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Verification of Reported Age of Centenarians in Thailand

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Abstract

The objectives of this study were to verify the number of Thai centenarians based on the Thai population registration database and to study the causes for an upward bias of age reporting among centenarians. A phone-based sample survey was conducted with key informants to compare registration data with the de facto number of living centenarians. A sample of presumed centenarians in a sub-set of Thailand's 76 provinces was selected to confirm the existence of the centenarians, along with their age, and to explain any discrepancies with registration data. This study found that among 358 recorded centenarians, only 53 (15%) were found to be still alive at the time of data collection. Among those who were still alive, 45 were contacted in person, with only 20 (44.4%) confirmed to be centenarians (i.e., age of 100 years or older). Older persons tend to misreport their age, usually with an upward bias, or the inaccuracy could be from an erroneous entry of the date on the birth certificate or household registration book. Furthermore, non-notification of death was the leading reason for not discharging deceased persons from registration data, thus contributing to an over-count of living centenarians. Based on the findings of this study, the authors provide recommendations for improving the quality of the population registration data, especially for Thailand's centenarians, and guidelines for future related research.

Keywords

Centenarian; older persons; registration data; reported age; Thailand

Introduction

The age structure of the population in many countries is shifting towards a more aged society. Thailand became an aged society in 2005 when the proportion of age 60 years or older individuals exceeded 10% of the overall population (The Foundation of Thai Gerontology Research and Development Institute, 2016). In mid-2020, Thailand had an estimated population of 66.5 million. Of this population, 12 million are older persons (age 60 years or above), or 18% of the total population (Office of the National Economic and Social Development Council, 2019). As a result of becoming an aging society, living beyond 100 years old does not seem so unusual anymore.

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Human longevity (i.e., life expectancy) is often confused with life span (Siegel, Swanson, & Shryock, 2004). Life span refers to the extreme limit in which the human body can survive in favorable natural conditions, and does not vary much among populations around the world (Dublin & Lotka, 1949). By contrast, life expectancy refers to the average number of years a person can expect to live (World Health Organization, 2006). Average life expectancy at birth of a population is strongly affected by the level of infant mortality and can vary widely among societies around the world.

At present, life expectancy is increasing globally, mainly due to improved environmental sanitation, medical services, and public health coverage of the population. While the maximum human life span has probably close to 120 years for the past millennium, global life expectancy at birth has nearly doubled in the past two centuries. In 2020 the life expectancy was about 70.8 years for men and 75.6 years for women (United Nations, 2019).

As a by-product of this increased longevity in the human population, centenarians are a unique group because of the milestone of having lived a full century (Robine, Saito, & Jagger, 2009). Indeed, several studies found that centenarians represent a model for healthy aging, and for understanding exceptional longevity (Balistreri et al., 2014; Motta, Bennati, Ferlito, Malaguarnera, & Motta, 2005). This noteworthy increase in the 'oldest-old' (age 80 years or older) is mainly due to the reduction in mortality below the age of 80 years (Thatcher, 1999). The growth in the number of centenarians around the world is quite remarkable. It is estimated that there were globally about 573,000 centenarians in mid-2020 (United Nations, 2019). What is more, this segment of the population is expected to quadruple in the next 30 years (United Nations, 2019). However, in order to track and study this exceptional group of the population, verification of age is critical, as well as consistency of age reporting across age groups. Thus, age reporting is a fundamental concern in the study of health and longevity (Yi, 2008). Several studies of the centenarian population have documented the major challenges of reliable age verification (Perls, Bochen, Freeman, Alpert, & Silver, 1999; Saito, Yong, & Robine, 2012; Yi, 2008).

In Thailand, the source of centenarian data is mainly taken from the population registration system. Although the quality of Thai registration data has improved over time, some studies have found inconsistencies, particularly with the number of centenarians (Hill et al., 2007; Prasartkul & Vapattanawong, 2006; Preston & Hill, 1980; Rukumnuaykit, 2006; Tangcharoensathien, Faramnuayphol, Teokul, Bundhamcharoen, & Wibulpholprasert, 2006; Vapattanawong & Prasartkul, 2011). The challenge for verification of centenarian data is two-fold: 1) What is the best approach to verifying the centenarian database in Thailand? and 2) What are the reasons why the number of centenarians is consistently overestimated?

