

## Social Environmental Factors for Korean and Australian Centenarians\*

Jong In Kim

*Division of health and Welfare, Wonkwang University, Republic of Korea*

### CONTENTS

|                  |                 |
|------------------|-----------------|
| I . Introduction | IV . Discussion |
| II . Methods     | V . Conclusion  |
| III. Results     | References      |
|                  | Abstract        |

### I . Introduction

Why are some people healthy and others not? It is not just a matter of individual genes, lifestyle choices or bad luck. Nor is it just a question of access to medical care. Living conditions - social, political, economic and environmental also play a major role.

It is importance of social factors that impact health. A great deal is known in world about social determinants of health, however such knowledge needs to be drawn together, more clearly understood and

arranged more systematically (WHO 2006a).

Social determinants factors that impact health are the social gradient, stress, early life, social exclusion, work, unemployment, social support, addiction, food and transport (Richard et al. 2003). Environmental determinants factors that impact health include air pollution, chemical safety, ionizing radiation, global environmental change, health and environment linkages as integral to economic development, occupation health, water, sanitation and health (WHO 2006b).

\* This paper was sponsored by Wonkwang University in 2007

Corresponding Author: Jong-In Kim

Division of Health and Welfare, Wonkwang University

#344-2 Shinyong-dong, Iksan City, Chonbuk, 570-749, Republic of Korea

Tel: +82-63-850-6569, Email: [kji122@wku.ac.kr](mailto:kji122@wku.ac.kr)

Article submitted 28 November 2008, Revised 6 January 2009, Approved 20 December, 2008

Specially, despite significant reductions in the concentrations of many pollutants, air pollution still harms health. International information exchanges and further collaboration are needed to evaluate the risks and promote the most efficient methods to prevent, eliminate or reduce these factors, including integrating health issues with sustainable development (WHO 2006c).

Unemployment factors including job security increases health, well-being and job satisfaction, yet higher unemployment rates cause more illness and a premature death. A good diet and adequate food supply are central for the promotion of health and well-being. A shortage of food and a lack of variety may cause malnutrition and deficiency. An excess intake can contribute to cardiovascular diseases, cancer, obesity and dental cavities (Richard et al. 2003).

And yet, if these factors that social and environmental determinant that impact health are controlled, could expect to survive to become a centenarian?

New figures from the Organization for Economic Cooperation and Development (OECD) showed that Australians had the fifth highest average life expectancy, at 80.3 years. Only people in Japan (81.8 years), Iceland (80.7), Spain (80.5), and Switzerland (80.4) could expect to live longer than Australians. Korea had a life expectancy of 76.9 years, the United Kingdom 78.5 years

and Americans an average span of 77.2 (OECD 2005a).

Australians are amongst the longest living people in the developed world despite being some of the fattest. Almost 22 per cent of Australians are considered obese, the sixth-worst level in the OECD. Americans topped the list, with 30.6 per cent of US citizens considered obese (OECD 2005b). Conversely only 3.2 per cent of Koreans and Japanese are considered obese, the best level in the OECD.

Living to become a centenarian and being healthy and happy is everyone's dream, yet is not an impossible dream. In 2003, there were 73 people who were a nonagenarian age or over, per 10,000 people in the Japan and 45 per 10,000 in Australia in 2001. In 2005, there were 13 people of a nonagenarian age or over, per 10,000 people in Korea (Kim 2005).

If that is the case, we were curious to determine what become of centenarians in their social environment.

Preceding studies of centenarians have been conducted in a few countries. Specially, study of cognitive functioning in centenarians (Hagberga et al. 2001), and age changes and differences in personality traits and states of the old and very old (Poon et al. 2002), as well as first autopsy study of an Okinawan centenarian as absence of many age-related diseases,

centenarians die healthy as an autopsy study (Bernstein et al. 2004), and comprehensive health status assessment of centenarians as results from the 1999 large health survey of veteran enrollees (Selim et al. 2005). Also, investigate the prevalence of centenarians who have preserved activities of daily living (Ozaki et al. 2007) and centenarians identified individual physical actions, mental attitude, religious orientation, genetics, and help from others as reasons for their long lives (Schrader 2008).

In Korea, preceding comparative studies on centenarians and youths have been conducted (Kim 1998; Kim 1999), and distributions of polymorphisms in relation with dementia status in Korean centenarians (Choi et al. 2003). Lifestyle factor studies between gastric cancer and centenarians, and longevity factors of centenarians in Korea (Kim 2003a; Kim 2003b), and studies on social and environmental factors related to centenarians' prevalence were further undertaken (Kim 2002; Kim 2005) Also, influence social-environment factors for region of centenarians (Kim 2007a) and differences in longevity factors amongst Korean centenarians, Octogenarians, and Sexagenarians (Kim 2007b).

Previous studies of this kind were searching to recognize a prevalent factor that was linked to longevity among centenarians, and since longevity is believed to be

associated with several factors continued studies are still required to identify the secrets that lead to a long life, with focus on centenarians.

However, despite the increase of very old people in the population, there has at present been no studies applied the social environmental approach to investigate differences in factors for regional centenarians among different countries.

In particular, longevity studies of centenarians need to identify factors associated with the social environmental factors for regional among countries, which may lead to a long and happy life.

If social environmental studies of an ageing population are neglected, the ageing society results for future generations demonstrate that this can lead to serious consequences that may become catastrophic without an effective and timely action plan.

