How to Write a Manuscript*

*And get it published

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Objectives

• To provide an overall framework of the structure of a manuscript.
• To provide a section-by-section guide to a manuscript presenting research findings.
• To provide strategies for efficiently writing a manuscript.
Overall Structure

- Introduction: Why the study was done.
- Methods: How the study was done.
- Results: What did the study find.
- Discussion: What do the results mean.
EXAMPLE OF A PAPER
Body-Mass Index and Mortality in Korean Men and Women

Sun Ha Jee, Ph.D., Jae Woong Sull, Ph.D., Jungyong Park, Ph.D., Sang-Yi Lee, M.D., Heechoul Ohrr, M.D., Eliseo Guallar, M.D., Dr.P.H., and Jonathan M. Samet, M.D.

ABSTRACT

BACKGROUND

Obesity is associated with diverse health risks, but the role of body weight as a risk factor for death remains controversial.

METHODS

We examined the association between body weight and the risk of death in a 12-year prospective cohort study of 1,213,829 Koreans between the ages of 30 and 95 years. We examined 82,372 deaths from any cause and 48,731 deaths from specific diseases (including 29,123 from cancer, 16,426 from atherosclerotic cardiovascular disease, and 362 from respiratory disease) in relation to the body-mass index (BMI) (the weight in kilograms divided by the square of the height in meters).

RESULTS

In both sexes, the average baseline BMI was 23.2, and the rate of death from any cause had a J-shaped association with the BMI, regardless of cigarette-smoking history. The risk of death from any cause was lowest among patients with a BMI of 23.0 to 24.9. In all groups, the risk of death from respiratory causes was higher among subjects with a lower BMI, and the risk of death from atherosclerotic cardiovascular disease or cancer was higher among subjects with a higher BMI. The relative risk of death associated with BMI declined with increasing age.

CONCLUSIONS

Underweight, overweight, and obese men and women had higher rates of death than men and women of normal weight. The association of BMI with death varied according to the cause of death and was modified by age, sex, and smoking history.
Introduction: The two paragraph model

• Paragraph 1:
  – A description of the problem to be addressed
  – A characterization of the state of evidence on the problem and gaps to be addressed

• Paragraph 2:
  – A description of the study question
  – A brief characterization of the study and the evidence generated by the study
Introduction: Para 1

• First paragraph

“In spite of decades of research, ____ remains a challenging problem for clinicians and patients.” or

“Worldwide, __ remains a substantial clinical and public health problem with over __ affected and __ deaths annually.”
Introduction: Para 2

• Second paragraph
  “To address this gap in understanding of __, we carried out___”
  “Using patients from ____ , we carried out a follow-up study___”
  “To better understand underlying mechanisms, we developed an animal model using XXXY knockout mice…”
Although obesity is widely accepted as an important health risk, the optimal body-mass index (BMI) (the weight in kilograms divided by the square of the height in meters) and the effects of being either underweight or overweight on the risk of death are controversial. In the Cancer Prevention Study (CPS) II,1 sponsored by the American Cancer Society, the rate of death was lowest among men with a BMI of 23.5 to 24.9 and among women with a BMI of 22.0 to 23.4; above and below these levels, the risk of death increased. However, being overweight was not associated with an increased risk of death in the National Health and Nutrition Examination Survey (NHANES) I, II, or III.2 The results of other studies have been mixed3,4 and may reflect differences in age, the number or extent of coexisting illnesses, and BMI distributions among subjects, as well as in analytic approaches.3,5

Statement of Problem

= Obesity + Mortality
Introduction

Since studies of the association between BMI and death have been conducted primarily in Western populations, it is uncertain whether the findings of these studies can be applied to other groups. Continental Asian populations have a higher percentage of body fat for a given BMI than do whites,\textsuperscript{6} and a World Health Organization (WHO) Expert Consultation proposed a new BMI cutoff of 23.0 for public health action in Asia.\textsuperscript{7} The use of this cutoff, however, was not directly supported by data on mortality.\textsuperscript{8,9} Indeed, deaths from any cause were lowest among men with a BMI of 24.0 to 24.9 and women with a BMI of 25.0 to 26.9 in a representative group of Chinese subjects.\textsuperscript{10,11}
Introduction

We conducted a prospective cohort study of BMI and the risk of death from any cause and from specific diseases in more than 1 million Koreans in the Korean Cancer Prevention Study (KCPS).\textsuperscript{12,13}
Exercise

• You have carried out a study on metabolic characteristics of Hispanic persons with diabetes at LAC-USC.

