

# An Assessment of Non-Communicable Diseases, Diabetes, and Related Risk Factors in the Republic of the Marshall Islands, Majuro Atoll: A Systems Perspective

Henry M. Ichiho MD, MPH; Ione deBrum CN Certificate; Shra Kedi; Justina Langidrik MPH; and Nia Aitaoto MPH, MS

## Abstract

*Non-communicable diseases (NCD) have been identified as a health emergency in the US-associated Pacific Islands (USAPI).<sup>1</sup> This assessment, funded by the National Institutes of Health, was conducted in the Republic of the Marshall Islands, Majuro Atoll and describes the burdens due to selected NCD (diabetes, heart disease, hypertension, stroke, chronic kidney 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. Findings reveal that the risk factors of poor diet, lack of physical activity, and risky lifestyle behaviors are associated with overweight and obesity and subsequent NCD that are significant factors in the morbidity and mortality of the population. The leading causes of death include sepsis, cancer, diabetes-related deaths, pneumonia, and hypertension. Population-based survey for the RMI show that 62.5% of the adults are overweight or obese and the prevalence of diabetes stands at 19.6%. Other findings show significant gaps in the system of administrative, clinical, data, and support services to address these NCD. There is no policy and procedure manual for the hospital or public health diabetes clinics and there is little communication, coordination, or collaboration between the medical and public health staff. There is no functional data system that allows for the identification, registry, or tracking of patients with diabetes or other NCDs. Based on these findings, priority issues and problems to be addressed for the administrative, clinical, and data systems 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 Republic of the Marshall Islands, Majuro Atoll during October 18-22, 2010. 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-associated Pacific Islands: Introduction and Methods*).<sup>2</sup> This work was funded by the National Institutes of Health, National Institute on Minority Health and Health Disparities.

## Geography of the Republic of the Marshall Islands and Majuro Atoll

The Republic of the Marshall Islands (RMI) is an island nation situated in the central Pacific Ocean between 4 degrees and 14 degrees North latitude and 160 degrees and 173 degrees East longitude. The country lies in two parallel chains of 29 low-lying atolls: the Eastern Ratak (Sunrise) and the Western Ralik (Sunset) chains of atolls and islands. The total number of islands and islets is about 1,225. The total land area of the RMI is 70

square miles scattered over the country's Exclusive Economic Zone of over 750,000 square miles, which means that the total land area is less than 0.01% of the total surface area. The RMI is divided into 24 municipalities with Majuro, Ebeye, Wotje and Jaluit as major district centers. Majuro and Kwajalein are served by international airlines, whereas Air Marshall Islands airline has numerous flights between Majuro, Kwajalein, and the outer islands, 23 of which have airstrips.

Majuro Atoll, a large coral atoll of 64 islands, is one of the legislative districts of the Ratak chain of the Marshall Islands. Majuro Atoll has a land area of only 3.7 square miles and encloses a lagoon of 114 square miles. As with other atolls in the Marshall Islands, Majuro consists of extremely narrow land masses which allow a person to walk from the lagoon side to the ocean side within minutes. The main population center, also named Majuro, is the capital and largest city of the Republic of the Marshall Islands. Majuro has a port, shopping district, hotels, and an international airport. The major population centers are the islets of Delap-Uliga-Darrit (D-U-D) listed from south to north, on the eastern edge of the atoll. Uliga is the main business district, and banking and tourism are increasingly important. Uliga is home to the College of the Marshall Islands, Assumption High School, and Uliga Elementary School where English is taught to all students. The RMI capitol building and government offices are located in Delap at the eastern point of Majuro Atoll. Delap also has several large stores. Darrit is mostly residential and has the largest public primary and secondary schools in the country, including Marshall Islands High School located near the north end of Majuro. At the western end of the atoll, about 30 miles from D-U-D, is the island community of Laura, a growing residential area with a popular beach. Laura has the highest elevation point on the atoll, estimated at less than 10 feet above sea level, has the best soil for planting, and is the home to several farms. Most of the roadway from Delap to Laura is a single two-lane paved road with houses on either side.<sup>3-9</sup>

## Population and Characteristics of the Population

Between 1973-1999, the population of the Marshall Islands more than doubled, increasing from 24,135 to 50,848 and the projected population in 2009 is estimated at 54,065. Of the population, based on the 1999 census, 23,682 reside on Majuro Atoll (47%) and another 10,903 Marshallese citizens reside on Kwajalein Atoll (21%), and 32% of the population in the outer islands. Based on these data, 68% of the residents on Majuro

Atoll and Kwajalein Atoll are considered to live in urban areas; whereas the remaining population in the outer islands lives in rural areas. Of the total population, 97.3% are born in the RMI and the remaining are from other Pacific Islands, the United States, and other countries. The country's population is young with 43% being under 14 years of age and 64.3% below 25 years of age. Based on the data from the 1988 and 1999 censuses, the life expectancy of males has increased from 59.6 to 65.7 years and for females the life expectancy increased from 62.6 to 69.4 years.<sup>10</sup>

As mentioned previously, according to the 1999 census (Table 1), the population of Majuro Atoll stands at 23,682 residents and represents 47% of the total population of the RMI. The median age of the Majuro Atoll population is 19.2 years. Children under 5 years of age comprise 14.4% of the population; 24.9% are older children between 5 and 14 years of age; while 22.9% are adolescents and young adults between the ages of 15 to 24 years. Adults 25-64 years of age represent 35.4% of the total population and elderly residents 65 years and older comprise 2.3% of the population. According to the 1999 census and reported in the *Republic of the Marshall Islands Statistical Yearbook 2002*, the median household income in Majuro is \$9,030 with 798 (8.8%) of the households with income <\$4999; while at the other extreme of the continuum, 80 (0.9%) households had an income of >\$50,000.<sup>10</sup>

