Noncommunicable diseases and risk factors in adult populations of several Pacific Islands: results from the WHO STEPwise approach to surveillance

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Abstract

Objective: To provide an overview of the prevalence of noncommunicable diseases (NCDs) and their risk factors in several Pacific island countries and territories (PICTs), in accordance with global NCD targets.

Methods: For six risk factors, data for adults (aged 25–64 years) from published reports of the World Health Organization STEPwise approach to NCD surveillance, or methodologically similar surveys, were collated, age standardised and compared across fifteen PICTs.

Results: In the majority of PICT populations, more than half of male current drinkers drank heavily and more than 40% of men and 20% of women were current smokers. In 10 populations, about 50% or more of women were insufficiently physically active. Prevalence of hypertension and diabetes exceeded 20% and 25%, respectively, in several populations. Near or more than half of men and women in all populations were overweight; in most, more than one-third of both sexes were obese.

Conclusions: The prevalence of NCDs and risk factors varies widely between PICTs and by sex. The evidence shows the high and alarming present and future burden of NCDs in the region.

Implications: Strengthened political commitment and increased investment are urgently required to tackle the NCD crisis, successfully achieve targets and ensure continuing sustainable development in the Pacific islands.

Key words: noncommunicable diseases, Pacific Islands, adults, prevalence, epidemiology
Behavioral Risk Factor Surveillance System (BRFSS). STEPS was selected as the primary data source for the present analysis as it is widely utilised and provides a standardised methodology for our comparisons.

STEPS methodology has been published in depth elsewhere. Briefly, the approach utilises a multi-stage cluster design with probability proportional to size sampling. Data are collected in person through interviewer-administered questionnaires (STEP 1), physical measurements (STEP 2) and biochemical analyses of blood samples (STEP 3). Each step has core, expanded and optional modules, use of which is informed by available resources and national data needs. Sample, non-response and population weights are applied to results as needed.

SPC holds a database with the results from surveys published by PICTs of STEPS and similar surveys. We analysed data from fifteen PICTs (Table 1). We included the survey for Wallis and Futuna, which was based on STEPS methodology, and the Baromètre Santé in New Caledonia which, like STEPS, utilised a multi-stage sampling design and in-person interviews.

Local adaptation of STEPS can result in methodological variations between PICTs. For example, Niue and Tokelau designed the survey to include all members of the target population. Details of the surveys’ methods can be found in individual country reports.

We examined the survey reports for results aligning to the global targets and their primary indicator for adults, as per the Global Action Plan for Noncommunicable Diseases. We identified relevant and comparable data for the main indicator to five of the nine targets and selected: i) the percentage of current (past 12 months) drinkers who reported consuming six or more drinks on average on a day in which alcohol was consumed (‘heavy drinking’); ii) the proportion of the population who obtained <600 MET minutes of total physical activity per week (‘insufficient physical activity’); iii) the percentage of the population who were current (past 12 months) tobacco smokers; iv) the proportion of the population with hypertension (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, or on anti-hypertensive medication); v) the percentage of the population with diabetes (raised fasting blood glucose or on medication for raised blood glucose); and vi) the percentage of the population with a Body Mass Index (BMI) ≥25 kg/m² (overweight), and ≥30 kg/m² (obese) (Table 2). We noted where variations to the definitions for current smoking, physical activity and diabetes occurred.

Although the age range of surveyed populations varied, all surveys included those aged 25 to 64 years. This was therefore the population of focus for this work. STEPS reports aggregated data into 10-year or, for French Polynesia, 20-year age brackets. Accordingly, we applied these results to the WHO world population to produce an age-standardised rate for those aged 25 to 64 years. Prior to standardisation, we developed and compared two standard populations for the Pacific with the WHO world population. As there was minimal difference for the 25–64 year age range, the WHO population was used. Standard errors and confidence intervals for the age-standardised estimates of prevalence were calculated using the approach described by Breslow and Day.

**Results**

**Harmful use of alcohol**

In PICT populations for which data were available, among men, nearly half or more of current drinkers reported consuming six or more standard drinks on average on a day when alcohol was consumed (Figure 1). The prevalence of heavy drinking varied more widely among women in PICTs and was highest for both sexes in Nauru and the Cook Islands. Across all populations, the point prevalence of heavy drinking was higher among men than women, though the magnitude of this gender disparity varied.