Objectives

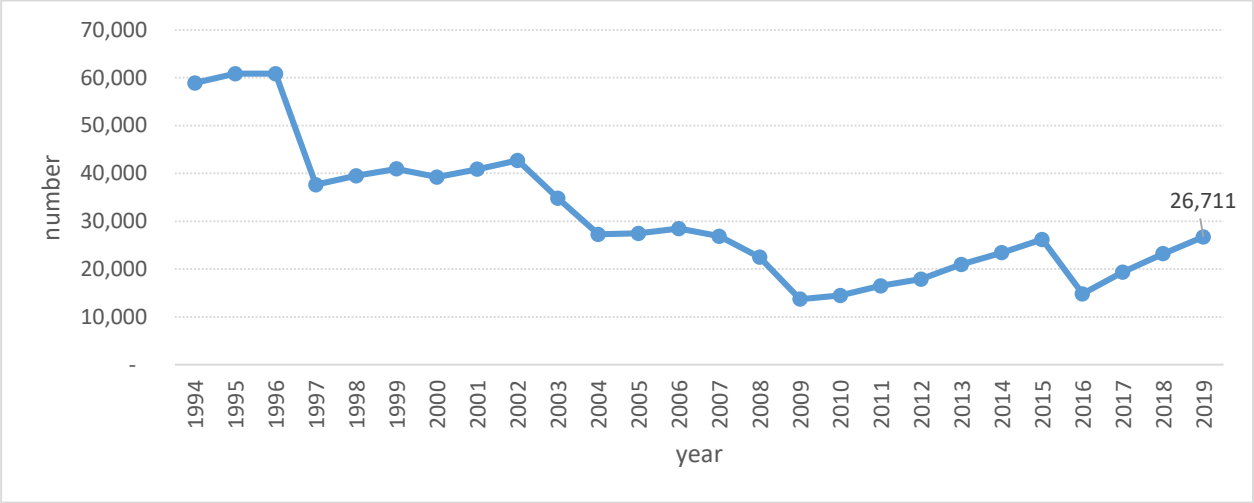
1. To verify the accuracy of the centenarian database in Thailand;
2. To study the reason for an upward bias of age reporting and the over-count of Thai centenarians.

Verification by demographic procedures

Verification of reported age is an essential step in studies of the oldest-old and centenarians. Several studies have attempted to verify the exact age of supposed centenarians in the population registration system. Multiple procedures were used for age verification, including face validity and concurrent validity. The personal identification (ID) documents of centenarians such as birth certificate, medical records, school records, military certificates, old passports, school report cards, or other official documents that list a person's age can be used as a primary measure of the person's age, (Gondo, Hirose, Yasumoto, Arai, & Saito, 2017; Perls et al., 1999; Willcox, Willcox, He, Wang, & Suzuki, 2008). Data from these sources can be triangulated with information from face-to-face interviews with centenarians, and their family members, cousins, or neighbors to confirm the exact age of the centenarians.

Nevertheless, for the oldest-old persons in Thailand, verification of age can be problematic. Many centenarians do not have birth records nor other documents to confirm their stated age. Also, the key informants may not have an objective way to confirm a person's age. According to the registration database, the number of Thai centenarians fluctuated for the period from 1994 to 2018. In 1995 and 1996, the data indicated that there were more than 60,000 Thai centenarians or about 0.1% of the total population (Figure 1). After 1996, the number of centenarians dropped sharply to less than 40,000 and then stabilized at around 35,000 to 41,000 from 1997 to 2003. However, from 2004 to 2008, the number of centenarians declined again, fluctuating in the range of 22,000-28,000. Then, in 2008, the total plummeted to 13,692 before doubling to 29,092 in 2015. In 2016, the number of centenarians decreased by nearly two-thirds to 11,905. These sudden reductions are due to the periodic purging of deceased persons from the population registration. Starting in 2016, the number of Thai centenarians has resumed a steady increase (with the same approximate slope as the period 2009 to 2015) and reaching 26,711 in 2019.

