

ANNUAL REPORT 2026: SURVEY OF DEMOGRAPHIC DATA AND PREVALENCE OF HEALTH RISK FACTORS IN NAYAO, CHACHOENSAO PROVINCE, THAILAND

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Abstract

Background: Rural communities in Thailand face a dual burden of non-communicable diseases (NCDs) and communicable health risks, compounded by limited access to preventive care. Annual community health surveys provide essential evidence for local health planning and targeted interventions.

Objectives: To describe the demographic characteristics and prevalence of major health risk factors among residents of Ban Na Yao, Chachoengsao Province, Thailand.

Methods: A cross-sectional community health survey was conducted in February 2026 among 1,268 residents of all age groups using standardized electronic questionnaires via REDCap (Research Electronic Data Capture), supplemented by anthropometric measurements and laboratory investigations. Age-specific analyses were applied: NCD risk factors, mental health, musculoskeletal disorders, cancer screening, and accidents were assessed among participants aged ≥ 18 years; intestinal parasitic infections were assessed across all ages. Adjusted prevalence ratios (aPR) were estimated using modified Poisson regression with robust variance estimators.

Results: Among 947 adults aged ≥ 18 years, the prevalence of hypertension, dyslipidemia, and diabetes mellitus was 33.0%, 23.0%, and 14.9%, respectively; obesity was identified in 43.9% of 849 adults with BMI measurements. No personal income and higher BMI were significantly associated with NCDs after age and sex adjustment. Moderate-to-high stress affected 30.6% of adults, depression 14.3%, and suicidal ideation 5.1%; key social determinants of depression included health-limiting daily activities, urgent unmet basic needs, and loneliness. Adolescent depression (PHQ-A ≥ 5) was 24.8%. The accident incidence was 14.5 per 100 population; female sex was protective, and severe fatigue was the strongest occupational accident risk factor. Cancer screening coverage remained below national targets across all modalities. The prevalence of intestinal parasitic infection was 1.6%, with *Strongyloides stercoralis* being the predominant species.

Conclusion: This community health survey identified a substantial and multifaceted burden of health problems in a rural Thai population. Low income, higher BMI, and social determinants of health, particularly functional limitations, food insecurity, loneliness, and transport barriers, emerged as the most consistently associated factors across health outcomes, underscoring the need for integrated interventions addressing both clinical and structural determinants of health.

Keywords: community health survey, epidemiology, mental health, musculoskeletal disorders, non-communicable diseases, rural health, social determinants of health

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Introduction

Community-based health surveys are foundational for identifying disease burdens, monitoring health trends, and informing targeted interventions, particularly in rural settings where access to specialist healthcare remains limited.⁽¹⁾ In Thailand, non-communicable diseases (NCDs) account for nearly 75% of all deaths nationwide, with cardiovascular disease, diabetes mellitus, chronic respiratory conditions, and cancer representing the leading contributors to premature mortality and disability-adjusted life-years lost.⁽²⁾ Concurrently, the country is undergoing a rapid demographic transition toward an aging society, with pronounced effects in rural and peri-urban communities, where younger working-age individuals increasingly migrate to economic centers, resulting in an older, more vulnerable resident population.⁽³⁾ Such structural dynamics underscore the need for annual surveillance programs that capture evolving local epidemiology and inform the efficient allocation of primary healthcare resources.

Ban Na Yao (Village Moo 15), located in Tha Kradan Subdistrict, Sanam Chai Khet District, Chachoengsao Province, has served as a long-standing research site for the Community Medicine Working Group of Phramongkutklao College of Medicine. The community is characterized by a large, predominantly agricultural population, a substantial proportion of migrant residents from northeastern Thailand, and a wide range of health-related challenges.

Evidence from prior annual reports has consistently demonstrated a substantial burden of non-communicable diseases among adults, particularly hypertension, obesity, dyslipidemia, and diabetes mellitus.⁽³⁾ Additional public health concerns include suboptimal uptake of cancer

screening, increased risk of osteoporosis among older adults, occupational hazards associated with agricultural and manual labor, and a high prevalence of mental health conditions, including stress, depression, and anxiety.^(4–8) Behavioral risk factors, such as tobacco use, hazardous alcohol consumption, physical inactivity, and unhealthy dietary patterns, remain highly prevalent and interact with socioeconomic determinants, including educational attainment, income, and occupational category, to exacerbate NCD risk across the life course.⁽⁹⁾ Although the prevalence of parasitic infections has declined, these conditions continue to pose a public health concern, particularly in the context of persistent traditional dietary practices involving the consumption of raw or undercooked meat and fish.⁽¹⁰⁾

The objective of the Annual Report 2026 is to describe demographic characteristics and the prevalence of major health risk factors among residents of Ban Na Yao, and to identify associated socioeconomic and behavioral determinants that may inform locally tailored health promotion and preventive care strategies. Findings are intended to support local health planning at the subdistrict and district levels, contribute to longitudinal surveillance of community health trends in rural Thailand, and reinforce the mission of Phramongkutklao College of Medicine to strengthen community medicine competencies among future physicians.

Methods

Study design and setting

This cross-sectional community health survey was conducted in Village Moo 15, Ban Na Yao, Tha Kradan Subdistrict, Sanam Chai Khet District, Chachoengsao Province, Thailand, from

February 20 to February 27, 2026. The study was ethically approved by the Institutional Review Board of the Royal Thai Army Medical Department (Number S081h/68_Exp). Written informed consent was obtained from all participants prior to data collection. For adolescents aged 12–17 years, written consent was obtained from a parent or legal guardian in addition to the participant's assent. For participants unable to read or write, consent was obtained verbally and witnessed by a third party. All consent forms were administered in Thai.

Ban Na Yao is a large semi-rural community located approximately 180 kilometers east of Bangkok, characterized by a predominantly agricultural population and a significant proportion of residents from northeastern Thailand. The community has served as a continuous research and teaching site for Phramongkutklao College of Medicine for decades, providing longitudinal epidemiological data to support local health planning.

Study population

The study population comprised all residents of Village Moo 15, Ban Na Yao. A total of 1,268 individuals from 16 sub-communities (Khum) were enumerated: Dok Khun ($n=198$), Bua Daeng ($n=189$), Phikun Thong-Rak Rue-Saeng Dao-Dao Rueang-Saeng Duean combined ($n=306$), Lamduan Dong ($n=194$), Ban Mai Ru Roi-Ratri-Benjamart ($n=166$), and Phutthachat-Banburi-Fueang Fa-Parichat-Red Rose ($n=215$). Age-specific eligibility criteria were applied across health domains as follows: surveys on alcohol consumption, smoking, and substance use were conducted among individuals aged ≥ 12 years⁽¹¹⁾; adolescent depression screening using the Patient Health Questionnaire for Adolescents (PHQ-A) was administered to those aged 12–18 years⁽¹²⁾; adult mental health assessments, hypertension screening, diabetes screening, and NCD risk factor surveys were conducted among individuals aged ≥ 18 years^(2,13); obesity screening and surveys on reproductive health and contraceptive practices were limited to those aged ≥ 20 years⁽¹⁴⁾; cancer-related data were collected from individuals aged ≥ 30 years^(4,15); musculo-

skeletal pain and osteoporosis risk assessments were conducted among those aged ≥ 40 years; and fecal immunochemical test (FIT) screening eligibility was applied to participants aged ≥ 50 years.⁽¹⁶⁾ Intestinal parasitic infection surveys, accident history, domestic violence, vaccination status, and personal income data were collected across all age groups.

