

# NUTRITIONAL STATUS, NON-COMMUNICABLE DISEASES, AND HEALTH BEHAVIORS AMONG INDIGENOUS URAK LAWOI AND NON-INDIGENOUS RESIDENTS OF LIPE ISLAND, SATUN PROVINCE

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## ARTICLE HISTORY

Received: 1 September 2025   Revised: 22 September 2025   Published: 7 October 2025

## ABSTRACT

Lipe Island is a popular tourism destination in Satun Province, Thailand, and is home to indigenous Urak Lawoi people who traditionally lived on subsistence fishery. The development of tourism on Lipe Island introduces migration by non-indigenous people from the mainland to the Island for tourism-sector jobs, potentially influencing dietary behaviors, nutritional status, non-communicable diseases, and alcohol and tobacco use among the locals. The objective of this study is to describe the prevalence of nutritional status among indigenous Urak Lawoi and non-indigenous residents of Lipe Island, Satun Province. We conducted a community-based cross-sectional study using convenience sampling in January 2023. Participants included adult residents of Lipe Island identified by the village health volunteers. We collected data using face-to-face interviews and analyzed the data using descriptive statistics. A total of 155 residents of Lipe Island participated in our study (n=155 residents), approximately 74% of whom reported speaking Lawoi Language at home and were considered as Urak Lawoi in our study. Urak Lawoi participants had a significantly higher prevalence of being overweight compared to participants of other ethnicities (31% vs. 18%; Adjusted OR = 3.10; 95% CI = 1.02, 9.40). Other differences were not statistically significant. However, the prevalence of overweight and obesity in the other ethnicities was also higher than the overall

level for Thailand. The reasons for this higher prevalence are unknown and should be further investigated. Limitations such as the study design, potential selection bias, and limited generalizability should be considered as caveats in the interpretation of the study findings.

**Keywords:** Overweight, Obesity, Non-Communicable Diseases, Indigenous, Thailand

**CITATION INFORMATION:** Wichaidit, W., et al. (2025). Nutritional Status, Non-Communicable Diseases, and Health Behaviors among Indigenous Urak Lawoi and Non-Indigenous Residents of Lipe Island, Satun Province. *Procedia of Multidisciplinary Research*, 3(10), 21.

## INTRODUCTION

Lipe Island is a popular tourism destination in Satun Province, Thailand, due to its crystal-blue water and pristine white sandy beaches. The Island is also home to indigenous Urak Lawoi people who traditionally lived on subsistence fishery. After the development of tourism, the indigenous people started living in permanent settlements and changed their lifestyle: the men primarily work as tourist boat operators while the women become homemakers.

The development of tourism also introduces migration by non-indigenous people from the mainland to the Island for tourism-sector jobs. The literature has shown that these changes coincide with changes in nutritional status (e.g., overweight and obesity), non-communicable diseases (NCDs), and health risk behaviors such as alcohol and tobacco uses. However, the extent to which these health outcomes differ between Urak Lawoi and non-indigenous residents of Lipe Island has not been described in the literature. Such data can help inform relevant stakeholders regarding the need to prioritize resources for health promotion programs for the local area. The objective of this study is to describe the prevalence of nutritional status among indigenous Urak Lawoi and non-indigenous residents of Lipe Island, Satun Province.

## LITERATURE REVIEWS

In the Pacific, dietary acculturation commonly occurred among islander communities after foreign colonization (Dela Cruz et al., 2022). Common changes include inadequate consumption of fruits and vegetables, which coincides with an increase in being overweight and obese (Reeve et al., 2022).

Previous studies on food security in indigenous communities used a survey of food stores for produce quality and price (Pollard et al., 2014) or a survey of reported disposable income spent on food at the household level (Lee & Lewis, 2018). Indigenous communities tend to have low food security (Goettke & Reynolds, 2019; Pollard et al., 2014; Sherriff et al., 2022), with higher price to access food and a higher proportion of income being used to purchase food (Lee & Lewis, 2018). Determinants of dietary changes in indigenous communities include cultural and socioeconomic issues (Sherriff et al., 2022).

The majority of households of indigenous people on Lipe Island earn less than 10,000 THB per month (Sripaew et al., 2024). The transformed economy and the need to purchase food instead of engaging in subsistence fishing and farming may drive households to consume more carbohydrate and less nutrient-dense food, potentially leading to overweight and obesity. Those on calorie-dense diets who are overweight are generally more likely to consume alcohol and smoke, as these characteristics tend to correlate (Islam et al., 2020).

## RESEARCH METHODOLOGY

### Study Design and Setting

We conducted a community-based cross-sectional study in the indigenous villages on Lipe Island, Satun Province, southern Thailand, in January 2023.