Write the first sentence of the paper
Methods: Translational Study

• Overall description of the study design
• Description of population criteria and ascertainment
• Description of data items and methods of data collection, including QA/QC
• Analytical strategy, covering analytical variables and methods
• Statistical software used
Methods: Laboratory Study

• Approach used: adequate description of the experimental system.
• Assays used: description and/or sufficient references.
• Data QA/QC
• Statistical analyses
Methods NEJM Paper

• Study Population
• Data Collection
• Follow-up and Outcome Classification
• Statistical Analysis
Methods

STATISTICAL ANALYSIS
Proportional-hazards models were used to evaluate the association between the baseline BMI and death. The BMI was categorized as less than 18.5, 18.5 to 19.9, 20.0 to 21.4, 21.5 to 22.9, 23.0 to 24.9, 25.0 to 26.4, 26.5 to 27.9, 28.0 to 29.9, 30 to 31.9, or 32.0 or more. Analyses were performed separately in men and women and were adjusted for the following covariates: age at enrollment (continuous variable), alcohol intake (five categories based on grams consumed per day: 0, 1 to 24 g, 25 to 49 g, 50 to 99 g, and 100 g or more), and participation in regular physical activity (yes or no). Because the proportion of women who reported having smoked cigarettes was small, analyses in women were restricted to those who reported never having smoked. Analyses of men who reported having smoked were adjusted for smoking status (never smoked, former smoker, or current smoker) and the number of cigarettes smoked daily among current smokers (1 to 9, 10 to 19, and 20 or more).
Methods

Modification of the effect of BMI was assessed by the inclusion of interaction terms of BMI category indicators with indicator variables for sex, age (three categories), and smoking history (two categories, one consisting of current and former smokers and one of lifetime nonsmokers). All analyses were conducted with the use of SAS software, version 9 (SAS Institute).
Results

• Description of population (Table 1)
• Initial analyses: Univariate or stratified analyses
• Main modeling results
• Analyses directed at subsets/modification
• Sensitivity analyses
The average BMI was 25.0, and the majority of subjects had a BMI below 25.0. The BMI was below 18.5 in 2.2 percent of men and 4.7 percent of women; above 25.0 in 23.8 percent and 26.8 percent, respectively; and above 30.0 in 0.8 percent and 2.4 percent, respectively.
INSTRUCTIONS FOR

TABLE CREATION

Creating a Table
Use the table editor of the word processing software to build a table. Do not embed tables as images in the manuscript file or upload tables in image formats. Regardless of which program is used, each piece of data needs to be contained in its own cell in the table. Tables should be single-spaced.

Avoid creating tables using spaces or tabs. For accepted manuscripts, tables created with spaces, tabs, and/or hard returns must be retyped during the editing process, creating delays and opportunities for error. Do not try to align cells with hard returns or extra spaces. Similarly, no cell should contain a hard return or tab. Although individual empty cells are acceptable in a table, be sure there are no empty columns.

Place each row of data in a separate row of cells:

Table 1. Title

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>500</td>
<td>510</td>
</tr>
<tr>
<td>Surgical</td>
<td>500</td>
<td>490</td>
</tr>
</tbody>
</table>
INSTRUCTIONS FOR TABLE CREATION

Note that numbers and percentages are presented in the same cell, and measures of variability are in the same cell as their corresponding statistic:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group A (n = 50)</th>
<th>Group B (n = 50)</th>
<th>Relative Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women, No. (%)</td>
<td>25 (50)</td>
<td>20 (40)</td>
<td>1.25 (1.11-1.57)</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>35 (8)</td>
<td>37 (7)</td>
<td>0.98 (0.92-1.05)</td>
</tr>
</tbody>
</table>
INSTRUCTIONS FOR TABLE CREATION