Therefore, the purpose of this paper was to identify longevity factors associated with the social environmental factors for regional of centenarians among countries, which Korean and Australian.

## **II. Methods**

### **1. Theoretical Frameworks**

In this paper, a theoretical study on social environmental factors is made within the

framework of approaches based on the results of previous studies (Kim 2002b; Kim 2005; Kim 2007a; kim 2007b; Grundy et al. 2002; Evert et al. 2003; Geller and Zenick 2005).

The approach describes social environmental factors related to macroscopic health as social-demographic factors and microscopic health as personal mental and dietary life factors. The former included urbanization, economic, pollution and dwelling factors, the latter included psychological and eating habits factors. Fig.1 shows the description of theoretical framework on social environmental factors in this paper. It will be to identify Korean and Australian centenarian differences of longevity index compared with the among countries.

The urbanization factors included the number of motor vehicles and finance independence. Because It has that in regions with lower levels of motor vehicle use there was less emission of air pollution, and that less financial of local governments may indicate why centenarian in undeveloped environment regions lived in an environment with greater fresh air. Therefore, the very elderly are particularly susceptible to dying from air pollution (Cakmak et al. 2007).

Economic factors included the degree of income. Because rising incomes can directly improve health status and lessen health inequity by financing provision of public

goods (Yusuf et al. 2007).

Pollution factors included the presence of air and water pollution as residential environmental factors. Daily increases in gases and particles are associated with increased mortality. The extremely elderly appear to be at greater risk than those who are younger (Cakmak et al. 2007). Also, elderly populations in Australia need to be protected from air pollution arising from outdoor sources to reduce cardiovascular disease (Barnett et al. 2006).

Dwelling factors included homeless, pavement of a road as residential socialness factors. Because homeless individuals are extreme examples of these overlooked populations ; they have the greatest risk of death, encounter barriers to health care, and lack the resources and relationships assumed necessary for appropriate the end of life care (Song et al. 2007).

Psychological factors included divorced and tobacco consumption. Because people aged 70 and older who were divorced had significantly higher rates of depression than widowed women (Zhang 2001). Also, gastric cancer victims where linked to smoking, twice more than in centenarians (Kim 2003a). Non-smoking can be a preventative measure for diseases such as lung cancer in the elderly (Kim, 2005). The smoke of cigarettes represents an important accelerator of the aging process, but

non-smokers can delay the appearance of diseases and of the aging process. Thus attaining longevity that non-smokers have a much higher life expectancy than smokers (Nicita-Mauro et al. 2008).

Eating habits included onion, barley, soybean, and garlic production. Because onions may be a useful herb for the prevention of cardiovascular disease, especially since they diminish the risk of blood clots (Nutrition Department, USA 2006). Also, barley has a clinical efficacy for the treatment of SARS with integrated traditional Chinese medicine and western medicine (WHO 2004). New research has shown that foods containing whole-grain barley or certain dry-milled ingredients from barley have cholesterol-lowering effects similar to those seen for certain oat foods (Aman 2006). Korean centenarians having better health due to more soybean paste and garlic intake (Kim 2003b). Allicin is the most powerful medicinal compound derived from garlic and provides the greatest reputed health benefits (Tattelman 2005).

Therefore, this paper must begin with the hypothesis that social environmental factors for regional Korean centenarians contrary to Australian are that a low economic level, fewer motor vehicles, minimum air pollution and water pollution, low divorced and unemployment rates, production of onion and soybean, low tobacco consumption, low

homelessness and low levels of paved road will be the equality score.

## 2. Participants of Study

Centenarians are a valuable resource for the study of successful aging (Perls et al. 1999). A total of 2,217 centenarians (190 men ; 2,027 women) living in Korea were considered. The sample comprised 4.68 centenarians per 100,000 populations living across the country in 2000. Total of 2,503 centenarians (784 men ; 1719 women) living in Australia were considered. The sample comprised 13.19 centenarians per 100,000 populations living across the country in 2001. As such, the overall sample size for this paper was the total number centenarians living in the two countries.

## 3. Procedure

In order to collect data on centenarians and social, and environmental factors those database and 2001 census of population were obtained from Australian State and Territory offices, Australian Bureau of Statistics (ABS, 2006) and Korea National Statistical Office (KNSO 2006).

This Researcher further spent time as visiting professor at The Australian National University to examine social environmental factors for some regional Korean centenarians and Australian from September 2005 to February 2006.

Korean centenarians were used in data of kim 2002b. Investigated data were administrated and items were classified into categories including demographic factors, physical factors, mental factors, and environmental factors (Australia NPI 2006; Korea GIS 2006) covering their way of life during the last century in a retrospective manner.

#### 4. Analyses

The comparison of social environment determinants of health among Korean and Australian centenarians were analyzed through associations between longevity index of centenarians and their associated social environmental factors for regional centenarians. The centenarian longevity index (C/P) has been calculated by dividing the total population of each country (p) by the total number of each country's centenarians (c). The longevity index of each country was calculated from states, large cities of more than million, the 162 statistical subdivisions in Australian, and the 244 Korean counties units where centenarians live except from those areas where not centenarians live.

