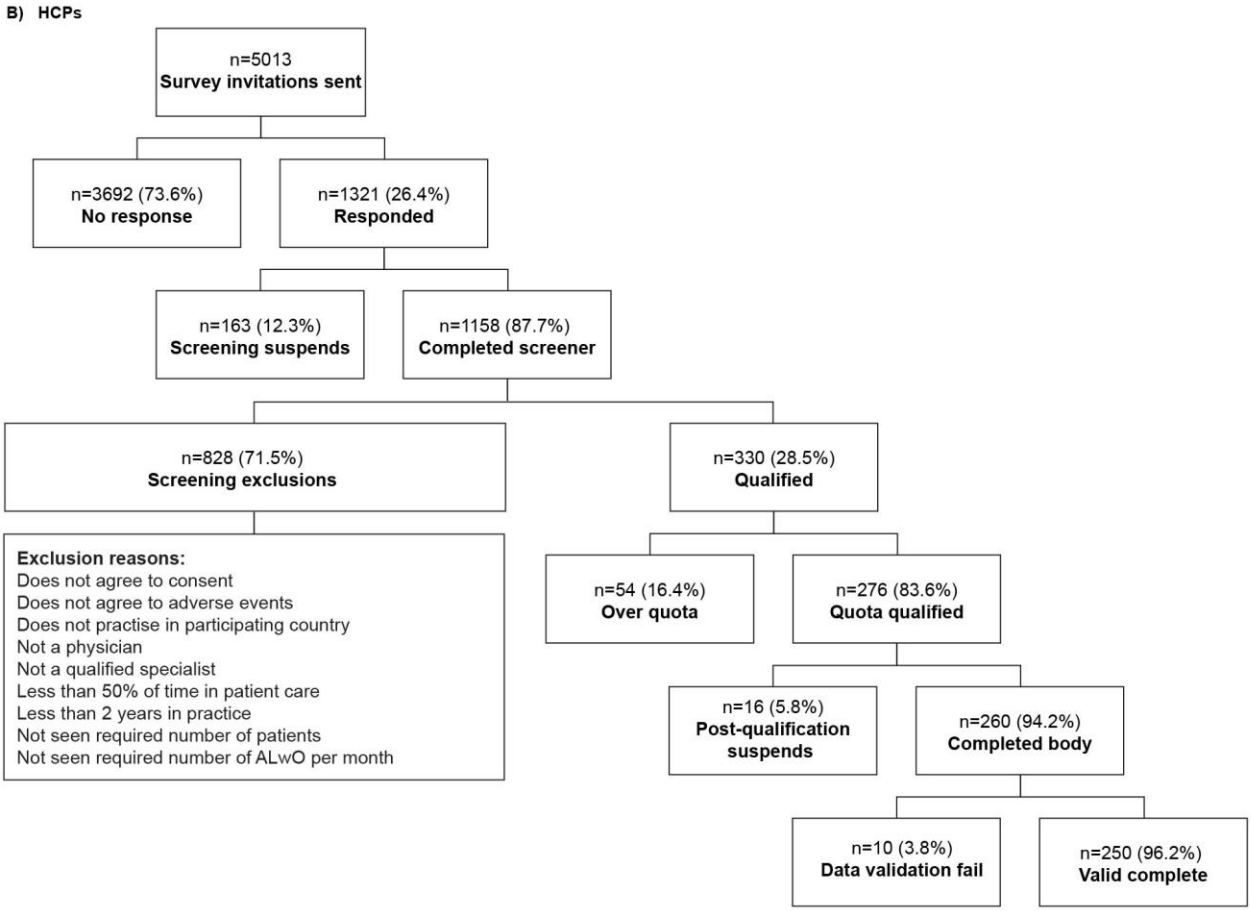
CONTENTS:

ONLINE SUPPLEMENTAL FIGURES

Figure 1 Sample disposition: A) ALwO and caregivers; B) HCPs.



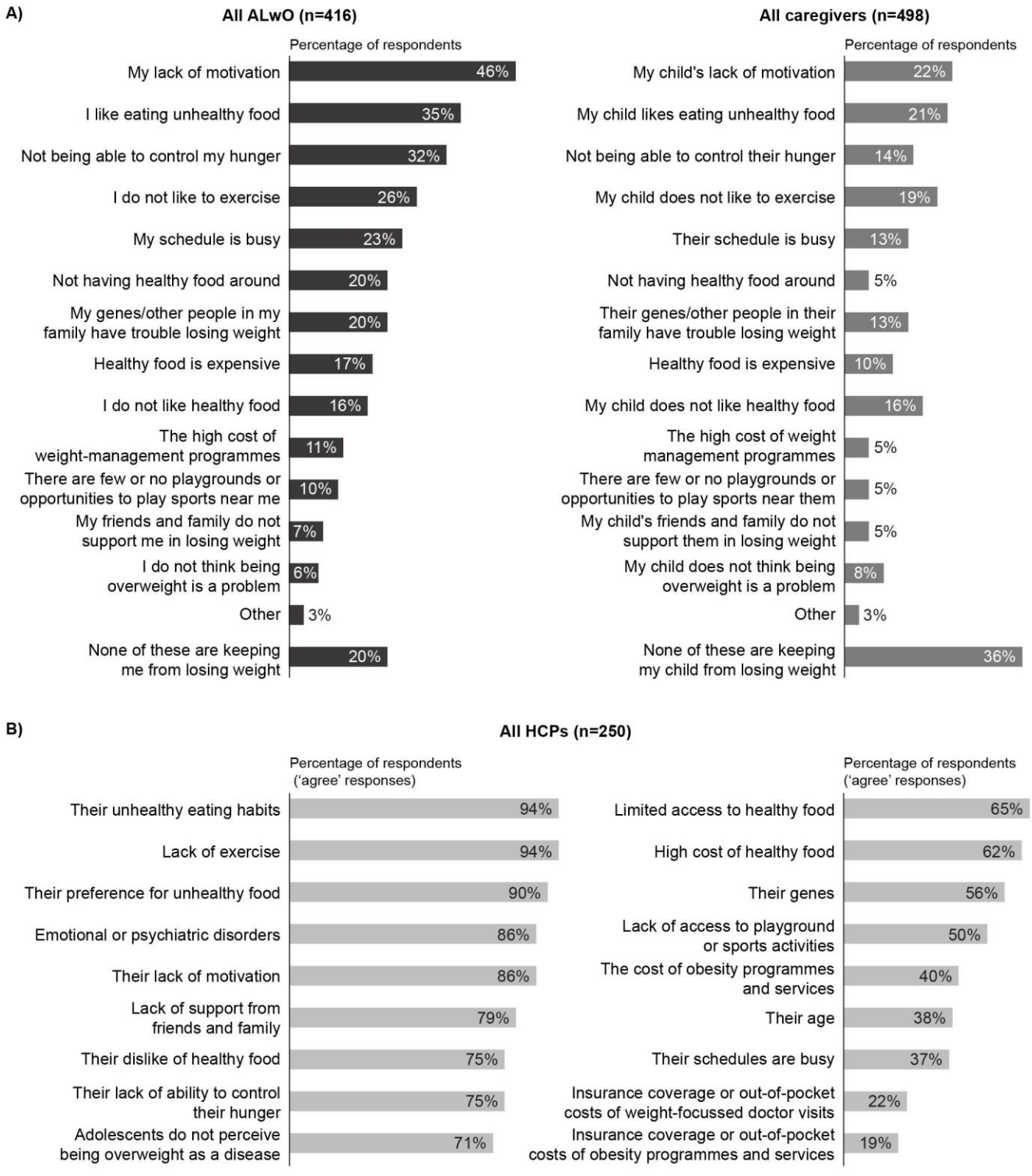


Screening suspends: respondent did not complete the qualification section of the survey but had not been marked as disqualified (ie, screening drop-out). Over quota: respondent was not able to continue as the required number of completed surveys matching the respondent's qualification criteria had been collected already.
Post-qualification suspends: respondent did not complete the main body of the survey fully (ie, survey drop-out).
Data validation fail: respondent's data failed validation checks and were removed from the final data set (eg, 'straight-lining' rating scale questions, very short completion time and incorrect answers to data validity questions).

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 2 Barriers to ALwO weight loss according to: A) ALwO and caregivers; B) HCPs.



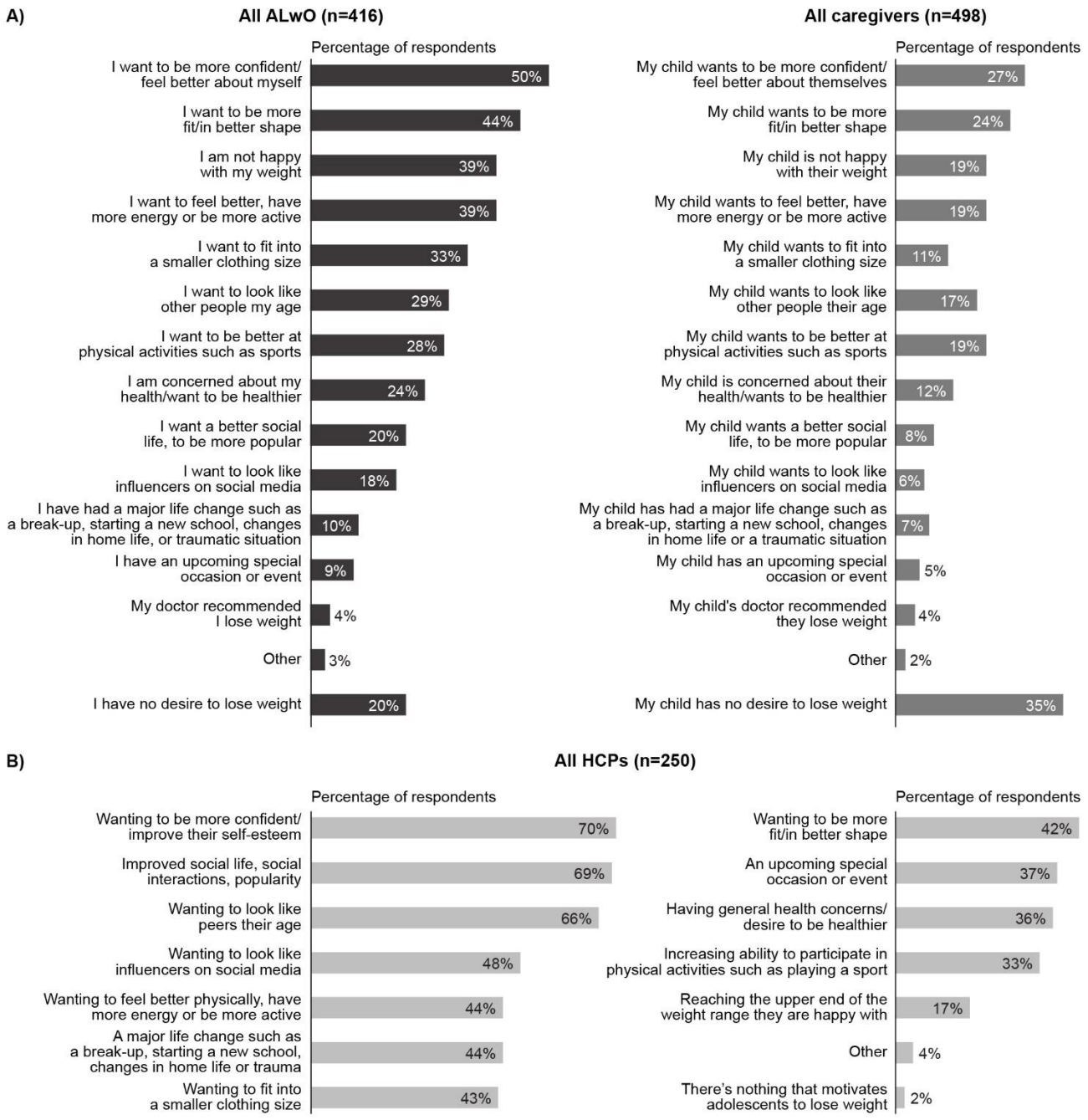
Panel A: data are the proportions of respondents who chose each statement as a barrier to losing weight for themselves (for ALwO) or their child (for caregivers), among all UK ALwO and caregivers. Panel B: data are the

proportions of respondents who reported that they ‘somewhat agree’ or ‘strongly agree’ that each statement is a barrier to losing weight for their ALwO patients, among all UK HCPs.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 3 Motivators for ALwO weight loss according to: A) ALwO and caregivers; B) HCPs.

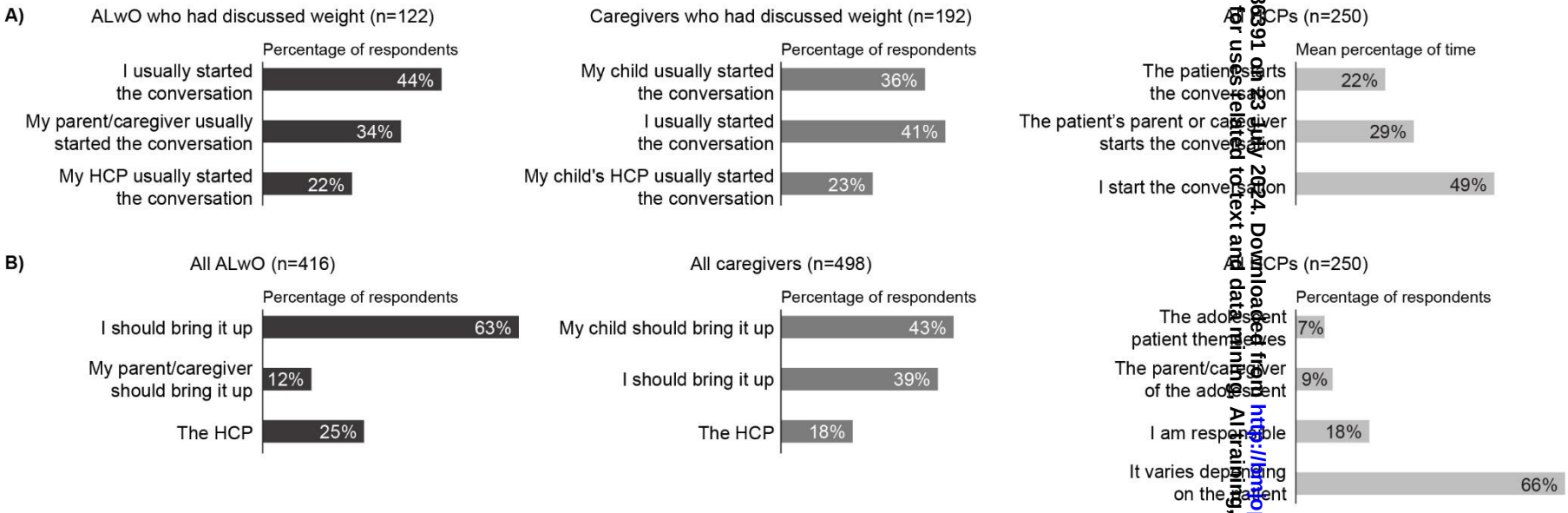


Data are the proportions of respondents who chose each statement as a motivator for losing weight for themselves (for ALwO), their child (for caregivers) or adolescents (for HCPs), among all UK ALwO, caregivers and HCPs.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 4 Perceptions of weight discussions with HCPs: A) who started the discussions; B) who should start the discussions.

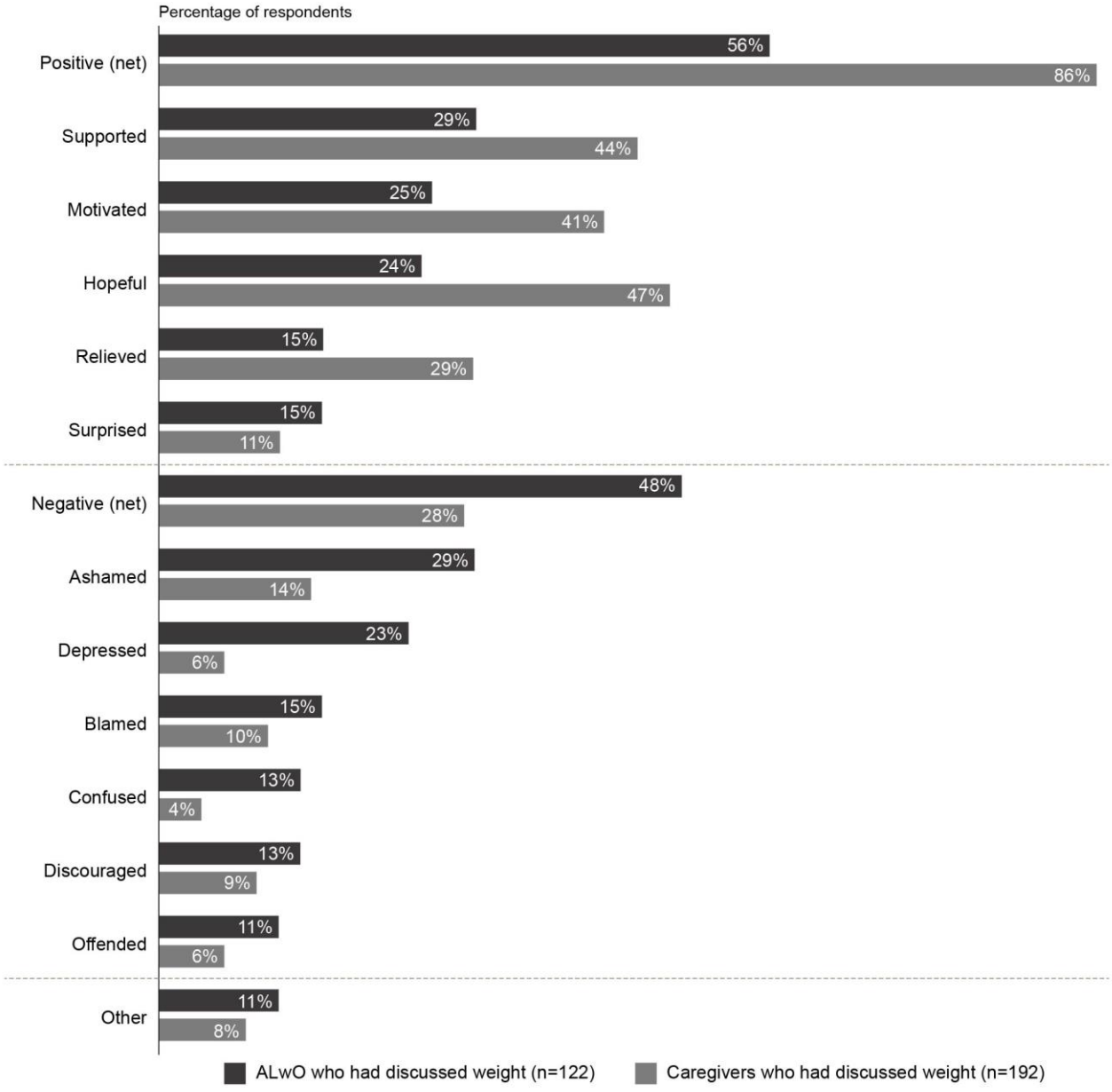


Panel A: ALwO and caregiver data are the proportions of respondents who chose each of the response options when asked who usually first discussed the topic of weight during appointments with HCPs, among the UK ALwO and caregivers who had discussed their/their child's weight with an HCP in the past year. It was only possible to select one response option. HCP data represent the mean proportion of the time that each group starts the conversation according to HCPs, among all UK HCPs. Panel B: data are proportions of respondents who chose each of the response options when asked who should bring up the topic of weight, among all UK ALwO, caregivers and HCPs. It was only possible to select one response option.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 5 Feelings of ALwO and caregivers following their most recent discussion about weight with an HCP.