To present data that span more than 1 row, do not merge the cells vertically. Instead, put the data in a cell near the middle of the rows. In Table 3, the final column lists the $P$ value for the overall age comparison:

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Blood Pressure, mm Hg</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-34</td>
<td>120/75</td>
<td></td>
</tr>
<tr>
<td>35-50</td>
<td>110/80</td>
<td>.08</td>
</tr>
<tr>
<td>51-80</td>
<td>125/82</td>
<td></td>
</tr>
</tbody>
</table>

The table should be constructed such that comparisons between groups read horizontally (see Tables 1 and 2). Do not draw lines or rules—the table grid feature will display the outlines of each cell.
INSTRUCTIONS FOR
TABLE CREATION

Data Presentation
When presenting percentages, include numbers (numerator, and
denominator if necessary). Include variability where applicable (eg,
mean [SD] or median [interquartile range]).

All P values should be reported as exact numbers to 2 digits past
the decimal point, regardless of significance, unless they are lower
than .01, in which case they should be presented to 3 digits. Ex-
press any P values lower than .001 as P<.001. P values can never
equal 0 or 1.

Footnotes
Be sure to explain empty cells. Also, if necessary add a footnote to
explain why numbers may not sum to group totals or percentages
do not total 100. List abbreviations for the table in a footnote and
use superscript letters to mark each footnote (a,b,c, etc).
General Problems with Tables

- Poorly labeled: title should make purpose clear
- Mixing types of data
- Putting Ns into all cells (only need for column)
- Providing p values rather than using symbols
- Not providing units
## Results: Table 1

**Table 1. Baseline Characteristics of the Study Population.**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men (N=770,556)</th>
<th>Women (N=443,273)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age — yr</td>
<td>45.0±11.1</td>
<td>49.4±12.1</td>
</tr>
<tr>
<td>BMI</td>
<td>23.2±2.6</td>
<td>23.2±3.1</td>
</tr>
<tr>
<td>Systolic blood pressure — mm Hg</td>
<td>124.5±16.0</td>
<td>121.5±19.1</td>
</tr>
<tr>
<td>Fasting serum glucose — mg/dl</td>
<td>92.1±23.1</td>
<td>89.9±22.4</td>
</tr>
<tr>
<td>Total serum cholesterol — mg/dl</td>
<td>191.1±37.7</td>
<td>194.4±39.3</td>
</tr>
<tr>
<td>Aspartate aminotransferase — U/liter</td>
<td>26.3±16.6</td>
<td>22.4±10.0</td>
</tr>
<tr>
<td>Alcoholic drinks — g per day</td>
<td>17.2±32.2</td>
<td>0.2±1.9</td>
</tr>
<tr>
<td>Smoking status — %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoked</td>
<td>20.8</td>
<td>93.8</td>
</tr>
<tr>
<td>Former smoker</td>
<td>20.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Current smoker</td>
<td>59.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Any alcohol use — %</td>
<td>76.8</td>
<td>14.3</td>
</tr>
<tr>
<td>Physical activity — %</td>
<td>28.6</td>
<td>16.6</td>
</tr>
</tbody>
</table>

*Data are from the KCPS, 1992–1995.\textsuperscript{12,13} Plus–minus values are means ±SD. Percentages may not total 100 because of rounding. To convert the values for cholesterol to millimoles per liter, multiply by 0.02586. To convert the values for glucose to millimoles per liter, multiply by 0.05551.*
Results

Systolic blood pressure, total serum cholesterol, fasting serum glucose level, and white-cell count had strong, progressive associations with increasing BMIs (Table 2).

During follow-up, 58,312 men died (including 22,249 from cancer, 10,486 from atherosclerotic cardiovascular causes, and 2442 from respiratory causes) and 24,060 women died (including 6874 from cancer, 5940 from atherosclerotic cardiovascular causes, and 920 from respiratory causes). The shape of the curve showing the association between BMI and the risk of death from any cause was similar in men, regardless of their smoking history, and in women who reported never having smoked (Fig. 1A). The hazard ratio was higher at the lowest and highest BMI values.
## Results: Possible Confounding

