

Food intake, nutritional and health status of Filipino adults according to occupations based on the 8th National Nutrition Survey 2013

Divorah Vinluan Aguila*, Glenn Melvin Purisima Gironella & Mario Villasaya Capanzana

*Food and Nutrition Research Institute, Department of Science and Technology
Bicutan, Taguig City, Philippines*

ABSTRACT

Introduction: The health and nutrition of a country's workforce plays an effective role in the social health and economic status of its society. **Methods:** This study determined the food intake, nutritional and health status of 69,505 Filipino adults and their households according to occupations using the 8th National Nutrition Survey conducted in 2013 by the Food and Nutrition Research Institute. Occupational grouping was based on the 1992 Philippine Standard Occupation Code. Descriptive statistics such as mean and percentages were generated using the survey module (svy) of Stata 12.0. **Results:** Chronic Energy Deficiency and anaemia were highest among adults with no occupation (12.3% and 14.8% respectively) and lowest among officials (4.3%) and those with special occupations (4.5%). Overweight, hypertension, high fasting blood sugar and high total cholesterol levels were highest among officials and lowest among farmers and professionals. Farmers had the highest percentage of smokers, alcoholic drinkers and with high physical activity level, while adults with no occupation had the lowest physical activity level. Households headed by special occupation groups had the highest energy intake, while farmers had the lowest protein, iron, vitamin A, thiamine, riboflavin, niacin and fat intakes. Crafts and related trade workers had the lowest percentage of households meeting the energy requirement (27.4%). **Conclusion:** The food intake, nutrition and health status of Filipino workers in certain occupations were poor, in need of improvement. A national policy on addressing the health, nutrition and welfare of workers is recommended.

Keywords: Filipino workers, nutritional status, health risks, food intake

INTRODUCTION

In 2016, approximately 40.8 million Filipino adults were employed in various occupations in the Philippines (PSA, 2016). The preliminary results of the Annual Labour and Employment Estimates for 2016, based on the average of the four Labour Force Survey

(LFS) rounds, reported an annual labour force participation rate of 63.4% out of the 68.1 million population ≥15 y. This is equivalent to about 43.2 million economically active among the population comprising either the employed or unemployed persons. Employed persons are grouped into three major sectors - agriculture, industry and

*Corresponding author: Divorah V Aguila

Food and Nutrition Research Institute, Department of Science and Technology, DOST Compound, Gen. Santos Ave., Bicutan, Taguig City

Tel: +632 837-2071 local 2296; Fax: +632 837-2934; E-mail: bheng_aguila@yahoo.com; dva@fnri.dost.gov.ph

services sector. Those in the services sector comprised more than half (55.6%) of the total employed persons. About 19.6% were engaged in wholesale and retail trade or in the repair of motor vehicles and motorcycles. Workers in the agriculture made up the second largest sector accounting for 26.9%, while those in the industry sector, 17.5%. As for occupation groups, workers in the elementary occupations remained the largest group making up 28.1% of the total employed persons in 2016. Managers comprised the second largest occupation group (17.0%), followed by service and sales workers (14.8%) and skilled agricultural, forestry and fishery workers (12.4%).

Inadequate nutrition is one of the leading causes of micronutrient deficiencies such as zinc, folic acid, iron deficiency anaemia and chronic diseases like diabetes and heart disease, which may result in an increase in medical expenses, a decrease in work capacity and ultimately, economical detriments (Haas & Brownlie, 2001). Since proper nutrition affects individuals' health and work capacity, the workers' nutrition can play a useful and effective role in the social health and economic status of the society (Bowman, 2007). Achieving an adequate nutrition programme not only increases the workers' health status, but also affects the economic development of the society.

The kind and nature of work a person has, may impact health because of the cumulative effect of an individual's work commitment over the lifetime. Occupation can affect health through direct impacts, such as physical job conditions (e.g., manual labour, exposure to noise and heat), psychosocial job characteristics, stress, and social support (Gueorguieva *et al.*, 2009). Occupations may also affect health through indirect mechanisms via income, health insurance, prestige, and

authority that are related to occupation (Ferrie *et al.*, 2005).

Another indirect effect of occupation may be the influence of peers or workplace characteristics on health habits (e.g., outside work or smoking bans) which in turn may affect health (Cheng *et al.*, 2000). The Whitehall studies reported that occupation has a significant impact on health, with a marked social gradient between British civil service grades and a variety of health outcomes, including coronary heart disease, self-reported health, and emotional well-being (Ferrie *et al.*, 2002; Stansfeld *et al.*, 2003).

The impact on health may worsen at older ages when occupational hazards accumulate and exert adverse effects beyond the working years. Evidence suggests that chronic stress, which is systematically related to occupation, results in a physiologic response, leading to overproduction of cortisol, translating into detrimental health effects that may accumulate over time (Miller & O'Callaghan, 2002). On the other hand, it is possible that differentials could narrow in old age if, for example, the relationship between occupation and health differs after retirement. Health could improve for those in manual occupations when retirees are relieved of the physical demands or psychosocial stress of their occupations.

Appropriate nutrition can play a part in improving the health status and increase the immunity of the body against diseases. An adequate intake of nutrients and energy may prevent the development of some diseases and nutritional disorders. In order to promote the nutritional status of a group, there is a need to gather information about the nutritional status of workers according to occupations. The present study was conducted to determine food intake, nutritional and health status of Filipino workers in different occupations.

MATERIALS AND METHODS

The study used data from 8th National Nutrition Survey (NNS) conducted by the Food and Nutrition Research Institute, Department of Science and Technology (FNRI-DOST) in 2013. The NNS was conducted in 79 provinces, 45,047 households and 172,323 individuals to provide national and regional estimates of nutritional status of the Filipino population. The NNS was based on a stratified multi-stage sampling design for household-based surveys covering all the 17 regions, including the National Capital Region.

