# Health Capacity to Work among Older Malaysians

Norma Mansor, Halimah Awang, and Donghyun Park*

This paper uses two methodologies to explore the extent to which greater labor force participation among older Malaysians can expand Malaysia's labor supply. The Milligan–Wise method estimates the potential to increase the labor force participation rate of older Malaysians by estimating how much they would work if they were to work as much as those with the same mortality rate in the past. The Cutler, Meara, and Richards-Shubik (2013) method estimates the same potential by estimating how much older Malaysians would work if they worked as much as their younger counterparts in similar health. We made further simulations to quantify the capacity of older Malaysians to work after they are 60 years old. The results show significant additional work capacity among older people in Malaysia, particularly males, urban dwellers, and those with low educational attainment.

*Keywords:* aging, health capacity, labor supply, Malaysia, simulation
*JEL codes:* J18, J21, J26

## I. Introduction

Malaysia is experiencing a demographic transition characterized by a steady increase in the size and proportion of its older population. The country's population

*Norma Mansor (corresponding author): Social Wellbeing Research Centre, Universiti Malaya, Kuala Lumpur, Malaysia. E-mail: norma@um.edu.my; Halimah Awang: Social Wellbeing Research Centre, Universiti Malaya, Kuala Lumpur, Malaysia. E-mail: halima@um.edu.my; Donghyun Park: Asian Development Bank, Metro Manila, Philippines. E-mail: dpark@adb.org. The Asian Development Bank recognizes "Vietnam" as Viet Nam.

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rose by 18.1% from 27.5 million in 2010 to 32.5 million in 2020, and projections show this will reach 41.5 million by 2040 (Department of Statistics Malaysia 2016, 2022c). The proportion of the population aged 65 years and over accounted for 6.8% of the total in 2020 compared with 5% in 2010 (Department of Statistics Malaysia 2022c). Refer to the Appendix for the stylized facts of Malaysia's population aging in more detail.[1] To address the short- and long-term challenges linked to population aging, Malaysia must build sound and sustainable socioeconomic, health, and social care systems for its older population.

Like many other aging countries, Malaysia is facing two long-run phenomena. While health and longevity have improved substantially over time, labor force participation has stagnated in recent years. Improved health is likely to increase the productive capacity of older persons; however, the improvement in their capacity to work has not been translated into an actual increase in their employment.

A longer working life benefits the well-being of older persons through income security, a greater sense of social participation and contribution, and self-fulfillment. At the societal level, greater labor force participation among older workers can help mitigate the shortage of workers and other challenges due to population aging (Lai and Yip 2022). Many countries have raised or are considering raising the statutory retirement age. However, extending the retirement age is a viable policy option only if there is evidence of an improvement in the health status of older persons, which allows them to be productive without risking their health and well-being.

Many factors affect the capacity of older individuals to work; health-related factors are among the most influential. Therefore, the objective of this study is to empirically investigate how health influences the work decisions of older people. We employ two methodologies, the Milligan–Wise (MW) (Milligan and Wise 2015) and the Cutler–Meara–Richards-Shubik (CMR) (Cutler, Meara, and Richards-Shubik 2013) methods, and investigate the extent to which greater labor force participation among older Malaysians can expand Malaysia's labor supply. We perform numerical analyses to quantify the health capacity of older Malaysians to work beyond age 60. Our empirical and numerical results show significant old-age work capacity in Malaysia, particularly among males, urban dwellers, and those with low educational attainment.

The rest of our paper is organized as follows. Section II describes how we can measure health capacity to work and better understand the "silver demographic dividend" in Malaysia. This is followed by discussions on estimating health capacity to work using the MW method in section III and the CMR method in section IV.

[1]To view all appendixes, please refer to the supplemental materials that are available at: https://www.worldscientific.com/doi/suppl/10.1142/S0116110524400043.

In section V, we discuss the results of the analysis and findings, and conclude by providing relevant policy directions.

## II. Measuring Health Capacity to Work and the Silver Demographic Dividend

Health capacity to work can be measured in different ways, but it can be crudely defined as the incremental years of working life brought about by improved health status. Examining the relationship between mortality and employment, Milligan and Wise (2015) proposed a method (MW method) that measures health capacity to work by determining "how much people with a given mortality rate today could work if they were to work as much as those with the same mortality rate worked in the past."

Regarding Cutler, Meara, and Richards-Shubik's (2013) regression-based measurement of the incremental health capacity to work (CMR method), recent studies have calculated the so-called silver demographic dividend, which refers to the potential economic gain from the untapped work capacity of older persons. In Japan, Ogawa et al. (2021) estimated the silver dividend that could be derived from the untapped work capacity of around 4.12 million individuals aged 60–79 to be an additional 3.2%–6.0% of the current real gross domestic product.

There are at least two critical institutional and policy contexts pertinent to developing Asian countries that can largely influence the expected size of incremental gains of health capacity to work and the silver dividend. First is the health status of older persons. While the overall healthy life span in the region is being extended, much is explained by the large decline in mortality among children under the age of 5. In contrast, the health status of older persons in developing Asia has not improved dramatically, with some economies even reporting a degree of deterioration and large inequalities (Kikkawa and Gaspar 2023). As life expectancy increases, the incidence of noncommunicable diseases and disabilities, particularly cognitive impairments such as Alzheimer's disease and dementia, is rising among the older age groups. Therefore, a detailed and regionally comparative study is needed to measure the potential gains (or losses) from the health capacity to work.

