COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS (CNMI)

NON-COMMUNICABLE DISEASES & RISK FACTOR HYBRID SURVEILLANCE REPORT

2016

Report developed by: Rica Dela Cruz and Haley Cash
January 25, 2018

Hafa Adai and Tirow,

I would like to commend the extraordinary work of the 2016 CNMI Hybrid Survey team, especially Dr. Haley Cash, Ms. Rica Dela Cruz, and Ms. Rebecca Robles. Their commitment and great effort to conduct such a large, wide-scale population survey of CNMI adults is commendable.

As we all are aware, non-communicable diseases (NCDs) such as diabetes, hypertension, chronic kidney disease, stroke, and heart disease wage immeasurable suffering and pain on our people. The care for non-communicable diseases substantially stress our health care system to the point that the late Governor Eloy Inos declared a State of Emergency regarding non-communicable diseases in 2013.

Though we knew of NCDs impact on our family and friends, it was difficult previously to capture the extent and prevalence of these diseases throughout our islands. The 2016 CNMI Hybrid Survey was able to address this concern. Here now we have population level surveillance data on the burden of NCDs and their risk factors (including obesity, cigarette smoking, betel nut chewing, low vegetable and fruit consumption) affecting our people.

Our task now is to evaluate these data and engage stakeholders to evaluate areas of focus for interventions. We are eager to partner with patients, clinicians, public health experts, community advocates, businesses, and external private and public partners to address these risk factors and diseases. It is our hope that you all will join our efforts. We are planning on repeating the Hybrid Survey in 2020 and are confident that our efforts between now and then can show significant improvements in the interim.

Sincerely,

[Signature]
Esther L. Muna
Chief Executive Officer
WITHIN THE CNMI:

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• 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
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• Dr. Marie Kainoa Fialkowski Revilla, Dietetics Program Director & Assistant Professor in Human Nutrition
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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

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

*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 & METHODOLOGY

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 SIZE DETERMINATION
‘Household’ sample size was determined based on the most populated islands in the CNMI: Saipan, Tinian and Rota.
Saipan = 817 Households (4.1% of total # households)
Tinian = 142 Households (12.7% of total # households)
Rota = 132 Households (12.6% of total # households)

SAMPLING PROCEDURES
Stage 1: Households were identified at random according to geographical stratification conducted on four levels: Island (Saipan, Tinian, Rota), Village Groups, Assignment Areas, & Blocks.
Stage 2: One individual was selected at random from each household using the KISH table method.

DATA ENTRY
Two weeks after initiation of the data collection, ongoing data entry was initiated in a designated Computer Room at CSD and entered by trained staff.
A data dictionary was created to explain the indicators and data codes.

DATA CLEANING
Descriptive statistics were produced for all variables. Values that do not match the data codes defined in the data dictionary were verified against the original questionnaire and rectified. Outliers were also checked, validated, & rectified.

DATA COLLECTION
Data were collected by trained enumerators using face-to-face questionnaires and anthropometric & other physical and biochemical measurements conducted at the households. If follow-up was necessary, a telephone call was conducted to obtain additional information from the participant. Quality control of completed questionnaires was ensured at different stages during the questionnaire-processing phase.

DATA ANALYSIS & REPORTING
Descriptive data analysis was conducted. Data were analyzed according to age group, gender, and ethnicity. Data were weighted by location. The report includes a project brief and interpretation of the data analyzed.
The sample randomly selected to participate in the Hybrid NCD and Rick 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**

**CENSUS**

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

**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
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
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.
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.

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.

Sugar Sweetened Beverage Consumption

Our bodies don’t need sugar to function properly. Added sugars contribute zero nutrients but many added calories, which can lead to excessive weight gain and obesity [13]. The American Heart Association recommends that women limit daily added sugar intake to no more than 6 teaspoons (25 grams). Men should limit daily added sugar intake to no more than 9 teaspoons (36 grams)*. Currently, three out of four adults in the CNMI reported to consume at least one sugar sweetened beverage per day.

*Children and teens should consume less than 6 teaspoons of added sugars a day and drink no more than 8 ounces (1 cup) of sugary beverages a week. Children under age 2 should have no added sugars.
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
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 (BMI ≥ 25 kg/m²). 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 (BMI ≥ 30 kg/m²). 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.
GENERAL HEALTH

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

![Chart: Perception of General Health]

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.

![Chart: Frequency of Annual Checkups]

![Chart: Has Health Care Coverage?]

![Chart: Avoided Medical Care Due to Costs?]