Data are the proportions of respondents who chose each response option among ALwO who had discussed weight with their HCP in the past year or caregivers who had discussed their child's weight with an HCP in the past year. Responses of ALwO and caregivers represent their own feelings. 'Positive (Net)' is the proportion who chose ≥1 positive answer (ie, supported, motivated, hopeful, relieved and/or surprised); 'Negative (Net)' is the proportion who chose ≥1 negative answer (ie, ashamed, depressed, blamed, confused, discouraged and/or offended).

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

REFERENCES

1 Halford JCG, Bereket A, Bin-Abbas B*, et al.* Misalignment among adolescents living with obesity, caregivers, and healthcare professionals: ACTION Teens global survey study. Pediatr Obes 2022;17:e12957. doi: 10.1111/ijpo.12957

Protocol

Study ID: DAS-003

Awareness, Care & Treatment In Obesity Management - An International Observation Among Teens (ACTION Teens)

Redacted protocol
Includes redaction of personal identifiable information only.

Disease Area Study

Study information

Title	Awareness, Care & Treatment In Obesity Management - An International Observation Among Teens (ACTION Teens)
Protocol version identifier	2.0
Date of last version of protocol	31-Mar-2021
Disease area/population	Obesity
Medicinal class under study	Not applicable
Research question and objectives	Primary Objective: To identify perceptions, attitudes, behaviours, and potential barriers to effective obesity care across Adolescents Living with Obesity (ALwO), Caregivers of ALwO, and healthcare providers (HCPs).
Country(-ies) of study	The study will be conducted in ten countries: 1. Italy 2. Spain 3. United Kingdom 4. Mexico 5. Colombia 6. Australia 7. Saudi Arabia 8. Turkey 9. South Korea 10. Taiwan

1 Table of contents

Page

2 List of abbreviations

ACTION Teens	Awareness, Care & Treatment In Obesity Management – An International Observation Among Teens
ALwO	Adolescents Living with Obesity
BMI	Body Mass Index
CAPI	Computer-Assisted Personal Interview
CATI	Computer-Assisted Telephone Interview
CAWI	Computer-Assisted Web Interview
DAS	Disease Area Studies
DCE	Data Check Edit
EU	European Union
GDPR	General Data Protection Regulation
HCP	Health Care Provider
IEC	Independent Ethics Committee
IRB	Institutional Review Board
PCP	Primary Care Provider
RDG	Random Data Generation
RSES	Rosenberg Self-Esteem Scale
SDTM	Study Data Tabulation Model
TAPI	Think Aloud Pre-test Interview
UK	United Kingdom
UTN	Universal Trial Number
WHO-5	World Health Organisation-5 Well-Being Index

3 Abstract

3.1 Title

Awareness, Care & Treatment In Obesity Management – An International Observation Among Teens (ACTION Teens).

3.2 Rationale and background

Worldwide, the prevalence of obesity has nearly tripled in the past 40 years; between 1975 and 2016, the prevalence of overweight and obesity among children and adolescents aged 5-19 rose from 4% to over 18%[(1)] Despite the growing obesity pandemic among adolescents, there is limited research available regarding the experiences, challenges, and needs of this population, their caregivers, and the health care providers (HCPs) who treat them.

3.3 Research question and objectives

ACTION Teens is a landmark study intended to provide critical global insights to improve obesity management and treatment for adolescents living with obesity. The goal of this study is to provide insights to drive awareness around the needs of adolescents living with obesity and their caregivers, as well as to identify key areas of misalignment between adolescents, their caregivers and the HCPs involved in obesity treatment and management. ACTION Teens is designed to generate evidence to identify and address these challenges on both a global and local level, extending the insights from the previously conducted ACTION-IO study.

Specifically, ACTION Teens seeks to identify perceptions, attitudes, behaviours, and potential barriers to effective obesity care across Adolescents living with obesity (ALwO), Caregivers of ALwO (parents or another legal guardian) and HCPs.

Insights from this study will be used to guide collaborative action to improve care, education, and support for ALwO and Caregivers of ALwO, as well as to create a communication platform to help change how adolescents, caregivers, and health care providers manage, treat, and support obesity.

3.4 Study design

ACTION Teens is a multinational cross-sectional survey-based study. The study consists of a quantitative online survey to be conducted among three groups of respondents in ten countries: Italy, Spain, United Kingdom, Mexico, Colombia, Australia, Saudi Arabia, Turkey, South Korea, and Taiwan.

3.5 Population

The respondent population will include ALwO, Caregivers of ALwO, and HCPs treating adolescents who have obesity.

3.6 Variables

A range of variables will be addressed in the survey including overall health and well-being of ALwO, weight loss conversations, attitudes about obesity and food, interactions with HCPs, impact of obesity, sources of information, and sociodemographics.

The variables will be quantified using Likert scales, single and multiple item selection, and numeric entry (e.g., frequencies and percentages).

3.7 Data source

ALwO and caregiver study respondents will be recruited from online, general population consumer panels by targeting and screening adults from a stratified general population sample to identify parents or caregivers of an adolescent with obesity. Verified caregivers will be asked for their interest in participating in the caregiver survey and will be asked for their permission for their adolescent to take the ALwO survey. The goal is to maximise the number of "matched pairs" of ALwO and their specific caregivers. HCP respondents will be recruited from online physician panels.

To qualify for the study:

- ALwO must be aged 12 to less than 18 years and have obesity according to BMI-for-age equal to or greater than the 95th percentile for age and sex according to the BMI-for-age charts appropriate locally for the country of residence based on self-reported inputs of sex, age, height, and weight (which will be calculated using an algorithm within the survey instrument).
- Caregivers of ALwO must be a parent or legal guardian of an adolescent with obesity as defined above, reside in the same household as the ALwO at least 50% of the time, and be involved in the healthcare decisions of the ALwO.
- HCPs must be Primary Care Providers (PCPs), Paediatricians, or specialists (i.e., Endocrinologists, Gastroenterologists, Nutrition Specialists, as relevant for each country) who care for adolescents ages 12 to less than 18 years who have obesity; HCPs must see at least ten patients with obesity ages 12 to less than 18 years in a typical month.

Respondents who do not meet these criteria will be excluded. Respondents may withdraw (i.e., discontinue the survey) at any time. Reason for discontinuation will not be captured.

Data will be collected in the survey via online data collection. Three unique surveys will be developed for each respondent group: ALwO, Caregivers of ALwO, and HCPs; some of the themes and questions will be the same across surveys to allow for analyses of similarities and differences. The surveys are expected to take approximately 20 minutes to complete for each respondent group.

Data collection is planned to begin in June 2021 and end in August 2021.

3.8 Study sample size

The study will aim to achieve a total of 14,600 completed surveys: 6,150 among ALwO (ranging from 450-1,000 per country); 6,150 among Caregivers of ALwO (ranging from 450 to 1,000 per country); and 2,300 HCPs (ranging from 150-300 per country).

3.9 Data analyses

Analyses will be performed using descriptive statistics. The data will be analysed in aggregate within each study respondent group. Data for questions that are the same/similar across study groups will be compared and contrasted. The data will be examined in total on a global level for each audience, i.e., all ALwO across the ten countries will be rolled up into a global total. The data will also be analysed and reported for the three audiences on an individual country level.

Final Caregivers of ALwO data will be weighted on key demographics as needed to best reflect the overall adult population in each country, using general population targets from government census/agencies or publicly available data sources.

The final study results are planned to be reported in November 2021.

4 Amendments and updates

None

5 Milestones

Table 1 Milestones

Milestone	Planned date
Start of data collection	Planned 14 June 2021
End of data collection	Planned 6 August 2021
Final report of study results	Planned 5 November 2021

6 Rationale and background

Worldwide, the prevalence of obesity has nearly tripled since 1975[1]. The prevalence of overweight and obesity among children and adolescents aged 5-19 has risen from just 4% in 1975 to just over 18% in 2016. The rise has occurred similarly among both boys and girls: in 2016, 18% of girls and 19% of boys had overweight and 6% of girls and 8% of boys had obesity[1].

Overweight or obesity during childhood has important short-term and long-term consequences. In the short term, children who have overweight or obesity are more likely to suffer from psychological comorbidities such as depression, anxiety, low self-esteem, a series of emotional and behavioural disorders, asthma, low-grade systemic inflammation, liver complications, and

musculoskeletal problems[2].In the long term, overweight or obesity during childhood increases the risk of developing cardiovascular diseases, hypertension, type 2 diabetes mellitus (T2DM), polycystic ovary syndrome, sleep apnoea, some cancers, and musculoskeletal disorders in adulthood, which can lead to disability and premature death[2, 3]. In addition, obesity in childhood is an independent risk factor for adult obesity[4]. Limited treatment options for obesity in this population may prevent HCPs from talking to adolescents living with obesity about their weight or addressing the issue with their caregivers.

Despite this growing obesity pandemic among adolescents, there is limited research available regarding the experiences, challenges, and needs of this population, their caregivers, and the HCPs who treat them. This landmark study is intended to provide critical global insights to improve obesity management and treatment for adolescents living with obesity.

7 Research question and objectives

7.1 Primary objective

- To identify perceptions, attitudes, behaviours, and potential barriers to effective obesity care across ALwO, Caregivers of ALwO, and HCPs.

7.2 Exploratory objective(s)

- To explore the relationship between obesity and quality of life/well-being, body image, and self-esteem.

8 Research methods

8.1 Study design

The ACTION Teens study is a cross-sectional, survey-based study, with data to be collected via an online survey by a third-party external vendor ([redacted]) through existing databases/panels. The study is descriptive and exploratory in nature. Health-related parameters will be collected, but there will be no collection of laboratory data.

A quantitative online survey was chosen for the study design to:

1. Assess personal attitudes and perceptions of individuals.
2. Quantify the results across individuals in each country to best represent the overall adult population in each country.
3. Ensure a robust sample of ALwO, Caregivers of ALwO, and HCPs.

The questionnaires used have been specifically developed for this study. Because this study is cross-sectional and the surveys are not developed for repeated use or for use in measuring clinical outcomes, they have not been validated for measurement consistency. However, the ALwO survey is expected to include two validated instruments: World Health Organisation (WHO)-5 Well-Being Index[5, 6] and the Rosenberg Self-Esteem Scale (RSES)[7]. Additionally, an international external steering committee consisting of HCPs and subject matter experts have provided input into the

survey materials. There will be three questionnaires: one each for ALwO, Caregivers of ALwO, and HCPs. Questionnaires will only include close-ended questions; there will be no open-text boxes.

Sample sizes have been selected to balance statistical power and recruitment feasibility. ALwO samples sizes for each country are targeted to achieve 3.1%-4.6% (ALwO and Caregivers of ALwO) or 5.7%-8.0% (HCPs) margin of error around a proportion estimate of 50%, with the margin of error calculated from a standard normal (Z-) distribution with z = 1.96, or approximately a 95% level of confidence. Sample sizes vary across countries based on population and recruitment considerations.

8.1.1 Outcome measures

8.1.1.1 Primary outcome measures

The primary outcome is the description of awareness, perceptions, and behaviours related to obesity and obesity management among ALwO, Caregivers of ALwO, and HCP treating ALwO.

Table 2 Primary Outcome(s)

Outcome measure	Time frame	Unit of measurement
Attitudes about obesity, attitudes about people with obesity, and beliefs about the impact of obesity	At the time of survey response	• 5-point Likert scales
Weight loss attempts in past year, motivations to lose weight, barriers to losing weight, and definition of successful weight loss/management	At the time of survey response	• Yes/No; percentage of patients • Multi-select from defined list
History and frequency of conversations about weight, initiator of weight conversations, and responsibility for initiating weight conversations that occur between adolescents living with obesity/their caregivers and healthcare providers	At the time of survey response	• Numeric entry; percentage of patients • Single select from defined list; percentage of time each initiates • Single select from defined list
Assessment of interactions between adolescents living with obesity/their caregivers and healthcare providers, reasons why obesity may not be discussed, frequency of obesity diagnosis, and frequency of follow-up appointments made to discuss obesity	At the time of survey response	• 5-point Likert scales • Multi-select from defined list • Yes/No; percentage of patients • Yes/No; percentage of patients
Sources of information used to learn about obesity, healthy lifestyles, weight loss, and weight management	At the time of survey response	• Multi-select from defined list

8.1.1.2 Exploratory outcome measures

Table 3 Exploratory outcome(s)

Endpoint/outcome measures title (associated survey)	Time frame	Unit of measurement
Well-Being (ALwO/Caregiver)	At the time of survey response	WHO-5 Well-Being Index; 6-point Likert scale
Assessment of body image (ALwO)	At the time of survey response	5-point Likert scale
Self-esteem (ALwO)	At the time of survey response	Rosenberg Self-Esteem Scale (RSES); 4-point Likert scale

8.2 Setting

8.2.1 Study population

Planned number of respondents to be included: 14,600 (6,150 ALwO, 6,150 Caregivers of ALwO, and 2,300 HCPs).

Table 4 Anticipated Number of Respondents to be Included in Each Country

	Spain	UK	Mexico	Colombia	Australia	Italy	Saudi Arabia	Turkey	South Korea	Taiwan
Adolescents	650	675	1000	450	450	650	500	700	525	550
Caregivers	650	675	1000	450	450	650	500	700	525	550
HCPs	250	250	300	200	150	250	200	300	200	200
Total	**1550**	**1600**	**2300**	**1100**	**1050**	**1550**	**1200**	**1700**	**1250**	**1300**

8.2.2 Inclusion criteria

Adolescents living with obesity

1. Informed consent obtained by parent/legal guardian and ALwO before any study-related activities (study-related activities are any procedure related to recording of data according to the protocol).
2. Male or female, aged 12 to less than 18 years at the time of signing informed consent.
3. Lives in one of the participating countries: Italy, Spain, UK, Mexico, Colombia, Australia, Saudi Arabia, Turkey, South Korea, and Taiwan.
4. Has a current BMI-for-age (based on self-reported sex, age, height, and weight) ≥ 95th percentile for age and sex based on charts appropriate locally for the country of residence.

Caregivers of Adolescents living with obesity

1. Informed consent before any study-related activities (study-related activities are any procedure related to recording of data according to the protocol).
2. Male or female, age above or equal to 24 years at the time of signing informed consent.
3. Lives in one of the participating countries: Italy, Spain, UK, Mexico, Colombia, Australia, Saudi Arabia, Turkey, South Korea, and Taiwan.
4. Has an adolescent in the household with a current BMI-for-age (based on self-reported sex, age, height, and weight) ≥ 95th percentile for age and sex based on charts appropriate locally for the country of residence.
5. Resides in the same household as the ALwO at least 50% of the time.
6. Is involved in the healthcare decisions of the ALwO.

Health Care Providers

1. Informed consent before any study-related activities (study-related activities are any procedure related to recording of data according to the protocol).
2. Male or female, age above or equal to 18 years at the time of signing informed consent.
3. Is a physician.
4. Practices in one of the participating countries: Italy, Spain, UK, Mexico, Colombia, Australia, Saudi Arabia, Turkey, South Korea, and Taiwan
5. In clinical practice ≥ 2 years.
6. Spends at least 50% of time in direct patient care.
7. Has seen/treated at least ten adolescent patients (age 12 to less than 18 years) with obesity in a typical month (defined as BMI-for-age ≥ 95th percentile for age and sex based on charts appropriate locally for the country of residence).

8.2.3 Exclusion criteria

Adolescents living with obesity

1. Previous participation in this study. Participation is defined as having given informed consent in this study.
2. Mental incapacity, unwillingness, inability, or language barriers precluding adequate understanding or cooperation.
3. Has had significant weight loss or weight gain due to major injury or illness/condition (e.g., cancer, accident, pregnancy) in the past 6 months.
4. Considers themselves to be extremely muscular.

Caregivers of Adolescents living with obesity

1. Previous participation in this study. Participation is defined as having given informed consent in this study.
2. Mental incapacity, unwillingness, inability, or language barriers precluding adequate understanding or cooperation.
3. ALwO they care for has had significant weight loss or weight gain due to major injury or illness/condition (e.g., cancer, accident, pregnancy) in the past 6 months.
4. Considers the ALwO they care for to be extremely muscular.

Health Care Providers

1. Previous participation in this study. Participation is defined as having given informed consent in this study.
2. Mental incapacity, unwillingness, inability, or language barriers precluding adequate understanding or cooperation.