Another important context is the pervasive informality in the labor market and its implications for social security coverage in developing economies. The International Labour Organization (2018) reported that around 1.3 billion people, or 62.8% of all those employed in Asia and the Pacific, are involved in the informal economy. Consequently, social insurance and pension coverage in many parts of the region remain low, notwithstanding the small amount that beneficiaries could receive if they

were covered. A large share of older persons in developing Asia do not have any (or at least adequate) pension or social protection, pushing them to work for as long as they can even when their health is compromised. Reforms involving adjustments in the pensionable age may become more relevant in their labor supply decisions.

The scope of this study is limited to older adults in Malaysia by examining their health capacity to work. Malaysia's silver dividend is estimated to be a gross domestic product increase of approximately 2.5%–4.2%, which is relatively smaller than Japan's (Ogawa et al. 2021). Life expectancy at age 60 in Malaysia was 18.7 years in 2022—with men expected to live another 17.5 years and women another 20.1 years (Department of Statistics Malaysia 2022a). The retirement age for public sector employees in Malaysia had been 55 years old until it was raised to 56 in 2001, 58 in 2008, and 60 in 2013. Following the introduction of the Minimum Retirement Age Act in 2012, the minimum retirement age was set at 60, effective from July 2013. There are ongoing debates as to whether the retirement age should be further increased given the increase in life expectancy beyond age 60. However, this raises concern as people living in rural areas are mainly employed in the informal sector with no access to old-age income security schemes. Another issue of concern relates to the higher prevalence of noncommunicable diseases among older people. It was reported that the prevalence of hypertension among those aged 60 and older is 51.1%, followed by hypercholesterolemia (41.8%) and diabetes (27.7%). These prevalence rates are significantly higher than those for Malaysians under the age of 60, indicating a deterioration of health among older Malaysians (Institute for Public Health 2019).

## III. Estimating Additional Health Capacity to Work Using the Milligan–Wise Method

Using the MW method, we estimate an individual's ability to work at older ages in Malaysia based on the relationship between mortality and employment that existed at an earlier time along with current mortality data. Appendix Figures A1 and A2 compare the employment–mortality curves in 2000 and 2019 for men and women, respectively, using the Labor Force Survey (LFS) and mortality rate data.

In 2019, the 1-year mortality rate for men at age 65 was about 23.4 per thousand and the labor force participation rate at this age was 16.5% (Table 1). In 2000, at age 62, the mortality rate was 23.4 per thousand, and the labor force participation rate at this age was 53%. Thus, if a male in 2019 had the same employment rate as a male did in 2000 with the same mortality rate, the employment rate of 65-year-old males would have been 36.5% higher than the actual employment.

Table 1. **Additional Employment Capacity in 2019 Using the 2000 Labor Force Participation–Mortality Relationship**

| | Male | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Age | Death Rate in 2019 | Employment Rate in 2019 | Employment Rate in 2000 at Same Death Rate | Additional Employment Capacity | Cumulative Additional Employment Capacity | Death Rate in 2019 | Employment Rate in 2019 | Employment Rate in 2000 at Same Death Rate | Additional Employment Capacity | Cumulative Additional Employment Capacity |
| 50 | 7.02 | 92.30 | | | | 3.74 | 54.00 | | | |
| 51 | 8.28 | 90.46 | | | | 4.27 | 52.00 | | | |
| 52 | 8.64 | 88.08 | | | | 4.61 | 49.00 | | | |
| 53 | 8.94 | 85.11 | | | | 5.39 | 45.00 | | | |
| 54 | 9.91 | 81.47 | | | | 5.34 | 42.00 | | | |
| 55 | 11.07 | 77.10 | | | | 6.41 | 38.00 | | | |
| 56 | 11.09 | 71.98 | | | | 6.53 | 35.00 | | | |
| 57 | 12.91 | 66.24 | 72.52 | 6.28 | 0.06 | 7.02 | 31.00 | | | |
| 58 | 13.90 | 60.02 | 68.96 | 8.94 | 0.15 | 8.48 | 28.00 | | | |
| 59 | 14.74 | 53.49 | 65.53 | 12.04 | 0.27 | 8.76 | 25.00 | | | |
| 60 | 16.75 | 46.80 | 62.95 | 16.15 | 0.43 | 9.45 | 21.00 | 24.39 | 3.39 | 0.03 |
| 61 | 18.39 | 40.11 | 59.70 | 19.59 | 0.63 | 11.52 | 18.00 | 22.21 | 4.21 | 0.08 |
| 62 | 18.68 | 33.58 | 60.24 | 26.66 | 0.90 | 11.31 | 15.00 | 22.10 | 7.10 | 0.15 |
| 63 | 21.24 | 27.36 | 57.20 | 29.84 | 1.19 | 12.46 | 11.00 | 23.03 | 12.03 | 0.27 |
| 64 | 22.05 | 21.62 | 54.91 | 33.29 | 1.53 | 13.45 | 8.00 | 19.38 | 11.38 | 0.38 |
| 65 | 23.38 | 16.50 | 53.00 | 36.50 | 1.89 | 15.09 | 4.00 | 17.48 | 13.48 | 0.52 |
| 66 | 25.21 | 12.17 | 46.74 | 34.57 | 2.24 | 16.90 | 1.00 | 16.55 | 15.55 | 0.67 |
| 67 | 29.13 | 8.79 | 49.01 | 40.23 | 2.64 | 16.90 | 0.00 | 14.62 | 14.62 | 0.82 |
| 68 | 31.22 | 6.50 | 42.74 | 36.23 | 3.00 | 18.74 | 0.00 | 15.19 | 15.19 | 0.97 |
| 69 | 30.65 | 5.48 | 41.47 | 35.99 | 3.36 | 19.99 | 0.00 | 11.92 | 11.92 | 1.09 |

