



Modernization: The Children's Healthy Living Program for Remote Underserved Minority Populations of the Pacific (CHL) from the US Affiliated Pacific Region



Children in the Marshall Islands

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**PhD & Training course: Urban Spaces – new opportunities for community action
promoting better food & health, August 29-31, 2016, Copenhagen**

Modernization - Urbanization

Epidemiologic Transition- Nutrition Transition



Hawaii Farmers Market

- As countries develop economically, they modernize and tend to urbanize, and this tends to involve changed structures to farming and transportation
 - More mechanized, less human labor (physical activity)
 - More processed food
 - Less active transportation
- Diseases shift from infectious to chronic diseases,
 - accompanied by less undernutrition and more obesity

Popkin, Horton and Kim 2001. The Nutrition Transition and Prevention of Diet-related Diseases in Asia and the Pacific. Food and Nutrition Bulletin, vol. 22, no. 4 (supplement) © The United Nations University, 2001

Developmental Origins of Health Status or

**“The circumstances in which women are pregnant
and children develop”**

“Babies come from society”

“Babies are record keepers of societal decisions”

(Winett, Wulf and Wallack 2016 AJPH 106:8:1369-73)



- Critical periods of growth
 - Early undernutrition predisposes to metabolic programming that results in overweight and obesity later in life (“Barker hypothesis”)
 - Important for modernizing countries
- Focus on the community & environment/context for intervention
- Growth indicators useful

U.S. Affiliated Pacific Region

- Jurisdictions have varied affiliation with US (states, territories, commonwealth, “free association”)
- Larger geographic area than continental US (7 time zones - 2 days)
- Obesity among the highest in the world among adults (about 70%) though data are limited
- Fewer data on child obesity
 - U.S. National Health and Nutrition Examination Survey (NHANES) does not cover the region
 - CHL fills this gap



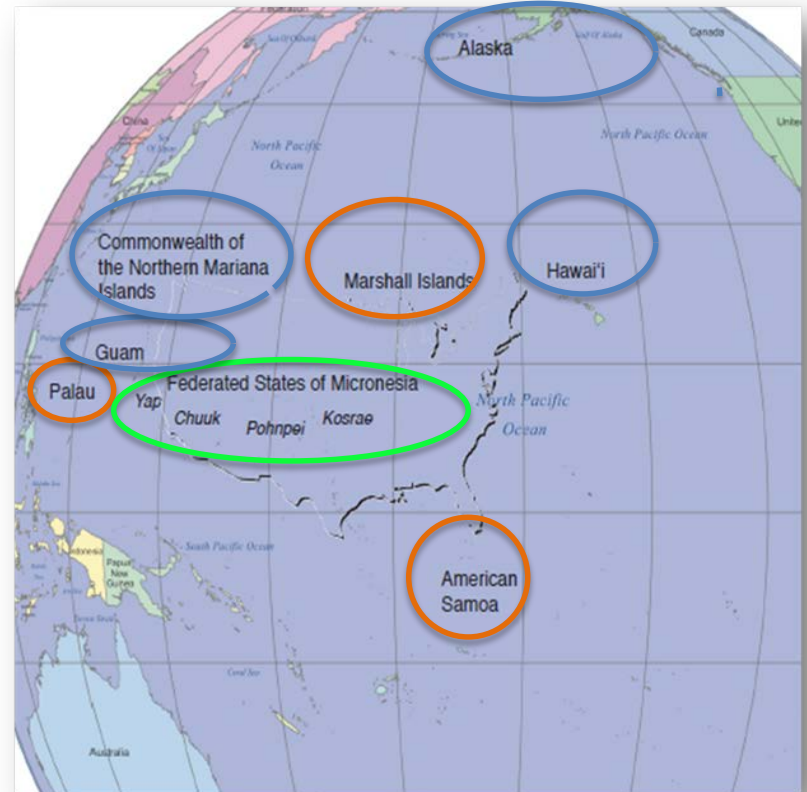
CHL Program

11 Jurisdictions of the US Affiliated Pacific

a modernizing region of lower middle income to high income
which have ties to the US

Classification of Jurisdiction Income by World Bank
Income Classification
(<http://chartsbin.com/view/2438>)

- Lower middle income (**LMI**):
Federated States of Micronesia
(Yap, Chuuk, Pohnpei, Kosrae)
- Upper middle income (**UMI**):
American Samoa, Marshall Islands, Palau
- High income (**HI**): Guam,
Northern Mariana Islands, US
states (Hawaii and Alaska)





CHL Program

in 11 jurisdictions of the US Affiliated Pacific Region

5 jurisdictions in intervention program

Rachel Novotny, Principal Investigator

- 11 jurisdictions collected prevalence survey
- 5 jurisdictions in CHL intervention trial (all are UMI except AM Samoa which is UMI)- prevalence survey was baseline survey



- Hawaii – University of Hawaii
- Guam – University of Guam
- Alaska – University of Alaska at Fairbanks
- American Samoa – American Samoa Community College
- Commonwealth of the Northern Mariana Islands – Northern Marianas College



United States Department of Agriculture, National Institute of Food and Agriculture, Grant 2011- 68001-30335 (Novotny PI)

CHL Community-Randomized Intervention Trial in 5 Jurisdictions (27 communities), Wilken et al 2013

Key



Jurisdiction (n=5)