Longevity Index (C/P)

=Centenarians(c) /Population(p)\*100,000

----- (1) (kim 2002b; kim 2007a)

A social environmental approach was used in which social economical factors, natural environmental factors, physical factors, dietary choices, living conditions and housing factors were considered. An statistical analysis was done using the Pearson's coefficient of correlation and Regression equations. For dependent variables, this study attempted to select significant variables which represents each characteristic, and organized them into economic levels (the median weekly household income and financial independence of local government), number of motor vehicles, air pollution (Sulfur dioxide SO<sub>2</sub> emissions), water pollution (Biochemical oxygen demand BOD), divorce rate, unemployment levels, the production of onion and barley, the production of soybean and garlic, tobacco consumption, homelessness and amount of paved roads (Fig.1). To identify the relationships in these variables they were rescaled from a continuous scale to the rate or number per 100 people.

### III. Results

#### 1. Differences in the longevity index for states in the two countries

Table 1 shows the comparison of the longevity index for states in Korea and Australia. Results concerning state differences indicated that the Australian state of South

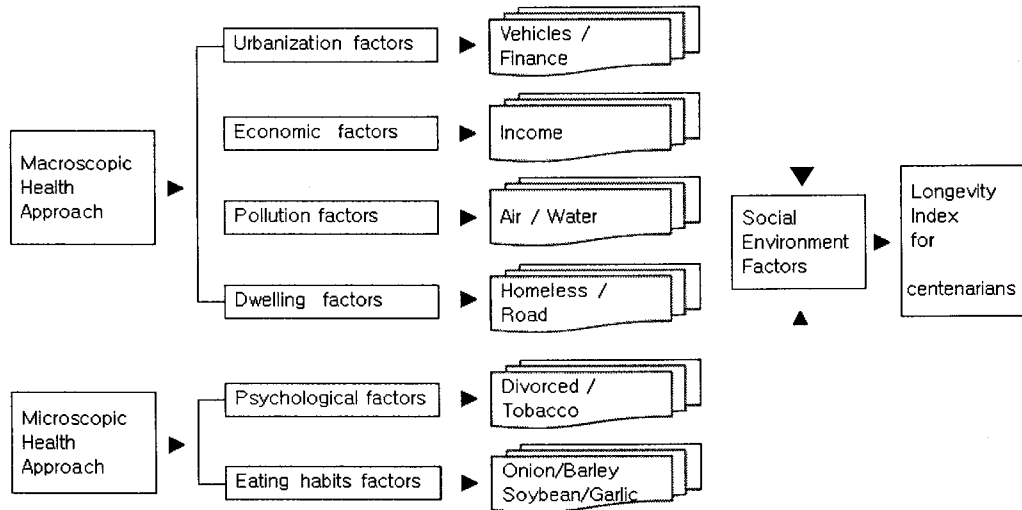


Fig.1.Description of Theoretical Framework

Australia scored the highest result in longevity index when compared with the other 7 Australian states. However, Australian Capital Territory scored the lowest in this index by about 2 times compared to South Australia. These results are indicative of the age of these

states with some states have a shorter history and period of urbanization.

In South Korea, Jeollanamdo scored the highest result in longevity index when compared with 9 states in Korea, with Gyeonggido scoring the lowest result in this

Table 1. Comparison of Longevity Index of States in Korea and Australia

| Australia                    | Longevity Index | Korea            | Longevity Index |
|------------------------------|-----------------|------------------|-----------------|
| South Australia              | 17.447          | Jeollanamdo      | 12.992          |
| Victoria                     | 14.876          | Jeollabukdo      | 9.355           |
| New South Wales              | 12.963          | Jejudo           | 8.538           |
| Western Australia            | 11.829          | Chungcheongnamdo | 8.388           |
| Tasmania                     | 11.606          | Gyeongsangbukdo  | 6.481           |
| Queensland                   | 11.381          | Chungcheongbukdo | 6.032           |
| Northern Territory           | 8.069           | Gangwondo        | 5.587           |
| Australian Capital Territory | 8.014           | Gyeongsangnamdo  | 4.351           |
|                              |                 | Gyeonggido       | 3.436           |
| Australia                    | 13.193          | Korea            | 4.683           |

Note: Longevity Index (C/P) has number of centenarians for regions per 100,000 people

Table 2. Comparison of Longevity Index of Subdivision in Korea and Australia

| Australia                      | Longevity Index | Korea                         | Longevity Index |
|--------------------------------|-----------------|-------------------------------|-----------------|
| <b>High areas</b>              |                 |                               |                 |
| Lyell Mersey -Lyell TAS        | 54.675          | Boseonggun Jeollanamdo        | 41.239          |
| Carnegie Central WA            | 50.319          | Sunchanggun Jeollabukdo       | 30.732          |
| Ord Kimberley WA               | 43.306          | Yeonggwanggun Jeollanamdo     | 28.089          |
| Riverland Murray Lands SA      | 41.094          | Damyanggun Jeollanamdo        | 24.763          |
| North Wimmera Wimmera VIC      | 35.727          | Yecheongun Gyeongsangbukdo    | 24.261          |
| <b>Low areas</b>               |                 |                               |                 |
| La Trobe Valley Gippsland VIC  | 4.233           | Haeundaegu Busan              | 1.472           |
| Outer South Western Sydney NSW | 3.982           | Suwonsi Jangangu Gyeonggido   | 1.348           |
| Belconnen Canberra ACT         | 3.672           | Nam-gu Ulsan                  | 1.227           |
| Tuggeranong Canberra ACT       | 3.474           | Bucheonsi Ojeonggu Gyeonggido | 1.073           |
| Hume City Melbourne VIC        | 2.287           | Donggu Busan                  | 0.766           |

field by about 4 times when compared with Jeollanamdo. This suggests that the development the states and the greater urbanization emitting more air pollution.

