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Body mass index and waist circumference as predictors of mortality among older Singaporeans

Authors: Angelique Chan, Chetna Malhotra, Rahul Malhotra, Truls Ostbye
Department: Program in Health Services and Systems Research

Background

- High body-mass index (BMI) and waist circumference linked to mortality
- Most studies conducted in younger populations
- Relationship between BMI and mortality in elderly is inconsistent. [1-4]

[1] Troiano RP et al. The relationship between body weight and mortality: a quantitative analysis of combined information from existing studies. Int J Obes 1996; 20:63-75.

2 Allison et al. Body mass index and all-cause mortality among people age 70 and over: the Longitudinal Study of Aging. Int J Obesity 1997; 21 (6):424-431.

3 Rajala et al. Body weight and the three year prognosis in very old people. Int J Obes 1990; 14: 997-1003.

4 Losonczy KG et al. Does weight loss from middle age to old age explain the inverse weight mortality relation in old age? Am J Epidemiology 1995; 141: 312-321.

Objective

- To assess the relationship of BMI and waist-circumference with all-cause mortality among older Singaporeans

Methods: Panel on Health and Aging of Singaporean elderly (PHASE)

- Wave 1: Conducted in January-July 2009.
  - Interviews with 5000 elderly ≥60 years
- Wave 2: July 2011-
  - Information on mortality

- Current analysis limited to 3860 individuals whose survival status was known

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Methods

- Outcome variable: All-cause mortality
- Independent variables:
  - BMI
    - Quintiles
    - International classification
      - Underweight: <18.5 kg/m^2
      - Normal: 18.5-25 kg/m^2
      - Overweight: 25-30 kg/m^2
      - Obese: >30 kg/m^2
  - Waist circumference
    - Quintiles
    - Categories[1]
      - Small [< 79 cm (men)/ <68 cm (women)]
      - Normal [79-94 cm (men)/ 68-80 cm (women)]
      - Action level 1 [94-102 cm (men)/ 80-88 cm (women)]
      - Action level 2 [≥102 cm (men)/ ≥88 cm (women)]
- Analysis stratified by smoking status (current/ former/ non-smokers)

[1] Lean et al. Waist circumference as a measure for indicating need for weight management. Br Med J 1995; 311:158-161.

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Statistical analysis

- Logistic regression predicting all-cause mortality for quintiles and standard classifications for BMI and waist circumference

Table 1: Descriptive statistics

	Total	Current smokers (n=441)	Former smokers (n=599)	Non-smokers (n=2820)
Age (Mean ± SD)	72.7 ± 8.1	71.2 ± 7.3	73.5 ± 7.9	72.8 ± 8.2
Gender				
Men	45.5	85.0	90.8	29.7
Women	54.5	15.0	9.2	70.3
Deaths	5.4	5.9	7.5	4.8
BMI (kg/m^2) (Mean ± SD)	24.3 ± 4.6	22.9 ± 4.8	24.3 ± 4.5	24.5 ± 4.6
Quintile 1 (<20.7)	20.0	32.8	18.1	18.3
Quintile 2 (20.7-22.95)	20.0	21.6	20.1	19.7
Quintile 3 (22.95 – 25)	20.0	17.4	23.1	19.8
Quintile 4 (25-27.43)	20.0	17.4	20.1	20.4
Quintile 5 (>27.4)	20.0	10.9	18.6	21.8
BMI categories (International)				
Underweight	7.6	13.7	6.1	7.0
Normal	52.4	58.1	55.2	50.9
Overweight	31.8	23.6	33.0	32.9
Obese	8.2	4.7	5.7	9.3

Table 1: Descriptive statistics

	Total	Current smokers (n=441)	Former smokers (n=599)	Non-smokers (n=2820)
Waist circumference (cm) **(Mean ± SD)**	88.0 ± 11.2	85.6 ± 9.8	89.7 ± 10.4	88.0 ± 11.5
Quintile 1 (<79)	19.3	23.2	13.1	20.0
Quintile 2 (79-85)	20.1	25.1	19.6	19.4
Quintile 3 (85-90.2)	20.7	21.7	22.9	20.1
Quintile 4 (90.4-97)	20.6	17.7	22.5	20.6
Quintile 5 (>97.1)	19.4	12.3	22.0	20.0
Waist circumference categories				
Small [< 79 (men)/ <68 (women)]	16.4	26.1	18.7	14.3
Normal [79-94 (men)/ 68-80 (women)]	33.8	47.9	45.7	29.0
Action level 1 [94-102 (men)/ 80-88 (women)]	21.7	17.7	22.5	22.2
Action level 2 [≥102 (men)/ ≥88 (women)]	28.2	8.4	13.0	34.5

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Table 2a: Age and gender adjusted odds ratios for all-cause mortality for quintiles of BMI and waist circumference

Measurement	Quintile 1	Quintile 3	Quintile 4	Quintile 5
Current smoker				
BMI	0.7 (0.2 – 2.2)	0.4 (0.1 – 1.7)	0.7 (0.2 – 2.8)	0.8 (0.2 – 3.4)
Waist circumference	1.02 (0.3 – 3.9)	1.4 (0.4 – 4.9)	1.0 (0.2 – 4.3)	1.4 (0.3 – 5.9)
Former smoker				
BMI	3.2 (1.0 – 10.7)	3.0 (0.9 – 10.0)	0.3 (0.03 – 2.8)	2.1 (0.6 – 7.6)
Waist circumference	2.6 (0.9 – 7.3)	1.4 (0.5 – 3.9)	0.5 (0.1 – 1.9)	1.0 (0.3 – 3.1)
Never smoker				
BMI	1.7 (0.9 – 3.2)	1.1 (0.5 – 2.2)	0.8 (0.4 – 1.8)	0.8 (0.4 – 1.7)
Waist circumference	**2.7 (1.4 – 5.2)**	1.8 (0.9 – 3.6)	1.2 (0.5 – 2.5)	1.3 (0.6 – 2.8)

Ref: Quintile 2

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Table 2b: Age and gender adjusted odds ratios for all-cause mortality for standard BMI and waist circumference classifications

Measurement	Underweight (BMI)/ small (waist circumference)	Overweight (BMI)/ action level 1 (waist circumference)	Obese(BMI)/ action level 2 (waist circumference)
Current smoker			
BMI categories	1.5 (0.5 – 4.6)	1.0 (0.3- 3.0)	2.1 (0.4 – 10.6)
Waist circumference categories	0.6 (0.2 – 1.8)	1.8 (0.7 – 5.1)	0.4 (0.1 – 3.8)
Former smoker			
BMI categories	1.4 (0.4 – 4.7)	0.4 (0.2 – 1.2)	1.0 (0.2 – 4.8)
Waist circumference categories	**2.9 (1.5 – 5.9)**	0.3 (0.1 – 1.2)	1.2 (0.4 – 3.6)
Never smoker			
BMI categories	1.4 (0.7 – 2.8)	0.6 (0.4 – 1.1)	0.8 (0.3 – 1.9)
Waist circumference categories	**1.6 (1.02 – 2.5)**	0.6 (0.4 – 1.1)	**0.4 (0.2 – 0.7)**

Ref: Normal BMI/waist circumference

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Conclusion

- No relationship between BMI and mortality
- Among non-smokers
  - Higher odds of mortality in those with smaller waist circumference
  - Lower odds of mortality among elderly in highest waist circumference classification
- Data collection for wave 2 of the survey ongoing and final results expected by May 2012

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Thank you

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