Source: Authors' calculations.

Conversely, the 1-year mortality rate for women at age 65 in 2019 was about 15 per thousand, and the labor force participation rate at this age was 4%. In 2000, at age 62, the mortality rate for women was 15 per thousand, and the labor force participation rate was 17.5%. Thus, if a female in 2019 had the same labor force participation rate as a female did in 2000 with the same mortality rate, the labor force participation rate of 65-year-old females would have been 13.5% higher than the actual employment. This may be explained by the fact that female labor force participation has increased substantially in recent years due to rising education levels and the shift away from agriculture to manufacturing and services employment.

Table 1 summarizes the additional employment capacity for males and females by extending the above exercise through age 69. For males below age 57 and females below age 60, the increase in mortality rate or employment rate over time impedes the calculation due to negative values obtained. For males, the calculation begins from the age of 57 while for females, the calculation begins from the age of 60. In total, men would have worked for an additional 3.36 years between the ages of 57 and 69 and women would have worked for an additional 1.09 years.

## IV. Estimating Additional Working Capacity Using the Cutler, Meara, and Richards-Shubik Method

The CMR method was deployed to examine to what extent older persons in Malaysia with a given level of health could work if they were to work as much as their younger counterparts with a similar level of health. Using the simulation exercise, this method attempted to quantify the potential work capacity of older workers in terms of their work capacity and the likely disability experience of the reference age group. The process began by taking individuals aged 50–59 years as the reference group to estimate the models. Subsequently, health capacity was simulated using the sample of respondents aged 60–79 years by combining the estimated coefficients with their actual characteristics.

For this, the study used a subsample of the data from the Malaysia Ageing and Retirement Survey, a national longitudinal study of older persons in Malaysia in which the first wave of data collection was conducted in 2018 and the second wave in 2020. Ethical approval was obtained from the Institutional Ethics Review Board of the Universiti Malaya.[2] The survey collected information from individuals aged 40 and

[2]Reference no. UM.TNC2/UMREC-341.

over with respect to (i) background, family support, and living arrangement; (ii) work, employment, and retirement; (iii) health, health-care utilization, psychosocial, and cognition; (iv) income and consumption; and (v) housing and assets. The first wave of the Malaysia Ageing and Retirement Survey successfully interviewed 5,613 respondents using a computer-assisted personal interview, and the subsample of 3,890 individuals aged 50–79 years was used for the analyses. Refer to the Appendix for the definition of variables, data sources, and descriptive analysis.

A linear probability model (LPM) and binary logistic regression were used to predict the binary outcome of employment, where a value of 1 indicates that an individual was employed (including paid employment, self-employed, and unpaid family worker), and a value of 0 indicates otherwise. Considering the heterogeneity of the sample, the analyses were done on several subgroups. These subgroups were based on gender (male and female), place of residence (urban and rural), and education level (secondary and above and at most elementary). For the predictors, this study included (i) individual characteristics (gender, education, marital status, place of residence, and ethnicity); (ii) self-reported health; (iii) functional limitations (activities of daily living [ADL], visual impairment, hearing impairment, physical limitations, and cognitive limitations); (iv) prevalence of health conditions (number of chronic diseases, diabetes, hypertension, heart disease, cancer, asthma, arthritis, back pain, and depression); and (v) risk factors (smoking, drinking, and being overweight). Three models were estimated: Model (0) is the parsimonious model with major health conditions in one integrated measure, model (1) is the model with essential variables, and model (2) is the model that includes essential variables and other variables. The coefficients and robust standard errors were reported for LPM, while odds ratios and 95% confidence intervals were reported for logistic regression models. The additional working capacity was calculated by taking the difference between the actual proportion and the simulated proportion of working respondents. Refer to Tables A5–A10 of the Appendix for the results of the logistic regression analysis.

