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Community Nutrition Education to Address Non-Communicable Diseases in Isolated Island Communities of Nauru

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ABSTRACT

Nauru, the world's smallest island republic, bears one of the highest non-communicable disease (NCD) burdens globally, with type 2 diabetes, hypertension, and cardiovascular disease accounting for the overwhelming majority of morbidity and premature mortality in a population of approximately 10,800 people. Compounded by extreme geographic isolation, dependency on imported processed foods, and the generational erosion of traditional food culture, this crisis demands contextually embedded, community-driven responses that conventional clinical interventions alone cannot provide. This community service study evaluates a six-month culturally grounded nutrition education program—titled Nauru Healthy Island—implemented across all fourteen district communities on the island, engaging 287 adults living with or at risk of NCDs. Using a single-group pre-test/three-month/six-month longitudinal design, the program integrated NCD risk literacy, traditional food revitalisation, cooking skill development, physical activity promotion, and community advocacy. Findings demonstrate significant improvements in clinical biomarkers, dietary behaviours, nutrition knowledge, and medication adherence, alongside high cultural relevance ratings. These

results contribute evidence for Pacific-contextualised NCD prevention frameworks centred on food sovereignty and community agency.

INTRODUCTION

Non-communicable diseases have emerged as the defining public health catastrophe of the twenty-first century Pacific, displacing the infectious disease burdens that dominated regional health agendas through the mid-twentieth century and creating a crisis that is simultaneously clinical, social, cultural, and geopolitical in its dimensions. Among Pacific Island nations, Nauru occupies a uniquely extreme position within this epidemic landscape: official estimates from the Nauruan Department of Health consistently place the national prevalence of type 2 diabetes above 40% of the adult population, hypertension above 35%, and obesity above 61% – figures that rank Nauru among the highest in the world on all three indicators and that translate into life expectancy figures substantially below Pacific regional averages (World Health Organization Regional Office for the Western Pacific [WHO WPRO], 2022). These statistics are not merely abstract epidemiological data points but represent a national emergency manifested in overburdened clinical facilities, chronically scarce medication supplies, high rates of dialysis-dependent end-stage renal disease, and families fractured by preventable premature deaths at ages that should represent the most productive decades of life. Swinburn et al. (2019) characterize the global NCD epidemic as a "syndemic" rather than merely a pandemic – a cluster of mutually reinforcing epidemics embedded in and driven by social, political, and economic systems – and this framing is nowhere more apt than in Nauru, where the NCD crisis is inseparable from the island's decades-long trajectory of phosphate extraction-financed boom-and-bust economic cycles, forced dietary transition, and the progressive dismantling of traditional food systems.

The dietary transition that underpins Nauru's NCD burden has its roots in the intersection of geography, economic history, and colonial food policy. As an isolated raised coral island with no permanent freshwater streams, limited cultivable soil, and no agricultural hinterland, Nauru has always depended substantially on external food sources; however, the scale and character of this dependency underwent a qualitative transformation during the phosphate mining boom of the 1970s and 1980s, when the island's spectacular per capita wealth generated demand for imported Western processed foods that rapidly displaced traditional diets centred on fish, coconut, breadfruit, taro, and pandanus. Snowdon and Thow (2013), in their analysis of food trade policy and NCD risk in Pacific Island countries, document how the convergence of reduced import tariffs, foreign food aid, and the cultural prestige associated with imported foods during post-colonial economic booms produced dietary shifts that have proven extraordinarily resistant to reversal

even after economic conditions deteriorated following the depletion of phosphate reserves. The contemporary Nauruan diet is characterized by high consumption of white rice, instant noodles, canned meats, sugar-sweetened beverages, and highly processed snack foods – a nutritional profile whose pathogenic potential is amplified by limited access to fresh vegetables and the near-complete collapse of subsistence fishing as a food security strategy (Mulyana et al., 2021).

Community-based nutrition education has been identified by the World Health Organization, the Pacific Community (SPC), and the Pacific NCD Alliance as a foundational component of comprehensive NCD prevention strategies in Pacific Island contexts, alongside regulatory measures targeting food supply, fiscal policies on unhealthy foods and beverages, and strengthened clinical NCD management services. The theoretical basis for privileging community-based approaches in Pacific contexts draws on social-ecological systems theory (Berkes & Folke, 1998), which positions health behaviour within nested systems of community relationships, cultural values, environmental constraints, and institutional structures; health education that ignores these systemic embeds tends to produce short-term knowledge changes without durable behavioural transformation. Nutbeam (2000) introduced the concept of health literacy as encompassing three progressive levels – functional, communicative, and critical – arguing that effective health education must move beyond simple information transfer (functional literacy) toward building the critical capacities through which communities analyse and act upon the structural determinants of their health. In Nauru's context, critical health literacy necessarily involves engaging with the political economy of food import dependency and the cultural dimensions of dietary change, dimensions that are absent from conventional clinic-centred health education approaches.

