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# Obesity and its associated factors in older nursing home residents in three European countries—Secondary data analyses from the "International Prevalence Measurement of Care Quality"

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## Abstract

**Background:** The prevalence of obesity has risen in recent decades and reached epidemic proportions worldwide. The proportion of those living with obesity is also increasing in nursing homes. This could impact the nursing care required, equipment and facilities provided, and morbidity in these settings. Limited evidence exists on clinical consequences of obesity in nursing home residents and their care.

**Objective:** Therefore, the aim was to examine the rate and associated factors of obesity (BMI ≥30; class I (BMI 30.0–34.9 kg/m$^2$), class II (BMI 35.0–39.9 kg/m$^2$), and class III (BMI >40.0 kg/m$^2$)) amongst older nursing home residents in European countries.

**Methods:** We analysed data from 21,836 people who reside in nursing homes in Austria, the Netherlands, and the United Kingdom. They participated in the "International Prevalence Measurement of Care Quality", a cross sectional study between 2016 and 2019, where trained nurses interviewed the residents, reviewed care records, and conducted clinical examinations. A tested and standardised questionnaire comprised questions on demographic data, measured BMI, medical diagnosis according to ICD-10, and care dependency. Descriptive and logistic regression analyses were performed.

**Results:** Obesity rates were highest in Austria (17.1%) and lowest in the UK (13.0%) ($p = .006$). Residents with obesity were younger and less likely to be care dependent or living with dementia and had more often diabetes mellitus, endocrine, metabolic, and skin diseases compared to residents without obesity ($p < .05$). Most obese residents had obesity class I. Therefore, two subgroups were built (class I vs. class II + III). Residents with obesity class II + III were more frequently care dependent for mobility, getting dressed and undressed, and personal hygiene compared to residents with class I ($p < .05$).

**Conclusions:** This study identified several factors that are associated with obesity amongst older nursing home residents in selected European countries.

**Implications for practice:** The division into obesity classes is important for planning targeted care according to the individual needs of nursing home residents.

**KEYWORDS**
body mass index, care dependency, Europe, nursing home, obesity, older people

## 1 | INTRODUCTION

In 2016, approximately 13% of the adult population worldwide were affected by obesity, defined by the World Health Organisation (WHO, 2021) as an abnormal excess in body fat which represents a health risk. Epidemiological studies show that the prevalence of obesity has risen in recent decades and has reached epidemic proportions (Großschädl & Stronegger, 2019; NCD-RisC, 2017), with prevalence predicted to increase for the foreseeable future (Thomas et al., 2014).

A wide range of determinants influence the development of obesity including genetic, behavioural, and socioeconomic factors (Großschädl & Stronegger, 2019; NCD-RisC, 2017; WHO, 2021). Obesity increases with age, although the prevalence decreases after the age of 70, possible due to emergent frailty (Batsis & Villareal, 2018), a survivor effect and because of the phenomenon of "anorexia of aging", which is defined as loss of appetite and/or decreased food intake in older persons (Landi et al., 2016). Obesity in older people is associated with adverse health outcomes and increased risk of long-term conditions, such as diabetes and heart failure (WHO, 2021). Factors favouring the development of obesity with age are the loss of muscle mass associated with a reduced resting metabolic rate and metabolic adaptation (Batsis & Villareal, 2018). Age-related changes in muscle and fat composition are also due to changes in oestrogen and testosterone with age. In women, the decrease in oestrogen during menopause leads to a decrease in fat-free mass, resulting in an increase in body weight. In men, the decreasing testosterone level has a negative effect on muscle mass and fat distribution in old age (Batsis & Villareal, 2018). Physical activity appears to have a protective as well as therapeutic effect against obesity in older people (Batsis & Villareal, 2018; Papadopoulou et al., 2020; Villareal et al., 2017).

Aging is associated with abdominal obesity, which is in turn associated with insulin resistance and the metabolic syndrome (Shaharuddin et al., 2020). The so-called obesity paradox, a mild form of obesity which may have protective effects in older age, is suggested by data which shows that fat reserves can improve survival from severe illnesses in later life. The epidemiology is, however, complex because of a likely survivor effect, where those with higher-risk obesity die younger (Bosello & Vanzo, 2021).

The prevalence of obesity is increasing amongst nursing home residents (Cai et al., 2013; Harris et al., 2020). Harris et al. (2020) reported a mean obesity prevalence rate in nursing homes in the United States of 31.1% (standard deviation 8.8). The increase in obesity prevalence could have a significant impact on the care

### SUMMARY STATEMENT OF IMPLICATIONS FOR PRACTICE

#### What does this research add to existing knowledge in gerontology?

- Several care related factors that are associated with obesity amongst older nursing home residents in selected European countries were identified.
- Residents with obesity were younger and less likely to be care dependent or living with dementia. They were more likely to have diabetes mellitus, endocrine, metabolic and skin diseases.
- Most obese residents had mild obesity. Residents with obesity classes II and III needed more care for hygiene, mobility, and getting dressed and undressed.

