

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS  
**NON-COMMUNICABLE DISEASES  
& RISK FACTOR HYBRID SURVEY  
REPORT**



2016



Report developed by: Rica Dela Cruz and Haley Cash

# ACKNOWLEDGEMENTS



## WITHIN THE CNMI:

### **Commonwealth Healthcare Corporation**

- Esther L. Muna, Chief Executive Officer
- Margarita T. Aldan, Director of Public Health

### **Division of Public Health Non-Communicable Disease Bureau**

- Becky Robles, NCD Bureau Administrator
- Amber Lynn Mendiola, Diabetes Project Assistant
- Dr. Sarojini Monteiro, former Epidemiologist

### **Community Guidance Center**

- Nadine Sablan, Director of the Community Guidance Center
- Glenn Manglona, Statistician Specialist/State Epidemiology Lead
- Reyna Saures, former Director of the Community Guidance Center

### **Department of Commerce**

- Mark Rabauliman, Secretary of Commerce
- Justin Andrew, Computer Specialist
- Alfonis Sound, former Acting Central Statistics Division Director
- Fermin Sakisat, Statistics Specialist
- Michael Levin, Survey Consultant

### **Northern Marianas College Cooperative Research Extension and Education Service (NMC-CREES)**

- Patricia Coleman, Leader of Programs, Nutrition and Health Programs, NMC-CREES
- Rose Castro, Extension Nutrition Educator, NMC-CREES

## EXTERNAL PARTNERS:

### **Centers for Disease Control and Prevention (CDC)**

- Stacy De Jesus, Pacific Islands Team Lead
- Loren Cadena, former Pacific islands Team Lead

### **World Health Organization (WHO)**

- Dr. Wendy Snowden, Team Coordinator-Pacific NCD and Health through the Life-Course

### **Pacific Island Health Officers' Association (PIHOA)**

- Dr. Haley Cash, Regional USAPI Epidemiologist
- Emi Chutaro, Executive Director

### **Substance Abuse and Mental Health Services Administration (SAMHSA)**

### **University of Hawaii, Children's Healthy Living Program (CHL)**

- Dr. Rachel Novotny, Interim Dean of CTAHR, CHL Principal Investigator, Professor, Graduate Chair, Nutrition PhD Program
- Dr. Marie Kainoa Fialkowski Revilla, Dietetics Program Director & Assistant Professor in Human Nutrition

# TABLE OF CONTENTS



<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>DASHBOARD SUMMARY .....</b>	<b>2</b>
<b>INTRODUCTION &amp; BACKGROUND .....</b>	<b>3</b>
<b>AIM .....</b>	<b>4</b>
OBJECTIVES .....	4
TARGET GROUP .....	4
<b>SURVEY METHODOLOGY .....</b>	<b>4</b>
<b>RESULTS .....</b>	<b>5-18</b>
SAMPLE SUMMARY .....	5
TOBACCO USE .....	6
Cigarette Use .....	
BETEL NUT USE .....	7
ALCOHOL USE .....	8
DIET & NUTRITION .....	9
Fruit & Vegetable Consumption .....	
Processed Meat Consumption .....	
Sugar Sweetened Beverage Consumption .....	
PHYSICAL ACTIVITY .....	10
OVERWEIGHT & OBESITY .....	11
GENERAL HEALTH & ACCESS TO HEALTH .....	12
ORAL HEALTH .....	13
SELF-REPORTED HEALTH CONDITIONS .....	14
DIABETES .....	15
HYPERTENSION .....	16
CHOLESTEROL .....	17
SCREENING .....	18
Pap Test .....	
Mammogram .....	
Colonoscopy .....	
<b>DISCUSSION .....</b>	<b>19</b>
CONCLUSION .....	19
RECOMMENDATIONS .....	19
<b>REFERENCES .....</b>	<b>20</b>

# EXECUTIVE SUMMARY



Non-Communicable Diseases (NCDs) such as heart disease, cancer, and diabetes are large contributors to illness, disability, and death. Research has found that there are many risk factors, such as cigarette smoking and unhealthy diet, which greatly increase the likelihood of developing these diseases. Within the last century, the Commonwealth of the Northern Mariana Islands (CNMI), a chain of islands located in the northwestern region of the Pacific Ocean, has experienced drastic change in lifestyles due to the introduction of Western culture. This change has led to the occurrence of many of these NCD risk factors and as a result an increase in NCDs.

CNMI undertook its first population-based, NCD household survey from January – April 2016. A total of 1,091 individuals, aged 18 years or older, participated in the survey. Respondents answered questions about their alcohol and tobacco use, dietary habits, physical activity, health access, oral health, health conditions, and cancer screening. Additionally, height and weight, random/non-fasting blood glucose, total cholesterol, and blood pressure were measured.

The aim of the Hybrid NCD and Risk Factor Survey was to assess the current prevalence of NCDs and NCD risk factors in the CNMI. Knowing the occurrence of NCD risk factors enables CNMI to monitor trends and can lead to a better understanding of specific reasons for the NCD prevalence in the CNMI, and to the development of targeted interventions to combat these diseases.

## KEY FINDINGS

### Risk Factors

- One out of four (25.2%) adults in the CNMI currently smoke cigarettes.
- One out of five (19.1%) adults in the CNMI currently chew betel nut, and the majority (87.6%) add tobacco to their chew.
- Almost a quarter (23.0%) of adults in the CNMI currently binge drink (drink five or more standard drinks for men and four or more standard drinks for women in one sitting).
- Three out of four (75.4%) adults in the CNMI eat less than the recommended 5 servings of fruits and vegetables per day.
- More than two thirds (70.5%) of adults in the CNMI eat at least one serving of processed meat per day.
- Three out of four (74.2%) adults in the CNMI drink one or more sugar sweetened beverage(s) per day.
- One out of three (33.0%) CNMI adults report not having participated in any physical activity or exercise in the past month.
- Almost two-thirds (64.0%) of adults in the CNMI are overweight or obese.

### General Health & Access to Health

- Almost half (42.3%) of adults in the CNMI perceive their health as fair or poor.
- Only one-third (35.7%) of adults in the CNMI reported having an annual medical checkup in the past year.
- Fewer than half (43.2%) of CNMI women aged 21 to 65 years old reported having a Pap test done within the past two years.
- About one-third (31.4%) of CNMI women aged 50 to 74 years old reported having a mammogram in the past two years.
- The majority (83.1%) of CNMI adults aged 50 to 75 years old have never received a colonoscopy.
- Almost half of CNMI adults (46.1%) do not have health care insurance.

### Non-Communicable Diseases

- Over half (56.0%) of CNMI adults are estimated to have hypertension.
- One out of five (17.3%) CNMI adults are estimated to have high cholesterol.
- It is estimated that 12.5-18.7% of adults in the CNMI have diabetes.



# DASHBOARD SUMMARY



Selected NCD Indicators	CNMI	U.S.	Comparison	U.S. Source
<b><u>Tobacco Use</u></b>				
Current cigarette smoking (past 30 days)	25.2%	18.1%	↑	BRFSS 2014
Current smokeless tobacco use (past 30 days)*	16.7%	4.1%	↑	BRFSS 2014
<b><u>Alcohol Use</u></b>				
Current alcohol use (past 30 days)	45.9%	53.3%	↓	BRFSS 2014
Current binge drinking (past 30 days)	23.0%	16.0%	↑	BRFSS 2014
<b><u>Nutrition</u></b>				
<5 servings of fruits and vegetables per day	75.4%	76.6%	○	BRFSS 2009
<b><u>Health and Healthcare</u></b>				
Self-reported fair or poor health	42.3%	16.9%	↑	BRFSS 2014
Medical check up in the past year	35.7%	69.6%	↓	BRFSS 2014
Has healthcare coverage	53.9%	87.6%	↓	BRFSS 2014
Avoided medical care due to cost	15.7%	13.1%	○	BRFSS 2014
<b><u>Oral Health</u></b>				
Dental visit within the past year	27.0%	65.3%	↓	BRFSS 2014
Any permanent teeth extracted due to tooth decay or gum disease	65.4%	43.6%	↑	BRFSS 2014
<b><u>Chronic Conditions</u></b>				
Overweight/obesity**	63.9%	65.0%	○	BRFSS 2014
Diabetes (self report + undiagnosed)***	18.7%	12.6%	↑	NHANES 2011-14
Hypertension (self report + undiagnosed)***	56.0%	33.5%	↑	NHANES 2013-14
High cholesterol (self report + undiagnosed)***	17.3%	12.1%	↑	NHANES 2011-14
<b><u>Cancer Screening</u></b>				
Up-to-date Pap (women 21-65)****	43.2%	82.5%	↓	BRFSS 2014
Mammogram in the past 2 years (women 50-74)	31.4%	78.1%	↓	BRFSS 2014

\*Smokeless tobacco use in the CNMI only includes those who chew betel nut with any kind of tobacco

\*\*Overweight/obesity was assessed in the U.S. using self-reported height and weight. In the CNMI, height and weight was physically measured.

\*\*\*Diabetes, hypertension, and high cholesterol U.S. prevalence rates are based on adults 20+ years (CNMI is 18+ years). Diabetes prevalence is based on testing of fasting blood sugar in the US mainland whereas diabetes prevalence among CNMI adults was measured using non-fasting/random blood sugar (RBS).

\*\*\*\*Up-to-date pap smear in the U.S. was a pap smear in the past 3 years; in the CNMI it was a pap smear in the past 2 years.

## Legend:

- ↑ Statistically higher than the US / worse indicator
- ↑ Statistically higher than the US / better indicator
- ↓ Statistically lower than the US / worse indicator
- ↓ Statistically lower than the US / better indicator
- Statistically comparable to the US / similar indicator



Non-Communicable Diseases (NCDs) are the leading causes of morbidity and mortality in the United States Affiliated Pacific Islands (USAPIs) (American Samoa, Guam, Commonwealth of the Northern Mariana Islands [CNMI], Federated States of Micronesia [FSM], Republic of Palau, and Republic of Marshall Islands [RMI]) [1]. In 2010, the Pacific Island Health Officers Association (PIHOA) declared a regional health emergency due to the epidemic of NCDs in the USAPIs [2]. The NCDs of concern in the USAPIs include diabetes, heart disease, stroke, cancer, and chronic obstructive pulmonary disease [2,3]. The social determinants of health demonstrate that there is a complex system of factors that are linked to NCDs which include demographic, social, technological, cultural, environmental, biological, economic, and political factors [4]. However, the five leading risk factors attributable to NCDs globally include unhealthy diets (insufficient consumption of fruit and vegetables, excessive consumption of salt, high fat, and high sugar foods), insufficient physical activity, excessive consumption of alcohol, obesity, and tobacco use [3]. In the Pacific Islands, betel nut (which is carcinogenic to humans) chewing with or without tobacco is also identified as a significant health problem [5].

Until 2016, there had been no well-established NCD surveillance in the CNMI [6]. Due to the need for NCD surveillance, the NCD Bureau, Division of Public Health (DPH), Commonwealth Healthcare Corporation (CHCC) partnered with the Community Guidance Center (CGC) and the Northern Marianas College (NMC) to develop a hybrid survey to simultaneously assess the Substance Abuse Mental Health Services Administration's (SAMHSA) National Outcome Measures (NOMs), as well as the Centers for Disease Control and Prevention (CDC), and the World Health Organization's (WHO) NCD risk factor indicators. This hybrid survey is a combination of the CNMI Behavioral Health Survey (CBHS), which was developed by CGC, CHCC and contracted to the Central Statistics Division (CSD), Department of Commerce since 2011, and the NCD hybrid survey, developed in 2016.