Figure 1: Reported number of Thai centenarians based on the population registration system: 1994-2019



Source: Department of Provincial Administration (2020)

The vital registration system in Thailand

The vital registration system in Thailand was first established as an attempt to prevent an epidemic of plague during the later period of the reign of King Rama V (circa 1909). The system was designated as national law in 1917, and enumerators collected and recorded population statistics from all households throughout the kingdom (Department of Provincial Administration - DOPA). The Bureau of Registration Administration (BORA) of DOPA of the Ministry of Interior, is the government organization responsible for collecting vital registration data. The total number of the registered populace in Thailand at the end of each calendar year is tabulated by province then announced to the public. The vital events include three types of data consisting of births, deaths, and in-out migration from the household (DOPA, 2020). Afterward, the resident (i.e., household) population is calculated by adding births and in-migrants and subtracting deaths and out-migrants.

According to the Thai Registration Act of 1991, registration of birth must be within 15 days post-partum, and within 24 hours of death or after the corpse is found. For birth and death registration, both events must be reported at the local registrar's office by the household head or proxy. In case of events occurring in remote areas, the notification can be made with the local tambon (sub-district) chief or village headman. For births and deaths occurring in a hospital, the attending physician will provide a report of a birth/death form, which the registrar then uses to issue the birth or death certificate to the household. The registrar will then enter the information into the database. Besides providing counts of the de jure population, the registration system data are used for other purposes, such as identifying males who are eligible for the military draft (at age 21), and taxation (DOPA, 1999; Prasartkul & Chuanwan, 2006).

In 1995, the population registration system in Thailand was computerized (DOPA, 1999), and this greatly improved the ability to tabulate and analyze the data for the country, or by province and district. In addition, all Thai citizens (age 7 years or older) can be identified and enumerated through their unique 13-digit ID number. However, there are inevitably gaps in the registration database since not all births and deaths are reported promptly, or some citizens may not have received an ID card for various reasons.

This study is interested in an apparent anomaly of the population registration database, namely, the fact that the reported number of living Thai centenarians is consistently disproportionate to the actual number. Most of this inaccuracy is due to the delayed purge of dead centenarians from the database (Chuanwan, Prasartkul, Chamratrithirong, Vapattanawong, & Hirschman, 2012; Prasartkul & Chuanwan, 2006). Other related studies include those of Prasartkul and Vapattanawong (2006) who studied the completeness of death registration, Knodel and Chayovan (1991), and Chamratrithirong, Debavalya and Knodel (1978) who studied age and birth data reporting in Thailand, and Preston and Hill (1980) calculated estimates of the completeness of death registration in Thailand. All these studies found significant inaccuracies and inconsistencies in the vital registration database.

Methodology

This paper is a part of a primary research project titled "Study of Centenarians in Thailand", with support from the Thailand Science Research and Innovation (TSRI). The data used in this study are from the population registration database of DOPA. The primary data used to identify Thai centenarians include name (confidential), age, gender, date of birth, and location of residence. The population for this study is the persons who were reported to have been born in 1915 or before (i.e., age 100 years or over in 2015). As of November 2015, there were 29,092 persons age 100 years or older in the national database. Seven provinces from each of the four geographic regions (total 28 provinces), and seven districts in Bangkok were selected by cluster sampling. Calls were made to the relevant persons of the district or Tambon Administrative Organization (TAO), and to the village headman or other community leaders to determine whether a local resident listed as age 100+ years was present or known to be alive. Through this process of phone contact with key informants, a total of 6,840 persons were identified who had reported birth dates before 1 January 1915 and were still alive.

To verify the exact age of these persons, the researchers randomly selected four provinces: Chainat in Central Thailand, Payao in the North, Khon Kaen in the Northeast, and Phuket in the South. The teams traveled to the field to conduct on-site interviews with the presumed centenarians or key informants. The total number of centenarians as recorded in the registration database as of November 2015 for these four provinces was 358 cases. Researchers attempted to locate all reported centenarians by visiting their homes and using personal interviews with them or a key informant (e.g., immediate relative, caregiver) to verify their age. The duration of the interview was about 30 minutes, and the interviews were recorded. The protocol and data collection tool for this study was approved by the Human Research Ethics Committee of the IPSR-Institutional Review Board (IPSR-IRB), with an approval number of COA. No. 2015/1-1-121.

