

# Challenges and Strategies for Controlling Indonesia's Emerging and Re-Emerging Infection Diseases (EID-REIDs)

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## ABSTRACT

*This review aims to highlight the occurrences of several emerging and re-emerging infectious diseases, particularly 13 types under surveillance of Indonesia's emerging contagious disease task force. These diseases are considered potentially epidemic, due to the nature of tropical climate and high humidity of Indonesia's area. Several factors contribute to the emergence of these diseases: in conjunction with human behavior. Most of these diseases are zoonotic, specifically spread by viruses. The latest emerging infectious disease in Indonesia is monkeypox. Controlling the management of EID-REIDs presents a major obstacle for international health initiatives, particularly in Indonesia because of its extensive population, varied geographical landscape, and constrained resources. Overcoming these obstacles demands tactics like prioritizing Indonesian policies, bolstering disease monitoring systems, upgrading diagnostic capacities, fortifying public health facilities, fostering community involvement and education, and executing efficient prevention and management protocols. These strategies should be implemented in collaboration with international partners and organizations to effectively control and prevent the spread of emerging and re-emerging infectious diseases in Indonesia.*

**Keywords:** *EID, REID, One Health, Infectious disease.*

## INTRODUCTION

Indonesia is the biggest maritime country in the world, with a population count of over 274 million as of January 20th, 2023. The beauty and diversity of Indonesia's nature and culture invite many tourism visits. The tropical climate with high sun exposure all year round is one of the mesmerizing properties that invite tourists to Indonesia. On the contrary, this tropical climate and the subsequent high humidity level are the best media for the spread of infectious diseases.

Indonesia showed a growing animal population that is known to be the reservoir or the carrier for these infectious diseases, such as poultry, rodents, monkeys, canines, wild birds, and pigs.<sup>1</sup>

Infectious disease is one of the leading causes of death in the world.<sup>2</sup> Improper treatment and response could lead to local endemics, which could be dangerous for the locals and tourists alike. Moreover, the high mobility of tourists could increase the risk of the local endemic becoming a global pandemic. The burden of

infectious disease is a result of the number of infections that happened in a prior period, and the epidemic of an emerging infectious disease, or re-emerging infection that rises in number.<sup>2,3</sup>

Emerging infectious disease, further mentioned as EID, is an infectious disease that is characterized by the rapid increase in case numbers and spread among the human population through biological agents, such as viruses, bacteria, fungi, and parasites. Most infectious disease that is known today is transmitted by animal (zoonotic diseases).<sup>3-5</sup> According to the Indonesia Health Ministry, there are three types of EID, which includes new emerging infectious diseases, pre-existing infectious diseases that spread to a new geographical area, and re-emerging infectious diseases, further mentioned as REID.<sup>3</sup>

Various factors could trigger EID and REID, including environmental factors, changes in human behavior, microbial adaptation, an increase in human population, high population in big cities with poor sanitation, international travel in the globalization era, a change in food handling and processing methods, and

the increase of microbial exposure and vector toward human.<sup>4-6</sup> Since infectious illnesses are a constant threat to the world, it is imperative to understand how once-dominant vector-borne diseases are resurfacing and minimizing the harm they inflict. These infections either go unnoticed or get overlooked. Thus, to promote appropriate public health responses, ongoing knowledge of infectious diseases and advancements in control efforts are required.<sup>4,5</sup>

## SEVERAL EID-REIDS AND DATA ON INDONESIAN EPIDEMIOLOGY

Uncontrolled EID-REIDs outbreaks can result in significant economic losses in addition to deaths, making them a danger to Indonesia's health security, among others:

### Mpox

**Picture 1.** On July 23rd, 2022, Monkeypox was announced by the WHO to be a Public Health Emergency of International Concern (PHEIC). The WHO later changed the name to Mpox on November 28th, 2022 and the international concern status was lifted by May

**Table 1.** Example of EID and transmission method<sup>6,7</sup>

Infectious Disease	Pathogen	Emerging/Re-emerging	Transmission
<b>Hantavirus pulmonary syndrome</b>	Hantavirus	Emerging	Zoonotic
West Nile fever	West Nile virus	Re-emerging	Vector-borne
Nipah virus infection	Nipah virus	Emerging	Zoonotic
Mpox infection	Monkeypox virus	Emerging	Zoonotic
Severe acute respiratory syndrome	SARS-CoV-1	Emerging	Respiratory (human to human)
COVID-19	SARS-CoV-2	Emerging	Respiratory (human to human)
Highly pathogenic avian influenza	H5N1, H5N6, H9N2 influenza virus	Emerging	Respiratory (human to human)
Middle East Respiratory Syndrome	MERS-CoV	Emerging	Zoonotic
2009 Influenza pandemic	H1N1 influenza virus	Emerging	Respiratory (human to human)
Lassa fever	Lassa virus	Re-emerging	Zoonotic
Dengue fever	Dengue virus	Re-emerging	Vector-borne
Yellow fever	Yellow fever virus	Re-emerging	Vector-borne
AIDS	HIV	Emerging	Human to human
<i>Escherichia coli</i> infection	<i>E. Coli</i> pathogen	Emerging	Foodborne
Typhoid fever	<i>Salmonella typhi</i>	Re-emerging	Foodborne, waterborne
Cholera	<i>Vibrio cholerae</i>	Re-emerging	Waterborne
Tuberculosis infection	<i>Mycobacterium tuberculosis</i>	Re-emerging	Respiratory (human to human)
Meningococcus meningitis	<i>Neisseria meningitidis</i>	Emerging	Environmental exposure
Malaria	<i>Plasmodium spp.</i>	Re-emerging	Vector-borne

11th, 2023.<sup>7,8</sup> The country with the highest impact as shown in **Figure 1**, had the cumulative number of cases of 81,9% of the total cases worldwide. Lao PDR reported its first Mpox case by the end of September 2023.<sup>7</sup> There are 712 cases of Mpox worldwide every month, from April to September 2023. It had decreased significantly compared to the 31.075 cases in its peak period during August 2022. The region with the highest cumulative number of cases was the West Pacific, and the region with the highest cumulative number of mortality was the USA.<sup>7</sup>

**Picture 2.** Documented Mpox cases in Indonesia starting from early 2023 to October 23rd, 2022, were as follows; nine suspected cases, six discarded cases, and nine confirmed cases. The risk factor of Mpox transmission in Indonesia, correlated from the nine confirmed cases was 100% through sexual transmission (**Figure 2**).<sup>9</sup>