Therefore, Australian centenarians scored about 2.8 times higher in longevity index than their Korean counterparts. These results in most cases indicate environment pollution caused by urbanization and the density of population.

## 2. Comparing the highest and lowest results in the longevity index

Table 2 shows the selected highest and lowest results out of longevity index between the various statistical subdivisions in Australia and the 244 countries in Korea that except in those regions where no centenarians live. Upon comparing the

difference in Australian statistical subdivisions, the highest results were achieved by Mersey-Lyell in the Australian state of Tasmania which scored about 24 times higher in longevity index than Hume City Melbourne Victoria which scored the lowest result. Also, the highest Boseonggun Jeollanamdo scored about 54 times higher in longevity index than the lowest result in Donggu Busan in Korea.

This suggests that regions that recorded the lowest results in longevity index have been previously urbanization, have a greater density of population, and greater environment pollution, yet the highest regions in longevity index are those which are not urbanized and have less environment pollution.



Table 3. Correlation of Longevity Index and Social Environmental Factors in Korea and Australia

| Social Environmental Factors |                          | Correlation |       |        |       |
|------------------------------|--------------------------|-------------|-------|--------|-------|
|                              |                          | Australia   |       | Korea  |       |
| A1                           | Income                   | -0.900      | 0.037 |        |       |
|                              | Tobacco consumption      |             |       | -0.990 | 0.000 |
|                              | Air pollution            |             |       | -0.747 | 0.054 |
| A2                           | Barley production        | +0.733      | 0.039 |        |       |
|                              | Onion production         | +0.729      | 0.040 |        |       |
|                              | Number of Motor vehicles |             |       | -0.867 | 0.002 |
|                              | Finance independence     |             |       | -0.707 | 0.033 |
| A3                           | Income                   | -0.575      | 0.020 |        |       |
|                              | Divorced                 | -0.517      | 0.040 | -0.517 | 0.040 |
|                              | Homeless                 |             |       | -0.575 | 0.020 |
|                              | Air pollution            |             |       | -0.717 | 0.002 |
|                              | Unemployed               |             |       | -0.723 | 0.002 |
|                              | Water pollution          |             |       | -0.687 | 0.003 |
| A4                           | Air pollution            | -0.199      | 0.011 |        |       |
|                              | Number of Motor vehicles | -0.160      | 0.042 |        |       |
|                              | Soybean production       |             |       | +0.470 | 0.000 |
|                              | Water pollution          |             |       | -0.561 | 0.000 |
|                              | Garlic production        |             |       | +0.218 | 0.001 |

Note; A1: Large city of more than million peoples, A2: States, A3: States and large city of more than include Greater Hobart (TAS) Canberra (ACT) in a Australia, A4: The whole country include city and that except non-centenarians regions.

### 3. Correlation of the longevity index and social environmental factors

Table 3 shows the correlation between the longevity index and social environmental factors for regions where Korean and Australian centenarians live. When correlating the longevity index for large city with more than one million peoples scored a strong correlation with income ( $r=-0.90$ ,  $P=0.037$ ) in Australia, yet in Korea these

same sized cities had a strong correlation with tobacco consumption ( $r=-0.99$ ,  $P=0.000$ ), and air pollution ( $r=-0.75$ ,  $P=0.054$ ).

The longevity index in Australian states has a strong correlation with the production of barley ( $r=0.73$ ,  $P=0.039$ ), and onion production ( $r=0.73$ ,  $P=0.040$ ), yet in Korea there was a strong correlation with the number of motor vehicles ( $r=-0.87$ ,  $P=0.002$ ), and financial of local governments ( $r=-0.71$ ,  $P=0.033$ ).

On correlation the longevity index in Australian states and large city with more than one million people had strong correlation with the income levels ( $r=-0.58$ ,  $P=0.020$ ), and the divorce rate ( $r=0.52$ ,  $P=0.040$ ), yet in Korea these same regions had a strong correlation with the divorce rate ( $r=-0.52$ ,  $P=0.040$ ), homelessness ( $r=-0.58$ ,  $P=0.020$ ), air pollution ( $r=-0.72$ ,  $P=0.002$ ), unemployment ( $r=-0.72$ ,  $P=0.002$ ), and water pollution ( $r=-0.69$ ,  $P=0.003$ ).

The correlation of the longevity index for the whole country included city and rural areas except regions without centenarians and there was a significantly correlation with air pollution ( $r=-0.20$ ,  $P=0.011$ ) and the number of motor vehicles ( $r=-0.16$ ,  $P=0.042$ ), yet in Korea there was a significantly correlation with soybean production ( $r=0.47$ ,  $P=0.000$ ), water pollution ( $r=-0.56$ ,  $P=0.000$ ), garlic production ( $r=0.29$ ,  $P=0.001$ ).

#### 4. The influence of social environmental factors on longevity in different regions

To investigate direct relationships between social environmental variables for regions of longevity between the two countries, this researcher conducted a multiple regression analysis. Table 4 shows the analysis of social environmental factors for longevity in Korea and Australia. A regression analysis of social environmental factors for the four regions measures found

cohesion to be the strongest predictor in all four regressions in Korea and five regressions in Australia.

