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Research Article

Exploring the Differences in Social Care Needs by the Degree of Obesity among Older Adults in England: A Cross-Sectional Study

Gargi Ghosh,[1] **Hafiz T. A. Khan**,[2] **and Salim Vohra**[2]

[1]*Department of Adult Nursing, Anglia Ruskin University, Faculty of Health, Education, Medicine & Social Care (HEMS), Chelmsford CM1 1SQ, UK*
[2]*Public Health Group, The University of West London, College of Nursing, Midwifery and Healthcare, Boston Manor Road, Brentford, Middlesex TW89GB, UK*

Correspondence should be addressed to Gargi Ghosh; gargi.ghosh@aru.ac.uk

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Objectives. The study aims to determine the social care need among overweight and obese older adults by identifying the number of social care support receipts from different sources. *Methods*. A sample of 5640 participants (aged 50 years and over) taken from the English Longitudinal Study of Ageing Wave 8 dataset. Multivariate logistic regression analysis was performed to explore the relationship between the study variables. *Results*. The statistical analyses demonstrated that overweight and obese older adults are the recipients of increasing amounts of informal social care. Moderate and morbidly obese participants are the recipients of increasing amounts of formal care compared to their normal-weight counterparts, with morbid obesity being a strong predictor for receipt of formal care. *Conclusions*. The present study's findings demonstrate that for older adults aged 50 years presence of morbid obesity is a strongest predictor for receipt of formal care, and their well-being is not associated with formal or informal care receipt. The findings on how wider lifestyle factors influence the number of social care receipts, from different sources, may help policymakers and healthcare providers to allocate limited resources for adult social care services and promote healthy ageing rather than just focusing on weight loss alone.

1. Introduction

The Centre for Policy on Ageing[1] found that England's obesity-related public health burden is partly related to the rapid increase in older adults in the United Kingdom (UK). There has been an epidemiological transition in most countries. The national disease burden moves to a greater or equal predominance of noncommunicable diseases compared to communicable diseases [2]. Obesity in old age is different because it acts synergistically with other health problems, leading to more severe chronic health conditions and disabilities. Both obesity and ageing lead to a significantly increased risk of noncommunicable diseases, such as low muscle strength, functional impairment, and premature death among older adults [3]. In the UK, the prevalence of obesity is more visible among older adults than their younger counterparts with around three-quarters of older adults aged between 65–74 years classified as overweight or obese [4]. It is estimated that by 2050, the former will rise to reach 2 billion and the latter to 434 million older adults [4]. Obesity in older adults, therefore, can impose a significant burden on the adult social care system. A report by the Office for National Statistics [5] stated that in Great Britain (England, Scotland, and Wales), more than one in three (36%) and one in five (20%) adults reported having long-term conditions or disabilities and limited long-term conditions, respectively. Therefore, the disease burden of increasing numbers of chronically sick older adults (aged 65 years and over as defined by the WHO) is a significant concern in England (Local Government Association [6]).

Health and social care in the UK are defined as services provided by public, private, and voluntary sector health and

social care organisations under the leadership of public sector local authorities [7]. The Health Survey for England (HSE) defines social care needs as solely connected to satisfying individuals' functional activities of daily living and helping them live as independently as possible in their own homes (National Health Service [8]). Functional activities refer to the activities of daily living (ADL) or instrumental activities of daily living (IADL) and the standard of mobility to enable an individual to live independently without any support. There are three community support systems in England to meet the support needs of older adults: formal state support, informal support, and formal paid support or a combination of these. Grundy and Read [9] discovered that the informal or unpaid support network is considered as the foundation of the support system for older adults, given that most informal care and support in England are provided by family or friends [10]. This is considered the most common and desirable support system for older adults rather than formal state support or formal paid support [11]. A study by Brown and Morris [12] using HSE data found that unpaid help covered 68% of social care support for care recipients aged 65 years and over in England. The number is progressively increasing in England due to increasing longevity [6] and recent adult social care funding cuts [13]. Variations in an individual's demographic and socioeconomic characteristics facilitate the level and nature of support needed [14], and several studies have found that informal caregiving may add to the care provider's own poor health and quality of life [15, 16].

In the UK, eligibility for older adults receiving formal state social care support is based on various elements, and these include a person's marital status, living arrangements (if they have other family members living with them to provide informal support), the individual's physical and mental health status, the extent to which a person can use the technology (which may be needed to improve their living environment) and finally the individual's economic condition (whether they can pay for their social care) [17]. A report by found that, when considering the socioeconomic status and social engagement in old age, there are several existing health inequalities in England and Scotland related to the distribution of health and social care benefits.

A longitudinal study on the elderly (aged 60 years and above) by Nizalova et al. [18] found that obese older adults are 25% more likely to be the recipients of long-term care support, particularly informal care, or privately paid care, than their normal-weight counterparts. A cross-sectional study by Sørbye et al. [19] evaluated that extremely obese older women (aged 65 years and above) require more help with their personal care than their normal weight counterparts. Thompson et al. [20] found that 63% of older adults aged 65 years and over received community-based social care.

The LGA [21] judged that there is not enough published data to establish whether obesity is directly associated with an increase in social care needs in older adults. However, a recent English study on older adults by Copley et al. [22] using cross-sectional survey data found that self-reported need for social care is positively related to body mass index (BMI) even after adjusting for sociodemographic factors and limiting long-term illness. The study modelled the need for care rather than the receipt of care. The challenges associated with obesity among older adults inevitably increase the use of healthcare resources due to added functional decline and homebound status [23]. Therefore, the factors that influence the demand for different sources of social care support for older adults need to be evaluated appropriately to redesign future adult social care services. Furthermore, it is not established whether there is an association between the amount of social care received and the demand for social care with an individual's increasing degree of BMI. Given recent cost-cutting in this area and the challenges associated with obesity, research is needed to determine the social care needs among overweight and obese older adults by identifying the number of social care support receipts from different sources. Therefore, the specific research objective for the present study is to explore the differences in social care needs based on the degree of obesity.