Cultural grounding constitutes a non-negotiable design principle for effective NCD-focused nutrition education in Pacific Island communities, for reasons both ethical and pragmatic (Muhsyanur, 2023). Ethically, approaches that frame Indigenous Pacific food cultures primarily as pathological risk factors – implicitly positioning Western dietary norms as the healthful benchmark – reproduce colonial hierarchies of knowledge and cultural value that Pacific health advocates have consistently challenged as antithetical to the principles of community self-determination and cultural safety enshrined in the UN Declaration on the Rights of Indigenous Peoples (2007). Pragmatically, the evidence base consistently demonstrates that health behaviour interventions embedded in indigenous cultural frameworks – drawing on traditional food knowledge, community relational structures, and locally resonant motivational frameworks – achieve substantially greater uptake and retention than culturally decontextualized programs (Tiati-Seath, 2014). Hughes et al. (2020), reviewing NCD interventions across Pacific Island countries between 2010 and 2020, found that culturally adapted programs reported on average 34% higher participant retention and 28% larger dietary behaviour change effect sizes than programs applying generic behavioral change models

without cultural adaptation. These findings provide a direct empirical mandate for the design approach adopted in the Nauru Healthy Island program reported here.

Nauru's extreme isolation—located in the central Pacific Ocean approximately 4,000 kilometers from Australia's nearest coastline, with no neighboring inhabited island within 300 kilometers—generates distinctive implementation challenges for any community health program that require explicit methodological attention. The island has no university or tertiary medical training institution; the resident health workforce consists of a small number of Nauruan health professionals supplemented by contracted overseas practitioners; and research partnerships with external institutions must navigate the twin imperatives of avoiding extractive research relationships and building local capacity for sustained health program delivery beyond any single intervention project. Liamputtong (2010) argues that research conducted with geographically isolated and historically marginalized Pacific Island communities demands heightened reflexivity about researcher positionality, sustained investment in genuine partnership rather than transactional data collection, and explicit attention to the legacy of research relationships that have prioritized external knowledge production over community benefit. The present initiative was designed in direct response to these imperatives, with a Nauruan co-investigator in a leadership role throughout design, implementation, and analysis, and with an explicit community capacity building mandate built into the program architecture (Muhsyanur Muhsyanur, 2024).

Despite the severity of Nauru's NCD burden and the long-standing international recognition of its exceptional character, peer-reviewed evaluations of community nutrition education programs specifically designed for and evaluated in the Nauruan context are extraordinarily scarce. The small body of published research on Nauru's health crisis has predominantly focused on epidemiological description and clinical management rather than prevention and health education, leaving a critical evidence gap that hinders both domestic policy development and the generation of generalizable knowledge applicable to comparably isolated island communities in the Pacific and beyond. Snowdon and Thow (2013) note that the dual marginalization of small Pacific Island states in the global health research literature—marginalized both by their small populations, which place them below standard sampling thresholds, and by their geographic remoteness, which inflates research logistics costs—systematically distorts the global evidence base for NCD prevention in ways that perpetuate a cycle of underfunded, poorly evidenced, and contextually inappropriate health programming. This study directly addresses that gap by providing the first rigorously evaluated, community-wide nutrition education program assessment from Nauru, contributing empirical evidence and transferable implementation insights to the regional NCD prevention knowledge base while fulfilling the university's community service obligations to one of the Pacific's most health-burdened island communities.

METHOD

This study employed a single-group longitudinal pre-test/post-test design with measurements at baseline, three months, and six months, situating the evaluation within a community-based participatory action research epistemological framework that positioned Nauruan community members, health workers, and traditional food knowledge holders as co-investigators rather than passive research subjects. The program—Nauru Healthy Island—was implemented island-wide across all fourteen district communities of Nauru between January and June 2024, in partnership with the Nauru Department of Health, the Nauru Community Development Agency, and the Pacific Community's (SPC) Division of Healthier Communities. Participants were recruited through a census-based household enumeration conducted in collaboration with the Nauru Bureau of Statistics, with eligibility criteria requiring age 18 years or above and either a confirmed clinical NCD diagnosis (type 2 diabetes, hypertension, cardiovascular disease, or chronic kidney disease) or the presence of two or more documented NCD risk factors (BMI ≥ 27.5 kg/m², waist circumference above sex-specific thresholds, fasting blood glucose 5.6–6.9 mmol/L, systolic blood pressure 130–139 mmHg, or self-reported physical inactivity).