### Population & Sample

Study participants included adult residents of Lipe Island, Satun Province, whose names are in the health office registry. Inclusion criteria were: 1) age 18 years or older, and; 2) name being listed in the health office registry. We excluded Lipe residents who had a cognitive or physical impairment that did not allow for convenient participation. Sample size calculation for the survey was based on the primary objective of dietary diversity assessment, which was unrelated to the current study, and yielded the final target sample size of 364 persons (n=364 adult residents of Lipe).

### Study Variables and Data Collection

Our study instrument was a structured interview questionnaire that included 5 sections: A) Demographic characteristics; B) Dietary behaviors (food frequency questionnaire);

C) Assessment of food security; D) Health-related knowledge, education, and literacy; E) Cultural-psychological-social determinants of dietary behaviors. We used the KoboToolbox web-based platform and KoboCollect application to host the study instruments. All interviews were conducted in the Thai language. The operational definitions of the study variables were as follows:

1) Ethnicity

We asked participants two questions regarding demographics: ethnicity "*A4a. Chuea Chart*" and language spoken at home ("*A4b. What language do you most often speak at home?*"). We used the responses to the question on language spoken at home as our measure of ethnicity in our analyses, as the participants who spoke Lawoi commonly stated that they were of Thai ethnicity, indicating potential confusion or unintended mixing of the concept of ethnicity with the construct of nationality or citizenship. The question was not prompted, and interviewers had to choose one answer from the following possible choices: Thai, Lawoi, Malay, Chinese, Burmese, Mon, Karen, Others, Don't know, and Refuse to Answer.

2) Nutritional status

We asked participants to self-report their weight and height. We then calculated the BMI based on the reported information and classified participants into the following categories: 1) Underweight (BMI of less than 18.50 kg per sq.m.); 2) Normal (BMI between 18.50 to 24.99 kg per sq.m.); 3) Overweight (BMI of between 25.00 to 29.99 kg per sq.m.); 4) Obese (BMI of more 30 kg per sq.m. or higher).

3) Non-communicable diseases (NCDs) status

We asked participants whether they had been diagnosed or otherwise received treatment for a number of diseases, and prompted the participants with the following list: diabetes, hypertension, hyperlipidemia, heart disease, kidney disease, cerebrovascular disease, liver disease, rheumatic diseases, other diseases. We also allowed participants to refuse to answer.

4) Health behaviors (alcohol and tobacco uses)

We asked participants regarding their alcohol use status using the question "*D7. In your lifetime, have you ever consumed alcohol? If yes, when was the last time that you drank?*". Similarly, we measured the participant's smoking status with two questions: 1) "*D9. In your lifetime, have you smoked 100 cigarettes or more?*" and "*D10. If yes, then was the last time that you smoked?*". We considered participants who had used alcohol within 12 months prior to the survey to be current drinkers, and participants who had smoked within 28 days prior to the survey to be current smokers.

5) Data Collection Procedures

We selected our participants using convenience sampling. We originally intended to select our participants by systematic sampling of the list of local residents supplied by the Satun Provincial Public Health Office. On the day of data collection, however, village health volunteers originally scheduled to escort us to the households of the selected residents were not available to assist, and we changed the strategy to convenience sampling of the local residents known to the remaining and available village health volunteers until the required sample size was met.

Village health volunteers escorted us to the households under their care and introduced us to residents of the households who met the study criteria. We then informed the local resident about the study and asked for written informed consent to conduct the study interview, each of which took approximately 30-45 minutes. At the end of the interview, investigators provided the participants with a small token of appreciation (ie., two bars of soap worth approximately 50 Thai Bahts). We collected data over a period of two days, approximately 6 hours per day. At the end of each work day, the investigators compensated each health volunteer with 300 Thai Bahts in cash.

## Data Management

The data collection team members entered all data onto the KoboToolbox platform (or KoboCollect application). The data collection team members then uploaded all data onto a password-protected server. We did not include any personally identifiable information in the data entry system to ensure the participants' anonymity. A member of the investigation team served as the data manager and performed regular quality checks to identify and address potential data-related issues. The investigation team performed routine data cleaning and exported the clean data set for statistical analyses.

## Data Analysis

We used descriptive statistics to summarize continuous variables as mean and standard deviation (SD) or median with interquartile range (IQR), and we summarized categorical variables as frequencies and percentages. We excluded participants who indicated "Don't know" and those who refused to answer the question on language spoken at home from the comparison of nutritional status and health behaviors. We have also conducted multivariable logistic regression analyses to assess the disparities by ethnicity, adjusting for the effects of age and sex as potential confounders.

## Human Research Ethics

We received ethical approval for the study from the Human Research Ethics Committee (HREC), Faculty of Medicine, Prince of Songkla University (REC.65-439-18-2).

