The Intersections of Global Health Security with: Inclusive Development, Migration, Private Sector, and Climate Change

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INTRODUCTION

1.1. PURPOSE AND SCOPE

USAID/Peru's Global Health Security Portfolio conducted an analysis about Global Health Security and the intersections with Inclusive Development, Migration, Private Sector, and Climate Change. The purpose of this analysis is to provide a perspective on how these cross-cutting themes relate with Global Health Security and serve as a basis for USAID/Peru's new activity designs.

1.2. METHODOLOGY

The methodology employed in this analysis consists of a literature review of secondary data complemented by empirical evidence, with the application of the intersectionality concept.

The aim of this analysis is to delineate the intersections between Global Health Security and four variables: Inclusive Development (1), Migration (2), Private Sector (3), and Climate Change (4.)

The guiding questions are as follows:

- Why are "Variables 1, 2, 3, and 4" pertinent to Global Health Security?
- What considerations should be taken into account when examining the relationship between "Variables 1, 2, 3, and 4" and Global Health Security?
- How these variables impact prevention, detection and response.
- How can the findings of this analysis inform recommendations for Global Health Security programming?

It's important to note that this literature review is not exhaustive. Sources utilized encompass academic articles, working papers, discussion papers, book chapters, and publications from various international development assistance organizations, as well as those from the Government of Peru.

The search engines employed include the National Library of Medicine (NLM), Google Scholar, PLOS, and The Lancet Global Health and Climate Change.

1.3. THE REGIONAL CONTEXT

Latin America has experienced significant social and economic changes both before and after the COVID-19 pandemic. Pre-pandemic, the region showed steady economic growth and declining poverty rates. However, persistent inequalities remained, with many countries facing

high levels of informal employment, political instability, and inadequate healthcare infrastructure.

The COVID-19 pandemic stopped the development of the region and reversed much of this progress. Lockdowns and economic downturns severely impacted sectors like tourism, manufacturing, and agriculture. The informal labor force was particularly affected, pushing millions back into poverty. The World Bank estimates that the region experienced a contraction of 7% in 2020 (The World Bank 2020). Healthcare systems were overwhelmed, exposing gaps in access and preparedness.

Post-pandemic recovery has been uneven. While some countries like Brazil and Mexico have seen some economic rebound due to commodity exports and vaccination campaigns, challenges persist. High inflation rates, rising debt, and the ongoing social impact of prolonged school closures continue to hinder progress. Additionally, climate change, migration, and political instability remain significant concerns.

The region is now focused on equitable growth, improved healthcare infrastructure, and social protection to rebuild and enhance resilience for future challenges.

The relations between Global health security and inclusive development, immigration, the private sector, and climate change in Latin America exist and are relevant. Addressing these interconnected factors through comprehensive policies and regional cooperation is essential for enhancing global health security and ensuring sustainable development. Here's an overview on how these factors impact the region.

- Inclusive Development aims to ensure equitable access to resources and opportunities, which is crucial for building resilient economic and social systems. Health service coverage in the Americas improved gradually over the 20 years before the COVID-19 pandemic. By 2019, 77% of the population had health coverage, up from 65% in 2000. The number of health workers increased, and government health investment rose by 1.1 percentage points. Average life expectancy at birth also increased from 73.7 years in 2000 to 77 years in 2019. However, these gains were not universal, as a third of the population continues to face barriers in access and coverage, the health workforce remains understaffed, and access to medicines and technologies remains difficult despite improvements in state regulation and surveillance (Pan American Health Organization 2022). Countries have challenges to enforce constitutional rights by expanding access to healthcare for its poor, geographically distanced and marginalized citizens, failing to prevent, detect, and respond to outbreaks, particularly in remote areas.
- Migration across the Americas is multifaceted and shaped by socio-economic and political crises, natural disasters, violence and war. The Venezuelan crisis alone has expelled over 7 million migrants and refugees through 2024, comparable to the Syrian crisis becoming the main driver of migration in the region.
  Moreover, the region is serving as a transit corridor for migrants who follow treacherous

routes, including the Gap of El Darien in Panama, on their way to the United States. In 2023 over 500,000 migrants from more than 50 countries coming from Latin America and regions as far away as Africa and Asia crossed El Darien, one of the most dangerous jungles in the world. Studies on the prevalence of communicable diseases in refugees and asylum seekers, and migrants identified the highest reported prevalence of malaria, active TB, HIV, Hep B and C infections among African refugees and asylum seekers, meanwhile the highest reported prevalence of latent TB, HBV and HCV was among Asian and Eastern Mediterranean refugees and asylum seekers ((Taha 2023); (Monge-Maillo 2015)). On the other hand latino migrants showed higher prevalence of Chagas disease, and malaria, particularly in Venezuelans (Abdallah 2022).

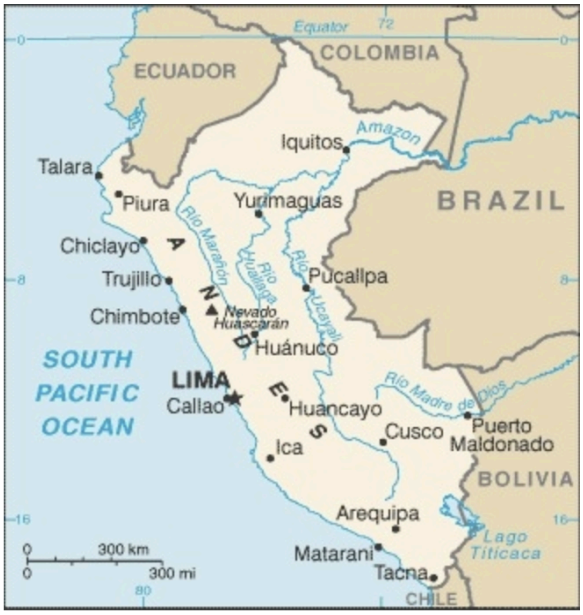
The deadly Gap of El Darien, is a 130 kilometers of dense vegetation, with high humidity, suffocating heat, rivers and swamps, where the Pan American Highway cuts-off. Migrants are exposed to dehydration, starvation, traumatic injuries, drowning, and psychological traumas, compounded by incidents of loss, violence and sexual assault ((Pappier 2023); (Núñez 2022)). Common diseases that are visible include open injuries, skin infections, gastrointestinal infections, fractures, and “trench foot”. Various deadly venomous reptiles, scorpions, spiders and toxic lepidoptera butterflies inhabit the area, causing accidents that range from local burning and necrosis to death. Mosquitoes are abundant, transmitting vector-borne illnesses like dengue, *P. vivax* and *P. falciparum* malaria, yellow fever, and Venezuelan equine encephalitis, eastern equine encephalitis,leishmaniasis, and avian schistosomiasis. Bat transmitted rabies is also present in El Darien ((Suarez 2022); (Escobar 2015)).

High volumes of migrants strain host countries' health systems, as evidenced in Brazil, Colombia, and Peru, where the influx of Venezuelan migrants has heightened demands on already under-resourced and understaffed healthcare services. Moreover, reports and studies indicate that migrants often carry and spread infectious diseases, complicating surveillance and response efforts. Additionally, migrants' poor living conditions, limited access to income and services, and avoidance of authorities if lacking documents increase their vulnerability to acquiring and spreading diseases. All these together make them a challenge for global health security.

- The private sector has played a notable role in poverty reduction, infrastructure development, and the extension of social protection. During the COVID-19 pandemic, it addressed supply demands (e.g., medicinal oxygen, medicines) and supported vaccine acquisition and distribution. Additionally, it has driven economic recovery in the post-pandemic period. The private sector's impact can be either beneficial or detrimental, depending on its activities. While sectors like tourism and agriculture have shown the benefits of collaborating with the health sector, potentially serving as valuable allies for global health security and One Health, sectors involved in infrastructure development, transportation, natural resource exploitation, and farming may lead to deforestation, pollution, and migration into wild forests. These activities can increase the risk of emerging and re-emerging diseases and antimicrobial resistance.
- Climate change is affecting Latin America, with direct and indirect implications for global health security and one health. The region’s ecosystems are being affected by extreme weather and climate shifts. Deforestation and increased droughts in the Amazon

decrease its carbon sequestration ability, contributing to global warming while increasing wildfire risks. Livestock farming and land use changes increase deforestation and encroach on wildlife habitats, raising the risk of zoonotic diseases spilling over to humans. Glacial melting in the Andes jeopardizes water supply for millions, threatening agriculture and human health and increasing the risk of water borne diseases. Agriculture, crucial to regional economies, faces growing threats due to erratic weather, droughts, and flooding, which undermine food security. Coastal communities are more vulnerable to rising sea levels and hurricanes, which can disrupt healthcare infrastructure and cause displacement, further straining health systems. The rise in infectious diseases like dengue and Zika is also linked to shifting climate patterns that create favorable conditions for disease-carrying vectors. Meteorological events such as “El Nino Costero” 2023-2024 has led to severe weather events in Latin America and the Caribbean, including droughts, flooding, heavy rainfall causing the rise of vector transmitted diseases.

1.4. THE PERUVIAN CONTEXT



Located in Western South America, Peru borders the South Pacific Ocean, and five countries, Bolivia, Brazil, Chile, Colombia, and Ecuador. Its terrain presents a western coastal plain, the Andes mountains (sierra), and the eastern lowland jungle of the Amazon Basin (selva).

Between 2000 and 2010, Peru experienced rapid economic growth fueled by mining, trade liberalization, and prudent fiscal policies. This growth made possible by the support of a strong private sector led to considerable poverty reduction and social inclusion, with the national poverty rate falling from about 58.7% in 2004 to 20.5% by 2019 (World Bank, 2021). The government's investments in social programs, infrastructure, education, and healthcare also contributed to this decline. (World Bank, 2021).

Despite these improvements, the COVID-19 pandemic in 2020 caused a setback. Lockdowns and economic contractions disproportionately affected those in the informal sector, pushing millions back into poverty. The poverty rate climbed to 30.1% in 2020, undoing years of progress in poverty alleviation (INEI, 2021). Government initiatives, such as cash transfers and stimulus measures, aimed to cushion the impact of the pandemic and promote recovery. Trade liberalization boosted exports, but pandemic-related disruptions highlighted Peru's dependence on commodity exports and global supply chains.

By 2021, after a significant economic downturn due to the COVID-19 pandemic, the economy bounced back quickly but has since slowed down sharply amid lower global growth related to Russia's war of aggression against Ukraine, increased political uncertainty, high inflation, tight financial conditions and more recently widespread social unrest and extreme weather conditions. The impact of these shocks has manifested in inflationary pressures, with rising prices hitting many vulnerable families.

As a path for further recovery Peru is diversifying its economy by expanding mining, agriculture, and services. The mining sector remains crucial, high metal prices have supported the economy contributing to exports and foreign exchange (Peruvian Ministry of Energy and Mines, 2023).

In 2023, Peru's population totaled 33.726 million, reflecting a 28.9% increase since 2000 (INEI.2017). Gender distribution showed 102 women per 100 men, and the ratio of individuals over 65 years to those under 15 was 33.4 per 100. Life expectancy at birth was 77.0 years, slightly below the regional average but 6.5 years higher than in 2000.[1] Most Peruvians are Mestizo 60.2%, Quechua 22.3%, white 5.9%, afro-peruvian or black 3.6%, Aymara 2.4%, Native or Amazon Indigenous 0.9%, Asian 1.2%, and 3.5% others (INEI.2017). The major languages are Spanish 82.9%, Quechua 13.6%, Aymara 1.6%, Ashaninka 0.3%, and other Amazonian languages 0.8% (2017 est.)

Peru's urban and coastal communities have benefited more from recent economic growth than rural and indigenous populations of the Amazon and mountain regions. As of 2020, 82.6% of Peru's population is concentrated in urban areas (Situation of the Peruvian Population. INEI. 2023). Development of cities in Peru followed a pattern of inequality with the population, wealth, and services concentrated in Lima, the capital with 11 million inhabitants, followed by the second largest city in Peru, Arequipa that has less than 1 million inhabitants. Of the 10 million Peruvians identified at risk of falling below the poverty line in 2021, 72.6 % lived in urban areas, 17.5% in rural areas, and the 9.8 % in semi urban areas.(8)

Peru is a participatory democracy. The President is elected every five years through voting. The country is divided into 24 departments, 196 provinces, and 1890 districts. The government has three branches at the national level, which are the Executive, Legislative, and Judicial branches. The Constitution is the highest law of the land. At the regional level, the departments and regions are in charge of governance. On the local level, provinces, districts, and populated centers exercise their authority. Local governments are the foundation of the country's territorial organization, and they operate with autonomy.("Organización del Estado Peruano" 2024) Over the past decade, evidence of public-sector corruption in Peru has increased dramatically. This has eroded citizens' confidence in democracy, and affected the country's political stability.

[1] Plataforma del Estado Peruano. Instituto Nacional de Estadística. 2023

1.4.1. Inclusive development

Approximately 60 percent of the Peruvian population lacks coverage for the four basic social protection guarantees outlined in the International Labour Organization's Recommendation No. 202. Nearly four million children (38 percent) live in poverty, lacking the minimum level of support necessary for food, education, care, and essential goods and services. Additionally, ten million adults (56 percent) lack full coverage under labor legislation, leaving them without basic protections for unemployment, disability, illness, or maternity. Moreover, ten million people (35 percent) lack access to essential healthcare, either due to a lack of health insurance or systemic barriers such as living in hard to reach areas, including geographical isolation. Furthermore, one and a half million older people (53%) lack basic income security due to insufficient coverage provided by pension systems. (Infante and Chalcana 2014)

The gap in inclusive development affects global health security in Peru by weakening the country's prevention, detection, and response capacities. Insufficient access to healthcare, education, and social services leaves marginalized populations, such as those in rural and remote areas, vulnerable to infectious diseases and health crises. This vulnerability results in delayed disease detection and impedes the implementation of preventive measures.

In terms of prevention, the lack of equitable healthcare infrastructure means many communities are excluded from vaccination programs, health education, and sanitation improvements. Consequently, these groups are more susceptible to disease outbreaks that can spread quickly across borders, threatening global health security.

Detection capacities are also impacted due to limited surveillance systems and diagnostic facilities in underserved regions. A lack of training and resources prevents healthcare workers from accurately identifying emerging health threats, which delays containment efforts and increases the risk of widespread transmission.

When it comes to response capacities, marginalized groups often receive inadequate care due to strained resources and logistical challenges. They face shortages of medical supplies and personnel, leading to delays in treatment and ineffective outbreak containment.

According to the United Nations Office On Drugs and Crime, following COVID-19 gender-related killings of women and girls increased in Central America by 3 percent and in South America by 5 per cent from 2019 to 2020 (UNDOC 2022). (for further detail on inclusive development see Chapter 2)

1.4.2. Migration

Venezuelan migration significantly impacts Peru's global health security capacities in prevention, detection, and response. Peru hosts over 1.5 million Venezuelan migrants, and this influx strains the country's healthcare system.

The sudden increase in demand for healthcare services has overwhelmed local health infrastructure, limiting the ability to deliver vaccines and preventive care. Migrants, often lacking formal health insurance, struggle to access regular immunization programs and health education. This situation can increase the vulnerability of both migrant and host populations to vaccine-preventable diseases.

The influx of migrants has complicated disease surveillance systems. Many migrants live in informal settlements with limited sanitation, which are prone to outbreaks of diseases like tuberculosis and dengue. The lack of robust healthcare data collection for this population makes it challenging to detect early signs of outbreaks, undermining prompt response.

The high demand for healthcare from migrant populations stretches Peru's healthcare workforce, resources, and facilities. This leads to treatment delays, shortages of essential medications, and inadequate care, limiting effective outbreak containment. Furthermore, the language barrier and varying healthcare practices hinder communication and coordination between healthcare workers and migrants. (for further detail on migration see Chapter 3)

1.4.3. Private sector

The private sector in Peru has both positive and negative impacts on global health security, affecting the country's prevention, detection, and response capacities.

The private sector can provide crucial support in healthcare delivery, innovation, and resource mobilization. Private hospitals and clinics increase access to essential health services, complementing the public system. During the COVID-19 pandemic, private companies assisted with mass testing, vaccine distribution, and the production of essential medical supplies like oxygen. Their resources and logistics expertise can strengthen emergency response efforts, allowing for more rapid and effective containment of outbreaks.

However, certain activities of the private sector can also undermine global health security. In mining, agriculture, and infrastructure development, environmental degradation and deforestation increase the risk of zoonotic disease transmission. For example, land-use changes and pollution can push wildlife closer to human populations, raising the likelihood of new outbreaks. Furthermore, private healthcare often prioritizes profit over equity, leading to disparities in access to care and preventive services. This creates pockets of vulnerable populations susceptible to infectious disease spread. (for further detail on the private sector see Chapter 4)

1.4.4. Climate change

Climate change directly impacts global health security by affecting Peru’s prevention, detection, and response capacities. Rising temperatures, changing rainfall patterns, and extreme weather events like floods and droughts are already exacerbating the spread of infectious diseases and straining healthcare systems.

Increasing temperatures and shifting rainfall patterns provide ideal breeding conditions for disease vectors, such as mosquitoes. This leads to higher transmission rates of diseases like dengue, Zika, and malaria, especially in regions that lack adequate vector control measures. Additionally, agricultural disruption from droughts and floods threatens food security, leading to malnutrition, which weakens immune responses to infections.

Climate change disrupts disease surveillance efforts by creating new areas of vulnerability. Populations migrating due to climate impacts often settle in informal areas with poor sanitation and limited healthcare, making it difficult to monitor disease trends effectively. This increases the likelihood of delayed detection of outbreaks, hindering containment efforts.

Extreme weather events damage healthcare infrastructure, disrupt supply chains, and create logistical challenges that delay emergency responses. This makes it harder to deliver timely treatment and vaccinations during outbreaks. In addition, resources are often diverted to disaster relief efforts, limiting the healthcare system's ability to address other emerging health threats. (for further detail on climate change see Chapter 5)

1.5. USAID PERSPECTIVE ON GLOBAL HEALTH SECURITY

Since the start of the 21st century, infectious disease outbreaks and epidemics have increased both in severity and frequency. The vast majority - 75% - of emerging infectious disease threats originate from animals, at a time when an increasing number of people around the world, including those in conditions of vulnerability, are living in closer proximity to animals due to deforestation, land use change driven by private and state actors, climate change, and a variety of other factors including human mobility. Around the world, millions of people have lost their lives and livelihood because the world lacks the capacity to prevent, detect, and respond to COVID-19 and other emerging infectious disease threats.

There are an estimated one billion cases of zoonotic diseases in people annually, and numerous other species are threatened or on the brink of collapse from a combination of anthropogenic pressures, including human-driven infectious disease transmission. Epidemics due to emerging viral diseases, in particular those caused by viruses with origins in wildlife hosts, are increasing in both frequency and severity. Spillover of these viruses from wildlife can be directly attributed to human activities. John Locke. PREDICT: Advancing Global Health Security at the Frontiers of Disease Emergence. USAID. 2021

USAID Global Health Security (GHS) Program seeks to prevent and mitigate the increasing occurrence and severity of epidemics, pandemics and other emerging infectious disease threats. USAID does this by partnering with countries, as well as global, regional, and local public and private sector organizations. These partnerships build and strengthen measurable, sustainable capacity while helping to develop and adopt evidence-based and innovative solutions to prevent, rapidly detect, effectively respond to, and ultimately recover from emerging infectious disease threats – whether naturally occurring, accidental, or deliberate.

Recognizing the connection between the health of the environment, animals and people, USAID implements the One Health Approach. The GHS Program uses an integrated approach that is inclusive of **four main efforts: strengthening capacity; responding to outbreaks and other health emergencies; bolstering the GHS architecture; and building resilience in concert with USAID's broader global health programs.** This program works with USAID's health emergency response effort, which seeks to rapidly contain outbreaks and mitigate pandemics. It also seeks to support linkages among USAID GHS-funded efforts and other USAID programs, such as: COVID-19; PEPFAR; PMI; tuberculosis and antimicrobial resistance (AMR); Maternal and Child Health and Nutrition; and food security. USAID's **GHS Program works with countries to identify and address their highest priority gaps,** with to strengthen their national International Health Regulation (IHR) core capacities, required to detect, assess, notify and report events, and respond to public health risks and emergencies of national and international concern. (World Health Organization 2005)

The following chapters analyze the intersection of global health security with inclusive development, migration, the private sector, and climate change. Each chapter includes a table listing the most relevant topics for consideration, followed by an analysis that expands on these topics with information and examples to illustrate and support the findings. At the end of each chapter, there is a section with conclusions and recommendations.

Chapter 2: INCLUSIVE DEVELOPMENT

2.1. CONSIDERATIONS

This chapter delves into the factors influencing the inclusion or exclusion of individuals, or groups thereof, and their ramifications from the perspective of Health Security, with a One Health approach.

When we think about inclusive development and GHS, we should consider:

- Lack of enforcement of Laws protecting those vulnerable
- Gender violence driven by stressors as epidemic increased (check gender section below)

- Poverty
- Hard to reach
    - Geographic distance-Isolation
    - Marginality in the slums of LIma and MDR
- Lack of social cohesion-community participation

- Lack of coordination and communication between community and health system
- Poor - under equipped healthcare facilities - weak countereference
- Services not culturally adapted
- Health providers challenges
- Insufficient prevention, challenging surveillance and response
- Poor health outcomes

- Gender aspects as per ADS 205.3.1
    - Law, policies, regulations, and enforcement
    - Cultural norms and beliefs
    - Gender roles, responsibilities, and time use
    - Access to and control over assets and resources
    - Patterns of power and decision-making
    - Personal safety and security

Below is an analysis of the factors influencing inclusion or exclusion in health, along with their consequences and recommendations. We also provide a set of examples based on the review of the literature and what was observed in recent health events in Peru, some examples are:

- Polio case in Datem del Marañon (poverty and geographic distance)
- TB in the marginal populations living in the slums of Lima (hard to reach)
- The health sector providers protection being systematically neglected during the COVID-19 Pandemic; and
- The Awajun- Wampis suffer high HIV/AIDS and Hep B rates, and are affected by

contamination generated by illegal mining (lack of coordination, poor health care facilities, services not culturally adapted, health providers challenges, insufficient prevention, challenging surveillance and response, and poor health outcomes).

2.2. KEY FINDINGS

Despite major advances in the fight against poverty, healthcare access remains a challenge for vulnerable populations in Peru. In order to access healthcare vulnerable individuals require healthcare facilities are available-accessible within a reasonable distance, that they are able to afford the cost of transportation and care, that the services are provided and are adequate to patients culture, and that care being offered is acceptable to users' dignity, culture and expectations.

2.2.1. LAWS- LEGAL FRAMEWORKS AND ENFORCEMENT

i) Lack of enforcement of Laws protecting those vulnerable

Laws establish frameworks for systematic and consistent implementation and enforcement. In Peru, the Constitution is the highest law, safeguarding human rights and ensuring access to services like education, health, work, and housing. Laws prioritize resource allocation for health, education, infrastructure, and emergency preparedness, enhancing the country’s capacity to meet objectives and respond to emergencies, including pandemics.

Health and life are fundamental rights guaranteed by society and assumed by the State. Civil rights significantly influence health as social determinants. The General Health Law (Law No. 26842) regulates actions to ensure the right to health, including disease surveillance and control (MINSA 2012). The National Multi-Sector Health Policy 2030 prioritizes health infrastructure and crisis response. The Law of the National Coordinated and Decentralized Health System (Law No. 27813) decentralizes health services, and the Law for Strengthening the Ministry of Health's Epidemiological Surveillance (Law No. 31961) outlines responsibilities for disease notification (MINSA 2023), and coordination with the Data Protection Law (Law No. 29733).

Peru has entered various international agreements to protect vulnerable populations, including indigenous peoples, recognizing their collective rights and territories. The State is responsible for providing fair and efficient responses, anticipating and mitigating future health risks, and ensuring the protection of women, children, young people, and medical personnel. The pandemic revealed that vulnerability among populations evolves, with health personnel being among the most vulnerable and unprotected.

The International Health Regulations (2005)-is one of those treaties- a legally binding agreement among WHO's 196 Member States, requires countries to conduct surveillance for potential international health threats and report them to WHO promptly. This aims to prevent, control, and respond to the international spread of disease while minimizing interference with international trade and travel (WHO, 2005).

Laws alone are insufficient without comprehensive regulation, funds, human resources,

equipment, and effective enforcement. Vulnerable populations, particularly in isolated regions, often face discrimination and neglect, leading to inadequate enforcement of existing laws. There is a lack of serious planning, insufficient funds, inadequate emergency responses, and poor-quality healthcare services. Information management is irregular and inadequate, and healthcare issues rarely feature on the political agenda unless societal pressure escalates.

Transmission in public places and at the workplace are important because these are where people get the disease. The state has to regulate these that the health sector is often unaware of. For example, during the COVID-19 pandemic, the GOP issued fines for non-compliance with preventive measures to contain the disease's spread at various instances-unauthorized walking in the streets, not using masks, public disobedience, not respecting social distancing, and attending to work unvaccinated (Gobierno del Perú 2021). Large companies often chose to pay fines rather than comply with implementing protection measures for their workers, leading to increased transmission and death of their personnel (OSHA/Oficina California 2020).

a) **Indigenous populations:** Laws provide the framework to protect indigenous populations' health security by guaranteeing enrollment in public health insurance (SIS) and preventing exploitation of indigenous lands. However, inadequate enforcement, insufficient political will, and removal of legal protections undermines these efforts. The cessation of mobile services to geographically distant areas where indigenous Amazon communities live during the COVID-19 pandemic have impeded access to SIS and other governmental social programs, restricting healthcare and education rights. (Ombudsman Office Peru.2021).

   The recent enactment of Law No. 31973 on January 11, 2024(Congreso de la República del Perú. 2024), amending Articles 29 and 33 of the Forestry and Wildlife Law (Law No. 29763), has removed long-standing legal protections for indigenous lands, forests, and resources. This change is expected to negatively impact indigenous Amazon communities by accelerating deforestation, illegal mining, illegal logging, and narcotics trafficking. These activities pose escalating threats to the lives and livelihoods of indigenous peoples.

   Environmental defenders and their families have faced threats, with the SERVIR-Amazonia Program revealing troubling patterns in Madre de Dios, such as deforestation, mercury contamination, and exploitation of indigenous women (Calle 2023). As a signatory of the Minamata Convention, Peru is responsible for reducing and eliminating mercury use to prevent severe health effects, similar to Minamata Disease documented in Japan (Gibb and O'Leary 2014).

b) **Disabled people:** Laws protecting disabled people are relevant for health security in Peru as they ensure equal access to healthcare, reduce health disparities, and enhance the overall well-being of this vulnerable population. According to the INEI, 3.2 million people in Peru have disabilities, many of whom rely on others for care and mobility (INEI Perú and Rivera-Araujo 2019).

Health coverage for disabled individuals through SIS has increased to 92%, compared to 86% for those without disabilities. However, coverage is still lower in rural and hard-to-reach areas (INEI-ENAHO. 2014-2022; Observatorio Nacional de la Discapacidad 2022). Inclusion in health security measures helps prevent disease spread, reduces healthcare costs, and promotes societal well-being. Effective implementation of the General Law on Persons with Disabilities (Law No. 29973) can improve access to healthcare and social services, thus strengthening Peru's health security (Ministerio del Trabajo y Promoción del Empleo-Discapacidad. 2024).

Challenges include gaps in enforcement, limited resources, and lack of accessibility in public infrastructure (Hashemi. 2022; Flores-Flores. 2018). About 63.5% of healthcare facilities have access barriers, and only 0.7% of schools are accessible to disabled people. Additionally, 88% of children with disabilities do not attend school (CONADIS-Grupo de Trabajo Multisectorial - PNA 2018; Defensoría del Pueblo del Perú 2019). Employment rates are also low, with 43% of disabled individuals employed compared to 72% of non-disabled individuals; 55% of the unemployed cite health reasons (Observatorio Nacional de la Discapacidad 2022).

2.2.2. POVERTY AND HARD TO REACH

i) Poverty, ethnicity and access to health care

In 2022, extreme poverty affected 5.0% of the population, increasing by 0.9 percentage points from 2021 and 2.1 percentage points from 2019. Extreme poverty was higher in rural areas (14.6%) than in urban areas (2.6%), with respective increases of 2.5 and 0.5 percentage points from 2021, and 4.8 and 1.6 percentage points from 2019 (INEI Peru 2022).

While almost the entire Peruvian population is covered by some type of health insurance, split between the state-subsidized Comprehensive Health Insurance (SIS) and the Social Health Insurance (EsSalud), there is still a high degree of fragmentation, barriers to access, and large differences in coverage among different groups (Casal-ILO 2020).

During the COVID-19 pandemic, indigenous people were disproportionately affected due to limited access to healthcare, water, sanitation, health personnel, equipment, medicines, tests, and vaccines. Regional governments lacked the budget to attend to Indigenous populations in remote areas, prioritizing large cities instead. Over 379,000 Indigenous people live in the Peruvian Amazon, with approximately 150,000 in urban areas and over 220,000 in rural areas. Their access to programs depends on identification documents issued by the National Registry of Identification and Civil Status (RENIEC) through limited campaigns in hard-to-reach areas. In Lima, stay-at-home orders and social distancing measures led to the unemployment of 2.3 million people, increasing the risk of food insecurity, especially for low-income families relying on daily wages (Cañari-Casaño 2021).

Systemic discrimination in healthcare manifests in the denial of care and mistreatment, eroding trust among users. This reflects societal discrimination and undermines efforts towards universal coverage and the Sustainable Development Goals, jeopardizing health security in Peru. The GOP has the challenge to seek alternatives to include those excluded and provide to them a social protection floor as a set of social security guarantees that should ensure, as a minimum, that, over the life cycle, all in need have access to essential health care and to basic income security which together secure effective access to goods and services defined as necessary at the national level (International Labor Organization 2020).

The COVID-19 Orphans in Peru

During the COVID-19 pandemic, over 97,000 children in Peru became orphans as a result of health insecurity, facing increased risks such as poverty and social exclusion. These conditions can lead to poor health outcomes due to limited access to healthcare and healthy living environments (World Bank, 2018). The rise in orphan numbers strains public health systems and social services, creating gaps in care and increasing vulnerability to health crises (CDC, 2019). Global and national responses must strengthen mechanisms to support orphans, who suffer from the abrupt loss of caregivers (Hillis 2021). Previous epidemics like Ebola, HIV/AIDS, and the 1918 Influenza pandemic show that such trauma can result in long-term mental health issues, including depression, anxiety, and PTSD, requiring specialized care and resources (CDC, USAID, The World Bank, WHO, et Al. 2021).Prioritizing the needs of orphans is the right thing to do for global health security.

ii) Geographic distance-Isolation

Our analysis reveals that geographic distance affects most those residing in the Peruvian Amazon, who are highly vulnerable and suffer disparities in health service access and coverage (Informe defensorial No 169. 2010; Informe defensorial No 001.2023). Geographic barriers include distance, limited means of communication such as roads and transportation (long trips by land or river), lack of economic means to cover the cost of transportation and stay. Transportation could take between seven hours to five days and cost between $40 to over $70. All of these are out of reach for a family living in poverty. Even if they would be able to get the funds, transportation is highly dependent on seasons and weather conditions.

Populations in voluntary isolation and those with initial contact deserve separate consideration, as they are highly vulnerable to respiratory-transmitted infectious diseases, particularly those that haven't been circulating in their communities, often referred to as external diseases. Historical records indicate that the spread of illnesses like influenza or malaria caused the death of one-third of the population in the 1990s due to contact with missionary priests. During the COVID-19 pandemic, illegal loggers entering from Brazil introduced the virus, resulting in significant impact.

The consequences of geographic isolation, specifically the lack of accessibility, are manifold. Firstly, there is reduced and unequal access to preventive information and a reduced

offer/access to preventive methods, resulting in e.g., immunization coverages falling below the protective threshold, a reduction in Sexually Transmitted Infection (STI) preventive methods, and the lack of use of water treatment. Moreover, the likelihood of providing timely diagnosis and appropriate care is reduced because primary healthcare facilities available in remote places often lack the means and have to refer the cases to facilities with a higher capacity, delaying diagnosis and treatment. Adequate treatment and outbreak control measures could be compromised due to the distance, time between the population and healthcare facilities, and bureaucracy. Treatment could be delayed because of limited information regarding the capacity of services and operating hours, potentially causing additional delays due to gaps in service availability. There are systemic failures that are present often when facilities are distant, these include the lack of personnel and funds to implement vaccination campaigns, and weakness in the disease notification and surveillance systems.

These circumstances not only escalate the direct and indirect costs associated with diseases but also heighten the risk of disease exacerbation, transmission to others, and mortality. Even if all necessary criteria are met, the utilization of services ultimately hinges on user demand and acceptance, further complicating the provision of care (Garbus et al., 2012; Giovanella and Fleury, 1995).

Based on the review of the literature and what was observed in recent health events in Peru, an example is:

a) **Polio case in Datem del Maranon:** A case of acute flaccid paralysis was detected in a one-year-old indigenous male infant in Manseriche, Datem del Marañón Province, Loreto, a remote area in the northeastern Peruvian jungle (Subgrupo de Inmunizaciones de la Mesa de Concertación de la Lucha contra la Pobreza (MCLCP)). Such low levels of coverage could allow the virus to circulate and mutate to a variant capable of causing paralysis.

   The child was initially taken to the district health center. Due to the center's lack of resolving capacity, he was referred to the regional hospital two days later. There, the syndrome was diagnosed, and a sample was taken for confirmation of vaccine-derived polio 22 days after the onset of illness. The sample was sent to the Oswaldo Cruz Institute in Brazil (FIOCRUZ) because Peru lacks PCR and genomic tests for polio. This led to a delayed outbreak control response. The child was taken to Lima for further assessment.

   The results from the Reference Laboratory were received three months later, on March 21, 2023, triggering notification to the National Liaison Center (CNE) of the IHR International Health Regulation and the launch of epidemiological control measures. Unfortunately, these measures were too late, resulting in an epidemiological alert, risk communication, and the deployment of a response team to search for cases and implement vaccination containment measures (Al-Kassab-Córdova et al.).

The child was discharged after assessment at the Children's Health National Institute (INN), but continuing care in Loreto is difficult due to poor access to services, a lack of specialists, and the need for dedicated care. Long distances, which can take between seven hours to four days, have an extremely high and unaffordable cost of $40 to over $70, which is unreachable for a family living in poverty.

