

Robertson, Deirdre A.; Andersson, Ylva; Lavin, Ciarán; Lunn, Pete

Working Paper

Comparing expert and public perceptions of the obesity epidemic in 3 countries

ESRI Working Paper, No. 768

Provided in Cooperation with:

The Economic and Social Research Institute (ESRI), Dublin

Suggested Citation: Robertson, Deirdre A.; Andersson, Ylva; Lavin, Ciarán; Lunn, Pete (2023) : Comparing expert and public perceptions of the obesity epidemic in 3 countries, ESRI Working Paper, No. 768, The Economic and Social Research Institute (ESRI), Dublin

This Version is available at:

<https://hdl.handle.net/10419/296740>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

ESRI Working Paper No. 768

Comparing expert and public perceptions of the obesity epidemic in 3 countries

Deirdre A. Robertson^{a,b*}, Ylva Andersson^a, Ciarán Lavin^a
and Peter D. Lunn^{a,c}

a. Behavioural Research Unit, Economic and Social Research Institute, Dublin, Ireland.

b. School of Psychology, Trinity College Dublin, Ireland.

c. Department of Economics, Trinity College Dublin, Ireland.

*Deirdre.robertson@esri.ie

Funding: This research was funded by the Government of Ireland Department of Health/ESRI Research Programme in Healthcare Reform.

Acknowledgements: We thank members of the Behavioural Research Unit in the ESRI for feedback on the design of this research. We thank Catherine Curran in the Department of Health and members of the research programme steering group for helping to identify suitable experts to approach. Finally, we thank the expert and public participants for the time they took to complete this study.

ESRI working papers represent un-refereed work-in-progress by researchers who are solely responsible for the content and any views expressed therein. Any comments on these papers will be welcome and should be sent to the author(s) by email. Papers may be downloaded for personal use only.

Abstract

The “obesogenic environment” contributes to the global obesity epidemic. However, many believe that obesity is caused solely by individual choice. This paper investigates how the public in Ireland, the UK, and USA perceive the causes, consequences and severity of obesity compared to an expert sample. We describe an experiment to assess whether describing the obesity within its historical context brings public perceptions closer to experts. We find significant differences between expert and public views and between countries. The experiment was effective, but effects were small. The paper discusses obstacles to acceptable policies to reduce rates of obesity in Ireland.

Keywords: Obesity; Overweight; Perceptions; Behaviour; Environment; Obesogenic; Attitudes; Policy

1. Introduction

The latter half of the twentieth century saw a revolution in the mass production, distribution and marketing of food. Energy-dense, low nutrition, cheap foods became widely available and were pervasively advertised to potential consumers [1]. Since 1975, the average number of calories available globally per capita has risen by approximately 500 calories daily; the equivalent of an additional two 42g chocolate bars per person per day [2]. These massive expansions of food systems along with shifts in culture, economics and mechanisation have influenced more sedentary lifestyles and increased consumption [1]. As a result, since 1975, obesity rates have nearly tripled [3]. The expert consensus is that the societal shifts that took place since the 1970s have created a 'health disrupting' environment that has led to the rise in obesity [1, 4].

Obesity is a complex disease defined as dysfunctional adiposity that also impairs health [4]. In epidemiology, obesity is defined as a Body Mass Index (BMI) of over 30 kg/m² while overweight is defined as a BMI of over 25kg/m². There are multiple causes of overweight and obesity including individual differences and biological factors, but the environment in which people live makes a substantive contribution. As well as the increased availability of food, rapid urbanisation, motorisation, sedentary jobs, changes to sleep, changes to costs of food and cultural shifts are all potential contributors [1, 4]. Yet public perceptions of obesity remain relatively naïve to many of these environmental factors; many believe that individual choice, personality and behaviour are as great or sometimes greater contributors to obesity than societal or environmental structures [5]. The dominant narrative in media across many countries was, at least until recently, that obesity was a result of individual choice and behaviour such as lack of willpower and laziness [6-8].

The individual choice narrative increases stigma and implies that individuals with obesity are themselves to blame [9, 10]. It is also associated with the types of policies that the public are willing to support. Policy support is at every individual's own discretion, but if support or opposition is based on a misperception of cause and effect, it may not accurately reflect their true preferences. People tend to support relatively weak anti-obesity policies, like information-based campaigns, and to oppose stronger policies, such as taxes or restrictions [11, 12]. By contrast, people who perceive obesity to be beyond the individual's control (either through biology or the environment) are more likely to support policies that try to reduce the obesogenicity of the environment [12, 13].

However, it is possible that this relationship is correlational and not causal. There may be certain types of people who perceive biological and environmental causes of obesity and who also support certain types of policy, but the perception does not necessarily cause the greater support. The solution is not so simple as telling people about the environmental causes of obesity. A recent systematic review found that telling people about the environmental causes of obesity had no effect on either their beliefs or their perceptions of policies designed to reduce rates of obesity [14]. It is not clear whether this is due to the stickiness of causal beliefs, or because the specific interventions tested were just not effective.

There is at least one cognitive bias that might explain why the individual choice narrative is so appealing and why changing causal beliefs might be difficult. The "fundamental attribution error" is the tendency for people to underestimate how a situation might influence someone else's behaviour and overestimate how much their behaviour is due to personality or disposition [15]. This may be why many people can more easily believe that those living with obesity lack willpower, but can less easily believe than that urban design, marketing and prevalence of energy-dense food influences choice, behaviour, opportunity and health.

This is not to say that there is no recognition of environmental causes of obesity by the public, nor that people are divided into camps of those who believe in individual or environmental reasons. It is possible that people hold multiple narratives in mind at one time. In Britain, 61% of people attributed overweight to the food environment and 57% to a lack of willpower [13]. Recent research in Ireland found that 80% of the population agreed with statements such as “people lack the willpower to diet or exercise regularly” but 80% also agreed with the statement “people become overweight because there are too many snack foods readily available in workplaces, shops and homes” [16]. This research was not designed to measure beliefs about causes of obesity and it is not possible to unpick how much weight people placed on snack foods *in the home* compared to snack foods in workplaces and shops when answering the question, but it illustrates how people can hold multiple beliefs about the causes of obesity. This issue is largely unexplored in the literature to date.

To our knowledge, all the studies to date ask people to reflect on causes of obesity and not on causes of the obesity epidemic. The distinction is subtle but important; the former may prompt people to consider an individual with obesity, while the latter invites them to think more broadly than the individual. Furthermore, most studies ask about causes of obesity without placing the obesity epidemic within its historical context of growing rates since 1975. Contextualising the epidemic in this way may attenuate the effect of the fundamental attribution error. While our tendency towards misattribution may lead someone to believe that an individual with obesity is likely to have certain personality characteristics, it is difficult to maintain that the past 50 years has seen mass changes in personality; societal factors must be at play. In this study, therefore, a primary motivation is to test whether contextualising the obesity epidemic within the growing rates of obesity since 1975 changes how people perceive its causes.

A second motivation for this study is the lack, at least to our knowledge, of studies that have carried out an in-depth exploration into how individuals perceive the causes of the obesity epidemic. Many studies describe scales that measure the extent to which individuals believe in environmental causes of obesity, or how much they agree with statements about different causes, but we have not identified a study that examines relative strengths of belief in different causes and how these relate to other beliefs and to relevant attitudes and to support for different policy options. We do not yet know the mental model that people hold in mind when they think about the obesity epidemic.

A third motivation is that there is relatively little data available on how people in Ireland perceive of the causes of obesity, as a recent Safefood report noted in June 2022 [16]. Some research has found variation between countries in how populations perceive obesity [10, 17]. To inform public policy, it is useful to know what public perceptions are in Ireland and whether they differ from our neighbours.

The aim of this research is to provide evidence to fill these three gaps in the current literature on perceptions of obesity.

2. Methods

Participants took part in an online study on their perceptions about obesity. They were randomised to read a brief description of the obesity epidemic either without context (control) or contextualised as a problem that has developed over decades (historical wording). All participants wrote open text responses on what they believed were the causes of the obesity epidemic. They then saw a list of 12 potential causes of the epidemic rated and ranked them in order of how much they thought they contribute. They were also asked what percentage of blame and responsibility different agents had for the obesity epidemic and reported their views on different types of policies. Finally, they were

asked questions about the health consequences of obesity, the rates of obesity in their country and the relative mortality rate of obesity. The main outcomes of interest are causal beliefs about the obesity epidemic, attribution of responsibility and blame for the obesity epidemic, perceptions of policy and belief that obesity is a health problem. The research compares how these outcomes differ between experimental conditions, between the public in three countries and between the public and experts.