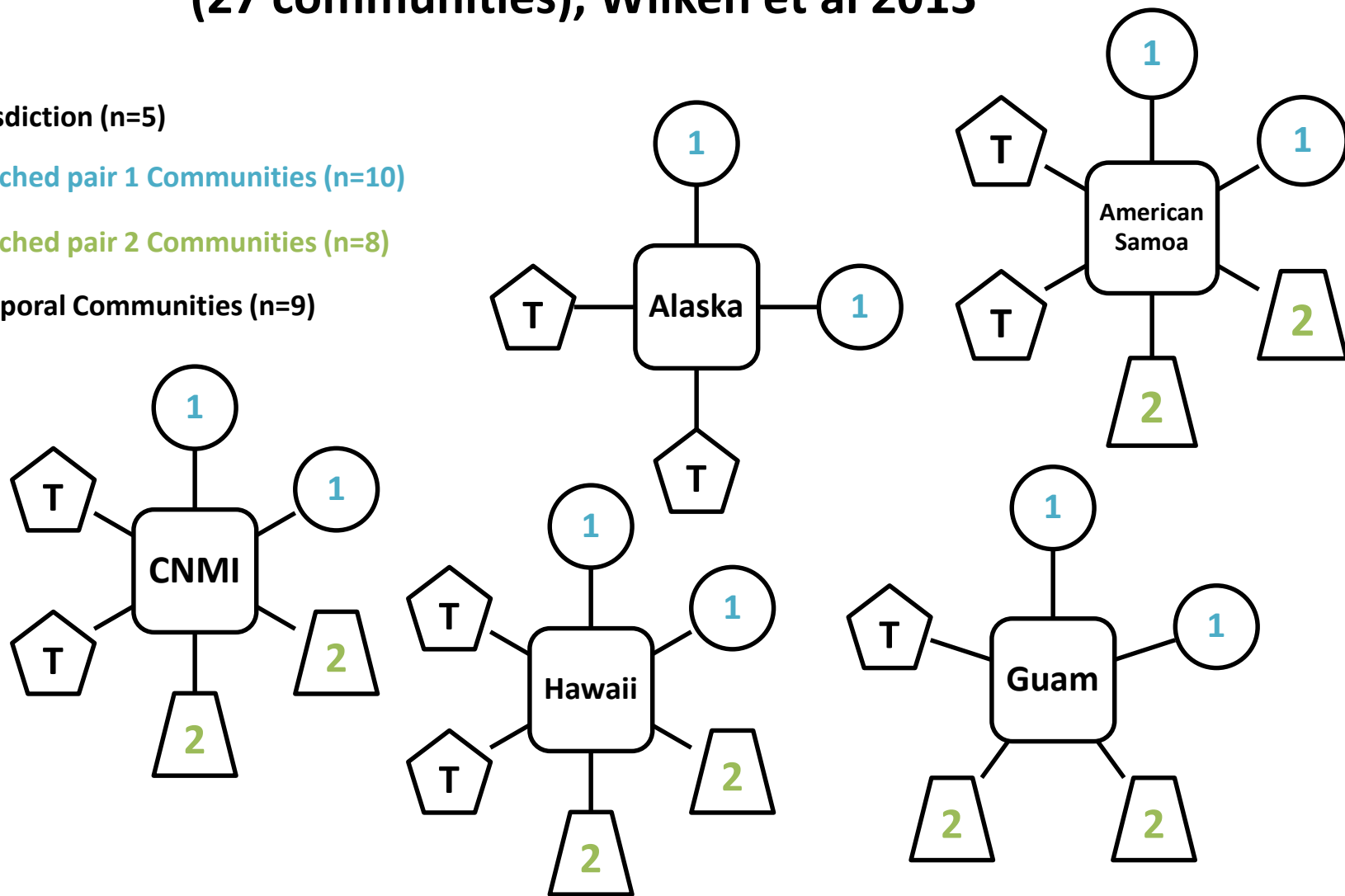
Matched pair 1 Communities (n=10)



Matched pair 2 Communities (n=8)



Temporal Communities (n=9)



Community is the Unit of Analysis for the intervention trial

CHL

Engagement of the Randomized Communities



Community Leaders meet in CNMI

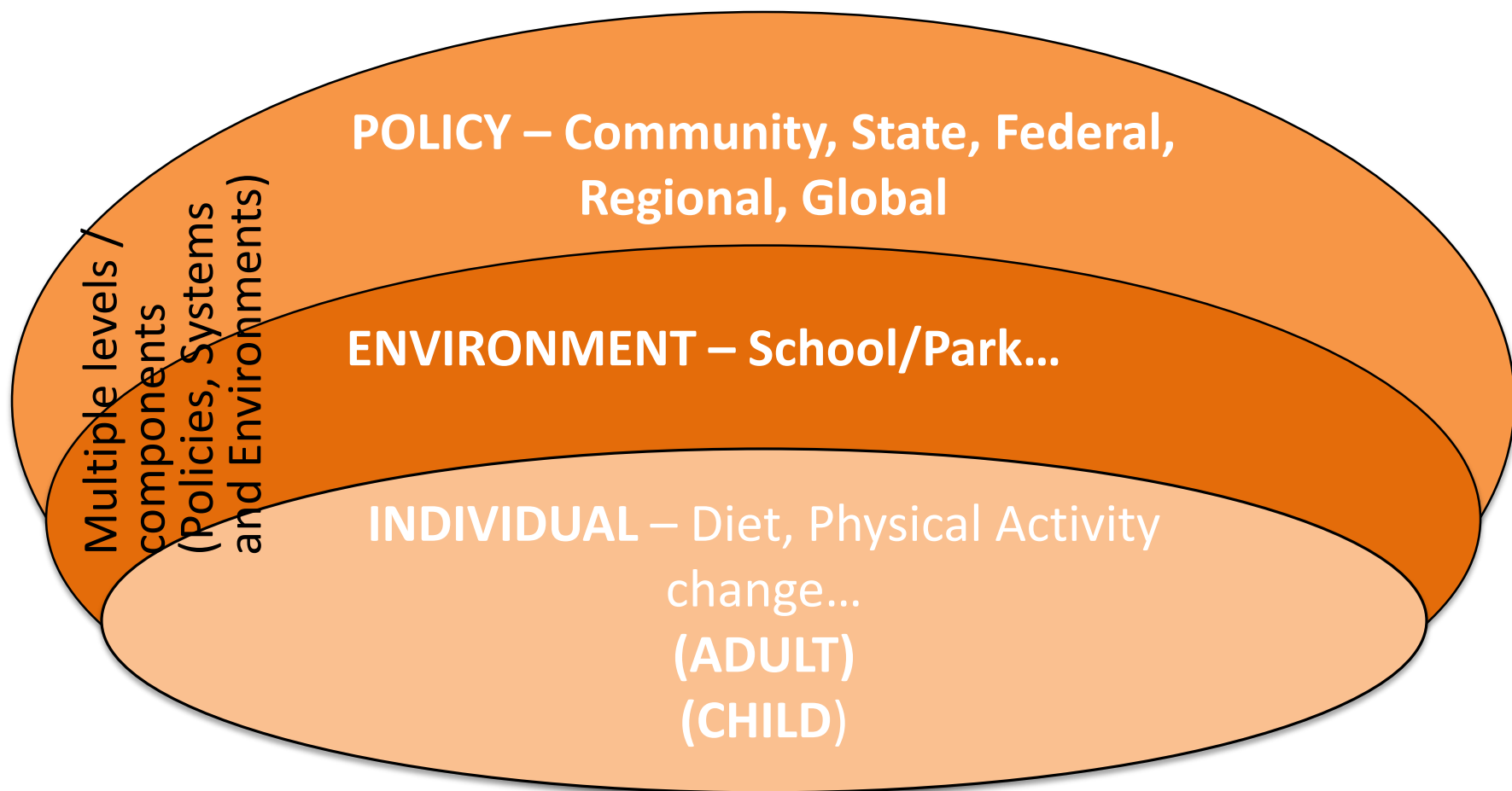
Table 1. Steps and Activities in the ANGELO Model as Modified by the Children's Healthy Living (CHL) Program

