Understanding Undernutrition in the Elderly Population in Singapore

CHEN QIJIAN, PUA YI-LIN AILEEN

Abstract

Internationally, the elderly are particularly susceptible to undernutrition. However, research on this problem has been lacking in Singapore, and elderly undernutrition often goes undetected and untreated. We aimed to understand the complexities of nutritional issues in community-dwelling elderly populations in Singapore—focusing on the interplay of interests among various stakeholders that mediate the provision of such care to the elderly—and the effectiveness and accessibility of these services from the elderly’s perspective. We found that the prominent factors driving undernutrition are a lack of education, a lack of committed participation from key organisations, and a lack of community concern that could help the elderly to overcome the difficulties of ageing.

Introduction

Singapore, like many developed countries around the world, faces an ageing population. The Health Promotion Board (HPB) estimated that the proportion of residents above 65 years of age would increase to one in every five residents by 2030 (HPB, 2014). As a result, the demand for programmes that could address the healthcare needs of an elderly population has been increasing. One key aspect of such programmes is nutrition, since the elderly are particularly susceptible to undernutrition (Chen, Schilling, & Lyder, 2001; Pirlich & Lochs, 2001). However, research on the problem of elderly undernutrition had been sparse in Singapore’s context. As a result, elderly undernutrition might often go underdiagnosed, unrecognised, and untreated in Singapore (Lim, 2013).

Nutrition is a major determinant of the elderly’s physical and psychological health, mobility and functionality, and overall wellbeing. Undernutrition not only contributes to serious ailments and disabilities, but also diminishes elderly individuals’ self-perception of health. These negative outcomes work hand in hand to erode the elderly’s quality of life (Chen et al., 2001). Leaving the problem unaddressed makes little economic sense: instead of alleviating the root cause of
these health complications at a low cost, allowing more severe problems to develop would increase medical expenses (Lim et al., 2012). Hence, we sought to more closely examine elderly undernutrition in Singapore.

Researchers in other countries have found that undernutrition is much harder to resolve amongst the elderly as compared to younger adults (Lim, 2010). Key concerns perpetuating this problem include a lack of formal mechanisms to handle issues related to undernutrition amongst the elderly, a lack of awareness of the problem, and a lack of commitment required to tackle the problem.

The purpose of this study was to understand the provision of adequate nutrition and related elderly care services in Singapore, and the accompanying difficulties and complications. In particular, the study looked at the interplay of interests among various stakeholders that mediate the provision of such care to the elderly. We were also interested in investigating how effective and accessible these services are from the elderly’s perspective, and the dietary and non-dietary factors that influenced the food intake patterns in the elderly population.

**Methodology**

The focus of this study was the *elderly in the community*. The elderly’s different living arrangements could influence their dietary habits, health, and social behaviour, and produce unique challenges in the provision of adequate nutrition. To better represent the heterogeneity within the population, we categorised the elderly in the community based on their living arrangements:

- **A)** Free-living elderly who are not part of any intermediate or long-term institutionalised care (e.g. community hospitals, nursing homes, respite care)
- **B)** Elderly attending day care
- **C)** Elderly in nursing homes

Researchers and interviewed experts agreed that these 3 categories form a majority of the elderly in the community. This categorisation allowed us to study each of the three categories separately, before analysing the elderly in the community as a whole.
In-depth interviews were conducted between February and April 2016 with the following stakeholders:

- The head dietician in a public acute general hospital (henceforth referred to as HD)
- 2 representatives of a government-affiliated organisation (henceforth referred to as government organisation representatives or GORs)
- 2 employees in the eldercare industry (also referred to as W1 and W2)
- 25 elderly individuals who fell under 1 of the 3 aforementioned categories (also referred to as E1–E25)

Details of the interviewees can be found in Appendix A. Interviewees were introduced to the study through the poster found in Appendix B.

We opted to conduct a qualitative study, in order to obtain a more nuanced understanding of elderly undernutrition in Singapore. Insights gleaned from the interviews and from Singapore-based research were juxtaposed against international research on elderly undernutrition, so as to assess the latter’s relevance to the local context. We aimed to close the gap between established international research and the sparse Singapore data, to offer more effective solutions to combat the elderly undernutrition problem.

**Literature Review**

Lim (2010) found that the risk and prevalence of undernutrition in elderly Singaporeans had been increasing, similar to the trend observed in Western countries. Yet, exact figures on the extent of undernutrition are unavailable, especially from intermediate or long-term care environments. Experts and research studies generally concurred that elderly undernutrition in Singapore is poorly characterised, which constitutes a gap in existing research. Our correspondence with the GORs surfaced alleged difficulties in obtaining the cooperation of eldercare providers (i.e., day care centres, nursing homes) to conduct screenings or assessments, and difficulties in reaching out to the large free-living elderly population due to budget and time constraints. Lack of academic interest was also identified as a problem by the experts we interviewed.
Past researchers had attempted to estimate the prevalence of nutritional risk among the elderly in Singapore. Yap, Niti, and Ng (2007) found that 35 to 60 percent of the community-dwelling Chinese elderly (above 55 years old) faced nutritional risk. A more recent study by Tay et al. (2016) indicated an even higher prevalence rate in their sample, with approximately 70 percent of 193 free-living older adults (above 50 years old) facing nutritional risk. Lim et al. (2012) provided a more conservative estimate that is generally accepted by the medical community: a 30 percent rate of nutritional risk across the elderly population.

Less is known about the prevalence of actual undernutrition. Koo et al.’s (2014) study of low-income, free-living elderly people (above 55 years old) on the Public Assistance (PA) scheme found a low prevalence rate of malnutrition of only 2.8 percent, even though 50.3 percent were estimated to be at risk. However, Lim (2010) found that a third of older adults admitted to acute care were malnourished, indicating the existence of a high-risk group within the community prior to hospital admission. However, Lim’s (2010) study was limited to elderly people with pre-existing medical conditions, and little information could be derived on the nutritional health of the elderly in the wider community.

