

An Assessment of Non-Communicable Diseases, Diabetes, and Related Risk Factors in the Federated States of Micronesia, State of Yap: A Systems Perspective

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Abstract

Non-communicable diseases (NCD) have been identified as a health emergency in the US-affiliated Pacific Islands (USAPI).¹ This assessment, funded by the National Institutes of Health, was conducted in the Federated States of Micronesia, State of Yap, and describes the burdens due to diabetes and other NCDs (heart disease, hypertension, stroke, chronic renal disease), and assesses the system of service capacity and current activities for service delivery, data collection and reporting as well as identifying the issues that need to be addressed. There has been a 1.2% increase in the population between 2000 and 2010; however, there was a significant increase in the 45-64 year old age group. Findings reveal that the risk factors of poor diet, lack of physical activity, and lifestyle behaviors lead to overweight and obesity and subsequent NCD that are a significant factor in the morbidity and mortality of the population. The leading causes of death include cancer, heart disease, and diabetes. Local household surveys show that 63% to 80% of the adults and 20.5% to 33.8% of the children were overweight or obese. The surveys also showed that 23% of the adult population had diabetes and 35% were hypertensive. Other findings show significant gaps in the system of administrative, clinical, data, and support services to address these NCD. There is a policy and procedure manual that guides the NCD staff. There is no functional data system that is able to identify, register, or track patients with diabetes and other NCDs. Priority administrative and clinical issues were identified.

Introduction

This paper presents findings from an assessment of the capacity of the administrative, clinical, support, and data systems to address the problems of non-communicable diseases (NCD) including diabetes and its risk factors in the Federated States of Micronesia, State of Yap, during May 16-20, 2011. Data and information were obtained through review of existing plans, reports, and documents; interviews were conducted with selected key informants; issues and needs were identified and groups of administrators and clinicians were used to define the priorities. (See article in this issue: *Assessing the System of Services for Chronic Disease Prevention and Control in the US-affiliated Pacific Islands: Introduction and Methods*).² This work was funded by the National Institutes of Health, Institute on Minority Health and Health Disparities.

Geography of the Federated States of Micronesia and the State of Yap

The Federated States of Micronesia (FSM) is an island nation consisting of approximately 607 islands in the Western Pacific. Although the area encompassing the FSM, is very large, the combined total land area is only 271 square miles with an additional 2,776 square miles of lagoon area. The 607 islands vary from large, high mountainous islands of volcanic origin to small atolls. The FSM consists of four geographically separate states: Chuuk, Kosrae, Pohnpei and Yap.

The State of Yap lies in the western part of the FSM and stretches from 6 to 10 degrees North latitude and 137 to 148 degrees West longitude. Although these islands encompass approximately 500,000 square miles of area in the Western Caroline Island chain, Yap State consists of only 45.8 square miles of land area. Yap Proper is the central area in Yap State and is a cluster of four islands (Marbaaq-Nimgil, Gagil-Tomil, Maap, Rumung) connected by roads, waterways and channels. Most of the coastal areas are mangroves with occasional coral beaches. The town of Colonia on Yap Proper is the capital. The State of Yap also has a total of 78 outer islands stretching nearly 600 miles east of Yap Proper of which twenty-two of the islands are inhabited. Most of the outer islands are coral atolls and are sparsely populated.³⁻⁸ Transportation on Yap Proper is becoming easier because of the development and improvement of paved roads. There are, however, clusters of villages that are still difficult to access because of unpaved dirt roads. The outer islands are also difficult to reach because of infrequent cargo ship field trips. A regular supply ship travels monthly to each of the outer islands, bringing supplies and health personnel to deliver goods and services. A few of the outer islands have runways (Woleai, Ulithi, Fais) that are serviced by Pacific Missionary Airways (PMA). PMA offers evacuation for medical emergencies and charges the Yap State government only fuel costs for other (non-emergent) medical trips. PMA also acts secondarily as a passenger airline providing more frequent transportation between the serviced islands than the field trip ship.

Population and Characteristics of the Population

In 2000, the population of Yap State stood at 11,241 residents with the following population distribution among these islands: *Yap Proper* had 7,391 residents (65.8% the population); and 3,850 residents (34.2%) in the Outer Islands that include: *Ulithi Atoll* has four inhabited islands (Azor, Falalop, Fatharai, Mogmog) and a population of 773 (6.9% of the population); *Woleai* is composed of two lagoons with 22 islands, five of which are inhabited with 975 persons (8.7% of the population); *Fais* - population 215 (1.9%); *Eauripik* - population 113 (1.0%); *Satawal* - population 531 (4.7%); *Faraulep* - population 221 (2.0%); *Ifalik* - population 561 (5.0%); *Elato* - population 96 (0.9%); *Ngulu* - population 26 (0.2%); and *Lamotrek* - population 339 (3.0%).⁹

Based on the 2000 Population Census and the preliminary analysis of the data for the 2010 Census, there has been a slight increase in the total population of 136 residents (1.2%) in Yap

| Age | 2000 | 2010 | Difference | Percent Change |
|-------|-------|-------|------------|----------------|
| <5 | 1372 | 1159 | -213 | -15.5 |
| 5-9 | 1361 | 1196 | -165 | -12.1 |
| 10-14 | 1355 | 1329 | -26 | -1.9 |
| 15-19 | 1353 | 1178 | -175 | -12.9 |
| 20-24 | 998 | 823 | -175 | -17.5 |
| 25-34 | 1405 | 1591 | 186 | 13.2 |
| 35-44 | 1441 | 1370 | -71 | -4.9 |
| 45-54 | 989 | 1386 | 397 | 40.1 |
| 55-64 | 448 | 850 | 402 | 89.7 |
| 65-74 | 322 | 294 | -28 | -8.7 |
| 75+ | 197 | 201 | 4 | 2.0 |
| Total | 11241 | 11377 | 136 | 1.2 |

Data source: Yap State Census Report, 2000 FSM Census of Population and Housing;⁹ Preliminary Population Counts for FSM 2010 Census¹⁰

between the census enumerations.^{9,10} In assessing the population by age groups, there appears to be a significant shift in the age composition of the population in that there are significant reductions in all the age categories of residents 24 years of age and under between the years 2000 and 2010. More important, is the significant increase in residents in the 45-64 year age groups because there is a positive association between age and risk of chronic disease. This increase in the number of older residents may have a significant impact in the prevalence of chronic diseases and the need for additional services.