Step	Activities
Step 1. Engage communities to identify and prioritize preferred intervention strategies	A local advisory committee was established in each jurisdiction.
	Multiple key informant meetings were held to learn about community-specific resources targeting young children, to help develop a shared vision of CHL's community involvement, and to guide work with the communities.
	Four community meetings were held in each of five jurisdictions to identify community-preferred intervention strategies. These strategies were collated by jurisdiction.
	Three inventories (programs, data, and policies) were compiled for each of four communities in each jurisdiction.
	Collated lists of preferred intervention strategies and inventory findings were shared in a second series of community meetings in each jurisdiction. Strategies on these lists were prioritized by community participants based on their perceived importance and feasibility.
Step 2. Review scientific literature	Intervention team conducted a systematic literature review of effective environmental strategies to prevent and control childhood obesity.
Step 3. Merge findings from the community and literature	CHL Coordinating Center merged findings from the community meetings and literature.
	The intervention team reviewed, discussed, and finalized the intervention activity grid.
Step 4. Formulate CHL multilevel intervention	The region-wide CHL intervention was formulated at week-long annual meeting with representatives from all jurisdictions.
	Jurisdiction-specific meetings were held to plan how the CHL intervention would be specifically operationalized in the jurisdiction's communities.

Braun et al. (ANGELO model- Analysis Grid for Environments/Elements Linked to Obesity)



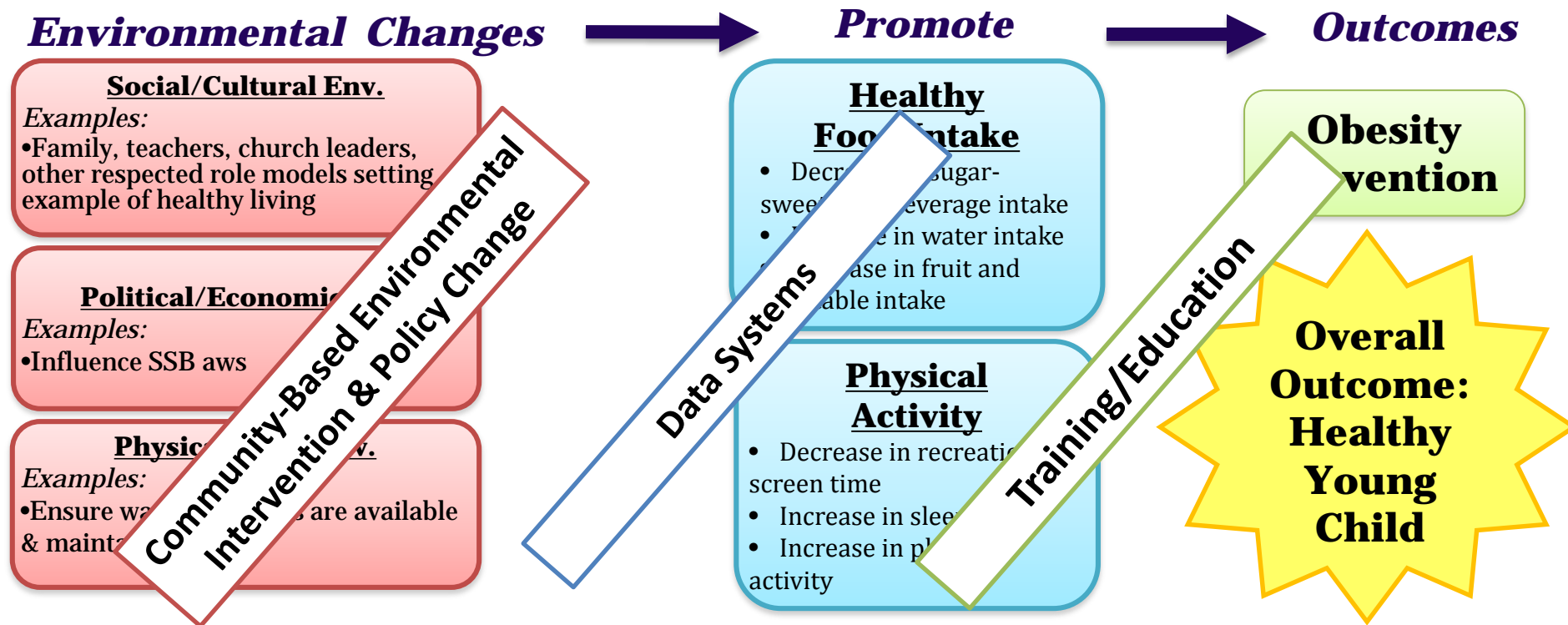
“Social Ecologic Model” of multiple multilevel influences on child obesity





CHL Program

Multilevel Multicomponent Multijurisdiction A Social Ecologic Model





CHL MLMC Intervention Template: 4 Cross-Cutting Functions, 19 Activities & 6 Behavioral Targets

Policy: Review Assessment Data for Policy & Physical Environment related to the 6 CHL behaviors

- a. Review preschool wellness policy assessment data to identify training needs
- b. Review community assessment data to identify areas for advocacy

Environment: Community Partnership and Advocacy for Environmental Change

- a. Work with coalitions to advocate for
 - i. Better access to parks that are safe & inviting
 - ii. Better access to clean water
 - iii. Safer environments for walking & biking
 - iv. Better food placement in stores
 - v. Gardens & hydroponics
- b. Partner with existing entities to purchase or obtain sponsorship for
 - i. Water in the preschools
 - ii. Gardening supplies for preschool kids
 - iii. Sports equipment for preschool kids
 - iv. Campaigns & messages

Messaging: Promote the CHL Message to Community

- a. Support role models to deliver CHL messages in various venues
- b. Enhance existing social marketing campaigns related to 6 CHL behaviors
- c. Advertise CHL or other activities that promote 6 CHL target behaviors