The first stage was the selection of primary sampling units, which

consisted of a barangay or a contiguous barangays with at least 500 households. The second stage involved the selection of enumeration areas, which consisted of a contiguous area in a barangay or a barangay with 150-200 households. The last stage (ultimate sampling units) consisted of the households. All members of the household were included in the survey. The occupations of household members were categorised into occupational groups based on the 1992 Philippine Standard Occupational Classification (PSOC) of Philippine Statistics Authority (PSA, 2018).

The sample size per component of the NNS in this report is shown in Table 1. The number of respondents

Table 1. Distribution of sample sizes by survey components and by occupational groups of household heads: Philippines, 2013

<i>Component</i>	<i>Sample size</i>
Anthropometry - ≥ 20 y	69,505
Biochemical - Haemoglobin 6 months old & over [†]	33,852
Clinical and health (≥ 20 y)	
Blood pressure	73,992
Smoking, Alcohol [†]	20,163
Blood sugar (≥ 20 y) [†]	18,495
Lipids (≥ 20 y) [†]	19,010
Households	35,825
Dietary intake [†]	8,592
Socioeconomic status (or wealth quintile)	35,584
Occupation of household heads	
<i>Special occupation</i>	204
<i>Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors</i>	2,378
<i>Professionals</i>	755
<i>Technicians and associate professionals</i>	909
<i>Clerks</i>	677
<i>Service workers and shop and market sales workers</i>	1,384
<i>Farmers, forestry workers and fishermen</i>	10,133
<i>Craft and related trades workers</i>	2,931
<i>Plant and machine operators and assemblers</i>	3,216
<i>Elementary occupation: Labourers and unskilled workers</i>	4,536
<i>No occupation</i>	8,663
<i>Missing occupation[‡]</i>	39

[†]used for national estimates only

[‡]estimates were not presented from households with small sample size (in some components)

per component varies if the component was designed to generate national or regional level estimates. The 2013 NNS used 69,505 respondents to assess the nutritional status of adults ≥ 20 y based on weight and height measurements. The Health Survey Component provided national estimate on anaemia, and the risk factors related to non-communicable diseases, including hypertension, diabetes, and cholesterol levels (DOST-FNRI, 2015). The Food Consumption Survey (FCS) collected data on food and nutrient intakes at the household level. It provided information on the quantities of food consumed, the nutritive value of the diet and the adequacy of intake of the population (DOST-FNRI, 2015).

The 2013 NNS used the wealth index to disaggregate the household into five wealth quintile groups. The wealth index used principal component analysis to group the households based on the

households' assets, characteristics of housing unit, access to utilities and infrastructure variables of the 2013 NNS.

A written informed consent was obtained from all the participants of this study through the mother or guardian. Ethical clearance was provided by the FNRI Institutional Ethics Review Committee (FIERC).

Descriptive statistics were used in reviewing data on the food intake, nutrition and health status of Filipino workers by various occupations in the Philippines. Data were analysed using Stata 12.1.

RESULTS

According to the World Health Organization (WHO), malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients (WHO, 2016). Using this

Table 2. Prevalence of chronic energy deficiency, overweight, and obesity among adults, ≥ 20 y by occupation

Occupation groups	Form of malnutrition		
	CED	Overweight	Obese
	% (SE)		
All adults	10.0 (0.1)	24.3 (0.2)	6.8 (0.1)
Special occupations	8.1 (1.8)	28.4 (3.3)	6.4 (1.4)
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	4.3 (0.4)	37.0 (0.8)	12.6 (0.6)
Professionals	5.1 (0.5)	32.1 (1.1)	10.4 (0.8)
Technicians and associate professionals	5.8 (0.7)	29.0 (1.2)	10.0 (0.8)
Clerks	7.0 (0.7)	29.6 (1.1)	9.3 (0.7)
Service workers and shop and market sales workers	8.3 (0.5)	27.5 (0.8)	7.5 (0.5)
Farmers, forestry workers and fishermen	11.4 (0.3)	14.9 (0.4)	2.4 (0.2)
Craft and related trades workers	8.9 (0.5)	22.0 (0.8)	4.2 (0.4)
Plant and machine operators and assemblers	5.9 (0.5)	31.1 (0.9)	8.2 (0.5)
Elementary occupation: Labourers and unskilled workers	9.5 (0.5)	22.0 (0.5)	6.5 (0.3)
No occupation	12.3 (0.2)	24.0 (0.3)	7.0 (0.2)

definition, the prevalence of malnutrition among Filipino workers aged ≥ 20 y by occupational group in the Philippines is summarised in Table 2. Results showed that Chronic Energy Deficiency (CED) was highest among adults with no occupation (12.3%) followed by farmers, forestry workers and fishermen (11.4%), and lowest among officials (4.3%) and professionals (5.1%). The prevalence of CED in these two occupational groups was higher than the national prevalence for CED. Overweight and obesity on the other hand were highest among officials (49.6%) and professionals (42.5%) yet lowest among farmers, forestry workers and fishermen (17.3%).

In general, 1 out of 10 Filipino adults is anaemic (Table 3). This suggests that the Philippines has a mild category of public health significance for anaemia. Anaemia is highest among adults who have no occupation (14.8%) and those who are farmers, forestry workers or fishermen (10.6%), and lowest among adults with special occupations (4.5%) and plant and machine operators and assemblers (5.3%).

