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Obesity and intensive staffing needs of nursing home residents

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Abstract

The objective of this study is to examine how increasing body mass index (BMI) among nursing home residents affects the amount of staffing assistance needed for activities of daily living (ADL). We analyzed 1,627,141 US nursing home residents reported in the 2013 Minimum Data Set in seven BMI categories, from underweight (BMI < 18.5 kg/m²) to obesity Class IIIB (≥ 50 kg/m²). Logistic regression models estimated the odds of nursing home-reported need for extensive (≥ 2 staff member) assistance needed for ADLs. The adjusted odds increased from 1.07 (95% Confidence Interval (95%CI) 1.06–1.08) for Class I, 1.16 (95%CI 1.14–1.17) for Class II, 1.33 (95%CI 1.31–1.35) for Class IIIA, and 1.90 (95%CI 1.86–1.95) for Class IIIB obesity residents compared to residents of normal weight. As a nursing home resident's BMI increases, especially for BMI ≥ 40 kg/m², the need for extensive staffing assistance with ADLs also increases substantially.

Keywords

Health disparities; Health services; Quality of care

Introduction

Obesity is a condition where excess body fat leads to adverse health effects and is commonly defined as a body mass index (BMI) of ≥ 30 kg/m².¹ For older adults, there is a significant association between obesity and increasing inability to perform activities that are essential to independent living.^{2–4} People with obesity are more likely to develop disabilities as they age.^{5,6} Disability is defined as an inability to independently perform activities of daily living (ADL) including functional mobility (move from a bed or chair, walking), dressing, personal hygiene, bathing, and self-feeding.⁷ Disability requires assistance or lifestyle adaptation,

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whether at home, in the hospital or in a nursing home, and frequently occurs in the form one or more informal or formal caregivers.^{8–10} No healthcare setting manages the challenges of disability more than nursing homes, where 80% of the 1.4 million residents in U.S. nursing homes report deficits in their ADLs.^{11,12}

Obesity is also common in nursing homes; 26% of newly admitted nursing home residents were obese in 2008.¹³ Disabled nursing home residents with obesity often need specialized care in the form of greater staffing.¹⁴ Various studies have detailed extended staffing time for care of residents with obesity. The need to provide ADL care included more than 9 minutes increase in each dressing time for obese nursing home residents and 60 minutes increase in bathing time for a resident with a BMI of 50 kg/m² compared to a normal weight resident.^{15,16} Disabled nursing home residents with obesity in Arkansas from 1999–2004 were more likely to need two or more staff members to assist with most ADLs compared to normal weight residents.¹⁷ Applying these findings is difficult because obesity is, by definition, inclusive of a wide spectrum of body sizes, but health effects and nursing needs generally increase as BMI increases. Understanding how reported need for assistance varies as BMI increases (for example, between a resident with a BMI of 30 kg/m² and a resident with a BMI of 50 kg/m²) will help to define the problem of obesity care in nursing homes in terms of who is most affected, how increasing BMI affects staffing and equipment needs, and what level of BMI should be the focus of policy interventions.^{9,17,18}

The objective of this study is to report the effect of increasing resident BMI on the reported need for extensive assistance with ADLs for U.S. nursing home residents. Because assistance with ADLs depends not only on BMI, but also on demographics (age and gender) and cognitive function, we controlled for these factors in these analyses.^{19–21}

Material and methods

Conceptual framework and hypothesis

The conceptual framework and hypotheses are derived from the observation that a more physically demanding task requires greater work in the form of exertion or time. In the setting of nursing care and obesity, this implies that increasing resident BMI increases the demands of nursing care and likely increases the time it takes to provide a service. When care is provided by one person, the care provider has a limited physical capability to respond to the greater weight of the resident to help with ADLs. Residents with a weight that is greater than the maximum assistance capacity of a care provider will need more than one person to provide care for the resident's assistance needs. Therefore, ADLs requiring assistance with mobility or functional movements (like walking, transfers to chairs, toileting) are likely to be more challenging for a single caretaker, and ADLs that only require assistance with instrumentation or smaller muscle movements (like self-feeding) would not be more challenging as resident BMI increased.

Hypothesis 1.—Nursing homes will be more likely to report that residents with a greater BMI will require two or more care providers to assist with ADLs associated full body weight movements (walking, transferring from bed or chair, dressing, toileting, bathing) compared to residents of lower BMI.

Hypothesis 2.—Nursing homes will not be more likely to report that residents with a greater BMI will require two or more care providers to assist with ADLs associated with light body weight movements (eating) compared to residents of lower BMI.