Social and environmental longevity predictors in large Australian cities were lower incomes (R-Sq (adj) =74.6%,  $P=0.037$ ), but in large Korean cities was lower tobacco consumption and air pollution (R-Sq (adj) =97.5%,  $P=0.000$ ).

Also, social environment longevity predictors in the states of Australia was onion and barley production, lower tobacco consumption, and homelessness (R-Sq (adj)=95.3%,  $P=0.007$ ), but in Korean states they were lower number of motor vehicles and less financial independence (R-Sq (adj)=70.5%,  $P=0.011$ ).

Social and environmental longevity predictors in Australian states and large cities were lower incomes, and lower divorce rates (R-Sq (adj)=75.0%,  $P=0.000$ ), but in Korean states and large cities they in Korea were lower levels of water pollution, less homelessness, and less paved road (R-Sq (adj) = 36.5%,  $P = 0.038$ ).

Social environment longevity predictors in Australia including city and rural that except where no centenarians live were lower levels of air pollution, homelessness, fewer numbers of motor vehicles, but in Korea predictors were less water pollution and soybean production (R-Sq (adj) = 36.3%,  $P = 0.000$ ).

Table 4. Analysis of Social Environmental Factors for Longevity Areas in Korea and Australia

| Areas            | Predictions variable | Coefficient | Constant | P     | R-Sq  |
|------------------|----------------------|-------------|----------|-------|-------|
| <b>Australia</b> |                      |             |          |       |       |
| A1               | Income               | -0.0162     | 29.549   | 0.037 | 81.0% |
| A2               | Onion production     | 0.0001      |          |       |       |
|                  | Barley production    | 0.0009      |          |       |       |
|                  | Tobacco consumption  | -11.558     | 27.422   | 0.002 | 98.0% |
|                  | Homeless             | 0.3393      |          |       |       |
| A3               | Divorced             | -4.5859     |          |       |       |
|                  | Income               | -0.0139     | 59.779   | 0.001 | 84.2% |
| A4               | Air pollution        | -0.0001     |          |       |       |
|                  | Homeless             | 0.3768      |          |       |       |
|                  | Motor vehicles       | -0.4934     | 57.961   | 0.001 | 16.1% |
| <b>Korea</b>     |                      |             |          |       |       |
| A1               | Tobacco consumption  | -3.1700     |          |       |       |
|                  | Air pollution        | -7.5000     | 16.400   | 0.001 | 98.3% |
| A2               | Motor vehicles       | -0.1120     |          |       |       |
|                  | Finance Independence | -0.0426     | 26.300   | 0.011 | 77.9% |
| A3               | Water pollution      | -0.0456     |          |       |       |
|                  | Homeless             | 0.0288      |          |       |       |
|                  | Pavement of a road   | -0.0360     | 08.001   | 0.038 | 49.2% |
| A4               | Water pollution      | -0.0875     |          |       |       |
|                  | Soybean production   | 2.9511      | 08.561   | 0.000 | 36.9% |

## IV. Discussion

### 1. Income, tobacco, and air pollution in large cities

This paper found that social environmental predictors for Australian centenarians living in large cities had lower incomes, but their Korean counterparts had lower levels of tobacco consumption, and air pollution.

This could be due to centenarians having better health due to lower levels of stress from participating in fewer economical

activities and being exposed to less air pollution by living in a less developed environment than those living in societies with high income levels in environments of developed city areas. It is of particular interest to note, people in higher-income groups tend to experience better physical health, yet this does not appear to be the direct result of access to medical care. This has prompted a search for psychological factors more likely to be present in high-income environments that might help to explain this relationship (Johnson et al.

2005). Results concerning age-group differences have indicated that centenarians recorded lower stress levels when compared with octogenarian and sexagenarian groups (Martin et al., 2002). Korean gastric cancer was recorded about 8 more times more than Korean centenarians (Kim, 2003a). This indicates that the older the person, the more mentally optimistic they are. Overall, more Korean centenarian optimists have outlived the pessimists since the former always enjoyed their lives 26 times more than the latter - a lifestyle that didn't allow for excessive anger and stress (Kim 2003b).

Additionally, the danger of tobacco usage means that non-smoking can be a preventative measure for diseases such as lung cancer in the elderly. Doctors in Shanghai performed autopsies on eight centenarians, which revealed that the main causes of death were pneumonia and cancer (Zheng et al. 1993). Furthermore, gastric cancer victims were linked to smoking, twice more than in centenarians (Kim 2003a).

Air pollution can affect centenarians' health in many ways including short-term effects like upper respiratory infections such as bronchitis and pneumonia and long-term health effects including chronic respiratory diseases. Sulfur dioxide can lead to lung diseases and continual exposure to air pollution affects the lungs of growing

children which may aggravate or complicate medical conditions in the elderly. In order to investigate risk factors for survival in centenarians, data of 299 centenarians including 175 who were deceased was analyzed and the main cause of death included respiratory diseases in 20% in Aichi Prefecture, Japan (Yagyu 2001). Furthermore, forty centenarians were identified with a median age of 100~108 years. Sixty percent were described as having been healthy before death. However, an acute organic failure causing death was found in 100%, including respiratory illnesses in 25% (Berzlanovich et al. 2005) of these cases.