We have included a sample of experts against which to benchmark public responses because the causes of obesity are multiple and complex. Although literature points more strongly to some reasons over others, we cannot definitively identify a leading cause for the obesity epidemic or measures of the relative strengths of causes. Instead, we compare perceptions of experts in obesity to those of the public, to identify when and by how much misperceptions and misconceptions occur.

See Table 1 for a list of pre-registered hypotheses.

Table 1. List of pre-registered hypotheses.

When the obesity epidemic is contextualised as a problem that has been developing over decades compared to a problem of today, people will:
H1. Be more likely to list at least one societal/environmental reason for the obesity epidemic.
H2. Give a higher ranking to societal causes of the epidemic.
H3. Assign less blame to individuals.
H4. Assign less responsibility for tackling the crisis to individuals.
H5. Prefer more intrusive policy interventions.
H6. Perceive more intrusive interventions to be more effective.
H7. Perceive obesity as a bigger health problem.
H8. Have views on the causes of obesity that are more closely aligned with expert views.
H9. Have views on the most effective types of policy to tackle obesity that are more closely aligned with expert views.

The pre-registration is available on the Open Science Framework.¹

2.1. Participants

Participants (N = 2400) were recruited from three different countries to take part in a 15-minute study on public perceptions of obesity. The countries were Ireland (n = 800), the UK (n = 800), and the US (n = 800). The UK and Irish sample were recruited from two market research companies², the US sample was recruited through Prolific using the representative sampling feature. Participants were paid €3/£3/\$3 for participating. In addition, a sample of obesity experts in Ireland and the UK were recruited through emails to universities, special interest groups, and public health organisations. An expert was defined as anyone with professional expertise in an area related to obesity working in Ireland or the UK. The experts were personally invited by the research team to

¹ <https://doi.org/10.17605/OSF.IO/CR27E>

² Ireland: RED-C, UK: Yonder Data Analytics.

participate. Researchers who had published academic papers on obesity in the disciplines of public health, medicine, nutrition and physical activity, individuals working on obesity, nutrition or physical activity policies in government and healthcare workers specialising in obesity were invited. Two expert groups working in obesity were also approached and asked to circulate to their members. The response rate thus cannot be calculated but the final number of experts who completed the survey was 51. Of the final expert sample, 10% worked in government or policy, 31% in healthcare, 57% in research and 2% in other. The sociodemographic breakdown of the public samples is shown in Table 2.

Table 2. Sociodemographic breakdown of the public samples

	Total Sample ^b	Ireland	UK	US
Age				
<30	15.8%	8.3%	18.5%	20.8%
30-39	20%	21.3%	18.6%	20.1%
40-49	17.3%	21%	14.8%	16.1%
50-59	16.6%	15.6%	16.9%	17.4%
60-69	19.3%	21.5%	17.4%	19.1%
70+	10.9%	12.4%	13.9%	6.5%
Male	50.7%	53.8%	49.1%	49.2%
Degree+ ^a	46.4%	34.8%	42%	62.5%
Social Grade (C2DE)	43.1%	55.1%	44.4%	29.8%
Employed	61.7%	61%	58%	66%
BMI (self-reported height and weight)				
<18.5 kg/m ²	2.2%	1.8%	2.1%	2.8%
18.5 kg/m ² to < 25 kg/m ²	35.7%	33.1%	38%	35.9%
25 kg/m ² to < 30 kg/m ²	27.6%	29.1%	27.6%	26.1%
>30 kg/m ²	34.5%	36%	32.3%	35.3%

a. Degree is defined as a bachelor's degree or over in Ireland and the UK and an associates degree or higher in the US.

b. There were no differences between socio-demographic characteristics and experimental condition.

Participants were unaware of the experimental condition they had been assigned to. The expert sample was not subjected to any experimental manipulation, but simply reported their perceptions of the obesity epidemic. The expert sample also did not answer socio-demographic questions.

2.2 Experimental Manipulations

Public participants read a brief description of the obesity epidemic at the start of the study. They were randomised to either the control condition or the historical wording condition. Specifically, in the control condition the paragraph read:

"The World Health Organisation (WHO) says there is an "obesity epidemic" around the world, including in [Ireland/ the UK/ the United States (US)]. Many people are overweight or obese."

In the historical wording condition, the paragraph read:

"The World Health Organisation (WHO) says there is an "obesity epidemic" that has been growing over the past 50 years around the world, including in [Ireland/ the UK/ the United States (US)]. Every year, more people are becoming overweight or obese. The number of people who are overweight or obese has nearly tripled since 1975."

Subsequent tasks were identical for all participants.

2.3 Additional Measures

Perceived causes of the obesity epidemic: We measured perceived causes of the obesity epidemic qualitatively and quantitatively. Qualitative data was collected through open text boxes. Participants were asked to complete the sentence “There is an obesity epidemic because...” in an open text box. They were asked to give only one cause of the obesity epidemic per box, but they could submit up to ten boxes. Responses were coded into three categories: individual choice or behaviour, physical/psychological/biological limitations and societal/obesogenic environment. Answers that could not be coded into one of these three categories were coded as “ambiguous”.

Participants then rated 12 given causes of the obesity epidemic on 7-point numeric response scales assessing to what degree they believe each cause has contributed to the obesity epidemic. The causes were informed by previous research on causal beliefs for obesity [5, 17-20]. Of the 12 causes, four were categorised as individual choice or behaviour (“People don’t make enough effort to exercise regularly, People don’t make enough effort to eat healthily, People don’t care about their weight, People don’t want to learn about healthy diets and lifestyles”), four were physical/psychological/biological limitations (“People inherit genes that contribute to weight gain, People are addicted to food, People have hormonal disruptions that contribute to weight gain, People have physical limitations that mean they are not able to exercise”), and four were societal/obesogenic environment (“Portion sizes in restaurants, fast-food shops, cafés and pubs are large, Unhealthy foods are heavily advertised, cheap, and widely available, Lack of time or money means people can’t exercise, Neighbourhoods are designed for travel by car rather than walking or cycling”). Participants were then shown the ranking of those 12 perceived causes towards the obesity epidemic that was implied by their previous ratings. They were asked to confirm if the ranking aligned with their beliefs or if they wished to re-order it. The aim was to get as accurate a portrayal as possible of people’s beliefs about the main contributors towards the obesity epidemic.

Blame and responsibility: Participants were asked how much they believed individuals, private businesses and government are to blame for the obesity epidemic in their country, and how much responsibility each of them has to tackle it. The participants used three sliders to assign the percentage of blame and responsibility they thought each entity had, where the total blame and responsibility for all three had to add up to 100%.

Policy perceptions: Participants rated six different types of policies designed to tackle the obesity epidemic on fairness, effectiveness, and support on 7-point numeric response scales. They were then shown the policies ranked by how much they had reported supporting them and how effective they thought they would be and were asked to confirm or change their ordering. The policy types were based on the Nuffield ladder of intervention that defines policies by their level of intrusiveness. As some of the levels overlapped, we collapsed some categories and adapted it for present purposes. The 6 levels that we showed were: restricting (“Policies that put limits on some unhealthy foods and inactivity”), taxing (“Policies that increase costs for some unhealthy foods and inactivity”), subsidising (“Policies that decrease costs for healthy foods and physical activity”), providing opportunities (“Policies that encourage and allow people to eat healthier and be more physically active”), informing (“Policies that give people information about food and physical activity”), and monitoring (“Policies that collect data on the diets and physical activity levels of the population”). Participants were given multiple examples of policies within each policy type but were asked to judge the type of policy rather than the specific examples.

Estimates of obesity: Participants were shown a 10x10 grid of figures and asked to imagine that they represented all the adults/children in their country. They were then asked to click on the grid to

indicate how many adults out of 100 they believed are overweight, how many of the overweight adults they believed are obese, how many children out of 100 they believed are overweight, and how many of the overweight children they believed were obese. We did not give any definition of overweight or obesity in this task because the aim was to assess participant perceptions, regardless of whether their own definition was correct.