#### What are the implications of this new knowledge for nursing care with older people?

- The classification of obesity is important when planning care for older people living with obese people because residents with obesity classes II/III showed higher care needs compared to those with obesity class I.
- Because residents with obesity had a higher prevalence of skin diseases, we recommend paying close attention to the skin care in older people living with obesity to prevent, e.g., intertrigo or pressure injuries.
- In the case of mild forms of obesity in nursing home residents, care should be taken to ensure that these do not progress to a more severe form.

#### How could the findings be used to influence policy or practice or research or education?

- Because of the growing obesity burden in aging populations, it is important to increase awareness of obesity in health and social care professionals through education.
- More research is needed to study the interaction between the environment, organisational factors and care quality for residents with obesity in nursing homes in order to justify potentially costly changes.
- Policies aimed at obesity reduction must address the setting and region where people live more strongly in the future.

services required, equipment and facilities provided, and morbidity in these settings. There are, however, limited data about the challenges of caring for nursing home residents with obesity (Harris et al., 2020). The few existing studies show that there is a significant association between obesity in older adults and increasing inability to perform activities that are essential to independent living (The GBD 2015 Obesity Collaborators, 2017). This activity limitation requires assistance from caregivers in nursing home setting (Harris et al., 2018, 2020). Harris et al. (2020) elected that as body mass index (BMI) increases, more care is needed in the form of extra staff and equipment to provide support with almost all investigated activities of daily living. Nevertheless, more insight into the care needs of older people with obesity in nursing homes is needed to enable precise planning of care, targeted action related to obesity, and to support independence amongst residents (Großschädl & Stronegger, 2019).

Most studies on obesity amongst older residents living in nursing homes come from the USA and Canada (Leichsenring et al., 2015). Population trends around obesity differ between North America and Europe, and it is therefore important to gather European data to understand the extent of obesity in nursing homes and to understand how this correlates with care-associated factors, such as care dependency. Against this background, this study aimed to examine obesity and selected care associated factors amongst nursing home residents in three European countries (Austria, The Netherlands, and the United Kingdom).

## 2 | MATERIALS AND METHODS

### 2.1 | Design

We conducted a secondary analysis of data collected as part of the International Prevalence Measurement of Care Quality, a cross sectional study, which is used to benchmark prevalence rates of care problems, such as incontinence, pressure ulcer, malnutrition or falls, in health care institutions across several European countries (Austria, Switzerland, the Netherlands, Turkey, and the United Kingdom) and on various care problems annually on one day. This includes data from hospitals and nursing homes. The study design has been described elsewhere (Eglseer et al., 2020; van Nie-Visser et al., 2013). Only nursing home data are included in the current paper.

### 2.2 | Data collection

We used data from nursing homes that participated in the quality measurements from the years 2016–2019 in the countries Austria, the Netherlands, and the United Kingdom. No data were available from 2020 due to suspension of the survey because of the COVID-19 pandemic. The data collection was independently performed by staff in participating nursing homes. All staff received standardised training and were provided with training materials. Data were collected by two nurses working as a team, by interviewing the resident or conducting a clinical examination or by reviewing their care records. From the included variables in this secondary data analysis, only BMI was directly assessed by weighing the residents. All other variables were collected by reviewing the care records. A standardised questionnaire based upon guidelines and expert consensus was used for data collection. The questionnaire is updated annually to ensure it aligns with the latest evidence and has been shown to have good reliability and validity (van Nie-Visser et al., 2013). It comprises questions on demographic data, medical diagnosis according to ICD-10 (WHO, 2016), and care dependency.

### 2.3 | Participants and sampling

A total of 45,024 residents in the voluntarily participating institutions in three countries were approached on the basis of eligibility for the quality measure and invited to participate. The only inclusion criterion was the necessity of a written (Austria) or oral (the United Kingdom and the Netherlands) informed consent. Participants that were not willing to participate had to specify the reason for non-participation. The highest response rate was observed in the Netherlands (95.1%) and the lowest in Austria (80.5%). 82.2% of the United Kingdom nursing home residents agreed to participate. After excluding residents without information on weight and height ($n = 23{,}153$) and with an implausible BMI that suggested a data entry error (≤10 kg/m$^2$ and ≥60 kg/m$^2$; $n = 35$), data from 21,836 nursing home residents were available for further analysis.