Capacity Building: Train the Trainers /Role models

- a. Train individuals to promote gardening in preschools & communities
- b. Train individuals to lead interactive, hands-on, & family-based sessions
- c. Train preschool providers on wellness policies
- d. Train preschool providers in curricula related to 6 CHL target behaviors
- e. Train role models (community champions, role celebrities, role models)

↓ SSB	↑ F/V	↑ PA	↑ Water	↓ Screen	↑ Sleep
X X	X X	X X	X X	X	X
X		X	X		
X	X X	X X	X		
X			X		
X	X	X	X	X	X
X X X	X X X	X X X	X X X	X X X	X X X
X X X	X X X	X X X	X X X	X X X	X X X
X X X X X	X X X X X	X X X X X	X X X X X	X X X X X	X X X X X

Development of the CHL Intervention

Community Based
Participatory Research
process to find
“environments”
(intervention foci) to
support in Pacific
communities to
achieve intervention
targets



CHL Hilo Hawaii Family Gardening
Photo: Luana Busby-Neff

CHL MLMC Community Selection Criteria for Intervention Program

- 27 communities were selected in 5 jurisdictions (in 2011) – 1 jurisdiction is UMI
 - 2000 US census data were used to inform selection of communities to be
 - >25% of the population of indigenous/native descent of each jurisdiction
 - >10% of the population under age 10 years, our target group
 - >1000 population size
 - Relatively accessible locations
- Communities were matched and randomized to intervention and control (community randomized)
- Some communities were also selected temporal assessment (BMI and waist)



Yap,
Photo Novotny

CHL Intervention Implementation Approach

- Partnered with, supports (funds), and “adds value” to existing programs that are conducting activities related to CHL’s 6 behavioral targets (positive deviance).
- Built local capacity and coalitions to sustain programs and policy changes.
- Promoted a common CHL message.
- Collected process information on the implementation strategies, duration, and reach.

Braun K et al 2014 Childhood Obesity





Community readiness (CR) for change for intervention planning and analysis

- **Method**

- Participants: Minimum of 5 key informants knowledgeable of the food and physical activity environment of each of the 4 intervention and control communities in each of 5 intervention jurisdictions, baseline and post-intervention (18 – 24 months)
- The CR survey: assessed 6 dimensions of CR -self-administered (online or paper).
- Scoring: Range 1 (No Awareness) to 9 (High Level of Community Ownership). Each dimension totaled and divided by the number of participants per community. Total for all dimensions divided by 6 (number of dimensions) to determine overall CR score for each community.

- **Result**

- Average CR scores remained relatively consistent post-intervention from baseline at 5.

- **Analysis**

- Community CR will be used to interpret the results of the intervention and to examine modification of effects .

CR Tool based on OPIC study using the Tri-ethnic Center tool adapted for the Pacific (Plested, Edwards and Thurman)

CHL Process Data Components: Monthly Intervention Implementation Grid

Table 2 - Community Activity Ratings							
	Acceptability	Reach	Likelihood of Effectiveness	Adoption	Sustainability	Feasibility	Total
1. Review Assessment Data for the Policy and Physical Environment related to the 6 CHL behaviors							
a. Review preschool wellness policy assessment data to identify training needs	3	3	3	3	2	3	17
b. Review CAT (community assessment toolbox) data related to the physical environment to identify areas for advocacy	3	1	2	1	1	3	11
2. Partner and Advocate for Environmental Change							
a. Work with existing community organizations and coalition and/or form new coalitions to advocate for							
i. Better access to parks that are safe and inviting					3	1	14
ii. Better access to clean water					1	1	7
iii. Safer environments for walking, biking, etc (e.g., bike lanes/racks, sidewalks, greenways)					2	1	11
iv. Better food placement in stores					1	2	8
v. Gardens and Hydroponics					1	2	10
b. Partner with existing entities to purchase or obtain sponsorship for							
vi. Gardening supplies for preschool kids					1	1	8
vii. Sports equipment for preschool kids					1	1	7
viii. Campaigns and messages					1	1	6



Tafuna
Elementary,
American
Samoa,
April 2013

CHL Measures by MLMC Level

- Individual Children - 2-8 yo, child race/ethnicity
 - Anthropometry (Height, Weight, and Waist)
 - Acanthosis Nigricans (Back of the neck)
 - Accelerometry (6 days)
 - Food and Activity logs (2 days)
 - Sleep Questionnaire
 - Screen Time
- Parent/Caregiver - Acculturation, Household SES, Household Food Insecurity
- Community – Readiness (Leaders), Environment (Store, Park, Walkability)
- Jurisdiction - Food & Utility cost survey & World Bank Income Level



Height measurement,
Palau

Acanthosis Nigricans Screening Scale

(Burke JP, Hale DE, Hazuda HP, Stern MP. 1999. A quantitative scale of acanthosis nigricans. Diabetes Care 22:1655-1659.)

Instructions: Rate and circle using a black/blue pen the severity of acanthosis nigricans on the back of the neck using the screening scale below.

Neck Severity Rating: 0 1 2 3 4

Comments: _____


Coded as present
or absent for this
presentation



Neck Severity Rating	Neck Severity	Description
0	Absent	Not detectable on close inspection.
1	Present	Clearly present on close visual inspection, not visible to the casual observer, extent not measurable
2	Mild	Limited to the base of the skull, does not extend to the lateral margins of the neck (usually <3 inches in breadth).
3	Moderate	Extending to the lateral margins of the neck (posterior border of the sternocleidomastoid) (usually 3-6 inches), should not be visible when the participant is viewed from the front.
4	Severe	Extending anteriorly (>6 inches), visible when the participant is viewed from the front.