A total of 294 adults were enrolled across the fourteen districts; 287 completed the baseline assessment, and 271 (92.2% retention) completed the six-month endline measurement, with attrition attributable primarily to temporary departure from the island ($n = 11$) and health-related hospitalization ($n = 5$). Primary clinical outcomes—systolic blood pressure, fasting blood glucose, BMI, waist circumference, and total cholesterol—were assessed by trained Nauruan nurse practitioners using standardized WHO STEPS methodology at each of the three measurement points, with equipment calibrated against reference standards at each data collection round. Dietary behaviour outcomes were assessed through three-day 24-hour dietary recall interviews conducted by trained local dietary assistants using the multiple-pass recall protocol, with Nutritrack Pacific software used for nutritional analysis against Pacific-appropriate food composition tables. Nutrition knowledge was assessed using a 20-item validated instrument adapted from the Pacific Nutrition Knowledge and Attitudes Survey (PNKAS), forward-back translated into Nauruan and reviewed by a five-member expert panel including two traditional food knowledge holders.

The intervention package comprised six integrated components delivered across six months: (1) NCD Awareness and Risk Education, delivered through fortnightly community hall sessions in each of the fourteen districts using visual learning tools co-designed with community artists; (2) Traditional Food Revitalisation Workshops, facilitated by elder food knowledge holders in collaboration with the program's registered dietitian, documenting and demonstrating nutritional preparation of local foods including breadfruit, coconut, pandanus fruit, and reef fish species; (3) Cooking Skill Demonstration Sessions using affordable, locally accessible ingredients; (4) Physical Activity and Movement Sessions adapted to the island's limited recreation infrastructure and incorporating

traditional Nauruan movement practices; (5) Self-Monitoring and Goal-Setting Coaching through individual monthly check-ins with trained community health workers; and (6) Family and Community Advocacy Training equipping participants to extend NCD prevention messaging within their household and neighbourhood networks. All components were delivered in Nauruan and English by a team comprising two visiting dietitians from Fiji National University, four Nauruan community health workers who completed a two-week residential training in Suva prior to program launch, and a network of thirty-two volunteer community facilitators recruited from participating districts and trained through a one-day orientation workshop. Cultural grounding was operationalized through three mechanisms embedded in the program design process: a ten-week pre-implementation co-design process facilitated through the Nauru Community Development Agency involving thirty-eight community members in content development; integration of traditional Nauruan food knowledge and ecological relationships as explicit curricular content rather than as supplementary additions; and continuous community advisory oversight through a Program Advisory Group comprising district representatives, health professionals, and traditional community leaders that met monthly throughout the implementation period.

Quantitative data were analysed using IBM SPSS Statistics 29.0; repeated-measures analysis of variance (RMANOVA) was used to assess change across the three time points for continuous outcome variables, with pairwise comparisons adjusted using the Bonferroni correction. Effect sizes for continuous outcomes were calculated using partial eta-squared (η^2); for binary outcomes, McNemar's test was applied with odds ratios reported. Statistical significance was set at $\alpha = .05$ two-tailed. Qualitative data from fourteen focus group discussions (one per district, conducted post-program) and twenty-four in-depth interviews with purposively selected participants were analysed using Braun and Clarke's (2006) reflexive thematic analysis, with analysis structured around the Pacific Model of Community Health (Finau, 1994) to ensure analytic categories reflected Pacific rather than Western-default conceptual frameworks. Ethical approval was granted by the Fiji National University College of Medicine Research Ethics Committee (Ref. CMNHS-ERCC-2023-147) and endorsed by the Nauru Department of Health Research Governance Committee (Ref. NDH-RGC-2023-08). Written informed consent was obtained from all participants; Nauruan-language consent documents were reviewed and approved by two community elders and the Nauru Government's cultural affairs liaison officer.

RESULT AND DISCUSSION

Clinical Biomarker and Anthropometric Outcomes

Repeated-measures analysis across the three time points revealed statistically significant improvements in all five primary clinical biomarkers and both anthropometric indicators, with the majority of improvements demonstrating a progressive trajectory between baseline, three months, and six months that suggests

a sustained and consolidating rather than plateauing intervention effect. Mean systolic blood pressure declined from 138.4 mmHg (SD = 16.2) at baseline to 129.7 mmHg (SD = 13.6) at six months—an absolute reduction of 8.7 mmHg ($F(2, 540) = 24.6$, $\eta^2 = .083$, $p = .001$) that is clinically meaningful: a sustained reduction of this magnitude is associated in the cardiovascular epidemiology literature with an approximately 14% reduction in risk of major cardiovascular events and a 9% reduction in stroke risk over ten years (Law et al., 2009). This reduction was achieved entirely through lifestyle modification—dietary improvement, increased physical activity, and sodium reduction—without any change to participants' antihypertensive medication regimens, which were held constant across the study period by agreement with the Nauru Department of Health. The finding that community-level behavioral intervention can produce clinically significant blood pressure reductions in a population with high baseline cardiovascular risk and no pharmacological augmentation is a particularly strong result for the program's theory of change.

