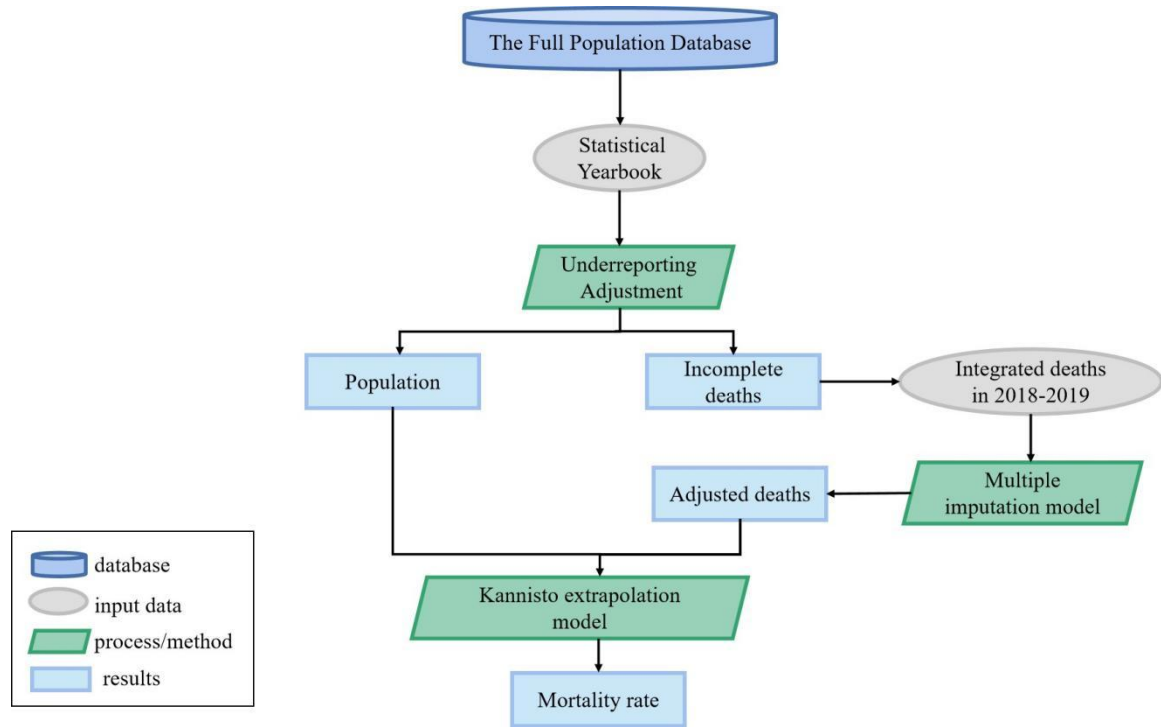**Supplementary Materials**

MI Imputation for Covariate Data of Death Population

We use the *mice()* package chain equation multivariate imputation in *R* software to implement MI of the covariate data of death population. In each simulated data set, the missing data will be filled with the Monte Carlo method, and the missing values will be done by Gibbs sampling, each variable containing missing values can be derived from the other variables in the dataset, and then applied to each simulated dataset using standard statistical methods in the *with()* function. These prediction equations can be used to predict the effective value of the missing data, the process iterates until all missing values converge. Among them, missing data in continuous variables (that means age) were replaced by the predicted mean, and missing data in categorical variables (such as gender, urban and rural areas) were replaced by binary logistic regression. Finally, by combining these corresponding results into a set of results through the *pool()* function, both the standard errors and *P*-values in the final model will accurately reflect the uncertainty due to missing values and MI.
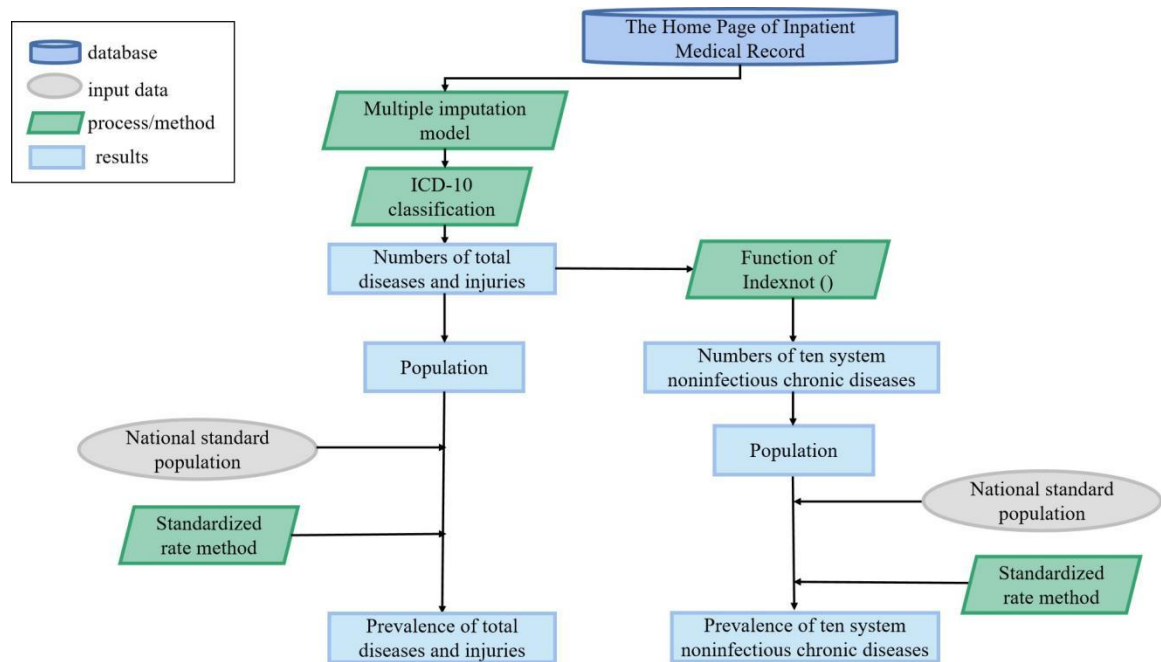
The Division of Administrative Regions in Shaanxi Province

