

Factors Associated with Overweight and Obesity among Adults 20.0 Years and Over: Results from the 2013 National Nutrition Survey, Philippines

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In 2016, the World Health Organization (WHO) estimated that at least 2.8 million people die each year as a result of overweight/ obesity associated with the occurrence of chronic diseases that has dire social and economic consequences. In the Philippines, the prevalence of overweight/ obesity among adults showed a gradually increasing trend. Local studies using national-scale data on the determinants of overweight/ obesity among adults in the Philippines are found to be lacking as related studies available were done on selected population groups only. This study aimed to address this research gap and provide evidence for setting goals and targets to halt the increase of overweight/ obesity. Analysis of secondary data was done using the 2013 National Nutrition Survey results. Findings revealed that 30.0% of 9,076 adults 20.0 years and over with complete socio-demographic, socio-economic, anthropometric, clinical, and health and dietary data were overweight/ obese. Controlling for the effects of other variables, the factors significantly associated with overweight/ obesity among adults 20.0 years and over included adequacy of recommended energy intake, type of residence, age group, civil status, wealth quintile, highest educational attainment, and smoking status. The odds of being overweight/ obese was 29% higher among those who met the recommended energy intake compared to those who did not, and 28% higher among those living in urban areas than rural areas. As socio-economic status improved and as the population aged, the odds of overweight/ obesity increased. Adults with partners were more likely to be overweight/ obese than those who were single. In comparison to adults with no grade completed, the odds of being overweight/ obese were higher among those who were high school/ vocational graduates and twice as high among college graduates. This study provides consistent evidence on the factors associated with overweight/ obesity, which may be addressed through multi-sectoral approach by crafting maximally effective programs and local policies.

Keywords: NCDs, NNS, obesity, overweight, Philippines, risk factors

INTRODUCTION

Lifestyle-related behaviors such as tobacco use, physical inactivity, harmful use of alcohol, and unhealthy diets all increase the risk of mortality caused by non-

communicable diseases (NCDs). More than 41 million people are killed each year by NCDs, equivalent to 71% of deaths globally. Over 85% of these NCD deaths occur in low- and middle-income countries (WHO 2018a). Cardiovascular diseases (CVDs) rank first, followed by cancer, respiratory diseases, and diabetes. In the Western Pacific Region (WPRO), NCDs are the leading causes of

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death and disability – accounting for 80% of all deaths (WHO-WPRO 2013). The risk factors are modifiable and driven by forces that include ageing, rapid, unplanned urbanization, and globalization of unhealthy lifestyles – all of which may lead to four key metabolic or physiological changes that increase NCD-risk: raised blood pressure, overweight/ obesity, hyperglycemia, and hyperlipidemia.

Overweight and obesity are major risk factors for a number of chronic diseases. In the past, these are considered problems of affluent countries; however, data shows that it has steadily affected low- and middle- income countries (WHO 2018b) that are now facing the double burden of malnutrition – battling both undernutrition and overnutrition. According to the Global Health Observatory (GHO) data, at least 2.8 million people die each year as a result of being overweight/ obese. An estimated 2.3% or 35 million people of global disability-adjusted life years (DALYs) are caused by overweight and obesity (WHO 2016b).

The most recent global estimates by the World Health Organization (WHO) show that in 2016, at least 1.9 billion or 39% of adults 18.0 years and over were overweight – of which 650 million were obese. Globally, 13% of adult population were obese. The prevalence of obesity worldwide nearly tripled in a span of 41 years – from 1975 to 2016 (WHO 2018b).

In the Philippines, the prevalence of overweight/ obesity among adults showed a gradually increasing trend from 16.6% in 1993 to 31.1% for both 2013 and 2015, in contrast with the generally decreasing trend of chronic energy deficiency/ underweight in the same age group (Figure 1) (DOST-FNRI 2015a). The Asia Roundtable on Food Innovation for Improved Nutrition (ARoFIIN) – a public-private partnership – reported an overweight and obesity prevalence of 23.6% and 5.1%, respectively in 2016 (Manila Standard 2017). The report – entitled “Tackling obesity in ASEAN: Prevalence impact and guidance on

interventions” – presents results on six (6) countries: the Philippines, Indonesia, Malaysia, Singapore, Thailand, and Vietnam. The report findings showed that the Philippines had the second-lowest overweight and obesity prevalence, affecting 18 million Filipinos. If monetized, obesity costed the Philippines around USD 500 million – 1 billion and 8% of its health care spending – making the country fourth-highest spender for conditions related to obesity that include NCDs such as diabetes, cancer, and CVDs (Tacio 2017). Based on the Global Status Report on NCDs by the WHO (2014b), the age-standardized prevalence of overweight and obesity among individuals 18 years and over in the Philippines is 21.5% and 4.1%, respectively in 2010 and 23.6% and 5.1%, respectively in 2014.

