

A) Introduction – Health and Ageing in the 21st Century in Singapore

Singapore is a rapidly ageing society with an average life expectancy of 83 (WHO, 2014). Between the 1970s and 2014, the median age in Singapore increased from 19.5 to 39.3 years old, and the old-age support ratio[†] decreased from 17 to 6.6. Population ageing in Singapore is partly attributed to the prolonged life expectancy, which increased by 10 years between 1983 and 2013 (Department of Statistics, 2014a). Meanwhile, the low fertility rate accelerated the ageing process: although there have been slight fluctuations, the fertility rate has been consistently decreasing and remained lower than the replacement rate since 1977 (WHO, 2014).

Of significance is the social transformation of the ageing cohort. Over 900,000 baby boomers (those born between 1947 and 1964) are moving into the post-65 years cohort. In terms of the demographic profile, they are different from their predecessors. The “new-old” and young-old (those approaching 65 years) are more educated, more affluent, and spent most of their adulthood in modern Singapore. Given their significantly different life experiences, it is important that we track their transition into the 3rd Age, and detail their expectations of and preparedness for retirement.

For an ageing society, it is critical that our post-65 years are adequately prepared for the 3rd and 4th Age, and that they embrace retirement with optimism. Public policy must be adapted to address emerging needs of older Singaporeans, and the infrastructure must evolve in tandem to support successful ageing aspirations. With a longitudinal research project that focuses on ageing needs and expectations, we will have data that will track emergent trends. As Singapore has become more ethnically diverse, we expect greater diversity in ageing expectations. In addition, as Singaporeans are increasingly exposed to ideals and lifestyles in other countries, they are likely to deviate from traditional expectations of ageing embraced by their predecessors.

This project leverages on the important findings of the first wave of the study (A Multidisciplinary Model to Promoting Longevity, Healthy and Successful Ageing MOE2010-T2-2-093, PLHSA hereafter), which focused on the socio-medical realities of health and ageing. In the next wave, we shift the focus toward mechanisms and correlations of successful ageing from a longitudinal perspective. The proposed study will incorporate a larger sample size (n=3,000) and wider age range (50 – 79) to allow observations on the complex and interlinked relationships among the key concepts (i.e., successful aging, health screening, physical and mental health, social capital, and social support). The inclusion of older respondents from a wider age range will also provide us a better prospect to follow up and analyse cohort trends of some of the aforementioned concepts and their associations from the young-old to the old-old across the two waves.

Key themes to be investigated for the next wave will be, but not limited to, these areas (see the Appendix 1 for the structure of key themes):

- Expanding the construct of Successful ageing – we will include other comparable dimensions of productive ageing (which looks at the significance of continued economic and social engagement), active ageing (which focuses on leisure and community engagement) and healthy ageing (to go beyond preventive health screening);
- Identity and successful ageing – we will examine the salience that older adults place on different facets of their identity, including their age, gender, ethnicity, marital status, family and community role. By looking at the intersectionality of multiple identities, we examine how this produces differential experiences of successful ageing.
- Successful ageing and intergenerational family relations – In the first wave of the study, approximately one fifth of old Singaporeans did not necessarily view family as important in their successful late life. This highlights the changing expectations of family, and the implications on informal social support when more Singaporeans remain single. The next wave aims to find out how factors of society, community, and living arrangements of the elderly could augment the new norms governing intergenerational family relations;
- Lay epidemiology and health behaviours/attitudes – Second-wave data will help to identify lay people’s sources of health information, their validation process of biomedical discourses, and their criteria to determine credibility of health information. In particular, attention will be paid to the social media as a resource for health guides.

[†]The number of persons aged 15 to 64 per elderly aged 64 and above.

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- Social capital and health behaviour – In the next wave of the study, the association between social capital and health outcomes will be further examined. With longitudinal data, we will be able to identify if social capital serves as a causal factor affecting health outcomes.
- Self-rated health, health outcomes and social determinants of health – we will build on the findings of the first wave and the medical experts in our team will introduce additional measurement tools and health assessment scales (e.g., the mini-mental state examination, MMSE) to better assess the physical and mental well-being of elders in Singapore.

Based on analyses of the aforementioned themes, avenues for community interventions will be examined to offer fresh insights into and perspectives on health and ageing, which would inform and frame future government policies.

Findings from the First Wave

The recently completed study (A Multidisciplinary Model to Promoting Longevity, Healthy and Successful Ageing MOE2010-T2-2-093, PLHSA hereafter) employed both qualitative and quantitative methodologies to derive and validate a multidisciplinary framework that investigated pro-health behaviour and successful ageing.

The collected data generated several crucial findings that we hope to further investigate in a longitudinal study. One example is the social construct of successful ageing. Unlike our initial expectation, the findings showed an emergent trend of independent ageing. The respondents' value on independence resonates with the recent finding from the Ministerial Committee on Ageing based on focus group discussions among older citizens (Gan Kim Yong, 2014). These findings highlight the importance of infrastructure preparedness as more Singaporeans expect to grow old independently and many more will live alone (either by choice or circumstance) in their 3rd and 4th age.