Research tools and measurements

Prior to data collection, community assessment tools were developed, including walking maps, family genograms, community organizational structure diagrams, community health system analyses, community calendars, and life histories, which provided the socio-cultural context necessary for appropriate questionnaire adaptation and community engagement. Physical examination equipment included digital sphygmomanometers, weighing scales, stadiometers, and 150-cm measuring tapes for waist circumference assessment.

Blood pressure was measured three times by medical students using digital sphygmomanometers, according to a standardized protocol, and the average of the second and third readings was used in accordance with the 2020 International Society of Hypertension Global Hypertension Practice Guidelines.⁽¹⁷⁾

Body weight and height were measured by medical students using a calibrated analog weighing scale and stadiometer, respectively, to calculate body mass index (BMI), classified using the WHO Asia-Pacific criteria: underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$), normal ($18.5\text{--}22.9 \text{ kg/m}^2$), overweight ($23.0\text{--}24.9 \text{ kg/m}^2$), obesity class I ($25.0\text{--}29.9 \text{ kg/m}^2$), and obesity class II ($\geq 30.0 \text{ kg/m}^2$).⁽¹⁸⁾

NCD risk factor data were collected from participants aged ≥ 18 years and included self-reported underlying diseases, current medication use, family history of NCDs in first-degree relatives, and behavioral data covering dietary patterns (sweet, fatty, and salty food consumption scored on a 1–5 Likert scale), physical activity, alcohol consumption, smoking, and substance use. For this analysis, hypertension was defined as a self-reported history of hypertension, current

antihypertensive medication use, or a mean of the second and third blood pressure readings $\geq 140/90$ mmHg. Diabetes mellitus and dyslipidemia were defined as self-reported history of the respective condition or current use of glucose-lowering or lipid-lowering medication, respectively. All NCD diagnoses were based on self-report and physical measurement; medical records were not reviewed.

Mental health in adolescents (aged 12-18 years) was assessed using the Patient Health Questionnaire for Adolescents (PHQ-A), a 9-item tool with scores ranging from 0 to 27, interpreted as: no depression (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe depression (20-27).⁽¹⁹⁾ Adult mental health (aged ≥ 18 years) was assessed using a multi-instrument battery: (1) the ST-5 stress questionnaire (5 items; score 0-15; interpreted as low 0-4, moderate 5-7, high 8-9, very high 10-15)⁽²⁰⁾; (2) the two-question depression screen (2Q), followed by the nine-question depression questionnaire (9Q) if score ≥ 1 , with severity classified as no/minimal depression (9Q < 7), mild (7-12), moderate (13-18), or severe (≥ 19)⁽²¹⁾; (3) the eight-question suicide risk scale (8Q) administered when 9Q ≥ 7 , with scores interpreted as no risk (0), mild (1-8), moderate (9-16), or severe risk (≥ 17), the latter prompting immediate psychiatric referral⁽²²⁾; (4) the Generalized Anxiety Disorder scale-7 (GAD-7; score 0-21), with scores ≥ 10 indicating moderate-to-severe anxiety warranting clinical review⁽²³⁾; and (5) the Thai Mental Health Indicator-15 (TMHI-15; score 15-60), categorized as good (51-60), fair (44-50), or poor (≤ 43) mental health.⁽²⁴⁾

Occupational accident data were collected using a four-section structured instrument covering: (1) accident history in the past year; (2) characteristics of the most recent lifetime accident (location, type, and activity at time of occurrence); (3) workplace environment, personal protective equipment (PPE) use, contributing risk factors, hazardous equipment, training adequacy, and worker fatigue level; and (4) injury type, body part affected, and medical treatment received. Injury severity was classified as minor (no treatment required), moderate (treatment

required, no hospitalization), or severe (inpatient hospital admission required).

Musculoskeletal pain was assessed using the Nordic Musculoskeletal Questionnaire (NMQ), which evaluated pain by anatomical region across four time frames: the past 7 days (acute), the past month, and 12 months (chronic).⁽²⁵⁾ Osteoporosis risk was estimated using two validated indices for Asian populations: (1) the Osteoporosis Self-Assessment Tool for Asians (OSTA), calculated as $0.2 \times [\text{body weight (kg)} - \text{age (years)}]$, with participants categorized as low risk (> -1), intermediate risk (-1 to -4), or high risk (≤ -4)⁽²⁶⁾ and (2) the Khon Kaen Osteoporosis Study index (KKOS), calculated as $[0.1 \times \text{body weight (kg)}] - [0.1 \times \text{age (years)}]$, with age-specific cutoffs for risk stratification.^(27,28) Additional health history items for musculoskeletal assessment included prior bone fracture, parental history of hip fracture, corticosteroid use, and diagnoses of osteoporosis or rheumatoid arthritis.

Intestinal parasitic infection data were obtained through direct wet-mount microscopy of stool samples, examining for *Opisthorchis viverrini*, *Strongyloides stercoralis*, hookworm, *Blastocystis* spp., and *Taenia* spp., alongside structured questionnaire data on risk behaviors, including footwear use, drinking water source, and consumption of raw or undercooked food.

Cancer data were collected from participants aged ≥ 30 years and covered personal cancer diagnosis history, family history, and participation in five cancer screening modalities: (1) fecal immunochemical test (FIT) for colorectal cancer (age ≥ 50 years); (2) breast self-examination (BSE); (3) clinical breast examination (CBE) by healthcare personnel (women aged ≥ 40 years); (4) mammography or ultrasound (women aged ≥ 40 years); and (5) Pap smear or self-administered HPV antigen rapid test (women aged ≥ 30 years). Barriers to cancer screening were categorized into four domains: knowledge, healthcare system, psychological, and economic factors. Screening frequency definitions and cancer screening criteria were based on the National Cancer Institute Service Plan for Cancer (Fiscal Year 2025).⁽²⁹⁾

Data collection

Data collection was conducted through structured face-to-face electronic interviews using the I-survey system via REDCap (Research Electronic Data Capture)^(30,31), supplemented by physical examinations and laboratory investigations at community stations established at Na Yao temple and through household visits. Community health volunteers assisted with participant mobilization and provided local logistical support. All interviewers received standardized training prior to data collection. Blood pressure measurement, anthropometry (weight, height, waist circumference), and collection of relevant laboratory specimens (stool samples) were performed at the community stations, while household interviews collected demographic and behavioral data. Cancer data were clearly distinguished from diagnostic data by explaining to participants that cancer screening referred to preventive tests in asymptomatic individuals. Adolescents identified as having suicidal ideation (item 9 of PHQ-A scoring positively, or 8Q score ≥ 17 in adults) were immediately referred to the nearest hospital with psychiatric services. Participants identified as hypertensive, obese, or at metabolic risk were provided with health education and appropriate referrals at the point of data collection. The full case report form is available from the corresponding author upon reasonable request.

Statistical analysis

Data were entered and managed in REDCap and analyzed using R statistical software version 4.4.2. Descriptive statistics, including frequencies, percentages, mean $\pm$ standard deviation (SD), median, and interquartile range (IQR), were used to summarize demographic characteristics and the prevalence of health risk factors. For NCD outcomes (hypertension, diabetes mellitus, and dyslipidemia), adjusted prevalence ratios (aPRs) with 95% confidence intervals (CIs) were estimated using modified Poisson regression with robust sandwich variance estimators, adjusting for age group and sex. For depression, a fully mutually adjusted modified Poisson model was fitted, including all sociodemograph-

ic predictors and social determinants of health organized according to the Healthy People 2030 framework.⁽³²⁾ For accident outcomes, overall and age-standardized incidence rates and incidence densities were computed using the internal study population as the reference standard; fully mutually adjusted modified Poisson models were then fitted separately for overall and occupational accidents. For osteoporosis risk, fully adjusted, mutually adjusted, and modified Poisson models were fitted for both the OSTA and KKOS indices. For intestinal parasitic infections, risk factor associations were examined using Fisher's exact test due to the small number of positive cases. For cancer screening barriers, associations with screening participation were assessed using crude odds ratios (OR) with 95% CI from univariable logistic regression. All p-values are two-sided, and statistical significance was set at $p < 0.05$.