2. Methods

2.1. Sample and Participants. The English Longitudinal Study of Ageing (ELSA) is a panel survey of a representative cohort of English women and men aged fifty years and over living within the community [24]. It provides data on participants' health, social circumstances, well-being, and economic condition. The method and technical aspects of the survey and its methodology are revealed elsewhere [25, 26]. This study used the ELSA Wave eight survey dataset that was conducted between May 2016 and June 2017 and had a sample size of 8,445 participants. For this study, underweight respondents (BMI < 18.5 kg/m^2) were removed from the analytic dataset to avoid selection bias. This is because several studies have found that physical or mental impairment, disabilities, and morbidity conditions are associated with poor nutrition among older adults [27, 28]. Finally, a sample size of 5,640 participants was found to be eligible for data analysis in this paper. The methods followed are as described in the earlier publication by Ghosh et al. [29].

All ELSA participants provided written and informed consent, and all ELSA waves have been approved by the National Research and Ethics Committee (London Multicentre Research Ethics Committee (MREC/01/2/91)). The ELSA participants are anonymised, and the anonymised data are freely accessible from the UK Data Service [30].

2.2. Data Collection. Three methods of data collection were used for ELSA Wave 8: face-to-face interviews using computer-assisted personal interviewing (CAPI), self-completion questionnaires using pen and paper (PAPI), and an observation and examination visit by a nurse. Face-to-face interviews were undertaken by trained interviewers using laptop computers at the participant's residential address to collect baseline demographic and physical and mental health status information for each participant [31].

Nurse home visits in Wave 8 involved collecting data for anthropometric and physical performance measures and biomeasurements. However, in Wave 8, the participant's height

was not measured as part of the anthropometric measurements. Therefore, Wave 6 participant's height data have been merged with the Wave 8 dataset to calculate the participant's BMI. This was because the Wave 8 cohort groups were the same as the Wave 6 cohort group. To make the dataset more nationally representative, all data are weighted by Wave 8 cross-sectional weights.

2.3. Variables and Measurements

2.3.1. Social Care Need. Social care need was measured as the amount of social care received. In ELSA, the amount of social care received was measured by self-assessing the number of Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) that participants were able to, or not able to, carry out [32]. Each participant was asked whether they can perform each task of ADL and IADL activities in terms of four categories: on their own, manage on their own with difficulty, and only do the activity with help or not at all [22].

The definitions of informal and formal care were adapted from the HSE [8]. Informal care is defined as any help or support received for at least one task of ADLs or IADLs or mobility activities and from any (or in combination) of the following sources: spouses or partners, family members, friends, and neighbours. Formal care is defined as any help or support received either from local authority-funded care or formal private paid-for support at least once a week and at least with one task.

The sources of formal care and support include one or a combination of the following providers: homecare worker/home help/personal assistant, member of staff at a care/nursing home, members of the reablement team, voluntary helper, warden/sheltered housing manager, cleaner, council handyperson, or any other formal helper. The informal support responses are dichotomised and coded as 0 for none and 1 for at least one. Likewise, the care and support receipt responses through formal sources were coded as 0 for none and 1 for at least one.

Assessing the amount of social care received by BMI, the predictors are adapted from a study by Vlachantoni et al. [17] and modified according to the requirements of the present study. The seven sets of categorical variables that were considered as follows: (1) demographic variables (age group, gender, marital status, coresidence status), (2) socioeconomic variables (employment status and level of education), (3) physical health (self-reported general health, ADL, and IADL disability), (4) mental health (well-being by CASP-19 scale), (5) receipt of support/use of services variables (a self-reported receipt of informal and formal support), (6) report of limiting long-standing illness, and (7) lifestyle variables (smoking, alcohol consumption, and anthropometric measurement for BMI by height and weight).

2.3.2. Body Mass Index (BMI). The height of each participant was measured to the nearest millimetre by a portable stadiometer while they stood upright without shoes and wearing only light clothing. Weight was measured using a portable electronic scale closest to 0.1 kg. However, the portable electronic scale had an upper limit of 130 kg meaning estimates that were made for those participants weighing above this limit. BMI for each participant was calculated by their weight in kilograms divided by height in meters squared. Weight was then categorised into five groups according to the World Health Organisation (WHO) classification: normal (BMI $\geq$ 18.5 to <25), overweight (BMI $\geq$ 25 to <30), moderate or class I obesity (BMI = 30–34.9 kg/m^2), severe or class II obesity (BMI = 35–39.9 kg/m^2), and morbid or class III obesity (BMI $\geq$ 40 kg/m^2). The BMI variable is coded progressively as 0 for "normal," 1 for "overweight," 2 for "moderate obesity," 3 for "severe obesity," and 4 for "morbid obesity."

2.4. Selected Covariates. The sociodemographic factors used are age, gender, marital status, and coresidence status, and the socioeconomic factors used are education and employment status. The behavioural or lifestyle factors used are the amount of smoking and drinking of alcohol. Several studies on older adults have found common ground when using the above-mentioned variables as risk factors for health, well-being, and social care outcomes [26, 33]. Ethnicity is not considered as one of the covariates for this study, as the study sample was not a representative sample of nonwhite respondents. The number of "white" participants was 6,746 (94.6%), whereas the number of nonwhite respondents was 38 (5.4%).

The age variable has been progressively valued as 0 for 50–60, 1 for 61–70, 2 for 71–80, and 3 for the 81+ years of the aged cohort. Three categories of coresident living identified from the ELSA data set are cohabiting partners, children, and grandchildren. The responses are dichotomised, and the coresident status is coded as 0 for no coresidents and 1 for at least one coresident. The term "cohabitation" is used in ELSA to show that a participant is living with a partner in the same household. Positive coresidents–partners, children, and grandchildren—are often a vital source of informal care [8, 22]. Further coding and measurements are displayed in Table 1.

