Trends of Health Status and Medical Utilization Among Korean Baby Boomers: Analysis From Korean Health Panel Survey 2008-2014

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Background: The state of health of baby boomers is difficult to describe in a few words. It requires an in-depth understanding and a detailed analysis of the current conditions and related factors. **Methods:** To analyze the differences in the health status among the generations, percentages were derived and generalized estimates equation models of each generation were performed using annual data from the Korea Health Panel Survey 2008-2014. We divided the Korean Health Panel data from 2008 to 2014 into the baby boom generation, older generation, and younger generation based on year of birth. The baby boom generation started with 2,775 people (17.6%) in 2008, and 1,650 people were included in the panel in 2014, comprising approximately 17% of the adult panel population. **Results:** As the results show, over time, the mental health, such as depression symptoms and the suicidal ideation, of the baby boom generation has come to be similar to the younger generation, and is getting worse, approaching the level of the older generation. The current older generation and baby boomers have contrasting results in terms of the differences in their depression symptoms, suicidal ideation, exercise habits, self-rated health, and number of illness days. **Conclusion:** It is time to investigate not only the differences in current status and patterns, but also the size and number of the population of Korean baby boomers suffering from health problems.

Key Words: Baby boomers, Health status, Medical care utilization

INTRODUCTION

The baby boomers are the demographic group born when birth rates suddenly increased in a socioeconomic stable situation following World War II or after the Korean War. It usually refers to more than one million children born in a year and this condition lasting for more than 3 years. In Korea, the population born between 1955 and 1963 is the first baby boom generation, numbering about 7,125,000 people and accounting for about 14.5% of the total population of the country. This generation found itself in a different social situation from the previous generation or later generations. That is, it faced a big burden as the sandwich generation that had to support both its parents and its children at the same time, while having higher education levels and being relatively richer than the previous generation[1].

However, research on the baby boomers' health status in terms of their homogeneous features and heterogeneous conditions needs to be conducted. Many factors affecting the health status of a generation have changed drastically. It is necessary to study whether current health status is a result of the age effect from early age, the cohort effect according to the lifetime accumulation of health risks, or the effect of various physical and social environments within a specific period. The cohort effect is considered to be the cumulative effect of age-specific and time-specific effects. A review of the various health-related factors and impacts experienced by baby boomers during their lifetimes needs to be conducted to improve cohort-specific health conditions. In order to enter a healthy old age, healthcare measures should be considered as tasks for individuals, the family, and the community, and a feature of social policy.

Changes in living conditions and employment status due to health problems among baby boomers can affect medical care use and can be a factor in increasing household expenses for medical expenses[2]. Jung and Kim[3] analyzed the determinants of medical expenditure by separating nonnative, pre-elderly, and elderly households using urban household survey data in 1999. They found income for the elderly was the

main factor influencing health expenditure. The labor life process from adolescence to middle age has had an impact on the health problems of baby boomers, and health problems in middle age may restrict participation in economic activities[4]. In the case of baby boomers, the vicious cycle of restricted participation in economic activities and reduced expenditure on healthcare, thus generating health problems, can be repeated[5,6]. According to a study by Sunwoo[7], 19.2% of baby boomers have never had a health checkup, and 46.4% of men currently smoked. In the past, it was found that 94.3% of male baby boomers smoked or had been a smoker previously. The female smoking ratio was as low as 3.5%. Drinking rates were 76.8% for males and 50.2% for females, with an average of 62.8% drinking. Sunwoo's study[7] concluded that most chronic diseases suffered by the baby boom generation arise from "suddenly eating well and not exercising."

Previous studies on the health of baby boomers have reported that this generation has a higher prevalence of chronic diseases than previous generations and later generations, and the incidence of certain diseases such as breast cancer and colorectal cancer is much higher. On the other hand, it has also been claimed that their health status is generally better than previous generations. The older they are, the worse their physical health condition and the increased incidence of various diseases, but the health security system has improved remarkably, and health consciousness and health behaviors are better than for the previous generation. It is difficult to say in a few words what the state of health of the baby boom generation is. It requires an in-depth understanding and a detailed analysis of current conditions, related factors, and comprehensive health outcomes.

This study examines the health status, health behavior, medical care use, and medical expenditure of the baby boomers by using the Korean Health Panel (KHP) Survey and compares them with the generation that preceded them and the one that followed.

