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■ Original Article

Influence of Offspring on Self-Rated Health among Older Adults: Evidence from the Korean Longitudinal Study of Aging (2006–2012)

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Background: We investigated whether offspring protect or jeopardize in parents.
Methods: We used data from the Korean Longitudinal Study of Aging and performed a longitudinal analysis of 10,236 individuals at baseline (2006) to estimate the association between offspring-related factors and self-rated health among individuals ≥45 years of age.
Results: The estimate for self-rated health was 0.612 times lower (95% confidence interval [CI], 0.503–0.746; P<0.0001) for those with zero offspring. The estimate for self-rated health was 0.736 (95% CI, 0.635–0.853; P<0.0001) for those with five offspring or more. The estimate for self-rated health was 0.707 (95% CI, 0.528–0.947; P=0.020) for males with zero offspring. The estimate for self-rated health was 0.563 (95% CI, 0.422–0.751; P<0.001) for females with no offspring and for females with five or more offspring. The estimate for self-rated health was 0.686 times lower (95% CI, 0.573–0.822; P<0.0001) for those with five or more offspring compared to females with two offspring.
Conclusion: Those with more offspring (≥5) and those with no offspring tended to have an increased probability of low self-rated health. Overall, our results suggest that offspring have a significant positive effect on self-rated health, which was evident graphically as an inverted U-shape.

Keywords: Loneliness; Adult Children; Parents; Self Report; Health Status; Life Style

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INTRODUCTION

Self-rated health (SRH) is a health measure used to rate participants' general health by asking them a simple question. This question has frequently been employed as a health indicator in sociological health research since the 1950s[1] and has been proposed as a general health assessment screening tool.[2]

According to several previous studies, SRH is considered a good indicator of future health and health care utilization.[3,4] Moreover, poor SRH has been shown to predict health outcomes such as mortality or objective health status.[2] SRH does not focus on a specific dimension of health, but rather provides a succinct means of summarizing the diverse components of an individual's health.[5]

SRH is an inclusive measure of health that yields information inaccessible by targeted health measurements and has increased its popularity in population-based and clinical studies.[2] Negative health ratings seem to represent pathogenetic biological processes that compromise health status and may herald future health adversity.[2]

Socioeconomic status may be an important determinant of health perception; higher perceived socioeconomic status is protective against a poor health perception and psychosomatic symptoms. This is in comparison to "objective" socioeconomic indicators, such as parental education or employment status.[6-8] Among health behaviors, dietary habits, exercise, smoking, and alcohol use are related to SRH.[9,10]

Arguments have been proposed both for and against a positive effect of offspring on health outcome.[11] Offspring provide social support and care within the family and social network. In addition, a greater number of offspring may prevent loneliness and provide parents with feelings of a meaningful life, which might positively affect mental health.[12] In contrast, because the role of parents is physically and mentally demanding, offspring can also be a source of strain when they are young. Therefore, parents can be particularly vulnerable to health problems such as mental disease.[13] As such, we determined whether offspring protect or jeopardize their parents' SRH.

METHODS

1. Sample

We used data from the 2006 Korean Longitudinal Study of Aging (KLoSA), which was performed by the Korean Labor Institute and funded by the Korean Ministry of Labor. The population of KLoSA participants included adults ≥45 years of age and resident in 15 large administrative areas. Although surveys of the elderly in other countries have studied adults ≥50 years of age, KLoSA extended its population group to include those aged 45–49 years to account for career changes during middle age. This has been an important social issue since the financial crisis in the late 1990s, which caused many people in the 45–49-year age group to become unemployed.

The present study used a sample from the first through fourth waves of data from the KLoSA, which was conducted by the Korean Labor Institute to collect basic data needed to devise and implement effective social and economic policies that address emerging trends related to population aging. KLoSA results are available on a national public database (website: http://survey.keis.or.kr) and the study was repeated every even-numbered year until 2012.

This study did not require an ethical review since the KLoSA dataset was publicly opened and information that could be used for individual identification was removed.

In the first baseline survey conducted in 2006, 10,254 individuals in 6,171 households (1.7 per household) were interviewed using a computer-assisted personal interviewing method. The second survey in 2008 followed up with 8,688 subjects, representing 86.6% of the original population. The third survey in 2010 followed up with 7,920 subjects who represented 80.3% of the original panel. The fourth survey in 2012 followed up with 7,486 subjects who represented 76.2% of the original panel.

Of these participants, we excluded 18, 9, 6, and 7 subjects in 2006, 2008, 2010, and 2012, respectively, due to a lack of information. Thus, a total of 10,236 subjects was selected for this analysis from the baseline survey conducted in 2006 (Figure 1).

2. Study Variables

1) Dependent variable

Self-reported data regarding SRH were extracted from the response to the question "how have you usually perceived your health status in the last year?" Responses to the question were categorized as either "good" or "bad" responses of "very good," "good," and "normal" indicated "good," and responses of "poor" and "very poor" indicated "bad."