Results

Characteristics of participants

Demographic data are presented in **Table 1**. A total of 1,268 participants from 16 sub-communities of Village Moo 15, Ban Na Yao, were included in the analysis. The majority were female (58.8%), with a mean age of 43.3 ± 24.5 years (range 0-96). The population demonstrated a constrictive age pyramid, with 26.7% aged under 20 years and 30.9% aged 60 years or older, reflecting a community in demographic transition toward an aging society (**Figure 1**).

Most participants practiced Buddhism (97.1%) and were married (48.9%). Agriculture was the predominant occupation (26.7%), and educational attainment was generally low; nearly three-quarters had completed primary school or below (71.4%). The vast majority were covered under Thailand's Universal Health Coverage Scheme (85.3%). Monthly income was low, with 46.9% reporting no personal income; among the 596 participants who reported an income amount, the median was 9,000 THB per month (mean $11,845 \pm 13,321$ THB, range 300-150,000 THB), and more than half (52.2%) earned below 10,000 THB.

Table 1. Demographic data of Village Moo 15 of Tha Kradan Subdistrict, Ban Na Yao, Chachoengsao Province in 2026 (N = 1,268)

Baseline Characteristics	n (%)
Sex	
Female	746 (58.8)
Male	522 (41.2)
Age (years)	
Mean $\pm$ SD (min-max)	43.3 $\pm$ 24.5 (0.0-96.0)
Median (Q1-Q3)	50 (17-62)
< 20	338 (26.7)
20-39	136 (10.7)
40-59	401 (31.6)
60-79	345 (27.2)
$\geq$ 80	47 (3.7)
Religion	
Buddhism	1,231 (97.1)
Christianity	27 (2.1)
Islam	4 (0.3)
No religion	4 (0.3)
Others	2 (0.2)
Marital Status	
Married	621 (48.9)
Single	515 (40.6)
Widowed	73 (5.8)
Separated	54 (4.3)
Divorced	5 (0.4)
Occupation	
Unemployed	342 (27.0)
Farmer	338 (26.7)
Student	223 (17.6)
Laborer	156 (12.3)
Merchant	148 (11.7)
Others	61 (4.8)
Level of education (n=1,264)	
No formal education	278 (21.9)
Primary education	628 (49.5)
Lower secondary education	163 (12.9)
Upper secondary/vocational education	131 (10.3)
Diploma	62 (4.9)
Bachelor's degree or higher	2 (0.2)
Unknown	4 (0.3)
Health Insurance Scheme	
Universal Coverage Scheme	1,082 (85.3)
Civil servant medical benefit	65 (5.1)

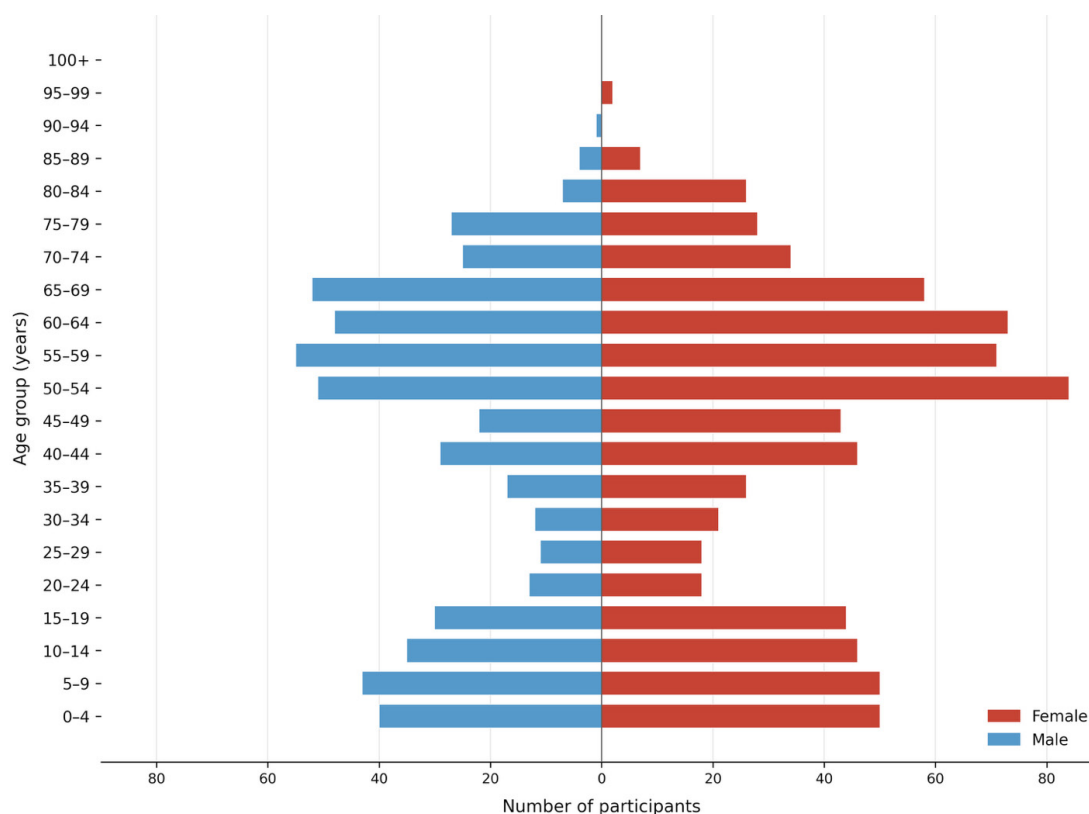
Table 1. Demographic data of Village Moo 15 of Tha Kradan Subdistrict, Ban Na Yao, Chachoengsao Province in 2026 (N = 1,268) (Cont.)

Baseline Characteristics	n (%)
Out-of-pocket	52 (4.1)
Social security	43 (3.4)
Others	14 (1.1)
Company welfare	12 (0.9)
Monthly Income	
No personal income	595 (46.9)
Has personal income	642 (50.6)
Unknown / prefer not to say	31 (2.4)
Monthly Income Range (THB) (n=596)	
Mean $\pm$ SD (min-max)	11,845 $\pm$ 13,321 (300-150,000)
< 5,000	167 (28.0)
5,000-9,999	144 (24.2)
10,000-19,999	169 (28.4)
20,000-29,999	52 (8.7)
$\geq$ 30,000	64 (10.7)
Body Mass Index (kg/m²) (n=849)	
Mean $\pm$ SD (min-max)	24.8 $\pm$ 4.8 (13.7-48.6)
Underweight (<18.5)	51 (6.0)
Normal (18.5-22.9)	295 (34.7)
Overweight (23.0-24.9)	130 (15.3)
Obese ($\geq$ 25.00)	373 (43.9)
Tobacco Smoking (n=1,160)	
Never smoked	835 (72.0)
Current smoker	325 (28.0)
E-cigarette Use (n=1,160)*	
No	1,108 (95.5)
Yes	52 (4.5)
Alcohol Consumption (n=1,160)	
Never drinker	535 (46.1)
Current drinker	430 (37.1)
Former drinker	195 (16.8)

*E-cigarette use reflects lifetime prevalence (ever vs. never use)

Body mass index was measured in 849 participants, with a mean of 24.78 ± 4.82 kg/m² (range 13.74-48.62). Using the WHO Asia-Pacific classification, 43.9% were obese (BMI $\geq$ 25.0

kg/m²). Regarding behavioral risk factors, 28.0% were current tobacco smokers, 4.5% used e-cigarettes, and 37.1% were current alcohol drinkers.