Results

The demographic characteristics of centenarians in 2015

As noted, the Thailand population registration database indicated that the country had 29,092 living persons who were age 100 years or older as of November 2015 (Table 1). Females outnumbered males, and about one in five had a reported age of 110 years or older, or "super-centenarian". However, based on previous studies of the Thai registration system, it is probable that the total of nearly 30,000 Thai centenarians is a serious overestimate.

Table 1: Number of centenarians by gender and age in the Thai population registration database: November 2015

Age	Year of birth	Male	Female	Total
100	*1915*	1,853	2,221	4,074
101	*1914*	2,064	2,249	4,313
102	*1913*	1,332	1,487	2,819
103	*1912*	1,156	1,101	2,257
104	*1911*	1,394	1,409	2,803
105	*1910*	1,167	967	2,134
106	*1909*	928	909	1,837
107	*1908*	487	494	981
108	*1907*	439	402	841
109	*1906*	411	437	848
110+	*Before 1906*	3,168	3,017	6,185
Total		**14,399**	**14,693**	**29,092**

Source: Department of Provincial Administration (2020)

Proof of life procedure

As the first step in contacting a presumed centenarian, the researchers called key informants in the four sample provinces to compare registration data with the de facto status of the person in question (some individuals may not have been removed from the database post-mortem). Then, from March to May 2016, field staff visited the actual household of those persons listed as age 100+ years. The data in Table 2 shows that of the 358 persons who were in the registration database and reported to be age 100+ years, only 53 were still alive (or about 15%) at the time of on-site household data collection.

Table 2: Number of presumed centenarians in the registration system and number confirmed to be still alive, by sample province (region)

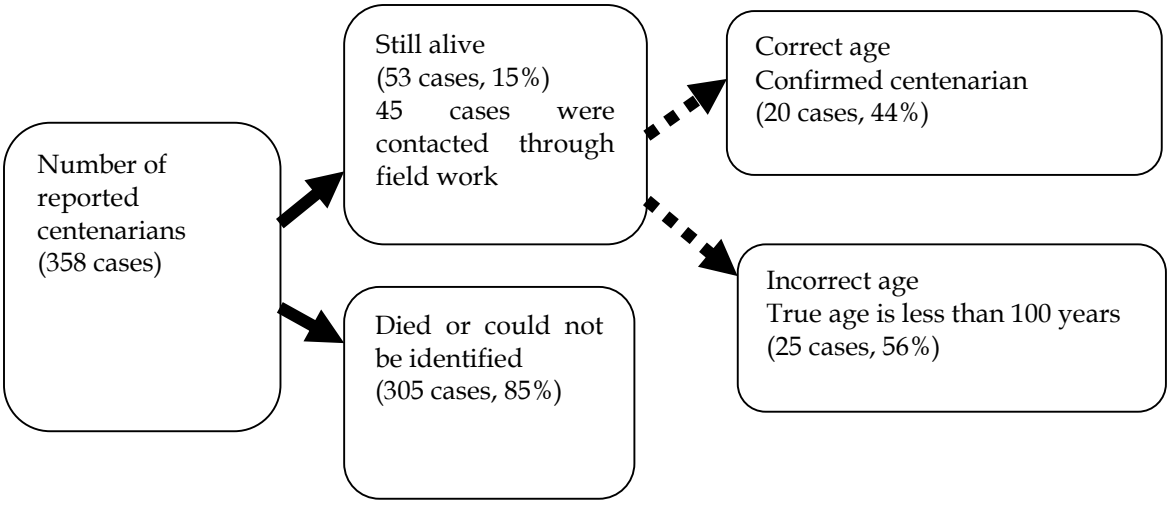
Province (region)	Number of presumed centenarians reported by the registration system	Number of presumed centenarians still alive	% still alive
Chainat (Central)	77	24	31.2
Payao (North)	31	12	38.7
Khon Kaen (Northeast)	185	11	5.9
Phuket (South)	65	6	9.2
Total	**358**	**53**	**14.8**

Age verification

To determine whether the person listed as a centenarian was age 100 years or older, the respondents were asked the Chinese animal year of birth, and that was compared with any paper documentation with a date of birth. In Asian cultures, older people are more likely to cite one of the 12 animals in the Chinese zodiac to define their year of birth rather than a numerical year (Willcox et al., 2008; Yi, 2008). If the reported age differed significantly from that recorded in the registration system, the possible reasons for the errors were investigated. In the absence of paper documentation, to confirm the age of the presumed centenarian, the field staff asked about the age of the respondent's first and last child, age at marriage, siblings' ages, and spouse's age (for male centenarians). Respondents were also asked about important events in their life (e.g., when they first entered school, when they first met their spouse).