8.2.4 Rationale for selection criteria

The broad inclusion and exclusion criteria will ensure the study includes respondents who are representative of adolescents living with obesity and healthcare providers who see adolescents who have obesity, in each country of interest.

To yield a natural fall-out of adolescents living with obesity in the absence of specific demographic targets for adolescents age 12 to less than 18 years in each country, adolescent and caregiver respondents will be recruited from a general population sample of adults age > 24.

- The targeted sample will be stratified to match general population demographic targets in each country, to ensure those entering the screener look like the adult population:
  - Sex
  - Age
  - Income
  - Education
  - Region
  - Race/ethnicity (included for Australia to ensure representativeness of the ethnic make-up of that country; excluded in the other countries due to the relative heterogeneous ethnic make-up of those countries)
- Adult respondents will then be screened for having a least one child with obesity (defined by BMI-for-age ≥ 95% percentile).

This will ensure that the qualifying sample composition will be largely representative of the adult population in each country. Final data will be weighted on key demographics as needed to best reflect the overall adult population in each country. General population targets have been gathered from the recent government census or government agencies for each country, when available. Peer reviewed data sources have been leveraged in cases where government provided data could not be obtained.

For the HCPs, PCPs and specialists who treat adolescents living with obesity will be recruited in each country. The specific types of physicians will be based on information from the steering committee members (in-country experts). Targeting physicians who are most likely to see/treat adolescents, provide direct patient care, and have a typical caseload of patients ensures these respondents are representative of HCPs who treat adolescents living with obesity in each country.

8.2.5 Withdrawal criteria

The respondent may withdraw at will at any time.

As is standard procedure in online surveys, respondents will be informed that the study is voluntary and can be stopped at any time. Respondents may withdraw/suspend taking the online survey at any time. [redacted] will not receive additional confirmation or justification from respondents regarding their choice to suspend taking the survey. This is typical for online surveys when respondents withdraw or choose to stop before completing the survey. There will not be any follow-up to understand reason for withdrawal.

Data for those who do not complete the full survey will not be included in the final data or analyses.

8.2.6 Data collection methods

Data collection will be conducted via cross-sectional, online surveys among each of the respondent groups. Prior to completing the survey, respondents will acknowledge consent to participate, and then complete an initial set of screening questions to determine if they qualify for the survey based on the inclusion criteria detailed in sections 8.2.2 and 8.2.3. Only respondents meeting the inclusion/exclusion requirements will continue on to the survey. The survey will be provided in the native language of each country for all respondents. Respondents may choose to suspend taking the survey at any time and for any reason in any part of the survey. Respondents may also temporarily halt the survey and return to complete later.

ALwO and caregiver respondents will be recruited from online panels/databases by targeting and screening adults from a stratified general population sample to identify parent or caregivers of an adolescent with obesity.

- Qualified caregivers will be asked for their interest in participating in the caregiver survey and will be asked for their permission for the child to take the ALwO survey.
- The goal is to maximise the number of "matched pairs" of ALwO and their specific caregivers.
- Once the matched pairs recruitment has been maximised, caregivers and adolescents will continue to be recruited to obtain the desired number of individual adolescent and caregiver completes. To ensure General Data Protection Regulation (GDPR) compliance, we will follow country policies regarding the age at which we are permitted to directly contact a child under the age of 18 for research activities:
    - Italy, Spain, Mexico, Australia, South Korea = age 14
    - Colombia, Saudi Arabia, Turkey, UK = age 16
    - Adolescents in Taiwan will not be contacted directly

HCP respondents will be recruited from online physician panels/databases.

In-person administration of the online survey may be used for ALwO and Caregivers of ALwO in Saudi Arabia, Turkey, and Taiwan, and for HCPs in Saudi Arabia. In this instance, a member of the in-country study team will either arrange a meeting in advance with respondents who qualify for the study via other methods (online, telephone) and administer the survey in a pre-set meeting location such as a focus group facility or the physician's office for the HCP sample.

Table 5 Data Collection Method, by Country

Country	Adolescents living with obesity (ALwO)/ Caregivers of ALwO	Heathcare Providers (HCP)
Italy	• Online	• Online
Spain	• Online	• Online
United Kingdom	• Online	• Online
Australia	• Online	• Online
Mexico	• Online	• Online
Saudi Arabia	• Telephone (computer-assisted telephone interview; CATI) • In-person (computer-assisted personal interview; CAPI)	• Telephone (CATI) • In-person (CAPI) • Online

South Korea	• Online	• Telephone (CATI) • Online
Turkey	• Telephone (CATI) • In-person (CAPI)	• Telephone (CATI) • Online
Colombia	• Online	• Online
Taiwan	• In-person (computer-assisted web interview; CAWI) • Online	• Online

Prior to the launch of the quantitative surveys, 60-minute web-assisted think aloud pre-test interviews (TAPIs) will be conducted with four ALwO, four Caregivers of ALwO, and four HCPs (two each of PCPs and specialists) in each country. Respondents will take the survey online while speaking with an in-country moderator by telephone or in-person. A moderator will conduct the interview for the purpose of assessing clarity, face validity, and relevance of questions and to determine if any modifications of the survey are warranted.

This study has taken measures to protect individual identification and personal information:

- Data will be pseudonymised.
- Linkage of ALwO and Caregivers of ALwO will be done at the online panel level.
- [redacted] will be responsible for collecting minimally necessary information. Individuals' names or other identifying information will not be collected except for the purposes of fulfilling honoraria and adverse event reporting requirements.
- Novo Nordisk will not receive any personally identifiable information or patient-level data. Individual names will not be associated with any analytic process.
- Honoraria by respondent groups will be as follows:
    - General Population (ALwO and Caregivers of ALwO): Panel credit/nominal honoraria provided by online panel company.
    - Health care providers: Compensation for time spent at Fair Market Value (FMV) for each country and specialty type.

Demographic elements collected will be used to ensure sample representativeness and may be used in sub-group analysis

8.3 Variables

.The outcome measures will be assessed within the survey using the following methods and analysis:

- Likert scales (e.g., agreement, impact, frequency)
    - Proportion of responses in each category will be reported.
- Single and multiple item selection (from a defined list)
    - Percentage of respondents selecting an item or items will be reported.
- Numeric entry (e.g., percentage of patients to whom a weight loss treatment has been recommended)

- Means, medians, and grouping intervals will be reported.

The variables to be collected in this study are listed in Table 6.

Table 6 Outcome Variables

Variables	Adolescents living with obesity (ALwO)	Caregivers of Adolescents living with obesity (ALwO)	Healthcare Providers (HCPs)	Measurement
RESPONDENT SCREENNG ASSESSMENTS				
Informed consent	X	X	X	N/A
In/Exclusion criteria	X	X	X	N/A
OVERALL HEALTH AND WELL-BEING	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
Overall health of ALwO	X	X		5-point Likert scale of "poor" to "excellent"
Well-being[a] of ALwO	X			WHO-5 Well-Being Index; 6-point Likert scale of "at no time" to "all of the time"
Self-esteem[b] of ALwO	X			Rosenberg Self-Esteem Scale (RSES); 4-point Likert scale of "strongly disagree" to "strongly agree"
Body image of ALwO	X	X		5-point Likert scale of "never" to "always" agree with each statement
Exercise frequency of ALwO in past week	X	X		8-item list ranging from "zero days" to 7 days"
Perception of ALwO's weight	X	X		5-point Likert scale of "below normal" to "extremely above normal (severe obesity)"
Frequency of weighing self	X			8-point frequency scale of "never" to "every day"
Concern about ALwO's weight	X	X		5-point Likert scale of "not at all concerned" to "extremely concerned"

Weight loss attempts of ALwO in past year	X	X	X	Yes/No (ALwO/Caregivers) Percentage of adolescent patients making a serious weight loss attempt (HCPs)
Successful weight loss attempts of adolescent patients			X	Percentage of adolescent patients making a serious weight loss attempt that was successful
Likelihood of ALwO to try to lose weight in next 6 months	X	X		5-point Likert scale of "not at all likely" to "extremely likely"
Attitudes towards ALwO weight loss	X	X	X	5-point Likert scale of "strongly disagree" to "strongly agree"
WEIGHT LOSS CONVERSATION AND MOTIVATION	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
People who ALwO can talk to about their weight	X			Multiple-selection response from defined list
HCPs talked to about ALwO's weight	X	X		Multiple-selection response from defined list
Weight management activities of ALwO in past year/ recommended to adolescent patients	X	X	X	Multiple-selection response from defined list
Effectiveness of weight management activities/ treatments			X	Multiple-selection response from defined list
Motivations of ALwO to lose weight	X	X	X	Multiple-selection response from defined list
Barriers to ALwO losing weight	X	X	X	Multiple-selection response from defined list
Definition of successful weight loss	X	X	X	Multiple-selection response from defined list
Household food, eating, and exercise environment	X	X		Multiple-selection response from defined list
ATTITUDES ABOUT OBESITY AND FOOD	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**

Attitudes about people with obesity	X	X	X	5-point Likert scale of "much harder" to "much easier" (compared to people without obesity)
Impact of ALwO's weight on perception of others	X	X	X	5-point Likert scale of "very negative impact" to "very positive impact"
Agreement with attitudes towards food (self)	X	X		5-point Likert scale of "strongly disagree" to "strongly agree"
Attitudes about obesity			X	5-point Likert scale of "strongly disagree" to "strongly agree"
INTERACTIONS WITH HCPS	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
Frequency of assessing adolescent patients' height/ weight; use of growth charts			X	4-point scale of "at every visit" to "at very few visits"; Yes/No
Frequency of calculating BMI-for-age of adolescent patients			X	4-point scale of "at every visit" to "at very few visits"
Discussion of ALwO's weight	X	X	X	Number of times discussed weight with a doctor (ALwO/Caregivers) Percentage of adolescent patients with obesity with whom discuss their weight (HCPs)
Informed by doctor that ALwO has overweight or obesity	X	X	X	Yes/No (ALwO/Caregivers) Percentage of adolescent patients with obesity informed about obesity diagnosis (HCPs)
Obesity diagnosis recorded in adolescent patients' medical records			X	5-point Likert scale of "never" to "always"
Initiator of conversation about weight	X	X	X	Single-selection response from defined list (ALwO/Caregivers) Percentage of time HCP, adolescent patient, or caregiver starts the conversation (HCP)

Person responsible for bringing up the topic of weight	X	X	X	Single-selection response from defined list
Criteria for initiating discussion about adolescent patient's weight			X	Multiple-selection response from defined list
Like/would like doctor to talk about weight	X	X		Yes/No
Feelings after weight discussion	X	X		Multiple-selection response from defined list
Comfort discussing weight with adolescent patients			X	5-point Likert scale of "not at all comfortable" to "extremely comfortable"
Attitudes about weight management discussions with doctor	X	X		5-point Likert scale of "strongly disagree" to "strongly agree"
Follow-up appointment related to weight	X	X	X	Yes/No (ALwO/Caregivers) Percentage of adolescent patients with obesity scheduled for a follow-up appointment (HCPs)
Reasons for not initiating discussions about ALwO's weight	X	X	X	Multiple-selection response from defined list
Comfort with weight loss medications or surgery for ALwO	X	X	X	5-point Likert scale of "strongly disagree" to "strongly agree"
Reasons for referring and not referring an adolescent patient with obesity for specialised obesity management			X	Multiple-selection response from defined list
IMPACT OF OBESITY	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
ALwO comorbidities		X	X	Multiple-selection response from defined list
Impact of obesity and other health conditions on overall health	X	X	X	5-point Likert scale of "no impact" to "very strong impact"
Hours of sleep ALwO gets each night	X	X		Number of hours on a school night and number of hours on a weekend night
Level of worry about weight affecting future health	X	X		3-point Likert scale of "not at all" to "a lot"

Overweight/obesity status of family members	X	X	X	Multiple-selection response from defined list
How successful society/healthcare system is at meeting needs of ALwO			X	5-point Likert scale of "not at all successful" to "extremely successful"
INFORMATION SOURCES	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
Resources used/most important source of information to learn about healthy lifestyles, weight loss and management	X	X	X	Multiple-selection response from defined list/Single-selection response from defined list
Awareness, usage, type of guidelines used, and effectiveness of obesity clinical treatment guidelines			X	Yes/No (awareness and usage) Multiple-selection response from defined list (type of guidelines) 5-point Likert scale of "not at all effective" to "extremely effective"
SOCIODEMOGRAPHICS	**Adolescents living with obesity (ALwO)**	**Caregivers of Adolescents living with obesity (ALwO)**	**Healthcare Providers (HCPs)**	**Measurement**
Age	X	X	X	Numeric entry for date of birth (behind-the-scenes calculation of age)
Sex	X	X	X	Single-selection response from defined list
Region	X	X		Single-selection response from defined list
Education		X		Single-selection response from defined list
Income		X		Single-selection response from defined list
ALwO's living situation	X	X		Single-selection response from defined list
Height, weight, BMI	X	X	X	Numeric entry for height and weight (behind-the-scenes calculation of BMI)

[a] Assessed by WHO-5 Well-Being Index

[b] Assessed by Rosenberg Self-Esteem Scale

8.4 Data sources

Potential respondents will be recruited using various general population and physician online panels and databases as appropriate in each country. Recruitment will be conducted through email where possible.

- Telephone recruitment may be used for ALwO/Caregivers of ALwO in Saudi Arabia and Turkey; face-to-face recruitment may be used for Taiwan.
- Telephone recruitment may be used for HCPs in Saudi Arabia, South Korea, and Turkey.

Contact information used to recruit respondents such as telephone number and email address will not be stored with respondent data.

Data is from responses collected in the surveys through online data collection.

8.5 Study sample size

The study will aim to achieve the following number of completed surveys:

- Total study sample — n = 14,600
- Adolescents living with obesity — n = 6,150 (range: 450-1,000 per country)
- Caregivers of Adolescents living with obesity — n = 6,150 (range: 450-1,000 per country)
- Health Care Providers — n = 2,300 (range: 150-300 per country)
  - Primary Care Physicians — n = 1,350
  - Paediatricians — n = 390
  - Specialists — n = 560

Sample sizes have been selected to reflect the population sizes of adolescents with obesity in each country and to balance statistical power and recruitment feasibility. Based on usual acceptance of smallest sub-sample, previous experience in ACTION studies (US, Canada, IO) and intention to perform sub-analyses on a country level.

Table 7 Sampling plan justification

Country	Total Adolescent Population Estimates[8]	Prevalence of Adolescent Obesity[9-18]	Estimated Number of Adolescent with Obesity	Adolescent Sample Size	Adolescent Sample – Margin of Error	Caregiver Sample Size	Caregiver Sample – Margin of Error	HCP Sample Size	HCP – Margin of Error
Spain	2,781,700	7-12%	278,170	650	3.8%	650	3.8%	250	6.2%
UK	4,454,300	17%	757,231	675	3.8%	675	3.8%	250	6.2%
Mexico	13,200,000	14%	1,848,000	1000	3.1%	1000	3.1%	300	5.7%
Colombia	4,960,800	5%	248,040	450	4.6%	450	4.6%	200	6.9%

Country	Total Adolescent Population Estimates[8]	Prevalence of Adolescent Obesity[9-18]	Estimated Number of Adolescent with Obesity	Adolescent Sample Size	Adolescent Sample – Margin of Error	Caregiver Sample Size	Caregiver Sample – Margin of Error	HCP Sample Size	HCP – Margin of Error
Australia	1,828,800	8%	146,304	450	4.6%	450	4.6%	150	8.0%
Italy	3,459,100	10%	345,910	650	3.8%	650	3.8%	250	6.2%
Saudi Arabia	2,842,000	13%	369,460	500	4.4%	500	4.4%	200	6.9%
Turkey	8,153,000	10%	815,300	700	3.7%	700	3.7%	300	5.7%
South Korea	2,844,000	15%	426,600	525	4.3%	525	4.3%	200	6.9%
Taiwan	1,349,400	22%	296,868	550	4.2%	550	4.2%	200	6.9%
Total	--	--	--	6,150	1.2%	6,150	1.2%	2300	2.0%

8.6 Data management

Data management is the responsibility of [redacted]. Data will be collected through an online survey programmed by [redacted] using Decipher Survey Software (FocusVision Worldwide Inc.). A survey link will be provided to respondents during recruitment which will allow them to access and complete the survey on their personal computer or internet enabled device, or on a laptop computer belonging to the in-country study coordinators for the purpose of administering the survey in-person (select countries).

The survey will be conducted using a secure website hosted by [redacted]. All data will be downloaded and stored on [redacted] secure servers and then transferred to Novo Nordisk in an encrypted SDTM format at the end of the study. The data transferred to Novo Nordisk will not contain any names or other personal information that can be used for direct identification of the individuals. [redacted] will follow all laws and regulations regarding management of personal information as required by the respondent's country of residence. The conduct of this study is in compliance with the GDPR.

Analysis of de-identified data will be conducted by [redacted] using various statistical software packages, including SPSS (IBM, version 23.0), Stata (StataCorp LLC, version IC 14.2), and Excel (Microsoft 365). Data will be cleaned and vetted for fraudulent or poor data as further described in section 8.8 Quality Control. [redacted] will generate SDTM Compliant data tables to be used in further analysis and reporting of the study results.

8.7 Data analysis

The data collected for the ACTION Teens study will be analysed according to the following objectives:

- Describe the ACTION Teens study population and compare awareness associated with the care and management of obesity among ALwO, Caregivers of ALwO and HCPs.
    - Identify across, and within subgroups 1) common issues and differences, 2) areas of disconnect, 3) possible solutions for improving obesity care.
        - Perform univariate descriptive statistics, correlations, tests for differences (chi-sq, t-tests), linear regression regarding perception of obesity, ALwO/Caregiver interactions, ALwO and caregiver/HCP interactions, and motivation and barriers/solutions for weight loss.
- Describe the physician population and common specialties treating adolescents living with obesity in each country being studied.
    - Using descriptive statistics, correlations, tests for differences (chi-sq, t-tests), identify differences in physicians' approach and success with treating obesity.
- Provide recommendations as to top barriers and motivators for ALwO/Caregivers of ALwO and the related strategies for HCPs to help ALwO.
    - Perform descriptive univariate analysis across study variables and identify areas of insight as well as disconnects between ALwO/Caregiver of ALwO-reported information and HCP-reported information.
        - Identify issues with obesity management that have actionable solutions to improve obesity care within each country.
        - Examine univariate statistics to identify perceptual and attitudinal disconnects between ALwO, Caregivers of ALwO, and HCPs.
        - Evaluate patient (ALwO/Caregiver)/HCP interaction regarding successful weight loss, particularly across the following hypothesised key behaviours: initiate a constructive dialogue, discuss management options, schedule follow-up.