Data source and study sample

U.S. Centers for Medicare & Medicaid Services Minimum Data Set (MDS), collected in 2013, was used for all residents of U.S. nursing homes accepting Medicare or Medicaid funding. A nursing home, as defined by federal regulations, is a residential facility that provides 24-hour nursing care and custodial care with intermittent medical, rehabilitation and other health and social services.²² The MDS contains all longitudinal assessment data of all residents of Medicaid and Medicare certified nursing homes. It includes nearly 400 data elements for each assessment including biometrics (height and weight), demographics, health conditions, cognitive function, functional status, services received, continence status, skin assessments. The MDS is completed for all residents in Medicare or Medicaid certified nursing homes on at least three occasions: on admission, annually, and if the resident shows significant change in status. A subset of MDS fields must be completed quarterly. It has been used since 1990, and it now in its third major version, MDS 3.0. This version, which is used in this project, has been validated in its clinical accuracy and relevance in comparison to research nurse assessments. The reliability of the MDS has been studied many times and generally been noted to be good, and MDS 3.0 has been shown to be superior to previous versions.^{23–25} To define the study sample, we limited the cohort to residents present on the April 4, 2013, the first Thursday in April. Other literature, including the Long-Term Focus dataset uses this methodology to standardize characteristics over time.^{26–28}

Dependent variable definitions

The outcome of interest was nursing home-reported need for extensive (≥ 2 staff member) assistance needed for ADLs. ADLs are described by eleven domains in the MDS. These domains include bed mobility, transfer, walk in room, walk in corridor, locomotion on unit, locomotion off unit, dressing, eating, toilet use, personal hygiene, and bathing. The definitions of each activity are fully described in Appendix Table A1. Reported need for assistance is defined in the MDS as reporting the need for “the most support provided over all shifts”, for each of the above activities may be coded as the following as “no setup or physical help from staff”, “setup help only”, “one person physical assist”, “two plus persons physical assist”, or “ADL activity itself did not occur during entire period.” For the following analysis, these levels of support provided were grouped into needing “two plus persons physical assist” or all other lesser forms of assistance.

Independent variable definitions

Body mass index category is the main predictor of interest. Resident height and weight was recorded from a measurement using facility-specific procedures. The recorded weight measurement is to reflect a measurement within the last 30 days, and height is to reflect the height at admission or within the last year, whichever is more recent. BMI was calculated at mass in kilograms divided by squared height in meters, and it was categorized into underweight, normal weight, overweight, obesity Class I, obesity Class II, obesity Class III

(subdivided into two groups obesity Class IIIA and Class IIIB). The definitions of each obesity category are described in Table 1. Residents with reported weight less than 50 pounds, weight greater than 1000 pounds, height less than 36 inches, or height greater than 90 inches were considered outliers and counted as missing observations.

Demographic variables include age categorized into less than 65 years old, 65 to less than 70 years old, 70 to less than 75 years old, 75 to less than 80 years old, and 80 years old or more. Gender is defined as the identity listed in the Social Security system of female or male. Race, in the MDS, is defined as self-identified race using the following categories: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian or other Pacific Islander, or White. For this analysis, race was categorized as “Black”, “White”, or other. Dementia status is defined by its presence as an active medical diagnosis within 7 days of the MDS assessment date.

Statistical methods

The odds of two-person assist for each ADL for each body mass index category was calculated using multivariable logistic regression with Huber-Eicker-White robust standard errors to adjust for facility-level clustering of resident characteristics present in the collected data. The regression model controlled for age category, gender, dementia status as these factors may confound the relationship between obesity and assistance needed with ADLs. The predicted probability of needing assistance of two persons, adjusted for all covariates, was computed by back-transformation (using the “margins” command) from the logistic regression model.²⁹ Stata 15.0 software was used for all analyses (StataCorp, College Station, TX).