### Table 2. Differences in Baseline Systolic Blood Pressure and Clinical Chemical Analyses, According to BMI. *

<table>
<thead>
<tr>
<th>BMI</th>
<th>Systolic Blood Pressure</th>
<th>Total Cholesterol</th>
<th>Fasting Serum Glucose</th>
<th>White-Cell Count</th>
<th>Systolic Blood Pressure</th>
<th>Total Cholesterol</th>
<th>Fasting Serum Glucose</th>
<th>White-Cell Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm Hg</td>
<td>mg/dl</td>
<td>cells/mm³</td>
<td></td>
<td>mm Hg</td>
<td>mg/dl</td>
<td>cells/mm³</td>
<td></td>
</tr>
<tr>
<td>&lt;18.5</td>
<td>-8.1</td>
<td>-19.9</td>
<td>-4.0</td>
<td>-94</td>
<td>-6.2</td>
<td>-14.3</td>
<td>-3.2</td>
<td>-360</td>
</tr>
<tr>
<td>18.5–19.9</td>
<td>-5.9</td>
<td>-15.8</td>
<td>-3.3</td>
<td>-143</td>
<td>-4.8</td>
<td>-10.9</td>
<td>-2.7</td>
<td>-350</td>
</tr>
<tr>
<td>20.0–21.4</td>
<td>-4.0</td>
<td>-11.4</td>
<td>-2.4</td>
<td>-97</td>
<td>-3.8</td>
<td>-8.0</td>
<td>-2.2</td>
<td>-266</td>
</tr>
<tr>
<td>21.5–22.9</td>
<td>-2.2</td>
<td>-5.9</td>
<td>-1.2</td>
<td>-56</td>
<td>-2.2</td>
<td>-4.4</td>
<td>-1.3</td>
<td>-138</td>
</tr>
<tr>
<td>23.0–24.9†</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25.0–26.4</td>
<td>2.0</td>
<td>4.5</td>
<td>1.0</td>
<td>56</td>
<td>2.6</td>
<td>3.7</td>
<td>1.2</td>
<td>137</td>
</tr>
<tr>
<td>26.5–27.9</td>
<td>3.9</td>
<td>7.1</td>
<td>2.0</td>
<td>120</td>
<td>4.7</td>
<td>6.2</td>
<td>2.2</td>
<td>215</td>
</tr>
<tr>
<td>28.0–29.9</td>
<td>6.2</td>
<td>9.3</td>
<td>3.2</td>
<td>129</td>
<td>6.9</td>
<td>7.3</td>
<td>3.3</td>
<td>320</td>
</tr>
<tr>
<td>30.0–31.9</td>
<td>8.2</td>
<td>11.2</td>
<td>4.9</td>
<td>151</td>
<td>9.9</td>
<td>9.7</td>
<td>4.7</td>
<td>440</td>
</tr>
<tr>
<td>≥32.0</td>
<td>11.5</td>
<td>13.3</td>
<td>7.8</td>
<td>99</td>
<td>12.4</td>
<td>10.3</td>
<td>6.4</td>
<td>649</td>
</tr>
</tbody>
</table>

* Data are from the KCPS, 1992–1995. 12,13 The reference category was a BMI of 23.0 to 24.9. All differences were adjusted for age (continuous). To convert the values for cholesterol to millimoles per liter, multiply by 0.02586. To convert the values for glucose to millimoles per liter, multiply by 0.05551.

† This group served as the reference group.
Figure 1. Hazard Ratios for Death from Any Cause and from Any Cause Except Respiratory, According to BMI and Smoking History. Data are from the KCPS, 1993–2004. The reference category was a BMI of 23.0 to 24.9. Results for men who reported having smoked cigarettes were further adjusted for whether the subject was a former smoker or a current smoker and the number of cigarettes smoked per day (1 to 9, 10 to 19, and 20 or more). All hazard ratios were adjusted for age.
Results: Stratified