A second noteworthy finding is the correlation between social capital and preventive health behaviour: Socially isolated elders were less likely to attend health screenings. Emerging demographic trends suggest that there are more households with smaller family units and more Singaporeans remaining single. This trend indicates that traditional reliance on family as the primary source of social support is being challenged. More research needs to be done to better understand how we can levy up on community support to augment the changes in family dynamics.

The project also informed on changing health beliefs and attitudes among a more educated young elderly subgroup. Several interesting findings surfaced, which merits further investigation. These include the attractiveness of complementary alternative medicine (CAM), especially the use of multivitamins among the more educated and affluent young old. Our preliminary investigation suggests that many may view the use of multivitamins as an alternative rather than supplementary to formal health screening. More work needs to be done in this area to fully understand how CAM is contextualized in the larger realm of preventive health behaviour.

The more endowed baby boomers are also influenced by technological innovation, and the social media as a significant source of health information is a finding that will definitely require more research. We know from qualitative interviews conducted that lay epidemiology is now much influenced by information from the social media. While the quantitative findings continue to inform that formal health institution and traditional media remain to be trusted sources for health information, it is important that we continue to track this as more older adults turn to the internet as a 24-7 health guide.

Perhaps the most significant finding from the first wave is the discourse on successful ageing. The findings contextualise ageing as an anticipatory process and demonstrated how the young-old in Singapore are determined to enter the 3rd age with greater optimism. The current validated construct has three dimensions captured by 12 indicators. This is a construct that will evolve as social environmental conditions change. With a significant proportion of Singaporeans transiting into the post-65 cohort, ideals of what it means to age successfully will remain as a national concern.

The impact of rapid economic transitions on ageing aspirations is an important research gap our project aims to fill. Singapore has achieved rapid economic growth and experienced radical social changes since its independence. These impacted the life experiences of Singaporeans, and gave rise to different aspirations between generations. Singapore's per capita GDP has dramatically risen from S\$2,832 in 1970 to S\$ 69,050 in 2013 (Statistics Singapore, 2014). Furthermore, there was a considerable change between 2003 and 2013 in education level alone: while 9.4 % of those aged between 45 and 54 attained a university qualification in 2003, the percentage increased to 21.8% in

2013 (Department of Statistics, 2014a). Based on an examination of the so-called ‘war generation’ in the UK, Vincent (2005) found that “quite narrow age ranges and very specific experiences differentiate and subdivide broader historical generations” (p. 595). In the Singapore context, the year 2012 has been referred to as a turning point in addressing ageing issues since this is the year in which the first cohort of post-war baby boomers turned 65. These baby boomers are often considered a distinctive generation as they benefited from the evolving education system, stable employment, and higher rates of employers’ contribution to the Central Provident Fund.

As Singapore is a fast-ageing society where social change is dynamic, it is critical to track these changes so that we can be prepared to receive growing numbers in the 3rd and 4th age. A new serial cross-sectional study will allow us to examine and compare health and social indicators among different subgroups of the older population and identify trends in health behaviours and attitudes. These data will provide information on infrastructure and public policy upgrades to promote graceful ageing in Singapore. To provide justification for the present submission, we highlight the key preliminary findings from our current analysis with the potential for an in-depth study (see Table 1).

<Table 1: Findings in Wave 1 and further Developments in Wave 2>

	Findings in Wave 1	Extension in Wave 2
Concepts of Successful Aging	<ul style="list-style-type: none"> • Most older Singaporeans highlighted the importance of financial security and good health. • The principle goal of the first wave was to derive components of successful ageing and investigate whether the concept of successful aging is applicable to the Singapore context. The construct constitutes of 12-items that cover three main dimensions: self-sufficiency, family connectedness and social engagement. 	<ul style="list-style-type: none"> • Investigate productive ageing; investigate the significance of continued employment and financial adequacy for retirements. • Investigate transforming inter-generational relations and new definition of filial piety, and implications on family support for the elderly. • In the next wave, we will expand our investigation to identify other elements that facilitate ageing well. To have a deeper understanding of what constitutes successful ageing, this new wave will include indicators on healthy ageing, active ageing and productive ageing.
Lay Epidemiology and Health Behaviours /Attitudes	<ul style="list-style-type: none"> • The abundance of information from multiple sources (e.g.: Internet, advertising, and TV show), coupled with the complexities of modern medicine results in individuals’ reliance on non-medical sources to contextualise the often contradictory medical messages on health prevention. • There was emerging uncertainty about biomedical advisories especially among the more educated with greater excess to sources of information on the social media. 	<ul style="list-style-type: none"> • With data collection in the second wave, the research team can continue to investigate the dynamics of lay belief systems and their implications on disease prevention behaviours. Of particular concern is a better appreciation of the validation process for health information. The detailed research questions are: <ol style="list-style-type: none"> 1) As an extension of the enquiry in regard to the trust on health-related information channels in the first wave: how do older adults decide which are the trusted sources of health information? 2) How do lay older adults interpret health? 3) What are the various complementary alternative medical care invoked by older adults and how do these work in tandem with biomedical prescriptions?
Social Capital and Health Behaviour	<ul style="list-style-type: none"> • The findings in Wave 1 indicate that there are independent effects of social capital on proactive health behaviours such as health screening tests. • Social capital, as a network- 	<ul style="list-style-type: none"> • In the next wave of the project, the association between social capital and health outcomes will be studied further. If longitudinal data are available at the next wave, they will provide chances to identify if social capital is a causal factor affecting health outcomes. Below are additional