Although the large variation in the studies’ estimates could have resulted from their different forms of assessment (details of these assessments can be found in Appendix C), it is highly likely that heterogeneity in living conditions across the elderly population also affected the estimates of risk and prevalence of undernutrition. We thus recommend large-scale sampling for a better understanding of elderly undernutrition in Singapore, and to identify at-risk groups to better target prevention and intervention programmes.

Owing to the complexities and difficulties in reaching out to the various groups of elderly people, small- or medium-sized organisations would unlikely have the resources or motivation to carry out large-scale sampling. The government might thus be in the best position to spearhead such efforts. As a step in the right direction, HPB surveyed a sample of elderly people in 2010, highlighting certain areas of undernutrition that deserve further attention. More details about the HPB (2010) survey can be found in Appendix D.

**Challenges in Identifying Undernutrition**

**Testing.** While internationally developed tests provide a way of estimating
the risk of undernutrition amongst the elderly, these tests would be limited in their applicability to Singapore’s context. Accounting for the local context would be critical for accurate and relevant results, since Singapore differs from other countries in terms of its heterogeneous elderly population. This difference stems mainly from Singapore’s predominantly Asian multi-religious and multicultural population, which is linked to varied lifestyle dynamics and susceptibility to certain health issues. Of the local studies we found, only Lim’s study (2010) utilised a test that had been verified to be appropriate to Singapore’s context and was tailored to hospitalised individuals (i.e., the Tan Tock Seng Hospital Nutrition Screening Tool).

Lack of clear standards. Many studies noted that undernutrition is a poorly defined concept, particularly so for elderly populations who are physiologically different from the average population.

Apart from differences in diagnostic criteria for undernutrition across different studies, some studies also used correlated secondary characteristics (i.e., nutritional screenings instead of nutritional assessments, which require comprehensive medical monitoring over a certain time period) to estimate prevalence, with varying levels of success (Lim, 2010; Pirlich & Lochs, 2001). In addition, nutritional standards are usually derived from populations with a much younger average age than the elderly, and no standards have been separately defined for the elderly (Pirlich & Lochs, 2001). Measures commonly used to help assess undernutrition include the recommended dietary allowance (RDA) or the elderly person’s calculated energy requirements (Chen et al., 2001). However, these measures might be unsuitable, given the elderly’s significant physiological and health differences from the general population. In general, energy requirement also tends to be a poor gauge of nutritional health.

The lack of clear standards for what constitutes elderly undernutrition has led to the use of different modes of assessment across studies, creating inconsistencies in the reporting of estimates of prevalence and risk in studies. Lim (2010) and HD acknowledged that a standardised method of assessing undernutrition would improve intra-country comparisons and enable the identification and tracking of at-risk groups.

Costs. The costs associated with comprehensively studying elderly nutrition would be immense. While the identification and tracking of at-risk groups would no
doubt be useful, stakeholders have little incentive to commission a large-scale study. In addition, the GORs and HD noted significant institutional resistance towards greater transparency, and the difficulty of convincing nursing homes to cooperate with studies on undernutrition. Compounding the issue is the fact that the organisations which would be more open to academic studies tend to be better managed and more progressive, potentially skewing the results of such studies. These obstacles are likely to obscure the true extent of elderly undernutrition in Singapore.

Results

Personal Factors that Lead to Undernutrition

While it is difficult to identify the root cause of undernutrition, antecedents of undernutrition serve as meaningful indicators of high-risk populations. For example, Chen et al. (2001) identified loss, loneliness, and chronic illness as indicators. However, such studies were based on populations of mainly Caucasian descent, and might not be transposable to Singapore’s context. Hence, we synthesised our literature review with qualitative insights gleaned from our interviews, to determine the applicability of the proposed indicators. While the elderly are a heterogeneous population with varying needs, wants, capabilities, and levels of functionality (Pirlich & Lochs, 2001), we wanted to explore how useful certain indicators could be in helping to understand the elderly’s problems.

Loss. Loss manifests through both physical and psychological wellbeing. For example, ageing tends to take a toll on the body’s metabolic functions (Saka, Kaya, Ozturk, Erten, & Karan, 2010). Hence, the elderly are usually required to reduce caloric intake while maintaining micronutrient intake, which can be difficult to achieve without family support or without the consultation of dieticians and relevant medical authorities (Chen et al., 2001; Lim, 2013). This has resulted in difficulties in satisfying the elderly’s nutritional requirements (Chen et al., 2001; Y. P. Lim, 2013).

In addition, deteriorating oral health and sensory functions can result in the loss of ease and enjoyment in eating. This prevalent issue is further exacerbated by the high cost of oral care in Singapore. Many elderly people in Singapore, especially those in institutionalised care, are unable to afford dentures or other oral care services (Soh, Chong, & Ong, 1992). In a Singapore-based review, Lieu et al. (2001) also
identified swallowing difficulties and the onset of dysphagia—conditions that might be expensive to treat—as risk factors for malnutrition and other ailments.

Our interviewees further elaborated on the elderly’s problems with eating. According to eldercare employee W1,

*a lot of [the elderly] don’t finish their food because it is difficult to chew and swallow… even when they eat soft foods… The food is also healthy so it is a bit bland and they don’t like it, so they just leave it alone.*

This appeared to be a significant problem for the elderly interviewed. Upon visiting the nursing home, we noticed that food was available in three modes: “rice”, “watery rice”, and “porridge”, in addition to a liquid diet for those who were completely unable to handle any form of solid food. Elderly interviewees E21, E22, E23, E24, and E25 agreed that efforts to make foods more chewable and easier to swallow would be redundant, as the very acts of chewing and swallowing were still painful. E21 further noted that there was “no point” making the food ingestible when the taste was unsatisfactory. E23 also noted that “soft rice” would be more appetising: not as mushy as “watery rice” nor as hard as “rice”. These responses indicated that the metric for food hardness in the nursing home should be reviewed, as the existing scale had been casually drawn up by kitchen staff with no scientific basis. The loss of appetite as a risk factor for undernutrition was regarded with some optimism by the GORs, since appetites could be easily alleviated by improving the variety and quality of food.