2) Independent variables: offspring-related variables

We used the number of offspring and the composition of the offspring (gender, number of grandchildren, proportion of cohabitation) as in-

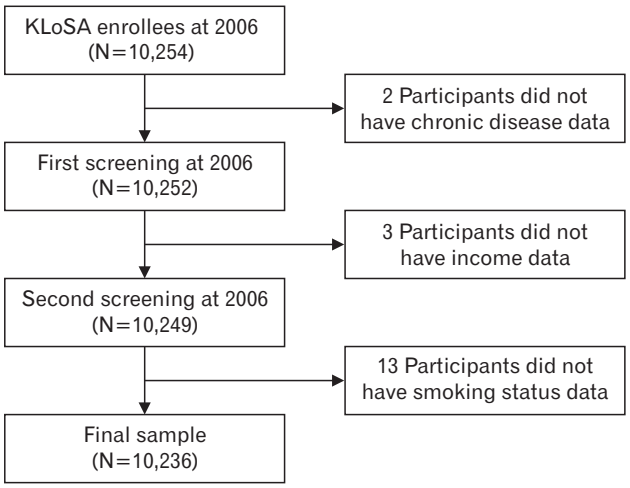

Figure 1. Adjusted effect of number of offspring on self-rated health according to gender. KLoSA, Korean Longitudinal Study of Aging.

Table 1. General characteristics of the study variables at baseline (2006)

Characteristic	Total			Good SRH			Bad SRH			P-value
	N	%	%*	N	%	%*	N	%	%*	
Age (y)										<0.0001
≤49	1,479	14.5	9.6	630	42.6	40.6	849	57.4	59.4	
50–54	1,173	11.5	8.3	631	53.8	52.5	542	46.2	47.5	
55–59	1,505	14.7	10.8	904	60.1	58.7	601	39.9	41.3	
60–64	1,380	13.5	13.1	939	68.0	68.4	441	32.0	31.6	
65–69	1,406	13.7	13.5	1,068	76.0	76.3	338	24.0	23.7	
70–74	1,507	14.7	20.4	1,259	83.5	83.8	248	16.5	16.2	
≥75	1,786	17.5	24.2	1,626	91.0	91.1	160	9.0	8.9	
Gender										
Male	4,452	43.5	47.0	3,414	76.7	80.4	1,038	23.3	19.6	
Female	5,784	56.5	53.0	3,643	63.0	66.6	2,141	37.0	33.4	
Education										<0.0001
≤Elementary school	4,823	47.1	39.9	2,530	52.5	54.0	2,293	47.5	46.1	
Middle school	1,653	16.2	16.8	1,257	76.0	77.6	396	24.0	22.4	
High school	2,704	26.4	30.8	2,333	86.3	88.1	371	13.7	11.9	
≥College	1,056	10.3	12.5	937	88.7	91.3	119	11.3	8.7	
Marital status										
Married	7,960	77.8	81.1	5,898	74.1	77.8	2,062	25.9	22.2	
Single	2,276	22.2	18.9	1,159	50.9	53.1	1,117	49.1	46.9	
No. of interactions with friends										<0.0001
Never	1,217	11.9	12.1	620	50.9	58.7	597	49.1	41.3	
3–6 times/y	603	5.9	6.1	427	70.8	74.6	176	29.2	25.4	
1–2 times/mo	1,828	17.9	18.9	1,370	75.0	79.1	458	25.1	20.9	
1–2 times/wk	3,282	32.1	32.1	2,407	73.3	77.3	875	26.7	22.7	
Every day	3,306	32.3	30.8	2,233	67.5	70.4	1,073	32.5	29.6	
Income										<0.0001
Yes	1,982	19.4	23.6	1,719	86.7	88.5	263	13.3	11.5	
No	8,254	80.6	76.4	5,338	64.7	68.4	2,916	35.3	31.7	
Economic activity										<0.0001
Yes	3,882	37.9	45.6	3,293	84.8	86.8	589	15.2	13.2	
No	6,354	62.1	54.4	3,764	59.2	61.6	2,590	40.8	38.4	
Smoking status										<0.0001
Never	7,291	71.2	68.7	4,875	66.9	70.8	2,416	33.1	29.2	
Former smoker	977	9.5	9.3	660	67.6	71.4	317	32.5	28.6	
Smoker	1,968	19.2	22.0	1,522	77.3	81.0	446	22.7	19.0	
Alcohol use										<0.0001
Yes	3,881	37.9	42.5	3,081	79.4	82.5	800	20.6	17.5	
Former user	685	6.7	6.1	318	46.4	47.8	367	53.6	52.2	
No	5,670	55.4	51.4	3,658	64.5	68.3	2,012	35.5	31.7	
Depressive symptoms										<0.0001
Yes	1,222	11.9	10.9	425	34.8	38.1	797	65.2	61.9	
No	9,014	88.1	89.2	6,632	73.6	77.4	2,382	26.4	22.6	
No. of chronic diseases†										<0.0001
0	5,379	52.6	57.8	4,656	86.6	88.7	723	13.4	11.3	
1	2,957	28.9	26.5	1,819	61.5	64.0	1,138	38.5	36.0	
≥2	1,900	18.6	15.8	582	30.6	31.2	1,318	69.4	68.8	
No. of offspring										<0.0001
0	319	3.1	3.6	186	58.3	63.9	133	41.7	36.1	
1	791	7.7	8.8	572	72.3	78.1	219	27.7	21.9	
2	3,512	34.3	40.6	2,837	80.8	83.1	675	19.2	16.9	
3	2,536	24.8	23.4	1,796	70.8	74.0	740	29.2	26.0	
4	1,457	14.2	11.6	865	59.4	60.7	592	40.6	39.3	
≥5	1,621	15.8	12.1	801	49.4	48.8	820	50.6	51.2	