Fasting blood glucose reductions followed a comparable pattern, declining from a mean of 7.4 mmol/L (SD = 2.1) at baseline to 6.5 mmol/L (SD = 1.7) at six months—an absolute reduction of 0.9 mmol/L that moves a meaningful proportion of participants from the diabetic range into the pre-diabetic or normoglycemic range. This glucose reduction is consistent with findings from the landmark Diabetes Prevention Program (Knowler et al., 2002), which demonstrated that structured lifestyle intervention programs producing equivalent levels of dietary improvement and physical activity increase could reduce progression from pre-diabetes to type 2 diabetes by 58% over three years—a benchmark of particular relevance in Nauru, where a substantial proportion of the adult population exists in the high-risk pre-diabetic metabolic zone. Fasting glucose changes were largest among participants who were at the pre-diabetic threshold at baseline (5.6–6.9 mmol/L, $n = 89$), suggesting that the intervention may have particular preventive efficacy for this high-risk subgroup—a finding with important implications for future program targeting within Nauru's constrained public health resource environment.

BMI and waist circumference reductions, while statistically significant, were more modest in absolute terms—mean BMI declined from 34.8 to 33.3 kg/m², and mean waist circumference from 104.3 cm to 100.4 cm over six months. These changes reflect the well-documented challenge of producing substantial weight loss through behavioral intervention alone in a six-month timeframe, particularly in populations with severe baseline obesity and in food environments where ultra-processed energy-dense foods remain the most economically accessible dietary options. Swinburn et al. (2011) argue compellingly that behavioral interventions conducted within what they term "obesogenic environments"—food and physical activity environments structurally biased toward excess caloric intake and sedentary behavior—are fighting structural currents that significantly attenuate the effects achievable through individual and community behavior change programs, regardless of program quality. In Nauru's case, the food environment is acutely

obesogenic: fresh vegetables and locally caught fish are significantly more expensive and less reliably available than imported processed staples, creating a food cost gradient that directly disadvantages healthy dietary choices for lower-income households. The modest anthropometric changes observed should therefore be interpreted not as a failure of the program but as a realistic outcome within an unmodified structural food environment, and as a compelling argument for complementary supply-side policy interventions including import tariff reform and subsidized local food markets.

Qualitative findings from post-program focus group discussions provided important context for interpreting the clinical outcome data, particularly regarding mechanisms of change and the differential experiences of participants across clinical risk profiles. Multiple participants described the Traditional Food Revitalisation component as the most influential element driving their dietary changes, specifically citing the reframing of traditional Nauruan foods as health-protective rather than inferior to imported alternatives as a pivotal cognitive shift. Several participants with type 2 diabetes described reducing their consumption of white rice – previously the dietary staple introduced as a phosphate-boom prestige food – in favor of breadfruit and coconut-based preparations introduced through the cooking demonstration sessions, reporting subjective improvements in energy levels and post-meal blood glucose stability that motivated sustained behavioural change. This revaluation of traditional foods resonates with the food sovereignty framework articulated by La Via Campesina (2007), which positions communities' right to define their own food systems and revalue indigenous food knowledge as a health, cultural, and political imperative – a framework particularly salient for communities whose NCD burden is traceable in part to the colonial displacement of pre-existing healthy food cultures.

Table 1. Clinical, Anthropometric, and Behavioural Outcome Indicators at Baseline, Three Months, and Six Months for Nauru Healthy Island Participants (N = 271)
Nauru Healthy Island Participants (N = 271)

Clinical/Behavioural Indicator	Baseline M (SD) or %	3-Month M (SD) or %	6-Month M (SD) or %	Change (Baseline-6M)	p-value
Systolic blood pressure (mmHg)	138.4 (16.2)	134.1 (15.0)	129.7 (13.6)*	-8.7 mmHg	.001
Fasting blood glucose (mmol/L)	7.4 (2.1)	7.0 (1.9)	6.5 (1.7)*	-0.9 mmol/L	.003
BMI (kg/m ²)	34.8 (6.3)	34.2 (6.0)	33.3 (5.6)*	-1.5 kg/m ²	.004
Waist circumference (cm)	104.3 (12.8)	102.7 (12.1)	100.4 (11.4)*	-3.9 cm	.002

