



# Incidence of Communicable and Non-Communicable Disease for Small Island Communities/Developing States: A Systematic Review and Proportional Meta-Analysis

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## ABSTRACT

**Background:** Small Island Communities (SIDS) are remote, vulnerable areas with unique challenges like weather changes, limited healthcare access, and limited epidemiological data. Studies on diseases like obesity and depression are limited, and a systematic review is needed to assess current incidence and risk in these communities. **Methods:** A Systematic review was conducting using search engines. Keywords utilized such as: “Small Island Community [MeSH] OR Small Island Developing States [MeSH]” AND “Incidence OR Prevalence OR Disease”. Each author conducted an independent analysis of each paper based on its title, abstract, and applicability for the PEOS framework. JBI critical appraisal techniques were used to assess the risk of bias in all included research. **Results:** 18 publications from different nations, such as Indonesia, Jamaica, Solomon Island, and others, were included in the 404.795 articles. All writers then synthesized the articles, which were then examined using JBI. The prevalence of communicable disease infected 99% of community including worm infections, conjunctivitis, malaria, and COVID-19 is particularly high in small island settings in nations like Indonesia, Jamaica, Vanuatu, the Solomon Islands, and Fiji. Risk is enhanced by factors including socioeconomic status and educational attainment. Analysis for non-communicable illnesses affected 27% of community include lung cancer, stress, obesity, stunting, depression, and hypertension. JBI score for all included is 75%, considered moderate risk of bias. **Conclusions:** Small Island communities face diverse diseases, requiring research and tailored solutions due to economic, environmental, and socio-cultural factors.

**Keyword:** Communicable Disease, Meta-Analysis, Non-Communicable Disease, Small Island Community

## ABSTRAK

**Latar Belakang:** Komunitas Pulau Kecil adalah daerah terpencil dan rentan dengan tantangan yang unik seperti perubahan cuaca, akses layanan kesehatan yang terbatas, dan kurangnya penelitian. Penelitian tentang penyakit seperti obesitas dan depresi masih terbatas, dan tinjauan sistematis diperlukan untuk menilai kejadian dan risiko saat ini di komunitas ini. **Tujuan:** Menentukan kejadian atau risiko penyakit menular atau tidak menular untuk masyarakat pulau kecil/negara berkembang. **Metode:** Tinjauan sistematis menggunakan berbagai mesin pencari. Kata kunci yang digunakan seperti: “Komunitas Pulau Kecil [MeSH] ATAU Negara Berkembang Pulau Kecil [MeSH]” DAN “Insiden ATAU Prevalensi ATAU Penyakit”. Semua artikel dianalisis secara independen oleh semua penulis berdasarkan judul, abstrak dan kesesuaian dengan kerangka kerja PEOS. Semua studi yang disertakan dianalisis untuk risiko bias menggunakan alat penilaian kritis *Joanna-Briggs Institute* (JBI). **Hasil:** Sebanyak 18 publikasi dari berbagai negara, seperti Indonesia, Jamaika, Solomon Island, dan lainnya, termasuk dalam 404.795 artikel tersebut. Semua penulis kemudian mensintesis artikel-artikel tersebut, yang kemudian diperiksa menggunakan JBI. Prevalensi penyakit menular yang menjangkiti 99% masyarakat termasuk infeksi



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cacing, konjungtivitis, malaria, dan COVID-19 sangat tinggi di negara-negara kepulauan kecil seperti Indonesia, Jamaika, Vanuatu, Kepulauan Solomon, dan Fiji. Risiko ini diperkuat oleh faktor-faktor termasuk status sosial ekonomi dan tingkat pendidikan. Analisis untuk penyakit tidak menular yang mempengaruhi 27% masyarakat termasuk kanker paru-paru, stres, obesitas, stunting, depresi, dan hipertensi. Skor JBI untuk semua yang termasuk adalah 75%, dianggap sebagai risiko bias sedang. **Kesimpulan:** Masyarakat pulau kecil menghadapi beragam penyakit, yang membutuhkan penelitian dan solusi yang disesuaikan dengan faktor ekonomi, lingkungan, dan sosial-budaya.