Sub-group analyses will be performed globally (i.e., total sample of ALwO, Caregivers of ALwO, and HCPs) and within country as sample sizes permit.

- For ALwO/Caregivers of ALwO, these analyses may include ALwO sex, ALwO age, ALwO obesity severity, Caregiver of ALwO sex, Caregiver of ALwO age, Caregiver of ALwO BMI class, and region.
- For HCPs, these sub-group analyses may include age, sex, specialty, years in practice, HCP practice setting, obesity expertise and region.

Bias will be minimised by 1) not specifying the topic of the study in the email survey invitations, but rather being general in nature (e.g., a survey about health issues), and 2) careful design of the screener to ensure respondents do not know the purpose of the study until they have met the qualification criteria. Steps outlined in previous sections around respondent recruitment (general population sample) will also assist in mitigating sampling bias.

The survey will be programmed such that every question must be answered to continue with the survey; thus, there will be no missing data for the completed surveys. Response options of "not applicable" or "not sure" will be included as appropriate for specific questions to ensure

respondents can accurately answer each question. Questions will be also asked in a culturally sensitive manner to facilitate accurate responses.

Most questions will be asked of the full sample; reduced base questions will be used sparingly (e.g., nature of discussions will be assessed only among those who have had discussions about weight with an HCP).

Range limits will be used for numeric entry questions (e.g., height, weight, percentages [0-100% or 1-100% as appropriate]). Outliers will be identified and truncated to the median as appropriate, determined on a case-by-case basis.

Weights will be applied to the Caregivers of ALwO data to mitigate selection bias and for generalizability. The final, incoming adult general population sample, including those failing to qualify for the survey, will be weighted to representative demographic targets within each country for age, sex, household income, education, and region within each country based on government and other public data. Weights are calculated using a raking technique to achieve the nearest possible sample and target balance, with individual respondent weights capped at 0.5 and 5.00 to avoid extreme design effects.

8.7.1 Definition of analysis sets

All of the survey responses for each respondent (ALwO/Caregiver of ALwO/HCP) who completes the survey in its entirety and meets the quality control measures as described in Section 8.8 will be included in the analyses; this constitutes the Full Analysis Set. [redacted] research team members will be responsible for reviewing interim data and identifying respondents with suspect data following a stringent set of guidelines (see Section 8.8). Only data that is considered to be of poor quality will be excluded.

8.7.2 Statistical methods

For all analyses, cut-off points for categorising continuous variables will be determined as appropriate for each relevant survey question (e.g., median, tertiles, quartiles). Outliers for continuous variables (e.g., height, weight) will be identified and truncated to the median as appropriate, determined on a case-by-case basis.

8.7.2.1 Analysis of primary outcome measure

The following statistical analyses will be performed for the primary outcome measure:

- Univariate descriptive statistics
    - Means, medians, and proportions across the total study population for each country as well as for data subsets (e.g., ALwO sex, ALwO age, Caregiver of ALwO sex, Caregiver of ALwO age, Caregiver of ALwO BMI class, HCP age, HCP sex, HCP specialty, HCP years in practice, HCP practice setting, ALwO/Caregiver/HCP region) for attitudes about people with obesity, beliefs about the impact of obesity, weight loss attempts, motivations for and barriers to losing weight, definition of successful weight loss/management, history and frequency of conversations about weight, initiator of weight conversations, person responsibile for initiating weight conversations, perceptions of interactions between ALwO/Caregivers of AlwO/HCPs, reasons for not discussing obesity, frequency of obesity diagnosis,

frequency of follow-up appointments made to discuss obesity, and sources of information used to learn about obesity/healthy lifestyles/weight loss/weight management.

- Classical tests of hypotheses (chi-square, t-tests, ANOVA) at alpha = 0.05 to identify differences in survey responses between the data subsets listed above.

- Linear regression and Pearson correlation coefficients to model the relationship between perception of weight/obesity, attitudes towards obesity and its management, motivation, and barriers/solutions for weight loss by ALwO age, ALwO sex, Caregiver of ALwO BMI class, and HCP specialty.

8.7.2.2 Analysis of exploratory outcome measures

The following statistical analyses will be performed for the exploratory outcome measures:

- Univariate descriptive statistics
    - Means, medians, and proportions across the total study population for each country as well as for data subsets (e.g. ALwO sex, ALwO age) for well-being, body image, and self-esteem.

- Classical tests of hypotheses (chi-square, t-tests, ANOVA) at alpha = 0.05 to identify differences in survey responses between the data subsets listed above.

- Linear regression and Pearson correlation coefficients to model the relationship between well-being, body image, and self-esteem by ALwO age and ALwO sex.

The WHO-5 scores will be calculated as follows:

- The raw score is calculated by totalling the figures of the five items, ranging from 0 to 25, 0 representing worst possible and 25 representing best possible quality of life.
- To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4.
- A percentage score of 0 represents worst possible, whereas a score of 100 represents best possible quality of life.

The RSES scores will be calculated as follows:

- A value will be assigned to each of the ten items: For items 1,2,4,6,7: Strongly Agree=3, Agree=2, Disagree=1, and Strongly Disagree=0. For items 3,5,8,9,10 (which are reversed scored): Strongly Agree=0, Agree=1, Disagree=2, and Strongly Disagree=3.

- The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.

8.8 Quality control

All surveys are programmed internally using Decipher, [redacted] secure online quantitative data collection software. [redacted] guarantees senior-level programming support on all research engagements, with programmers who have been trained using a stringent quality control process to ensure surveys are programmed error-free. [redacted] utilises a rigorous quality assurance process which includes the following:

- Programmer and researcher manual testing: Manual testing process which includes several members of the research and programming team (Operations) testing each survey path thoroughly to ensure accuracy in both the text and all survey logic (skip and jump patterns). Each survey is tested with several different web browser software packages as well as one IOS and Android mobile device.
- Random Data Generation (RDG) and Data Check Edits (DCE): Once testing is completed by both the [redacted] operations and research teams, a member of the operations team runs a set of randomly generated data ("dummy" data) to fill all possible paths and quotas, then writes a programmatic check designed to test the validity of the survey. Each question is tested for the correct number and coding of responses, that respondents answering the questions meet the base criteria as well as duplicate any calculated or algorithmic variables and compared for accuracy. An independent member of the operations team then writes the DCE. The data is also run through the DCE one again with soft launch data, full field data (data from the day after full fielding has begun) and the final data set.
- Soft launching: Once the DCE is approved, [redacted] will begin fielding with a limited amount of sample designed to recruit 10% of the total quota. The soft launch data is then thoroughly checked utilising the DCE to ensure programming accuracy.
- In-field data checks: A core member of the [redacted] research team monitors the data at regular intervals (e.g., 10%, 25%, 50%, 75% of data collection). The data is examined for the following and considered together to identify and exclude respondents for whom the data is suspect/of poor quality:
    - Length of survey – survey length will be estimated prior to fielding; any surveys completed substantially below a lower threshold will be evaluated.
    - Quality control questions – each survey will include a few questions for the sole purpose of being a quality control check (e.g., "For quality control purposes, please select No" with response options of "Yes, No, Maybe"). These questions allow us to evaluate a respondent's level of attention to the survey.

Adherence to this process ensures that high-quality data is collected. All survey data will be stored on the secure Decipher platform.

8.8.1 Monitoring procedures

This protocol requires collection of data without monitoring. All data will be collected by [redacted] using in-country research partners as described in section 8.2.6.

8.8.2 Critical documents

Before starting the study (which is when informed consent is obtained from the first respondent), the following documents must be available to Novo Nordisk or external vendor:

- Approval/favourable opinion from Institutional Review Board (IRB)/Independent Ethics Committee (IEC) (or other appropriate bodies as required locally) clearly identifying the documents reviewed: the protocol including version, patient information/informed consent form and any other written information to be provided to the respondent, respondent enrolment procedures.

- Copy of IEC/IRB approved patient information/informed consent form/any other written information/advertisement (or document of waiver by IEC/IRB of informed consent).
- Study agreement (contract).

8.8.3 Retention of study documentation

The external vendor ([redacted]) must agree to archive the documentation pertaining to the study in an archive for at least 5 years after final report/first publication of the study, whichever comes later. [redacted] should not destroy any documents without prior permission from Novo Nordisk.

Novo Nordisk will retain the documentation pertaining to the study according to company procedure and in accordance with national regulations if they require a longer retention period.

8.9 Limitations of the research methods

As this is a disease area study, there may be several limitations including the cross-sectional nature of the data collection, descriptive nature of the data being collected, reliance on self-reported height and weight (which could underestimate BMI-for-age), and accuracy of respondent recall. Response rates may affect sample representativeness, which will be mitigated by stratified sampling and demographic weighting of the Caregiver of ALwO population.

8.10 Other aspects

Not applicable.

9 Protection of human subjects

The study will be conducted in accordance with EphMRA Code of Conduct[19] and European Union (EU) General Data Protection Regulation (GDPR)[20] (for ensuring the well-being and rights of respondents in survey-based study activities.

9.1 Informed consent form for study participants

Consent procedures are included in the surveys for each respondent. All informed consent procedures will be submitted to and approved by local Ethics Committee/IRB prior to the start of data collection. Once a respondent enters the survey and selects his/her preferred language, information about the study will be presented, including: purpose of the research, participation consists of completing a 20-minute survey, they will receive the online panel credit/honoraria listed in their invitation, there are no costs to them to participate, participation is voluntary and they can withdraw/stop at any time, how and for how long their data will be stored, and the authorised entities that may have access to the anonymised data. The respondent must provide electronic consent to proceed to the survey.

In obtaining and documenting informed consent, [redacted] must comply with the applicable regulatory requirement(s) and adhere to the requirements in the Declaration of Helsinki[21].

If a respondent is not of legal age, then the respondent's assent must also be obtained according to local requirements.

9.2 Data handling

If the respondent withdraws the previously given informed consent, the respondent's data will be handled as follows:

- Data collected will not be used as part of the statistical analysis.
- Data will be collected and handled in accordance with local law and IRB/IEC procedures.

9.3 Institutional Review Boards/Independent Ethics Committee, health authorities and other relevant national institutions/bodies

Study specific documentation (study protocol, patient information/informed consent form, respondent materials) must be submitted to the relevant national bodies as required by national regulation and procedures in the participating countries.

The study must be approved by the IEC/IRB for each participating country or a centralised IEC/IRB as appropriate.

9.4 Premature termination of the study

The sponsor may decide to stop the study or part of the study at any time. If the sponsor decides to stop the study, online data collection will be suspended. Data will be retained for analysis purposes as desired by the sponsor in accordance with this document.

If a study is prematurely terminated or suspended, information must be provided to the relevant national bodies as required by national regulation and procedures.

10 Management and reporting of safety data

Due to the cross-sectional nature of this study, the lack of survey questions regarding any products, and no opportunity to enter free text in the questionnaire, mentions of adverse events and other safety information can only potentially occur during the 60-minute web-assisted telephone pre-tests in countries for which all survey recruitment and data collection is conducted online. This includes the following countries:

- ALwO/Caregivers of ALwO: Italy, Spain, United Kingdom, Australia, Mexico, South Korea, Colombia
- HCP: Italy, Spain, United Kingdom, Australia, Mexico, Colombia, Taiwan

In other countries, mentions of adverse events and other safety information may also occur during telephone or in-person recruitment, or in-person survey administration. This includes the following countries:

- ALwO/Caregivers of ALwO: Saudi Arabia, Turkey, Taiwan
- HCP: Saudi Arabia, Turkey, South Korea

Respondents will be shown a clause at the beginning of each survey during the pre-tests (TAPIs), or during telephone or in-person recruitment, or in-person survey administration, indicating that in the event an adverse event is mentioned, [redacted] will ask the respondent whether they are willing to waive confidentiality and agree to be further contacted for follow-up questions regarding the reported event.

If [redacted] is made aware of any information that meets the definition of an adverse event or other safety information associated with a Novo Nordisk product or the generic name of a Novo Nordisk product during interviews or other in-person contact, this information will be systematically collected and reported to Novo Nordisk in accordance with the processes outlined in this protocol.

Since this study does not investigate a specific medicinal product but investigates a therapeutic area (obesity), all adverse events or other safety information involving Novo Nordisk products used within that indication will be collected and reported as solicited. Reports regarding a Novo Nordisk product that is not used within the therapeutic area under investigation will also be collected but will be regarded as spontaneous.

Adverse events must be reported to the Novo Nordisk affiliate safety department by [redacted] on the applicable adverse event form. In addition to this, for serious adverse reactions/serious adverse events, further information must be reported by [redacted] on the Novo Nordisk safety information form.

[redacted] must report to Novo Nordisk within the following timelines. For serious adverse reactions/serious adverse events:

- **Initial information** must be reported on the Novo Nordisk adverse event form **within 24 hours** of the [redacted] of the event.
- **Further information** must be reported on the Novo Nordisk safety information form **within five calendar days** of the survey administrator's knowledge of the event.
- If the initial reporting to the Novo Nordisk affiliate was made by any **other means** (for example phone call within 24 hours), initial and further safety information must be provided on the Novo Nordisk adverse event and safety information form **within five calendar days** of the survey administrator's knowledge of the event on the forms, as described above.

For non-serious adverse events:

- Initial and further information must be reported on the Novo Nordisk safety reporting form within **14 calendar days** of the survey administrator's knowledge of the event.

11 Plans for disseminating and communicating study results

All information supplied by Novo Nordisk in connection with this study must remain the sole property of Novo Nordisk and is to be considered confidential information. No confidential information must be disclosed to others without prior written consent from Novo Nordisk. Such information must not be used except in the performance of this study.

11.1 Registration of study information

In accordance with Novo Nordisk's commitment to transparency in clinical activities, this study will be registered on `ClinicalTrials.gov´ and www.novonordisk-trials.com no later than at enrolment of the first study respondent. At least one study site per participating country will be included in the study registration.

11.2 Communication and publication

Novo Nordisk commits to communicating or otherwise making available for public disclosure results of studies regardless of outcome. Public disclosure includes publication of a paper in a scientific journal, abstract submission with a poster or oral presentation at a scientific meeting, or by other means.

All information supplied by Novo Nordisk in connection with this study must remain the sole property of Novo Nordisk and is to be considered confidential information. No confidential information must be disclosed to others without prior written agreement from Novo Nordisk. Such information must not be used except in the performance of this study. The information obtained during this study may be made available to other physicians who are conducting other studies with the study product, if deemed necessary by Novo Nordisk.

At the end of the study, one or more publication(s) may be prepared by steering committee members in collaboration with Novo Nordisk. Novo Nordisk reserves the right to postpone publication and/or communication for up to 60 days to protect intellectual property and reserves the right not to release interim results or data until a study report is available. The results of this study will be subject to public disclosure on external websites according to international regulations, as reflected in the Novo Nordisk Commitment to share information about clinical studies.

In a multi-centre study based on the collaboration of all study sites, any publication of results in a journal article must acknowledge all study sites. Where required by the journal, the physician/external vendor from each site will be named in the acknowledgement.

The physician/external vendor must ensure submission of the results of the study (either abstracts or full study report) to IEC/IRB (or other appropriate bodies as required locally) if the protocol or protocol abstract was submitted to any of these.

In all cases, the study results must be reported in an objective, accurate, balanced, and complete manner, with a discussion of the strengths and limitations of the study. All authors will be given the relevant statistical tables, figures, and reports needed to support the planned publication. In the event of any disagreement about the content of any publication, both the physicians' and Novo Nordisk's opinions must be fairly and sufficiently represented in the publication.

Novo Nordisk maintains the right to be informed of any physician/external vendor plans for publication and to review any scientific paper, presentation, communication, or other information concerning the investigation described in this protocol. Any such communication must be submitted in writing to the Novo Nordisk study manager prior to submission for comments. Comments will be given within four weeks from receipt of the planned communication.

11.3 Physician/external vendor access to data and review of results

As owners of the study database, Novo Nordisk has discretion to determine who will have access to the database.

Provided that certain conditions are fulfilled, Novo Nordisk may grant access to information obtained during this study to researchers who require access for research studies studying the same disease and/or product studied in this study.

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List of figures and tables

Table of Figures

Page

No table of figures entries found.