Of the 53 presumed centenarians, 45 were contacted by the field research team. Of these, 20 (44.4%) were confirmed to be age 100 years or older (Figure 3). Female centenarians outnumbered their male counterparts by a ratio of 9 to 1 (Table 3).

Figure 3: The status of 358 centenarians listed in the population registration database



There were only 20 living centenarians who were true centenarians (i.e., with an age of 100 years or over). These centenarians' ages ranged from 100 to 109 (Table 4).

Table 3: Number and percentage of reported centenarians who had the correct age

Information	Male	Female	Total
Reported centenarians in sample provinces	7	38	45
Confirmed centenarians	2	18	20
%	28.6	47.4	44.4
Ratio: Male: Female (confirmed centenarian)			1:9

Table 4: Validity of centenarian age as reported in the population registration system by gender

Age	Male			Female			Total
	Correct	Incorrect	Total	Correct	Incorrect	Total	
100	1	0	1	1	0	1	2
101	1	3	4	5	7	12	16
102	0	1	1	2	2	4	5
103	0	0	0	4	5	9	9
104	0	1	1	0	6	6	7
105	0	0	0	1	2	3	3
106	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0
108	0	0	0	1	1	2	2
109	0	0	0	0	1	1	1
Total	**2**	**5**	**7**	**14**	**24**	**38**	**45**

The reasons for age misreporting and undercount of the number of centenarians in the Thai population registration database

Based on the quantitative and qualitative data collection, it is possible to conclude the following as the causes of age misreporting and underestimate of the number of Thai centenarians:

1) Most Thais assume that the listed date of birth of the person in the household registration or on the national ID card is accurate. In nearly every case where the researchers were able to contact the household of a presumed centenarian, the person of interest or their younger relatives/caregivers would present the national ID card or household registration booklet to confirm that the person was age 100 years or older. In the words of one female respondent, incorrectly listed in the population registration system as age 103 years:

> *"These days, I am always hesitant to say what my real age is. I can't really remember anymore, and I'm afraid of reporting a wrong age, or being accused of lying."*

2) Centenarians tend to remember their age in relation to prominent public figures, such as the King, or revered monks. However, some claim that the local registrar made a mistake. In the words of a woman who was incorrectly registered as age 101 years:

> *"I was born in the same year as King Rama 9 (i.e., age 89 years), which is less than 100 years. But the registration date of birth is wrong. In the old days, the person who registered my birth was the kamnan (sub-district chief), and he made a mistake when reporting my date of birth and never bothered to correct it."*

3) Some centenarians are not listed by name in the household registration book. However, when fact-checking with neighbors, senior members of the community can confirm that the person is a resident and can estimate when the person was born. In the words of one woman (incorrectly listed in the database as age 100 years):

> *"Around here, I don't think there is anyone left who is over 100 years old. The oldest are in their 80s. For example, just two houses down -- the house with a fence has some older persons."*

4) Another type of mistake in age-reporting occurs if the local community leader enters the wrong name of the person in the household registration. This mistake can cause a discrepancy in reporting the date of birth. In the words of one woman (incorrectly listed as a centenarian):

> *"The kamnan just took my husband's age and assigned it to me in the household registration book. In fact, we are one Zodiac cycle (i.e., 12 years) apart in age. I am not 100 years old yet."*

5) In some cases, a person knows that their age in the household registration is wrong, but sees no reason to have it changed. Some have tried to have it corrected but failed. In the words of one woman:

> *"Actually, I am not 100; I am only 88 years old. I told the district registrar, but he didn't fix it. My ID card says I'm 100 years old, and I get a higher elderly welfare subsidy of 1,000 baht (per month), so what's the use in correcting it?"*

6) In a few cases, the researchers found that incorrect age reporting occurred due to a centenarian's tendency to over-report age by one Zodiac animal cycle (i.e., 12 years), and that can introduce errors into the registration database that are hard to detect and correct.