### 2.4 | Main variables

Body mass index was calculated as body weight in kilograms divided by the square of the height in meters. Weight and height were measured directly whenever possible or, where this was clinically unobtainable, previous measurements by the residents or reported measurements by their relatives were used. Obesity was defined according to the WHO (2021) classification as BMI ≥30 kg/m$^2$. Rates (%) for obesity were calculated, and residents were categorised as: obesity class I (BMI 30.0–34.9 kg/m$^2$), class II (BMI 35.0–39.9 kg/m$^2$), and class III (BMI >40.0 kg/m$^2$). Care dependency was assessed using the comprehensively tested Care Dependency Scale (CDS) which comprises various activities of daily living (e.g., continence, mobility and hygiene). It is an assessment scale to measure 15 dimensions of care dependency on a five-point Likert scale ranging from 1 (completely care dependent) to 5 (completely independent). Higher scores refer to lower care dependency (Dijkstra et al., 1996). The German version of the CDS has been tested for use in nursing homes, and the internal consistency, inter- and intrarater reliability, and criterion validity were found to be good (Lohrmann et al., 2003).

## 2.5 | Statistical analyses

IBM SPSS Statistics 26 for Windows was used for data analyses. Differences between various subgroups were analysed using the chi-squared test for categorical variables. The data were not normally distributed, and therefore, the Mann–Whitney *U* test and the Pearsons correlation coefficient were used for metric variables. A logistic regression analysis was conducted with obesity as the dependent variable. The selection of the variables was guided by clinical relevance and statistical significance. If the variance inflation factors were below four, we assumed no multicollinearity between the variables (Hair et al., 2016). The backward stepwise multivariable logistic regression analysis included all significant variables according to the univariable analysis. Hosmer–Lemeshow goodness of fit test, Cox & Snell $R^2$ and Nagelkerke $R^2$ was performed to reveal the fit of the final model (Field, 2018). *p*-Values lower than .05 were considered statistically significant.

## 2.6 | Ethical considerations

All participating nursing home residents or their legal representatives gave their oral (the United Kingdom and the Netherlands) or written informed consent (Austria). In the United Kingdom, the primary study is conducted as part of service improvement and development work and, therefore, is exempt from research consent by recommendation of the Health Research Authority (HRA). In Austria and the Netherlands, the respective responsible ethical committees gave their approval for the study protocol on the basis of rolling annual review. The data have been anonymized.

# 3 | RESULTS

About 70% of all investigated nursing home residents ($n$ = 21,836) were female and the median age was 85 (the Netherlands) and 86 years (Austria and the United Kingdom), respectively. Except for sex, all demographic characteristics differed significantly between the countries. Nursing home residents in the United Kingdom were more care dependent (38.0) than residents in the Netherlands (48.0) and Austria (44.0). Furthermore, the median BMI was lower in nursing home residents in the United Kingdom (23.3 kg/m$^2$) than in the Netherlands (24.6 kg/m$^2$) and Austria (24.6 kg/m$^2$) (Table 1). 17.1% of the Austrian, 14.9% of the Dutch and 13.0% of the United Kingdom nursing home residents were obese ($p$ = .006). Most of the residents with obesity had class I (the Netherlands: 73.0%; Austria: 70.9%; the United Kingdom: 70.1%) and between 8.3% (the Netherlands) and 10.4% (the United Kingdom) had class III obesity (Figure 1).

Residents with obesity were significantly younger compared to residents without obesity across all countries. Furthermore, residents with obesity were less likely to live with dementia and more likely to have diabetes mellitus by comparison with residents without obesity. Stroke, diseases of the circulatory system and diseases of the respiratory system were more prevalent in residents with obesity in the Netherlands compared to residents without obesity.

**TABLE 1** General characteristics of the study sample.

| | NL ($n$ = 18,587) | AT ($n$ = 1189) | UK ($n$ = 2060) | $p$-Value* |
|---|---|---|---|---|
| Female sex (%) | 69.9 | 71.3 | 71.2 | .311 |
| Age in years, median (IQR) | 85.0 (79.0–90.0) | 86.0 (79.0–91.0) | 86.0 (80.0–90.0) | .001 |
| BMI kg/m$^2$, median (IQR) | 24.6 (21.6–27.8) | 24.6 (21.5–28.2) | 23.3 (19.9–27.1) | <.001 |
| 5 most prevalent diseases (%) | | | | |
| Dementia | 49.6 | 54.8 | 65.6 | <.001 |
| Diseases of the circulatory system | 47.1 | 71.0 | 23.0 | <.001 |
| Diseases of the musculoskeletal system | 22.8 | 47.6 | 18.1 | <.001 |
| Mental diseases | 22.1 | 41.1 | 15.0 | <.001 |
| Diabetes mellitus | 19.6 | 20.6 | 16.0 | <.001 |
| Number of diseases, median (IQR) | 3.0 (2.0–4.0) | 5.0 (3.0–6.0) | 2.0 (1.0–3.0) | <.001 |
| Care dependency[a], median sumscore (IQR) | 48.0 (33.0–62.0) | 44.0 (28.0–58.0) | 38.0 (24.0–53.0) | <.001 |
| Totally dependent (%) | 13.4 | 20.7 | 25.0 | <.001 |
| To a great extent dependent (%) | 30.7 | 30.5 | 38.1 | |
| Partially dependent (%) | 27.0 | 26.2 | 21.6 | |
| To a great extent independent (%) | 18.1 | 16.3 | 9.7 | |
| Totally independent (%) | 10.8 | 6.3 | 5.6 | |