Table of Tables

Page

Checklist for Reporting Of Survey Studies (CROSS)

Section/topic	Item	Item description	Page
Title and abstract			
Title and abstract	1a	State the word “survey” along with a commonly used term in title or abstract to introduce the study’s design.	1-2
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion, and conclusions.	2-3 (due to the structured header/format for BMJ Open, background information is not required, but has been encompassed into the objective)
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done, and why this survey is needed.	5-6
Purpose/aim	3	Identify specific purposes, aims, goals, or objectives of the study.	7
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g., cross-sectional or longitudinal).	7
Data collection methods	5a	Describe the questionnaire (e.g., number of sections, number of questions, number and names of instruments used).	7 (described in Halford et al; p7 refer readers here)
	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure, and reference links (if any).	7 (described in Halford et al; p7 refer readers here)
	5c	Provide information on pretesting of the questionnaire, if performed (in the article or in an online supplement). Report the method of pretesting, number of times questionnaire was pre-tested, number and demographics of participants used for pretesting, and the level of	7 (provided in Halford et al; p7 refer readers here)

		similarity of demographics between pre-testing participants and sample population.	
	5d	Questionnaire if possible, should be fully provided (in the article, or as appendices or as an online supplement).	7 (provided in Halford et al; p7 refers readers here)
Sample characteristics	6a	Describe the study population (i.e., background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	7
	6b	Describe the sampling techniques used (e.g., single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	8
	6c	Provide information on sample size, along with details of sample size calculation.	9
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	9
Survey administration	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the survey was conducted (e.g., outpatient room or by use of online tools, such as SurveyMonkey).	8 (further information provided in Halford et al)
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure, and follow-up days.	7
	7c	Provide information on the entry process: –>For non-web-based surveys, provide approaches to minimize human error in data entry. –>For web-based surveys, provide approaches to prevent "multiple participation" of participants.	This is explained in the online supplement of Halford et al
Study preparation	8	Describe any preparation process before conducting the survey (e.g., interviewers' training process, advertising the survey).	This is explained in the online supplement of Halford et al
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board [IRB] approval, Helsinki declaration, and good clinical	7, 22

		practice [GCP] declaration (as appropriate).	
	9b	Provide information about survey anonymity and confidentiality and describe what mechanisms were used to protect unauthorized access.	9 (further information provided in Halford et al)
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	9
	10b	Report any modification of variables used in the analysis, along with reference (if available).	9; Plus additions for: Fig 1-2, Fig S2-S4 *Caption: detail response options that have been merged or coded differently to the original response options*
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e., missing completely at random [MCAR], missing at random [MAR] or missing not at random [MNAR]) and methods used to deal with missing data (e.g., multiple imputation).	9
	10d	State how non-response error was addressed.	9
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	N/A - cross-sectional survey
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	9
	10g	Describe any sensitivity analysis conducted.	N/A - descriptive analysis
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	3-4 of supplement

	11b	Provide reasons for non-participation at each stage, if possible.	3-4 of supplement
	11c	Report response rate, present the definition of response rate or the formula used to calculate response rate.	10; (methods for defining response rate are provided in Halford et al)
	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g., view proportion, participation proportion, completion proportion).	3-4 of supplement (methods for unique visitors are provided in Halford et al)
Descriptive results	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	10-15, fig 1-4, and fig 1-5 of supplement
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and p-values.	N/A – descriptive analysis
	13b	For multivariable analysis, provide information on the model building process, model fit statistics, and model assumptions (as appropriate).	N/A – descriptive analysis
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	N/A – descriptive analysis
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	4, 19
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions and suggest areas for future research.	16-20
Generalizability	16	Discuss the external validity of the results.	18-19
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation, and analysis.	21

Conflict of interest	18	Declare any potential conflict of interest.	21-22
Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	21

BMJ Open

Insights from the ACTION Teens study: a survey of adolescents living with obesity, their caregivers and healthcare professionals in the UK

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Insights from the ACTION Teens study: a survey of adolescents living with obesity, their caregivers and healthcare professionals in the UK

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Keywords (3–6): Nutrition & dietetics, paediatric endocrinology, public health, community child health

ABSTRACT

Objectives: ACTION Teens explored the attitudes, behaviours, perceptions and barriers to effective obesity care among adolescents living with obesity (ALwO), caregivers and healthcare professionals (HCPs).

Design: Cross-sectional online survey study.

Setting: Study across 10 countries; here, we report data from UK respondents.

Participants: Overall, 416 ALwO (aged 12 to <18 years; body mass index ≥95th percentile for age and sex [WHO charts]), 498 caregivers and 250 HCPs in the UK completed the survey (August–December 2021).

Primary and secondary outcome measures: Survey questions addressed key aspects of obesity management for ALwO.

Results: Overall, 46% of ALwO perceived their weight as normal or below normal and 86% believed their health was at least good; 56% and 93% of caregivers responded similarly for their ALwO. Despite this, most ALwO (57%) had attempted to lose weight in the past year and 34% felt highly motivated to lose weight. YouTube and social media were most often used by ALwO for information about weight management (41% and 39%); few ALwO and caregivers sought information from a doctor (13% and 22%). Among ALwO who had discussed weight with an HCP (n=122), 49% trusted their weight-management advice. Only 10% of ALwO and 8% of caregivers were told by a doctor that they/their child had obesity. For HCPs, obesity-related comorbidities were the most common reason for initiating weight conversations with ALwO (73%), while short appointment times were the most common barrier (46%). Overall, 30% of ALwO and 11% of caregivers did not feel comfortable bringing up weight with an HCP.

Conclusions: Improved education and communication are needed among ALwO, caregivers and HCPs in the UK to help improve awareness of obesity, its aetiology and its impact on

health, and to support HCPs to proactively initiate weight-related conversations and build trust with ALwO and caregivers.

Trial registration: ClinicalTrials.gov (NCT05013359).

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Three key stakeholder groups were surveyed: adolescents living with obesity (ALwO), caregivers and healthcare professionals.
- Stratified sampling and demographic weighting of caregivers mitigated selection bias.
- Due to the survey-based design, body mass index was calculated using self-reported height and weight data.
- The cross-sectional design may have limited the ability to determine cause and effect.
- Surveys were hosted online in English; therefore, respondents without internet access or who were unable to read English were, by default, excluded.

INTRODUCTION

The prevalence of obesity has risen in young people throughout the UK [1]. Data from the 2021/2022 National Child Measurement Programme showed that in England 10% of children aged 4–5 years were living with obesity and 12% were living with overweight [2]. In the same year, 23% of those aged 10–11 years were living with obesity and 14% with overweight [2]. Across the UK, disparities in the prevalence of obesity also exist, with those living in more deprived areas facing a greater likelihood of developing obesity than those living in less deprived areas [2, 3].

Children/adolescents living with obesity (ALwO) are five times more likely to be living with obesity in adulthood than children/adolescents without obesity, and have an increased risk of health complications (including cardiovascular and metabolic disease) in adulthood [4-6]. Obesity is also associated with mental health issues among ALwO [7, 8], and there is increasing evidence suggesting a bidirectional relationship between the two [9-11]. Furthermore, socioeconomic disadvantage may increase the risk of comorbidity between obesity and poor mental health, and this risk increases with age [9]. However, intervention during early childhood can lead to long-term improvements in body mass index (BMI) [12].

Lifestyle and behaviour interventions are the cornerstones of treatment for ALwO and there is a growing body of literature on the effectiveness of multidisciplinary team intervention [13]. The National Institute for Health and Care Excellence recognises, among others, the role of primary care providers – often perceived as ‘gatekeepers’ – in managing obesity among children/adolescents, including by raising awareness and making referrals to weight-management services [14, 15]. However, it is unclear how many young people are currently seen specifically for obesity in primary care [16], and available data in England suggest less than one-fifth of children with obesity discuss obesity during primary care consultations [17]. Furthermore, there is no nationwide requirement to commission weight-management services

for young people, and when provided, these services may be variable and fragmented, resulting in geographical inequalities in weight-management services [18]. Recently, a pilot scheme of Complications from Excess Weight clinics in England began, in order to deliver on the long-term plan for the National Health Service (NHS), which envisages a holistic, multidisciplinary approach for treating severe obesity-related complications in young people [19]. However, this expansion of services is unlikely to reach the majority of young people requiring treatment [18].

Obesity in young people is one of the biggest public health challenges in the UK [20]. Despite the rising prevalence and current healthcare environment [1], research on the lived experiences, needs and challenges of ALwO, caregivers and healthcare professionals (HCPs) is lacking. The Awareness, Care and Treatment In Obesity maNagement (ACTION) Teens study explored attitudes, behaviours, perceptions and barriers to effective obesity care among ALwO, caregivers and HCPs from 10 countries. Findings from the global, Spanish, Italian and Saudi Arabian analyses have been reported previously [21-24]. Here, we present UK data.

METHODS

Study design and participants

ACTION Teens (NCT05013359) was a cross-sectional survey study conducted in Australia, Colombia, Italy, Mexico, Saudi Arabia, South Korea, Spain, Taiwan, Turkey and the UK; the full methods have been published previously [21]. Data from the UK were collected between August 2021 and December 2021 via an online survey.

Eligible adolescents were aged 12 to <18 years, living in the UK and had a BMI – calculated from self-reported weight, height, age and sex – ≥95th percentile for age and sex based on World Health Organization charts [25]. Eligible caregivers were ≥25 years of age, lived with their ALwO for ≥50% of the time, were based in the UK and were involved in healthcare decisions for their adolescent. Eligible HCPs were physicians practising in the UK, had worked in clinical practice for ≥2 years, cared directly for patients for ≥50% of their time and were visited by ≥10 ALwO in a standard month. HCPs included primary care practitioners, general paediatricians and those with other relevant specialties (nutrition specialists, paediatric endocrinologists, paediatric gastroenterologists, obstetricians and gynaecologists).

The study was approved for the UK by the Institutional Review Board of WCG, Puyallup, WA, USA (tracking number: 20212733; approval date: 27 July 2021). Informed consent was provided by all participants, including a parent/legal guardian of the ALwO. The study was conducted according to the EphMRA Code of Conduct, the principles of the Declaration of Helsinki and applicable laws/regulations related to management of personal information.

Survey development

Separate yet overlapping surveys were created for the ALwO, caregivers and HCPs. An international steering committee that included content experts, as well as HCPs,

developed/approved the survey materials; the members of the steering committee authored the global ACTION Teens study manuscript, in which the full surveys were published [21].

Patient and public involvement

A person living with obesity was involved in the design and dissemination plans for the ACTION Teens study.

Procedures

KJT Group Inc., Rochester, NY, USA, carried out data collection. Data were collected via an online survey that was programmed with Decipher Survey Software (Forsta). Online panels/databases were used to recruit caregivers and ALwO by targeting/screening adults from a stratified general population sample to identify caregivers of ALwO. The screening forms are available alongside the full surveys [21]. Eligible caregivers were invited to participate in the study and were asked to consent to their ALwO's participation. After recruitment of 'matched pairs' of caregivers and ALwO reached a maximum, recruitment continued with a view to increasing the number of respondents to meet the target sample size. Physician panels/databases (online) were used for recruiting HCPs. All surveys were provided in English. ALwO and caregivers received nominal honoraria/panel credit from the online panel company and HCPs were compensated at fair market value for the UK and their specialty type.

Outcomes

As previously described [21], the surveys investigated key aspects of obesity management for ALwO, including: attitudes towards obesity/people living with obesity, and beliefs regarding the impact that obesity has; weight-loss efforts in the past year, motivations/barriers for weight-loss efforts and how successful weight loss/management is defined; history/frequency of discussions about weight and initiator of/responsibility for starting weight discussions between caregivers/ALwO and HCPs; interactions between ALwO, caregivers and HCPs, reasons why

obesity might not be talked about and frequency of obesity being diagnosed and follow-up appointments; and information sources used to learn about weight loss, weight management, obesity and healthy lifestyles. These outcomes were assessed using Likert scales, numeric responses, no/yes responses or multiple/single item selection (response options dependant on question). To ensure there were no missing responses, participants were required to answer all survey questions.

Sample size

The target sample size for the UK was 675 completed surveys from ALwO, 675 from caregivers and 250 from HCPs. Sample sizes were chosen based on the population size of ALwO in the UK and to balance recruitment feasibility and statistical power. They were designed to achieve a margin of error (around a proportion estimate of 50%) of 3.8% for ALwO, 3.8% for caregivers and 6.2% for HCPs. The margin of error was calculated from a standard normal (Z-) distribution with z=1.96, or approximately 95% confidence.

Statistical analysis

The full analysis set comprised all ALwO, caregivers and HCPs who completed the survey. De-identified data were analysed by KJT Group using Stata (StataCorp LLC, version IC 14.2), Excel (Microsoft 365) and SPSS (IBM, version 23.0). Data were described using univariate descriptive statistics (proportions, means and medians). If appropriate, continuous variable outliers (data points two standard deviations from the mean) were removed from the data set when analysing the relevant variable, to control for potential error/misinterpretation that may impact descriptive statistics; therefore, the relevant results were based on a reduced base size. Data for caregivers were weighted based on representative demographic targets within the UK (for sex, age, education, household income and region) for generalizability and to mitigate selection bias. The full statistical methods have been published previously [21].

RESULTS

Demographics and characteristics

A total of 416 ALwO, 498 caregivers and 250 HCPs completed the survey in the UK, representing 36%, 43% and 22% of all UK respondents, respectively (**online supplemental figure 1**). The demographics and characteristics of respondents are summarised in **table 1**. Most participants were from England. Among ALwO and caregivers, there were more female respondents than male; 30% of ALwO were living with Class III obesity and over a third of caregivers had obesity (Class I, II or III) (**table 1**). Most HCPs (60%) were primary care practitioners and 26% of HCPs reported receiving advanced training in weight management or obesity following medical school.

Table 1 Demographics and characteristics

Demographics and characteristics	ALwO	Caregivers	HCPs
Full UK sample, N	416	498	250
Matched pair (ALwO and caregiver), n (%)	21 (5)	21 (4)	N/A
Unmatched, n (%)	395 (95)	477 (96)	N/A
Country of residence, n (%)			
England	348 (84)	425 (85)	220 (88)
Northern Ireland	12 (3)	6 (1)	9 (4)
Scotland	31 (7)	40 (8)	13 (5)
Wales	25 (6)	27 (5)	8 (3)
Age, years, mean (SD)	15.3 (1.7)	41.4 (8.3)	44.9 (9.3)
Female, n (%)	246 (59)	288 (58)	89 (36)
BMI classification of ALwO*			
Obesity Class I	49% (n=204)	55% (n=276)	60% (SD: 21)
Obesity Class II	21% (n=86)	22% (n=112)	26% (SD: 14)
Obesity Class III	30% (n=126)	22% (n=110)	13% (SD: 11)
BMI classification of caregivers and HCPs,† n (%)			
Underweight (<18.5 kg/m^2)	N/A	42 (8)	6 (3)
Healthy weight (18.5–24.9 kg/m^2)	N/A	139 (28)	123 (63)
Overweight (25.0–29.9 kg/m^2)	N/A	132 (27)	54 (28)
Obesity Class I–III (≥30.0 kg/m^2)	N/A	185 (37)	13 (7)
Primary medical specialty, n (%)			
Primary care practitioner	N/A	N/A	150 (60)
General paediatrician	N/A	N/A	40 (16)
Other specialty‡	N/A	N/A	60 (24)

*BMI classification for ALwO participants, the ALwO of caregiver participants and the ALwO patients of HCP participants (Obesity Class I = BMI ≥95th percentile for age and sex; Obesity Class II = BMI ≥120% of 95th percentile for age and sex; Obesity Class III = BMI ≥140% of 95th percentile for age and sex). ALwO and caregiver data represent the proportion (number) of ALwO; HCP data represent the mean proportion (SD) of ALwO patients.

†BMI classification of participating caregivers/HCPs (n=196 for HCPs).

‡Includes nutrition specialists, paediatric endocrinologists, paediatric gastroenterologists, obstetricians and gynaecologists.

ALwO, adolescents living with obesity; BMI, body mass index; HCP, healthcare professional; N/A, not applicable; SD, standard deviation.

Table adapted from [21].

Perceptions of obesity

Among ALwO, 46% perceived their weight as either normal or below normal, 86% believed their health was at least good and 50% believed their health was at least very good (**figure 1A and 1B**). Similarly, most caregivers (56%) perceived their ALwO's weight as either normal or below normal, 93% believed their ALwO's health was at least good and 71% believed their ALwO's health was at least very good (**figure 1A and 1B**).

Few ALwO (15%) were extremely or very worried about their weight and a similar proportion of caregivers (12%) believed this to be the case for their child (**figure 1C**). Less than a fifth of ALwO (19%) and only 13% of caregivers worried a lot about how their/their child's weight could impact their future health (**figure 1D**). Among ALwO and caregivers, 31% and 41%, respectively, were not worried at all about the impact of the adolescent's weight on their future health (**figure 1D**).

Weight-loss attempts, barriers, motivators and attitudes

Overall, 57% of ALwO had made at least one weight-loss attempt in the past year and 28% reported being very likely to make a weight-loss attempt within 6 months; fewer caregivers responded similarly for their ALwO (27% and 20%, respectively).

Lack of motivation was the barrier to weight loss most often reported by ALwO (selected by 46%), whereas caregivers most often reported that none of the specified response options were keeping their child from losing weight (**online supplemental figure 2A**). ALwO and caregivers also reported barriers related to the cost (selected by 17% of ALwO and 10% of caregivers) and availability (selected by 20% of ALwO and 5% of caregivers) of healthy food

and the cost of weight-management programmes (selected by 11% of ALwO and 5% of caregivers). For HCPs, 94% agreed that both unhealthy eating habits and lack of exercise were barriers to their adolescent patients losing weight (**online supplemental figure 2B**). ALwO's top motivators for losing weight were wanting to be more confident/feel better about themselves (selected by 50%) and wanting to be fitter/in better shape (selected by 44%); 20% of ALwO had no desire to lose weight (**online supplemental figure 3**). These data differed to those for caregivers and HCPs: caregivers most commonly believed their child had no desire to lose weight (selected by 35%) and HCPs believed wanting to be more confident/improve self-esteem, wanting to improve social life and wanting to look like peers were the top motivators for ALwO (selected by 70%, 69% and 66%, respectively) (**online supplemental figure 3**).

Regarding attitudes towards weight loss, approximately one-third (34%) of ALwO felt highly motivated to lose weight and three-quarters of ALwO (75%) felt weight loss was completely their responsibility. In comparison, 45% of caregivers and 55% of HCPs disagreed that weight loss was completely the ALwO's responsibility. More than half of caregivers (58%) thought their child would naturally slim down as they got older and taller, and 45% felt that following a successful weight-loss attempt, it would be easy for their child to keep the weight off; 21% and 35% of HCPs, respectively, responded similarly for their adolescent patients.

Information sources

ALwO most often reported that they seek information about weight management from YouTube (41%) and social media (39%); caregivers often used YouTube as well (24%), alongside search engines (26%) and family and friends (24%) (**figure 2**). Few ALwO (13%) and caregivers (22%) sought information from a doctor.