## BACKGROUND

The Commonwealth of the Northern Mariana Islands (CNMI) is a chain of fourteen islands, located in the northwestern region of the Pacific Ocean. A commonwealth of the United States of America since 1978, the CNMI follows U.S. governance and systems, in addition to its own established constitution, legislative body, and laws [7].

Of the 14 islands, the majority of the inhabitants reside on three of the islands: Saipan, Tinian, and Rota. According to the 2010 census, the CNMI has a population of about 53,883 [8]. Saipan, the CNMI's capital, is the most populous island inhabiting about 48,000 people, while Tinian and Rota inhabit about 3,000 people each [9]. The CNMI is home to a diverse group of races and ethnicities. Close to half of the population in the CNMI is Asian, with Filipinos making up the majority of this group. Additionally, about a third of the population is Pacific Islanders, of which the majority of this group is of native Chamorro descent [9].



## AIM

The CNMI Hybrid NCD survey aimed to assess the prevalence of selected NCDs and their associated risk and protective factors. NCD risk/protective factors included nutrition, physical activity levels, betel nut chewing with and without tobacco, cigarette smoking, alcohol use, and cancer screening rates. NCDs were estimated by self-report as well as physical measurements.

## OBJECTIVES

1. Inform the local community of CNMI and support partners on NCD and risk factors' prevalence
2. Use these data to prioritize and tailor NCD prevention programs developed and supported by the Division of Public Health Services
3. Support further research on NCD risk factors in the CNMI
4. Use these data as a baseline to monitor progress and trends in reducing the mortality and morbidity associated with NCDs in the CNMI

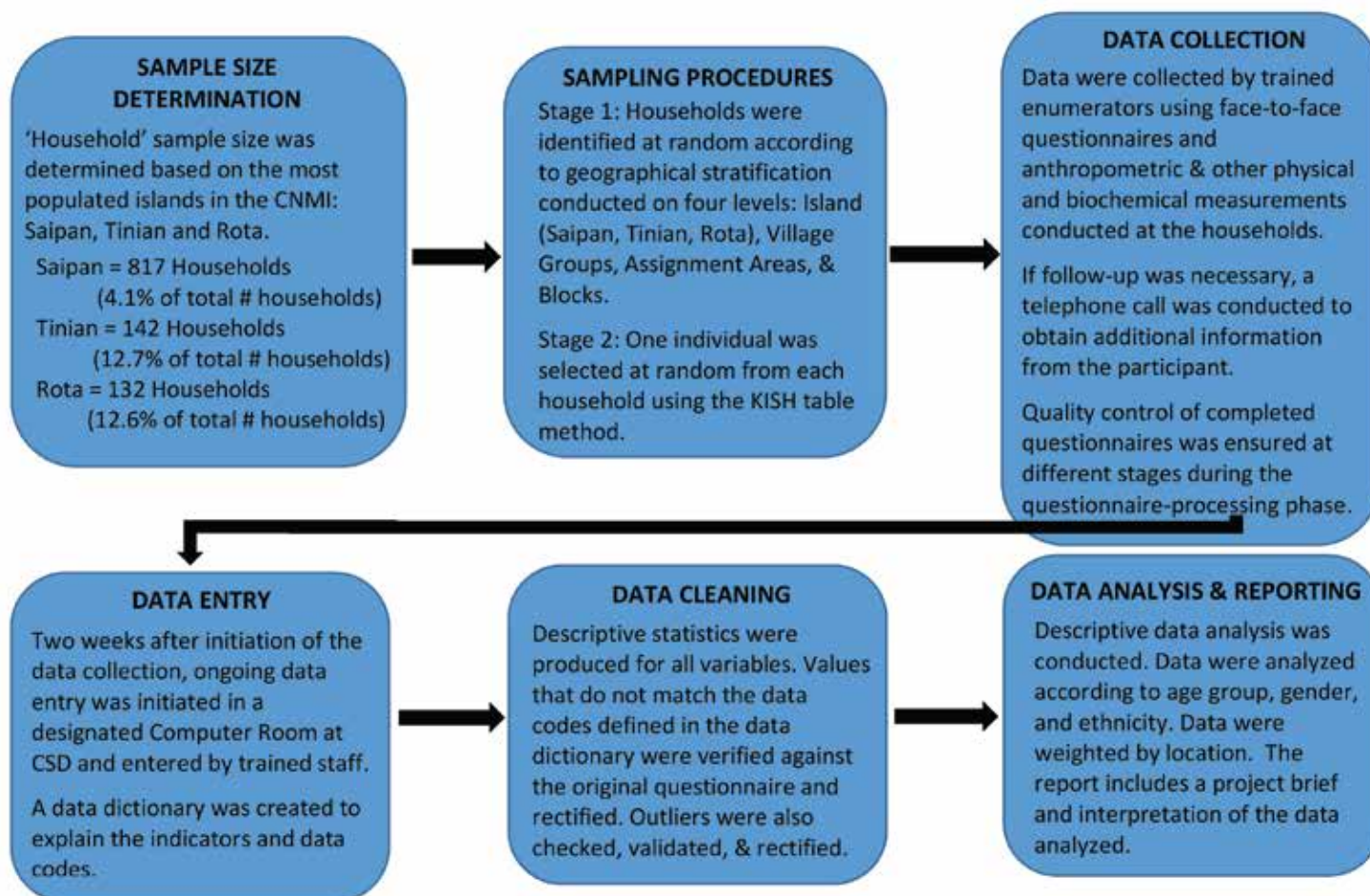
## TARGET GROUP

Participants eligible for the CNMI Hybrid NCD survey included all CNMI residents aged 18 years and over.

## DATA COLLECTION

Data collection began on January 20, 2016 and ended on April 29, 2016. A total 1,091 respondents completed the survey and measurements.

## SURVEY METHODOLOGY



# SAMPLE SUMMARY



The sample randomly selected to participate in the Hybrid NCD and Risk Factor survey appears to be representative of the total CNMI population overall when weighted. The demographic distributions of the 2010 census are relatively similar to that of distributions of the survey sample demographics, although the sample may contain a higher number of older individuals and fewer younger individuals than the overall population. However, it is important to keep in mind that the most recently available census data are from 2010, so the age structure may have shifted.

## WEIGHTED SAMPLE

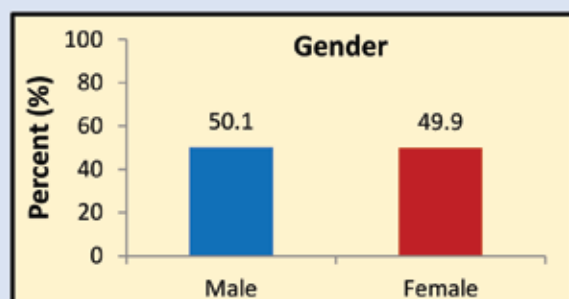


Figure 1. Gender distribution among CNMI adults sampled for survey, 2016

## CENSUS

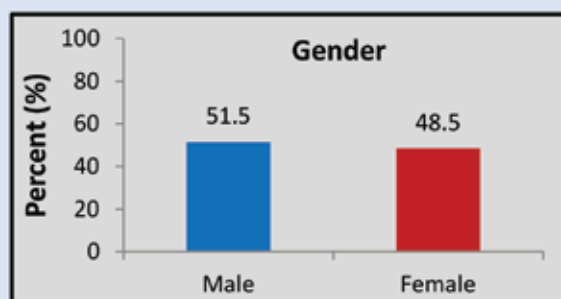


Figure 2. Gender distribution among adults in the CNMI, 2010 census

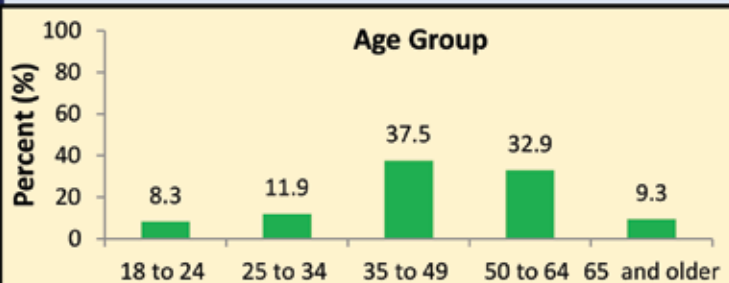


Figure 3. Age distribution among CNMI adults sampled for survey, 2016

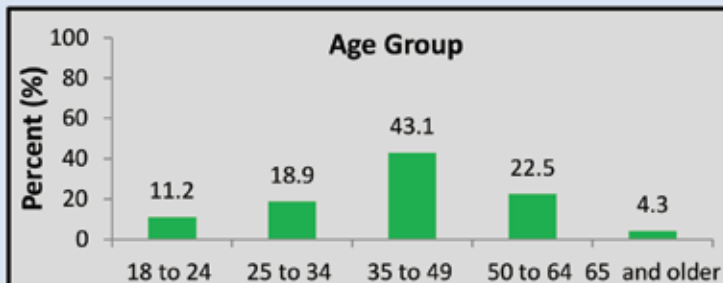


Figure 4. Age distribution among adults in the CNMI, 2010 census

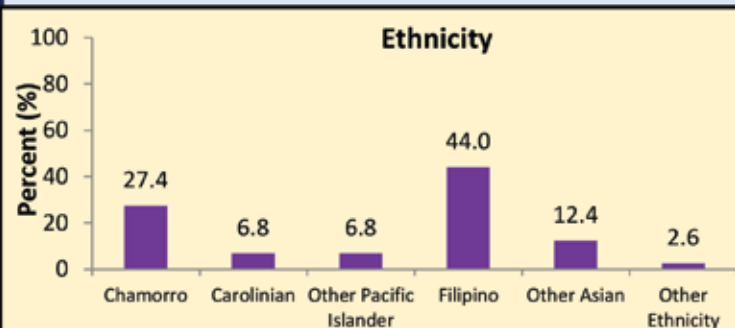


Figure 5. Ethnicity\* distribution among CNMI adults sampled for survey, 2016

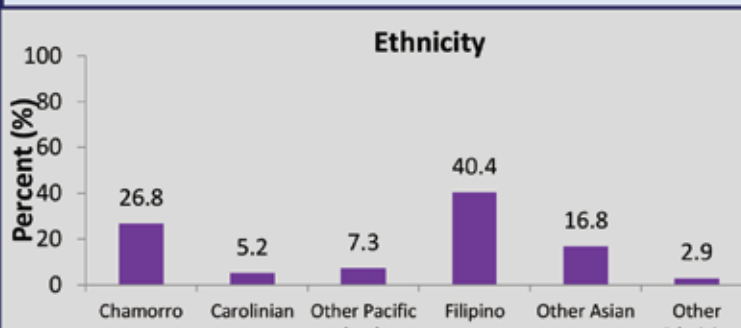


Figure 6. Ethnicity\* distribution among adults in the CNMI, 2010 census

\*Other Pacific Islander includes Chuukese, Pohnpeian, Kosraean, Yapese, Palauan, Marshallese, and Other Pacific Islander; Other Asian includes Bangladesh, Chinese, Japanese, Korean, Nepalese, Thai, and Other Asian; Other Ethnicity includes Caucasian, African American, Hispanic, or Other.





## Cigarette Use

One out of four adults in the CNMI reported to currently smoke cigarettes. More men than women smoke cigarettes. Additionally, adults 25-34 years old have the highest prevalence of smoking. Lastly, Chamorros, Carolinians, and other Pacific Islanders have the highest prevalence of smoking. Although CNMI adults report smoking cigarettes, the majority do report wanting to quit.