Socioeconomic indicators that have an impact on the health status of the population in the FSM are the level of poverty, size of families, and literacy rates among the population. In the State of Yap, in the 2000 census, there were a total of 2,030 households of which 1,578 (77.7%) reported some cash income with a median household income of approximately \$6,489 and a mean household income of \$10,300. Of the 2,030 households, there is a median of 5.4 persons per household with an average of 4.9 persons per household in Yap Proper compared to 6.2 persons per household in the Outer Islands.¹¹ Yap literacy rates (able to read and write in any one of the languages) for people 10 years and older is 92.3%.¹²

Mortality and Morbidity Data

Leading Causes of Death

J. Yurow, Chief of Public Health, provided the data (May 18, 2011) from the Medical Records Office of the Yap State Hospital. Mortality data were aggregated for 2008-2010 and crude mortality rates per 100,000 population were calculated based on the Yap 2000 census of 11,377 residents. The overall crude mortality rate for 2008-2010 was 709.0/100,000 population. The leading causes of death were cancer (126.0), injury (70.3), diabetes (67.4), respiratory disease (58.6), heart disease (55.7), and cerebrovascular accident (55.7). When the proportions of the deaths due to chronic diseases or related conditions (heart

| Cause of Death | 2008 | 2009 | 2010 | 2008-2010 | Rate ^a |
|------------------|------|------|------|-----------|-------------------|
| Cancer | 9 | 19 | 15 | 43 | 126.0 |
| Injury | 8 | 6 | 10 | 24 | 70.3 |
| Diabetes | 9 | 9 | 5 | 23 | 67.4 |
| Respiratory | 5 | 9 | 6 | 20 | 58.6 |
| Heart disease | 10 | 6 | 3 | 19 | 55.7 |
| CVA ^b | 5 | 7 | 7 | 19 | 55.7 |
| Birth Injury | 4 | 5 | 0 | 9 | 26.4 |
| Malnutrition | 3 | 0 | 0 | 3 | 8.8 |
| Unknown | 12 | 18 | 9 | 39 | 114.3 |
| Other | 7 | 11 | 25 | 43 | 126.0 |
| Total | 72 | 90 | 80 | 242 | 709.0 |

^aCrude mortality rate/100,000 population. ^bCVA – Cerebrovascular accident. Data source: Personal communication, J. Yurow (May 18, 2011)

| Year | Total | NCD-related ^a | Percent ^b |
|------|-------|--------------------------|----------------------|
| 2006 | 43 | 15 | 34.9 |
| 2007 | 35 | 19 | 54.3 |
| 2008 | 21 | 10 | 47.6 |
| 2009 | 25 | 9 | 36.0 |
| 2010 | 33 | 13 | 39.4 |

^aNCD-related – Heart disease, renal transplant, renal failure, cancer, cerebral vascular accident. ^bPercent NCD-related medical referrals. Data Source: Personal communication, S. Chonmon (May 17, 2011)

disease, diabetes, cancer, CVA) are aggregated for each year, these chronic diseases accounted for 50.4% of all deaths in 2008, 45.6% of the deaths in 2009, and 37.5% of the deaths in 2010 (data not shown).

Medical Referrals

S. Chonmon, Medical Referral Coordinator, in a conversation, provided data on medical referrals (May 17, 2011). Over the past five years, medical referrals were decreasing in numbers from a high of 43 patients in 2006 to a low of 21 patients in 2008. However, since that time, the number of referrals has again been increasing and, in 2010, 33 patients were referred for off-island care. The data on patients who were referred for NCD-related diagnoses (heart disease, renal transplant and follow-up care after the renal transplant, renal failure, cancers, and cerebrovascular accident) reveal that in 2006, 34.9% of the patients referred for off-island care was for an NCD-related diagnosis. In subsequent years the proportion has fluctuated with the highest proportion of 54.3% in 2007 and 39.4% in 2010. It is estimated that the annual costs of these off-island medical referrals are approximately \$500,000 – therefore, based on these figures, in the year 2010 Yap State spent approximately \$200,000 for off-island medical referrals due to care for patients with a chronic disease alone.

Population-Based Surveillance and Local Survey Data

NCD Risk Factors STEPS Report

Yap State has conducted the NCD Risk Factors STEPS survey, however, the report has not been finalized and is not available (As of May 2011).

Wa'ab Community Health Center Household Survey

J. Gilmataam, Director of the Wa'ab Community Health Center, provided survey information and data tables (May 17, 2011). The Wa'ab Community Health Center Household Survey (2006-2007) included 1,395 households with 3,496 adults and 1,736 children and represented 71% of the resident population of Yap Proper only. The survey gathered data on risk behaviors and in response to the question, "Do you currently smoke any tobacco?", 22% of the surveyed population reported smoking with 28% of the men and 11% of the women smoking. When asked, "Do you drink any alcohol?", a total of 34% reported alcohol use with 48% of the men and 22% of the women; and 86% chewed betel nut and of those, 60% chewed betel nut with tobacco and 40% with alcohol. Measurements of body weight and height for adults and children were obtained to calculate the body mass index (BMI) and the data revealed that overall 63% of the adults were overweight or obese (27% overweight and 36% obese); for children, 32% were overweight or obese (12% overweight and 20% obese). Data for the two major NCDs showed that 35% of the adults surveyed were hypertensive (45% of men and 29% of women), and 23% were diagnosed with diabetes (24% of men and 21% of women).

Outer Island Household Survey

J. Yurow, Chief of Public Health, provided the survey data tables (May 19, 2011). The Yap State Cancer Prevention and Control Program funded the Outer Island Household Survey of 1,896 adults and 2,042 children (2-14 years) during 2008 and 2009. Data was collected during a face-to-face interview, physical measurements were taken and blood samples were obtained. The data were analyzed using the EpiInfo Program and data tables were created; however, a final report of the Outer Island Household Survey was not available. The data presented in this report are extracted from the preliminary analysis of the data and provided in a series of data tables. These data tables included analyses for data on BMI status, tobacco use, alcohol use, betel nut use, hypertension, and diabetes stratified by gender, age, and island of residence. The data for body mass index (BMI) status of adults show that 24.5% of the adults surveyed were of normal BMI status and 74.1% were overweight or obese. The percent of adults who are obese (41.4%) exceeds those who are overweight (32.7%). While men are more likely than women to be overweight (35.5% and 30.8%, respectively), women are more likely than men to be obese (40.6% and 34.5%, respectively).