**Insufficient physical activity**

The prevalence of insufficient physical activity was higher in women than men in PICTs (Figure 2). In 10 populations, about 50% or more of women obtained less than 600MET minutes of physical activity per week; in comparison, this was the case for men in five PICTs. For both sexes, the proportion of the population who were insufficiently active varied considerably across the Pacific; prevalence was highest in the Cook Islands (more than 70% of men and women) and lowest in Vanuatu (less than 15% of men and women).

**Tobacco smoking**

More than one-quarter of men in Niue smoked, and almost three-quarters in Kiribati (Figure 3). Overall, a higher percentage of men than women were current smokers; however, in the majority of PICT populations, at least 20% of women smoked. The gender difference was reversed in French Polynesia and Nauru where there was a higher point prevalence of smoking among women.

**Hypertension**

At least 13% of men and women in all populations presented had hypertension (Figure 4). In the majority of populations, prevalence exceeded 20%. Hypertension was least common in the Solomon Islands and most prevalent in American Samoa and the Cook Islands, where more than 30% of women and 40% of men had hypertension.
Gender differences varied between countries, though men appeared to be more affected.

**Diabetes**

Notwithstanding definition variations between reports, prevalence of diabetes exceeded 25% in men in nine populations, and in women in eight populations (Figure 5). Prevalence was highest in American Samoa where 53.4% (95%CI 49.0-57.9) of men and 45.0% (95%CI 41.7-48.3) of women were affected. Diabetes was least common in women in the Solomon Islands, although it still affected 14.3% (95%CI 10.8-17.9).

**Overweight and Obesity**

In eleven of fifteen PICT populations in which height and weight were measured, more than 80% of women were overweight (Figure 6). In seven populations, more than 80% of men were overweight. The lowest prevalence of overweight was in Vanuatu, although this still equated to nearly half of men and more than half of women.

The prevalence of obesity in women exceeded 70% in American Samoa, Tokelau, Tonga, Nauru, and Wallis and Futuna (Figure 6). In men, prevalence was highest in Nauru, Tokelau and American Samoa, and lowest in Fiji and Vanuatu. Weight and height were self-reported in New Caledonia; age-standardised prevalence of obesity was 32.9% (95%CI 30.2-35.5) in women and 26.6% (95%CI 23.5-29.8) in men. Compared to overweight, there was a clearer demarcation between the sexes in obesity prevalence in PICTs, which affected women more than men. There was, however, wide variation between populations in the magnitude of this gender difference.

**Discussion**

This paper presents data aligned to the global NCD targets and indicators on the prevalence of tobacco and alcohol use, diabetes and hypertension, insufficient physical activity and overweight/obesity, from STEPS or similar surveys conducted in fifteen PICTs. The prevalence of many or all of these risk factors is high in several PICTs, demonstrating the immense burden of NCDs in the region.

**Alcohol**

WHO global estimates for 2010 indicate that 21.5% of male and 5.7% of female drinkers (15+ years) engage in heavy episodic drinking (defined as consumption of ≥60 g of pure alcohol – six or more standard drinks – on at least one single occasion at least monthly).28 Comparison with the Pacific data described here is limited due to the different age ranges and definitions of heavy episodic drinking. Of those available, we selected the indicator most similar to the WHO definition and most consistently reported on across PICTs. Our analysis demonstrates that the prevalence of heavy drinking is high in several PICTs, especially among men. Our results, however, must be interpreted cautiously as in some PICT populations the number of current and heavy drinkers – particularly among women –

### Table 2: Selected STEPS indicators aligned to the corresponding global indicator and target for noncommunicable disease risk factors in adults.