The RMI Economic Policy, Planning and Statistics Office (EPPSO) published the *Summary of Key Findings, RMI 2006 Community and Socio-Economic Survey, 2006*. The summary of findings showed that Majuro is home to almost half of the entire population of the Marshall Islands, continues to see rapid growth, and has the highest receiving area of domestic and international migrants (6,029 residents living elsewhere before coming to Majuro). The median age has increased from 19 years in 1999 to 21 years in 2006. However, while there is a steadily aging population structure, about 40% of its population is below 15 years of age. Economic data showed that unemployment was estimated at 31% in 1999 and remains high with an estimated range of 25%-39% in 2006. About 40% of employed persons work in the public sector; the median household income of all surveyed sites was \$12,603 as compared to Majuro's median household income of \$14,737, which places it second to Ebeye at \$17,321. Food sources for Majuro showed that 22% of households relied on local protein sources (higher than Ebeye at 10%, but lower than Wotje at 84%, Jaluit at 72%, Arno at 100%, and Ailuk at 98%). One third of households relied on local fruits and vegetables – the most commonly grown were coconuts, breadfruit, nin, pandanus, and banana.<sup>11</sup>

Socio-culturally, the Marshallese are a matrilineal society where family ties and mutual reciprocity are very strong despite modern influences. Unlike western society, the extended system of family is prevalent and family ties are strong. The church and religion have played a significant role in shaping the attitude and behavior of the people since the missionaries first arrived in the islands during the 1830's. Food habits among the residents of the Marshall Islands have undergone a change for the

Age	Male	Female	Total	Percent
<5	1782	1637	3419	14.4
5-14	2981	2919	5900	24.9
15-24	2737	2694	5431	22.9
25-34	1755	1723	3478	14.7
35-44	1267	1267	2534	10.7
45-54	934	746	1680	7.1
55-64	355	346	701	3.0
65-74	188	174	362	1.5
75-84	60	75	135	0.6
85+	22	20	42	0.2
Total	12081	11601	23682	100

Data source: Statistical Yearbook 2002<sup>10</sup>

worse due to high wage earnings in non-traditional occupations, development of a cash-based economy, and the availability of imported western food. The traditional nutritious diet consisting primarily of breadfruit, coconut, pandanus, taro, protein rich fish, chicken, and pork has been overtaken by imported canned and processed food. Alcohol, smoking, substance abuse, and the crime rate are on the rise particularly among the young. Life style changes combined with changes in the diet, have led to the increasing incidence of diabetes and the secondary complications associated with diabetes. The health of the people is moving through a transition in morbidity and mortality, so that currently more people die from non-communicable life-style diseases than from communicable diseases.

## Morbidity and Mortality Data

### Leading Causes of Death

Mortality data are reported in the *Ministry of Health, Republic of the Marshall Islands "Kumiti Ejmuur" Annual Reports for 2007-2008 and 2009* (Table 2). These data reflect all of the deaths for the RMI and are not limited to Majuro. Mortality data were aggregated for 2007-2009 and crude mortality rates per 100,000 were calculated based on the RMI 1999 census of 50,840 residents. The overall crude mortality rate for 2007-2009 was 599.3/100,000 population. The leading causes of death were sepsis (77.4), followed by cancer (47.2), diabetes-related (42.0), pneumonia (21.0), and hypertension (18.4) [Table 2].<sup>12,13</sup> These data clearly show the burden of non-communicable and their impact on mortality in RMI.

### Medical Referrals

The *Ministry of Health, Republic of the Marshall Islands "Kumiti Ejmuur" Annual Report for FY 2009* (Table 3) lists the top ten diagnoses for off-island healthcare referrals among all residents of RMI for the years 2007-2009. During FY 2007, there were a total of 124 medical referrals: 44 to Honolulu (of which 22 were referred to the Tripler Army Medical Center and

13 to Shriners' Hospital) and 80 to the Philippines. The direct referral expenses for these 124 patients were \$2,146,192 for an average cost of \$17,308 per patient. For FY 2008, there were a total of 139 referrals of which 26 were referred to Honolulu (16 to Tripler Army Medical Center, and 11 to Shriners' Hospital) and 109 to the Philippines, for a total direct referral expense of \$2,027,364 and an average cost of \$14,585 per patient. Fiscal year 2009 saw the highest number of off-island referrals of 147 patients, of which 37 were referred to Honolulu (22 to Tripler Army Medical Center, and 15 to Shriners' Hospital), and 103 to the Philippines. The total direct referral expenses for FY 2009 were \$2,512,235 with an average cost of \$17,090 per patient.<sup>13</sup>

## Population-Based Surveillance Data NCD Risk Factors STEPS Report

The data for the RMI NCD Risk Factor STEPS survey were obtained during August to October 2002 (Table 4).<sup>14</sup> Because of the wide and complex distribution of the population within the nation, the survey population (3045 individuals 15-64 years of age) was stratified into urban and rural with further sub-stratification of the urban population into Majuro (50.9% of the survey population), Ebeye (20.7%), and the rural population into outer islands (21.5%) and the nuclear exposed islands of Bikini, Enewetak, and Rongelap atolls (6.8%). The results are only available for the RMI as whole.

Data for health behaviors showed that 23.1% of the respondents reported current smoking and 19.8% reporting current alcohol use. Overall, 91.0% of the survey respondents reported consuming fewer than 5 servings of fruits and vegetables per day. For physical activity, the data show that 66.1% of the respondents had low physical activity with a higher proportion of women (70.3%) when compared to men (61.3%). Additionally, 11.5% of the respondents engaged in moderate-intensity physical activity, while 22.5% engaged in high-intensity physical activity (data not shown).

Overall, 62.5% of the survey population was overweight or obese, with the proportions increasing with age, and with a higher prevalence among females (65.4%) as compared to males (59.9%). The data among the obese population showed a four-fold increase in obesity among 25-34 year olds (41.9%) when compared to the 15-24 year olds (10.6%). Central obesity, measured as waist circumference, has been shown to correlate well with visceral fat and in association with a BMI greater than 25 in adults is a risk factor for NCDs. The data show that 35.4% of the population is centrally obese with a significantly higher proportion of females (54.2%) affected compared to males, 54.2% and 18.4%, respectively (data not shown). Based on measurements on venous samples, the prevalence of diabetes among 15-64 year old adults in the RMI is 19.6% with

Cause of Death	2007	2008	2009a	2007-2009	Rateb
Sepsis	43	44	31	118	77.4
Cancer	27	9	36	72	47.2
Diabetes related	0	0	64	64	42.0
Pneumonia	18	14	0	32	21.0
Hypertension	0	0	28	28	18.4
CPc Arrest	8	13	0	21	13.8
Mld	14	5	0	19	12.5
Suicide	0	0	14	14	9.2
Renal failure	11	0	0	11	7.2
CVAe	0	10	0	10	6.6
Uremia	7	0	0	7	4.6
Other	148	204	166	518	339.6
Total	276	299	339	914	599.3

