

196 investigated further.

197 Palau was the only country in Oceania which did not have any available data concerning
198 the population prevalence of raised blood glucose prior to the present survey,¹⁴ despite the fact
199 that Pacific island countries have some of the highest rates of diabetes in the world.^{1,2} This
200 survey showed that more than 20% of the participants had diabetic level hyperglycemia, and
201 more than 60% of the participants had ADA-defined impaired fasting glycemia (IFG) or
202 diabetes (≥ 100 mg/dL). It is known that diabetes, if untreated for years, causes serious
203 complications such as diabetic retinopathy, nephropathy, and neuropathy, as well as ischemic
204 cardiac diseases. Urgent actions are needed to screen and control blood glucose of the
205 population in Palau.

206 Although the evidence of health impacts of the given risk factors has been identified
207 around the world, a limited number of those studies were conducted in the Pacific Islands. As
208 of today, most of the countries and territories in the Pacific region have accessible data of the
209 key NCD risk factors for their population, such as those from the WHO STEPS surveys. All
210 of these data could be potentially used for further studies to investigate local characteristics of
211 NCDs for the islanders. In addition, comparisons across the island countries have also become
212 possible, because of the standardized methodology used for the data collection.

213 There are some limitations in the present survey that merit discussion. We could not obtain
214 valid variables on fruit and vegetable intakes by servings, standard amounts of alcohol

215 consumption, and quantity of physical activity due to inappropriate methods of the interviews.
216 Regarding blood tests, capillary whole blood samples were applied to the dry chemistry
217 method. Although the device has been calibrated for plasma automatically, the results might
218 not correspond to those done by venous plasma samples at the laboratory, the standard method
219 for measuring and reporting glucose concentrations in blood. Accordingly, the criteria of
220 appropriate cutoffs might be different from those we adopted in this article.

221 In conclusion, this survey has provided useful baseline epidemiological data on the major
222 NCD risk factors, with very high prevalence on both behavioral and biological risk factors.
223 On the basis of this survey, policymakers could develop more effective and efficient NCD
224 prevention or control strategies for the public.

225

226 **ACKNOWLEDGMENTS**

227 The authors wish to thank staff members of the Bureau of Public Health, Ministry of Health,
228 Republic of Palau for the data collection. Appreciation is also given to the Regional Office for
229 the Western Pacific, WHO for the full financial and technical support during the survey. The
230 content is solely the responsibility of the authors and does not necessarily represent the
231 official views of the Palauan Government or the WHO. This paper is part of a joint research
232 project between Palau and Japan, supported by the Health and Labour Sciences Research
233 Grants for Research on Global Health Issues (H24-chikyukibo-ippan-004) to A.A. from the

234 Ministry of Health, Labour and Welfare, Government of Japan.

235 Conflicts of interest: None declared.

236

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Table 1 Characteristics of participants aged 25-64 years in Palau NCD STEPS survey, 2011-2013 (valid %)