Therefore, social environmental factors for Australian centenarians living in large cities live in regions with lower income, and in Korea live in regions with lower levels of smoking, and air pollution when comparing the two countries because they had lived a less stressful live in undeveloped environment in a fresh air environmental, with non-smoking.

## **2. Onion and barley, vehicles, finance in states**

It also found that centenarians had social environmental factors for Australian centenarians living in the states had greater onion and barley production, while those living in Korean states had less motor

vehicles and less finance of local government.

It is known that onions, and other members of allium species, are highly valued herbs possessing both a culinary and medicinal value. Onions may be a useful herb for the prevention of cardiovascular disease, especially since they diminish the risk of blood clots. Onions also protects against stomach and other cancers, as well as protecting against certain infections. Onion can improve lung function, especially in asthmatics (Nutrition Department, USA 2006).

The WHO reported that barley has a clinical efficacy for the treatment of SARS with integrated traditional Chinese medicine and western medicine: an analysis of 524 cases; barley are compound medical prescriptions for patients with poor appetite, for patients whose major symptom is high fever, for patients whose major symptoms

are cough and shortness of breath, and for patients at the convalescent stage (WHO 2004).

It has previously been shown that in regions with lower levels of motor vehicle use there was less emission of air pollution, and that less financial of local governments may indicate why centenarian in undeveloped environment regions lived in an environment with greater fresh air.

**3. Divorce, unemployment in states which include large cities**

This paper also found that social environmental factors for states which included large cities that Korean and Australian centenarians had lower income levels, and in Australia a lower divorce rate, however in Korean those of states which included large cities had lower levels of

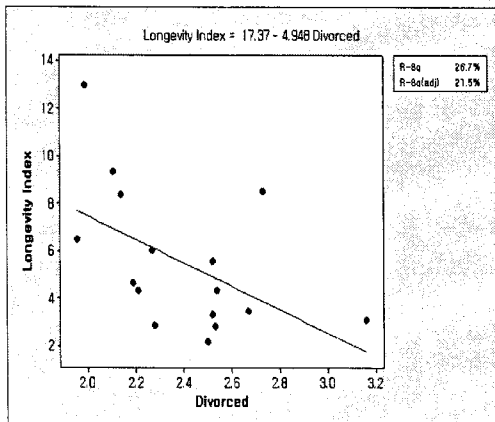


Fig.2. Longevity index and divorce for Korean

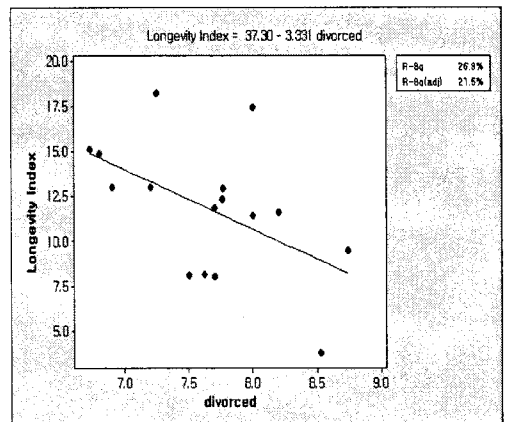


Fig.3. Longevity index and divorce for Australian

divorce, less homelessness, lower levels of air pollution, and lower unemployment when comparing the 2 countries.

Specially, it also found that divorce rate for states which included large cities that Korean and Australian centenarians had the same lower divorce levels, higher those of longevity index (Fig.2; Fig.3).

This could be due to centenarians having less stress on their health due to the lower divorce rate and unemployment in Korean and Australian regions. In particular, people aged 70 and older who were divorced and childless had significantly higher rates of depression than widowed women (Zhang 2001). Centenarians have less anxiety and depression than the subjects in the younger groups (Perls et al. 1999). Fundamentally, centenarians are known to have a low level of age-associated diseases and good mental health despite substantial physical limitations (Selim et al. 2005). Therefore, good mental health means that a non-stress live had lower levels of divorce and unemployment. Those who do not get angry and control stress are believed to live longer.

#### **4. Soybean and garlic, water pollution in the whole country**

It also found that social environmental factors for the whole country including city and rural areas except for those where not centenarians lived that Australian

centenarians lived in areas with lower levels of air pollution, and lower levels of motor vehicles usage, but those in Korea lived in areas with soybean production, less water pollution, garlic production when the two countries were compared.

This could be due to Korean centenarians having better health due to more soybean paste and garlic intake. In particular, the ratios of vegetarians among centenarians including those who consume a small quantity of meat, reside in a rural districts, those who eat light meals, and those who eat soybean paste soup everyday (Kim 2003b). Allicin is the most powerful medicinal compound derived from garlic and provides the greatest reputed health benefits. Garlic health benefits and medicinal properties have long been known (Tattelman 2005). Garlic has long been considered an herbal wonder drug, with a reputation for preventing everything from the common cold and flu to the Plague.

Polluted water like chemicals in drinking water can cause health problem and lead to water-borne diseases. Eventually, it is a hazard to human health. Nobody can escape the effects of water pollution. Therefore, the worse the levels of water pollution on the environment the lower the longevity index for Korean and Australian centenarians.