Men with a BMI of 23.0 to 24.9 who reported never having smoked had the lowest risk of death from any cause (Table 1 of the Supplementary Appendix, available with the full text of this article at www.nejm.org). As compared with men with a BMI of 23.0 to 24.9, men who reported never having smoked had a hazard ratio for death from any cause of 1.29 (95 percent confidence interval, 1.15 to 1.44) in association with a BMI of less than 18.5, a hazard ratio of 1.04 (95 percent confidence interval, 0.98 to 1.10) in association with a BMI of 25.0 to 29.9, and a hazard ratio of 1.71 (95 percent confidence interval, 1.44 to 2.03) in association with a BMI of 30.0 or more. As compared with men with a BMI of 23.0 to 24.9, men who reported having smoked had a hazard ratio for death from any cause of 1.36 (95 percent confidence interval, 1.30 to 1.42) in association with a BMI of less than 18.5, a hazard ratio of 0.98 (95 percent confidence interval, 0.95 to 1.01) in association with a BMI of 25.0 to 29.9, and a hazard ratio of 1.31 (95 percent confidence interval, 1.18 to 1.45) in association with a BMI of 30.0 or more.
Results: Sex Stratified

Among women (with the analysis restricted to those who reported never having smoked), the risk of death from any cause was lowest for those with a BMI of 23.0 to 24.9 and similar for those with a BMI of 20.0 to 26.4 (Fig. 1A, and Table 2 of the Supplementary Appendix). As compared with women with a BMI of 23.0 to 24.9, women with a BMI of less than 18.5 had a hazard ratio for death from any cause of 1.17 (95 percent confidence interval, 1.09 to 1.26), women with a BMI of 25.0 to 29.9 had a hazard ratio of 1.04 (95 percent confidence interval, 1.00 to 1.08), and women with a BMI of 30.0 or more had a hazard ratio of 1.20 (95 percent confidence interval, 1.10 to 1.30).
Results: By Cause

The association between BMI and the risk of death according to the cause of death had a similar pattern of variation for both sexes (Fig. 2, and Tables 1 and 2 of the Supplementary Appendix). The risk of death from respiratory causes decreased progressively with increasing BMI, whereas the risk of death from atherosclerotic cardiovascular causes increased steadily with increasing BMI. The risk of death from cancer increased at a BMI above 26.0 to 28.0. Deaths from respiratory causes explained some of the increase in the risk of death at a low BMI (Fig. 1B). For deaths associated with lung disease, the association between BMI and the risk of death was similar for the major categories of pulmonary illnesses, including tuberculosis, chronic obstructive pulmonary disease (COPD), asthma, and pneumonia; the association persisted after the exclusion of the first five years of follow-up. With this exclusion, the hazard ratio for death from respiratory causes that was associated with a decrease in BMI of 1.0 was 1.26 (95 percent confidence interval, 1.20 to 1.31) among men who reported never having smoked, 1.25 (95 percent confidence interval, 1.22 to 1.27) among men who reported having smoked, and 1.08 (95 percent confidence interval, 1.05 to 1.12) among women.

By Cause of Death
Results: By Cause

Figure 2. Hazard Ratios for Death from Cancer and from Atherosclerotic Cardiovascular and Respiratory Causes, According to BMI and Smoking History.

Data are from the KCPS, 1993–2004. The reference category was a BMI of 22.0 to 24.9. Results for men who reported having smoked cigarettes were further adjusted for whether the subject was a former smoker or a current smoker and the number of cigarettes smoked per day (1 to 9, 10 to 19, and 20 or more). The number of deaths from respiratory causes among subjects with a BMI of 30.0 or more was too small to yield a reliable estimate of relative risks. All hazard ratios were adjusted for age. Panels A, B, and C have different scales for hazard ratios in the vertical axes.
Results

The relative increase in the risk of death from any cause that was associated with a high BMI was dependent on age (Fig. 3). For both sexes, the highest relative risks associated with a high BMI were observed among subjects younger than 50 years of age. An increase in BMI to more than 25.0 was not associated with an increased risk of death from any cause among men or women who were 65 years or older at baseline. The interaction between BMI and age was significant (P<0.001), as were interactions between BMI and sex and BMI and smoking history (P<0.001 for both).
Results: By Sex

Figure 3. Hazard Ratios for Death from Any Cause among Men and Women with No History of Smoking, According to Age Group and BMI. Data are from the KCPS, 1993–2004. The reference category was a BMI of 23.0 to 24.9. All hazard ratios were adjusted for age. Panel A and Panel B have different scales for hazard ratios.
Results

