



Mini Review

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The Use of Cross-Sectional and Longitudinal Weights in Korean Health Panel Survey

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Introduction

In household panel surveys, the same households and individuals are interviewed at multiple time points and then information is obtained from them. Panel studies have considerable analytical advantages over one-time surveys such as analysis of gross change, analysis of unit-level change, analysis of time related characteristics of events and identifying causality [1,2]. However, panel surveys often suffer from a high degree of panel attrition between waves, where panel attrition means the continued loss of respondents from the original sample due to mortality, migration between waves and survey non-response [2,3].

The Korean Health Panel Survey

The Korean Health Panel (KHP) survey is a household panel survey conducted by the Korean Institute for Health and Social Affairs. The KHP survey was designed to examine medical service use, out-of-pocket healthcare payments and uninsured medical services. The KHP survey has provided not only information on health care utilization and health care expenditure among household and individuals, but also various factors such as socio-

economic characteristics, chronic conditions, private health insurance, and health behaviours [4,5].

The original KHP sample was selected in 2008 via a stratified cluster design. Based on 2005 census data as a frame, the whole nation was stratified by 16 provinces and about 8,000 households were allocated in each province. In the first stage of selection, 389 census districts were selected by the probability proportional to cluster size sampling method and 10 households were selected randomly in the selected census districts in the next stage [6].

When it was introduced in the 2008 reference year, the survey was intended to provide longitudinal data as well as cross-sectional data, but over the years, the precision of cross-sectional estimates become lower and lower because of panel attrition. In order to compensate for the weakness, the top-up sample of 2,500 household was selected in 2013 from the 2010 census data using a similar design as the original sample design of 2008 and was added to the survey [7]. The KHP sample has evolved over time due to following rules, population and household changes, and sample attrition. Table 1 shows the evolution of sample households from 2008 to 2018 reference year (Table 1).

Table 1: The evolution of household and individual samples in KHP survey.

Year	Household	Individual	Year	Household	Individuals
2008	7,009	21,283	2014	6,862	19,219
2009	6,314	19,153	2015	6,607	18,130
2010	5,956	17,885	2016	6,437	17,424
2011	5,741	17,035	2017	6,408	17,184
2012	5,434	15,872	2018	6,379	17,008
2013	5,200				

Note: Source: Korea Health Panel site (www.khp.re.kr)



Cross Sectional and Longitudinal Weights

Many panel surveys provide two kinds of weights, cross-sectional weights and longitudinal weights to data users. Basic distinction between the two weights comes from the different populations to be represented. There are 2^t-1 possible combinations of populations that can be represented by a t-wave panel survey. Among them t are cross-sectional populations and (2^t-1-t) are longitudinal populations [2]. Annual cross-sectional target population changes every year due to birth, death and immigrants. For this reason, the cross-sectional sample for a given year is composed of all longitudinal persons and cohabitants living

with longitudinal persons on the corresponding reference year [8-10]. Survey weights are attached to the sample units and used to estimate population parameters. The cross-sectional weights are useful for Cross-sectional populations and the longitudinal weights are useful for longitudinal populations.

In KHP survey, both cross-sectional weights and longitudinal weights has been constructed and provided to data users from the first year of 2008. The following Table 2 shows the estimated individual's medical expenditures from cross-sectional and longitudinal respondents on the original panel each year, where cross-sectional weights and longitudinal weights are used to calculate the estimates respectively (Table 2).

Table 2: Estimated individual's medical expenditures in KHP survey (US \$).

Year	Cross-Sectional Sample of Individuals		longitudinal Sample of Individuals	
	Size	Mean	Size	Mean
2008	21,250	302.46	21,250	302.46
2009	19,127	321.79	18,852	322.89
2010	17,872	347.88	17,392	347.63
2011	17,028	382.53	16,413	385.65
2012	15,858	411.87	15,211	411.21
2013	14,838	430.25	14,062	437.02
2014	13,972	430.44	13,128	428.19
2015	13,257	443.53	12,533	444.67
2016	12,760	489.49	12,005	492.5
2017	12,655	505.54	11,603	501.49
2018	12,519	543.1	11,388	541.96

From the table we found four meaningful results. First, both the number of longitudinal and cross-sectional respondents is decreasing due to panel attrition, which is the same as the case of households. Second, cross-sectional sample size is greater than longitudinal sample size because of cohabitant in the sample households. For an example of 2018 year, the longitudinal sample size went down to 11,388 individuals, which is at most 90.9% of the cross-sectional sample. Third, the individual's medical expenditures are increasing in both samples, which can be explained by aging effect of panel members and economic growth effect. Finally, two estimated medical expenditures are similar and not significant in each year. It may be due to the shortage of cohabitant sample.

Summary

In this review, I addressed the Korean Health Panel survey, which is a household panel survey, started in 2008. The survey has provided some useful information on health care utilization and health care expenditure as well. Like other panel surveys, the KHP survey has suffered from panel attrition. To support the cross-sectional representativeness of the survey due to panel attrition, a top-up sample was added in 2014. Both cross-sectional weights and longitudinal weights has been constructed and used to estimate

the cross-sectional population parameter as well as longitudinal population parameter each year.

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