Total cholesterol (mmol/L)	5.82 (1.14)	5.66 (1.08)	5.41 (0.97)*	-0.41 mmol/L	.008
Daily vegetable servings (no.)	1.4 (0.8)	2.1 (0.9)	2.9 (1.1)*	+1.5 servings	<.001
Sugar-sweetened beverage intake (days/wk)	5.3 (1.7)	4.1 (1.6)	2.8 (1.5)*	-2.5 days/wk	<.001
Physical activity (min/wk)	82.4 (44.6)	112.8 (50.3)	148.6 (55.7)*	+66.2 min/wk	<.001
Nutrition knowledge score (0-20)	9.1 (3.2)	13.4 (2.9)	15.8 (2.6)*	+6.7 points	<.001
Medication adherence (%)	51.3	67.4	78.9*	+27.6 pp	<.001

Note. Asterisk (*) denotes statistically significant change from baseline at the six-month measurement point (RMANOVA with Bonferroni-corrected pairwise comparisons, $p < .05$). pp = percentage points. All RMANOVA F-statistics significant at $p < .05$. Effect sizes (partial η^2) ranged from .048 to .114 across clinical and behavioural indicators, representing small-to-medium magnitudes consistent with population-level lifestyle intervention benchmarks.

Dietary Behaviour Change: Vegetables, Sugar-Sweetened Beverages, and Nutritional Knowledge

Dietary behaviour changes constituted the most robust and consistently documented outcome domain of the Nauru Healthy Island program, with improvements across multiple dietary indicators demonstrating the program's capacity to produce meaningful shifts in food consumption patterns within a structurally constraining food environment. Mean daily vegetable servings increased from 1.4 (SD = 0.8) at baseline to 2.9 (SD = 1.1) at six months – an absolute increase of 1.5 servings per day that more than doubled baseline vegetable consumption and moved the group mean considerably closer to, though still below, the WHO-recommended five servings per day. This improvement was achieved primarily through the program's cooking demonstration sessions, which focused on preparing affordable, locally accessible plant-based foods that participants could realistically incorporate into daily cooking routines given Nauru's food import infrastructure and household budgetary constraints. The cooking session approach – in which participants prepared, served, and consumed improved recipes together – exemplifies what Contento (2011) identifies as the "hands-on experiential learning" mode that produces the most durable dietary behaviour changes, because it simultaneously addresses knowledge, skills, food environment familiarity, and taste preferences in a single integrated learning episode.

Sugar-sweetened beverage (SSB) consumption—identified in the program's baseline needs assessment as the single dietary behaviour most strongly correlated with metabolic risk in participating households—declined from a mean of 5.3 days per week (SD = 1.7) at baseline to 2.8 days per week (SD = 1.5) at six months, an absolute reduction of 2.5 days per week ($F(2, 540) = 31.2, \eta^2 = .104, p < .001$). This reduction is both statistically and clinically significant: systematic reviews of SSB reduction interventions consistently link a decrease of this magnitude to meaningful improvements in metabolic syndrome indicators, particularly fasting glucose and waist circumference, through pathways including reduced total caloric intake, improved insulin sensitivity, and decreased hepatic de novo lipogenesis (Malik et al., 2010). Qualitative data indicated that the NCD Risk Education component's specific attention to the biology of SSB-related metabolic harm—delivered through visual tools including a sugar content demonstration that physically displayed the volume of refined sugar contained in commonly consumed beverages—was identified by the largest number of participants as the single most impactful educational experience of the program. This finding supports the pedagogical argument advanced by Freire (1970) that effective health education with structurally marginalized communities must generate genuine conscientization about the political and economic dimensions of health risk, not merely transfer technical nutritional information.

Nutrition knowledge scores—assessed using the adapted 20-item Pacific Nutrition Knowledge and Attitudes Survey instrument—improved from a baseline mean of 9.1 (SD = 3.2) to a six-month mean of 15.8 (SD = 2.6), an absolute gain of 6.7 points that represents a 73.6% improvement relative to baseline. This very large effect size ($d = 2.32$) is consistent with findings from comparable nutrition education interventions in Pacific Island communities reviewed by Hughes et al. (2020), who document that knowledge gains from well-designed community nutrition programs typically outpace behavioural changes—reflecting the well-established knowledge-behaviour gap in health education, in which improved nutritional understanding is a necessary but not sufficient condition for sustained dietary change. Critically, the narrowing of the gap between knowledge gains (73.6% improvement) and behavioural gains (107.1% improvement in vegetable consumption; 47.2% reduction in SSB days) observed in the present study—with behavioural change actually exceeding knowledge change on some indicators—suggests that the program's multi-component design, which complemented educational content with practical skill development and peer support, was effective in translating knowledge into action to a greater extent than purely educational approaches typically achieve.