| STEPS Indicator (25-64 years) | Global Indicator | Global Target |
|-------------------------------|-----------------|---------------|
| % of current (past 12 months) drinkers who report consuming 6 or more drinks on average during a day on which alcohol is consumed | Age-standardized prevalence of heavy episodic drinking among adolescents and adults, as appropriate, within the national context | At least a 10% relative reduction in the harmful use of alcohol, as appropriate, within the national context |
| % of population who engage in <600 MET minutes of total physical activity per week | Age-standardized prevalence of insufficiently physically active persons aged 18+ years (defined as less than 150 minutes of moderate-intensity activity per week, or equivalent) | A 10% relative reduction in prevalence of insufficient physical activity |
| % of population who are current smokers (smoked tobacco in the past 12 months, either daily or non-daily) | Age-standardized prevalence of current tobacco use among persons aged 18+ years | A 30% relative reduction in prevalence of current tobacco use among persons aged 15+ years |
| % of population with raised blood pressure (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg) or on anti-hypertensive medication | Age-standardized prevalence of raised blood pressure among persons aged 18+ years (defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg) and mean systolic blood pressure | A 25% relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances |
| % of population with raised blood glucose or on medication for raised blood glucose | Age-standardized prevalence of raised blood glucose/diabetes among persons aged 18+ years (defined as fasting plasma glucose concentration ≥7.0 mmol/l [126 mg/dl] or on medication for raised blood glucose) | Halt the rise in diabetes and obesity |
| % of population with BMI ≥25kg/m² and % of population with BMI ≥30kg/m² | Age-standardized prevalence of overweight and obesity in persons aged 18+ years (defined as body mass index ≥25 kg/m² for overweight and body mass index ≥30 kg/m² for obesity) | A 25% relative reduction in the prevalence of overweight and obesity, according to national circumstances |

Source: WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020.5
is low, resulting in wide uncertainties around our estimates.

The gender disparity in heavy drinking in the Pacific is consistent with that observed across WHO regions. Gender differences vary in magnitude between PIC Ts, reflecting diverse societal norms and cultures. Alcohol harm reduction initiatives in the Pacific must therefore be culturally specific, gender responsive and mindful that women may experience more harm from the same level or pattern of alcohol consumption as men.

Recognising that the impact of harmful alcohol use extends beyond the individual, affecting the health, social and economic welfare of families and communities, there is cause and wide scope for implementation in PIC Ts of identified “best buy” strategies and those within the Global Strategy to Reduce Harmful Use of Alcohol. Comprehensive monitoring of the effects of such action and progress towards the global target will require triangulation of information and use of multiple indicators. These can include per capita alcohol consumption, as recommended by the global framework, in addition to data on the consumption and sale of alcohol in the informal sector (home brew) in PIC Ts, an area in which current knowledge is limited. In addition, understanding of drinking patterns in PIC Ts could be expanded with further research on kava and its association with alcohol consumption.

Physical activity

Globally, 31.1% of adults (15+ years) are insufficiently physically active; women are more inactive than men and prevalence of physical inactivity is greater in high-income countries. Our results notably reveal a high prevalence of insufficient physical activity in several PIC Ts, especially among women.

Achieving and exceeding the global target will require enhanced efforts in this sphere. As initiatives to increase physical activity in PIC Ts may also address the high prevalence of overweight and obesity, their importance cannot be underestimated. Guidelines for physical activity in adults have been developed specifically for the Pacific; continuing dissemination and communication to communities is essential. Further evaluation of the impact of physical activity initiatives is also needed; recommendations to enable success and longevity of programs include embedding them within national NCD strategies and partnering with multiple sectors and organisations, in government and the community.

Tobacco

WHO estimates for 2011 indicate that Pacific countries have some of the highest adult prevalences of current tobacco smoking within the Western Pacific, far exceeding the lowest in the region – 21% of men in Australia and New Zealand, and less than 5% of women in many Asian countries.
Considering the alarmingly high prevalence of smoking in PICTs, particularly among men, a 30% relative reduction in tobacco use may not sufficiently curtail the public health detriment tobacco causes. Accordingly, Ministers of Health in the Pacific have committed instead to achieving a ‘Tobacco-Free Pacific by 2025’ with adult tobacco use prevalence below 5% in each PICT.39 For smoking, given the significant regional inequalities in prevalence, this will be relatively more challenging for some PICTs than others. Substantial gains may be achieved with accelerated and comprehensive implementation of the Framework Convention on Tobacco Control (FCTC) in the 14 Pacific countries that are signatories, and of equivalent measures in the PICTs that are not. First and foremost, legislation needs to be FCTC compliant. Furthermore, current impediments to implementing legislation need to be addressed in PICTs. These include insufficient capacity to enforce the law, a lack of cross-sectoral support and limited anti-tobacco advocacy from civil society.39 Importantly, our analysis focuses on smoked tobacco. In parts of Melanesia and Micronesia, tobacco is commonly chewed, often in conjunction with betel nut.39 Continuing research on the use of smokeless tobacco in the Pacific will be necessary to comprehensively monitor progress towards the targets.

