

**Citation:**

Kulminski AM, Arbeev KG, Kulminskaya IV, Ukraintseva SV, Land K, Akushevich I, Yashin AI. Body mass index and nine-year mortality in disabled and nondisabled older U.S. individuals. *J Am Geriatr Soc*. 2008 Jan;56(1):105-10. Epub 2007 Nov 15.

**PubMed ID:** [18005352](#)

**Study Design:**

Cohort Study

**Class:**

B - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To investigate the association between BMI and long-term mortality (9 years) in disabled and non-disabled older individuals ( $\geq 65$  years old) using disability-focused data from the 1994 National Long-Term Care Survey.

**Inclusion Criteria:**

Individuals who participated in the 1994 National Long-Term Care Survey.

**Exclusion Criteria:**

Data from individuals who did not report height and weight in the 1994 NLTCS were excluded.

**Description of Study Protocol:****Recruitment**

Data from the 1994 National Long-Term Care Survey (NLTCS).

**Design:** Cohort study

The authors used data from the 1994 NLTCS; Medicare vital statistics files linked to the NLTCS during the 9 years of follow-up were analyzed to look at the ability of change in BMI to predict death.

**Blinding used (if applicable):** not applicable

**Intervention (if applicable):** not applicable

**Statistical Analysis**

Cox proportional hazard regression models; BMI 22.0 - 24.9 was used as the reference category. The robustness of the estimates was tested by adjusting for age and sex and confounders; excluding smokers and proxy reports of weight; and stratification according to disability as well as age-stratification for disabled and non-disabled individuals.

## Data Collection Summary:

### Timing of Measurements

9 years of follow-up measurements, linked to Medicare vital statistics files.

### Dependent Variables

- Mortality

### Independent Variables

- Body Mass Index (BMI) based on height and weight which were based on self- and proxy report
- Disability

### Control Variables

- Alcohol consumption
- Smoking status
- Health conditions (cancer, heart attack, stroke, other heart problems)
- Activities of Daily Living (ADL)
- Instrumental Activities of Daily Living (IADL)
- Race (Black, white, other)
- Baseline information for mediators of obesity on mortality (such as hypertension, diabetes)

## Description of Actual Data Sample:

**Initial N:** The 1994 NLTC represented 5,088 individuals.

**Attrition (final N):** 297 individuals were excluded due to missing height and weight information; 2,956 individuals died during the 9 years of follow-up. Data for 4,791 individuals were analyzed.

**Age:**  $\geq 65$  years

**Ethnicity:** The sample was primarily white.

**Other relevant demographics:** The sample included more men than women. 1,762 individuals of the sample (noninstitutionalized, unimpaired) were designated to be included as a "healthy supplement" and better represent nondisabled individuals.

### Anthropometrics

**Location:** The sample was nationally representative of the United States

## Summary of Results:

## Key Findings

- Overweight and Grade 1 Obesity (BMI 25.0 - 34.9) appear not to be a risk factor for 9-year mortality in individuals age 65 and older.
- Older individuals can be more tolerant of being overweight than younger individuals.
- Nondisabled older individuals have a narrower range of tolerable deviations from optimal weight than disabled older individuals.
- The health and well-being of older individuals should be considered when recommending optimal body weight.

### Relative Risk of Death According to Selected BMI Categories (95% Confidence Interval)

Age (years)	BMI <18.5	BMI 18.5 - 21.9	BMI 25.0 - 29.9	BMI 30.0 - 34.9	BMI ≥ 35.0
Nondisabled 65 - 74 y	1.61 (P>0.05) (0.36- 7.12)	1.23 (P>0.05) (0.60- 2.53)	0.90 (P>0.05) (0.53- 1.55)	1.09 (P>0.05) (0.56 - 2.13)	1.23 (P>0.05) (0.53 - 2.83)
Nondisabled 75 - 84 y	1.16 (P>0.05) (0.63 - 2.14)	1.14 (P>0.05) (0.80 - 1.62)	0.62 (0.46-0.85)	0.58 (0.36 - 0.94)	1.20 (P>0.05) (0.60-2.43)
Nondisabled ≥85 y	1.30 (P>0.05) (0.53- 3.16)	1.02 (P>0.05) (0.55-1.90)	0.80 (P>0.05) (0.36-1.77)	---	---
Disabled 65 - 74 y	1.89 (0.94-3.80)	1.12 (P>0.05) (0.65-1.92)	0.52 (0.33-0.82)	0.63 (P>0.05) (0.38-1.07)	0.92 (P>0.05) (0.56-1.52)
Disabled 75 - 84 y	2.09 (1.44-3.03)	1.84 (1.43-2.37)	0.95 (P>0.05) (0.76-1.18)	0.87 (P>0.05) (0.65-1.16)	0.84 (P>0.05) (0.59-1.20)
Disabled ≥85 y	1.42 (P>0.05) (0.96-2.10)	1.26 (P>0.05) (0.92-1.71)	1.07 (P>0.05) (0.78-1.45)	1.07 (P>0.05) (0.67-1.72)	3.04 (1.27-7.27)

## Other Findings

BMI patterns are age-sensitive; disability affects this sensitivity.

## Author Conclusion:

Overweight and grade 1 obesity (BMI 25.0 - 34.9) appear not to be a risk factor for 9-year mortality in individuals age 65 and older who participated in the 1994 National Long-Term Care Survey. BMI patterns relative to risk of death are age-sensitive and disability affects this sensitivity; health and well-being of older adults should be considered when recommending an optimal body weight.

## Reviewer Comments:

*Large, nationally representative sample. Height and weight based on self- and proxy reports.*

## Research Design and Implementation Criteria Checklist: Primary Research

### Relevance Questions

- |    |   |     |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | N/A |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?   | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?  | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies)  | N/A |

### Validity Questions

- |      |   |     |
|------|---|-----|
| 1.   | <b>Was the research question clearly stated?</b>  | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?   | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated?  | Yes |
| 1.3. | Were the target population and setting specified?   | Yes |
| 2.   | <b>Was the selection of study subjects/patients free from bias?</b>   | Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | Yes |
| 2.2. | Were criteria applied equally to all study groups?  | Yes |
| 2.3. | Were health, demographics, and other characteristics of subjects described?   | Yes |
| 2.4. | Were the subjects/patients a representative sample of the relevant population?  | Yes |
| 3.   | <b>Were study groups comparable?</b>  | Yes |
| 3.1. | Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)   | Yes |
| 3.2. | Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?  | N/A |
| 3.3. | Were concurrent controls used? (Concurrent preferred over historical controls.)   | Yes |

3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	No
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>No</b>
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	???
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	<b>Yes</b>
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes

8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	<b>Yes</b>
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

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