## A. Estimating Additional Working Capacity by Gender

Married men were more likely to work than unmarried men (Table 2). Men with diagnosed illnesses, hypertension, depression, and asthma were less likely to work in all the models using both methods. Men with ADL limitation (ADL 4 and ADL 6) were less likely to work except in model (1) using logistic regression. The positive impact of smoking was significant in all models using LPM, while significant in models (0) and (2) using logistic regression. The impact of self-rated health was only

Table 2. **Results of Regression Analysis by Gender (Male)**

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| married | **0.106**** (0.045) | **0.101**** (0.045) | **0.096**** (0.044) |
| urban | −0.025 (0.02) | −0.025 (0.02) | −0.005 (0.021) |
| srh_good[a] | −0.015 (0.031) | −0.014 (0.032) | −0.029 (0.031) |
| srh_fair[a] | −0.007 (0.033) | −0.001 (0.034) | −0.007 (0.032) |
| srh_vpoor[a] | −**0.109**** (0.055) | −**0.097*** (0.058) | −0.078 (0.056) |
| adl_1 | −**0.055**** (0.026) | −**0.047*** (0.026) | |
| illness | −**0.037**** (0.016) | | |
| smoking | **0.034*** (0.02) | **0.035*** (0.02) | **0.034*** (0.02) |
| edu_elementary[b] | | 0.01 (0.027) | 0.004 (0.028) |
| edu_middle[b] | | −0.013 (0.025) | −0.012 (0.024) |
| edu_college[b] | | 0.003 (0.032) | 0.004 (0.033) |
| diabetes | | −0.028 (0.03) | −0.02 (0.031) |
| hypertension | | −**0.058**** (0.025) | −**0.066***** (0.025) |
| heart | | 0.034 (0.053) | 0.045 (0.053) |
| depression | | −**0.11**** (0.046) | −**0.099**** (0.046) |
| adl_2 | | | −**0.06**** (0.03) |
| eyesight | | | −0.058 (0.061) |
| hearing | | | −0.054 (0.079) |
| physical | | | 0.027 (0.028) |
| asthma | | | −**0.142*** (0.084) |
| arthritis | | | 0.105 (0.069) |
| back pain | | | −0.027 (0.032) |
| drinking | | | 0.046 (0.031) |
| overweight | | | −0.007 (0.021) |
| eth_chinese[c] | | | −0.055 (0.045) |
| eth_indian[c] | | | −**0.103*** (0.056) |
| eth_others[c] | | | 0.031 (0.022) |
| *R*-squared | 0.060 | 0.076 | 0.104 |

LPM = linear probability model.
Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
[a]Reference category is very good or excellent health.
[b]Reference category is high school.
[c]Reference category is Malay.
Source: Authors' calculations.

significant in models (0) and (1) using LPM, where respondents with poor or very poor health were less likely to work than those in very good health. Ethnicity was found to be significant in model (2) using both methods for Indian respondents who were less likely to work than Malay respondents.

The significance of marriage and smoking remained in all the models and methods among women (Table 3). However, the number of women who smoked was very small. Married women were less likely to work, while smoking women were more likely to work than their respective counterparts. Women with diagnosed illnesses were less likely to work as indicated in model (0) using both methods. Women with a postsecondary education were more likely to work compared to those with a high school education in models (1) and (2) using both methods. Women with at most an elementary school education were less likely to work compared to those with a high school education in model (1) using both methods.

In summary, the common significant factors among men and women were marital status, smoking, and diagnosed illnesses. From the regression analysis, the impact of diagnosed diseases such as hypertension, depression, and asthma was more prevalent among men. Marriage had the opposite impact on men and women. Married men and married women were more and less likely to work, respectively, than their nonmarried male and female counterparts.

We simulated the additional working capacity by combining the actual characteristics and the estimated coefficients from the regression analysis. The actual working capacity of men was higher than that of women, with the actual working capacity among men decreasing gradually, while no distinct pattern emerged across ages for women (Figures A3–A8 of the Appendix). The actual working capacity among men aged 60–64 was 78.7%, and this proportion dropped to 58.5% among men aged 75–79. The actual working capacity among women aged 60–64 was 46.1%, which declined to 42.1% among women aged 65–69. However, at ages 70–74, the actual working capacity for women increased to 48.3% and achieved its peak at 48.4% among women aged 75–79.

Generally, the extra working capacity simulated using LPM regression was slightly higher than using logistic regression, but there were no substantial differences between the two methods. Both methods showed that women have no extra working capacity at ages 60–64 as indicated by the deficit value obtained from the simulation. Additional capacity to work improved for both men and women as they aged, albeit more so for women who showed a drastic increment compared to men. A similar trend was observed using the MW method.

Table 3. **Results of Regression Analysis by Gender (Female)**

| | LPM | | |
|---|---|---|---|
| **Variables** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| married | −**0.287***** (0.035) | −**0.295***** (0.035) | −**0.301***** (0.035) |
| urban | 0.027 (0.031) | 0.004 (0.031) | −0.002 (0.033) |
| srh_good[a] | −0.01 (0.068) | 0.012 (0.067) | 0.022 (0.067) |
| srh_fair[a] | −0.05 (0.069) | −0.005 (0.069) | −0.002 (0.068) |
| srh_vpoor[a] | −0.101 (0.082) | −0.061 (0.082) | −0.053 (0.082) |
| adl_1 | −0.025 (0.034) | −0.02 (0.033) | |
| illness | −**0.043**** (0.022) | | |
| smoking | **0.216*** (0.113) | **0.249**** (0.112) | **0.261**** (0.114) |
| edu_elementary[b] | | −**0.064*** (0.038) | −0.045 (0.04) |
| edu_middle[b] | | −0.001 (0.042) | 0.005 (0.043) |
| edu_college[b] | | **0.272***** (0.053) | **0.273***** (0.055) |
| diabetes | | −0.026 (0.041) | −0.014 (0.042) |
| hypertension | | −0.051 (0.034) | −0.05 (0.035) |
| heart | | 0.017 (0.092) | 0.026 (0.092) |
| depression | | 0.017 (0.048) | 0.016 (0.048) |
| adl_2 | | | 0.026 (0.037) |
| eyesight | | | −0.019 (0.067) |
| hearing | | | 0.014 (0.078) |
| physical | | | −**0.065*** (0.038) |
| asthma | | | −0.007 (0.07) |
| arthritis | | | 0.039 (0.12) |
| back pain | | | 0.042 (0.044) |
| drinking | | | 0.01 (0.105) |
| overweight | | | −0.001 (0.035) |
| eth_chinese[c] | | | 0.07 (0.056) |
| eth_indian[c] | | | −0.079 (0.059) |
| eth_others[c] | | | −0.059 (0.04) |
| *R*-squared | 0.070 | 0.099 | 0.109 |