The prevalence of hypertension among adults ≥ 20 y in the Philippines is 22.3%. By occupation, hypertension was highest among officials (28.5%), plant and machine operators and assemblers (25.8%), and craft and related trade

Table 3. Prevalence of anaemia, hypertension and high fasting blood glucose among adults ≥ 20 y by occupation

<i>Occupational grouping</i>	<i>Anaemia</i>		<i>Hypertension</i>		<i>Fasting Blood Glucose</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
All adults	18309	11.1	73992	22.3	18495	5.6
Special occupations	83	4.5	283	19.6	80	3.7
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1123	9.7	4189	28.5	1120	10.3
Professionals	588	9.6	2233	17.7	591	5.9
Technicians and associate professionals	445	8.3	1668	20.4	432	5.6
Clerks	543	8.7	1996	19.1	546	4.0
Service workers and shop and market sales workers	922	8.5	3270	18.6	917	3.9
Farmers, forestry workers and fishermen	3441	10.6	12143	23.9	3309	3.6
Craft and related trades workers	1007	8.1	3422	24.5	976	4.8
Plant and machine operators and assemblers	891	5.3	3360	25.8	855	6.4
Elementary occupation: Labourers and unskilled workers	2181	8.3	8050	20.6	2132	5.8
No occupation	7071	14.8	33310	21.9	7523	5.9

workers (24.5%), yet lowest among professionals (17.7%).

Diabetes type 2 prevalence based on high fasting blood glucose level in 2013 among Filipino adults is 5.6%, based on the cut-off of 126 mg/dL. By type of occupation, adults with high positions like officials (10.3%), plant and machine operators and assemblers (6.4%), and professionals (5.9%) have the highest prevalence of diabetes. Diabetes prevalence among officials is almost double than the national prevalence (5.6%). Surprisingly, unemployed adults also have a high prevalence of diabetes (5.9%). Lowest prevalence of diabetes was seen among farmers, forestry workers and fishermen (3.6%).

In this analysis, lipid profile was determined using the cut-offs based on the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III). Results showed (Table 4) that more than half (52.8%) of Filipino adults in general have desirable cholesterol level, more than one-fourth (28.6%) have borderline-high cholesterol level, while close to one-fifth (18.6%) have high cholesterol level. By occupational group, adults working in the farm, forest or into fishing have the highest percentage of desirable cholesterol level (65.4%). Borderline-high to high cholesterol levels are highest among adults who work as officials (34.4% and 27.4%), while least among farmers,

Table 4. Cholesterol distribution among adults ≥ 20 y by occupation of household heads

Occupation groups	n	% Distribution by cholesterol levels								
		Desirable			Borderline-high			High		
		<200			200-<240			≥ 240		
		%	95% CI		%	95% CI		%	95% CI	
All adults	19,010	52.8	51.6	54.0	28.6	27.8	29.4	18.6	17.8	19.4
Special occupations	82	52.4	40.0	64.8	27.6	16.6	38.6	20.0	11.1	28.9
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1,134	38.2	35.2	41.2	34.4	31.7	37.1	27.4	24.8	30.1
Professionals	604	46.2	41.7	50.8	33.4	28.9	37.8	20.4	17.0	23.9
Technicians and associate professionals	446	45.6	40.3	51.0	33.3	28.3	38.3	21.1	16.4	25.8
Clerks	559	50.8	45.6	55.9	30.2	26.0	34.5	19.0	15.5	22.5
Service workers and shop and market sales workers	942	51.5	48.0	55.0	30.3	27.1	33.6	18.2	15.6	20.7
Farmers, forestry workers and fishermen	3,405	65.4	63.2	67.6	23.1	21.4	24.8	11.5	10.2	12.9
Craft and related trades workers	1,010	56.2	51.4	61.0	28.5	25.0	32.0	15.3	12.6	18.0
Plant and machine operators and assemblers	878	49.8	46.1	53.4	31.3	28.2	34.4	19.0	15.9	22.0
Elementary occupation: Labourers and unskilled workers	2,195	55.2	52.4	58.1	28.8	26.4	31.2	16.0	14.1	17.9
No occupation	7,741	51.2	49.7	52.6	28.2	27.1	29.2	20.7	19.6	21.7

Table 5. Proportion of current smokers among adults ≥ 20 y by various occupations

Occupational group	n	Smoking status								
		Never			Current			Former		
		%	95% CI	%	95% CI	%	95% CI			
All Adults	20,163	59.2	58.2	60.1	25.4	24.5	26.2	15.5	14.7	16.3
Special occupations	97	42.8	30.5	55.0	33.9	24.1	43.6	23.4	11.5	35.2
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1,225	60.7	57.7	63.6	21.9	19.4	24.4	17.4	14.9	19.9
Professionals	676	80.2	75.9	84.4	9.2	6.3	12.1	10.7	7.8	13.5
Technicians and associate professionals	485	55.9	50.8	61.0	23.7	19.9	27.5	20.4	15.4	25.4
Clerks	620	71.9	67.1	76.7	13.2	10.0	16.4	14.9	11.5	18.3
Service workers and shop and market sales workers	1,042	61.7	58.1	65.2	23.6	20.8	26.5	14.7	12.3	17.1
Farmers, forestry workers and fishermen	3,467	35.2	33.1	37.2	45.8	43.8	47.9	19.0	17.5	20.5
Craft and related trades workers	1,091	39.2	35.0	43.4	43.4	39.0	47.7	17.4	14.9	19.9
Plant and machine operators and assemblers	950	36.0	31.8	40.2	44.0	40.3	47.8	20.0	17.4	22.6
Elementary occupation: Labourers and unskilled workers	2,322	54.2	51.8	56.5	31.6	29.4	33.9	14.2	12.5	16.0
No occupation	8,174	71.6	70.4	72.8	14.7	13.8	15.7	13.7	12.7	14.6

forestry workers or fishermen (23.1% and 11.5%).