A particularly noteworthy sub-finding within the dietary behaviour domain emerged from disaggregated analysis by age cohort and district. Participants aged 50 years and above recorded the largest absolute gains in vegetable consumption and the smallest reductions in SSB intake, while the reverse pattern was observed in the 18–35 age cohort—a divergence that qualitative data attributed to generational differences in relationship to traditional food culture. Older participants possessed

substantially greater pre-existing traditional food knowledge that the revitalisation workshops activated rather than built from scratch, facilitating rapid dietary diversification toward familiar indigenous foods. Younger participants, by contrast, had grown up with imported processed foods as their primary dietary reference point and required more scaffolded skill-building before traditional food alternatives felt practically accessible. This age-differentiated pattern has direct implications for program design, suggesting that future iterations should develop age-stratified content tracks that leverage elder traditional knowledge while providing age-appropriate behavioral scaffolding for younger cohorts—an approach consistent with Tiatia-Seath's (2014) recommendation for intergenerational program architectures that position cultural knowledge transmission as both a means and an end of Pacific health promotion.

Programme Engagement, Cultural Relevance, and Implementation Fidelity

Programme engagement indicators were remarkably high across all six components and all fourteen district communities, with overall attendance rates ranging from 85.7% for the Self-Monitoring and Goal-Setting Coaching component to 97.2% for the NCD Awareness and Risk Education sessions. These attendance figures substantially exceed benchmarks reported in the Pacific NCD programme literature, where community health programme attendance rates above 75% are considered strong and above 90% exceptional (Hughes et al., 2020). The uniformly high engagement rates across a geographically compact but socially heterogeneous island population suggest that the programme's design—with its emphasis on co-developed, culturally grounded content, delivery through trusted community facilitators, and scheduling aligned with participants' daily life obligations—successfully addressed the structural and motivational barriers that typically attenuate engagement in community health programmes targeting NCD-burdened populations with complex care needs and constrained discretionary time.

Perceived cultural relevance ratings, assessed through end-of-programme evaluation surveys using a five-point Likert scale (1 = not at all culturally relevant; 5 = extremely culturally relevant), were uniformly high across all six components, ranging from 4.2 for the Self-Monitoring and Goal-Setting Coaching component to 4.8 for the Traditional Food Revitalisation Workshops. The Traditional Food component's highest cultural relevance rating aligned with qualitative data from focus groups in which participants consistently described the experience of seeing traditional Nauruan foods presented in a health promotion context—rather than implicitly displaced by imported foods in health messaging—as both emotionally significant and motivationally powerful. Several participants used the Nauruan concept of *irun*—a culturally specific term denoting the pride associated with enacting one's cultural identity—to describe their experience of the traditional food revitalisation sessions, suggesting that the programme had successfully connected dietary behaviour change to a motivational register rooted in cultural identity rather than merely in clinical risk avoidance. Deci and Ryan's (2000) self-determination

theory identifies identified and integrated motivation—motivation rooted in personal values and identity rather than external threat or reward—as the form of motivation most predictive of long-term behaviour change, providing theoretical grounding for the programme's culturally anchored motivational strategy.

Implementation fidelity monitoring, conducted through structured observation checklists completed during 20% of randomly selected sessions across all components and sites, yielded a mean fidelity score of 87.4% (SD = 5.8%), indicating that programme content was delivered as designed with a high degree of consistency across the fourteen district communities. The lowest fidelity scores were recorded for the Physical Activity and Movement Sessions component (mean 79.3%), primarily attributable to the adaptation challenges posed by Nauru's extremely limited outdoor recreation infrastructure—the island's circumference is just 19 kilometres, and its only recreation oval is shared among multiple organised sports and community activities—which required facilitators to exercise substantial creative adaptation in session design. Paradoxically, several facilitators reported that the necessity of adapting movement activities to available spaces generated community creativity that produced locally invented activities more engaging and culturally resonant than the standardized movements originally scripted, illustrating what Baranowski et al. (2003) describe as the productive tension between fidelity and adaptation in community health programme delivery: rigid fidelity to externally designed content can suppress the contextual adaptations that make programmes genuinely fit for purpose in their delivery environments.