LPM = linear probability model.

Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

[a]Reference category is very good or excellent health.

[b]Reference category is high school.

[c]Reference category is Malay.

Source: Authors' calculations.

## B. Estimating Additional Working Capacity by Place of Residence

Gender and marital status remained significant across models and methods in the urban subsample where women and married respondents were less likely to work compared to their respective male and unmarried counterparts (Table 4). Respondents with a postsecondary education were more likely to work as indicated by all models and using both methods. Respondents with diagnosed illnesses in model (0) and with diagnosed hypertension in model (1) and model (2) were less likely to work than those without any illnesses. The urban subsample also showed that Indian respondents were less likely to work than Malay respondents.

In the rural subsample, women and marital status were significant in all the models and methods where a similar negative impact was found (Table 5).

Table 4. **Results of Regression Analysis by Place of Residence (Urban)**

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| female | −**0.374***** (0.029) | −**0.355***** (0.03) | −**0.349***** (0.03) |
| married | −**0.156***** (0.041) | −**0.16***** (0.04) | −**0.162***** (0.04) |
| srh_good[a] | −0.032 (0.047) | −0.022 (0.046) | −0.025 (0.047) |
| srh_fair[a] | −0.044 (0.05) | −0.026 (0.05) | −0.028 (0.05) |
| srh_vpoor[a] | −0.068 (0.067) | −0.042 (0.068) | −0.035 (0.068) |
| adl_1 | −0.031 (0.031) | −0.025 (0.031) | |
| illness | −**0.053***** (0.019) | | |
| smoking | 0.036 (0.029) | 0.044 (0.03) | 0.037 (0.03) |
| edu_elementary[b] | | −0.018 (0.035) | −0.006 (0.036) |
| edu_middle[b] | | 0.053 (0.034) | **0.06*** (0.035) |
| edu_college[b] | | **0.127***** (0.037) | **0.118***** (0.038) |
| diabetes | | −0.057 (0.036) | −0.038 (0.038) |
| hypertension | | −**0.058*** (0.031) | −**0.066**** (0.032) |
| heart | | −0.009 (0.059) | 0.014 (0.062) |
| depression | | −0.015 (0.046) | 0.004 (0.046) |
| adl_2 | | | −0.018 (0.035) |
| eyesight | | | −0.115 (0.071) |
| hearing | | | −0.06 (0.097) |
| physical | | | −0.029 (0.035) |
| asthma | | | 0.031 (0.072) |
| arthritis | | | 0.099 (0.084) |
| back pain | | | 0.029 (0.043) |
| drinking | | | 0.063 (0.049) |
| overweight | | | −0.005 (0.028) |

*Continued.*

Table 4. *Continued.*

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| eth_chinese[c] | | | −0.015 (0.042) |
| eth_indian[c] | | | **−0.102**** (0.048) |
| eth_others[c] | | | −0.022 (0.037) |
| *R*-squared | 0.187 | 0.198 | 0.208 |

LPM = linear probability model.
Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
[a]Reference category is very good or excellent health.
[b]Reference category is high school.
[c]Reference category is Malay.
Source: Authors' calculations.

Respondents in poor or very poor health were less likely to work than those in very good health; however, it was only significant in LPM. Respondents with a middle school education were less likely to work, while those with a postsecondary school education were more likely to work than those with at most elementary schooling. Respondents with diagnosed hypertension and asthma were less likely to work than those without such ailments. Hence, the common factors between urban and rural areas were gender, marriage, education, and diagnosed hypertension.

The actual working capacity for both urban and rural subsamples have no distinct pattern across ages (Figures A9–A14 of the Appendix). In the urban subsample, the actual working capacity was 58.7% (60–64), 52.4% (65–69), 54.2% (70–74), and 53.9% (75–79), while the rural subsample has an actual working capacity of 65.3% (60–64), 66.2% (65–69), 64.2% (70–74), and 51.1% (75–79). Overall, the actual working capacity of the rural subsample was higher than the urban subsample.

In terms of additional working capacity, both the urban and rural subsamples increased across ages and, in particular, urban workers outperformed their rural counterparts. For example, the extra working capacity simulated using LPM in model (0) was 17.2% among those aged 60–64; this proportion gradually increased to 35.2% among those aged 75–79 in the urban subsample (Figure A9 of the Appendix). Comparably, the extra working capacity simulated using LPM in model (0) was 9.6% among those aged 60–64; this proportion gradually increased to 24.5% among those aged 75–79 in the rural subsample (Figure A12 of the Appendix).