2.4.1. Functional Disability. Several studies use "activities of daily living" (ADL) and "instrumental activities of daily living" (IADL) to define disabilities with functional impairment due to poor physical or mental health [34]. The poor ADL and IADL scores reflect difficulties with performing one or more tasks of daily living that are essential for an individual to be able to live independently on their own. The ELSA gathered data on self-reported ADL activities during the face-to-face interviews. The ELSA measurement scale uses six domains of basic functional activity within ADL and nine domains of activity under IADL to obtain a better picture of a participant's functional impairment (see Table 1 for all activities under ADL and IADL). The scores were skewed negative, with most of the respondents reporting no impairment for an individual activity, and the responses were dichotomised using a two-point coding scale (0-1). All ADL activities were combined

Table 1: Description of variables and their summary analysis based on ELSA Wave eight dataset ($n = 5640$).

Variables	ELSA Wave 8 survey question ID	Measurement of variables	Variables coding	Sort cases by BMI ≥ 18.5	
				n	%
Body mass index in kg/m^2	ehtm (from Wave 6) estwt	(Weight/height squared)			
		Underweight	0	—	—
		Normal	1	1636	22.9
		Overweight	2	1670	23.4
		Obese	3	2334	32.7
Age in years	Indobyr iintdaty	(Interview year-year of birth)			
		50–60	0	1347	23.9
		61–70	1	2163	38.4
		71–80	2	1413	25.1
		81+	3	717	12.7
Gender	Indsex	Female	0	2848	50.5
		Male	1	2792	49.5
Marital status	dimarr	Married/remarried/separated/legal partner	0	3689	65.4
		Unmarried/single/divorced/widowed	1	1948	34.5
Coresident status	Couple	Relationship status			
		Neither	0	1681	29.8
		Married/Cohabit	1	3960	70.2
	Chinhh	Child in the household			
		No	0	4282	75.9
		Yes	1	1358	24.1
	Gcinhh	Grandchild in the household			
		No	0	5448	96.6
		Yes	1	192	3.4
		None	0	1353	24.0
		At least one (partner/children/grandchildren)	1	4288	76.0
Smoking status	Heska	Nonsmoker	0	3014	53.4
		Current smoker	1	547	9.7
Current alcohol intake (in last 12 months)	Scako	None/rarely	0	2203	39.1
		Frequently/daily	1	2805	49.7
Education	fqendm	Age full-time school education completed			
		Never/≤14 years	0	403	7.1
		15–18 years	1	4125	73.1
		≥19 years/not yet finished	2	1111	19.7
Employment status	wpdes	Retired/unemployed	0	3865	68.5
		Employed/self-employed	1	1730	30.7
Self-rated health status	Hehelf	"Would you say your health is …"			
		Excellent	0	649	11.5
		Very good	1	1636	29.0
		Good	2	1813	32.1
		Fair	3	1066	18.9
		Poor	4	477	8.5

Table 1: Continued.

Variables	ELSA Wave 8 survey question ID	Measurement of variables	Variables coding	Sort cases by BMI ≥ 18.5	
				n	%
Disability		Activities of daily living (ADL) 6 items			
	Headldr	ADL: difficulty in dressing			
	Headlwa headlba	ADL: difficulty in walking			
	headlea	ADL: difficulty in bathing			
	headlbe	ADL: difficulty in eating			
		ADL: difficulty getting in and out of bed			
	headlwc	ADL: difficulty using toilet			
		No ADL	0	4681	83.0
		At least one	1	959	17.0
		Instrumental activities of daily living (IADL) 9 items			
	headlma	IADL: difficulty using map			
	headlda	IADL: difficulty recognising physical danger			
	headlpr	IADL: difficulty preparing a hot meal			
	headlsh	IADL: difficulty shopping for groceries			
	headlph	IADL: difficulty making phone calls			
	headlsp	IADL: difficulty with communication			
	headlme	IADL: difficulty taking medications			
	headlho	IADL: difficulty working around house and garden			
		IADL: difficulty managing money			
	headlmo	No IADL	0	4511	80.0
		At least one	1	1129	20.0
Subjective chronic illness		Self-reportedlong-standing illness			
	Heill	No	0	2553	43.1
		Yes	1	3087	54.7
Well-being or quality of life		Control, autonomy, self-realisation, pleasure (CASP) −19 scale 19 items (often/sometimes/not often/never)			
	Scqola	CASP-19 scale: how often feels age prevents them from doing things they like			
	Scqolb	CASP-19 scale: how often feels what happens to them is out of their control			
	Scqolc	CASP-19 scale: how often feels free to plan for the future			
	Scqold	CASP-19 scale: how often feels left out of things			
	Scqole	CASP-19 scale: how often can do the things they want to do			
	Scqolf	CASP-19 scale: how often family responsibilities prevent them from doing things			
	Scqolg	CASP-19 scale: how often feels they can please themselves what they do			
	Scqolh	CASP-19 scale: how often feels their health stops them from doing what they want to do			
	Scqoli	CASP-19 scale: how often shortage of money stops them from doing things			
	Scqolj	CASP-19 scale: how often look forward to each day			
	Scqolk	CASP-19 scale: how often feels that their life has meaning			
	Scqoll	CASP-19 scale: how often enjoys the things they do			
	Scqolm	CASP-19 scale: how often enjoys being in the company of others			
	Scqoln	CASP-19 scale: how often looks back on their life with a sense of happiness			
	Scqolo	CASP-19 scale: how often feels full of energy these days			
	Scqolp	CASP-19 scale: how often choose to do things they have never done before			
	Scqolq	CASP-19 scale: how often feels satisfied with the way their life has turned out			
	Scqolr	CASP-19 scale: how often feels that life is full of opportunities			
	Scqols	CASP-19 scale: how often feels the future looks good for them			

Table 1: Continued.