The data for Outer Island children 2-14 years of age show that 33.8% of the children are overweight or obese with 29.5% of the boys and 35.0% of the girls in this category. The proportion of children who are obese (18.2%) is higher than those

Table 4. Behavioral Risk Factors, Hypertension, Diabetes Among Adults by Gender, Wa'ab CHC, Yap Proper, 2006-2007

| Risk Factor | % Total | % Male | % Female |
|---|---------|--|----------|
| Tobacco use | 22 | 28 | 11 |
| Alcohol use | 34 | 48 | 22 |
| Hypertension ^a | 35 | 45 | 29 |
| Diabetes ^b | 23 | 24 | 21 |
| Betel nut use | 86 | Comment: 60% with tobacco and 40% with alcohol | |
| Adult: Overweight ^c or obese ^d | 63 | Comment: 27% overweight and 36% obese | |
| Children: Overweight ^e or obese ^f | 32 | Comment: 12% overweight and 20% obese | |

^aHypertension – Blood pressure $\geq 140/90$ mmHg. ^bDiabetes – Blood sugar ≥ 126 mg/dl. ^cOverweight – BMI=25.0 kg/m² - 29.9 kg/m². ^dObese – BMI ≥ 30 kg/m². ^eOverweight – BMI=8th percentile - 94.9th percentile. ^fObese – BMI ≥ 95 th percentile. Data Source: Personal communication, J. Gilmataam (May 17, 2011)

Table 5. Weight Category of Outer Island Adults, Outer Island Household Survey, Yap State, 2008-2009

| Weight Category | % Total (n=1852) | % Male (n=750) | % Female (n=1102) |
|-------------------------------|------------------|----------------|-------------------|
| Underweight ^a | 1.5 | 2.3 | 0.9 |
| Normal weight ^b | 24.5 | 27.7 | 22.3 |
| Overweight ^c | 32.7 | 35.5 | 30.8 |
| Obese ^d | 41.4 | 34.5 | 46.0 |
| Overweight+Obese ^e | 74.1 | 70.0 | 76.8 |

^aUnderweight – BMI<18.5 kg/m². ^bNormal – BMI=18.5 kg/m²- 24.9 kg/m². ^cOverweight – BMI=25.0 kg/m² - 29.9 kg/m². ^dObese – BMI ≥ 30 kg/m². ^eOverweight+Obese – BMI ≥ 25.0 kg/m². Data Source: Personal communication, J. Yurow (May 17, 2011)

children who are overweight (15.8%). The data on childhood overweight and obesity show a wide variation of the prevalence of overweight and obese children when stratified by island of residence. Eauripik documented missing data in 96.4% of the cases and was not part of the analysis. For the remaining island groups, the proportion of overweight and obese children ranged from 17.3% in Satawal to an alarming 94.2% among the children in Fais with the majority of these children (89.9%) in the obese category. Among the children in Ifalik and Woleai, 42.7% and 41.4% respectively were overweight or obese. In the remaining island groups of Elato/Lamotrek, Piig/Fachailap, Satawal, and Ulithi the proportion of the children who were overweight or obese ranged from 17.3% to 22.9%.

The survey also provided data for BMI status, tobacco use, alcohol use, betel nut use, hypertension, and diabetes stratified by selected islands of residence (see Table 8). Eauripik has the highest proportion of overweight and obese adults (81.9%), closely followed by Ifalik (80.7%). Those islands with the lower proportions overweight or obese adults are Fais (66.3%) and Elato/Lamotrek (66.8%). The Fais had the highest prevalence of adults diagnosed with diabetes (23.9%), followed by Elato/Lamotrek (20.8%), and Eauripik (20.0%). The data for hypertension shows that Fais also has the highest proportion of adults

| Weight Category (BMI) | % Total (n=1948) | % Male (n=1050) | % Female (n=992) |
|-------------------------------|------------------|-----------------|------------------|
| Underweight ^a | 6.8 | 8.8 | 4.0 |
| Normal weight ^b | 59.4 | 56.8 | 56.7 |
| Overweight ^c | 15.6 | 11.8 | 18.1 |
| Obese ^d | 18.2 | 17.7 | 16.9 |
| Overweight+Obese ^e | 33.8 | 29.5 | 35.0 |

^aUnderweight – BMI<5th percentile. ^bNormal – BMI=5th percentile - 84.9th percentile. ^cOverweight – BMI=85th percentile - 94.9th percentile. ^dObese – BMI≥95th percentile. ^eOverweight+Obese – BMI≥85th percentile. Data Source: Personal communication, J. Yurow (May 17, 2011)

| Outer Island | Overweight ^a | Obese ^b | OW+Obese ^c | Missing |
|----------------|-------------------------|--------------------|-----------------------|---------|
| Eauripik | 0 | 3.6 | 3.6 | 96.4 |
| Elato/Lamotrek | 15.3 | 7.6 | 22.9 | 0 |
| Fais | 4.3 | 89.9 | 94.2 | 1.4 |
| Ifalik | 28.3 | 14.4 | 42.7 | 3.9 |
| Piig/Fachailap | 15.8 | 5.3 | 21.1 | 0 |
| Satawal | 9.3 | 8.0 | 17.3 | 1.3 |
| Ulithi | 10.5 | 10.5 | 21.0 | 1.0 |
| Woleai | 17.9 | 23.5 | 41.4 | 4.5 |

^aOverweight – BMI=85th percentile - 94.9th percentile. ^bObese – BMI≥95th percentile. ^cOverweight+Obese – BMI≥85th percentile. Table numbers are percentages. Data Source: Personal communication, J. Yurow (May 17, 2011)

| Outer Island | Overweight ^a | Obese ^b | OW+Obese ^c | Diabetes ^d | Hypertension ^e |
|----------------|-------------------------|--------------------|-----------------------|-----------------------|---------------------------|
| Eauripik | 20.8 | 61.1 | 81.9 | 20.0 | 20.0 |
| Elato/Lamotrek | 35.9 | 30.9 | 66.8 | 20.8 | 13.5 |
| Fais | 31.8 | 34.5 | 66.3 | 23.9 | 26.1 |
| Ifalik | 39.0 | 41.7 | 80.7 | 12.9 | 6.5 |
| Piig/Fachailap | 23.2 | 50.0 | 73.0 | 14.0 | 2.3 |
| Satawal | 34.7 | 33.3 | 68.0 | 12.7 | 7.4 |
| Ulithi | 33.3 | 37.1 | 70.4 | 18.9 | 11.1 |
| Woleai | 26.2 | 46.0 | 72.2 | 15.5 | 9.5 |