<sup>a</sup>Only the top five causes of death listed for 2009. <sup>b</sup>Crude mortality rate/100,000 population. <sup>c</sup>Cardiopulmonary. <sup>d</sup>Myocardial infarct. <sup>e</sup>Cardiovascular accident. Data source: Kumiiti Ejmuur" Annual Report, FY 2007 and 2008<sup>12</sup> and "Kumiiti Ejmuur" Annual Report, FY 2009<sup>13</sup>

FY 2007			FY 2008			FY 2009		
Diagnosis	n	%	Diagnosis	n	%	Diagnosis	n	%
1. Orthopedic	24	19.4	1. Cancer	24	17.3	1. Orthopedic	30	20.4
2. Cancer	24	19.4	2. Ophthalmology	23	16.5	2. Cancer	23	15.6
3. Congenital	14	11.3	3. Orthopedic	19	13.7	3. Congenital	23	15.6
4. Ophthalmology	14	11.3	4. Congenital	18	12.9	4. Ophthalmology	14	9.5
5. Surgery	12	9.7	5. Cardiovascular	13	9.4	5. Cardiovascular	14	9.5
6. Cardiovascular	8	6.5	6. Surgery	8	5.8	6. Neurology	12	8.2
7. Neurology	6	4.8	7. Neurology	7	5.0	7. Int Medicine	9	6.1
8. Urology	5	4.0	8. Urology	7	5.0	8. Urology	6	4.1
9. ENT	5	4.0	9. OB/Gyn	6	4.3	9. Surgery	4	2.7
10. Int Medicine	5	4.0	10. ENT	6	4.3	10. ENT	3	2.0
Total Referred	124	100	Total Referred	139	100	Total Referred	147	100

Data source: "Kumiiti Ejmuur" Annual Report, 2007 and 2008<sup>10</sup> and "Kumiiti Ejmuur" Annual Report, 2009<sup>13</sup>

Risk Factor	% Total (N=3045)	% Male (n=1234)	% Female (n=1811)
Current smoker	23.1	39.5	6.0
Current alcohol use	19.3	33.5	4.5
Binge drinking	65.7	67.1	55.0
Consume <5 servings	91.0	91.9	90.1
Low activity	66.1	61.3	70.3
Overweight (BMI 25-29.9)	30.9	33.3	28.3
Obese (BMI ≥30)	31.6	26.6	37.1
Overweight + Obese	62.5	59.9	65.4
Central obesity	35.4	18.4	54.2
Hypertension (≥140/90)	10.5	11.6	9.3
Elevated cholesterol (≥200mg/dl)	21.6	20.3	22.9
Low HDL (≤35mg/dl)	39.1	48.8	29.1
Elevated triglyceride (≥151mg/dl)	7.8	9.5	6.0
Elevated FBS (≥126 mg/dl)	19.3	18.6	20.1
Diabetes	19.6	18.9	20.5

Data source: WHO, NCD Risk Factors STEPS Report, RMI, 2002<sup>14</sup>

a slightly higher proportion among women (20.5%) compared to men (18.9%).

Five critical risk factors for NCD, including daily smoking, overweight or obese, raised blood pressure, consuming fewer than 5 servings of fruits and vegetables, and low level of physical activity, were aggregated to examine the risk of NCD in the study population. Participants were divided into three groups: high (3-5 risk factors), moderate (1-2 risk factors) and low (no risk factors). Using this stratification, 60.2% of the study population was at high risk, 39.1% at moderate risk and only 0.7% at low risk for developing a chronic disease (Table 5). When combining these risk factors, the risk for developing NCDs is very high among the residents of the RMI and every effort should be made to address these risk factors at the individual, community, and national levels.

#### RMI High Schools Youth Risk Behavior Survey

The results of the YRBS survey (Table 6), showed that between 2003 and 2007, the proportion of students who were overweight or obese decreased from 42.6% to 40.6%. When the data are separated into overweight students and obese students and further examined, there is an overall decline in the proportion of overweight students between 2003 and 2007 (23.7% to 15.0%); whereas students who were obese steadily increased in the same period from 18.9% to 25.6%.<sup>15</sup> The data seems to indicate that overweight students are progressing to obese status rather than converting to a healthy weight. Additionally, almost one third of the students are trying to lose weight through exercise and food restriction. Dietary habits show that students continue to eat few fruits and vegetables, and a large proportion are not physically active while in school.

Combined Risk	% Total (N=3045)	% Male (n=1234)	% Female (n=1811)
High Risk	60.2	62.1	58.4
Moderate Risk	39.1	37.1	41.0
No risk	0.7	0.8	0.6

<sup>a</sup>Risk factors – daily smoking, overweight or obese, raised blood pressure, consuming fewer than 5 servings of fruits and vegetables, and low level of physical activity. Data source: WHO, NCD Risk Factors STEPS Report, RMI, 2002<sup>14</sup>

Weight and Weight Management	2003	2007
Overweight (BMI ≥85% and <95%)	23.7	15.0
Obese (BMI ≥95%)	18.9	25.6
Overweight + Obese	42.6	40.6
Trying to lose weight	34.8	37.1
Exercised to lose weight	60.8	61.3
Ate less food to lose weight	56.5	52.5
Dietary Behavior	2003	2007
Ate fruit 1+ times in past 7 days	80.7	77.0
Ate green salad 1+ times in past 7 days	65.4	59.9
Physical Activity	2003	2007
Attended PE 1+ days	57.9	55.9
Attended PE class daily	14.9	14.7
Watched TV 3+ hours per day	24.0	19.3
Played on team sports past 12 months	65.5	63.3

Data source: High School YRBS, Marshall Islands, 2003-2007<sup>15</sup>

## Diabetes Specific Data

### Diabetes Prevalence

Based on the findings of the NCD-STEPs survey, the prevalence of diabetes among 15-64 year old adults in the RMI is 19.6% with a slightly higher proportion among women (20.5%) compared to men (18.9%). A Microsoft Excel-based data file is used to record patient encounters in the Public Health Diabetes Clinic. However, it is unable to perform the functions of a clinical care database or produce aggregated summary reports of patients or services rendered. Currently, there are 533 patients listed in the database, but no summary reports or other information can be aggregated or extracted from the data system.