Results

Of the 1,677,419 nursing home residents, we excluded 50,278 with missing information for height or weight (n = 36,781), age (n = 348), urinary or bowel incontinence (n = 895), medical conditions (n = 8314), or functional status (n = 3940). The final cohort included 1,627,141 residents. Of those, 92,551 (5.7%) were under-weight, 559,226 (34.6%) were normal weight, 469,026 (29.0%) were overweight, 261,538 (16.2%) were Class I obese, 123,655 (7.7%) were Class II obese, 83,597 (5.2%) were Class IIIA obese, and 26,830 (1.7%) were Class IIIB obese. Nursing home residents under the age of 65 years old were more likely to have Class III obesity (16.0% in <65 years old, 2.3% in 80 years or older). Women were more likely than men to be underweight (6.5%, 4.3%, respectively), Class II obese (8.1%, 6.8%, respectively), or Class III obese (7.7%, 5.1%, respectively). Black residents were more likely than white or other race residents to have Class I obesity (17.3%, 16.2%, and 14.7%, respectively), Class II obesity (9.0%, 7.6%, and 6.4%, respectively), or Class III obesity (9.3%, 6.6%, and 5.2%). The distribution of resident body mass index category, when subdivided into short-stay and long-stay residents, was nearly identical (Table 2).

Following Hypothesis 1 and 2, the unadjusted prevalence of reporting two or more-person assistance increased as BMI increased for every type of assistance need except for eating assistance which was not associated with increasing BMI (Table 3). After adjusting for age,

gender, and dementia status, increasing BMI was associated with an increasing odds ratio of a two or more person assist for all activities. The odds ratio of needing two or more person assistance ranged from 1.23–2.23 for residents with Class III Obesity compared to residents of normal weight, except eating assistance. When the predicted probability of assistance was plotted as a function of BMI, residents with Class III obesity had a much higher probability of needing extensive assistance than those with lower BMI (see Fig. 1). Residents with Class IIIA obesity were associated with an adjusted odds ratio of 1.33 (95% CI 1.31–1.35) and residents with Class IIIB obesity were associated with an adjusted odds ratio of 1.90 (95% CI 1.86–1.95) of receiving a two-person assist with any activity of daily of living.

Discussion

2013 national nursing home assessment data in this study showed that 30.7% of all residents were obese, and increasing BMI was associated with a significantly increased reported need for assistance of two persons with reported ADLs. The odds of needing a two-person assist with mobility related activities increased as BMI increased, with the most pronounced odds ratios for people with BMI 40 kg/m² and over (supporting Hypothesis 1). The only activity with which this relationship did not exist was in eating assistance, where there was no significant increase in need for two-person assist (supporting Hypothesis 2). This relationship was robust, even after adjusting for age, gender and dementia status. As obesity prevalence increases in nursing homes, the staffing, equipment, and skills necessary to provide adequate assistance for residents with higher BMIs must be evaluated to avoid safety issues for residents and staff.

This study found that as BMI increases, more care was needed in the form of extra staff to provide help with every type of ADL except for eating activities. Beyond the extra staff, these staff members noted needing more time to perform the same task with obese residents. Observational and qualitative research has consistently noted complexity when providing care for residents with obesity including the need for increased time to assist with bathing and dressing.^{15,16} Studies from acute care settings have noted similar trends in additional staffing needs as BMI increases.³⁰ Over the past 15 years, staffing at nursing homes has stayed level in terms of nursing aide hours per resident per day.²⁸ The rate of obesity among nursing home residents has increased from 16.9% in 2000 to 30.7% in 2013, and the prevalence of obesity has doubled since the turn of the century.¹³ This growing mismatch between unchanging staffing hours and increasing obesity prevalence may lead to greater challenges in properly caring for residents with obesity. In a recent survey of nursing homes administrators, 31% of respondents reported that staffing was not adequate to care for morbidly obese residents (defined in this study as residents weighing 325 pounds or more), and a survey of hospital discharge planners found that 60% of respondents thought that nursing homes had staffing concerns regarding admission of someone with a BMI of 35 or more.^{31,32} While this difference between available workforce and assistance needed may have be compensated for by new methods or technology, it is most likely that staff are using a greater proportion of time and energy caring for the intensive needs of residents with obesity. Resident obesity is leading to a serious workforce issue.

Next, obesity has been associated with adverse events in nursing homes, and staffing has been implicated in these relationships. Cai et al noted a higher incidence of pressure ulcers among residents with obesity, and this relationship was moderated by staffing rates.¹³ The increased risk of pressure ulcers may be related to biologic etiologies (increased skin pressure and shearing forces), nursing issues (difficulty assessing skin integrity) and system issues (staff availability to turn resident). Additionally, nursing homes with higher rates of obesity have been noted to have slightly higher rate of staffing as well as more inspection deficiencies.^{33,34} This indicates that resident obesity is associated with resident harm, nursing homes are attempting to adapt to changing demographics related to obesity, and quality is often lower in nursing homes where obesity rates are high.