The basic drivers of overweight and obesity are multifactorial and complex. Thus, it is not enough to formulate interventions that target individual behavioral changes only, but rather also address the built environment where the individual exists that influence physical activity and dietary behaviors. At present, existing policies and programs in the Philippines tend to address the NCD risk factors as a whole, which include unhealthy diet and physical inactivity. The WHO (2014b) reports that the Philippines has a national systems response to NCDs in the form of an operational policy, strategy, or action plan to reduce physical inactivity and/or promote physical activity – as well as to reduce unhealthy diet and/or promote healthy diets to mitigate the main risk factors for overweight and obesity. According to the WHO NCD Progress Monitor index (WHO 2017), the country has no existing policies for salt/ sodium and saturated fatty acids/ trans-fats and no existing restrictions for marketing of unhealthy food products to children.

Settings-based approaches to promote healthy lifestyle are implemented through the conduct of weekly dance activities – in compliance with the Civil Service Commission (CSC)

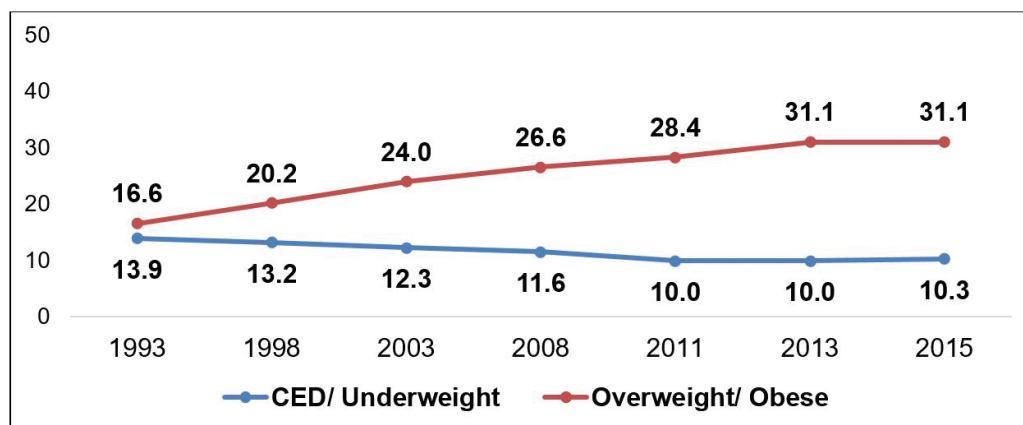


Figure 1. Trends in the prevalence of malnutrition among adults, 20.0 years and over: Philippines, 1993–2013 (Reference: Philippine Nutrition Facts and Figures 2013: 8th National Nutrition Survey Anthropometry).

Memorandum Circular No. 38, s 1992 or “*Physical and Mental Fitness Program for Government Personnel*” in government workplaces – and a dance activity in schools after flag ceremony, initiated by the Department of Health. The most recent legislative undertaking aimed to help address the problem of overweight and obesity is the legislation of taxation on sugar-sweetened beverages (SSB) as part of the first package of the Comprehensive Tax Reform Program (CTRP) or TRAIN Law (DOF).

As an emerging public health problem, the drivers of overweight and obesity need to be addressed using a multi-sectoral approach because of its multifaceted and complex nature. Local studies using national-scale data on the determinants of overweight/ obesity among adults in the Philippines are found to be lacking, as related studies available were done on selected population groups (Goyena *et al.* 2017, Adair 2012) and done in other countries (Gupta *et al.* 2012, Mihardja and Soetrisno 2012, Ghorbani *et al.* 2015, Little *et al.* 2016). The identification of the factors of overweight/ obesity among adults is warranted to aid in the formulation of nutrition and health policies and interventions that are maximally effective.

This study aimed to address this research gap and provide for an evidence-based approach for setting goals and targets to halt the increase of the prevalence of overweight/ obesity in the country and attain the WHO Global NCD Targets of 2025 (WHO 2017) and assist in the attainment of health target 3.4 for Sustainable Development Goal # 3, which is the reduction by one-third of premature mortality from NCDs through prevention and treatment and promotion of mental health and well-being (WHO 2018a). It may also be used as a basis for a legislation-based promotion of healthy lifestyle that includes physical activity and a healthful, balanced diet.

MATERIALS AND METHODS

Study Design and Sampling Design

Secondary analysis utilizing data collected in the 8th NNS conducted by the Food and Nutrition Research Institute (FNRI) in 2013 was done. The 8th NNS adopted the 2003 Master Sample of the Philippine Statistics Authority (PSA), employing a stratified three-stage sampling design. The first stage is the selection of Primary Sampling Units (PSUs) consisting of one barangay or a combination of contiguous barangays with at least 500 households each. Enumeration areas (EAs) with 150–200 households were identified from these PSUs, from which housing units were randomly selected. The household is the sampling unit, which was randomly selected. Further details on the survey and sampling design of the 8th NNS is published elsewhere (DOST-FNRI 2015b).

Selection of Variables

The variables used in this study was based on the conceptual framework of malnutrition by the ASEAN/UNICEF/WHO (2016) Regional Report on Nutrition Security in ASEAN Volume 2 (ASEAN-UNICEF-WHO 2016) and other previous studies (Back *et al.* 2018, Rodríguez-Martín *et al.* 2009, Trinh *et al.* 2009, Wang *et al.* 2016, Rachmi *et al.* 2017). Employment, socio-economic status, and educational status are the basic causes at the societal level. Underlying causes at the household/ family level include food insecurity plus poor water and sanitation practices. Immediate causes include physical inactivity and poor dietary intake in both quality and quantity.