We explored whether the association between BMI and the risk of death from atherosclerotic cardiovascular disease could be explained by systolic blood pressure or levels of blood glucose or cholesterol. As expected, adjustment for these factors attenuated this association (Table 3). Analyses of death from any cause, from cancer, and from respiratory causes adjusted for risk factors are shown in Tables 3, 4, and 5, respectively, of the Supplementary Appendix.
# Results: Addressing Confounding

## Table 3. Hazard Ratios for Death from Atherosclerotic Cardiovascular Causes, According to BMI.*

<table>
<thead>
<tr>
<th>BMI</th>
<th>Men</th>
<th>Women</th>
<th>Adjusted for Age</th>
<th>Adjusted for Covariates†</th>
<th>Adjusted for Covariates and Intermediate Variables‡</th>
<th>Adjusted for Age</th>
<th>Adjusted for Covariates†</th>
<th>Adjusted for Covariates and Intermediate Variables‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>0.85 (0.76–0.94)</td>
<td>0.78 (0.70–0.86)</td>
<td>1.07 (0.96–1.19)</td>
<td>0.86 (0.76–0.98)</td>
<td>0.80 (0.70–0.91)</td>
<td>0.97 (0.85–1.11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.5–19.9</td>
<td>0.90 (0.83–0.97)</td>
<td>0.85 (0.79–0.92)</td>
<td>1.08 (0.99–1.17)</td>
<td>0.90 (0.81–1.00)</td>
<td>0.86 (0.77–0.96)</td>
<td>1.00 (0.90–1.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0–21.4</td>
<td>0.97 (0.91–1.03)</td>
<td>0.93 (0.87–0.99)</td>
<td>1.07 (1.00–1.14)</td>
<td>0.96 (0.88–1.05)</td>
<td>0.93 (0.85–1.02)</td>
<td>1.02 (0.93–1.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.5–22.9</td>
<td>0.95 (0.90–1.01)</td>
<td>0.93 (0.88–0.99)</td>
<td>1.02 (0.96–1.09)</td>
<td>0.94 (0.86–1.02)</td>
<td>0.93 (0.86–1.02)</td>
<td>0.98 (0.90–1.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.0–24.9‡</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0–26.4</td>
<td>1.04 (0.97–1.11)</td>
<td>1.04 (0.97–1.12)</td>
<td>0.98 (0.91–1.05)</td>
<td>1.03 (0.94–1.13)</td>
<td>1.03 (0.94–1.13)</td>
<td>0.97 (0.88–1.06)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.5–27.9</td>
<td>1.13 (1.04–1.24)</td>
<td>1.15 (1.05–1.26)</td>
<td>1.02 (0.94–1.12)</td>
<td>1.02 (0.91–1.13)</td>
<td>1.02 (0.91–1.14)</td>
<td>0.91 (0.81–1.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.0–29.9</td>
<td>1.32 (1.18–1.49)</td>
<td>1.36 (1.20–1.52)</td>
<td>1.09 (0.97–1.23)</td>
<td>1.13 (1.01–1.28)</td>
<td>1.15 (1.02–1.30)</td>
<td>0.99 (0.88–1.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0–31.9</td>
<td>1.58 (1.29–1.95)</td>
<td>1.58 (1.28–1.95)</td>
<td>1.21 (0.98–1.50)</td>
<td>1.31 (1.09–1.57)</td>
<td>1.33 (1.11–1.59)</td>
<td>1.08 (0.90–1.30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥32.0</td>
<td>2.75 (1.98–3.82)</td>
<td>2.86 (2.05–3.97)</td>
<td>1.94 (1.39–2.71)</td>
<td>1.32 (1.01–1.62)</td>
<td>1.30 (1.02–1.65)</td>
<td>1.04 (0.82–1.32)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Data are from the KCPBS, 1993–2004.  
† Covariates are age (continuous); cigarette smoking, including status (never smoked, former smoker, or current smoker) for both sexes and the number of cigarettes smoked per day (1 to 9, 10 to 19, or ≥20) for men, alcohol intake (0, 1 to 24, 25 to 49, 50 to 99, or at least 100 g per day for men and 0 g per day or any intake for women), and level of participation in physical exercise.  
‡ Intermediate variables are fasting blood glucose levels, systolic blood pressure, and serum cholesterol levels (all continuous).  
‡ This group served as the reference group.
Discussion Topics