* One participant was excluded due to missing age and sex data (total enrolled N = 1,268).

Figure 1. Population pyramid of Ban Na Yao, Tha Kradan Sub-district, Sanam Chai Khet District, Chachoengsao Province, Thailand in 2026 (N = 1,267)

Non-communicable diseases

Among 947 adults aged ≥ 18 years, the prevalence of hypertension was 33.0% (n=312), dyslipidemia 23.0% (n=218), and diabetes mellitus 14.9% (n=141). Of the 849 adults with available BMI measurements, 43.9% were obese. After adjustment for age and sex, no personal income was significantly associated with hypertension (aPR 1.23, 95% CI 1.01-1.51) and diabetes mellitus (aPR 1.84, 95% CI 1.28-2.64). Higher BMI was significantly associated with both hypertension and dyslipidemia; overweight participants had higher hypertension prevalence (aPR 1.96, 95% CI 1.17-3.26), and this association strengthened with obesity class I (aPR 1.90, 95% CI 1.15-3.12) and class II (aPR 2.72, 95% CI 1.64-4.53). For dyslipidemia, obesity class I (aPR 3.22, 95% CI 1.18-8.80) and class II (aPR 3.74, 95% CI 1.34-10.43) were significantly associated with higher prevalence. Although current smoking and alcohol consumption showed inverse associations with some NCDs,

these likely reflect survival bias inherent in the cross-sectional design and should not be interpreted as protective effects (**Table 2**).

Community mental health

Among 101 adolescents aged 12-18 years who completed the PHQ-A, 25 (24.8%) screened positive for depression. Among 946 adults aged ≥ 18 years, moderate-to-high stress (ST-5 ≥ 5) was the most prevalent mental health problem (289, 30.5%), followed by depression (9Q ≥ 7) in 135 (14.3%), below-average mental health (TMHI-15 ≤ 43) in 78 (8.2%), suicidal ideation (8Q ≥ 1) in 48 (5.1%), and moderate-to-severe anxiety (GAD-7 ≥ 10) in 32 (3.4%).

Factors significantly associated with adult depression after adjustment are presented in **Table 3**. Among social determinants of health, health limiting daily activities showed the strongest association (aPR 2.00, 95% CI 1.42-2.81), followed by urgent unmet basic needs (aPR 1.82, 95% CI 1.25-2.65), loneliness and social isolation

Table 2. Factors associated with non-communicable diseases among adults aged ≥ 18 years, Ban Na Yao, Chachoengsao Province in 2026 (N = 947)

Factor	Hypertension (n = 312)		Diabetes (n = 142)		Dyslipidemia (n = 218)	
	n /N (%)	aPR (95% CI)	n/N (%)	aPR (95% CI)	n/N (%)	aPR (95% CI)
Education level (n=943)						
No/primary school	261/652 (40.0%)	Reference	124/652 (19.0%)	Reference	191/652 (29.3%)	Reference
Lower secondary school	19/118 (16.1%)	0.81 (0.53-1.23)	9/118 (7.6%)	0.83 (0.42-1.64)	12/118 (10.2%)	0.87 (0.51-1.48)
Upper secondary/diploma	28/171 (16.4%)	0.93 (0.65-1.33)	9/171 (5.3%)	0.63 (0.32-1.26)	14/171 (8.2%)	0.77 (0.45-1.30)
Bachelor's degree or higher	2/2 (100%)	3.15 (2.21-4.51)	0/2 (0.0%)	-	0/2 (0.0%)	-
Occupation (n=947)						
Government/company employee	4/28 (14.3%)	Reference	3/28 (10.7%)	Reference	2/28 (7.1%)	Reference
Merchant/self-employed	27/147 (18.4%)	0.66 (0.27-1.63)	18/147 (12.2%)	0.54 (0.17-1.72)	25/147 (17.0%)	1.00 (0.23-4.24)
Laborer	36/152 (23.7%)	0.93 (0.38-2.27)	11/152 (7.2%)	0.36 (0.10-1.24)	20/152 (13.2%)	0.86 (0.19-3.75)
Farmer	119/335 (35.5%)	1.00 (0.42-2.38)	48/335 (14.3%)	0.49 (0.16-1.53)	91/335 (27.2%)	1.20 (0.29-5.01)
Unemployed	118/247 (47.8%)	1.16 (0.49-2.75)	60/247 (24.3%)	0.76 (0.25-2.35)	74/247 (30.0%)	1.05 (0.25-4.37)
Other	8/38 (21.1%)	1.03 (0.37-2.83)	2/38 (5.3%)	0.32 (0.06-1.72)	6/38 (15.8%)	1.33 (0.29-6.01)
Monthly income (n = 874)						
≥ 10,000 THB	147/566 (26.0%)	Reference	58/566 (10.2%)	Reference	103/566 (18.2%)	Reference
< 10,000 THB	4/19 (21.1%)	0.59 (0.25-1.36)	4/19 (21.1%)	1.56 (0.63-3.89)	5/19 (26.3%)	0.99 (0.47-2.07)
No personal income	130/289 (45.0%)	1.23 (1.01-1.51)	68/289 (23.5%)	1.84 (1.28-2.64)	89/289 (30.8%)	1.08 (0.82-1.42)
Body mass index (kg/m²) (WHO Asia-Pacific) (n = 849)						
Normal (18.5-22.9)	73/295 (24.7%)	Reference	29/295 (9.8%)	Reference	52/295 (17.6%)	Reference
Underweight (< 18.5 kg/m²)	11/51 (21.6%)	1.26 (0.76-2.09)	7/51 (13.7%)	0.75 (0.33-1.73)	4/51 (7.8%)	2.28 (0.82-6.32)
Overweight (23.0-24.9)	54/130 (41.5%)	1.96 (1.17-3.26)	16/130 (12.3%)	0.81 (0.34-1.96)	32/130 (24.6%)	2.78 (0.99-7.78)
Obese class I (25.0-29.9)	97/264 (36.7%)	1.90 (1.15-3.12)	54/264 (20.5%)	1.49 (0.67-3.31)	74/264 (28.0%)	3.22 (1.18-8.80)
Obese class II (≥30.0 kg/m²)	53/109 (48.6%)	2.72 (1.64-4.53)	23/109 (21.1%)	1.61 (0.68-3.80)	35/109 (32.1%)	3.74 (1.34-10.43)
Tobacco smoking (n = 947)						
Never smoked	227/641 (35.4%)	Reference	108/641 (16.8%)	Reference	177/641 (27.6%)	Reference
Former smoker	49/141 (34.8%)	1.01 (0.75-1.35)	21/141 (14.9%)	0.93 (0.57-1.50)	31/141 (22.0%)	1.05 (0.72-1.54)
Current smoker	36/165 (21.8%)	0.75 (0.53-1.07)	13/165 (7.9%)	0.58 (0.32-1.05)	10/165 (6.1%)	0.36 (0.19-0.68)

Table 2. Factors associated with non-communicable diseases among adults aged ≥18 years, Ban Na Yao, Chachoengsao Province in 2026 (N = 947)

Factor	Hypertension (n = 312)		Diabetes (n = 142)		Dyslipidemia (n = 218)	
	n /N (%)	aPR (95% CI)	n/N (%)	aPR (95% CI)	n/N (%)	aPR (95% CI)
Alcohol consumption (n = 868)						
Never drinker	126/345 (36.5%)	Reference	72/345 (20.9%)	Reference	99/345 (28.7%)	Reference
Former drinker	72/182 (39.6%)	1.09 (0.88-1.35)	34/182 (18.7%)	0.88 (0.61-1.27)	54/182 (29.7%)	1.14 (0.87-1.49)
Current drinker	92/341 (27.0%)	1.00 (0.80-1.25)	26/341 (7.6%)	0.47 (0.30-0.74)	46/341 (13.5%)	0.74 (0.54-1.02)

aPR, adjusted prevalence ratio; CI, confidence interval. Models fitted using modified Poisson regression with robust variance estimators, adjusted for age group and sex. Bold values indicate statistical significance ($p < 0.05$).
Hypertension defined as self-reported history of hypertension or antihypertensive medication use, OR mean of blood pressure readings 2 and 3 ≥ 140/90 mmHg. Diabetes mellitus and dyslipidemia defined by self-reported history or current medication use.