Since the elimination of polio in Peru 32 years ago, six cases of vaccine-derived poliovirus (VDPV) were reported between 2003 and 2011 in urban and semi-urban areas. This was the seventh confirmed case of VDPV infection, attributed to low polio vaccine coverage at the community level. Polio vaccine coverage was below 59% in 2020 and 75% in 2022 (Subgrupo Inmunizaciones de la MCLCP 2023).

iii) Marginality in the Slums of Lima-Multidrug resistant Tuberculosis

Individuals in vulnerable social classes, races, lower socioeconomic statuses, and other minority groups bear the highest burden of both, chronic diseases (Havranek 2015), and emerging and re-emerging infectious diseases (Teitelman, Riegel, and Oseei Baah 2018).

Disease outcomes are not solely determined by the healthcare received during illness; societal factors such as access to social services, employment, education, and basic needs also significantly impact health. These social determinants of health (SDH) are unevenly distributed across gender, class, race, sexual orientation, socioeconomic status, and minority groups, contributing to the disproportionate burden of chronic diseases in vulnerable populations (Heidenreich 2011).”Linking marginalization with social determinants of health can improve our understanding of the inequities in health care delivery and the disparities in chronic disease burden among vulnerable groups” (Osei Baah 2018). Marginalization, as defined by Hall et al. in 1994, is "the process through which persons are peripheralized based on their identities, associations, experiences, and environment" (Meleis 1994).

Tuberculosis (TB) remains the world's leading infectious disease killer in low- and middle-income countries, also being the overall leading cause of death among people living with HIV (PLHIV), accounting for around 30 percent of AIDS-related deaths. Nearly 95 percent of TB deaths occur in the developing world. HIV and multidrug-resistant TB (MDR-TB) present a particularly deadly combination (USAID, TB/HIV-Global Health). The risk of developing TB among PLHIV is 18 times higher than in the rest of the global population, posing a significant concern for global health security.

b) **TB in the marginal populations living in the slums of Lima:** Peru is one of the most affected countries by tuberculosis, with increasing disease rates. TB rates have risen from 200 per 100,000 inhabitants in 1990 to 75.3 per 100,000 inhabitants in 2020, with a further increase to 96.9 per 100,000 inhabitants in 2023. The slums of Lima, Peru, particularly Carabayllo, are the epicenter of TB and MDR-TB transmission . Over 55.7 percent of all TB cases in Peru are reported in Lima and Callao, with 77.8 percent of these cases being MDR-TB (MINSA-Sala de Situación TB 2023).

Carabayllo, a sprawling slum in the north of Lima, is a tuberculosis hotspot characterized by overcrowded, poorly ventilated, and humid housing conducive to disease transmission. Individuals marginalized in Carabayllo, including drug addicts and those living with HIV and tuberculosis coinfection, are particularly vulnerable (Collyns 2017). HIV/AIDS and tuberculosis coinfection have been reported in PLHIV in Peru since 2000, comprising 5 percent of all TB cases (1,418 cases), with 65 percent concentrated in Lima and Callao.

From a health security perspective, multi-drug-resistant tuberculosis (MDR-TB) is a significant concern. With support from USAID/Peru, Partners in Health worked with thousands of patients to reduce treatment abandonment rates from 7 to 8 percent to less than 1 percent by empowering local community members as health promoters. These community members were essential to this effort because they knew which members of their community were coughing or had lost weight, as well as those who were hiding or were otherwise not reachable by other health services (Rueckert 2017).

Since 2012, Partners in Health has implemented a strategy in Carabayllo, supported by a state-of-the-art tuberculosis detection laboratory housed in an old shipping container. This laboratory, the only one of its kind in Latin America, can make 25 diagnoses a day, significantly enhancing Peru's healthcare services. Diagnostics are crucial for detecting tuberculosis, emphasizing the importance of timely diagnosis in disease control. However, the challenge of tuberculosis extends beyond medical issues to encompass social factors.

iv) Lack of social cohesion-social participation and equity on health

According to the U.S. Department of Health and Human Services, social cohesion refers to "the extent of connectedness and solidarity among groups in society" (“Social Cohesion - Healthy People 2030 | health.gov” 2023). Social networks not only foster social capital but can also influence health behaviors and outcomes, a phenomenon known as "social contagion."

Social cohesion plays a crucial role in understanding social inclusion and the dynamics among different social actors towards a comprehensive conception of health as "a complete state of physical, mental, and social well-being" (WHO, 1946). This approach integrates biomedical aspects of diseases, such as curative strategies, with the social context, considering social determinants of health and disease. These determinants are influenced by various mechanisms, including macroeconomic policies, public policies (such as education and health), and social policies, leading to disparities in income, ethnicity, social class, and education. These factors act as modulators, exacerbating health inequities rather than serving as primary causes (Solar 2007).

Addressing health inequities requires strategies targeting the structural and intermediate

determinants of health, focusing on socio-economic and political contexts through intersectoral actions, social participation, and citizen empowerment. However, these efforts are hindered by dysfunctions in the governance system, including:

- Limited representation of social actors, particularly Amazonian indigenous people.
- Insufficient involvement of health specialists and marginalized groups in decision-making processes.
- Weak accountability mechanisms and limited transparency in holding actors responsible for their actions.
- Institutional immobility: Norms, rules, and decision-making processes resistant to change, perpetuating power disparities and impacting health distribution.
- Inadequate policy space for health protection in policy making arenas outside the health sector, leading to health subordination to other objectives.
- Lack of mandatory enforcement of international treaties or softer forms of regulation, such as standards and guidelines promoting health.

Amazonian people view themselves as interconnected with nature, the environment, and the economy, rejecting the Western notion of separating these elements. Social relationships among Amazonian people are based on integration and solidarity to sustain their community. Reciprocity and mutual aid, known as "choba-choba," are prevalent practices in native communities of the Peruvian jungle, where social dynamics encompass biological aspects (Kapfhammer 2019).

Indigenous participation is limited due to a lack of legitimate representation, reluctance of trained healthcare professionals to work in rural areas, inflexible system rules, and processes that fail to adapt to their needs. Despite having diagnoses, concrete solutions are often lacking. Development policies, like the recent changes in the forest development policy, may increase the entry of external agents affecting the environment and indigenous health, elevating the risk of zoonotic diseases and potential spillover to humans.

Therefore, addressing the well-being of vulnerable groups necessitates understanding the social dimensions shaping their health status, as these factors largely outweigh the influence of the health system alone. Numerous studies have demonstrated that health services contribute only a fraction, ranging from 15% to 43%, while socioeconomic and environmental factors account for the majority, ranging from 57% to 85%, in determining people's health status. (McGinnis 2002)

2.2.3. DETERMINANTS WITHIN THE HEALTH SYSTEM

i) Lack of coordination and communication between community and health system

The coordination and communication between indigenous communities and the health system are showing some improvement due to advancements in communication technologies, such as satellite phones and cell phones, whose usage is increasing in the region alongside the expansion of GSM networks. However, the absence of indigenous operators fluent in local

languages and culturally competent remains a significant barrier.

When large segments of the population lack communication and coordination with the health system, it weakens the overall health security of the region. Infectious diseases can spread unchecked in communities that are disconnected from the healthcare system. In the case of outbreaks like COVID-19, this can have severe consequences, as isolated populations lack information and access to appropriate care.

Moreover, challenges are even greater in remote communities where mobile health teams arrive by boat on a monthly or quarterly basis and stay for only a few days. Those residing far from riverine populations, where healthcare is provided, may be left behind if they are unable to reach the designated point in time.

ii) Poor and under equipped healthcare facilities - weak countereference

Health facilities are concentrated in urban areas. Out of the 24000 health service providers registered with Renipress, only 8,800 belonged to the Public Sector (36 percent). According to MINSA, 8,297 out of these 8,800 primary healthcare facilities have inadequate installed capacity, meaning that 94.5 percent have precarious infrastructure and obsolete, inoperative, or insufficient equipment.

Rural healthcare facilities often lack proper storage and logistics to administer vaccines safely and effectively. Refrigeration and reliable power supplies are limited, which can compromise vaccine integrity. Additionally, weak counter-referral systems limit vaccination coverage in remote communities, making them more susceptible to vaccine-preventable diseases such as measles and yellow fever. These outbreaks increase the potential for cross-border transmission and pose a significant risk to global health security.

Healthcare facilities in the Peruvian Amazon often lack diagnostic equipment and adequately trained personnel, which delays the diagnosis and treatment of infectious diseases. For example, malaria is frequently misdiagnosed or untreated due to limited access to rapid diagnostic tests and microscopes. This increases the risk of prolonged illness, and potential drug resistance. As a result, localized outbreaks can escalate, posing a threat to health security.

In Loreto, the limited availability of intensive care beds, ventilators, and oxygen supplies led to high mortality rates. Rural clinics, often the first point of contact, lacked the resources to identify severe COVID-19 cases and arrange timely transfers to specialized facilities. This limited the ability to contain the virus and contributed to widespread transmission. A lack of oxygen, medications, laboratory equipment, and skilled personnel discourages indigenous populations from seeking care at local facilities.(ASIS Indigna 2020, MINSA).This results in greater reliance on traditional healers and reduces participation in disease surveillance programs, vaccination campaigns, and health education initiatives. Consequently, this lack of engagement weakens the region's preparedness and response to emerging health threats.

a) **Health workers in Peru faced significant challenges during the COVID-19 pandemic, highlighting the importance of protecting their rights.** They faced challenges including overwork and poor labor conditions working long hours without effective treatments or vaccines available. Their labor conditions were inadequate, many were subject to renewable contracts lacking life-health insurances, social security and adequate compensation (Rees 2021). Replacements for health personnel were brought from universities and shifts were extended by providing bonuses for long hours served, those under renewable contracts often lacked life-health insurance, social security, or adequate compensation, but stayed on the job wishing to secure a position

   Access to Personal Protective Equipment (PPE) that either was insufficient or inadequate, and lacked training increasing their risk of infection and jeopardizing their ability to provide care. The younger and non-contract workers often had insufficient and inadequate PPE, increasing infection risk. Reuse of PPE and the use of inadequate materials were common, especially in ICU and COVID-19 wards (Raraz-Vidal 2021).

   Non-pharmacological measures like hygiene, early detection, and PPE were hindered by global shortages and supply chain issues. Health workers faced attacks from family members and carers of patients at the health care centers and were discriminated against and harassed by neighbors who wanted them away (World Health Organization 2020).

   The psychological impact of the pandemic on health workers included increased stress, anxiety, burnout, depression, and suicidal ideation (Pan American Health Organization 2022). Moreover, some of them suffered moral distress as they were required to make decisions that affected the survival of others, sometimes against their will or belief-. conceptualized as the psychological distress that arises when a healthcare worker is prevented, by personal or institutional constraints, from doing what they believe to be right, and associated with poor self-esteem, low job satisfaction, burnout and intention to leave one's position or profession (D'Alessandro 2022). A study conducted by the University of Maryland determined the presence of post-traumatic stress disorder (PTSD) symptoms in 34 percent of health workers that responded to COVID-19, highlighting the importance of mental health support services for those involved in the response (Andhavarapu 2022). They also faced high Infection and Mortality Rates. Between March 2020 and 2022, 164,000 health workers contracted COVID-19, with 66% being women. Lima had the highest number of deaths (999) representing 43 percent of the health sector deaths nationwide, with health technicians, assistants, and doctors being the most affected groups (Ministry of Health, Peru, 2022).

iii) Services not culturally adapted

MINSA health services face the challenge of addressing cultural adaptation gaps for indigenous, afro-peruvian, and Venezuelan communities,

Bridging cultural gaps in healthcare is critical to ensure accessible and effective interventions. Intercultural competence training in health security and "One Health" is necessary to enhance programming(Fleckman 2015).

Services that lack cultural adaptation often fail to consider traditional community structures, resulting in poor health outcomes. Historical distrust of government health programs and exclusion of community leaders from vaccination and surveillance initiatives contribute to lower immunization rates, increasing the risk of vaccine-preventable diseases like measles and rubella (Pan American Health Organization 2019), and reducing the capacity of the health system to identify outbreaks at early stages avoiding further disease spread.

Effective communication is essential, as many indigenous people speak only their native languages. Without interpreters or language proficiency, healthcare providers risk misdiagnosis and improper treatment.

Peru's efforts in cultural adaptation began focusing on the over four million indigenous people distributed across 55 indigenous communities, and hard to geographically distant areas (Ministerio de Cultura 2021). MINSA developed reproductive, maternal, and neonatal healthcare guidelines and seeked to address geographic, social, and economic barriers. Despite these efforts, a significant gap in the cultural appropriateness of healthcare services for indigenous groups remained (Ombudsman Office, 2008; Del Mastro N. et al., 2021).

This lack of cultural adaptation causes distrust between indigenous communities and healthcare providers, leading to reliance on traditional healing or self-treatment. During the COVID-19 pandemic, poor communication with indigenous leaders led to rumors, distrust, and vaccine hesitancy, severely impacting public health efforts ("Rumors feed vaccine reluctance among Peru's Indigenous community," NBC News, 2021).

iv) Health providers challenges

Peru faces healthcare challenges such as provider shortages, high staff turnover causing clinic closures, and limited clinic hours (Reyes, 2007; Defensoría del Pueblo, 2008). In Loreto, which houses almost half of Peru's indigenous population, there are only 6.2 physicians per 10,000 people, well below the World Health Organization's recommendation of 44.3 per 10,000 (INEI, 2017; WHO, 2016). This issue is prevalent nationwide, as healthcare workers often prefer urban areas like Lima due to better career opportunities.

In vulnerable regions like the Amazon, the Andes, and urban slums, a shortage of dedicated healthcare providers impacts health security. Harsh conditions and isolation lead to staff burnout and turnover, weakening relationships with communities and compromising prevention, detection, and response.

In Lima's urban slums, healthcare workers face overwhelming workloads and high risks of infectious disease. Maintaining directly observed treatment (DOTS) for multidrug-resistant tuberculosis (MDR-TB) is crucial, as poor provider engagement can undermine trust, lead to

treatment abandonment, disrupt surveillance, and reduce adherence to protocols.

Inconsistent provider engagement and communication barriers with marginalized communities erode trust in the healthcare system, increasing reliance on traditional healers and limiting disease surveillance. This weakens Peru's ability to detect and respond to health threats, jeopardizing global health security.

Frequent dengue outbreaks in the Amazon and northern Peru necessitate diligent surveillance. However, staff shortages and a lack of committed local healthcare workers hinder timely detection and intervention, particularly in flood-affected areas.

Based on the review of the literature and what was observed in recent health events in Peru, an example is:

a) **The Awajun-Wampis case:** People live in a resource-rich area of forests, water, oil, and gold along the Peru-Ecuador border. Their remote location makes their territory accessible only after several days of river travel. They are recognized internationally as guardians of the Amazon forest.

   However, they face systematic neglect. Only 49 percent of Wampis and 36 percent of neighboring Awajun communities have access to health facilities (Third Census of Native Communities 2017, INEI). The available healthcare staff are inadequately trained, equipped, and supplied, impeding culturally appropriate prevention, detection, and treatment.

   The Awajun and Wampis grapple with HIV/AIDS rates ranging from 1 to 4 percent (Red de Salud Condorcanqui 2018), surpassing the nationwide prevalence of 0.4% in Peru (MINSA, 2022). A 2012 study by MINSA in the wampi territory revealed alarmingly high rates of Hepatitis B, with 75 percent prevalence of Anti-HBc antibody in women and 86 percent in men. .Additionally, the Wampis confront escalating numbers of illegal loggers and miners, who deforest and contaminate their tribal lands with mercury to extract gold.

   Limited health and sexual education provided in schools by teachers lacking knowledge, materials and methods (Ombudsman's Office, 2017)contribute to high rates of early sexual activity and unintended teenage pregnancies, with one in five adolescents aged 15-19 already mothers (INEI, 2017). HIV/AIDS and STIs are often misattributed to witchcraft due to cultural beliefs.

   The Awajun people have a culturally distinct perception of disease. They interpret illness as which is often attributed to the actions of another tribe member. HIV/AIDS is also regarded as "tunchi," and its transmission is believed to be caused by a spirit (Flores Rojas 2020).

Effective HIV/AIDS management requires culturally appropriate prevention, diagnosis, and treatment. However, inadequate health facilities and a reliance on plant-based treatments hinder detection and care. From 2014 to 2021, over 170 individuals died from HIV complications, with nearly 450 abandoning treatment. Adherence to treatment remains under 20 percent, far below the national average of 80 percent, increasing the risk of drug resistance. (Red de Salud Condorcanqui. Data 2014 to 2021-not available) Since 2020 Condorcanqui Health Network has been under investigation for presumptive corruption (El Comercio 2020).

Effective HIV management requires prevention, diagnosis, treatment, and response. However, without culturally appropriate messaging, prevention and care initiatives are often ineffective. Understaffed and poorly equipped health facilities cannot adequately detect and manage HIV, and the Wampis community has largely rejected antiretroviral therapy (ART) in favor of plant-based treatments.

Between 2014 and 2021, over 170 individuals died from HIV-related complications, and nearly 450 abandoned treatment, according to Red de Salud Condorcanqui data. Adherence to treatment is less than 20%, well below the national average of 80%, increasing the risk of ART drug resistance (Red de Salud Condorcanqui. Data 2014 to 2021).

v) Insufficient prevention

Insufficient prevention measures significantly impact global health security, especially in Peru, where diverse geographic and socioeconomic factors are crucial. Insufficient prevention leads to higher disease incidences, resulting in inadequate care and poor outcomes, exacerbating health issues in the community. This was evident in Peru during the re-emergence of vaccine-derived polio in Loreto in 2023, following years of low polio immunization coverage (Al-kassab-Córdova 2023).

Without robust prevention measures, infectious diseases can emerge, re-emerge, and spread rapidly, overwhelming health systems, particularly in regions with limited healthcare infrastructure. Frequent health issues reduce workforce productivity and increase healthcare costs, straining local economies. The Ministry of Health of Peru (MINSA) aimed to eliminate malaria through the Malaria Zero Plan, targeting operations in the Loreto region, which accounted for over 90% of malaria cases. By 2020, they reduced 75% of malaria cases and prevented over 80,000 cases. However, the SARS-CoV-2 pandemic reduced prevention and control operations, leading to an increase in malaria cases, partly due to Venezuelan migrants reintroducing the disease in low transmission areas (MINSA 2022). Historically, malaria has impacted Peru's economy, accounting for three percent of the Gross Domestic Product (GDP) in 1998 (Proyecto Vigía- MINSA- USAID/Perú 1998).

Peru's economy significantly benefits from tourism, especially to sites like Machu Picchu and Cuzco. Disease outbreaks or perceived risks can drastically reduce tourist numbers, impacting the economy, as seen during COVID-19. This leads to further socio-economic challenges.

vi) Challenging surveillance and response

Surveillance and response face significant challenges and are often infeasible without healthcare facility presence, trust, and cultural competence. From a health security and one health perspective, surveillance is key. Without it diseases can go undetected and spread until an outbreak arises. This is particularly important in the case of urban and rural areas in proximity to the forest and rivers where wild animals live and the risk of animal-human spillover is higher (Ellwanger and Bogo 2021; Halsey and Castillo Oré 2012).

Challenges for surveillance and response in Peru include:

- High turnover and Inadequate training for healthcare workers
- The absence of culturally competent and bilingual workers
- Implementing participative community surveillance
- Inconsistent data collection in remote regions leads to gaps in data that fails to reflect disease prevalence accurately and delays response
- Underreporting and misreporting by overburdened, underpaid healthcare workers (WHO, 2020)
- Tiered laboratory structure is often insufficient for comprehensive infectious disease testing, requiring samples to be sent to reference laboratories (PAHO, 2019)
- Changes in priorities and lack of funding may cause setbacks in surveillance
- The arrival of migrants carrying low counts of known pathogens and new ones is challenging
- Outbreak investigation and control measures are difficult to apply in populations on the move-migrants, requiring additional strategies; and
- Decentralized healthcare causes surveillance system fragmentation, complicating data sharing and coordinated responses during health crises (WHO, 2018).

The above mentioned challenges may affect prevention, detection and response in various manners. The delayed detection of outbreaks in overwhelmed surveillance systems, reduce the effectiveness of early containment measures. A lack of timely identification of disease clusters hinders the implementation of isolation, contact tracing, and targeted vaccination campaigns (World Health Organization, 2018). Inconsistent surveillance data prevents effective resource allocation for public health interventions. This may lead to over or under supplying crucial resources like vaccines and medications to high-risk areas, undermining response strategies (Pan American Health Organization, 2019). Surveillance challenges disproportionately affect marginalized communities in remote areas. Limited reporting and tracking infrastructure result in underrepresentation of these populations in health data, leading to a failure in addressing their specific health needs and a widening of healthcare disparities (Pan American Health Organization, 2019). A weak surveillance infrastructure reduces Peru's early warning capacity. Without robust disease monitoring and reporting mechanisms, emerging health threats are often identified only after reaching advanced stages, limiting the effectiveness of containment measures (Centers for Disease Control and Prevention, 2020).

Peru has experience implementing community based surveillance of metaxenic diseases through the USAID funded Vigia Project, involving community health workers as a leader, health promoter, and responsible of surveillance, articulating with the health and education sectors (Nunez, Medina Hoyos, and Burgos Zavaleta 2002). Given the geographic distance, capacities and needs it is advisable that Peru strengthens both community and lab surveillance. Peru's surveillance infrastructure is expected to improve with the support of the World Bank through the project of modernization of the disease surveillance and control system in Peru. This project aims to build and equip 21 regional public health laboratories and 29 regional epidemiological and health surveillance offices. (The World Bank Supports Peru's Efforts to Strengthen Preparedness and Response to Health Emergencies. The World Bank. 2021)

vii) Poor health outcomes

Poor health outcomes negatively impact global health security by burdening healthcare systems, reducing workforce productivity, and hindering economic growth. High rates of illness and mortality can lead to instability and weaken societal resilience. Additionally, inadequate health infrastructure and resources can exacerbate the spread of infectious diseases, posing a global threat. Strengthening health systems and improving health outcomes are essential for maintaining global health security and ensuring a stable future.

Peru has struggled with high maternal and infant mortality rates, particularly in remote and indigenous communities. These outcomes highlight gaps in the healthcare system, weakening the population's resilience to health crises.

Chronic malnutrition affects a significant portion of Peru's child population, especially in rural areas. Malnutrition negatively affects immune systems, making children more susceptible to infectious diseases and leading to long-term health and developmental issues. By 2021, 51% of the Peruvian population suffered from moderate or severe food insecurity. Food insecurity has to do with access to sufficient, safe, and nutritious food to meet daily needs, it's when people don't have enough to eat and don't know where their next meal will come from (Feed America 2022).Malnutrition, including anemia, obesity, and overweight among children and adolescents, continues to rise. Chronic malnutrition is a major public health problem among children under 5, limiting their development and hindering efforts to eradicate poverty (World Food Program 2021).

Furthermore, Peru has one of the highest TB incidence rates in the Americas. The spread of TB, particularly multidrug-resistant strains, poses a significant challenge to both national and global health security, as it can cross borders and lead to wider outbreaks.

2.2.4. GENDER ANALYSIS SECTION

This section complements the previous discussion on inclusive development. It examines data for gender integration throughout the Program Cycle across six domains recommended by ADS 205.3.1. The aim is to understand the intersection of global health security with inclusive development and gender. The six domains are:

- Law, policies, regulations, and enforcement
- Cultural norms and beliefs
- Gender roles, responsibilities, and time use
- Access to and control over assets and resources
- Patterns of power and decision-making; and
- Personal safety and security.

i) Law, policies, regulations, and enforcement

While the previous section on Laws addressed inclusive development and laws for poor and indigenous populations, this section focuses on the aforementioned domains.

Peru engages in international agreements with the UN and the International Labor Organization to protect indigenous people, women, children, LGBTQI+ individuals, and migrants. These agreements are implemented by the GOP in coordination with international organizations. However, constitutional rights are often unenforced due to lack of political will, inadequate training, conflicting interests, and state weaknesses. Additionally, cultural norms, beliefs, and attitudes are barriers to inclusion and equality.

a) **Gender:** Despite laws promoting gender equality, weak enforcement hinders effective health interventions and the protection of vulnerable populations (Human Rights Watch, 2021). Gender disparities in Peru lead to poorer health outcomes for women, who face higher risks due to limited access to healthcare, economic inequality, and gender-based violence, exacerbated during crises like COVID-19 (UN Women, 2020). Gender-based economic disparities, discrimination, and cultural factors limit women's access to healthcare and participation in the health sector workforce, affecting overall health security (ILO, 2019). Women's access to reproductive health services is inconsistent, particularly for indigenous populations in remote areas, impacting maternal health and contributing to higher morbidity and mortality rates (UNFPA, 2020).

   The COVID-19 pandemic affected both genders, with men experiencing more severe forms of SARS-CoV-2 and higher mortality rates. Women faced reduced access to healthcare and economic opportunities and increased domestic violence (World Bank, 2021). Additionally, the pandemic led to a rise in violence and disappearances of women, with inadequate law enforcement response. The safety and security of vulnerable populations are constitutional rights that must be upheld, even during global health crises (*Gender Equality in Peru n.d*).

b) **LGBTQI+:** The Second National Survey on the Rights of the LGBTQI+ Population indicates that 1.7 million adult Peruvians identify with a non-heterosexual orientation, comprising 8 percent of the population as of 2017 (EnCompass LLC 2023). Regrettably, transgender people face starkly reduced life expectancies, often 40 years or less (PAHO 2013).

   Laws protecting LGBTQI+ people are relevant for health security in Peru because they should promote equal access to healthcare, reduce discrimination, and ensure that this vulnerable population receives necessary medical services.

   “There are gaps in access to health care by the LGBTQI+ population due to discrimination, abuse, and a lack of specialized services'' (EnCompass LLC 2023). Protecting LGBTQI+ rights helps prevent health disparities, reduces the spread of infectious diseases, and supports mental health. Discrimination and hate crimes against the LGBTQI+ community persist despite the introduction of Anti-Discrimination Laws in 2017 to prohibit discrimination and hate crimes based on sexual orientation and gender identity. There are no laws criminalizing consensual same-sex conduct among adults, but there is a disproportionate impact of discrimination and violence against LGBTQI+ individuals due to the inconsistent enforcement of local laws and regulations by the police and municipal security (“Serenazgo”). Furthermore, during the pandemic there was an increase of gender violence, particularly against the transgender community (Diaz 2023).

ii) Cultural norms and beliefs

Cultural norms and beliefs are crucial for health security in Peru because they shape health behaviors, influence acceptance of medical interventions, and determine compliance with public health measures.

Peruvian society, influenced by traditions, colonialism, and racism, includes racialized structures historically justifying the servitude of indigenous people and women (Ministerio del Trabajo y Promoción del Empleo 2022). The Macho culture emphasizes male dominance within family dynamics, impacting women's access to healthcare, as they may need permission from male family members to seek medical treatment (Fuller 2018; Bravo 2020; INEI, 2020).

Christianity, predominantly Catholicism, is the major religion in Peru, with over 75% of rural residents identifying as Catholic and 14% as Evangelical. The Catholic Church is actively engaged in health and politics, aligning with conservative movements and advocating for human rights. Collaborating with religious institutions can enhance public health campaigns by leveraging their influence to promote vaccination, hygiene practices, and other health initiatives. Understanding religious beliefs allows healthcare providers to offer culturally sensitive care, improving patient trust and cooperation, essential for effective disease prevention and health promotion.

Traditional healing practices are prevalent in many indigenous communities, affecting how these populations perceive and engage with modern healthcare(Garcia et al., 2019). Indigenous women often require accompaniment to healthcare facilities and may hesitate to discuss their concerns in front of non-indigenous people. Understanding these cultural factors helps tailor public health strategies, increasing their effectiveness and ensuring broader community participation, thereby enhancing overall health security (WHO, 2021).

Misconceptions surrounding disease, often viewed as caused by witchcraft and sorcery, lead to increased cases of HIV/AIDS, treatment abandonment, and death among the Awajun and Wampi Amazon indigenous tribes (Flores Rojas 2020) (see section on the Awajun and Wampi people).

iii) Gender roles, responsibilities, and time use

According to the Center for Strategic & International Studies, incorporating a gender lens in global health security aligns with U.S. national interests by advancing women's and girls' healthcare access, promoting social and economic development, providing humanitarian assistance, and enhancing the success of preparedness, response, and recovery activities (Fleischman 2021).

In Peru, women's labor market participation increased from 20.3 percent in 1972 to 66.1 percent in 2022 (The World Bank 2022). However, full-time female workers are 1.5 times more likely than men to earn less than two-thirds of the median wage, and young women face 1.7 times higher unemployment rates than men. Recent mothers experience 10 percent more unemployment than those with older children (The World Bank 2023).

The COVID-19 pandemic exacerbated these issues, disproportionately affecting women in informal employment (Gamero, Perez, and Organización Internacional del Trabajo 2020), however it hit men harder.

Women in Peru spend nearly 40 hours per week on unpaid household tasks, such as cleaning, cooking, and caregiving, limiting their opportunities for paid employment and income (Flora Tristan | Oxfam 2023). Cultural perceptions that women are better suited for caregiving lead to an unequal distribution of unpaid domestic work, with 70 percent of Peruvians believing women are primarily responsible for care activities (Flora Tristan | Oxfam, 2023).

a) **Indigenous women:** Women from lower socio-economic backgrounds, especially Indigenous and Afro-Peruvian women, are often employed in informal, low-wage sectors, contributing to the feminization of poverty(El Comercio-IPE.2022). These women face compounded discrimination based on gender and ethnicity, limiting their economic and social advancement opportunities (Águila Peralta 2015).

   Despite over 80% of Indigenous women having health insurance, access to health services remains inadequate, with many communities lacking proper facilities and

professionals (INEI, 2018. (World Bank, 2023).The pregnancy rate among Indigenous adolescents in the Amazon is 10.6 percent higher than other populations, and chronic malnutrition is significantly higher in rural areas (24.4 percent) compared to urban areas (6.8 percent)(INEI-ENDES 2021).

b) **Gendered impact of the COVID-19 pandemic:** The pandemic had a significant gendered impact in Peru impacting both genders, however it hitted men hader. Up to 75 percent of ICU patients were male, and the mortality rate among men was higher, especially with age (Bruhn-Olszewska and Bożena 2022). The Lancet reported that 73,000 fathers died in Peru compared to 19,000 mothers due to the pandemic (Hillis 2021).

   At the community level, women faced higher risks of COVID-19 exposure while caring for family members, increased job loss, and gender-based violence. However, male healthcare workers had a higher mortality rate (97.2 percent male vs. 2.8 percent female), particularly those over 60 years old (Villamonte-Calanche 2023).

c) **Gender and Infectious diseases:** Gender roles critically determine susceptibility to infectious agents, shaping activities, time allocation, and exposure levels. Women's roles in home care, backyard poultry farming, and food preparation influence the transmission of diseases such as dengue, Zika, malaria, and Highly Pathogenic Avian Influenza. Men face elevated risks during agricultural work, hunting, fishing, mining, and other outdoor activities. A CDC Peru study revealed men are significantly more susceptible to snakebites (64.4 percent) compared to women (35.6 percent) during agricultural activities (CDC|MINSA Peru 2021).

iv) Access to and control over assets and resources

Access and control over assets and resources are important because they directly influence individuals' ability to manage health risks, access healthcare services, and maintain overall well-being. Economic stability ensured through access and control over financial and physical assets, allows individuals to afford healthcare services, healthy food, and safe living conditions, at the health determinants level, reducing vulnerability to health risks and improving overall health outcomes.

Peruvian women have limited opportunities to reach and hold leadership positions in private sector enterprises, 37.5 percent in small enterprises and 21.8 percent in medium and large enterprises (USAID 2019). Women who lead enterprises have a lower educational level than men under the same working conditions. An average of 4.3 percent of female leaders have postgraduate studies compared to 11.2 percent of male leaders (a gap of 6.9 percent).

Most of the managers of agricultural and forestry holdings in Peru are men, but women are gaining territory as owners of the holdings, and their opinions are being listened to, particularly if they have experience in the business. In a study on rice production conducted in the coast of Peru, 23 percent of the property rights were owned by women, who

participated in the family labor, represented 31 percent of the hired labor, and participated in the decision making regarding spending income (Muriel 2014).

According to the World Bank, women owned less than 25 percent of the land in Peru. Though this number has increased over the years, several factors including the “higher rate of illiteracy among women, or the fact that women who were not married but in consensual unions had no right to own the land of the household,” have reduced land ownership opportunities for women (De Nys 2013).

In January 2024 the Peruvian Congress approved a revision of the Forestry Law No 29763, removing long-standing legal protections for indigenous lands and forests via Law No. 31973, (Congreso de la República del Perú 2024). This revision reduces protections for biodiversity and territories controlled by indigenous ethnic groups, placing them in high vulnerability by removing their territorial control. This controversial measure contradicts Peru's clean development and environmental conservation policies, potentially leading to increased deforestation, illegal gold mining with mercury contamination, and violence against Amazon guardians by miners and loggers.

v) Patterns of power and decision-making

Patterns of power and decision-making have to do with resource allocation, policy de development, access to health care, community engagement and health outcomes. Traditionally, Peruvian society assigned women to child-rearing and household finances, while men were breadwinners and decision-makers. Despite the persistence of macho culture and gender-based discrimination, progress in gender equality has been made, with women increasingly assuming leadership roles. Peru now has a female President for the first time, and four out of 19 ministers are women(Presidencia Consejo de Ministros del Perú 2024). Women also hold 26.2% of parliamentary seats, advancing Peru to 22nd out of 146 countries in gender equality in political empowerment (Women Count 2023).

Due to significant income and power disparities, middle and upper-class families often hire women from rural, lower socio-economic backgrounds as domestic helpers, who work at low rates to support their families (Scroope 2018).

Leadership in rural areas remains predominantly male, with 95.9 percent of community leaders being men and only 4.1 percent women, according to the 2017 Indigenous Communities Census (INEI 2018).

A 2022 assessment by CILAC and UNESCO found Peru had the lowest number of female researchers in Latin America and the Caribbean, mainly in health, agriculture, and social sciences. The National Council on Science and Technology (CONACYT) has developed STEM programs to support and promote women researchers into leadership positions. (CILAC and UNESCO 2022). Despite these advances, Peru is experiencing a brain drain. A study by the Instituto de Estudios Peruanos found that 60 percent of those aged 18-24 and 51 percent of

those aged 25-39 plan to leave the country within three years, impacting future leadership ((Moncada 2023).