^aOverweight – BMI=25.0 kg/m² - 29.9 kg/m². ^bObese - BMI≥30 kg/m². ^cOverweight+Obese – BMI≥25.0 kg/m². ^dDiabetes – Blood sugar ≥126 mg/dl. ^eHypertension – Blood pressure ≥140/90 mmHg. Table numbers are percentages. Data Source: Personal communication, J. Yurow (May 17, 2011)

| Outer Island | Alcohol Use | | Smoke Tobacco | | Betel Nut | |
|----------------|-------------|--------|---------------|--------|-----------|--------|
| | Male | Female | Male | Female | Male | Female |
| Eauripik | 63.6 | 26.0 | 18.2 | 32.0 | 77.3 | 86.0 |
| Elato/Lamotrek | 72.0 | 20.5 | 65.6 | 53.5 | 93.5 | 72.4 |
| Fais | 38.0 | 8.3 | 52.0 | 31.7 | 72.0 | 70.0 |
| Ifalik | 3.3 | 1.7 | 47.4 | 48.1 | 82.2 | 72.9 |
| Piig/Fachailap | 0 | 3.2 | 52.0 | 54.8 | 8.0 | 6.5 |
| Satawal | 17.9 | 29.6 | 69.0 | 44.4 | 90.5 | 82.2 |
| Ulithi | 50.5 | 28.2 | 50.5 | 34.6 | 78.8 | 76.1 |
| Woleai | 58.9 | 14.2 | 35.6 | 27.4 | 84.9 | 67.4 |

Table numbers are percentages. Data Source: Personal communication, J. Yurow (May 17, 2011)

with hypertension (26.1%) followed by Eauripik (20.0%) and Elato/Lamotrek (13.5%). It is important to note that the island groups with the highest proportion of residents diagnosed with both diabetes and hypertension are Eauripik, Elato/Lamotrek, and Fais.

Data for lifestyle risk behaviors including use of alcohol, smoking tobacco, and chewing betel nut were stratified by gender. The data in Table 9 show that when asked “Do you currently drink any alcohol?”, reported alcohol use varied widely among

the Outer Islands ranging from a high of 72.0% among men on Elato/Lamotrek to 0% of the men on Piig/Fachailap. When asked, “Do you currently smoke any tobacco?”, tobacco smoking was reported by 69% of the men on Satawal and 65.6% of the men on Elato/Lamotrek. Among the women, the proportion ranged from a low of 27.4% on Woleai to a high of 54.8% on Piig/Fachailap. Betel nut chewing is high among both men and women on all of the Outer Islands except for Piig/Fachailap where only 8.0% of the men and 6.5% of the women report chewing betel nut.

Men and Women’s Health Week Survey

During 2008, the Yap State Public Health Division conducted health education and health screening for National Men’s Health Week and Women’s Health Week. These screenings were conducted in five sites in Yap Proper – Central Public Health, Tomil CHC, Gagil CHC, Nimgil CHC, and Maap CHC. J. Yurow, Chief of Public Health, provided the information and data on May 19, 2011. A total of 434 men and 518 women participated in the screenings. The results of the screening showed that 80% of both the men and the women were overweight or obese. For the men 31% were overweight and almost half (49%) were obese. The results for the women showed that 29% were overweight and more than half (51%) were obese. Random blood sugar (RBS) measurements showed that 16% of the men and 12%

| Indicator | Male (n=434) | Female (n=518) |
|-------------------------------|--------------|----------------|
| Overweight ^a | 31% | 29% |
| Obese ^b | 49% | 51% |
| Overweight+Obese ^c | 80% | 80% |
| RBS >140 mg/dl ^d | 16% | 12% |
| BP >140/90 mmHg ^e | 25% | 19% |

^aOverweight – BMI=25.0 kg/m²-29.9 kg/m². ^bObese – BMI≥30 kg/m². ^cOverweight+Obese – BMI≥25.0 kg/m². ^dRBS-Random blood sugar. ^eBP-Blood pressure. Data source: Personal communication, J. Yurow (May 19, 2011)

of the women tested had values greater than 140mg/dl which resulted in referrals for further diagnostic investigation. Results of the blood pressure measurements showed that 25% of the men and 19% of the women were hypertensive. The results of these surveys must be interpreted with care because these measurements are on participants who voluntarily attended the National Men's and Women's Health Week events and may represent a biased population – therefore these results are limited to these participants and cannot be generalized to the wider population.

Maternal and Child Health, School Health Survey

D. Palemar, Maternal and Child Health (MCH) Coordinator provided the information and data on May 18, 2011. In the 2006-2007 school year, the Yap State MCH Program in collaboration with the Public Health Dental Division and the Clinical Division, the Yap Department of Education, the Wa'ab Community Health Centers, and the Neighboring Island Dispensary System, conducted the first Yap State School Health Program Survey. The School Health Program team visited elementary schools in Yap and provided physical examinations, weight and height measurement with BMI calculation, vision check, hemoglobin check, de-worming treatment, preventive dental treatment, and check of immunization status. During 2006-2007, a total of 1,245 students were screened from 14 elementary schools on Yap Proper. The overall results of the BMI measurements show that 318 (24.0%) children were overweight or obese. During the 2009-2010 school year, a second survey was conducted among the 14 elementary schools and 12 Early Childhood Education Centers on Yap Proper. A total of 1,415 students were screened and 290 (20.5%) were overweight or obese.

Global Youth Tobacco Survey — Federated States of Micronesia, 2007

The Global Youth Tobacco Survey (GYTS) was conducted in 2007 in all four FSM states; a total of 1,363 students ages 13-15 participated and the data were aggregated for analysis and reporting for the entire FSM nationally.