Variables	ELSA Wave 8 survey question ID	Measurement of variables	Variables coding	Sort cases by BMI ≥ 18.5	
				n	%
Informal social care receiving	Cahnno	Received no informal help with tasks			
	Cahnhw	Received help with at least one task from husband/wife/partner			
	Cahnso	Received help with at least one task from son			
	Cahnda	Received help with at least one task from daughter			
	Cahngc	Received help with at least one task from grandchild			
	Cahnsi	Received help with at least one task from sister			
	Cahnbr	Received help with at least one task from brother			
	Cahnor	Received help with at least one task from other relative			
	Cahnfr	Received help with at least one task from friend			
	cahnne	Received help with at least one task from neighbour			
		Not at all	0	4623	82.0
		At least one	1	1017	18.0
Formal social care receiving	cahnhc	Received help with at least one task from homecare worker/home help/personal assistant			
	cahnnh	Received help with at least one task from a member of staff at care/nursing			
	cahnre	Received help with at least one task from a member of the reablement team			
	cahnvo	Received help with at least one task voluntary helper			
	cahnwa	Received help with at least one task from the warden/sheltered housing manager			
	cahncl	Received help with at least one task from a cleaner			
	cahnhm	Received help with at least one task from a council handyman			
		Received help with at least one task from another formal helper			
		Not at all	0	5352	94.9
		At least one	1	288	5.1

into one group to assess if the respondents have "no impairment of ADL" (coded 0) or "at least one impairment of ADL" (coded 1). Similarly, all IADLs are combined into one group to assess if the respondents have "no impairment of IADL" (coded 0) or "at least one impairment of IADL" (coded 1).

2.4.2. Self-Rated Health Status (SHS). The single self-reported health measure is widely used in research, and in other contexts, and is regarded as a robust way of measuring health status [35].

Self-rated health status was assessed by asking participants to mark their health on a 5-point Likert scale ranging from excellent to poor. Responses were coded as 0 for excellent, 1 for very good, 2 for good, 3 for fair, and 4 for poor. However, for the regression analysis in the present study, the above-mentionedself-rated health status (SHS) has been dichotomised using a two-point coding scale (0-1). The responses with fair and poor SHS were combined into one group to be coded 0, and similarly, the responses with excellent, very good, and good SHS were combined into one group to be coded 1.

2.4.3. Long-Standing Illness. Self-reportedlong-standing illness was also assessed by each participant being asked "whether it has a self-reportedlong-standing illness," and the answers were grouped into "yes" and "no." For the present study, the responses were dichotomised and coded as 0 for "no" and 1 for "yes."

2.4.4. Well-being. Well-being was measured as hedonic or psychological well-being. To evaluate the effect of positive weight gain on psychological well-being, a strongly validated scale was used, that is, the controlling autonomy self-realisation pleasure scale (CASP). The 19-item CASP-19 measuring instrument was included as part of the self-completion document. Participants were asked how frequently each of the statements (all statements are included in Table 1) in CASP-19 applied to them on a 4-point Likert scale ranging from 0–3, where 0 represents often and 3 represents never. The statements are mostly negatively worded, so coding was changed for a few positively worded statements to match with the rest of the statement coding, where 0 represents good quality of life and 3 represents poor quality of life. All responses have been totalled within a range between 0–57, with higher scores reflecting poor well-being.

2.5. Data Analysis. A descriptive statistical analysis was initially performed with the help of the Statistical Package for Social Sciences (SPSS) V.25.0 software package [36] summarising the impact of obesity on the number of informal and formal social care receipts among older adults. The data are subsequently stratified according to respondents' demographics. To conclude the hypothesis with 95% confidence, the generated p value of the χ^2 statistics should be less than 0.05 ($p < 0.05$) to be considered statistically significant.

3. Results

3.1. Participant Characteristics. All selected characteristics of the participants are presented in Table 1. The mean age of the respondents was 68 years, and 32.7% of them were obese. In the working dataset, there were 9.8% and 0.5% more obese and overweight participants than normal-weight participants. The study population comprised more females than males (50.5% vs. 49.5%), with most of them being married (65.4%), having at least one coresident (76%), and currently not smoking (53.4%) and retired or unemployed (68.5%). About half of the participants (49.7%) consumed alcohol frequently or daily. Out of 5640 participants, only 1111 (19.7%) participants were either continuing their education during data collection or leaving their formal education at 19 years of age or over. About three-quarters (73.1%) of participants left formal education between 15–18 years of age. Most older adults marked their subjective health status (SHS) as good (32.1%) and very good (29%) than poor (8.5%), with more than half having a self-reportedlong-standing illness (54.7%). In addition, 17% and 20% of participants reported having a disability with at least one ADL and at least one IADL, respectively. Participants who received social care support at the time of data collection reported having more informal care (18%) than formal care (5.1%).

Results from the Chi-square (χ^2) statistical analysis (Table 2) show that an individual's BMI is statistically significantly associated with both informal and formal social care received (χ^2 (4) = 23.30, $p < 0.05$; and χ^2 (2) = 15.16, $p < 0.05$, respectively). Except for an individual's smoking status, all other sociodemographic, behavioural, socioeconomic, and health and well-being covariates are strongly associated ($p < 0.01$) with both the informal and formal social care received.

Among the five weight groups depending on the high BMI, the most informal and formal care support was received by the obese participants, that is, 43% and 41.2%, respectively, out of all informal and formal support received.

In addition, individuals with moderate obesity received the most informal and formal social care (21.2% and 20.6%, respectively) among the three obese groups, as shown in Table 2. Moreover, it was found that overweight individuals received about 2.5 times and two times more informal and formal social care support, respectively, than their normal-weight counterparts. For the oldest old, receipt of informal and formal care support was, respectively, 3.3 times and 9.3 times more than the participants aged 50–60 years.