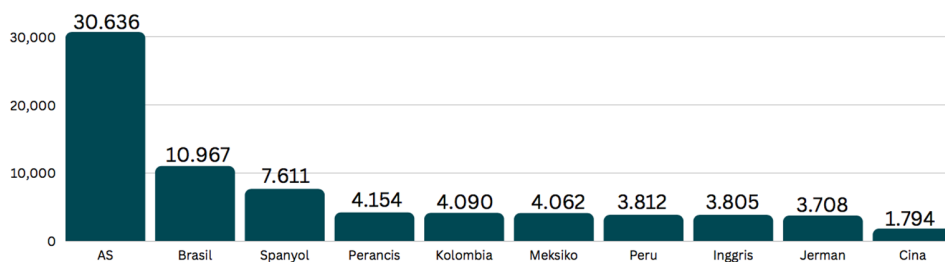
**COVID-19**

**Picture 3.**

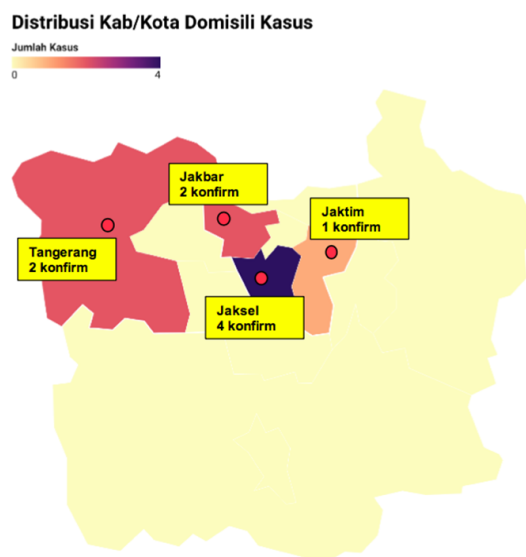
The WHO has terminated COVID-19 status as a Public Health Emergency of International Concern (PHEIC) since May 5th, 2023. The COVID-19 Case Fatality Rate (CFR) counted from December 31st, 2019, until October 25th, 2023, was 0,9%. The total confirmed case worldwide was 771.549.718 and the death toll was 6.974.473. New COVID-19 strains have continued to develop in recent days, and the newest strain has reportedly caused 31.939 cases in the last seven days as shown in **Figure 3**.<sup>7,10</sup>

**Picture 4.**

COVID-19 pandemic status in Indonesia was terminated on August 4th, 2023, by the presidential order 'Peraturan Presiden No. 48 tahun 2023 tentang Pengakhiran Penanganan Pandemi COVID-19'. Indonesia's CFR was 2,38% with a total confirmed case of 6.813.652



**Figure 1.** Transmission of Mpox 2022-2023 in ten countries with the highest number of case<sup>7,8</sup>



**Figure 2.** Indonesia's transmission of Mpox case in 2023<sup>9</sup>

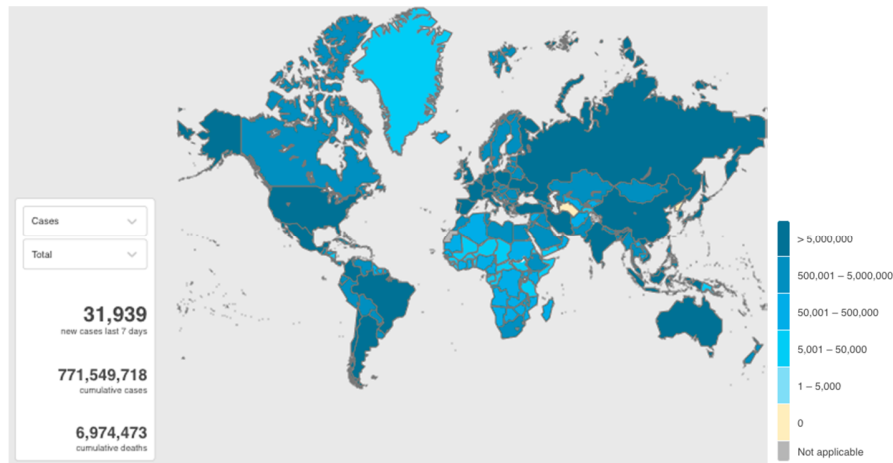


Figure 3. Confirmed COVID-19 case worldwide<sup>10</sup>

and a death toll of 161.920 in 514 cities, and 34 provinces. Furthermore, Indonesia reported an additional 223 confirmed cases and two death cases in the last month.<sup>7,11</sup>

COVID-19 has different mortality rates according to the symptoms, whether it started as asymptomatic, to a critical condition with secondary infection. Triyono et al. showed the difference in research, which was conducted in Indrapura Hospital Surabaya during 2020-2021. The research purpose was to describe the outcome of COVID-19 patients with asymptomatic and mild symptoms reported at the onset of hospitalization. Triyono et al., reported 0% CFR was observed on asymptomatic patients and patients with mild symptoms.<sup>12</sup>

Furthermore, another research by Asmarawati et al., conducted in UNAIR Hospital Surabaya in 2021 observed the outcome of COVID-19 patients with moderate to critical symptoms. Asmarawati et al., reported a CFR of 16,28% in patients with moderate to critical symptoms which was accompanied by 19.7% bacterial co-infection subsequently. The CFR number was found to be higher in patients with co-infection, compared to patients without co-infection (CFR 8%). Overall, Indonesia reported a higher CFR compared to other countries globally because it was found that the rate of co-infection in Indonesia was higher subsequently, for example, China had a CFR of 13.9% while the United Kingdom had a CFR of 3.2%.<sup>13</sup>

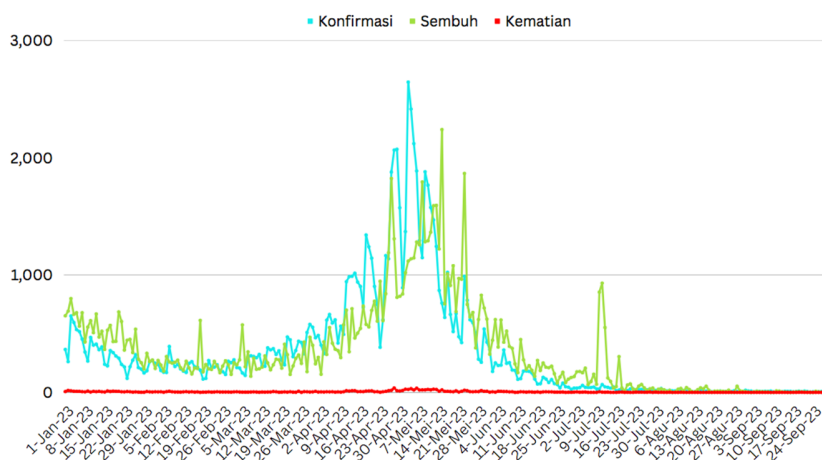


Figure 4. COVID-19 cases in Indonesia as of 2023<sup>7</sup>

**AVIAN INFLUENZA**

**Picture 5**

Avian influenza strain A(H5N1) was one of the EIDs with the highest CFR. The CFR reached 52,3% with 880 cases and 460 death cases from 2003 up until 2023. There were ten confirmed cases in 2023, namely one case in Chile, one case in PRC, four cases in Cambodia, and four cases in the UK (Figure 5). The death case was reported in Cambodia, which accounted for three cases out of four.<sup>5</sup> The occurrence of A(H5N1) in Indonesia was reported in May 2023, when there were found to be two cases of A(H5N1) in the Solok region, West Sumatra. However, both cases tested negative. The reported CFR of A(H5N1) in Indonesia reached 84% with 168 deaths in 200 confirmed cases, from 2005 to 2017. Therefore, it was deemed necessary to direct more attention to A(H5N1), which was why the government issued 'Peraturan Menteri Kesehatan No. 414/Menkes/SK/IV/2007' and followed by the 'Peraturan Gubernur Jawa Timur No. 3 Tahun 2007' as a countermeasure to A(H5N1). The result was satisfactory as there were no reported cases of A(H5N1) ever since 2018.<sup>7</sup>