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Table 1. Continued

Characteristic	Total			Good SRH			Bad SRH			P-value
	N	%	%*	N	%	%*	N	%	%*	
No. of male offspring										<0.0001
0	1,316	12.9	14.5	919	69.8	74.2	397	30.2	25.8	
1	4,044	39.5	42.5	3,044	75.3	79.1	1,000	24.7	20.9	
2	3,404	33.3	31.6	2,332	68.5	72.0	1,072	31.5	28.1	
3	1,037	10.1	8.2	577	55.6	57.1	460	44.4	42.9	
≥4	435	4.3	3.2	185	42.5	41.1	250	57.5	58.9	
No. of female offspring										<0.0001
0	2,462	24.1	26.6	1,795	72.9	76.9	667	27.1	23.1	
1	3,646	35.6	37.2	2,673	73.3	77.3	973	26.7	22.7	
2	2,418	23.6	22.5	1,613	66.7	70.3	805	33.3	29.7	
3	1,048	10.2	8.7	625	59.6	62.3	423	40.4	37.8	
≥4	662	6.5	5.0	351	53.0	53.2	311	47.0	46.8	
Proportion of cohabitation (%)										<0.0001
No cohabiting offspring	4,580	44.7	40.1	2,860	62.5	65.0	1,720	37.6	35.0	
≤24.9	574	5.6	4.0	293	51.1	50.3	281	49.0	49.7	
25.0–49.9	1,374	13.4	11.1	842	61.3	62.9	532	38.7	37.1	
50.0–74.9	1,367	13.4	14.6	1,031	75.4	78.2	336	24.6	21.8	
≥75.0	2,341	22.9	30.2	2,031	86.8	88.2	310	13.2	11.8	
Average age of offspring										<0.0001
Q1 (≤27.5)	3,490	34.1	45.1	2,974	85.2	86.7	516	14.8	13.3	
Q2 (27.6–36.0)	2,630	25.7	25.2	1,927	73.3	73.7	703	26.7	26.3	
Q3 (36.1–44.0)	2,245	21.9	17.2	1,315	58.6	57.9	930	41.4	42.1	
Q4 (≥44.1)	1,871	18.3	12.5	841	45.0	43.7	1,030	55.1	56.3	
No. of grandchildren										<0.0001
0	4,022	39.3	50.3	3,378	47.9	85.5	644	20.3	14.5	
1–2	1,499	14.6	13.9	1,035	69.1	71.2	464	31.0	28.8	
3–4	1,357	13.3	11.2	874	64.4	65.9	483	35.6	34.2	
5–6	1,180	11.5	8.9	663	56.2	56.7	517	43.8	43.3	
7–8	876	8.6	6.3	482	55.0	53.8	394	45.0	46.2	
≥9	1,302	12.7	9.4	625	48.0	46.7	677	52.0	53.3	
Total	10,236	100.0	100.0	7,057	68.9	73.1	3,179	31.1	26.9	

SRH, self-rated health.
*Weighted %. †Hypertension, diabetes, arthritis or rheumatoid arthritis, cancer, chronic obstructive pulmonary disease, liver disease, heart disease, cerebrovascular diseases, and mental illness.

dependent variables. Proportion of cohabitation was the number of offspring living with their parents divided by the total number of offspring in five categories: no cohabiting offspring, ≤24.9, 25.0–49.9, 50.0–74.9, and ≥75.0. Average offspring age was divided into four categories: Q1 (≤27.5 years old), Q2 (27.6–36.0 years old), Q3 (36.1–44.0 years old), and Q4 (≥44.0 years old). In addition, the number of grandchildren was included as a covariate.

3) Control variables

The age groups of participants were as follows: ≤49, 50–54, 55–59, 60–64, 65–69, 70–74, and ≥75 years of age. Education status was divided into four categories: less than or completed elementary school, middle school, high school, and college or more. Individuals were classified as married or single, and the latter group included those married previously, widowed, or divorced. Income status was divided into two categories: yes, the participant received income or no, they did not. The number of interactions with friends was divided into five categories: every day, 1–2 times/wk, 1–2 times/mo, 3–6 times/y, and never. Economic activity status was divided into two categories, namely employed or unemployed. In addition, health status and behavioral variables (smoking status, alcohol use, and depressive symptoms) were included as covariates. Finally, number of chronic diseases (including hypertension, diabetes, arthritis or rheumatoid arthritis, cancer, chronic obstructive pulmonary disease, liver disease, heart disease, cerebrovascular diseases, and mental illness) was categorized into three groups: 0, 1, and ≥2.