## Description of the Administrative System

### Legislation and Regulations

RMI legislation provides the Ministry of Health the overall authority to provide for the health, safety, and welfare of the residents of RMI and laws on tobacco control, prohibition of smoking in public areas, and food safety:

(1) *Title 7 Public Health, Safety and Welfare, Chapter 1 Public Health and Sanitation* is an Act to provide for the health, safety and welfare of the people of the Republic through the establishment of health services, and control of sanitation, and related matters.

(2) *Title 7 Public Health, Safety, and Welfare, Chapter 17 Tobacco Control* aims to reduce tobacco use and its consequent harm by: (a) protecting children and other nonsmokers from inducements to use tobacco; (b) protecting nonsmokers from exposure to tobacco smoke; (c) ensuring that the population is adequately informed about the risks of tobacco use and exposure to second hand tobacco smoke and about the benefits of quitting smoking; (d) promoting a climate where nonsmoking and the absence of tobacco promotion is the norm.

(3) *Title 7 Public Health, Safety, and Welfare, Chapter 8 Prohibition of Smoking* prohibits smoking in public premises and public vehicles (4) *Public Law 2010-37, Food Safety Act 2010* is an Act to authorize the RMI government to provide for the health, safety and welfare of the people by prohibiting the importation, production, processing, handling, distribution, and domestic trade of unsafe, unwholesome and poor quality food.

### Planning Documents

KUMIT (*Komaron Ukot Mour Ilo Tomak – You can change life based on belief*) is the RMI NCD/Nutrition Strategy for 2008-2013. The KUMIT was based on the results of the 2002 NCD Risk Factors STEPS survey that revealed significant risk factors that contributed to the increasing rates of morbidity and mortality due to chronic illnesses among RMI residents. KUMIT has been used to guide the planning and implementation of policy, programs, services, and activities to address non-communicable diseases and nutrition issues in the RMI. This plan is based on the Ministry of Health's theme, "*health is a shared responsibility*" and involves government agencies, community groups, and non-governmental organizations in the implementation of the activities.

The NCD/Nutrition planning framework is built around six components: (1) NCD/Nutrition organization; (2) Tobacco and betel nut control; (3) Alcohol control; (4) Physical activity; (5) Healthy eating; and (6) Monitoring, evaluation, and surveillance. Strategies and activities were developed to meet the 2012 national targets through the implementation of the plan. These targets include: (1) Reduce the prevalence of risk factors (tobacco smoking, physical inactivity, consumption of fruits and vegetables, and alcohol use) by 10%; (2) Reduce the prevalence of iron deficiency anemia by 10%; (3) Increase exclusive breastfeeding by 10%; (4) Reduce the prevalence of diabetes by 10%; (5) Reduce hospital admission rates attributable to NCD by 10%; (6) Reduce the rate of amputation by 50%, and (7) Reduce cardiovascular mortality by 10%.<sup>16</sup>

### Policy and Procedure Manual

There are no policies and procedures manuals for the Majuro Hospital Diabetes Clinic or the Public Health Diabetes Clinic. In a conversation with Dr. R. Maddison (October 21, 2010), it was reported that he is working with the Diabetes Task Force to

review and adapt the Diabetes Performance Measures: Majuro Hospital Diabetes Clinic (Table 7) that will establish the basic guidelines and standards for the provision of clinical services for patients with diabetes.

### Funding and Resources

Major funding sources to support the administration and activities include \$86,000 from the CDC for diabetes prevention and control; \$100,000 for activities related to the prevention and control of tobacco use; and \$100,000 from the American Recovery and Reinvestment Act of 2009 (ARRA) to work with communities to develop policies for nutrition, physical activity, and tobacco control. Funds from international sources include \$50,000 every two years from WHO to develop and implement small projects in the communities related to physical activity, nutrition, food safety, and health promotion in schools. Additional international funds of \$120,000 are provided by the WHO-SPC (2-1-22 Program) to help implement the activities described in the KUMIT. These major sources of funding are received by the Ministry of Health in Majuro and distributed to the Bureaus of Kwajalein Atoll and Outer Islands.

### Health Insurance

The Republic of the Marshall Islands, Ministry of Health, Supplemental Health Plan enables subscribing members to access approved medical facilities in Hawai'i and obtain services such as routine doctor visits not covered under the Basic Health Plan. The Supplemental Health Plan is open to all residents of the Marshall Islands, Marshallese working as Foreign Mission employees, and full-time students studying overseas. In the Marshall Islands, benefits under the Basic Health Plan include all health care provided at an approved Provider Facility. Outside of the Marshall Islands, benefits under the Basic Health Plan include health care approved by the National Medical Referral Committee and emergency care when traveling and provided within 30 days of departure. The Supplement Health Plan pays for services according to the schedule of benefits (80% of approved services with 20% co-pay) up to an annual maximum of \$100,000 per person after an annual deduction of \$200. The monthly premium for a single resident is \$60, whereas the premium for a family up to five members is \$180, and \$240 for a family of 6-10 members. In 2009, there were 1,046 enrollees in the Supplemental Health Plan, which represents 1.9% of the estimated 2009 population of 54,065 residents.<sup>13</sup>

### Partnerships and Collaborations

The DPCP established several working partnerships with local community groups and with international organizations. Local collaborations with groups in the RMI include: (1) National Women's Organization, to support their annual meeting and provide training, screening, and educational materials to the women; (2) Youth to Youth in Health to conduct health campaigns in tobacco cessation, physical activity, and nutrition through educational sessions and community outreach to include radio spots, flyers, posters, and educational materials; (3) The