Perceived problem: Participants responded to questions about their perceptions of obesity as a problem on numeric rating scales from 1-7 (i.e., “Obesity is a major health problem in [Ireland/ the UK / the Unites States (US)]”).

Mortality beliefs: Participants ranked the mortality rate of six different causes of death (“Smoking”, “Obesity”, “Alcoholism”, “Suicide”, “Drug addiction”, “Road accidents”) from highest to lowest deaths per year in their country.

Obesity consequences: Participants were asked what effects they thought obesity had on a person’s health through open text boxes. They were asked to write one effect per box. They were also shown a list of 16 health problems and asked to select which, if any, were more likely to occur with obesity. Eight items on the list have established links to obesity (e.g., “high blood pressure, fertility problems, joint problems”), while the other eight have no established link to obesity (e.g., “lyme disease”, “appendicitis”, “vertigo”).

Attention check: Participants were asked “Earlier we showed you a picture of 100 people and asked you to click on it. What did we ask you to do?” with response options “To guess the number of people who are hospitalised each year in [Ireland/UK/US]”, “To guess the number of people who are overweight or obese in [Ireland/UK/US].”, “To guess the number of people who die of overweight or obesity in [Ireland/UK/US].”

Finally, we collected socio-demographic information, including age, gender, educational attainment, nationality (Ireland, UK, US), employment status, job sector (health, government, hospitality sector, none), social class, whether they had a child under the age of 18 in their household, weight and height, own perceived weight group running from very underweight to very overweight, estimated weight of friends and family on a scale running from “none of my friends and family are overweight or obese” to “all of my friends and family are overweight or obese”.

2.4 Procedure

Participants took part online through a laptop, phone, or tablet. They were told that the purpose of the study was to assess public perceptions of obesity. After providing consent to take part, participants were randomly assigned to read the introductory paragraph that described obesity as a problem now, or as a problem that has developed over decades. After reading this paragraph, they completed the tasks measuring perceptions of obesity.

3. Results

The analysis plan was pre-registered on Open Science Framework.³ In the sections that follow we will describe differences in responses by country, by expert status and by experimental condition.

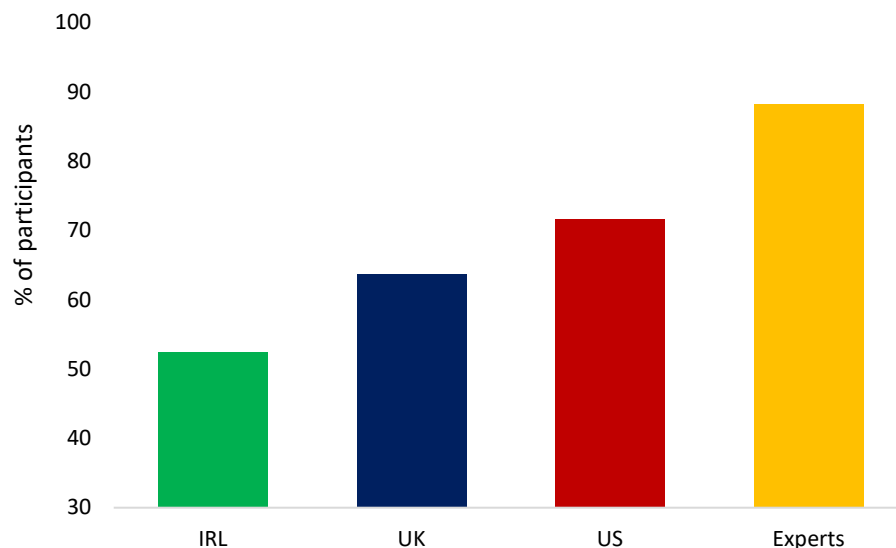
3.1 Perceived causes of obesity

³ Robertson, D. A. (2022, December 2). Public perceptions of the obesity epidemic.
<https://doi.org/10.17605/OSF.IO/CR27E>

3.1.1 Do perceived causes of the obesity epidemic differ across countries and between the public and experts?

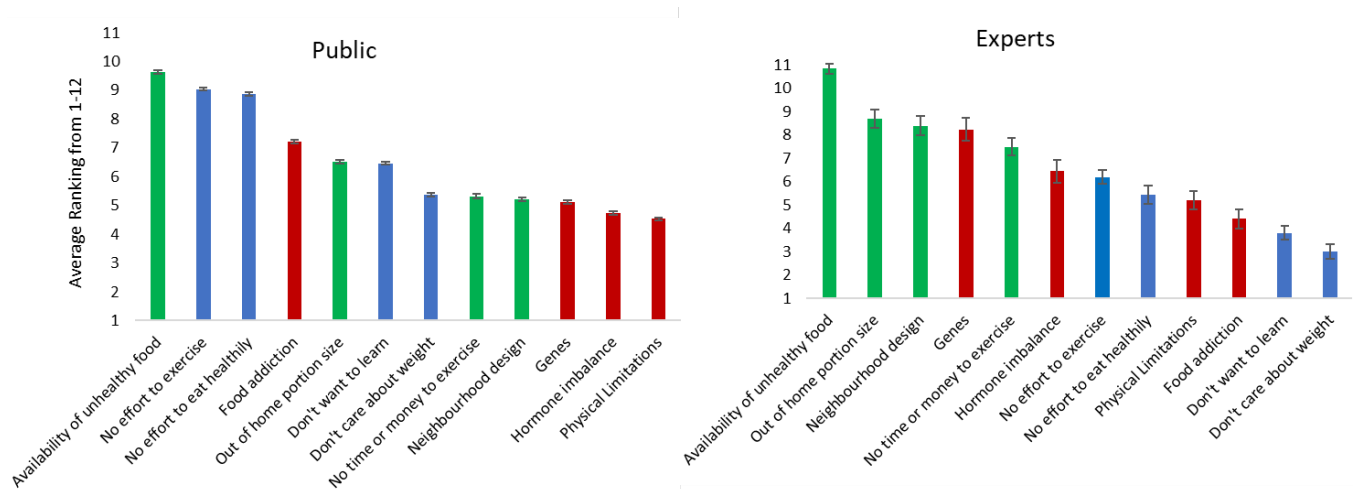
Participants were asked to finish the sentence “There is an obesity epidemic because...”. Participants gave an average of 3.2 (SD = 1.8) reasons. Two researchers coded these responses into four categories of cause: societal/obesogenic environment, individual choice or behaviour, physical/psychological/biological limitation and ambiguous. Causes that were coded as societal/obesogenic environment included responses such as “much of the food at grocery stores is heavily processed”; those coded as individual behaviour included responses such as “people are lazy”; those coded as physical/psychological/biological limitations were responses such as “family genes”. In the whole sample of the three populations, 62.5% of participants gave at least one reason that was coded as a societal/obesogenic cause of obesity. Participants in the UK and US were much more likely to give a societal/obesogenic cause for obesity than participants in Ireland. Figure 1 shows the size of this effect. Over 70% of US participants gave a societal/obesogenic cause compared to just over 50% of participants in Ireland. Participants in the US also gave more causes on average (M = 3.8, SD = 2.6) compared to participants in Ireland (M = 2.9, SD = 1.6) and the UK (M = 3, SD = 1.7). Nearly 90% of the expert sample gave at least one societal/obesogenic cause of obesity.

Figure 1. Percentage of participants who gave at least one societal/obesogenic environment cause.



Participants ranked the extent to which they thought each of 12 given reasons contributed to the obesity epidemic. The order of ranking can be seen in Figure 2. In the full public sample, the highest ranked reason was the availability of unhealthy food, a societal/obesogenic reason. This was followed by individual behaviours; people making no effort to exercise and no effort to eat healthily. In Ireland, the top ranked cause was people making no effort to exercise.