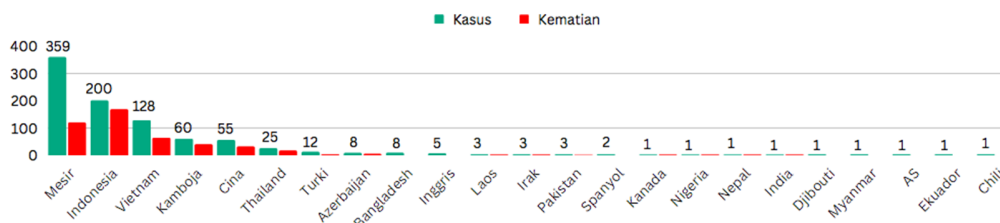


Figure 5. Confirmed case and mortality distribution of A(H5N1) based on countries in 2003-2023<sup>7</sup>

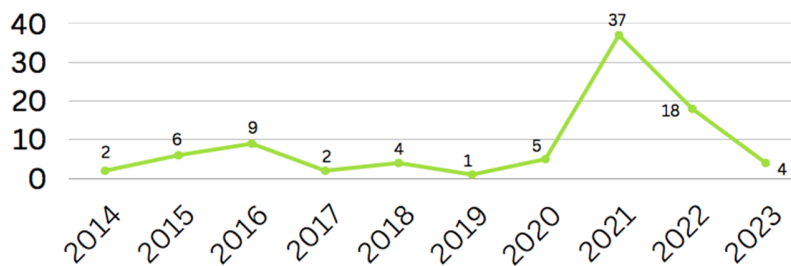


Figure 6. Global distribution of A(H5N6) in 2014-2023<sup>7</sup>

**Picture 6.**

A(H5N6), a different strain of avian influenza virus, was first reported in 2014. Compared to the A(H5N1), the number of A(H5N6) cases was scarce (Figure 6). During the period of 2014-2023, the total confirmed cases were 88 cases, with 87 cases in China, one case in Lao PDR. The death toll was reported to be 34 deaths with a CFR of 38.6%. The latest case was reported on September 27th, 2023.<sup>14</sup> Occurrences of A(H5N6) in Indonesia have not been reported.<sup>7</sup>

**Picture 7.**

Confirmed cases of A(H9N2), another strain of avian influenza virus, were reported throughout the year. The first case was reported in 1998, and the latest case was reported in the 38th week of 2023. The total number of the case was 120 cases, with two death cases and a CFR of 1,67%.<sup>7</sup> China reported four cases during the period, with the latest case reported in August 2023.<sup>11</sup> Based on the latest EID monitoring in Indonesia, there have not been any occurrences of A(H9N2) cases up until the 41st week of 2023 (Figure 7).<sup>7</sup>

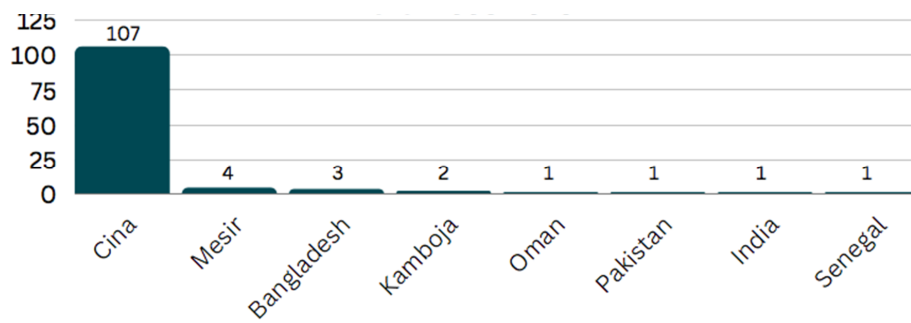


Figure 7. Global distribution of A(H9N2) in 1998-2023<sup>7</sup>

**NIPAH VIRUS DISEASE**

**Picture 8**

The latest distribution of the Nipah virus disease was reported in Kerala, India (Figure 8). There were six confirmed cases, with two death cases due to acute respiratory distress syndrome (ARDS) and pneumonia (CFR 33.3%)<sup>12</sup>. Contact tracing from the six cases found 1288 close contacts, where 1180 tested negative, and the remainder was then isolated. The source of the index case infection was not found. Moreover, evidence of familial and hospital transmission was found, which increased the risk of Nipah virus disease.<sup>15</sup> Bangladesh reported ten confirmed cases of Nipah virus with eight death cases and a CFR of 72.7%, as shown in picture 8.

Indonesia has not yet reported any case of Nipah virus disease.<sup>7,15</sup>

**POLIO**

**Picture 9**

From October 18th to 25th 2023, there were numerous reports of polio cases. Pakistan reported one positive case of WPV1, while in the Congo Democratic Republic; two cases of eVDPV1 were reported. Madagascar also reported six cases of eVDPV1, and one case of eVDPV2 in Kenya (Figure 9).<sup>16</sup> Polio cases were found in Indonesia as well. In addition to the number of cases in Figure 9, Indonesia reported cVDPV2 cases in March 2023, in Subdistric Purwakarta, West Java Province<sup>7,16</sup>

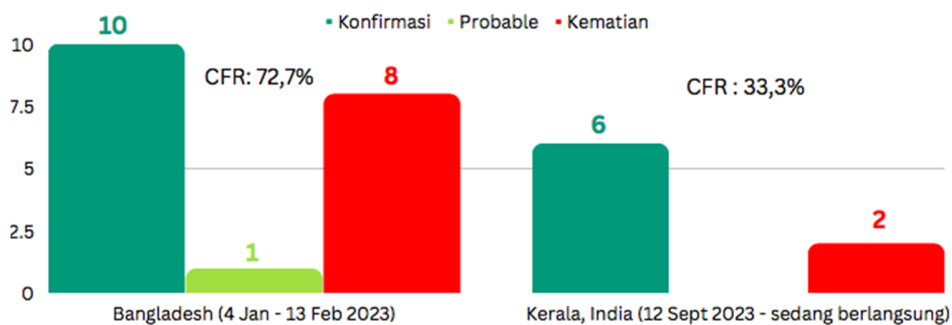


Figure 8. Global distribution of nipah virus disease confirmed case and mortality rate<sup>7,15</sup>