Tobacco use among the youth in FSM is high with almost half (45.6%) having tried cigarette smoking with 56.2% of the boys and 34.7% of the girls reporting ever smoking. Almost

| School Year | Sites | Students Screened | Overweight ^a |
|-------------|---|-------------------|-------------------------|
| 2006-2007 | 14 Elementary Schools | 1245 students | 318 (24.0%) |
| 2010-2011 | 14 Elementary Schools and 12 ECE ^b | 1415 students | 290 (20.5%) |

^aIncludes overweight and obese – BMI ≥ 85th percentile. ^bECE – Early Childhood Education. Data Source: Personal communication, D. Palomar (May 18, 2011)

one-third of the students (28.3%) report current smoking. Of those never smokers, 30.1% report being likely to initiate smoking next year. The data also show the difficulties in cessation in that 83.2% of the current smokers report having tried to quit tobacco use without success and 86.5% want to stop smoking. Educational efforts to reduce smoking among youth is evidenced by 41.4% of the students reporting having been taught about the dangers of tobacco smoke and 47.1% were taught about the effects of smoking during the past year. The data for exposure to environmental tobacco smoke show that 60.7% of the students report exposure to smoke from others in the home, 48.8% have one or more parent who smoke and 71.3% report exposure to smoke in public places. Overall, 32.5% of the students think smoking should be banned in public places.¹³

Diabetes Specific and Related Data Diabetes Prevalence

No data system is available to provide the prevalence rates for diabetes or its related chronic conditions among residents of Yap State. However, there were a series of community surveys and health screening activities conducted between 2006 and 2010 which estimate the prevalence of diabetes and hypertension among the surveyed participants. In 2006-2007, the Wa'ab Community Health Center Household Survey (Table 4) of 71% of the population of Yap Proper showed that overall 23% of the population was diagnosed with diabetes and 35% with hypertension. In 2009, the Outer Island Household Survey showed that 12.7% to 23.9% of the residents of the Outer Islands had been diagnosed with diabetes and 2.3% to 26.1% of the population was hypertensive (Table 8). During 2008, a series of health screenings were conducted in communities on Yap Proper for Men's and Women's Health Week. The results of these screenings (Table 10) showed that 12% of the women and 16% of the men were screened positive for diabetes and referred for further diagnosis and treatment.

Diabetes and Tuberculosis

A. Rengan, TB Program Coordinator, provided the information and data on May 19, 2011. There are few documented cases of patients with active tuberculosis infections in Yap State. In

Table 12. Global Youth Tobacco Survey, Public Schools Grades 7-11, FSM, 2007

| Indicator | % Total | % Boys | % Girls |
|--|---------|--------|---------|
| Prevalence | | | |
| Had ever smoked cigarettes | 45.6 | 56.2 | 34.7 |
| Currently use any tobacco product | 46.2 | 51.9 | 39.8 |
| Currently smoke cigarettes | 28.3 | 36.9 | 19.8 |
| Currently use other tobacco products | 37.0 | 41.8 | 32.1 |
| Never smokers likely to initiate smoking next year | 30.1 | - | - |
| Exposure to Second Hand Smoke | | | |
| Live in home where others smoke | 60.7 | - | - |
| Around others who smoke outside their home | 71.3 | - | - |
| Think smoking should be banned from public places | 32.5 | - | - |
| Think smoke from others are harmful | 37.0 | - | - |
| Have one or more parents who smoke | 48.8 | - | - |
| Cessation – Current Smokers | | | |
| Want to stop smoking | 86.5 | - | - |
| Tried to stop smoking during the past year | 83.2 | - | - |
| Have ever received help to stop smoking | 91.7 | - | - |
| School Educational Efforts During Past Year | | | |
| Taught in class of dangers of smoking | 41.4 | - | - |
| Discussed in class why people their age smoke | 32.0 | - | - |
| Taught in class of the effects of tobacco use | 47.1 | - | - |

^aCurrent use – use of tobacco product on one or more of the past 30 days. Data source: Centers for Disease Control and Prevention, Global Tobacco Surveillance System Data¹³

Table 13. Number of Patients with Tuberculosis and Diabetes, Yap State, 2008-2011

| | 2008 | 2009 | 2010 | 2011 ^a |
|-------------------|------|------|------|-------------------|
| Active TB | 6 | 6 | 2 | 1 |
| LTBI ^b | 0 | 0 | 0 | 0 |
| Diabetes | - | - | - | 0 |

^aJanuary – May, 2011. ^bLTBI – Latent tuberculosis infection. Data Source: Personal communication, A. Rangon (May 19, 2011)

2008 and 2009, there were six patients with known TB, in 2010 there were two patients and for January-May 2011 there was one identified patient who was screened negative for diabetes. In 2011, screening for diabetes among patients with active tuberculosis was initiated because of the recommendations from the Pacific Island Tuberculosis Controllers Association and the Pacific Chronic Disease Council (PCDC). Procedures are being planned between the NCD/Diabetes Program and the Tuberculosis Program for all patients diagnosed with diabetes to be screened for tuberculosis.

Amputation

J. Yurow, Chief of Public Health, provided the data on May 19, 2011. The ER/Surgical logbook was examined to determine the number of patients who required lower limb debridement or

amputation. The limited data available in the logbook showed two patients requiring amputation in 2008, none in 2009, and two more patients in 2010 with amputation.

Renal Dialysis

There are no renal dialysis services available in Yap State.

Description of the Administrative System

Legislation and Regulations

(1) In 1994, Yap State enacted Yap State Law No. 3-80 (1994) – An Act to amend Title 11 of the Yap State Code by adding sections 1301, 1302, and 1303 to prohibit the advertisement of harmful products and sale to minors of tobacco products. (2) In 2010, Yap State Law No. 7-75. (2010) was enacted and amended Title 15 of the Yap State Code to prohibit smoking tobacco in government buildings and public places without exception. (3) On October 22, 2010, Yap State Resolution No. 7-183 was adopted requesting the Governor to direct the line departments to commence the development of an appropriate nutrition policy for the State of Yap setting forth the minimum requirements for the people of the State of Yap.

Planning Documents

There is no Yap State Health Plan or a plan to address the problems of non-communicable diseases. There are plans with specific activities for the CDC-funded Diabetes Prevention and Control Program. The plan (Section 902 Workplan) was developed, with input from the four states, by the NCD Program Coordinator at the FSM National Department of Health and Social Affairs (HESA) and all the activities are implemented in all four states.