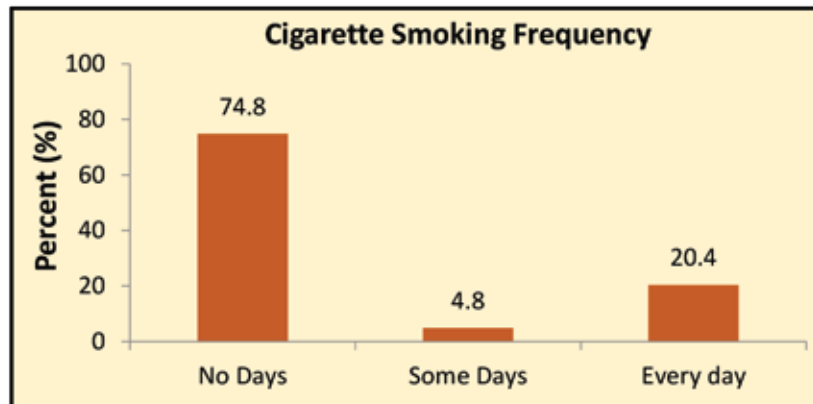


Figure 7. Frequency of cigarette smoking in the past 30 days among adults in the CNMI, 2016

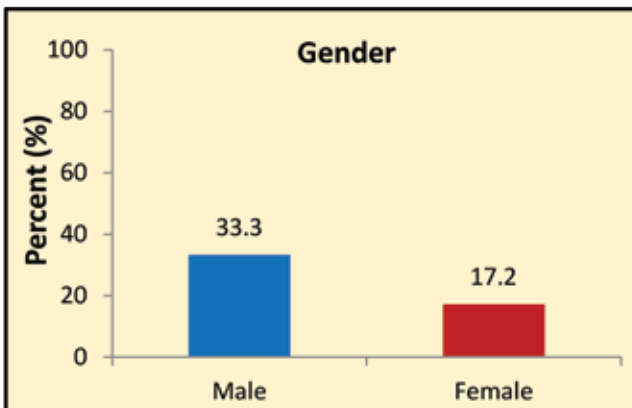


Figure 8. Current cigarette smoking among adults in the CNMI by gender, 2016

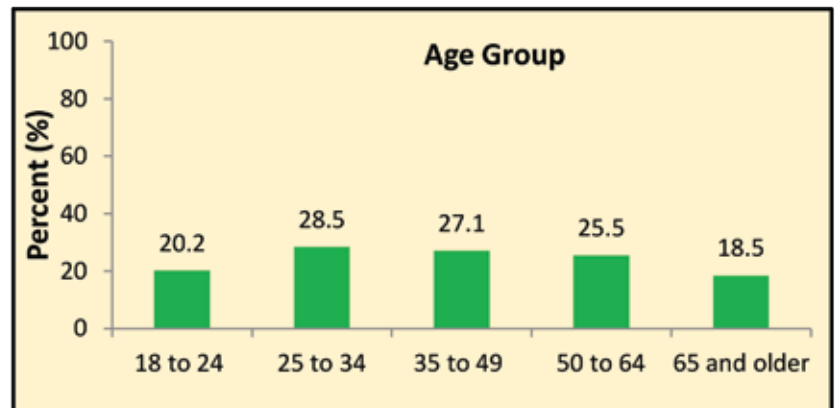


Figure 9. Current cigarette smoking among adults in the CNMI by age, 2016

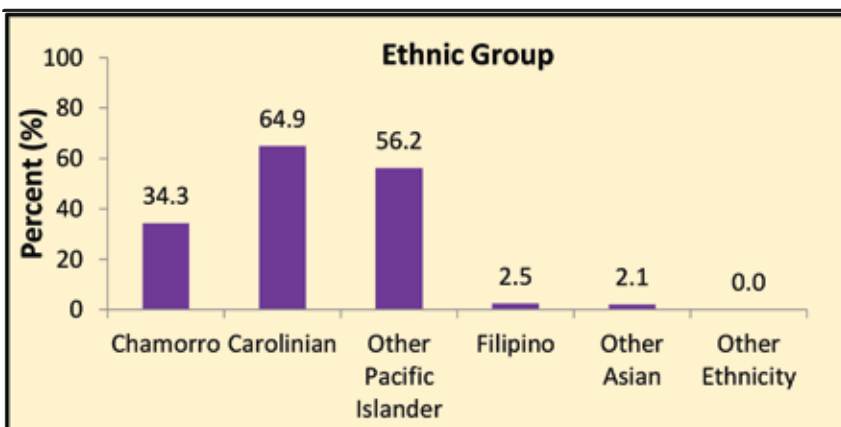


Figure 10. Current cigarette smoking among adults in the CNMI by ethnicity, 2016

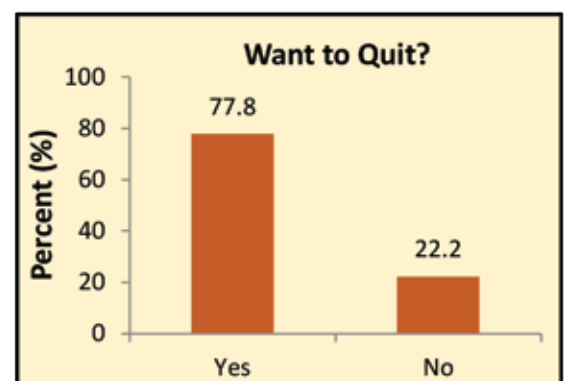


Figure 11. Current CNMI adult cigarette smokers who want to quit smoking cigarettes, 2016

# BETEL NUT USE



About one out of five adults in the CNMI self-reported chewing betel nut in the past 30 days. About the same percentage of men and women in the CNMI reported chewing betel nut. Additionally, the majority of chewers are between the ages 18 to 34 years old and are Pacific Islanders. Most of the current betel nut chewers add tobacco to their chew (mostly cigarettes). Among the betel nut chewers, two out of three do report wanting to quit.

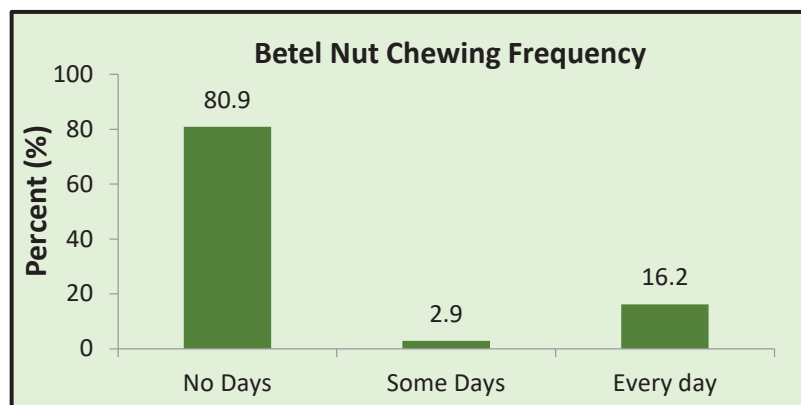


Figure 12. Frequency of betel nut chewing in the past 30 days among CNMI adults, 2016

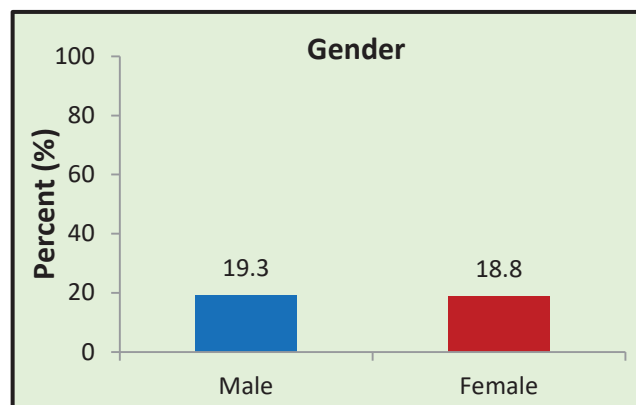


Figure 13. Current betel nut use among adults in the CNMI by gender, 2016

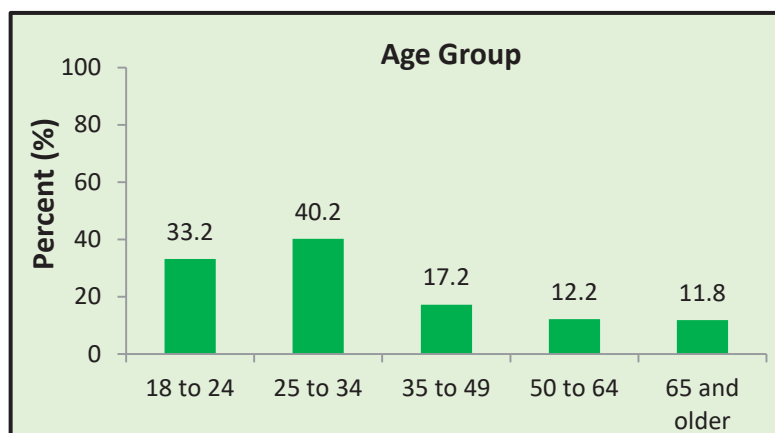


Figure 14. Current betel nut use among adults in the CNMI by age, 2016

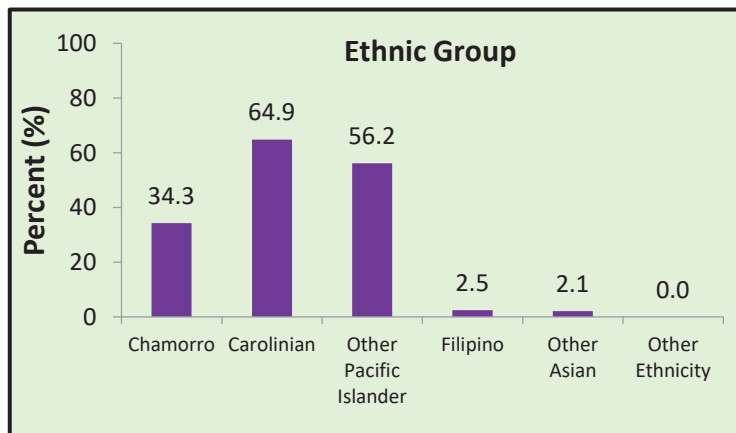


Figure 15. Current betel nut use among adults in the CNMI by ethnicity, 2016

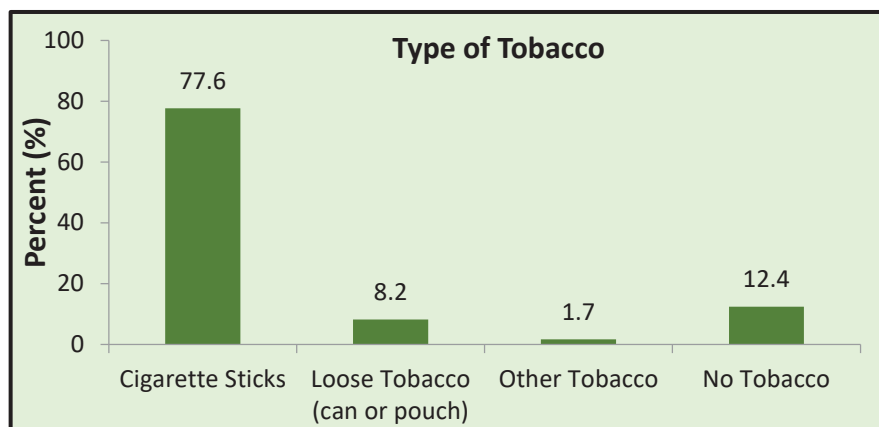


Figure 16. Distribution of tobacco type used in betel nut chew among adults in the CNMI, 2016

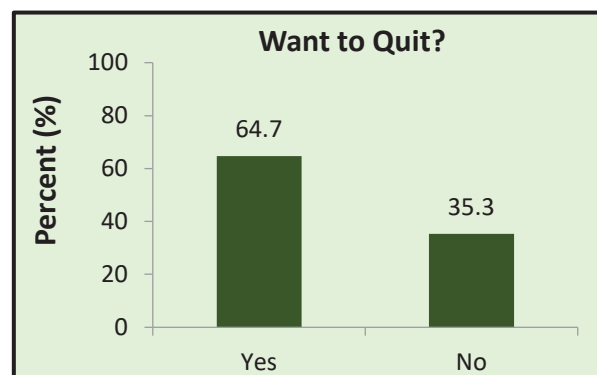


Figure 17. Current CNMI adult betel nut chewers who want to quit chewing betel nut, 2016

# ALCOHOL USE



Almost half of CNMI adults report drinking alcohol in the past 30 days, with 3.1% having drunk alcohol every day. In addition, about one out of four adults in the CNMI reported binge drinking in the past 30 days (binge drinking is defined as five or more drinks for men and four or more drinks for women in one sitting). More men than women binge drink. Additionally, those ages 25 to 34 years old report the most binge drinking within their age group. Lastly, Chamorros, Carolinians, and other Pacific Islanders have a higher prevalence of binge drinkers compared to other ethnic groups.