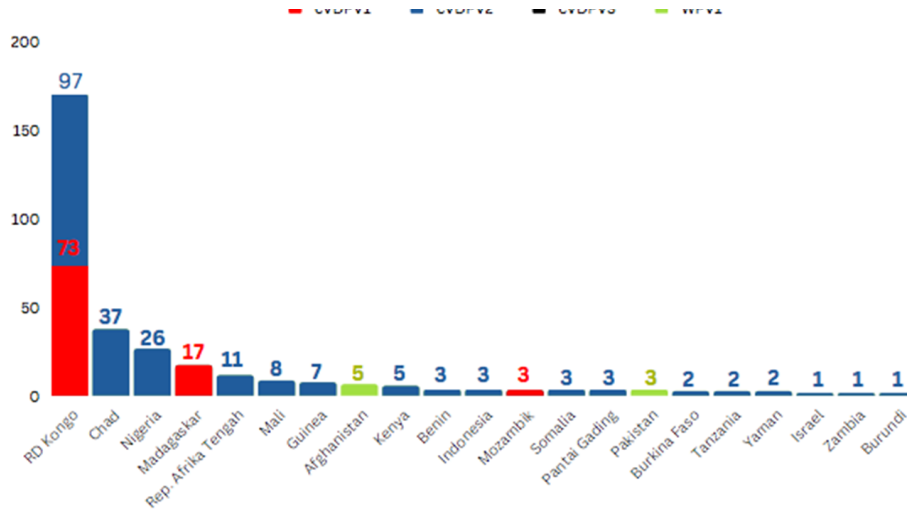


Figure 9. Global distribution of poliovirus based on virus subtype as of 2023<sup>7</sup>

**MERS**

**Picture 10**

*Middle East respiratory syndrome CoronaVirus* (MERS-CoV) was first reported in April 2012 and reached a record high in 2014. During the year 2023 up until September, there were two confirmed cases and one death case with a CFR of 50% (Figure 10). Cumulative number of confirmed cases globally was 2.605 cases, with a CFR of 36%. Most of the cases were reported in Saudi Arabia, which counted for 2.196 cases, with a CFR of 39%.<sup>17,18</sup> Indonesia has yet to report any MERS-CoV cases.<sup>7</sup>

**LEGIONELLOSIS**

**Picture 11**

The USA had legionellosis endemic in 2023. Majority of the patients were asymptomatic, which was why the laboratory test for legionellosis was not frequently performed. Cumulative cases of legionellosis in the USA up until October 14th, 2023 counted 5269 cases, with an additional 243 cases reported just in the last week.<sup>19</sup> Other countries that also reported additional cases of legionellosis include; Australia (16 cases), Hongkong (5 cases), and Taiwan (5 cases). Indonesia had reported three confirmed cases of legionellosis in Bandung, West Java, in 2023 (Figure 11).<sup>7</sup>

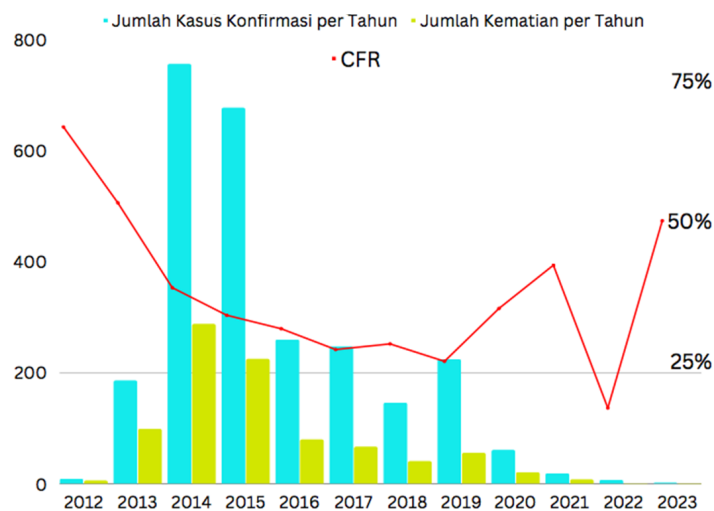
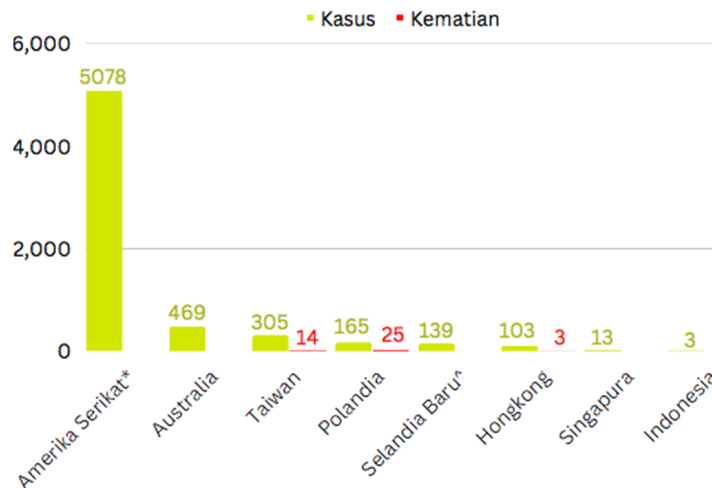


Figure 10. Confirmed cases and mortality rate of MERS in 2012-2023.<sup>7</sup>



**Figure 11.** Distribution of Legionellosis case and mortality rate based on countries as of 2023<sup>7</sup>

**YELLOW FEVER**

**Picture 12**

The latest report of yellow fever was found in the Central African Republic with five cases in July 2023. Cumulative confirmed cases were 286 cases with 39 death cases and CFR of 13,64%. Sixteen WHO African regional countries and three countries in the WHO USA region reported these numbers during 2021-2023 (**Figure 12**). There have yet to be any cases of yellow fever in Indonesia.<sup>7</sup>

**MENINGOCOCCAL MENINGITIS**

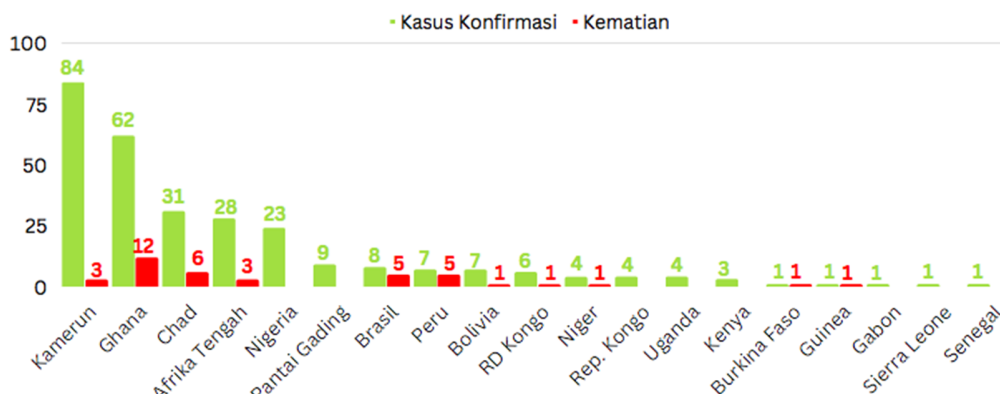
Meningococcal meningitis cases in 2023 were reported to reach 6.568 cases, with 570 total confirmed cases and 423 death cases (CFR 6,44%). One month before the writing of this article, Nigeria reported 21 new cases and 3 death

cases, while New Zealand reported 6 new cases, Australia reported 3 cases, and the USA reported an additional 2 cases. However, Indonesia has yet to report any confirmed case of meningococcal meningitis.<sup>7</sup>