Age group of years	Male					Female				
	25-34	35-44	45-54	55-64	Total	25-34	35-44	45-54	55-64	Total
Number	193	295	318	240	1046	188	312	379	259	1138
Educational attainment										
primary or lower	18.5	15.4	19.9	16.8	17.7	11.8	12.8	13.4	20.2	14.5
secondary	40.7	45.1	38.3	41.2	41.3	31.0	41.0	42.2	34.2	38.2
college or higher	40.7	39.6	41.8	42.0	41.0	57.2	46.2	44.4	45.5	47.3
number of missing	4	2	2	2	10	1	0	5	2	8
Marital status										
single	53.9	22.1	16.7	8.8	23.3	43.5	19.9	10.6	7.4	17.9
married/cohabiting	44.5	71.4	72.2	76.9	68.0	51.1	69.6	69.6	62.1	64.8
divorced/separated	1.6	6.1	8.8	8.0	6.5	4.3	7.8	10.3	10.5	8.7
widowed	0.0	0.3	2.2	6.3	2.2	1.1	2.6	9.5	19.9	8.6
number of missing	2	1	1	2	6	2	6	1	3	12
Annual household income (USD)										
<5000	35.5	24.1	22.3	26.5	26.2	31.6	27.3	26.3	27.0	27.6
5000-9999	34.3	36.0	35.7	29.6	34.1	28.3	25.4	23.1	19.5	23.7
10000-14999	7.2	14.9	15.9	16.1	14.1	18.4	15.4	18.3	19.1	17.7
15000-19999	8.4	7.7	7.1	7.6	7.6	9.9	8.5	8.9	8.8	8.9
≥20000	14.5	17.2	19.1	20.2	18.0	11.8	23.5	23.4	25.6	22.1
number of missing	27	34	35	17	113	36	52	41	44	173
Smoking										
non-smoker	41.5	47.5	43.1	41.3	43.6	60.1	63.1	60.9	62.2	61.7
ex-smoker	26.4	29.5	34.0	36.7	31.9	28.7	28.5	29.8	27.4	28.7
current smoker	32.1	23.1	23.0	22.1	24.5	11.2	8.3	9.2	10.4	9.6
Betel nut and tobacco chewing										
non-chewer	55.4	50.2	57.9	64.2	56.7	42.0	42.6	46.7	52.9	46.2
current chewer	44.6	49.8	42.1	35.8	43.3	58.0	57.4	53.3	47.1	53.8
Tobacco product use										
non-user	35.8	34.6	41.8	48.3	40.2	36.7	38.8	42.2	49.0	41.9
current user	64.2	65.4	58.2	51.7	59.8	63.3	61.2	57.8	51.0	58.1
Alcohol drinking										
non-drinker	19.7	17.3	23.6	24.6	21.3	31.9	35.3	35.9	45.6	37.3
ex-drinker	25.9	30.2	31.1	31.3	29.9	35.6	41.3	40.1	40.9	39.9
current drinker	54.4	52.5	45.3	44.2	48.8	32.4	23.4	24.0	13.5	22.8
Fruit intake (day/week)										
0-1	41.6	46.2	43.4	42.9	43.7	41.0	36.2	31.6	23.0	32.4
2-4	42.6	32.4	38.6	38.3	37.5	41.0	39.7	40.2	45.1	41.3
≥5	15.8	21.4	18.0	18.8	18.7	18.0	24.0	28.2	31.9	26.2
number of missing	3	5	7	0	15	5	0	3	2	10
Vegetable intake (day/week)										