	<p>based resource, is significantly related to health screening behaviours—both the total number of health screenings for the whole sample and female-specific health screenings.</p> <ul style="list-style-type: none"> • Social isolates were less likely to receive either general or female-specific health screenings. • The effect of having social contact with physicians and nurses have a particularly strong impact on health screening behaviours. 	<p>research topics in this area:</p> <ol style="list-style-type: none"> 1) To further understand the relationship between social capital and social support in Singapore. 2) Between social support and social capital, which is more strongly related to health outcomes (e.g., self-rated health) and more conducive to health screening behaviours? 3) In terms of the composition of successful ageing, what are the roles of social capital and social support? In other words, how much the concept of successful ageing and its variation can be attributed to social capital and social support, respectively?
<p>Self-rated Health, Health Outcomes and Social Determinants of Health</p>	<ul style="list-style-type: none"> • Numerous studies have shown that self-rated health is strongly associated with mortality, decline in functional ability, new comorbidity, healthcare utilization, and nursing home placement. • In the first wave of the study, the majority of the Singaporean elderly assessed that they are in a good health condition. 85.7% of the respondents indicated that their health was “very good (11.9%)” or “good (72.6%).” • The level of household income had a significant direct effect on self-rated health. 	<ul style="list-style-type: none"> • Some of the health outcomes such as activities of daily living (e.g. bath self and eating meals) did not show sufficient variance in the first wave. This finding suggests that Singaporeans aged from 50 to 69 are generally healthy and not many of them suffer from severe ailments. In the next wave, we will extend the eligibility age band to 50 – 79 years. This will cover the old-old who will have more health care needs and many will be living with disabilities. The data will be very useful in planning for infrastructural support for the dependent elderly. • Additionally, health scales to measure newly emerging health conditions will be included. For example, to investigate cognitive ability among the elderly population, mini-mental state examination (MMSE) will be added to the survey questionnaire.

B) Highlights of the First Wave

Findings from the first wave were shared at several conferences, both international and local. These include the 20th International Association of Geriatrics and Gerontology (IAGG) World Congress in Seoul where a symposium was dedicated to the findings of our project (Straughan & Kim, 2013; Son, 2013; Feng, 2013). We also organised a symposium in Singapore, *Symposium on Successful Ageing*, in March 2014. The Symposium was attended by representatives from various government agencies working on ageing concerns (e.g. Ministry of Social Family Development, Ministry of Health, National Population and Talent Division, and People’s Association), nongovernmental organizations (e.g. RSVP Singapore and C3A), fellow academics, graduate and undergraduate students and older Singaporean citizens (NUS Alumni). There was also extensive media coverage on the event and the project. In addition to numerous conference papers/posters as well as invited talks/presentations, the team is working on manuscripts targeted at top-tiered international journals. (Details of the conference papers and manuscripts in progress can be found in the Final Report submitted in August 2014.)

The research team’s project has drawn interest from reputable institutions such as the Korean Institute of Health and Social Affairs (KIHASA) and Shanghai University. These two international research partners joined us to facilitate a cross-cultural study on successful ageing in major Asian cities. The partnering institutions adopted our survey design and questionnaire, completing data collection in their respective cities in 2012. The Harvey A. Friedman Center for Ageing at University of Washington in St Louis is also keen on working with the research team and we began exploring

avenues for collaboration and expanding our study to other global cities. Given the success of our first wave and the significance of preliminary findings, it is critical to harness the cross-cultural partnerships that have been established and continue to pursue promising leads. There are also community groups (e.g., WINGS and Tsao Foundation) that expressed interests working with us and using our findings to advise policies.

C) Rationale for extension

Given the significance of our preliminary findings and success of our first wave of the study, it is critical to leverage on the potentials of our findings and continue to pursue promising leads amidst the shifting social landscape. Furthermore, the importance of health and ageing research is crucial at this historical juncture. For the last four decades, there have been substantial changes in Singapore's demographic profile. While the median age was only 19.5 years old in 1970, it increased to 39.3 in 2014. The proportion of citizens aged 65 and over grew from 5% to 11% between 1980 and 2014 (Department of Statistics, 2014a). In addition, the number of Singaporeans aged 65 and above will more than double between this year and 2030, rising from 431,601 to over 900,000. By the middle of the 21st century, the demographic profile will reach the point where there are more in the older age groups than the younger age groups (National Population and Talent Division, 2013). These significant demographic issues need to be addressed in a measured and calibrated way to overcome its challenges.