**Table 2.** Cases of Meningococcal Meningitis in Numerous Countries as of 2023.<sup>7</sup>

Country	No. of case	Confirmed	Death
Nigeria	2765	303	190
Niger	1883	261	120
Congo DR	1462	ND	120
USA	287	ND	ND
Australia	113	ND	ND
New Zealand	49	ND	ND
Taiwan	3	3	0
Singapore	3	ND	ND
Italy	1	1	1
Hongkong	1	1	0
Norway	1	1	1
Total	6525	570	420

ND: No Data



**Figure 12.** Distribution and mortality rate of yellow fever in 2021-2023<sup>7</sup>



## LISTERIOSIS

Listeriosis is a food-borne disease, which is fatal, and has a serious risk. Listeriosis is caused by the bacteria *Listeria monocytogenes*. The occurrence rate is 0,1-10 cases per one million people yearly. The latest listeriosis outbreak was reported in South Africa. During the period of 2017 up to March 2018, South Africa reported 978 cases, with 183 death cases from the confirmed 674 cases (CFR 27%).<sup>20</sup>

There are several outbreaks of listeriosis reported in four countries globally as of now. Majority of the confirmed cases were found in the USA, which accounted for 520 cases, followed by Taiwan, which accounted for 157 cases.<sup>7</sup>

## DENGUE

Five different dengue serotypes can cause dengue virus infection, and each year an estimated 390 million people become infected. In the past 20 years, the number of cases of dengue fever reported has increased tenfold, from 500,000 cases in 2000 to 5.2 million cases in 2019. Currently, dengue fever is endemic in over 100 countries. On August 15, 2023, the Republic of Chad became the final country to declare a dengue outbreak, with 1342 suspected cases, 41 confirmed cases, and 1 fatality<sup>21,22</sup>

### Picture 13

Indonesia, an archipelagic nation in Southeast Asia, has a tropical environment with endemic populations of the two primary DENV mosquito vector species. Since 1968, the Ministry of Health has been implementing a nationwide effort to prevent and control dengue disease. On a nationwide level, the CFR can be brought down to less than 1% in 50 years; nevertheless, there were 143,266 cases of dengue in 2022, and 57,884 cases between August 23, 2023, and the beginning of 2023, with the most recent

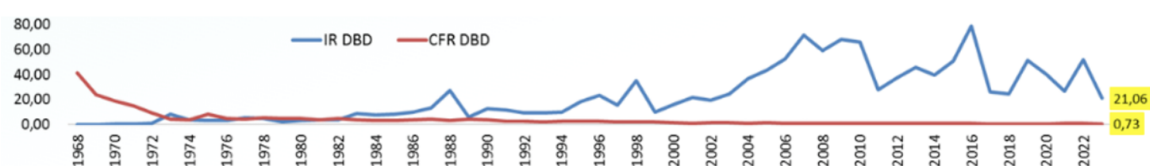
morbidity rate being 21.06 per 100,000 people. Dengue fever cases in East Java are expected to reach 13,236 in 2022, with a morbidity rate of 33 cases per 100,000 people and a CFR of 1.2%, which still does not meet the national average as shown in **Figure 13**.<sup>23</sup>

The Ministry of Health of Indonesia has set an aim of reducing the CFR to 0% by 2030 in order to manage dengue disease. Since there is no known treatment for dengue fever, the author investigated natural items as potential substitutes. The author discovered in 2022 that *Sterculia quadrifida*, also known as Faloak, has the potential to be an antiviral drug for DHF<sup>24</sup> due to its epicatechin and scopoletin components as well as the resemblance of several of its amino acid proteins to ribavirin. The author conducted research in 2010 on the use of *Monascus jmbA* rice, usually referred to as *Angkak nasi*, as an alternative therapy to boost platelet counts in dengue fever patients by inhibiting inflammation.<sup>25</sup>

In addition to exploring substitute therapies, the author highlights the significance of fortifying vector control, bolstering Dengue surveillance, and augmenting ongoing community engagement as all-encompassing measures for managing Dengue fever in Indonesia.

## HIV-AIDS

AIDS, or acquired immunodeficiency syndrome, is a severe public health concern worldwide, primarily due to the Human Immunodeficiency Virus (HIV). With a projected 1.3 million new cases, there will be around 39 million HIV patients in 2022, of which 1.5 million are children under the age of 15. After peaking in 1995, the number of new cases has now decreased by 59%. The number of deaths from AIDS-related illnesses is expected to be approximately 630,000 in 2022, a 69% reduction from the 2004 peak.<sup>26</sup>



**Figure 13.** Dengue Hemorrhagic Fever (DHF) morbidity and CFR, Indonesia, 1968–2023<sup>23</sup>

**Picture 14**

It is projected that there will be 543,100 people living with HIV (PLHIV) in Indonesia in 2020, down from the 643,443 PLHIV recorded in 2016. Along with the global drop in new HIV infections, Indonesia is also experiencing a decline in new HIV infections. With a frequency of 0.26%, the HIV epidemic in Indonesia is a concentrated disease that primarily affects important populations. Contrary to the trend of HIV transmission in the early 2000s by sharing needles, sexual contact was the primary means of HIV transmission in 2020. This is still far short of the Ministry of Health's 2030 target, represented in **Figure 14** as the 95-95-95 indication.<sup>27</sup>

Since September 2013, the Provincial Government of Special Capital Territory of Jakarta, Papua, Bali, Riau, and East Java have all been named as areas with concentrated HIV prevalence, along with five additional provinces. HIV cases were recorded in 2022 at a rate of 9,208, up from 5,538 in 2021. The total number of new HIV cases identified between 1989 and 2022 was 90,212. There are currently 1,178 HIV testing services available in East Javan hospitals and health centers, and 24,531 people living with HIV are receiving ARV (anti-retrovirus) treatment.<sup>28</sup>

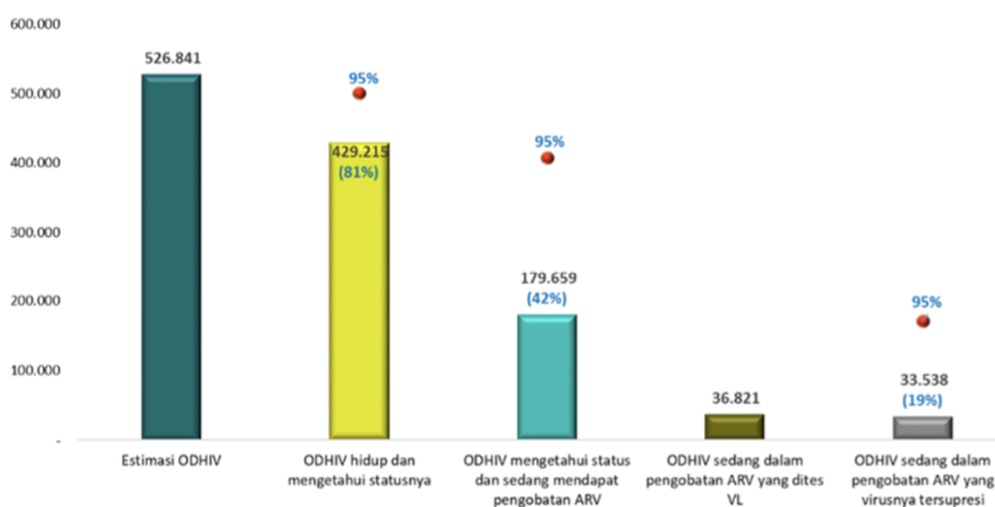
The stigma and discrimination surrounding HIV and sexually transmitted infection diseases (STID) encourage people to seek treatment at health facilities for HIV-related conditions, but there is still a dearth of accompanying personnel

for people living with HIV (PLHIV), who are hard to reach and located far from places of service.