Smoking status was defined using the WHO Stepwise Approach to Surveillance which grouped smoking status into three categories namely current smokers, former smokers and individuals who have never smoked at all. Table 5 shows that only one-fourth of adults in general are current smokers, while more than half (59.2%) never smoked at the time the survey was conducted in 2013. By occupational group, farmers, forestry workers and fishermen (45.8%) have the highest percentage of current smokers, followed by plant and machine operators

and assemblers (44.0%), and craft and related trades workers (43.4%), the percentages of which are almost double compared to the general population (25.4%).

In this review, alcohol drinking is defined using the operational definition of alcohol consumption by WHO (2014). Table 6 shows that about 5 of 10 adults, ≥ 20 y are current drinkers, 1 of 10 are former drinkers, while about 4 of 10 adults are lifetime abstainers. Adults working as plant and machine operators and assemblers (71.8%) have the highest percentage of current drinkers, followed by adults with special occupations

Table 6. Alcohol drinking status among adults ≥ 20 y by occupation

Occupational group	n	Drinking status								
		Lifetime abstainers			Former drinkers			Current drinkers		
		%	95% CI	%	95% CI	%	95% CI			
All adults	20,163	38.3	36.8	39.8	13.6	12.5	14.6	48.2	47.0	49.4
Special occupations	97	18.5	10.4	26.7	12.8	4.7	20.9	68.7	58.7	78.6
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1,225	38.1	35.0	41.1	14.3	12.1	16.4	47.7	44.4	51.0
Professionals	676	46.8	42.2	51.3	12.3	9.4	15.3	40.9	36.5	45.4
Technicians and associate professionals	485	29.9	25.7	34.2	12.7	9.4	16.0	57.4	52.6	62.2
Clerks	620	40.0	35.3	44.7	13.1	10.2	16.1	46.9	42.0	51.7
Service workers and shop and market sales workers	1,042	33.7	29.9	37.5	12.1	9.7	14.5	54.2	50.2	58.2
Farmers, forestry workers and fishermen	3,467	24.8	22.5	27.0	10.1	8.6	11.6	65.2	63.0	67.3
Craft and related trades workers	1,091	22.8	19.8	25.7	11.5	8.6	14.4	65.7	61.9	69.4
Plant and machine operators and assemblers	950	19.6	15.9	23.2	8.6	6.7	10.5	71.8	68.0	75.6
Elementary occupation: Labourers and unskilled workers	2,322	34.6	32.2	37.0	12.3	10.6	14.0	53.1	50.6	55.6
No occupation	8,174	49.5	47.4	51.5	16.5	15.0	17.9	34.1	32.5	35.7

(68.7%), and craft and related trades workers (65.7%).

In terms of physical activity, more than half (54.5%) of the Filipino adults in general has high physical activity level. By type of occupation, farmers, forestry workers and fishermen have the highest percentage with high level of physical activity (79.9%) which is indicative of the kind and type of work they have in the field or at sea. This group is followed by adults working in craft and related trades (69.4%), and those who have elementary occupation like labourers and unskilled workers. Highest percentage of low physical activity level is seen among adults with no occupation

(59.1%), followed by clerks (56.8%), and professionals (55.6%) (Table 7).

In terms of food intake, Tables 8 and 9 summarised the mean one-day per capita food intake of the households by occupational group of household heads. Households with special occupations have the highest energy intake, while the group of farmers and fishermen had the lowest protein, iron, vitamin A, thiamine, riboflavin, niacin and fat intakes. Households headed by craft and related trade workers have the lowest percentage of households meeting the energy requirement (27.4%). Households headed by farmers and fishermen have the lowest percentage of households

Table 7. Physical activity level of adults ≥ 20 y by various occupations

Occupational groups	n	Physical activity [†]					
		Low			High		
		%	95% CI	%	95% CI	%	95% CI
All adults	19,551	45.5	43.8	47.1	54.5	52.9	56.2
Special occupations	92	52.6	42.1	63.1	47.4	36.9	57.9
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1,191	50.1	46.6	53.6	49.9	46.4	53.4
Professionals	637	55.6	50.5	60.7	44.4	39.3	49.5
Technicians and associate professionals	471	49.5	43.8	55.1	50.5	44.9	56.2
Clerks	595	56.8	52.1	61.5	43.2	38.5	47.9
Service workers and shop and market sales workers	980	42.8	38.9	46.6	57.2	53.4	61.1
Farmers, forestry workers and fishermen	3,443	20.1	17.8	22.5	79.9	77.5	82.2
Craft and related trades workers	1,052	30.6	26.6	34.5	69.4	65.5	73.4
Plant and machine operators and assemblers	898	38.4	34.3	42.5	61.6	57.5	65.7
Elementary occupation: Labourers and unskilled workers	2,225	30.9	28.2	33.6	69.1	66.4	71.8
No occupation	7,953	59.1	57.2	60.9	40.9	39.1	42.8

[†]A person not meeting any of the following criteria is considered being physically inactive and therefore at risk of chronic disease:

- 3 or more days of vigorous-intensity activity of at least 20 minutes per day; OR
- 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day

meeting the requirement for protein (52.5%), vitamin A (20.1%), thiamine (27.4%) and riboflavin (14.9%)

DISCUSSION

The nutritional and health status of Filipino adults ≥ 20 y working in various occupations is of concern. Adults without occupations, farmers, forestry workers and fishermen are chronically energy deficient and anaemic. These findings are in line with the studies of Clemens *et al.* (2015) and Roelfs *et al.* (2011), who reported associations between unemployment and increased risk of

both ill-health and mortality. These associations may occur in part through adverse health-related behaviours – principally smoking, diet, exercise, and alcohol consumption. In the case of farmers, forestry workers and fishermen in the Philippines, the living condition of this occupational group, coupled with poor health, high risk to extreme events, poverty and poor quality of diet, may have contributed to the occurrence of CED. Previous studies showed that populations with lower socioeconomic status were more prone to anaemia (Alaofe *et al.*, 2009; Luo *et al.*, 2011).