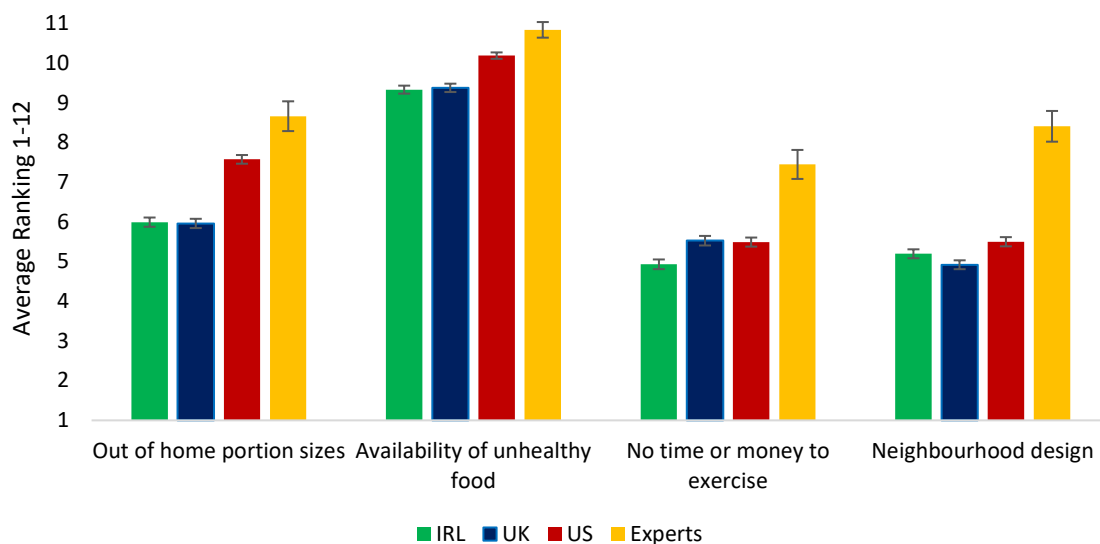
Figure 2. Average ranking of 12 different perceived causes of the obesity epidemic by the public and experts.



Note. We have reverse scored the rankings so that higher scores indicate a perceived stronger contribution to the obesity epidemic. Green bars indicate societal/obesogenic environment causes, blue bars indicate individual choice or behaviour causes and red bars indicate physical/psychological/biological limitations.

We combined the average rankings for each of the four societal/obesogenic causes and compared responses between conditions. Participants in the US were more likely to give higher rankings to environmental causes of obesity than participants in Ireland. When specific environmental causes were examined, participants in the US ranked all 4 higher than participants in Ireland and the UK combined but ranked the availability of unhealthy food and out of home portion sizes as being substantially more contributory than participants in Ireland and the UK did (Figure 3). Experts also ranked all 4 environmental causes of obesity more highly than the public samples.

Figure 3. Average ranking of the 4 environmental causes of the obesity epidemic by country and expert status.



3.1.2 Does placing the obesity epidemic in its historical context influence public perceptions of the perceived causes of obesity?

We ran a logistic regression to check whether people were more likely to give an environmental cause when they had read the historical context of the obesity epidemic. Table 3 shows the model; we found no effect of wording on likelihood of giving an environmental cause. There were large socio-demographic differences. Older people, men and those in social grades C2DE compared to ABC1 were less likely to give any environmental reason for obesity in their responses. However, the biggest difference was the country of the respondent.

We did find an effect of the historical wording on ranking of environmental causes of obesity. Participants who saw obesity described within its historical context gave higher rankings ($M = 6.8$, $SD = 1.7$) to environmental causes than participants in the control condition ($M = 6.6$, $SD = 1.8$). The difference is statistically significant, and the wording pushed participants' rankings in the direction of expert perceptions, but the absolute size of the effect is small, about 1/10 of a standard deviation in rankings (Table 3).

Table 3. Regressions showing effect of country and experimental condition on perceived causes of the obesity epidemic.

	Model 1. Gave any societal/obesogenic reason in open text.	Model 2. Gave a higher ranking to societal/obesogenic reasons.
Historical wording condition	-0.02 (0.09), $p=.40^a$	0.18 (0.07), $p=.006^a$
Age (ref. < 30)		
30-39	-0.16 (0.15), $p=.30$	-0.30 (0.12), $p=.01$
40-49	-0.33 (0.16), $p=.04$	-0.47 (0.12), $p<.001$
50-59	-0.24 (0.16), $p=.14$	-0.34 (0.12), $p=.006$
60-69	-0.72 (0.15), $p<.001$	-0.49 (0.12), $p<.001$
70+	-0.86 (0.17), $p<.001$	-0.42 (0.14), $p=.002$
Male	-0.44 (0.09), $p<.001$	-0.55 (0.07), $p<.001$
Degree+	0.11 (0.10), $p=.25$	0.31 (0.08), $p<.001$
Social Grade (ref. ABC1)		
C2DE	-0.22 (0.10), $p=.02$	-0.16 (0.08), $p=.04$
Farmer/Unsure	-0.03 (0.25), $p=.92$	-0.07 (0.19), $p=.73$
Country (ref. Ireland)		
UK	0.39 (0.11), $p<.001$	-0.03 (0.09), $p=.71$
US	0.67 (0.11), $p<.001$	0.62 (0.09), $p<.001$
Constant	0.83 (0.17), $p<.001$	6.93 (0.13), $p<.001$

a. One-tailed test

b. Note. We ran Model 2 using a linear regression and an ordinal logistic regression and found the same effects. We report the linear regression in this table.

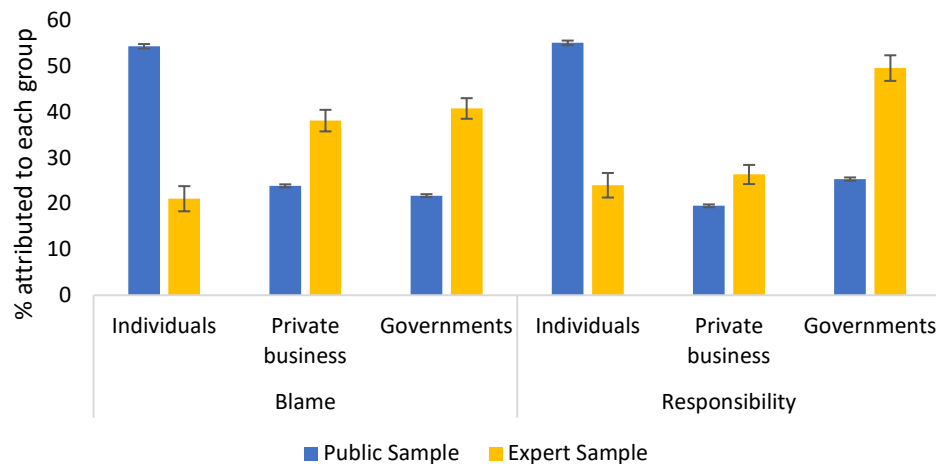
3.2 Blame and Responsibility

3.2.1 Do blame and responsibility for tackling the obesity epidemic differ across countries and between the public and experts?

Participants assigned a proportion of blame for the obesity epidemic and responsibility for tackling it to individuals, government and private business. The public samples attributed over 50% of the blame and responsibility for the obesity epidemic to individuals, nearly double that of private business and governments who were only attributed approximately 25% of the blame each. The assignment of blame and responsibility was reversed in the expert sample who attributed

governments and businesses a nearly equal share of blame (38% and 41% respectively). The experts assigned 50% of the responsibility to tackling the crisis to governments.

Figure 4. Percent of blame for the obesity epidemic and responsibility to tackle it assigned to individuals, government and private business by the public sample and the expert sample.



3.2.2 Does placing the obesity epidemic in its historical context influence public perceptions of the perceived causes of blame and responsibility?

We ran linear regression models to test whether those who saw obesity described within its historical context gave lower attributions of blame and responsibility to individuals (Table 4). We find an interaction between country and experimental condition on blame and responsibility. Participants in Ireland who saw the historical wording assigned lower levels of blame and responsibility to individuals (Figure 5). The overall effect was small compared to the difference between the public and experts.

We ran an exploratory analysis to check whether people who gave an environmental cause for the obesity epidemic assigned the same amount of blame and responsibility to individuals as those who did not give an environmental cause. People who did not give any environmental cause for obesity in the open text attributed 59% (SD = 23.5%) of the blame and 59% (SD = 24.5%) of the responsibility to tackle the obesity epidemic to individuals. People who recognised at least one environmental cause of obesity attributed less blame (51.5%, SD = 23.6%) and responsibility (52.5%, SD = 24.4, $Z = 7.61$, $p < .00001$) to individuals.

Figure 5. Blame and responsibility assigned to individuals by country and experimental condition.