There is one major planning document the *Federated States of Micronesia's Strategic Develop Plan – 2004-2023: The Next 20 Years: Achieving Economic Growth & Self-Reliance*. This Strategic Development Plan (SDP) was developed in 2004 as the result of the 3rd FSM National Economic Summit with over 400 participants from all four states. The development of this extensive and comprehensive plan involved all sectors of the government, the private sector, traditional leaders, non-governmental organizations, churches, citizen groups, and donor institutions. The Department of Health Services for Yap State is implementing some of the activities in the health section of the SDP to establish NCD prevention and control programs. The primary activities include individual screenings for NCD, community outreach and education, diabetes educational promotion, and educational materials developed and translated. The three areas of focus are to address the problems associated with overweight and obesity, diabetes and its complications, and hypertension.

Funding and Resources

Funding and resources for the prevention and control of diabetes are limited in Yap State. The Yap State NCD Program receives approximately \$16,000 through the FSM National Department of Health and Social Affairs from the CDC-DPCP program for personnel and educational supplies to implement community

outreach, awareness, and education. The NCD Program also receives \$19,000 from the first year of a three-year SPC grant. In-kind resources are shared among the other public health programs and the Yap State Hospital to assure that diabetes prevention and control services are provided.

Policy and Procedure Manual

The *Yap State, Department of Health Services Policy and Procedure Manual for the NCD Program (June 2006)* is comprehensive and extensive and addresses the following major sections: Public Health Goal, NCD Program Goal, Definitions of NCD diseases, Responsibilities of NCD Program, Management of NCD Program, NCD Clinics, NCD Program Services, Responsibilities of the NCD Program Coordinator, Client Care, and Coordination of services with WCHC.

This manual establishes that the NCD Program is responsible for implementing strategies to prevent the incidence of diabetes type 2 and hypertension and their related complications of cardiovascular and renal disease among the people of Yap State and to treat and support persons who have been diagnosed with these diseases. The responsibilities of the NCD Program are: (1) To educate the community on prevention of NCD and their related complications through health education, promotion and community awareness programs; (2) To establish and maintain regular community health screening for early identification of disease and referral for treatment; (3) To establish and maintain an accurate registry of all known diabetes and hypertension clients in the community; (4) To follow-up all referrals of newly diagnosed clients from the Hospital Ward, Outpatient Department (OPD), and community screening to ensure they receive regular health status monitoring and compliance support; (5) To follow-up clients who are not compliant with attendance at appointments at Public Health and/or CHC Clinics; (6) To educate clients/families/communities in the care of diabetes such as regular monitoring of the disease, foot care, diet, exercise, and medication compliance, when to visit clinic; and (7) Prepare other health department and CHC staff to educate clients, family members and the community in the prevention and care of NCDs.

Health Insurance

The *Federated States of Micronesia National Government Employees' Health Insurance Plan (FSMNGEHIP)* came into effect in 1984, just as the FSM was forming as a nation. The original health plan was designed as a social safety net to provide benefits for health care services, including diagnosis, treatments, surgery, and hospitalization. Eligibility was limited to employees of the FSM National Government. In 1990 the FSM Congress enacted legislation to expand the eligibility to include all the State Government employees and other agencies' employees, and also allowed the employee to enroll their dependents and members of their household. In 1994, the FSM Congress passed PL 8-133 to further extend the health insurance coverage to employees in the private sector, and other non-government organizations and their dependents. Today,

| Plan Option | Employee Share (48%) | Employer Share (52%) | Biweekly Premium |
|--|----------------------|----------------------|------------------|
| Basic Option (BA) | \$6.86 | \$7.44 | \$14.30 |
| Supplemental Resident Option (SR) | \$15.58 | \$16.87 | \$32.45 |
| Supplemental Non-Resident Option (SNR) | \$21.38 | \$23.17 | \$44.55 |

Data source: Federated States of Micronesia. MiCare Web Site¹⁴

the health plan is known as *MiCare* and is extending medical coverage for the entire workforce of the FSM, both public and private. In January 2006, the President signed into law an amendment extending eligibility to students attending post secondary institutions in the FSM. The MiCare Health Insurance Plan consists of three (3) options: Basic Option (BA) covers health care services and medical treatments rendered locally; Supplemental Resident Option (SR) provides the benefits under BA and, in addition, includes referral to an off-island health care facility; and Supplemental Non-Resident Option (SNR) covers all the benefits under BA and SR, however, is available only to employee, staff and their dependents who are placed in government offices outside of the FSM. Table 14 shows the premiums required for each of the options.¹⁴ In Yap State, there are 550 subscribers and their dependents with the FSM National Government's MiCare Health Insurance Plan.

Partnerships and Collaborations

The staff of the Yap State NCD Program works with several organizations and programs in the community and includes the following: Nimgil Youth Organization, Dalipebinaw Youth Sports club, the Yap Interagency Nutrition Education Council and other local sports associations. Activities include promoting nutrition in communities, organizing walk-a-thons, educating youth on making good lifestyle choices, and training athletes.

Research

No known research has been conducted in Yap State related to nutrition, physical activities, or NCDs.

Description of Clinical Services System Medical and Health Professionals and Facilities

Yap State Hospital has an emergency room, outpatient clinics, inpatient wards, surgical suites, a dental clinic, pharmacy, laboratory and X-ray services, and health administration offices which include offices for data and statistics. In addition to these acute care services, the Public Health Clinic provides services within the same facility as the hospital. The hospital and its services are directly accessible only to the residents of the urban center. For residents from the outer islands access is difficult because of limited transportation. In addition to this centralized facility, the State of Yap has four Community Health Centers located in populated catchment areas on Yap Proper: the Maap/Rumung CHC, the Gagil CHC, the Tomil CHC, and the Nimgil CHC.

| Table 15. Medical and Health Professionals in Yap State, 2008 | | | |
|---|--------|---------------------------------|--------|
| Yap State Hospital | Number | Yap Division of Public Health | Number |
| Curative Services | | Public Health Clinics | |
| Clinical Medical Services (MD, MO) | 12 | Medex ^a | 3 |
| Clinical Nursing Services (GN, PN/NA) | 35 | Nursing Services | 12 |
| Health Services Administration | | Midwife/Nurse Practitioner | 1 |
| Director/Deputy Director | 1 | Dispensary Managers | 24 |
| Division Chief | 3 | Nutritionist | 0 |
| Hospital Administrator | 0 | Epidemiologist | 0 |
| Health Planner | 0 | Health Educator | 0 |
| Epidemiologist | 0 | DOT ^b workers | 2 |
| Public relations | 0 | Dental Health Clinics | |
| Hospital Support Services | | Dentists | 1 |
| Laboratory | 7 | Dental Nurse | 7 |
| Radiology | 4 | Dental Assistant/Aids | 0 |
| Pharmacy Tech | 4 | Other Divisions | |
| Physical therapy | 0 | Substance Abuse/Mental Health | 11 |
| Clinical Nutritionist | 0 | Environmental Health/Sanitation | 4 |
| Vital and Health Statistics | 1 | | |