MATERIALS AND METHODS

To analyze the differences in health status and medical care utilization among generations, this study used annual data from the KHP Survey 2008-2014 (annual data beta version 1.1)[8]. The baby boom generation started with 2,775 people

(17.6%) in 2008. They were born between 1955 and 1963, and 1,650 people were consistently included in the panel in 2014, which is approximately 17% of the adult panel population. The younger generation consisted of panel participants who were born after 1963 of adults aged 20 years or older. The older generation represents other older adults who are not included in the baby boomers and younger generation groups and were born before 1955 (Table 1).

As health outcome variables, this study used self-rated health (total 100 scored), the number of chronic diseases, body mass index, the total number of bedridden people for the last month, smoking status, alcohol drinking status, depression symptoms (yes/no), suicidal ideation (yes/no), the number of emergency room visits, outpatients visits and admission days for a year, and the total amount of medical costs. In this study, annual house income includes the sum of the assets and salaries of all family members in a year. The criteria for assets vary according to year. In 2008, assets consisted of the total family income of each family member, such as properties, pensions, government subsidies, and private funding, and in other years (2009-2011), assets consisted of real estate, movable properties, pensions, government subsidies, and private funding. We used equivalized household income by dividing it by the square root of the household size. This scale implies that, for instance, a family of 4 members has twice the needs as a one-person household. For employment status, the variable was divided into 2 categories: employment and unemployment status. Marital status was also categorized according to being married and living together, and other categories included being separated, divorced, or widowed.

To compare the trend of health status and medical care utilization among the generations, generalized estimating equations (GEE) were used. GEE can be used to estimate the causal relationships of penal data, especially for the analysis of Time Series Data, namely repeated measurement data of categorical or continuous responsible variables[9]. KHP data is panel data which was surveyed annually in relation to the same recipients, with the same content being yielded every year. KHP, in particular, includes several varying covariates that are changeable at every survey point. Therefore, GEE may the most suitable analysis model to reflect the features of many of the varying covariates.

Table 1. Total participants analyzed by year: Korea Medical Panel Survey 2008-2014

Group	2008	2009	2010	2011	2012	2013	2014
Older generation	5,471 (34.7)	5,033 (36.2)	4,751 (37.4)	4,532 (38.1)	4,253 (38.8)	4,026 (39.7)	3,816 (40.4)
Baby boomers	2,775 (17.6)	2,405 (17.3)	2,191 (17.2)	2,060 (17.3)	1,915 (17.5)	1,765 (17.4)	1,650 (17.5)
Younger generation	7,527 (47.7)	6,450 (46.4)	5,776 (45.4)	5,312 (44.6)	4,786 (43.7)	4,342 (42.9)	3,970 (42.1)
Total	15,773 (100)	13,888 (100)	12,718 (100)	11,904 (100)	10,954 (100)	10,133 (100)	9,436 (100)

Values are presented as number (%).

RESULTS

1. General Characteristics of Baby Boom Generation in KHP

The baby boomers have the highest ratio of middle school graduates compared to the current older and younger generations. Most of the younger generation have more high school graduates. The number of nonmanual workers is more than 3 times higher than the older generation, where the numbers of farmers and fishermen have decreased by more than half. Smoking and drinking rates are similar to those of the younger generation, but the baby boomers engage in the highest level of physical activity over 4 days per week. In the previous baby boom generation (older generation), the number of recipients of basic livelihood aids was greater, and the number of chronic diseases, the number of days of illness, and the prevalence of depression symptoms were higher than the baby boom generation. In terms of medical care utilization, the average number of annual hospitalizations and use of outpatient clinics and average annual medical expenses were the highest among the older generation, followed by the baby boom generation and the younger generation (Table 2).

The average annual income of the baby boomers grew from 44 million Korean won (KRW) in 2008 to 53 million KRW in 2014, which is similar to the income level of each young man in a year. However, elderly households were at the level of 27 million KRW in 2008, but they were the lowest, at 27.7 million KRW, in 2014, showing a significant difference among the generations.