**Kata Kunci:** Masyarakat Pulau Kecil, Meta Analisis, Penyakit Menular, Penyakit Tidak Menular

## 1. Introduction

Small Island Communities are human communities that occupy an area with characteristics such as remote areas, vulnerable to economic and environmental problems, separated from an island and bounded by the sea. If the area is placed and forms a country, it is called a Small Island Developing States (SIDS). This kind of community faces particular difficulties and differs greatly from places with extensive. Challenges such as weather changes, limited access to health care, lack of health research and others arise the complexity of health problems that arise.<sup>[1]</sup> Many studies in this area are focusing on stunting and soil transmitted helminths, Although previous epidemiological studies have generally explained that diseases in remote areas are dominated by infectious diseases, the prevalence of non-communicable diseases has also increased significantly. Research by Furusawa<sup>[2]</sup> in the Solomon Islands in 2021 showed the risk of obesity and depression can occur and very few things like this are studied in the same regional setting. A systematic review is necessary to determine what disease risks are now understood in order to create opportunities for comprehensive solutions to a complicated regional environment, as there is a dearth of information regarding the incidence and risk of diseases in regional settings such as these. Therefore, evaluating the present incidence and risk of communicable or non-communicable diseases for small island populations and developing states is the result of this systematic review.

## 2. Material and Methods

### 2.1 Search Strategy

The preferred reporting items for systematic reviews and meta-analysis (PRISMA), which were employed in this study, were synthesis without meta-analysis. We employed a variety of search engines, including Science Direct, PubMed, and Google Scholar. We employ a variety of terms, including “Small Island Community [MeSH] OR Small Island Developing States [MeSH]” AND “Incidence OR Prevalence OR Disease”. Small Island Developing States determined based on list of SIDS from United Nations.<sup>[3]</sup> Particularly Indonesia, which consists of small islands separated from the province, an outermost small island separated by land from the capital city of its province, or an island bounded around the perimeter by the ocean is sought separately using the name of the island based on the presidential decree of the republic of Indonesia Number 6 of 2017 concerning the determination of outermost small islands.<sup>[4]</sup> A Small Island Community is defined as an area inhabited by a group of people that has no land crossings and is bordered only by the sea. This systematic review registered at PROSPERO with number: [CRD42023440313].

We include any papers that are at least 10 years old, have complete text available, are written in English or Indonesian, and provide incidence or risk of communicable or non-communicable disease in small island community/developing states. Rural or isolated communities that are nonetheless connected to the province's landmass are excluded.

### 2.2 Study Selection

The PEOS framework (**P**opulation = human, **E**xposure = Small Island Community OR Small Island Developing States, **O**utcomes = Incidence or Risk of Communicable OR Non-Communicable Disease, and **S**tudy type = Observational study) was used to independently determine each author's eligibility. The main finding that researchers utilized to calculate the risk or incidence of communicable or non-communicable disease for impoverished countries or tiny island communities. To settle disputes, the investigators came to an agreement.

### 2.3 Data Extraction and Quality Evaluation

From each included study, the following data were taken: (1) First authors; (2) Article year; (3) Country; (4) Communities; (5) Total Sample; (6) Primary Outcome; and (7) Finding. The main goal is to estimate the

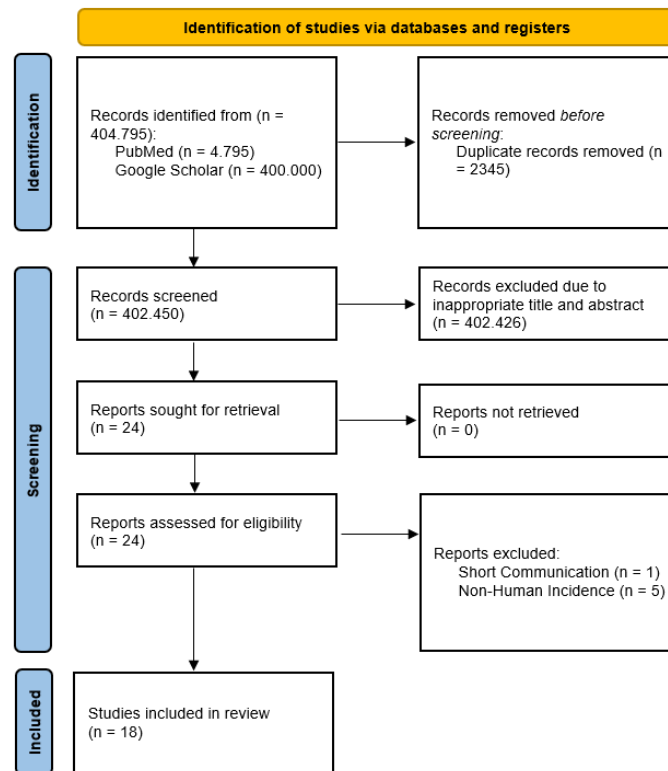
prevalence or risk of contagious or non-contagious diseases in underdeveloped countries and tiny island populations. Full text was reviewed by all authors with Joanna-Briggs Institute Critical Appraisal Tools according to the type of articles received ([jbi.global/critical-appraisal-tools](http://jbi.global/critical-appraisal-tools)). Disagreements were resolved by consensus. We will determine score of JBI on each included article based on how many yes on checklist based on study design (cross-sectional) by total of checklist then score in percentage (%).

