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# Factors associated with the progression and prevention of noncommunicable diseases in community-dwelling Filipino adults

## A cross-sectional study

Yuko Yamaguchi, RN, MHS<sup>a,\*</sup> , Maria Teresa Reyes Tuliao, MD, PhD<sup>b</sup>, Hiroya Matsuo, MD, PhD<sup>c</sup>

### Abstract

Noncommunicable diseases (NCDs) are an important cause of disability and death in Muntinlupa, Manila, Philippines. However, there is little community-based research on lifestyle behaviors that affect the progression of NCDs or on the hindrances to NCD prevention.

This cross-sectional study investigated the lifestyle behaviors associated with the progression and prevalence of NCDs and clarified factors associated with health promotion for the NCDs prevention among 168 Filipino adults aged 50 years and above in the community setting.

The prevalence of diabetes, cardiovascular disease, cancer, chronic respiratory disease, hypertension, and overweight/obesity found 13.1%, 8.9%, 1.8%, 4.2%, 59.5%, and 36.9%, respectively. Of 63 adults who underwent blood tests, high blood glucose and abnormal lipids found 20.6% and 80.9%, respectively. Filipino adults ate breakfast, lunch, and dinner more than 5 days a week, Merienda 4.2 days a week, and a midnight snack 1.7 days a week. The mean frequencies of physical activity at vigorous, moderate, and light intensity levels were 2.6 times a week, 1.9 times a week, and 3.8 times a week, respectively. Men were more likely to be smokers than women. Mean frequencies of alcohol consumption were 0.6 days a week. Filipino adults who practiced diet control, regular physical activities, no smoking, limited alcohol intake, stress control, and regular health checkups were 68.3%, 34.1%, 35.9%, 35.3%, 32.9%, and 24.6%, respectively. Hypertension was positively associated with the duration of tobacco use and frequency of salt intake. Overweight/obesity was positively associated with the frequency of Merienda. Diet control was positively related with internal Multidimensional Health Locus of Control scale. Smoking and alcohol control were significantly related with income level.

Community-dwelling Filipino adults in this study had a high prevalence of NCD progression and insufficient awareness of preventative behaviors. Diet control is associated with self-awareness of health and smoking and alcohol control are associated with economic status. These findings ought to contribute to develop the effective strategies for NCD prevention in community-dwelling Filipino adults.

**Abbreviations:** BMI = body mass index, FFA = free fatty acids, HDL = high-density lipoprotein, LDL = low-density lipoprotein, LMICs = low- and middle- income countries, MHLC scale = Multidimensional Health Locus of Control scale, NCDs = noncommunicable diseases, SMI = skeletal mass index, WHR = waist-hip ratio.

**Keywords:** community, health promotion, lifestyle behavior, noncommunicable diseases

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Data are available upon reasonable request.

All participants signed an informed consent document.

The authors declare that there is no conflict of interest.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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## 1. Introduction

Noncommunicable diseases (NCDs) such as cancer, cardiovascular disease, diabetes, and chronic respiratory diseases are the largest contributors to mortality worldwide, and disproportionately affect people in low- and middle-income countries (LMICs).<sup>[1]</sup> The World Health Organization (WHO) reported that NCDs account for 71% of the 57 million global deaths in 2016; 80% occur in LMICs owing to rapid unplanned urbanization, unhealthy lifestyles, under-resourced and inaccessible health care.<sup>[1]</sup> Over 50% of all deaths in Southeast Asia are caused by NCDs and this rate is the highest among all WHO regions.<sup>[1,2]</sup> In addition, the prevalence of NCDs was seen to be high in middle-aged people, especially age groups 50 to 59 years.<sup>[1,2]</sup>

In the Philippines, NCDs are the leading cause of death. Sixty-eight percent of the total deaths were due to NCDs in 2015, and especially cardiovascular disease was highest cause of death.<sup>[1,3,4]</sup> The Philippines Department of Health developed a national intervention policy to enhance access to medicine and reduce risk factors for NCDs in 2014.<sup>[5-7]</sup> On the contrary, current policies for the prevention of NCDs have gaps in implementation. Many Filipinos reportedly still have insufficient fruit and vegetable intake, consume high amounts of salt, and are smokers.<sup>[8-11]</sup> Therefore, it is necessary to develop support measures for the prevention of NCDs along with Filipino lifestyle behaviors as well as to improve individual practice for the prevention of NCDs. However, there is little community-based research on lifestyle behaviors that affect the progression of NCDs or on the hindrances to NCD prevention.