Table 5. **Results of Regression Analysis by Place of Residence (Rural)**

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| female | −**0.404***** (0.035) | −**0.393***** (0.035) | −**0.398***** (0.036) |
| married | −**0.182***** (0.043) | −**0.197***** (0.043) | −**0.195***** (0.044) |
| srh_good[a] | 0.013 (0.065) | 0.01 (0.065) | 0.012 (0.066) |
| srh_fair[a] | −0.004 (0.067) | 0.005 (0.067) | 0 (0.069) |
| srh_vpoor[a] | −**0.157*** (0.081) | −**0.144*** (0.081) | −**0.141*** (0.084) |
| adl_1 | −0.043 (0.035) | −0.028 (0.035) | |
| illness | −0.027 (0.022) | | |
| smoking | **0.053*** (0.031) | **0.06*** (0.031) | 0.053 (0.032) |
| edu_elementary[b] | | −0.049 (0.037) | −0.047 (0.04) |
| edu_middle[b] | | −**0.085**** (0.039) | −**0.081**** (0.041) |
| edu_college[b] | | **0.141***** (0.054) | **0.14**** (0.055) |
| diabetes | | −0.009 (0.041) | −0.004 (0.042) |
| hypertension | | −**0.071**** (0.034) | −**0.068**** (0.034) |
| heart | | 0.112 (0.082) | 0.114 (0.081) |
| depression | | −0.071 (0.052) | −0.075 (0.052) |
| adl_2 | | | 0.007 (0.039) |
| eyesight | | | 0.044 (0.068) |
| hearing | | | 0.061 (0.088) |
| physical | | | −0.013 (0.039) |
| asthma | | | −**0.153*** (0.089) |
| arthritis | | | 0.011 (0.156) |
| back pain | | | 0.007 (0.041) |
| drinking | | | 0.032 (0.051) |
| overweight | | | −0.009 (0.032) |
| eth_chinese[c] | | | −0.082 (0.101) |
| eth_indian[c] | | | −0.106 (0.121) |
| eth_others[c] | | | −0.018 (0.034) |
| *R*-squared | 0.260 | 0.279 | 0.285 |

LPM = linear probability model.
Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
[a]Reference category is very good or excellent health.
[b]Reference category is high school.
[c]Reference category is Malay.
Source: Authors' calculations.

## C. Estimating Additional Working Capacity by Educational Attainment

Gender and marital status were significant among respondents with a secondary education or above (Table 6). Women and married respondents were less likely to work in this subsample. Self-rated health was significant in model (0) using both methods, where respondents in poor or very poor health were less likely to work compared to those in very good health. Having a diagnosed illness in general was negatively associated with work capacity. Indian respondents (logistic model) and those with hypertension and depression were less likely to work than Malay respondents and those without hypertension and depression, respectively.

Among respondents with at most an elementary school education, gender and marital status have a similar impact, where women and married respondents were less likely to work than men and nonmarried respondents, while smoking respondents were more likely to work than nonsmokers (Table 6). The results showed that

Table 6. **Results of Binary Logistic Regression by Education (Secondary and Above)**

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| female | −**0.369***** (0.027) | −**0.366***** (0.027) | −**0.363***** (0.028) |
| married | −**0.169***** (0.037) | −**0.171***** (0.037) | −**0.176***** (0.037) |
| urban | 0.005 (0.024) | 0.006 (0.024) | 0.017 (0.025) |
| srh_good[a] | 0.016 (0.041) | 0.016 (0.041) | 0.011 (0.041) |
| srh_fair[a] | −0.035 (0.044) | −0.029 (0.044) | −0.034 (0.044) |
| srh_vpoor[a] | −**0.124*** (0.068) | −0.105 (0.067) | −0.111 (0.068) |
| adl_1 | −0.028 (0.029) | −0.019 (0.029) | |
| illness | −**0.055***** (0.017) | | |
| smoking | 0.015 (0.025) | 0.018 (0.025) | 0.011 (0.025) |
| diabetes | | −0.029 (0.033) | −0.021 (0.033) |
| hypertension | | −**0.079***** (0.029) | −**0.075***** (0.029) |
| heart | | −0.028 (0.063) | −0.024 (0.063) |
| depression | | −**0.106**** (0.047) | −**0.102**** (0.048) |
| adl_2 | | | −0.011 (0.032) |
| eyesight | | | 0.009 (0.061) |
| hearing | | | 0.058 (0.101) |
| physical | | | −0.006 (0.031) |
| asthma | | | −0.04 (0.075) |
| arthritis | | | 0.084 (0.086) |
| back pain | | | −0.01 (0.04) |
| drinking | | | 0.034 (0.047) |

*Continued.*

Table 6. *Continued*.

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| overweight | | | −0.023 (0.025) |
| eth_chinese[b] | | | −0.038 (0.045) |
| eth_indian[b] | | | −0.087 (0.056) |
| eth_others[b] | | | −0.001 (0.03) |
| *R*-squared | 0.204 | 0.209 | 0.214 |

LPM = linear probability model.
Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
[a]Reference category is very good or excellent health.
[b]Reference category is Malay.
Source: Authors' calculations.