Table 8. Per capita mean one-day energy and nutrient intake by occupation of household heads should add “% meeting Philippines RDAs for energy and each nutrient”

Occupation groups	Energy (kcal)	Protein (g)	Iron (mg)	Vit. A (mcg RE)	Calcium (g)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vit. C (mg)	Carbohydrates (g)	Fats (g)
All households	1813	56.6	9.4	534.2	394.8	0.83	0.76	18.3	43.8	310.6	37.9
Special occupations	2036	65.6	10.7	1092.6	425.9	0.95	1.15	21.9	46.4	320.9	54.1
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	1914	63.6	10.3	628.3	397.1	0.95	0.87	20.2	44.0	306.6	47.5
Professionals	1941	68.6	10.9	591.4	471.3	0.99	0.97	21.8	55.0	292.2	54.2
Technicians and associate professionals	1875	62.3	10.5	1130.5	406.6	0.88	1.09	20.2	45.3	293.9	49.9
Clerks	1813	59.2	9.9	770.5	377.7	0.92	0.86	19.4	37.4	291.0	45.7
Service workers and shop and market sales workers	1808	59.4	9.6	727.9	374.1	0.93	0.89	19.6	38.6	294.5	42.9
Farmers, forestry workers and fishermen	1815	52.4	8.8	375.8	392.5	0.74	0.63	16.7	46.9	338.1	27.7
Craft and related trades workers	1776	54.3	9.3	556.9	364.9	0.83	0.74	17.6	39.6	304.2	37.7
Plant and machine operators and assemblers	1789	57.6	9.3	480.5	385.9	0.87	0.75	18.5	40.4	293.6	42.4
Elementary occupation: Labourers and unskilled workers	1768	53.7	8.9	482.8	365.2	0.80	0.72	17.6	38.7	310.3	34.5
No occupation	1806	58.0	9.7	548.5	426.1	0.83	0.79	18.9	47.3	302.1	40.1

Table 9. Percentage of households meeting energy and nutrient intake by occupation of household heads

<i>Occupation groups</i>	<i>Energy</i>	<i>Protein</i>	<i>Iron</i>	<i>Vit. A</i>	<i>Calcium</i>	<i>Thiamin</i>	<i>Riboflavin</i>	<i>Niacin</i>	<i>Vit. C</i>
All households	34.9	59.9	15.2	27.5	11.0	36.1	23.5	83.6	29.6
Special occupations	46.4	80.2	17.4	38.4	19.6	56.2	47.4	90.3	41.3
Officials of government and special-interest organisations, corporate executives, managers, managing proprietors and supervisors	42.1	70.3	21.2	33.8	13.4	45.3	30.7	88.9	30.6
Professionals	41.2	74.7	21.2	43.9	22.0	45.0	43.5	90.4	46.7
Technicians and associate professionals	37.7	72.0	21.0	33.8	12.8	44.1	27.7	90.1	32.2
Clerks	31.7	64.0	14.9	29.4	11.1	43.2	25.4	86.9	21.0
Service workers and shop and market sales workers	35.0	66.0	13.9	33.2	9.7	48.0	33.5	87.9	21.7
Farmers, forestry workers and fishermen	33.9	52.5	12.1	20.1	10.4	27.4	14.9	76.6	32.5
Craft and related trades workers	27.4	56.9	11.0	29.2	8.2	38.7	21.8	84.9	25.9
Plant and machine operators and assemblers	30.2	63.9	11.5	28.6	10.1	40.3	25.9	88.0	25.9
Elementary occupation: Labourers and unskilled workers	31.6	54.7	11.2	25.8	8.4	33.2	21.0	82.3	25.6
No occupation	39.9	61.6	21.3	28.9	12.7	35.7	26.5	84.4	31.6

While there are reports of an increase in weight associated with unemployment (Monsivais *et al.*, 2015), this does not hold true with the present study as adults with no occupation have the highest prevalence of CED. Other studies suggest a fall in body mass index (BMI) ranking during unemployment (Jonsdottir & Asgeirsdottir, 2014). According to Hughes (2017), an increase or decrease in weight is associated with unemployment, and may be gender specific or dependent on pre-unemployment BMI. On the other hand, the high prevalence of overweight and obesity observed among adults working as officials or professionals could be attributed to several work characteristics such as long work weeks (Solovieva *et al.*, 2013) and shift-work to psychosocial factors such as job stress (Nigatu *et al.*, 2016; Proper *et al.*, 2016). In contrast, workers who toiled for >40 hours per week or were exposed to a hostile work environment were significantly more likely to be obese (Luckhaupt *et al.*, 2014). Long work hours may be contributing to the rising obesity problem by reducing time for physical activity, particularly for individuals working with high ranks, managers or in sedentary occupations (Cook and Gazmararian, 2018). On the other hand, hostile work environments, like other stressors, may promote obesity through an increase in total caloric intake (Groesz, *et al.*, 2012). Longitudinal studies of workplace and hostility may help clarify this relationship.