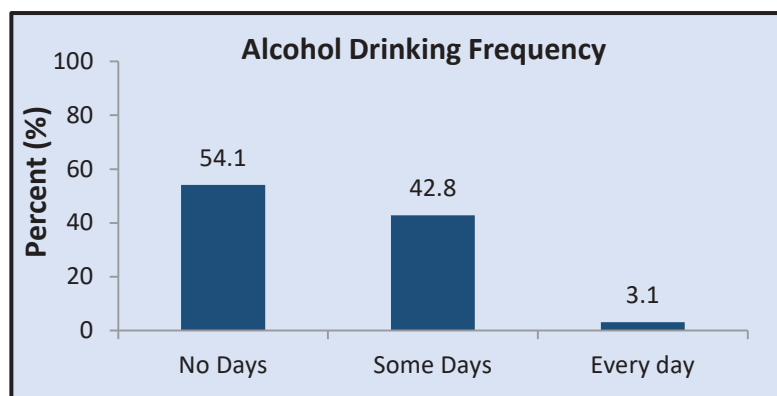


Figure 18. Frequency of alcohol consumption in the past 30 days among CNMI adults, 2016

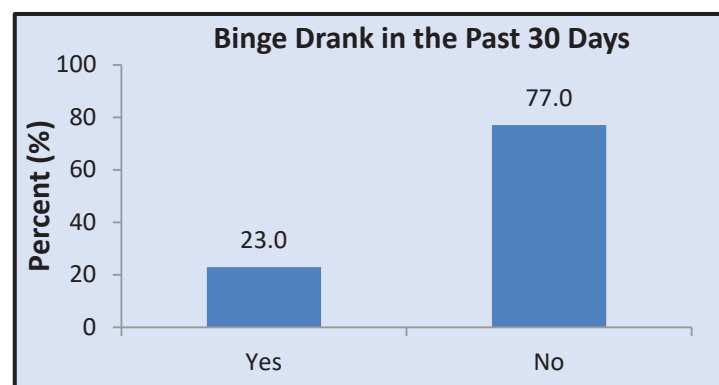


Figure 19. Adults in the CNMI who binge drank alcohol in the past 30 days, 2016

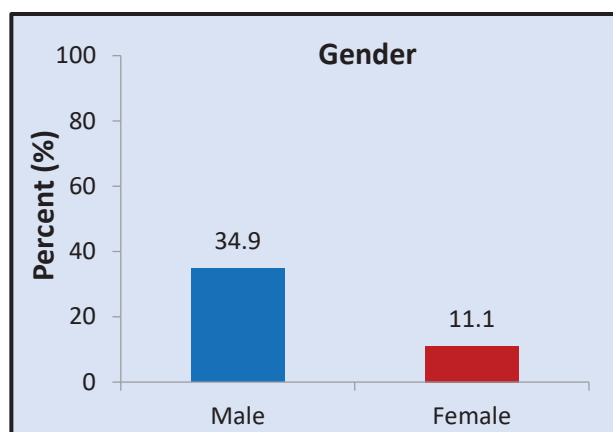


Figure 20. CNMI adults who binge drink alcohol by gender, 2016

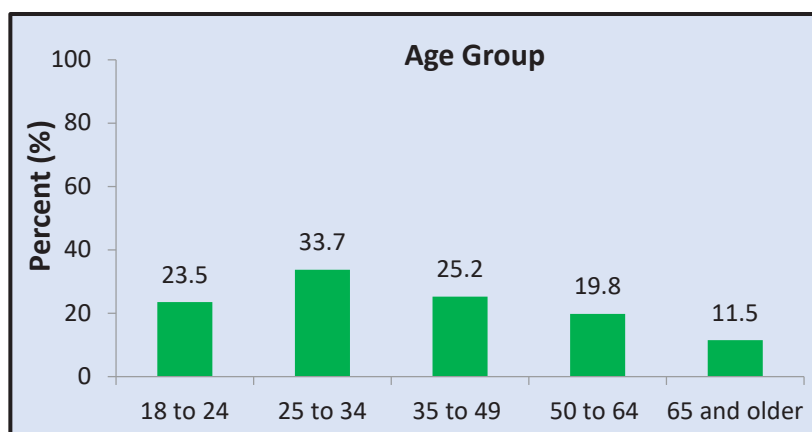


Figure 21. CNMI adults who binge drink alcohol by age, 2016

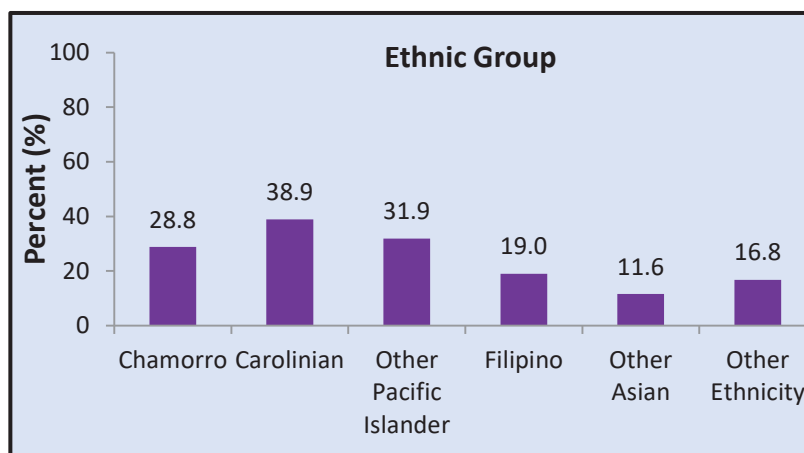


Figure 22. CNMI adults who binge drink alcohol by ethnicity, 2016



## Fruit & Vegetable Consumption

The Centers for Disease Control and Prevention (CDC) recommends 5 to 9 servings of fruit and vegetables per day [10]. Currently, about one out of four adults in the CNMI reported to consume this recommended amount of fruits and vegetables per day. The majority surveyed had reported to have at least two servings of fruit and vegetables in a day.

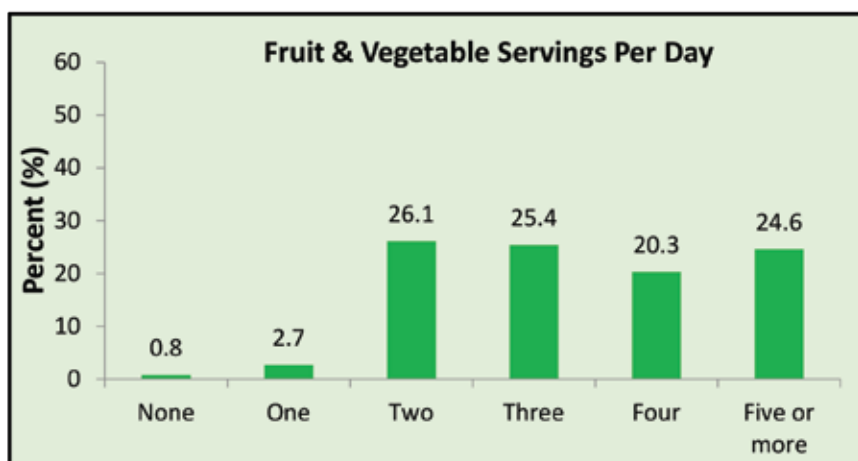


Figure 23. Fruit and vegetable servings per day among CNMI adults, 2016

## Processed Meat Consumption

Processed meats (such as bacon, hot dogs, canned corned beef, and Spam) are high in sodium and have been found to increase the risk for various diseases including hypertension, heart attacks, stroke, and cancer [11, 12]. As a result, processed meat should be eaten very minimally, if at all. In the CNMI, over two-thirds of adults reported consuming at least one serving per day.

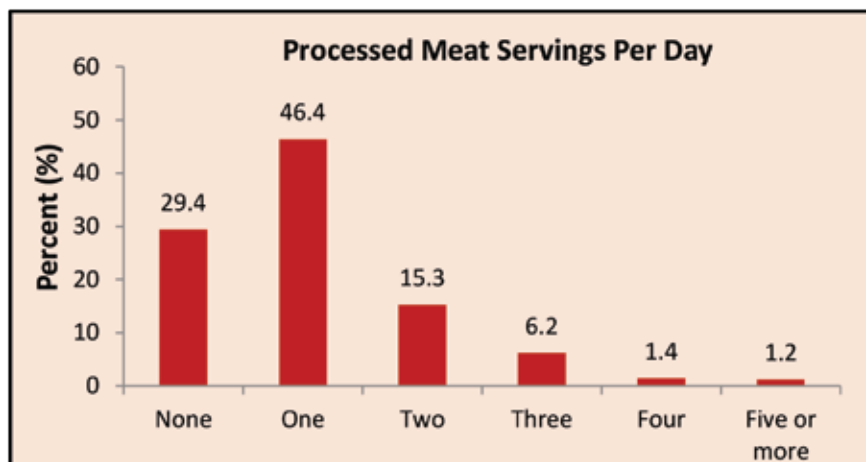


Figure 24. Processed meat servings per day among CNMI adults, 2016

## Sugar Sweetened Beverage Consumption

Sugar sweetened beverages (such as soft drinks, Hi-C, Kool-Aid, and Tang) are significant sources of added sugars and calories in a diet. Consuming sugary drinks can lead to unhealthy weight gain and increase the risk for diabetes [13]. Currently, three out of four adults in the CNMI reported to consume at least one sugar sweetened beverage per day.

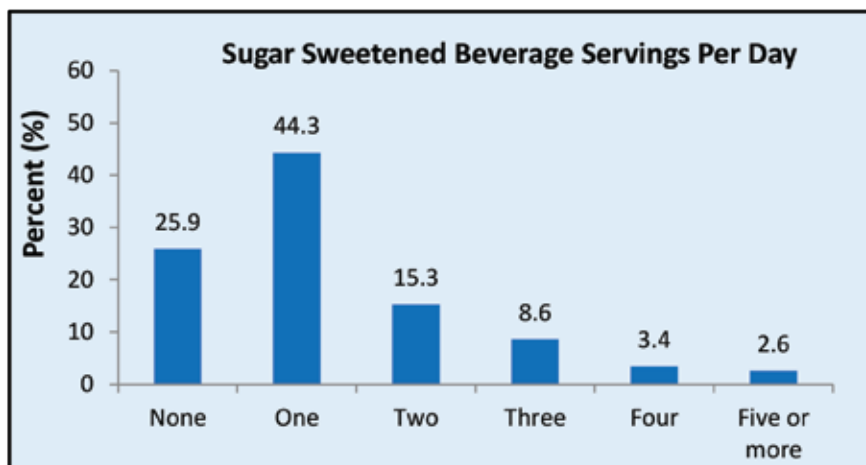


Figure 25. Sugar sweetened beverage servings per day among CNMI adults, 2016



# PHYSICAL ACTIVITY



Currently, about two thirds of adults in the CNMI self-reported having participated in any physical activity or exercise during the past month, other than their regular job. More men appear to participate in physical activity or exercise than women. Additionally, physical activity appears to be similar across age groups. Lastly, more than half of adults within each ethnic group reported having exercised in the past month, with non-specified ethnic groups (“other ethnicity”) having reported the most exercise.