3.2. Exploring the Differences in Informal Social Care Needs by the Degree of Obesity. The unadjusted binary logistical regression analysis (Table 3) shows the independent effect of BMI compared to normal-weight individuals. All variables except overweight, moderate, and severe obesity and an individual's smoking status are significant at the 5% level in the unadjusted models. The adjusted model evaluates that compared to the 50–60-year age group, the odds of receiving informal care strongly increased by 163% and 437% for 71–80 year and 81+ year cohorts, respectively (OR: 2.63, 95% CI: 1.56–4.44, $p < 0.01$; and OR: 5.37, 95% CI: 3.00–9.63,

Table 2: Cross-tabulation to determine social care received.

Variables	Social care received							
	Informal				Formal			
	None		At least one		None		At least one	
	N	%	*N*	%	*N*	%	*N*	%
BMI								
Normal	1345	29.1	292	28.7	1536	28.7	100	34.7
Overweight	1382	29.9	287	28.2	1600	29.9	69	24.0
Moderate obesity	1048	22.7	215	21.2	1204	22.5	59	20.6
Severe obesity	557	12.1	117	11.5	645	12.1	28	9.8
Morbid obesity	283	6.1	105	10.3	356	6.7	31	10.8
Total	4615	82.0	1016	18.0	5341	94.9	287	5.1
Respondents	5631				5631			
P value	0.001				0.004			
	$\chi^2 = 23.30$				$\chi^2 = 15.16$			
Age								
50–60	1246	27.0	101	9.9	1333	24.9	14	4.9
61–70	1876	40.6	287	28.2	2106	39.3	57	19.8
71–80	1115	24.1	298	29.3	1327	24.8	86	29.9
81+	386	8.3	331	32.5	586	10.9	131	45.5
Total	4623	82.0	1017	18.0	5352	94.9	288	5.1
Respondents	5640				5640			
P value	0.001				0.001			
	$\chi^2 = 527.20$				$\chi^2 = 332.46$			
Gender								
Female	2199	47.6	650	63.9	2662	49.7	187	64.7
Male	2424	52.4	367	36.1	2690	50.3	102	35.3
Total	4623	82.0	1017	18.0	5352	94.9	289	5.1
Respondents	5640				5641			
P value	0.001				0.001			
	$\chi^2 = 89.11$				$\chi^2 = 24.57$			
Marital status								
Married	3131	67.8	558	54.9	3584	67.0	105	36.3
Unmarried/others	1490	32.2	458	45.1	1764	33.0	184	63.7
Total	4621	82.0	1016	18.0	5348	94.9	289	5.1
Respondents	5637				5637			
P value	0.001				0.001			
	$\chi^2 = 60.67$				$\chi^2 = 114.14$			
Coresidents								
None	995	21.5	357	35.1	1189	22.2	164	56.9
At least one	3628	78.5	660	64.9	4163	77.8	124	43.1
Total	4623	82.0	1017	18.0	5352	94.9	288	5.1
Respondents	5640				5640			
P value	0.001				0.001			
	$\chi^2 = 84.36$				$\chi^2 = 180.762$			
Smoking								
No	2408	84.8	607	83.8	2836	84.5	178	87.3
Yes	430	15.2	117	16.2	521	15.5	26	12.7
Total	2838	79.7	724	20.3	3357	94.3	204	5.7
Respondents	3562				3561			
P value	0.502				0.286			
	$\chi^2 = 0.45$				$\chi^2 = 1.14$			
Alcohol								
None/rarely	1687	40.5	516	61.3	2072	43.4	131	56.7
Frequently/daily	2480	59.5	326	38.7	2705	56.6	100	43.3
Total	4167	83.2	842	16.8	4777	95.4	231	4.6
Respondents	5009				5008			
P value	0.001				0.001			
	$\chi^2 = 122.98$				$\chi^2 = 15.90$			
Education								
Never/≤14	213	4.6	190	18.7	331	6.2	71	24.7
15–18	3403	73.6	722	71.0	3944	73.7	181	62.8
≥19/not yet finished	1006	21.8	105	10.3	1075	20.1	36	12.5

Table 2: Continued.

Variables	Social care received							
	Informal				Formal			
	None		At least one		None		At least one	
	N	%	*N*	%	*N*	%	*N*	%
Total	4622	82.0	1017	18.0	5350	94.9	288	5.1
Respondents	5639				5638			
P value	0.001 $\chi^2 = 287.21$				0.001 $\chi^2 = 143.11$			
Employment								
Retired/unemployed	2929	63.9	937	92.8	3587	67.6	279	96.5
Employed	1657	36.1	73	7.2	1720	32.4	10	3.5
Total	4586	82.0	1010	18.0	5307	94.8	289	5.2
Respondents	5596				5596			
P value	0.001 $\chi^2 = 323.77$				0.001 $\chi^2 = 107.55$			
ADL disability								
None	4267	92.3	414	40.7	4562	85.2	119	41.3
At least one	356	7.7	603	59.3	790	14.8	169	58.7
Total	4623	82.0	1018	18.0	5352	94.9	288	5.1
Respondents	5640				5640			
P value	0.001 $\chi^2 = 1572.25$				0.001 $\chi^2 = 373.55$			
IADL disability								
None	4245	91.8	266	26.1	4454	83.2	57	19.7
At least one	378	8.2	752	73.9	898	16.8	232	80.3
Total	4623	82.0	1018	18.0	5352	94.9	289	5.1
Respondents	5641							
P value	0.001 $\chi^2 = 2247.54$				0.001 $\chi^2 = 1572.25$			
Self-rated general health status								
Excellent	630	13.6	18	1.8	645	12.1	3	1.0
Very good	1563	33.8	72	7.1	1605	30.0	30	10.5
Good	1560	33.8	253	24.9	1737	32.5	76	26.5
Fair	702	15.2	364	35.8	967	18.1	98	34.1
Poor	167	3.6	310	30.5	397	7.4	80	27.9
Total	4622	82.0	1017	18.0	5351	94.9	287	5.1
Respondents	5639				5638			
P value	0.001 $\chi^2 = 1226.59$				0.001 $\chi^2 = 232.60$			
Self-reported long-standing illness								
No	2451	53.0	102	10.0	2520	47.1	33	11.4
Yes	2171	47.0	916	90.0	2831	52.9	256	88.6
Total	4622	82.0	1018	18.0	5351	94.9	289	5.1
Respondents	5640				5640			
P value	0.001 $\chi^2 = 622.87$				0.001 $\chi^2 = 140.85$			