## RESEARCH RESULTS

A total of 155 residents of Lipe Island participated in our study (n=155 residents). Most participants were female with a mean age of 48 years (*Table 1*). The majority of participants were married with children, and had primary school education or less. The majority of households earned 10,000 THB per month or less. Approximately 74% reported speaking Lawoi Language at home and were considered as Urak Lawoi in our study. Based on self-reported weight and height, nearly 80 percent of the participants fit the criteria for being overweight or obese. The prevalence of hypertension, hyperlipidemia, and diabetes were all near 40 percent. More than two-fifths of the participants were current drinkers, and approximately one-tenth were current smokers.

**Table 1** Characteristics of the study participants (n=155 residents of Lipe Island)

Characteristic	Frequency (%) or Mean $\pm$ SD
<b>Sex:</b> Female	124 (80%)
<b>Age in years (mean <math>\pm</math> SD)</b>	48 $\pm$ 14
<b>Language spoken at home</b>	
Lawoi	114 (74%)
Thai	22 (14%)
Others	18 (12%)
Didn't know or refused to answer	1 (<1%)
<b>Occupation (Three most common answers)</b>	
Retired/ homemaker	50 (32%)
Laborer/ manual workers	47 (30%)
Unemployed	21 (14%)
<b>Religion:</b> Buddhism	138 (89%)
<b>Marital Status</b>	
Married with children	115 (74%)
Widows / Divorced / Separated	16 (10%)
Single	14 (9%)
Married, no children	10 (7%)

Characteristic	Frequency (%) or Mean $\pm$ SD
<b>Highest Education Level Completed:</b>	
Never went to school	17 (11%)
Primary school	100 (65%)
Junior high school or higher	36 (24%)
<b>Household Monthly Income</b>	
Equal to or less than 10,000 THB	103 (67%)
More than 10,000 THB	23 (15%)
Don't know	19 (12%)
Refuse to answer	19 (7%)
<b>Nutritional status based on body mass index</b>	
Underweight (BMI of less than 18.50 kg per sq.m.)	0 (0%)
Normal (BMI between 18.50 to 24.99 kg per sq.m.)	33 (21%)
Overweight (BMI of between 25.00 to 29.99 kg per sq.m.)	38 (25%)
Obese (BMI of more 30 kg per sq.m. or higher)	65 (42%)
Refused to provide weight or height)	19 (12%)
<b>Co-morbidities (Three most common answers)</b>	
Hypertension	58 (38%)
Hyperlipidemia	57 (38%)
Diabetes	56 (37%)
<b>Alcohol use status</b>	
Never drinkers	54 (35%)
Former drinkers (consumed alcohol in lifetime but not in the past 12 months)	33 (21%)
Current drinkers (consumed alcohol within the past 12 months)	67 (43%)
Refused to answer or incomplete information	1 (<1%)
<b>Tobacco use status</b>	
Never smokers	133 (86%)
Former smokers (used tobacco in lifetime but not in the past 28 days)	3 (2%)
Current smokers (used tobacco within the past 12 days)	15 (10%)
Refused to answer or incomplete information	4 (3%)

Comparison of the participants categorized as Urak Lawoi vs. those categorized as other ethnicities showed that Urak Lawoi participants had significantly higher prevalence of being overweight (31% vs. 18%; Adjusted OR = 3.10; 95% CI = 1.02, 9.40), and higher but not statistically significant prevalence of obesity (50% vs. 44%; Adjusted OR = 1.84; 95% CI = 0.70, 4.81) (Table 2). Urak Lawoi participants had higher prevalence of hypertension, hyperlipidemia, diabetes, being current drinkers, and lower prevalence of current smokers, but all of these differences were not statistically significant.

**Table 2** Nutritional status, co-morbidities, alcohol use, and tobacco use among Urak Lawoi and people of other ethnicities who resided on Lipe Island (column percents)

Characteristic	Other ethnicities (n=40 participants)	Urak Lawoi (n=114 participants)	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Nutritional status based on body mass index</b>				
Normal	15 (39%)	18 (19%)	(Reference)	(Reference)
Overweight	7 (18%)	30 (31%)	<b>3.57 (1.22,10.42)</b>	<b>3.10 (1.02,9.40)</b>