Elderly people with mobility restrictions also constitute at-risk individuals, especially if they are living alone (Koo et al., 2014; Lim, 2013). Visible efforts have been made to make their food acquisition simple as part of a “barrier-free society” (Committee on Ageing Issues [CAI], 2006). Efforts include upgrading lifts to access all floors in public housing blocks, and introducing wheelchair-friendly features in all public housing precincts, so that the elderly could access shops and services within their precinct with greater ease (CAI, 2006). Nevertheless, more could be done to facilitate ease of movement, especially for elderly people who live alone. Some interviewees (E2 and E11) displayed an unwillingness to buy fresh produce due to the tedium of making trips to the supermarket and cooking. E11, who had limited mobility due to a stroke, also commented that the ease of travelling
to the supermarket was negated by his inability to carry groceries home on his own. This highlights an important problem: the presence of elderly-friendly infrastructure might still be undermined by the lack of complementary services.

Finally, the loss of financial stability could also be a major risk factor (Koo et al., 2014; Lim, 2013). The financial situations of the elderly are evidently diverse, resulting in heterogeneous consumption habits. For example, malnourished, low-income elderly individuals are more concerned with the cost of food than with nutritional quality, and generally buy canned products, which results in insufficient nutrient intake (Koo et al., 2014). This phenomenon points to the possibility of food insecurity amongst segments of the elderly population—a problem that the GORs also highlighted. In general, food insecurity is said to exist “whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain” (Wolfe, Olson, Kendall, & Frongillo, 1996).

Many of the interviewees living in one-room flats (E1, E2, and E11) followed similar lifestyles, often choosing foods of low nutritional quality, due to the fear of inadequate funds and the inconvenience of cooking. However, the elderly individuals receiving care (from family, day care, or nursing homes) did not face such concerns. More affluent elderly individuals who lived with their families could afford more fresh produce, and faced fewer issues obtaining groceries.

**Loneliness.** Loneliness, depression, and/or bereavement tend to lead to reduced food intake, which can in turn precipitate dietary inadequacies (Chen et al., 2001; Lim, 2013). This corroborates with the finding that Chinese men who are single, divorced, widowed, or living alone faced a higher risk of undernutrition (Yap, Niti, & Ng, 2007). Having a meal is typically a social activity, and the loss of companions can lead to decreased attention to meals. We observed this phenomenon with E17, who lived alone and appeared to be deeply affected by the death of her husband and close friends over the years:

I have no desire to cook anything special for just myself. Just coffee and biscuits are okay; they satisfy my hunger sufficiently. Sometimes I will go to the [nearby coffeshop] to get something to eat, but it is not very enjoyable eating alone, and it is also so expensive. (Translated from Hokkien)
Interviewees living in nursing homes (E21 to E25) who had few friends and visitors also found eating tiresome and difficult because it was unenjoyable without company.

However, this problem could be a self-perpetuating one. Feelings of embarrassment from being seen in public in a frail state can cause the elderly to subconsciously seek isolation, which reduces the likelihood of forming a strong support network. This in turn exacerbates the problem of loneliness. An anecdote from E3 illustrated this phenomenon:

[A friend of mine] stopped coming to our lim kopi (coffee drinking) sessions or lunch chats after he got a stroke. He just rots at home. The other day I went to visit him and he yelled at me until I left… he is scared that he will ‘lose face’ just because he is a cripple now. Look at [another friend]: still coming [to the coffee shop] in a wheelchair. What is there to be embarrassed about? (Translated from Hokkien and Singlish)

Elderly people who live with family tend to be more active and face fewer issues with loneliness and undernutrition. This is because they tend to have greater motivation and a stronger sense of duty to stay healthy, to minimise the burden on family members and to continue caring for their grandchildren. This sentiment was echoed by many interviewees (E4, E5, E6, E7, E9, E10, E12, E18, E20, E21, and E23). As E7—a grandmother of ten—put it,

I try to eat well because it will trouble my family if I am sick. Also, at home I do most of the cooking, so I want to cook healthy food for my grandchildren—more vegetables; less salt and oil. We older folk don’t know a lot about nutrition because no one taught us, so we go by intuition. (Translated from Mandarin)

**Chronic illnesses.** The onset of chronic illnesses can lead to undernutrition in various ways, such as by creating eating and mobility difficulties. The simultaneous use of multiple medications to treat illness, or polypharmacy, is one such contributing factor (Chen et al., 2001; Lieu, Chong, & Seshadri, 2001; Saka et al., 2010). Different medications could impede nutrient absorption and metabolism, or reduce appetite through side effects such as anorexia, nausea, and vomiting. More recent studies
showed that polypharmacy could diminish the joy of eating by reducing taste and smell sensitivity, making the elderly less motivated to eat (Lim, 2010; Pirlich & Lochs, 2001; Volkert, 2002).

While it is undetermined whether polypharmacy and undernutrition have a correlational or causational relationship, Lim (2010) found in a Singapore-based study that the comorbidity of 3 or more medical conditions constitutes a significant risk factor for undernutrition upon hospital admission.

