Sources of Variation in U.S. Mortality: A Latent Variable Analysis
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Introduction
Nonfatal risk factors exert a strong influence on health and mortality within the United States, accounting for about half of all deaths. Identifying the role of nonfatal risk factors in U.S. mortality patterns is challenging as mortality data do not provide information on the risk factors that gave rise to a particular disease. We explore the role of nonfatal risk factors, which reveal vital statistics data. Our base assumption is that each latent variable is a consequence of a manifestation of a small number of latent variables. Although these factors are not directly observable, we hypothesize that they are indirectly identifiable through the imprint they leave on patterns of mortality.

Data
Mortality data by underlying cause of death, sex, and US state were obtained from the National Center for Health Statistics and denominators for the corresponding years were obtained from the Census Bureau. Causes of death were classified using a scheme developed at the University of Washington. Cause-specific death rates for adults ages 20-64 were calculated on the combined 2000-2009 data by sex and age-standardized to the US 2000 census population. Within each sex, if a particular cause contributed fewer than 10,000 deaths over the interval 2000-2009 for males or 5,459 for females, the cause was dropped from the analysis.

Methods
We use factor analysis, a method for determining the structure embedded in a set of variables and describing that structure in terms of a set of factors which we consider as being representative of latent variables. Our methodological approach is based on the premise that individual causes of death are each partial and indirect representations of underlying risk factors. Factor analysis provides a means of determining the patterns among the entire set of causes of death. This method represents a powerful new tool for identifying the contribution of modifiable risk factors to mortality patterns in countries with vital statistics data.

Table 1. Eigenvalues, Diversity and Cumulative Properties of Causes Explained

Table 2. Factor Loadings, Males

Table 3. Factor Loadings, Females

Conclusion
This method represents a powerful new tool for identifying the contribution of modifiable risk factors to mortality patterns in countries with vital statistics data.

References
Penn Demography