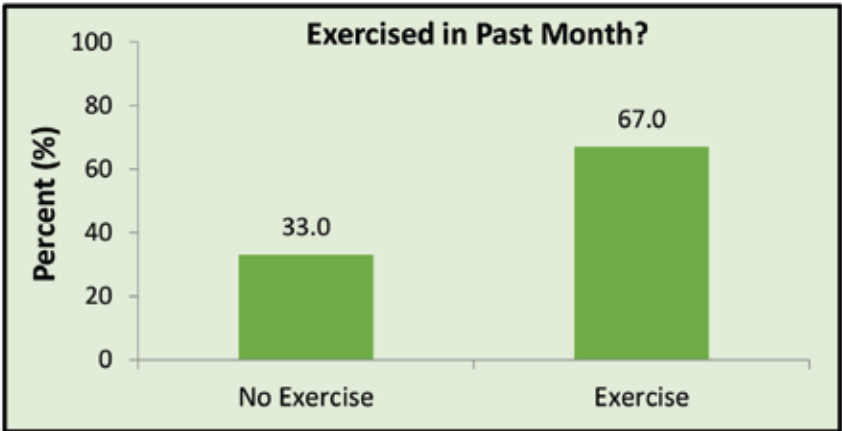


Figure 26. Participation in any physical activity or exercise during the past month among adults in the CNMI, 2016

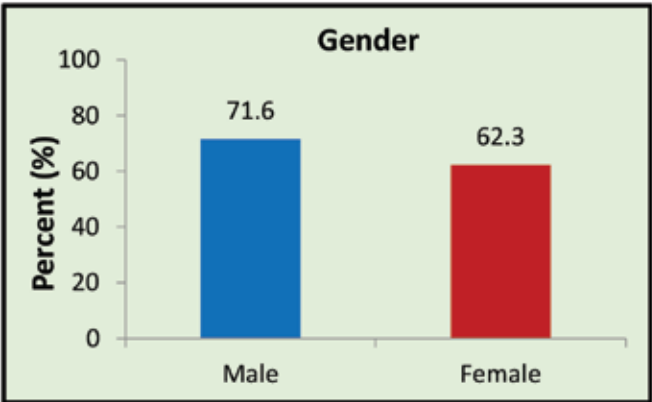


Figure 27. Participation in any physical activity or exercise in the past month among CNMI adults by gender, 2016

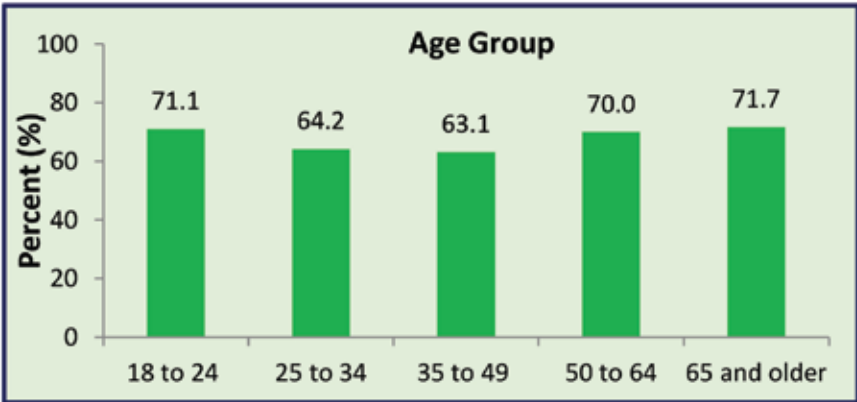


Figure 28. Participation in any physical activity or exercise in the past month among CNMI adults by age, 2016

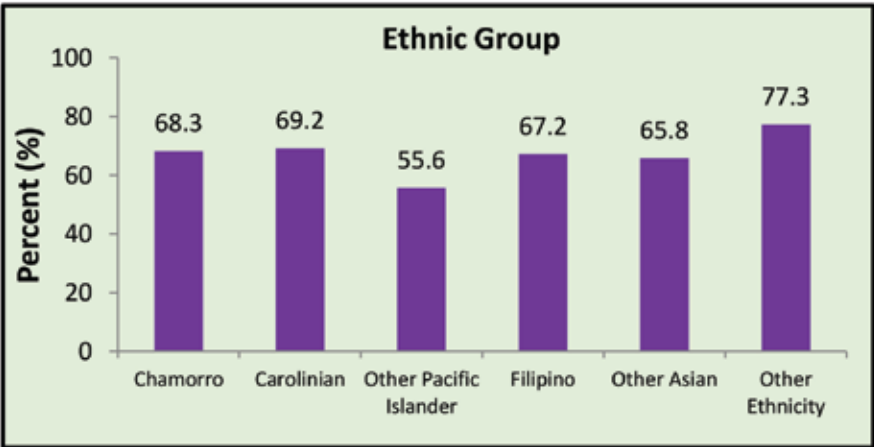


Figure 29. Participation in any physical activity or exercise in the past month among CNMI adults by ethnicity, 2016

# OVERWEIGHT/OBESITY



Despite more than half of CNMI adults reporting to have exercised at least once during the past month, a high proportion of CNMI adults measured body mass index (BMI) are overweight or obese ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ). Determination of the body mass index was through measurements of height in meters and weight in kilograms. Currently, about two out of three adults in the CNMI are overweight or obese, with almost a third of adults in the CNMI being obese ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ). There is a similar prevalence of overweight or obese men and women in the CNMI. Additionally, more than half of adults within each age group are overweight or obese, although the highest rates were among young adults (25 to 34). Lastly, the prevalence of overweight and obese adults is highest among Chamorros, Carolinians, and other Pacific Islanders.

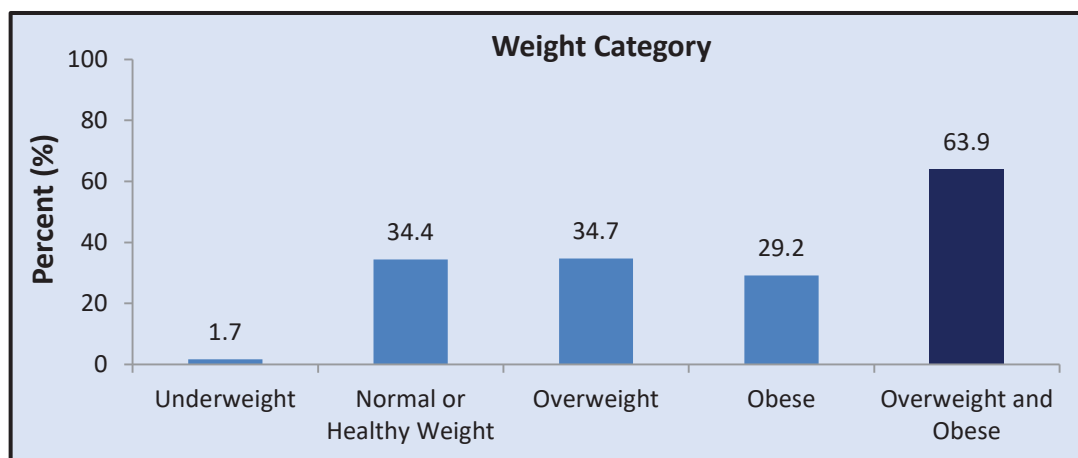


Figure 30. Distribution of weight among adults in the CNMI, 2016

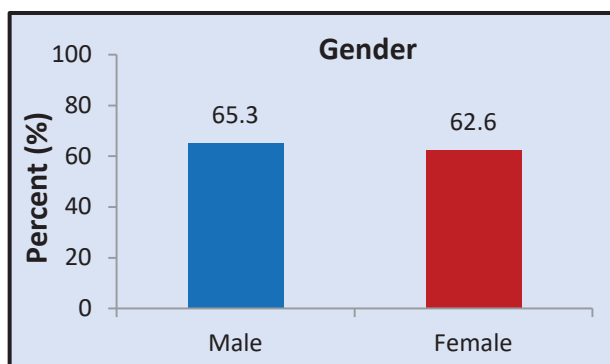


Figure 31. Overweight and obese adults in the CNMI by gender, 2016

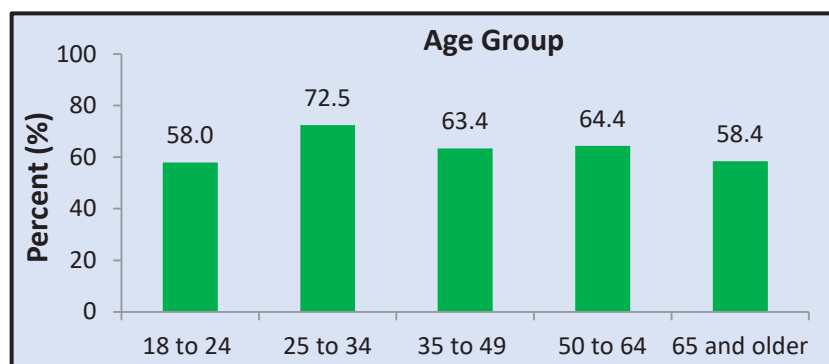


Figure 32. Overweight and obese adults in the CNMI by age, 2016

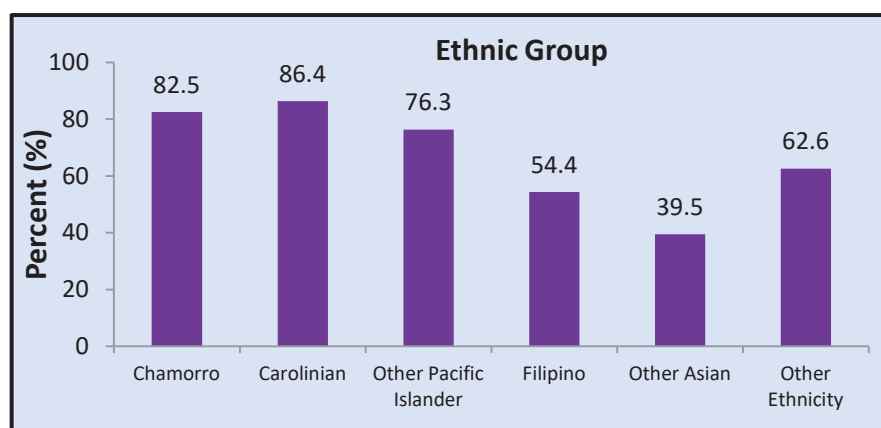


Figure 33. Overweight and obese adults in the CNMI by ethnicity, 2016



## GENERAL HEALTH

42.3% of adults in the CNMI reported their general health to be fair or poor.