LGBTQI+ representation in public office is increasing. According to IPSOS - National Survey on Human Rights-2019, eigth percent of Peru's population identifies as non-heterosexual, facing discrimination and denied rights (IPSOS 2023). Between 2018 and 2022, despite a record number of LGBTQI+ candidates, only one openly gay councilor was elected, with fewer than eight LGBTQI+ officials overall (ONPE 2022).

vi) Personal safety and security

Security issues can disrupt healthcare facilities' operations. Attacks on these facilities or personnel hinder the delivery of essential services and emergency response efforts, which are critical during pandemics (van Stekelenburg 2022). Furthermore, this type of disruption exacerbates the spread of infectious diseases as individuals may avoid seeking medical help due to fear of discrimination, violence, or instability (WHO 2020).

a) **Violence against health personnel:** A survey of 200 physicians treating COVID-19 patients in Peru revealed that 84.5 percent experienced workplace violence, primarily from patients' families. Male physicians and those in COVID-19 ICUs were at higher risk(Agueda- Muñoz Del Carpio and Malaga 2021).

   Preventive measures like quarantine, vaccination campaigns, and contact tracing require stable environments. Insecurity undermines these efforts, leading to uncontrolled disease transmission. Attacks on healthcare not only disrupt services but also affect the psychosocial health of patients, providers, and their families. Such attacks cause shortages of healthcare workers, who may avoid work due to safety concerns(WHO 2020).

b) **Violence against women:** Insecure conditions disproportionately affect vulnerable groups, including women, children, and marginalized communities, who face greater barriers to care during pandemics (Human Rights Watch 2020). Peru has high levels of gender violence, with 54.9 percent of married or cohabiting women experiencing intimate partner violence (INEI-ENDES 2021). In 2021, 52.2 percent of female violence victims were in urban areas, and 53.8 percent in rural areas.

   During the COVID-19 pandemic, violence against women surged, with approximately 20,000 women experiencing violence and over 4,000 women and teenagers reported as killed or missing between March 2020 and August 2021 (Defensoría del Pueblo 2021). Gender-based violence, termed the "Second Pandemic," persisted post-pandemic, leading to significant protests against femicide known as the "Ni Una Menos Movement" (CLACSO and UNAM 2021). Records show discrepancies between the Defensoría del Pueblo, reporting 186 deaths from March 2020 to July 2021, and the Ministry of Women and Vulnerable Populations, reporting 182 deaths over the same period. Additionally, the analysis document does not account for the estimated

7,723 disappearances of women and girls (4,297 between March and December 2020 and 3,426 from January to July 2021) (Defensoría del Pueblo 2021- pages 16 and 17).

Given the magnitude of this problem, the Prosecutor of the District of Sullana convened an intersectoral table to guarantee the response that goes beyond the police and legal, including various sectors. However, no information was found that an intersectoral table had been established at the national level (Ministerio Público Fiscalía de la Nación 2021).

c) **Violence against LGBTQI+:** According to the Observatory of Trans People, 52 transgender women were murdered in Peru between 2008 and 2023 (Observatorio de Personas Trans 2023), with more than 10 additional murders reported in January-February 2024 (Inter American Commission on Human Rights 2024). Recent killings are allegedly linked to territorial disputes in Lima's streets involving Venezuelan cisgender women.

Discrimination against LGBTQI+ individuals has a detrimental impact on health security by creating barriers to healthcare access, contributing to poorer health outcomes, and undermining public health efforts. Fear of discrimination can prevent LGBTQI+ people from accessing preventative services, such as HIV testing and mental health support (UNAIDS, 2020). Persistent discrimination and stigma contribute to higher rates of mental health issues, including depression, anxiety, and suicidal ideation among LGBTQI+ populations (WHO, 2021).

Discrimination affects a considerable portion of the LGBTQI+ population, with approximately 71 percent encountering prejudice across various domains including education, employment, familial settings, healthcare, and political arenas (Ministerio de Justicia and IPSOS 2020).

According to the Index of Prejudice and Negative Attitudes from the 2nd National Survey on Human Rights conducted by IPSOS (Pag 77), the Peruvian society exhibits the highest level of prejudices and negative attitudes (expressed in the percentage of negative perception) against individuals facing incarceration (60 percent), followed by migrants (56 percent). LGBTQI+ individuals and disabled people have 46 percent of negative perceptions each, followed by people living with HIV/AIDS and the elderly ranked with 35 percent for each (Ministerio de Justicia and IPSOS 2020).

Individuals openly identified as transgender face discrimination and violence, particularly in more conservative and rural areas(Ministerio de Justicia and IPSOS 2020). LGBTQI+ people from marginalized backgrounds, including indigenous or Afro-Peruvian communities, may encounter intersecting forms of discrimination based on sexual orientation, gender identity, ethnicity, and socio-economic status.

d) **Violence against Individuals with Disabilities:** Those who have disabilities, especially women, face heightened rates of domestic violence. Between 2017 and 2018, 74 percent of reported cases of violence against disabled individuals were women. Risk assessments indicate that women with disabilities face significantly higher risks compared to those without disabilities, with 53 percent and 28 percent classified as at moderate and severe risk, respectively (MIMP 2019).

2.3. RECOMMENDATIONS

Inclusive development plays a pivotal role in improving global health security in Peru. We forget that whatever we do in specific health security must have a framework that should consider "inclusion" as a cross-cutting element. (e.g. if we are addressing AMR, we should think of who could be affected by AMR or have a larger role in AMR because of some element generating exclusion associated with gender, poverty, indigenousness, remoteness, etc.)

Addressing these challenges requires a comprehensive approach that integrates community engagement, strengthens health systems, and prioritizes culturally sensitive care. By ensuring effective communication, social cohesion, and resource allocation, Peru can enhance its social cohesion.

D.1. PREVENT

P1.1 LEGAL INSTRUMENTS

- Work with the Congress and the "National Cross-Sector Table to Alleviate Poverty" on a Law to close the gap and guarantee essential health care for vulnerable and underserved populations
- improve Laws to protect first line workers, including health workers during health security emergencies, using the COVID-19 experiences as a base line; and
- Promote the review of the amended Forestry Law No. 31973 because of its negative impact to environment, and health, in addition to its impact on climate change (cross sectoral with climate change).

P1.2. GENDER EQUITY*:*

- Promote the implementation of a "National Cross-Sector Consultation Table" to provide a system solution to the killings and disappearance of women - "The Second Pandemic" caused by the COVID-19 pandemic, and create mechanisms to prevent something like this happening again- consider including deaths-disappearance of women as notifiable disease.

P2. FINANCING:

- Provide technical support to estimate the funds necessary to cover the gap on inclusion
- Assist the creation of a Multi-year National Action Plan for Health Security that impacts on inclusion. Consider surveillance, laboratories, healthcare, IEC, and zoonotic diseases
- Identify high priority Global Health Security components-packages for funding at the

local level, seeking sustainability in the long term, beyond the life of the project
- Seek private sector funding, particularly from those companies operating in the areas where communities reside; and
- Inform communities and local authorities about their Global Health Security needs and risks and how these contribute to preparedness and response against a possible new pandemic, and provide them with tools to introduce GHS in decentralized planning for resource allocation.

P3. IHR COORDINATION, NATIONAL IHR FOCAL POINT:

- Promote inclusion as an "across the table" consideration
- Promote the participation of the Office of the Prime Minister and the Ministry of Development and Inclusion because of their capacity to coordinate and mobilize resources to mitigate the impact on vulnerable populations
- Promote the understanding and use of a Joint External Evaluation tool adapted for regional and local use to reflect their status seeking and enhance cross-cutting capacities
- Analyze regions/ districts with vulnerable populations and a history of bad performance and corruption of the health sector leadership, and develop strategies that would generate positive change; and
- Strengthen the leadership of authorities working in GHS at the national, regional, and local levels.

P4. ANTIMICROBIAL RESISTANCE:

- Monitor the status of AMR in vulnerable populations, particularly the poor living in the slums of big cities such as Lima, and indigenous in remote towns in the Amazon; and
- Recognize AMR as one of the biggest threats to Global Health Security and analyze viable alternatives to raise awareness and support operations to prevent, detect, and reduce the risk of AMR in Peru.

P5. ZOONOTIC DISEASE:

- Raise awareness of Amazon region’s regional and local governments on the risks of zoonotic diseases and potential animal human spill over and spread in vulnerable communities in their territories
- Partner with regional and local organizations to implement the One Health approach training targeting at-risk communities benefiting implementers of theShare information on antimicrobial stewardship - principles and practices with local healthcare providers, veterinarians, and agricultural workers to prevent uninformed use of antibiotics; and
- Support synergic efforts conducted by MINSA, SENASA, SERFOR in the dissemination of knowledge and building of integrated approaches to address prioritized zoonotic diseases.

P6. FOOD SAFETY:

- Add food security on the JEE as there is not Food safety with food security and availability. Those not included, particularly the poor suffer from food insecurity. In the

case of Peru, in 2021 51 percent of peruvian population was suffering moderate or severe food insecurity; and

- Include supply chain and logistics to ensure vulnerable populations access to food. (Climate change will be a driver of food insecurity.

P7. BIOSAFETY AND BIOSECURITY:

- Ensure biosafety and biosecurity for health workers in general as a vulnerable population and for those taking care of those not included by training them on biosafety and biosecurity and providing them with Personal Protective Equipment; and
- Provide on the job training and supervision to ensure standards are being kept.

P8. IMMUNIZATION: A national vaccine delivery system with nationwide reach, effective distribution, easy access for marginalized populations, adequate cold chain, and ongoing quality control is able to respond to new disease threats.

- Conduct a joint assessment of immunization strategies for vulnerable populations to strengthen the GHS capacities; and
- Support MINSA's National immunization program in the review of their strategies to immunize hard-to-reach dispersed communities seeking to increase coverage and long term sustainability.

D.2. DETECT

D1. NATIONAL LABORATORY SYSTEM:

- Support the strengthening and articulation of laboratories in remote areas with the national and macro-regional public health centers, particularly in the Peruvian Amazon where the higher risk for a zoonotic disease spillover is; and
- Support access to point-of-care tests by health workers, including community health workers in hard to reach areas, to facilitate the early detection of vulnerable individuals.

D2. SURVEILLANCE:

- Enabling community surveillance to complement Lab surveillance, particularly in remote geographical areas
- Reinforce surveillance capacities of the personnel running health facilities in hard to reach areas serving vulnerable populations, and ensure quality of the data and integration with the regional and national systems
- Conduct periodic on-the-job training, supervision, data-quality assessments, and collaborative groups between health facilities; and
- Train those managing data on the integrity of data emphasizing the registration of socio-demographic information to allow gendered analysis.

D3. HUMAN RESOURCES:

- Develop creative solutions to high turnover of healthcare providers, especially in rural areas, including on-the-job training at the Bachelors and Masters degree level focused on Global Health Security and One Health for doctors, nurses and veterinarians
- Recruit and retain healthcare professionals from diverse backgrounds to help build trust,

improve patient-provider communication, and reflect the diversity of the community they serve

- Promote the hiring of members of vulnerable populations as community health workers or local researchers and utilize their knowledge of the local people and natural environment
- Promote Global Health Security and One Health literacy, including climate, environmental, infectious diseases, and inclusive development awareness campaigns for communicators and school teachers; and
- Implement a lifecycle approach, from inspiring girls, boys, and young people to pursue STEAM careers related to GHS and One Health.

D.3. RESPOND

R1. HEALTH EMERGENCY MANAGEMENT:

- Review the continuity of operations and multi-hazard plans against all threats, particularly in geographic areas with a high concentration of vulnerable populations and where health services and social protection programs are weak, and seek to strengthen rapid response at the community level for future pandemics; and
- Enable local organizations to access contracts as service providers for vulnerable populations in areas with limited state presence in order to facilitate the delivery of essential services and support to underserved communities.

R2. LINKING PUBLIC HEALTH AND SECURITY AUTHORITIES:

- Increase the awareness of health sector authorities and operators on how to work jointly with prosecutors and law enforcement to enforce public health measures for the general population and companies under occupational safety; and
- Support the application of a “Public Health Approach” to address violence with a socio-ecological and systems approach.

R3. HEALTH SERVICES PROVISION:

- Review strategies to facilitate physical access to healthcare during epidemic or pandemic emergencies in areas with high concentration of vulnerable populations, and hard to reach areas.

R4. INFECTION PREVENTION AND CONTROL:

- Support the creation of IPC committees at health facilities in remote hard to reach areas serving vulnerable populations (Law 31972 has omitted mentioning the facility level for , strengthening surveillance, prevention, and control of infections)
- Train workers at these facilities on IPC; and
- Monitor the creation of IPC committees at health facilities in other regions.

R5. RISK COMMUNICATION AND COMMUNITY ENGAGEMENT:

- Include content about inclusion, non-discrimination, gender equity, and violence

management in materials developed by the project

- Support indigenous and young people committed to Global Health Security and One Health as champions, and promote their participation on project activities and the sharing of their information through social media
- Promote Social and Behavioral Change strategies to elevate hygiene practices, biosafety measures, and the recognition of signs and symptoms of prevalent emerging infectious diseases in specific regions, including targeted education and awareness campaigns
- Prepare communication materials in indigenous languages on prevention and control of emerging and re-emerging zoonotic infectious diseases
- Supporting training and diversity education for journalists, editors, and communication agents on GH and One Health with the lenses of intersectionality and vulnerability; and
- Empower local health workers and the community as community health workers to manage Antimicrobial Resistance and other diseases.

IHR RELATED HIHR RELATED HAZARDS AND POINTS OF ENTRY AND BORDER HEALTH

POINT OF ENTRY:

- Seek collaboration with the Andean Health Organization (ORAS) to promote border health with neighboring countries, prioritizing topics as Resolutions of the Andean Region Ministries of Health that are of mandatory fulfillment within countries; and
- Check portability for migrants and Indigenous communities in border areas with limited geographic access to health facilities.

CE. CHEMICAL EVENTS:

- Support risk awareness on Mercury intoxication and promote discussions to seek alternatives on how to manage this challenge in the context of Global Health Security
- Promote an integrated approach between USAID Health and Environmental sectors to address this challenge; and
- Intoxication with Mercury is listed as one of the areas of Global Health Security- Joint External Evaluation- Chemical Events. Known as Minamata Disease, mercury intoxication is under Minamata Convention on the reduction and elimination of the use of mercury, from which, Peru is a signatory. Mercury is a product utilized by gold illegal miners, an activity that is invading the Peruvian Amazon, threatening indigenous people rights, causing deforestation and increasing the risk of spill-over of zoonotic diseases.

Chapter 3: MIGRATION

3.1 CONSIDERATIONS

This chapter delves into the factors influencing migration, or groups thereof, and their ramifications from the perspective of Health Security, with a One Health approach.

When we think about migration and GHS, we should consider:l factors:

- Human mobility
  - Migratory flows - mobility patterns
- Migration laws and policies in Peru
- Borders and point of entry
- Border health and Humanitarian challenges
- Humanitarian transportation- Risk and exposure during the trip- Human trafficking

- Social determinants of health
  - Demography
  - Pre departure health
  - Gender, discrimination, and roles
  - Socio economic conditions:
    - Access to work and barriers to formal employment
    - Integration and recognition of qualifications.
  - Environmental conditions
    - Housing and shelter
    - WASH
    - Nutrition-Food security

- Health system response
  - Health insurance and access to healthcare
  - Local diseases patterns
  - Mental health
  - Strain on health systems/providers and supplies
  - Epidemiological surveillance
  - Pre-departure health
    - Measles
    - Malaria
    - HIV/AIDS and continuum of care

Below we provide an analysis of the elements that determine inclusion or exclusion of migrants, along with their corresponding consequences and recommendations.

We also provide a set of examples based on the review of the literature and what was observed in recent health events in Peru, some examples are:

- Venezuelan migrants in Peru- Equity indicators
- Infectious disease implications of large-scale migration of Venezuelan nationals; and
- Global Health Security and imported diseases in Peru.

3.2. KEY FINDINGS

International migration is a growing phenomenon, both in scope and in complexity, affecting almost all countries in the world. According to the International Organization for Migration (IOM) in 2020 there were some 281 million international migrants worldwide, representing three point six per cent of the total global population (International Organization for Migration 2021).

3.2.1. HUMAN MOBILITY, RISK AND POINTS OF ENTRY

i) Human Mobility

The phenomenon of migration, or more broadly, the phenomenon of human mobility, insofar as it is coextensive with human life and human flow, cannot be tackled, let alone regulated and contained, with the emergency approach. It is a phenomenon that requires understanding, and the reshaping of perceptions, and narratives of xenophobia and discrimination. It is important to shape and align priorities, pertaining to the freedom of movement of goods and people, civil rights and sovereignty, with health security. Policies change migratory flows and routes making the trips harder and riskier or safer and easier, and humanized from the human rights perspective. The crossings of long distances, jungles, deserts, and seas show the desperation and the need of legal pathways.

“Moreover, migrants face a perceived xenophobia, discrimination and the creation of an enemy”, while contrasting with the Global South perspective of migration promoting humanity, has been heavily affected by the COVID-19 pandemic. Shaping the narratives or migration has to do with data, and evidence-based policies (Agora europe et al. 2022).

The Global Health Security objective is to prevent, detect and respond to emerging infectious diseases threats. For some GHS is seen as an effort to control and tighten border controls, as it occurred during the COVID-19 pandemic, when the pandemic required the closing of borders and to expel migrants or restrict their movement, under the argument of securitization (Wenham 2019); while for others using a security lens to discuss health challenges brings net benefits to the health sector because of the increased policy attention, financing and allocation of resources (McCoy et al. 2023).

In contrast, lessons learned from South Africa in the management of over two million migrants and refugees, showed that the failure to adequately engage with migration and mobility is likely to undermine progress towards global targets, as despite existing laws that theoretically grant access to healthcare rights, the effective deny of this rights at the services because of discrimination and other barriers, undermines efforts to control infectious diseases, including

HIV and Tuberculosis (Vearey, De Gruchy, and Maple 2021). Healthy migration is good for development, but current responses within public-health systems – including for communicable and non-communicable diseases, and maternal and child health – do not engage adequately with migration(Segati and Landau 2013). The resulting health inequities undermine the developmental opportunities of migration

While not listed in the World Health Organization list of determinants of health, migration is a determinant of health. In each phase of a person's journey, potential health risks and possible health protective factors exist that can have a short-term or long-term effect on their wellbeing. (Arroyo Laguna et al. 2022)

Migration trajectories involve pre-departure health determinants and circumstances at places of origin; short-term or long-term transit, which might involve interception by authorities, non-governmental groups, or criminal gangs; destination situations of long-term or short-term stay; and return to places of origin for resettlement or for temporary visits before remigration.

a) Migration flows and Mobility patterns

a.1) Migration from and to Peru: Between 1990 and 2022, 3,390,591 million Peruvian citizens, accounting for 10.5 percent of the population as of 2022, emigrated abroad. Of these emigrants, 52 percent were women and 48 percent were men. The primary destinations were Chile (28.5 percent), the United States (17.3 percent), Bolivia (11.4 percent), and Spain (11.4 percent). Gender-specific data reveals that 55.1 percent of qualified professional emigrants were women, particularly in scientific and intellectual fields, whereas 91.8 percent of unqualified women were housewives. Unqualified male emigrants were primarily engaged in farming or fishing (INEI 2023). The main factors driving Peruvian emigration, according to IPSOS, include economic hardship, conflict, disasters, climate events such as the "El Nino Coastal Phenomena," and the pursuit of a better future(IPSOS - Game Changers 2023).

From the Global Health Security perspective Tuberculosis is a significant concern on Peruvian migrants due to its incidence 151x100,000 as of 2022f. Migrants from Peru may carry latent or active TB, which can pose public health challenges in host countries. One study in Florence- Italy, found that Peruvian migrants accounted for about 20% of yearly diagnosed cases (Zammarchi 2014). While the prevalence rate is not disproportionately high among Peruvian migrants, HIV/AIDS remains a concern due to the global nature of the epidemic.

Between 2010 and 2022, more than 216,800 Peruvians returned to Peru. Of these returnees, 51 percent were men and 48.5 percent were women. Individuals aged 15 to 49 comprised 65.3 percent of the returnees, with 64.2 percent being single. The majority of returnees were coming from Chile (35.3 percent), Spain (15.3 percent), the United States (9.5 percent), Argentina (7.7 percent), and Ecuador (5.6 percent) (INEI 2023). More than being carriers of infectious diseases, some returning migrants in vulnerable socio economic conditions require psychological support that is provided by Law No

30001 For the economic and social reinsertion of the returning migrant (Poder Legislativo 2013).

a.2) Venezuelan migration to Peru

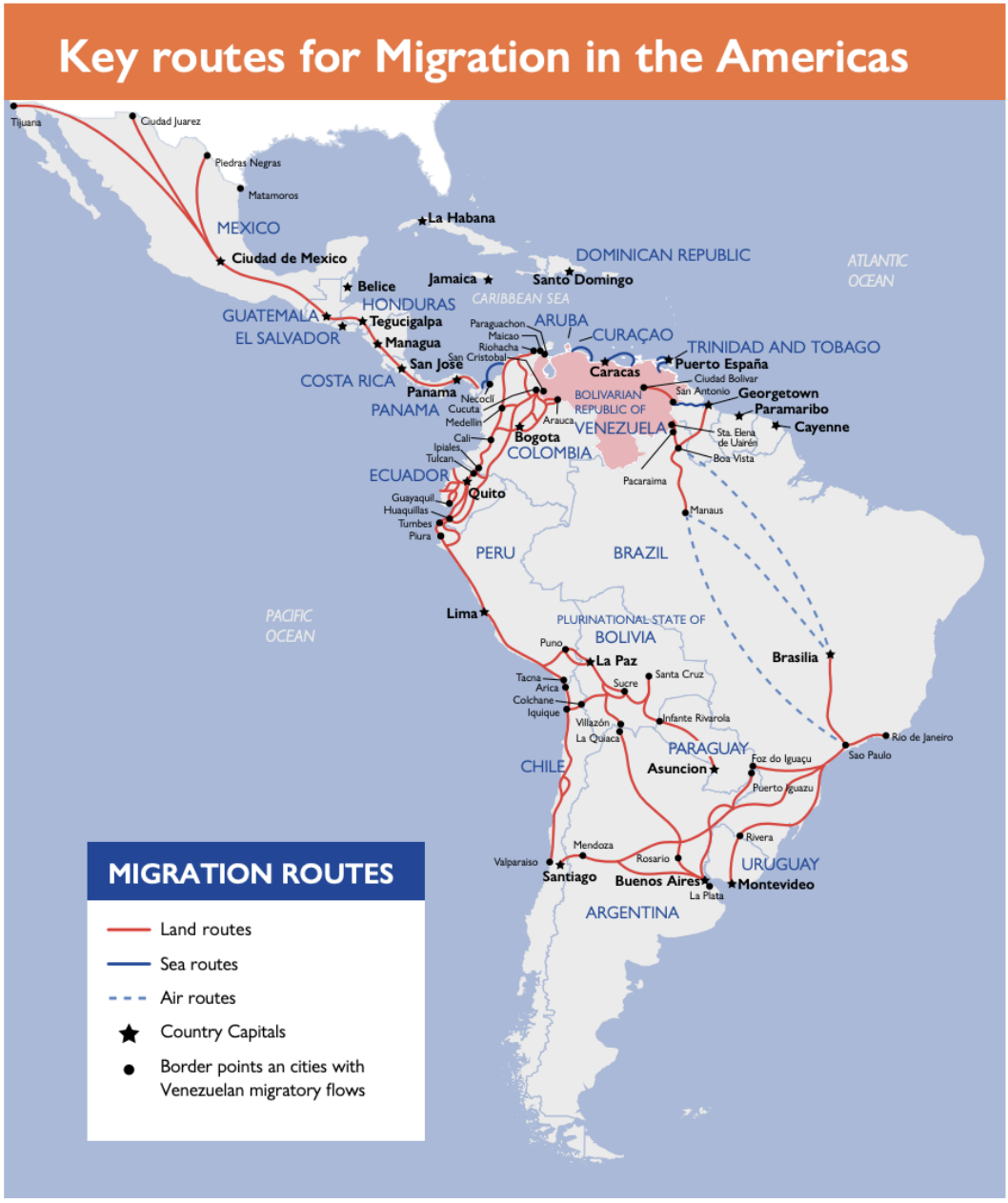
The Bolivarian Republic of Venezuela has faced a prolonged political and socio-economic crisis due to declining oil prices, government overspending, international sanctions, and inflation. Factors driving Venezuelan migration included an increase in violence, an increase of the percentage of the population living in extreme poverty, an increase in food insecurity, lack of access to basic services, social conflicts, political tension, and climate threats worsening living conditions and health for vulnerable populations. This crisis has led to deteriorating economic and health indicators and the collapse of the healthcare system (The Lancet 2018).

The initial wave of Venezuelan migration in the early 2000s involved economically advantaged and educated individuals relocating to the United States and Europe seeking for better conditions of living. As conditions worsened, migration of desperate people who had nothing else to lose increased, and is projected to exceed 6.8 million by 2024 (R4V 2023). In Latin America, the main destination for Venezuelans is Colombia (2.5 M), followed by Peru (1.5 M), and Chile (450 thousand) (R4V 2023). In Peru, Venezuelan migrants surged from 44,000 in 2016 to 1,617,000 by June 2023 (Superintendencia Nacional de Migraciones Perú 2023), becoming the second-largest recipient of Venezuelans. Venezuelans now make up over 85.7 percent of the migrant population in Peru[2].

The drivers of Venezuelan migration to Peru were economic stability, being able to get a job in the informal economy, and the possibility of formalizing immigration status through the Temporary Permanence Permit (PTP) (Arroyo Laguna et al. 2022).

Venezuelan migrants reported crossing the border between Venezuela and Colombia in the state of Táchira and the city of Cúcuta (82.6 percent of cases). The primary route from Cúcuta involves traveling by bus to other Colombian cities, such as Bogotá (25.1 percent) or Valle del Cauca (11.6 percent). Migrants often crossed the Rumichaca international bridge on the Colombian-Ecuadorian border, then traversed Ecuador with stops in Quito and Guayaquil, finally arriving at Huaquillas, the border area with northern Peru. Venezuelan migrants often travel by foot to reach Peru. This journey for most of them typically involves traversing long distances under challenging conditions by crossing rivers and jungles, being exposed to environmental risks, in addition to those related to the travel. Alternatively, some traveled by air directly from Caracas to Lima(Arroyo Laguna et al. 2022).

[2] Other migrant nationalities include Colombians (3.8 percent, 51,964), Ecuadorians (1.2 percent, 15,655), Americans (1 percent, 14,101), Spaniards (1 percent, 13,804), Argentinians (0.8 percent, 11,444), Chileans (0.8 percent, 11,313), Brazilians (0.8 percent, 10,460), and Chinese (0.7 percent, 10,001 (National SuperIntendence on Migrations Peru, 2023).



Regarding the travel duration to reach the Peruvian border by land, 23.8 percent of surveyed migrants reported starting their journey less than a week ago, 15.5 percent took between eight and 15 days, and 12.1 percent traveled for 16 to 30 days. Additionally, 48.5 percent of respondents in Tumbes indicated they started their trip from Venezuela more than a month ago. Of these, 11.3percent traveled for 31 to 60 days, 6.3 percent for 61 to 90 days, and 30.9 percent had been outside Venezuela for more than three months. The main destination for 92.6 percent of migrants, followed by Chile (5.3 percent), Argentina (1.2 percent), and Bolivia (0.6 percent) (IOM, 2019a). Notably, Peru is considered both a transit and permanent destination (Arroyo Laguna et al. 2022)

ii) Migration laws policies and policies

To facilitate humanitarian entry, Peru offered the "Permiso Temporal de Permanencia" - PTP (also known as "Carnet de Permiso Temporal de Permanencia" - CPP) to Venezuelan migrants from January 2017 to June 2019. This one year- renewable permit allowed Venezuelans to live and work legally in Peru, pay taxes, and access health and education services. In 2018 and 2019, Peru adopted changes in entry requisites due to political shifts, and growing safety concerns among Peruvian authorities and citizens regarding incidents of violence involving Venezuelans. New requirements included the presentation of a valid or expired passport, a visa, and exit stamps from Ecuador. (Rivadeneyra and Universite Paris Cite 2019).

Moreover, Peru activated the Extraordinary Work Permit Act, allowing Venezuelan migrants to work for a period of two months, while they process the Ficha de Canje Internacional issued by INTERPOL certifying that a person isn't an internationally wanted fugitive (Red Notice).

Health emergencies, such as the resurgence of measles from Venezuelan migrants and COVID 19 resulted in the closing of borders and the increase of entry requirements. The Peruvian government strengthened immigration control on the northern borders and, at times, imposed mandatory social immobilization with border closures lasting up to a month (MINSA - COVID-19 2020). This led to the establishment of camps in border areas, resulting in a humanitarian crisis characterized by difficult living conditions, lack of food, safe water, and medicines, particularly affecting vulnerable Venezuelan migrants.

According to the International Organization for Migration (IOM, 2020), these requirements were difficult to comply with for over 63 percent of migrants, while the remaining 37 percent were admitted as tourists, residents, or under a humanitarian visa (Arroyo Laguna et al. 2022). As of 2022, only 73.9 percent of refugees and migrants were registered.

iii) Borders and points of entry- Border Health Services

International borders are defined by the International Migration Organization as "Politically defined boundaries that separate territory or maritime zones between states and their territories. These areas encompass border crossing points, immigration and transit zones, as well as embassies and consulates. Such areas include border crossing points (airports, land border crossing points, ports), immigration and transit zones, the "no-man's land" between crossing points of neighboring countries, as well as embassies and consulates (insofar as visa issuance is concerned)"(IOM 2019).

The main entry point into Peru is Aguas Verdes (Tumbes) - Huayquillas (Ecuador) at the northern border with Ecuador, through the "Centro de Atención Binacional Fronterizo" (CEBAF). The second and third points of entry by the volume of migrants attended were international airports and the border with Chile, Santa Rosa-Tacna.Migrants also use the Desaguadero and Yunguyo crossing in the border with Bolivia, a route less monitored. The Peruvian government has increased patrols and surveillance at known illegal entry points. This includes drone and

sensor surveillance, and the deployment of the police and military (IOM 2024, Superintendencia Nacional de Migraciones 2021).

According to INEI in 2024 only 37 percent of Venezuelans in Peru possess a passport (13 percent valid and 24 percent expired). Consequently, at least 63 percent of Venezuelans in the country are unable to fulfill the visa requirements. Furthermore, Peruvian consulates in Ecuador, Colombia, and Venezuela ceased issuing humanitarian visas during the COVID-19 pandemic and have yet to resume operations (INEI, ENPOVE Survey 2022, January 2023).

Closure of an international border, and the implementation of entry restrictions by heightening entry requisites, entails the restriction of international mobility. Historically border control measures and quarantines have often been used effectively as public health measures to control infectious diseases (Grepin, Aston, and Burns 2023). Entry restrictions at the borders have been applied at different times, and for variable duration.

With the enforcement of controls at the border, Venezuelan migrants either established camps or engage with smugglers. Those staying at camps faced deteriorating socio economic and health conditions day by day, because of weather inclemencies, being robbed, or having paid irregular fees to the police, and heavily depended on solidarity and international cooperation to survive.

The closing of borders at under various circumstances (measles, COVID-19, changes in passport requirements, and more recently Peru's denying the entry of migrants on its south border following Chile's decision to deport them) drove some migrants lacking passports to take clandestine routes by paying smugglers known as "trocheros", "coyoteros" or "moteros" to enter Peru. These actors saw migration restrictions as a business opportunity. Within time, criminal organizations such as The Tren de Aragua gang, gained hegemony on migrant smuggling and drug trafficking routes between Peru, Chile, and Bolivia (InSight Crime 2023).

Those who engage with the smugglers enter into Peru by crossing paths owned by gangs that generate a financial obligation to them, with high interests putting them heavily into debt. The gangs associated with human smuggling, often extort migrants forcing them to pay using violence, and sexually abusing and exploiting young women. Human smuggling is related with human trafficking, drug and weapon trafficking, illicit trafficking of drugs and firearms, the smuggling of fuel, medicines, and gas (InSight Crime 2023). To avoid remaining in this "limbo" and becoming poorer, many migrants choose not to live on the streets and take the risk of crossing, facing jail, deportation, and the prohibition to re-enter Peru for up to 15 years (Peru21 TV Channel 2021).

iv) Border Health

According to the Centers for Disease Control and Prevention (CDC), Border Health focuses on populations moving across borders and the communities they interact with before, during, and after travel. This includes communities on both sides of an international border. Border Health collaborates with Global Health Security in compliance with the International Health

Regulations(IHR 2005) to limit the spread of health threats (CDC 2024), and it is part of the Global Health Security Strategy (U.S. Government - Global Health Security Strategy 2024).

The increasing influx of migrants into Peru highlights the need for enhanced health resources and coordinated management of health risks at borders. According to Peru's General Health Law (Law No. 26842), articles 83 and 85, the Ministry of Health (MINSA) is responsible for the surveillance and sanitary control of all entry points, ensuring compliance with national laws and international treaties (MINSA 2012). In coordination with the National Council for Border Development and Border Integration (CONADIF), MINSA engages in strengthening health services in border regions through training healthcare personnel, providing culturally appropriate care, and implementing extensive health campaigns by national programs (e.g., immunizations, HIV/AIDS, Tuberculosis, vector-borne diseases, noncommunicable diseases, sexual and reproductive health, and mental health) (MINSA 2012).

The resurgence of measles in Venezuela led to its spread across the region through Venezuelan migrants, affecting Colombia and Brazil. In response, Peru implemented border control measures such as closing borders, initiating a large-scale Measles Vaccination Plan in border areas, and requiring proof of measles vaccination as an entry requirement for unvaccinated individuals. The high demand for immunizations among Venezuelans seeking to enter Peru necessitated extended service hours and increased staff in the health sector (MINSA-Sarampion 2018).

COVID-19, Supreme Decree No. 008-2020-SA declared a National Health Emergency for 90 days, implementing measures for COVID-19 prevention and control at the borders (MINSA - COVID-19 2020). This involved requiring travelers to present a health affidavit at entry points and restricting arrivals from affected countries. Measures evolved to include mandatory isolation, then quarantine for 14 days, and eventually required a negative PCR or antigen test result.

The arrival of migrants at border points of entry (POE) often exceeds the capacity of regional authorities and local health teams, with reports of up to 10,000 entries and exits per day at major crossing points (Doctors without Borders 2024). With varying numbers, the International Organization for Migration’s Displacement Tracking Matrix recorded peak daily movements of 1,053 entries and 785 exits in February 2023 (IOM 2023). Migrants primarily require shelter, food, water, and hygiene supplies, along with access to medical, sexual, reproductive, and mental health services. Health screenings at POE are critical for detecting and managing potential health risks, including infectious diseases, with various stages of disease which pose an increased threat to both migrants and the host communities near borders and in high migrant influx areas (Doctors Without Borders 2024).