3. Analytical Approach and Statistics

A chi-squared test and a longitudinal data analysis were conducted. We ran a generalized linear mixed model (GLIMMIX) with the binary distribution, which controls for the characteristics of individuals that change over time, such as confounding variables, with the exception of sex. To determine whether the probability of all covariates including SRH changed over time, we included time (year) in the model as a categorical covariate; the regression coefficient was used to estimate both the change in probability of SRH and independent variables annually.

Table 2. Adjusted effect of number of children on self-rated health according to parents

Variable	Total		Male		Female	
	Odds ratio (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
No. of offspring						
0	**0.612 (0.503–0.746)**	**<0.0001**	**0.707 (0.528–0.947)**	**0.020**	**0.563 (0.422–0.751)**	**0.000**
1	0.898 (0.794–1.015)	0.085	0.931 (0.763–1.137)	0.482	0.878 (0.748–1.029)	0.108
2	1.000		1.000		1.000	
3	**1.180 (1.077–1.292)**	**0.000**	**1.333 (1.149–1.546)**	**0.000**	1.094 (0.974–1.229)	0.129
4	0.967 (0.862–1.084)	0.560	1.146 (0.939–1.399)	0.179	0.869 (0.754–1.002)	0.053
≥5	**0.736 (0.635–0.853)**	**<0.0001**	0.807 (0.619–1.051)	0.111	**0.686 (0.573–0.822)**	**<0.0001**
No. of grandchildren						
0	0.921 (0.758–1.121)	0.412	1.073 (0.762–1.510)	0.687	0.833 (0.653–1.062)	0.141
1–2	0.840 (0.710–0.993)	0.041	0.886 (0.655–1.200)	0.435	**0.794 (0.648–0.973)**	**0.026**
3–4	**0.853 (0.734–0.991)**	**0.038**	0.884 (0.669–1.167)	0.383	**0.800 (0.668–0.956)**	**0.014**
5–6	**0.821 (0.714–0.943)**	**0.005**	0.855 (0.659–1.108)	0.236	**0.781 (0.663–0.922)**	**0.003**
7–8	0.925 (0.811–1.055)	0.244	0.909 (0.709–1.166)	0.452	0.912 (0.782–1.064)	0.241
≥9	1.000		1.000		1.000	
Proportion of cohabitation (%)						
No cohabiting offspring	**0.810 (0.722–0.910)**	**0.000**	**0.831 (0.693–0.997)**	**0.046**	**0.806 (0.692–0.939)**	**0.006**
≤24.9	**1.222 (1.017–1.468)**	**0.032**	**1.531 (1.079–2.173)**	**0.017**	1.138 (0.911–1.421)	0.254
25.0–49.9	0.896 (0.777–1.032)	0.128	0.915 (0.721–1.161)	0.464	0.880 (0.733–1.055)	0.167
50.0–74.9	0.903 (0.797–1.024)	0.112	0.942 (0.775–1.145)	0.550	0.887 (0.751–1.047)	0.156
≥75.0	1.000		1.000		1.000	
Average age of offspring (y)						
Q1 (≤27.5)	0.963 (0.793–1.170)	0.707	0.728 (0.525–1.008)	0.056	1.109 (0.859–1.431)	0.426
Q2 (27.6–36.0)	1.078 (0.932–1.248)	0.312	0.860 (0.663–1.115)	0.256	1.066 (0.884–1.284)	0.504
Q3 (36.1–44.0)	1.063 (0.955–1.185)	0.265	0.910 (0.745–1.112)	0.357	1.047 (0.915–1.198)	0.504
Q4 (≥44.1)	1.000		1.000		1.000	
Age (y)						
≤49	1.000		1.000		1.000	
50–54	**0.834 (0.712–0.977)**	**0.024**	0.899 (0.696–1.162)	0.417	0.844 (0.687–1.038)	0.109
55–59	**0.713 (0.600–0.847)**	**0.000**	**0.752 (0.575–0.984)**	**0.038**	**0.776 (0.612–0.983)**	**0.036**
60–64	**0.598 (0.498–0.718)**	**<0.0001**	**0.718 (0.535–0.964)**	**0.028**	**0.610 (0.475–0.782)**	**<0.0001**
65–69	**0.482 (0.397–0.586)**	**<0.0001**	**0.703 (0.514–0.962)**	**0.028**	**0.428 (0.328–0.557)**	**<0.0001**
70–74	**0.393 (0.319–0.484)**	**<0.0001**	**0.524 (0.374–0.734)**	**0.000**	**0.355 (0.268–0.470)**	**<0.0001**
≥75	**0.307 (0.246–0.384)**	**<0.0001**	**0.385 (0.266–0.558)**	**<0.0001**	**0.268 (0.200–0.359)**	**<0.0001**
Gender						
Male	**1.259 (1.150–1.378)**	**<0.0001**	NA		NA	
Female	1.000		NA		NA	
Education						
≤Elementary school	**0.278 (0.241–0.321)**	**<0.0001**	**0.296 (0.234–0.374)**	**0.000**	**0.249 (0.184–0.336)**	**<0.0001**
Middle school	**0.476 (0.410–0.552)**	**<0.0001**	**0.428 (0.334–0.549)**	**0.001**	**0.460 (0.338–0.627)**	**0.001**
High school	**0.679 (0.588–0.783)**	**<0.0001**	**0.638 (0.506–0.804)**	**0.006**	**0.639 (0.470–0.868)**	**0.012**
≥College	1.000		1.000		1.000	
Marital status						
Married	**1.076 (1.000–1.158)**	**0.050**	1.061 (0.902–1.248)	0.472	0.989 (0.909–1.077)	0.804
Single	1.000		1.000		1.000	
No. of interactions with friends						
Never	**0.421 (0.379–0.467)**	**<0.0001**	**0.385 (0.326–0.454)**	**<0.0001**	**0.489 (0.427–0.560)**	**<0.0001**
3–6 times/y	**0.754 (0.675–0.843)**	**<0.0001**	**0.700 (0.582–0.842)**	**0.000**	**0.799 (0.694–0.918)**	**0.002**
1–2 times/mo	1.089 (1.000–1.186)	0.051	1.039 (0.905–1.192)	0.590	**1.134 (1.015–1.267)**	**0.026**
1–2 times/wk	0.972 (0.906–1.043)	0.429	1.062 (0.936–1.205)	0.348	**0.914 (0.840–0.995)**	**0.038**
Every day	1.000		1.000		1.000	
Income						
Yes	**1.308 (1.197–1.428)**	**<0.0001**	**1.407 (1.240–1.595)**	**<0.0001**	**1.273 (1.122–1.446)**	**0.000**
No	1.000		1.000		1.000	
Economic activity						
Yes	**1.762 (1.642–1.891)**	**<0.0001**	2.412 (2.160–2.694)	<0.0001	1.413 (1.286–1.554)	<0.0001
No	1.000		1.000		1.000	