Abbreviations: AT, Austria; BMI, body mass index; IQR, interquartile range; NL, Netherlands; UK, United Kingdom.

[a]Higher scores refer to lower care dependency.

*$p \leq .05$, chi-squared test for categorical variables, Mann–Whitney *U* test and Pearsons correlation coefficient for metric variables.

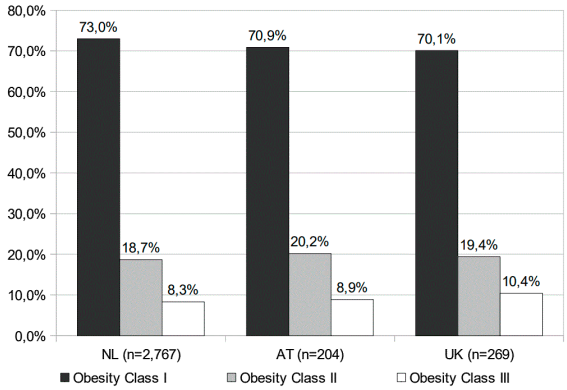


**FIGURE 1** Obesity and its associated factors in older nursing home residents in three European countries. Rates of obesity classes amongst nursing home residents with obesity stratified by countries ($p$-value = .062).

Furthermore, endocrine and metabolic diseases and diseases of the skin were more prevalent in residents with obesity compared to residents without obesity in Austria and the Netherlands. We calculated a significant correlation between BMI and care dependency ($r = .137$ (the Netherlands), $r = .230$ (Austria), and $r = .176$ (the United Kingdom)). Table 2 shows that nursing home residents with obesity were significantly less care dependent than those without obesity. The prevalence of being largely care dependent or totally care dependent was significantly higher in residents without obesity in all items of the care dependency scale.

In the multivariable regression analysis, the Hosmer–Lemeshow test demonstrated a reasonably good fit of the model (11.979) and a small effect explained by Cox and Snell's $R^2$ of .054 and Nagelkerke's $R^2$ of .095 (Field, 2018). Nursing home residents in Austria had a higher risk of being obese compared to the other countries. Age and care dependency were also significantly associated with obesity. The younger the residents and the lower the care dependency, the higher the risk of being obese. Residents with diabetes mellitus, stroke, diseases of the circulatory system, the respiratory system or the skin had a higher risk of being obese, whereas residents with cancer, dementia and diseases of the eye had a lower risk of being obese (Table 3).

A lower number of residents had class II and III obesity, compared to class I. Therefore, two subgroups were built (class I vs. class II + III). Residents with obesity class II + III were statistically significant younger than residents with class I (80 years vs. 84 years). The median care dependency did not differ significantly between the different classes of obesity, but the percentage of dependent residents in the individual items of the CDS scale did. Residents with obesity class II + III were more likely to be dependent for "mobility", "getting dressed and undressed" and "hygiene" compared to residents with class I. Conversely, residents with obesity class I were significantly more care dependent in the items "contact with others" and "learning ability" as compared to residents with obesity class II + III (Table 4).

## 4 | DISCUSSION

The aim of this study was to describe obesity and associated care relevant factors of obesity amongst nursing home residents in three European countries. The median BMI in our sample in all three countries can be categorised as "normal weight", which reaches up to 25 kg/m$^2$, and the proportion of obese residents was relatively low in the examined countries, compared to obesity rates in American nursing homes, which are over 30% (Harris et al., 2020).

Comparing countries shows that the rates of the median BMI as well as obesity was higher in Austrian and Dutch nursing home populations than in the United Kingdom's population. This is in contrast to the general adult populations' obesity rates, which are highest in the United Kingdom, followed by the Netherlands and Austria (The GBD 2015 Obesity Collaborators, 2017). Additionally, United Kingdom's participating nursing homes had significantly more care dependent residents than Austria and the Netherlands. It may be that in Austria they are less care dependent, as there is not such an explicit distinction between residential and nursing home care; many nursing homes provide both (Riedl & Kraus, 2010) and therefore also care for people who are less in need of care. In the United Kingdom there is a clear distinction in this regard, with nursing homes being particularly for people with medical needs and higher care requirements (Carehome.co.uk, 2022). These disparities may be also explained by the high proportion of residents diagnosed with dementia in United Kingdom's nursing homes. Nearly two thirds of residents in the United Kingdom had dementia, in contrast to Austria and the Netherlands where about half of the residents have a dementia diagnosis. Dementia is associated with a higher degree of care dependency (Schüssler et al., 2016) and additionally with weight loss and malnutrition (Volkert et al., 2015).