The role of the thirty-two volunteer district facilitators in sustaining programme engagement deserves particular analytical attention as a potentially transferable implementation model. These community members—selected through community nomination processes rather than through professional qualifications—served as the primary interface between the programme's structured content and participants' daily lives, providing informal support, accountability, and encouragement between formally scheduled sessions. Post-programme interviews with participating community health workers and the district facilitators themselves indicated that the facilitator role had generated unexpected spillover effects beyond formal programme delivery: several facilitators reported spontaneously establishing informal neighbourhood cooking groups, advocating for traditional food procurement at community events, and initiating conversations about food import policy with district representatives. This organic extension of programme influence through community facilitator networks instantiates the concept of health promotion diffusion through social networks theorized by Valente (2012), who demonstrates that peer-delivered health interventions consistently produce larger population-level effects than clinician-delivered programs because peer facilitators are more trusted, more accessible, and more likely to embed health messages in the relational contexts that shape day-to-day behaviour.

Table 1. Programme Component Attendance Rates, Completion Rates, and Participant-Rated Cultural Relevance and Perceived Usefulness Across Six Nauru Healthy Island Components (N = 271)

Programme Component	Attendance Rate (%)	Completion Rate (%)	Perceived Cultural Relevance (1-5)	Perceived Usefulness (1-5)
NCD Awareness & Risk Education	97.2	96.1	4.6	4.7
Traditional Food Revitalisation Workshops	94.8	91.3	4.8	4.9
Cooking Skill Demonstrations	96.5	94.0	4.7	4.8
Physical Activity & Movement Sessions	89.3	85.6	4.3	4.5
Self-Monitoring & Goal-Setting Coaching	85.7	80.2	4.2	4.4
Family & Community Advocacy Training	91.4	88.7	4.5	4.6

Note. Cultural Relevance and Perceived Usefulness scores are mean values on a five-point Likert scale (1 = not at all relevant/useful; 5 = extremely relevant/useful), collected through end-of-programme evaluation surveys. Completion Rate is defined as the percentage of enrolled participants who completed at least 80% of scheduled sessions within each component. Component delivery was standardised across all fourteen district communities.

Community Capacity Building, Advocacy Outcomes, and Health System Implications

Beyond the direct participant-level outcomes documented through clinical and behavioural assessments, the Nauru Healthy Island programme generated a set of community capacity and health system outcomes whose implications for sustained NCD prevention may prove more consequential in the long run than any individual-level behaviour change. The thirty-two community facilitators trained through the programme acquired competencies in health communication, group facilitation, basic nutrition counselling, and community advocacy that represent a significant addition to Nauru's extremely thin community health workforce—a workforce augmentation achieved at a fraction of the cost of equivalent formal health professional training. Post-programme competency assessments of the facilitator

cohort indicated that 28 of 32 (87.5%) had achieved proficiency thresholds across all five competency domains assessed, and qualitative interviews confirmed that all facilitators expressed strong motivation to continue programme-related activities in their districts beyond the formal six-month implementation period. Simmons et al. (2017) emphasize that community health worker capacity development must be accompanied by institutional integration and ongoing supportive supervision to prevent the common pattern of trained volunteer attrition following project conclusion; the study team has accordingly engaged the Nauru Department of Health in discussions about formal recognition and stipend support for programme facilitators as community health outreach workers within the national health system.

The Family and Community Advocacy Training component generated measurable community-level policy outcomes that extended the programme's impact well beyond enrolled participants. By programme conclusion, three of Nauru's fourteen district councils had passed resolutions committing to promote traditional food availability at district community events, with one district establishing a monthly traditional food market in partnership with households that maintain productive gardens and coconut processing capacity (Muhsyanur et al., 2022). Additionally, a formal petition signed by 143 programme participants and submitted to the Nauruan Parliament requested the introduction of a sugar-sweetened beverage tax—an evidence-based fiscal measure that Nauru's government had discussed but not implemented for over a decade—citing the programme's health education content as the basis for their advocacy position. While parliamentary action on this petition had not been confirmed at the time of writing, the fact that community members mobilised structured democratic advocacy drawing on their health literacy gains represents precisely the form of community agency that Nutbeam (2000) identifies as the highest expression of critical health literacy: the capacity to analyse structural determinants of health and translate that analysis into collective action for policy change.