^aMedex – Medical Officer. ^bDOT – Direct Observation Treatment. Data source: 2008 Health Digest, Federated States of Micronesia¹⁵

There are also 19 dispensaries in the Outer Islands as part of the Primary Health Care Division that are served by health aides. Only the most basic of health care services are provided by these sites and consultation with medical personnel at the hospital is necessary for more complicated medical care. The 2008 Health Digest for the Federated States of Micronesia lists the administrative staff, medical care staff, public health staff, and support staff for the medical and health facilities. It is important to note that there are no nutritionists, epidemiologists, or physical therapists in Yap State.¹⁵

Outreach and Prevention

The Yap NCD Program staff provides outreach and prevention services that include providing educational brochures and materials in the community that usually accompany community presentations on nutrition and physical activity; radio spots; school presentations and activities that involve the students around nutrition and physical activity; and health fairs and community events. There is only one staff person – the NCD Coordinator, so many of these community outreach services are done in collaboration with other public health programs that provide outreach and education in the community.

Screening and Diagnosis

The strategy to reduce morbidity and premature mortality associated with Type 2 diabetes is to assure early detection through active case finding and screening. Screening services are provided upon request by the patient and in a variety of settings that include outreach activities at community events, community health centers, regular public health clinic visits, and Yap Hospital outpatient services. There is a public health

NCD Program manual that sets the standards and criteria for screening, diagnosis, and treatment. The NCD manual sets the policies and procedures for the NCD Program, other programs in the health department, and the community Primary Health Care centers that provide outreach, screening, and diagnosis.

Treatment and Management

Health care providers at Yap State Hospital Outpatient Department, the Public Health NCD Clinic, and the four Community Health Centers provide treatment and management services for patients with diabetes and hypertension. Patients have the choice of selecting the health care provider among the providers at any of these facilities. The NCD Manual includes a flow chart that sets the policy for the flow of communication between Wa'ab Community Health Center (WCHC) and the public health NCD Program on the management and treatment of patients.

Coordination and Communication

Two weekly staff meetings are conducted: one meeting for all the staff from the WCHC, public health programs, and other related agencies to meet and collaborate on upcoming activities and resolve issues and problems that have been identified, and a second Public Health staff meeting where WCHC staff attend may bring up issues or provide an update on upcoming activities.

Description of the Support Services System Quality Assurance and Continuing Education Program

The Department of Health Services has a Quality Assurance Audit for the NCD Program. The Quality Assurance Audit assesses several indicators for each of the following the standards: Standard 1: To ensure the Program Coordinator and other staff

involved with the program present professional image and practice good work ethic. Standard 2: To ensure the NCD Program is managed effectively to achieve optimum outcomes. Standard 3: To ensure NCD services are coordinated with the CHCs. Standard 4: To ensure the Program Coordinator implements all administrative responsibilities. Standard 5: To ensure that clients are satisfied with NCD Program services.

The continuing education program in Yap State is under the responsibility of the Hawai'i/Pacific Basin Area Health Education Center (AHEC) that provides health education, career recruitment, and health professions training and needs assessment research to the entire State of Hawai'i and selected Pacific Island jurisdictions including Yap State, Palau, CNMI, and American Samoa. The AHEC Program provides educational sessions once a week for physicians, nurses, public health staff, and ancillary health staff. In addition, there are two opportunities for continuing education for the public health and WCHC staff: Cross Training every Friday morning and continuing medical education (CME) courses.

Diabetes Health Education Materials

The NCD Program is currently using culturally appropriate diabetes and other NCD educational materials and brochures in Yap. Some examples of educational materials include: At Least 30 Minutes of Physical Activity (*Pasig Atyou Mith-Mith Gechgech Yaragel*), Eat Smart (*Muko e tin fel ngafhik I dowam*), If You Are Pacific Islander, You May Be At Risk For Diabetes, Walk 10,000 Steps Every Day, Every Pacific Islander Should Know: You Can Control Your Diabetes, Foot Care for People with Diabetes (Papa Ola Lokahi, Pacific Diabetes Education Program);¹⁶ and Diabetes is Everyone's Business (SPC).^{17,18}

Pharmacy Services

Pharmacy services are provided by the Yap State Hospital. The available oral medications for diabetic patients include: Glucophage (metformin), Micronase (glyburide), Glucotrol (glipizide), and Metformin+Glyburide. The pharmacy staff reported that there are no major problems with the ordering of medication and there is a consistent supply of medications.

Laboratory Services

Laboratory services are provided by the Yap State Hospital. The laboratory is able to perform the following: blood sugar determination, 2-hour glucose tolerance test, hemoglobin A_{1c}, total cholesterol, high density lipoprotein, triglyceride, creatinine, and urea. One of the major problems reported by the staff are limited resources for test reagents and supplies. The Laboratory Supervisor is working with each of the Public Health Coordinators to establish the required reporting of laboratory tests for each program and is requesting the NCD Coordinator provide information on the reporting of laboratory tests for the NCD Program.

Description of the Data System

There is no overall data system in the Yap State Department

of Public Health that provides the data and information for all the public health programs. Each program may have its own unique dedicated data system with no coordination or connections between the existing systems. The NCD Program does have a stand-alone Microsoft Access-based Patient Information Data System; however there is no policy and procedure manual for the data system, and no training on the use of data from the database. Data on patient visits are collected from the weekly Public Health NCD Clinic and the four Community Health Centers; however, data are not collected from the Outpatient Department of the Yap State Hospital where patients with diabetes and hypertension may be seen by the physicians.

F. Lifang, DPCP Coordinator provided data from the NCD Program database (May 19, 2011). The current NCD Program data system has a total of 695 patients in the database with 341 patients identified as having diabetes, 345 patients with hypertension only, and 172 patients with diabetes and hypertension. These data can be stratified by age categories, gender, and lagoon island/outer island. However, further examination of the data shows that patient records are not up to date and many patient records have missing data fields and the database incomplete.