Some studies have demonstrated obesity is associated with higher levels of disability amongst older people (The GBD 2015 Obesity Collaborators, 2017; van Nie-Visser et al., 2013). Against expectations, nursing home residents with obesity in our sample were less care dependent. This may be a further reason for the lowest obesity rate amongst the participants from the United Kingdom, since they had the highest rate for care dependency. Overall, this supports the assumption that the "obesity paradox" may be present in nursing home residents with regard to care dependency. However, the residents with obesity were also younger and lived less often with dementia. Another analysis of international data showed that the proportion of people with obesity decreases again in old age (75+) compared to younger age groups (Chooi et al., 2019).

The "obesity paradox" may also explain how obesity is not always the best indicator for health and dependency (Batsis et al., 2016). For nursing home residents, a higher BMI, for example, is associated with a lower risk of death (Veronese et al., 2015). Therefore, weight-loss interventions for older adults should be planned and delivered carefully and especially for persons with obesity in nursing homes. Evidence on the benefits and harms of weight-loss interventions for

**TABLE 2** Comparison between residents with and without obesity in terms of sex, age, diseases and care dependency stratified by countries.

| | NL | | AT | | UK | |
|---|---|---|---|---|---|---|
| | Obese ($n$ = 2767) | Non-obese ($n$ = 15,818) | Obese ($n$ = 204) | Non-obese ($n$ = 986) | Obese ($n$ = 269) | Non-obese ($n$ = 1792) |
| Female sex (%) | 74.5* | 69.1 | 67.5 | 72.1 | 69.4 | 71.4 |
| Age (in years) | 83 (75–88)* | 86 (80–90) | 83 (74–88)* | 87 (80–91) | 82 (75–88)* | 86 (81–91) |
| Diseases (%) | | | | | | |
| Dementia | 35.6* | 52.0 | 41.4* | 57.6 | 56.7* | 67.0 |
| Diseases of the circulatory system | 51.1* | 46.4 | 73.4 | 70.5 | 20.5 | 23.4 |
| Diseases of the musculoskeletal system | 22.0 | 22.9 | 48.3 | 47.5 | 20.9 | 17.7 |
| Mental disorders | 23.0 | 21.9 | 44.3 | 40.5 | 19.4* | 14.4 |
| Diabetes mellitus | 32.0* | 17.4 | 36.0* | 17.4 | 27.2* | 14.3 |
| Stroke | 20.9* | 17.2 | 16.7 | 16.1 | 19.0 | 16.7 |
| Diseases of the eye | 14.8* | 18.2 | 16.7 | 18.2 | 6.3* | 10.3 |
| Diseases of the respiratory system | 18.1* | 13.6 | 19.2 | 18.1 | 14.6 | 11.5 |
| Diseases of the genitourinary system | 13.4 | 13.7 | 33.5 | 31.2 | 6.3 | 6.5 |
| Diseases of the nervous system | 11.9 | 11.5 | 17.7 | 21.3 | 6.0 | 8.8 |
| Cancer | 8.2* | 9.5 | 5.9 | 9.5 | 10.8 | 10.2 |
| Diseases of the digestive system | 7.7 | 8.2 | 33.5 | 30.6 | 4.1* | 8.1 |
| Endocrine and metabolic diseases | 9.5* | 7.5 | 36.0* | 27.1 | 4.9 | 6.3 |
| Diseases of the skin | 10.8* | 8.8 | 13.3* | 8.6 | 4.5 | 2.5 |
| Other[a] | 7.7 | 7.7 | 23.2 | 22.6 | 8.9 | 7.6 |
| Diseases of the blood | 5.1 | 4.8 | 13.8 | 14.6 | 5.6 | 4.4 |
| Diseases of the ear | 3.9* | 5.1 | 7.4 | 5.9 | 1.5 | 2.6 |
| Addiction | 2.1 | 2.3 | 6.9 | 5.2 | 0.7 | 1.1 |
| Infectious diseases | 2.0 | 2.1 | 2.0 | 1.6 | 0.4 | 0.5 |
| Spinal cord lesion | 0.8* | 0.4 | 1.0 | 0.8 | 0.7 | 0.3 |
| Number of diseases | 3 (2–4)* | 3 (2–4) | 5 (3–6) | 5 (3–6) | 2 (1–3) | 2 (1–3) |
| Care dependency[b] (median sumscore) | 52 (39–64)* | 47 (32–61) | 53 (38–61)* | 41 (26–56) | 43 (32–55)* | 37 (23–52) |
| Items CDS % totally and to a great extent dependent | | | | | | |
| Eating and drinking | 24.1* | 34.0 | 17.7* | 39.2 | 26.9* | 38.4 |
| Continence | 34.2* | 39.1 | 39.9* | 54.5 | 48.1* | 57.5 |
| Body posture | 23.2* | 26.1 | 32.5* | 38.6 | 30.2 | 36.6 |
| Mobility | 30.5* | 32.8 | 32.5* | 42.8 | 47.4 | 49.7 |
| Day/night pattern | 15.3* | 23.6 | 21.7* | 31.4 | 29.1* | 42.9 |
| Getting dressed and undressed | 46.1* | 49.6 | 46.8* | 57.3 | 59.7* | 63.6 |
| Body temperature | 28.0* | 35.4 | 18.7* | 35.7 | 37.3* | 51.9 |
| Hygiene | 51.2* | 55.9 | 57.6* | 61.9 | 67.5 | 69.2 |
| Avoiding of danger | 39.8* | 50.5 | 36.0* | 55.2 | 59.0* | 67.4 |