$p < 0.01$, respectively) while the model was adjusted for other covariates. The older males strongly reduced the odds of receiving informal care support by 53% more than their female counterparts. Unlike the unadjusted model, compared to married participants, being unmarried/single/widowed/divorced significantly reduced the odds of receiving informal care support by 41%. In addition, compared to the older adults with a minimum level of education, having the highest education and medium level of education significantly reduced the odds of receiving informal care by 55% and 41%, respectively. Moreover, individuals having at least one ADL and IADL disability and self-rated long-standing illness were significantly associated with an increased number of receiving informal care support when the model was adjusted for BMI, age, and other variables. Compared to individuals with no ADL and IADL, having a disability and no long-standing illness disabled with at least one ADL and IADL, and having long-standing illness significantly increased the odds of receiving informal care by 280%, 734%, and 185% respectively. Nevertheless, older adults with excellent/very good/good SHS significantly reduced the odds of receiving informal social care by 48% more than those who reported their health status as fair or poor.

Table 3: Determining informal social care receiving.

Variable	Unadjusted						Adjusted					
	B	S.E	Sig	Exp (B) (OR)	95% C.I. for exp (B)		B	S.E	Sig	Exp (B) (OR)	95% C.I. for exp (B)	
					Lower	Upper					Lower	Upper
BMI												
Normal	Ref											
Overweight	−0.04	0.09	0.64	0.96	0.80	1.15	0.17	0.18	0.33	1.19	0.84	1.68
Moderate obesity	−0.06	0.10	0.57	0.95	0.78	1.15	0.37	0.19	0.05	1.45	1.10	2.11
Severe obesity	−0.03	0.12	0.82	0.97	0.77	1.23	0.01	0.23	0.98	1.01	0.64	1.59
Morbid obesity	0.54	0.13	0.001	1.71	1.32	2.21	0.35	0.26	0.18	1.42	0.86	2.35
Age												
50–60	Ref											
61–70	0.64	0.12	0.001	1.89	1.49	2.40	0.44	0.25	0.08	1.56	0.95	2.55
71–80	1.19	0.12	0.001	3.29	2.59	4.18	0.97	0.27	0.001	2.63	1.56	4.44
81+	2.36	0.13	0.001	10.58	8.23	13.59	1.68	0.30	0.001	5.37	3.00	9.63
Gender												
Female	Ref											
Male	−0.66	0.07	0.001	0.52	0.45	0.59	−0.76	0.14	0.001	0.47	0.35	0.62
Marital status												
Married	Ref											
Unmarried/others	0.54	0.07	0.001	1.72	1.50	1.98	−0.54	0.23	0.02	0.59	0.37	0.91
Coresidence												
None	Ref											
At least one	−0.68	0.08	0.001	0.51	0.44	0.59	−0.14	0.24	0.56	0.87	0.54	1.40
Smoking												
No	Ref											
Yes	0.08	0.11	0.47	1.09	0.87	1.36	0.21	0.19	0.27	1.23	0.85	1.78
Alcohol												
Never/rarely	Ref											
Frequently/daily	−0.84	0.08	0.001	0.43	0.37	0.50	−0.14	0.13	0.31	0.87	0.67	1.13
Education												
Never/≤14	Ref											
15–18	−1.44	0.11	0.001	0.24	0.19	0.29	−0.53	0.22	0.02	0.59	0.38	0.90
≥19/not yet finished	−2.15	0.14	0.001	0.12	0.09	0.15	−0.79	0.28	0.01	0.45	0.26	0.79
Employment												
Retired/unemployed	Ref											
Employed	−1.98	0.13	0.001	0.14	0.11	0.18	−0.37	0.24	0.12	0.69	0.43	1.10
ADL disability												
None	Ref											
At least one	2.86	0.08	0.001	17.44	14.78	20.58	1.34	0.15	0.001	3.80	2.85	5.07
IADL disability												
None	Ref											
At least one	3.46	0.09	0.001	31.87	26.75	37.98	2.12	0.14	0.001	8.34	6.35	10.95
Self-rated general health status												
Fair/poor	Ref											
Excellent/very good/good	−2.14	0.08	0.001	0.12	0.10	0.14	−0.65	0.15	0.001	0.52	0.39	0.70
Self-reported long-standing illness												
No	Ref											
Yes	2.32	0.11	0.001	10.22	8.26	12.65	1.05	0.18	0.001	2.85	1.99	4.06
Poor well-being by CASP-19 scale	0.08	0.00	0.001	1.09	1.08	1.09	0.01	0.01	0.13	1.01	1.00	1.03
Constant							−3.14	0.57	0.001	0.04		

Informal social care coding: none (0) and at least one (1).

3.3. Exploring the Differences in Formal Social Care Needs by the Degree of Obesity. Table 4 displays the results of binary logistic regression examining the association between formal social care received with increasing degree of BMI both independently and with the effect of age and other predictors. The unadjusted model shows that except for individual obesity status and smoking status, all other variables are significant at the 5% level in the unadjusted models.

The adjusted model shows that older adults with morbid obesity significantly increased the odds of formal social care receipt by 101% (OR: 2.01, 95% CI: 1.08–3.71, $p < 0.05$) than

Table 4: Determining formal social care receiving.