Table 7. Diabetes Performance Measures: Majuro Hospital Diabetes Clinic, 2010	
Measure	Performance Criteria
Frequency of visits	If meeting goals: Every 4-6 months If not meeting goals: Every 3 months or as indicated
Fasting or random blood sugar	Every diabetic visit
Weight/Height (BMI)	Every visit
Cardiovascular assessment	BP every visit EKG/CXR: Baseline PRN ASA therapy for patients >40 years old K+ level: Once or if indicated
Feet examination	Foot exam without shoes/socks: Every visit Lower extremity sensory exam: Perform a comprehensive vascular, neurologic, musculoskeletal, skin and soft tissue exam at least once a year (See Diabetes Foot Screening Form)
Eye examination	Dilated eye examination yearly (Type 2) Dilated eye examination 3-5 years (Type 1)
Lipid profile	Initial diagnosis: Total cholesterol and triglycerides • If total cholesterol >200mg/dl: Lipid counseling • If total cholesterol >240mg/dl: Check HDL and LDL, start statins If meeting goals: Annual or as indicated If not meeting goals: Every 3-4 months or as indicated
Hemoglobin A <sub>1c</sub>	Every 3-6 months
Creatinine	Annual or every 3-6 months if abnormal
UA for Microalbumin	Annual: If >30mg, start ACE inhibitor
Flu vaccine	Annual
Pneumovax	Once
Tetanus toxoid	Every 10 years
Nutritional therapy	2 or more per year
Health Education/Self-Management Training	SBGM: Blood glucose monitoring should be encouraged in all patients to help reach and maintain treatment goals • Education visits: 1 or more per year • Educational needs should be assessed at time of diagnosis and when there is poor clinical control or a major change in therapy • Self-management education needs and plans should be documented in the medical record and acknowledged by all providers
Oral/Dental screening	Annual
Smoking cigarettes	Advise to quit smoking: Every visit
Other metabolic conditions	Uric acid: Annual CBC: Once or as indicated

Data source: Personal communication, Dr. R. Maddison (October 21, 2010)

Men's Organization to establish garden projects at churches and provide training and education on agriculture and nutrition; (4) Community Health Volunteers for women to promote physical activity in the community such as: organize walks and weight loss competitions, and organize health screening in communities that includes measurements for BMI, and waist circumference; (5) *Momman in Keimokran Ilo Ejmour* (Men's Church Group from different denominations) to organize community activities and collaborate with Ministry of Health to provide training; assessment for NCD needs; screening for obesity, HTN, diabetes, and establish mini-projects in the communities that include sports activities and gardening; and (6) Diabetes Wellness Center to provide nutrition training and staff funding for physical activities in the program.

The collaboration with international organizations includes: (1) UNICEF sponsored Vitamin A campaign for children 6 months to 4 years of age; (2) Volunteer dietitian from Japan assigned to Health Promotion and Disease Prevention Program for two years; (3) Two health consultant trainers, funded by Taiwan, for the National Training Workshops that provides train the trainer sessions for teachers and health care providers on diet, nutrition, and physical activities targeting young children in the schools.

### Research

No known research activities related to NCDs or diabetes are currently conducted in the RMI.

## Description of Clinical Services System

### Medical and Health Professionals

In the RMI, three bureaus provide the direct health care services: The Bureau of Majuro Atoll Health Care Services (BMAHCS), the Bureau of Kwajalein Atoll Health Care Services (BKAHCS), and the Bureau of Outer Islands Health Care Services (BOIHCS). The health and medical care providers in these bureaus provide: (1) Clinical care services in the hospitals, health care centers, and as outreach activities; (2) Primary health care and preventive services in the hospital, health care settings, schools, communities, and house-to-house outreach; (3) Health promotion and education activities and special projects with community groups; and (4) Data collection to monitor health indicators, health care provision, and assessment of the health care system.

Under the Bureau of Majuro Atoll Health Care Services (BMAHCS), there are three facilities—the Leroij Atama Zedkeia Medical Center with 101 beds, the Laura Health Center, and the Rongrong Health Center. In addition, there are four private clinics that provide services and include the Majuro Clinic (medical services), Capital Dentistry (dental services), and the Eyesight Professional, and Opticare (optometry services). Table 8 lists the medical and allied health personnel for each of the three bureaus.<sup>13</sup>

### Outreach and Prevention

The Health Promotion and Disease Prevention (HPDP) Program staff provides a variety of outreach and prevention services that include, community presentations on diabetes risk factors, nutrition, and physical activity that are supported with educational brochures and materials, radio spots, posters, and announcements; school presentations and activities that engage the students around nutrition and physical activities; and health fairs, church gatherings, and community events. A major event is the “train the trainers” workshop for teachers, which is held during the summer and before school begins. The educational sessions provide “back to school tips” for teachers and students, and cover food safety, the importance of eating well, hand washing, and the importance of physical activities. A major annual event is the “Legislator Luncheon” which provides education and information to legislators to increase their awareness of health issues and the policies required to address the problems. Success of the previous Legislator Luncheon led to a law that banned the selling of betel nuts in the Marshall Islands. In the future, the Legislator Luncheon will focus on national policies to ban the sales and distribution of junk food to students in and around the schools.

There is an equivalent of 9.3 full time positions in both the HPDP program and public health nursing that provide these outreach and prevention services in the community—14 public health nurses (at 50% FTE each) provide outreach and prevention activities; one Outreach Worker (50% FTE) and one Health Educator (80% FTE) for outreach and prevention activities in the community; and one Physical Activity Coordinator who conducts physical activity programs in the Diabetes Wellness Center (50% FTE) and provides community-based activities

Table 8. Medical Providers, RMI Ministry of Health Bureau, 2009

Position	BMAHCS <sup>a</sup>	BKAHCS <sup>b</sup>	BOIHCS <sup>c</sup>	Total
<b>PHYSICIANS</b>				
Family Practitioner	9	2	1	12
General Practitioner	0	0	1	1
Internist	1	1	0	2
Pediatrician	2	1	0	3
Ob-Gynecologist	2	2	0	4
Ophthalmologist	1	0	0	1
Psychiatrist	1	0	0	1
Orthopedic surgeon	1	1	0	2
General surgeon	1	2	0	3
Urologist	0	1	0	1
Radiologist	1	0	0	1
Pathologist	1	0	0	1
Anesthesiologist	1	2	0	3
SUBTOTAL	21	12	2	35
<b>ALLIED HEALTH</b>				
Medical Assistant	3	0	0	3
Health Assistant	5	0	56	61
Dentist	5	2	0	7
Graduate Nurse – PH	26	8	-	34
Graduate Nurse – Clinical	72	22	-	94
Practical Nurse – PH	12	10	-	22
Practical Nurse - Clinical	18	0	-	18
Nurse Aide – PH	4	0	-	4
Nurse Aide - Clinical	23	0	-	23
SUBTOTAL	168	42	56	243
GRAND TOTAL	189	54	58	278

<sup>a</sup>Bureau Majuro Atoll Health Care Services. <sup>b</sup>Bureau Kwajalein Atoll Health Care Services. <sup>c</sup>Bureau Outer Islands Health Care Services. Data source: “Kumiti Ejmuur” RMI Annual Report, FY 2009<sup>13</sup>

(for remaining 50%). There are needs for further education and training of outreach and prevention staff to include sessions on: communication skills, public relations, the nutritional value of foods (calories, sodium, fat, sugar), and self-managing diabetes and its complications.