In 2022, observations at Border Patrol Detention Centers in Texas revealed African migrants arriving with active or latent tuberculosis during COVID-19. Positive cases were isolated and treated, while tens to hundreds of close contacts were identified, tested, and followed up. Upon release, migrants were referred to regional public health officers for continued case management. This highlights significant challenges for Peru, which lacks adequate surveillance, laboratory services, rapid response teams, and patient contact tracing nationwide (P. Aguilar, 2024).

v) Humanitarian Challenges

Migrants, mainly Venezuelans, endure harsh conditions like exposure to weather inclemencies, lack food and safe water, and emerging health issues during their journeys, presenting significant humanitarian challenges. These challenges are exacerbated by sudden changes in immigration and security policies changing requirements, forcing migrants to make prompt decisions about departing or leaving a country for health or safety reasons.

For example, policy changes in Peru and Chile led to humanitarian challenges for migrants. Peru's requirement for a passport and visa to access the PTP prompted thousands of Venezuelans to rush border crossings, risking irregular entry, smuggling, and trafficking. In 2023-2024, when Chile tightened security, over 2,000 Venezuelans and 50 Haitians were pushed to the Peruvian border, only to be stranded without basic necessities like food, water, or shelter due to closed borders and lack of proper documents. Seven Haitians not adapted to environmental conditions were affected by the high altitude (over 3600 meters above the level of the sea) and died at the Desaguadero border while waiting for the border to reopen.

Furthermore, the costs and availability of essentials like food, water, and lodging vary significantly across borders, with Peru generally being more expensive than Chile. This disparity forces many migrants to sleep outdoors, facing additional challenges such as adverse weather, local threats, lack of sanitation, and discrimination. Despite these hardships, Venezuelan migrants report feeling safer in Peru compared to Chile, where they face increased physical violence and discrimination(CARITAS and Catholic Relief Services 2023).

vi) Humanitarian transportation- Risk and exposure during the trip

Safe long-distance transportation remains a crucial need for refugees and migrants, particularly to mitigate potential criminal activity and protection risks such as smuggling, human trafficking, gender-based violence, and harsh weather. During 2022, 40 percent of Venezuelans entering Peru through Tumbes irregularly experienced incidents such as robbery, xenophobia, fraud, or extortion during their journeys (UNHCR and HIAS, Tumbes Border Monitoring, January-April 2023).

Discrimination and xenophobia hinder access transportation services; 14 percent of respondents faced nationality-based discrimination when using public transport. Often undocumented migrants cannot buy tickets from formal transportation providers due to their irregular status, except in cases of extreme vulnerability like survivors of gender-based-violence,

seniors, and pregnant women (2022 ENPOVE survey).

Human trafficking in Peru has increased, with Venezuelan refugees particularly affected. The percentage of Venezuelan victims rose from 6.5% in 2018-2019 to 10% in 2021 (R4V. Working Group for Refugees and Migrants (GTRM), 2021; Directorate for Investigation of Human Trafficking of the National Police of Peru 2020-2021). Venezuelan women and girls are at high risk of trafficking for sexual exploitation, but many do not report due to fears of deportation or ignorance of the local protection system that offers assistance to all, regardless of status.

3.2.2. SOCIAL DETERMINANTS OF HEALTH (SDH)

According to the World Health Organization (WHO), the social determinants of health are "the circumstances in which people are born, grow, live, work and age," including the health system. These circumstances result from the distribution of money, power, and resources at the global, national, and local levels, which in turn depend on the public policies adopted by a country's governments. Social determinants of health explain most health inequities (PAHO 2023).

The influence of social determinants of health (SDH) on individual and community health outcomes is significant. They play a crucial role in shaping the ability to prevent, detect, and respond to health threats. These determinants also impact how well people can prepare for health emergencies and predict their life chances, which in turn determines their capacity to take preventive measures, respond to emergencies, and utilize healthcare services (Yegnanarayana and Saraswathy 2021). The existence of a social gradient in health across the socioeconomic spectrum, with the poorest individuals experiencing the worst health outcomes, further underscores the need to address these determinants for better health outcomes.

The Venezuelan health system collapse has severely impacted the health of its nationals reversing health gains. Under-five mortality has increased by 40% in the past decade, with current rates at 29 per 1000 live births. Non-communicable diseases account for two-thirds of deaths, followed by injuries, communicable diseases, and maternal and perinatal conditions. The weaknesses in health programs result in low vaccination rates or compliance with public health measures. Despite vaccination campaigns, coverage remains low, with less than half of infants vaccinated for diphtheria and tetanus and only one-third for measles in 2022. Malaria cases increased by 990% between 2007 and 2017 and remain unaccounted. Approximately 10.8 million people with chronic diseases lacked access to care in 2021(Doocy 2022).

During their trip, migrants face environmental, weather, and violence risks. While traveling toward their destiny they are exposed to contaminated water, vector-borne diseases, and dangerous wildlife—long journeys cause muscle or joint pain, sunburns, dehydration, and allergies. Migrants with chronic conditions such as diabetes, hypertension, asthma, cancer, as well as those with infectious diseases - tuberculosis, HIV, and malaria - may experience worsened symptoms due to harsh conditions of the trip, basic needs deprivation, and lack of treatment. Many are robbed, suffer from the trauma of attacks and sexual violence during their travels, while others fall into exploitation by organized crime.

i) Demography

According to the II ENPOVE Survey, 1,347,000 people lived in Peru in 2021, 50.6 percent of whom were women and 49.4 percent of whom were men. Data consistently shows that the majority of these migrants are young, with 57.4 percent between the ages of 20 and 49 and 6.4 percent between 15 and 19. Thirty-three percent are single, 13.6 percent are married, and 41 percent cohabit (INEI—ENPOVE II 2022).

ii) Gender, roles, and discrimination

a) **Gender:** According to Plan International (2020), 98 percent of Venezuelan men had employment compared to 65.5 percent of women. In 2021, only 19.2 percent had a formal contract, while 80.8 percent of Venezuelan migrants and refugees worked in the informal sector, facing low wages and unfavorable working conditions(INEI - ENPOVE II 2022).

b) **Roles among Venezuelan men and women:** The study conducted by Blouin in 2019 highlighted perceived differences in masculine roles between Venezuelans and Peruvians. According to the research, 57% of respondents from both genders acknowledged these distinctions.

In Peru, household chores are primarily carried out by women, whereas in Venezuela, they are more evenly distributed among family members. Additionally, income administration is typically managed by men in Peru, whereas in Venezuela, it is commonly shared among household members. Changes in traditional roles have led to criticism of men in Peru and impacted their perceived respect. Despite the perception of Peruvian women as submissive due to macho culture, they are actively involved in jobs typically considered "tough" and traditionally attributed to men (Blouin et al., 2019).

There are perceived differences in masculine roles between Venezuelans and Peruvians. Fifty-seven percent of respondents from both genders acknowledged these differences (Blouin et al., 2019).

In Peru, household chores are primarily assigned to women, whereas in Venezuela, they are more evenly distributed among family members. Furthermore, in Peru, men typically manage income administration, whereas in Venezuela, it is commonly shared among household members. Men in Peru have faced criticism for changes in traditional roles that have impacted their perceived respect. Peruvian women, often viewed as submissive and influenced by macho culture; however, they were also engaged in jobs typically considered "tough" and traditionally attributed to men(Blouin et al., 2019).

c) **Discrimination:** The Venezuelan population in Peru faces significant discrimination. A

2019 survey by the Institute of Peruvian Studies indicated a negative attitude towards Venezuelan migrants, with 73% of Peruvians expressing opposition to migration. The primary reasons for this rejection were economic concerns, with 75% believing migrants take jobs from Peruvians, and security concerns, with 67% associating migration with increased crime (CIESS 2022).

Venezuelan women in Peru face significant discrimination based on both nationality and gender, leading to reduced employment prospects. This discrimination often results in hyper-sexualized stereotypes, affecting both cisgender and transgender women. They also face negative stereotypes, including accusations of "stealing husbands," being opportunistic, feeling superior, and lacking seriousness at work (Freier and Perez 2021). They are often labeled as dishonest and criminal, with the media perpetuating these stereotypes (Sanchez et al. 2020). Consequently, many are denied employment opportunities and resort to harmful coping mechanisms, such as transactional sex, which endangers their safety and dignity (Peru RMNA 2023).

LGBTQI+ Venezuelan migrants experience compounded challenges, including heightened vulnerability to discrimination and limited access to health services, and employment. This further marginalizes them and exacerbates their struggles in Peru(OIM - ONU Migracion 2020).

iii) Access to work and barriers to formal employment

As of May 2023, there are two types of documentation for foreign nationals in Peru:

- Humanitarian Residence Permit: Grants Venezuelan asylum seekers access to employment, education, and healthcare services.
- Temporary Stay Permit (Permiso Temporal de Permanencia- PTP): Provides access to employment, and education to other non-refugee immigrants.

Venezuelan migrants experience high job turnover as they seek better opportunities and working conditions. Gender disparities exist, with 73 percent of men holding up to three jobs and 69 percent of women remaining in the same job since arrival. Unemployed women take twice as long as men to secure employment (43%), and some Venezuelan women are lured into fake job interviews connected to sex work. The R4V Joint Needs Assessment 2022 revealed a gender pay gap among refugee and migrant populations, with women earning an average of 1,000 Peruvian soles per month, while men earned an average of 1,299 Peruvian soles per month (INEI PERU, ENPOVE Survey 2023).

iv) Integration and Recognition of Qualifications

According to a survey conducted by Equilibrium - CenDe 32 percent of Venezuelan migrants in Peru have completed university education. Among Venezuelan migrants, women outpace men, with 31 percent possessing university degrees compared to 20 percent of men (Equilibrium CenDE 2023).

Most of those having professional degrees (92 percent) brought their titles with them. However,

despite 94 percent of women and 90 percent of men having professional degrees accredited in Venezuela, only three percent have had their degrees officially recognized in Peru due to barriers in migratory regularization, stringent requirements, and financial constraints (INEI, 2019).

Even qualified migrants with necessary documentation face additional barriers to formal employment. Legislative Order 689 and Executive Order 014-92-TR allow companies to hire up to 20 percent foreign workers, with 30 percent of payroll allocated to them. Non-resident migrants face a 30 percent withholding tax on Peruvian income, hindering their integration into the formal economy.

v) Financial Inclusion and remittances

The primary driver of Venezuelan immigration is the country's economic crisis, which has led to a pressing need for employment opportunities and remittance sending. In Peru, between 68 to 74 percent of Venezuelan men and women engage in sending remittances, with women facing heightened risks of exploitation in the workplace when requesting these transactions.

Over 80 percent of Venezuelan migrants and refugees had prior experience with financial products in their home country. However, in Peru, the level of financial inclusion remains low, standing at only 14 percent, due to stringent requirements mandated by financial institutions (Licheri & Mejía, 2021).

vi) Housing and Shelter

Approximately 80 percent of Venezuelan migrants and refugees have settled in Lima, the preferred destination due to employment opportunities and government services. Most Venezuelans reside in the city's northern, working-class neighborhoods. However, there is a growing trend of Venezuelans moving to smaller coastal cities outside Lima, including the regions of Arequipa, Callao, Ica, Lambayeque, La Libertad, and Piura (USAID| Peru 2021).

To reduce the risk of evictions that during the pandemic rose to 50.3 percent and to avoid paying high rents there is a trend of Venezuelan refugees and migrants occupying areas more susceptible to disasters, opting for cheaper and informal settlements in the northern regions of the country (CIESS 2022). Twenty three percent of Venezuelan households lack consistent access to water through public networks (INEI, ENPOVE Survey 2022), 18 percent live in cold and unsanitary conditions, 12 percent lack mosquito nets, and 12 percent report living far away from health care facilities (HIAS, Rapid Needs Assessment for Climate Emergency, 2023).

vii) Nutrition-Food Security

Socio-political instability in several countries and the potential climate impacts of "El Niño Costero" conditions in 2023 -2024 are anticipated to further affect food production and regional food systems.FAO, Crop Prospects and Food Situation; Quarterly Global Report, No2 (July 2023),

Due to households' economic constraints in meeting their basic needs, refugees and migrants often resort to negative coping mechanisms, such as reducing the number of daily meals,

reducing food portions, buying lower quality foods, and begging. In Peru, for example, more than one third (39 percent) of refugees and migrants in-destination reported skipping meals and over half (51 percent) consumed a limited variety of foods. (INEI, ENPOVE 2022)

3.2.3. HEALTH SYSTEM RESPONSE

i) Health Insurance and Access to Healthcare

Peru's Integrated Health Insurance (Seguro Integrado de Salud - SIS) provides healthcare to migrants and refugees holding permanent residence status, but not to those with temporary stay permits (Permiso Temporal de Permanencia - PTP or holders of the Carnet de Permiso Temporal de Permanencia-CPP). Under the framework of the Legislative Decree No 1164 (Congreso de la República 2024), those covered by the subsidized regime of the Integrated Health Insurance (Seguro Integrado de Salud - SIS) offers free access to children under five (including immunizations and child care) and pregnant women regardless of their legal status, and others based on vulnerability criteria under the "Sistema de Focalización de Hogares"- SISFOH (Ven Informado 2023). There are five SIS insurance plans:

- **Free SIS:** for people in poverty or extreme poverty, pregnant mothers, children, firefighters, among other groups included by rule
- **SIS For All:** for people who do not have health insurance, regardless of their economic condition
- **Independent SIS:** for any citizen at a low cost
- **SIS for small business:** for owners of small business who wish to affiliate their workers and their beneficiaries; and
- **SIS Entrepreneur:** for independent workers who do not have employees under their supervision (such as hairdressers, dressmakers, gasfitters, etc.).

As of April 2024, the Budget Commision of the Congress approved the extension of coverage by the Integrated Health Insurance (SIS) to prevent and control HIV/AIDS and Tuberculosis in migrant and refugees, and the next step still pending is the modification of Legislative Decree No 1164 regulating access to SIS.

According to the Study of Living Conditions of Venezuelan Migrants in Peru (ENPOVE), 27 percent of Venezuelan refugees and migrants in Peru have some form of health insurance, while 73 percent do not. This marks a significant increase from 2018, when only 8 percent had health insurance. Additionally, between December 2022 and May 2023, there was a 6 percent increase in non-Peruvians affiliated with the Integrated Health Insurance (SIS), equating to 179,440 individuals (MINSA - "Asegurados extranjeros" 2023)**.**

Of those with health insurance, 20 percent are covered by the Integrated Health Insurance (SIS), 5.4 percent have EsSalud, and 1.6 percent have other private insurance (INEI - ENPOVE II 2022). The same source indicates that 24 percent of refugees and migrants from Venezuela reported needing medical attention in Peru. However 27 percent of them did not seek healthcare, 32

percent because of financial constraints and 19 percent because of lack of insurance (INEI - ENPOVE II 2022).

Despite the progress in increasing the population covered by SIS, the lack of access to healthcare for approximately 1,125,000 individuals poses a significant barrier to Global Health Security, as it hampers efforts to prevent, detect, and respond to illnesses. The health of migrants while in transit along their migration journey is a matter of collective concern and responsibility. Excluding them from health programs based on their migratory status goes against international human rights treaties and contradicts ethical standards in global public health practice. Therefore, it is essential to prioritize a coordinated initiative across regions to protect the health of both migrants and local populations. Efforts should focus on integrated disease surveillance, prompt response to outbreaks, and the provision of culturally and linguistically appropriate services to uphold human rights and freedom (Agudelo Higuita 2023).

Venezuelan pregnant women have better access to healthcare services through the SIS than other migrant women. However, some of them reported experiencing discrimination and xenophobia at health facilities, including refusals to provide information and care, and mistreatment as deterrents to seeking medical care (MINSA - Family Planning 2023).

Access to treatment for chronic diseases remains a significant unmet health need. While 28 percent of refugees and migrants from Venezuela report having a chronic disease, only 49 percent are receiving treatment (Action Against Hunger, and European Union 2021).

Mental health is emerging as a growing challenge, with the special screening exam for mental and behavioral disorders being the most frequent diagnostic procedure applied to refugees and migrants affiliated with the SIS in 2023. The absence of regular migratory status and formal income exacerbates psychosocial risks, with 66 percent of refugees and migrants in Lima and Tumbes reportedly experiencing depression, stress, and thoughts of suicide without receiving adequate psychosocial support (Centro de Atención Psicosocial, ACNUR, and AECID 2022).

Certain population groups, such as LGBTQI+ persons, face even greater risks, with approximately 7 out of 10 requiring access to consultations, assessment, and counseling related to mental health issues. Fifty-two percent of LGBTQI+ persons surveyed faced multiple barriers, including economic limitations, double discrimination for being part of the LGBTQI+ community and their nationality, and lack of knowledge about available healthcare services. From the GHS perspective are the invisible among the invisible. There is no official epidemiological data on the mental health of the LGBTQI+ migrant and refugee population, nor of the general population (LHSS 2023).

ii) Strain on health system/providers and supplies

Migrants' health depends on their pre-departure health status. While most migrants are healthy, those who are sick may carry chronic conditions or pathogens to new areas, increasing the risk of outbreaks. High influxes of migrants can strain the health systems of destination countries (Abubakar 2018). Strenuous circumstances such as the closing of borders or

pandemics can lead to overcrowded healthcare facilities, reducing access to medical care for both migrants and the local population, and heightened risk of disease transmission within healthcare settings (International Organization for Migration 2021).

Migrants belonging to vulnerable populations having limited access to healthcare may face barriers such as legal restrictions, financial constraints, discrimination, making them more susceptible to health issues and less likely to seek medical attention, leading to undiagnosed and untreated conditions, posing a public health risk (International Labour Organization 2019).Effective health monitoring and surveillance systems are essential to track and manage health issues among migrant populations. Migrants may move frequently and live in informal or transient conditions, complicating efforts to monitor their health and implement public health interventions (European Centre for Disease Prevention and Control 2020).

Moreover, there are issues of discrimination of Venezuelan migrants, particularly women that result in lack of trust. To address this Peruvian health services should embrace “discrimination free for migrants” policies to be able to improve health system outcomes with migrant populations.

iii) Epidemiological surveillance

Migrant flows can facilitate development and enrich nations but also pose global health risks by spreading infectious diseases across borders. Epidemiology and surveillance teams struggle with migrant populations due to unfamiliarity with their backgrounds and difficulty interpreting risk and exposure histories.

Venezuelan nationals present heightened challenges due to their forced migration from a country with failing systems, unmet basic needs, and a resurgence of infectious diseases and environmental threats. Disrupted public health programs have led to vaccine shortages and outbreaks of vaccine-preventable diseases, such as diphtheria (2016-2018) and measles (2017-2018), predominantly in Bolivar State (PAHO-Diphtheria 2018; PAHO - Measles 2018).

Despite previous malaria elimination efforts, reduced vector control and antimalarial drug shortages increased malaria cases from 136,402 in 2015 to over 319,765 in 2017, with Bolivar State accounting for 64% of cases (World Health Organization-Malaria 2017; PAHO-Malaria 2018). In 2016, an estimated 120,000 Venezuelans were living with HIV, with only 61% accessing antiretroviral therapy (UNAIDS 2022). The lack of prevention and treatment programs has exacerbated the spread of HIV and tuberculosis (TB), with shortages of medications, uncontrolled HIV, and widespread malnutrition contributing to increased TB cases (Parkin Daniels 2017; Semple 2018; Tuite et Al. 2018).

The unprecedented Venezuelan migration poses significant challenges for surveillance and response in Peru due to these factors.

- Massive influx of migrants at borders and entry points exceeds all capacities, existing or planned

- Health and surveillance teams at borders lack training, resources, and are overwhelmed, hindering effective screening and triage for detection and early containment
- Insufficient lab and rapid response teams at border entry points and the regional level
- Lab results from samples submitted to reference labs, often arrive late
- Migrants carrying low counts of known pathogens make detection challenging
- Migrants health will be invisible, until there is a mandate to record the country of origin, age, and gender
- Mobility situation causes delayed detection of outbreaks, requiring a review of protocols to adapt to this situation
- Exclusion of migrants from health services and insurance coverage
- Fragmented surveillance systems (SIS, EsSalud, private, and NGOs) complicate data sharing, making early response and coordination challenging during health crises
- Overburdened and underpaid healthcare workers contribute to underreporting and misreporting
- Lack of culturally competent, migrant-inclusive health services hampers engagement and trust, and difficulties in data gathering
- Lack of contact information complicates tracing migrants
- Shifts in priorities and funding can cause setbacks in surveillance efforts; and
- Investigating and controlling outbreaks in mobile populations requires additional strategies.

Peru needs to enhance its epidemiological and surveillance capabilities to manage mobile populations by modernizing disease surveillance and control systems.Support from bilateral and multilateral agencies is crucial for this effort (The World Bank, 2021).

iv) Infectious diseases and migration- Migrant carriers of diseases

Several infectious diseases that had been previously well controlled or eliminated in Venezuela have emerged as significant public health concerns as a result of the deterioration of the health services (Tuite, 2018). The diseases listed below were identified as the main events with exportation risk for Venezuelans, prior to the COVID-19 pandemic, and have been assessed within the context of Global Health Security to identify patterns and findings. In this analysis we used these diseases to characterize the status of the Venezuelan population and access to treatment.

Summary of key infectious diseases events in Venezuela with exportation risk

Disease	Description	Major driver(s)	Exported cases reported?	Source
Diphtheria	1086 confirmed cases (as of 21 April 2018);cases reported across entire country	Low vaccination coverage	Yes	Pan American Health Organization—13
Measles	2154 confirmed cases (as of 08 June 2018);outbreak concentrated in Bolivar state	Low vaccination coverage	Yes	Pan American Health Organization14

Malaria	319765 cases reported from 01 Jan to midOctober 2017; cases concentrated in Bolivar state	Lack of vector control; shortage of medicine	Yes	Pan American Health Organization—17
HIV	Approximately 6500 new cases in 2016;highest prevalence among the Warao indigenous population	Lack of testing and treatment	Yes (congenital cases reported in Colombia)	UNAIDS20; Daniels—21. New York Times—50

Source: Tuite et Al 2018

a) Measles

Measles is considered among the most contagious viral infections due to its high potential epidemic risk of transmission (Muscat and Mamou 2015), particularly affecting children and leading to severe health complications, including diarrhea, ear infections, blindness, pneumonia, and encephalitis. Common symptoms are high fever, runny nose, cough, red and watery eyes, white spots inside the cheeks, and a widespread rash. Serious cases, especially among malnourished individuals or those with inadequate healthcare, can result in death. The fatality rate can reach up to 10% (PAHO, 2024).

Before widespread vaccination initiatives in 1980, measles caused approximately 2.6 million deaths annually worldwide, including 12,000 in the Americas. Since 2002, measles has been considered eliminated from the Americas due to the absence of endemic transmission. This achievement was the result of regional efforts to maintain high vaccination coverage through regular immunization programs and large-scale vaccination campaigns. Despite being declared eliminated in the Americas in 2016, measles resurfaced in 2017 due to continued presence of the virus worldwide (Prieto Alvarado 2023), and the breakdown of the measles program in Venezuela. Until April 2019, the Pan American Health Office reported confirmed measles cases in 12 countries: Argentina, Bahamas, Brazil, Canada, Chile, Colombia, Costa Rica, United States, Mexico, Peru, Uruguay, and Venezuela. Additionally, nine countries reported cases imported from outside the region with different genotypes.

The lack of vaccines and an inadequate vaccination program in Venezuela led to a resurgence of vaccine-preventable diseases. Measles reemerged in 2017 with 2,154 confirmed cases by June 2018, resulting in 35 deaths, primarily in Bolivar and Delta Amacuro states.

In 2018 and 2019, Colombia and Brazil experienced measles outbreaks due to cases imported by Venezuelan migrants, despite having received measles-free certification in 2014 and 2016, respectively. In 2018, Colombia reported 7,185 suspected measles cases across all ages, with 208 (2.9%) confirmed cases, of which 140 were linked to Venezuelan cases. The nationality distribution of confirmed cases was 53.4% Colombian and 46.6% Venezuelan (PAHO - Measles 2018). Outbreaks occurred in departments along migrant routes to southern countries, leading to import-related cases and hospital transmission in Colombia. A portion of the migrant population did not report their vaccination status

or the occurrence of measles (INS - Sarampión 2019).

From January to November 2018, there were 2,801 confirmed measles cases in the Brazilian Amazonas, with indigenous populations near the Venezuelan border being highly vulnerable. The D8 lineage MVi/Hulu Langat.MYS/26.11 genotype, reported in outbreaks in Colombia and Brazil, was also found in Argentina, Chile, Ecuador, and Peru, and was linked to the epidemic in Venezuela and cases in Europe (Elidio GA. Measles Outbreak.2018; OPS. Actualización Sarampión 2020; NS - Sarampión 2019) This genotype accounted for 78% of measles cases worldwide in 2019 (Patel 2020).

The increase in travel and international trade, coupled with population migration from areas with low vaccination rates (below 95% coverage and less than two doses before age five), had elevated measles to a top public health priority. Consequently, under the International Health Regulations (IHR), National Liaison Centers had intensified efforts to detect, monitor, and control suspected and confirmed measles cases entering or leaving countries. This aimed to implement public health interventions to mitigate and reduce the risk of spread, especially in border areas (Loayza - Alarico 2019).

To prevent the spread of measles through migrating Venezuelans, Peru implemented several border control measures. These included closing borders, launching a large-scale Measles Vaccination Plan in border areas, and requiring proof of measles vaccination for unvaccinated individuals entering the country. The high demand for immunizations among Venezuelans entering Peru necessitated an increase in staff to extend immunization services (MINSA-Sarampion 2018).

In 2018, Peru confirmed 42 cases of measles, all of which were imported or import-related, with no deaths recorded, substantially less than the number of cases linked to Venezuelan migrants reported in Colombia and Brazil. Of these cases, 26 percent (11) were in children under one year of age. The confirmed cases were reported in Amazonas, Callao, Cusco, Ica, La Libertad, Lima, Piura, and Puno, with entry routes by land, air, and river. In 2019, one measles case was confirmed in Peru, involving a 40-year-old Peruvian woman from Spain who entered the country on March 21 (Loayza - Alarico 2019, #).

Peru's success in controlling vaccine-preventable disease outbreaks is due to comprehensive vaccination campaigns that ensure coverage for both first and second doses exceeds 95%, in line with PAHO's recommendations. These efforts include identifying and vaccinating at-risk populations such as healthcare workers and those in tourism and transportation, implementing plans to vaccinate migrant populations at high-traffic borders, and providing a rapid response to imported measles cases to prevent endemic transmission.

From a Global Health Security and migration perspective, the reintroduction of measles in the region highlights the importance of maintaining immunization coverage above the 95% threshold. This includes training and equipping local teams, establishing mandatory registration of the country of origin within sociodemographic data to identify if cases are

related to migrants, and increasing access to healthcare for migrants in situations of irregularity. Routine checks on immunization status are crucial, and migrants should be able to report health events without facing sanctions, in accordance with "good Samaritan" practices.

b) Malaria

According to the World Malaria Report 2023 (World Malaria Report. WHO.2023), malaria continues to be a significant global health issue. Malaria can be reintroduced in countries that have achieved sustained control and elimination through migrants from endemic regions. These countries may have reduced their diagnostic and surveillance efforts, making them vulnerable to the re-establishment of malaria (Ibraheem Nasir et Al.Prevention of re-establishment of malaria: historical perspective and future prospects. Malaria Journal. 2020).

Intensive malaria control efforts, including a national indoor residual spraying with DDT, reduced the number of cases and mortality rate in Venezuela from 164 deaths per 100,000 in 1936 to zero in 1962 (Griffing et Al.Malaria control and elimination, Venezuela, 1800s–1970s. Emerg Infect Dis 2014). A resurgence of malaria occurred, estimating 467,421 cases in 2019—a 1200 percent increase leads to increased exposure compared to 2000. (Gabaldon. Malaria in Venezuela. The Lancet Global Health 2021). Venezuela's incidence of 32·8 per 1000 people at risk is eight times higher than that of neighboring Brazil, comparable to that of Ethiopia (34 cases per 1000 people at risk) (Gabaldon et Al.2021.) Venezuela accounted for 73 percent of malaria deaths on the continent, with most cases caused by *Plasmodium vivax,* primarily originating from the Bolivar state. (Tuite et Al.2018; Epi Update Malaria in the Americas. PAHO.2018)

Malaria control efforts in Peru began in 1916, with various programs implemented intermittently. In 1998, 243,856 cases were reported (Ministry of Health, 1999). The most significant elimination initiative started in 1957, reducing malaria transmission by 86%. However, malaria resurged in the 1970s due to economic difficulties, leading to decreased operational personnel and inadequate intervention against outbreaks. Additionally, resistance to chloroquine in *P. falciparum* and DDT was detected. New funding mechanisms with the Global Fund facilitated the "Project for the Control of Malaria of Border Areas of the Andean countries - PAMAFRO" between 2006 and 2010. This project reduced malaria cases by nearly 80% in Loreto through dedicated funding and community involvement. Despite these efforts, malaria resurfaced in subsequent years.

In 2017, the Ministry of Health (MINSA) established malaria elimination as a health policy priority, launching the Zero Malaria Plan (PMC) in 2018 in Loreto, which accounted for over 90 percent of the country's malaria cases and 98 percent of P. falciparum cases. By 2020, the PMC had reduced cases by 75 percent in Loreto, preventing over 80,000 cases, particularly in indigenous Amazonian, remote, and border

populations. However, the COVID-19 pandemic disrupted control activities, threatening these achievements. There was an increase in cases in the Amazonas and Junin departments and persistent cases in 173 districts from 2018 to 2020.

The Tumbes region in northern Peru had been free from autochthonous malaria transmission, with only sporadic imported cases, until an outbreak in December 2018. This outbreak was linked to a cluster of imported cases among Venezuelan migrants traveling to Lima. Passive surveillance identified nineteen imported cases, with all patients reporting previous malaria infection in their country of origin, often with incomplete or no treatment (M Solis et Al.2022), potentially leading to medication resistance and increased disease transmission (MINSA).

Poor living conditions of Venezuelans in transit, coupled with high vector densities in malaria foci areas, were determinants in the outbreak. The local population lacked immunity against the malaria variant brought by migrants, increasing their susceptibility. During the outbreak, 14 locally acquired cases were recorded, with 64.3 percent symptomatic. This contrasts with Brazil, where 84% of cases were symptomatic (Silva Filho. 2018). A higher proportion of asymptomatic cases increases the risk of disease spread.

Venezuelan migrants might have arrived infected or acquired the disease while traveling through malaria-endemic regions in Colombia and Ecuador. In 2018, Colombia reported 63,143 malaria cases, with 49 percent attributed to *Plasmodium vivax* and 47 percent to *Plasmodium falciparum*, marking a 14 percent increase compared to 2017 (INS-Colombia. 2018).

Despite the alarming increase in malaria cases in Venezuela, Colombia, and Ecuador and the presence of Venezuelan migrants in Peru, it's concerning that febrile surveillance was not conducted among migrants in endemic areas. Instead, intervention measures began upon detection of the cluster. Surveillance and containment activities included house-to-house case identification using thick smear testing and active searches for febrile cases for prompt diagnosis and treatment.

Field activities were crucial for timely diagnosis and treatment, preventing an uncontrolled increase in case numbers. DIRESAS and GERESAS, especially those with significant Venezuelan migrant populations, should be on high alert, receiving early warnings based on environmental surveillance, including vector monitoring, temperature, humidity, and associated factors beyond the border.

Challenges such as decentralization and fragmentation of the health system, along with migrants denied healthcare or distrusting the system, result in uncoordinated health services and populations left behind, complicating malaria prevention and control efforts. Reduced malaria priority and funding have led to inadequate detection, lack of rapid tests, training, diagnostic supplies, and supervision, ineffective spraying programs,

and increased transmission risks.

Despite these challenges, GERESA managed to contain and control the outbreak among migrants, a notable achievement given the reduced prioritization of malaria and limited resources. Insufficient funding, medical supplies, and trained personnel hinder effective malaria control and treatment, affecting surveillance systems and delaying responses.

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It is of utmost importance to continue educating health personnel, migrants, and refugees about malaria. Open communication about health status and guidance on prevention and seeking medical attention are crucial. Health personnel require proper training and adequate resources for diagnostic, surveillance, and treatment activities. The changes in migratory patterns are reshaping global disease distribution, including the emergence of drug-resistant malaria. In 2022, 88 percent of Venezuelan migrants traveling through Darien originated from areas with chloroquine-resistant *P. falciparum* malaria (Agudelo Higuita et al., 2023).

c) HIV/AIDS

Thousands of Venezuelans infected with HIV migrate to other countries for treatment. Estimates from PAHO and the Venezuelan Ministry of Health indicate that approximately 110,000 people in Venezuela are living with HIV, of which only 76 percent (about 74,000) have been diagnosed. Among those diagnosed, only 77 percent (55,000) receive treatment, with 20 percent achieving an undetectable viral load. These figures fall short of the objective to ensure that 95 percent of those infected are aware of their status, 95 percent access treatment, and 95 percent achieve effective viral suppression (PAHO - HIV Migrants 2023).

Venezuelan migrants choose Peru because HIV treatment is free in public hospitals for those eligible. As of June 2022, the Local Systems Sustainability project estimated that 8,000 Venezuelan refugees and migrants in Peru are living with HIV/AIDS (LHHS 2022), and only 3,500 of them were receiving treatment (OIM - HIV 2024). The rate of HIV infection in the adult refugee and migrant population from Venezuela (1 percent) is about three times higher than that reported for the general population in Peru (0.3 – 0.4 per cent), according to an R4V partner's survey. (IOM, Biobehavioral survey among the Venezuelan migrant population living in Lima, Callao and Trujillo June 2023).

Haitians, like many others in the region, travel to other countries seeking a better future and treatment. Most HIV transmission among Haitians occurs through heterosexual sex,

with higher prevalence in major cities.

While the overall prevalence of HIV has remained stable in Haiti, women and key populations have higher rates. Among women aged 15-49, the HIV prevalence is 2.3%, compared to 1.5% for men. In 2017, 3,400 women aged 15 and over were newly infected with HIV, compared to 3,200 men. Higher HIV/AIDS prevalence rates are observed among gay men, sex workers, and prisoners (ABDGN.ORG- Together Forging Change n.d.). Haitian migrant flows are directed both north and south, with their presence noted in cities and border areas of Peru, where they interact with local populations.

In Peru, the HIV prevalence in the adult general population is around 0.4 percent. However, it is concentrated in vulnerable groups such as men who have sex with men (MSM) and transgender women, with prevalence rates of 10 percent and 30 percent, respectively. As noted in the Inclusive Development Chapter, higher HIV/AIDS rates have been observed in indigenous populations in northern Peru, particularly among the Awajun and Wampis.

HIV/AIDS population dynamics are complex, and migration is a significant factor. The presence of untested migrants with risky sexual behaviors who might be carriers of HIV and other STIs increases the risk of transmission. This risk is amplified when they interact with Peruvian men and women who may be attracted to them or share partners with them. From a health security perspective, this situation requires further research.