Household Food Insecurity Core Question, from US Department Agriculture

FORM 23-02 – 24-month	Children's Healthy Living Program Information About Your Child 	For Office Use Only Child's ID: _____ Date: ____/____/____ MM DD YEAR Checked by: _____
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OTHER INFORMATION

FOOD SECURITY/AVAILABILITY

1. In the past 12 months, how often does your money for food run out before the end of the month?

☐ Never ☐ Seldom ☐ Sometimes ☐ Most times ☐ Always ☐ Don't know ☐ No Response

- **Food insecurity** classified **yes** if household money for food ran out before the end of the month **sometimes, most times or always** (Nord, et al., 2002; USDA Core Food Security Module)



CHL INDIVIDUAL LEVEL SAMPLE

Child Enrollment & Measurement

Jurisdiction	Consented	Anthropometry	FAL*	Acticals*
Guam – 24 month	908	858	705	404
CNMI – 24 month	1,011	1,001	653	485
Am. Samoa – 24 month	950	950	569	360
Hawaii – 24 month	1,034	1,016	423	408
Alaska – 24 month	782	741	340	247
24 Month Intervention Total	4,685	4,566	2,690	1,904
Baseline Intervention Total	4,488	4,443	2,614	2,032
FAS Prevalence Study	1,287	1,227	1,149	554
CHL Total	10,460	10,236	6,454	4,490

*target was 150 for FAL
(food and activity log)
and 100 for Actical
accelerometers per
community

Building native
walking trails in
Hawaii



Anthropometric Measurement and Classification

- Child's height, weight and waist were measured (n=5463) by trained and standardized staff with 99% reliability obtained (Li et al 2015, Am J Hum Bio).
- **Obesity** status was categorized using BMI based on CDC's 2000 reference data (the norm used in the region) for 2-8 year olds.
 - **Obese** $\geq 95^{\text{th}}$ BMI percentile for age and sex
 - Cutoff values for biologically implausible values were defined according to CDC as < -4 or > 5 SD according to BMI z scores and removed.
- **Underweight** was defined categorized based on CDC's 2000 reference data
 - Underweight $< 5^{\text{th}}$ percentile for age and sex
 - Cutoff values for biologically implausible values were defined and removed according to CDC as < -4 or > 5 SD according to BMI z scores.
- **Stunting** was defined as current height-for-age z score (HAZ) < -2 SDs below the mean of CDC reference data (n=5461).
 - Cutoff values for extreme z scores for HAZ were < -6 or > 6 SD from the mean and were removed from the analysis.

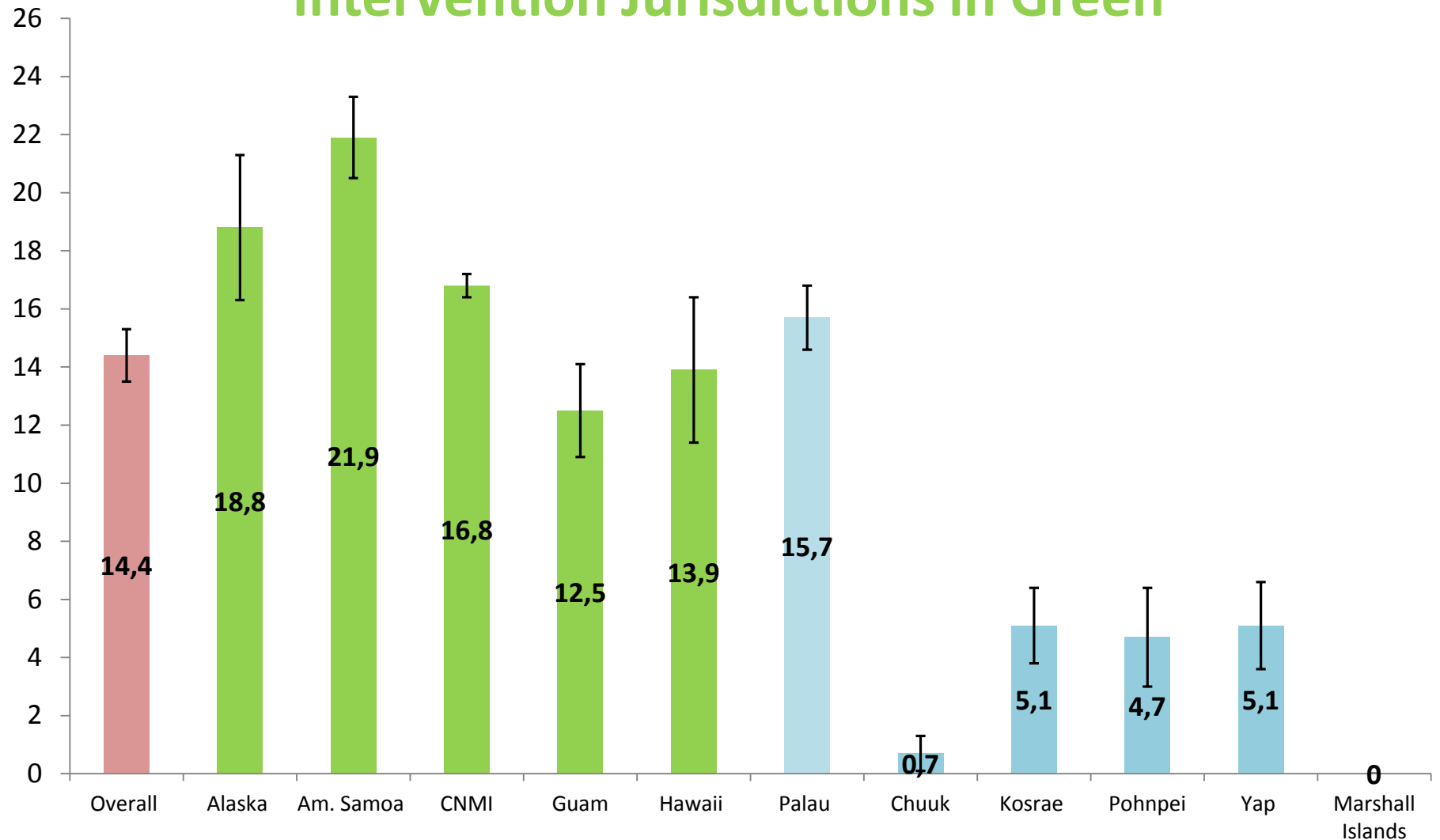
Visualizing stunting





CHL Baseline Prevalence of Obesity* by Jurisdiction (2 – 8 year olds)