Increased use of specialized equipment including Hoyer lifts, transfer boards, and bariatric-sized beds, chairs, and treatment tables may help alleviate the burden of extra assistance needed by the obese residents. Numerous nursing reviews have described the utility of a broad range of equipment for care of residents with obesity. Despite this, it is unclear how accessible and useful this equipment is in most nursing homes.^{35–37} In the previously mentioned survey of Pennsylvania nursing homes, 68% of respondents reported concerns about the specialized equipment needed for morbidly obese residents in their nursing home.³¹ Among hospital discharge administrators, 72% of respondents reported perceived nursing home concerns regarding equipment necessary for care for residents with a BMI of 35 or more.³² Such equipment is expensive to purchase or lease, and it may be difficult to justify for nursing homes with lower numbers of residents with obesity, leading nursing homes with less equipment, staffing, or volume to refuse admission to these prospective residents. Indeed, one third of hospital discharge planners reported that nursing homes often or always refuse admission to these residents.³² Specialized equipment for obesity care has a narrow range of uses, unlike the utility of higher staffing rates which can be utilized in many ways, making these expenses difficult to justify for lower volume facilities.

The residents that are affected by the challenges related to staffing and equipment are residents that may already been subject to systemic disparities by race, socioeconomic status, and gender in care outcomes. Therefore, the issues related to obesity may be causing persistent or widening disparities. Residents with obesity are more likely to be less than 65 years old, have Medicaid payer sources, more be racial minorities, and be female. Similar populations of obese individuals have also been identified as having lower levels of household wealth than individuals of normal body weight.³⁸ Nursing home administrators and hospital discharge planners have identified reimbursement and financing of nursing home care as a significant barrier to admitting and caring for these residents. Due to the demographics of the nursing home population with obesity, any disparities in care for these residents disproportionately affect people that are poor, minorities, and women. Improvement in the financing and care for people with obesity in nursing homes may help narrow the gap in quality of care for disadvantaged populations.

This study has limitations. All height and weight are reported by MDS assessors using facility-specific standard practices which may vary from facility to facility. The main outcome of needing two-person assistance only reports the assessor's perception and may not be an accurate measure of daily received assistance. All statistical models controlled for

a limited number of demographic factors and residual unmeasured confounding may remain in the final model estimates.

Conclusions

Increased assistance is necessary to provide care for residents as their obesity increases. Residents with a BMI greater than 40 kg/m² are much more likely to need such assistance, but even small increases in BMI from normal weight were associated with increased need for two-person assistance. The health, quality of life, employee safety, and policy challenges related to obesity in nursing homes demands serious consideration from the nursing, medical and public health communities.

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Appendix

Table A1

Activities of daily living with definitions from the Long-Term Care Facility Resident Assessment Instrument User's Manual

Activity of daily living	Definition of activity
Bed mobility	How [the] resident moves to and from lying position, turns side to side, and positions body while in bed or alternate sleep furniture.
Transfer	How [the] resident moves between surfaces including to or from : bed, chair, wheelchair, standing position (excludes to/from bath/toilet)
Walk in room	How [the] resident walks between locations in his/her room
Walk in corridor	How [the] resident walks in corridor on unit
Locomotion on unit	How [the] resident moves between locations in his/her room and adjacent corridor on same floor. If in wheelchair, self-sufficiency once in chair.
Locomotion off unit	How [the] resident moves to and returns from off-unit locations (e.g. areas set aside for dining, activities or treatments). If facility has only one floor, how resident moves to and from distant areas on the floor. If in wheel chair, self-sufficiency once in chair.
Dressing	How [the] resident puts on, fastens, and takes off all items of clothing, including donning/removing a prosthesis or TED hose. Dressing includes putting on and changing pajamas and housedresses.
Eating	How [the] resident eats and drinks, regardless of skill. Do not include eating/drink during medication pass. Includes intake of nourishment by other means (e.g. tube feeding, total parenteral nutrition, IV fluids administered for nutrition or hydration).
Toilet use	How [the] resident uses the toilet room, commode, bedpan, or urinal; transfers on/off toilet; cleanses self after elimination; changes pad; manages ostomy or catheter; and adjusts clothes. Do not include emptying of bedpan, urinal, bedside commode, catheter bag or ostomy bag.
Personal hygiene	How [the] resident maintains personal hygiene, including combing hair, brushing teeth, shaving, applying makeup, washing/drying face and hands (excludes baths and showers)
Bathing	How [the] resident takes full-body bath/shower, sponge bath, and transfers in/out of tub/shower (excludes washing of back and hair)

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Fig. 1.
Probability of Resident Needing Two-person or More Assistance for Any Activity of Daily of Living.