Thus, a principal source of age misreporting in the population registration system is a lack of conscientiousness on the part of local community leaders, or a rigidity in the system, which

discourages making changes to data that are already in the system. These errors are random and, thus, hard to correct by statistical corrections.

Discussion and conclusions

This study aimed to verify the database of centenarians in Thailand and to study the reasons for an upward bias in age reporting of older Thais. The focus of this study was persons who were born in 1915 or before (i.e., age 100 years or over in 2016). The Thai population registration database indicated that there were 29,092 Thai centenarians as of November 2015. Phone calls were made to the local offices and community leaders to try to determine if persons listed as 100+ years were, in fact, still alive and present in the community. In order to verify the data, a team of researchers traveled to a representation of communities to conduct household visits and to conduct interviews to triangulate the officially-reported data with documented evidence and first-hand reports by the person of interest and their relatives/caregivers. The over-count of the number of centenarians found in this study reflects the shortcomings of the registration data. In the sample of 45 living persons who were listed in the registration as age 100 years or older, less than half (20 cases) were confirmed as centenarians. Female centenarians outnumbered males by a ratio of 9 to 1.

In studying the accuracy of the reported number and age of centenarians, it is essential to have enough information that can be triangulated to verify the exact age. In Thailand, there are limitations in obtaining supporting documentation (e.g., birth certificate, ID card, school records), and that can leave the only official source being the household registration, which may not be updated in a timely fashion, or if at all. Other countries have also studied the accuracy of age reporting for their oldest-old and centenarian group, and some have multiple independent sources of data with to compare. For example, Japan has the following sources for age estimation: 1) Family Registration System (Koseki); 2) Resident Registry System (Jyumin-hyo); 3) Census; 4) Japan Pension Service (JPS; Nippon Nenkin Kiko); and 5) Centenarian list (Zenkoku Koreisha Meibo) (Saito et al., 2012; Willcox et al., 2008).

Similarly, in the US and UK, there are multiple sources of data for age, including the decennial census, the social security system, military certificates, old passports, family bibles, and baptismal or other church certificates (Perls et al., 1999; Rosenwaike & Stone, 2003).

By contrast, this study had to rely on more qualitative information sources such as life history and memory, with assistance from younger family members and caregivers. That information can help support or cast doubt on the data in the registration system in the absence of more objective evidence of age. The researchers are confident that most Thai centenarians can accurately recall the animal year (Chinese Zodiac) in which they were born. While the animal years themselves on a 12-year cycle, it is possible to determine which cycle the respondent is referring to by anchoring the year with other important life events. Thus, at present, enumeration of centenarians in Thailand should use a comprehensive approach which merges all the relevant information listed in official and non-official documents and rank or weight them by plausibility.

A chief concern that emerges from this study is how can the oldest-old and centenarians in society be motivated to see the importance of obtaining and retaining documents, and other information

that can verify their age. This study found that most centenarians did not appreciate the importance of the population registration system, at least regarding age reporting. Also, there may be complacency or resignation among these older persons after they have tried and failed to correct errors with their age in the registration system. Finally, there actually may be an incentive to be erroneously reported as older than one truly is since the state's elderly monthly cash subsidy increases with age. As information technology improves, and more and more households have the capacity for video calls, it should be possible to conduct more qualitative outreach remotely, and to review physical documentation through video.

The findings from this study should be useful for both the Bureau of Registration Administration (BORA) and the Department of Provincial Administration (DOPA), as long as they see the importance to accurately enumerating the number of Thai centenarians, and reducing the amount of age misreporting and over-counts of the elderly due to lax purging of the database to correct for deaths. If a more precise number of centenarians is known, then that would help the government to focus on specific policies and programs for these select members of society.

The reader should be reminded of some limitations of this study. The step in data collection which relied on phone calls to local officials is subject to reporting errors or guesswork, especially if the key informant is not a member of the centenarian's family. Also, the sample for the on-site field verification was small and limited in geographic scope. In addition, the researchers did not attempt to verify that the death of a listed centenarian occurred or to locate those who were lost-to-follow-up.

It is a demographic certainty that the number of centenarians will continue to increase in the future. Thus, policies and programs need to focus on improving and maintaining the quality of life of its oldest-old members by expanding health care, social welfare, and housing subsidies for this segment of the population.

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