The HIV epidemic in Indonesia is expected to be resolved by expanding testing and treatment services, providing more education and counseling about complete ARV treatment for PLHIV, empowering communities, Nongovernmental Organizations (NGOs), and cadres to reach out to the community and educate them about HIV and related conditions like TB, Distal Sensory Polyneuropathy (DSP), Toxoplasmosis, and others, and implementing a multi-month ARV policy. Other solutions include the use of propolis, an alternative medication that boosts immune function in patients with low CD4.<sup>29-31</sup>

**TUBERCULOSIS**

Before the COVID-19 pandemic, tuberculosis (TB) was the leading infectious cause of mortality worldwide, surpassing HIV/AIDS as the top cause of death. It was also one of the top ten infectious diseases. According to estimates, 10.6 million people in 202 countries will have tuberculosis (TB) in 2022—133 instances for every 100,000 people—of which 6.3% are PLHIV. With a CFR of 12.2%, the death rate among TB patients is 1.3 million. After India, Indonesia is currently the country with the second-highest number of tuberculosis cases worldwide.<sup>32</sup>



**Figure 14.** HIV/AIDS program accomplishments as of 2022<sup>27</sup>

In Indonesia, TB is expected to affect 969,000 people in 2021 or 354 cases per 100,000 people, whereas TB-HIV is expected to affect 22,000 cases annually, or 9.1 cases per 100,000 people. There were 144,000 TB-related deaths, or 52 per 100,000 people. In 2022, 724,309 cases (75% of all cases) have been notified of TB; the remaining 25% of cases remain unreported, unreachable, or undiscovered. 12,531 TB RO cases were found, accounting for 51% of the 28,000 predicted TB RO cases in 2021.<sup>33</sup>

**Picture 15**

A total of 78,799 (73.3%) tuberculosis cases were detected in East Java in 2022. Compared to the 43,247 cases of tuberculosis discovered in 2021, the number of cases has grown. **Figure 15** shows the identification of tuberculosis cases in East Java according to districts or cities. East Java has yet to reach the 90% national objective for treated TB cases, and the achievement of TB case discovery (73.3%) still lags behind TB case treatment achievements (63.74%). The East Java TB treatment success rate (89.01%) is still below the treatment success rate indicator for 2022, which is 90%.<sup>28</sup>

The Healthy Living Community Movement (GERMAS), which works in tandem with medical facilities, is crucial because it monitors tuberculosis cases that have not been treated, mentors and keeps track of cases that are lost to

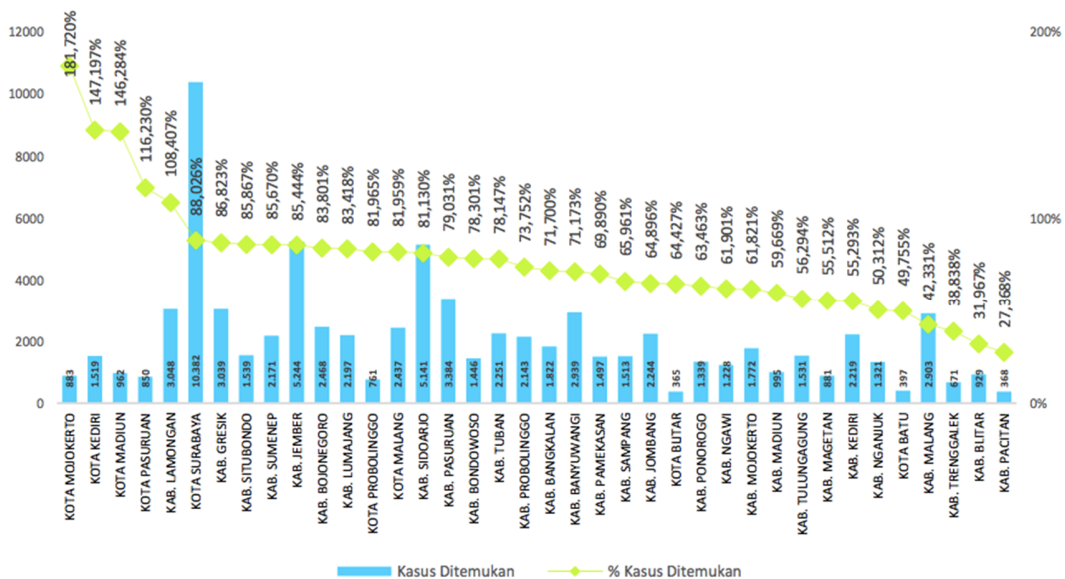
follow-up, regularly assesses the effectiveness of treating cases in each district or city, and records and reports at every service. The timely and comprehensive provision of health care must be prioritized in order to combat the TB epidemic.

**CONTROL MEASURES AND CHALLENGES OF EID-REIDS**

Controlling EID-REIDs presents a significant challenge for global health programs, particularly in Indonesia where the large population, diverse geography, and limited resources pose specific difficulties. <sup>34</sup> Addressing these challenges in Indonesia requires various strategies such as emphasizing points in Indonesian regulation, enhancing disease surveillance systems, improving diagnostic capabilities, strengthening public health infrastructure, promoting community engagement and awareness, and implementing effective prevention and control measures (**Figure 16**).

**Picture 16**

The national health system in Indonesia has been reformed by ‘*Permenko PMK No, 7 Tahun 2022*’ concerning Guidelines for the Prevention and Control of Zoonoses and New Infectious Diseases. This regulation has been implemented in the Ministry of Health of Indonesia and aims to strengthen the health resilience system under ‘*Inpres No. 4 Tahun 2019*’ by strengthening