0-1	9.9	12.6	15.7	20.2	14.8	10.8	8.7	8.8	8.1	8.9
2-4	39.1	42.5	44.1	42.9	42.4	37.6	36.5	37.9	36.4	37.2
≥5	51.0	44.9	40.3	37.0	42.8	51.6	54.8	53.3	55.4	53.9
number of missing	1	1	5	2	9	2	0	2	1	5
Body mass index (kg/m ²)										
<18.5	0.5	1.1	0.3	1.7	0.9	3.8	1.0	0.8	1.6	1.5
18.5-24.9	34.6	24.0	22.2	16.7	23.7	33.2	25.6	19.4	15.7	22.6
25-29.9	32.4	32.9	35.9	38.9	35.1	24.5	27.5	32.6	35.9	30.6
≥30	32.4	42.0	41.6	42.7	40.3	38.6	45.9	47.2	46.8	45.3
number of missing	5	12	3	1	21	4	7	8	11	30
Systolic blood pressure (mmHg)										
<120	16.2	11.5	8.5	5.8	10.2	53.7	29.1	18.6	5.8	24.4
120-129	29.8	23.1	20.6	8.8	20.2	22.3	28.5	15.9	10.5	19.2
130-139	23.6	28.5	19.3	17.5	22.3	11.2	20.4	18.0	17.9	17.5
140-159	27.2	26.1	30.1	38.3	30.3	9.6	16.2	27.9	30.7	22.3
≥160	3.1	10.8	21.5	29.6	17.0	3.2	5.8	19.6	35.0	16.6
number of missing	2	0	2	0	4	0	3	2	2	7
Diastolic blood pressure (mmHg)										
<80	49.2	27.5	25.9	25.4	30.5	52.1	40.8	32.1	31.9	37.8
80-84	16.8	18.0	13.6	17.1	16.2	13.3	16.8	14.1	21.0	16.3
85-89	11.5	14.6	17.7	18.8	15.9	13.3	14.6	18.6	15.2	15.8
90-99	14.7	28.1	26.3	26.3	24.7	17.6	21.4	21.2	19.1	20.2
≥100	7.9	11.9	16.5	12.5	12.7	3.7	6.5	14.1	12.8	10.0
number of missing	2	0	2	0	4	0	3	2	2	7
Hypertension										
≥140/90 mmHg	35.1	48.8	56.3	70.4	53.6	23.4	33.3	52.0	67.3	45.6
≥140/90 mmHg or on medication	35.6	49.5	57.9	73.3	55.0	24.5	36.2	56.0	69.6	48.5
≥160/100 mmHg	9.9	14.9	25.0	32.9	21.2	5.9	8.7	22.0	37.4	19.2
Fasting glucose (mg/dL)										
<100	50.6	39.4	30.7	28.5	36.2	64.5	46.2	35.9	28.1	41.7
100-109	29.5	26.7	26.4	22.4	26.1	18.7	23.9	25.2	22.8	23.2
110-125	9.6	16.7	20.0	20.1	17.2	9.6	14.4	19.0	16.7	15.7
≥126	10.2	17.1	22.9	29.0	20.4	7.2	15.5	19.9	32.5	19.5
(≥126 mg/dL or on medication)	10.2	17.5	23.9	29.4	21.0	7.2	15.5	20.9	34.6	20.3
number of missing	27	44	38	26	135	22	48	53	31	154
Triglycerides (mg/dL)										
<100	34.4	22.7	22.8	19.3	24.1	37.9	33.6	24.7	23.3	29.0
100-149	24.4	29.8	26.5	29.0	27.6	28.6	32.0	29.9	27.9	29.8
150-199	15.6	16.4	22.4	18.8	18.7	11.8	16.6	16.7	20.5	16.7
≥200	25.6	31.1	28.4	32.9	29.7	21.7	17.8	28.7	28.3	24.5
number of missing	33	57	50	33	173	27	53	55	40	175
Total cholesterol (mg/dL)										

<160	55.2	51.4	44.1	38.8	46.9	63.4	55.8	33.1	37.0	45.1
160-189	29.4	29.7	34.9	36.4	32.9	25.0	30.6	33.4	24.7	29.3
190-199	5.5	5.6	6.6	6.5	6.1	2.4	6.0	10.8	8.8	7.7
200-239	9.2	12.4	12.1	16.4	12.7	8.5	6.4	16.9	22.9	14.1
≥240	0.6	0.8	2.2	1.9	1.4	0.6	1.1	5.7	6.6	3.8
(≥200 mg/dL or on medication)	9.8	13.7	17.6	22.0	16.1	9.8	8.3	24.7	34.8	20.1
number of missing	30	46	46	26	148	24	47	47	32	150

USD indicates United States dollar

Table 2 Characteristics of participants by ethnic background (valid %)

	Male			Female		
	Palauan	Filipino	Others	Palauan	Filipino	Others
Number	751	200	93	875	206	56
Age group of years						
25-34	13.8	25.5	40.9	14.7	23.8	17.9
35-44	26.1	33.0	33.3	26.9	31.6	21.4
45-54	32.6	28.0	18.3	32.9	32.0	44.6
55-64	27.4	13.5	7.5	25.5	12.6	16.1
Educational attainment						
primary or lower	19.0	10.7	22.0	15.3	10.3	18.2
secondary	42.0	42.9	31.9	37.9	42.6	27.3
college or higher	39.0	46.4	46.2	46.8	47.1	54.5
Marital status						
single	20.5	28.1	35.9	16.3	26.3	10.9
married/cohabiting	68.7	67.8	62.0	65.4	58.5	78.2
divorced/separated	8.2	3.0	1.1	8.8	8.8	7.3
widowed	2.7	1.0	1.1	9.5	6.3	3.6
Annual household income (USD)						
<5000	17.3	51.4	44.0	19.4	62.1	22.7
5000-9999	34.0	37.3	28.0	24.8	19.2	25.0
10000-14999	18.8	2.2	2.7	19.8	10.4	13.6
15000-19999	9.1	4.3	2.7	10.7	2.2	6.8
≥20000	20.9	4.9	22.7	25.3	6.0	31.8
Smoking						
non-smoker	41.5	48.0	49.5	56.0	84.0	69.6
ex-smoker	37.2	18.0	20.4	34.1	9.2	16.1
current smoker	21.3	34.0	30.1	9.9	6.8	14.3
Betel nut and tobacco chewing						
non-chewer	42.3	97.5	84.9	31.4	98.5	83.9
current chewer	57.7	2.5	15.1	68.6	1.5	16.1
Tobacco product use						
non-user	31.4	64.0	59.1	28.1	91.7	73.2
current user	68.6	36.0	40.9	71.9	8.3	26.8
Alcohol drinking						
non-drinker	19.7	21.0	35.5	32.5	57.3	37.5
ex-drinker	30.8	32.5	17.2	43.0	31.6	23.2
current drinker	49.5	46.5	47.3	24.6	11.2	39.3
Fruit intake (day/week)						
0-1	48.2	31.8	33.0	35.7	22.3	19.6
2-4	35.4	43.9	41.8	40.1	47.1	37.5
≥5	16.4	24.2	25.3	24.2	30.6	42.9