TABLE 2 (Continued)

| | NL | | AT | | UK | |
|---|---|---|---|---|---|---|
| | Obese ($n$ = 2767) | Non-obese ($n$ = 15,818) | Obese ($n$ = 204) | Non-obese ($n$ = 986) | Obese ($n$ = 269) | Non-obese ($n$ = 1792) |
| Communication | 12.7* | 21.3 | 12.8* | 27.1 | 20.9* | 33.0 |
| Contact with others | 18.3* | 29.6 | 17.2* | 35.0 | 32.5* | 46.5 |
| Sense of rules and values | 23.4* | 34.2 | 24.1* | 41.7 | 36.9* | 50.1 |
| Daily activities | 30.1* | 42.9 | 32.5* | 53.8 | 50.0* | 62.2 |
| Recreational activities | 38.4* | 50.3 | 27.1* | 50.8 | 67.2 | 73.6 |
| Learning ability | 37.1* | 50.4 | 36.9* | 55.2 | 46.6* | 60.4 |

Abbreviations: AT, Austria; CDS, care dependency scale; NL, Netherlands; UK, United Kingdom.

[a]Other includes congenital malformations and deformations, symptoms and abnormal laboratory findings, injuries and poisoning, addictive drug overdosis, external causes of morbidity, factors influencing health.

[b]Higher scores refer to lower care dependency.

*$p \leq .05$, chi-squared test for categorical variables, Mann–Whitney $U$ test and Pearsons correlation coefficient for metric variables.

TABLE 3 Univariable and multivariable logistic regression with the dichotomous variable obesity as outcome ($N$ = 21,836).

| | Univariable | | Multivariable | |
|---|---|---|---|---|
| | $p$-Value | OR [95% CI] | $p$-Value | OR [95% CI] |
| Austria compared to the Netherlands | .042 | 1.176 [1.006–1.375] | .005 | 1.278 [1.078–1.516] |
| United Kingdom compared to the Netherlands | .022 | 0.854 [0.747–0.977] | .088 | 1131 [0.982–1.304] |
| Sex[a] | <.001 | 1.230 [1.131–1.338] | <.001 | 1.610 [1.472–1.762] |
| Age | <.001 | 0.965 [0.961–0.968] | <.001 | 0.960 [0.956–0.963] |
| Care dependency[b] | <.001 | 1.015 [1.013–1.017] | <.001 | 1.012 [1.010–1.015] |
| Number of diseases | <.001 | 1.043 [1.021–1.065] | .012 | 0.955 [0.921–0.990] |
| Diabetes mellitus | <.001 | 2.257 [2.077–2.453] | <.001 | 2.268 [2.065–2.491] |
| Cancer | .021 | 0.854 [0.747–0.976] | .023 | 0.846 [0.732–0.977] |
| Endocrine and metabolic diseases | <.001 | 1.304 [1.154–1.474] | | |
| Dementia | <.001 | 0.522 [0.483–0.563] | <.001 | 0.713 [0.651–0.780] |
| Stroke | <.001 | 1.250 [1.139–1.373] | .002 | 1.174 [1.059–1.302] |
| Diseases of the eye | <.001 | 0.786 [0.707–0.874] | .002 | 0.823 [0.730–0.929] |
| Diseases of the ear | .013 | 0.787 [0.651–0.951] | | |
| Diseases of the circulatory system | <.001 | 1.198 [1.112–1.291] | <.001 | 1.289 [1.174–1.414] |
| Diseases of the respiratory system | <.001 | 1.375 [1.245–1.518] | <.001 | 1.351 [1.208–1.511] |
| Diseases of the skin | <.001 | 1.309 [1.156–1.483] | <.001 | 1.443 [1.254–1.660] |

*Note*: Cox & Snell's $R^2$ .054; Nagelkerke's $R^2$ .095; Hosmer–Lemeshow test $X^2$ 11,979; df = 8; $p$ = .152. No is always the reference category.