Conversations about weight

A small proportion of adolescents (10%) and caregivers (8%) had been informed by a doctor that they or their child were living with obesity. Among ALwO and caregivers who had discussed weight with an HCP (n=122 and n=192, respectively) and HCPs, all groups most frequently reported bringing up the topic of weight themselves during HCP appointments (44%, 41%, 49%, respectively) (**online supplemental figure 4A**). Additionally, among all ALwO and caregivers, most ALwO (63%) felt they were responsible for initiating weight discussions with an HCP; 43% of caregivers thought that their child should bring it up (**online supplemental figure 4B**). Concerningly, most HCPs (66%) felt responsibility varied depending on the patient and 7% thought it was the adolescent's responsibility to initiate weight discussions; only a minority felt it was their own responsibility (18%) (**online supplemental figure 4B**). HCPs reported the presence of obesity-related comorbidities (73%), the adolescent patient's weight (64%) and the patient's mental/emotional state (64%) as the most common reasons for initiating weight-related discussions with ALwO. Additionally, 50% of HCPs reported that unhealthy lifestyle was a factor they considered when deciding whether to initiate weight-related discussions with ALwO.

ALwO who had discussed weight with an HCP reported a mixture of positive and negative feelings after their most recent discussion; 29% of ALwO felt supported and 25% felt motivated, although a similar proportion felt ashamed (29%) and depressed (23%) (**online supplemental figure 5**). Caregivers who had discussed their child's weight with an HCP tended to have more positive feelings after the last discussion, with hopeful (47%), supported (44%) and motivated (41%) among the most common feelings described. Fifteen percent of ALwO and 11% of caregivers felt surprised after their most recent weight-related discussion (**online supplemental figure 5**). Relative to caregivers, a greater proportion of ALwO felt ashamed (29% vs 14%) and a lower proportion felt supported (29% vs 44%) and motivated (25% vs 41%). Among the ALwO and caregivers who had discussed their/their child's weight with an

HCP, 49% of ALwO and 68% of caregivers trusted the HCP's weight-management advice, and 43% of ALwO and 61% of caregivers felt the HCP understood the difficulties of weight loss.

Overall, 46% of the ALwO who had discussed weight felt comfortable talking to an HCP about their weight; a greater proportion (66%) of caregivers who had discussed their ALwO's weight with an HCP felt comfortable. However, in terms of barriers to discussing weight, 30% of all ALwO and 11% of all caregivers did not feel comfortable bringing up their/their child's weight with an HCP (**figure 3**). In addition, 20% of HCPs did not feel comfortable discussing weight with their adolescent patients with obesity (**figure 3**). Other barriers selected by ALwO and caregivers included the ALwO already knowing how to manage their weight (selected by 25% and 18%, respectively), not seeing the ALwO's weight as a significant medical issue (selected by 24% and 22%, respectively) and not wanting to discuss weight with either the caregiver or adolescent being in the room for the respective group (selected by 20% of ALwO and 12% of caregivers) (**figure 3**).

Most HCPs (82%) felt they had a responsibility to actively contribute to their adolescent patients' weight-loss efforts and 76% of HCPs felt motivated to help with these efforts. HCPs often regarded appointment times not being long enough (46%) and having more important health issues to discuss (36%) as barriers to initiating weight-loss discussions with ALwO (**figure 3**).

DISCUSSION

Results from the UK analysis of the ACTION Teens study suggest there is misalignment among ALwO, caregivers and HCPs, and highlight areas where improvements in communication and education are required to enhance obesity care for ALwO in the UK. A summary of the barriers identified for ALwO and caregivers is shown in **figure 4.**

A large proportion of adolescents did not recognise they are living with overweight or obesity, despite nearly a third of ALwO having Class III obesity. In turn, few ALwO were very or extremely worried about their weight and few worried a lot about the consequences of their weight on their future health. There was also a high proportion of caregivers in this analysis with overweight or obesity. In areas of high obesity prevalence, people's perception of 'normal' weight can shift, leading to a distorted perception of their body [26]. Additionally, only a small proportion of ALwO and caregivers (10% and 8%, respectively) had been informed by a doctor that they or their child were living with obesity, far fewer than those in the global ACTION Teens study (44% and 29%, respectively) [21]. This may be due to challenges identifying overweight/obesity because of lack of contact with young people in primary care [27], which may, in turn, have contributed to the underestimation of weight in this analysis.

Most ALwO believed weight loss is solely their responsibility, indicating signs of self-blame and internalised weight stigma. Apparent attitudes of caregivers could partly drive these beliefs; many caregivers believed it would be easy for their ALwO to keep weight off after losing it, and only approximately half of caregivers disagreed that weight loss was entirely their child's responsibility. Additionally, most HCPs agreed that unhealthy eating habits and lack of exercise are barriers to their ALwO losing weight, and only half of HCPs disagreed that weight loss is entirely the ALwO's responsibility. These attitudes feed the misconception that weight is a personal choice, and although weight stigma was not directly assessed in our study, these views may be linked to weight stigma and biased attitudes towards ALwO. Obesity should be

recognised as a complex, relapsing, long-term condition with multiple causes, including genetics, behavioural and social determinants of health [28, 29]. Of note, attitudes among HCPs may impact the level of care provided to people with obesity [30]. Increasing education on the causes of obesity and ensuring interactions with patients are positive may help to reduce weight stigma among HCPs – such training is needed for those working with ALwO [31].

Of interest, our analysis found that approximately half of ALwO and two-thirds of caregivers who had discussed weight with an HCP reported trusting the HCP's weight-management advice. However, ALwO reported mixed feelings following weight-related discussions with an HCP; 48% reported negative feelings, including ashamed, depressed and blamed, and 30% did not feel comfortable bringing up weight with their HCP. Such negative feelings may be due to experiences and/or internalisation of weight stigma, which is pervasive and can arise from multiple sources, including peers, educators, caregivers, media and HCPs [32]. Continued negative experiences and conversations can contribute to depression, anxiety and low self-esteem, and may reinforce feelings of personal responsibility [33]. Taken together, these findings highlight the complexity and sensitivity of these interactions and suggest a need to improve ALwO's interactions with HCPs. This is also despite policy recommendations and consensus statements outlining the importance of respectful communication about weight, including the use of non-stigmatising language, following evidence of weight bias in healthcare [29, 34]. A recent review exploring perspectives of young people who access support for mental health found that they need a trusting relationship to discuss sensitive issues – they wanted their HCP to listen to their concerns with empathy and make them feel comfortable [35]. Continuity of care, unhurried consultations and a long-term patient–doctor rapport all contributed towards a positive relationship [35].

We found that ALwO primarily used social media and YouTube for information about weight. A small proportion of ALwO had sourced information about weight from a doctor, and

among those who had discussed weight with an HCP, less than half trusted the advice from HCPs, suggesting an urgent need for HCPs to review communication and engagement strategies for adolescents. A greater understanding of the type and impact of weight-management content that ALwO are viewing on social media could help improve engagement. ALwO may believe accessing information from an HCP is more difficult than social media due to perceived barriers such as appointment times and few HCPs initiating weight-related discussions. The rapid availability and diversity of information from social media may also be appealing to young people [36]. Of note, reliance on online/digital health technologies increased rapidly during the COVID-19 pandemic [37, 38]. To better communicate with ALwO about weight-management interventions, HCPs should consider a more proactive approach that utilises digital communications and technology.

Although HCPs in this analysis generally recognised they have an obligation to help ALwO manage weight, the presence of obesity-related comorbidities was the most frequently selected reason for initiating weight-loss discussions. Few HCPs (18%) believed they were responsible for initiating these conversations; the majority believed it varies depending on the patient, which calls for further research into who they believe is responsible. Delaying these weight-related conversations and any potential intervention that the ALwO requires may hinder the ALwO's health in the long-term by putting them at greater risk of developing obesity-related comorbidities [12, 39]. Additionally, short appointment times were identified by HCPs as the main barrier to initiating weight-related conversations with ALwO. The time available for consultations in primary care (on average 9.2 minutes) is generally limited by a lack of capacity and competing priorities, such as administrative burdens [40]. A meta-analysis found that insufficient appointment times were an organisational barrier to HCPs having weight-related discussions with the caregivers of adolescents [41]. Furthermore, HCPs felt they had few contact opportunities due to limited routine contact appointments and potential long gaps [41].

Difficulties accessing primary care consultations can make it challenging for adolescents to build a relationship with their primary care practitioner [42, 43]. Professional stakeholders in a UK adolescent weight-management programme echoed that longer-term support was needed for ALwO, although they recognise the current restraints on resources [44]. There is a need to address appointment time constraints, the lack of available resources, the importance of adequate training and promotion of healthy lifestyles among ALwO and caregivers when considering future interventions within the UK.

This study has many strengths, including the involvement of three respondent groups (ALwO, their caregivers and HCPs involved in obesity management/treatment) and the stratified sampling and weighting of caregivers' data to mitigate selection bias. Limitations include the cross-sectional study design, limiting the ability to determine cause and effect; the relatively small sample size; the reliance on self-reported data (height and weight) to determine eligibility, which could have led to an inaccurate BMI and does not provide data on body composition; few ALwO and caregivers being matched; and the possibility of response bias, such as the potential bias towards digitally active participants due to the online nature of the survey. Furthermore, in the UK, the survey was available in English only, limiting respondents to those who could understand English. Therefore, our findings are likely to be most generalizable to English-speaking, digitally active ALwO, caregivers and HCPs. Future studies could involve adolescents/ALwO in the design of questionnaires/studies, explore adolescents' lived experience of obesity (including its impact on mental health) in greater depth and investigate ways to improve weight-related communications and information sources.

In conclusion, the rising prevalence of adolescent obesity and data from this study highlight a need to improve education and communication among ALwO, caregivers and HCPs in the UK. It is also important to improve trust in HCPs among ALwO to encourage uptake of health services. Additional training for HCPs could help reduce weight stigma and increase

understanding of the complexity of obesity, thus empowering HCPs to initiate potentially challenging weight-related conversations with ALwO and caregivers. Recognition of obesity may also improve perceptions of weight among ALwO and caregivers. A whole-system approach to obesity is needed to improve care, including close collaboration with local authorities [45]. On an institutional level, the NHS and health sector should consider establishing additional support and education for ALwO, caregivers and HCPs, to increase recognition of obesity as a chronic disease and to reinforce the importance of appropriate weight-related discussions throughout its workforce. Although resources are stretched, adequate consultation times are required to ensure ALwO receive the care, sensitivity and attention necessary, and to allow HCPs to address their concerns and build a trusting relationship with ALwO. Weight-related communication strategies in the future should consider using social media and digital technology to improve ALwO's access to high-quality and trusted information about weight.

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Contributors

JCGH is a member and Chair of the ACTION Teens Steering Committee and thus contributed to the design of the study. JCGH, AB, KC, LJE, AG, DG, CH and SS participated in interpretation of the ACTION Teens UK data. JCGH, AB, KC, LJE, AG, DG, CH and SS participated in drafting and revising the manuscript and approved the final submitted version. JCGH is the guarantor for this work.

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Competing interests

JCGH reports consultancy fees from Novo Nordisk for his role as a member of the ACTION Teens Steering Committee during the conduct of the study, consultancy fees from Boehringer Ingelheim and Dupont (paid to the University of Leeds), honoraria from Novo Nordisk (paid to the University of Leeds), support from Novo Nordisk for attending meetings and financial support from Dupont for participation in an advisory board (paid to the University of Leeds). AB reports honoraria from Johnson and Johnson, Novo Nordisk, Obesity UK and the Office for

Health Improvement and Disparities, outside the submitted work; he is also on the Medical Advisory Board of, and a shareholder of, Reset Health Clinics. KC reports speaker fees from Apollo Endosurgery and Ethicon and participation in advisory boards for Boehringer Ingelheim and Eli Lilly; he is also the Chair of Trustees for the patient charity WLSinfo and for the European Coalition for People living with Obesity. LJE receives funding from the Medical Research Council and National Institute for Health and Care Research and is a member of the Office for Health Improvement and Disparities National Child Measurement Programme board and the NHS Complications from Excess Weight Clinics E-board. AG is a full-time employee of Novo Nordisk. DG reports honoraria, speaker fees and support for meeting attendance from Novo Nordisk. CH reports consultancy fees from Ethicon and Novo Nordisk. SS reports honoraria from Merck, Novo Nordisk, Pfizer and Sandoz.

Patient and public involvement

A person living with obesity was involved in the design and dissemination plans for the ACTION Teens study.

Patient consent for publication

Not applicable.

Ethics approval

The study was approved for the UK by the Institutional Review Board of WCG, Puyallup, WA, USA (tracking number: 20212733; approval date: 27 July 2021). Informed consent was provided by all participants, including a parent/legal guardian of the ALwO. The study was conducted according to the EphMRA Code of Conduct, the principles of the Declaration of Helsinki and applicable laws/regulations related to management of personal information.

Data availability statement

Data will be shared with bona fide researchers submitting a research proposal approved by the independent review board. Individual participant data will be shared in data sets in a de-identified and anonymised format. Data will be made available after research completion. Information about data access request proposals can be found at novonordisk-trials.com.

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FIGURE LEGENDS

Figure 1 Perceptions of: A) ALwO's current weight; B) ALwO's health; C) ALwO's worry about weight; D) worry about ALwO's weight impacting future health.

Data are the proportions of respondents who chose each prespecified option, among all UK ALwO (left bars) or UK caregivers (right bars). Numbers may not sum to 100% due to rounding.

ALwO, adolescents living with obesity.

Figure adapted from [18].

Figure 2 Information sources used by ALwO and caregivers to learn about healthy lifestyles, weight loss and weight management.

Data are the proportions of respondents who reported having used each information source, among all UK ALwO (top bars) and UK caregivers (lower bars).

ALwO, adolescents living with obesity.

Figure adapted from [18].

Figure 3 Barriers to discussing weight with HCPs: A) barriers reported by ALwO and caregivers; B) barriers reported by HCPs.

Panel A: data are the proportions of respondents who chose each statement as a reason for not discussing their/their child's weight with the ALwO's HCP, among all UK ALwO and UK caregivers.
Panel B: data are the proportions of respondents who chose each statement as a reason they may not discuss weight with an ALwO patient, among all UK HCPs.

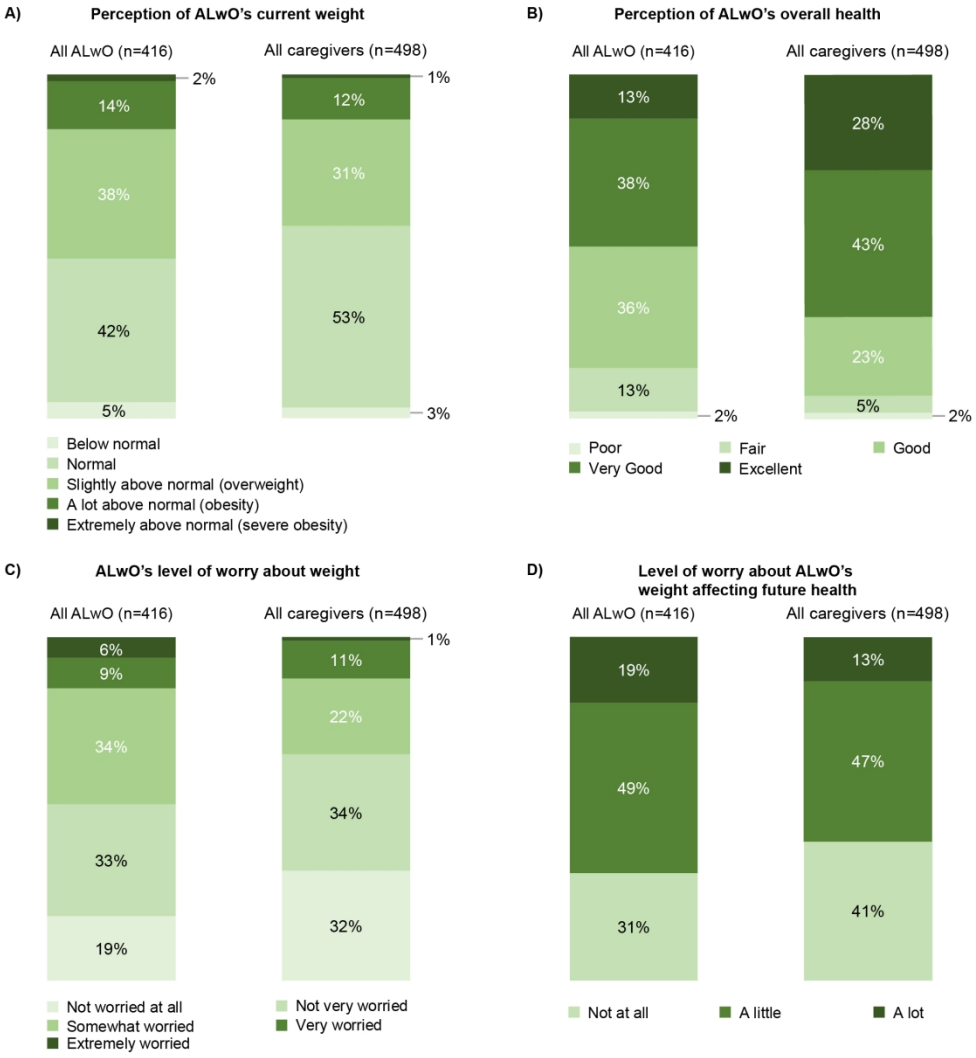
ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [18].

Figure 4 Summary of key barriers to adolescent obesity management identified for ALwO and caregivers in the ACTION Teens UK study.

Barriers have been grouped into three overarching themes: environmental, personal and HCP consultation-based barriers. Barriers in the middle section (red boxes) apply to both ALwO and caregivers.

ALwO, adolescents living with obesity; HCP, healthcare professional.



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Data are the proportions of respondents who chose each prespecified option, among all UK ALwO (left bars) or UK caregivers (right bars). Numbers may not sum to 100% due to rounding.
ALwO, adolescents living with obesity.
Figure adapted from [18].