**Hypertension**

In many PICTs, at least one-fifth of the population has hypertension. Globally, prevalence of hypertension in those 25 years and older is about 40%,38 and indeed men in some PICTs are similarly affected. Achieving the global target of a 25% relative reduction in hypertension prevalence is critical for the Pacific, particularly through population health strategies, as treatment costs escalate with increasingly complex regimens and can rapidly outstrip the national annual pharmaceutical budget.38 Simultaneously, integrated cardiovascular risk management is being implemented across the Pacific through the Package of Essential NCD Interventions for Primary Health Care in Low Resource Settings.40 Data on dietary salt intake in the Pacific are scarce and have not previously been collected in STEPS. Salt intake questions and measurements are being included in second STEPS surveys. In Fiji, and in Samoa as part of the Samoa STEPS survey, a comprehensive research initiative is underway to ascertain the change in population salt intake (including measurement of 24-hour urinary salt levels) after implementation of salt-reduction strategies.41

**Diabetes, overweight and obesity**

The data presented reflect evidence that some of the highest prevalences of diabetes, overweight and obesity in the world are found in the Pacific.42,43 Considering these unprecedented levels, PICTs must not just halt but also reverse the rise in these risk factors. This is critical considering that the costs of treatment of diabetes, like hypertension, may overwhelm health systems.49 The impact of international trade, particularly as it affects dietary patterns, must be

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**Figure 4: Age-standardised prevalence (with 95% confidence intervals) of hypertension* among those 25 to 64 years, by sex and Pacific Island Country and Territory.**

| Country        | Males | Females |
|----------------|-------|---------|
| FSM: Chuuk      | 29.2% | 29.2%   |
| FSM: Polynesian | 29.2% | 29.2%   |
| FSM: Tonga      | 29.2% | 29.2%   |
| FSM: Pohnpei    | 29.2% | 29.2%   |
| Kiribati        | 29.2% | 29.2%   |
| Marshall Islands| 29.2% | 29.2%   |
| Nauru           | 29.2% | 29.2%   |
| Niue            | 29.2% | 29.2%   |
| Vanuatu         | 29.2% | 29.2%   |
| FSM: Chukh      | 29.2% | 29.2%   |
| Solomon Islands | 29.2% | 29.2%   |
| Cook Islands    | 29.2% | 29.2%   |
| American Samoa  | 29.2% | 29.2%   |
| American Polynesia | 29.2% | 29.2%   |
| American Samoan | 29.2% | 29.2%   |
| American Chuuk  | 29.2% | 29.2%   |
| American Pohnpei| 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
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| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
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| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
| American Nauru  | 29.2% | 29.2%   |
| American Vanuatu| 29.2% | 29.2%   |
| American Solomon Islands | 29.2% | 29.2%   |
| American Tonga  | 29.2% | 29.2%   |
| American Kiribati| 29.2% | 29.2%   |
| American Marshall Islands | 29.2% | 29.2%   |
addressed in the Pacific. Globalisation has contributed to imported cereals replacing root crops, and fatty imported meats becoming the main sources of protein.\textsuperscript{44} Returning to traditional diets may be challenging as in some PICTs the relative lower costs and higher convenience of imported products contribute to purchase and consumption.\textsuperscript{45,46} In addition, countries’ ability to enact public health policy, such as that pertaining to food imports, can be significantly constrained by international trade agreements.\textsuperscript{47}

Public health measures to tackle obesity and diabetes include taxation of sugar-sweetened beverages. Several PICTs have introduced such taxes with fiscal and/or public health intentions.\textsuperscript{48} To reverse the rise in obesity and diabetes, the health of younger generations must be considered. Childhood obesity has several immediate and long-term health consequences, including a higher risk of NCDs in adulthood.\textsuperscript{49} To be sustainably effective, PICTs’ NCD strategies need to incorporate a life course approach.

**Implications for practice**

NCD risk factors are highly prevalent and pervasive in the Pacific. Across indicators, there are inequalities between the sexes and between countries. PICTs and development partners must be cognisant of gender and inter-country disparities. Conscious action is required to ensure that where risk factor prevalence is low, it does not increase, and that there is an equitable reduction in disease within countries and within the region. This will require quantitative and qualitative research on the underlying drivers of risk behaviours in PICTs, in order for national NCD strategies to be well-informed and responsive to populations.