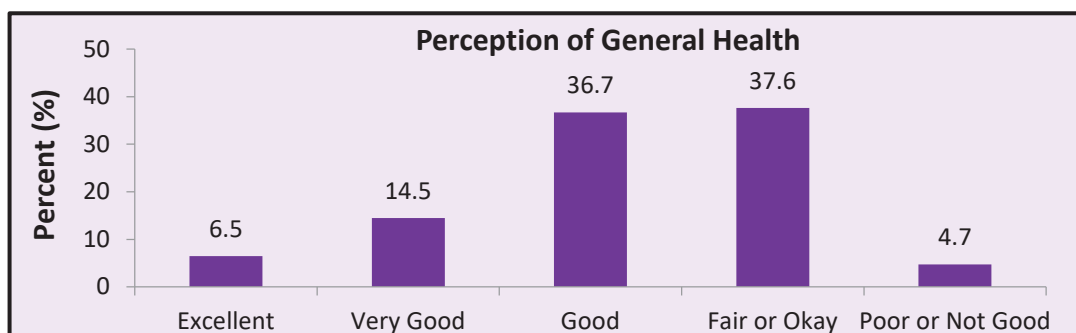


Figure 34. Perceived health among adults in the CNMI, 2016

## ACCESS TO HEALTH

About one out of five adults in the CNMI reported never having an annual checkup with a medical provider, and only 35.7% had a check up in the past year. Additionally, almost half of adults report not having any kind of health care coverage (including health insurance, Medicaid, or Medicare). Despite this, only 15.7% of adults in the CNMI reported avoiding medical care because of costs.

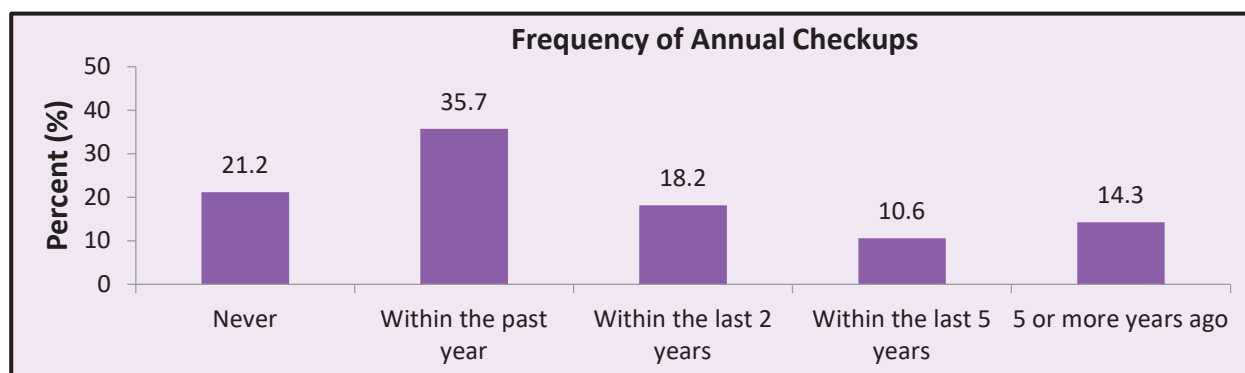


Figure 35. Frequency of annual checkups with a medical provider among adults in the CNMI, 2016

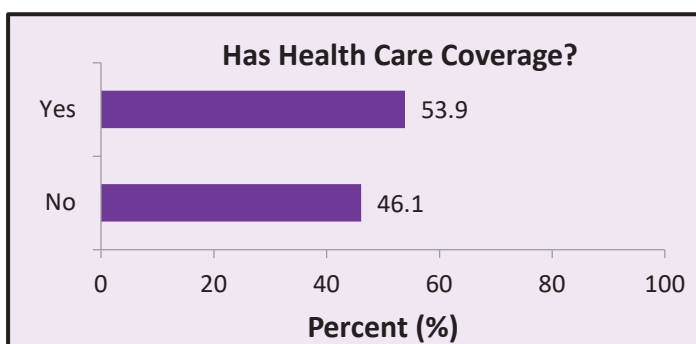


Figure 36. CNMI adults with health care coverage, 2016

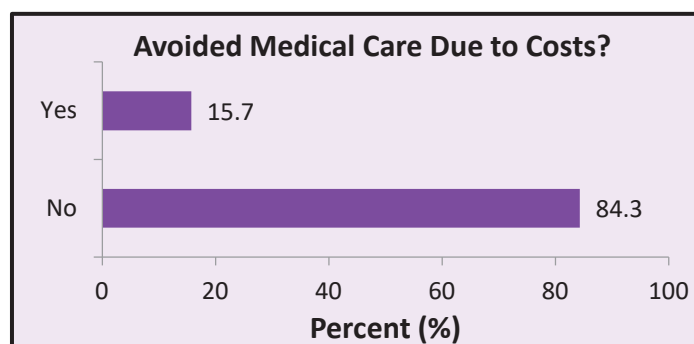
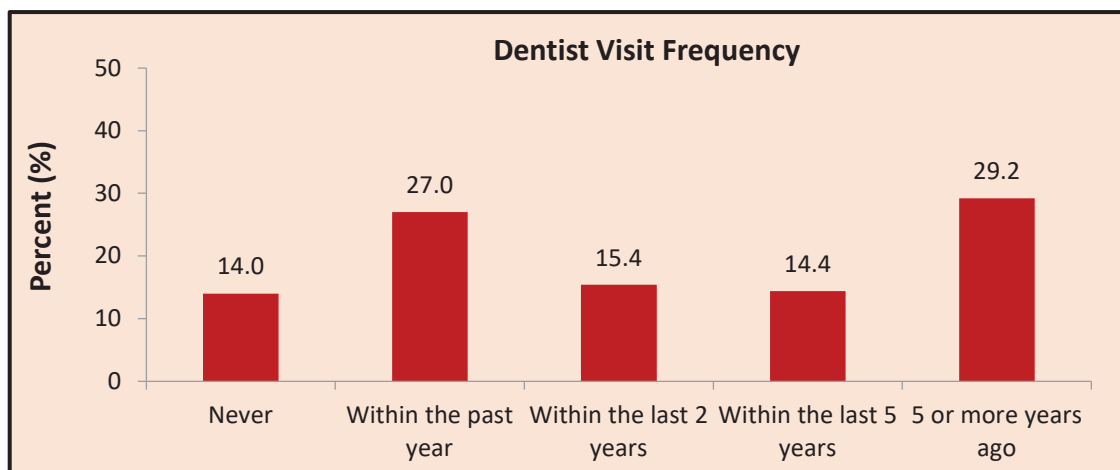


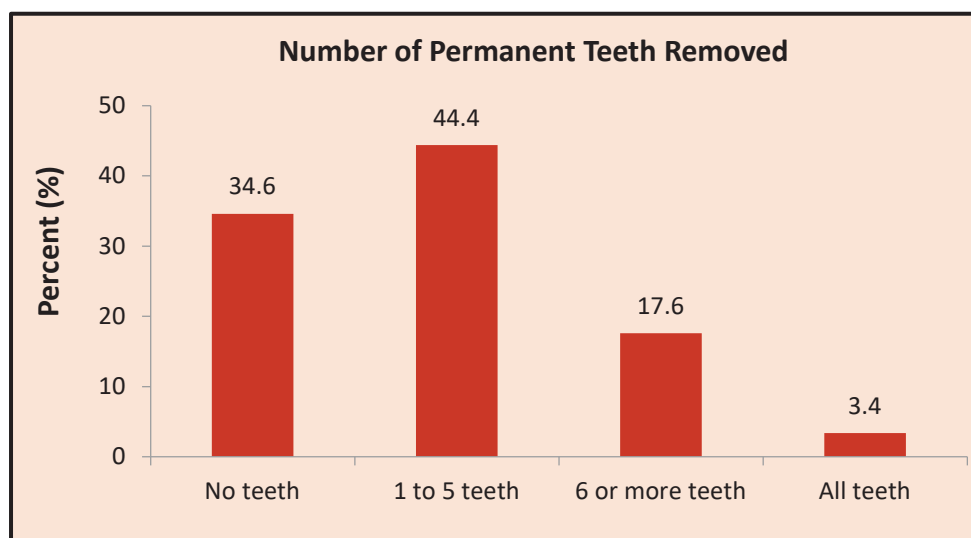
Figure 37. CNMI adults that needed medical care, but did not get care due to costs, 2016



The majority of adults in the CNMI has visited a dentist or dental clinic. However, only about one-third of adults reported having a dental visit within the past year. Additionally, about two thirds of adults reported having at least one permanent tooth removed because of tooth decay or gum disease.



**Figure 38. Frequency of visits to the dentist or a dental clinic among adults in the CNMI, 2016**



**Figure 39. Adults in the CNMI who had permanent teeth removed because of tooth decay or gum disease, 2016**



# SELF-REPORTED HEALTH CONDITIONS



These prevalences are based solely on self-report of these conditions. Actual burden of these conditions is likely higher because of lack of self-report due to various reasons including undiagnosed disease, misunderstanding of diagnosis, or lack of health care utilization.

**Table 1. Self-reported diseases among adults in the CNMI, 2016**

Cardiovascular Disease			
Coronary Heart Disease, Angina, or Heart Attack	3.3%	Male	3.6%
		Female	2.9%
Other Heart Condition or Heart Disease	3.6%	Male	2.6%
		Female	4.5%
Stroke	1.2%	Male	1.3%
		Female	1.1%
Pulmonary Disease			
Emphysema or Chronic Obstructive Pulmonary Disease (COPD)	0.9%	Male	0.7%
		Female	1.0%
Asthma	5.8%	Male	4.6%
		Female	6.9%
Other Chronic Diseases			
Ulcer (stomach, duodenal, or peptic)	2.7%	Male	2.5%
		Female	2.9%
Gout	4.9%	Male	7.3%
		Female	2.4%
Osteoarthritis (not gout)	5.6%	Male	4.3%
		Female	7.0%
Cancer or malignancy of any kind	1.5%	Male	0.7%
		Female	2.2%



## SELF-REPORTED PREVALENCE

Self-reported diabetes was determined by asking participants if they had ever been told by a medical provider that they had diabetes, or at risk for diabetes (pre-diabetes). About one out of ten adults in the CNMI reported having diabetes. About a fourth of adults said they had never had their blood sugar checked by a medical provider.

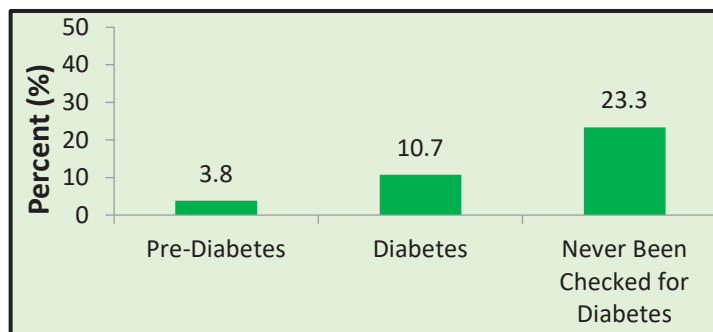


Figure 40. Self-reported pre-diabetic and diabetic adults in the CNMI, 2016

## RANDOM BLOOD SUGAR MEASUREMENT

Biochemical measure of random blood sugar was determined by a small blood sample from a finger stick and rapid test on a CardioChek device taken by a trained enumerator. Although a non-fasting blood sugar level cannot by itself allow for a diagnosis of diabetes, an elevated non-fasting blood sugar level can suggest diabetes. 13.7% of adults tested had a non-fasting blood sugar  $\geq 140$ mg/dl, and 4.7% had a non-fasting blood sugar  $\geq 200$ mg/dl.