Data on the socio-demographic and socio-economic profile of the respondents and selected behavioral and lifestyle factors were gathered through face-to-face interview using an interview guide. Anthropometric data was collected by actual weight and height measurement of respondents, using standard techniques and procedures. Data on individual dietary intake was collected using 24-h food recall for two (2) non-consecutive days.

Socio-demographic and socio-economic profile include sex, age group, civil status, highest educational attainment, occupation, type of residence, and wealth quintile. Sex was categorized into male and female. Occupation was categorized into 10 major groups based on the 1992 Philippines Standard Occupation Code (PSOC) (PSA). Type of residence was categorized into two (2) using the Philippine Standard Geographic Code as reference (PSA). Wealth index served as the proxy indicator for wealth status of households derived using data collected from the socio-economic component of the NNS using principal component analysis (PCA).

Body mass index (BMI) was computed and categorized according to the WHO cut-off standards of 25.0–29.99 kg/m² to define overweight and ≥ 30.00 kg/m² to define obesity.

Selected lifestyle related factors covered in the study include physical activity status, smoking status and alcohol consumption status. Physical activity was categorized into physically inactive and physically active based on the WHO Steps Surveillance Manual (WHO 2005). Smoking status was categorized into three (3) – current, former, and never – based on the WHO STEPS Surveillance Manual. This includes individuals who consumed commercial/ manufactured cigarettes, hand-rolled cigarettes, pipes full of tobacco, cigars/cheroots, and/or *cigarillos*. Alcohol consumption was likewise categorized into three (3) – lifetime abstainer, former, and current – based on the WHO Global status report on alcohol and health (WHO 2014a).

Adequacy of dietary intake was evaluated using the Philippine Dietary Reference Intake. An individual

meeting 100% of recommended energy intake (REI) is considered to have adequate energy intake, and those meeting 100% of the estimated average requirement (EAR) for protein is considered to have adequate protein intake. Intakes less than 100% of both REI and protein EAR were considered inadequate.

Study Population and Subjects

The subjects of this study were Filipino adults 20.0 years and over. Upon data merging, a total of 9,076 adults 20.0 years and over had complete anthropometric, socio-demographic, selected NCD-risk factor, and dietary data. Subjects with incomplete data on aforementioned components were dropped from the analysis.

Data Processing and Analysis

Sampling weights were computed and adjusted for non-response and were post-stratified based on the projected population obtained from the PSA. Weighted statistical analyses were done using Stata Version 12.0 designed for complex analysis, taking into consideration the stages of household selection for participation in the survey. Descriptive statistics such as means, standard deviations, frequencies and percentages, and confidence intervals were generated to describe the distribution of each variable. Multiple logistic regression was used for the determinants of overweight and obesity among adults. Reliability of estimates for the odds ratio (OR) was set at 95% confidence interval.

Ethics

The 8th NNS was approved by the FNRI Institutional Ethics Review Committee (FIERC) on 19 Feb 2013, with Protocol Code FIERC-2012-001. Consent was obtained in writing from respondents prior to actual data collection. The Informed Consent Form contained all the components of the 8th NNS, detailed data collection procedures, and non-disclosure of information for anonymity and confidentiality purposes. The contents of the informed consent form are published elsewhere (DOST-FNRI 2015b).

RESULTS AND DISCUSSION

Results

Sample characteristics. The socio-demographic and socio-economic characteristics of overweight and obese adults 20.0 years and over are presented in Table 1. Overall, three out of 10 adults (30.0%) were overweight/obese. The proportion of overweight and obesity was higher among females (33.5%) than males (26.3%), among older age groups of 40–49.0 years (36.0%) and 50–59 years (36.6%) than younger groups, and among those with partners (married and live-in) than those without (single, widow/ widower, and separated). Overweight and obesity prevalence increased as educational attainment improved.

Table 1. Socio-demographic and socio-economic characteristics of overweight and obese adults 20.0 years and over: Philippines, 2013 (n=9,076).

Socio-Demographic Characteristics	n	% (95% CI)
Philippines	9,076	30.0 (28.4–31.6)
Sex		
Male	4,490	26.3 (24.5–28.2)
Female	4,586	33.5 (31.7–35.4)
Age Group		
20–29 y.o.	1,862	19.6 (17.2–22.3)
30–39 y.o.	1,667	32.8 (30.1–35.6)
40–49 y.o.	2,015	36.0 (33.7–38.3)
50–59 y.o.	1,793	36.6 (33.4–40.0)
60 y.o. and over	1,739	26.6 (23.9–29.5)
Civil Status		
Single	1,798	22.5 (19.6–25.7)
Married	5,452	34.1 (32.5–35.7)
Live-in	773	27.4 (23.6–31.4)
Widow/Widower	838	28.3 (25.0–31.9)
Separated/Annulled/ Divorced	210	22.2 (16.6–29.0)

Cont. Table 1. Socio-demographic and socio-economic characteristics of overweight and obese adults 20.0 years and over: Philippines, 2013 (n = 9,076).