The aims of this study were to investigate lifestyle behaviors associated with the progression and prevalence of NCDs, and to identify factors associated with NCD prevention activities among Filipino adults in the community setting.

## 2. Materials and methods

### 2.1. Research design and participants

We conducted a cross-sectional study among Filipinos aged 50 years and over living in communities in Muntinlupa in March 2019. Muntinlupa is classified as a highly urbanized city. It is located in the southernmost city of the National Capital Region and divided into 9 districts, with a total population of 504,509 in 2015.<sup>[12]</sup> Around 20% households in Muntinlupa below the minimum income required to meet basic food needs.<sup>[13]</sup> The majority of citizens cannot afford private medical services because the private medical services usually cost 5 times more than the public medical services.<sup>[12]</sup>

The exclusion criteria for this study were as follows: disabilities that prevented standing for body composition examination, dementia, and mechanical implants such as pacemakers. A convenience sample of people who used a health center was recruited by community health volunteers who were registered and trained well at the health center. The research team members made an appointment with the director of health center and community health volunteers in Muntinlupa to explain the concept of this study. Before data collection, participants who regularly used health center received a letter from the community health volunteers written to explain the purpose of this study, how to collect the data, data collection schedule, etc. Participants who provided consent for data collection took part in this study. To determine the sample size, PS: Power and Sample Size Calculation version 3.1.6 (Dupont WD and Plummer WD,

Department of Biostatistics, Vanderbilt University, Nashville, TN) was used. An error of 0.05 and power of 90% was defined.

The institutional review boards of Kobe University's Graduate School of Health Sciences, Japan (approval number 702) and Hospital ng Muntinlupa, Philippines (approval number 0001-2019) approved this study. The researchers obtained written informed consent from the participants before data collection, and the participants' anonymity was preserved.

### 2.2. Measurements

We used a self-administered questionnaire that included the following components: characteristics, health status (including weight and waist measurement fluctuations since the third decade of life), lifestyle behaviors (smoking, alcohol consumption, dietary habits, and daily physical activities), social relationships, Multidimensional Health Locus of Control (MHLC) scale,<sup>[14]</sup> and NCD prevention activities. Daily physical activities were defined as those performed for more than 1 hour a day and were classified into 3 intensity groups, vigorous, moderate, and light, according to the WHO criteria.<sup>[15]</sup> Social relationship factors included having no relationships with neighbors, having communal support, and experiencing a sense of loneliness. The MHLC scale evaluates the extent to which individuals attribute their health to their own actions.<sup>[14]</sup> It consists of 18 items with 6 Likert-like responses [from 1 (strongly disagree) to 6 (strongly agree)] divided into 3 subscales: internal HLC, external HLC, and chance HLC. Each subscale has 6 items.<sup>[14]</sup> Internal HLC is a brief that individuals are responsible for their own health outcomes, external HLC is a brief the responsibility for given health outcomes can be attributed to factors that do not depend on the individual, and chance HLC is a brief that health outcomes are related to chance and fate.<sup>[14]</sup> NCD prevention activities consisted of the presence or absence of diet control, regular physical activity, no smoking, limited alcohol intake, stress control, and regular health checkups (Yes or No).

The initial forward translation from English to Tagalog was conducted by 2 independent bilingual translators who were both Tagalog native speakers. The 2 translations were compared and contrasted, and then synthesized into one final translation. Both translators reviewed the joint translation and discussed its conceptual adequacy and clarity. The joint translation was translated backwards into English by 2 bilingual translators who had no contact with the first translators. The 2 translations were compared with the original questionnaires. The questionnaire was developed based on the preliminary study conducted in February and March 2018 among 113 Filipinos aged 50 years and over living in Muntinlupa.