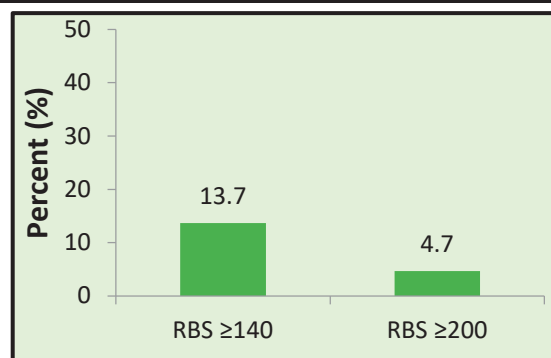


Figure 41. Fasting blood sugar among adults in the CNMI, 2016

## COMBINED SELF-REPORT + RANDOM BLOOD SUGAR DIABETES ESTIMATE

A diabetes prevalence combining the self-reported and biochemical measure results was determined using the two different non-fasting blood sugar cutoffs. Based on these estimates, diabetes prevalence ranged from 12.5% to 18.7% among adults in the CNMI. The prevalence of diabetes increases substantially with age. Additionally, Chamorro, Carolinian, and Other Pacific Islanders have the highest prevalence of diabetes.

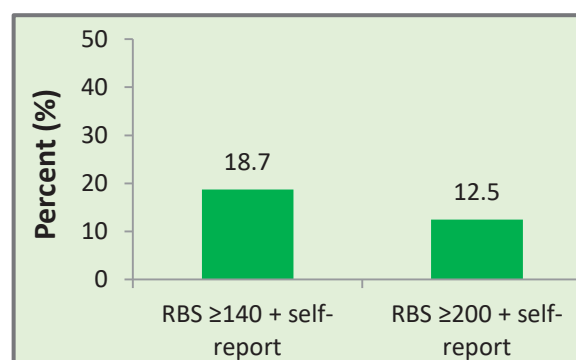


Figure 42. Estimates of diabetes in the CNMI using combined self-reported and biochemical measure method, 2016

Table 2. Estimated diabetes in the CNMI by gender, 2016

Gender	% RBS $\geq 140$ + self-report	% RBS $\geq 200$ + self-report
Male	19.7	12.7
Female	17.7	12.3

Table 3. Estimated diabetes in the CNMI by age, 2016

Age Group	% RBS $\geq 140$ + self-report	% RBS $\geq 200$ + self-report
18 to 24	9.7	4.2
25 to 34	8.6	7.3
35 to 49	13.8	8.5
50 to 64	24.6	15.4
65 and older	37.9	32.7

Table 4. Estimated diabetes in the CNMI by ethnicity, 2016

Ethnic Group	% RBS $\geq 140$ + self-report	% RBS $\geq 200$ + self-report
Chamorro	25.3	20.3
Carolinian	21.9	18.7
Other Pacific Islander	22.6	15.4
Filipino	16.4	8.6
Other Asian	10.4	5.4
Other Ethnicity	8.6	8.6

# HYPERTENSION



## SELF-REPORTED PREVALENCE

Self-reported hypertension was determined by asking participants if they had ever been told they had hypertension, or high blood pressure. About a fourth of adults in the CNMI reported having hypertension and one out of ten people said they had never had their blood pressure checked by a medical provider.

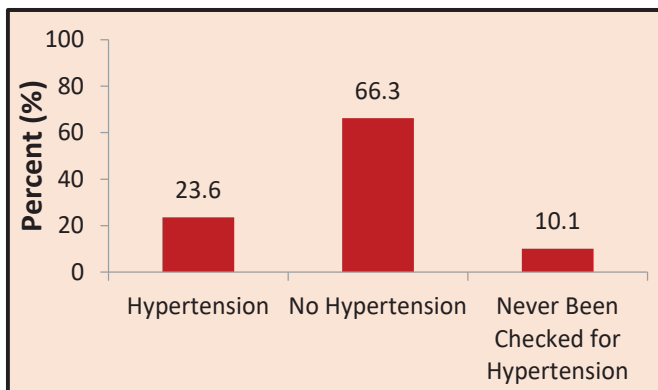


Figure 43. Self-reported adults in the CNMI with hypertension, 2016

## PHYSICAL MEASURE PREVALENCE

Physical measure of hypertension was determined by the average of two blood pressure readings taken by trained enumerators. Hypertension is indicated by a systolic measure greater than or equal to 140 mm Hg and/or a diastolic measure greater than or equal to 90 mm Hg.

About half of adult blood pressures measured were high indicating hypertension.

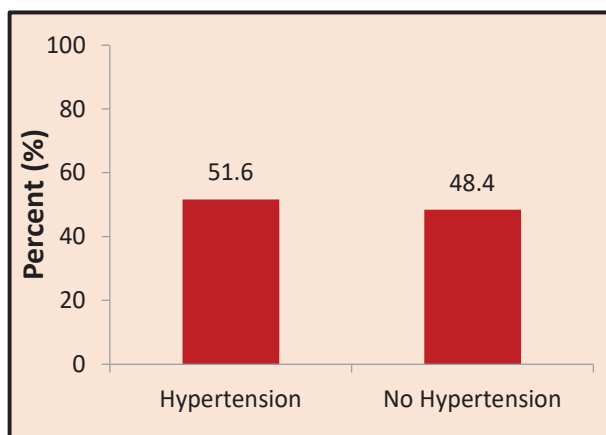


Figure 44. Adults in the CNMI with hypertension using biomechanical measure, 2016

## COMBINED SELF-REPORT + PHYSICAL MEASURE PREVALENCE

To account for under/over-reporting and measurement error or refusal, a hypertension prevalence combining self-reported and physical measure results was determined. Using this method, more than half of adults in the CNMI have hypertension. More men suffer from hypertension than women. Additionally, it is seen most in older adults aged 50 years and older. However, at least a third of young and middle aged adults are also hypertensive. Lastly, Pacific Islanders (including Chamorro, Carolinian, and other Pacific Islanders) and Filipinos have a high prevalence of hypertension.

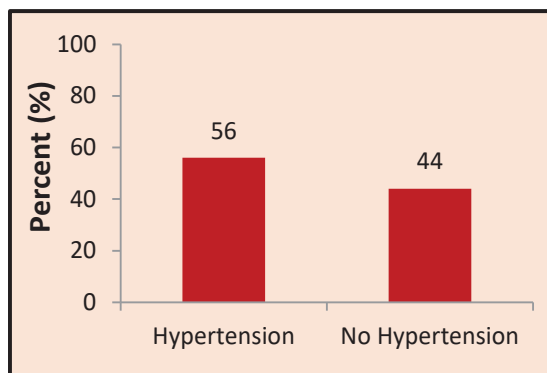


Figure 45. Adults in the CNMI with hypertension using combined self-reported and biochemical measure method, 2016

Table 5. Adults in the CNMI with hypertension by gender, 2016

Gender	Percent (%)
Male	61.3
Female	50.9

Table 6. Adults in the CNMI with hypertension by age group, 2016

Age Group	Percent (%)
18 to 24	37.5
25 to 34	40.8
35 to 49	47.5
50 to 64	70.6
65 and older	75.4

Table 7. Adults in the CNMI with hypertension by ethnicity, 2016

Ethnic Group	Percent (%)
Chamorro	58.0
Carolinian	54.1
Other Pacific Islander	57.3
Filipino	61.9
Other Asian	35.1
Other Ethnicity	39.5



## SELF-REPORTED PREVALENCE

Self-reported high cholesterol was determined by asking participants if they had ever been told they had high blood cholesterol. 13.7% of adults in the CNMI self-reported to having high cholesterol. About half of adults said they had never had their blood cholesterol checked by a medical provider.

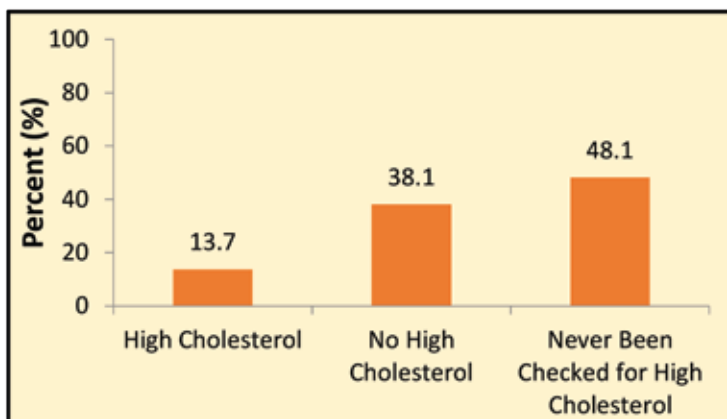


Figure 46. Self-reported adults in the CNMI with high cholesterol, 2016

## BIOCHEMICAL MEASURE RESULT

Biochemical measure of total cholesterol was determined by a small blood sample from a finger stick and rapid test on a CardioChek device taken by a trained enumerator. A blood total cholesterol level greater than or equal to 240 mg/dl indicated high total cholesterol.

4.2% of CNMI adults tested had high total cholesterol.

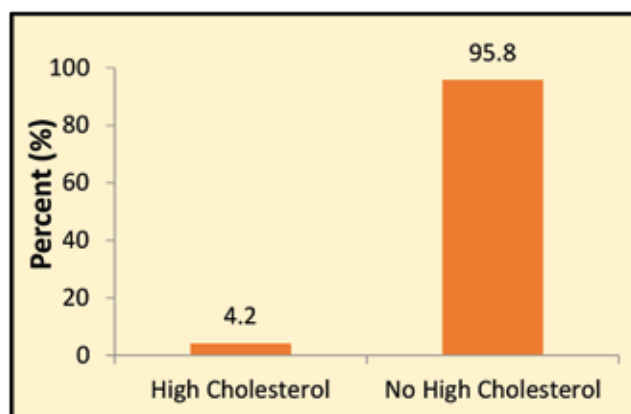


Figure 47. Adults in the CNMI with high total cholesterol using biomechanical measure, 2016

## COMBINED SELF-REPORT + BIOCHEMICAL MEASURE

To account for under/over-reporting and measurement error or refusal, high cholesterol prevalence combining self-reported and biochemical total cholesterol measure results was determined. Using this method, one out of five adults in the CNMI have high cholesterol. Slightly more women than men have this condition. Additionally, high cholesterol in the CNMI increases with age. Lastly, the prevalence of high cholesterol is highest among Chamorros, Carolinians, and other non-specified ethnicities.

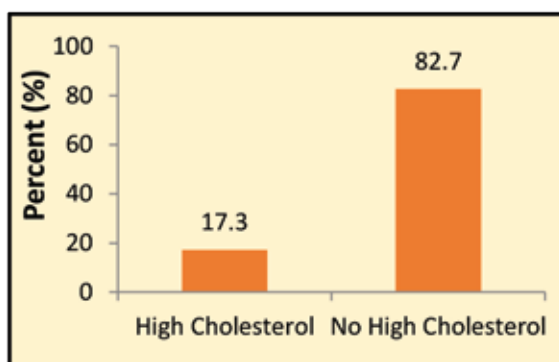


Figure 48. Adults in the CNMI with high cholesterol using combined self-reported and biochemical measure method, 2016

Table 8. Adults in the CNMI with high cholesterol by gender, 2016

Gender	Percent (%)
Male	15.2
Female	19.2

Table 9. Adults in the CNMI with high cholesterol by age, 2016

Age Group	Percent (%)
18 to 24	6.5
25 to 34	8.2
35 to 49	14.3
50 to 64	22.9
65 and older	29.2

Table 10. Adults with high cholesterol

Ethnic Group	Percent (%)
Chamorro	24.3
Carolinian	16.8
Other Pacific Islander	8.3
Filipino	15.3
Other Asian	11.8
Other Ethnicity	23.6





## PAP TEST

The Centers for Disease Control and Prevention (CDC) recommends the pap smear test for all women between the ages 21 to 65 years old [14]. Among all CNMI women between the ages 21 to 65 years old, the majority had received at least one Pap smear in her life. However, 17.9% reported never receiving a pap smear.