Variable	Unadjusted						Adjusted					
	B	S.E	Sig	Exp (B) (OR)	95% C.I. for exp(B)		B	S.E	Sig	Exp (B) (OR)	95% C.I. for exp(B)	
					Lower	Upper					Lower	Upper
BMI												
Normal	Ref											
Overweight	−0.41	0.16	0.01	0.66	0.48	0.91	−0.38	0.26	0.13	0.68	0.41	1.12
Moderate obesity	−0.30	0.17	0.08	0.74	0.54	1.04	0.19	0.26	0.47	1.21	0.72	2.03
Severe obesity	−0.39	0.22	0.07	0.67	0.44	1.03	−0.16	0.33	0.63	0.85	0.45	1.63
Morbid obesity	0.30	0.21	0.16	1.35	0.89	2.04	0.70	0.31	0.03	2.01	1.08	3.71
Age												
50–60	Ref											
61–70	0.92	0.30	0.002	2.51	1.40	4.48	0.85	0.49	0.08	2.35	0.90	6.12
71–80	1.79	0.29	0.001	5.96	3.40	10.46	1.56	0.49	0.001	4.78	1.82	12.52
81+	3.02	0.28	0.001	20.55	11.83	35.67	2.04	0.51	0.001	7.70	2.82	21.06
Gender												
Female	Ref											
Male	−0.62	0.13	0.001	0.54	0.42	0.69	−0.30	0.20	0.13	0.74	0.50	1.10
Marital status												
Married	Ref											
Unmarried/others	1.27	0.13	0.001	3.57	2.79	4.56	−0.34	0.38	0.37	0.71	0.34	1.49
Coresidence												
None	Ref											
At least one	−1.53	0.12	0.001	0.22	0.17	0.28	−1.19	0.37	0.002	0.31	0.15	0.64
Smoking												
No	Ref											
Yes	−0.24	0.22	0.27	0.79	0.52	1.21	−0.26	0.30	0.37	0.77	0.43	1.38
Alcohol												
Never/rarely	Ref											
Frequently/daily	−0.53	0.14	0.001	0.59	0.45	0.77	0.33	0.19	0.09	1.39	0.95	2.02
Education												
Never/≤14	Ref											
15–18	−1.55	0.15	0.001	0.21	0.16	0.29	−0.23	0.26	0.40	0.80	0.47	1.35
≥19/not yet finished	−1.86	0.21	0.001	0.16	0.10	0.24	0.28	0.35	0.42	1.32	0.67	2.61
Employment												
Retired/unemployed	Ref											
Employed	−2.63	0.33	0.001	0.07	0.04	0.14	−0.31	0.45	0.49	0.73	0.31	1.76
ADL disability												
None	Ref											
At least one	2.11	0.13	0.001	8.25	6.45	10.57	0.34	0.21	0.12	1.40	0.92	2.12
IADL disability												
None	Ref											
At least one	3.01	0.15	0.001	20.37	15.09	27.49	2.00	0.24	0.001	7.41	4.62	11.88
Self-rated general health status												
Fair/poor	Ref											
Excellent/very good/good	−1.56	0.13	0.001	0.21	0.16	0.27	−0.22	0.23	0.34	0.80	0.52	1.26
Self-reported long-standing illness												
No	Ref											
Yes	1.96	0.19	0.001	7.12	4.91	10.33	0.65	0.29	0.03	1.91	1.08	3.37
Poor well-being by the CASP-19 scale	0.07	0.01	0.001	1.08	1.06	1.09	0.02	0.01	0.09	1.02	1.00	1.04
Constant							−5.31	0.91	0.001	0.005		

Formal social care coding: none (0) and at least one (1).

their normal-weight counterparts. In addition, compared to the 50–60-year age group, the odds of receiving formal care strongly increased by 378% and 670% for the 71–80 years and 81+ years age groups, respectively, while the model is adjusted for other covariates. Like the unadjusted model, older adults with positive coresidence status significantly reduced the odds of receiving formal care support by 69% to those with no coresidence.

Furthermore, like the unadjusted model of formal care, an individual's IADL disability and self-rated long-standing illness were strongly associated with the increasing number of receiving formal care support when the model was adjusted for BMI, age, and other variables. Compared to individuals with no disability with ADL and IADL and no long-standing illness, being disabled with at least one ADL

and IADL and having long-standing illness increased the odds of receiving formal care by 40%, 641%, and 91%, respectively.

4. Discussion

The statistical analyses demonstrate that for older adults, morbid obesity is the strongest predictor for formal care receipt.

The increasing age of 71–80 years and the oldest old (81+ years) positively and strongly increases the odds of informal care receipt. In addition, there is a strong association between the gender of older adults, marital status, and SHS with the receipt of informal social care support with a significant association for older adults with the coresidence status being in receipt of formal social care support. In addition, the increasing level of education significantly reduces the odds of informal care receipt; however, there is no strong association between education and the receipt of formal social care.

The number of difficulties with ADLs and IADLs, an individual's self-rated health status, and long-standing illness are the strongest predictors for receiving informal care support. However, for the receipt of formal care, an individual's disability by IADLs rather than ADLs and long-standing illness are the strongest predictors.

The result of descriptive statistics (Table 2) shows that out of a total of 5631 respondents, overweight and obese older adults together received more informal care support than formal care support. The findings are also supported by a longitudinal study: "the overall impact of obesity on care use appears primarily due to the effect on informal care, while the effect on privately paid care or formal care is smaller. However, the prevalence of being overweight is highest for those not receiving any type of care." [32] This is in line with the present study that overweight individuals received the highest percentage of no-care support (29.9%) while noticeable from the outcomes that older adults receive more informal and formal care support with increasing age. A cross-sectional English study of older adults aged 65 years and over by Vlachantoni et al. [17] reported that the receipt of social care support from various sources increases with increasing age. The study also showed that almost half of the participants aged 85 years, who had at least one difficulty with ADL or IADL, received support from informal sources. However, in the present study, the oldest old overweight and obese participants received 32.5% informal care and 45.5% formal care support.