We measured waist circumference, blood pressure, and blood parameters including triglycerides, high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), total protein, albumin, fasting glucose, glycated albumin, and free fatty acid (FFA). A grip dynamometer (T.K.K.5001 GRIP-A, TAKEI) was used to measure grip strength (to assess muscle strength), and bioelectrical impedance analysis (MC-780, TANITA) was used to measure the body mass index (BMI; in kg/m<sup>2</sup> using body weight and height) and skeletal muscle mass index (SMI; in kg/m<sup>2</sup> using appendicular skeletal muscle mass and height).

In this study, the progression and prevalence of NCDs were defined as cancer, cardiovascular disease, diabetes, chronic respiratory diseases, hypertension, and overweight/obesity.<sup>[1,3]</sup> Hypertension was classified based on WHO criteria as a systolic

blood pressure  $\geq 140$  mm Hg and/or a diastolic blood pressure  $\geq 90$  mm Hg<sup>[16]</sup>; overweight and obesity were defined BMIs  $> 25$ .<sup>[17]</sup> High blood sugar was defined as glycated albumin levels  $\geq 16.5\%$ .<sup>[18]</sup> Abnormal blood lipids were defined as LDL  $\geq 140$  mg/dL, HDL  $\leq 40$  mg/dL, and/or triglycerides  $\geq 150$  mg/dL.<sup>[19]</sup> History of NCDs was ascertained using standard criteria combining information from self-reported medical history, medication use, and clinical examination by staff geriatrician.

### 2.3. Data analyses

Differences in health status, lifestyle behaviors, and the NCD prevention activities between the sexes were tested using an unpaired Student *t* test for continuous variables and the Chi-square and Fisher exact tests for categorical variables. In addition, we used an unpaired Student *t* test or Fisher exact test to clarify the factors associated with NCD prevention activities. Logistic regression analyses were used to test the association between the progression and prevalence of NCDs and lifestyle behaviors after adjusting for age and sex. Odds ratio (OR) and 95% confidence interval (CI) were calculated. A *P*-value of less than .05 was considered statistically significant. Data analyses were performed using SPSS version 25.0 for Windows (IBM Corp., Armonk, NY).

### 3. Results

The socioeconomic and demographic characteristics of 168 Filipino adults are summarized in Table 1. Of the 168 adults, 4 were excluded from the analysis after dropping out midway through the study (97.7% valid response rate). The age of the subjects was  $61.9 \pm 8.0$  years, 78.0% were women, 4.8% were living alone, 79.2% were Christian, and 41.1% had a daily household income under 300 pesos. Moreover, 5.4% had no relationship with their neighbors, while 71.4% had communal support within the community.

The subjects' health statuses are summarized in Table 2. The prevalence of diabetes, cardiovascular disease, cancer, chronic respiratory disease, hypertension, and overweight/obesity were 13.1%, 8.9%, 1.8%, 4.2%, 59.5%, and 36.9% respectively. The prevalence of chronic respiratory disease in men was significantly higher than those in women ( $P = .002$ ). Sixty-three adults underwent blood tests. Of the 63 adults, high blood sugar and abnormal blood lipids were found in 20.6% (10.3% men and 29.4% women), and 80.9% (86.2% men and 76.5% women), respectively. The prevalence of abnormal blood lipids in men was significantly higher than that in women ( $P = .02$ ). Men were more likely to have chronic respiratory disease ( $P = .002$ ), higher SMI ( $P < .001$ ), and higher grip strength ( $P < .001$ ). Additionally, women had larger waists ( $P = .03$ ), larger hips ( $P = .04$ ), and higher BMIs ( $P = .002$ ). There were no significant differences in the rates of diabetes, cardiovascular disease, cancer, hypertension, overweight and obesity, weight, and waist fluctuations since the third decade of life, blood pressure, waist-hip ratio, HDL, LDL, triglycerides, total protein, albumin, fasting glucose, glycated albumin, and FFA between the sexes.

Lifestyle behaviors and NCD prevention activities are summarized in Table 3. The prevalence of smoking was significantly higher in men (75.7%) than in women (19.1%) ( $P < .001$ ). The mean duration of tobacco use was also significantly longer among men than among women ( $P = .007$ ). Mean frequencies of alcohol consumption were 0.6 days a week.