Dementia and Parkinson’s disease are also strongly correlated with undernutrition upon hospital admission (Lim, 2010). This suggests that elderly people with such conditions could face nutritional issues, although the extent of the problem is unknown. W2 observed that elderly people with caregivers are notably less susceptible to this problem:

The good thing about [the day care centre] is that there is someone to feed the elderly. For those with dementia who cannot provide themselves with regular meals, or those with Parkinson’s who cannot hold the spoon properly, it is difficult for them to eat alone… I’m not too sure how many of them there are in the neighbourhood since a lot of them simply don’t come [to the day care centre].

In general, interviewees with chronic illnesses emphasised the importance of the caregiver. E19, who had Parkinson’s, noted that he would not be able to function without someone to help him with work that involved fine motor skills. E20 pointed out that he was unlikely to be able to shop for groceries and cook by himself. When discussing ways to reduce their reliance on caregivers, E19 and E20 agreed that occupational therapists played an important role in readjusting the lives of the elderly to make independent living more possible.

W2 also observed that many elderly people who have chronic illnesses fall through the cracks due to the nature of their ailments. This would be a pertinent issue when tackling undernutrition in elderly populations.

**Lack of knowledge.** Another contributing factor could be the lack of accurate knowledge about food and nutrition. Yap et al. (2007) found that lower levels of education are linked to higher risks of undernutrition, which could be explained by
the lack of relevant knowledge, poorer living conditions, or a combination of these and other factors. Koo et al. (2014) also observed that some low-income elderly people are not aware of their poor nutritional status, basic nutritional requirements, or the food services available to them.

The GORs and HD both expressed that the elderly lack knowledge about nutrition. This sentiment is partially validated, as a majority of the elderly interviewees cooked and ate whenever and whatever they wanted (with little regard to nutrition), and perceived a lack of hunger as a sign of sufficient nutrition. This problem is further illustrated by the rising obesity rate and simultaneous risk of nutritional deficiency amongst the elderly. In recent studies, for example, elderly participants were found to be at risk of nutrition deficiency while also being overweight or having a high Body Mass Index (Chan, Lim, Ernest, & Tan, 2010; Tay et al., 2016). However, technology could be used to remedy this lack of knowledge, as E7 noted:

I didn’t know a lot at first, but my children bought me an iPad, and my grandchildren showed me cooking shows. A lot of these shows are in Chinese, and talk about balanced diets and healthy eating. This made me reconsider my own family’s diet, and helped me to make changes.
(Translated from Mandarin)

Institutional Factors that Lead to Undernutrition

The lack of institutional outreach and support also contributes to elderly undernutrition. We sought to identify institutional obstacles that hinder improvements in elderly nutrition, with a focus on nursing homes and day care centres, since free-living elderly are less dependent on these organisations.

Inability to reach out to key stakeholders. The problem of elderly undernutrition cannot be solely attributed to the government’s lack of effort. The government has exerted consistent effort to address this problem, from producing publicity materials on nutrition targeted at the elderly (HPB, 2014) to funding elderly activities (CAI, 2006).

However, care-providing institutions are not inclined to participate in such activities. For example, the GORs commented that efforts to educate community chefs in day care centres and nursing homes are “lacking in efficacy”, as these initiatives have generally been unsuccessful. According to the GORs, the lack of
success could be attributed to low sign-up and attendance rates, organisations’ lack of commitment to encourage consistent attendance, and lack of practice of imparted knowledge. Outreach efforts are further hindered by the lack of a database to store the chefs’ contact information. Even when the government and academics attempt to communicate with day care centres and nursing homes, responses are often lacklustre; it is uncertain if the information is transmitted to the relevant parties. This information bottleneck means that the key stakeholders might not have the necessary information to spur change.

**Resistance to change.** An additional hurdle to institutional efficacy is a general resistance towards changing practices. This resistance boils down to 2 key reasons: lack of enforcement, and occupational and linguistic differences.

Change is often unenforced in the nursing homes and day care centres. Since these institutions are mostly run independently of the government, any improvements proposed by the government are optional. Also, HD observed a lack of enforcement mechanisms in relation to the institutions’ key performance indicators (KPIs). While nursing homes have made slight improvements in line with a new scheme that sets benchmarks for these institutions to meet, the GORs consider these guidelines to be basal and lacking the impetus needed for real change to occur.

Change is also hampered by occupational and linguistic differences, usually between trainers and parties undergoing training. W1 expressed that training many of the nurses to be more attentive to the elderly’s eating habits is… not a good solution. We have too many patients in different rooms—nursing is very busy and these people [providing training] don’t really understand.

The GORs also noticed a lack of rapport between community chefs and their trainers. In most situations, there are linguistic differences: courses are conducted in English, while some chefs communicate mainly in Hokkien. Furthermore, the chefs are observed to be generally disagreeable with changes made to their kitchen spaces, and display a stubborn refusal to make progress.

Overall, the current methods used to engage institutions appear to be ineffective in motivating key players to change. Such a phenomenon could be explained and further complicated by the stressors that institutions experience in daily operations.
Lack of resources. Many nursing homes and day care centres are run by non-governmental organisations (NGOs) and subsist partially on donations. Thus, the budgets set aside for meals and manpower are often very limited, which inevitably affect dietary planning and nutritional content of meals. As one GOR noted,

it is actually quite common for ingredients to be donated in bulk amounts… this usually gives the chefs a big headache because ingredient diversity is limited, and there is no control over quality.

In such organisations, a lack of preventive nutritional planning is commonly observed due to the lack of an in-house dietician. The GORs pointed out that existing regulations only require menus in nursing homes to be reviewed by a dietician biannually, which leaves day-to-day decisions about nutrition to chefs who are typically not trained in dietetics. Day care centres are even more limited in resources, relying on caterers or their own chefs to creatively improvise menus.

In addition, according to the GORs and HD, the lack of resources forces these organisations to depend on donations, which cause them to place significant emphasis on maintaining a good reputation in the public eye. This might lead to increased cover-ups of elderly undernutrition, and resistance towards academics who wish to study the problem of elderly undernutrition in Singapore.