The data system is able to produce a monthly encounter data report that is sent to the FSM National NCD Program. However, because of the incomplete and inaccurate data in the database, the results of the data tables in these monthly reports are questionable. Further assessment revealed no other reports are generated from the database for clinical management and monitoring of patients or for analysis and interpretation to evaluate the outcomes of patients served in the Public Health NCD Program.

Conclusions: Prioritized Issues and Needs

Non-communicable diseases, including diabetes, have been identified as an emergency in the US-affiliated Pacific Islands. The residents in the Pacific jurisdiction experience some of the highest rates of diabetes and other chronic diseases. The first step to address this issue is to describe the burden of chronic diseases, identify and describe the programs and agencies charged with delivering care to patients, and assess the capacity of the system of service. This report presents new information and identifies the problems and issues that will need to be addressed to make an impact on the health disparities caused by NCDs. Although chronic disease surveillance system data, local population survey data, vital statistics, and program data exist,¹⁹ there continues to be limited availability of these data and a paucity of published data. Often mortality, morbidity, and risk behavior data across the Pacific jurisdictions cannot be compared because of differences in defining the data elements, data collection methods, and timeliness of reporting.

There has been a slight increase (1.2%) in the population in Yap State between 2000 and 2010, however, there has been a shift in the population based on age groups. There is a decline in the number of residents under 24 years of age and a significant increase in the 45-64 year old age group. The leading causes of

death include cancer, heart disease, and diabetes. Other findings from local household surveys show that 63% to 80% of the adults were overweight or obese and 20.5% to 33.8% of the children were overweight or obese. The Wa'abCHC Household Survey showed that 23% of the survey population had diabetes and 35% were hypertensive.

The description of the system of services reveal that there is one major planning document – the Strategic Development Plan with a health section to establish NCD prevention and control programs that include screenings for NCD, community outreach and education, diabetes educational promotion, and educational materials developed and translated. The three areas of focus are to address the problems associated with overweight and obesity, diabetes and its complications, and hypertension. There is also a policy and procedure manual for the NCD Program that is used by program staff. Other findings reveal that there is no functional data system that is able to identify, track, and monitor patients with diabetes or other NCDs. The laboratory reports problems with the lack of resources for test reagents and supplies.

Based on the findings of this assessment and the prioritization by a group of administrators and a group of clinicians, the top three administrative priority needs identified included: (1) Need to review and update the NCD Program Policy and Procedure Manual – include Outpatient Department (OPD), Ward, Community Health Centers (CHCs); (2) Need to improve the current data system: (a) Coordinate with OPD and CHCs to send data, and (b) Update patient records; and (3) Need for the new Chronic Disease Electronic Management System (CDEMS) Registry to include onsite training in Yap on how to use the data registry and how to analyze and interpret the data. The top three clinical priority needs identified included: (1) Need to expand the content of the education sessions to include nutrition, physical activity, lifestyle behaviors, and tobacco use; (2) Need to collaborate and partner with other public health programs to conduct outreach, education sessions, and workshops; and (3) Need to assure that all clinicians in Public Health, OPD, and CHCs use the American Diabetes Association Standards of Medical Care for screening, diagnosis, treatment, and management of diabetes. Tables 16 and 17 list the priority ranking of the issues and needs.

| Table 16. Administrative Issues Priority Ranking | | |
|--|--|----------------------------|
| Priority Rank | Administrative Issue/Need | Average Score ^a |
| 1 | Need to review and update the NCD Program Policy and Procedure Manual – include OPD, Ward, CHCs and distribute widely | 20.8 |
| 2 | Need to improve the current data system: (a) Coordinate with OPD and CHCs to send data, and (b) Update patient records | 22.8 |
| 3 | Need for the new CDEMS Registry to include on site training in Yap on how to use the data registry and how to analyze and interpret the data | 25.0 |
| 4 | Need to expand the content of the preventive education and the number of partnerships with various community organizations | 26.5 |
| 5 | Need for a comprehensive Yap State Health Plan | 32.3 |
| 6 | Need for legislation to earmark a percentage of the “sin tax” for preventive health activities | 35.3 |
| 7 | Need for department policy and enforcement to prohibit betel nut chewing in DHS facilities | 35.5 |
| 8 | Need for additional resources for PPD tests to screen patients with diabetes for TB | 37.8 |
| 9 | Need to enforce the existing “No selling of outside food” on hospital grounds | 40.5 |
| 10 | Need to encourage SAFE walking by developing and building sidewalks and walkways | 53.8 |

^aLower the average score, higher the priority

| Table 17. Clinical Issues Priority Ranking | | |
|--|--|----------------------------|
| Priority Rank | Clinical Issue/Need | Average Score ^a |
| 1 | Need to expand the content of the education sessions to include nutrition, physical activity, lifestyle behaviors, tobacco use | 22.8 |
| 2 | Need to collaborate and partner with other PH programs to conduct outreach, education sessions, and workshops | 23.5 |
| 3 | Need to assure that all clinicians in PH, OPD, and CHCs use the ADA Standards of Medical Care for screening, diagnosis, treatment and management of diabetes | 26.3 |
| 4 | Need to expand the content of screening to include: eye care, foot care, kidney disease, H. flu, and pneumococcal vaccine | 30.5 |
| 5 | Need for educational materials on “Food Composition” for patient education | 31.3 |
| 6 | Need to provide train-the-trainer education on “Self-Management Education” for patients with NCDs | 33.3 |
| 7 | Need for annual community screening for NCDs in 1-2 communities in each CHC area | 33.8 |
| 8 | Need to provide additional specialty training for at least one physician on the treatment and management of diabetes | 37.8 |
| 9 | Need for annual community screening for NCDs in 1-2 Outer Island communities | 39.5 |
| 10 | Need additional resources for laboratory supplies and reagents | 48.5 |

^aLower the average score, higher the priority

Disclosure Statement

The authors report no conflict of interest.

Acknowledgements

Funded by the National Institute on Minority Health and Health Disparities (NIMHD) of the National Institutes of Health (NIH) (Grant 3R24MD001660). The content is solely the responsibility of the author and does not necessarily represent the official views of the NIMHD or the NIH. A special thank you to Dominic Taruwemai, Director of Health, Yap State for his administrative support; the key informants and the participants of the priority setting groups for their expertise; and the Yap State Needs Assessment Team, Frank Lifang (Team Leader), Julie Yurow, Martina Legasurgam, Cyril Yinnifel, Margaret Lefagochog, and Kipier Lippwe (FSM National NCD Coordinator) for their participation.

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