**Table 1**

#### Socioeconomic and demographic characteristics of community-dwelling Filipino adults.

Variables	
Sex, No. (%)	
Men	37 (22.0)
Women	131 (78.0)
Age, yr, mean $\pm$ SD	61.9 $\pm$ 8.0
Family, No. (%)	
Spouse/partner	89 (53.0)
Children	108 (64.3)
Grandchildren	67 (39.9)
Relatives	8 (4.8)
Alone	8 (4.8)
Religion, No. (%)	
Buddhist	1 (0.6)
Muslim	2 (1.2)
Christian	133 (79.2)
Daily household income level, No. (%)*	
<300 pesos	69 (41.1)
300–600 pesos	54 (32.1)
>600 pesos	24 (14.3)
Social relationships, No. (%)	
No relationship with neighbors	9 (5.4)
Having communal support	120 (71.4)
Sense of loneliness	
Never	9 (5.4)
Sometimes	141 (83.9)
Always	13 (7.7)

SD = standard deviation

\* 1 peso = 0.02 USD

In terms of dietary habits, Filipino adults ate breakfast, lunch, and dinner more than 5 days a week, Merienda 4.2 days a week, and a midnight snack 1.7 days a week. The mean frequencies of physical activity at vigorous, moderate, and light intensity levels were 2.6 times a week, 1.9 times a week, and 3.8 times a week, respectively. Those who control diet, undergo regular physical activities, refrain from smoking, limit alcohol intake, control stress, and take regular health checkups were 68.3%, 34.1%, 35.9%, 35.3%, 32.9%, and 24.6%, respectively.

The associations between the prevalence and progression of NCDs and lifestyle behaviors are summarized in Table 4. After adjusting for age and sex, hypertension was positively associated with the duration of tobacco use (OR 1.06, 95% CI 1.01–1.11,  $P = .02$ ) and frequency of salt intake (OR 1.53, 95% CI 1.07–2.17,  $P = .02$ ). Overweight/obesity was positively associated with the frequency of Merienda (OR 1.16, 95% CI 1.02–1.33,  $P = .02$ ).

Factors associated with activities for the prevention of NCDs are summarized in Table 5. Those who control diet was positively related with internal MHLC ( $P = .07$ ), though the differences were not statistically significant. Those who control smoking and alcohol consumption were significantly related with income level ( $P = .02$  and  $P = .02$ , respectively).

### 4. Discussion

Our study revealed that the proportion of Filipino adults with NCD progression appeared to be extremely high and many Filipinos may have early-stage or undiagnosed NCDs. In addition, diet control was positively associated with internal HLC. Smoking and alcohol control were positively associated

**Table 2**  
**Health status of community-dwelling Filipino adults.**

Variables*	Total	Men	Women	P
Progression and prevalence of NCDs	n=168	n=37	n=131	
Diabetes	22 (13.1)	6 (16.2)	16 (12.2)	.17
Cardiovascular disease	15 (8.9)	3 (8.1)	12 (9.2)	.30
Cancer	3 (1.8)	1 (2.7)	2 (1.5)	.07
Chronic respiratory disease	7 (4.2)	5 (13.5)	2 (1.5)	.002
Hypertension	100 (59.5)	26 (26.3)	74 (56.5)	.18
Overweight and obesity	62 (36.9)	13 (35.1)	49 (37.4)	.85
Weight fluctuations since the third decade	n=168	n=37	n=131	
Lost weight	30 (17.9)	8 (21.6)	22 (16.8)	.21
Same weight	49 (29.2)	14 (37.8)	35 (26.7)	
Less than 10 kg gain	13 (7.7)	2 (5.4)	11 (8.4)	
Over 10 kg gain	66 (39.3)	10 (27.0)	56 (42.8)	
Waist fluctuations since the third decade	n=168	n=37	n=131	
Clothes feel tight/cannot put them on	87 (51.8)	14 (37.8)	73 (55.7)	.10
Clothes just fit	55 (32.7)	13 (35.1)	42 (32.1)	
Clothes feel large	20 (11.9)	7 (18.9)	13 (9.9)	
Physical status	n=168	n=37	n=131	
Blood pressure, mm Hg				
Systolic blood pressure	147.0±29.8	147.2±35.2	147.0±28.3	.96
Diastolic blood pressure	79.1±13.5	76.8±13.7	79.8±13.4	.24
Waist, cm	91.6±9.3	89.2±6.4	92.3±9.8	.03
Hip, cm	96.5±8.6	94.0±7.4	97.3±8.7	.04
WHR	0.9±0.07	1.0±0.1	0.9±0.1	.94
BMI, kg/m <sup>2</sup>	24.2±4.1	22.4±3.1	24.8±4.2	.002
SMI, kg/m <sup>2</sup>	6.9±0.9	7.7±1.0	6.7±0.7	< .001
Grip strength (kg)	19.8±8.6	27.7±7.0	17.7±7.7	< .001
Blood examination	n=63	n=29	n=34	
HDL, mg/dL	55.2±12.1	56.8±13.4	53.8±10.9	.32
LDL, mg/dL	149.4±36.5	154.9±43.3	144.7±29.5	.29
Triglycerides, mg/dL	153.9±108.0	140.4±65.1	165.4±134.3	.36
Total protein, g/dL	8.0±0.4	8.0±0.4	8.1±0.3	.37
Albumin, g/dL	4.4±0.2	4.3±0.2	4.4±0.2	.05
Fasting glucose, mg/dL	93.6±52.5	86.4±47.0	99.6±56.8	.33
Glycated albumin (%)	16.9±6.4	15.7±6.2	17.8±6.6	.20
FFA, μEq/L	894.7±299.4	808.8±196.9	917.0±318.6	.25