The government's reports on the demographic trends in general and the elderly population in particular highlighted key challenges and opportunities. The rapid rate of population ageing certainly offers challenges, intertwined with the declining fertility rate. Although the life expectancy in Singapore has increased at a similar pace with other developed countries, the consistent low fertility rate has contributed to a fast growth in the old-age support ratio. Meanwhile, older Singaporeans' active involvement in productive labour opens up new opportunities. Labour force participation rates among those aged 65 and above has risen. The rates of the 60-64 and 65-69 age groups respectively reached 59.7% and 40.2%, increasing by 13 to 14% between 2007 and 2013 (Department of Statistics, 2014b). Older Singaporeans' labour force participation seems to be further facilitated by the government's initiative to create more opportunities for Singaporeans to continue working beyond retirement age, and encourage employers to tap this increasing pool of experienced older workers (National Population and Talent Division, 2013).

While calls to leverage on the growing potential of elderly employees have been made, these older workers need to be healthy to achieve the potential to the fullest extent. Life expectancy of these Singaporeans has increased; but the number of years they are expected to spend in good health is diminishing. An additional concern over the increased life expectancy is the corresponding increase in proportion of individuals who will be very old, unhealthy and dependant. A greater prevalence of chronic diseases and terminal illnesses such as cancer and diabetes has serious implications on eldercare costs and conflicts with the government's goal of cultivating a "healthy, active and secure" elderly population (Committee on Ageing Issues 2006, p.11). Fearing the detrimental social implications stemming from an ageing society, several high level government committees have been formed since the 1980s to address issues concerning population ageing. Notably, the Government established a Ministerial Committee on Ageing to harness the opportunities and combat challenges to "achieve the vision of successful ageing in Singapore" (Ministry of Community Development, Youth and Sports, 2007; Tan, 2011). Studies on health and ageing will help fulfil this vision by informing effective policy interventions as the proportion of those aged above 65 increases. Information gleaned from socio-medical research on the elderly will prepare government officials, civil society, and other stakeholders for the challenges ahead. The social and economic implications of Singapore's rapidly shifting social landscape, coupled with the need to promote active ageing and engage with older segments of the population, calls our research into significance.

D) A need for a Longitudinal (Serial Cross-sectional) Study

Having accomplished a cross-sectional probe into the health attitudes and behaviours of the elderly, the next step is to embark on a longitudinal study (serial cross-sectional cohort study) that will allow us to track and investigate cohort changes over time. Menec (2003) explained that when it comes to health studies on well-being and daily activity, it is impossible to know from [stand-alone] cross-sectional studies 'whether participation in social activities promotes greater well-being or whether greater life satisfaction provides an impetus for being more socially active' (p. S75). While such

longitudinal studies cannot determine causality, they will nonetheless allow for trend analyses and provide valuable information such as the temporal relations among variables. We propose a longitudinal study for not only its methodological merits but also the lack of longitudinal data on health and ageing in Singapore. Currently, such information is not captured by other local studies such as the National Health Survey (Epidemiology and Disease Control Division, Ministry of Health, 2011). The new proposal will add in-depth data on fundamental influences of health behaviour among older adults and healthy ageing. As age-related illnesses and health issues are chronic and take time to surface, the nature of healthy and ageing research further compels such longitudinal research.

E) Key highlights of Wave 2

The strength of this proposal is in the multidisciplinary approach to an important emerging social issue that has global implications. Our team comprises both medical professionals and social scientists, and they will bring the strengths of both medical and sociological perspectives to the discourse. The longitudinal study, which proposed a serial cross-sectional approach for trend analysis, will allow us to track emerging trends on health and ageing.

The second-wave survey plans to increase the sample size to 3,000 in order to involve more aged respondents by expanding the upper age limit to 79. This increased sample size will add significant value to what has been accomplished in the first-wave survey. First, it will allow us to observe the relationship among the key concepts of this project (i.e., successful aging, health screening, physical and mental health, limitations in mobility (ADL, IADL), social capital, or social support) among the newly added segment of older respondents. Second, the inclusion of older respondents will provide us with a better prospect to follow up and analyse trends of some of the aforementioned concepts and their associations from middle to old, and to older ages across the two waves. Third, the heterogeneous age range including middle- and old-aged respondents will be instrumental in producing higher possibilities for multifaceted comparative studies involving the three megacities.

Social epidemiology as a field has been critiqued for examining the health effects of a particular social factor in different countries without accounting for the international variations (Kaplan 2004). While this project proposal will seek funding only for research in Singapore, it is certainly a tremendous value-add that we have teams of international collaborators with independent funding waiting to partner us in this endeavour to embark on a longitudinal study with an expanded scope. By looking into the extent in which the national context affects the impact of social determinants on health, wave two of this research project would thus address this gap in the existing theory.

F) Key Concepts to be investigated Longitudinal Study

Concept of Successful Ageing

We examined the concept of successful ageing to add value to existing studies on successful ageing (Baltes & Smith, 2003; Bowling & Dieppe, 2005; Dillaway & Byrnes, 2009). From the qualitative interviews, 12 items were identified as components in successful ageing. This multidimensional index, which includes self-sufficiency, family connectedness and social engagement, was validated in the survey. In the next wave, we plan to expand our understanding of what constitutes successful ageing and include concepts of healthy ageing, active ageing and productive ageing in the study.