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Table 2. Continued

Variable	Total		Male		Female	
	Odds ratio (95% CI)	P-value	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Smoking status						
Never	**1.130 (1.025–1.245)**	**0.014**	0.985 (0.874–1.111)	0.810	**1.959 (1.595–2.405)**	**<0.0001**
Former smoker	0.912 (0.819–1.015)	0.093	**0.861 (0.763–0.972)**	**0.016**	1.332 (0.927–1.914)	0.120
Smoker	1.000		1.000		1.000	
Alcohol use						
Yes	**1.184 (1.099–1.276)**	**<0.0001**	**1.462 (1.295–1.651)**	**<0.0001**	0.990 (0.899–1.090)	0.836
Former user	**0.516 (0.469–0.567)**	**<0.0001**	**0.558 (0.485–0.641)**	**<0.0001**	**0.586 (0.504–0.682)**	**<0.0001**
No	1.000		1.000		1.000	
Depressive symptoms						
Yes	**0.213 (0.192–0.235)**	**<0.0001**	**0.213 (0.178–0.254)**	**<0.0001**	**0.219 (0.194–0.248)**	**<0.0001**
No	1.000		1.000		1.000	
No. of chronic disease						
0	**8.195 (7.183–9.350)**	**<0.0001**	**10.649 (8.561–13.247)**	**<0.0001**	**6.720 (5.698–7.925)**	**<0.0001**
1	**2.766 (2.417–3.166)**	**<0.0001**	**3.156 (2.524–3.947)**	**<0.0001**	**2.479 (2.094–2.935)**	**<0.0001**
≥2	1.000		1.000		1.000	
Year						
2006	**0.612 (0.557–0.673)**	**<0.0001**	**0.561 (0.479–0.657)**	**<0.0001**	**0.657 (0.584–0.740)**	**<0.0001**
2008	**0.570 (0.519–0.625)**	**<0.0001**	**0.517 (0.443–0.605)**	**<0.0001**	**0.613 (0.546–0.689)**	**<0.0001**
2010	**0.568 (0.519–0.622)**	**<0.0001**	**0.532 (0.457–0.619)**	**<0.0001**	**0.604 (0.539–0.676)**	**<0.0001**
2012	1.000		1.000		1.000	

Bold type is considered statistically significant.
CI, confidence interval; NA, not applicable.

The criterion for significance was a two-tailed P≤0.05. All analyses were conducted using the SAS statistical software ver. 9.2 (SAS Institute Inc., Cary, NC, USA).

RESULTS

Table 1 lists the general characteristics of the covariates included in this study according to SRH at baseline (2006). There were 10,236 research samples.