Access to healthcare services in Peru for HIV care is a significant issue among people living with HIV (PLHIV), including migrants, due to the presence of social determinants that hinder and delay the initiation of antiretroviral treatment, compounded by the stigma and discrimination. The SIS provides healthcare to migrants and refugees holding permanent residence status, but not to those with temporary stay permits (Permiso Temporal de Permanencia - PTP or holders of the Carnet de Permiso Temporal de Permanencia-CPP). As a result, migrants and refugees diagnosed with TB or HIV/AIDS can only access the SIS with permanent residency, unless they do so based on vulnerability criteria under the “Sistema de Focalización de Hogares”- SISFOH. Currently, there is a legislative proposal (PL 5253/2022-CR) aimed at temporarily and exceptionally affiliating this population until the issuance of the carnet de extranjeria. As mentioned above in the health insurance for migrants and access to healthcare services, a first step has been achieved towards the extension of coverage to those with HIV/AIDS and Tuberculosis, but further efforts are still needed to make the necessary adjustments to Legislative Decree No 1164.

Reflecting on foreign experiences: The Impact of Removing the Immigration Ban on HIV-Infected Persons in the United States (Winston and Beckwith 2011)

The immigration ban on HIV-infected individuals, in place for 22 years in the United States, was lifted on January 4, 2010, eliminating mandatory HIV testing from immigration examinations. The ban, introduced in the 1980s, had been based on fears of foreigners taking American jobs and becoming a burden on the health and welfare systems, and it was mistakenly accepted as a public health measure to prevent HIV transmission.

The ban had ignored the modes of HIV transmission, the existing HIV epidemic within the U.S., and the financial requirements for immigrants (every person entering into the U.S. shall provide proof of means of subsistence). Its removal promoted safer travel, simplified family reunification, combated stigma, and aligned U.S. policies with global efforts to fight HIV/AIDS.

However, it also raised concerns about reduced HIV testing among foreign-born populations, contrasting with CDC recommendations for routine opt-out HIV testing. Sub-Saharan Africa for example carries the highest global burden of HIV, with limited access to prevention services, cultural norms, gender inequalities, and high prevalence rates within certain communities contributing to the increased risk among individuals from this region. In 2019, sub-Saharan Africa accounted for approximately 67% of all people living with HIV globally (UNAIDS). For example, Eswatini (formerly Swaziland) has an adult HIV prevalence rate of about 27.3%. These specific challenges should be considered by decision-makers when developing targeted interventions and testing strategies.

The lifting of the ban has been a call to action for healthcare providers and advocates to strengthen alliances with immigrant communities. This included designing culturally relevant interventions for prevention, testing, and care linkage, supporting community-based education using peer educators, integrating outreach programs into cultural events, and focusing on heterosexual and female transmission education. Increased testing opportunities and culturally sensitive counseling have been crucial. Providers need to understand the specific risk factors and cultural perspectives of local immigrant communities to ensure that the change in HIV immigration policy benefited this at-risk population.

v) Continuum of care

The primary goal of HIV treatment is to achieve viral suppression, meaning the virus is very low or undetectable in the body. This helps individuals with HIV stay healthy, improve their quality of life, live longer, and reduce the risk of transmitting HIV to others. The HIV continuum of care

includes the following steps: i) receiving an HIV diagnosis; ii) linking to care within 30 days after a positive diagnosis; iii) receiving ongoing medical care for HIV; iv) achieving a very low viral load (National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC. 2023)

The continuum of care for Venezuelan and Haitian migrants in the region is disrupted. Many migrants did not receive adequate treatment in their home countries due to weak programs, lack of medicines, and insufficient testing. This leads to high viral loads, increased transmission risks, and reduced life expectancy and quality of life for those living with HIV/AIDS.

Although some migrants seek better treatment, many are unaware of available HIV services and may encounter different treatment protocols in new countries. This disruption can cause antiretroviral therapy (ART) failure and viral resistance. By the end of 2022, only 29.8% of migrants worldwide were receiving ART, and 21 out of 30 national drug resistance surveys reported pretreatment HIV drug resistance to nevirapine (NVP) or efavirenz (EFV) above 10% (Migration, Human Mobility & HIV Access To Prevention And Care. IOM. 2012).

A regional cross-border partnership is essential to harmonize treatment protocols and ensure access to HIV treatment without requiring documents. This would facilitate uninterrupted care for migrants and improve health outcomes.

3.3. RECOMMENDATIONS

D.1. PREVENT

P1.1 LEGAL INSTRUMENTS

- Share information with authorities and legislators about the consequences of abrupt policy changes as a driver of augmented migration, its impact on health security, and design adaptive mechanisms to strengthen health sector capacities to adequately manage increased migrant flows and prevent humanitarian crises.
- Present information showing stakeholders and legislators the importance from the Global Health Security perspective of providing extended access to health care to migrants not covered by SIS carrying infectious diseases such as HIV/AIDS and TB to ensure the continuum of care.
- Support the modification of Legislative Decree No 1164 (promoted by congressmen Jose Jerri and Susel Paredes) aimed at affiliating Migrants and refugees with HIV/AIDS and TB to SIS temporarily and exceptionally until the issuance of the “carnet de extranjeria”.
- Work with the Andean Organism of Health on a resolution to advance the harmonization of therapies and access to testing and treatment for infectious diseases, including but not limited to HIV/AIDS, and Tuberculosis.
- Promote the review of barriers to economic migrant integration by legislators towards their removal to facilitate economic integration and reduce dependency on the state.

P1.2. GENDER EQUITY

- Promote the concept of “Healthcare Facilities Discrimination Free” against Venezuelan women and LGBTQI+ to regain trust and improve health system outcomes with migrant populations.

P2. FINANCING:

- Propose a collaborative effort with the Congress's Budget Committee to develop a more extensive GHS modification of the SIS on migration. This modification would extend coverage to basic programs (e.g., immunizations for all ages, mental health, all diseases of immediate notification, and non-communicable diseases), ensuring a more inclusive healthcare system.
- Remind regional and local authorities to include migrant populations in their plans.

P3. IHR COORDINATION, NATIONAL IHR FOCAL POINT:

- Keep track of and evaluate public health hazards within the country, including those linked to migration, and promote binational coordination especially during humanitarian emergencies working with PAHO.
- Facilitate increased cross cultural and regional awareness of diseases by national and local teams, and the incorporation of these variables in the analysis of migrants' health.

P4. ANTIMICROBIAL RESISTANCE:

- Promote the monitoring of the status of MDR-TB and a survey to assess the presence of HIV/AIDS ARV resistance in vulnerable populations, including refugees and migrants, and share information with the IHR coordination.

P5. ZOONOTIC DISEASE:

- Identify zoonotic diseases present in the Andean and Central American corridors, and assess the risk of transmission to migrants.
- Raise awareness of zoonotic diseases that are common in Venezuela and the corridors.

P6. FOOD SAFETY:

- Keep surveillance to foodborne diseases in migrant populations
- Assess food insecurity in migrants.

P7. BIOSAFETY AND BIOSECURITY:

- Ensure biosafety and biosecurity for Health workers assessing health status and immunizing migrants at entry points, and to those implementing public health programs by training them on biosafety and biosecurity and providing them with Personal Protection Equipments.

P8. IMMUNIZATION:

- Monitor immunization coverage of migrant population at entry points.
- Ensure migrants have access to vaccines similarly to Peruvians.

- Design immunization strategies for migrants particularly during outbreaks of immune preventable diseases.
- Engage Venezuelan community leaders to increase immunization coverage in migrant populations and track families with children in irregular situations

D.2. DETECT

D1. NATIONAL LABORATORY SYSTEM:

- Strengthen border laboratories capacities to do testing in real time.
- Assess the possibility of mobile solutions that could be transferred to other borders
- Support access to point-of-care tests by Venezuelan community health workers to reach migrant populations in irregular situations.

D2. SURVEILLANCE:

- Make mandatory the registration of socio-demographic information on country of origin, and gender to make migrants, and LGBTQI+ migrants visible (e.gVenezuelan women, trans-women are discriminated against when they attend healthcare facilities, and as a result they opt not to seek care, even they may be carriers of infectious diseases).
- Prepare brief documents for stakeholders and decision makers about the impacts of lacking information on migrants
- Review with surveillance teams strategies to work with populations in mobility situations.
- Work with the Health SuperIntendency- SUSALUD to ensure private sector providers and social security are reporting on migrants health.
- Train epidemiologists, rapid response teams members, and analysts on Social Determinants of Health, migrant health, sociocultural, and environmental aspects to facilitate their understanding and interpretation of migrants health.

D3. HUMAN RESOURCES:

- Create a division specialized in migrant health that is responsible for improving program indicators in these populations.
- Advocate for the implementation of policies that foster migrant-friendly and discrimination-free healthcare facilities. This is crucial as it can help build trust and encourage healthcare-seeking behavior among the affected population.
- Expedite the recognition of migrant titles by thoroughly reviewing existing mechanisms and procedures. This is a pressing need as it can pave the way for their swift integration into the public health workforce, bolstering public health efforts.
- Promote the hiring of authorized Venezuelan migrants and refugees as community health workers or local researchers, as they may know better people and natural behaviors.
- Promote Global Health Security and One Health literacy, including climate, environmental, infectious diseases, and inclusive development awareness campaigns for

migrant communicators and teachers.
- Implement a lifecycle approach, starting with inspiring migrant girls, boys, and young people to pursue STEAM careers related to GHS and One Health.

D.3. RESPOND

R1. HEALTH EMERGENCY MANAGEMENT:

- Review the continuity of operations and multi-hazard plans against all threats, particularly in geographic areas with a high concentration of migrants where health services and social protection programs are weak, seeking alternatives of care for future pandemics.
- Work with PAHO and MINSA in the development of health emergency management plans and projects to address migrant emergencies.

R3. HEALTH SERVICES PROVISION: services.

- Review strategies to facilitate migrants' and refugees' access to healthcare during Global Health Security emergencies.
- Raise awareness about discrimination at Health facilities and support a campaign to identify the most “Migrant Friendly Health Facility”. A friendly health facility can detect cases of EIDs circulating among this population.

R4. INFECTION PREVENTION AND CONTROL:

- As part of integrating migrants into SIS, seek to provide infection screening programs, catch-up vaccinations, and the distribution of hygiene and water disinfection utensils and condoms.
- Engage migrants in local prevention community activities (e.g., cleaning and covering water recipients against Arbovirus, COVID-19 vaccine immunizations)

R5. RISK COMMUNICATION AND COMMUNITY ENGAGEMENT:

- Promote Social and Behavioral Change strategies to elevate hygiene practices, biosafety measures, and the recognition of signs and symptoms of prevalent emerging infectious diseases among migrant populations living in at-risk areas, including migrants.
- Prepare communication materials the on prevention and control of EIDs
- Ensure the messages are culturally appropriate and use language and designs appealing to migrants.
- Engage Venezuelan community leaders in health promotion
- Support Venezuelan migrants committed to Global Health Security and One Health as champions. Promote their participation in project activities, and the sharing of their information through migrant social media channels.
- Supporting training and diversified education for journalists, editors, and communication agents on GH and One Health through the lenses of intersectionality and vulnerability.

Include content on discrimination against migrants and seek support for the campaign

IHR RELATED HIHR RELATED HAZARDS AND POINTS OF ENTRY AND BORDER HEALTH

PoE: POINTS OF ENTRY AND BORDER HEALTH:

- Work with the National Council for Border Development and Border Integration (Conadif) to include aspects pertaining to GHS and migration in the agenda.
- Engage the Ministry of Health's responsible for Points of Entry and conduct visits to validate border security and points of entry preparedness from the perspective of GHS.

CHAPTER 4: PRIVATE SECTOR

4.1. CONSIDERATIONS

This chapter delves into the positives and negative effects of the private sector, from the perspective of Health Security, with a One Health approach.

When we think about the private sector and GHS, we should consider:

Health-related private sector

- Healthcare delivery: Private sector participation- key for expanding coverage in cities
  - Private healthcare delivery
  - Private pharmacies, making medicines more accessible
  - Quality of care
- Private sector and the COVID-19 Pandemic
- Health sector Regulatory Agencies oversight for maintaining the quality and affordability of private health sector services and products: A challenging scenario
- Private sector data sharing and surveillance (healthcare and labs)
- Supply chain and transportation (oxygen, medical industry, vaccines, PPE, and diagnostic tools)
- Innovation and technology early adoption (telemedicine, diagnostics, tests, vaccines)

Non-health-related private sector

- Productive and infrastructure sectors: Benefits and impacts
  - Mining, gas, & oil
  - Tourism: a sector willing to invest in health security after the pandemic- an opportunity for public-private partnerships
  - Agriculture and deforestation: Palm oil cultivation
  - Development of large infrastructure

- Regulations compliance
  - Environmental impact regulations
- Modalities of participation of the private sector in Peru
  - Private sector financing- PROINVERSION
  - Public-private partnerships
  - Corporate Social Responsibility
- Ethics and Corruption

Business associations

- **Business associations against HIV**
- **Private sector businesses resilience to the COVID-19 pandemic**
  - Donations of goods and services
  - Innovation and development
  - Digital solutions-Apps

Challenges to One Health and the Private Sector

- Zoonotic diseases and antimicrobial usage
    - Livestock and poultry farms: Bat rabies, high pathogenic Avian Influenza, and brucellosis
    - Antimicrobial unreported usage

The private sector's impacts in health, both beneficial and detrimental, are vast. In this analysis, we are not providing a comprehensive classification of these effects, nor aligning them with various disciplines. Instead, our aim is to digest and present some of the impacts that we believe are most closely related to global health security and one health, providing you with a clear understanding of these key areas.

As part of the analysis, we provide a set of examples of the private sector relations with GHS based on the review of the literature and what was observed in recent health events in Peru:

- Antimicrobial unreported usage
- Zoonotic diseases in livestock and poultry farms

4.2. KEY FINDINGS

4.2.1. THE PRIVATE SECTOR

The private sector is usually defined as organizations and entities that are not part of any governmental structure. The private sector differs between countries, ranging from single owned businesses- individuals to global corporations. It includes for-profit and not-for-profit organizations, formal and information structures, commerce, and industry. Private sector organizations play a key role in providing goods, services, and technical expertise that can complement effective preparedness and response (FEMA 2020).

The private sector creates nine out of ten jobs in the developing world, and is also a leader in innovations, delivers specific goods and services, helps develop industries or technologies, enables the functioning of a diverse group of businesses, and adds to the national income; representing 90% of financial flows into emerging markets. (Rodriguez 2019).

Health operations require resources to include all leaving no one behind, however, resources are limited, that is when the private sector comes in. USAID works with partner countries - as well as global, regional, and local public and private sector organizations - to help strengthen the systems needed to prevent and mitigate the increasing occurrence and severity of emerging infectious disease threats (USAID - Global Health Security, n.d.).

The World Health Organization (WHO) has identified six building blocks for robust, people-centered health systems. Private companies are making tangible, high-impact contributions to each of these building blocks to strengthen health systems in low and

middle-income countries like Peru. The challenge now lies in maintaining active collaboration, expanding the private sector's understanding of Global Health Security, and identifying priority areas where their collaboration would be valuable in the long term.

Private sector engagement in global health started by supporting the fight against malaria and HIV/AIDS. Early private sector initiatives such as social marketing applied marketing principles to social goals and were employed in various contexts, from safe water interventions against the cholera pandemic to seat belt campaigns (Salama and Jakab. 2020.) Private sector engagement is "ad hoc and opportunistic", specific for each one of the actors in response to country needs, and global health priorities (Kabwama et al.2022.) For example, private sector alcohol beverage companies engaged in HIV prevention and response promoting responsible drinking and addressing global health issues in Sub-Saharan Africa where nearly 26 million were positive to HIV, by training staff in prevention, promoting voluntary testing, and providing access to treatment for employees and their families (UNAIDS 2015; (USAID - PEPFAR 2016).

For analysis the private sector is divided into:

- Private health sector
- Non-health related private sector

4.2.2. THE PRIVATE HEALTH SECTOR IN PERU

i) Healthcare delivery: Private sector participation key for expanding coverage in urban areas

The 1990s marked significant economic reforms, including privatization aimed at reducing public sector inefficiencies and fostering private sector participation in healthcare. The Peruvian health sector has since transformed, with private entities playing a pivotal role in expanding coverage and improving health outcomes. These contributions include private healthcare providers, privately owned health facilities, labs, and pharmacies; insurance companies, and pharmaceutical companies enhancing healthcare accessibility and quality (1997 Social Security Modernization Law No 26790).

Economic liberalization encouraged private investments in health services, leading to a rise in private healthcare facilities and providers. As a result, the healthcare system in Peru includes a significant role for the private sector, which comprises for-profit providers such as Health Provider Entities (EPS (companies that provide private health services to affiliated workers who pay a premium over their social security contributions). Private insurers offer specialized and non-specialized services provided by private medical practices, clinics, diagnostic services, pharmacies, and logistical support. Additionally, informal private providers, including traditional medicine practitioners in Indigenous communities, contribute to the healthcare landscape (Alcalde-Rabanal et al. 2011).

Since the 1990s, the number of private hospitals and clinics in Peru has significantly increased. By 2021, there were 24,838 registered healthcare providers in the National Register of Providers

(RENIPRESS) of the National Health Superintendency. Of these, 8,800 belonged to the public sector (36%), 381 to EsSalud (1.5%), and 9,820 to the private sector (40.9%); in addition to 5,179 unclassified providers, with 95% of them being private, the total number of private sector providers reaches 14,740, 62% of all health service providers in Peru. This expansion has enabled this sector to play a crucial role in addressing gaps left by public healthcare, especially in urban areas (Renipress 2021; Cámara de Empresarios Privados del Peru 2021).

Private hospitals in Peru often provide better-equipped and higher-quality care, attracting middle and upper-income populations who can afford private insurance or out-of-pocket payments. In contrast, the public sector serves the poor and those lacking insurance that are eligible in urban, and rural areas through primary care centers, medical centers, and second-level hospitals, which have fewer facilities and personnel. According to MINSA, 77.8 percent of primary healthcare services nationwide suffer from inadequate installed capacity, reflected in precarious infrastructure, obsolete equipment, and insufficient or inoperative healthcare facilities (MINSA 2023).

Private healthcare providers have introduced top technology and specialized services previously non-available nationwide nonexistent in the public sector, such as advanced diagnostics, specialized procedures, and comprehensive maternal and child health services, improving health outcomes but increasing disparities with public services (Carrillo-Larco 2022).

Private health insurance companies have expanded healthcare coverage by providing alternatives to SIS, particularly for formal employees and higher-income groups. The growth of private insurance has increased competition, improving service quality and efficiency in both private and public sectors. Private insurers have also developed microinsurance schemes targeting low-income groups, contributing to increased healthcare coverage (Proyecto BID 2015).

The private pharmaceutical sector has enhanced access to medications, with multinational companies and local manufacturers. Private sector involvement in research and development has been pivotal, with pharmaceutical companies investing in new drugs and treatments, addressing both common and rare diseases, and improving public health (Barazorda-Ccahuana 2023).

Despite substantial advancement towards the goals of universal healthcare with private sector contributions in Peru, ethical concerns remain, including: i) equity in access, as disparities in healthcare access between socioeconomic groups, with low-income populations struggling to afford private services persist, exacerbating inequalities (Alcalde-Rabanal et al. 2011; Carrillo-Larco 2022); ii) high fees for COVID-19 services and price gouging for medical supplies, undermining the ethical responsibility of healthcare providers to prioritize patient care over profit (Human Rights Watch 2021); and iii) Lack of transparency and accountability in private sector operations, particularly regarding pricing and resource allocation, in association with authorities erodes public trust. Ensuring accountability for quality care remains a challenge (Transparency International 2021).

The private health sector is essential for extending coverage and addressing emerging and re-emerging diseases due to its widespread presence and service reach. Peru should integrate the private sector into its preparedness and response processes to enhance Global Health Security capacities.

ii) Private sector healthcare delivery and the COVID-19 Pandemic

During the pandemic, low-income urban households in Peru faced heightened risk and vulnerability, while the response prioritized hospitals and Intensive Care Units, with substantial budgets for equipment and supplies (Villar, Francke, and Loewenson 2024). Approximately 10-20% of Peruvians lacked access to healthcare, with significant disparities across cities, provinces, and between urban and rural areas (Hart 2021). The 2022 National Household Survey (ENAHO) reported that 70 percent of individuals needing medical care did not receive it, primarily due to delays (35 percent), distance (13 percent), and lack of insurance (3 percent) (Aguirre 2023).

Weak regulatory capacities of SUSALUD allowed private clinics and pharmacies to increase medicine and service costs, adversely affecting low-income urban residents. This led to impoverishment due to expensive private care or the need for home care (Durand et al., 2020; Villar et al., 2024).

These service inequalities contributed to declining satisfaction with public services and the perception that only the wealthy could access adequate care (Único, 2021). Limited testing and lab investments by the public sector hindered outbreak management, while later involvement of the private sector in testing and vaccination, often at high costs, provided access but eroded trust due to the lack of protection of public interest and mismanagement of public funds by authorities (Angulo et al., 2021 and Villar, Francke, and Loewenson 2024).

Deficiencies in public health facilities exacerbated poor health outcomes. Public facilities frequently lacked medicinal oxygen for severe cases, with large private companies dominating the supply chain. Public procurement processes were slow and unstable, limiting oxygen availability. In the first half of 2021, long queues formed as patients' relatives struggled to purchase expensive oxygen for home care, while overcrowded hospital corridors highlighted the dire situation(Comercio, 2021).

The COVID-19 pandemic highlighted private sector operations during a major Global Health Security event. Although private sector support was crucial for health gains, improvements are needed to prevent additional challenges in future pandemics, particularly by enhancing health regulations to facilitate universal healthcare access, and strengthening weak links of the private sector as supplier of essential services such as tests, vaccines, medicines and oxygen.

iii) Health Sector Regulatory Agencies: Crucial for ensuring safety, quality, and affordability

Health regulatory agencies are essential for overseeing healthcare providers, pharmaceuticals,

and medical devices, conducting public health surveillance, and managing health crises. Strengthening their capacity is a must for enhancing health security and ensuring population well-being.

The Ministry of Health (MINSA) and regulatory bodies such as SuSalud, DIGEMID, and DIGESA encounter challenges due to low budget allocations, poor financial management, limited capacity, and reported unethical practices, resulting in a shortage of healthcare resources and an inability to fulfill legal mandates (Tarazona n.d.).

Inadequate regulation of cost escalation in private healthcare has left many individuals with significant healthcare needs unable to access preventive services, forcing them to bear the burden of expensive private care or resort to home-based care solutions (Gianella et al., 2021; Villar et al., 2024). This led to decreased public satisfaction with public services and the perception that only the wealthy could access adequate care (Único, 2021).

Moreover, insufficient public sector investment in primary healthcare resulted in low testing levels during the initial waves of the pandemic. Consequently, the private sector assumed testing and vaccination responsibilities, charging high costs for rapid antigen tests, which led to scandals involving the misuse of public funds (Angulo et al., 2021; Villar et al., 2024).

Finally, the regulatory system failed to manage the risks associated with relying on a few private suppliers for essential items like medicinal oxygen, coupled with a lack of stock control mechanisms and limited public alternatives, left thousands of severe COVID-19 patients struggling for oxygen. In early 2021, long 24-hour queues formed as patients' relatives attempted to purchase overpriced oxygen for informal home care due to the collapse of the hospital system, representing a significant denial of human rights (Comercio, 2021).

Although the private sector eventually collaborated on solutions with international partners, including USAID, such situations should be managed under Global Health Security frameworks, particularly the IHR. This involves learning from past lessons and strengthening regulatory and legislative frameworks.

iii) Private sector surveillance data (healthcare and lab) integration into the national platforms

Disease surveillance is key for Health Security, to detect, respond and control EIDs outbreaks. While private health facilities play a significant role in healthcare delivery in low and middle-income countries, their chronic underreporting in disease surveillance can lead to underestimated cases and undetected disease pockets.

In Nigeria, only 40 percent of private health facilities comply with routine disease surveillance reporting, with compliance rates ranging from 17 percent to 60 percent across six states (Olusesan Ayodeji, 2020). A study in Taiwan found 83 percent (340/406) of private sector providers complied with reporting, with common reasons for non-compliance including patient privacy concerns (32.8 percent), cumbersome reporting procedures (31.1 percent), and

uncertainty about reportable diseases (29.5 percent) (Hsiu-Fen Tan, 2009).

The Peruvian health system faces significant challenges in disease surveillance, including issues with reporting, data integration across multiple systems including the private sector, ensuring data quality, and timely data analysis. Health system governance is managed by the Ministry of Health (MINSA), which delegates responsibilities to Regional Health Directorates (DIRESAS) and Specialized Health Directorates (GERESAS) across different regions. MINSA's regulatory roles require close oversight and coordination with both public and private entities within the National Health System. However, fragmentation complicates collaborative efforts across various subsectors, government levels, and geographic areas (Redes, 2020).

As of May 2021, 41 percent of laboratories authorized for molecular diagnostics were private, 39 percent were public, and 9.4 percent belonged to EsSalud (MINSA.Tiempos Pandemia.2021). In its attempt to consolidate an Integrated Health Information Management System, MINSA collected the private sector information under SUSALUD, enforcing the Universal Health Insurance Law No 29344. Under this Law, SUSALUD collects data through the Electronic Information Transfer System for Health Establishments (SETI IPRESS), covering health resources, outpatient consultations, emergencies, hospitalizations, births, epidemiological surveillance events, and surgical procedures. Healthcare facilities are required to submit this data to SUSALUD, with penalties for incorrect data submission. While substantial data is published monthly on an open data portal, it is not adequately analyzed or integrated into sector policies (Sistemas de gestión. The World Bank Group. 2023). However, despite SUSALUD's efforts, reporting coverage remains low, particularly among regional government facilities, with reporting rates at 50 percent for EsSalud services, 23 percent for MINSA/GORE establishments, and only 2 percent for private sector facilities(Sistemas de gestión. The World Bank Group. 2023).

During the pandemic, efforts to integrate data included the development of an application to consolidate and monitor COVID-19 patient data at the central level, integrating various systems. This application consolidated data from screening, diagnostic tests, epidemiology (NotiWeb and F200 from SISCOVID), laboratory tests (Netlab and F100 from SISCOVID), clinical follow-up, and deaths (SINADEF). These efforts highlighted crucial gaps in integrating information systems into an effective Integrated Health Information System (Sistemas de gestión. The World Bank Group. 2023).

The effective integration of private sector information in surveillance is a must from the Health Security perspective, particularly in Peru, where over 60 percent of its providers and 40 percent of its labs belong to the private sector.

iv) Supply chain

Supply chains are integral to global health security and health system strengthening. They ensure the timely and efficient delivery of medical supplies, equipment, and medications essential for preventing, detecting, and responding to health threats.

Supply chains define the cost and accessibility of medicines and supplies. A well-functioning health supply chain provides broad geographic access to affordable, high-quality products and operates with efficiency, adaptability, and financial integrity. In pre-pandemic conditions, product availability at retail pharmacies in OECD countries was over 95%, while in low- and middle-income countries, it was roughly 38% in public health facilities and under 60% in private outlets (European Pharmaceutical Wholesaler Industry, 2006; WHO/HAI, 2008).

The COVID-19 pandemic underscored the humanitarian logistics needs in Latin America. Despite robust logistics capacities, national stakeholders identified a lack of coordination, limited knowledge about international humanitarian mechanisms, and interagency collaborations as significant challenges (Logistic Cluster WFP, 2023).

Peru, one of the hardest-hit countries, struggled to supply medicines for regular programs and urgent life-saving supplies like oxygen, personnel protection equipment (PPE), and vaccines (Herrera-Añazco et al., 2021). This highlighted the difficulty in maintaining health services continuity and last-mile distribution during a crisis (Foreign Policy Solutions - Conference on Supply Chain, 2021).

Before the pandemic, Peru had oxygen-generating plants using iso tanks or cryogenic tanks supplied by a few companies like Linde Peru and Air Products (an oligopoly). During the second wave of COVID-19, Peru required 170 tons per day, while production was 34.6 tons (Min. Defense), leading to oxygen shortages and deaths in Huaraz, Caraz, Yungay, Huancavelica, Huanuco, and Lima. The increased need for high-flow oxygen therapy significantly raised demand leading to the loss of over 20,000 deaths by August 2020 (Comisión de Seguimiento a la Emergencia y Gestión de Riesgo de Desastres COVID-19 2020).

To address the crisis, agreements were made between MINSA and the National University of Engineering to acquire and install 47 oxygen plants, which faced implementation delays. Mining and oil companies, including Chinalco, Minsur, Southern Copper, and Gold Fields, donated oxygen plants to the health sector, but some of these also experienced delays due to bureaucracy. The demand surge prompted the mapping of oxygen plants and special tanks nationwide and the establishment of needs assessments to identify stock levels and availability (Comisión de Seguimiento a la Emergencia y Gestión de Riesgo de Desastres COVID-19 2020; El Comercio 2021).

Health supply chains face challenges including limited geographic reach, unreliable forecasting, insufficient warehousing and distribution scale, and poor access to financing. Antiquated systems often fail to handle the increasing volume and complexity of medical supplies. Private sector investment can enhance supply chain efficiency, expanding access for underserved populations.

A resilient health system requires a strong supply chain to ensure the availability of preventive measures, detection technologies, and essential medical supplies. Effective supply chain

management involves collaboration among government agencies, private sector entities, and international partners, ensuring efficient resource allocation and alignment with international health regulations (World Health Organization, 2021).

Ethical practices in procurement, management, and distribution prevent issues like hoarding and inequitable access. Regulatory oversight and transparent supply chain management uphold ethical standards and build public trust (Transparency International, 2020).

USAID, in partnership with Peru's Ministry of Health (MINSA) and the private sector, has supported relations with manufacturers, negotiated prices, prioritized intervention areas, and improved last-mile distribution of vaccines in a strategic partnership with Coca Cola. USAID Global Health Supply Chain Program (USAID 2020) provides technical assistance to strengthen supply chains in over 70 countries by maintaining stock levels, expanding quality supplier bases, engaging with universities to build supply chain workforce, and developing information systems to prevent stock-outs. Collaborations with private sector partners, such as Coca Cola and the Bill and Melinda Gates Foundation, have enhanced supply chain systems in African countries and could support further improvements in Peru.

v) Innovation and technology early adoption (telemedicine, diagnostics, tests, vaccines)

Innovation and early technology adoption relate to global health security because it involves enhanced disease surveillance and response. During the COVID-19 pandemic, the private sector made a considerable effort to develop the SARS-CoV-2 Rapid Antigen test, which was rapidly adopted as point-of-care testing (POCT), allowing for rapid diagnosis in urban and remote and underserved areas, allowing Peruvian authorities to have a more accurate perspective of the pandemic impact, with the private sector as an essential implementor during the collapse of the public system. Another example of POCT introduced in Peru is the OptiMAL-IT rapid test to promptly and accurately diagnose malaria and prevent morbidity and mortality (Arróspide et al., 2022).

Another example of innovation is the use of telemedicine. Peru began using telemedicine to support Universal Health Coverage and access in rural areas with low workforce numbers before the pandemic. By 2020, this early deployment enabled a rapid and comprehensive expansion, indicating that telemedicine was viewed more as an emergency measure during the pandemic rather than a permanent change to health service provision. The review of telemedicine suggests (i) that Peru's preparedness in terms of telemedicine policy and regulation helped expand telemedicine at a time of necessity rapidly and (ii) that due to this investment and with a better understanding, Peru now has a short-run window of opportunity for the Peruvian Government to continue its regulatory development and investment further to deploy telemedicine services as a UHC improvement measure and to better align the health system to the country's health needs (Rees and Peralta 2024).

Moreover, the global success of mRNA vaccines against COVID-19 highlights the potential for rapid vaccine development in response to emerging infectious diseases. Peru's participation in

global vaccine trials underscores its commitment to early adoption of innovative technologies. Four out of 130 vaccines that reached the clinical evaluation phase were introduced in Peru, considering the results of international studies, including Pfizer, Johnson & Johnson, AstraZeneca, and Sinopharm (Viper Group 2022). However, the rapid development of potential vaccines led to mistrust and concern about their quality and safety among the population, creating barriers to participation in vaccine clinical trials. This is something to consider for future pandemics (De Los Ríos Pinto et al., 2022).

On digital solutions, Peru's private sector, government, and academia collaborated to promote digital solutions against COVID-19, including a prevention app, an information chatbot, and internet services for hospitals attending COVID-19 patients (for more information on digital solutions, please refer to the section on "Non-Health Private Sector - Private Sector Resilience to the Pandemic").

4.2.3. NON-HEALTH RELATED PRIVATE SECTOR

The non-health related private sector has been a driving force behind Peru's robust economic growth, making it one of the strongest in Latin America over the past decade. It plays a crucial role in the country's economic development and growth, encompassing a wide range of industries including mining, agriculture, manufacturing, services, and technology. Despite the progress, the sector faces challenges such as political instability, regulatory uncertainty, and social conflicts related to mining projects.

From an economic and development perspective, the primary sectors in Peru are:

- Mining is a cornerstone of Peru's economy, making a significant contribution to GDP and exports. Peru is a leading producer of copper, gold, silver, and zinc, attracting substantial foreign investment, with multinational companies operating major mining projects nationwide.

- The gas & oil sector in Peru significantly contributes to the economy through exploration and production activities. Major players include multinational companies like Repsol, Petroleos del Peru and Total (Mordor Group 2024). Foreign investment drives technological advancements and enhances production capabilities. The sector generates significant revenue through taxes, royalties, and export earnings while creating job opportunities. However, it faces environmental concerns and operational risks.

- The agriculture sector is renowned for its export-oriented production, especially in crops like cacao, coffee, palm soy, asparagus, and avocados. Diverse climatic zones in Peru enable the production of various agricultural products. Agriculture is a primary source of employment in rural areas, providing livelihoods for a significant portion of the population.

- Peru's manufacturing sector includes food processing, textiles, and chemicals. It has been growing steadily, driven by both domestic demand and export opportunities. While facing challenges such as infrastructure deficits and regulatory hurdles, there are growth opportunities in areas like agro-industry and the manufacturing of high-value products.

- The service sector, including finance, tourism, and retail, is expanding rapidly. Tourism, in particular, significantly contributes to Peru's rich cultural heritage and natural attractions, attracting millions of visitors annually.

- Facilities operation, including water and sanitation/sewage, solid waste management are also operated by private companies.