The conflicting operating interests that the organisations face partially account for their resistance to change. More should be done to assess the nuances of the challenges that such organisations face.

Recommendations

Evidence from this and other studies shows that undernutrition in elderly populations is a multifactorial problem (Lim, 2013). As such, the recommendations we present in this paper should be integrated into a more comprehensive strategy, with a focus on increasing nutritional intake and addressing the underlying causes of undernutrition. Our recommendations were derived from the insights gleaned from the interviews conducted, taking into consideration the ease of implementation and the impact that each recommendation could be expected to generate.
Educating Caregivers and the Elderly

Educating caregivers could be a low-cost, high-efficacy strategy, since education often has multiplicative effects. HD and the GORs suggested that, in most cases, caregivers genuinely care about the elderly, implying a general willingness to implement advice that would improve the quality of care for the elderly. It would hence be easier to educate the caregivers and get them to accept appropriate advice, as compared to institutionalised care centres.

Education could be achieved through public media in community-centric areas (e.g., exhibits in community centres), where interest would likely be high due to the nature of the topic. Depending on the exact content, supermarkets could also serve as spaces for education due to the high throughput of the elderly and their caregivers. Product recommendations could even be woven into the educational materials for the supermarkets’ benefit as well.

Such education should be directed towards the elderly, and not just their caregivers. Many elderly individuals, especially those who are socially isolated, tend to not track their nutritional intake and to be unaware of the symptoms of undernutrition (Chen et al., 2001; Lim, 2010). W2 pointed out that the elderly tend to be headstrong and unwilling to take advice from relatives and most eldercare workers, but are more willing to listen to doctors and dieticians—people they perceive to be experts on nutrition.

As such, organising events that include free health and nutrition screenings could be an avenue through which we provide the elderly with objective, tailored feedback that they would be more willing to accept. Apart from the opportunity to provide tailored advice to the elderly, these events could also serve as a good avenue to encourage the elderly to monitor their weight and watch for key signs of undernutrition. For instance, weight loss of more than 5 to 10 percent within 6 months would be considered clinically significant for elderly individuals (Lim, 2013).

With elderly undernutrition routinely undetected, we could also create checkpoints for routine screenings within communities or in hospitals, and develop a standard screening test for contextualised risk screening of the elderly in Singapore (Lim, 2013). For further discussion on educating the elderly and their caregivers
about nutrition, refer to Appendix E.

Building a Community that Engages the Elderly

Beyond targeting the elderly and their caregivers, we should build a supportive community where the elderly feel a sense of belonging. Building a community that cares for its elderly would help to keep the elderly occupied, stave off loneliness, and minimise physical and psychological harm.

Our interviews revealed that the shrinking of social circles for the elderly over time is a prominent issue. This issue underlies the importance of ensuring that the elderly have avenues to engage with the community and to make new friends. We identified day care centres, supermarkets, coffee shops, and community centres to be some of the main areas where our elderly interviewees interact with the community.

As such, it is important that such areas are properly managed to maximise community building, in order to achieve long-term, sustainable impact. Some suggestions include maximising interaction spaces and hosting activities that involve the elderly and other community members. The GORs interviewed also suggested holding free cookouts for the elderly at community centres. These cookouts serve to teach the elderly how to prepare affordable and nutritious meals, and to offer them a platform to make new friends. The costs of hosting such an event would be extremely low compared to the potential benefits that it could generate.

Encouraging Multigenerational Living

Our interviews with the professionals and the elderly individuals revealed that the elderly are generally happiest when living with their families, where there is sufficient stimulation, a sense of community, and greater autonomy. These factors contribute to a supportive environment for ageing. As such, it is important that the government encourages the creation of an environment that supports multigenerational family cohesion. While the government has previously offered different schemes to encourage this outcome, HD contended that these schemes are aimed at reducing the burden for families who already wish to live together, and do not truly provide incentives for families to choose to live together. Such schemes included the Multi-Generation Priority Scheme and the Proximity Housing Grant, which seek to ensure support for families who want to live together or in close proximity (CAI, 2006). Although the uptake of such schemes is on the rise, HD noted that there are structural
problems (e.g., lack of suitable multi-generation flats) that limit their effectiveness.

Economic considerations aside, the most sustainable way to promote multigenerational living would be through moral suasion: by inculcating filial piety amongst Singaporeans. There are numerous ways to achieve this, whether through programmes that expose young people to the challenges of ageing, heart-wrenching films and commercials, or civic education in schools. The key condition is that the government must be dedicated to leading such a movement.

**Reducing Institutional Barriers and Restrictions**

We discussed institutional barriers to transparency, which make it difficult to assess the severity of undernutrition in homes and other NGOs. This is a difficult problem to change, and according to the GORs, would require a paradigm shift from the existing “them-versus-us” mentality to a cooperative mindset between the NGOs and the public. However, the NGOs’ competing interests of maintaining transparency and attracting donations mean that a neutral and interested third party (such as the government) should intervene with appropriate policies and schemes, to enable the NGOs to be more accepting of change and progress.

**Conclusion**

This study highlights some prominent but controllable factors that drive elderly undernutrition in Singapore: lack of education, competing interests of institutions, and lack of community concern. Particularly, the public seems to be largely unaware of this problem of undernutrition; a dearth of relevant academic research also prevents the problem from gaining legitimacy. While the recommendations made in this paper target the education of families and the community in preventing elderly undernutrition, Singapore is headed for a profound demographic change. The lack of formal infrastructure and care processes outside of the family unit greatly hinders preventive efforts in this area, which would require greater spending on costlier treatment options. These preventive efforts are also hindered by a lack of motivation at the individual level. Thus, awareness of the situation has to be raised before the costs associated with this problem escalate.