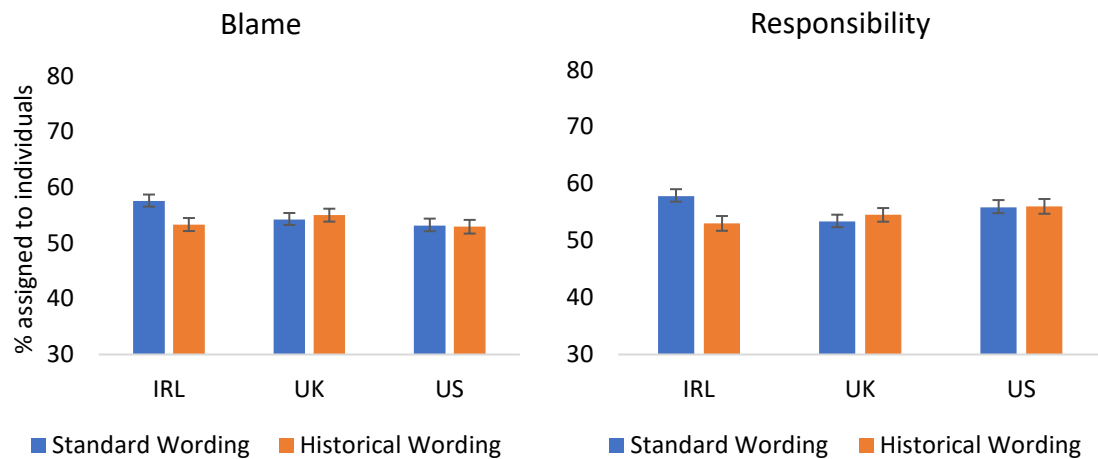


Table 4. Linear regression showing the relationship between condition, country and the interaction between them on blame and responsibility for the epidemic that is assigned to individuals.

	Model 3. Blame for the obesity epidemic assigned to individuals	Model 4. Responsibility for tackling the obesity epidemic assigned to individuals
Historical wording condition	-4.02 (1.66), $p=.007^a$	-4.58 (1.70), $p=.004^a$
Country (ref. Ireland)		
UK	-2.23 (1.69), $p=.019$	-3.11 (1.74), $p=.07$
US	-2.11 (1.71), $p=.022$	1.23 (1.76), $p=.48$
Condition*Country Interaction		
Historical Condition*UK	4.73 (2.35), $p=.004$	5.68 (2.41), $p=.02$
Historical Condition*US	3.22 (2.35), $p=.017$	3.97 (2.42), $p=.10$
Age (ref. < 30)		
30-39	7.52 (1.63), $p<.001$	7.68 (1.68), $p<.001$
40-49	8.83 (1.68), $p<.001$	9.65 (1.73), $p<.001$
50-59	10.60 (1.69), $p<.001$	11.29 (1.74), $p<.001$
60-69	13.21 (1.64), $p<.001$	15.48 (1.69), $p<.001$
70+	14.56 (1.91), $p<.001$	15.98 (1.97), $p<.001$
Male	1.84 (0.97), $p=.06$	1.43 (1.00), $p=.15$
Degree+	-2.11 (1.06), $p=.05$	-2.26 (1.10), $p=.04$
Social Grade (ref. ABC1)		
C2DE	-1.29 (1.08), $p=.23$	0.42 (1.11), $p=.71$
Farmer/Unsure	-2.22 (2.66), $p=.40$	-4.50 (2.74), $p=.10$
Sector		
Hospitality	-1.15 (2.66), $p=.67$	-2.64 (2.74), $p=.34$
Healthcare	-0.61 (1.92), $p=.75$	1.85 (1.97), $p=.35$
Government	1.13 (2.35), $p=.63$	0.18 (2.41), $p=.94$
Constant	48.27 (1.98), $p<.001$	46.89 (2.04), $p<.001$

a. One-tailed test

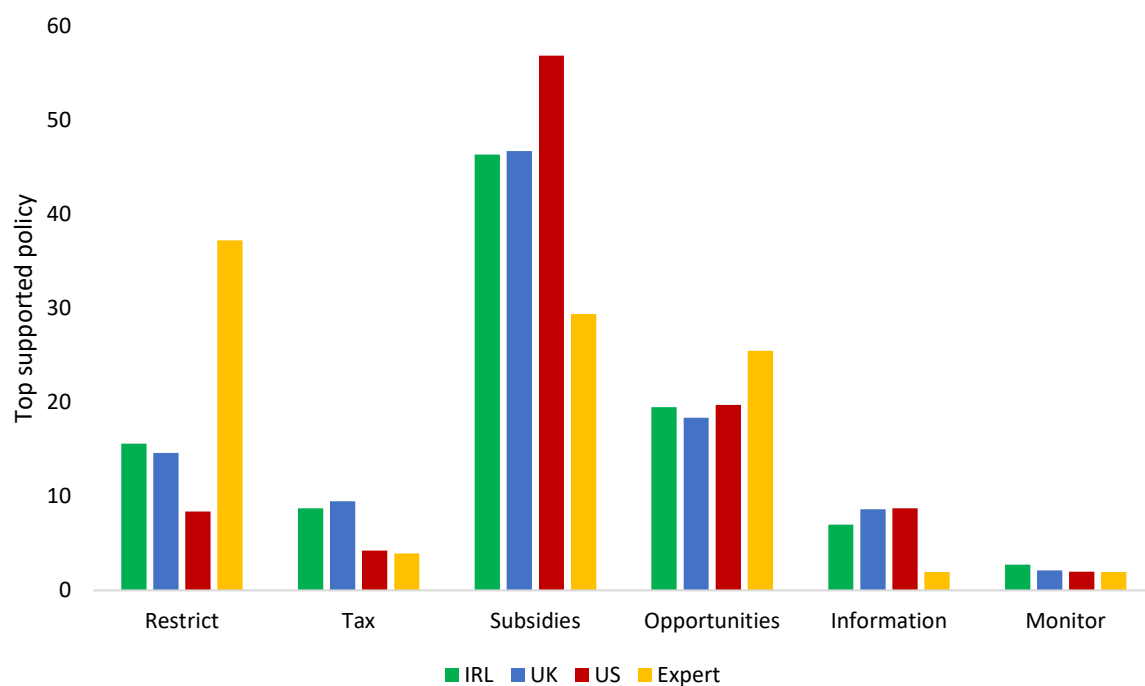
b. Note. We ran the models using linear regression and ordinal logistic regression and found the same effects. We report the linear regressions in this table.

3.3 Policy Perceptions

3.3.1 Does support for policy options and perceptions of policy efficacy differ across countries and between the public and experts?

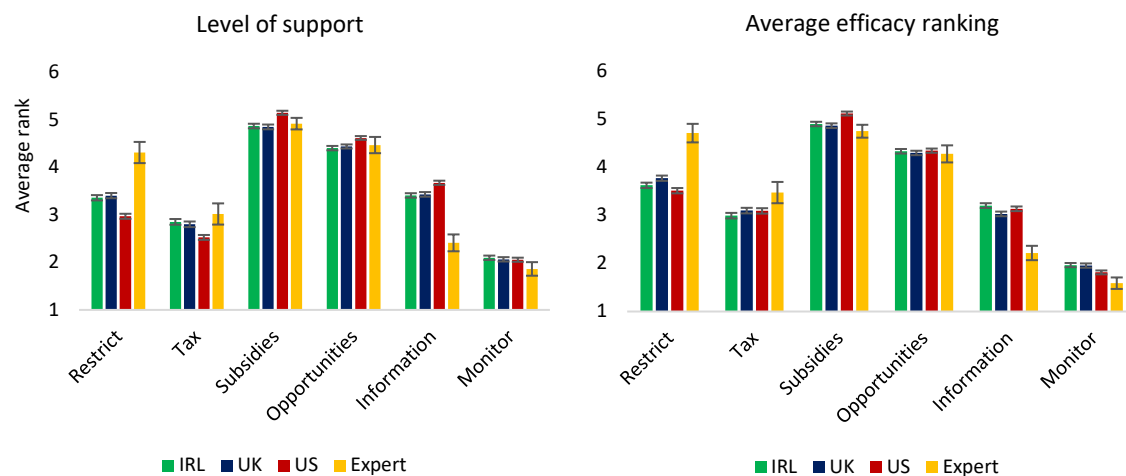
Participants ranked their perceptions of 6 different levels of policy that ranged in intrusiveness from monitoring obesity but not intervening to implementing restrictions on foods or modes of transport. The type of policy most strongly supported by the public was subsidies. There was little difference between participants in Ireland and the UK. Both were more likely to put restrictions and taxes as their top policy compared to participants in the US, but participants in all three countries were most likely to favour subsidies. In comparison, the policy most favoured by the expert sample was restrictions (see Figure 6).