To monitor the Pacific’s progress towards NCD targets, surveillance systems need to be enhanced. Regular repetition of surveys is imperative. To ensure comparability over time, it is important to maintain consistency of the questions and definitions used. STEPS, BRFSS and other NCD survey tools could be streamlined to reduce the burden that multiple surveys may place on communities. There are several repositories of NCD data in the Pacific. These need to be streamlined and integrated with those for communicable diseases to promote a more integrated approach to health system planning nationally and regionally. Additionally, intense efforts are required to build in-country capacity for data analysis, to ensure PICTs have ownership of their survey results and access to them in a timely manner. The Pacific Public Health Surveillance Network has been implementing the Fiji National University-accredited ‘Data for decision-making’ program. This program for health professionals working with health information covers both communicable and noncommunicable diseases and is designed to improve in-country surveillance and health information systems.

**Strengths and limitations**

By utilising results from standardised surveys conducted across the region, this work provides a comprehensive, Pacific-focused perspective on NCDs and their risk factors. Furthermore, the data this analysis uses are often the primary source of NCD information for PICTs, upon which national policies and health care planning are based.

There are several limitations to this work. The surveys used in this analysis were conducted between 2002 and 2011; the epidemiology of NCDs would likely have changed since. By only utilising data from published reports of STEPS and similar surveys, our analysis is confined to fifteen PICTs. Full reports were not available for STEPS surveys from Samoa and Papua New Guinea, although fact sheets providing crude rates have been published through WHO. Information from other sources such as BRFSS would also enhance the perspective presented here.

As detailed in some reports, sampling frames may be limited due to costs or logistical challenges of surveying certain areas or islands. Results are consequently not always nationally representative.
Occasionally, survey reports present results using unique indicator definitions. Where this occurred, we had to exclude results to preserve the validity of comparisons, or calculate best possible estimates using the available data.

This analysis includes those aged 25 to 64 years. NCDs and the forces that drive them exert their influence at much earlier ages. Synthesis of data on risk factor prevalence in children and adolescents is needed. We were unable to assess differences in age-standardised prevalence of risk factors by socioeconomic status, rural/urban residence and ethnicity, as the required elements for such an analysis were unavailable. Of note, the Fiji STEPS report provides aggregate results by sex for locality and ethnicity. It would be useful to include these covariates in all future PICT survey reports, to ascertain the leading drivers of the NCD epidemic and the inequalities within.

This work focuses on the primary indicators corresponding to the main targets chosen by the Global NCD Action Plan. STEPS can also be used to track progress on additional indicators of fruit and vegetable consumption and total cholesterol level. Mean population glucose and mean population BP are also available to monitor the respective targets. While there is an optional STEPS module for mental health, this has not yet been implemented in PICTs. Further, no such module exists for musculoskeletal diseases. Improving surveillance of both these conditions is essential; depression and low back pain cause the highest two amounts of disability in the Pacific and globally.3,4,5 Opportunities to monitor and respond to these NCDs are urgently needed and are currently being missed.

Conclusion
Given that present risk factor distribution is indicative of future disease prevalence, the outlook for the Pacific is ominous. With limited financial resources and capacity, prioritisation of targets and corresponding interventions is required. The “best buys”, cost-effective initiatives which can significantly reduce premature mortality and economic losses in PICTs, are the foundation of the crisis response. In alignment with the policy options discussed earlier, they include:

- Increasing tobacco taxation, restricting tobacco marketing and implementing smoke-free environments;
- Increasing taxation on, and restricting access to and advertising of alcohol;
- Reducing salt intake; and
- Implementing multiple drug therapy and counselling for those at risk of cardiovascular events.29

Current investment by international and regional organisations and countries themselves to tackle NCDs, however, is insufficient and disproportionate to their prevalence and impact. The case for augmented cross-sector action on the Pacific NCD emergency is unassailable and investments need to ensure adherence to the principles of development effectiveness. Substantial further funding, escalated action and accountability by all partners and stakeholders are essential to prevent NCDs from crippling health systems and arresting economic and social development in the Pacific islands.

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