Lay Epidemiology and Health Behaviours/Attitude

In the discourse of health and illness, lay epidemiology unlocks insights into how individuals interpret preventive health prescriptions (Prior, 2003). As Allmark and Todd (2006) explained, 'lay epidemiology' is a term used to describe the processes through which health risks are understood and interpreted by lay people. In the same vein, our objective was to appreciate the dynamics of lay belief systems and their implications on disease prevention. To that end, our qualitative data revealed that an individual's trust in medicine, the complexity of modern medicine, sources of information and social class all played important roles in influencing the outcomes of lay epidemiology. The abundance of information from multiple sources (e.g.: Internet, advertisements, etc.), coupled with the complexities of modern medicine results in laymen relying on non-medical sources to contextualise the often contradictory medical messages on illness prevention (Straughan, 2014). The analysis showed that lay epidemiology resulted in three likely outcomes: compliance with formal biomedical advice, invoking complementary alternative medicine, or not doing anything. Where there was

sufficient trust in medicine that was reinforced by support networks, the individual was likely to embrace pro-health behaviour and conform to health screening prescriptions (Straughan, 2014). However, where there was uncertainty about biomedical advisories, alternative healing options remained attractive to older adults. Future waves of research will delve deeper into this topic. The phenomenon remains to be an important portion of health and ageing research as scholars have invoked lay epidemiology to explain the results of smoking cessation programs (Lawlor, Frankel, Shaw, Ebrahim, & Smith, 2003) and knowledge on nutrition (Coveney, 2005) amongst many other public health concerns.

In the next wave, we plan to employ both quantitative (surveys) and qualitative (interviews) methodologies to uncover the social processes that guide elderly individuals when they attempt to make sense of and resolve conflicting health reports. We want to find out the critical sources of information that influence elderly individuals, and the manner in which these individuals interpret and navigate through the healthcare domain.

Social Capital and Health Behaviour

Based upon the first-wave data, we found that social capital, as a network-based resource, is significantly related to health screening behaviours such as the blood test for diabetes and cholesterol, stool test for colon cancer, pap smear, and mammogram. Specifically, social capital is significantly related to the total number of health screenings for the whole sample and is further associated with taking female-specific health screenings. In contrast, social isolates who could not provide information on any network alter were less likely to go for either general or female-specific health screenings. Therefore, it is imperative to identify if there is a consistent association between social capital and health screening behaviours across time using the second-wave data. It would be also worthwhile to check the degree to which the relationship between social capital and health screening behaviours varies in the three different megacities (namely, Singapore, Shanghai, and Seoul) and if such city-level variation is robust when the different time-points of the surveys are taken into account. Overall, in the next wave, we aim to cover the association between social capital and health outcomes. If a longitudinal data are available at the next wave, they will provide chances to identify if social capital is a causal factor affecting health outcome. Literature has not been clear about the relationship between social capital and social support in Singapore, and specifically on how social capital is related to social support. The second-wave data will offer an opportunity to test the relationship.

Self-rated Health, Health Outcomes and Social Determinants of Health

Numerous studies have shown that self-rated health is strongly associated with decline in functional ability, new comorbidity, healthcare utilization, and nursing home placement. In particular, self-rated health is a powerful predictor of subsequent mortality, even when a great variety of health and medical measures are controlled for. In the first wave of the study in 2012, 85.7 % of the respondents assessed that their health was “very good (11.9%)” or “good (72.6%)” (as opposed to 12.4% of “not good” and 1.7% of “good”; figures weighted by gender, age, and ethnicity). The 2010 National Health Survey showed that 59.2% Singaporeans aged from 50 to 59 and 56.9% from 60 to 69 rated their health as “very good” or “good” (Epidemiology and Disease Control Division, Ministry of Health, 2011, p. 82). In one of the studies published in 2009, among Singaporeans 40 years old and above, 72.4% evaluated their health “excellent (19.3 %)” or “good (53.1%)” with 22.5% of “fair” and 5.1% of “poor” (Ramkumar et al., 2009, p. 608). Despite the differences of eligible age, data collection method, and survey instrument, our findings suggest a changing trend with regard to self-rated health which will be in a considerable need of further examination. Moreover, there is a growing demand for us to better understand the components of self-rated health among Singaporeans. Self-ratings of health involve complex judgments across multiple health or health-related domains (Benyamini, et al., 2000; Krause & Jay, 1994). As the outcome of a subjective evaluation process, self-rated health is often shaped by self-criterion, self-referencing, others’ opinions and culture-based health ideas. Researchers realized that self-rated health clearly measures something more—and something less—than objective medical ratings (Maddox & Douglass, 1973 as quoted in Quesnel-Vallee, 2007); nevertheless, to tell what is the valid “heart” and what is the unnecessary “noise” within the measurement of self-rated health is still puzzling (Benyamini, 2008). A further wave of qualitative and quantitative investigation could better help us to understand the above issues for Singaporeans. In particular, we may consider employing a methodological technique of having an objective third party (in this case, the questionnaire surveyor) rate the health of respondents in tandem with questions on self-rated health.