Figure 6. Top supported policy by country and expert status.



Experts gave higher average rankings to restrictions and taxes and lower average rankings to subsidies, information and monitoring than the public. Experts also thought restrictions and taxes would be more effective than the public (Figure 7).

Figure 7. Expert and public rankings of different types of policy.



3.3.2 Does placing the obesity epidemic in its historical context influence support for policy options and perceived efficacy?

We assigned a score of 1-6 to indicate the level of intrusiveness of the top supported policy type by each person. The intrusiveness score of the top supported policies by participants in the control and historical wording condition did not differ; both were 3.9 (SD = 1.1), reflecting the majority preference for subsidies (rank 4).

The majority support for subsidies meant we had limited variance in our dependent variable. We therefore ran a pre-registered exploratory analysis to check if the level of support that participants gave to different policies differed by what experimental condition they had been in and by how effective they thought the policy was. We ran a multilevel ordinal logistic model with the level of support participants gave to a policy (rating scale 1-7) as the dependent variable, experimental condition as the independent variable and controlling for the type of policy they were rating, how effective they thought that policy was and how fair they thought it was. Table 5 shows the results of the analysis. Compared to policies involving monitoring obesity without intervening, people were more likely to support policies providing information, opportunities or subsidies. Compared to monitoring, they were also more likely to support taxes and restrictions, but not as strongly as the other three. Participants in the UK and US gave lower ratings generally than participants in Ireland. Participants' support of a policy was strongly influenced by how effective and fair they thought the policy was, but the effect of perceived fairness on support was nearly twice as strongly as the effect of perceived efficacy on support.

We carried out two additional exploratory analyses to check whether participants' beliefs about the causes of obesity and responsibility for tackling the obesity epidemic influenced support for policy options. We did this in two ways. We ran a multilevel ordinal logistic model with the level of support participants gave to a policy (rating scale 1-7) as the dependent variable, how strongly they thought the obesogenic environment causes obesity and how much responsibility they assigned to individuals to tackle the obesity epidemic as independent variables. We included the type of policy they were rating, experimental condition and age, gender, education and social grade in the model as well. Table 5 shows this analysis. People who rated environmental causes of obesity as stronger contributors to the obesity epidemic also gave higher ratings to policies to tackle obesity. The more strongly people believe that individuals are responsible for tackling the obesity epidemic, the less they supported policies generally.

We ran a further exploratory analysis where we weighted the level of support people gave to each policy by the level of intrusiveness of that policy. We multiplied the level of intrusiveness of the policy (ranging from 1 for monitoring to 6 for restricting) by the level of support they would give to that policy (rating scale 1-7, rescaled as 0-6). This ranged from 0 to 126 with 0 being people who strongly opposed every type of policy and 126 being people who strongly supported every type of policy. We ran a linear regression with this scale as the dependent variable and how strongly they thought the obesogenic environment causes obesity and how much responsibility they assigned to individuals to tackle the obesity epidemic as independent variables. We included the experimental condition and age, gender, education and social grade in the model as well. The more strongly people ranked environmental causes of the obesity epidemic, the more they supported more intrusive policies. The more strongly people believed that individuals are responsible for tackling the obesity epidemic, the less strongly they supported more intrusive policies (Table 5).

Table 5. Predictors of support for policy options.

	Model 5. Level of support for any policy.	Model 6. Level of support for any policy.	Model 7. Level of support weighted by intrusiveness of policy.
Historical wording condition	0.10 (0.06), $p=.05^a$	0.03 (0.07), $p=.35^a$	-0.15 (1.06), $p=.44^a$
Policy Type (ref. Monitor)			
Inform	0.43 (0.06), $p<.001$	1.70 (0.06), $p<.001$	
Opportunity	0.52 (0.07), $p<.001$	2.50 (0.06), $p<.001$	
Subsidies	0.56 (0.07), $p<.001$	2.55 (0.06), $p<.001$	
Tax	0.13 (0.06), $p=.03$	-0.31 (0.05), $p<.001$	
Restrict	0.11 (0.06), $p=.06$	0.38 (0.05), $p<.001$	
Perceived efficacy of policy	0.95 (0.02), $p<.001$		
Perceived fairness of policy	1.83 (0.02), $p<.001$		
Age (ref. < 30)			
30-39	0.12 (0.10), $p=.24$	-0.08 (0.12), $p=.53$	-2.38 (1.81), $p=.19$
40-49	0.11 (0.10), $p=.28$	-0.20 (0.13), $p=.13$	-4.04 (1.88), $p=.03$
50-59	0.24 (0.10), $p=.02$	-0.07 (0.13), $p=.60$	-1.73 (1.89), $p=.36$
60-69	0.17 (0.10), $p=.08$	-0.08 (0.13), $p=.52$	-2.29 (1.86), $p=.22$
70+	0.38 (0.12), $p<.001$	0.15 (0.14), $p=.30$	2.34 (2.15), $p=.28$
Male	-0.10 (0.06), $p=.09$	-0.07 (0.07), $p=.32$	-1.16 (1.09), $p=.29$
Degree+	0.04 (0.07), $p=.57$	0.07 (0.08), $p=.36$	2.24 (1.18), $p=.06$
Social Grade (ref. ABC1)			
C2DE	-0.06 (0.07), $p=.38$	-0.15 (0.08), $p=.07$	-2.16 (1.20), $p=.07$
Farmer/Unsure	-0.06 (0.17), $p=.73$	0.07 (0.20), $p=.73$	1.50 (2.95), $p=.61$
Sector			
Hospitality			4.33 (2.96), $p=.14$
Healthcare			2.57 (2.13), $p=.23$
Government			6.66 (2.60), $p=.01$
Country (ref. Ireland)			
UK	-0.26 (0.07), $p<.001$	-0.59 (0.09), $p<.001$	-7.08 (1.32), $p<.001$
US	-0.26 (0.08), $p<.001$	-0.45 (0.09), $p<.001$	-7.84 (1.40), $p<.001$
Environmental causes ranks		0.04 (0.02), $p=.05$	0.78 (0.34), $p=.02$
Individuals' responsibility for tackling the obesity epidemic		-0.01 (0.00), $p<.001$	-0.17 (0.02), $p<.001$
Constant			91.37 (3.48), $p<.001$
Individual Effect	1.25 (0.07)	2.45 (0.11)	

a. One-tailed test

3.4 Obesity as a Problem

3.4.1 Do participants in different countries and experts differ in the extent to which they see obesity as a problem?

Most participants perceive obesity to be a major health problem in the country in which they live. The mean score in the full public sample was 6 (SD = 1.14) on a scale of 1-7. Participants in the US perceived it to be a slightly bigger problem (M = 6.4, SD = 0.9) than participants in the UK (M = 5.9, SD = 1.1) and in Ireland (M = 5.9, SD = 1.3). Experts perceived it to be a greater problem again (M = 6.7, SD = 0.6) (Figure 8).

3.4.2 Does placing the obesity epidemic in its historical context influence the extent to which people perceive obesity to be a health problem in their country?