#### 2.4 Statistical Analysis

We performed the proportion meta-analysis using R Studio (2024.09.0+375). proportional analysis with metaprop program code and the library (meta). The incidence of communicable and non-communicable diseases was analyzed proportionately. Because it would be confusing, the entire sample with an incidence ratio of 1:1 was excluded. Forest plots with proportion values and 95% CI were used to display the data. When the 95%CI value narrowed, the results were deemed accurate; when it deviated from the percentage value, the results were deemed less reliable. The I<sup>2</sup> and t<sup>2</sup> values were also displayed in order to perform heterogeneity testing. The degree of variability between studies increases with the I<sup>2</sup> value. In order for the results to be representative of broader conclusions (not just research), the proportion value is calculated using the Random Effect Model technique.

### 3. Results and Discussion

A total of 404.795 studies were identified and selected based on the title, abstract and suitability with PEOS framework (Fig.1). There are 18 articles included and have been independently analyzed by all authors and agree for both of these articles to be appropriate and further for data synthesis and extraction.



**Figure 1.** Identification of Studies Based on PRISMA Flowchart

#### 3.1 Communicable Disease in Small Island Community/Developing States

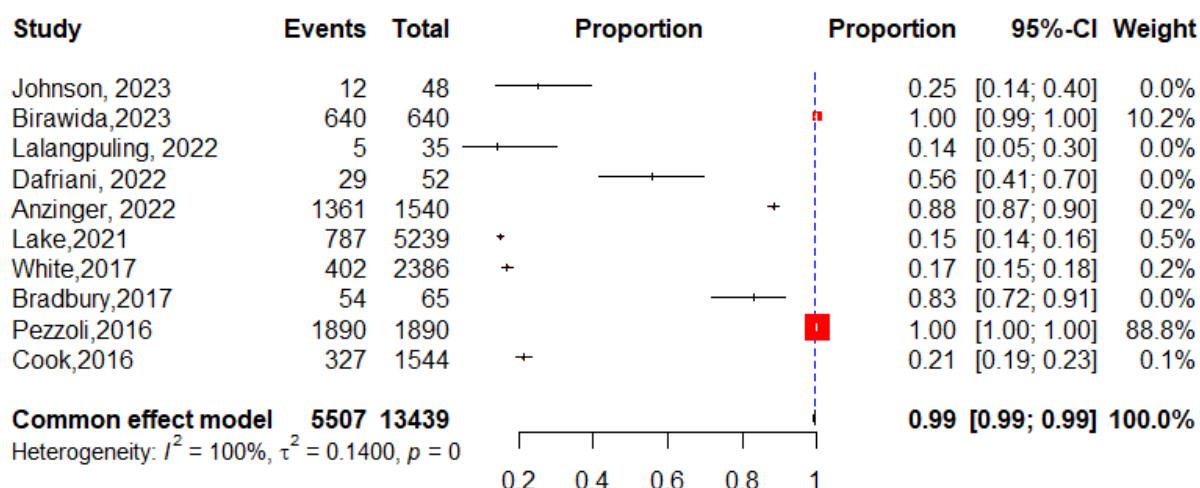
There were 12 articles involving 13,708 samples on cases of communicable disease. Articles obtained vary from various countries such as Indonesia, Jamaica, Vanuatu, the Solomon Islands, and Fiji. With the same location setting, many infections occur ranging from worm infections, conjunctivitis, malaria, to COVID-19. Some articles explain several variables that enable an increased risk of a disease such as Manumpa<sup>[5]</sup> in 2017 showing factors such as socio-economic and educational levels play a role in the risk of malaria. The incidence of tuberculosis (TB) is also potentially high in one location with the setting of small islands as surveyed by Pezzoli<sup>[6]</sup> in 2016 investigating the prevalence of TB in Fiji that continues to increase every year. Naturally, the environment on small islands is ideal for the development of tuberculosis, particularly when treatment is inadequate and the disease persists in a remote location. Small island area that is theoretically infected with