There is great value in pursuing programmes to improve the state of elderly
nutrition in Singapore. Apart from significant healthcare savings and reduced care burdens on families and caregivers, improved nutrition greatly improves the elderly’s wellbeing, self-image, social life, and quality of life. Furthermore, by creating a more inclusive community that is able to deal with the problem in a sustainable manner, benefits can extend far beyond the wellbeing of the elderly to the wider society.
References


Lim, Y. P. (2013). Under-nutrition in the elderly—can it be prevented? *Tan Tock
Understanding Undernutrition in the Elderly Population in Singapore


Appendix A: Details of Interviewees

Table 1 profiles the individuals interviewed for the purposes of this study. The sample size was small, with only five professionals and 25 elderly persons interviewed.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td>Head dietician in a public acute general hospital</td>
<td>HD is a leading figure in the field of elderly nutrition research. Most of her research been conducted in the context of Singapore. She has contributed to the local development of elderly nutrition diagnosis and treatment plans. Mode: Face-to-face interview, in English Ethnicity: Chinese</td>
</tr>
<tr>
<td>GORs</td>
<td>2 representatives of a government-affiliated organisation</td>
<td>The government-affiliated organisation handles various eldercare-related services and policies. Mode: Face-to-face interview, in English Ethnicity: Chinese</td>
</tr>
<tr>
<td>W1</td>
<td>Senior nurse in a nursing home</td>
<td>W1 is based in an elderly care ward. She oversees some junior nurses and trainees, and appears to have a nuanced understanding of some of the major difficulties in the home with regard to eldercare. Mode: Telephone interview, in English Ethnicity: Malay</td>
</tr>
<tr>
<td>W2</td>
<td>Appointed caregiver in an elderly day care centre in a public housing setting</td>
<td>W2’s work involves tending to the day-to-day needs of the elderly in the day care centre on weekdays. The centre practices relatively flexible care services (i.e., it has no explicit restrictions on the types of elderly persons who are eligible for care). Mode: Face-to-face interview, in English Ethnicity: Chinese</td>
</tr>
<tr>
<td>E1</td>
<td>Elderly persons (Free-living) In their late 70st</td>
<td>These 4 elderly men have been friends for over thirty years; they gather almost daily in a neighbourhood coffee shop. They appear healthy (though slightly overweight) and cheerful. E4 is wheelchair-bound due to a stroke that resulted in partial paralysis. E1 and E2 live alone, while E3 and E4 live with family members. Mode: Face-to-face interview, in Hokkien and Singlish Ethnicity: Chinese</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>E5, E6</td>
<td>Elderly persons (Free-living) In their late 70s</td>
<td>These 2 elderly women are long-time friends and meet regularly in the void deck of a block of flats. Both appear to be active and physically fit. They live with family members. Mode: Face-to-face interview, in Mandarin Ethnicity: Chinese</td>
</tr>
<tr>
<td>E7</td>
<td>Elderly person (Free-living) Aged 78</td>
<td>This elderly woman identifies strongly with her role as a grandmother. She lives with her family members and appears cheerful and optimistic about her retirement. Mode: Face-to-face interview, in Mandarin and Hokkien Ethnicity: Chinese</td>
</tr>
<tr>
<td>E8, E9, E10</td>
<td>Elderly persons (Free-living) In their late 60s</td>
<td>These three elderly women met in a belly-dancing class in their neighbourhood community club last year. E8 lives with her husband (with no surviving children), while E9 and E10 live with their families. Mode: Face-to-face interview, in English and Mandarin Ethnicity: Chinese</td>
</tr>
<tr>
<td>E11</td>
<td>Elderly person (Free-living) Aged 66</td>
<td>This well-educated elderly man describes himself as an “old-school broker”. E11 is single, lives alone in a one-room public housing flat, and used to work regular hours. Since he suffered a stroke, which led to difficulties with walking and bending over, his health and strength have deteriorated rapidly. Mode: Face-to-face interview, in English Ethnicity: Chinese</td>
</tr>
<tr>
<td>E12</td>
<td>Elderly person (Attending day care) In her early 80s</td>
<td>This elderly woman attends day care regularly, though not daily. She lives with her family. However, because of her poor health, her family sends her to day care to alleviate the stress they face from taking care of her, and to distract her from her pain and discomfort. Mode: Face-to-face interview, in English Ethnicity: Chinese</td>
</tr>
<tr>
<td>E13, E14, E15</td>
<td>Elderly persons (Attending day care) In their late 70s</td>
<td>These elderly men attend day care regularly, though not daily. E13 lives with his sister, while E14 and E15 live alone. They face slight mobility difficulties and minor health issues (e.g., E14 has hypertension) that do not hinder their daily activities. Mode: Face-to-face interview, in Mandarin and Hokkien Ethnicity: Chinese</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>E16, E17, E18</td>
<td>Elderly persons (Attending day care) In their late 70s</td>
<td>These three elderly women attend day care daily. E16 and E17 live alone after suffering bereavement, while E18 lives with her family. Their main motivation for attending day care is to seek company and distraction from boredom. Mode: Face-to-face interview, in Hokkien Ethnicity: Chinese</td>
</tr>
<tr>
<td>E19, E20</td>
<td>Elderly person (Attending day care) In their early 80s</td>
<td>These elderly men attend day care daily. E19 has Parkinson’s disease, while E20 has poor eyesight. Their families send them to day care, so that they can receive better care in the day. The men are cheerful, enjoying each other’s company and staff members’ assistance. Mode: Face-to-face interview, in Mandarin Ethnicity: Chinese</td>
</tr>
<tr>
<td>E21</td>
<td>Elderly person (In nursing home) Aged 82</td>
<td>This elderly man has been in the nursing home for about four months. He has family members who visit him frequently. He is extremely vocal about the nursing home needing to improve its food quality and level of care (although he also expresses strong gratitude towards the home’s nurses). Mode: Face-to-face interview, in English Ethnicity: Malay</td>
</tr>
<tr>
<td>E22, E23, E24, E25</td>
<td>Elderly persons (In nursing home) Generally in their 80s</td>
<td>These four elderly individuals are roommates in the same nursing home. They are rather ill and unable to talk much. They express resignation towards their fate, and do not particularly enjoy anything in their lives, much less the nursing home food. Mode: Face-to-face interview, in Mandarin and Hokkien Ethnicity: Chinese</td>
</tr>
</tbody>
</table>

Table 1. Interviewee profiles

The relative homogeneity of the participants presented some methodological difficulties. Although care was taken in the selection of participants to ensure a more heterogeneous sample of elderly persons, limitations in time and outreach hindered the attainment of a more representative sample size.