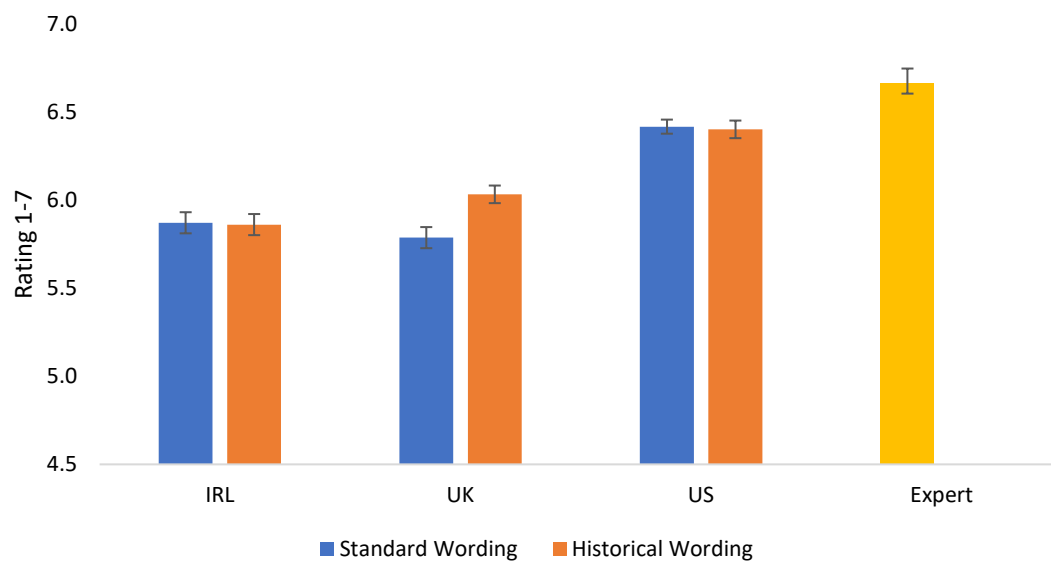
We ran an ordinal logistic regression with the extent to which people perceive obesity to be a health problem as the dependent variable and experimental condition as the independent variable (Table 6). Participants who saw the historical wording were slightly more likely to perceive obesity as a major health problem than participants who saw the standard wording. When we ran an interaction effect between experimental condition and country, this effect was specific to the UK sample. The experimental wording pushed participants' responses closer towards expert views, but not to the same level.

Table 6. Effect of experimental condition and country on perception of obesity as a health problem.

Obesity as a health problem in participant's country	
Historical wording condition	0.13 (0.08), $p=.04^a$
Age (ref. < 30)	
30-39	-0.05 (0.13), $p=.72$
40-49	-0.04 (0.14), $p=.74$
50-59	0.32 (0.14), $p=.02$
60-69	0.34 (0.13), $p=.01$
70+	0.39 (0.15), $p=.01$
Male	-0.11 (0.08), $p=.17$
Degree+	0.10 (0.09), $p=.26$
Social Grade (ref. ABC1)	
C2DE	-0.06 (0.09), $p=.47$
Farmer/Unsure	0.16 (0.23), $p=.47$
Country (ref. Ireland)	
UK	-0.03 (0.09), $p=.72$
US	0.92 (0.10), $p<.001$

a. One-tailed test

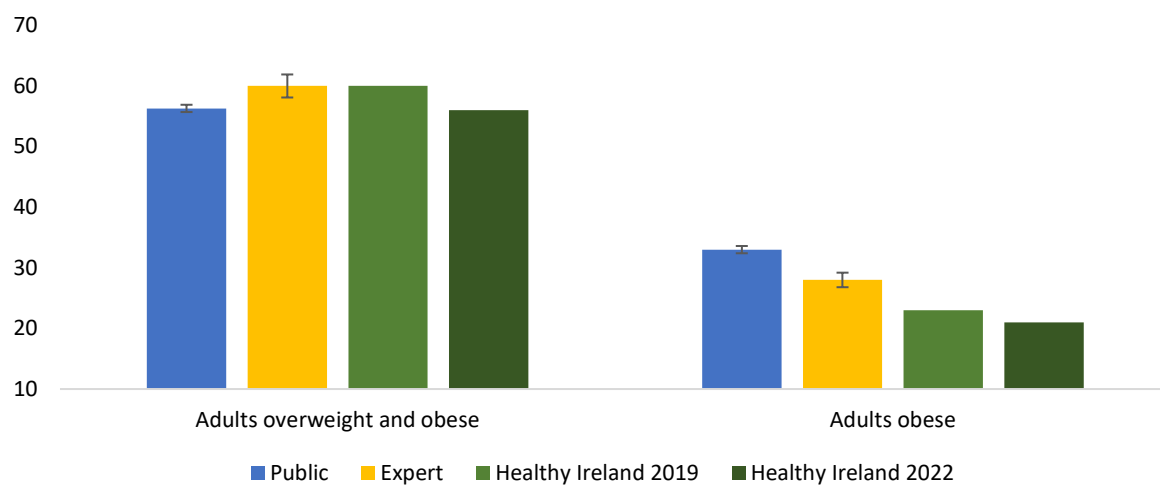
Figure 8. Ratings of the extent to which obesity is a major healthcare problem in the participant's country.



3.5 Knowledge of Obesity

We asked participants to estimate the percentage of people who are overweight and obese and obese in their country. We just report the Irish estimations here. Both the public and expert estimations of obesity rates were very close to the rates reported by the Healthy Ireland surveys in 2019 and in 2022 (Figure 9). The BMI figures of 2022 are the most recent but they were self-reported while those in 2019 were measured. We thus include both. Participants were also accurate in identifying consequences of obesity with an average of 14 responses correct out of 16. The public and expert samples both perceived obesity and smoking to have higher mortality rates than alcohol, drugs, road deaths and suicide.

Figure 9. Public in Ireland and expert estimations of the rates of overweight and obesity.



4. Discussion

When the obesity epidemic is described as having grown since the 1975 as opposed to being described as a problem of today, public perceptions of the epidemic move closer to those of experts. People who read the historical description give slightly higher rankings to environmental causes of obesity, they attribute slightly less blame and responsibility for the obesity epidemic to individuals and they see obesity as a slightly greater health problem compared to those who read the standard wording. We write 'slightly' because the overall effect sizes for the different wording conditions are small, they are heterogeneous between countries, and they are outshone by the large differences between Ireland and the US and between the public and expert samples.

There is a big gap between how the public in Ireland perceive the obesity epidemic and how experts perceive it. The public in Ireland are less aware of the environmental causes of obesity, they are less likely to rank environmental factors as strong contributors when made aware of them, they attribute high levels of blame to individuals for the obesity epidemic and they believe individuals have a greater responsibility to tackle the epidemic than governments or private business. Perhaps more surprisingly, the public in Ireland differs from the public in the UK and US in recognising the obesogenic environment as a cause of the obesity epidemic. One might ask if these misperceptions are important. Previous work suggests that the individual choice narrative can increase stigma and indeed obesity [21]. This study shows that these (mis)perceptions also influence support for different policies. The public in Ireland largely support policies to tackle obesity but prefer subsidies over the restrictions that experts think will be effective and would support. The public are more likely to support policies they think are effective and are much more likely to support policies they think are fair. Yet they do not accurately rate which policies are likely to be effective, at least when benchmarked against the perceptions of an expert sample. Furthermore, the less the public recognise the contribution of the obesogenic environment to rates of obesity and the more they think individuals are responsible for tackling the obesity epidemic, the less strongly they support obesity policies. If support for policy options or opposition is based on misperceptions, it may not reflect true preferences. Of course, we must also acknowledge that the definition of misperception is based on the difference between expert and public perceptions rather than on objective criteria. We are thus acting on the assumption that the expert view is more likely to reflect the most up-to-date knowledge and scientific consensus.

What might explain the stark differences in perceptions between the public in Ireland, other countries and an expert sample? It is not that the public in Ireland do not recognise obesity as a health problem. Although the public in Ireland rated it as a less of a problem than the experts did, the mean rating was 6 out of 7. It is not a lack of knowledge about the consequences of obesity as most could correctly identify health conditions that more commonly occur with obesity; the mean score in our knowledge check of consequences was 14 out of 16. It is not that the public in Ireland are not aware of the rates of overweight and obesity in Ireland, the estimations were close to both expert estimations and real reported rates. In fact, the public slightly overestimated the numbers of people with obesity. It is possible that the abundance of energy-dense, low nutrition, convenience food is more salient day-to-day in the US than it is in Ireland due to a bigger selection of shops and fast-food outlets in a bigger country. This may explain why the public sample in the US are more likely to recognise this as a contribution to obesity than the public in the UK or Ireland. Experts in Ireland and the UK may be more attuned to the increased availability of these foods in Ireland and the UK, while non-experts may need the availability to surpass a higher threshold to recognise it. However, this cannot be the only explanation, the public in Ireland did rank "availability of unhealthy food" second on the list of possible contributors to the obesity epidemic. Thus, on this outcome, the

Public in Ireland differ from experts mainly in magnitude. The public recognise environmental causes of obesity, just not as strongly as the experts do.