In terms of social determinants of health, the analysis of the first wave suggested that there were remarkable effects of socio-economic factors (i.e., gender, ethnicity, educational attainment, and household income) on the overall level of health (i.e., self-rated health). The level of household income has a significant direct effect on perceived general health controlling for gender, ethnicity, and education. A path analysis suggested that there are indirect effects of household income and educational attainment, which are mediated by the degree of social support, which in turn, affects the level of perceived general health. Malays and Indians showed lower self-rated health compared to ethnic Chinese, after gender, education, and income were taken into consideration. Yet, it appeared that Malays and Indians had higher level of social support, which might mitigate other negative effects of lower self-rated health. As for the effect of gender, it did not appear that females were necessarily at the risk of poorer perceived health compared to males. The overall results were similar to Lim, Ma, Heng, Bhalla, & Chew (2007) as Lim et al. (2007) also presented on the robust influences of social determinants on self-rated health such as gender, ethnicity, and household income. With regard to the effect of ethnicity, Lim et al. (2007) reported the opposite directions of finding compared to this study: Malays and Indians had lower odds of rating poor health than Chinese. When it comes to the non-significance of gender, there are some studies which show dissimilar results. For example, in Lim, et al.(2007), females were more likely to report poorer health condition. These interesting consistencies and/or divergences of findings can be more effectively examined through the comparison with succeeding waves of qualitative and quantitative data of the research project.

G) Methodology

As in Wave 1, there will be two main phases in the data collection process. Phase 1 will be qualitative interviews, and phase 2 will be a large-scale quantitative survey.

Phase 1 - Qualitative interviews

We will conduct one-on-one interviews to find salient social and cultural factors that will bridge knowledge gaps and frame our survey questionnaire in phase 2. Through such qualitative interviews, we aim to tease out social processes and perceptions from the Singapore context that might not be easily captured in quantitative surveys. In particular, given the unique Asian cultural context, contesting ideologies in the local belief systems may have eluded documentation in previous studies. Therefore, we aim to find out more about the definitions of “successful ageing” through interviews. Such subjective definitions and ideologies are most effectively achieved through interviews.

We aim to conduct 50 interviews to have a snapshot of the variety of responses that one may hope to capture on health and ageing. Recruitment of the respondents will be done in partnership with organisations that work with the elderly such as the Council for Third Age (C3A) and the People’s Association (PA). These organisations have access to a wide range of elderly respondents of different social-economic status. We have previously worked with these organisations during the qualitative phase in our previous health research.

Phase 2 - Large Scale Quantitative Survey

This involves the second phase of a serial cross-sectional community survey of Singapore citizens. With this phase, the project will host a longitudinal data set of 2 waves for a cohort study of older adults in Singapore. For further sample top-ups of respondents, we will seek the cooperation of the Department of Statistics to obtain a probability sampling scheme of the specific age range.

We plan to recruit a survey company to ensure that the data collection process adhere to rigorous methodological standards. It is critical to engage professional surveyors instead of students as the majority of elderly respondents (especially those in age group 70-79) are likely to speak dialects (Hokkien, Teochew, Hakka, Cantonese, Malayalam, Punjabi, etc.). In addition, a survey company will also be able to strictly regulate the interviewing timing for their professional surveyors (3pm-10pm on weekdays and weekends) so that the respondent demographics will not be skewed. Furthermore, a professional survey company will have the ability to manage the large data and achieve stringent quality control with an average of 85% telephone contacts among respondents to guarantee data validation and reliability.

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In the recently completed survey (ie, Wave 1), we recruited undergraduate surveyors and found out that most undergraduates were unable to give their full-time commitment to the project. Many students conducted their interviews on weekday afternoons, which resulted in an oversampling of housewives and the unemployed. Furthermore, the majority dropped out after conducting a few surveys. To address the shortfall, we had to lengthen our recruitment phase due to the high turnover rate. As a result, our fieldwork phase was extended by more than a month. More pertinently, undergraduate students are less equipped and ill-prepared to interview and engage elderly respondents in their local dialects, especially when discussing medical and healthcare issues. While this problem was mitigated somewhat in the first wave as a smaller proportion of those aged 50-69 could only converse in dialects, in this proposal, we expect there will be more older respondents who can only converse in dialects as we will expand the eligible age group to 50-79 years.

To ensure that undergraduates will continue to have learning opportunities through this research project, we will continue to offer Undergraduate Research Opportunities (UROP) linked directly to the project. In the first wave, the PI supervised 9 students under UROP. We will continue to take in students via this pathway for a more holistic and comprehensive training in research methodologies.

While we hope to engage a professional survey company for the community-based data collection, we will continue to use undergraduate and graduate student assistants in the qualitative phase. They will work under close supervision and mentorship of the research team. We will also link undergraduates interested in conducting fieldwork in the quantitative phase with the survey company.