- Emerging technology-related sectors are evolving with increased investment in startups and digital infrastructure. The government's focus on digital transformation and innovation is fostering growth

i) Productive and infrastructure sectors: Benefits a impacts

For this analysis, we have selected tourism and agriculture as case studies for global health security.

a) **Tourism: A sector willing to invest in health security after the pandemic- An opportunity for Public Private Partnerships**

Peru, renowned for its historic legacy and rich biodiversity, attracts visitors from around the world. Before the pandemic, tourism contributed 3.9% to the national GDP, making it Peru's third-largest foreign exchange generator(MINCETUR.2022).

The COVID-19 pandemic severely impacted revenues and decimated the workforce, causing a nationwide loss of 154,000 jobs in 2020 (Instituto Peruano de Economía. 2020).

This was due to health measures and border closures. Before the pandemic, Peru welcomed 4.4 million foreign tourists, generating $4.4 billion in revenue. However, this dropped to 850,000 visitors between January and October 2020. Recovery has been gradual in 2022 and 2023 but has not yet returned to pre-pandemic levels (De La Vega. 2024. Economía).

The General Tourism Law of 2009 (Law No. 29408) and its regulations declare tourism a matter of national interest in Peru. They mandate that "ministries, regional governments, local governments, and public entities linked to infrastructure and service needs must consider the requirements of the tourism sector in their plans, programs, budgets, projects, and actions" (Article 1). The law establishes a public-private collaboration body to formulate recommendations, propose actions, and align visions and interests on tourism development. It also includes a Private Investment Promotion Committee to manage Public-Private Partnership projects. Tourism management is

highly decentralized through Regional Tourism Advisory Committees under the authority of Governors, coordinating with the Ministry of Tourism (Ley General del Turismo.2009).

Tourism is a cornerstone in the development vision of regional governments due to its revenue-generating capacity. During the pandemic, the tourism sector faced significant challenges, including the scarcity and limited quality of essential public goods such as healthcare services, vaccine access, transportation infrastructure, connectivity, telecommunications, internet access, and environmental protection (Daries. Nota Tecnica Sectorial BID.2021).

The health sector's capacity has become a critical factor in determining a tourist destination, influencing travelers' decision-making. Biosafety is now a primary source of competitive advantage or disadvantage, heavily reliant on sanitary conditions and measures to limit contagion. This includes the importance of both national and international safety certifications and efficient systems for tourist medical care and potential repatriation. These considerations present challenges for highly isolated destinations or those in early stages of tourism development (Jaime. 2020).

In 2024, Peru ranked 80th out of 110 countries on the Health Care Index, which evaluates the quality of healthcare systems based on factors such as infrastructure, healthcare professional competencies, costs, medicine availability, and government readiness to handle epidemics and pandemics. This low ranking is significant for the private sector, investors, and high-income tourists globally (CEO World Magazine, 2024). Enhancing the healthcare sector's capacity has become crucial for Peru, as biosafety is now a primary competitive factor. This emphasizes the need for higher standards and certifications, with the private sector ready to invest (V Jaime, S Bucaram. Nota Tecnica Sectorial BID. 2021).

There is a renewed interest in the tourism sector to improve healthcare quality and availability while strengthening overall capacities. Global tourism trends are focusing on nature-based projects in protected areas (PCAs), which facilitate social distancing and small group visits. The Peruvian Amazon is seen as an opportunity for product diversification and extending tourism benefits. The challenge is to approach this inclusively, involving vulnerable and indigenous communities historically marginalized from tourism.

Moreover, this opens an opportunity for Peru's GHS structure to access resources and partnerships to strengthen its capabilities. PCAs are vital for sustainable tourism and can promote best practices based on One Health principles, balancing the health of people, animals, and ecosystems (One Health, EcoHealth Alliance, 2022).

b) Agriculture, deforestation and palm oil cultivation: Health related aspects

Deforestation is a major cause of biodiversity loss, (Giam X.2017) and the joint report on

forests by United Nations Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP) emphasized its negative impact on human health (The State of the World's Forests 2020).

Between 2002 and 2021, 68.4 million hectares of tropical forest were lost globally. During this period, Peru lost 2.3 million hectares at a rate of 134,000 hectares per year, primarily due to illegal land use and agricultural expansion (Global Forest Watch 2021).

According to SERFOR (Peru, 2024), over 75 percent of Peru's deforestation is due to small farming agriculture. Migrants from the Andes settle in Amazon public conservation lands, practicing inappropriate agriculture that leads to soil degradation and further deforestation (Alberto Gonzales, SERFOR, 2024).

In the Peruvian Amazon, monocultures, particularly oil palm, expanded from 15,000 hectares in 2000 to near to 110,000 hectares in 2019 (Ministry of Agriculture and Irrigation). Profitability and biodiesel use attract investors (Lu de Lama, 2015).Since 2020, global market demands have increased, driving rapid industrial agriculture expansion into forest lands. The industrial exploitation of oil palm in Peru aligns with global trends. Peruvian oil palm exports rose 46 percent from January to December 2023 compared to 2022, driven by favorable markets and growing demand (AgroData Peru 2023).

An OXFAM study in 2021 highlighted the negative impact of large-scale oil palm plantations on land use, carbon emissions, and Indigenous peoples in Peru (Agribusiness climate crisis in Peru. OXFAM.2021). Despite evidence, recent national policy shifts have opened former conservation territories for exploitation and further deforestation, likely accelerating oil palm industry growth.

MINSA is combating rising dengue outbreaks and maintaining efforts to control malaria; however, not much is being done to prevent outbreaks caused by man-made environmental changes due to economic activities.

Morand's 2021 study found associations between palm oil cultivation and increased vector-borne diseases (Morand et al., 2021). The references below extracted from this study, describe the relation between palm soy and diseases in various regions of the world:

- Association between the increase in vector-borne disease outbreaks and the expansion of oil palm plantations, emphasizing the negative impact on biodiversity in Southeast Asia and South America (Vijay 2016)
- Acknowledge the effects of oil palm monoculture on increasing the risks of zoonotic and vector-borne infectious diseases (Sloan 2020)
- Address the increase of mosquito-borne viruses, transmitted by *Aedes albopictus* and *Aedes aegypti*, in oil palm and rubber plantations, which favor the spread of dengue, Zika, chikungunya, and yellow fever(Young 2017)

- Mentions the presence of *Trypanozoma cruzi* -Chagas disease transmitting agent development in oil palm plantations in the Colombian Amazon (Erazo. 2019)

Given the evidence on the impact of oil palm's on health outcomes, it would be necessary to further expand knowledge on the behavior of these diseases in areas where oil palm is being cultivated in Peru.

ii) Environmental Impact and Regulations

Major human activities impact the environment, affect biodiversity, cause deforestation, pollute air, soil, and water, accelerate natural resource depletion, and harm public health.

The Brazil-Peru Interoceanic Highway connects the Atlantic Ocean in Brazil with the Pacific Ocean in Peru, crossing central South America. Built to enhance commerce channels to Africa and Europe for Peru and offer Brazil direct access to Oceania and Asia, it exemplifies large infrastructure projects with mixed social and environmental impacts. Completed in 2010, the highway is minimally used for Peru-Brazil trade, raising concerns about its necessity and links to corruption. In Madre de Dios, the highway has brought both positive and negative changes. Positively, communities report increased wealth, improved access to healthcare, and more fresh food availability. Negatively, they face an influx of potentially dangerous migrants, increased dengue cases, and traffic accidents. Additionally, commercial hunting has emerged, shifting from subsistence hunting to selling bushmeat in local markets (Riley-Powell and Lee 2018).

A review of Peru's Environmental Statistics for 2022, particularly Component five on Environmental Health, reveals basic and limited information alongside a growing number of unresolved social and environmental issues (INEI. 2022). Moreover, studies in Peru show a correlation between human activities deforestation and the increase of arboviral diseases such as dengue, oropouche, chikungunya, mayaro, and zika, as well as malaria, in areas with significant vegetation loss (Romero-Alvarez and Escobar 2017). "Before 1990, dengue transmission was urban, located in cities like Iquitos, Tarapoto, and Pucallpa. Now it is becoming ruralized and affecting smaller populations, while Oropuche is urbanizing due to intense population movement and migration" (Cesar Cabezas 2024).

Peru's General Law for the Environment-Law No 28611 (Ministerio del Ambiente 2005) in Article 1 establishes the right to live in a healthy environment, outlining the Ministry of Environment's duty to ensure environmental management, public health, conservation, and sustainable development. Article 7 designates environmental health and biodiversity conservation as public priorities.

The National System for Environmental Impact Assessment (EIA) and its Regulations (Law No 27446) constitutes a cross-sectoral tool for environmental management. All activities and projects must comply with these regulations to obtain licenses, operate, and receive incentives. The EIA tool is recognized for its effectiveness and potential to mitigate potential damage

including the risk of Emerging Infectious Diseases (EID) in hotspots and predictable transmission areas (R Gupta. 2023). However, its implementation in Peru needs updating to incorporate new risks and tools, including the potential emergence of a new pandemic.

Recognizing the interconnectedness of humans, animals, and the environment, the United States Environmental Protection Agency (EPA) has adopted the One Health Approach (EPA One Health Approach). This approach is moving towards a Total Environmental Framework that integrates Health Impact Assessment (HIA) as a decision-support tool, promoting sustainable and healthy communities by balancing environmental, social, and economic factors (EPA Health Impact Assessment).

In the wake of the pandemic, Peruvian authorities are concerned with reviewing the health system and regulations to enhance preparedness and response capabilities in the event of future pandemics. Congressman Malaga, for instance, is exploring preventive measures to avert a potential pandemic originating within the country. Given Peru's status as a hot-spot for EIDs transmitted by vectors, efforts should be directed not only towards early detection but also towards preventing risks along the chain of transmission via adequate environmental practices.

The General Directorate of Environmental Health and Food Safety (DIGESA), under the Ministry of Public Health (MINSA), serves as the National Authority for Environmental Health and Food Safety. It oversees various aspects, including Environmental Impact Assessments (EIAS). If Health Impact Assessments (HIAS) are introduced, DIGESA should also be involved, but it will require additional reinforcement.

iii) PROINVERSIÓN -Platform to Mobilize Private Sector Financing

The Investment Promotion Agency (ProInversión) encourages private investment in public services and infrastructure through Public-Private Partnerships (PPPs), based on both national and subnational initiatives. Between 2002 and 2022, ProInversión awarded investments and transactions totaling USD 38,510 million. PPPs contributed the most with USD 28,917 million, while Asset Projects and Works for Taxes accounted for USD 7,502 million and USD 2,092 million, respectively.

From a health sector perspective, ProInversión manages significant investments to enhance hospital and health center capacities, showcasing its ability to mobilize substantial private sector funding. A 2022 report highlights a US$ 280 million investment in EsSalud specialized hospitals in Áncash and Piura, aiming to benefit 1.2 million insured individuals and create 51,000 jobs through a PPP model (Gestion, 2022-Lessons learned). USAID/Peru should consider collaborating with ProInversión to leverage private sector funding for Global Health Security (GHS) goals.

iv) Ethics and corruption

In Paragraph 22 of the 2019 Resolution on Universal Health Coverage (A/RES/74/2), the United Nations General Assembly recognized corruption as a serious barrier to resource mobilization and allocation, undermining efforts to achieve universal health coverage (UHC) and Health Security). In Paragraph 56, the resolution called for Member States to prioritize the fight against corruption to build effective, accountable, transparent, and inclusive institutions that enable health for all (WHO 2023).

Corruption, defined as the abuse of entrusted power for private gain, is a public health issue. It undermines the human right to health and efforts to strengthen health systems. The consequences are significant, with up to 80 percent of non-salary health funds in some countries never reaching local primary health facilities, depriving patients in need (WHO 2023).

Peru's ranking of 121st out of 180 countries on the 2023 Corruption Perceptions Index (CPI) with a score of 33 out of 100 underscores significant corruption issues (Transparency International, 2023). A survey by DATUM revealed that 96 percent of Peruvians perceive corruption levels as "very high" or "high" (Encuesta DATUM. 2023; TI. Corruption Perceptions Index. 2023).

A 2011 study on corruption in Latin America's health sector, including Peru, revealed vulnerabilities in public health services, particularly in human resources. Absenteeism was identified as a serious issue, driving patients to private practices. Additionally, the management of medicines, supplies, and assets in health facilities was found to be prone to abuse (K Hussmann, 2011). Husman's analysis emphasized the lack of corruption risk assessments and decentralization to exacerbate corruption.

Public sector corruption and excessive bureaucracy are key enablers of anti-competitive practices and corruption in the private sector (Preventing Corruption, OCDE). Ethical lapses and inadequate control mechanisms further contribute to private sector corruption. Jorge Medina of Proética-Peru noted that private sector corruption in Peru has increased alongside general corruption (Corrupción en el sector privado, Proética).

Following the COVID-19 pandemic, the Peruvian Congress is investigating irregularities and corruption in the Ministry of Health, EsSalud, and regional and local governments regarding the procurement of vaccines and medical supplies, aiming to sanction those found guilty (Evidencias irregularidades, Congreso Peru, 2022).

Corruption threatens Global Health Security by undermining crucial interactions between the public and private sectors in addressing health threats. Although not explicitly addressed in the International Health Regulations (IHR), the significant impact of corruption and its potential recurrence in future pandemics necessitate mechanisms to prevent and reduce corrupt practices as part of Global Health Security. WHO provides key actions and policy recommendations to tackle corruption under Anti-corruption, Transparency, and Accountability (ACTA) considerations, which include:

- Prevent the problems before they occur,
- Mainstream anti-corruption practices in all strategies, policies, plans, programmes and projects,
- Integrate ACTA into efforts to strengthen pandemic prevention, preparedness and response,
- Strengthen accountability systems, including whistle-blower protection; and
- Increase the digitization of public health procurement systems.

4.2.4 BUSINESS ASSOCIATIONS AGAINST INFECTIOUS DISEASES
i) Business associations against HIV/AIDS in Peru

From 1983 to September 2010, Peru reported 26,823 AIDS cases, with 71% in Lima and Callao, resulting in 15,000 deaths. The Peruvian Business Council, in response to the HIV (CEVIH) initiative, helped stabilize and decrease these numbers. CEVIH comprised 14 private companies working with the Peruvian Ministry of Health (MINSA) to reduce the impact of HIV/AIDS and tuberculosis with support of the "Budget by Results'' (PpR) program, which allocated funds to work with private sector CEVIH member companies that implemented several preventive actions to combat HIV/AIDS within their organizations, raising awareness about HIV prevention among 90,000 workers and their families.

The actions included:

- Awareness Campaigns: Member companies organized informational sessions and campaigns to educate employees about HIV prevention, transmission, and treatment.
- Distribution of Preventive Materials: They distributed condoms and educational materials to promote safe sexual practices.
- Testing and Counseling Services: Companies provided access to voluntary HIV testing and counseling services to encourage early detection and support for those affected.
- Workplace Policies: Implementation of non-discrimination policies to protect workers living with HIV, ensuring they are treated fairly and with respect.
- Training Programs: Conducted training programs for managers and staff to foster a supportive environment and reduce the stigma associated with HIV.

These preventive measures aimed to improve labor relations, increase productivity, and enhance the quality of life through tolerance and non-discrimination, significantly contributing to the fight against HIV/AIDS in Peru (MINSA - CEVIH 2011).

ii) Private Sector Resilience to the COVID-19 pandemic

According to the Ministry of Production-PRODUCE, the pandemic resulted in the closure of half a million formal businesses in Peru, mainly small and medium-sized enterprises that could not absorb the shock, leading to a reduction in the total number of productive units from 2.4 million

in 2019 to 1.8 million in 2020 (INEI - PRODUCE 2021). The most affected sectors were hotels and restaurants (-43.6%), commerce (-26.5%), other services (-24.6%), and transportation (-13.3%), all linked to tourism. Moreover, manufacturing firms closed (-21.9%) due to the impact on sales caused by virus containment measures, while restrictions in global transportation affected international sales (Instituto Peruano de Economía 2020)

To mitigate business closures, prevent further loss of employment opportunities, and support both entrepreneurs and the population, the Government of Peru (GOP) implemented programs and policies aimed at benefiting the population. These initiatives included financing, fiscal measures, deferred payments, employment protection, digital inclusion, and training (Mercado Laboral Peruano. IPE Instituto Peruano de Economía. 2020).

The magnitude of the impact of COVID-19 prompted private companies to assume a role and join the spontaneous solidarity movement that spread across Peru. Moreover, the private sector was up to the task and played a key role in representing Peruvians' right to access the vaccine and in the early adoption of innovation and technology, including telemedicine, applications, vaccines, and diagnostic tests. As a result, the Congress of Peru authorized the private sector to purchase and import vaccines and medicines against COVID-19 via Law 31225 (CRP - Adquisición Vacunas 2021), and Supreme Decree No 014-2022 SA (MINSA - Vac 2022).

The National Confederation of Private Business Institutions (CONFIEP), through its COVID-19 Business Solidarity initiative, established a database that allows access to information on its associated private businesses' solidarity activities nationwide from the onset of the pandemic until now. To date, CONFIEP has documented nearly 14 million beneficiaries and an estimated $75 million in contributions (El Comercio.Coronavirus en Perú: Empresas. 2020) (CONFIEP Mapa Interactivo "Solidaridad Empresarial - Covid 19.) The main areas of support include:

Donation of goods and services:

- COVID-19 Vaccination: Facilitation at 525 locations, 7637 transfers of medical equipment and personnel, donation of 19,542 medical equipment, and 2000 campaigns to promote vaccination.
- Medical Oxygen: Donation of 69 oxygen plants, 2600 mechanical ventilators, 4700 oxygen cylinders, and 500 oxygen concentrators.
- Personal Protective Equipment: Nearly 2.4 million masks donated, along with 130 thousand liters of disinfectant alcohol and 900 thousand protective accessories and face shields.
- Assistance to Vulnerable Families and Provision Delivery: Donation of 3.3 million liters of safe water, 95 million kilograms of food, and vouchers for over a million people living in food insecurity.
- Logistic Support: Facilitation of healthcare for 115 thousand individuals, support for 3400 informational prevention campaigns, management of 268 humanitarian flights, and provision of 3419 hotel rooms for quarantine.

Financial services:

- "Tu Ayuda Vale Doble" by Banco Bilbao Vizcaya (BBVA), donating personal protective equipment to healthcare workers.
- "Hoy Más que Nunca, Manos Unidas" by BANBIF, donating food and essential supplies.
- "#YoMeSumo" campaign by Banco de Crédito del Perú (BCP) in support of vulnerable families in the country, raising $32.7 million for 2.8 million families.

Innovation and development:

- Mechanical engineering applied to respirators- Researchers from Universidad de Piura Engineering Faculty developed a prototype of a ventilator and repaired ventilators used to attend COVID-19 patients in the ICUs of three hospitals. They also manufactured personal protection equipment forSura Peru in partnership with Pixed, a Peruvian social entrepreneurship small business specialized in 3D printing, producing 8,980 face shields for medical personnel for distribution in 12 hospitals in Lima and Piura.
- Engie: "Duna" textile association, made up of women entrepreneurs from the Chilca district (Cañete), produced 20,000 masks financed by Engie to be distributed to COVID-19 emergency personnel.
- Pacífico Seguros: donated $1.3 million to finance the equivalent of a $13,000 life insurance policy for families of healthcare personnel, police and army officers deceased from COVID-19.

Digital health solutions

The private sector collaborated with the academy and the Presidency of the Council of Ministers in Peru to promote digital solutions against COVID-19. More than 30 companies and universities joined the High-Level Multisectoral Commission directed by the Presidency of the Council of Ministers to collaborate against the coronavirus via a Digital Solutions Working Group against COVID-19. Some of the solutions presented are:

Health:

- Prevention App- Peru in your hands (Perú en tus manos): This innovative app, a product of a collaborative effort between organizations from Peru, the United States, and Korea, is a testament to the strength of collaboration between the private sector, academia, and government. Its objective is to warn citizens about exposure and areas with a higher probability of contagion for prevention to support the return of citizens to economic activity once restrictions are lifted.
- Information Chatbot- BotPe: An automated chat created by Rimac Insurance and the Digital Transformation Lab, this chatbot plays a crucial role in keeping citizens informed with updated information on COVID-19 restrictions and recommendations. Clínica Internacional: provided virtual consultation, triage via web chat and telephone for symptomatic individuals, and guidance.
- Internet services for hospitals attending COVID-19 patients- Bitel: provided dedicated internet service for the Social Security-Essalud hospital in Villa Panamericana, including infrastructure installation, network enhancement, and donation of tablets and smartphones to health workers for virtual consultation and telehealth.

Education:

- Free data in support of e-learning strategies- Movistar, Claro, Entel, and Bitel provided free data to support remote learning via the “Aprendoencasa.pe website” (I learn at home), ensuring families are not billed.
- E-learning platform-"Aprendo en Casa" developed by the Ministry of Education in support of distance learning enabling children and youth to continue learning from home during the pandemic. The platform was functional on television, radio, and the web.
- Training of trainers- The ‘Enseña Perú’ association trained 37 teachers from the Huari province to run e-learning.

Supply chain and transportation services:

- E–marketing and commerce App-"Tienda Cerca" platform developed by Bakus, connecting small shoppings owners with their customers, by featuring a directory linked to a geolocation system facilitated users' access to the nearest store. Connected 109,000 stores with their customers in all regions, with delivery service in 16% of its stores.
- Logistic support to deliver vaccines and supplies to hard to reach areas: Coca-Cola - "Hombro a Hombro" coordinated the shipment of humanitarian aid from over 100 companies to the most vulnerable populations through its logistics network in coordination with the government, delivering 6,000 tons of aid to half a million people. It transported 1,000,000 vaccines, facilitating the distribution of the first batch of the Sinopharm COVID-19 vaccines in coordination with the private sector business for the launching of the vaccination of front-line workers.
- Logistic support to transport people- Uber partnered with the NGO Juguete Pendiente and Interbank to carry out the "Destinos Solidarios" campaign for transporting blood donors in collaboration with the blood bank.
- The supermarkets Wong and Metro, facilitated access to supermarkets to run blood donation campaigns using mobile blood banks.

4.2.5. ONE HEALTH CHALLENGES AND THE PRIVATE SECTOR

i) Zoonotic diseases

Endemic and emerging zoonotic diseases spread between animals and humans pose a significant threat to public health. Sixty percent of infectious diseases affecting humans are of zoonotic origin. The impact of zoonotic diseases includes threat to animal and human health, loss of productivity, and death. Moreover, zoonotic diseases cause numerous social impacts, threatening local and national economic stability, causing loss of animals, trade bans, quarantine, increased regulations on animal transport, and affecting tourism (Priorización de Zoonosis en el Perú. 2024.)

Peru is considered a hotspot for zoonotic diseases, and the intensification of private sector

activities that are expanding into the forest increases the risk of human-animal contact increasing the odds for a zoonotic spillover into humans.

To prevent, detect and respond to Zoonotic Diseases, the animal health and public health sectors collaborate periodically in specific activities for the prevention, detection, and response to the most of the priority zoonoses at the national, intermediate, and local levels, following the strategic objectives of the One Health approach, via a Multi-Sector joint team. Seeking to increase the collaboration, a list of proprietary zoonosis was developed between 2023-204. The zoonotic diseases prioritized for Peru are listed below.

Zoonotic Diseases
Rabies
Zoonotic Influenza*
Brucellosis
Viral Hemorrhagic Fevers ǂ
Anthrax
Zoonotic Tuberculosis
***Zoonotic influenza includes avian and swine flu.** **ǂ Viral hemorrhagic fevers include Ebola, Marburg, Rift Valley fever, Crimean-Congo hemorrhagic fever, and/or Lassa fever.**

Workshop on Prioritization of One Health Zoonotic Diseases (OHZDP) in Peru

Peru has experienced significant agricultural intensification in recent years, expanding the exploitation of its agricultural territories into previously untouched areas such as the Amazon rainforest. This expansion often involves deforestation, habitat destruction, and encroachment into wildlife habitats, increasing the risk of zoonotic disease transmission. The following sections of the analysis are focused on rabies, influenza and brucellosis, the first three diseases prioritized by Peru.

a) **Cattle Farming and Bat Transmitted Rabies**

In 2020, the total cattle population in Peru was 5.6 million, which marked a 16 percent estimated increase since 1994. During the period of 2014-2020, the dairy cow population reached 906,689 heads, with an annual growth rate of 1.9 percent. The regions with the highest cattle population were Cajamarca (18 percent) and Puno (10.5 percent) (INE - Sector Ganadero 2022).

In Peru, small farmers rear cattle on land with no other economic activity, utilizing 70% of previously deforested land in the Amazon for pastures. Cattle production is a result of land clearance by small farmers who cultivate food crops for domestic markets or perennial cash crops for international markets (Killeen 2023).

Cattle raising in Peru is more accurately described as an artisanal activity rather than a

modern production model. Cattle are viewed as a liquid asset that accrues value over the short-term and can be monetized easily for medical emergencies or milestone events. The economic return on these low-tech cattle production practices is low, with a net cash flow of only about $50 per hectare, compared to about $300 USD for maize and $850 USD for cacao (Killeen 2023).

The most common diseases in the jungle are anaplasmosis and rabies, while fascioliasis is prevalent in the highlands. The most relevant zoonotic diseases are tuberculosis, brucellosis, and hydatidosis. SENASA has official animal health programs for the control and eradication of bovine tuberculosis and brucellosis, as well as for the prevention and control of anthrax, symptomatic anthrax, malignant edema, herbivore rabies, parasitic diseases, and vaccination against foot-and-mouth disease in areas of possible incidence (MINAGRI, 2016 y MINAGRI 2017-2027).

Rabies remains a significant challenge for public health authorities and poses a constraint to livestock in Peru. It is one of the most deadly viral zoonoses affecting both humans and animals, and cattle are particularly affected(Miroslav Ulloa. 2020).

In Peru, there is transmission of wildlife rabies, with vampire bats as reservoirs. In the absence of other animals, vampire bats feed on humans. The circulation of wildlife rabies persists in some endemic regions of Peru, expanding into new areas involving new bat species without previous records, thereby impacting public health. The highest risk scenarios for wildlife rabies are in the Amazon region and some inter-Andean valleys (Condori. 2013).

MINSA and MINAG recognize the gravity of the rabies threat and have elevated it to a top priority. They have implemented joint surveillance, information sharing, and complementary actions to combat this disease. Farmers who are well-informed about the risk of rabies are actively involved in reporting cases. The effectiveness of rabies immunization in preventing new cases is well-documented, making it the primary strategy against this disease. Unfortunately, the unvaccinated remain the most vulnerable.

Between 2015 and 2022, a total of 1,259 rabies cases were reported in animals in Peru. The majority of cases occurred in the inter-Andean valleys, where there is a high cattle population, and to a lesser extent, in Indigenous communities in the Amazon. Cattle were the most affected at 89.8 percent (1131 cases), followed by horses at 5.2 percent (66 cases), bats at 2 percent (25 cases), and goats at 0.9 percent (11 cases). During the pandemic, the number of rabies cases in cattle nearly doubled to 204 cases in 2021 from 113 cases in 2020. However, reported cases decreased to 58 in 2023, falling below levels observed in previous years (Vargas.2022).

Bovine rabies cases are more frequent in the inter-Andean valleys than in other regions of the Amazon plains. The highest case density was observed in the regions of Ayacucho,

Cuzco, and Apurímac, which are all located in the Andes.

There is a need to review the current national program for the prevention and control of rabies in livestock, incorporating the ecology of vampire bats, as well as the prediction of the geographic and temporal spread of infection waves. These approaches could improve the efficiency of other current prevention measures that have not shown the expected control effects, such as indiscriminate culling of vampire bats (Miroslav. 2020.)

b) Poultry farming and High Pathogenic Avian Influenza

The Peruvian poultry sector is a significant contributor to the national GDP, accounting for 1.8 percent. It produces 65 percent of the country's animal protein and makes up 28 percent of the total agricultural production. In 2022, Peru ranked fourth in broiler chicken production and fifth in laying hens in Latin America (Vera Vargas-APA y Ruiz. Ranking avícola. 2022).

The industry represents over half of the Peruvian livestock, with an intensive production system prevalent along the Pan-American Highway. Around 80 percent of the national bird population is in the coastal region, with the remaining 20 percent distributed between the sierra and the selva. Notably, the province of Lima contains more than 50 percent of the total poultry producers in the region (MINAGRI - Aves nd.).

Poultry production in Peru involves industrial production on coastal farms and backyard production in the highlands and jungles. Commercial farms follow strict biosecurity measures and vaccination protocols to prevent disease transmission from wild and backyard birds. However, urban encroachment and perimeter protection failures can cause wild or backyard birds to meet farm birds and can still lead to disease transmission between birds and humans.

Despite protection and biosecurity measures, and due to the disorderly growth of populations in urban and peri-urban areas intruding into farming areas or due to perimeter protection failures, wild or backyard birds meet farm birds and can potentially transmit diseases to birds and humans.

In 2002, Peru was declared free of Avian Influenza-SENASA Resolution No. 273-2005-AG, but in November 2022, a mass die-off of pelicans (SERNAP. 2023) due to HPAI A/H5N1 prompted a sanitary alert. The virus then spread to other domestic and wild birds, zoo animals, and marine mammals (Alerta MINSA. 2023). By early 2023, the outbreak in Peru had extended to marine mammals, notably affecting the South American sea lion, which also experienced a mass die-off (Leguia. 2023).

The recent emergence of highly pathogenic avian influenza (HPAI) H5N1 viruses in mammals and birds in the Americas (Ramey 2022; and Vreman.2023) poses a severe threat to wild and endangered species, poultry production, human spillover (Vreman 2023 and Kalthoff 2010). The H5N1 virus (clade 2.3.4.4b) arrived in North America from

Eurasia in late 2021 and rapidly spread across the continent via wild birds, leading to spillover events into poultry farms and the infection of wild terrestrial mammals (Caliendo. 2021; and Alkie 2022). An apparent transmission of clade 2.3.4.4b H5N1 viruses among minks in Spain further intensified concerns that the avian virus was adapting to mammals, potentially signaling an approaching H5N1 global pandemic in humans (Leguia. 2023).

Bird Flu detected in dairy cows in the United States (CDC 2024)
In 2024, remnants of the bird flu virus (H5N1) were detected in 20% of pasteurized milk samples from 297 commercial dairy products across 38 states in the United States. High-pathogenic avian influenza (HPAI) viral particles were found in one in five samples, indicating that the pasteurization process left non-infectious, inactive fragments of the virus.

Highly pathogenic avian influenza affecting the Peruvian coast in November 2022 resulted in over a million birds dying or culling. This situation has left poultry producers desperate as their businesses collapse, risking their investments, families, and employees' livelihoods while jeopardizing Peru's long-term food security and economy (El Sitio Avícola. 2022). Furthermore, fearing the loss of their livelihoods and the abrupt enforcement of regulations that deprive them of property access, many are reluctant to report cases, leading to animal culling and punitive sanctions. The prolonged circulation of highly pathogenic avian influenza and its potential for transmission to other species poses a high risk of a potential new variant with increased transmissibility to native species, endangered mammals, and humans.

This protracted situation has evolved from a technical sectoral problem to a political, economic, and social issue, with implications for global health security and the security of Peru. Congressman Málaga expressed concern during a meeting with MINSA and SENASA regarding SENASA's refusal to support a backyard poultry vaccination pilot financed by the private sector to evaluate its potential to break the transmission chain.

In response to questions about multisectoral actions to address such issues and the health sector's involvement, a health representative noted the need for current intersectoral commission operations like those for COVID-19. Due to existing regulations, the responsibility for avian influenza lies with agriculture. These regulations give SENASA vertical responsibility without significant coordination or support from the health sector. The SERFOR is responsible for cases involving humans or wild animals but lacks a multidisciplinary approach. The Ministry of Health is adopting a One Health approach as an alternative.

The Congressman expressed support and suggested revising laws given the post-pandemic landscape, stressing the need to act promptly to prevent another

pandemic arising from avian influenza due to government inaction. Global Health Security and One Health are related to the private sector because they identify common points and call for a joint response to new complex problems through innovative intersectoral approaches.

c) Goat farming and Brucellosis

Brucellosis is another zoonotic disease listed in the Peruvian prioritization of One Health Zoonotic Diseases that could affect both cattle and goats. Goats are present in urban and peri-urban settings and can grow independently or in co-grazing with cattle. Goat farming is highly adaptive to temperature and terrain and does not require special care or feeding. Goats can reproduce several times in a year, and their products, mainly meat and milk, are easily commercialized. Even just one goat is profitable for small farmers, making goats one of the preferred animals in family agriculture.

Goats can carry various zoonotic infections and transmit them to other animals and humans e.g., brucellosis, rabies, black leg, Antrax. Chlamydiosis,Q Fever-coxiellosis, salmonellosis, listeriosis (Cornell University 2024; SENASA- Sanidad Animal nd). The goat population in Peru has remained stable throughout the years, with an estimated 2 million goats as of 2019. Despite yearly variations, goat meat production remains high among those with less resources. Most of the goat cattle are in Piura and Lima, where 25 percent and 11 percent of goat meat is processed, respectively (Reporte Caprinos. 2003 and INEI. 2022.)

The earliest documented Brucella outbreak in humans in Peru was in 1967 when 2,456 human cases were recorded in the proximity of Lima and Callao. With goat farmers and their families most at risk, MINSA and MINAGRI implemented a multisector response program with PAHO's support.[3] The outbreak was controlled, reducing the prevalence in humans to around 300 cases per year (Navarro Vela).

In 2007, MINSA estimated the prevalence of brucellosis in human farmers raising goats in the Canete province at 0.04 percent using preventive measures as stables and goat vaccination (MINSA Brucellosis 2007). Other studies determined the prevalence of brucellosis in goats at 0.27 percent for Lima, and 6.8 percent for Callao (Taboada 2003; Toledo 2007; Escobedo). In 2018, SENASA identified 58 cases of goat brucellosis in the vicinity of Lima. Brucella is a disease that mainly affects the poor and those in need, especially those who may lack access to diagnostics and care (Giraldo 2021). Another review of Brucella cases in Lima showed that it disproportionately affected women from Lima (58.8 percent), and Callao (75.0 percent). The most affected were housewives who prepared family meals using cheese and other goat milk derivatives (Escobedo 2018).

Brucellosis' clinical picture is vague, and it favors chronicity, complicating therapeutic

[3] The first One Health intervention in Peru.

alternatives and a definitive cure.[4] As a disease of long duration with a prolonged convalescence period, brucellosis not only impacts patients' health, but also the health of the economy. A timely diagnosis and treatment with antibiotics may reduce disability; however, access to diagnosis and treatment may be limited for vulnerable populations living in remote regions (Giraldo Coral 2021).