Below, we propose several demographic factors that future studies of elderly undernutrition could take note of.
Ethnicity

Only one elderly interviewee in our study belonged to a minority ethnic group: E21, a Malay man in a nursing home. Ethnic minorities cannot be fully represented by only one interviewee. In fact, E21 suggested that he was an exception among the Malays, as “Malays like to take care of their old people, not put them in a nursing home”. Nevertheless, his tone was convivial and not bitter. He was aware that his rapidly deteriorating condition required palliative care in the nursing home, where family members and friends frequently visited him. However, his statement also implied that different ethnic groups might hold different values and approaches towards caring for the elderly, which could differentially influence elderly undernutrition across ethnic groups. Since existing studies tended to focus on Singapore’s ethnic Chinese majority—due to the ease of sampling—future studies could look more into the nutritional outcomes of ethnic minorities.

Age

Many local and international studies have detailed the effects of ageing on nutrition. However, these studies have not determined if the effects of ageing on an elderly individual’s health are confounded by other such factors as generational differences in mindsets. Identifying the exact underlying factors would affect the way caregivers and policymakers engage the elderly.

Gender

Yap et al. (2007) found that males face a higher risk of social isolation. Our interview data appear to corroborate this finding. E3 and E11 were isolated males. In addition, the male interviewees tended to socialise based on routine: E1–E4 met regularly in the coffee shop; E13–E15 and E19–E20 met regularly in the day care centre; and E22–E25 shared a room in the nursing home. Females, on the other hand, appear more receptive to participating in activities to meet new people. As such, in encouraging social activity amongst the elderly, different approaches might be required to effectively engage men and women.

Elderly Activity

Most of the elderly individuals who agreed to our interviews were quite active—if not physically, then socially. Since these individuals were less likely to be isolated, we faced a self-selection bias that might have compromised the representativeness
of our sample. All the elderly interviewees had meaningful contact with other people (typically more than once a week); and though they might have felt lonely due to the amount of free time they had, they did not necessarily feel isolated. Research should be conducted to engage elderly individuals who are more isolated, to better assess their risks and attend to their needs.
Appendix B: Study Poster

Figure 1 below depicts the poster used to introduce the study to the interviewed individuals and organisations.

Figure 1. Poster used to introduce project to stakeholders
Appendix C: Review of Elderly Nutrition Assessments Used in Existing Literature

Yap, Niti, and Ng (2007) found that 35 to 60 percent of community-dwelling Chinese elderly (above 55 years old) faced nutritional risk. This study utilised a ten-question ‘Yes/No’ checklist titled “DETERMINE your Nutritional Health”, where a score of three or more on the test indicates nutritional risk. The questions for this test can be found in Table 2.

A more recent study by Tay et al. (2016) utilised the SCREEN II test, a 14-item questionnaire. The study found that approximately 70 percent of the 193 free-living adults (above 50 years old) faced nutritional risk. The questions for this test can be found in Table 3.

Lim (2010) used the Tan Tock Seng Hospital Nutrition Screening Tool to screen elderly people who were hospitalised. The tool was shown to be the most effective screening tool compared to other nutritional screening tests used in the local context.

Koo et al. (2014) found that low-income, free-living elderly individuals (above 55 years old) on the Public Assistance scheme had a low prevalence of actual malnutrition (2.8 percent), even though a risk assessment conducted using the Mini Nutritional Assessment (MNA) and DETERMINE test indicated a risk of 50.3 percent. The questions for the MNA can be found in Figure 2.
<table>
<thead>
<tr>
<th>Questions</th>
<th>Score if ‘Yes’</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have an illness or condition that made me change the kind and/or amount of food I eat.</td>
<td>2</td>
</tr>
<tr>
<td>I eat fewer than two meals per day.</td>
<td>3</td>
</tr>
<tr>
<td>I eat few fruits or vegetables, or milk products.</td>
<td>2</td>
</tr>
<tr>
<td>I have three or more drinks of beer, liquor or wine almost every day.</td>
<td>2</td>
</tr>
<tr>
<td>I have tooth or mouth problems that make it hard for me to eat.</td>
<td>2</td>
</tr>
<tr>
<td>I don’t always have enough money to buy the food I need.</td>
<td>4</td>
</tr>
<tr>
<td>I eat alone most of the time.</td>
<td>1</td>
</tr>
<tr>
<td>I take three or more different prescribed or over-the-counter drugs a day.</td>
<td>1</td>
</tr>
<tr>
<td>Without wanting to, I have lost or gained 10 pounds in the last six months.</td>
<td>2</td>
</tr>
<tr>
<td>I am not always physically able to shop, cook and/or feed myself.</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 2. Questions asked in the DETERMINE test*
<table>
<thead>
<tr>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1a) Has your weight changed in the past 6 months? (participant identified gain, loss or maintenance and the amount of weight change (about 5 pounds, 6–10 pounds, more than 10 pounds))</td>
</tr>
<tr>
<td>(1b) Have you been trying to change your weight in the past 6 months?</td>
</tr>
<tr>
<td>(1c) Do you think your weight is...? (perception of overweight, underweight or appropriate weight).</td>
</tr>
<tr>
<td>(2) Do you skip meals?</td>
</tr>
<tr>
<td>(3) Do you limit or avoid certain foods?</td>
</tr>
<tr>
<td>(4) How would you describe your appetite?</td>
</tr>
<tr>
<td>(5) How many pieces or servings of fruit and vegetables do you eat in a day?</td>
</tr>
<tr>
<td>(6) How often do you eat meat, eggs, fish, poultry or meat alternatives?</td>
</tr>
<tr>
<td>(7) How often do you have milk products?</td>
</tr>
<tr>
<td>(8) How much fluid do you drink in a day?</td>
</tr>
<tr>
<td>(9) Do you cough, choke or have pain when swallowing food or fluids?</td>
</tr>
<tr>
<td>(10) Is biting or chewing food difficult for you?</td>
</tr>
<tr>
<td>(11) Do you use commercial meal replacements or supplements?</td>
</tr>
<tr>
<td>(12) Do you eat one or more meals a day with someone?</td>
</tr>
<tr>
<td>(13a) Who usually prepares your meals?</td>
</tr>
<tr>
<td>(13b) Which statement best describes meal preparation for you?</td>
</tr>
<tr>
<td>(14) Do you have any problems getting your groceries?</td>
</tr>
</tbody>
</table>