Table 3. Factors associated with positive depression screening among adults aged ≥ 18 years ($9Q \geq 7$), Ban Na Yao, Chachoengsao Province in 2026 (N = 946)

Factor	n/N (%)	Depression aPR (95% CI)	p-value
Sex			
Male	41/383 (10.7%)	Reference	
Female	94/563 (16.7%)	1.11 (0.78-1.59)	0.566
Age group (years)			
18-39	23/153 (15.0%)	Reference	
40-49	13/140 (9.3%)	0.60 (0.31-1.15)	0.123
50-59	24/261 (9.2%)	0.42 (0.20-0.86)	0.018
60-69	39/231 (16.9%)	0.66 (0.34-1.28)	0.219
70-79	27/114 (23.7%)	0.74 (0.35-1.57)	0.436
≥ 80	9/47 (19.1%)	0.57 (0.23-1.42)	0.229
Marital status			
Married	86/616 (14.0%)	Reference	
Single	24/200 (12.0%)	0.70 (0.44-1.12)	0.135
Widowed	19/73 (26.0%)	1.26 (0.78-2.02)	0.341
Separated/divorced	6/54 (11.1%)	0.82 (0.40-1.69)	0.594
Education level			
No/primary education	102/652 (15.6%)	Reference	
Lower secondary school	15/117 (12.8%)	1.04 (0.52-2.09)	0.911
Upper secondary/diploma	17/171 (9.9%)	1.09 (0.59-2.02)	0.780
Bachelor's degree or higher ¹	1/2 (50.0%)	51.99 (5.88-459.63)	<0.001
Occupation			
Government/company employee	2/28 (7.1%)	Reference	
Merchant/self-employed	11/146 (7.5%)	1.80 (0.22-14.48)	0.581
Laborer	22/152 (14.5%)	2.25 (0.27-18.57)	0.452
Farmer	39/335 (11.6%)	2.46 (0.30-19.94)	0.400
Unemployed	59/247 (23.9%)	3.04 (0.36-25.89)	0.309
Other	2/38 (5.3%)	1.25 (0.11-14.03)	0.854
Monthly income			
$\geq 10,000$ THB	59/565 (10.4%)	Reference	
$< 10,000$ THB	2/19 (10.5%)	0.78 (0.21-2.92)	0.713
No personal income	63/289 (21.8%)	1.07 (0.65-1.73)	0.799
Social determinants of health			
Economic stability			
Food insecurity	73/296 (24.7%)	1.50 (1.03-2.17)	0.034
Housing payment difficulty	42/213 (19.7%)	1.03 (0.72-1.46)	0.876
Instable employment/income	101/544 (18.6%)	1.48 (0.94-2.33)	0.091
Urgent unmet basic needs	27/74 (36.5%)	1.82 (1.25-2.65)	0.002
Education access and quality			
Health literacy difficulty	64/306 (20.9%)	1.06 (0.74-1.52)	0.756
Needs further education/training	107/672 (15.9%)	1.13 (0.75-1.72)	0.553

Table 3. Factors associated with positive depression screening among adults aged ≥ 18 years (9Q ≥ 7), Ban Na Yao, Chachoengsao Province in 2026 (N = 946) (Cont.)

Factor	n/N (%)	Depression aPR (95% CI)	p-value
<i>Health care access and quality</i>			
Cannot afford healthcare	39/169 (23.1%)	0.88 (0.57-1.34)	0.546
Transport barrier to healthcare	51/199 (25.6%)	1.47 (1.01-2.14)	0.043
Health limits daily activities	71/248 (28.6%)	2.00 (1.42-2.81)	<0.001
<i>Neighborhood and built environment</i>			
Housing security concern	16/112 (14.3%)	0.65 (0.40-1.05)	0.080
Feels unsafe at home/community	68/390 (17.4%)	1.13 (0.82-1.57)	0.457
Insufficient basic household goods	92/645 (14.3%)	0.93 (0.68-1.29)	0.682
<i>Social and community context</i>			
Caregiving burden	84/405 (20.7%)	1.26 (0.88-1.81)	0.208
Loneliness/social isolation	38/148 (25.7%)	1.56 (1.11-2.20)	0.011

aPR, adjusted prevalence ratio; CI, confidence interval. Fully mutually adjusted modified Poisson regression with robust variance estimators (sandwich estimator); Bold values indicate $p < 0.05$. Depression status was assessed using the Thai two-question depression screening tool (2Q), followed by the nine-question depression questionnaire (9Q) for participants with a positive 2Q screen (score ≥ 1). Positive depression screening was defined as a 9Q score ≥ 7 .

¹Bachelor's degree or higher: n = 2 (full sample) / n = 1 (complete-case model); estimate unreliable due to very small cell size.

tion (aPR 1.56, 95% CI 1.11-2.20), food insecurity (aPR 1.50, 95% CI 1.03-2.17), and transport barriers to healthcare (aPR 1.47, 95% CI 1.01-2.14). Among sociodemographic factors, adults aged 50-59 years had significantly lower depression prevalence compared with those aged 18-39 years (aPR 0.42, 95% CI 0.20-0.86).

Occupational health and accidents

Among 942 adults aged ≥ 18 years with available accident data, 137 (14.5%) reported at least one accident in the past year, resulting in 284 total accident events (age-standardized incidence density of 30.1 per 100 population). The majority were general accidents (63.5%), with vehicle accidents being the leading cause (56.4%), followed by slips and falls (24.8%). Most accidents occurred on public roads (51.9%). Among 50 occupational accident cases, farmers accounted for the majority (56.0%), carelessness was the most common contributing risk factor (64.0%),

and 76.0% of workers were not using personal protective equipment at the time of injury.

Factors associated with accidents are presented in **Table 4**. After adjustment, female sex was significantly associated with lower prevalence of both overall accidents (aPR 0.48, 95% CI 0.32-0.72) and occupational accidents (aPR 0.46, 95% CI 0.22-0.98). For overall accidents, waking unrefreshed was significantly associated with higher accident prevalence (aPR 1.78, 95% CI 1.27-2.49), and adequate safety training was protective (aPR 0.66, 95% CI 0.43-0.99). For occupational accidents, severe fatigue showed the strongest association (aPR 4.07, 95% CI 1.28-12.94), and working on road or transport was associated with substantially higher occupational accident prevalence (aPR 8.98, 95% CI 1.03-78.42), though this estimate should be interpreted with caution given the wide confidence interval.