BMI=body mass index; FFA=free fatty acids; HDL=high-density lipoprotein; LDL=low-density lipoprotein; NCDs=noncommunicable diseases; SD=standard deviation; SMI=skeletal mass index; WHR=waist-hip ratio.

\* No. (%) or mean±SD.

with higher income. These findings indicate for the first time that NCD prevention practices may be influenced by internal health control and socioeconomic inequalities among community-dwelling Filipino adults. Furthermore, certain lifestyle behaviors led to the progression and prevalence of NCDs in these subjects. A significant relationship was observed between hypertension and the duration of tobacco use and frequency of salt intake, as well as between overweight/obesity and having Merienda.

In term of NCD prevalence, diabetes, cardiovascular disease, cancer, and chronic respiratory disease were found in 13.1%, 8.9%, 1.8%, and 4.2% of our subjects, respectively. In contrast, NCD progressions such as hypertension and overweight/obesity were found in 59.5% and 36.9%, respectively. Blood data revealed that 20.6% and 80.9% of the tested subjects had high blood glucose and abnormal lipid levels, respectively. This study also found that the prevalence of abnormal blood lipids in men was significantly higher than that in women although waists, hips, and BMIs in women were significantly higher than those in men. Postmenopausal women have been reported to exhibit elevated levels of total cholesterol, triglycerides, and LDL because menopause-induced estrogen deficiency is associated with dysregulation of lipid metabolism.<sup>[20–22]</sup> On the contrary, Feng

et al<sup>[22]</sup> found that triglycerides levels were higher in men than in women in their 50 to 60s and LDL levels in men was almost as much as the levels in women in their 70s. Trends of lipid levels might reflect the aging process on lipid metabolism by sex. WHO reported that diabetes, cardiovascular disease, cancer, and chronic respiratory disease were estimated to account for 4%, 35%, 10%, and 6% of all deaths among Filipino adults, respectively, in 2016.<sup>[11]</sup> In addition, 6% had elevated blood glucose, 5% had BMIs >30 kg/m<sup>2</sup>, and 20% had elevated blood pressure.<sup>[11]</sup> In comparison, the proportion of Filipino adults with NCD progression in this study appeared to be extremely high, indicating that many Filipinos may have early-stage or undiagnosed NCDs. Early detection for NCDs by discovering the preliminary group of NCDs and preventive interventions for NCDs is urgently needed.