2. Trends in Health Status, Health Behavior, and Medical Care Utilization of Baby Boomers

Self-rated health returns show that the three generations are healthier in order of age. This means the younger the generation, the healthier they rated themselves. The baby boomers had 2 to 2.5 chronic diseases, an average body mass index of 23, and an average of 4 days monthly being bedridden because of illness. In relation to depression, elderly households are similar to baby boomer households, but the younger generation is lower than these. This tendency is maintained from 2009 to 2013. The baby boomers had the lowest level of depression in 2010, but the youngest generation had the lowest level in 2013. Regarding the question of suicidal ideation, the older generation and the baby boom generation were similar.

The baby boomer smoking rate was 1.5 times higher than

Table 2. Baseline (2008) general characteristics of the generations among the Korean Medical Panel participants

Variable	Older generation	Baby boomers	Younger generation
Sex			
Men	2,502 (45.7)	1,383 (49.8)	3,679 (48.9)
Women	2,969 (54.3)	1,392 (50.2)	3,848 (51.1)
Age (yr)	65.6±8.1	48.9±2.6	33.4±7
Marital status			
Others	1,366 (25.0)	289 (10.4)	2,893 (38.4)
Married	4,105 (75.0)	2,486 (89.6)	4,634 (61.6)
Educational level			
No schooling	927 (16.9)	28 (1.0)	8 (0.1)
Elementary school	1,964 (35.9)	354 (12.8)	61 (0.8)
Middle school	955 (17.5)	532 (19.2)	218 (2.9)
High school +	1,625 (29.7)	1,861 (67.1)	7,240 (96.2)
Occupational status			
Out of labor	2,757 (50.4)	677 (24.4)	2,971 (39.5)
Nonmanual job	537 (9.8)	813 (29.3)	2,708 (36.0)
Service job	160 (2.9)	210 (7.6)	374 (5.0)
Farmers	916 (16.7)	207 (7.5)	108 (1.4)
Manual job	1,101 (20.1)	868 (31.3)	1,366 (18.2)
Basic living aids			
None	5,096 (93.2)	2,680 (96.6)	7,351 (97.7)
Beneficiary	375 (6.9)	95 (3.4)	176 (2.3)
Income (Korean won)	26,611,957±26,942,277	44,852,094±32,025,468	46,751,701±29,827,278

Values are presented as number (%) or mean±standard deviation.

the elderly generation rate. Unlike young people, who maintain a similar ratio every year, baby boomers' smoking rate tends to decrease every year, but they have a similar profile to young adults. Their drinking profile was similar to their smoking one. In relation to exercise, the baby boom generation showed the highest level of 4 to 7 days of moderate exercise per week compared to the other generations (Table 3).

There is no difference in the number of emergency rooms used among the generations. Moreover, there is no difference among the generations in terms of hospital medical use. Outpatient visits are the highest among the older generation and baby boomers come next. For all generations, medical expenditure has increased in recent years (Table 4).

As a result of a GEE analysis with adjusted confounding variables, the baby boomers showed higher self-rated health. Compared to the older generation, depression symptoms were higher among baby boomers, but, interestingly, suicidal ideation was lower in baby boomers than in the older genera-

tion. The frequency of medical care utilization and incurring medical costs was less among the baby boomers than among the older generation (Table 5).

DISCUSSION

As the results show, mental health, such as the baby boom generation's depression symptoms and suicidal ideation, which is similar to the younger generation, is approaching the level of the older generation. Interestingly, there were opposing features displayed in mental health status: Depression symptoms among baby boomers were worse among the baby boomers than the older generation but suicidal ideation was lower. The elderly generation and baby boomers showed contrasting results in terms of differences in exercise habits, self-rated health, and numbers of bedridden days.

The baby boom generation is considered to be vulnerable for chronic diseases. In Korea, the medical insurance law

Table 3. Health and medical care utilization among the older generation, baby boomers, and the younger generation by year