Table 4. Factors associated with overall and occupational accidents, Ban Na Yao, Chachoengsao in 2026

Factor	Overall Accident (N=942)			Occupational Accident (N=684)		
	n/N (%)	aPR (95% CI)	p-value	n/N (%)	aPR (95% CI)	p-value
Sex						
Male	75/381 (19.7%)	Reference		30/315 (9.5%)	Reference	
Female	62/561 (11.1%)	0.48 (0.32-0.72)	<0.001	20/369 (5.4%)	0.46 (0.22-0.98)	0.044
Age group (years)						
18-39	22/153 (14.4%)	Reference		11/117 (9.4%)	Reference	
40-49	18/140 (12.9%)	0.98 (0.53-1.79)	0.940	7/125 (5.6%)	0.85 (0.29-2.47)	0.759
50-59	40/259 (15.4%)	1.05 (0.60-1.85)	0.862	17/216 (7.9%)	0.92 (0.38-2.20)	0.849
60-69	30/230 (13.0%)	0.77 (0.41-1.45)	0.422	10/163 (6.1%)	0.61 (0.22-1.70)	0.348
70-79	21/114 (18.4%)	1.08 (0.55-2.09)	0.827	4/53 (7.5%)	0.81 (0.23-2.87)	0.740
≥80	6/46 (13.0%)	0.96 (0.37-2.51)	0.940	1/10 (10.0%)	1.51 (0.19-12.02)	0.697
Occupation						
Government/company employee	7/28 (25.0%)	Reference		5/28 (17.9%)	Reference	
Merchant/self-employed	16/145 (11.0%)	0.44 (0.17-1.10)	0.079	6/145 (4.1%)	0.33 (0.08-1.29)	0.111
Laborer	21/152 (13.8%)	0.48 (0.21-1.11)	0.085	8/152 (5.3%)	0.51 (0.16-1.63)	0.253
Farmer	55/333 (16.5%)	0.51 (0.22-1.18)	0.118	28/333 (8.4%)	0.71 (0.22-2.27)	0.562
Unemployed	33/246 (13.4%)	0.47 (0.18-1.19)	0.111	-	-	-
Other	5/38 (13.2%)	0.34 (0.10-1.17)	0.088	3/26 (11.5%)	0.67 (0.17-2.70)	0.575
Workplace						
Not working	34/254 (13.4%)	Reference		1/57 (1.8%)	Reference	
Home	24/178 (13.5%)	0.94 (0.54-1.63)	0.821	10/150 (6.7%)	3.92 (0.46-33.47)	0.212
Agriculture field	49/317 (15.5%)	0.96 (0.55-1.68)	0.892	21/309 (6.8%)	2.56 (0.35-19.01)	0.357
Office/building	8/57 (14.0%)	1.02 (0.43-2.43)	0.957	3/53 (5.7%)	2.27 (0.20-26.40)	0.513
Market	2/33 (6.1%)	0.45 (0.11-1.83)	0.266	0/30 (0.0%)	-	-
Road/transport	17/78 (21.8%)	1.12 (0.57-2.19)	0.741	15/68 (22.1%)	8.98 (1.03-78.42)	0.047
Factory	3/25 (12.0%)	0.76 (0.24-2.44)	0.650	0/17 (0.0%)	-	-

Table 4. Factors associated with overall and occupational accidents, Ban Na Yao, Chachoengsao in 2026 (Cont.)

Factor	Overall Accident (N=942)			Occupational Accident (N=684)		
	n/N (%)	aPR (95% CI)	p-value	n/N (%)	aPR (95% CI)	p-value
Alcohol consumption						
Never	37/344 (10.8%)	Reference		15/219 (6.8%)	Reference	
Former drinker	28/180 (15.6%)	1.16 (0.72-1.86)	0.546	7/112 (6.2%)	0.63 (0.25-1.63)	0.343
Current drinker	72/418 (17.2%)	1.45 (0.96-2.19)	0.077	28/353 (7.9%)	1.12 (0.55-2.29)	0.756
Smoking history						
Never	82/639 (12.8%)	Reference		30/445 (6.7%)	Reference	
Former smoker	31/138 (22.5%)	1.00 (0.62-1.59)	0.984	10/97 (10.3%)	0.67 (0.26-1.68)	0.392
Current smoker	24/165 (14.5%)	0.64 (0.39-1.04)	0.069	10/142 (7.0%)	0.56 (0.25-1.28)	0.169
Fatigue level						
None	45/349 (12.9%)	Reference		6/194 (3.1%)	Reference	
Mild	42/305 (13.8%)	0.93 (0.62-1.38)	0.710	20/247 (8.1%)	2.13 (0.92-4.97)	0.079
Moderate	41/230 (17.8%)	1.26 (0.84-1.90)	0.263	18/194 (9.3%)	2.51 (0.99-6.32)	0.052
Severe	9/58 (15.5%)	1.03 (0.51-2.08)	0.933	6/49 (12.2%)	4.07 (1.28-12.94)	0.017
Underlying diseases						
None	60/443 (13.5%)	Reference		23/360 (6.4%)	Reference	
Any underlying disease	77/499 (15.4%)	1.28 (0.90-1.82)	0.176	27/324 (8.3%)	1.46 (0.81-2.64)	0.207
Sleep duration						
< 6 hours	36/226 (15.9%)	Reference		11/173 (6.4%)	Reference	
6-8 hours	79/569 (13.9%)	0.89 (0.60-1.30)	0.538	29/422 (6.9%)	1.12 (0.53-2.40)	0.764
> 8 hours	20/145 (13.8%)	0.89 (0.53-1.50)	0.672	8/87 (9.2%)	1.29 (0.50-3.31)	0.602
Sleep quality						
Difficulty falling/staying asleep	65/459 (14.2%)	0.75 (0.54-1.03)	0.077	30/363 (8.3%)	1.16 (0.67-2.01)	0.592
Waking unrefreshed	91/500 (18.2%)	1.78 (1.27-2.49)	<0.001	34/373 (9.1%)	1.41 (0.77-2.60)	0.268
Daytime sleepiness	18/109 (16.5%)	1.13 (0.70-1.82)	0.613	9/83 (10.8%)	1.36 (0.66-2.79)	0.407
Safety training						
No adequate training	112/719 (15.6%)	Reference		39/492 (7.9%)	Reference	
Adequately trained	25/223 (11.2%)	0.66 (0.43-0.99)	0.043	11/192 (5.7%)	0.59 (0.30-1.17)	0.130

Table 4. Factors associated with overall and occupational accidents, Ban Na Yao, Chachoengsao in 2026 (Cont.)

Factor	Overall Accident (N=942)			Occupational Accident (N=684)		
	n/N (%)	aPR (95% CI)	p-value	n/N (%)	aPR (95% CI)	p-value
Days/week using risk tools						
Never (0 days)	76/543 (14.0%)	Reference		25/336 (7.4%)	Reference	
Occasional (1-3 days/week)	33/155 (21.3%)	1.45 (0.97-2.19)	0.073	11/128 (8.6%)	0.99 (0.49-2.00)	0.975
Frequent (4-6 days/week)	10/72 (13.9%)	0.77 (0.41-1.42)	0.399	5/65 (7.7%)	0.99 (0.39-2.51)	0.984
Daily (7 days/week)	18/172 (10.5%)	0.68 (0.40-1.15)	0.152	9/155 (5.8%)	0.59 (0.26-1.32)	0.202

aPR, adjusted prevalence ratio; CI, confidence interval. Fully mutually adjusted modified Poisson regression with robust variance estimators (sandwich estimator); Bold values indicate $p < 0.05$.

Musculoskeletal disorders and osteoporosis

Musculoskeletal pain and osteoporosis risk were assessed among 793 participants aged ≥ 40 years. Knee pain was the most prevalent complaint (342, 43.4%), followed by shoulder pain (326, 41.4%), lower back pain (317, 40.2%), neck pain (243, 30.8%), and hip or thigh pain (213, 27.0%). When stratified by sex, shoulder pain, back pain, and neck pain were more prevalent among females (43.2%, 39.1%, and 32.3%, respectively), while back pain was slightly more common among males (41.8% vs 39.1%).