The weighted prevalence of bad SRH at baseline for those with: zero offspring was 3.6%, one offspring was 8.8%, two offspring was 40.6%, and five or more offspring was 12.1% (Table 1).

Table 2 shows the adjusted effect of the number of offspring on SRH according to sex of the participants. The estimate for SRH for those with zero offspring was 0.612 (95% confidence interval [CI], 0.503–0.746; P<0.0001) compared to those with two offspring. The estimate for SRH for those with five or more offspring was 0.736 (95% CI, 0.635–0.853; P<0.0001), compared to those with two offspring. The estimate for SRH for males with zero offspring was 0.707 (95% CI, 0.528–0.947; P=0.020) compared to those with two offspring. The estimate for SRH for females with zero offspring was 0.563 (95% CI, 0.422–0.751; P<0.001) compared to females with two offspring. The estimate for SRH for females with five or more offspring was 0.686 (95% CI, 0.573–0.822; P<0.0001) compared to females with two offspring.

Table 3 shows the adjusted effect of offspring composition on SRH according to sex. The estimate for SRH for males with no offspring was 0.808 (male 95% CI, 0.691–0.946; P<0.0001) and 0.768 (female 95% CI, 0.670–0.880; P<0.000) compared to those with two offspring. The estimate for SRH for females with four or more female offspring was 0.834 (95% CI, 0.697–0.997; P=0.047).

DISCUSSION

Our primary purpose was to investigate the impact of offspring on SRH in a longitudinal model using a nationally representative sample of adults ≥45 years of age in South Korea. Our results show that those with more offspring (≥5) and those with no offspring tended to have an increased probability of low SRH. Overall, our results suggest that the number of offspring has a relatively large and significant positive effect on SRH, which was evident graphically as an inverse U-shape.

These associations between SRH and offspring were independent of offspring-related variables (number of grandchildren, proportion of cohabitation, and average age of offspring), sociodemographic variables (age, sex, education, marital status, number of interactions with friends, income, and economic activity status), health risk behavior variables (smoking status and alcohol consumption), health status (depressive symptoms and number of chronic diseases), and year.

Previous studies of the association between offspring and health outcomes have shown that a variety of offspring-related factors affect health outcomes. For example, one previous study showed a high possibility of risk for those with five or more offspring and those who had an adolescent birth.[14]

Although substantial evidence is available regarding the effect of offspring on specific physical health outcomes such as chronic diseases

Table 3. Adjusted effect of composition of children on self-rated health according to parents