Brucella was recently listed as one of the One Health Zoonotic Diseases prioritized in Peru during the MINSA-SENASA-SERFOR joint prioritization process conducted in 2023–2024. These efforts are encouraging and demonstrate an opportunity for sectors to overcome an outdated One Health challenge by including it as a disease of obligatory notification, conducting monitoring actions for better understanding of its severity and distribution, raising awareness, and including it in prevention and control plans and programs (Giraldo Coral 2021).

d) Antimicrobial unreported usage in farms as an inductor of human Antimicrobial Resistance

The World Health Organization (WHO) ranks antibiotic resistance as one of the top 10 global health threats, predicting it could cause 700,000 deaths per year, potentially reaching 10 million by 2050. In 2019, bacterial antimicrobial resistance (AMR) directly caused 1.27 million deaths and contributed to 4.95 million deaths (Antimicrobial Resistance Collaborators, 2022). In Latin America, AMR has reached critical levels, with carbapenem non-susceptibility among gram-negative organisms rising from 0.3 percent in 2002 to 21 percent in 2016. Some countries report a prevalence of 20 to 50 percent, according to the Latin American Network for Antimicrobial Resistance Surveillance (V. Fabre, 2022).

The global threat of antimicrobial resistance is perpetuated by corruption, which undermines medical product regulation, disrupts supply chains, and facilitates unauthorized access for users. Corruption also creates perverse incentives and conflicts of interest, leading to overprescribing and irrational use of medical products (WHO 2023).

Antimicrobial resistance (AMR) in Peru is a complex issue. Despite over two decades of initiatives, efforts have been fragmented and sector-specific. The Ministry of Health began AMR studies in hospitals in 2005. Since 2011, the Ministry of Agriculture and Irrigation, through SENASA, has monitored antimicrobials in primary agricultural foods, documenting their presence in milk in 2014 (Redding LE. 2014; SD 010-2019-SA 2019-2021) by the FAO - WHO Multi-Sector Commission.

[4] In September 2003, through Office N° 1663-2003-DGSP/MINSA, the Ministry of Health promulgated Ministerial Resolution N° 978-2003-SA/DM, which approves the Technical Standard for the Diagnosis and Treatment of Human Brucellosis in Peru. This document includes objectives, diagnostic, treatment, and operational definitions. However, it does not establish the need for epidemiological surveillance, therefore it is not considered as a zoonotic disease that requires epidemiological surveillance.

Antibiotic Growth Promoters (AGPs) had been used in the poultry industry for over six decades to improve production parameters (Moore et al., 1946). In Peru, private sector farmers extensively used antimicrobials as AGPs to boost productivity and efficiency, reducing the growth period for a two-kilogram chicken from 112 days (16 weeks) to 40 days (5.5 weeks). This practice increased profits by bringing products to market faster, accelerating the return on investments (MINAGRI, Aves). Publicly, AGPs were known simply as growth promoters, misleading consumers. The growth-enhancing effects of antimicrobials were due to four mechanisms: reduced nutrient use by microorganisms, reduction of bacterial metabolites, increased nutrient absorption through a thinner gut wall, and inhibition of subclinical infections (Fernández, 2024).

Supreme Decree 010-2019-SA aimed to address underreported antimicrobial usage by establishing the National Plan Against Antimicrobial Resistance 2019-2021 and the Multi-Sector Commission (Gov Peru 2019), using the One Health Approach to integrate efforts. The plan's strategic objectives were to raise awareness, enhance knowledge through surveillance and research, reduce infection incidence, promote appropriate antibiotic use, and increase investment in research and development. However, the mandate of the National Plan ended three years ago and has not been updated, leaving no current instrument to regulate antimicrobial resistance.

A review of the National Plan from the private sector perspective suggests it was included only as a guest (Article 3- Conformación). However, the plan requires extensive private sector participation to implement norms on the adequate dispensation of antimicrobials in private clinics, including training, oversight, and enforcement. It also references private sector support for research and development. While the plan mentions studies on antimicrobial use in food and animal products, it does not reference private sector actors or the participation of private sector laboratories.

The report on the analysis of the progress of the multi-sector plan for tackling antimicrobial resistance 2020-2021 (MINSA 2023) includes only one reference to the private sector, mentioning the implementation of good practices in dispensation norms and indicating pending activities. The report highlights only one multi-sector activity aimed at raising awareness and sharing good practices on AMR, with participation from both human and animal health representatives.

Following recommendations from FAO and WHO, SENASA implemented a prohibition in 2013 on the importation, manufacturing, and sale of veterinary products containing chloramphenicol, nitrofurans (furazolidone and nitrofurazone), olaquindox, and nitroimidazoles (dimetridazole, ipronidazole, metronidazole, and tinidazole). These substances were identified as potentially toxic and carcinogenic. Although suspicions existed about some of these medicines and evidence supported their teratogenic and carcinogenic effects, no explicit reference was made to their role in antimicrobial resistance (MINAGRI-SENASA: Prohíben diversos principios activos, 2013).

The National Reference Lab for AMR surveillance in the human health sector is the National Institute of Health, which has been strengthened and equipped. Integrated surveillance is being piloted in four hospitals. There is no data on private sector involvement, except for Cayetano Heredia University's Unit on Antimicrobial Resistance, which conducts extensive AMR research through various projects.

To prevent further human exposure to Antimicrobial Growth Promoters (AGPs), SENASA Peru banned the import, manufacture, and sale of veterinary products containing colistin, including colistin-mixed food. The ban was based on concerns that persistent use in animals at non-recommended doses could develop resistant bacteria and reduce the efficacy of antibiotics in humans (MINAGRI-SENASA: Prohíben Colistina.2019.) In healthcare, colistin, also known as polymyxin E, is reserved as a last-resort treatment for multidrug-resistant gram-negative infections, particularly severe pneumonia.

MDR continues to advance in Peru, posing challenges for the Multi-Sector Commission to further include the private sector and develop a cross-sector multi-year plan. Congressman Huamán has proposed a law to strengthen the containment of antimicrobial resistance under the One Health Approach, aiming to enhance public coordination and create mechanisms for AMR containment (Huamán, 2023). While this approach is correct, it is crucial to involve the private sector from the outset and aggressively expand the antimicrobial ban to currently allowed antimicrobials. Additionally, research on Alternatives to the Use of Antimicrobials (ATA) should be conducted with FAO support. The constraints of Avian Influenza should also be assessed to shape a vision for food security.

ii) Bush meat markets

Bushmeat is defined as "non-domesticated terrestrial mammals, birds, reptiles, and amphibians harvested for food" (Nasi and Brown 2008). It is a crucial non-timber forest product that helps support food security in rural tropical forest areas (Van Vliet and Mbazza 2021). Many rural families rely on bushmeat as their primary source of protein, and it is consumed in both rural and urban areas (Sunderland et al. 2013). The bushmeat trade also contributes to household incomes, sometimes being the main source of cash or providing additional income during hardships or for special needs (Van Vliet - CIFOR 2014; Van Vliet and Mbazza 2011).

Seventy-two percent of emerging infectious diseases are zoonotic (Jones 2008). The activities related to bushmeat, such as hunting, handling, and consuming, significantly increase the risk of zoonotic disease transmission(Kurpiers 2015). Wet markets further facilitate cross-species disease transmission (Chen et al., 2020). These factors underscore the critical link between bushmeat, wet markets, and disease transmission, and stress the urgent need to address this nexus to prevent future pandemics.

The COVID-19 pandemic has highlighted wildlife markets as a significant human health

challenge. The One Health approach recognizes the interdependence of zoonotic diseases, environmental pressures, and animal and human health. It provides a framework for improving global pandemic preparedness by enhancing the understanding of zoonotic diseases and their spillover into humans.

The illegal wildlife trade in Peru impacts a wide variety of species, which are sold as pets, bushmeat, or for traditional medicine and crafts. This activity significantly harms these species' populations and overall biodiversity. Although Peru has a legal framework allowing for the sustainable use of wildlife resources and the capacity to sanction offenders throughout the supply chain, greater efforts are needed to eradicate illegal trafficking (SERFOR 2016).

One of the rare examples of bushmeat markets in Latin America is in Iquitos Peru where the lack of cattle ranching in this part of the lowland Amazon gave birth to a very lucrative bushmeat trade. As rural communities get access to markets and invest in other cash generating activities (e.g. commercial agriculture, livestock raising, timber exploitation etc), hunting contributes to a lesser proportion of the total income (Traffic- Wildlife trade monitoring network 2011).

An assessment of the wild meat trade in the Iquitos-Peru market from 1973 to 2018 examined market trends and their impact on livelihoods. Wild meat sales increased by 6.4 tons per year, mirroring urban population growth, and peaked at 442 tons in 2018, contributing $2.6 million (0.76%) to the regional GDP. Five species of ungulates and rodents made up 88.5% of the traded biomass. Despite the growth in sales, wild meat consistently comprised 1-2% of the total urban meat diet annually due to the availability and higher consumption of cheaper meats, like poultry, which was 45.8% more affordable in 2018 and the most consumed meat.

Most wild meat was sold salted or smoked, reducing the risk of foodborne diseases (Mayor 2021). Notably, only 17% of households in the Peruvian Amazon reported participating in hunting and hunting contributed the smallest value behind farming, fishing, and other resource extraction activities (Coomes et al. 2004).

From the One Health perspective, it is crucial to identify gaps and build knowledge through research, raise awareness about the risks of wild meat, work with local actors, enhance wildlife and human surveillance laboratory capacities, and promote active coordination, joint planning, and data sharing between SERFOR and MINSA.

A. PROGRAMMATIC RECOMMENDATIONS

D.1. PREVENT

P1. LEGAL INSTRUMENTS

- Share information with authorities and legislators about the health consequences of deforestation and large economic activities in the Amazon basin, highlighting their impact on the increased transmission of arboviral diseases and malaria. Seek support to promote the review of the Environmental Impact Assessment (EIA) purpose in Peruvian

environmental legislation and regulations, and advocate for the incorporation of Health Impact Assessments (HIA) in major private sector activities,

- Present WHO's Anti-corruption, Transparency, and Accountability (ACTA) considerations to authorities, legislators, and private sector stakeholders. Based on lessons learned from past pandemics and epidemics, promote the incorporation of ACTA and corruption risk assessment in upcoming regulations; and
- Follow up on the law proposed by Congressman Huamán to strengthen antimicrobial resistance containment under the One Health Approach. Promote the active involvement of the private sector in this law.

P2. FINANCING:

- Propose co-designing public-private investment projects with the tourism private sector to enhance health security standards in collaboration with PROINVERSION and MINSA. This would increase Peru's competitiveness and serve the social purpose of improving health services in hard-to-reach areas linked to touristic routes; and
- Promote the creation of business associations to combat reemerging diseases like dengue using attractive financial mechanisms for the private sector, such as works-for-taxes or public-private partnerships.
- Strengthen SUSALUD and DIGESA regulatory capacities to ensure the right to health for vulnerable populations.
- Promote competitive practices among private sector suppliers as providers of MINSA and Essalud, including expanding local production capacity of essential medicines such as medicinal oxygen.

P3. IHR COORDINATION, NATIONAL IHR FOCAL POINT:

- Promote the participation of the private sector to Coordination meetings, seeking for their advice and support.

P4. ANTIMICROBIAL RESISTANCE:

- Ensure active private sector involvement in the National Plan Against Antimicrobial Resistance.
- Share information with the private sector poultry industry and associations on the risks of currently allowed antimicrobials and alternatives.
- Request FAO to share the achievements of the Reduce the Need for Antimicrobials on Farms for Sustainable Agrifood Systems Transformation (RENOFARM) and Alternatives to the Use of Antimicrobials (ATA) with the private sector poultry industry in Peru.

P5. ZOONOTIC DISEASE:

- Ensure participation of private sector in zoonoses detection, reporting and control, and compliance with preventive and control measures
- Develop a joint plan with SENASA for integrating disease surveillance and control for non-prioritized diseases not listed for immediate notification but still important for public health.
- Conduct joint health situation analysis for prioritized diseases.
- Work with MINAGRI, SENASA and SERFOR in the incorporation of Good Practices across

all their training materials directed to the industry that include One Health and how to protect, prevent and respond to zoonotic diseases from the occupational and primary healthcare perspectives to protect private sector workers.

P7. BIOSAFETY AND BIOSECURITY:

- Ensure private sector operators related to the program receive training in biosafety and biosecurity to meet industry standards, increasing Peru's competitiveness and strengthening Health Security.

P8. IMMUNIZATION:

- Engage the private sector in the planning of immunization campaigns to facilitate achieving targets,
- Systematize the partnership experiences between MINSA and Coca Cola for vaccine distribution to remote areas, and develop a model for validation with other private actors; and
- Support private sector self-funded zoonotic disease immunization initiatives as a pilot project and assess the impact jointly with SENASA.

D.2. DETECT

D1. NATIONAL LABORATORY SYSTEM:

- Provide technical assistance to private laboratories to enhance methods and techniques for the diagnosis of One Health Proprietary Diseases; and
- Support MINSA and MINAGRI to integrate private sector lab reporting in their systems.

D2. SURVEILLANCE:

- Work with MINSA and the World Bank to ensure the integration of Information Health Systems adequately incorporates private sector providers,
- Support the private sector to comply with MINSA surveillance reporting standards,
- Support the implementation of Data Quality Assessments on private sector reports on EIDs; and
- Assess the behavior of vector-borne diseases in relation to deforestation and economic activities, such as oil palm cultivation.

D3. HUMAN RESOURCES:

- Incorporate supply chain management in pre and postgraduate programs at universities.
- Ensure participation of private sector in EIDS, reporting and control, and compliance with preventive and control measures,
- Train private sector managers on ethics, good practices and corruption prevention under the ACTA framework; and
- Promote the participation of private sector app developers in global health security

solutions, via contests and hackathons.

D.3. RESPOND

R1. HEALTH EMERGENCY MANAGEMENT:

- Review the continuity of operations and multi-hazard plans to respond to Highly Pathogenic Avian Influenza outbreaks in collaboration with the private sector, MINSA, SENASA and SERFOR.

R3. HEALTH SERVICES PROVISION:

- Set standards for supply chain with the private sector and improve coordination and management,
- Involve private sector companies in immunization campaigns to increase coverage,
- Seek for advancements on health systems information integration, oriented to monitor stocks of critical supplies (medicinal O2, medicines, tests);
- Raise awareness of private sector providers about diagnostic, notification, and management of EIDs.

R4. INFECTION PREVENTION AND CONTROL:

- Improve IPC in private sector health facilities, in animal and human sectors,
- Improve IPC in private sector commercial activities related with animal management; and
- Provide technical assistance to the tourism sector on infection prevention and control standards at hotels.

R5. RISK COMMUNICATION AND COMMUNITY ENGAGEMENT: States Parties should have plans and systems for risk communication and community engagement (RCCE) during public health emergencies. This includes strategies such as media and social media communications, mass awareness campaigns, health promotion, stakeholder and community engagement, and infodemic management.

- Promote private sector engagement as corporate social responsibility to work with employees and neighbors to prevent and control public health emergencies such as dengue outbreaks,
- Continue collaborating with app developers and promote their participation in public health emergencies by developing technology solutions that would prevent diseases or improve health security,
- Promote Social and Behavioral Change strategies to elevate hygiene practices, biosafety measures, and the recognition of signs and symptoms of prevalent emerging infectious diseases among tourism operators; and
- Promote the development of materials of communication targeting priority zoonotic diseases.

CHAPTER 5: CLIMATE CHANGE

5.1. CONSIDERATIONS

This chapter examines climate change, its relations, impacts and effects from the perspective of Health Security, with a One Health approach.

When we think about climate change and GHS, we should consider:

- **Extreme weather- Heat waves and air quality:** Poor air quality and heatwaves exacerbate respiratory and cardiac conditions, increasing the risk of respiratory infections and contributing to premature deaths.
- **Extreme weather- Cold Waves:** affecting more the poorest and underserved in Peru
- **Water and food security:** The reduction of water reserves due to melting glaciers and severe droughts impacts water quality and availability, affecting food production. This can lead to malnutrition, foodborne-waterborne diseases, heightening health risks.
- **Vector-borne diseases:** Rising temperatures, changes in precipitation, and increased humidity create favorable conditions for the transmission of vector-borne diseases such as Dengue, Zika, and malaria.
- **Climate change can lead to internal displacement:** Communities are forced to migrate due to weather pressures
- Extreme weather events damage healthcare infrastructure and disrupt access to essential medical services.
- **Preparedness and Response:** Enhancing early warning systems, disease surveillance, and emergency preparedness is crucial in addressing health risks associated with climate change

Climate change directly impacts global health security by affecting Peru's prevention, detection, and response capacities. Rising temperatures, changing rainfall patterns, and extreme weather events like floods and droughts are already exacerbating the spread of infectious diseases and straining healthcare systems.

Increasing temperatures and shifting rainfall patterns provide ideal breeding conditions for disease vectors, such as mosquitoes. This leads to higher transmission rates of diseases like dengue, Zika, and malaria, especially in regions that lack adequate vector control measures. Additionally, agricultural disruption from droughts and floods threatens food security, leading to malnutrition, which weakens immune responses to infections.

Climate change disrupts disease surveillance efforts by creating new areas of vulnerability. Populations migrating due to climate impacts often settle in informal areas with poor sanitation and limited healthcare, making it difficult to monitor disease trends effectively. This increases the likelihood of delayed detection of outbreaks, hindering containment efforts.

Extreme weather events damage healthcare infrastructure, disrupt supply chains, and create logistical challenges that delay emergency responses. This makes it harder to deliver timely treatment and vaccinations during outbreaks. In addition, resources are often diverted to disaster relief efforts, limiting the healthcare system's ability to address other emerging health threats. (for further detail on climate change see Chapter 5)

5.2. KEY FINDINGS

5.2.1. CLIMATE CHANGE AND ITS EFFECTS IN PERU

i) Climate Change

The Earth's atmosphere regulates temperature and protects life through the greenhouse effect. Human activities, including burning fossil fuels in industries, agriculture, transportation, and housing, along with high-consumption lifestyles, forest fires, and volcanic eruptions, have increased Greenhouse Gas (GHG) concentrations, trapping heat and raising Earth's temperature. Since the 1800s, global temperatures have risen by 1.2°C (2.2°F), with the rate of warming accelerating. If current GHG emission trends continue, global warming is projected to reach 1.5°C between 2030 and 2052 (IPCC 2018). Warming of 1.5°C and beyond will likely worsen extreme weather events, escalating challenges related to disease burden, water and food security, and potentially exacerbating social conflicts (IPCC 2018). Limiting warming to 1.5°C, compared with 2°C, could reduce the number of people exposed to climate-related risks and poverty by several hundred million by 2050 (IPCC 2023).

Extreme weather during 2021 and 2022 caused widespread devastation globally, straining health services already impacted by the COVID-19 pandemic. Floods resulted in thousands of deaths, displaced hundreds of thousands, and caused billions in economic losses. Wildfires also caused significant destruction, and many countries experienced record-high temperatures Extreme heat events increase mortality and morbidity worldwide. Vulnerable populations, including adults over 65 and children under one, experienced 3.7 billion more heatwave days in 2021 than the annual average from 1986 to 2005. Heat-related deaths rose by 68% between 2000-2004 and 2017-2021, exacerbated by the COVID-19 pandemic (Romanello 2022).

Populations at disproportionately higher risk of adverse consequences include poor and vulnerable populations living in cities, indigenous peoples living in remote and hard to reach areas, local communities dependent on agricultural or coastal livelihoods. Poverty and marginality in disadvantaged populations is expected to rise as global warming increases (IPCC 2023, WHO-IPCC Evidence Review 2022)

Climate change is a complex, multifaceted problem threatening human existence and the earth's sustainability for the human race by altering temperature and humidity, inducing ecological shifts in crops, weeds, vectors, and pathogens. Climate change impacts go beyond global warming, causing health events due to the emergence/resurgence of novel infectious pathogens, vector-borne diseases, displacement of people, economic losses, food insecurity, and mental health issues. With the existing health infrastructure inequities, vulnerable communities, particularly those in low-middle-income countries, are disproportionately impacted by its consequences (Sah 2023).

The increased frequency of heat waves, and changes in rainfall patterns, cause floods and droughts, accelerating or lengthening vector borne diseases transmission seasons and bringing diseases to new geographical areas. People living with Respiratory, cardiovascular and metabolic diseases, could worsen and die during heatwaves and those with mental health issues suffer crises. It complicates preventing, detecting, and responding to Global Health Security threats by straining healthcare systems, disrupting infrastructure, and creating resource shortages. Extreme weather events can hinder surveillance and emergency response efforts, while the displacement of populations complicates disease tracking and management.

ii) Climate change and extreme weather in Peru

Peru is highly vulnerable to climate change, meeting seven out of nine criteria identified by the United Nations Framework Convention on Climate Change (UNFCCC) for nations particularly susceptible to climate impacts. These criteria include low coastal areas, arid zones, regions exposed to floods, droughts, and desertification, fragile mountainous ecosystems, disaster-prone areas, regions with high urban atmospheric pollution, and economies heavily reliant on fossil fuel production and use (BID/NU/CEPAL 2024).

Average temperatures have risen by 1°C since the 1960s, especially along the coast, jungle, and in the southeastern Sierra. Drier and warmer weather in the Andes caused the loss of half of Peru’s glacier surface in the last 60 years. This situation is exacerbated by annual droughts, frosts, and hail affecting Andean communities (De Apata and Dionisio 2023).

Between 2012 and 2022, emergencies due to climatic and oceanographic phenomena increased by 132%, peaking at 7,539 events in 2019. In 2022, these events impacted approximately 257,402 people, marking a 75.7% decrease compared to 2012 (CEPLAN 2020).

The 2020 National Adaptation Plan (NAP Peru 2020) highlights agriculture, fisheries, aquaculture, water resources, and public health as vulnerable sectors. Critical ecosystems, including mountain regions, dry forests, Amazon rainforests, and marine coastal areas, are also at risk of intense rains (USAID 2017; European Union 2020). Rural and indigenous populations' economies heavily depend on climate-sensitive sectors. Changes in precipitation and temperature are leading to increased vector and waterborne diseases, and droughts are affecting food security, pushing competition for water resources among productive sectors and human consumption (World Food Programme and Action Against Hunger 2024).

Coastal urban populations face increased risks from rising sea levels, extreme storms, and cyclones. Additionally, large urban poor populations are vulnerable to floods and landslides, which are exacerbated by climate change, posing a threat to recent development gains in the country.

Historical climate - Key climate changes since the 1960:	Future Climate – Projected changes in climate:
● Increase in average temperatures of 1°C. ● Decreased number of cold days and nights, increased number of warm days and nights. ● Increased precipitation along the coast and northern mountains, coupled with increased intensity and frequency of rainfall events. ● Decreased rainfall in the northern rainforests, and decreased intensity and frequency of rainfall events in the central highlands. ● Greater recurrence of dry spells and droughts in central and southern highlands and rainforest. ● Number of intense rainstorms, mudflows and forest fires more than doubled in the past 10 years and floods have increased by 60 percent since 1970.	● Increases in average maximum temperatures of2°-3°C and of average minimum temperatures by4°-6°C by 2065, with warming occurring more rapidly along the coast and in the southeastern highlands. ● Rainfall is expected to increase along the coast, but projected changes in rainfall in the highlands and Amazon vary, with some models suggesting increases and others decreases. ● Sea level rise of more than 0.5 meters by 2100. ● Increase in the frequency and intensity of natural disasters such as floods and droughts.

Source: Climate Change Risk Profile Peru, USAID - Updated 2024

5.2.2. PERU'S BACKGROUND AND LANDSCAPE ON CLIMATE CHANGE

i) Background

Peru has been an active participant in the United Nations Framework Convention on Climate Change (UNFCCC) since signing in 1992 and ratifying the agreement in 1993, demonstrating its commitment to reducing greenhouse gas (GHG) emissions, having submitted three National Communications (NC) to the UNFCCC.

The First National Communication (2001) authored by the National Commission on Climate Change from the National Environmental Committee, provides a comprehensive overview of Peru's climate change. It puts significant emphasis on health, including increased malaria and cholera outbreaks, reports about 33 deaths from heat waves, extreme weather damage to 557 healthcare facilities with rebuilding costs exceeding $50 million and recommends enhancing

health education, improving WASH and strengthening detection- diagnostics of vector-borne diseases, and promoting vaccine production (CNCC Peru - NC 1 2001)[5].

The Second National Communication (2010) Developed with support from the Global Environmental Fund (GEF) and the United Nations Development Program (UNDP), includes GHG estimates across various sectors. It emphasizes the health sector's role, considering the Millennium Development Goals and the management of hospital waste. The report underscores the need for integrated, territorially-based analysis tools, educational guidelines on sustainable development, and indicators for assessing environmental education. Finally it mentions as a priority the need for further research and analysis on the relation between climate change and health. (CNCC NC2 2010; MINAM/PNUD/GEF - NC2 2010).

The Third National Communication (2016), a comprehensive report, influenced by Peru's leadership at COP 20, provides an updated GHG inventory with 2019 emissions estimated at 210,404.42 Gigagrams (Gg) of CO2 (MINAM-Infocarbono 2019). It highlights land use as the main source of emissions and supports reforms in forest management, including the establishment of the National Forest and Wildlife Service (SERFOR) and the promotion of renewable energy use (MINAM NC3 2016; MINAM-Infocarbono 2019; Congreso de la República del Perú 2011), with minor references to the health sector.

Peru developed national and decentralized regional adaptation plans. The national adaptation plans from 2002 and 2015 did not prioritize health or include specific health adaptation strategies. In a decentralized healthcare system, regional plans from 2009 to 2017 demonstrated improvements in systematization and structure over time. However, health was not a priority. There is a lack of alignment, cohesiveness in format, content, planning, and execution among the plans. The regional departments in Peru stood on unequal footing regarding health sector adaptation to climate change. The lack of local research on health impacts and insufficient focus on marginalized people has created a policy vacuum. The Peruvian case study reflects global challenges in prioritizing health in national and regional adaptation plans (Aracena et Al. 2021)

Following the approval of the National Strategy on Climate Change in 2015 (MINAM 2015) and the Climate Change Law and Regulations in 2018 (MINAM 2018) by Congress, Peru submitted its first Nationally Determined Contribution Report to the UNFCCC in 2020 (NDC Gobierno del Perú 2020), emphasizing the need to enhance health services' adaptive capacity and improve resilience among vulnerable populations. The NDC focuses on disaster risk management, resilient infrastructure, and private investment in adaptation (NDC Gobierno del Perú 2020).

[5] Various organizations, including commissions, projects, and national authorities, have produced Peru´s guiding documents on climate change- National Communications and National Determined Contributions (NDC). However, authority changes shifted the vision from cross-sector participation to vertical implementation, limiting collaboration across sectors. Initially, the health sector's participation was planned, but it was later reduced to providing estimates on health facility waste elimination. Following COVID-19, the health sector was incorporated into the High-Level Commission on Climate Change. The roles of DIGESA, DIGERD, and DIGIESP evolved throughout this process and require assessment. The absence of a unified state policy on climate change has led to inconsistent outcomes, resulting in both successful practices and maladaptation.

Finally, the Third Biennial Update Report submitted in 2023(Gobierno del Perú - 3rd BUR 2023), which includes the creation of the High-Level Commission on Climate Change, encompassing the Health Sector, and enabling it to influence climate policy. It also details mitigation measures in the energy and agroforestry sectors, promoting clean energy, improved kitchens, agroecological practices, and reforestation efforts (Gobierno del Perú - 3rd BUR 2023).

Peru's Climate Priorities

The Government of Peru (GOP), defined its climate action via its Nationally Determined Contributions (NDCs) (NDC- Gobierno del Perú 2020) setting targets in adaptation (e.g., design and implementation of early warning systems, strengthening IEC and BCC to increase awareness on climate change and public health, improve ecological and hydrological systems in degraded areas to revive rivers and lakes-water sowing, and agriculture good practices) and mitigation (renewable energies, sustainable transportation, forestry management, recycling), enhancing the country's resilience to climate change economy-wide. Key mitigation and adaptation goals include:

- Limiting GHG emissions by 30–40 percent by 2030 and achieving net carbon neutrality by 2050
- Implementing 90 adaptation measures across critical sectors, including Water, Health, Fishing and Aquaculture, Agriculture, and Forests.

ii) Preliminary Landscape.

a) Ministry of the Environment (MINAM)

The National Environment Policy (MINAM 2021) of the Ministry of Environment (MINAM) defines the objectives, priorities, and standards. The Directorate-General for Climate Change and Desertification (DGCCD) implements the National Climate Change Strategy (MINAM 2015) and carbon emission reduction policies under the guidance of the National Committee on Climate Change (CNCC), the Indigenous Peoples Commission (PPICC), and the High-Level Commission on Climate Change (CACC). The Nationally Determined Contributions Multi-Sector Working Group (GTM-NDC), established by Supreme Resolution No. 005-2016 (Gobierno del Perú 2016) and led by MINAM with support from the National Center for Strategic Planning (CEPLAN), coordinates the efforts of thirteen ministries and regions on their Nationally Determined Contributions (NDCs).

b) Ministry of Agriculture and Irrigation (MINAGRI)

The Ministry of Agriculture and Irrigation (MINAGRI) regulates agricultural matters and provides high-quality public goods and services. It oversees the National Agricultural Policy, promotes sustainable agricultural development and social inclusion in rural areas, and contributes to food security in Peru. MINAGRI also promotes the sustainable use of water, forests, and wildlife resources for environmentally responsible conservation and socio-economic development.

Under MIDAGRI, the Agricultural and Irrigation Sector Commission on Climate Change oversees GHG mitigation measures and reports progress to MINAM. The National Service of Animal Health (SENASA) conducts surveillance of diseases in wild animals,

with samples processed by the Directorate of Animal Health laboratories. The National Forestry and Wildlife Service (SERFOR) promotes sustainable management of flora and fauna, defines policies, issues regulations, and provides technical assistance for forestry and wildlife management. SERFOR also promotes scientific research, collaborates with entities to ensure sustainability, and manages regional forestry authorities.

c) Ministry of Health (MINSA)

In 2021, the High-Level Commission on Climate Change (CANCC) approved the health sector's commitments during its Fifth Session. According to the Framework Law on Climate Change – (Law No. 30754), sectoral authorities are responsible for formulating, implementing, monitoring, and reporting on their Nationally Determined Contributions (NDC) concerning climate change.

iii) The Health Sector in Peru and its vision to face climate change - The NDC's

The Health Sector Working Group on Climate Change (GTCC MINSA), led by the General Directorate of Disaster Risk Management and National Defense in Health (DIGERD), along with DIRESAs, GERESAs, and Integrated Health Networks Directorates (DIRIS), developed the "Tentative Programming of Nationally Determined Contributions in Adaptation to Climate Change of the Ministry of Health to 2030" (NDC - MINSA 2022), a 70-page document. Approved by Ministerial Resolution No. 599-2022/MINSA, it focuses on climate change adaptation measures up to 2030.
[6]

The NDC - MINSA 2022 document highlights the health sector's inadequate preparedness for climate change, emphasizing a holistic approach that includes primarily adaptation strategies, leaving gaps in cross-sector collaboration. It identifies population and health services as primary subjects susceptible to climate change, with varying risk degrees.
The proposed Health Sector adaptive measures include:

- Enhancing Public Health Surveillance Systems: Strengthen health networks surveillance by incorporating climate information into situation rooms to address dangers and vulnerabilities associated with climate change.
- Integrating Comprehensive Climate Change Management into Health Sector Documents: Strengthen the institutional capacity for health adaptation to climate change by incorporating new capabilities and functions into the organizational structure of health sector entities.

[6] An earlier document from 2018, "Tentative Programming of the NDCs in ACC in the Health Thematic Area: NDC on Adaptation Multi-Sector Working Group 2020-2030" (MINAM 2018), served as a foundation for Peru's NDCs submitted to the UNFCCC. Available on MINAM's website, this 200-page document ("GTM-NDC''. 2018), developed with broad sectoral support, includes system analysis, roles definitions, regional and local adaptation strategies, and a detailed indicator framework, though its length can be cumbersome.

- Enable entities to respond effectively to climate change challenges and prioritize sustainable interventions for vulnerable populations in the short, medium, and long term.
- Including Climate Change Management in Health Sector Planning: Integrate climate change adaptation aspects into the formulation, updating, implementation, and monitoring of planning instruments and tools governing health sector actions.
- Prioritize sustainable interventions that benefit vulnerable populations over various timeframes
- Strengthening Human Resources Training in Climate Change Management: Enhance the training of National Health System personnel in the comprehensive management of climate change impacts on health
- Promoting Healthy Practices Among Vulnerable Families: Promote healthy practices in vulnerable families to mitigate the effects of increased exposure to extreme temperatures, vector-borne diseases, and contaminated food and water due to climate change.
- Implementing Adaptation Strategies for Vulnerable IPRESS: Develop and implement strategies to reduce risks and prepare vulnerable IPRESS (health facilities) for climate change-related hazards: Consider structural, non-structural, and functional components to create climate-resilient health institutions.

MINSA has identified 14 climate change adaptation measures as part of the health NDCs, focusing on the health infrastructure, services, and the population. To implement these measures, MINSA established 30 specific enabling conditions in four categories: financial mechanisms, information for evidence-based decision-making, institutional arrangements, and monitoring and surveillance. Twenty-three of these conditions will be implemented in the short (2021) and medium (2025) terms, while seven are to be implemented in the long term (2030). Funding comes from public sector investment projects and programs budgets, the private sector, and the International Climate Fund. These efforts aim to ensure the health and well-being of the Peruvian population and contribute to the global fight against climate change.

Despite the gap on mitigation, to align with Peru's NDC targets, MINSA integrated 41 health care facilities into the Global Network of Green and Healthy Hospitals to reduce Greenhouse Gases (GHG), addressing the health sector's 4.4 percent contribution to total emissions(Salud sin Daño 2022). However it requires further strengthening in risk reduction and adaptation of health facilities to strengthen their resilience to climate change (PAHO 2020).

The individual and comparative analysis identifies factors limiting adaptive capacity, such as ineffective governance, inadequate public awareness, and insufficient technological advancements in climate services, including early warning systems. Despite improved governance and proactive measures, a lack of awareness about climate change and its impacts hinders progress (Siña et al. 2016).. The OECD emphasizes the need for consensus on key issues and prioritizes knowledge dissemination, advocating for a risk-based approach over a reactive one.

The 2022 document supports community awareness initiatives but lacks a comprehensive review of existing strategies for effective knowledge dissemination. Successful models, like FAO's andragogical approaches to adult learning (FAO. Educational foundations of the field school" n.d.), should be emulated in One Health interventions. It also addresses health services' vulnerabilities but overlooks critical areas like infrastructure inadequacies exacerbated by climate change, necessitating a reevaluation for infrastructure resilience.

Additionally, the document highlights the importance of Comprehensive Climate Change Management but overlooks the need for robust human resource capacity development and research agendas. Knowledge must extend to universities, medical professionals, public health practitioners, NGOs, private entities, and all sectors.