## V. Conclusion

In conclusion, when comparing Korean and Australian centenarians, it becomes evident that regions with lower income levels and smoking, less air pollution, higher onions and barley production and consumption, lower levels of motor vehicles, less financial independence of local government, and lower divorce, less unemployment rates, higher soybean and garlic production and consumption, and less water pollution. This is due to regions of longevity almost always having fresh air and clean water, good food, good family health well, low unemployment levels, low tobacco consumption, and low levels of development in the environment. Thus, the social environmental factor for regions centenarians of the two countries which leads to a long life is the result not of inherent but the control of acquired factors.

## References

- Aman, P. 2006. Cholesterol-lowering effects of barley dietary fibre in humans: scientific support for a generic health claim. *Scandinavian Journal of Food and Nutrition*, (50): 173-176.
- Australian Bureau of Statistics (ABS), 2006. 2001 Census Data by Location Name.
- Barnett, AG, Williams GM, Schwartz J et al. 2006. The Effects of Air Pollution on Hospitalizations for Cardiovascular Disease in Elderly People in Australian and New Zealand Cities. *Environmental Health Perspectives* (114): 1018 - 1023.
- Bernstein AM, Willcox BJ, Tamaki H, Perls TT et al. 2004. First Autopsy Study of an Okinawan Centenarian: Absence of Many Age-Related Diseases. *J. Gerontol. A Biol. Sci. Med. Sci.*, (59): 1195-1199.
- Berzlanovich AM, Keil W, Waldhoer T, Sim E et al. 2005. Do Centenarians Die Healthy? An Autopsy Study. *J. Gerontol. B. Psychol. Sci. Soc. Sci.* (60):862-865.
- Cakmak S, Dales RE, and Vidal CB. 2007. Air Pollution and Mortality in Chile: Susceptibility among the Elderly. *Environmental Health Perspective*, (115): 524-527.
- Choi YH, Kim JH, Kim DK et al. 2003. Distributions of ACE and APOE Polymorphisms and Their Relations With Dementia Status in Korean Centenarians. *J. Gerontol. A Biol. Sci. Med. Sci.*,(58): 227-231.
- Evert J, Lawler E, Bogan H and Perls T, 2003. Morbidity profiles of

- centenarians: Survivors, delayers, and escapers. *Journal of Gerontology, Medical Sciences* (58):232-237.
- Geller AM and Zenick H. 2005. Aging and the Environment: A Research Framework. *Environ Health Perspect*, (113): 1257-1262.
- Grundy E, Glaser K. 2002. Socio-demographic differences in the onset and progression of disability in early old age: a longitudinal study, *Age and Ageing*, (29): 149-157.
- Hagberga B, Alfredson BB, Poon LW, Hommac A. 2001. Cognitive functioning in centenarians: A coordinated analysis of results from three countries. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, (56): 141-151.
- Johnson W, Krueger RF. 2005. Predictors of Physical Health: Toward an Integrated Model of Genetic and Environmental Antecedents. *J. Gerontol. B. Psychol. Sci. Soc. Sci.* (60): 42-52.
- Kim JI. 1998. Analysis of health factor for longevity of centenarians in Korea. *Journal of the Korea Health & Welfare Society*, (1): 9-38.
- Kim JI. 1999. Comparative analysis of health factor for youth-adult and centenarians in Korea. *Journal of the Korea Health & Welfare Society*, (2): 9-37.
- Kim JI. 2002a. Longevity and occupation. *Age and Ageing*, 31(6): 485-487.
- Kim JI. 2002b. Social-environment factors by region of centenarians. *Journal of the Korea Gerontological Society*, 21(3): 157-168.
- Kim JI. 2003a. Lifestyle factors between gastric cancer and centenarians. *Korea Association of Health and Medical Sociology*, (14): 233-247.
- Kim JI. 2003b. Longevity factors of centenarians in Korea. *Journal of Korean Society for Health Education Promotion*, 20(4): 41-50.
- Kim JI. 2005. Social-environmental factors by region for cause of death of elderly people in Korea. *Journal of the Korea Gerontological Society*, 2005; 25(2): 9-19.
- Kim JI. 2007a. Influence Social-Environment Factors for Region of Centenarians. *Journal of the Korea Gerontological Society*, 2007; 27(3): 635-647.
- Kim JI. 2007b. Difference in Longevity Factors amongst Korean Centenarians, Octogenarians, and Sexagenarians. *Journal of Korean Society for Health Education Promotion*, 24(5): 51-64.
- Korea National Statistical Office (KNSO). 2005. 2000 Census population.
- Martin P, Long MV and Poon LP. 2002. Age changes and differences in