Intervention Jurisdictions in Green

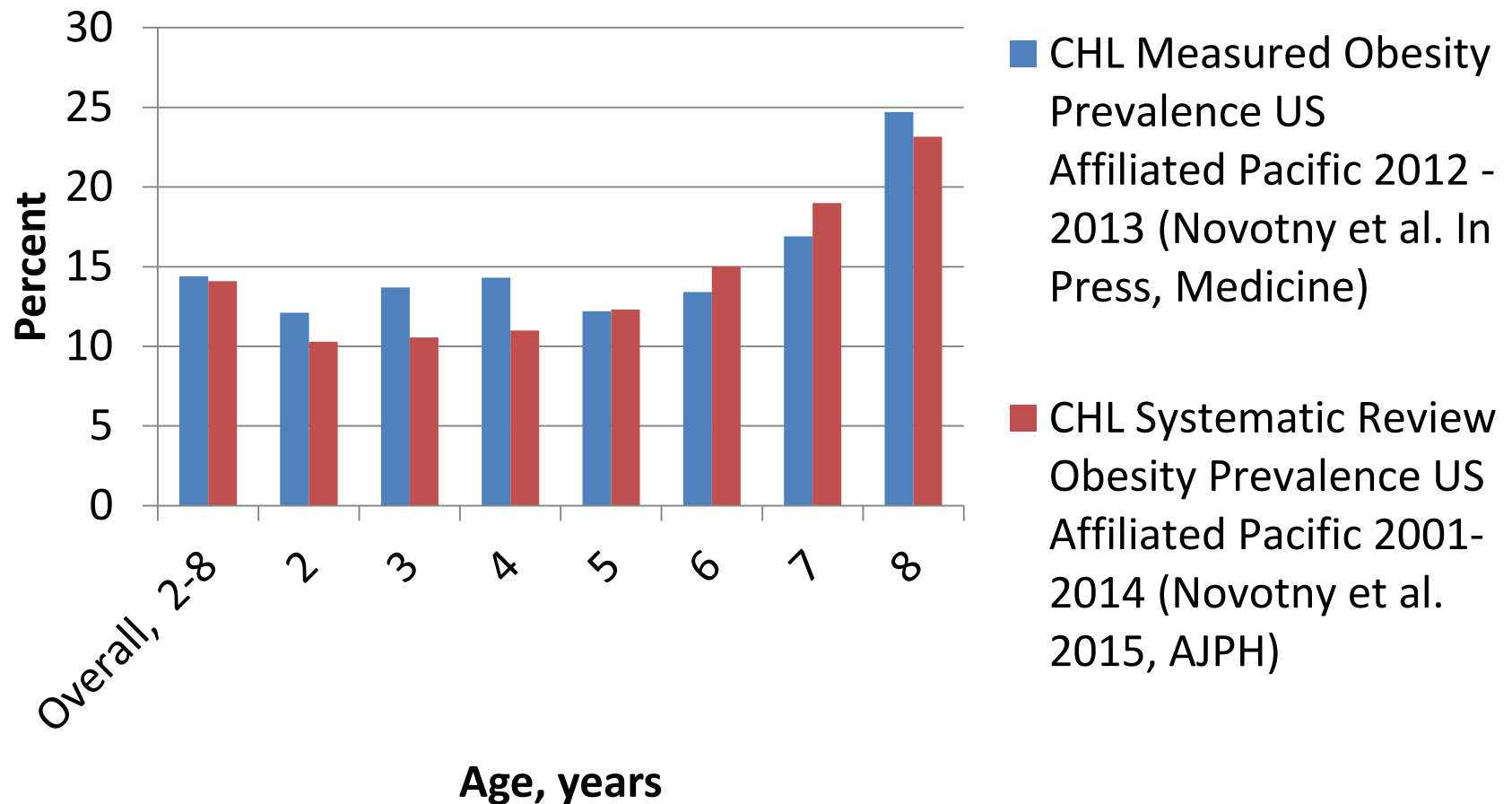


* BMI ≥ 95th percentile, weighted for population size and adjusted for community clustering.

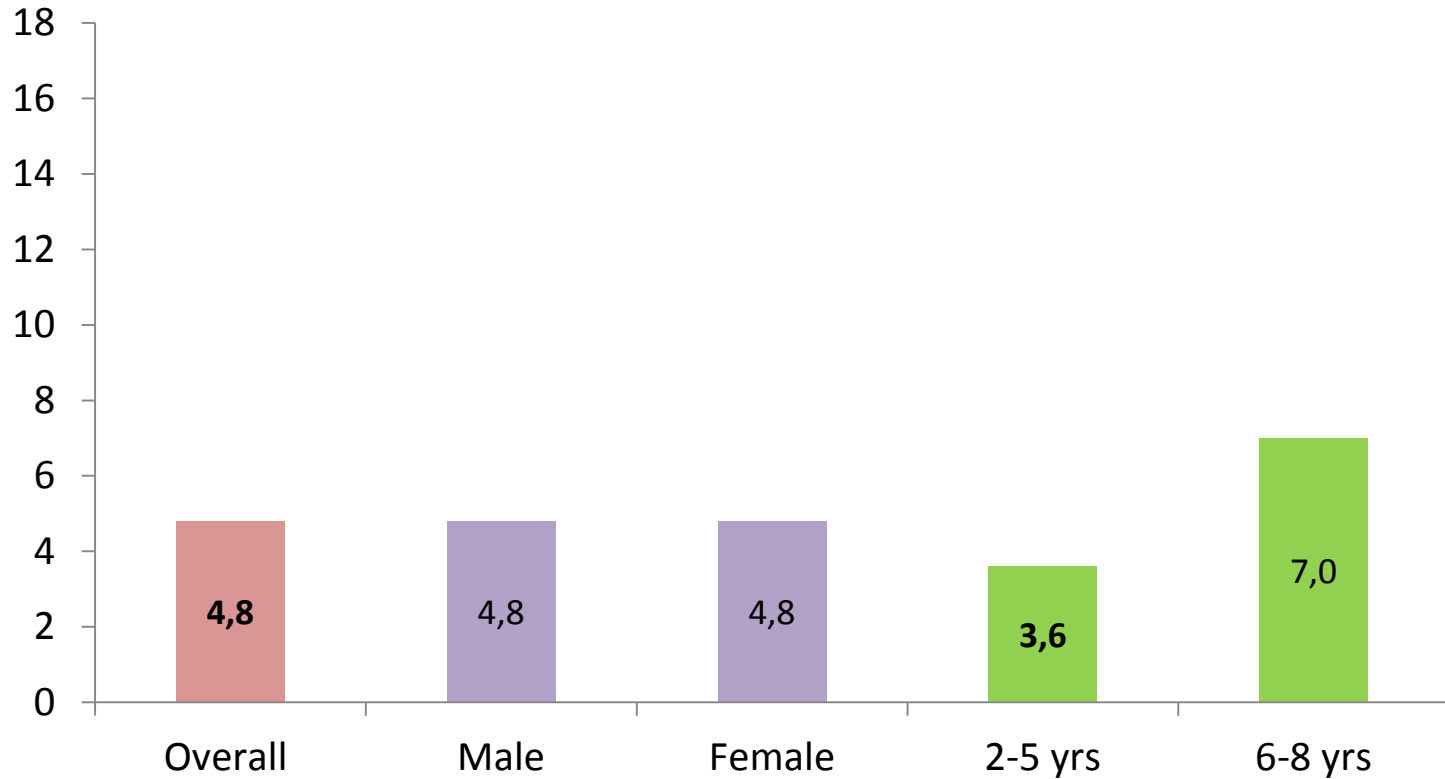
14.1% overweight (85th to 94th percentile) overall