Health and medical care	2008	2009	2010	2011	2012	2013	2014
Self-rated health							
Older generation	-	67.1±17.7	68.9±16.2	65.5±17.2	65.9±16.8	65.1±17.1	-
Baby boomers	-	73.8±15.1	73.5±14.7	71.1±14.7	71.2±14.6	70.1±15.2	-
Younger generation	-	75.3±14.4	74.7±13.9	73.8±13.9	73.9±14.0	73.2±14.1	-
No. of chronic diseases							
Older generation	2.4±1.6	3.1±2.0	3.5±2.3	3.7±2.4	3.8±2.4	4.1±2.5	4.1±2.5
Baby boomers	1.6±1.0	2.0±1.4	2.2±1.5	2.4±1.6	2.4±1.6	2.5±1.8	2.5±1.8
Younger generation	1.3±0.7	1.5±1.0	1.6±1.1	1.7±1.2	1.7±1.2	1.7±1.2	1.7±1.2
Body mass index (kg/m^2)							
Older generation	-	23.4±3.0	23.3±3.0	23.3±3.0	23.3±3.7	23.3±3.0	23.3±3.0
Baby boomers	-	23.5±2.8	23.6±2.8	23.5±2.8	23.6±2.8	23.6±2.8	23.6±2.8
Younger generation	-	22.7±3.1	22.8±3.2	22.9±3.2	23.0±3.2	23.1±3.2	23.1±3.2
Days bed ridden							
Older generation	-	8.6±9.8	9.6±10.4	9.6±10.6	8.8±10.0	7.9±9.6	10.5±10.7
Baby boomers	-	4.1±5.7	5.1±6.8	4.5±6.2	5.3±6.7	4.8±6.3	4.5±6.8
Younger generation	-	3.6±4.9	3.1±4.4	4.2±6.3	3.5±5.3	3.7±5.4	4.1±5.8
Emergency Department							
Older generation	1.3±0.7	1.3±0.9	1.3±1.5	1.4±1.6	1.3±1.6	1.3±0.7	1.2±0.5
Baby boomers	1.2±0.5	1.2±0.5	1.2±0.5	1.2±0.6	1.2±0.5	1.2±0.5	1.2±0.5
Younger generation	1.2±0.6	1.2±0.6	1.2±0.6	1.2±0.6	1.2±0.5	1.2±0.5	1.2±0.5
Admission							
Older generation	1.5±1.1	1.6±1.3	1.6±1.2	1.6±1.2	1.5±1.1	1.5±1.0	1.5±1.0
Baby boomers	1.3±1.1	1.4±1.6	1.4±1.0	1.3±1.0	1.3±1.0	1.3±0.8	1.3±0.7
Younger generation	1.2±0.6	1.2±0.7	1.2±0.7	1.2±0.7	1.2±0.7	1.2±0.7	1.2±0.7
Outpatients							
Older generation	23.8±26.2	2 5.5±29.2	28.4±31.1	30.7±32.8	32.8±34.5	33.8±36.0	32.7±35.3
Baby boomers	12.6±13.7	13.5±14.2	14.8±15.6	16.6±17.6	17.2±18.0	17.7±19.1	17.4±20.5
Younger generation	8.1±8.8	8.6±9.4	8.6±9.4	9.8±12.1	9.9±12.2	10.6±13.2	10.3±12.9
Medical cost (Korean won)							
Older generation	1,230,367±2,046,652	1,330,567±1,933,923	1,387,759±1,997,069	1,464,879±2,058,138	1,528,245±2,093,235	1,613,278±2,103,600	1,584,088±2,076,929
Baby boomers	702,834±3,462,198	759,276±1,596,780	891,458±2,550,041	925,203±2,638,152	1,026,143±2,713,496	1,105,805±2,869,925	1,110,122±2,892,563
Younger generation	379,270±948,565	453,236±1,056,210	506,741±1,153,053	554,140±1,264,113	593,610±1,207,343	679,913±1,286,392	725,873±1,392,226

Values are presented as mean±standard deviation.

Table 4. Health behaviors and mental health among the older generation, baby boomers, and the younger generation by year