Sample Design and Enhancement

Wave II data collection will focus on examination of the dynamic interrelationships between social life and health to promote longevity and vitality in the lives of older adults. Our major aim for PLHSA Wave II is to increase the scientific value of our Wave I dataset. We firstly propose to re-visit respondents five years after their initial interviews. Hence, a panel design will allow us to examine changes in key measures of health and social relationships within same individuals. We also plan to add new cases for the second wave, in order to make a comparable sample size to the first wave, which is essential for studying important health and socioeconomic trends in Singapore. Therefore, the Wave II sample will include two types of respondents. Respondents who participated in the first wave will be re-interviewed. These individuals will constitute the panel component of PLHSA and allow for population-based longitudinal analysis of health and social relationships.

We expect that there will be significant attrition in the panel study. We project a reasonable rate for successful revisit will fall within a range between 50% and 80%. The upper limit is based on one of the best response rates that are available in Singapore (see Appendix 2 for the detail on the Singapore Chinese Health Study). The lower limit is based on the assumption that there is at least a 50% chance of response. Thus, for budgeting purposes, we estimate that we can reach up to a sample size of 1,000 which correspond to a response rate of 65% (mid-point between 50% and 80%).

The gradual attrition of the panel across waves leads to a reduction in sample size, and in order to maintain a comparable sample size for legitimate trend analysis, we propose to add new individuals in the second wave to replenish the loss from the first wave and enhance the scientific value of this large survey. Given that the total population of the current study is 1,179,704 (Singaporeans who are aged from 50 to 79 as of 2014, see Table 2), we will adopt the sampling ratio of 1% of 150,000 (for populations 150,000 to less than 10 million) (see Neuman 1997). Given that this proposal is part of a longitudinal study with intentions to revisit this sample in Wave III, we will include a larger of 2000 to account for attrition in the longitudinal follow-up.

<Table 2: Singapore Population>

	Singapore Residents 50 – 79 years			
	50-59 years	60-69 years	70-79 years	Total
Number	603,895	392,700	183,109	1,179,704
Percentage	51.2%	33.3%	15.5%	100%

Reference: Singapore Department of Statistics (Department of Statistics, 2014a)

Name of PI: Paulin Tay Straughan

To sum up, the total number of the Wave II sample will be 3,000 (see Table 3), in which 1,000 is from the panel component of the Wave I and 2,000 is from the newly interviewed respondents.

<Table 3: Estimated Number of Completed Cases, PLHSA Wave II>

	Targeted Cases
Panel from the Wave I	1,000
New Eligible Respondents	2,000
Total	3,000

Research symposium

We plan to organize one full-day symposium where researchers and stakeholders can share their findings, exchange ideas, and foster further cooperation. In addition to sharing findings with international academics working on similar ageing research, we will also share findings on aging and health to our local partners and stakeholders. We will leverage on the symposium to disseminate the research findings to policy makers, relevant industries, and governmental ministries working on health and ageing issues.

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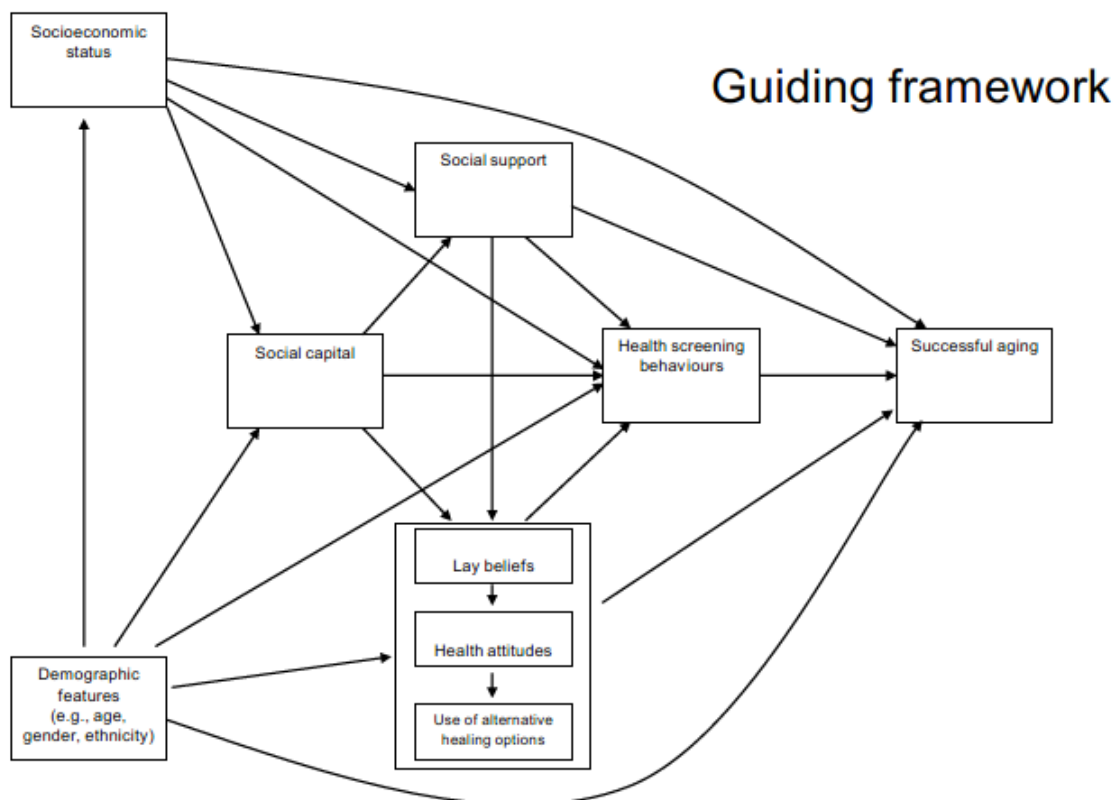
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Appendix 1. Conceptual Model of the Project