Regarding NCD prevention activities, dietary control was adequate among our subjects, while physical activities, smoking and alcohol control, stress control, and health checkups were inadequate. Our findings show that health awareness may improve dietary control. Previous studies also showed that dietary control was achieved by self-efficacy.<sup>[23,24]</sup> Meals in the Philippines usually consist of large portions of rice, salty fish,

**Table 3**  
**Lifestyle behaviors and activities for the prevention of noncommunicable diseases among community-dwelling Filipino adults.**

Variables <sup>a</sup>	Total (n=168)	Men (n=37)	Women (n=131)	P
Smoking habit				
Current smoker	53 (31.5)	28 (75.7)	25 (19.1)	< .001
Duration of tobacco use, yr	12.4±10.9	16.8±12.1	10.1±9.6	.007
Alcohol consumption, times per wk	0.6±1.6	0.9±2.0	0.6±1.5	.24
Meal intake, days per wk				
Breakfast	5.5±2.3	5.4±2.3	5.5±2.3	.85
Lunch	5.4±2.3	5.3±2.4	5.5±2.3	.61
Dinner	5.4±2.3	5.3±2.4	5.4±2.3	.80
Merienda <sup>b</sup>	4.2±2.5	4.4±2.3	4.2±2.6	.64
Midnight snack	1.7±2.3	1.8±2.2	1.7±2.4	.77
Vegetable intake, days per wk	5.2±1.8	5.0±1.5	5.2±1.9	.66
Fruit intake, days per wk	4.8±1.8	4.7±1.9	4.9±1.8	.61
Salt intake, days per wk	2.2±0.9	2.1±0.8	2.2±1.0	.57
Physical activity, days/wk				
Vigorous intensity	2.6±2.0	2.8±2.0	2.5±2.1	.45
Moderate intensity	1.9±1.9	2.0±1.9	1.8±1.9	.61
Light intensity	3.8±2.4	3.3±2.3	3.9±2.5	.16
NCD prevention activities				
Diet control	114 (68.3)	26 (70.3)	88 (67.7)	.84
Regular physical activity	57 (34.1)	16 (43.2)	41 (31.5)	.24
No smoking	60 (35.9)	14 (37.8)	46 (35.4)	.85
Limited alcohol intake	59 (35.3)	13 (35.1)	46 (35.4)	.99
Stress control	55 (32.9)	16 (43.2)	39 (30.0)	.17
Regular health checkups	41 (24.6)	8 (21.6)	33 (25.4)	.83

NCD=noncommunicable disease; SD=standard deviation.

<sup>a</sup>No. (%) or mean±SD.

<sup>b</sup>Merienda is a light meal between breakfast and lunch and between lunch and dinner.

and meat, with small amount of fruits and vegetables; moreover, adhered to snack habit.<sup>[25]</sup> Abris et al<sup>[26]</sup> reported that Filipinos have poor dietary selections and rely on energy-dense foods such as sweets and salt- or fat-proceeded foods. In contrast, our subjects appeared to consume adequate amounts of fruits and vegetables. Filipino adhere to Merienda habits, which is a light meal taken between breakfast and lunch and between lunch and dinner.<sup>[27]</sup> Indeed, Filipino adults in this study took Merienda 4.2 days a week. This study indicates that Filipino Merienda habit may lead to obesity and overweight. In addition, our study revealed a significant relationship between

the frequency of salt intake and hypertension, consistent with data linking elevated salt intake to hypertension, heart disease, and stroke.<sup>[28]</sup>

WHO recommended that adults should do at least 150 minutes of moderate-intensity activity per week, do at least 75 minutes of vigorous intensity activity per week, or an equivalent combination of moderate and vigorous intensity activity.<sup>[15]</sup> About 34.1% of the Filipino population practices regular physical activity, and the mean frequency of moderate-intensity activities for more than 1 hour is less than 2 days a week, which is relatively inadequate.<sup>[29,30]</sup> The findings suggest that Filipino adults have

**Table 4**  
**Logistic regression models the relationship between the progression and prevalence of non-communicable diseases and lifestyle behaviors in community-dwelling Filipino adults.**