[a]Female as the reference category.

[b]Care dependency assessed with the Care Dependency Scale (CDS); possible scores range between 15 and 75, whereby lower scores indicate a higher care dependency.

this target group is largely lacking (Goisser et al., 2020). Not only malnourished older persons but also older persons with obesity can be at nutritional risk, if they adhere to a low quality diet (Batsis et al., 2016). Thus, for older persons with obesity, it may be more important to optimise specific dietary patterns or intake of specific nutrients such as protein or critical vitamins rather than focusing on weight loss and BMI (Goisser et al., 2020).

Our study showed that diseases of the skin were more prevalent in residents with obesity compared to residents without obesity. Henderson et al. (2006) reported that skin infections are common comorbidities associated with obesity. It is recommended to pay close attention to the skin care of older obese individuals to prevent intertrigo or pressure injuries. Furthermore, it is recommended that the care of residents with obesity should be based on evidence-based principles of chronic disease management following clinical practice guidelines (Wharton et al., 2020).

The differences between care settings across European countries are well documented. In the United Kingdom, the nursing home

**TABLE 4** Comparison between residents with obesity divided in "class I" and "class II +III" in terms of sex, age, number of diseases and care dependency stratified by countries.

| | NL | | AT | | UK | |
|---|---|---|---|---|---|---|
| | Obesity class I ($n = 2020$) | Obesity class II + III ($n = 749$) | Obesity class I ($n = 144$) | Obesity class II + III ($n = 59$) | Obesity class I ($n = 188$) | Obesity class II + III ($n = 80$) |
| Female sex (%) | | | | | | |
| Age (in years) | 84 (76–88)* | 80 (72–86) | 84 (76–89)* | 80 (71–84) | 84 (75–88) | 80 (74–87) |
| Number of diseases | 3 (2–4) | 3 (2–4) | 4 (3–6) | 5 (4–6) | 2 (1–3) | 2 (1–3) |
| Care dependency[a] (median sumscore) | 52.0 (39.0–64.0) | 52.0 (39.0–63.0) | 53.0 (39.0–61.0) | 52.0 (37.0–62.0) | 42.0 (31.0–54.0) | 45.0 (33.0–55.0) |
| Items CDS % totally and to a great extent dependent | | | | | | |
| Eating and drinking | 24.3 | 23.8 | 19.4 | 13.6 | 26.6 | 27.5 |
| Continence | 33.3 | 36.4 | 36.8 | 47.5 | 50.0 | 43.8 |
| Body posture | 22.1 | 26.3 | 29.2 | 40.7 | 29.3 | 32.5 |
| Mobility | 28.8* | 35.1 | 29.9 | 39.0 | 44.7 | 53.8 |
| Day/night pattern | 15.5 | 14.8 | 19.4 | 27.1 | 28.2 | 31.3 |
| Getting dressed and undressed | 44.9 | 49.3 | 43.8* | 54.2 | 59.0 | 61.3 |
| Body temperature | 28.1 | 27.6 | 18.8 | 18.6 | 37.8 | 36.3 |
| Hygiene | 49.9* | 54.9 | 58.3 | 55.9 | 68.6 | 65.0 |
| Avoiding of danger | 39.7 | 40.2 | 34.7 | 39.0 | 60.6 | 55.0 |
| Communication | 13.4 | 10.7 | 13.9 | 10.2 | 21.3 | 20.0 |
| Contact with others | 19.6* | 15.0 | 18.1 | 15.3 | 33.0 | 31.3 |
| Sense of rules and values | 24.3 | 21.4 | 25.0 | 22.0 | 37.2 | 36.3 |
| Daily activities | 30.5 | 28.8 | 32.6 | 32.2 | 50.5 | 48.8 |
| Recreational activities | 38.4 | 38.2 | 28.5 | 23.7 | 67.6 | 66.3 |
| Learning ability | 38.7* | 32.8 | 35.4 | 40.7 | 48.9 | 41.3 |

Abbreviations: AT, Austria; CDS, care dependency scale; NL, Netherlands; UK, United Kingdom.

[a]Higher scores refer to lower care dependency.