Osteoporosis risk was assessed using two validated indices among 713 participants with complete weight data. By the OSTA index, 252 participants (35.3%) were classified as at risk, while the KKOS index identified a higher proportion, with 315 participants (44.2%) at risk. After adjustment ($n=655$), older age was the strongest predictor of osteoporosis risk under both indices, with those aged 70-79 years having substantially higher OSTA risk prevalence (aPR 7.30, 95% CI 5.01-10.63) and KKOS risk prevalence (aPR 4.24, 95% CI 3.24-5.55) compared with the 50-59 year reference group. Lower income was consistently associated with higher osteoporosis risk, those earning less than 10,000 THB had significantly higher OSTA risk (aPR 1.54, 95% CI 1.08-2.19) and KKOS risk (aPR 1.66, 95% CI 1.23-2.23) compared with those earning $\geq 10,000$ THB; no personal income was also significantly associated with higher KKOS risk (aPR 1.56, 95% CI 1.15-2.13). Female sex was significantly associated with higher OSTA risk (aPR 1.34, 95% CI 1.05-1.71) but not KKOS risk. After adjustment, corticosteroid use, smoking, alcohol consumption, history of accidents, diabetes mellitus, and hypertension were not significantly associated with osteoporosis risk under either index.

Intestinal parasitic infections

Stool examination was performed in 703 participants across all age groups. Of these, 692 (98.4%) tested negative, and 11 (1.6%) were positive for at least one intestinal parasite. *S.stercoralis* was the most prevalent species, detected in 7 individuals (1.0% of those tested), accounting for 63.6% of all infected cases.

Hookworm, *O. viverrini*, *Taenia* spp., and *Trichomonas hominis* were each identified in 1 individual (0.1% each), representing 9.1% of infected cases per species.

Risk factor associations were examined using Fisher's exact test among 412 participants who completed both stool examination and the behavioral questionnaire, of whom 6 (1.5%) tested positive. Male sex was the only factor significantly associated with intestinal parasitic infection (3.1% vs 0.4% in females, $p=0.037$). All positive cases were aged 40-59 years, though the age group did not reach statistical significance ($p=0.081$). Occupation, footwear use, and consumption of raw fish or other raw foods were not significantly associated with infection. Given the very small number of cases, these findings should be interpreted with caution, and no formal conclusions regarding risk factors can be drawn.

Cancer screening

Cancer data were collected from 869 participants aged 30 years or older. Cervical cancer was the most prevalent cancer among women (9 cases, 1,734.1 per 100,000 female population), followed by breast cancer (5 cases, 963.4 per 100,000). Among the total population, colorectal cancer had a period prevalence of 690.4 per 100,000, liver and bile duct cancer 575.4 per 100,000, and lung cancer 230.1 per 100,000.

Cancer screening coverage was 50.2% for Pap smear or HPV testing combined, 41.3% for breast self-examination (BSE), 34.3% for clinical breast examination (CBE), 22.3% for mammography or ultrasound, and 22.2% for fecal immunochemical test (FIT). The most commonly reported barrier to cancer screening was financial constraints (444, 51.4%), followed by healthcare system barriers (421, 48.8%), emotional barriers (206, 23.9%), and knowledge barriers (128, 14.8%). Knowledge barriers were significantly associated with lower screening participation across all modalities: FIT (OR 0.18, 95% CI 0.08-0.42), BSE (OR 0.25, 95% CI 0.13-0.48), CBE (OR 0.34, 95% CI 0.17-0.67), mammography or ultrasound

(OR 0.25, 95% CI 0.10-0.64), Pap smear (OR 0.21, 95% CI 0.11-0.40), and HPV testing (OR 0.13, 95% CI 0.03-0.55). Financial barriers were significantly associated with lower participation in FIT (OR 0.56, 95% CI 0.38-0.81), Pap smear (OR 0.69, 95% CI 0.49-0.98), and HPV testing (OR 0.56, 95% CI 0.35-0.92). Neither healthcare system barriers nor emotional barriers were significantly associated with participation in any screening modality.

Discussion

This community-based cross-sectional survey provides updated epidemiological evidence on the health risk profile of Ban Na Yao in Chachoengsao Province in 2026. The findings reveal a substantial and multifaceted burden spanning non-communicable diseases, mental health morbidity, occupational injuries, musculoskeletal disorders, and suboptimal cancer screening uptake. Socioeconomic deprivation, including low or absent income, lower educational attainment, and unemployment, emerged as a consistent determinant across nearly all health domains, complementing findings from the 2024 survey conducted in adjacent villages within the same community.⁽³⁾

Non-communicable diseases

The findings reveal a substantial burden of NCDs in this community, with prevalences of obesity (43.9%), hypertension (33.0%), dyslipidemia (23.0%), and diabetes mellitus (14.9%) exceeding or paralleling national estimates. Hypertension prevalence in this study is comparable to findings from NHES VII among participants residing outside municipal areas, which are considered representative of rural populations.⁽³³⁾ This pattern is consistent with national evidence of increasing hypertension prevalence and a narrowing urban–rural gap over time. Similarly, the higher diabetes prevalence observed may be attributable to the older age structure of the study population, in line with national trends showing rising diabetes prevalence alongside suboptimal awareness and glycemic control. Local evidence further highlights gaps in management, as a

significant proportion of hypertensive patients remain uncontrolled despite diagnosis, emphasizing limitations in continuity of care at the primary care level.⁽³⁴⁾

The high prevalence of obesity, comparable to trends observed in other rural Thai communities, suggests an ongoing epidemiological transition driven by reduced physical activity and dietary shifts toward energy-dense foods.⁽³⁵⁾ The adjusted analyses confirm the role of income as a key socioeconomic determinant, with no significant association between personal income and either hypertension or diabetes mellitus after adjustment for age and sex. Higher BMI was also significantly associated with both hypertension and dyslipidemia across obesity classes, reinforcing the clinical importance of weight management in this population. Importantly, the apparent inverse associations of smoking and alcohol consumption with NCD prevalence likely reflect survival bias inherent in the cross-sectional design and should not be misinterpreted as protective effects. Overall, these findings underscore the need for integrated, community-based strategies that go beyond screening to address long-term risk factor modification and chronic disease management.

Community mental health

The present study highlights a substantial and persistent burden of mental health problems in this rural community, with 30.6% of adults experiencing moderate-to-high stress, 14.3% screening positive for depression, and 5.1% reporting suicidal ideation, alongside a high prevalence of adolescent depression (24.8%). These findings are consistent with the previous survey in the same community⁽³⁾, suggesting a stable and ongoing burden over time. The observed prevalence of depression is comparable to national estimates (18.6%) but notably higher than that reported in some rural Thai settings (4.5%), likely reflecting the older age structure and socioeconomic vulnerability of this population.⁽⁸⁾ Evidence from rural Thailand further indicates that depression is particularly common among older adults due to social isolation and demographic shifts, including outmigration of younger populations.⁽³⁶⁾

Consistent with both national and international literature, social determinants of health, particularly health-limiting daily activities, urgent unmet basic needs, loneliness and social isolation, food insecurity, and transport barriers to healthcare, emerged as the strongest independent determinants of depression after full mutual adjustment, consistent with evidence linking food insecurity and social isolation to depression in low- and middle-income settings.^(37–39)

Notably, conventional socioeconomic variables such as unemployment, income, and education were not independently associated with depression after accounting for these structural determinants, suggesting their effects may be mediated through downstream social and functional consequences. The high prevalence of adolescent depression aligns with national data showing depressive symptoms are common among Thai adolescents and strongly associated with low socioeconomic status.⁽⁴⁰⁾ Together, these findings underscore the need for sustained community-based mental health interventions addressing social isolation, food security, functional health limitations, and access barriers, with early identification among adolescents.