According to the administrative division of Shaanxi Province of the People's Republic of China, Shaanxi Province is divided into 10 prefecture-level cities. According to the geographical environment and humanities and folklore, the prefecture-level cities are divided into three major regions. Yulin and Yan'an in northern Shaanxi are called Shanbei; Xi'an, Tongchuan, Baoji, Xianyang, and Weinan in the center of Shaanxi are called Guanzhong; and Hanzhong, Ankang, and Shangluo in southern Shaanxi are called Shanna. In 2014, the State Council approved the establishment of the Xi Xian New Area in Shaanxi Province, involving seven counties (districts) under the jurisdiction of Xi'an and Xianyang. The Yangling Agricultural Hi-tech Industries Demonstration Zone is referred to as the Yangling Demonstration Zone under the jurisdiction of the Yangling district of Xianyang, with prefecture-level administrative power. When we were studying LE, this study included the Yangling Demonstration
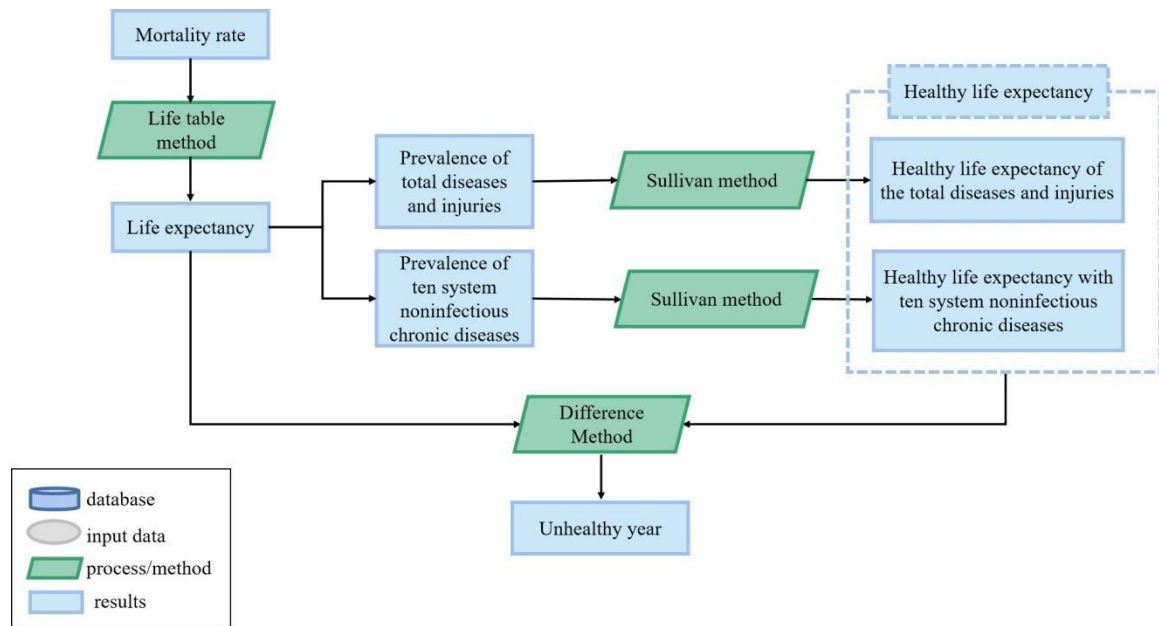
Zone and Xixian New District (both belong to Guanzhong), and they are counted as prefecture-level cities. However, since the calculation of HLE requires specific disease data, the original 10 prefecture-level cities were calculated.

Supplementary Figure 1: The process of the estimation of mortality rate.

Supplementary Figure 2: The process of the estimation of prevalence.

Supplementary Figure 3: The process of the estimation of LE, HLE, and unhealthy years. HLE: Healthy life expectancy; LE: Life expectancy.