### Screening and Diagnosis

Diabetes screening services are provided, upon request by the patient, in a variety of settings that include, regular clinic visits, outreach activities at the workplace, health fairs, special community events, and church events. There are no written criteria to determine people at risk who should be screened or written protocols for follow up for patients with elevated blood glucose levels. Patients who screen positive for diabetes are given a referral to the next Tuesday morning clinic for their first visit with fasting blood sugar values. There is a need to develop policies and procedures or standards for diabetes screening and referral for patients who screen positive.

## **Treatment and Management**

Treatment and management services for patients with diabetes are provided in the Majuro Hospital Diabetes Clinic by the public health staff. There are no policies and procedures or standards to provide the guidance to assure that the services patients are receiving are consistent, comprehensive, and high quality. Patients are also given the choice of selecting a care provider between public health physicians in the clinic or physicians that provide curative services in the hospital as outpatients. Because there are no mechanisms for linkage between the “public health” physicians and the “curative” physicians there is fragmentation and loss of continuity in the care for patients with diabetes and other chronic diseases.

## **Renal Dialysis**

On October 22, 2010, the RMI Minister of Health and the Ambassador from Taiwan dedicated and opened the new Majuro Dialysis Center. The Taiwan government donated two dialysis units and the Taiwan Health Center worked with the Ministry of Health to prepare the facility and provide opportunities for two nurses and one physician to receive extensive training on renal dialysis in Taiwan. The dialysis center will be open to provide services to patients in Majuro when staff training is completed.

## **Foot Care Clinic**

The prevalence of lower limb amputations secondary to the complications of diabetes has been a problem in the RMI for many years. In 2004, there were 81 patients that required amputations with a gradual decline to 53 patients in 2006. However, by 2008, there was a 24% increase in the rate of amputations and a peak of 82 patients who required an amputation in 2009. As a result of these data, the DPCP and the Public Health Diabetes Clinic in collaboration with WHO, the Taiwan Health Center, and the Ministry of Health Rehabilitation Unit developed the Diabetes Foot Care (DFC) Clinic in January 2010. The DFC Clinic is conducted on Monday and Friday mornings with a maximum of 10 patients per session to ensure that all patients receive nutrition counseling, tobacco cessation education, and comprehensive foot screening. Data were obtained in a conversation (October 21, 2010) with I. deBrum, Director of Health Promotion and Disease Prevention Program and the Chief of the Physical Therapy Program. During January through September, 2010, there were a total of 346 new patients referred to the DFC Clinic and provided comprehensive services, an additional 254 patients were seen for follow-up care and 86 patients were referred to the Diabetes Wellness Center for their intervention program.

The data for amputations for a 9-month period in 2010 revealed that 62 patients required amputation of the lower extremity secondary to the complications of diabetes. However, the data does not differentiate between patients living on Majuro and patients from the outer islands. It would be important to stratify the data based on patient residence because the DFC Clinic and the Diabetes Wellness Center program in their efforts to prevent amputation are available to patients on Majuro and it

has been recognized that a large number of patients requiring amputation are being referred from the outer islands.

## **Diabetes Wellness Center**

Between 2002 – 2005, the Canvasback Mission conducted a research project involving patients diagnosed with diabetes to determine if changing lifestyle behaviors, diet, and physical activity can have a positive impact in weight, blood sugar, cholesterol, triglycerides, and Hb A<sub>1c</sub> measurements. Information and data were obtained in a conversation with T. Smith, Director of the Diabetes Wellness Program (October 19, 2010). Two cohorts of 60 clients each were selected. The control group received blood glucose monitoring and the intervention group received blood glucose monitoring, education on healthy lifestyles including how to eat healthy foods, cooking demonstrations, and exercise. After following the two cohorts for 12 weeks, there were significant positive results in all the measurements in the intervention group when compared to the control group. In 2006, based on the results of this research project, the interventions were used to develop the lifestyle and behavioral change program at the Diabetes Wellness Center. Since that time, there have been 13 cohorts of approximately 40 participants who start the program and an average of 30 participants graduate in each cohort from the program. This intervention continues with the 14<sup>th</sup> cohort starting in October 2010. In each cohort, among those participants who complete the program, there is evidence of significant improvements in the majority of participants for several of the body and biochemical parameters measured.

In addition to the diabetes wellness intervention, the Center also has a restaurant and a bakery that is open to the public and serves a buffet breakfast and lunch. Meals are discounted for participants in the wellness intervention program. The restaurant serves between 30 to 40 people per day. There are also daily exercise programs that are open to the public, and two garden projects on the hospital grounds—one produces the vegetables used in the restaurant and the other garden is for the participants. The garden project is an important component of the wellness program because it provides an opportunity for physical activity, produces the vegetables for the cooking demonstrations, and supports and promotes the message of “healthy lifestyles”.

## **Hyperbaric Chamber**

The Republic of the Marshall Islands has one hyperbaric chamber located at the Majuro Hospital. To date, 13 patients at risk for lower limb amputation have been treated in the chamber and amputation of the lower extremity was prevented in ten of the patients.

## **Description of the Support Services System Diabetes Health Education Materials**

The DPCP currently uses culturally appropriate diabetes and other NCD educational materials and brochures in Majuro. Examples of these materials include: How Do You Get Diabetes? (*Kwjela ke owi wawein?*) You Should Stop Eating Fatty Food



(*Kwon kadiklok am mōñā mōñā ko rokuriij*), Youth - Health Guide (*Jodrikdrik Ran, Reitok Mōk*), Control Your Diabetes For Life (*Kejbarok Naninmej In Tonal Eo Ibbam Toon Wot Am Mour*), Small Steps Big Rewards, 10,000 Steps, Benefits of Physical Activity (Papa Ola Lokahi, Pacific Diabetes Education Program);<sup>17</sup> Types of Foods for Diabetes and Nutritional Tips, Basic Food Groups, Healthy Lifestyles, and Diabetes Prevention and Management in the Pacific Islands (SPC);<sup>18,19</sup> and You Can Control Your Diabetes: Health Passport (Taiwan Health Center and the RMI Ministry of Health).<sup>20</sup>

### Pharmacy Services

The pharmacy at the Majuro Hospital provides pharmaceutical services to the inpatient facility, the public health clinics, and the dispensaries. The pharmacy is staffed by one pharmacist and four pharmacy technicians.