Health behavior and mental health	2009	2010	2011	2012	2013	2014
Smoking status						
Older generation						
None	4,007 (81.4)	3,793 (82.0)	3,690 (83.3)	3,527 (84.6)	3,392 (85.9)	3,213 (86.1)
Smoker	914 (18.6)	834 (18.0)	741 (16.7)	642 (15.4)	557 (14.1)	517 (13.9)
Baby boomer						
None	1,748 (74.2)	1,628 (75.8)	1,549 (76.2)	1,450 (77.0)	1,358 (78.3)	1,267 (78.0)
Smoker	607 (25.8)	519 (24.2)	485 (23.8)	433 (23.0)	377 (21.7)	357 (22.0)
Younger generation						
None	4,338 (72.7)	3,994 (72.7)	3,711 (72.9)	3,381 (73.5)	3,073 (73.2)	2,848 (73.4)
Smoker	1,632 (27.3)	1,500 (27.3)	1,382 (27.1)	1,218 (26.5)	1,127 (26.8)	1,033 (26.6)
Alcohol drinking						
Older generation						
None	2,209 (47.2)	1,984 (45.0)	2,040 (48.8)	2,080 (52.7)	2,054 (54.6)	2,031 (57.1)
Drinker	2,473 (52.8)	2,429 (55.0)	2,143 (51.2)	1,864 (47.3)	1,707 (45.4)	1,528 (42.9)
Baby boomer						
None	585 (27.3)	470 (24.4)	550 (30.0)	537 (31.5)	518 (33.4)	530 (35.8)
Drinker	1,560 (72.7)	1,456 (75.6)	1,285 (70.0)	1,169 (68.5)	1,034 (66.6)	949 (64.2)
Younger generation						
None	976 (19.1)	825 (17.3)	885 (20.3)	894 (22.6)	820 (22.9)	861 (25.6)
Drinker	4,143 (80.9)	3,936 (82.7)	3,481 (79.7)	3,056 (77.4)	2,767 (77.1)	2,500 (74.4)
Moderate or severe exercise per week						
Older generation						
None	3,042 (61.8)	3,383 (73.1)	3,089 (69.7)	2,904 (69.7)	2,476 (62.7)	2,679 (71.8)
1–3 Days	580 (11.8)	497 (10.7)	582 (13.1)	480 (11.5)	564 (14.3)	395 (10.6)
4–7 Days	1,299 (26.4)	747 (16.1)	760 (17.2)	785 (18.8)	908 (23.0)	656 (17.6)
Baby boomer						
None	1,181 (50.2)	1,319 (61.4)	1,156 (56.8)	991 (52.6)	864 (49.8)	989 (60.9)
1–3 Days	514 (21.8)	429 (20.0)	465 (22.9)	408 (21.7)	377 (21.7)	301 (18.5)
4–7 Days	659 (28.0)	399 (18.6)	413 (20.3)	484 (25.7)	494 (28.5)	334 (20.6)
Younger generation						
None	3,287 (55.1)	3,553 (64.7)	2,972 (58.4)	2,580 (56.1)	2,233 (53.2)	2,337 (60.2)
1–3 Days	1,393 (23.3)	1,096 (20.0)	1,281 (25.2)	1,080 (23.5)	1,011 (24.1)	847 (21.8)
4–7 Days	1,289 (21.6)	845 (15.4)	840 (16.5)	939 (20.4)	956 (22.8)	696 (17.9)
Depression symptoms						
Older generation						
No	4,060 (87.8)	3,917 (89.7)	3,812 (90.5)	3,587 (90.3)	3,412 (90.1)	
Depressed	564 (12.2)	452 (10.4)	399 (9.5)	384 (9.7)	375 (9.9)	
Baby boomer						
No	1,930 (89.9)	1,874 (92.5)	1,742 (90.6)	1,639 (91.8)	1,514 (91.4)	
Depressed	218 (10.2)	152 (7.5)	180 (9.4)	146 (8.2)	142 (8.6)	
Younger generation						
No	4,827 (90.1)	4,738 (94.0)	4,394 (93.7)	3,984 (94.0)	3,661 (94.2)	
Depressed	533 (9.9)	302 (6.0)	296 (6.3)	253 (6.0)	224 (5.8)	
Suicidal ideation						
Older generation						
Yes	658 (14.2)	421 (9.6)	311 (7.4)	320 (8.1)	292 (7.7)	
No	3,966 (85.8)	3,948 (90.4)	3,900 (92.6)	3,651 (91.9)	3,495 (92.3)	
Baby boomer						
Yes	243 (11.3)	138 (6.8)	142 (7.4)	107 (6.0)	101 (6.1)	
No	1,905 (88.7)	1,888 (93.2)	1,780 (92.6)	1,678 (94.0)	1,555 (93.9)	
Younger generation						
Yes	500 (9.3)	262 (5.2)	227 (4.8)	183 (4.3)	171 (4.4)	
No	4,860 (90.7)	4,778 (94.8)	4,463 (95.2)	4,054 (95.7)	3,714 (95.6)	

Values are presented as number (%).