The findings of binary logistic regression analyses (Tables 3 and 4) are in line with the study by Nizalova et al. [18], which explored whether an individual's BMI over 40 kg/m^2 is associated with a higher proportion of receiving informal care. Moreover, a report by the LGA stated that "when obesity data were split into three categories (BMI 30–34.9/BMI 35–39.9/BMI 40+), it was found that severe obesity has a statistically significant effect on the use of long-term care, whether informal care, privately paid home care, or formal home care" [6] (the LGA considered severe obesity as being BMI 40+, however, in the present study, it is defined as morbid obesity). An Irish cross-sectional study by Mc Hugh et al. [37] explored the model when it was adjusted with other covariates and discovered that an individual's BMI was not statistically significantly associated with the receipt of formal care support from state-provided home help services. In the present study, only morbid obesity was significantly associated with the receipt of formal care at a 5% level. Copley et al. [22] stated that BMI is positively related to the self-reported need for social care, while the model was adjusted for sociodemographic factors and limiting long-term illness.

A cross-sectional English study of older adults (regardless of obesity status) aged 65 years and over by Vlachantoni et al. [17] discovered, however, that women were more strongly associated with receiving formal support from paid-for care than men and more so if single and unmarried. The study also discovered that participants living with their children were receiving 0.22 more informal care than those not living with their children. The present study is in line with the outcome that individuals with positive coresidence status strongly reduce the amount of formal social care receipts. Although in this study, gender and marital status are not strongly associated with the receipt of formal care support, they are strongly related to the receipt of informal care support. Unsurprising from the findings, it is noticeable that compared to individuals with a minimum level of education, having the highest education and medium level of education significantly reduced the odds of receiving informal care. It is possibly because education has an impact on increasing physical functioning and SHS among adults of all ages [38].

Older adults with at least one IADL disability are strongly associated with the increasing numbers receiving formal care support when the model was adjusted for BMI, age, and other variables. However, the association is insignificant with ADL disability. The findings are in line with a cross-sectional English study by Vlachantoni et al. [17] that reported difficulties with the number of ADLs and IADLs were the strongest predictors of receiving state support. In particular, the study showed that the odds of receiving formal care with paid-for support was about 42 times more for individuals with at least one IADL disability than for those with no IADL difficulties. The study also reported that "the receipt of informal and state support is associated with a person's difficulties with ADLs such as bathing and getting dressed, while the receipt of paid-for support is more closely associated with one's difficulties with specific IADLs, such as shopping and doing housework or garden work" [17]. They concluded that limiting long-standing illness is a strong determinant of social care support receipt for both men and women and also evaluated that the odds of receiving formal support by paid-for care were almost double for participants who reported limited long-standing illness than those who reported none, which is in line with the present study (OR: 1.91 for long-standing illness). A study by Nizalova et al. [32] found that the need for either type of social care could be reduced in the future if individuals had good or better SHS which is in line with the present study for informal social care support only. Vlachantoni et al. [17] also found that

depression does not affect the demand for social care use, which is in line with the present study that the poor well-being of participants does not affect self-reported receipt of any social care. A study by Grant et al. [39] stated that increased symptoms of depression could be a strong predictor of an individual's poor well-being.

4.1. Study Strengths and Limitations. The strength of the study is using a large English prospective cohort data set, and therefore, the findings are generalisable to the English population. Moreover, ELSA used standardised data collection methods, and all data collection tools are validated, such as the CASP-19 scale.

However, there are a few limitations to this study. Firstly, height was not measured in the same data collection wave as weight or with other lifestyle, health, and social care factors. This could introduce measurement bias as participants may have changed their height status as an older adult's height can reduce due to age-associated spinal shortening [40]. Several studies though, have found agreement on health outcomes using height coefficients from the ELSA dataset, as height is measured in every alternative wave in ELSA [22, 41]. Secondly, although BMI is a well-known measure of obesity, there is evidence that the measure of central obesity may be more important in determining health outcomes [42]. Thirdly, different studies use different cut-off points for BMI to determine obesity. Fourthly, this is a cross-sectional study which is, per se, a limitation. Finally, we also need to learn more about the potential effects of technological advancements as well as the prospective, scalable effects of medical advancements, since there is still little evidence on how public expectations are evolving. Our knowledge and capacity to make reliable future predictions still have limitations.

In future studies, it is possible to improve the modelling to better understand the factors that influence demand and to produce estimates and scenarios of future needs that are more accurate and nuanced. Furthermore, the kind of care that people and families will be able, or willing, to offer for themselves and the kind of support that would be most successful for them are the areas where the evidence is less developed.

5. Conclusion

The present study's findings demonstrate that in older adults aged 50 years and over, morbid obesity is the strongest predictor for formal care receipt, and their well-being is not associated with both formal and informal care receipt. Older adults' age, functional disability by IADL, and self-reported long-standing illness are strongly associated with both formal and informal care support. To date, obesity-related NHS expenditure and the burden on NHS services is the main driving force for local healthsystems rather than its implication for adult social care services [6]. However, the present study's findings on how lifestyle factors influence the number of social care receipts may help policymakers and healthcare providers allocate limited resources for adult social care services and promote healthy ageing rather than just focusing on weight loss. This would have the added benefit of also focusing on narrowing health inequalities as many overweight and obese adults are from lower socio-economic groups. In addition, public, private (for example, the food industry), and voluntary sectors must follow a collaborative whole systems approach (WSA) to fight against these rising challenges of obesity [6] and assist local government to plan and tailor interventions for overweight and obesity management.

Data Availability

The SPSS data used to support the findings of this study have been deposited in the UK Data Service repository [43] ([DOI 10.5255/UKDA-SN-5050-24]).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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