The medications available for the control of diabetes include: Metformin, Glyburide, and insulin. The pharmacy does not provide syringes or needles for the injectable insulin, nor glucometers or strips; however, needles and syringes may be obtained from hospital supply. Other medications commonly used by patients with diabetes with co-morbid conditions include: statin and anti-hypertensive medications (Analpril, Atenolol, Nifedipine).

Administrative issues include: (1) The medication/drug ordering and procurement process is cumbersome and time-consuming; (2) There are multiple drug vendors and the quality of the drugs from foreign pharmaceuticals is questionable due to varying or unknown regulatory practices; (3) There is inadequate space for storage of medications and supplies; (4) There is a need for an inventory management system; and (5) There are training needs for the pharmacy technicians including: patient counseling on drug use and side effects, basic pharmacology, customer service, and dosage calculations.

### Laboratory Services

All of the basic laboratory tests are available for diagnosing and monitoring the treatment and management of patients with diabetes. These laboratory tests include: blood glucose, Hemoglobin A<sub>1c</sub>, total cholesterol, triglycerides, urinalysis for microalbuminuria, and renal function tests. No major problems were reported.

### Description of the Data System

The current data system is a Microsoft Excel-based spreadsheet that documents patient encounters in the Public Health Diabetes Clinic. Currently, there are 533 active patients listed in the program, however, no other information can be extracted from the data system. In addition, there are no policies and procedure manuals for data collection, data entry and data management and reporting. Currently the spreadsheet is populated with data extracted from the medical records and there are no data collection forms, and no summary reports.

RMI plans to implement the Chronic Diseases Electronic Management System (CDEMS) in Majuro and eventually convert

the Patients Electronic Care System (PECS) that is now being used in Ebeye to CDEMS so that there will be consistency in data collection and management in the two major sites in the Marshall Islands. The Director of IT Services received training on the development and implementation of the CDEMS data system. In October 2010, a pilot project was initiated at the Majuro Hospital Public Health Diabetes Clinic and conducted on the days that the diabetes clinic is open. The Director of IT Services and the NCD Coordinator attend the clinic to collect data using CDEMS data forms that are completed by the physicians and enter the data into the CDEMS database. With the successful implementation of the CDEMS in the Majuro Hospital, the system will be expanded to include the Laura Health Center and the Diabetes Wellness Center.

### Conclusion: Prioritized Issues and Needs

Some of the highest rates of diabetes and other chronic diseases are experienced by Pacific Islanders. To begin to address this situation, the first step is to identify and describe the burden of chronic diseases and diabetes, describe the programs and agencies responsible for providing the health and medical care to patients, and assess the capacity of the administrative and clinical system of services to provide the infrastructure to address the problems. This report presents the issues and problems that need to be addressed to make a positive impact on the disparities in health caused by NCDs.

Mortality data show that sepsis, cancer, diabetes-related, pneumonia, and hypertension were the leading causes of death in the RMI. Findings from RMI NCD-STEPPS surveys reveal that low consumption of fruits and vegetables, lack of physical activity, and lifestyle behaviors are associated with overweight and obesity. Overall, 62.5% of the population is overweight or obese starting with 34.5% of the 15-24 year olds and dramatically increasing to 74.2% of the 25-34 year olds. These data suggest that there is a trend of significant weight gain between the late adolescent years and early adulthood and identifies a prime intervention period to implement health campaigns aimed at preventing obesity. Data on the overall prevalence of diabetes for Majuro are not available, however, based on the NCD-STEPPS survey for RMI, the prevalence of diabetes among 15-64 year old adults is 19.6% with a slightly higher proportion among women (20.5%) as compared to men (18.9%). Although chronic disease surveillance system data, local population survey data, vital statistics, and program data exist,<sup>21</sup> 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.

The description of the system of services reveals that there is one major planning document – the RMI NCD/Nutrition Strategy for 2008-2013 (known as the KUMIT) that is based on the findings of the NCD-STEPPS Survey. This document will guide the planning and implementation of policies, programs, services, and activities to address NCD and nutrition issues. There is

Table 9. Administrative Issues Priority Ranking		
Priority Rank	Issue/Need	Average Score <sup>a</sup>
1	Need to encourage and gain commitment for the implementation of the activities defined in the KUMIT	11.7
2	Need to develop policy and procedures for the provision of services for diabetes and NCDs	15.7
3	Need for training of Diabetes and NCD Staff on data analysis reporting, and utilization	16.0
4	Need to address the limitation of funding and resources for diabetes and NCDs	20.3
5	Need to repeat the NCD STEPS survey in 2012	26.3
6	Need to encourage research on all aspects of diabetes and NCDs	36.0

<sup>a</sup>Lower the score, higher the priority

Table 10. Clinical Issues Priority Ranking		
Priority Rank	Issue/Need	Average Score <sup>a</sup>
1	Need for a team and "1-Stop" approach to providing comprehensive care in the PH Diabetes Clinic	23.6
2	Need for training of Outreach Staff on: communication skills, public relations, nutrition value of foods, self care management	24.9
3	Need for policy/procedures for follow-up of referrals of patients who are screened positive	25.8
4	Need for specialty training on diabetes treatment and management for physician(s) and nurse(s)	27.3
5	Need to educate patients and families on diabetes self-management skills	27.4
6	Need for a Legislative Luncheon to increase awareness and educate on diabetes and NCD issues	31.1
7	Need for standards on test values for screening - review ADA and IDF standards	33.0
8	Need to identify a physician to be trained for the Hemodialysis Center	33.6
9	Need to address the problems in the pharmacy: ordering and procurement, inventory, storage, quality of drugs and training of Pharmacy Staff: basic pharmacology, patient counseling, customer service, dosage calculation	36.3

<sup>a</sup>Lower the score, higher the priority

little coordination or communication between the health care providers in the hospital and public health clinics. There is no policy and procedure manual for the hospital or public health diabetes clinics, however, the Diabetes Performance Measures are being developed that will establish the basic guidelines and standards for providing clinical services for patients with diabetes in both the hospital and public health clinics. There are also several administrative issues in the pharmacy that need to be addressed.