Table 5. Difference in health status, medical care utilization, and medical costs for the different generations using a generalized equation estimates model

Variable	Estimate	95% Confidence limits	Pr>|Z|
Self-rated health			
Older generation	Reference		
Baby boomers	2.020	1.45, 2.59	<0.0001
Younger generation	3.030	2.48, 3.59	<0.0001
Depression symptoms			
Older generation	Reference		
Baby boomers	0.015	0.001, 0.03	0.0035
Younger generation	-0.002	-0.01, 0.01	0.6513
Suicide ideation			
Older generation	Reference		
Baby boomers	-0.012	-0.02~-0.002	0.0209
Younger generation	0.002	-0.007~0.01	0.6069
No. of Emergency Department visits			
Older generation	Reference		
Baby boomers	-0.100	-0.17, -0.04	0.0025
Younger generation	-0.080	-0.14, -0.03	0.0049
No. of admissions to hospital			
Older generation	Reference		
Baby boomers	-0.170	-0.24, -0.10	<0.0001
Younger generation	-0.280	-0.36, -0.21	<0.0001
No. of outpatient visits			
Older generation	Reference		
Baby boomers	-9.891	-10.78, -8.99	<0.0001
Younger generation	-14.442	-15.32, -13.55	<0.0001
Medical costs			
Older generation	Reference		
Baby boomers	-520,826	-624,098, -417,553	<0.0001
Younger generation	-845,047	-916,378, -773,716	<0.0001

All of the estimates calculated are adjusted by sex, educational status, occupational status, marital status, household income, and beneficiaries of basic living aids.

was enacted in December 1963 (Law No. 1623), and after July 1977, compulsory medical insurance coverage began. However, the medical insurance coverage that begun in 1977 was applied to workers at workplaces with more than 500 employees, while the medical insurance system (Law No. 3081) was based on the Medical Insurance Act for public servants and private school staff. Therefore, it can be said that only public employees, faculty members, or regular workers who worked in a workplace with 500 or more employees were covered by health insurance[10].

Small workplace workers with 5 or more employees were included as health insurance beneficiaries in 1988. Until then, small workplace workers had not been covered by national health insurance. In 1982, the local residents' health insurance pilot project began, and in 1989, the city medical insurance was fully implemented and public health insurance for the self-employed and enriched fishery workers was implemen-

ted. Until 1989, self-employed or fishery workers had limited access to healthcare via health insurance, but the situation has improved significantly since then. In 1989, baby boomers were entering adulthood as an insurance system to treat illnesses or injuries at a lower cost was established. Along with the improvements in the national insurance system and in medical technology itself, the health promotion law was enacted in 1995. This seems to have greatly increased awareness of health promotion in adulthood for the baby boomers in general[7].

The health status of the baby boomers can be determined according to their chosen profession[11,12]. However, it is important to consider the different healthcare services that vary according to the working lives of patients.

Individual employment, turnover, and retirement processes are determined by a variety of factors. The baby boomers experienced a heavy workload in the late 1990s due

to the currency crisis, restructuring, and the early retirement of the previous generation, and this population tranche is now retiring every year. The baby boomers are a generation that saw changes in the types of illness and health problems they encountered due to westernized eating habits and a lack of exercise, as well as being a generation that is different from previous generations, suffering from heavy work stress and heavy childcare and education burdens[13]. How do we explain the effect age has on mental health, and what can we do to prevent mental health problems arising? To what extent do the health policies fit into the length of the quality of their lives so that they will bring them to a vibrant old age? Now, it is time to look not only for the differences in current statuses and patterns, but also for the sizes and quantities of the population suffering from health problems. It will be necessary to work on estimating the potential population size and the health insurance and long-term care services that they will be using in the mid to long term.

In conclusion, there is a conflicting story about the state of health of the baby boomers. Some results show a prevalence of depression symptoms that is greater than the older generation and a good response to health in terms of self-rated health, health behaviors, healthcare utilization, and suicidal ideation. In general, depression is a phenomenon that can occur because the baby boomers, who are middle-aged in terms of their lifecycle, are at a time in their lives when many socially demanding problems arise, especially retirement. In terms of the latter, the health security net of this generation has been remarkably improved, so that it is in a position where it is better placed than previous generations in terms of health consciousness and health practice.

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