Characteristic	Other ethnicities (n=40 participants)	Urak Lawoi (n=114 participants)	Crude OR (95% CI)	Adjusted OR (95% CI)
Obese	17 (44%)	48 (50%)	2.35 (0.98,5.68)	1.84 (0.70,4.81)
<b>Co-morbidities (Three most common answers)</b>				
Hypertension	11 (28%)	47 (42%)	1.87 (0.85,4.13)	1.47 (0.61,3.54)
Hyperlipidemia	12 (31%)	44 (40%)	1.48 (0.68,3.22)	1.02 (0.41,2.59)
Diabetes	13 (33%)	42 (38%)	1.22 (0.56,2.62)	0.88 (0.38,2.04)
<b>Alcohol use status</b>				
Never drinkers	(n=39)	(n=114)	(Reference)	(Reference)
Former drinkers	16 (41%)	38 (33%)		
Current drinkers	8 (21%)	25 (22%)	1.32 (0.49,3.53)	1.64 (0.58,4.61)
<b>Tobacco use status</b>				
Never smokers	(n=39)	(n=111)	(Reference)	(Reference)
Former smokers	32 (82%)	100 (90%)	N/A	N/A
Current smokers	0 (0%)	3 (3%)		
Current smokers	7 (18%)	8 (7%)	0.37 (0.12,1.09)	0.71 (0.2,2.51)

\*Adjusted for age and sex

## DISCUSSION & CONCLUSION

In this community-based cross-sectional study, we described the prevalence of nutritional status among indigenous Urak Lawoi and non-indigenous residents of Lipe Island, Satun Province. We found that the study participants whom we categorized as Urak Lawoi had higher prevalence of overweight and obesity than the study participants whom we categorized as being of other ethnicities. The findings of this study serve as potentially useful baseline information for relevant stakeholders. However, a number of issues need to be discussed in the interpretation of the study findings.

The categorization of participants as Urak Lawoi vs. other ethnicities based on language spoken at home should be considered as crude and prone to potential errors, but we made this choice due to the potential confusion of nationality and citizenship during data collection. The Urak Lawoi language is a dialect of Malay (Wongbusarakum, 2005), but is strictly in oral form, and the other components of the Urak Lawoi culture has faced potential decline as early as in the early 2000s (Arunothai et al., 2008; Wongbusarakum, 2005). Anecdotally, there were participants who did not understand the question regarding the language or referred to the language as "*paasaa chao baan*" ("the local folks' language") instead of using the term "Lawoi". As such, there could be misclassification of ethnicity and the proportion of participants who were Urak Lawoi could be higher than what was reported in our findings, but the extent to which this occurred cannot be determined. As the future of the Lawoi language is uncertain, future studies should consider using other proxies of the Lawoi identities (e.g., asking whether the participant participates in Lawoi rituals) as an additional measure of identity.

The most alarming aspect of our study findings was that four-fifths of the participants who were Urak Lawoi were overweight or obese. The prevalence was higher than that of certain Pacific island nations, including the Marshall Islands, Kiribati, and Micronesia (World Health Organization, 2025). The reason for this high prevalence is unknown, but could be attributed to changes in diet (Xiao et al., 2021) as well as a lack of physical activity (Emmons et al., 2007). The prevalence of overweight and obesity among participants of other ethnicities was also concerning and was higher than the general population of Thailand (Languepin, 2024). The reasons for this higher prevalence in both groups are unknown and should be further investigated. The prevalence of chronic diseases was higher than what was reported as non-aggregated data in a previous study (Sripaew et al., 2024), although the sampling and data collect methods in the mentioned study were slightly different from ours. The prevalence of current drinking among the participants in both groups was higher than expected, considering

that the majority of the participants were women, and prevalence of alcohol consumption among women in Thailand is much lower than among men (Nontarak & McNeil, 2022). However, it is unknown whether the pattern of use is problematic, as found in other indigenous communities (Ramamoorthi & Jayaraj, 2015). Those interested should further investigate these emerging issues.

This is one of the first studies to describe differences in obesity, NCDs, and alcohol use between Urak Lawoi people and those of other ethnicities. However, our study had a number of limitations which should be considered in the interpretation of our study findings. Firstly, the cross-sectional design precludes the ability to make causal inference. Ethnic identity should not be considered as a cause of the outcomes. The findings only showed that the differences existed. Secondly, we collected data by asking the village health volunteers to bring our data collectors to the households of the participants based on the volunteers' convenience. This process could have contributed to a non-random sampling scheme, which is a common source of selection bias in cross-sectional studies (Pai, 2019). The prevalence of overweight, obesity, and NCDs could have been biased and higher than the source population, which also limited the ability to make comparisons to other studies. Thirdly, we collected data during daytime, when the participants were home but their male spouses were at work. These circumstances limited the generalizability of our study findings.

In conclusion, we found that residents of Lipe Island who spoke the Lawoi Language at home, which we used as a proxy for being of Urak Lawoi ethnicity, were more likely than participants of other ethnicities to be overweight or obese. However, the prevalence in the other ethnicities was also higher than the overall level for Thailand. The reasons for this higher prevalence are unknown and should be further investigated. Limitations including the study design, potential selection bias, and limited generalizability should be considered as caveats in the interpretation of the study findings.

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**Data Availability Statement:** The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

**Conflicts of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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