The programme's documentation of traditional Nauruan food knowledge—carried out through the Traditional Food Revitalisation Workshops and preserved in a co-produced community nutrition resource booklet published in Nauruan and English—represents a cultural heritage preservation outcome that extends beyond the health domain. Several elder participants who served as knowledge holders in the workshops described the documentation process as fulfilling a responsibility to ensure that traditional food practices would not be permanently lost to younger generations increasingly oriented toward imported food cultures. This intergenerational knowledge transfer dimension connects the programme to the broader literature on indigenous food sovereignty and the role of traditional food systems in maintaining cultural identity, ecological relationships, and community wellbeing in Small Island Developing States facing the compound pressures of climate change and economic globalisation. McLennan and Ulijaszek (2015) argue that the NCD burden in Pacific Island communities cannot be fully addressed without simultaneously addressing the cultural and ecological dimensions of food

system change—a position that the Nauru Healthy Island programme's integrated approach embodies in practice and that the present findings empirically support through the demonstrated health benefits of traditional food revitalisation as a programme component.

The health system implications of the programme's outcomes extend to medication adherence, a clinically critical dimension of NCD management that is frequently neglected in community nutrition education programmes but that was incorporated into the Nauru Healthy Island design given Nauru's documented challenges with chronic disease medication supply, storage, and uptake. Medication adherence rates among participants with confirmed NCD diagnoses increased from 51.3% at baseline to 78.9% at six months—an improvement of 27.6 percentage points that has direct clinical consequences for blood pressure control, glycaemic management, and cardiovascular risk reduction in a population with high polypharmacy burden and historically low treatment adherence. This adherence improvement is not a direct outcome of the nutrition education content per se but an emergent effect of the programme's broader empowerment mechanisms: participants who developed greater health literacy, stronger self-efficacy, and more robust peer support networks through the programme were better equipped to navigate the practical and motivational challenges of chronic disease medication management. Haynes et al. (2008), in their systematic review of medication adherence interventions for chronic disease, identify health literacy and social support as two of the most consistently effective adherence-promoting factors—precisely the capabilities that the Nauru Healthy Island programme built across its full six months of engagement. This finding suggests that community nutrition education programmes designed with an explicit empowerment framework can generate adherence benefits that complement and potentially amplify the clinical effects of pharmacological NCD management, a conclusion with direct relevance for the design of integrated NCD prevention and management systems in resource-constrained Pacific Island health contexts.

CONCLUSION

The Nauru Healthy Island programme provides robust longitudinal evidence that a culturally grounded, community-embedded, multi-component nutrition education programme can generate clinically significant improvements across the full spectrum of NCD-related biomarkers, dietary behaviours, health knowledge, and medication adherence within a six-month implementation period in one of the world's most geographically isolated and NCD-burdened island communities—achieving these outcomes not despite its cultural grounding but, the evidence compellingly suggests, substantially because of it. The 8.7 mmHg reduction in systolic blood pressure, the 0.9 mmol/L decline in fasting blood glucose, the 1.5 additional daily vegetable servings, the 47.2% reduction in sugar-sweetened beverage consumption days, the 73.6% improvement in nutrition knowledge scores, and the 27.6 percentage-point increase in medication adherence collectively

represent a breadth and consistency of positive change that strongly validates the programme's integrated, culturally anchored design philosophy.

Based on these findings, the following recommendations are urgently advanced: (1) the Government of Nauru, in partnership with the Pacific Community (SPC) and WHO WPRO, should commit to institutionalising and scaling the Nauru Healthy Island model across a sustained three-year program cycle with dedicated annual government budget appropriation, ensuring that community facilitators are formally recognised and compensated as community health outreach workers within the national health workforce framework; (2) the Nauruan Parliament should act on the community petition by introducing a sugar-sweetened beverage excise tax at a rate of at least 20% ad valorem, with revenues earmarked for traditional food market development and community nutrition programming, consistent with the fiscal NCD prevention evidence base for Pacific Island countries; (3) Nauru's import tariff and food subsidy framework should be reviewed to eliminate the inverse price gradient that currently makes ultra-processed imported staples cheaper than locally produced and traditionally available foods, as no community nutrition education programme can achieve its full potential in a food environment structurally hostile to healthy food choice; (4) regional Pacific health institutions – including the Pacific Community, WHO WPRO, the University of the South Pacific, and Fiji National University – should establish a dedicated collaborative research and programme support mechanism for Small Island Developing States with populations below 50,000, ensuring that the absence of domestic university capacity in microstates does not translate into perpetual research and programmatic marginalization; (5) the traditional food knowledge documentation produced through this programme should be formally archived through a partnership with the University of the South Pacific's Pacific Collection and made accessible as an open-access educational resource for health workers, educators, and community members throughout Nauru and the broader Pacific region; and (6) future programme iterations should incorporate a longitudinal follow-up design extending to at least 18 months to assess the durability of clinical and behavioural improvements beyond the programme's active phase, addressing the critical evidence gap regarding sustained NCD behaviour change in Pacific Island community intervention contexts.

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