Socio-Demographic Characteristics	n	% (95% CI)
Highest Educational Attainment		
No Grade Completed	258	16.3 (11.7–22.3)
Preschool/Elementary Level	3,169	23.0 (21.2–24.9)
High School/Vocational	3,679	30.6 (28.9–32.3)
College Level/Higher	1,970	38.4 (34.9–41.9)
Occupation		
Special Occupations (AFP personnel, unclassified jobs)	57	33.3 (21.6–47.6)
Officials of Government and Special-Interest Organizations, Corporate Executives, Managers Managing Proprietors and Supervisors	604	50.5 (45.9–55.0)
Professional	294	39.1 (32.3–46.4)
Technicians and Associate Professionals	194	38.7 (31.1–46.9)
Clerks	284	34.5 (28.1–41.4)
Service Workers And Shop and Market Sales Workers	433	36.9 (32.0–42.0)
Farmers, Forestry Workers and Fishermen	1,657	15.6 (13.9–17.4)
Craft and Related Trades Workers	457	21.7 (16.6–27.9)
Plant And Machine Operators and Assemblers	409	42.0 (36.9–47.3)
Elementary Occupation: Laborers and Unskilled Workers	1,033	28.0 (24.9–31.4)
No Occupation	3,654	29.1 (27.1–31.1)
Type of Residence		
Rural	5,071	24.1 (22.6–25.6)
Urban	4,005	35.2 (32.8–37.7)
Region		
Ilocos Region	591	26.9 (23.2–30.8)
Cagayan Valley	488	20.8 (16.7–25.4)
Central Luzon	761	30.4 (27.0–34.1)
Bicol	521	23.6 (19.0–29.0)
Western Visayas	658	19.9 (15.7–24.9)
Central Visayas	720	28.8 (25.1–32.7)
Eastern Visayas	494	30.4 (25.5–35.7)
Zamboanga Peninsula	343	24.9 (20.2–30.2)
Northern Mindanao	500	28.4 (23.7–33.7)
Davao	508	28.1 (25.2–31.1)
SOCCSKSARGEN	427	25.2 (21.4–29.6)
NCR	838	41.1 (35.7–46.8)
CAR	357	34.6 (27.2–43.0)
ARMM	275	20.0 (14.8–26.6)
Caraga	362	33.7 (30.2–37.3)
CALABARZON	866	33.7 (30.1–37.5)
MIMAROPA	367	23.6 (17.3–31.2)
Wealth Quintile		
First Quintile (Poorest)	1,843	17.1 (14.5–20.0)
Second Quintile	1,908	24.3 (22.0–26.9)
Middle	1,924	26.3 (22.0–31.1)
Fourth Quintile	1,707	34.6 (32.0–37.4)
Fifth Quintile (Wealthiest)	1,694	43.7 (40.8–46.6)

Overweight and obesity was more prevalent among officials of government and special interest organizations, corporate executives, managers, managing proprietors, and supervisors (50.5%) plus plant/ machine operators and assemblers (42.0%). Moreover, at least one-third of those who worked as professionals (39.1%), technicians, and associate professionals (38.7%); service workers and shop/ market sales workers (36.9%); clerks (34.5%); and those with special occupations (33.3%) were overweight/ obese. Farmers, forestry workers, and fishermen only had 15.6% prevalence.

More than one-third (35.2%) of urban dwellers, almost one-fourth (24.1%) of rural dwellers, and at least one-third of adults residing in the National Capital Region (NCR) (41.1%), Cordillera Administrative Region (CAR) (34.8%), Caraga (33.7%), and CALABARZON (33.7%) were overweight/ obese.

In terms of socio-economic status, overweight/ obesity prevalence increased as wealth quintile improved – with four out of 10 (43.7%) from the richest quintile being overweight/ obese.

Selected lifestyle-related risk factors such as physical activity, smoking status, and alcohol status were also studied. Results in Table 2 showed that overweight/ obesity was prevalent at 31.1% in physically inactive and at 29.1% in physically active adults. One-third of never smokers (33.4%) and current smokers (32.9%) plus only one-fifth (21.1%) of former smokers were found to be overweight/ obese. The prevalence of overweight/ obesity among lifetime abstainers, former drinkers, and current drinkers ranged 29.2–31.0%.

Dietary intake was also accounted for (Table 3), which is a crucial factor of the nutritional outcome. Mean energy intake of overweight/ obese adults was 1,752.0 kcal. Mean intake for macronutrients was 298.4 g of carbohydrate, 34.8 g of fat, and 58.9 g of protein. Average beverage intake was 72.8 g.

Table 3. Mean one-day per capita dietary intake of overweight or obese adults 20 years and over: Philippines, 2013 (n = 9,076).

Energy and Nutrients	Mean	SE	95% CI	
			LL	UL
Energy (kcal)	1,752.0	17.1	1,718.3	1,785.6
Carbohydrate (g)	298.4	3.2	292.1	304.7
Fat (g)	34.8	0.8	33.2	36.4
Protein (g)	58.9	0.6	57.7	60.1

Table 2. Proportion of overweight and obese adults 20.0 years and over by selected lifestyle-related risk factors: Philippines, 2013 (n = 9,076).