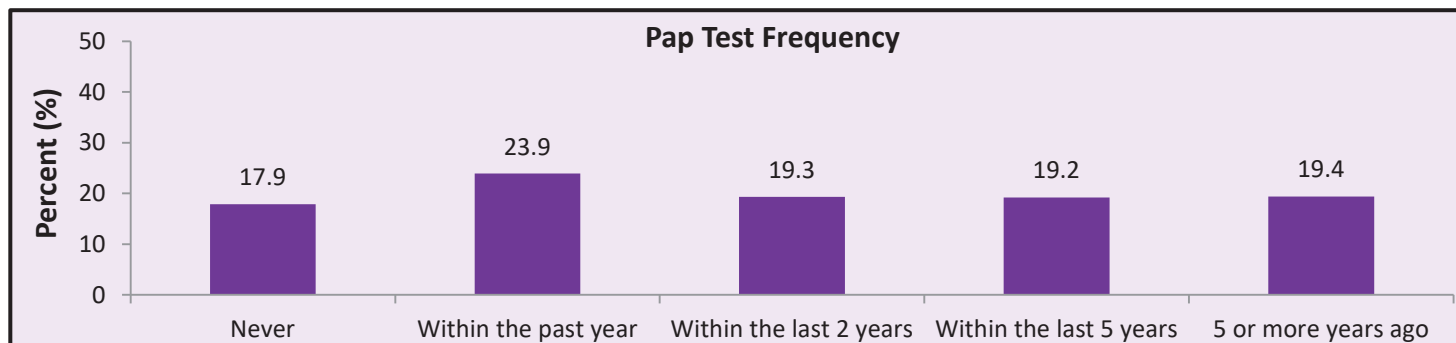


Figure 49. Frequency of Pap tests among women aged 21 to 65 years old in the CNMI, 2016

## MAMMOGRAM

The CDC recommends women ages 50 to 74 years old begin breast cancer screening with mammograms [15]. Among women aged 50 to 74 years old in the CNMI, two out of three women reported ever having a mammogram, leaving a third of women never having received a mammogram.

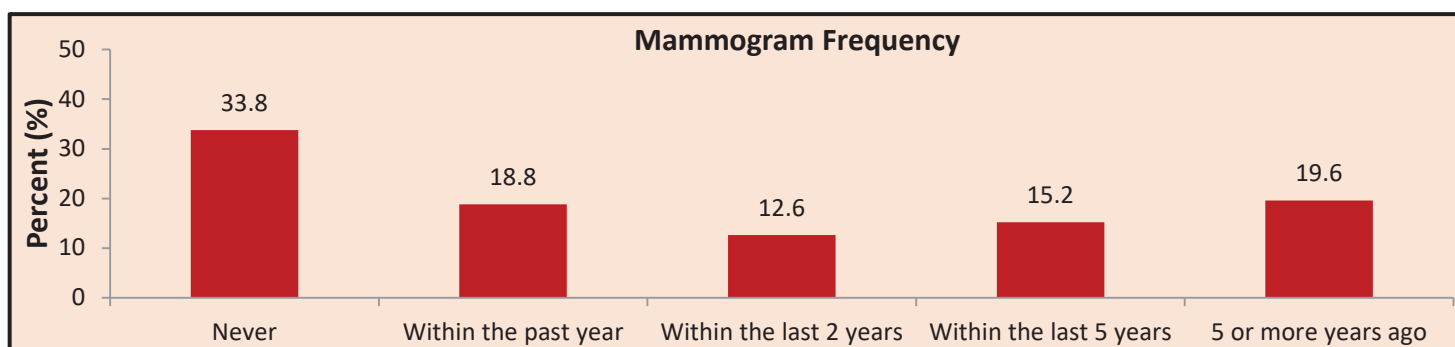


Figure 50. Frequency of mammograms among women aged 50 to 74 years old in the CNMI, 2016

## COLONOSCOPY

The CDC recommends colorectal cancer screening between the ages 50 and 75 years old [16]. Among adults aged 50 to 75 years old in the CNMI, the majority reported never having received a colonoscopy.

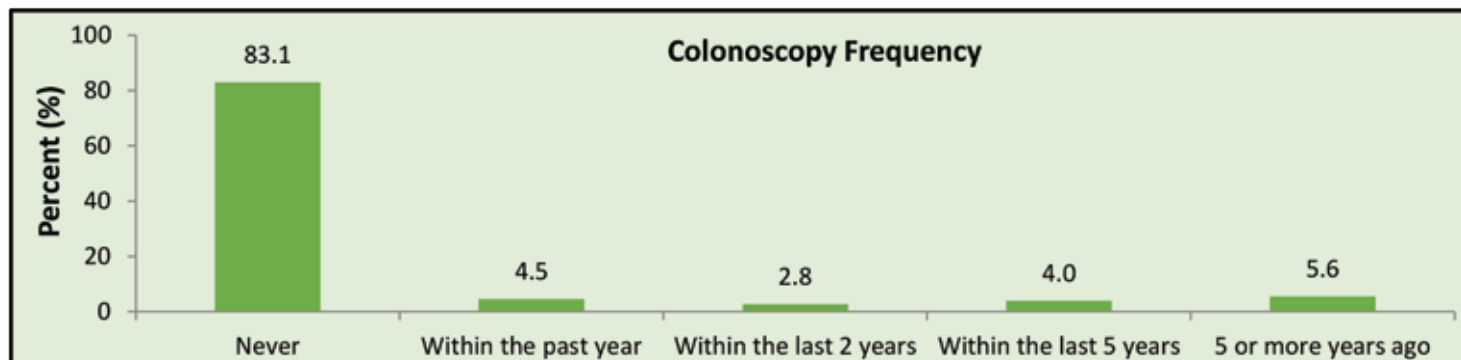


Figure 51. Frequency of colonoscopy among adults aged 50 to 75 years old in the CNMI, 2016



## CONCLUSION

As previously mentioned, non-communicable diseases are the leading causes of morbidity and mortality in the U.S. Affiliated Pacific Islands, which includes the CNMI [1]. Based on the results found, it is apparent that many CNMI residents are currently suffering from various NCDs and their lifestyle may be contributing to these morbidities. Cigarette smoking, betel nut chewing, low vegetable and fruit consumption, and overweight/obesity have been identified as prevalent risk factors of NCDs in the CNMI. Evidence-based programs and policies targeting adults as well as youth may be particularly effective in reducing the prevalence of NCDs in the CNMI.

Prevalence of NCDs may also be impacted by limited medical resources in this small island territory such as lack of medical specialists, lack of appropriate equipment and technicians, and lack of laboratory testing supplies and capacity. This is especially true in the smaller outer islands. These limited resources may be contributing to the low prevalence of medical screenings, including mammograms and colonoscopies.

Additionally, it is evident that there are striking ethnic disparities with most NCDs and NCD risk factors. Programs targeting native Chamorro/Carolinian and other Pacific Islander groups should be considered.

Priority areas for health improvement in the CNMI include (1) reducing overweight and obesity, (2) improving diet/nutrition and increasing physical activity, (3) addressing tobacco and betel nut use, and (4) strengthening NCD screening programs among adults in the CNMI.

## LIMITATIONS

- Most data collected were based on self-report so bias may exist
- Non-fasting blood glucose was conducted rather than fasting blood glucose to determine diabetes prevalence which is not ideal

## RECOMMENDATIONS

Successes include:

- Thorough training of enumerators
- Standardization of anthropometric measures (height and weight)
- Successful collaboration between CHCC, CSD, CGC, and NMC-CREES CHL
- Support and collaboration of partners, specifically CDC, PIHOA, SAMHSA, and WHO

Challenges include:

- Not enough enumerators were recruited and trained and enumerator retention was an issue
- Enumerators had a difficult time transporting and managing equipment alone and conducting measurements in homes
- Blood samples were challenging to obtain due to non-optimal supplies and random blood sugar (RBS) is not ideal for diagnosis of diabetes

With these successes and challenges, the following recommendations were made:

- Consider tablets for electronic data collection rather than paper surveys
- Consider having participants work with partners or in small groups
- Purchase larger gauge lancets and high quality capillary tubes for the next survey
- Hire and train a larger number of enumerators



1. World Health Organisation, *Noncommunicable diseases country profiles 2014*. 2014, WHO: Geneva.
2. Pacific Islands Health Officers Association, *Declaring a Regional State of Health Emergency Due to the Epidemic of Non-Communicable Diseases in the United States-Affiliated Pacific Islands- Board Resolution #48-01*. 2010.
3. World Health Organisation, *Global action plan for the prevention and control of noncommunicable diseases 2013-2020*. 2014, WHO: Geneva.
4. World Health Organisation, *Social determinants of health: the solid facts (2nd edition)*, R. Wilkinson and M. Marmot, Editors. 2003, World Health Organisation: Copenhagen.
5. World Health Organisation, *Review of Areca (Betel) Nut and Tobacco Use in the Pacific: A Technical Report*. 2012: WHO Western Pacific Region.
6. NCD Bureau, *NCD Capacity Report*. 2015, Division of Public Health: Commonwealth Northern Marianas Islands.
7. Central Intelligence Agency, World Fact Book, *Australia-Oceania: Northern Mariana Islands*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/cq.html>
8. United States Census 2010, *Island Area: Commonwealth of the Northern Mariana Islands*. Retrieved from [http://www.census.gov/population/www/cen2010/island\\_area/cnmi.html](http://www.census.gov/population/www/cen2010/island_area/cnmi.html)
9. Goworowska J and Wilson S. *Recent Population Trends for the U.S. Island Areas: 2000 to 2010: Current Population Reports*. U.S. Department of Commerce: U.S. Census Bureau. April 2015.
10. Center for Disease Control and Prevention, *5 A Day Works*. Retrieved from [http://www.cdc.gov/nccdphp/dnpa/nutrition/health\\_professionals/programs/5aday\\_works.pdf](http://www.cdc.gov/nccdphp/dnpa/nutrition/health_professionals/programs/5aday_works.pdf)
11. Center for Disease Control and Prevention, *Sodium and Food Sources*. Retrieved from <http://www.cdc.gov/salt/food.html>
12. Simon S. American Cancer Society, *World Health Organization Says Processed Meat Causes Cancer*. October 2015. Retrieved from <http://m.cancer.org/cancer/news/world-health-organization-says-processed-meat-causes-cancer>
13. Park S, Xu F, Town M, and Blanck H. Center for Disease Control and Prevention, *Prevalence of Sugar-Sweetened Beverage Intake Among Adults – 23 States and the District of Columbia, 2013*. Retrieved from <http://www.cdc.gov/mmwr/volumes/65/wr/6507a1.htm>
14. Center for Disease Control, *What Should I know About Screening?* Retrieved from [http://www.cdc.gov/cancer/cervical/basic\\_info/screening.htm](http://www.cdc.gov/cancer/cervical/basic_info/screening.htm)
15. Center for Disease Control and Prevention, *What is Breast Cancer Screening?* Retrieved from [http://www.cdc.gov/cancer/breast/basic\\_info/screening.htm](http://www.cdc.gov/cancer/breast/basic_info/screening.htm)
16. Center for Disease Control and Prevention, *Colorectal Cancer Screening Guidelines*. Retrieved from [http://www.cdc.gov/cancercolorectal/basic\\_info/screening/guidelines.htm](http://www.cdc.gov/cancercolorectal/basic_info/screening/guidelines.htm)



**Commonwealth Healthcare Corporation**  
**1 Lower Navy Hill Road, Navy Hill**  
**Saipan, MP 96950**



**For more information, call the**  
**Non-Communicable Disease Bureau**  
**at (670) 236-8719**