Table 1

Body mass index category definitions.

Body mass category	Definition
Underweight	Body Mass Index < 18.5 kg/m ²
Normal weight	Body Mass Index 18.5 kg/m ² and < 25 kg/m ²
Overweight	Body Mass Index 25 kg/m ² and < 30 kg/m ²
Obesity Class I	Body Mass Index 30 kg/m ² and < 35 kg/m ²
Obesity Class II	Body Mass Index 35 kg/m ² and < 40 kg/m ²
Obesity Class III	Body Mass Index 40 kg/m ²
Obesity Class IIIA	Body Mass Index 40 kg/m ² and < 50 kg/m ²
Obesity Class IIIB	Body Mass Index 50 kg/m ²

Table 2

Demographic and functional characteristics of nursing homes residents by body mass index.

Characteristic (% unless otherwise noted)	Body mass index category			Overweight	Category I Obesity	Category II Obesity	Category IIIA Obesity	Category IIIB Obesity
	Underweight	Normal weight						
Definition of kg/m²	<18.5	18.5–24.9		25–29.5	30–34.9	35–39.9	40–49.5	50
N	92605 (5.7)	562615 (34.6)		472541 (29.0)	263537 (16.2)	124627 (7.7)	84209 (5.2)	27010 (1.7)
Median Weight, kg (IQR)	44(40–49)	58(52–65)		72(65–80)	84(77–93)	96(88–106)	112(102–124)	142(126–162)
Age, years								
Median (IQR)	84(75–91)	84(75–90)		82(73–88)	79(69–86)	75(65–84)	71(62–79)	64(56–72)
Female	69025 (74.5)	366643 (65.2)		292027 (61.8)	171313 (65.0)	86645 (69.5)	62494 (74.2)	20265 (75.0)
Race								
Black	11369 (12.3)	65657 (11.7)		59988 (12.7)	36858 (14.0)	19292 (15.5)	14234 (16.9)	5479 (20.3)
Other	9397 (10.1)	55816 (9.9)		44289 (9.4)	22013 (8.3)	9483 (7.6)	5928 (7.0)	1767 (6.5)
White	71839 (77.6)	441142 (78.4)		368264 (77.9)	204666 (77.7)	95852 (76.9)	64047 (76.1)	19764 (73.2)
Length of stay								
100 days or more	68976 (74.1)	420188 (74.6)		356876 (75.5)	198117 (75.2)	91463 (73.4)	59343 (70.5)	19394 (71.8)
No Activity of Daily Living Deficits								
Bed Mobility	9562 (10.3)	82777 (14.7)		81999 (17.3)	48452 (18.4)	23043 (18.5)	14817 (17.6)	4409 (16.3)
Transfer Self	7618 (8.2)	70676 (12.6)		72245 (15.3)	43373 (16.5)	20711 (16.6)	13487 (16.0)	4060 (15.0)
Walk In Room	9217 (9.9)	85170 (15.1)		85467 (18.1)	50700 (19.2)	23926 (19.2)	15608 (18.5)	4390 (16.2)
Walk In Corridor Self	8571 (9.3)	81036 (14.4)		81344 (17.2)	48268 (18.3)	22544 (18.1)	14532 (17.3)	3824 (14.2)
Locomotion On	13633 (14.7)	117095 (20.8)		118578 (25.1)	72940 (27.7)	36230 (29.1)	24547 (29.1)	7905 (29.3)
Locomotion Off	11112 (12.0)	96877 (17.2)		100445 (21.3)	63320 (24.0)	31949 (25.6)	21942 (26.1)	7249 (26.8)
Dressing	4851 (5.2)	43967 (7.8)		45462 (9.6)	28013 (10.6)	13792 (11.1)	9032 (10.7)	2652 (9.8)
Eating	40676 (43.9)	297328 (52.8)		281173 (59.5)	173528 (65.8)	88451 (71.0)	63436 (75.3)	21200 (78.5)
Toileting	5850 (6.3)	54253 (9.6)		56635 (12.0)	34618 (13.1)	16791 (13.5)	10992 (13.0)	3012 (11.1)
Personal Hygiene	6771 (7.3)	57790 (10.3)		58936 (12.5)	36643 (13.9)	18877 (15.1)	12931 (15.4)	3873 (14.3)
Bathing	2459 (2.7)	23030 (4.1)		25316 (5.4)	16255 (6.2)	8445 (6.8)	5589 (6.6)	1576 (5.8)

IQR, interquartile range.

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