**Figure 15.** Discovery of TB cases by district/city in East Java in 2022<sup>28</sup>

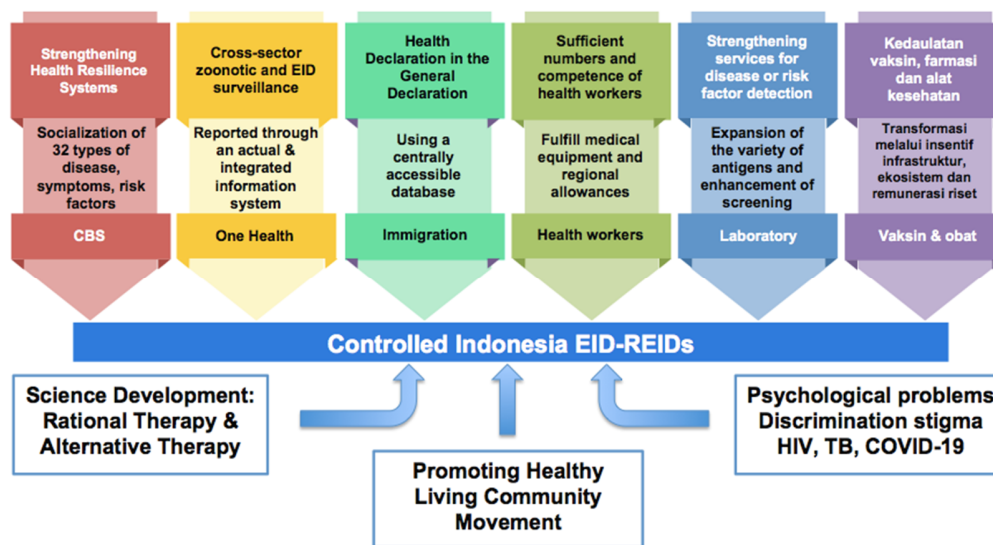


Figure 16. Proposed measures to control EID-REIDs in Indonesia

community-based surveillance (CBS). To effectively carry out CBS, efforts will be made to boost the spirit of volunteerism among community members. This will involve recruiting and assigning tasks to volunteers in an optimized manner, as well as strengthening forums for disaster risk reduction. Additionally, organizing volunteers at the village/*kelurahan* level will be a key part of the process.<sup>34</sup>

The types of diseases, symptoms, and risk factors which are included in the CBS, intersect with the list of potentially epidemic diseases based on *'Permenkes No. 1501 tahun 2010 tentang Jenis Penyakit Tertentu yang Dapat Menimbulkan Wabah dan Upaya Penanggulangannya'*. Based on the Early Warning and Response System or *'Sistem Kewaspadaan Dini dan Respons'* (SKDR), the types of situations that require further surveillance include unusual occurrences in animals and humans; tuberculosis, COVID-19, malnutrition, and food poisoning. There are a total 32 types of diseases, symptoms, and risk factors that are included in the CBS, as shown in **Table 3**.<sup>26,34</sup>

The Republic of Indonesia has implemented several legislations to address EID-REIDs through efficient and effective control, eradication, and prevention. *'Undang-Undang No. 1 tahun 1962'* concerning sea quarantine and *'Undang-Undang No. 2 tahun 1962'* concerning air quarantine are the oldest laws governing this topic. Up until

*'Permenko PMK No. 7 Tahun 2022'*, which adopts the One Health System from Centers for Disease Control and Prevention (CDC) and European CDC (ECDC) and is strengthened by articles 91 and 92 of *'Undang-Undang No. 17 Tahun 2023'*, multidisciplinary and multisectoral collaboration at local, regional, national, and international levels is the norm.<sup>34-36</sup>

One Health involves the comprehensive monitoring of zoonotic diseases and emerging infectious diseases across different sectors, with a focus on community-based surveillance, laboratory analysis, and reporting through an established information system. This approach aims to facilitate accurate detection and support effective implementation. The CDC and ECDC have identified new infectious diseases and priority zoonotic diseases to incorporate into the One Health system. This will enable better allocation of resources, enhanced oversight, guidance for research, and improved readiness and response protocols in support of global health. These include<sup>34</sup>:

1. Zoonotic influenza (Avian Influenza, Swine Influenza and other influenza viruses)
2. Zoonotic Corona Virus (COVID-19, MERS, and other corona viruses)
3. Anthrax
4. Rabies
5. Tuberculosis
6. Leptospirosis

**Table 3.** Types of diseases, symptoms, and risk factors based on the CBS<sup>26</sup>

No.	17 Types of potentially epidemic diseases ( <i>Permenkes No. 1501 tahun 2010</i> )	Early Warning and Response System / SKDR (23 symptoms)	Others (community definition are available and tested)
1.	Cholera	Suspect of cholera	
2.	Pest		
3.	Dengue Hemorrhagic Fever	Suspect of Dengue Fever	Dengue Hemorrhagic Fever
4.	Measles	Suspect of measles	Measles
5.	Polio	Acute Flaccid Paralysis	
6.	Diphtheria	Suspect of Diphtheria	Diphtheria
7.	Pertusis	Suspect of Pertusis	
8.	Rabies	Case of Rabies-transmitting Animal Bites	Rabies
9.	Malaria	Confirmed malaria case	Malaria
10.	Avian Influenza (H5N1)	Suspect of avian flu in humans	Avian Flu
11.	Anthrax	Suspect of Anthrax	Anthrax
12.	Leptospirosis	Suspect of Leptospirosis	Leptospirosis
13.	Hepatitis		
14.	Influenza A H1N1 pdm09		
15.	Meningitis	Suspect of Meningitis/Encephalitis	
16.	Yellow Fever	Acute Jaundice	
17.	Chikungunya	Suspect of Chikungunya	
18.		Acute Diarrhea	Diarrhea
19.		Pneumonia	
20.		Influenza-like illness	
21.		Suspect of Hand, Foot, Mouth Disease (HFMD)	
22.		Bloody diarrhea/dysentriae	
23.		Suspect of Neonatal Tetanus	
24.		Suspect of Tetanus	
25.		Cluster of Unusual Diseases	
26.		Suspect of Typhoid Fever	
27.			Unusual occurrences in animals
28.			Unusual occurrences in humans
29.			Tuberculosis
30.			COVID-19
31.			Malnutrition
32.			Food poisoning

The One Health idea is a smart move and a fantastic concept. However, one Health in Indonesia is still not working smoothly in the field, with improper identification of actors across sectors and levels of government as well as improper management of the private sector's involvement. The policies surrounding animals in Indonesia are unclear; they include obligatory vaccinations, bans on the trade and consumption of wild animals, and mandatory health reporting as a preventive measure against zoonoses. Primary health services fall under the purview of the central, local, and village governments.<sup>34-36</sup>

The implementation of technology, community education initiatives, centralized

health personnel, and the determination of standardization in the animal industry, particularly in the areas of veterinary care, food, and shelter; fortifying the standardization of the procedure and flow of reporting infectious diseases discovered in animals and humans by veterinary professionals, human doctors, and medical personnel to the government. One more obstacle to One Health is the dearth of epidemiologists in Indonesia. Because sectoral egos persist, efforts to strengthen One Health have already been made in each area, but they have not been perceived as an integrated effort. Derivative rules that follow up on One Health and engage numerous sectors relevant to One

Health might present the spirit of enhancing One Health as specified in the law.<sup>34-36</sup>

When flying internationally, the General Declaration (Gendec) is a document that includes details on the operator, the aircraft registration, the flight number and date, the name of the crew on duty, the origin and destination of the trip, and a health statement. Passengers with a fever who also exhibit symptoms like a persistent cough, looking ill, persistent diarrhea, skin rash, persistent vomiting, respiratory issues, anxiety, or bleeding and bruises but no prior injuries that might suggest an infectious disease can be recorded by the flight crew on the Health Declaration form. The Health Declaration can be a solid Early Warning System if a disease is found that needs attention, but the documentation is manual, the clinic areas are far apart, and there is no central database that can access activities carried out in health clinics spread across the country. Our airports collect patient visit data that can only be accessed at the respective clinics.<sup>37-39</sup>