Hypertension is a significant risk factor to cardiovascular diseases. The high prevalence of hypertension observed among officials and plant and machine operators and assemblers could be attributed to psychological and social factors that have been reported as contributors to the onset and trajectory of hypertension. Psychosocial factors, such as hostility and job strain, have been found to be associated with higher

circulating levels of catecholamines, higher cortisol levels, and increased blood pressure over time (Cuevas, Williams & Albert, 2017).

The type of occupation is reportedly a risk factor for type-2 diabetes mellitus (DM). Nagaya *et al.* (2006) showed that Japanese manager/administrative workers aged ≥ 50 y showed increased risk to DM. In the present study, adults working as officials had the highest prevalence of overweight and obesity. The same occupational group had the highest number of hypertension and high fasting blood glucose level. According to Pavlou *et al.* (2018), many mechanisms have been proposed to explain why hypertension and T2DM co-exist in the same individuals. Obesity and increased visceral adiposity present as the most important pathogenetic factors. Moreover, insulin resistance is also a very important component for the development of both entities. Insulin resistance is associated with increased vascular adhesion molecules expression, oxidative stress, inflammation, and decreased vascular nitric oxide levels, which in turn promote vascular stiffness resulting in persistent hypertension (Smulyan *et al.*, 2016).

Tobacco and excessive alcohol consumption are addictive behaviours, listed among the 10 leading risk factors that cause death and disability in the world, and health consequences are greater if their consumption is combined (Reis, Quintal & Lourenc, 2018). When alcohol and tobacco are used together, this increases the risk of some types of cancer and cardiovascular diseases, more than the use of either drug alone (Lee *et al.*, 2005). In this review, the opportunity to obtain alcoholic beverages and tobacco cigarettes inexpensively, when combined with social pressure by peers to drink and smoke, is an especially powerful explanation for high rates of alcoholism among adults with

special occupations, farmers, forestry workers, fishermen, plant & machine operators and assemblers.

Strong evidence shows that physical inactivity increases the risk of many adverse health conditions, including the world's major non-communicable diseases (NCDs) such as coronary heart disease (CHD), type 2 diabetes (T2DM), and breast and colon cancers, and shortens life expectancy (Lee *et al.*, 2012). High percentage of farmers, forestry workers, fishermen, plant and machine operators and assemblers showed high physical activity level. In contrast, low levels of physical activity were reported among adults with no occupation, clerks and professionals. This result provides potential avenues for public health interventions.

In terms of dietary intake, the lowest prevalence of household heads meeting energy and nutrient requirement based on the Philippine Dietary Reference Intakes (PDRI) are those that are involved in heavy works such as craft and related trades, plant and machine operation and assembly, elementary occupation (labourers and unskilled), clerical works and farming, and forestry and fishing. Those with the highest proportion of households meeting the energy and nutrient intake are those headed by special occupations, officials and professionals. It is expected that with occupations requiring heavy work, the nutrient demand and energy expenditure are high. Therefore, adequate nutrient and energy intake of workers are essential. If daily energy expenditure is higher than the energy intake, consequently the energy balance becomes negative and it can affect the work power. Dietary analysis of the study conducted in South Africa showed 56% deficit of energy in farmers (Christie, 2008). In a study conducted on forest workers in Greece, there was a decrease in the received energy equal

to 1193 kcal/d (Gallis, 2007). In a study by Capanzana *et al.* (2018), households headed by fishermen and farmers in the Philippines had higher prevalence of stunting and underweight among children 0-10 years old compared to other occupation groups of household heads.

Given the results of the present study, it is evident that the food intake, nutritional and health status of workers by various occupations demand attention. The World Health Organization defines health as not only the absence of disease but also a state of complete mental and physical wellbeing in relation to the productivity and performance of an individual, thus, a well-nourished, healthy workforce is a pre-condition for sustainable development. At the same time, the nutritional well-being of a population reflects the performance of its social and economic sectors, and to a large extent, is an indicator of the efficiency of national resource allocation. Investing in health and nutrition of workers is therefore wise because the enormous social and financial costs of malnutrition are averted. Moreover, improved nutrition has an enhancing effect on investments in health, education and agriculture sectors (FAO, 2004).

There is a growing worldwide recognition that worksite health and wellness programmes afford an excellent opportunity to positively impact the health profile of a large proportion of a country's workforce population (Despres *et al.*, 2014). Workplaces have been established as one of the priority settings for health promotion in the 21st century (Malik *et al.*, 2014). They have been shown to directly influence the physical, mental, economic and social well-being of employees and as a result, the health of their families. The concept of promoting health in the workplace is becoming increasingly relevant as more

organisations recognise the importance of a healthy workforce to obtain success across their organisation. There are several benefits for employers in investing in the health of their employee, such as reduced sickness absence, increased productivity and better staff retention (Abdin *et al.*, 2018).

In the study of Henke *et al.* (2011), Johnson & Johnson (J&J) was one of the first to implement a comprehensive workplace wellness programme and one of the few companies with data obtained through a longitudinal study of their health and wellness programmes. J&J realised an overall increase in the number of employees classified as low-risk (defined as 0 to 2 health risks) from 78% to 87.5% over the course of a 5-year period. During the same time period, they reported reductions in the percentage of employees who were sedentary (from 39% to 21%), used tobacco (12% to 3.6%), had high blood pressure (14% to 6.4%), and high cholesterol (19% to 6.2%).

The evidence is clear that the benefits to workers who engage in wellness programmes are tangible. By making healthier lifestyle choices, workers can greatly impact their energy, quality of life, and overall well-being; reduce their health risks; and minimise the likelihood of developing chronic health conditions.