(i) respondents with heart disease were more likely to work than those without it, and (ii) respondents with a physical limitation were less likely to work compared to those without any physical limitation. Gender and marital status were the common significant factors of the likelihood to work across education levels.

The actual working capacity of respondents with at least a secondary education was higher than those with at most elementary schooling (Figures A15–A20 of the Appendix). The actual working capacity of respondents with at least a secondary education showed a rising trend with age, while the actual working capacity of respondents with at most an elementary education showed a declining trend. The actual working capacity among those with a secondary education or above was 66.9% at ages 60–64, while among those with at most an elementary education, the actual working capacity was 56.7%. Both proportions declined at ages 65–69 and then improved slightly at ages 70–74.

The additional working capacity for respondents with at most an elementary school education increased drastically compared to respondents with at least a secondary education (Figures A15–A20 of the Appendix). For example, based on model (0) and LPM, the additional working capacity among respondents with at least a secondary education was 18.5% at ages 60–64 (Figure A15 of the Appendix) compared to 4.4% among respondents with at most elementary schooling (Figure A18 of the Appendix). The additional working capacity among those with at least a

Table 7. **Results of Regression Analysis by Education (Elementary School or Less)**

| | LPM | | |
|---|---|---|---|
| **Variable** | **Model 0_ols** | **Model 1_ols** | **Model 2_ols** |
| female | −**0.423***** (0.042) | −**0.419***** (0.042) | −**0.419***** (0.043) |
| married | −**0.185***** (0.047) | −**0.182***** (0.048) | −**0.185***** (0.048) |
| urban | −0.006 (0.035) | −0.008 (0.035) | 0.004 (0.038) |
| srh_good[a] | −0.087 (0.097) | −0.083 (0.095) | −0.077 (0.093) |
| srh_fair[a] | −0.015 (0.098) | −0.014 (0.096) | −0.014 (0.093) |
| srh_vpoor[a] | −0.106 (0.107) | −0.129 (0.105) | −0.119 (0.103) |
| adl_1 | −0.042 (0.039) | −0.046 (0.039) | |
| illness | −0.005 (0.025) | | |
| smoking | **0.122***** (0.039) | **0.113*****(0.04) | **0.114***** (0.043) |
| diabetes | | −0.022 (0.05) | −0.014 (0.053) |
| hypertension | | −0.032 (0.04) | −0.044 (0.04) |
| heart | | **0.129*** (0.075) | **0.163**** (0.075) |
| depression | | 0.05 (0.051) | 0.049 (0.051) |
| adl_2 | | | 0.019 (0.049) |
| eyesight | | | −0.112 (0.075) |
| hearing | | | 0.024 (0.087) |
| physical | | | −**0.081*** (0.048) |
| asthma | | | −0.044 (0.09) |
| arthritis | | | 0.064 (0.162) |
| back pain | | | 0.07 (0.048) |
| drinking | | | 0.039 (0.058) |
| overweight | | | 0.043 (0.038) |
| eth_chinese[b] | | | 0.021 (0.077) |
| eth_indian[b] | | | −0.103 (0.072) |
| female | | | −0.039 (0.04) |
| *R*-squared | 0.241 | 0.246 | 0.260 |

LPM = linear probability model.
Notes: Model (0): Parsimonious model with major health conditions in one integrated measure. Model (1): Model with essential variables. Model (2): Model with essential and other variables from the Malaysia Ageing and Retirement Survey data. Value without parenthesis is the coefficient and value with parenthesis is the robust standard error. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
[a]Reference category is very good or excellent health.
[b]Reference category is Malay.
Source: Authors' calculations.

secondary education increased to 22.6% at ages 65–69, fell to 18.1% at ages 70–74, and rose again to 22.7% at ages 75–79. Among respondents with at most elementary schooling, the additional working capacity increased to 10.2% at ages 65–69, then improved to 21.9% at ages 70–74 and 37.9% at ages 75–79.

## V. Discussion and Conclusion

The low employment rate among older Malaysians aged 50 and over was caused by the relatively low minimum retirement age and the low Employee Provident Fund minimum withdrawal age (World Bank 2020).[3] There is a noticeable gender gap in labor force participation rate among older Malaysians, with the low labor participation rate among women largely due to family obligations such as caregiving and household chores (World Bank 2019).

In this study, we examined the health capacity to work, focusing on health-related factors in predicting the likelihood of older persons to work. Following the MW method, we used LFS data and macro data for the mortality rate as a proxy of health to predict additional working capacity. The results showed that the cumulative additional working capacity was 3.36 years for men and 1.09 years for women. Women at age 59 and below had negative additional capacity to work, which was also lower than that of men, indicating that women at these ages were working beyond their capacity. The additional capacity for women started to improve as age increased to 60 and older, which suggests that women might be more affected by the mandatory retirement age than men. This, in turn, indicates that besides health, other underlying factors could affect a woman's decision to continue to work beyond retirement. In this case, the mortality rate might not be sufficient to explain the relationship between health and employment. Another important point to note with the MW method is the use of LFS data, which covers only individuals aged 15–64 years, and that extrapolation was used to estimate the employment rate beyond age 64. Further research could use census data, which covers a wider age range, to estimate the employment rate of those aged 65 and older.