Based on these findings (Table 9) the top three administrative priority needs identified by the assessment participants included: (1) Need to encourage and gain commitment for the implementation of the activities defined in the KUMIT; (2) Need to develop and implement policy and procedures for the provision of services for diabetes and NCDs; and (3) Need for training of Diabetes and NCD staff on data analysis reporting, and utilization. The top three clinical priority needs identified (Table 10) included: (1) Need for developing a team and "one-stop" approach to providing comprehensive care in the Public Health Diabetes Clinic; (2) Need for training of outreach staff on communication skills, public relations, nutritional value of foods, and self-care management; and (3) Need for policy and procedures for follow-up of referrals of patients who are screened positive. Tables 9 and 10 list the priority ranking of the issues and needs.

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### Authors' Affiliation:

- Pacific Chronic Disease Coalition, Atlanta, GA (HMI)
- Republic of the Marshall Islands, Ministry of Health (ID, SK, JL)
- College of Public Health, University of Iowa, Iowa City, IA (NA)

### Correspondence to:

Henry M. Ichiho MD, MPH; c/o Augusta Rengiil, Executive Director, Pacific Chronic Disease Coalition; Ph: (680) 587-2010; Email: pcdc10@gmail.com

## References

1. Pacific Islands Health Officers Association. Board Resolution #48-01: Declaring a Regional State of Health Emergency Due to the Epidemic of Non-Communicable Diseases in the United States-Affiliated Pacific Islands. May 24, 2010. [http://www.palau-health.net/images/NCD\\_Declaration.pdf](http://www.palau-health.net/images/NCD_Declaration.pdf). Accessed October 31, 2012.
2. Ichiho H, Aitaoto N. Assessing the system of services for chronic diseases prevention and control in the US-affiliated Pacific Islands: Introduction and methods. *Hawaii J Med Public Health*. 2013;72(5 Suppl 1):5-9.
3. Embassy of the Republic of the Marshall Islands, Washington D.C. Geography Web site. <http://www.rmiembassyus.org/Geography.htm>. Accessed October 5, 2010.
4. Embassy of the Republic of the Marshall Islands. Washington D.C. Culture Web site. <http://www.rmiembassyus.org/Culture.htm>. Accessed October 5, 2010.
5. Infoplease: Part of the Family Education Network Web site. Marshall Islands Web site. <http://www.infoplease.com/ipa/A0107767.html>. Accessed September 20, 2010.

6. Marshall Islands Visitors Authority. Iokwe Web site. <http://www.visitmarshallislands.com>. Accessed September 5, 2010.
7. Kroon E, Ravi R, Gunawardane K, Briand K, Riklon S, Soe T, Diaz Balaoing GA. Cancer in the Republic of the Marshall Islands. *Pacific Health Dialog*. 2004;11(2):70-77.
8. Central Intelligence Agency. The World Factbook, Australia-Oceania: Marshall Islands Web site. <https://www.cia.gov/library/publications/the-world-factbook/geos/rm.html>. Accessed April 25, 2012.
9. U.S. Department of State. Background Notes: Marshall Islands Web site. <http://www.state.gov/r/pa/ei/bgn/26551.htm#>. Accessed March 15, 2012.
10. Economic Policy, Planning and Statistics Office. *Statistical Yearbook, 2002*. Majuro, Republic of the Marshall Islands: Economic Policy, Planning and Statistics Office; 2002.
11. Economic Policy, Planning and Statistics Office. *Summary of Key Findings, RMI 2006 Community and Socio-Economic Survey*. Majuro, Republic of the Marshall Islands: Economic Policy, Planning and Statistics Office; No date.
12. Ministry of Health. "Kumiti Ejmuur" *Annual Report, FY 2007 and 2008*. Majuro, Republic of the Marshall Islands: Ministry of Health; 2008.
13. Ministry of Health. "Kumiti Ejmuur" *Annual Report, FY 2009*. Majuro, Republic of the Marshall Islands: Ministry of Health; 2009.
14. World Health Organization, Western Pacific Region and the Ministry of Health, Republic of the Marshall Islands. *NCD Risk Factors STEPS Report: Ministry of Health, Republic of the Marshall Islands, 2002*. Suva Fiji: World Health Organization; 2007.
15. Centers for Disease Control and Prevention. Youth Online: High School YRBS, Marshall Islands 2003-2007 Results Web site. <http://apps.nccd.cdc.gov/YouthOnline/App/Results.aspx>. Accessed March 12, 2011.
16. Ministry of Health. *KUMIT (Komaron Ukot Mour Ilo Tomak), Republic of the Marshall Islands Noncommunicable Disease (NCD)/Nutrition Strategy 2008-2012*. Majuro, Republic of the Marshall Islands: Ministry of Health; No date.
17. Papa Ola Lokahi. Pacific Diabetes Education Program Web site. <http://www.pdep.org>. Accessed September 5, 2012.
18. Secretariat of the Pacific Community. Featured publications Web site. <http://www.spc.int/en/featured-publications.html>. Accessed September 5, 2012.
19. Secretariat of the Pacific Community. Healthy Pacific Lifestyles Web site. [http://www.spc.int/hpl/index.php?option=com\\_docman&Itemid=5](http://www.spc.int/hpl/index.php?option=com_docman&Itemid=5). Accessed September 5, 2012.
20. Taiwan Health Center in the Republic of the Marshall Islands, Taipei Hospital, Department of Health, Ministry of Health, Republic of the Marshall Islands. *You can control your diabetes: Health passport*; No date.
21. Hosey G, Ichiho H, Satterfield D, Dankwa-Mullan I, Kuartei S, Rhee K, et al. Chronic disease surveillance systems within the US associated Pacific Island jurisdictions. *Preventing Chronic Disease* 2011; 8(4):A86. [http://www.cdc.gov/pcd/issues/2011/jul/10\\_0148.htm](http://www.cdc.gov/pcd/issues/2011/jul/10_0148.htm).