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

**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**
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

<table>
<thead>
<tr>
<th>Cardiovascular Disease</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease, Angina, or Heart Attack</td>
<td>3.3%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Other Heart Condition or Heart Disease</td>
<td>3.6%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.2%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulmonary Disease</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emphysema or Chronic Obstructive Pulmonary Disease (COPD)</td>
<td>0.9%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Asthma</td>
<td>5.8%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Chronic Diseases</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulcer (stomach, duodenal, or peptic)</td>
<td>2.7%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Gout</td>
<td>4.9%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Osteoarthritis (not gout)</td>
<td>5.6%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Cancer or malignancy of any kind</td>
<td>1.5%</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
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.

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 ≥140mg/dl, and 4.7% had a non-fasting blood sugar ≥200mg/dl.

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.

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

<table>
<thead>
<tr>
<th>Gender</th>
<th>% RBS ≥140 + self-report</th>
<th>% RBS ≥200 + self-report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>19.7</td>
<td>12.7</td>
</tr>
<tr>
<td>Female</td>
<td>17.7</td>
<td>12.3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Age Group</th>
<th>% RBS ≥140 + self-report</th>
<th>% RBS ≥200 + self-report</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>12.7</td>
<td>7.3</td>
</tr>
<tr>
<td>30-39</td>
<td>12.413.8</td>
<td>8.5</td>
</tr>
<tr>
<td>40 to 64</td>
<td>24.6</td>
<td>15.4</td>
</tr>
<tr>
<td>65 and older</td>
<td>37.9</td>
<td>32.7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>% RBS ≥140 + self-report</th>
<th>% RBS ≥200 + self-report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamorro</td>
<td>25.3</td>
<td>20.3</td>
</tr>
<tr>
<td>Carolinian</td>
<td>21.9</td>
<td>18.7</td>
</tr>
<tr>
<td>Other Pacific Islander</td>
<td>22.6</td>
<td>15.4</td>
</tr>
<tr>
<td>Filipino</td>
<td>16.4</td>
<td>8.6</td>
</tr>
<tr>
<td>Other Asian</td>
<td>10.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Other Ethnicity</td>
<td>8.6</td>
<td>8.6</td>
</tr>
</tbody>
</table>
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.

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.

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.

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

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>61.3</td>
</tr>
<tr>
<td>Female</td>
<td>50.9</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 to 24</td>
<td>37.5</td>
</tr>
<tr>
<td>25 to 34</td>
<td>40.8</td>
</tr>
<tr>
<td>35 to 49</td>
<td>47.5</td>
</tr>
<tr>
<td>50 to 64</td>
<td>70.6</td>
</tr>
<tr>
<td>65 and older</td>
<td>75.4</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamorro</td>
<td>58.0</td>
</tr>
<tr>
<td>Carolinian</td>
<td>54.1</td>
</tr>
<tr>
<td>Other Pacific Islander</td>
<td>57.3</td>
</tr>
<tr>
<td>Filipino</td>
<td>61.9</td>
</tr>
<tr>
<td>Other Asian</td>
<td>35.1</td>
</tr>
<tr>
<td>Other Ethnicity</td>
<td>39.5</td>
</tr>
</tbody>
</table>
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.

4.2% of CNMI adults tested had high total cholesterol.

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

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15.2</td>
</tr>
<tr>
<td>Female</td>
<td>19.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12.7</td>
</tr>
<tr>
<td>Female</td>
<td>12.4</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 to 24</td>
<td>6.5</td>
</tr>
<tr>
<td>25 to 34</td>
<td>8.2</td>
</tr>
<tr>
<td>35 to 49</td>
<td>14.3</td>
</tr>
<tr>
<td>50 to 64</td>
<td>22.9</td>
</tr>
<tr>
<td>65 and older</td>
<td>29.2</td>
</tr>
</tbody>
</table>

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.

Table 10. Adults with high cholesterol

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamorro</td>
<td>24.3</td>
</tr>
<tr>
<td>Carolinian</td>
<td>16.8</td>
</tr>
<tr>
<td>Other Pacific Islander</td>
<td>8.3</td>
</tr>
<tr>
<td>Filipino</td>
<td>15.3</td>
</tr>
<tr>
<td>Other Asian</td>
<td>11.8</td>
</tr>
<tr>
<td>Other Ethnicity</td>
<td>23.6</td>
</tr>
</tbody>
</table>
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.

![Pap Test Frequency](image)

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.

![Mammogram Frequency](image)

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.

![Colonoscopy Frequency](image)

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
- Non-fasting blood glucose was measured with a point-of-care device and the test strips used may have been affected by the hot and humid conditions present in the CNMI, therefore glucose levels could potentially be underestimated

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 non-fasting blood sugar is not ideal for estimation 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
- Fasting blood sugar (FBS) or point-of-care hemoglobin A1c should be considered for future surveys
REFERENCES