Selected Lifestyle-related Risk Factors	n	% (95% CI)
General Physical Activity		
Physically Inactive ¹	3,896	31.1 (29.4–32.9)
Physically Active ¹	5,180	29.1 (26.7–31.7)
Smoking Status		
Never Smoker ^{2a}	5,130	33.4 (31.9–35.0)
Former Smoker ^{2b}	2,450	21.1 (18.6–23.8)
Current Smoker ^{2c}	1,496	32.9 (29.9–36.1)
Alcohol Status		
Lifetime Abstainer ^{3a}	3,351	31.0 (29.0–33.0)
Former Drinker ^{3b}	1,190	30.6 (27.7–33.7)
Current Drinker ^{3c}	4,535	29.2 (27.3–31.1)

Notes:

¹A person not meeting any of the following criteria is considered as physically inactive or insufficiently physically active – 3 or more days of vigorous intensity activity of at least 20 min/d; or 5 or more days of moderate intensity activity or walking of at least 30 min/d

^{2a}Never smokers – those individuals who have never smoked at all

^{2b}Former smokers – those who have ever smoked in the past year prior to survey whether in a daily basis or an aggregate lifetime consumption of at least 100 cigarettes but not daily

^{2c}Current smokers – those who smoke during time of survey either on a daily basis (at least one cigarette a day) or on a regular/ occasional smoking; those who do not smoke daily but who smoke at least weekly; or those who smoke less often than weekly

^{3a}Lifetime abstainers – those who have never consumed alcohol

^{3b}Former drinkers – those who have previously consumed alcohol, but have not done so in the previous 12-mo period

^{3c}Current drinkers – those who were currently consuming alcohol during the survey period

Adequacy of energy and protein intake was also assessed (Table 4). More than one-third of those meeting the 100% recommended energy intake (REI) (35.5%) and estimated average requirement (EAR) of 100% for protein (34.3%) were overweight/ obese.

Table 4. Energy and protein adequacy of overweight or obese adults 20 years and over: Philippines 2013 (n = 9,076).

Adequacy of energy and protein intake	n	% (95% CI)
Meeting 100% energy requirement		
No	6,494	28.5 (27.0–30.1)
Yes	2,582	35.5 (32.8–38.4)
Meeting 100% protein requirement		
No	6,494	26.1 (24.4–27.9)
Yes	2,582	34.3 (32.3–36.4)

Factors associated with overweight and obesity.

Controlling for the effects of other variables, the factors associated with overweight/ obesity among adults 20.0 years and over included adequacy of recommended energy requirement, type of residence, age group, civil status, wealth quintile, highest educational attainment, and smoking status (Table 6). The results of the univariate analysis are presented in Table 5.

Being overweight/ obese is 1.3 times more likely among adults who meet the 100% REI than those who do not. The odds of overweight/ obesity were higher among those

living in urban areas (OR: 1.28; CI: 1.09–1.50; $p = 0.002$) than in rural areas.

The odds of being overweight/ obese increased as the age group progressed up to the 50–59 age group. Compared to the 20–29 age group, adults 30–39 years (OR: 2.05; CI: 1.66–2.53; $p < 0.000$), 40–49 years (OR: 2.51; CI: 2.03–3.10; $p < 0.000$) and 50–59 years (OR: 2.51; CI: 2.03–3.09; $p < 0.000$) were twice as likely to be overweight/ obese. Those 60 years and over were 1.69 times more likely to be overweight/ obese than the youngest adult age group.

Table 5. Univariate analysis of factors affecting overweight and obesity among adults, 20 years and over: Philippines, 2013 (n = 9,076).

Factors	Odds Ratio	SE	t	p-value	95% CI		F-statistic	Prob > F
					LL	UL		
Region							4.77	<0.001*
Constant	0.70	0.08	-3.06	0.002	0.56	0.88		
Ilocos	0.53	0.08	-4.20	0.000	0.39	0.71		
Cagayan Valley	0.37	0.07	-5.51	0.000	0.26	0.53		
Central Luzon	0.63	0.09	-3.23	0.001	0.47	0.83		
Bicol	0.44	0.08	-4.47	0.000	0.31	0.63		
Western Visayas	0.36	0.07	-5.54	0.000	0.25	0.51		
Central Visayas	0.58	0.09	-3.65	0.000	0.43	0.78		
Eastern Visayas	0.62	0.11	-2.77	0.006	0.45	0.87		
Zamboanga Peninsula	0.47	0.09	-4.16	0.000	0.33	0.67		
Northern Mindanao	0.57	0.10	-3.30	0.001	0.41	0.80		
Davao	0.56	0.08	-4.21	0.000	0.43	0.73		
SOCCKSARGEN	0.48	0.08	-4.52	0.000	0.35	0.66		
NCR			<i>Reference</i>					
CAR	0.76	0.16	-1.30	0.196	0.50	1.15		
ARMM	0.36	0.08	-4.64	0.000	0.23	0.55		
Caraga	0.73	0.10	-2.25	0.025	0.55	0.96		
CALABARZON	0.73	0.10	-2.20	0.028	0.55	0.97		
MIMAROPA	0.44	0.10	-3.57	0.000	0.28	0.69		
Type of Residence							59.19	<0.001*
Constant	0.32	0.01	-28.13	0.000	0.29	0.34		
Rural			<i>Reference</i>					
Urban	1.72	0.12	7.69	0.000	1.49	1.97		
Sex							50.95	<0.001*
Constant	0.36	0.02	-21.17	0.000	0.33	0.39		
Male			<i>Reference</i>					
Female	1.41	0.07	7.14	0.000	1.28	1.55		
Age Group							40.88	<0.001*
Constant	0.24	0.02	-17.30	0.000	0.21	0.29		
20–29 y.o.			<i>Reference</i>					
30–39 y.o.	2.00	0.19	7.21	0.000	1.66	2.42		