CONCLUSION

The food intake and nutritional and health status of Filipino workers in the studied occupations were poor and needs to be improved. While chronic energy deficiency and anaemia were high in certain occupational groups, overweight, hypertension, high fasting blood sugar and high total cholesterol were high on others. Smoking, alcoholic drinking and physical inactivity were contributors to low health status in certain occupations. The needs of occupational groups at-risk

to malnutrition should be prioritised for improvement. A comprehensive national policy on health, nutrition and welfare improvement among workers is recommended.

Authors' contributions

DVA and MVC contributed to the design, data analysis and drafting of the manuscript; GPG contributed to the design, acquisition of data and data analysis.

Conflict of interest and funding disclosure

The authors declare that they have no conflict of interests. This study was funded by the WorldFish Philippines. The funding body had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

References

- Abdin S, Welch RK, Byron-Daniela J & Meyrick J (2018). The effectiveness of physical activity interventions in improving well-being across office-based workplace settings: a systematic review. *Public Health* 160: 70-76.
- Alaofè H, Zee J, Dossa R & O'Brien HT (2009). Impact of socioeconomic and health related factors on the iron status of adolescent girls from two boarding schools in Southern Benin. *Int J Adolesc Med Health* 21: 545-54.
- Bhatia R (2016). Influence of Maternal Occupation on Family Food Pattern & Eating Habits of Preschool Children. *South-Asian Journal of Multidisciplinary Studies* 3(5): 86-94.
- Bowman S (2007). Low economic status is associated with suboptimal intakes of nutritious foods by adults in the National Health and Nutrition Examination Survey 1999-2002. *Nutrition Research* 27(9): 515-523.
- Capanzana MV, Aguila DV, Gironella GMP & Montecillo KV (2018). Nutritional status of children ages 0-5 and 5-10 years old in households headed by fisherfolks in the Philippines. *Archives of Public Health* 76:24.
- Cheng Y, Kawachi I, Coakley EH, Schwartz J & Colditz G (2000). Association between psychosocial work characteristics and health functioning in American women: Prospective study. *British Medical Journal* 320: 1432-1436.
- Christie CJA (2008). Relationship between energy intake and expenditure during harvesting tasks. *The Occupational Ergonomics* 8(1): 1-10.

- Clemens T, Popham F, Boyle P (2015). What is the effect of unemployment on all-cause mortality? A cohort study using propensity score matching. *Eur J Public Health* 25(1): 115–121.
- Cook MA, Gazmararian J (2018). The association between long work hours and leisure-time physical activity and obesity. *Preventive Medicine Reports* 10: 271–277. <https://doi.org/10.1016/j.pmedr.2018.04.006>
- Cuevas AG, Williams DR & Albert MA (2017). Psychosocial Factors and Hypertension: A Review of the Literature. *Cardiol Clin* 35: 223–230. <http://dx.doi.org/10.1016/j.ccl.2016.12.004>.
- Department of Labor and Employment (DOLE) (2013). *Occupational health package: A primer*. DOLE Occupational Safety and Health Center, Manila, Philippines.
- Despres JP, Almeras N & Gauvin L (2014). Worksite health and wellness programs: Canadian achievements & prospects. *Prog Cardiovasc Dis* 56(2014): 484–492.
- El-Qudah JM, Al-Widyan O, Alboqai OK, Suleiman AA & Quasem JM (2008). Fat Soluble Vitamins (A, E and K) Intake among a Sample of Jordanian University Students. *World Applied Sciences Journal* 5(2): 252–257.
- Ferrie JE, Martikainen P, Shipley MJ & Marmot MG (2005). Self-reported economic difficulties and coronary events in men: Evidence from the Whitehall II study. *International Journal of Epidemiology* 34: 640–648.
- Ferrie JE, Shipley MJ, Smith GD, Stansfeld SA & Marmot MG (2002). Change in health inequalities among British civil servants: The Whitehall II study. *Journal of Epidemiology and Community Health* 56: 922–926.
- Food and Agriculture Organization of the United Nations (2004). Incorporating Nutrition Considerations into Development Policies and Programmes. Brief for Policy-makers and Programme Planners in developing countries. From <ftp://ftp.fao.org/docrep/fao/007/y5343e/y5343e00.pdf>. [Retrieved on Feb. 26, 2018].
- Food and Nutrition Research Institute–Department of Science and Technology (2015). Philippine Nutrition Facts and Figures 2013. *8th National Nutrition Survey: Overview*. DOST Compound, FNRI Bldg. Bicutan, Taguig City, Philippines.
- Gallis C & Panagopoulou P (2007). Nutrient intakes of Greek forest workers and researchers do not meet all Reference Dietary Intakes. *Nutrition Research* 27(6): 321–326.
- Groesz LM, McCoy S, Carl J, Saslow L, Stewart J, Adler N, Laraia B & Epel E (2012). What is eating you? Stress and the drive to eat. *Appetite* 58(2):717–721.
- Gueorguieva R, Sindelar JL, Falba TA, Fletcher JM, Keenan P, Wu R & Gallo WT (2009). The impact of occupation on self-rated health: Cross-sectional and longitudinal evidence from the health and retirement survey. *Journal of Gerontology: Social Sciences* 64B (1): 118–124, doi:10.1093/geronb/gbn006.
- Haas JD & Brownlie IVT (2001). Iron deficiency and reduced work capacity: a critical review of the research to determine a causal relationship. *The Journal of Nutrition* 131(2): 676S–690S.
- Henke RM, Goetzel RZ & McHugh J (2011). Recent experience in health promotion at Johnson & Johnson: lower health spending, strong return on investment. *Health Aff* 30: 490–499.
- Hughes A, Kumarib M (2017). Unemployment, underweight, and obesity: Findings from Understanding Society (UKHLS). *Preventive Medicine* 97:19–25. <http://doi.org/10.1016/j.ypmed.2016.12.045>.
- Karin I, Proper KI, van de Langenberg D, Rodenburg W, Vermeulen RCH, van der Beek AJ, van Steeg H & van Kerkhof LWM (2016). The Relationship Between Shift Work and Metabolic Risk Factors A Systematic Review of Longitudinal Studies. *Am J Prev Med* 2016;50(5):e147–e157.
- Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT & Lancet Physical Activity Series Working Group (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 380(9838):219–29. doi: 10.1016/S0140-6736(12)61031-9.
- Jazayeri S, Nouri M, Pourebrahim R, Fakhrzadeh H & Ardeshtir Larijani MB (2004). Food and nutrient intakes among 20–60 aged inhabitants of Tehran University of Medical Sciences Population Lab Region. *Iranian Journal of Diabetes and Lipid Disorders* 3(1): 81–89.
- Jonsdottir S & Asgeirsdottir TL (2014). The effect of job loss on body weight during an economic collapse. *Eur. J. Health Econ.* 15(6): 567–576. <http://dx.doi.org/10.1007/s10198-013-0494-z>.
- Luckhaupt SE, Cohen M, Li J & Calvert GM (2014). Prevalence of obesity among U.S. workers and associations with occupational factors. *Am J Prev. Med.* 46(3): 237–248. <https://doi.org/10.1016/j.jameprev.2013.11.002>.