*Table 3. Questions asked in the SCREEN II test*
Appendix D: HPB’s National Nutrition Survey

Data from HPB’s (2010) National Nutrition Survey, which included 170 people aged 60–69 in the sample, suggested that the elderly’s diets are more likely to be deficient in protein, vitamins, and minerals.

25.3 percent of the elderly sample were found to have a protein intake below recommended levels, compared to 11.2 percent of people aged 18–29. The elderly were also found to consume the least amount of protein-based produce like poultry, meat, eggs, and soy products (HPB, 2010). This finding is consistent with a more recent study by Tay et al. (2016), which found that less than 20 percent of their 193 Singaporean participants above the age of 50 consumed more than two servings of protein sources daily.

This protein deficiency is in part due to the high cost of meat (a common source of protein), and the elderly’s inability to estimate the appropriate amount of protein required in their diets. These problems are less prevalent in elderly people receiving care in day care centres or nursing homes, where food is catered. However, many elderly people still experienced significant difficulties in eating meat because it is more difficult to chew than other common foods.

Difficulties in chewing also results in less-than-ideal vegetable consumption among the elderly. In the HPB survey, only 23.7 percent of the elderly met the recommended intake of vegetables. Similarly, Tay et al.’s (2016) study found a lack of adequate vegetables and dairy products in elderly diets. While prolonged cooking may help to soften vegetables for easier chewing, many of the elderly complain that the vegetables would end up bland and mushy and would choose not to eat them. Consequently, vitamin and mineral deficiencies are also prominent issues. 15.6 percent of the elderly surveyed were found to have inadequate vitamin A intake, the highest across all age groups. This is a worrying phenomenon, since vitamin A deficiency is not believed to be common in developed countries.

Calcium deficiency is another important area to address, since the elderly require higher amounts of calcium compared to other age groups. 54.3 percent of the elderly surveyed were found to have inadequate calcium intake. On a related note, the elderly also consumed the least milk across all age groups. Many of the elderly respondents did not enjoy drinking milk and were not aware of alternative calcium
sources (or even the existence of calcium). However, some elderly individuals who did not enjoy milk had been made aware of the importance of calcium through advertisements on the television, and had devised ways to make dairy intake more enjoyable.

The elderly might also face dehydration problems. While 55 percent of the adults sampled consumed the recommended 1.5 litres of plain water daily, only 42.7 percent of the elderly aged between 60 and 69 met this recommendation. Elderly individuals who are in poor health—living in nursing homes or alone—might find it difficult to pour water for themselves or to drink and swallow at times.

This list of common undernutrition areas is not exhaustive. The elderly in Singapore might be deficient in other nutrients such as dietary fibre, folate, and vitamin C. However, due to the lack of extensive research and difficulties faced in discussing complex terms with many interviewees, no further information could be gathered.
Appendix E: Educating the Elderly and Their Caregivers

While many different topics could be suitable for the education of the elderly and their caregivers, an awareness of the target group and of the context would be necessary. For instance, educating the elderly on snack and meal planning might be suitable for an event held in a supermarket or in a coffee shop setting. The content of the education should focus on highlighting the areas in which the elderly face nutritional deficiency (as described in Appendix D), as well as ways to address these problems.

Greater Specificity in Meal Planning

Common advice such as having smaller and more frequent meals or having more nutrient-dense, low-calorie snacks should be accompanied with recipes or specific recommendations, as the elderly might face difficulties in adhering to overly generic advice (in particular, E4, E6, and E7 indicated this concern).

Improving the Eating Experience

Due to the deterioration of sensory functions and dental health, making food appetising for the elderly should take precedence over preparing typically ‘healthy’ food. The GORs mentioned that their governmental organisation intends to take this direction. In particular, caregivers and cooks for the elderly might benefit from learning new recipes and methods to prepare texture-appropriate food that would make chewing and swallowing more pleasant for the elderly.

Supplementation and Fortification

HPB recommends that the elderly should consume food rich in energy, protein, and vitamins; examples listed included fish, meat, milk, nuts, legumes, cheese, and yoghurt (HPB, 2010, 2014). However, feedback from the elderly suggests that they generally have a distaste for cheese, yoghurt, and most dairy products, and that the lower-income groups are less likely to spend on fresh produce. The GORs added that getting the elderly to adapt to new food in their old age would be difficult. As such, the supplementation and fortification of food already commonly consumed by the elderly—through an industry-level intervention or culinary education of caregivers and the elderly themselves—might be a more feasible approach.