Cont. Table 5. Univariate analysis of factors affecting overweight and obesity among adults, 20 years and over: Philippines, 2013 (n = 9,076)

Factors	Odds Ratio	SE	t	p-value	95% CI		F-statistic	Prob > F
					LL	UL		
40–49 y.o.	2.30	0.21	8.98	0.000	1.92	2.77		
50–59 y.o.	2.37	0.18	11.59	0.000	2.05	2.74		
60 y.o. and over	1.49	0.14	4.21	0.000	1.24	1.79		
Civil Status							13.08	<0.001*
Constant	0.29	0.03	–13.93	0.000	0.24	0.35		
Single			Reference					
Married	1.78	0.15	6.87	0.000	1.51	2.09		
Live-in	1.29	0.14	2.45	0.015	1.05	1.59		
Widow/Widower	1.36	0.13	3.15	0.002	1.12	1.65		
Separated/Annulled/Divorced	0.98	0.18	–0.13	0.897	0.68	1.40		
Wealth Quintile							36.76	<0.001*
Constant	0.21	0.02	–16.20	0.000	0.17	0.25		
First Quintile (Poorest)			Reference					
Second Quintile	1.56	0.17	4.05	0.000	1.26	1.94		
Middle	1.73	0.27	3.57	0.000	1.28	2.34		
Fourth Quintile	2.58	0.30	8.18	0.000	2.05	3.24		
Fifth Quintile (Wealthiest)	3.77	0.46	10.86	0.000	2.96	4.79		
Highest Educational Attainment							33.03	<0.001*
Constant	0.20	0.04	–8.38	0.000	0.13	0.29		
No Grade Completed			Reference					
Preschool/Elementary Level	1.53	0.31	2.12	0.035	1.03	2.27		
High School/Vocational	2.26	0.46	4.03	0.000	1.52	3.37		
College Level/Higher	3.19	0.65	5.68	0.000	2.13	4.76		
Meeting 100% Energy Requirement							28.37	<0.001*
Constant	0.40	0.02	–23.76	0.000	0.37	0.43		
No			Reference					
Yes	1.38	0.08	5.33	0.000	1.23	1.56		
Meeting 100% Protein Requirement							53.38	<0.001*
Constant	0.35	0.02	–22.55	0.000	0.32	0.39		
No			Reference					
Yes	1.48	0.08	7.31	0.000	1.33	1.65		
Total Energy Intake							17.91	<0.001*
Constant	0.33	0.02	–14.66	0.000	0.28	0.38		
Total Energy Intake	1.00	0.00	4.23	0.000	1.00	1.00		
Total Carbohydrate Intake							0.09	0.763
Constant	0.42	0.03	–12.02	0.000	0.37	0.48		
Total Carbohydrate Intake	1.00	0.00	0.30	0.762	1.00	1.00		
Total Fat Intake							64.25	<0.001*
Constant	0.32	0.02	–19.99	0.000	0.29	0.36		
Total Fat Intake	1.01	0.00	8.02	0.000	1.01	1.01		

Cont. Table 5. Univariate analysis of factors affecting overweight and obesity among adults, 20 years and over: Philippines, 2013 (n = 9,076)