Novotny et al Medicine in press

CHL Young Child Obesity Estimates

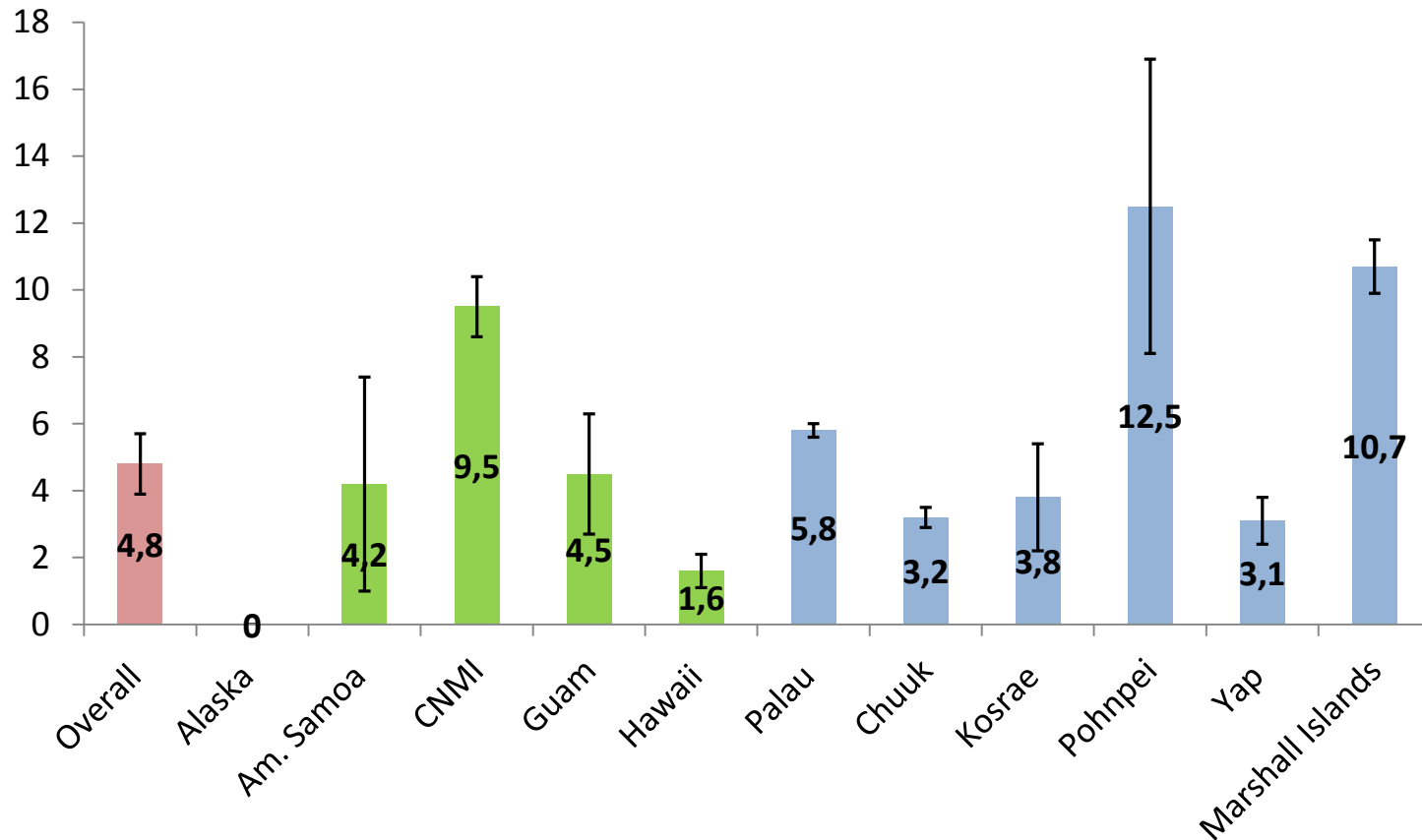


Prevalence* of Acanthosis Nigricans by Sex and Age Group



* Any presence of AN, weighted for population size and adjusted for community clustering.
Novotny et al Medicine in press

Prevalence* of Acanthosis Nigricans by Jurisdiction



* Any presence of AN, weighted for population size and adjusted for community clustering.
Novotny et al Medicine in press

CHL Overall Intervention Impact Analysis

- Mixed Model testing each outcome (BMI, waist and each of 6 target behaviors) accounting for Clustering (Communities) in a Group (Community) Randomized Trial.





CHL Preliminary MLMC Intervention Impact Analysis

- Regression models
 - Adjust for clustering of communities within jurisdiction and age distribution of children
 - Intervention effect is represented by interaction between type of community (intervention, control, temporal) and time (baseline, 24 month)
 - Child Outcomes (powered on BMI)
 - BMI z-score, Waist circumference, Screen time, Acanthosis nigricans
 - Conservative analysis on community differences only, which is the randomization unit

Start of the day in Yap







CHL Hypothesized Intervention Impact Measures

(6 behavioral outcomes, 3 health outcomes)

Primary

- 
1. Sleep by 15 min/day
 2. Moderate to Vigorous Physical Activity by 10 min/day
 3. Fruit & Vegetable intake by 1 serving/day (1/2 c/day)
 4. Water intake by ½ cup/day
 5. **Sedentary behavior (screen time) by 10 min/day**
 6. Sugar Sweetened Beverage intake by ½ cup/day

- 
1. **Prevalence of obesity by 8% (0.10 kg/m², BMI z-score)**
 2. **Waist circumference by 2% (1.12 cm)**

Secondary

- 
3. **Acanthosis nigricans by 5%**

Use of dose of intervention in analysis

- Secondary analyses will use dose of intervention
 - Association of changes in outcomes to intervention activities based on quantitation
- Examine activity implementation for communities with biggest changes
 - For example, did activities targeting SSB lead to the change in SSB consumption?
 - Did the community with the biggest change do something that the others did not?