- Luo R, Zhang L, Liu C, Zhao Q, Shi Y, Miller G, Yu E, Sharbono B, Medina A, Rozelle S & Martorell R (2011). Anaemia among students of rural China's elementary schools: Prevalence and correlates in Ningxia and Qinghai's poor counties. *J Health Popul Nutr* 29: 471-85.
- Malik S, Blake H & Suggs S (2014). A systematic review of workplace health promotion interventions for increasing physical activity. *Br J Health Psychol*: 149-180.
- Miller DB & O'Callaghan JP (2002). Neuroendocrine aspects of the response to stress. *Metabolism: Clinical & Experimental* 51(6 Suppl. 1): 5-10.
- Mirowsky J & Ross CE (2008). Education and self-rated health – Cumulative advantage and its rising importance. *Research on Aging* 30: 93-122.
- Monsivais P, Martin A, Suhrcke M, Forouhi NG & Wareham NJ (2015). Job-loss and weight gain in British adults: evidence from two longitudinal studies. *Soc. Sci. Med.* 143: 223-231. <http://dx.doi.org/10.1016/j.socscimed.2015.08.052>.
- Nagaya T, Yoshida H, Takahashi H & Kawai M (2006). Incidence of type-2 diabetes mellitus in a large population of Japanese male white-collar workers. *Diabetes Research and Clinical Practice* 74(2): 169-174. <https://doi.org/10.1016/j.diabres.2006.03.010>.
- Nigatu YT, van de Ven HA, van der Klink JJJ, Brouwer S, Reijneveld SA, Bültmann U (2016). Overweight, obesity and work functioning: The role of working-time arrangements. *Applied Ergonomics* 52:128-134.
- Philippine Statistics Authority (2016). *Philippine Standard Occupational Classification (PSOC)*. From <http://nap.psa.gov.ph/csd/psoc1.asp>. [Retrieved February 26 2018].
- Philippine Statistics Authority (2016). *Annual Labor and Employment Estimates for 2016*. From <https://psa.gov.ph/content/2016-annual-labor-and-employment-status>. [Retrieved February 26 2018].
- Patel PA, Patel PP, Yagnik B, Vora K, Verma A, Patel AD, Chiplonkar SA & Khadilkaar AV (2016). Nutritional status assessment of women from different occupations in urban and semi-urban regions of Gujarat. *Int J Food Nutr Sci* 3(6): 1- 4.
- Pavlou DI, Paschou SA, Anagnostis P, Spartalis M, Spartalis E, Vryonidou A, Tentolouris N, Siasos G (2018). Hypertension in patients with type 2 diabetes mellitus: Targets and Management. *Maturitas* 112: 71-77.
- Reis AM, Quintal C & Lourenc O (2018) Killing two birds with one stone? Association between tobacco and alcohol consumption. *Public health* 154: 136-143.
- Roelfs DJ, Shor E, Davidson KW & Schwartz JE (2011). Losing life and livelihood: a systematic review and meta-analysis of unemployment and all-cause mortality. *Soc. Sci. Med.* 72 (6): 840-854. <http://dx.doi.org/10.1016/j.socscimed.2011.01.005>.
- Smulyan H, Lieber A, Safar ME (2016). Hypertension, diabetes type II, and their association: role of arterial stiffness, *Am. J. Hypertens* 29: 5-13.
- Solovieva S, Lallukka T, Virtanen M & Viikari-Juntura E (2013). Psychosocial factors at work, long work hours, and obesity: a systematic review. *Scand J Work Environ Health* 39(3): 241-58.
- Stansfeld SA, Head J, Fuhrer R, Wardle J & Cattell V (2003). Social inequalities in depressive symptoms and physical functioning in the Whitehall II study: Exploring a common cause explanation. *Journal of Epidemiology and Community Health* 57: 361-367.
- Thelin A & Holmberg S (2014). Type 2 Diabetes and Lifestyle- A Prospective Population-Based Cohort Study among Rural Men. *International Journal of Diabetes and Clinical Research* 1: 2.
- Vaida N (2013). Impact of Maternal Occupation on Health and Nutritional Status of Preschoolers. (In Srinagar City). *Journal of Humanities And Social Science* 7(1): 9-12.
- World Health Organization (2016). *What is malnutrition?* From <http://www.who.int/features/qa/malnutrition/en/> [Retrieved October 2 2018].