Factors	Odds Ratio	SE	t	p-value	95% CI		F-statistic	Prob > F	
					LL	UL			
Total Beverage Intake								5.03	0.026*
Constant	0.42	0.02	-22.24	0.000	0.39	0.45			
Total Beverage Intake	1.00	0.00	2.24	0.026	1.00	1.00			
SSB Intake								11.5	0.0008*
Constant	0.40	0.02	-22.12	0.000	0.37	0.44			
SSB Intake	1.00	0.00	3.39	0.001	1.00	1.00			
General Physical Activity								1.59	0.208
Constant	0.41	0.03	-14.61	0.000	0.36	0.46			
Physically Inactive	1.10	0.08	1.26	0.208	0.95	1.27			
Physically Active	<i>Reference</i>								
Smoking Status								35.76	<0.001*
Constant	0.27	0.02	-16.82	0.000	0.23	0.31			
Lifetime Abstainer	1.88	0.14	8.31	0.000	1.62	2.18			
Former Smokers	1.84	0.17	6.71	0.000	1.54	2.19			
Current Smokers	<i>Reference</i>								
Alcohol Status								1.62	0.199
Constant	0.41	0.02	-18.84	0.000	0.38	0.45			
Lifetime Abstainer	1.09	0.05	1.74	0.083	0.99	1.20			
Former Drinkers	1.07	0.08	0.90	0.371	0.92	1.25			
Current Drinkers	<i>Reference</i>								
Occupation								27.35	<0.001
Constant	0.41	0.02	-18.03	0.000	0.37	0.45			
Special Occupations	1.22	0.37	0.65	0.517	0.67	2.23			
Officials of Government and Special-Interest Organizations, Corporate Executives, Managers, Managing Proprietors, and Supervisors	2.48	0.23	9.84	0.000	2.07	2.98			
Professional	1.57	0.22	3.16	0.002	1.18	2.07			
Technicians and Associate Professionals	1.54	0.27	2.50	0.013	1.10	2.16			
Clerks	1.28	0.22	1.45	0.147	0.92	1.79			
Service Workers and Shop and Market Sales Workers	1.42	0.17	2.98	0.003	1.13	1.80			
Farmers, Forestry Workers, and Fishermen	0.45	0.04	-10.11	0.000	0.39	0.53			
Craft and Related Trades Workers	0.68	0.10	-2.53	0.012	0.50	0.92			
Plant and Machine Operators, and Assemblers	1.77	0.20	5.07	0.000	1.42	2.20			
Elementary Occupation: Laborers and Unskilled Workers	0.95	0.09	-0.58	0.560	0.80	1.13			
No Occupation	<i>Reference</i>								

Table 6. Multivariate analysis on overweight or obesity of adults 20 years and over by selected factors: Philippines, 2013 (n = 9,076).

Factors	Odds Ratio	SE	t	p-value	95% CI	
					LL	UL
Constant Term	0.04	0.01	-15.73	0.000	0.02	0.05
Meeting 100% Energy Requirement						
No			<i>Reference</i>			
Yes	1.29	0.08	4.05	0.000	1.14	1.47
Type of Residence						
Rural			<i>Reference</i>			
Urban	1.28	0.10	3.08	0.002	1.09	1.50
Age Group						
20–29 y.o.			<i>Reference</i>			
30–39 y.o.	2.05	0.22	6.71	0.000	1.66	2.53
40–49 y.o.	2.51	0.27	8.49	0.000	2.03	3.10
50–59 y.o.	2.51	0.27	8.62	0.000	2.03	3.09
60 y.o. and over	1.69	0.20	4.39	0.000	1.34	2.14
Civil Status						
Single			<i>Reference</i>			
Married	1.39	0.15	3.01	0.003	1.12	1.72
Live-in	1.35	0.16	2.48	0.014	1.06	1.72
Widow/Widower	1.19	0.15	1.32	0.186	0.92	1.53
Separated/Annulled/Divorced	0.78	0.15	-1.26	0.210	0.54	1.15
Unknown	0.52	0.60	-0.56	0.576	0.05	5.10
Wealth Quintile						
First Quintile (Poorest)			<i>Reference</i>			
Second Quintile	1.41	0.16	2.98	0.003	1.12	1.77
Middle	1.51	0.22	2.78	0.006	1.13	2.03
Fourth Quintile	2.08	0.27	5.67	0.000	1.61	2.69
Fifth Quintile (Wealthiest)	2.72	0.44	6.13	0.000	1.97	3.75
Highest Educational Attainment						
No Grade Completed			<i>Reference</i>			
Preschool/Elementary Level	1.32	0.26	1.40	0.162	0.89	1.94
High School/Vocational	1.73	0.35	2.75	0.006	1.17	2.57
College Level/Higher	2.09	0.46	3.31	0.001	1.35	3.23
Smoking Status						
Lifetime Abstainer	1.71	0.14	6.52	0.000	1.46	2.01
Former Smokers	1.54	0.14	4.66	0.000	1.28	1.85
Current Smokers			<i>Reference</i>			

Adults with partners were more likely to be overweight/ obese than those who were single. Married adults and those with live-in partners had 39% and 35% higher odds of becoming overweight/ obese than single adults.

In terms of socio-economic status, the odds of being overweight/ obese increased as wealth improved. Those in

the rich (OR: 2.08; CI: 1.61–2.69; $p < 0.000$) and richest quintiles (OR: 2.72; CI: 1.97–3.75; $p < 0.000$) were more than twice more likely to be overweight/ obese compared to adults in the poorest quintile.

The likelihood of being overweight/ obese increased with educational attainment. In comparison with adults

with no grade completed, the odds of being overweight/ obese was higher among those who were high school/ vocational graduates (OR: 1.73; CI: 1.17–2.57; $p = 0.006$) and twice as high among college graduates (OR: 2.09; CI: 1.35–3.23; $p = 0.001$).

DISCUSSION

To the knowledge of the researchers, this is the first study in the Philippines that investigated the factors associated with overweight and obesity among adults using a nationally-representative sample. Based on NNS results, there was a 50% increase in the prevalence of overweight/ obesity among adults 20.0 years in a span of 20 years – from 1993 to 2013. Along with this increase was a 3.9 percentage point decrease in the prevalence of chronic energy deficiency/ underweight among adults in the same time period. This phenomenon coincides with the growth of the Philippine economy brought about by rapid urbanization, globalization, and technological advancements resulting to nutritional and epidemiological transitions.