Variable	Total		Male		Female	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
No. of offspring with male						
0	**0.855 (0.775–0.943)**	**0.002**	**0.808 (0.691–0.946)**	**0.009**	0.910 (0.800–1.035)	0.151
1	1.000		1.000		1.000	
2	1.006 (0.934–1.084)	0.864	0.946 (0.832–1.076)	0.394	1.058 (0.965–1.160)	0.231
3	0.923 (0.824–1.034)	0.168	0.880 (0.718–1.080)	0.219	0.956 (0.833–1.097)	0.518
≥4	**0.797 (0.671–0.947)**	**0.010**	0.735 (0.527–1.024)	0.069	0.823 (0.672–1.007)	0.059
No. of offspring with female						
0	**0.837 (0.771–0.908)**	**<0.0001**	**0.768 (0.670–0.880)**	**0.000**	0.908 (0.817–1.009)	0.072
1	1.000		1.000		1.000	
2	**0.886 (0.818–0.960)**	**0.003**	0.965 (0.841–1.107)	0.604	**0.836 (0.757–0.924)**	**0.001**
3	**0.864 (0.773–0.966)**	**0.010**	0.931 (0.764–1.135)	0.474	**0.824 (0.719–0.945)**	**0.006**
≥4	**0.855 (0.736–0.993)**	**0.040**	0.852 (0.645–1.126)	0.257	**0.834 (0.697–0.997)**	**0.047**
No. of grandchildren						
0	1.030 (0.848–1.250)	0.769	1.250 (0.893–1.750)	0.194	0.888 (0.698–1.130)	0.333
1–2	0.971 (0.825–1.144)	0.726	1.045 (0.780–1.399)	0.770	0.894 (0.733–1.091)	0.270
3–4	1.014 (0.877–1.171)	0.855	1.073 (0.824–1.396)	0.601	0.931 (0.783–1.106)	0.415
5–6	0.988 (0.867–1.127)	0.858	1.075 (0.845–1.369)	0.555	0.915 (0.783–1.069)	0.264
7–8	1.008 (0.887–1.147)	0.900	1.012 (0.793–1.291)	0.924	0.981 (0.844–1.141)	0.805
≥9	1.000		1.000		1.000	
Proportion of cohabitation (%)						
No cohabiting offspring	**0.774 (0.695–0.861)**	**<0.0001**	**0.826 (0.697–0.980)**	**0.028**	**0.762 (0.661–0.878)**	**0.000**
≤24.9	1.065 (0.895–1.266)	0.478	1.349 (0.965–1.886)	0.080	0.998 (0.809–1.230)	0.984
25.0–49.9	0.925 (0.811–1.055)	0.246	1.001 (0.802–1.250)	0.990	0.890 (0.753–1.053)	0.174
50.0–74.9	**0.885 (0.785–0.997)**	**0.045**	0.924 (0.765–1.117)	0.415	0.876 (0.749–1.024)	0.097
≥75.0	1.000		1.000		1.000	
Average age of offspring (y)						
Q1 (≤27.5)	0.862 (0.716–1.039)	0.119	**0.674 (0.489–0.930)**	**0.016**	0.945 (0.748–1.193)	0.632
Q2 (27.6–36.0)	1.035 (0.894–1.198)	0.644	0.816 (0.628–1.059)	0.127	1.016 (0.844–1.221)	0.870
Q3 (36.1–44.0)	1.037 (0.931–1.155)	0.510	0.887 (0.726–1.084)	0.242	1.018 (0.891–1.165)	0.789
Q4 (≥44.1)	1.000		1.000		1.000	
Age (y)						
≤49	1.000		1.000		1.000	
50–54	**0.824 (0.704–0.964)**	**0.016**	0.891 (0.690–1.151)	0.376	**0.802 (0.654–0.984)**	**0.035**
55–59	**0.686 (0.578–0.814)**	**<0.0001**	**0.745 (0.569–0.975)**	**0.032**	**0.689 (0.547–0.868)**	**0.002**
60–64	**0.568 (0.474–0.680)**	**<0.0001**	**0.713 (0.531–0.957)**	**0.024**	**0.525 (0.413–0.667)**	**<0.0001**
65–69	**0.451 (0.372–0.546)**	**<0.0001**	**0.690 (0.504–0.944)**	**0.020**	**0.358 (0.278–0.461)**	**<0.0001**
70–74	**0.362 (0.295–0.444)**	**<0.0001**	**0.517 (0.369–0.724)**	**0.000**	**0.289 (0.221–0.378)**	**<0.0001**
≥75	**0.281 (0.226–0.350)**	**<0.0001**	**0.371 (0.256–0.538)**	**<0.0001**	**0.219 (0.165–0.290)**	**<0.0001**
Gender						
Male	**1.266 (1.157–1.386)**	**<0.0001**	NA		NA	
Female	1.000					
Education						
≤Elementary school	**0.269 (0.234–0.310)**	**<0.0001**	**0.291 (0.231–0.367)**	**0.000**	**0.236 (0.175–0.318)**	**<0.0001**
Middle school	**0.460 (0.396–0.533)**	**<0.0001**	**0.416 (0.325–0.533)**	**0.001**	**0.438 (0.322–0.597)**	**0.001**
High school	**0.670 (0.580–0.773)**	**<0.0001**	**0.632 (0.501–0.796)**	**0.005**	**0.619 (0.456–0.840)**	**0.009**
≥College	1.000		1.000		1.000	
Marital status						
Married	**1.099 (1.022–1.182)**	**0.011**	1.081 (0.921–1.269)	0.338	1.006 (0.925–1.095)	0.882
Single	1.000		1.000		1.000	
No. of interaction with friend						
Never	**0.417 (0.376–0.463)**	**<0.0001**	**0.385 (0.326–0.455)**	**<0.0001**	**0.488 (0.426–0.559)**	**<0.0001**
3–6 times/y	**0.754 (0.675–0.843)**	**<0.0001**	**0.700 (0.582–0.841)**	**0.000**	**0.801 (0.697–0.921)**	**0.002**
1–2 times/mo	1.084 (0.996–1.181)	0.063	1.034 (0.900–1.187)	0.639	**1.131 (1.012–1.263)**	**0.030**
1–2 times/wk	0.972 (0.906–1.043)	0.432	1.059 (0.933–1.201)	0.375	**0.917 (0.843–0.999)**	**0.047**
Every day	1.000		1.000		1.000	

(Continued to the next page)