the possibility of pandemic cases such as COVID-19 can be disputed in this study. A study by Anzinger<sup>[7]</sup> in 2022 in Jamaica examined the IgG antibody SARS-CoV-2 while Omicron was still a concern variant. Of the 1540 patients, 88.4% were positive for COVID-19. Therefore, it can be concluded that if in the future there is a pandemic with the same transmission model, then small island setting should not be excluded and still have the risk of transmission. Based on the statistical results of the meta-analysis, the proportion of communicable disease incidence in small island communities was 99% (95%CI: 0.99 - 0.99) with high heterogeneity results (I<sup>2</sup>, 100%) [Fig.2]. It can be interpreted that this community is very vulnerable to communicable disease with a very narrow 95%CI result. However, the heterogeneity found is also very high, which can be influenced by various factors including the environment, behavior, and various other things.

**Table 1.** Findings on Communicable Disease

Author, year	Countries	Communities	Total Sample (n)	Findings*
Manumpa <sup>[5]</sup> , 2017	Indonesia	South Alor, West Alor Regency, NTT	173	The factors influencing the incidence of malaria were socioeconomic status (sig 0.000), education level (sig 0.001).
Pezzoli <sup>[6]</sup> , 2016	Fiji	Fiji	1890	1890 new case of TB cases reported and linear upward trends for all cases
Anzinger <sup>[7]</sup> , 2022	Jamaica	Jamaica	1540	88.4% IgG antibodies for SARS-CoV-2 detected with 77% showing evidence of previous SARS-CoV-2 infection
Johnson <sup>[8]</sup> , 2023	Vanuatu	Vanuatu	48	12 of 48 (25%) infected by viral-associated conjunctivitis in Vanuatu and human adenovirus as the most etiology for viral conjunctivitis
Birawida <sup>[9]</sup> , 2023	Indonesia	Spermonde Archipelago, South Sulawesi	640	640 cases of Acute Respiratory Infection (ARI)
Lalangpuling <sup>[10]</sup> , 2022	Indonesia	Talaud Island, North Sulawesi	35	5 students (14,29%) positive of STH
Dafriani <sup>[11]</sup> , 2022	Indonesia	Mentawai Island, West Sumatera	52	29 patients (55,8%) were positive of pulmonary TB
Lake <sup>[12]</sup> , 2021	Solomon Island	Western Province	5239	787 of 5239 (15%) population had scabies, higher in males than females (16.7% vs 13.5%)
White <sup>[13]</sup> , 2017	Samoa Island	Apia	2386	402 (17%) of Influenza-like illness, followed by acute fever, chikungunya, watery diarrhoea, and others.
Bradbury <sup>[14]</sup> , 2017	Solomon Island	Malaita Province	65	54/66 (81.8%) contained by N.americanus hookworm
Cook <sup>[15]</sup> , 2016	Jamaica	Kingston	1544	21.2% population has anti-Toxocara igG, males had higher than females.
Ningrum <sup>[16]</sup> , 2014	Indonesia	Nunukan, North Kalimantan	96	The average fluorine content of rainwater is 0.178 and severity of dental caries people who consume rainwater based on DMF-T index is 3.41 (medium category) and the people who do not drink rainwater is 1.49 (low category).