Photo by Novotny

Palau

Complexity, Interaction and Attribution

- Planned principal component analysis (PCA) of intervention activities to identify clusters of activities that were implemented together.
- Planned reduced rank regression of change in target (e.g., obesity) on intervention activities to identify clusters of activities that affected target together.



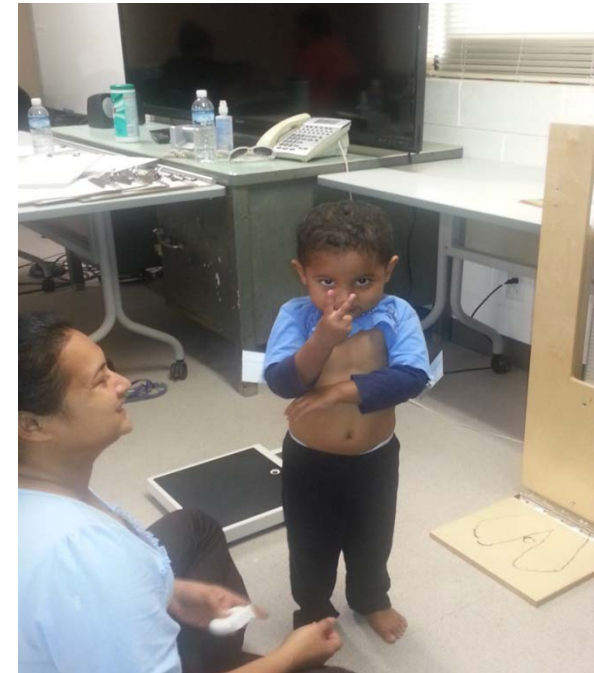
Data Analysis of MLMC Intervention

- **Primary Analysis**

- Randomized Community Trial degrees of freedom adjustment is too conservative
 - Methods for adjusting to an “effective sample size”
 - Develop random bootstrap comparison group as alternative
- Transformations needed for some variables
 - Difficult to interpret
- Use Categorical outcomes
 - BMI category, Meeting PA and diet compared to recommendations

- **Secondary analysis**

- Examine change among communities that have need for change
- Identify activities influencing change where change occurred overall (SSB, Water, Sleep changed in intervention and control)
- Look at exposure to intervention where change occurred overall



Ready for Waist
Circumference
Measurement, Yap

CHL Important Lessons Learn



- Community Engagement
 - Relationship building
 - Readiness of communities
- Process Measures
 - Definitions – Fidelity, Dose, Reach, Exposure
 - For Monitoring
 - For Analysis measure
- Impact Measures
 - Definitions
 - Effectiveness approaches
 - Total Impact (embrace complexity) and Component analyses
 - Statistical methods –unit of analysis, implementation measures
- Sustainability/Maintenance
 - Plan from beginning- approach of supporting those relationships
 - Adoption
 - Coalitions
 - Policy change

Discussion/Implications/Policy

- Use additional metrics to capture other aspects of food security, especially of the subsistence population
- Countries in economic growth (nutrition transition) are vulnerable to the “dual burden of malnutrition”
- Policies that balance economic development with protection of health are needed to address inequities and protect a healthy local food system
 - In development of markets
 - Support small farmers
 - Support postharvest processes to prevent loss



Children wait to participate in CHL Study, Pohnpei



Ongoing CHL Initiatives

- **Training** - CHL Summer Institute, and other ongoing child obesity prevention training initiatives, including anthropometric measurement and standardization
- **BMI/Health Monitoring** - Building and Sustaining from the CHL base
- **Maintaining the CHL PSC & partnership** - USDA Land Grant multistate project, other grants, PacTrac3 Diet analysis Software Coordination, Accelerometry Coordination, manuscript and data use approvals
- **CHL Data Coordination** - Continue to analyze and use the CHL data- publish, make data available for research, program and policy planning & advocacy

Disseminating CHL via the CHL web site

<http://www.chl-pacific.org/>

[Alaska](#) · [American Samoa](#) · [Federated States of Micronesia](#) · [Guam](#) · [Hawaii](#) · [Marshall Islands](#) · [Northern Mariana Islands](#) · [Palau](#)

CHL

Children's Healthy Living Program

for Remote Underserved Minority Populations
in the Pacific Region

Enhancing child wellness!

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Our Feature Story



CHL Teams and CHL Coordinating Center Collect and Validate Regional Data

HONOLULU, HI. Data is the name of the game as CHL heads the last 7 months of this 5-year project. Data collection is critical to getting baseline numbers as well as impact measurements. All teams are working hard to collect and enter data in ... [\[Read More...\]](#)

Project Happenings



CHL Team and TASA role models receive WHO Healthy Islands Recognition 2015 award!

SAIPAN, CNMI. In Chamorro culture, the latte stone has come to symbolize the strength, vitality, and endurance of the Chamorro people.



**Support CHL's work
with a financial gift.**

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CHL Newsbrief

- Vol 4, Issue 3, July-Sept 2015 **New!**
- Vol 4, Issue 2, Apl-June 2015
- Vol 4, Issue 1, Jan-Mar 2015
- Vol 4, Issue 4, Oct-Dec 2014
- Vol 4, Issue 3, July-Sept 2014
- Vol 4, Issue 2, Apl-June 2014
- Vol 4, Issue 1, Jan-Mar 2014
- Vol 3, Issue 4, Oct-Dec 2013
- Vol 3, Issue 3, July-Sept 2013
- Vol 3, Issue 2, Apl-June 2013
- Vol 3, Issue 1, Jan-Mar 2013
- Vol 2, Issue 4, Oct-Dec 2012
- Vol 2, Issue 3, July-Sept 2012
- Vol 2, Issue 2, Apl-June 2012
- Vol 2, Issue 1, Jan-Mar 2012
- Vol 1, Issue 1, Oct-Dec 2011



Ke kmal mesaul

Komol tata

Si Yu'us ma'ase

Kamgan Ukudigaa

Kulo

Fa'afetai

Quyana

Kammagar

Gunalchéesh

Kalahngan

Kangof

Maasee'

Mahalo