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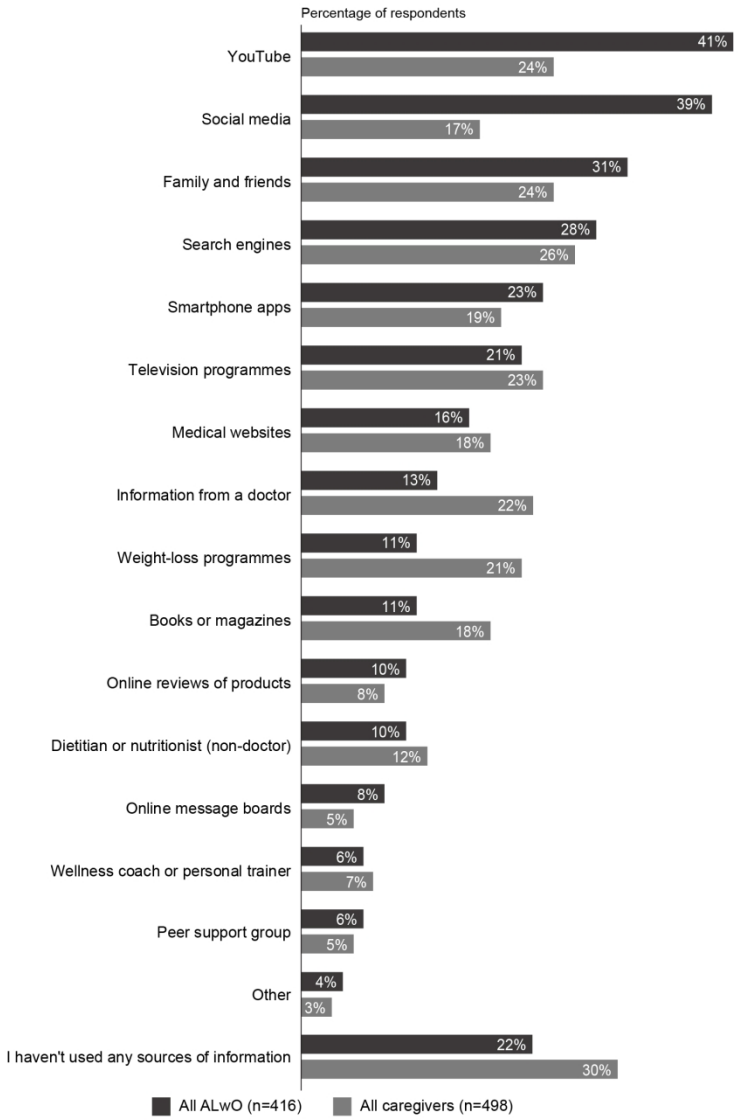

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ALwO, adolescents living with obesity.
Figure adapted from [18].

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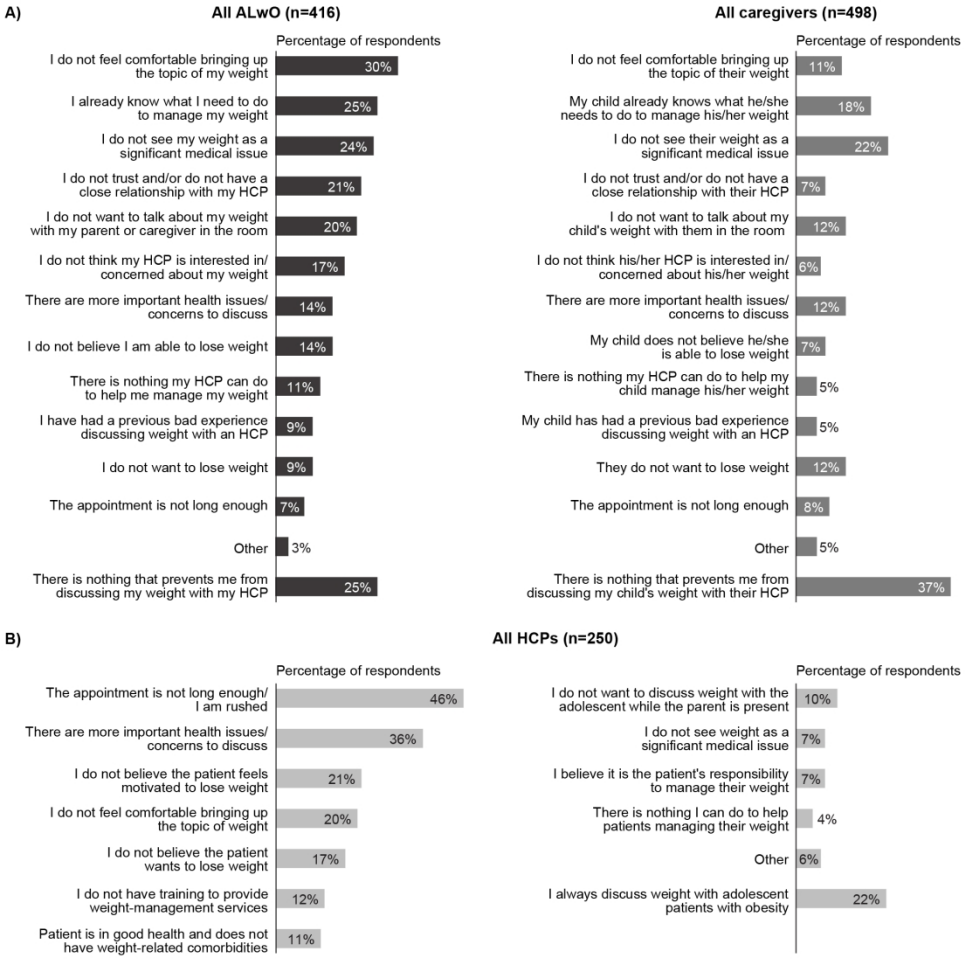

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ALwO, adolescents living with obesity; HCP, healthcare professional.
Figure adapted from [18].

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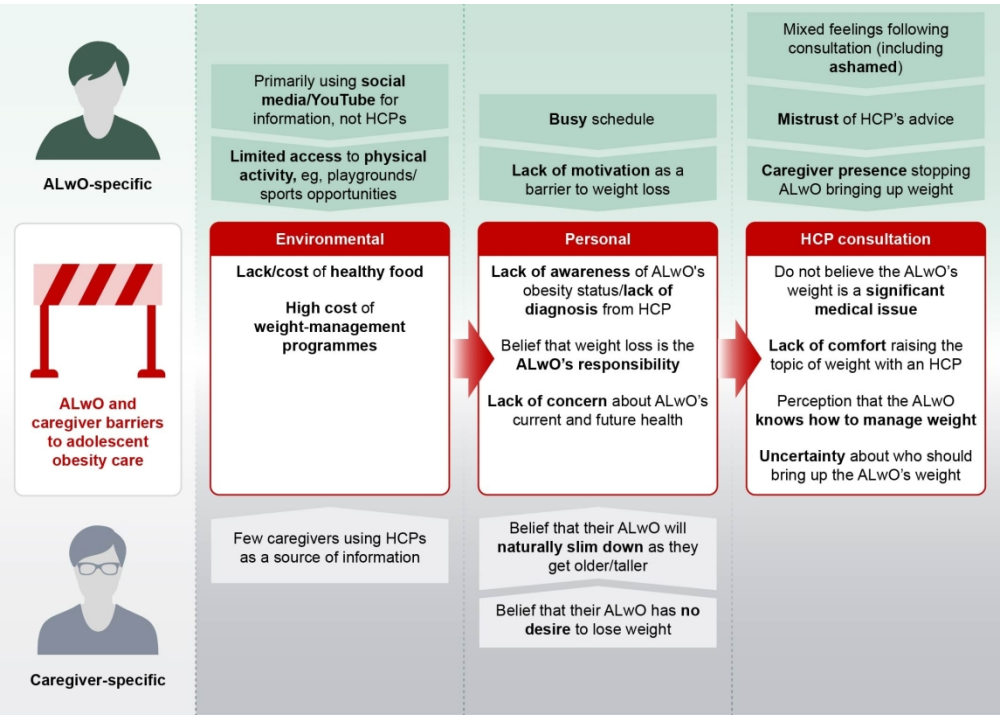

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ALwO, adolescents living with obesity; HCP, healthcare professional.

180x127mm (300 x 300 DPI)

ONLINE SUPPLEMENTAL MATERIAL

This document contains supplemental material for:

Insights from the ACTION Teens study: a survey of adolescents living with obesity, their caregivers and healthcare professionals in the UK

Jason C G Halford,[1] Adrian Brown,[2] Kenneth Clare,[3] Louisa J Ells,[4] Anngona Ghosh,[5] Dinesh Giri,[6] Carly Hughes,[7] Senthil Senniappan[8]

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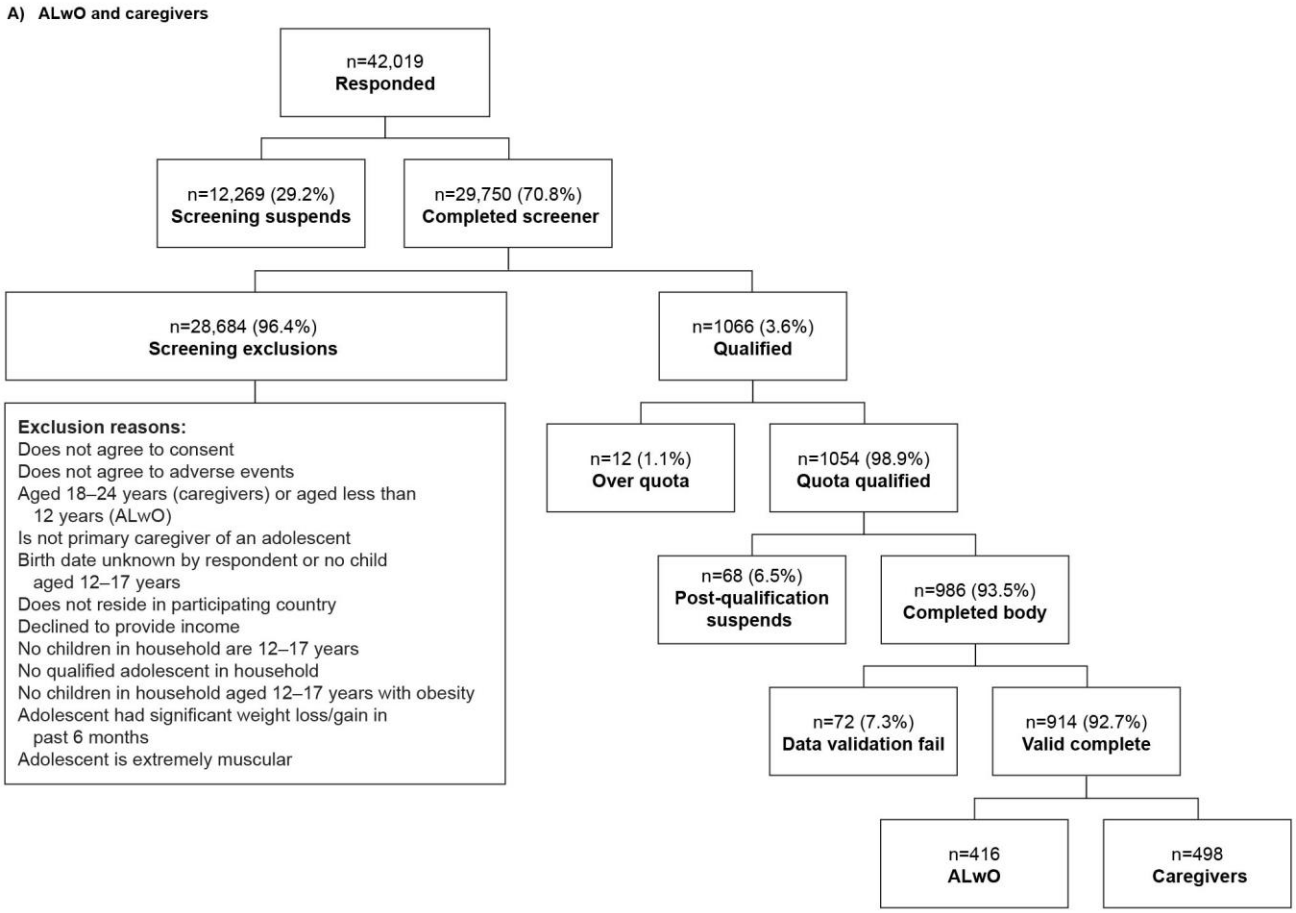
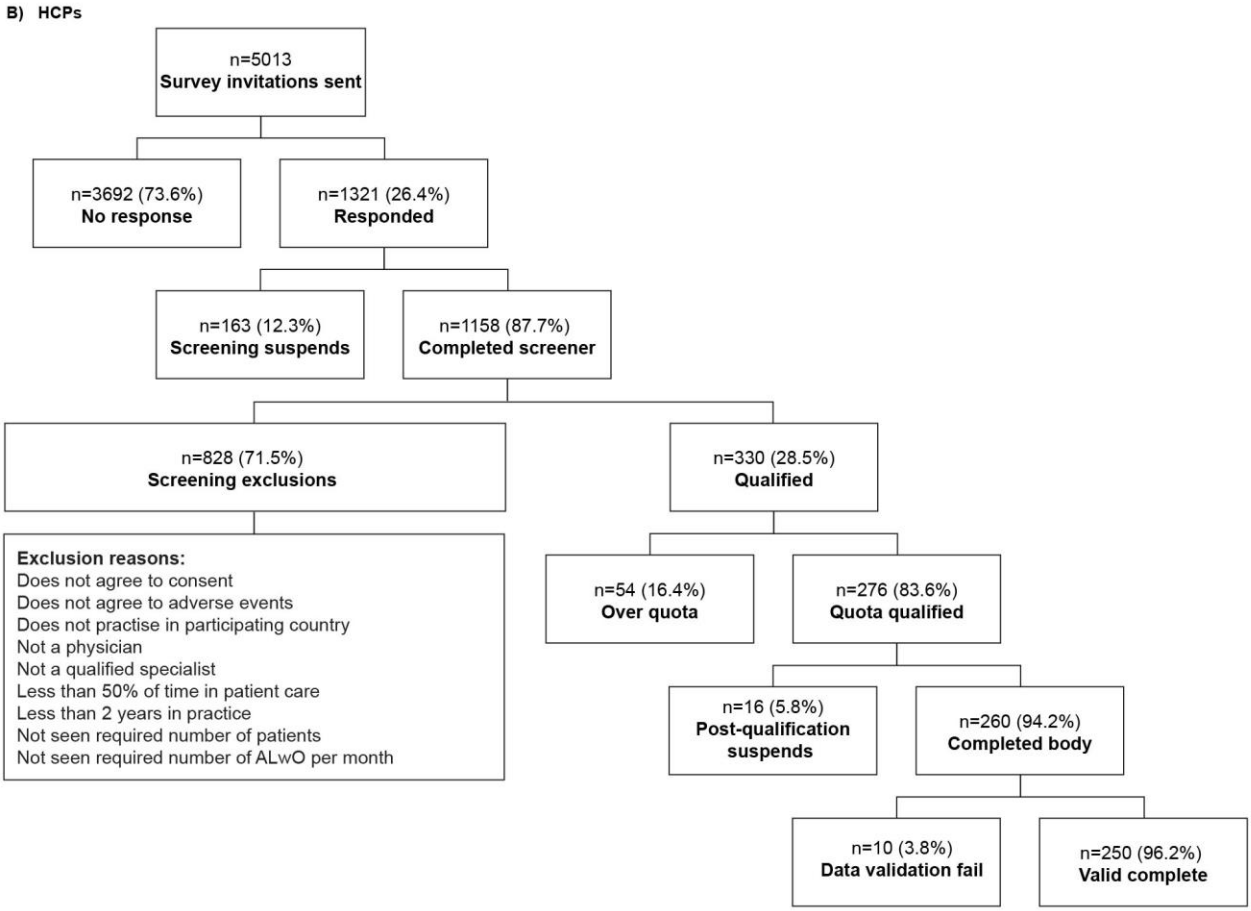
CONTENTS:

ONLINE SUPPLEMENTAL FIGURES

Figure 1 Sample disposition: A) ALwO and caregivers; B) HCPs.