Occupational health and accidents

The present study demonstrates a substantial burden of accidents and occupational injuries in this rural community, with 14.5% of adults reporting at least one accident in the past year, predominantly involving road traffic incidents and agricultural work. The predominance of road traffic injuries aligns with national and global evidence identifying road traffic accidents as a major public health problem in Thailand, with one of the highest mortality rates in Asia and significant impacts on working-age populations.⁽⁴¹⁾ The observed association with male sex is consistent with the literature.⁽⁴¹⁾ Occupational injuries were concentrated among farmers and road or transport workers, reflecting the broader Thai context in which a large proportion of the workforce is engaged in agriculture, often in the informal sector, lacking adequate safety protections and surveillance systems.^(42, 43) Notably, waking unrefreshed was significantly associated with

overall accident occurrence, consistent with evidence that sleep disturbance nearly doubles the risk of workplace accidents⁽⁴⁴⁾, and adequate safety training was protective, aligning with literature demonstrating that occupational safety training improves safety climate and reduces injury risk in agricultural settings.^(45, 46) The strong dose-response relationship between fatigue and occupational accidents further supports evidence that fatigue impairs cognitive and motor performance, increasing injury risk in manual labor settings.^(44, 46) Together, these findings underscore the need for sustained injury prevention strategies that address road safety, sleep health, occupational safety training, and the strengthening of occupational health systems, particularly for informal agricultural workers.

Musculoskeletal disorders and osteoporosis

Musculoskeletal disorders (MSDs) and osteoporosis represent a substantial and inter-related health burden in this rural population, particularly among adults aged ≥ 40 years. Knee pain was the most prevalent complaint (43.4%), followed by shoulder (41.4%), lower back (40.2%), neck (30.8%), and hip or thigh pain (27.0%), consistent with patterns seen in agricultural communities where repetitive physical labor, stooping, and heavy lifting are well-established contributors to musculoskeletal pain and disability.^(47, 48) These findings are consistent with global evidence from the Global Burden of Disease study identifying MSDs, particularly low back pain, as leading causes of years lived with disability worldwide.⁽⁴⁹⁾ Concurrently, 35.3% and 44.2% of participants aged ≥ 40 years were classified as at osteoporosis risk by the OSTA and KKOS indices, respectively, consistent with prior studies in Thai and Asian populations.^(15–17) After adjustment, older age and lower income were associated with higher OSTA risk across both indices, while female sex was significantly associated with higher OSTA risk (aPR 1.34, 95% CI 1.05–1.71). The income gradient likely reflects inequalities in nutritional intake, particularly calcium and vitamin D, and in access to preventive care.⁽⁵⁰⁾ At the same time, the higher OSTA risk among females is consistent with the

well-established sex difference in bone mineral density loss following menopause.⁽⁵¹⁾ Notably, corticosteroid use, a well-established biological risk factor for bone loss⁽⁵²⁾, was not independently associated with osteoporosis risk after adjustment, suggesting potential confounding by age and comorbidity in the crude analysis. Together, these findings highlight a growing dual burden driven by population aging, occupational exposures, and social determinants, underscoring the need for integrated, community-based strategies that target ergonomic interventions, nutritional support, and targeted osteoporosis screening to reduce long-term disability and fracture risk.

Intestinal parasitic infections

The prevalence of intestinal parasitic infections in this community was low (1.6%), with *S. stercoralis* as the most frequently identified organism. This finding is consistent with the declining trend in soil-transmitted and food-borne parasitic infections in Thailand, reflecting improvements in sanitation, health education, and access to healthcare in recent decades.⁽¹⁰⁾ However, the persistence of *S. stercoralis*, particularly among adult males and agricultural workers, aligns with previous studies indicating that transmission remains endemic in rural settings, especially where contact with contaminated soil and inconsistent footwear use are common.^(10,53) The absence of statistically significant associated factors in this study is likely due to the small number of positive cases, rather than a true lack of risk. Notably, traditional dietary practices, such as consuming raw or undercooked food, continue to pose a risk of certain parasitic infections, although their impact appears limited in this population. These findings suggest that while the overall burden is low, targeted prevention strategies, particularly health education on personal hygiene, safe food practices, and consistent use of protective footwear, remain important for sustaining control and preventing re-emergence in vulnerable subgroups.

Cancer screening

Cancer screening coverage in this community remained substantially below national targets

across all modalities, with particularly low uptake of mammography/ultrasound and FIT, and only moderate coverage of cervical cancer screening. These findings are consistent with national data from Thailand, which demonstrate persistent gaps in screening participation despite the expansion of services under the Universal Health Coverage scheme.⁽²⁹⁾ Financial constraints were the most commonly reported barrier. In contrast, knowledge-related barriers, although less frequent, were the strongest predictors of non-participation across all screening types, highlighting the critical role of health literacy in preventive health behaviors. This pattern aligns with previous studies showing that limited awareness, misconceptions about cancer risk, and fear of diagnosis significantly reduce screening uptake in both rural Thai and other low- and middle-income settings.^(54, 55) Additionally, structural barriers, such as limited access to healthcare facilities and competing economic priorities, may further limit participation, particularly among low-income populations. Given that early detection through screening is a key strategy for reducing cancer morbidity and mortality, these findings underscore the need for targeted interventions that address both financial and knowledge barriers, including community-based education, outreach programs, and improved accessibility of screening services.

This study has several important strengths. It is a community-based survey covering 1,268 participants across all age groups and multiple health domains, enabling a comprehensive assessment of the local health profile. The use of standardized and validated instruments, such as the Nordic Musculoskeletal Questionnaire, PHQ-based mental health tools, and established osteoporosis risk indices — alongside integration of interview data, physical examinations, and laboratory investigations enhances the reliability of findings. As part of an annual longitudinal surveillance program, this report contributes to tracking health trends over time in this community, complementing the 2024 survey.⁽³⁾ Analytically, the use of modified Poisson regression with robust variance estimators and the Healthy People 2030 framework for social

determinants of health represents methodological strengths that improve the validity and interpretability of the association analyses.

Several limitations should be considered. The cross-sectional design precludes causal inference and is subject to temporal ambiguity. Many variables were self-reported, introducing potential recall and reporting biases, particularly for behavioral risk factors and past medical history. Selection bias may also be present if certain subgroups (e.g., working-age males) were underrepresented during data collection. Furthermore, some analyses, such as those for intestinal parasitic infections, were limited by small case numbers, reducing statistical power to detect associations. Finally, the findings may have limited generalizability to similar rural Thai settings, given the study population's specific socioeconomic and demographic context.

Conclusion

This community-based annual health survey documents a substantial and multifaceted burden of health problems in a rural Thai population, encompassing non-communicable diseases, mental health conditions, musculoskeletal disorders, occupational injuries, and gaps in cancer screening. The adjusted analyses consistently identify low income and higher BMI as key determinants of NCD outcomes, while social determinants of health, particularly functional health limitations, food insecurity, loneliness, and transport barriers to healthcare, emerge as the strongest independent determinants of depression. The low prevalence of intestinal parasitic infections reflects improvements in sanitation and health behaviors over time, though vigilance remains warranted. The aging population structure amplifies risks across all health domains and is likely to increase future disease burden. These findings underscore the need for integrated, community-based interventions addressing both clinical and structural determinants of health, with priority given to income support, nutritional programs, social connectedness, and improved access to preventive services. Longitudinal follow-up of this

cohort will be essential for tracking disease trajectories and evaluating the impact of locally implemented interventions over time.

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