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Vegetable intake (day/week)						
0-1	17.5	8.0	7.6	10.4	2.9	7.3
2-4	44.1	42.2	29.3	40.3	30.1	14.5
≥5	38.4	49.7	63.0	49.3	67.0	78.2
Body mass index (kg/m ²)						
<18.5	0.5	1.0	3.4	0.9	4.0	1.8
18.5-24.9	15.4	47.0	41.6	13.0	56.1	50.0
25-29.9	33.2	42.9	34.8	31.4	30.3	19.6
≥30	51.0	9.1	20.2	54.6	9.6	28.6
Systolic blood pressure (mmHg)						
<120	8.9	13.5	13.2	21.3	31.1	48.2
120-129	17.9	24.0	30.8	18.8	19.9	23.2
130-139	21.2	23.0	28.6	17.2	21.4	7.1
140-159	32.4	25.0	25.3	24.8	15.5	8.9
≥160	19.5	14.5	2.2	18.0	12.1	12.5
Diastolic blood pressure (mmHg)						
<80	27.1	39.0	40.7	33.8	50.0	55.4
80-84	15.4	14.5	26.4	17.1	13.1	14.3
85-89	16.6	15.0	13.2	16.1	16.0	10.7
90-99	27.4	19.5	13.2	21.9	15.0	12.5
≥100	13.6	12.0	6.6	11.2	5.8	7.1
Hypertension						
≥140/90 mmHg	58.5	44.5	33.0	50.6	31.6	21.4
≥140/90 mmHg or on medication	59.9	45.5	35.2	53.5	34.0	25.0
≥160/100 mmHg	23.6	19.0	6.6	21.2	12.6	12.5
Fasting glucose (mg/dL)						
<100	34.6	35.7	52.8	41.5	42.6	40.8
100-109	24.4	33.9	23.6	20.9	29.0	34.7
110-125	17.5	15.2	19.4	15.6	16.9	12.2
≥126	23.5	15.2	4.2	22.0	11.5	12.2
(≥126 mg/dL or on medication)	24.0	16.4	4.2	22.9	12.0	12.2
Triglycerides (mg/dL)						
<100	23.0	26.1	29.2	26.2	37.4	42.0
100-149	28.0	26.1	27.8	29.7	29.3	32.0
150-199	19.5	16.1	16.7	18.7	11.5	6.0
≥200	29.5	31.7	26.4	25.5	21.8	20.0
Total cholesterol (mg/dL)						
<160	48.9	41.2	42.3	47.1	38.0	41.2
160-189	32.1	37.1	29.6	28.2	32.1	35.3
190-199	6.4	5.3	5.6	6.5	13.6	3.9
200-239	11.0	15.9	21.1	14.6	12.0	13.7
≥240	1.7	0.6	1.4	3.6	4.3	5.9

(≥ 200 mg/dL or on medication)	14.9	17.6	23.9	20.7	17.4	21.6
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USD indicates United States dollar