In conclusion, a more comprehensive, expert-guided, and proactive approach is needed. Cross-sector participation focused on human health should be strengthened, mitigation and resilience strategies integrated, and infrastructural vulnerabilities addressed to enhance the health sector's resilience to climate change challenges.

v) Economic impacts of climate change and extreme weather events

A joint study by the Peruvian government, the Economic Commission for Latin America and the Caribbean (ECLAC), and the Inter-American Development Bank (IDB) on "The Economics of Climate Change in Peru" was presented during COP 20 in Lima. The study estimates that Peru could face economic losses of 11.4% to 15.4% of GDP by 2100 due to climate change. These figures do not include the 11.1% GDP loss caused by the COVID-19 pandemic in 2020(BID and CEPAL 2014). Combined, the pandemic and climate-related losses could potentially exceed 22% of GDP, as climate change acts as a threat multiplier (United Nations - Climate 2021).

According to the joint IADB- CEPAL analysis for Peru, key sectors like fishing, agriculture, and livestock are projected to bear significant impacts, potentially leading to food insecurity.

Hydroelectric power, mining, gas and oil, agriculture, and other industries may compete with human populations for water resources, particularly in drought-affected regions, resulting in operational setbacks, affecting production, and heightened social conflict. Additionally, the tourism sector may suffer due to increased occurrence of extreme weather events(BID and CEPAL 2014).

The influence of climate change extends to monetary policy, by slowing productivity growth through health and infrastructure damage, increasing uncertainty and causing inflation volatility, similar to COVID-19. Businesses face threats from extreme weather events damaging infrastructure and supply chains, leading to higher production costs and pricing uncertainty for resources, energy, transportation, and insurance (IMF 2020)

5.2.3. Direct Impacts

i) Extreme Weather: Heatwaves, forest fires and poor air quality worsen respiratory and cardiac diseases, increasing the risk and adverse effects of respiratory infections related to GHS threats, contributing to premature deaths

a) **Heatwaves:** As one of the most dangerous natural weather hazards, heatwaves can severely impact public health, safety, infrastructure, and the environment. In 2018, over 220 million vulnerable individuals were exposed to heatwaves, and more than 60,000 heat-related deaths were recorded in Europe alone in 2022. A heatwave is defined as a period of local excess heat accumulating over several unusually hot days and nights. (WMO, 2022).

   The 2023 Lancet Countdown report suggests that global heat-related deaths could increase by 370% without adaptation measures if temperatures rise by 2°C (Romanello et al., 2023). The Lancet Countdown 2022 report highlighted a 0.2°C rise in average summer temperatures in Peru from 1986 to 2005 in at least eight regions. Temperatures have consistently increased since the 1960s-1980s, correlating with a 152% rise in heat-related deaths among adults over 65 years from 2000-2004 to 2017-2021 (Blanco-Villafuerte & Hartinger, 2023). Globally, population exposure to heatwaves is projected to increase with further warming, disproportionately affecting those with the least resources unless additional interventions and adaptation measures are implemented.

   The human body's physiological response to heat includes an increase in body temperature, detected by thermoreceptors, which then activate the thermoregulatory center. This response includes peripheral vasodilation and sweating, resulting in significant fluid and electrolyte loss and placing strain on the cardiovascular system (PAHO - Aguilar & Edwards, 2021).

   Vulnerability to extreme temperatures is determined by a range of demographic, health, physical, socioeconomic, and institutional factors. The most vulnerable populations include newborns, children, the elderly, individuals with disabilities, those on medication, and those who use drugs or alcohol. Those with health conditions like diabetes, mental health disorders, cardiovascular diseases, respiratory diseases, obesity, and kidney diseases face increased risk of death. Even healthy individuals engaged in outdoor physical activities are at risk if protective measures are not taken (PAHO - Aguilar & Edwards, 2021).

   In 2023, heatwaves intensified by the "Coastal El Niño" phenomenon affected Peru. Lima endured a heatwave lasting 173 days (SENAMHI Peru 2024).In Madre de Dios, a record temperature of 41.4°C in 2023 led to five deaths among adults aged 18 to 69, including military personnel, agricultural workers, and a merchant exposed during peak heat hours (Romero & Mitma, 2023), while records from Piura show the deaths of eight children under two years old in 2016 (America TV noticias 2016).

Urban areas where heat waves exacerbate air pollution and disrupt key infrastructure are particularly affected. Beyond immediate health risks, heatwaves also negatively affect agricultural productivity, labor efficiency, water and sanitation systems, critical infrastructure, and biodiversity (WMO, 2022).

Heatwaves pose a multifaceted threat to global health security by directly impacting human health, straining healthcare systems, affecting food and water security, and destabilizing economic and social systems. Addressing these challenges requires comprehensive meteo-health integration and early warning systems, epidemiological surveillance ,risk communication, education, restrictions on outdoor activities during peak heat hours, changes in local regulations and emergency management, enhanced cross-sector collaboration with participation of community based organizations. It also requires specialized training for health workers on heat risk prevention and case management, and healthcare facilities must be prepared to manage the increased demand caused by heat stroke, particularly for those with chronic conditions or who are electrically dependent for life support (Aguilar-Alcala and Edwards - PAHO 2019; PAHO, Aguilar-Alcala and Edwards - PAHO-Eng 2021).

b) **Air quality:** Poor air quality is a significant risk factor for respiratory and cardiovascular diseases, including asthma, chronic obstructive pulmonary disease (COPD), lung cancer, and heart disease. Exposure to pollutants like particulate matter (PM2.5), ozone, nitrogen dioxide, fumes, and heat can exacerbate these conditions, increasing morbidity and mortality rates.

Fossil fuel combustion is one of the major sources of greenhouse gas emissions globally releasing environmental pollutants with immediate harmful effects to human health. Fine particulate matter (PM2.5) air pollution is responsible for 63% of deaths from environmental causes and 3% of deaths from all causes (Lelieveld, Evans, and Fnais 2015).

Peru has an average yearly air pollution of 23.5 µg/m3, ranking 38th worldwide in terms of air quality, surpassing neighboring countries such as Chile (22.2) and Mexico (19.5) (IQ Air 2023). Lima is the most polluted city in South America, with an average concentration of fine particles (PM2.5) of 26 µg/m3.

Air pollution caused by PM2.5 in Peru resulted in 7,800 deaths in 2019. One-third of these deaths were directly caused by burning fossil fuels. PM2.5 is one of the most hazardous environmental pollutants, as it penetrates deep into the lungs, exacerbating chronic, cardiac, pulmonary diseases-including asthma, and mental illnesses, increasing the demand for hospital visits and care, and potentially leading to premature death. Asthma is the most common chronic disease among children with 80% of asthma-related deaths occurring in low- and middle-income countries (LMICs). Asthma prevalence among children and adolescents in Lima, Peru ranges from 13% to 19.6%,

with less than 5% of children in low-resource settings adhering to guideline-based therapies (Romani and Siddharthan 2020).

The Lancet Countdown Global 2022 report states that premature deaths due to poor air quality cost Peru 1.4% of its GDP in 2021, equivalent to the average income of nearly half a million Peruvians. From a global health security perspective, air contamination can worsen the effects of heatwaves, with negative impacts potentially amplified by wildfires.

c) **Wildfires:** The intensification of heatwaves due to climate change associated with droughts, humidity reduction is likely to lead to a higher number of wildfire events with further impact on air quality. Recent wildfires, including those in Australia (2019-2020), the Amazon rainforest in Brazil (2019-2020), the western United States (2018, 2020), and British Columbia, Canada (2017-2018), have reached unprecedented scale and duration. Since August 2020, record-breaking wildfires along the U.S. West Coast have burned 2.7 million hectares, resulting in over 30 fatalities and leaving tens of thousands homeless. Models show that the risk of wildfires will continue to rise globally as climate change worsens, increasing mortality and morbidity from burns, wildfire smoke, and associated mental health effects (Bell, Haines, and Xu 2020).

Wildfires require three conditions: fuel, oxygen, and an ignition source, collectively known as the fire triangle. Climate change increases the likelihood of these conditions being met. It contributes to more frequent and intense heat waves, providing ignition sources. Additionally, the global surface wind speed has increased significantly since 2010, primarily driven by ocean-atmosphere oscillations such as El Niño events, potentially linked to climate change. Strong winds enhance oxygen supply, aiding wildfire spread and challenging firefighting efforts. Forest fires can result in the destruction of facilities or prolonged closures for cleanup (Bell, Haines, and Xu 2020).

The frequency and impact of forest fires have surged in recent years, primarily ignited for agricultural land clearing and promoting livestock ranching. In dry conditions, these fires can escalate uncontrollably and infiltrate the forest. Between 2019 and 2022, Peru witnessed a doubling in the number of forest fires, with an unprecedented 70 percent affecting the Amazon Basin, particularly in Ucayali, Loreto, Huánuco, and Madre de Dios regions. Agriculture, cattle ranching, logging, mining, and waste burning were identified as major contributors. The climate crisis, marked by dry conditions, heatwaves, and droughts, exacerbated by "El Niño Coastal Phenomena," heightens the risk of forest fires (FAO - Evaluacion Forestal 2020). Forest fires can reduce air quality, which can have negative impacts on human health. In 2019, Peruvian authorities from Amazon cities reported the arrival of dense smoke resulting from large forest fires in Brazil and Bolivia.

SERFOR's adaptation measures in the National Climate Document (NCD) primarily emphasize central-level risk management and a robust regulatory framework. In contrast, the community-oriented approach focuses on oversight, ecosystem restoration,

employing sustainable forest management technologies, satellite monitoring, and diversifying production chains. Acknowledging limited resources, there is a crucial need for careful consideration and effective implementation of adaptation strategies for fire management in a changing climate. NCDs should explore alternatives such as safeguarding fire-sensitive ecosystems, mitigating unacceptable fire risks, enhancing habitat connectivity, establishing fire refugia, supporting native vegetation recovery, promoting operational flexibility, and formulating adaptive staffing and budgeting strategies.

d) Electric power disruption as a result of severe weather/ heatwaves

Electric power is crucial to modern life, affecting environmental sustainability, economic development, social equity, and global security. Power is mainly sourced from gasoline, diesel, gas, coil, electricity, and nuclear centrals. Clean electricity as a source of energy is key to reduce greenhouse gas (GHG) emissions and maintain essential services such as production, banking, transportation, education, and healthcare facilities and laboratories (US EPA, 2023).

Peru's mix of power sources comprises 56% thermoelectric, 38.7% hydroelectric, 3% wind, and 2.13% solar, with hydroelectric power accounting for 63% of total production. Urban electricity coverage is over 97%, while rural coverage is 83%, with lower rates in Amazonian regions. During droughts, deficits in hydroelectric power are covered by gas and diesel plants. In the 2021 drought, the failure of over 200 hydroelectric plants, accounting for 29% of power generation, led to increased reliance on gas and diesel. Despite commitments under the Paris Agreement, Peru's energy system remains heavily dependent on fossil fuels. The system is vulnerable to climate change-induced events like heatwaves, fires, and droughts, which can disrupt electricity supply (Ritchie, Roser, and Rosado, 2020).

Climate change exacerbates the frequency and duration of power outages due to storms, floods, wildfires, and heatwaves, which compromise infrastructure and power transmission (Casey, 2021; HHS Empower, 2024). People with chronic health conditions who rely on durable medical equipment (DME) are especially vulnerable during power outages.

Ensuring global health security requires sustainable energy supply to healthcare facilities, laboratories, and electro-dependent patients. This involves public preparedness, mapping of critical facilities and people with special needs-electrode pendants, modernizing energy infrastructure to withstand extreme weather, diversifying and integrating renewable energy sources, implementing smart grids, developing emergency power plans for critical facilities, and raising public awareness to strengthen response efforts (Aguilar-Alcala and Edwards - PAHO 2019).

ii) Extreme Weather- Cold waves affecting more the poorest and underserved in Peru
Peru is vulnerable to severe cold weather including cold snaps, particularly in the high Andean areas of Arequipa, Cusco, and Puno. This climatic phenomenon involves a sudden drop in temperature caused by cold and dry air from the polar region. It affects the Andean and is most prevalent between June and August.

Every winter, around 600,000 Peruvians living more than 3,500 meters above sea level struggle to survive the freezing altiplano conditions. These communities are often dispersed and consist of at most 50 or 60 families, which makes managing the problem challenging. During periods of low temperatures, pneumonia cases and mortality increase in children under five years and older adults. There were 450 pneumonia deaths reported in 2010, 378 deaths in 2015, and 629 deaths in 2018. According to MINSA, the most affected are those living in poor conditions, lacking proper housing, with limited access to health services who often have health indicators below national standards. Climate change is expected to sustain these events in the medium term, but besides the humanitarian aspect, these are not part of Global Health Security scope. (MINSA - Friaje 2019; El País 2023)

iii) Water and Food Security: The reduction of water reserves due to melting glaciers and severe droughts impacts water quality and availability, affecting food production. This can lead to malnutrition, foodborne-waterborne diseases, heightening health risks.

a) **Glacier reduction:** Peru, home to 71 percent of the world's tropical glaciers, faces a critical water supply challenge due to glacier retreat caused by rising temperatures. Glaciers play a vital role in Andean hydrology, storing water for release throughout the year. Nearly half of Peru's glaciers have vanished (49.9%) in the past 37 years, with accelerated melting in the 2020, putting regions like the Huaraz (Peru) under imminent flooding risk. Regions like Puno and Arequipa are at high risk. If current trends persist, only 10 percent of Peru's glaciers will remain in the next 30 years. This poses a threat to water availability for agriculture and human consumption, impacting electricity production, as 52 percent of the country's power is hydro-generated from basins fed by glacier water (European Union nd; Turpo-Cayo 2022).

b) **Water:** Peru has abundant water resources, with three primary sources contributing over 2 million hectares annually. The Pacific slope covers 22%, the Atlantic slope covers 75 percent , and Titicaca covers 4 percent . Water use and management follow Water Resources Law No. 29338 (MINAM 2019). However, access to water and sanitation in Peru is unequal, with water stress due to factors like rurality, dispersion, infrastructure deficits, and lack of transport.

   The Cost region, where nearly 70% of the population resides and 82% of the GDP is generated, faces critical water scarcity, particularly in the Chillón, Rímac, and Lurín basins (Sebastián 2022). As of 2019, countrywide access to improved water sources is 90.8%, but availability doesn't meet demand, especially in rural areas. Urban populations had access to drinking water for an average of 18.7 hours/day in 2020. As of

2019, countrywide access to improved water sources stands at 90.8% (75.6% rural, 76.9% in Selva, 88.8% in Sierra, 94.9% urban, and 95% in the Costa region.) Improved sanitation access was 77.2% in 2019, with rural areas lagging behind at 28.3%. Inadequate sanitation and sewerage systems pose risks, leading to contamination and waterborne diseases. Although wastewater treatment has improved (up to 77.5% in 2020), 22.5% of collected wastewater was discharged untreated into aquatic ecosystems in 2020. During the COVID-19 pandemic, SARS-CoV-2 RNA wastewater monitoring was conducted in Lima-Callao and Arequipa, showing its usefulness as an economical and sensitive approach for resilience (Pardo-Figueroa 2022).

Climate change has altered Peru's hydrological cycle, affecting water availability, increasing flood and drought risks, and causing water pollution. The "El Niño Costero'' phenomenon disrupts precipitation patterns, leading to flooding and droughts, impacting natural lakes and water systems. Lima is anticipated to face a 30% water imbalance in the next 10 to 15 years due to reduced rainfall, extreme weather events, pollution, and overexploitation of aquifers. The Amazon rivers and Lake Titicaca aquifer systems are also affected by extended heatwaves and reduced water levels, with the frequency of "El Niño'' occurring now every five years instead every 15 years due to climate change acceleration, according to SENHAMI (MINAGRI - Autoridad Nacional del Agua - Cuencas2016; MINAGRI- Autoridad Nacional del Agua- PEI 2017)

c) **Agriculture and food production:** Agriculture is emerging as a particularly vulnerable sector. Climate change can wash away fields, lead to livestock loss, and force farmers to reduce planting during extreme events, resulting in scarcity, heightened demand, and increased prices. For each degree Celsius rise in global temperature, there is a 5 to 15 percent decrease in overall crop production (Turner 2017) .
The private sector faces increased pressure to their operational exposure to climate hazards and may reduce production or commercialization if climate change increases the risks or reduces the efficiency of its operations. Extreme weather as heat does not only reduce workers productivity but also increases vector borne diseases such as dengue and malaria, historically known to negatively affect the workforce (Pankratz and Schiller 2023).
Droughts threaten food security and agricultural diversity, with unpredictable rainfall patterns causing challenges for farmers, reducing crop yields, and pushing younger generations to migrate in search of better opportunities (De Apata and Dionisio 2023).

iv) Vector-borne diseases: Rising temperatures, changes in precipitation, and increased humidity create favorable conditions for the transmission of vector-borne diseases such as Dengue, Zika, and malaria.

Climate change can increase the spread of food, water, and vector-borne diseases by extending the areas and durations in which conditions are favorable for outbreaks. Climate change is expected to increase mortality and morbidity from infectious diseases worldwide (Grobusch,

2022). A recent study predicts that with a 2°C rise in global temperatures, over 4,000 cross-species viral transmission could occur among 3,000 mammalian species in the next 50 years, potentially making climate change a dominant factor in viral spread (Carlson et al., 2022).

The majority (70%) of emerging diseases (e.g.Ebola, Zika, Nipah encephalitis), and almost all known pandemics (e.g. influenza, HIV/AIDS, COVID-19), are zoonoses – i.e. are caused by microbes of animal origin. These microbes 'spill over' due to contact among wildlife, livestock, and people. An estimated 1.7 million currently undiscovered viruses are thought to exist in mammal and avian hosts. Of these, 631,000–827,000 could have the ability to infect humans (Daszak et Al. IPBES 2020).

The most important reservoirs of pathogens with pandemic potential are mammals (in particular bats, rodents, primates) and some birds (in particular water birds), as well as livestock (e.g. pigs, camels, poultry). Extreme or persistent changes in temperature, precipitation, humidity, and air pollution associated with climate change can expand the size of EID reservoirs, increase host–pathogen and cross-species host contacts to promote transmission or spillover events, and degrade the overall health of susceptible host populations leading to new EID outbreaks(Daszak et Al. IPBES 2020).

Mordecai EA et al. revealed that mosquito-borne pathogens have peak transmission at a temperature range of 23–29°C and decline to zero below 9–23°C and above 32–38°C. By analyzing the reproductive number (R0) of pathogens from the aspect of thermal biology, such findings provide direct evidence of how climate change could affect the transmission of ectothermic vectors and parasites (Mordecai et Al. 2022).

Drinking water safety is crucial in preventing the spread of emerging infectious diseases (EIDs). Climate change can lead to increased rainfall and flooding, contaminating water supplies and raising the risk of waterborne diseases (WBDs) caused by enteric bacteria and parasites like Salmonella and Cryptosporidium (Shaman, 2023). In climate-vulnerable areas, climatic hazards threaten drinking water safety, leading to outbreaks of WBDs and vector-borne diseases (VBDs) like cholera, dengue, and malaria (Amit Hasan et al., 2023).

Climate change and air pollution can worsen air quality and negatively impact the immune system, increasing the risk of respiratory diseases. Chronic exposure to air pollution induces inflammation and oxidative stress and weakens immune function, especially in vulnerable groups like young children, older adults, and those with pre-existing respiratory conditions (Tran et Al. 2023). Extended exposure to high temperatures can also reduce the production of antigen-specific CD8+ T cells and antibodies, further compromising the immune response (Moriyama and Ichinohe 2019).

According to the Intergovernmental Panel on Climate Change the prevalence of vector-borne diseases, including malaria, dengue, has increased in recent decades with high confidence, and it is expected to rise further over the next 80 years unless measures are taken to adapt and strengthen control strategies.

a) **Climate change, malaria, mining and cease of operation of control programs the perfect storm:** Malaria, caused by Plasmodium species and transmitted by infected female Anopheles mosquitoes, remains the most deadly climate-sensitive vector-borne disease. In 2023, over 619,000 deaths were attributed to malaria, predominantly affecting pregnant women and young children in Africa (WHO, plate number 1). The number of cases of *P. vivax* malaria in Peru increased from 2019 to 2024, while the number of *P. falciparum* cases increased from 2207 to 3222 (MINSA/CNE 2024).

Malaria prevalence is influenced by changes in rainfall, humidity, and temperature, which directly impact the behavior and survival of Anopheles mosquitoes. A temperature increase of 0.2°C per decade in the highlands of Colombia has been linked to malaria spreading to higher elevations, altering the malaria map (Sirajh, 2013).

Illegal mining and deforestation in the Amazon region increase the incidence of malaria and other diseases among Indigenous people (Ellwanger et al., 2020). Mining activities create favorable environments for Anopheles mosquitoes by producing water pools that serve as breeding sites. Climate-driven drought further favors the proliferation of mosquitoes. Furthermore, the migration of people to mining areas leads to an increase in susceptible population density in remote areas, facilitating the spread of malaria (Murta et al., 2021).

Venezuelan migrants carrying malaria have been identified as a cause of transmission in former areas of low prevalence (see migration). An increase in the number of migrants carrying malaria may change epidemiological patterns.

The rebound in malaria in Peru is driven not only by climate change, deforestation, and mining, but also because of the defunding and removal of prevention programs (Leif Bates, 2023). Moreover, extreme weather not only can cease healthcare facility operations, interrupting access to prevent malaria diagnosis and treatment, but it can also disrupt supply chains by affecting access by road, river, and air.

Dengue: Over the past few decades, the spread of dengue, the most common mosquito-borne viral disease globally, has increased significantly due to declining vector-control programs and the rise in global trade, travel, and intra-regional migration in the Americas region (Martin-Filho et al., 2023).

The year 2024 has been marked as one of the worst years for dengue cases on record. As of July 23, over 10 million dengue cases have been reported from 176 countries across all WHO regions, with the Americas accounting for most cases. There have been more than 24,000 severe cases and 6508 deaths (The Lancet-Editorial 2024). The dengue cases reported in Peru as of EW 29 of 2024 were 259,129, with 241 dengue-related deaths. This marks an increase of 55,700 cases compared to 2023.

Water-storage containers, commonly used in areas with inadequate piped water supply, can become breeding sites for mosquitoes, driving epidemics (Da Conceição Araújo et al. 2020).

The Lancet Countdown Global 2022 report shows a notable increase in the R0 values of *Aedes aegypti* and *Aedes albopictus,* indicating a higher ease and speed of disease spread. These higher values suggest that the disease is spreading more easily and quickly, potentially leading to increased dengue outbreaks in new areas. Between 2012 and 2021, the R0 of *A. aegypti* and *A. albopictus* increased by 0.83 and 1.14, respectively, compared to the base period (1951-1960) (Romanello et al. 2022).

Dengue fever is becoming a growing health threat due to various factors, including rapid urbanization, increased travel, and climate change. Between January 1 and July 29, 2023, 222,620 dengue cases were reported to MINSA, making it the largest outbreak on record in Peru, ten times higher than the average number during the same period over the previous five years. The coastal northwestern parts of Peru reported the highest number of cases, with extreme rainfall caused by Cyclone Yaku, an unusual low-pressure system in the far Southeastern Pacific, impacting Ecuador and northern Peru in early March 2023. In Lima, the case count reached almost 87000 cases, significantly higher than in previous years, including in neighborhoods that have historically not reported cases (Munayco et al. 2024).

v) Climate change and internal displacement: Climate change can lead to internal displacement, particularly among young people who are forced to migrate due to weather pressures. Climate change-related migrants often become part of economic migration as they lack means of livelihood (Peña - OIM and Jara, 2023).

A 2021 survey found that 67% of global cities expect significant public health and infrastructure impacts due to climate change, with extreme cases potentially requiring entire populations to relocate from vulnerable areas (Wats et al., 2021). In 2021, over 60% (5.9 million people) of internal displacements worldwide were caused by extreme weather events (Internal Displacement Monitoring Centre and Norwegian Refugee Council, 2022). In Peru, approximately 659,000 people were displaced by disasters from 2008 to 2022, primarily due to climate-related floods. Efforts are being made to define and regulate climate migrants in Peru (Peña - OIM and Jara, 2023).

From a global health perspective, climate migration can strain healthcare systems, especially if adverse weather conditions persist, potentially leading to disease outbreaks. Additionally, internally displaced persons may suffer mental health impacts due to the loss of family, livelihoods, and belongings, requiring support to rebuild their lives.

vi) Extreme weather events damage healthcare infrastructure and disrupt access to essential medical services.

Climate change and extreme weather events significantly impact Peru's healthcare facilities, hindering disease prevention, detection, and treatment. These events damage infrastructure, disrupt services, and create challenging conditions for healthcare providers and patients. Hospitals, clinics, and health posts are often ill-equipped to withstand extreme weather, leading to the destruction of buildings and critical equipment. In 2023, Peru faced El Niño Costero, with over 500 health services damaged by relentless rains. The severe weather put hundreds of hospitals and health centers at risk, leading to the closure of 57 health establishments across 21 regions when the country declared a state of emergency. This destruction directly impacts the availability and quality of medical services, leaving communities without essential healthcare (WHO, 2021).

Cyclone Yaku inflicted significant material damage, particularly affecting health services. Patients with tuberculosis were treated alongside laboratory and nursing staff, dangerously close to areas for pregnant women. Collapsed bathrooms and the presence of dengue larvae and mosquitoes exacerbates the situation. Despite urgent repair requests from the Tupac Amaru Health Center to the Chiclayo Health Network, no action was taken.

Since December, rains and floods, intensified by Cyclone Yaku, have damaged 505 health establishments, especially in Tumbes, Piura, and Lambayeque. Although the government promised to strengthen primary care infrastructure during the COVID-19 pandemic, few repairs were made. 87.4 percent of primary healthcare facilities faced overcrowded conditions, poor ventilation, and outdated or insufficient equipment.

Disease prevention relies heavily on continuous and consistent healthcare services. However, Extreme weather events such as floods, heatwaves, and storms can disrupt the cold chain infrastructure. Flooding can damage storage facilities and transportation routes, leading to delays and potential spoilage of temperature-sensitive medical supplies. Heatwaves can overwhelm cooling systems, causing failures in refrigeration units used to store vaccines and medications. These disruptions directly impact the effectiveness of vaccination programs and the distribution of other preventive medications (WHO, 2021). The increasing average temperatures due to climate change pose a continuous threat to the cold chain. Higher ambient temperatures require more robust cooling solutions to maintain the necessary storage conditions for vaccines and medications. In many regions of Peru, especially rural and highland areas, maintaining adequate refrigeration is challenging due to limited infrastructure and resources. As temperatures rise, the risk of cold chain failures increases, compromising the quality of medical supplies (MINSA, 2022).

To address these challenges, it is essential to invest in resilient cold chain infrastructure. This includes deploying advanced refrigeration technologies, improving transportation networks, and ensuring consistent electricity supply, particularly in remote areas. Additionally, incorporating renewable energy solutions, such as solar-powered refrigeration units, can

enhance the reliability of the cold chain in the face of climate change. Strengthening community-based healthcare systems and training healthcare workers to manage cold chain logistics are also crucial steps to mitigate the impact of climate change on preventive healthcare programs (Ellwanger et al., 2020).

vii) Diseases surveillance and early warning systems

a) Disease surveillance

Early detection of outbreaks is key for effective management and control. Extreme weather events can compromise laboratory facilities and diagnostic equipment, delaying disease detection and response. In Peru, where healthcare accessibility is challenging, climate-related disruptions exacerbate difficulties in diagnosing and monitoring diseases, leading to potential outbreaks and uncontrolled spread (Siraj, 2013).

The epidemiological analysis in the MINSA Situational Analysis report considers disease and population variables but overlooks environmental factors like temperature, humidity, heatwaves, droughts, floods, and forest fires. These factors, along with migration and economic practices at the population level and urban or industrial development, increase exposure risks and are not sufficiently addressed in current analyses or intervention summaries.

Moreovers, there are climate change related conditions - heatwaves that are already causing disease and death in Peru, that are not being notified, and MINSA actions are limited to provide alerts.

Effective policy decisions for climate change and emerging infectious diseases (EIDs) require robust prediction models that accurately simulate transmission dynamics. This may involve adopting advanced AI and machine learning approaches and integrating large datasets to enhance prediction accuracy, as demonstrated by the GeoSentinel Network.

Geographic information systems (GIS) can collect and store geographically and temporally referenced information to visualize and analyze factors associated with EID outbreaks. Satellite imagery and remote sensing can identify interfaces between pathogen reservoirs and susceptible hosts, potentially serving as early warning systems for increased EID risks. The Peruvian Space Agency, supported by NASA, can further expand these capabilities to improve global health security and food security by assessing water reservoirs and crops.

Innovative surveillance approaches are needed to detect new EID pathogens and diagnose cases. Successful prevention and containment of EID outbreaks require multi-disciplinary and inter-continental collaboration, integrating simulation models, mobile applications, satellite imagery, remote sensing, biosensors, point-of-care analysis, and genomic surveillance. Cross-sectoral collaboration among MINSA, MINAGRI, and MINAM is essential.

From a global health security perspective, genomic surveillance is crucial for tracking EID sources and routes, providing information on emerging drug resistance, and guiding therapeutic interventions.

vii) Mitigating climate change impacts with vaccines

The consequences of climate change on human health are complex and still being explored, but evidence increasingly shows its potential to worsen the spread of infectious diseases. Effective mitigation measures are crucial in addressing this global crisis. Vaccines and vaccination are among the most cost-effective public health interventions, yet they are not widely recognized as a major strategy for mitigating climate change-related health effects.

Rising temperatures contribute to the spread of vector-borne diseases like dengue, chikungunya, and malaria, and affect the transmission of airborne diseases such as influenza and respiratory syncytial virus infection. It is essential for the Ministry of Health (MINSA) to understand these risks and develop strategies to use vaccines and vaccination as part of climate change mitigation where appropriate.

In 2024, the Brazilian Butantan Institute published results from an ongoing phase 3 trial of the Butantan-Dengue Vaccine. This single-dose vaccine, developed in collaboration with the U.S. NIH showed an efficacy of 89.5 percent against DENV-1 and 69.6 percent against DENV-2, with no detection of DENV-3 and DENV-4 during the follow-up period. Adverse events were more common in the vaccine group (58.3 percent) compared to the placebo group (45.6 percent within 21 days post-injection (Esper G., 2024).

MINSA should consider these findings and evaluate the potential of integrating vaccines into its climate change mitigation strategies to protect public health effectively.

ix) Preventing other risks resulting from climate change- antimicrobial resistance

Antimicrobial resistance is one of the main challenges of this era, and one of the various mechanisms contributing to its expanded use in Peru is the animal industry. See chapter three, on the private sector and the use of antimicrobials in chicken as grown inducers and the proliferation of multiple resistant bacteria circulating in Peru that are affecting humans. What we are learning is that antimicrobial resistance is also linked to climate change. (Magnano San Lio. 2023) Temperature rise as a consequence of climate change is increasing bacterial growth rates and horizontal gene transfers. (Philipsborn, Rebecca 2016) Further investigation should be conducted from the One Health perspective, particularly in Peru, because of its history with AMR.

D. PROGRAMMATIC RECOMMENDATIONS

D.1. PREVENT

P1. LEGAL INSTRUMENTS *AND GENDER EQUITY:*

- Share the new U.S. Government Global Health Security Strategy 2024 with high-level stakeholders and decision-makers, including champions within the ministries of agriculture, health, and environment.

P2. FINANCING:

- Collaborate with financial institutions implementing Climate Action initiatives (e.g., World Bank, IADB, CAF) to provide recommendations for programming on climate change adaptation and Global Health Security.
- Provide training and technical assistance to DIRESA and Geresa to enhance their capacity to mobilize regional funding, ensuring the sustainability of the GHS-OH approach.

P4. ANTIMICROBIAL RESISTANCE:

- Promote research on Antimicrobial Resistance and Climate Change, to identify if this is happening in Peru, particularly in regions with a high prevalence of AMR microorganisms and rising temperatures.

P5. ZOONOTIC DISEASE:

- Monitor emerging and re-emerging zoonotic disease events, epizootics, and spillovers in areas affected by the new forest law, and map these occurrences accordingly.
- Track patterns in the transmission of rabies among humans and animals, taking into account environmental variables.

P6. FOOD SAFETY:

- Collaborate with agriculture and food security sectors to monitor food availability from a One Health perspective, considering its vulnerability to extreme weather and volatility.

P8. IMMUNIZATION: .

- Raise awareness about the impacts of climate change on immunization operations to enhance standards conducive to Global Health Security, including guidance on climate mitigation, adaptation, and operational sustainability.
- Promote the mapping of vaccine-preventable diseases vulnerable to climate change, focusing on those posing challenges to Global Health Security.

D.2. DETECT

D1. NATIONAL LABORATORY SYSTEM:

- Increase awareness about the impacts of climate change on laboratory system

operations, and promote the integration of climate resilience standards favorable to Global Health Security.

D2. SURVEILLANCE:

- Strengthen efforts by the Peruvian CDC on climate surveillance, including their virtual situational room, through training on prioritized One Health diseases.
- Integrate a climate resiliency module into community surveillance teams' training to bolster their ability to address climate-related health challenges.
- Promote the monitoring of high-risk areas susceptible to combined One Health and Climate Change effects.
- Support data gathering and analysis to better understand the impacts of Climate Change on Emerging Infectious Diseases (EIDs) in Peru.

D3. HUMAN RESOURCES:

- Integrate principles of Global Health Security - One Health and Climate Change into pre-graduate and post-graduate educational institutions.
- Expand curricula to include topics related to climate change and resilience, ensuring learners are equipped to address these critical issues.
- Facilitate knowledge and research exchange between indigenous communities and technical experts on One Health and Climate Change Adaptation strategies, leveraging indigenous wisdom to inform early warning systems.

D.3. RESPOND

R1. HEALTH EMERGENCY MANAGEMENT:

- Provide technical assistance for the validation and improvement of the Peruvian NCDs for the health sector currently being implemented under an Emergency decree.

R3. HEALTH SERVICES PROVISION:

- Raise awareness among health providers working in remote or hard-to-reach health facilities about changes in Emerging Infectious Diseases (EIDs) driven by climate change and ensure they are familiar with diagnostic and treatment norms for zoonoses of public health relevance.

R5. RISK COMMUNICATION AND COMMUNITY ENGAGEMENT:

- Develop One Health interventions in indigenous communities in collaboration with environmental defenders, focusing on collective defense strategies, digital security, and rapid-response mechanisms for prevention, detection, and control.
- Prioritize One Health literacy for all audiences, encompassing climate, environmental, and emerging and re-emerging diseases.

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