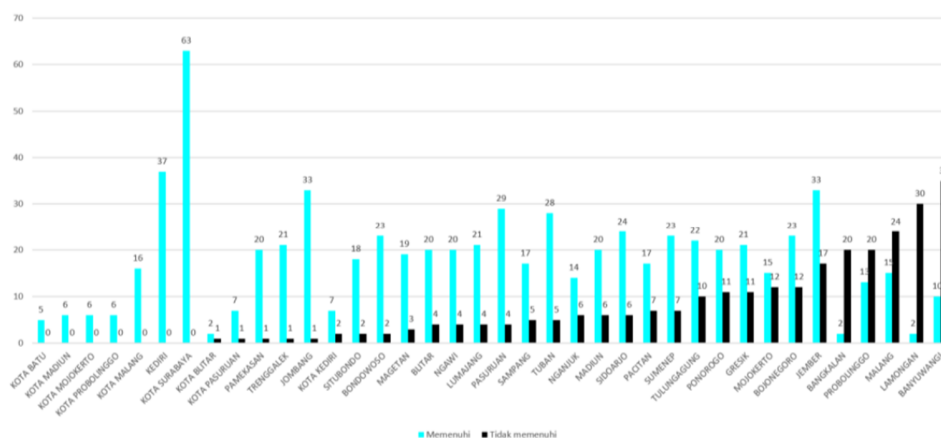
HIV, TB, dengue fever, and other endemic diseases and REIDs present a threat to our nation. In addition to Indonesia's tropical climate and high relative humidity, many regions of the country frequently suffer from poor dietary conditions, a lack of health-related education and awareness, and prescription non-compliance. For instance, in East Java, the second most populous region in Indonesia, there is a shortage of medical staff in its community health facilities, The regency governments in Indonesia often encounter a scarcity of medical personnel at community

health centers, primarily due to inadequate funding for the region and the efforts of healthcare professionals to establish health facilities. The health workers with the least fulfillment in East Java are health promotion, environmental health, dentists, medical laboratory technology experts, pharmacists, and nutritionists, respectively.<sup>28</sup>

By providing a picture of the demographics and health status of the East Java community in various health performance variables and indicators, the East Java Provincial Health Service hopes to ensure the availability of accurate and reliable East Java health data through the creation of the East Java Provincial Health Profile in 2022. East Java Province is making an effort to comply with Minister of Health Regulation Number 43 of 2019 regarding community health centers by hiring nine different types of strategic health workers; however, as of December 31, 2022, only seven districts and cities in the East Java region had hired nine different types of strategic health workers for their community health centers (**Figure 17**).<sup>28</sup>

**Picture 17**

To detect diseases or risk factors that impact society, extensive promotional and preventive efforts are required. These include expanding antigen types, immunization, building capacity, and screening in primary care, as well as increasing access, human resources, medications, and service quality, and bolstering laboratory services like the Institute of Tropical Disease (ITD) UNAIR.<sup>40</sup>



**Figure 17.** Distribution of 9 strategic health care providers in East Java's primary health care facilities<sup>28</sup>

With thorough promotion and preventative measures, HIV is a disease that may be treated and prevented. To restore our ability to lead normal lives, a great deal of work needs to be done to address psychological issues, the stigma associated with prejudice, and the possibility of this condition being prevented and cured. The mindset of integrating all parties involved to ensure that handling this illness is handled the same way as other illnesses. The winner is the person who wants to get help and takes their medicine as prescribed.<sup>29-31</sup>

Numerous challenges remain in the way of Indonesia's efforts to develop vaccines and medications, including those related to research facilities, time, institutional integration, viruses, and study subjects. In order to combat the epidemic, we have realized how crucial pharmaceutical sovereignty and medical devices are. Since 2020, Indonesia has seen a number of developments, including the emergence of three vaccine producers and the ability to produce medical raw materials on the country's soil. In the research and innovation ecosystem, the author promotes and supports transformation patterns through ecosystems, infrastructure, and compensation incentives<sup>40</sup>

Using a variety of research techniques, the author highlights the significance of creating screening, therapy, diagnosis, and monitoring. Examples include the development of treatments based on widely known substances, like Faloak, which may be used to treat dengue fever<sup>24</sup> and have anti-viral properties; the use of *Monascus jmbA* rice (*Angkak*) to boost platelet counts in dengue fever patients due to its anti-inflammatory properties<sup>25</sup>; evidence of DSP screening in HIV patients using the Brief Peripheral Neuropathy Screen (BPNS) questionnaire instrument; and the use of propolis as a support system for HIV cases with specific conditions.<sup>31</sup>

The author illustrates rational therapy with a program at the Indrapura Field Hospital that the author oversaw during the COVID-19 pandemic. This program included things like not prescribing antivirals for mild-to-moderate cases, increasing program endurance, encouraging good nutrition, isolating patients, and remembering to use therapy program psychology to help COVID-19

patients deal with depression brought on by their isolation.<sup>12,13</sup>

Lastly, the author wants to stress the significance of developing ecosystems (health technology, regulations and policies that support it, convenience and facilities, mentoring, coaching, and supervision that help or support the development process and sustainable use of health technology), along with improvements in health governance and policies. The author would also like to emphasize the importance of integrating and developing health data systems, developing health application systems, and developing ecosystems (health technology, regulations and policies that support it, providing healthy food and accelerating improved nutrition, increasing prevention and early detection of disease, improving environmental quality, and increasing healthy living education).<sup>40</sup>

## CONCLUSION

Given the impact that emerging and reemerging infectious illnesses entail, particularly the financial weight on the nation, proper management of these diseases is crucial. This is crucial, particularly in Indonesia where there is a lot of humidity and a tropical climate. In order to successfully stop the spread of illness and avert outbreaks and epidemics, an integrated cross-sectoral system is necessary. In addition to being conducted in the health sector, this preventative and treatment effort needs the backing of all other sectors as well, including the tourism and economic sectors. Indonesia already has a comprehensive and all-encompassing system in place to address the spread of infectious illnesses through One Health, according to a review of the literature. But One Health in Indonesia is still not working smoothly in the field, with improper identification of actors across sectors and levels of government as well as improper management of the private sector's involvement. The effective control of the outbreak relies significantly on the functioning of laboratory networks and strategic health service providers in urban areas and localities. Hence, it is prudent to integrate a technology-driven health information database system along with improved healthcare policies to keep pace with the rapid progress of modern

times and the changing nature of infectious diseases.

## RECOMMENDATIONS

We would like to put forward the following recommendations to policymakers regarding the management and control of infectious diseases, based on author understanding:

1. Application of the One Health concept with the assistance of a cross-sector and cross-program integrated information system.
2. Stepping up community-based surveillance (CBS) to increase public awareness of newly developing infectious diseases, their prevention, and early symptom detection to catch them before an outbreak happens.
3. Extending the types of antigens and vaccinations; increasing primary care screening and capacity; enhancing access, resources, medications, and service quality; and fortifying laboratory services like ITD UNAIR for the identification of illnesses or risk factors that affect society.
4. Socialization and education to ensure that EID-REIDs disease can be prevented and treated in order to minimize the psychological load imposed, as well as to remove the negative stigma linked to EID-REIDs victims, such as cases of TB, COVID-19, and HIV.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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