Variables	Diabetes		Cardiovascular disease		Cancer		Chronic respiratory disease		Hypertension		Overweight/obesity	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Duration of tobacco use, yr	0.97 (0.91–1.04)	.39	0.92 (0.82–1.03)	.14	0.96 (0.78–1.19)	.71	0.97 (0.88–1.07)	.56	1.06 (1.01–1.11)	.02	0.99 (0.95–1.03)	.70
Alcohol, drinks per wk	1.13 (0.88–1.44)	.33	1.26 (0.97–1.65)	.09	0.71 (0.23–2.23)	.56	0.99 (0.84–1.21)	.99	1.17 (0.93–1.46)	.18	0.95 (0.78–1.17)	.64
Meal intake, days per wk												
Breakfast	0.99 (0.81–1.22)	.97	1.06 (0.82–1.38)	.66	1.61 (0.62–4.16)	.33	0.99 (0.69–1.43)	.96	0.93 (0.81–1.07)	.30	1.05 (0.91–1.21)	.48
Merienda*	1.09 (0.90–1.31)	.39	1.18 (0.93–1.49)	.16	1.33 (0.81–2.18)	.26	0.83 (0.58–1.17)	.28	1.03 (0.91–1.17)	.60	1.16 (1.02–1.33)	.02
Midnight snack	1.12 (0.94–1.33)	.22	0.87 (0.66–1.15)	.33	1.23 (0.85–1.76)	.27	0.79 (0.48–1.31)	.37	1.01 (0.88–1.15)	.99	0.94 (0.81–1.08)	.35
Vegetable intake, days per wk	1.01 (0.78–1.29)	.99	0.97 (0.72–1.30)	.83	0.97 (0.55–1.71)	.91	1.37 (0.77–2.44)	.29	0.94 (0.79–1.12)	.47	1.02 (0.86–1.21)	.85
Fruit intake, days per wk	0.92 (0.72–1.17)	.48	1.07 (0.78–1.46)	.68	0.91 (0.55–1.52)	.71	0.79 (0.53–1.19)	.26	0.89 (0.74–1.05)	.17	0.97 (0.82–1.16)	.76
Salt intake, days per wk	1.05 (0.64–1.73)	.84	1.59 (0.89–2.84)	.12	0.55 (0.16–1.92)	.35	0.87 (0.33–2.25)	.77	1.53 (1.07–2.17)	.02	1.21 (0.86–1.70)	.28
Physical activity, day per wk												
Vigorous intensity	0.93 (0.74–1.19)	.57	1.09 (0.84–1.44)	.51	1.24 (0.78–1.95)	.37	1.02 (0.69–1.51)	.93	0.87 (0.75–1.02)	.10	1.01 (0.85–1.17)	.99
Moderate intensity	0.87 (0.66–1.14)	.31	1.03 (0.77–1.37)	.83	0.93 (0.53–1.63)	.80	0.81 (0.48–1.37)	.81	0.97 (0.82–1.14)	.72	1.04 (0.88–1.22)	.66
Light intensity	0.87 (0.72–1.05)	.15	0.83 (0.66–1.05)	.83	0.75 (0.47–1.18)	.75	0.98 (0.70–1.38)	.92	1.07 (0.94–1.22)	.29	1.02 (0.89–1.16)	.78

Adjusted for age and sex.

CI=confidence interval; OR=odds ratio.

\*Merienda is a light meal between breakfast and lunch and between lunch and dinner.

**Table 5**  
**Factors associated with activities for the prevention of noncommunicable diseases in community-dwelling Filipino adults.**