• Summary of findings (always first)

• Implications of findings—next steps (always last)
Our study confirms the findings of previous studies demonstrating that the relationship between death from any cause and BMI follows a J-shaped pattern. This curve reflects the association between BMI and the risk of death from all the major diseases. Among subjects with a low BMI, the increased risk was driven by respiratory and other causes, whereas among those with a high BMI, it was associated with cancer and cardiovascular diseases. Similar patterns were observed in smokers and those who reported never having smoked, implying that confounding by a history of smoking cannot explain the J-shaped relationship. This J-shaped risk relationship has been documented in several of the largest, but not all, cohorts. The patterns in the Korean, Chinese, and Western cohorts appear to be similar, suggesting that the risk of death associated with obesity among Asians is not apparent at lower BMI values, as compared with that among Western populations.
Discussion: Comparison

Because of the weight distribution of the subjects, the KCPS probably contains substantially more information about people with lower BMI values than do studies with Western cohorts. At a BMI of less than 18.5, hazard ratios for death were significantly increased, with the excess due, in part, to respiratory causes. In the Nurses’ Health Study, Hu et al.\textsuperscript{5} showed that an increased risk in the leanest group was primarily due to an increase in COPD and cirrhosis. Other studies have also noted a substantially increased risk of death among subjects with a low BMI,\textsuperscript{1,2} although they did not provide information about the cause of death. He et al.\textsuperscript{10} identified an increased risk of death among underweight Chinese subjects, which persisted after the exclusion of subjects with baseline cardiovascular disease, cancer, renal disease, or COPD, and an increased risk of death during the first three years of follow-up. In the CPS II study, Calle et al.\textsuperscript{1} showed a greater increase in the risk of death associated with being underweight among those with a history of disease at enrollment than among those without such a history; relative risks in CPS II were similar to estimates in the KCPS for BMI values of less than 18.5. In NHANES,\textsuperscript{2} relative risks were higher overall (values were as high as 3.0 across the age and smoking strata), but analyses included subjects with coexisting illnesses and included deaths during the entire follow-up period.

Comparison to Other Studies
Discussion: Variation in Findings

To reduce the potential for attributing an excess risk of being underweight to weight loss associated with illness, we excluded from all analyses subjects reporting diagnoses of certain chronic diseases at enrollment, as well as during the first two years of follow-up, and we conducted sensitivity analyses that excluded the first five years of follow-up. Although this analytic strategy may be effective if the illness causing rapid weight loss leads to death, reverse causation may influence risk estimates if the disease course is lengthy and accompanied by weight loss.\textsuperscript{19} COPD has these characteristics, and subjects with more severe disease had greater weight loss over time.\textsuperscript{20} In several studies, after adjusting for lung function, the BMI remained a significant predictor of death.\textsuperscript{21,22} Thus, for COPD, the relationship between BMI and the risk of death may represent both reverse causation and a true causal role for body weight in determining prognosis. For tuberculosis, wasting at the time of diagnosis is a feature of the disease, and body weight predicts the short-term risk of death.\textsuperscript{23-25} The exclusion of the first two years of follow-up should address any acute contribution of active tuberculosis to body weight.
Discussion: Generalizability

Since the distribution of respiratory causes of death may differ between Koreans and inhabitants of Western countries, it may not be possible to generalize our findings to other populations. Deaths from respiratory causes were due to tuberculosis in 19.3 percent of subjects, to pneumonia in 27.9 percent, to COPD in 27.8 percent, and to asthma in 24.7 percent.
Discussion: CVD