Subsequently, the CMR method was used to examine the association between the predictors and employment status. The magnitude of the associations was obtained based on the estimated coefficients. To ensure robustness, we used two types of regression models: an LPM and a logistic regression model. The results of the two models were similar. The heterogeneity across subgroups was also examined in this study where we ran the analysis across three subgroups: gender, place of residence, and education level.

Both the MW and CMR methods showed that women have less additional capacity to work than men. Marital status was the most influential determining factor of the likelihood to work among women. Traditionally, married women have been

[3]The Employee Provident Fund is a government retirement savings fund responsible for ensuring members' retirement well-being.

homemakers and caregivers, but such domestic work is not given due recognition (International Labour Organization and Asian Development Bank 2011). Therefore, there is a need to recognize participation in domestic work as a form of labor participation. Health is a more important determinant of work for men, who are usually the primary breadwinners. This explains why some health factors were significant only among men. The mandatory retirement age is also a determinant of working capacity, particularly among women. The proportion of workers engaged in agriculture (and other informal sectors), which older people used to predominate, has declined rapidly. Due to structural changes in the economy, more and more people are engaged in the formal sector and therefore subject to the mandatory retirement age. In other words, more are forced to withdraw from the labor force.

The regression analysis showed that marital status was equally important for both men and women. Married men were more likely to work regardless of their education level, with a high proportion of them in the informal sector. Married women were less likely to work than their nonmarried counterparts; however, the more educated were more likely to work. Education catalyzes women's participation in the labor market. Educated women have the skills and knowledge that can allow them to compete in the labor market and continue to contribute to society (World Bank 2022). A study by Tran Pham and Nguyen (2021) found that women with a high level of educational attainment are more likely to have social interactions and high household income, indicating a positive rate of return for having more education.

In general, the CMR simulation shows that the additional capacity to work among men is higher than for women. A deficit value was found among women at ages 60–64. In this study, we treated a deficit value as having no capacity for interpretation and determined that there is no negative value in measuring capacity in a real world application. The additional capacity to work improved as both men and women aged, more so for women who showed a more drastic increment than men. One possible explanation is the impact of marriage and family obligations in reducing the likelihood and willingness of women to work at age 60 and younger, giving them greater additional capacity to work at older ages, especially among those with relatively more education. The impact of marital status could be explained by the gender norms that are embedded in many countries (Teerawichitchainan, Prachuabmoh, and Knodel 2019; Boo 2021). In Malaysia, housework falls disproportionately on the shoulders of women, while men serve as the primary breadwinners (Boo 2021). Future research can perform separate analysis to examine the additional capacity to work among married and nonmarried women to estimate the potential labor force participation of female workers if they were to have the same employment rates as males.

We conducted a separate analysis based on the place of residence and found that hypertension and asthma were the only two health-related factors that were significant. Additional work capacity was higher among respondents from urban areas compared to those from rural areas. One possible explanation is that individuals from rural areas have been working up to their limit, as indicated from our sample that the actual working capacity for respondents from rural areas was higher than those from urban areas. Older persons in rural areas are more likely to work compared to their counterparts in urban areas, particularly beyond the minimum retirement age (Schmillen et al. 2020).

In the subsample analysis by education level, we divided the respondents into two groups: (i) secondary and above, and (ii) no more than elementary schooling. The result indicated that women were less likely to work than men regardless of their education level, which further emphasized the traditional role of women as caretakers of their household. Additional working capacity showed an increasing trend along with age for both cohorts, with the magnitude of increment higher among respondents with at most an elementary education compared to respondents with at least a secondary education. This could be explained by the informal nature of work of individuals with less education, suggesting that they can work for as long as they can with no age limit.

We found urban residents to have greater additional capacity to work than their rural peers. One possible explanation is the large proportion of rural residents involved in agricultural and informal sector activities. Another explanation could be the higher prevalence of dual-income families in urban areas arising from a higher cost of living. Rural families are typically characterized by men who are sole breadwinners and women who take care of the home and family. This further highlights the gender gap in the Malaysian labor force. It also points to the important role of the family, as opposed to health capacity, in influencing women's labor force participation. Married women are less likely to work than their never-married counterparts, regardless of their health status.

Evidence from this study raises questions as to whether Malaysia's labor market provides opportunities for older people to work or if it is too rigid to cater to workers' needs for greater flexibility. Older workers may prefer more flexible working hours but may not necessarily mind longer working hours. Some may look for more meaningful jobs. A key issue is whether there exists workplace discrimination against older workers in addition to ageism, even as the skills and experience of older people can contribute to the productivity of firms and industries. Policymakers must seek to (i) provide incentives for employers to provide opportunities and more flexible work

arrangements for older workers; and (ii) tackle workplace discrimination, ageism, and other barriers to old-age work in order to unleash the productive potential of older Malaysians.

## ORCID

Norma Mansor https://orcid.org/0000-0001-8828-8202
Halimah Awang https://orcid.org/0000-0001-6592-6478
Donghyun Park https://orcid.org/0000-0003-3186-6061

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[4]Effective 1 February 2021, Asian Development Bank placed a temporary hold on sovereign project disbursements and new contracts in Myanmar.

## Appendix

To view all appendixes, please refer to the supplemental materials that are available at: https://www.worldscientific.com/doi/suppl/10.1142/S0116110524400043.