Table 3. Continued

Variable	Total		Male		Female	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Income						
Yes	**1.306 (1.196–1.426)**	**<0.0001**	**1.399 (1.234–1.587)**	**<0.0001**	**1.277 (1.125–1.450)**	**0.000**
No	1.000		1.000		1.000	
Economic activity						
Yes	**1.759 (1.639–1.888)**	**<0.0001**	**2.392 (2.142–2.672)**	**<0.0001**	**1.407 (1.280–1.546)**	**<0.0001**
No	1.000		1.000		1.000	
Smoking status						
Never	**1.134 (1.029–1.250)**	**0.012**	0.985 (0.874–1.111)	0.808	**1.991 (1.621–2.446)**	**<0.0001**
Former smoker	0.920 (0.826–1.024)	0.126	**0.863 (0.765–0.975)**	**0.018**	1.345 (0.935–1.936)	0.109
Smoker	1.000		1.000		1.000	
Alcohol use						
Yes	**1.182 (1.097–1.273)**	**<0.0001**	**1.453 (1.287–1.641)**	**<0.0001**	0.983 (0.892–1.082)	0.722
Former user	**0.516 (0.469–0.567)**	**<0.0001**	**0.558 (0.486–0.642)**	**<0.0001**	**0.586 (0.504–0.681)**	**<0.0001**
No	1.000		1.000		1.000	
Depressive symptoms						
Yes	**0.212 (0.192–0.234)**	**<0.0001**	**0.210 (0.176–0.251)**	**<0.0001**	**0.219 (0.194–0.247)**	**<0.0001**
No	1.000		1.000		1.000	
No. of chronic disease						
0	**8.180 (7.171–9.331)**	**<0.0001**	**10.528 (8.466–13.093)**	**<0.0001**	**6.734 (5.711–7.940)**	**<0.0001**
1	**2.763 (2.414–3.162)**	**<0.0001**	**3.136 (2.508–3.921)**	**<0.0001**	**2.482 (2.096–2.937)**	**<0.0001**
≥2	1.000		1.000		1.000	
Year						
2006	**0.613 (0.558–0.674)**	**<0.0001**	**0.558 (0.476–0.653)**	**<0.0001**	**0.664 (0.590–0.747)**	**<0.0001**
2008	**0.570 (0.520–0.626)**	**<0.0001**	**0.515 (0.441–0.602)**	**<0.0001**	**0.618 (0.550–0.693)**	**<0.0001**
2010	**0.570 (0.520–0.624)**	**<0.0001**	**0.532 (0.457–0.620)**	**<0.0001**	**0.607 (0.542–0.679)**	**<0.0001**
2012	1.000		1.000		1.000	

Bold type is considered statistically significant.
CI, confidence interval; NA, not applicable.

that occur frequently,[15,16] our research has used general health measures, such as an individual's SRH,[17] to predict future health status.

In general, the simple question, "How would you rate your health? Poor, fair, good, very good, or excellent?" is typically labeled as SRH, and is also known as self-assessed health, self-evaluated health, subjective health, or perceived health. The exact wording and response options for SRH questions vary. The question most widely used in the US has responses on a scale including "excellent," "very good," "good," "fair," and "poor," whereas the options recommended by World Health Organization[18] and the EURO-REVES 2 group[19] are "very good," "good," "fair," "bad," and "very bad." Another version uses the options "very good," "fairly good," "average," "fairly bad," and "bad."[20] Although the levels and distributions are not directly comparable between these different measures, they represent parallel assessments of the same phenomenon, and show basically concordant answers.[21]

Idler and Benyamini[22] proposed four explanations for the validity of SRH as a predictor of future health outcomes: (1) SRH is more inclusive than covariates used in many studies, (2) SRH is a dynamic evaluation that judges the trajectory of health and not only current health at a defined point in time, (3) SRH influences behavior that subsequently affects health status, and (4) SRH is influenced by the use of resources that reflect or even affect the ability to cope with health threats.

One possible explanation for our results, based on a previous study, is that raising offspring is associated with direct costs, such as nutrition and education, and opportunity costs. Opportunity costs may possibly be generated by reducing parents' time on the job and thus the higher probability of profit. Less time on the job results in reduced earnings and a high possibility of experiencing poverty, which is associated with negative health outcomes.[23-25]

Offspring from a multiple birth increase the probability of suffering financially and increase a female's probability of experiencing periods of particularly bad overall health.[26] Females with no offspring often express feelings of emptiness and loneliness, and can feel demoralized. Although the strict sanctions against not having children have abated somewhat, the norms of desirability of having offspring remain strong. Nevertheless, a number of theorists and researchers have challenged the view that offspring increase well-being.

A few strengths and limitations of this study should be mentioned. One of the strengths is that the participants may be representative of relatively older adults (≥45 years). Second, our results were estimated through longitudinal data, which are surveyed annually. We obtained a large sample size, so the results can be generalized to older South Korean adults. Nevertheless, we do acknowledge possible limitations. The first problem is that respondents' reports are subjective, imperfect,

and potentially affected by false consciousness and adaptation of resources. Second, because personality characteristics are likely associated with SRH, failure to include them in the statistical models could lead to an exaggeration of the association of interest. Third, in addition to the potential biases discussed above that are likely to inflate the associations between the number of offspring and some of the health variables, we recognize that the estimates may understate the potential associations for all outcomes because of the short follow-up period. Fourth, although there may have been twins, twin males and females, or triplets, we did not measure offspring composition. Fifth, previous findings suggest that high parity (six or more offspring), early first birth, and the experience of infant death or pregnancy loss are associated with worse self-reported health at an older age. Early childbearing also has a clear positive correlation with limitations in activities of daily living.[17,27] However, we did not include these factors because of a lack of information. Finally, although we used longitudinal data, the results possibly reflect reverse causality and bidirectional relationships when assessing the association between the number of offspring and SRH.

We conducted a longitudinal data analysis using a nationally representative sample among adults ≥45 years of age. Our results provide additional evidence for relatively large and significant positive effects of additional offspring on SRH, which will predict future health status.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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