For deaths from atherosclerotic cardiovascular disease, the hazard ratio increased steadily with increasing BMI, similar to the findings in a smaller cohort study of insured Koreans. Information on selected cardiovascular risk factors showed an increasingly unfavorable profile with increasing BMI, but these risk factors alone did not explain the excess risk of death from atherosclerotic cardiovascular causes associated with obesity. Although misclassification of cardiovascular risk factors, particularly those that vary during follow-up, could partially explain the persistent risk, the metabolic syndrome, sleep-disordered breathing, and other consequences of increased BMI are also likely to contribute to the risk associated with cardiovascular disease. The association of BMI with the risk of death from atherosclerotic cardiovascular causes was substantial, as has been shown in many other studies. A few large cohorts provided reasonably precise estimates of the risk of death from cardiovascular causes according to BMI. Similar, progressive increases in risk associated with BMI were seen in some studies, including the Nurses’ Health Study, non-smokers in the Physicians’ Health Study, and the CPS I, but not in others, including CPS II, a U.K. cohort of particularly lean people, men with cardiovascular disease in the Physicians’ Health Study, and a representative sample of Chinese men and women.
Discussion: Cancer

The risk of death from cancer increased slightly among overweight men and women and more substantially among subjects with a BMI above 30.0 at enrollment; we observed no excess risk among subjects who had a low BMI at enrollment. In a meta-analysis by McGee,27 pooled estimates of the risk of death from cancer that compared obese subjects with those of normal weight were much smaller — 1.10 for women and 1.06 for men — than in our study. The Nurses’ Health Study reported risks similar to those in our study, but risks in similar BMI strata were lower in CPS I and II.1,31 Distributions of deaths according to the type of the primary tumor differ between Korean and U.S. populations.32 Nonetheless, our findings indicate that obesity does contribute to Korea’s cancer burden.

Jee et al. NEJM 2006;355(8):779-87
As has been reported in other populations, we found that the association between BMI and the risk of death varied according to age, with little evidence of increased risk among obese subjects over the age of 65 years. This effect modification has been the subject of controversy because BMI is less well correlated with adiposity in the elderly and because of the increased probability of undiagnosed diseases and survivor effects in this age group. Substantial interest exists, however, in conducting an estimation of the future burden of obesity as today’s obese children and young adults grow older. In other studies, investigators showed that an older age at enrollment (the variable used in our analysis) attenuated the risk associated with obesity. In fact, in CPS I, overweight and obesity were not associated with an increased risk of death among subjects older than 85 years. In a recent report by Flegal et al. of follow-up data from NHANES I, II, and III, subjects in the oldest age group (70 years or older) who had a BMI of more than 25 were not at increased risk for death. Our evidence provides support for this modification of effect by age, but this effect has not been observed in all populations.
Discussion

The association of BMI in the overweight and obese range with an increased risk of death from atherosclerotic cardiovascular causes and cancer suggests that control of excess adiposity may reduce the two most important causes of death among Koreans. The inverse association between BMI and the risk of death from respiratory causes partly explains the J-shaped relationship between BMI and the risk of death from any cause, but further research is warranted to examine the extent of reverse causation and to consider the role of other causes of an increased risk of death in association with a low BMI.
Discussion: Asians

In considering whether the findings of the KCPS can be applied to other populations, we recognize that Asian populations generally have a higher percentage of body fat than do Western populations at the same BMI level. In a meta-analysis of the predictive ability of BMI to estimate the percentage of body fat among various ethnic groups, Deurenberg et al. found that for the same percentage of body fat, BMI among subjects from various East Asian countries was lower by 1.9 to 3.2 than that of white subjects. Although contributing factors are not completely understood, Asians generally have a slighter body build than do whites, and slighter people tend to have less muscle mass and connective tissue.
Discussion

Consequently, the WHO recommends that cutoff values in the definition of overweight and obesity should be lower for Asian populations than for Western populations.\textsuperscript{7,38} Our observations may prove to be useful in the evaluation of this recommendation.

Recommendations
Last Paragraph

• Hard to write!
• Avoid starting with: “In summary…”
• Do not making too sweeping statements
• Comment on consequences of knowledge gained:
  – Guidelines implications
  – Further research
  – Other policy consequences
General Points 1

• Use the active voice at times (WE…)
• Avoid priority claims
• No lengthy literature reviews in the Introduction
• Do not repeat findings that are in tables and figures
• Watch that last paragraph
• Avoid temptation—of cutting and pasting!
General Points 2

• What general (to be continued) but should have the journal in mind when writing.
• What audience is relevant?
• “Just do it”
• Use input from collaborators but need one voice
EXERCISES