*$p \leq .05$, chi-squared test for categorical variables, Mann–Whitney *U* test and Pearsons correlation coefficient for metric variables.

sector is dominated by private commercial providers (with 82% the highest share in Europe). By contrast, the majority of nursing homes in the Netherlands are managed by public non-profit providers (92%) (Cushman & Wakefield, 2020). In Austria, public providers still dominate (51%), followed by private providers (40%) and religious organisations (9%) (Riedl & Kraus, 2010). The mean admittance age to a nursing home in the UK is 85.7 years, while it is lower in the Netherlands (mean 84.4 years) (Collingridge Moore et al., 2020). For Austria, the only estimates available are average age of entry, which is 83.3 years for the year 2020 (Ribic, 2020). Furthermore, countries in Europe differ in terms of their geographical features, climate and access to both preventive and acute health care services (Blundell et al., 2017). These features may explain some of the differences revealed by this study but it is more surprising, given the significant differences between organisational settings, how similar the populations involved in the studies were with regards to obesity, both in terms of its predictors and correlates. This adds to the body of evidence that comparisons between long-term care sectors are legitimate and useful (Achtenberg et al., 2019). A closer look at the obesity classes revealed differences in care dependency in residents in class I and II + III. The total care dependency score was not different between the obesity classes, however there were differences in the individual CDS items. Similar to Harris et al. (2018), our data showed higher assistance needs for residents in higher obesity classes with regard to the items "hygiene", "mobility" and "getting dressed and undressed". These items are associated with a lot of nursing care effort; in Harris et al. (2018) these were associated with a need of assistance of at least two persons as well as specific equipment (lifter). It is expected that the number of residents with obesity class II + III will rise in the coming years, which may lead to high workload for the nursing staff (Harris et al., 2018). This higher amount of workload in residents with obesity class II + III should be recognised in the cash-for-care schemas, which are calculated based on required care and which exists for example in Austria (The Austrian Pflegegeld) and the Netherland's (The Dutch Zorgprofielen and The Dutch Persoonsgebonden Budget) (Da Roit & Le Bihan, 2010). However, it must be noted that inferring causality between obesity and care dependency is not permitted based on these study results.

### 4.1 | Limitations

The cross-sectional design enables us to comment on correlation only. Reasons for regional differences in the prevalence of obesity and causes of obesity and care characteristics could not be investigated. It is possible that the data were not representative because the care homes, and resident cohorts, were volunteers and not randomly sampled. Our data also included a high amount of missing values, which is the reason why the BMI could not be calculated for 23,153 residents. This could have influenced the results, as patients in poor health and with higher degree of care dependency might have been less likely to have their weight or height measured, and this could have in turn biased our findings. Other studies have described a socioeconomic gradient in obesity in industrialised countries, higher levels of obesity in those in lower socioeconomic groups (Lugo et al., 2015). For this study variables on socioeconomic status were not available. In general, no questions related to obesity (for example if weight/height were measured directly or reported by relatives) were available in the demographic questionnaire used in the "International Prevalence Measurement of Care Quality". It also has to be acknowledged that most of our investigated residents were not obese and that the data may have been impacted by a very large number of residents from the Netherland's compared with the United Kingdom and Austria which may have caused a Type 1 error.

## 5 | CONCLUSION

We found that nursing home residents of nursing homes in the United Kingdom, Austria, and the Netherlands with obesity were younger, less care dependent and lived less often with dementia. They were more likely to have diabetes mellitus, endocrine, metabolic and skin diseases compared to those without obesity. Most of the nursing home residents who were obese had mild obesity (class 1). The environment in nursing homes has so far received little attention to date in the international research of obesity. More research is needed to study the interaction between the environment, organisational factors and care quality for residents with obesity in nursing homes in order to justify potentially costly changes. Policies and interventions aimed at obesity reduction must take account of individuals' care setting and the geographical area where they are based more strongly in the future and not only the subjects themselves. Primary data are necessary to achieve better data quality and to be able to make country comparisons. Thus, the limitations arising from the secondary data analysis could be avoided.

### 5.1 | Implications for practice

The classification of obesity is important in nursing when planning care for obese residents because we found that residents with obesity classes II and III needed more care in relation to hygiene, mobility and in getting dressed and undressed. This was true for all three countries. Because of the growing obesity burden in aging populations, it is important to increase awareness of obesity in health and social care professionals.

### AUTHOR CONTRIBUTIONS

FG, DS, DE, and SB contributed to the conception and idea of the paper. CL, IE, ALG, JMGAS, and SB contributed to the study design and data acquisition. FG, DS, and SB contributed to the analysis and interpretation of data for the work. All authors contributed to drafting the work and approved of the version to be submitted.

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### CONFLICT OF INTEREST STATEMENT

There is no conflict of interest.

### DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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