\*Proportion were presented in n(%)



**Figure 2.** Incidence Forest Plot of Communicable Disease among Small Island Community

### 3.2 Non-Communicable Disease in Small Island Community/Developing States

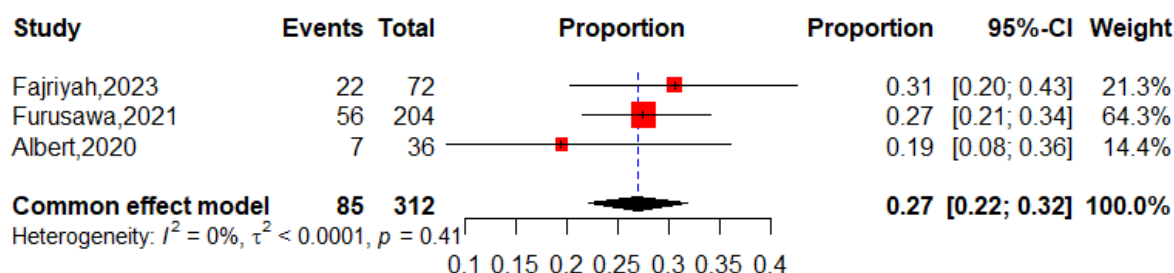
A total of five studies involving 3,895,633 populations in various countries such as Indonesia, the Solomon Islands and Jamaica. Numerous non-communicable diseases have been identified, including lung cancer, stress, obesity, stunting, depression, hypertension, and malnutrition. Research by Furusawa<sup>[2]</sup> in the Solomon Islands in 2021 to determine the incidence of communicable and non-communicable diseases and found that a location setting in the Salomon Islands has a risk of obesity and also depression (OR 1.13 dan 1.25). This increases the risk of mental illnesses in addition to nutrition-related ones. According to meta-analysis statistics, tiny island communities had a 27% (95%CI: 0.22 - 0.32) incidence of non-communicable diseases, with very low heterogeneity values ( $I^2$ , 0%) [Fig.3]. This can be interpreted that the small island community has a proportion of non-communicable events of 27%, so that this community is not spared from non-communicable diseases with low heterogeneity results, indicating that there are not many factors that influence the incidence that could potentially occur by variables that are fixed or the same in each region.

**Table 2.** Findings on Non-Communicable Disease

Author, year	Countries	Communities	Total Sample (n)	Findings
Furusawa <sup>[2]</sup> , 2021	Solomon Island	Taro	113	Higher Risk of Obesity [OR 1.13 (95%CI: 1.02 - 1.27), p=0.0189]
		Manuppo	115	Higher risk of depression [OR 1.25 (95%CI: 1.08 - 1.44), p=0.0026]
		Sasamunga	116	26.5% of population has Hypertension Moderate stress levels as much as 30.6%.
Fajriyah <sup>[17]</sup> , 2023	Indonesia	Bintan, Kepulauan Riau	72	Adolescents with obesity nutritional status were 36.1%. The result of statistical test shows that the p value is 0.027 with r = 0.261 whereas. any relationship between stress levels and obesity among adolescents in SMA Negeri 1 Bintan Timur.
Tursini <sup>[18]</sup> , 2022	Indonesia	Rupat	NA	18.5% Cases of stunting in children
Albert <sup>[19]</sup> , 2020	Solomon Island	Malaita Province	86	Overall, 30.3% women were overweight and 20.7% were obese
		Western Province	36	Malnutrition in 20% infants (aged 6 - 23 months) and 40% of children (aged 2 - 5 years)

Reid <sup>[20]</sup> , 2020	Jamaica	Jamaica	3.895.095	1.634/3.895.095(0.04%) of all female popoulation had breast cancer and contribute to 24% of all female cancer deaths
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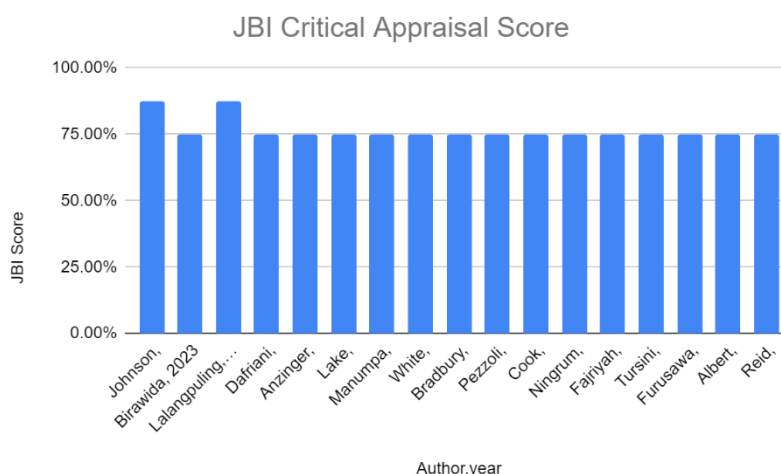
NA: Not Available