After adjusting for potential confounders, this study found that overweight/ obesity is significantly associated with energy adequacy, type of residence, age, civil status, wealth quintile, educational attainment, and smoking status.

Adults who met 100% of energy requirement were found to have higher odds of being overweight/ obese. This may be explained by the concept of positive energy balance wherein weight gain is brought about greater energy intake than energy expenditure, thus resulting to a higher likelihood for overweight/ obesity.

Consistent with other studies, the odds of being overweight/ obese was higher among adults who were urban dwellers than those in rural areas (Little *et al.* 2016, Hong *et al.* 2018). This may be due to the attributes of the food and physical environment, which promotes a generally unhealthy lifestyle of increased consumption of energy-rich but nutrient-poor diets and a sedentary lifestyle (Mkuu *et al.* 2018). Reliance on technology for convenience and accomplish a variety of tasks – from grocery shopping to cooking and spending leisure time – has enabled a lifestyle that replaced actual physical activity with accomplishing most tasks with just the click of a button while in the comfort of any place, any time.

The likelihood of being overweight/ obese as age group increases may be explained by metabolic changes which tend to slow as a person ages (Hong *et al.* 2018). As pointed out by Hajek *et al.* (2015), ageing is accompanied with changes in body composition, height, food intake and energy expenditure. Decreased muscle mass and height

associated with ageing may reduce physical activity and energy expenditure (Hajek *et al.* 2015).

Another significant factor associated with adult overweight/ obesity is civil status or marital status. Similar with other studies, the odds of being overweight/ obese was noticeably higher among those married or living with a partner (Mkuu *et al.* 2018, Hong *et al.* 2018, Sobal *et al.* 2012, Tzotzas *et al.* 2010). Wang *et al.* (2016) surmised that marital status is associated with body weight changes, wherein transition into marriage and transition into singlehood were associated with weight gain and weight loss, respectively. Moreover, Teachman (2016) provided perspectives for this phenomenon anchored on social and economic variables, perception of attractiveness, and negative stress such as marital disruption. Married individuals were more likely to have another person to eat with, which may make them eat more regularly, causing weight gain. It was also supposed that married individuals care less about their physical attractiveness in terms of body weight because, unlike single people, they are not actively seeking a mate.

The premise of overweight/ obesity more common among the more affluent is conflicting, as researches have shown that overweight/ obesity is primarily a problem of the rich in developing countries while the burden of overweight/ obesity in developed countries has shifted to the poor (HU-CSPH 2010). In the same article, it was indicated that a 25% increase on wealth index was associated with a 54% BMI increase and a 33% overweight increase. Interestingly, in studies among women (Hong *et al.* 2018, Little *et al.* 2016, Bishwajit 2017), those who belonged to higher income groups had animal-rich diets than lower-income women. It was also highly likely that lower-income women tend to do more physical labor than their more affluent counterparts. Consumption behaviors among high income women (Mkuu *et al.* 2018) – which is also primarily driven by the environment an individual is in – showed that they are more likely to consume high-caloric foods, which increases the risk of being overweight/ obese.

Those with higher educational attainment had higher odds of becoming overweight/ obese compared to those with lower education attainments. These individuals were more likely to reside in urban areas for employment, to have more resources because of job opportunity, and to be immersed in a food and physical environment that perpetuates an unhealthy lifestyle. These results were found to be in agreement with other studies wherein those who had secondary education or higher were more likely to be overweight/ obese (Hong *et al.* 2018, Mkuu *et al.* 2018).

Lifetime abstainers and former smokers were more likely to be overweight/ obese than current smokers, parallel with other studies (Watanabe *et al.* 2016). This might be explained by previous reports that tobacco use may be associated with disruptions in digestive and absorptive functions of the gastrointestinal system (Dare *et al.* 2015), increasing energy expenditure, and suppressing appetite (Wang *et al.* 2016). In a research among younger people, smoking was used as a method to control weight.

CONCLUSION

This study reports a gradual increase in the prevalence of overweight/ obesity among adults 20.0 years and over in the Philippines. The approximately 50% increase in the prevalence of overweight/ obesity versus the 3.9 percentage point decrease in the prevalence of chronic energy deficiency (CED)/ underweight in a span of 20 years is reflective of a dire situation the country faces. Not only does the persistent problem of undernutrition exist, but also overweight/ obesity emerging as a public health problem. The factors associated with overweight/ obesity identified in this study were found to be consistent with the results of other bodies of work. It is particularly notable that higher educational status, higher socioeconomic status, and residence in urban areas pose an increased likelihood of being overweight/ obese. Along with the other factors found to be associated with overweight obesity – age, energy adequacy, civil status, and smoking status – it can be surmised that overweight/ obesity as a public health concern is driven by a multitude of factors that can be addressed using a multi-sectoral approach. That being said, it is also deemed as a challenge for public policy makers and program and intervention formulators to balance the resources and plan for efficient programs to address both undernutrition among the poor and overweight/ obesity among the more affluent and for the attainment of the WHO Global NCD Targets of 2025 and SDG 3.

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