Appendix 2. The Response Rates of 5 year Follow-up of Singapore Chinese Health Study (SCHS, PI Stephanie and London, 1998-2004)

	Number of Cases	Percentage
Interviewed	52,325	82.7%
Refused	3,528	5.6%
Disability related reason	669	1.1%
Dead	4,717	7.5%
Moved	447	0.7%
Unable to contact	1,517	2.4%
Initial cohort	63,257	

Source: <http://www.niehs.nih.gov/research/atniehs/labs/epi/studies/singapore/>

Investigator

The project team comprises sociologists from Singapore, China and South Korea who specialize in medical sociology and research methods, and medical professionals from Faculty of Medicine (NUS) and Health Promotion Board (HPB). Sociological theories on human behaviour, social capital and social networks, health attitudes and contesting lay belief systems are mobilized to complement biomedical knowledge on health screening prescriptions and practices. In addition, both qualitative and quantitative methodologies are to be utilized to fully exploit data. This multidisciplinary and multi-institutional collaboration offers a unique opportunity to examine a variety of hypotheses related to health screening behaviors so that the study can significantly contribute to healthy ageing.

Straughan (PI) and Seow (co-PI) have worked successfully in their project on breast screening among Singapore women. This proposal will allow them to elaborate on the original model derived and extend the analysis to other areas of health-seeking behavior, including men's health.

All researchers are skilled both quantitatively and qualitatively. In particular, Straughan (PI) specializes in research methodology. Son (co-PI) does ageing research, extensive modeling for social network analysis and will use Structural Equation Modeling to derive more robust models to predict health-seeking behavior and successful ageing. Feng (co-PI) is well-versed with gerontological and health research in China. Kim (co-PI) has a background in network analysis and social network changes in longitudinal studies.

Environment

All eight members of the team are in environments conducive for conducting research and where research is strongly supported. There will be minimal lag time for the research as the core members of the team have already been working on the project since 2011. The success of this research project will be a key factor in the staff performance evaluation exercise for all team members. At the National University of Singapore, there is a strong research culture with infrastructure support for research work. Software programs required for the analysis are available and the library (especially the digital library) is world-class. Additionally, as a premier tertiary educational institution, there is a readily available talent pool among the undergraduate and graduate student population which the researchers can tap on for interviewers and research assistants.

Preliminary Studies

Paulin Straughan (PI), Joonmo Son (Co-PI), Feng Qiushi (Co-PI) and Adeline Seow (Co-PI) completed (AcRF) Tier 2 project: "A Multidisciplinary Model to Promoting Longevity, Healthy and Successful Ageing," which places them in a vantage point for continuing with a longitudinal study on successful ageing. Having met the objectives of the current project, they are well-poised to further the research field.

Paulin Straughan (PI) and Adeline Seow (Co-PI) successfully completed a study on the take-up of mammography among Singaporean women in conjunction with the first National Breast Screening Exercise. The collaboration was very successful, and resulted in seven published articles in the top-tiered journals in both social science and medicine and numerous conference papers.

Straughan has received numerous grants from NUS to study various social issues. She has recently completed a study on ultra-low fertility rate in Singapore, which was based on a survey of fertility decisions of 1500 married Singaporeans (NUS funded research project R-111-000-057-112; \$149,000). She has been invited to present the findings to closed-door international audiences in Tokyo and Seoul, and also at several local conferences. In addition to a book and several journal articles, the project also hosted a successful workshop which brought together experts on low fertility from countries like Japan, Korea, Taiwan, China, Hong Kong, Australia, and the U.S.

Straughan was also invited to be principal consultant to various government-commissioned studies like Marriage & Parenthood Project (with Mathews), the 3-Generation Family (with Mathews), the National Survey of Senior Citizens 2004 and the first comprehensive survey of marriage and divorce in Singapore (which resulted in a book, *Marriage Dissolution in Singapore*, published by Brill in 2009). She was the Principal Investigator in a large project on Low Income Households in Singapore (commissioned by the Ministry of Community Development, Youth & Sports) and the Sociological

Study on Littering (commissioned by the National Environmental Agency NEA). The findings for the latter have informed several new initiatives adopted by the NEA to address the littering concerns in Singapore. A copy of the report is available at <http://www.publichygienecouncil.sg/news/2011/10/28/sociological-study-on-littering-in-singapore>.