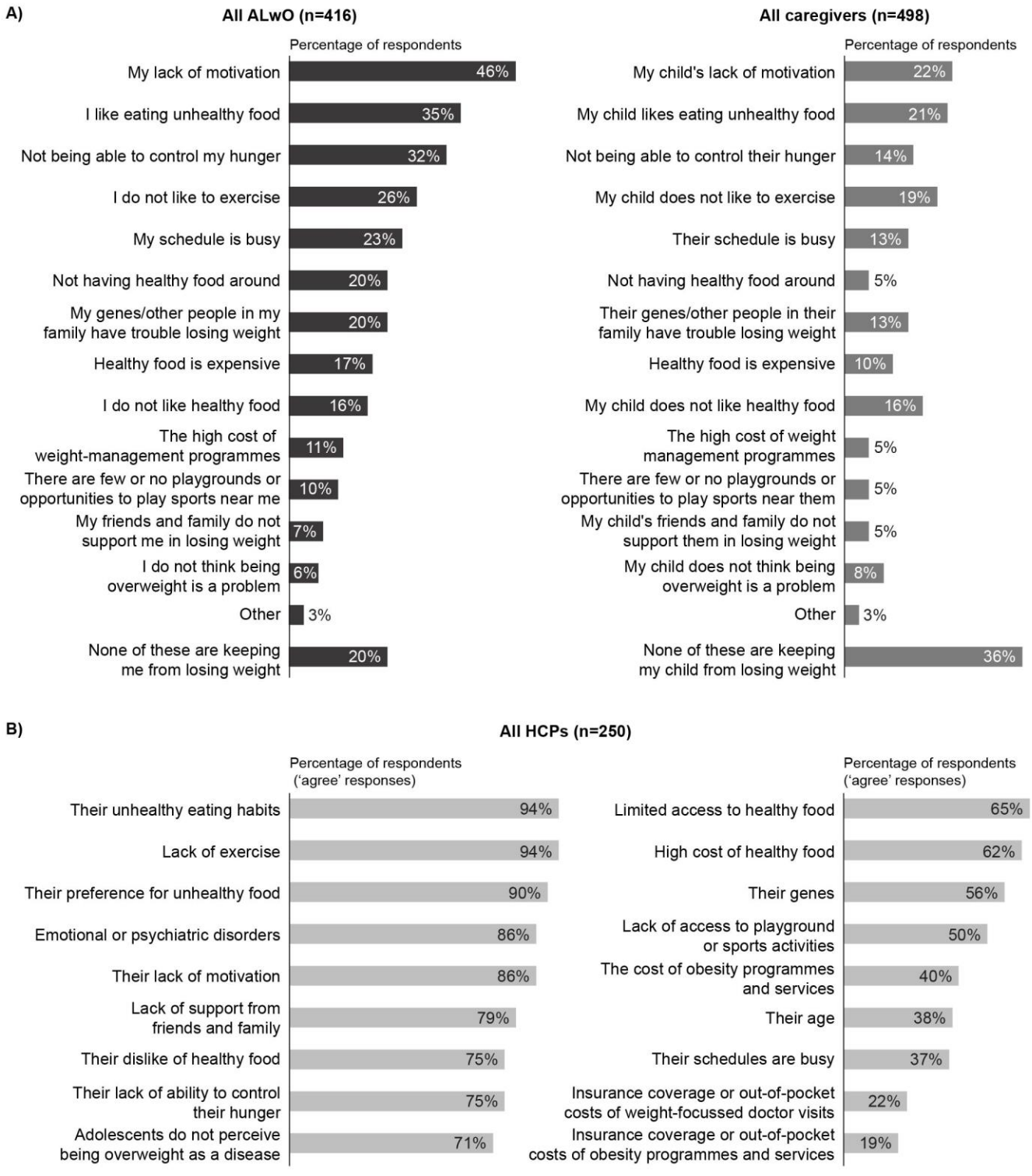


Screening suspends: respondent did not complete the qualification section of the survey but had not been marked as disqualified (ie, screening drop-out). Over quota: respondent was not able to continue as the required number of completed surveys matching the respondent's qualification criteria had been collected already.
Post-qualification suspends: respondent did not complete the main body of the survey fully (ie, survey drop-out).
Data validation fail: respondent's data failed validation checks and were removed from the final data set (eg, 'straight-lining' rating scale questions, very short completion time and incorrect answers to data validity questions).

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 2 Barriers to ALwO weight loss according to: A) ALwO and caregivers; B) HCPs.



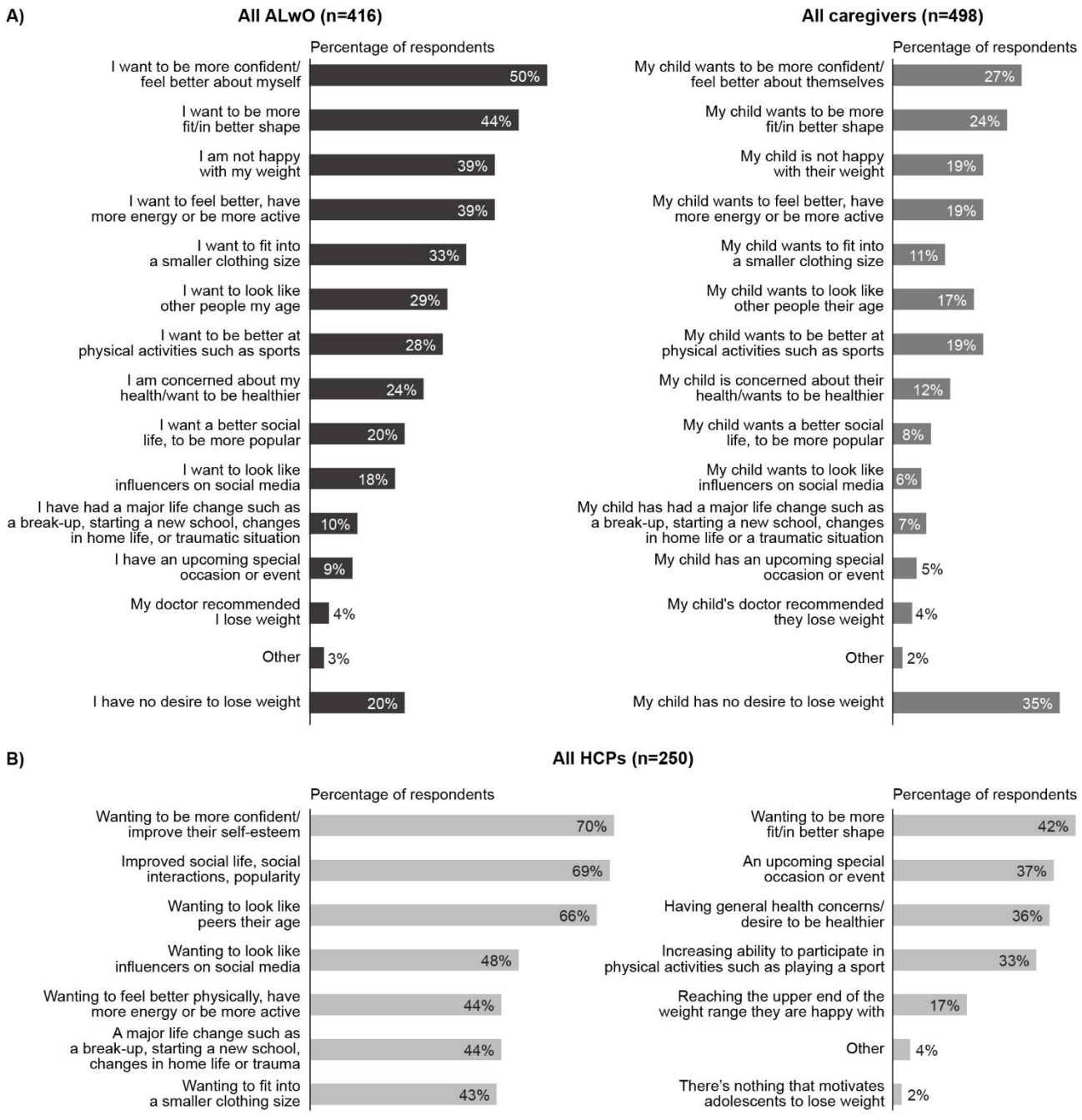
Panel A: data are the proportions of respondents who chose each statement as a barrier to losing weight for themselves (for ALwO) or their child (for caregivers), among all UK ALwO and caregivers. Panel B: data are the

proportions of respondents who reported that they ‘somewhat agree’ or ‘strongly agree’ that each statement is a barrier to losing weight for their ALwO patients, among all UK HCPs.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 3 Motivators for ALwO weight loss according to: A) ALwO and caregivers; B) HCPs.

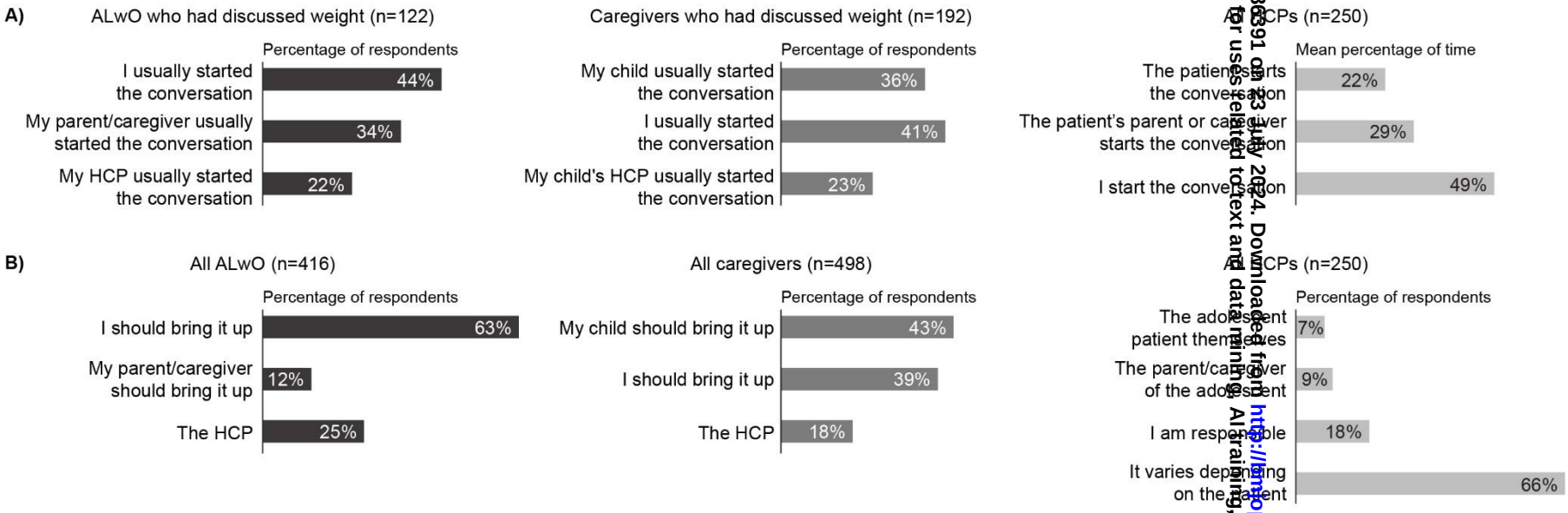


Data are the proportions of respondents who chose each statement as a motivator for losing weight for themselves (for ALwO), their child (for caregivers) or adolescents (for HCPs), among all UK ALwO, caregivers and HCPs.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 4 Perceptions of weight discussions with HCPs: A) who started the discussions; B) who should start the discussions.

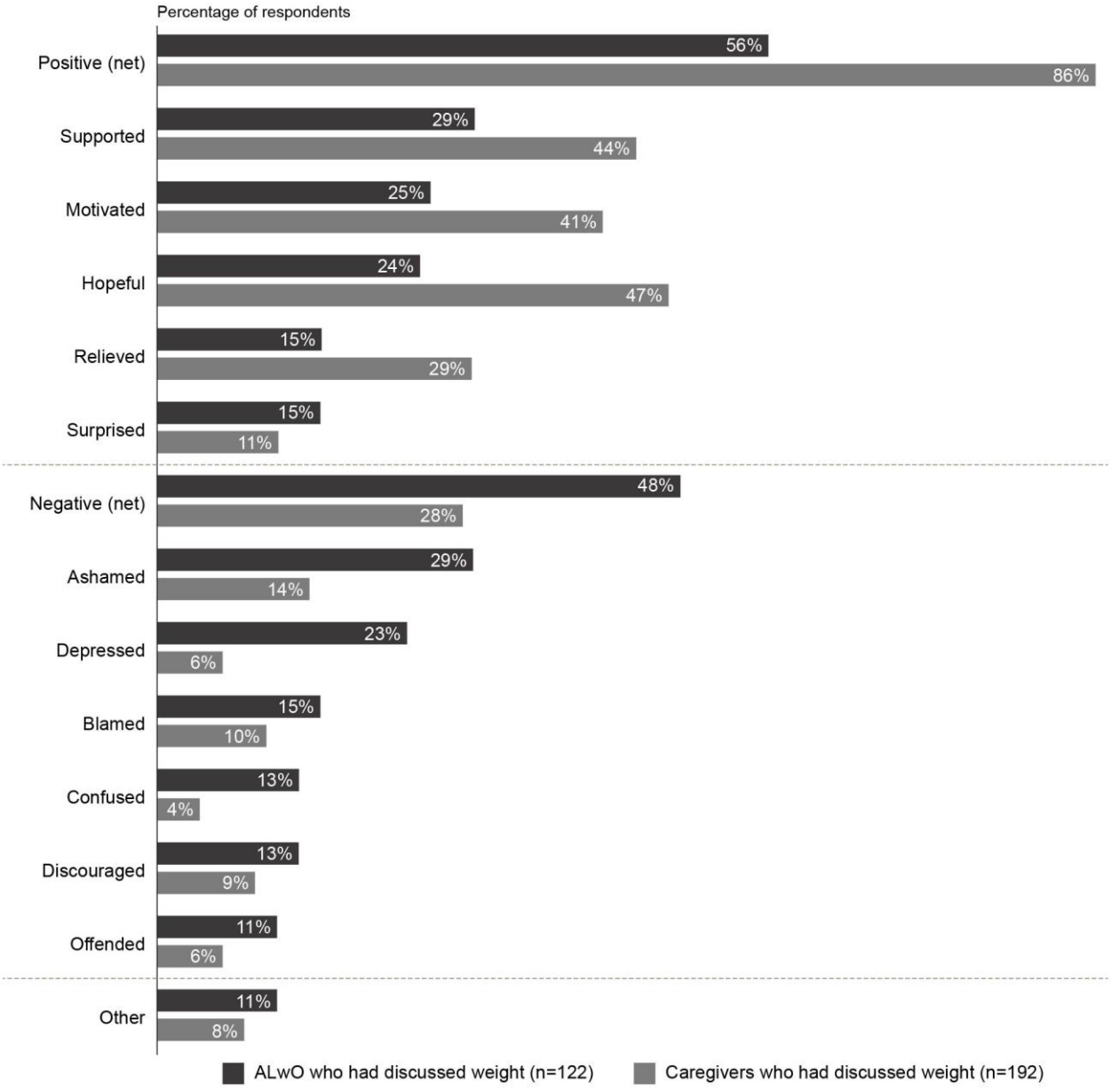


Panel A: ALwO and caregiver data are the proportions of respondents who chose each of the response options when asked who usually first discussed the topic of weight during appointments with HCPs, among the UK ALwO and caregivers who had discussed their/their child's weight with an HCP in the past year. It was only possible to select one response option. HCP data represent the mean proportion of the time that each group starts the conversation according to HCPs, among all UK HCPs. Panel B: data are proportions of respondents who chose each of the response options when asked who should bring up the topic of weight, among all UK ALwO, caregivers and HCPs. It was only possible to select one response option.

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

Figure 5 Feelings of ALwO and caregivers following their most recent discussion about weight with an HCP.



Data are the proportions of respondents who chose each response option among ALwO who had discussed weight with their HCP in the past year or caregivers who had discussed their child's weight with an HCP in the past year. Responses of ALwO and caregivers represent their own feelings. 'Positive (Net)' is the proportion who chose ≥1 positive answer (ie, supported, motivated, hopeful, relieved and/or surprised); 'Negative (Net)' is the proportion who chose ≥1 negative answer (ie, ashamed, depressed, blamed, confused, discouraged and/or offended).

ALwO, adolescents living with obesity; HCP, healthcare professional.

Figure adapted from [1].

REFERENCES

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Checklist for Reporting Of Survey Studies (CROSS)

Section/topic	Item	Item description	Page
Title and abstract			
Title and abstract	1a	State the word "survey" along with a commonly used term in title or abstract to introduce the study's design.	1-2
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion, and conclusions.	2-3 (due to the structured header/format for BMJ Open, background information is not required, but has been encompassed into the objective)
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done, and why this survey is needed.	5-6
Purpose/aim	3	Identify specific purposes, aims, goals, or objectives of the study.	6
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g., cross-sectional or longitudinal).	7
Data collection methods	5a	Describe the questionnaire (e.g., number of sections, number of questions, number and names of instruments used).	7 (described in Halford et al; p7 refer readers here)
	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure, and reference links (if any).	7 (described in Halford et al; p7 refer readers here)
	5c	Provide information on pretesting of the questionnaire, if performed (in the article or in an online supplement). Report the method of pretesting, number of times questionnaire was pre-tested, number and demographics of participants used for pretesting, and the level of	7 (provided in Halford et al; p7 refer readers here)

		similarity of demographics between pre-testing participants and sample population.	
	5d	Questionnaire if possible, should be fully provided (in the article, or as appendices or as an online supplement).	7 (provided in Halford et al; p7 refers readers here)
Sample characteristics	6a	Describe the study population (i.e., background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	7
	6b	Describe the sampling techniques used (e.g., single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	8
	6c	Provide information on sample size, along with details of sample size calculation.	9
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	9
Survey administration	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the survey was conducted (e.g., outpatient room or by use of online tools, such as SurveyMonkey).	8 (further information provided in Halford et al)
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure, and follow-up days.	7
	7c	Provide information on the entry process: –>For non-web-based surveys, provide approaches to minimize human error in data entry. –>For web-based surveys, provide approaches to prevent "multiple participation" of participants.	This is explained in the online supplement of Halford et al
Study preparation	8	Describe any preparation process before conducting the survey (e.g., interviewers' training process, advertising the survey).	This is explained in the online supplement of Halford et al
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board [IRB] approval, Helsinki declaration, and good clinical	7, 22

		practice [GCP] declaration (as appropriate).	
	9b	Provide information about survey anonymity and confidentiality and describe what mechanisms were used to protect unauthorized access.	9 (further information provided in Halford et al)
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	9
	10b	Report any modification of variables used in the analysis, along with reference (if available).	9; plus options for supplementary figures 2 & 5 *Caption detail response options that have been merged or coded differently to the original response options*
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e., missing completely at random [MCAR], missing at random [MAR] or missing not at random [MNAR]) and methods used to deal with missing data (e.g., multiple imputation).	9
	10d	State how non-response error was addressed.	9
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	N/A - cross-sectional survey
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	9
	10g	Describe any sensitivity analysis conducted.	N/A - descriptive analysis
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	3-4 of supplement
	11b	Provide reasons for non-participation at each stage, if possible.	3-4 of supplement

	11c	Report response rate, present the definition of response rate or the formula used to calculate response rate.	10; (methods for defining response rate are provided in Halford et al)
	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g., view proportion, participation proportion, completion proportion).	3-4 of Supplement (methods for unique visitors are provided in Halford et al)
Descriptive results	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	10-11
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and p-values.	N/A – descriptive analysis
	13b	For multivariable analysis, provide information on the model building process, model fit statistics, and model assumptions (as appropriate).	N/A – descriptive analysis
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	N/A – descriptive analysis
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	4, 19
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions and suggest areas for future research.	16-20
Generalizability	16	Discuss the external validity of the results.	19
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation, and analysis.	21
Conflict of interest	18	Declare any potential conflict of interest.	21-22

Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	21