Variables <sup>a</sup>	Diet control			Regular physical activity			No smoking			Limited alcohol intake			Stress control			Regular health checkups		
	Yes	No	P	Yes	No	P	Yes	No	P	Yes	No	P	Yes	No	P	Yes	No	P
Age, yr	61.9±7.8	61.9±7.8	.76	61.9±7.8	61.9±7.8	.91	61.9±7.8	61.9±7.8	.35	61.9±7.8	61.9±7.8	.31	61.9±7.8	61.9±7.8	.45	61.9±7.8	61.9±7.8	.39
Income level <sup>b</sup>																		
<300 pesos	46.2	47.6	.47	47.4	46.1	.99	34.6	53.2	.02	31.4	54.7	.02	38.8	50.5	.40	50.0	45.6	.55
300–600 pesos	39.4	31.0		36.8	37.1		38.5	36.2		47.1	31.6		40.8	35.1		40.6	36.0	
>600 pesos	14.4	21.4		15.8	16.9		26.9	10.6		21.6	13.7		20.4	14.4		9.4	18.4	
MHLC scale <sup>c</sup>																		
Internal	25.7±6.4	23.8±6.9	.07	24.2±6.6	25.6±6.6	.19	24.5±6.3	24.9±6.8	.61	25.5±6.9	24.9±6.5	.59	25.5±6.5	24.9±6.7	.60	25.0±7.5	25.1±6.3	.94
External	27.0±6.8	25.4±7.3	.16	25.6±6.6	26.3±7.4	.78	27.0±7.1	26.2±6.9	.49	26.9±7.5	26.3±6.7	.59	27.0±7.1	26.2±6.9	.50	26.6±8.1	26.5±6.6	.95
Chance	23.6±6.2	23.0±6.6	.63	23.3±6.3	23.4±6.3	.87	23.5±6.3	23.3±6.3	.85	23.4±6.7	23.4±6.1	.08	24.3±6.4	22.9±6.2	.18	23.6±7.2	23.3±6.0	.78
Social relationships																		
No relationship	4.4	7.5	.47	1.8	7.3	.17	6.7	4.7	.72	0.51	0.56	.99	0.55	0.54	.99	0.40	0.56	.99
Support	73.2	69.8	.71	78.6	68.8	.20	68.3	74.3	.47	65.5	75.7	.20	63.0	76.6	.10	0.80	0.70	.23
Loneliness																		
Never	3.5	9.4	.15	8.8	3.6	.28	6.7	4.7	.77	5.1	5.6	.99	1.8	7.1	.64	4.9	5.6	.10
Sometimes	88.6	73.6		78.9	86.4		86.7	82.2		84.7	83.3		87.3	82.1		92.7	81.0	
Always	4.4	15.1		10.5	6.4		5.0	9.3		6.8	8.3		7.3	8.0		6.8	10.3	

Loneliness=Sense of loneliness; No relationship=No relationship with neighbors; SD=standard deviation; Supporter=Having communal support.

<sup>a</sup>% or mean±SD.

<sup>b</sup>1 peso = 0.02 USD.

<sup>c</sup>MHLC scale=Multidimensional Health Locus of Control scale. It consists of 3 items (internal, external, and chance HLC). Each ranged from 0 to 30.

inadequate awareness and practice toward physical activity, which may lead to onset NCDs.

The prevalence of chronic respiratory diseases in men was significantly higher than in women, which may be attributed to smoking given that significantly more men were current smokers. The WHO reported that 41% and 7% of tobacco smokers in the Philippines are men and women, respectively,<sup>[31]</sup> which is inconsistent with our findings. Alcohol consumption among Filipinos was low, although it has increased by almost 30% in Southeast Asia over 5 years.<sup>[32]</sup> Lower alcohol consumption in the Philippines may be related to religious attitudes given the largely Catholic population.

Our study showed that smoking and alcohol control were associated with economic status. Previous studies indicated that alcohol and smoking were associated with livelihood factors such as household income and employment status.<sup>[33,34]</sup> Socioeconomic inequalities based on wealth and education influenced the adequacies of health literacy and the self-management of NCDs.<sup>[35–37]</sup> These findings suggest that developing social structures may help Filipino adults support their health and enhance individual awareness of NCD prevention.

Our study had some limitations. Its cross-sectional design precluded identifying causal relationships. The convenience sampling might reduce sample representativeness and research value. The small sample size might have affected the large standard error for the sample, which lowered the statistical power limited the efficacy of the analysis. Moreover, we could not perform any multivariate analyses because the number of covariates into a regression model is limited. A self-administered questionnaire was used, suggesting that the reliability of the responses is limited. The information about the comorbidities and medical interventions were not collected in this study. In addition, the imbalance in the sex ratio could affect the outcomes of this study. Lastly, this study was conducted in Manila, an urban area of the Philippines, which limited the enrollment of representative Filipino adults. Future work will focus on adding qualitative research such as focus group, in-depth, or open-ended interviews to solidify our statistical argument as well as using larger sample size.

In conclusion, our study of community-dwelling Filipino adults revealed a high prevalence of NCD progression and insufficient

awareness of preventative behaviors leading to prevalence and progression of NCDs. Moreover, diet control is associated with self-awareness of health, and smoking and alcohol control are associated with economic status. Each country has its own customs and environments that can affect lifestyles habits. Our findings may provide insight into the development of effective strategies such as promoting equal health care access, improving early health checkup systems that detect NCD progression, and providing information or education on NCD prevention for community-dwelling Filipino adults.

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