Previous work has shown that merely informing people about environmental causes of obesity does not change perceptions of causes or policy [14]. The intervention in this study was simple and avoided trying to persuade people of causes, but merely prompted them to think about the obesity epidemic as something that has been developing since 1975. This description moved perceptions of the obesity epidemic closer to expert perceptions, but a gap persists. It may be that this intervention and previous ones were just not strong enough to bridge the gap that exists between public and expert perceptions of the contribution of the environment to obesity. However, it may also be that the focus on differences in perceived causes of the obesity epidemic is a red herring; there are other potentially more fundamental differences between the public and experts that have been identified in this study.

Two areas in which the public and experts diverge are how they attribute responsibility for tackling the obesity epidemic and the types of policies they would support. In attributing responsibility for tackling the obesity epidemic, expert and public views are entirely at odds with each other. The experts attribute most of the responsibility for tackling obesity to governments with equal amounts to private business and individuals. The public attribute most responsibility to individuals with much lesser responsibility to private business and governments. Even when people recognise at least one societal cause of the obesity epidemic, they still attribute over 50% of the responsibility for tackling the epidemic to individuals. Some possible reasons are a lack of awareness about how government policy or industry initiatives could help to reduce rates of obesity, a lack of belief in the implementation of such policies or worry about the impact policies would have on people's choices. This finding needs more exploration to understand the reasons. However, there may be creative ways to increase awareness of the role played by private businesses in creating an obesogenic environment. One study in the US with teenagers found that exposing the food marketing techniques that they were being targeted with reduced the positive associations they had with junk food and changed their dietary habits [22]. While this was in a specific subgroup of the population, there may be techniques to make the obesogenic environment more salient to people to reduce the responsibility assigned to individuals.

The second significant difference is the types of policy that experts and the public would most strongly support. Experts prefer restrictions while the public prefer subsidies. Both samples more strongly support policies that they think will be effective so the difference suggests that the public may be underestimating how effective some policies may be. Some previous work has found that communicating the efficacy of proposed policies increases policy support for them, although only some forms of communication were effective [23]. Nevertheless, this suggests that communications that focus on what effects are expected from a policy may be more important than those that focus mainly on what they are trying to address.

There are some limitations to this study and the data. First, we are aware that we have not discussed biological causes of obesity in any detail. There is evidence that there are genetic and biological underpinnings for obesity. We included these in the ranking task where participants rated perceived causes of obesity. The consensus view is that biology and the environment interact. The purpose of this study is to inform public policy and as such we focus on the environmental causes of obesity that policies are most likely to influence. In addition, the questions focused on causes of the obesity epidemic generally and did not ask specifically about causes of obesity in children, for which there may be different perceptions. Second, we have attempted to collect data from broadly nationally representative samples using quota sampling in all three countries, but the data was collected

online, and it is possible that samples are not truly representative. We included sociodemographic controls for age, gender, education and social grade in all models to account for differences. Third, we did not impose either a minimum sample or a representative sampling frame for the expert sample. We defined our criteria for expertise at the start and sent personal invitations to the experts we had identified, or the organisations to which they belonged, so that we could be confident that we were capturing expertise in obesity. We sampled the views of experts from two of the three countries in this study, Ireland and the UK. We have a higher number of researchers (57%) than healthcare workers (31%) or those working in government or policy (10%). However, many of the people we invited are involved in at least two, sometimes three, of these areas and participants within the expert sample had substantially less variation in their responses than participants within the public samples meaning that we can rely on the smaller sample.

This study captures how the public in three countries perceive the causes, consequences, responsibilities, blame and policy interventions for the obesity epidemic. It also highlights differences between public and expert views. It is the first study, to our knowledge, to carry out such an in-depth exploration of perceptions and misperceptions in all of these areas and to assess how they relate to one another. Although much previous research focusses on perceived causes of the obesity epidemic, we identify bigger differences between experts and the public in who they see as being responsible for tackling the obesity epidemic and the types of policies they support. These two factors have not received as much attention to date and merit further investigation. Understanding more about public perceptions of the obesity epidemic may help to design effective interventions to help bring public perceptions closer to those of experts.

References

1. Swinburn, B.A., et al., *The global obesity pandemic: shaped by global drivers and local environments*. The Lancet, 2011. **378**(9793): p. 804-814.
2. Roser, M., H. Ritchie, and P. Rosado. "Food Supply" Published online at OurWorldInData.org 2013 19/12/22]; Available from: Retrieved from: '<https://ourworldindata.org/food-supply>' [Online Resource].
3. World Health Organization. *Obesity and Overweight*. 2016 11th June 2020]; Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
4. Breen, C., et al., *Obesity in Adults: A 2022 Adapted Clinical Practice Guideline for Ireland*. Obesity Facts, 2022. **15**(6): p. 736-752.
5. Reynolds, J.P., et al., *Communicating evidence about the causes of obesity and support for obesity policies: Two population-based survey experiments*. International journal of environmental research and public health, 2020. **17**(18): p. 6539.
6. De Brún, A., et al., *The emergence and portrayal of obesity in The Irish Times: content analysis of obesity coverage, 1997-2009*. Health Commun, 2012. **27**(4): p. 389-98.
7. Nimegeer, A., C. Patterson, and S. Hilton, *Media framing of childhood obesity: a content analysis of UK newspapers from 1996 to 2014*. BMJ Open, 2019. **9**(4): p. e025646.
8. Chiang, J., et al., *Geographic and Longitudinal Trends in Media Framing of Obesity in the United States*. Obesity (Silver Spring), 2020. **28**(7): p. 1351-1357.
9. Joslyn, M.R. and D.P. Haider-Markel, *Perceived causes of obesity, emotions, and attitudes about Discrimination Policy*. Social Science & Medicine, 2019. **223**: p. 97-103.
10. Mata, J. and R. Hertwig, *Public Beliefs About Obesity Relative to Other Major Health Risks: Representative Cross-Sectional Surveys in the USA, the UK, and Germany*. Annals of Behavioral Medicine, 2018. **52**(4): p. 273-286.
11. Diepeveen, S., et al., *Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis*. BMC Public Health, 2013. **13**(1): p. 756.

12. Mazzocchi, M., et al., *What is the public appetite for healthy eating policies? Evidence from a cross-European survey*. Health Economics, Policy and Law, 2015. **10**(3): p. 267-292.
13. Beeken, R.J. and J. Wardle, *Public beliefs about the causes of obesity and attitudes towards policy initiatives in Great Britain*. Public health nutrition, 2013. **16**(12): p. 2132-2137.
14. Reynolds, J.P., et al., *Communicating evidence about the environment's role in obesity and support for government policies to tackle obesity: a systematic review with meta-analysis*. Health psychology review, 2022. **16**(1): p. 67-80.
15. Gilbert, D.T. and P.S. Malone, *The correspondence bias*. Psychological bulletin, 1995. **117**(1): p. 21.
16. Safefood, *Public acceptability of policies to address obesity: Findings from a mixed-methods study on the island of Ireland*, Safefood, Editor. 2022, Safefood: Cork.
17. von dem Knesebeck, O., et al., *Public beliefs about causes of obesity in the USA and in Germany*. International Journal of Public Health, 2019. **64**(8): p. 1139-1146.
18. Pearl, R.L. and M.S. Lebowitz, *Beyond personal responsibility: effects of causal attributions for overweight and obesity on weight-related beliefs, stigma, and policy support*. Psychol Health, 2014. **29**(10): p. 1176-91.
19. McGlynn, J. and M.S. McGlone, *Desire or Disease? Framing Obesity to Influence Attributions of Responsibility and Policy Support*. Health Communication, 2019. **34**(7): p. 689-701.
20. Robinson, K., et al., *Perceptions of body weight that vary by body mass index: Clear associations with perceptions based on personal control and responsibility*. Journal of Health Psychology, 2022. **27**(1): p. 147-165.
21. Tomiyama, A.J., et al., *How and why weight stigma drives the obesity 'epidemic' and harms health*. BMC Medicine, 2018. **16**(1): p. 123.
22. Bryan, C.J., D.S. Yeager, and C.P. Hinojosa, *A values-alignment intervention protects adolescents from the effects of food marketing*. Nature Human Behaviour, 2019.
23. Reynolds, J.P., M. Pilling, and T.M. Marteau, *Communicating quantitative evidence of policy effectiveness and support for the policy: Three experimental studies*. Soc Sci Med, 2018. **218**: p. 1-12.