- personality traits and states of the old and very old. *J. Gerontol. B. Psychol. Sci. Soc. Sci.* (57): 144-152.
- Nicita-Mauro V, Balbo CL, Mento A. et al. 2008. Smoking, Aging and the Centenarians. *Experimental Gerontology*, (43): 95 - 101.
- Nutrition Department, MI, USA. 2006. Onions are Beneficial for Your health. <http://www.vegetarian-nutrition.info/updates/onions.php>
- OECD, 2005a. OECD Health Data 2005: Life expectancy (in years), Females, Males and Total Population at birth (Excel), xls, 35Kb, English. <http://www.oecd.org/dataoecd/7/42/35530071.xls>
- OECD. 2005b. OECD in Figures 2005 - Health status table. Xls English. <http://ocde.p4.siteinternet.com/publications/doifiles/012005061T003.xls>
- Ozaki, Uchiyama and Tagaya et al. 2007. The Japanese Centenarian Study: Autonomy Was Associated with Health Practices as Well as Physical Status. *J Am Geriatr Soc*, (55):95-101.
- Perls TT, Bochen K, Freeman M et al. 1999. Validity of reported age and centenarian prevalence in New England. *Age and Ageing*, (28): 193-197.
- Republic of Korea, Ministry of Environment, National Institute of Environmental Research. 2005. 2000 Environmental web GIS serves system.
- Richard W, Michael M. 2003. Social determinants of health: the solid facts. 2nd edition, World Health Organization, Regional Office for Europe: 1-31
- Schrader SL. 2008. Centenarians' Views on Long Life and Nursing Home Living. *J Am Med Dir Assoc*, (9): 45-50.
- Selim AJ, Fincke G, Berlowitz DR, Miller DR, Qian SX, et al. 2005. Comprehensive Health Status Assessment of Centenarians: Results From the 1999 Large Health Survey of Veteran Enrollees. *J. Gerontol. A Biol. Sci. Med. Sci.*, (60): 515-519.
- Song J, Bartels DM et al. 2007. Dying on the Streets: Homeless Persons' Concerns and Desires about End of Life Care. *Society of General Internal Medicine*,(22) : 435-441.
- Tattelman E. 2005. Health Effects of Garlic, The American Academy of Family Physicians, 103.
- The Australian Government, Department of the Environment and Heritage. 2006. 2001 The National Pollutant Inventory (NPI).
- WHO. 2004. SARS: Clinical Trials on Treatment Using a Combination of Traditional Chinese Medicine and Western Medicine. Report 2: Clinical efficacy of the treatment of SARS with

integrated Traditional Chinese medicine and Western medicine: an analysis of 524 cases. 194.

WHO. 2006a. Commission on Social Determinants of Health.

[http://www.who.int/social\\_determinants/en/](http://www.who.int/social_determinants/en/)

WHO. 2006b. Protection of the human environment health topics.

[http://www.who.int/phe/health\\_topics/en/index.html](http://www.who.int/phe/health_topics/en/index.html)

WHO. 2006c. Air quality and health.

<http://www.euro.who.int/air>

WHO. 2005. The world is fast ageing - have we noticed?

<http://www.who.int/ageing/en>.

Yagyu K, Kikuchi S and Tauchi H. 2001. Risk Factors for Total Mortality in Centenarians in Aichi Prefecture, *Japan Annals of the New York Academy of Sciences*, 928:380.

Yusuf S, Nabeshima K, and Ha W. 2007. Income and Health in Cities: the Messages from Stylized Facts. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, (84), 35-41.

Zhang Z, Hayward MD. 2001. Childlessness and the Psychological Well-Being of Older Persons. *J. Gerontol. B. Psychol. Sci. Soc. Sci.* (56):311-320.

Zheng ZX, Wang ZS, Zhu HM et al. 1993. Survey of 160 centenarians in Shanghai. *Age and Ageing*, (22): 16-19.

## ABSTRACT

The purpose of this study was to investigate differences in regions and social environmental factors for centenarians between two countries. The sample sizes for this paper were a total number of centenarians in the two countries. Centenarians from different regions were examined in conjunction with the social environmental factors of the longevity approach. Statistical analysis was done using the Pearson's coefficient of correlation and regression equations.

It became evident that centenarians among two countries lived in regions with lower income levels, lower tobacco consumption, lower levels of air pollution, onion and barley productions, fewer motor vehicles, a lower divorce rate, lower unemployment, soybean and garlic productions, and less water pollution.

The finding imply that centenarians among two countries lead to a life of longevity is the result not only social environmental factors reactions that have fresh air, clean water and health food but also of health behaviors that have bacco consumption and divorce rate. Also, these support future studies of improvement of social environmental pollution, agricultural products of health food, and health behaviors of nonsmoking for life of longevity.

**Key Words:** Social Environmental Factors ; Korean ; Australian ; Centenarians

<국문초록>

## 한국과 호주 백세인의 사회 환경요인

이 연구의 목적은 한국과 호주 백세인의 사회 환경요인을 규명하고자 시도되었다. 조사대상은 양국가의 통계청에서 산출한 백세인 전체를 표본으로 하였다. 백세인의 지역에 대한 차이는 장수요인과 연관된 사회 환경요인을 선정하여 조사 분석하였다. 자료처리는 피어슨 상관관계(Pearson's Coefficient of Correlation)와 회귀방정식 (Regression Equations)을 활용하였다.

분석결과, 양국가의 백세인 거주 지역은 소득수준이 낮고 담배 소비량도 적으며, 대기오염도 낮고 양파와 보리를 생산하고, 콩과 마늘을 재배하며, 자동차가 적고 이혼율이 낮으며, 실업비율이 낮고 수질오염이 적은 지역이었다. 이와 같은 연구결과를 볼 때, 양국가의 백세인은 건강식의 농산물생산과 사회 환경요인이 장수요인으로 작용한 것으로 판단된다. 그러므로 백세인의 건강증진을 위한 사회 환경요인은 건강식품, 쾌적한 환경, 금연 및 건강행태 등으로 이들에 대한 노인보건교육과 지속적인 노인들의 건강증진 연구가 진행되어야 할 것으로 사료된다.

주제어: 한국인, 호주인, 백세인, 사회 환경요인