**Figure 3.** Incidence Forest Plot of Non-Communicable Disease Among Small Island Community.

### 3.3 Risk of Bias

Using JBI Critical Appraisal tools with a cross-sectional design, each author independently analyzes the risk of bias. The number of affirmative responses is divided by the total number of items on the checklist in the % result. Because most studies do not explain co-funding issues and because manuscripts seldom offer solutions for dealing with co-funding elements, we only sometimes observed JBI ratings of about 75% (6/8). All result of risk of bias were presented in Figure 4.



**Figure 4.** Risk of Bias for Included Studies

### 3.4 Discussion

#### 3.4.1 Article Search Constraints

Instead of employing terminology to make article searches easier, some barriers to article searching utilize the name of the region or study site. As a result, it appears that there is very little study on tiny island communities, yet when studied by area, it may be discovered more frequently. Research on drug-resistant TB, multidrug-resistant tuberculosis, and empyema from tuberculosis, for instance, uses the same language as tuberculosis so that consumers may find it and access it with ease. Small island communities, on the other hand, do not employ a single terminology, and the title and keywords of the article concentrate on the name of the location under study. And there is the potential that research data is not published online because there are limited resources for researchers in other regions to be able to publish the results of their data because the location setting is known to have complexity including in the economic field.

#### 3.4.2 Summary and Interpretation of Findings

Of the 18 studies that have been included from different countries with various communities included, information has been revealed that diseases present in small island community/developing states are not only associated with stunting and worm infections alone. In the realm of communicable diseases, 99% of the



population is afflicted with a variety of illnesses, including COVID-19, malaria, TB, and conjunctivitis. The high proportion rate of communicable diseases in this population could be caused by a number of factors, as demonstrated by the high heterogeneity (I<sup>2</sup>, 100%). On the non-communicable disease affected 27% of total proportion of the community. Aspect not only the case of stunting as it is known to date, depression and obesity are risk factors in the setting of such a location. This study can be interpreted as the small island community/developing states have many risk factors for other mutilations in addition to stunting and worm infections. Therefore, this information indicates that health problems in the location are so varied this is due to various factors can be such as economic, environmental, human behavior, socio-cultural and other that are very diverse in different areas.

The results that have been found show that a variety of diseases (both communicable and non-communicable diseases) can be found in the islands, not much different from urban areas. Therefore, special attention needs to be paid to the islands, especially regarding health facilities, which are still focused on urban areas. These findings can also support other researchers in the health sector to further explore both the disease profile of the islands and also the risk factors that are owned according to the natural and cultural wealth that may affect it. Especially in the Indonesian region, this research can be used as support that island communities need attention in health aspects that are inseparable from the threat of a disease and are also exacerbated by limited health facilities.

### 3.5 Limitation, Strength, and Future Research Directions

This research has limited data that can be accessed because some of them are repositories (grey literature) that cannot full-text access. This is because research at such locations is carried out by new researchers as the ultimate task of the university so it is only published on the repository. The other limitations of this study are not focused on any variables that can affect the incidence or risk of each study because each area has its own complexity. Therefore, it is difficult to find the similarities of factors that can influence them. This study's strength is its ability to compile current data on disease incidence and risk in a setting that has never been studied before. It has demonstrated that this type of setting is not just focused on stunting or worm infection, but also on numerous other potential diseases that must be considered individually. Subsequent research indicates that every place has a distinct variety of factors that could affect the likelihood of a disease outbreak in a small island community or developing state. As part of the incidence or risk of disease, factors including weather variations, environmental influences, social behavior, culture, and others must be taken into account. Stunting and worm infections are only two of the many diseases that may be examined, providing opportunity for diverse study leading to complete remedies based on the region case by case.

## 4. Conclusion

Stunting and worm infection are not the only diseases that pose a hazard to small island communities and underdeveloped nations. Other ailments including depression, obesity, pandemics, and others continue to grow more common in these areas. Because local communities differ in their economic, environmental, and sociocultural practices, incidences and dangers may differ in each region. As a result, additional study is necessary to resolve health issues at each place, and the necessary answer is tailored to the particular circumstances of each instance.

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