


The response to COVID-19 in Timor-Leste: lessons learnt

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ABSTRACT

The response to the COVID-19 pandemic in Timor-Leste offers lessons that may be useful for incorporating into future responses to infectious disease outbreaks in similar resource-limited settings. In this paper, we identify nine key areas for learning from Timor-Leste's experience of the COVID-19 pandemic: (1) the importance of prior preparation for health emergencies, (2) the establishment of effective leadership and governance structures, (3) the protective impact of early border restrictions, (4) the rapid expansion of diagnostic laboratory capacity, (5) the impact of effective health communications in supporting the vaccine roll-out, (6) the opportunity to build capacity for clinical care, (7) the use of public health interventions that were found to have limited public health impact, (8) the broader effects of the pandemic and the public health response and (9) translation of lessons from COVID-19 to other public health priorities.

INTRODUCTION

At the onset of the COVID-19 pandemic, there was understandable concern about the potential for devastating impacts in Timor-Leste, a lower-middle-income country in Southeast Asia with a population of 1.3 million people.¹ While there are sustained efforts to provide quality universal health coverage,^{2 3} there continue to be large challenges and a significant reliance on the support of development partners. Despite these barriers, early recognition of the potential scale of the COVID-19 problem and dynamic policy decisions contributed to better-than-expected overall outcomes in Timor-Leste.⁴

Between January 2020 and December 2022, Timor-Leste experienced three distinct waves of community transmission, and ongoing surveillance continues to document low level transmission, especially in the capital city of Dili. Seroprevalence data suggest that nearly half of the population had been infected by SARS-CoV-2 at least once by October 2021.⁵ The total number of recorded deaths by December 2022 was 138.⁴

SUMMARY BOX

- ⇒ COVID-19 affected every country in the world, with varying application of different public health responses, and varying impacts on health systems and health outcomes.
- ⇒ Lessons from Timor-Leste's experience of the COVID-19 pandemic can be used to inform future responses to infectious disease outbreaks in Timor-Leste, and in other similar settings globally.
- ⇒ International border restrictions played an important role in delaying community transmission of COVID-19 in Timor-Leste, allowing for additional investments in health system preparations.
- ⇒ Laboratory investments were critical in support of the public health response to COVID-19 and are being used to support responses to other infectious diseases challenges.
- ⇒ Effective health communication helped to facilitate high uptake of COVID-19 vaccination, reducing the impact of the pandemic in Timor-Leste.
- ⇒ Public health and social measures that were instituted to address COVID-19 can have unintended consequences, and using evidence to inform such decisions is essential.

In this paper, we identify nine key lessons from Timor-Leste's experience of the COVID-19 pandemic.

THE IMPORTANCE OF PREPAREDNESS FOR HEALTH EMERGENCIES

Significant investment in improving health systems in Timor-Leste preceded the global pandemic, and strengthened diagnostic laboratory services and public health surveillance capacity provided a foundation for the rapid expansion required to respond to the challenge of COVID-19.⁶⁻⁹ In 2018, a joint external evaluation (JEE) reviewed Timor-Leste's capacity to prevent, detect and rapidly respond to public health risks based on the International Health Regulations.¹⁰ The JEE noted some strengths in the public health system, but also identified priority areas for improvement in emergency response



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capacities of different technical areas.¹⁰ This led to the development of a multisectoral National Action Plan for Health Security, and Integrated Disease Surveillance Response guidelines,⁶ which have since been revised to include COVID-19.

In 2016, the WHO supported the National Health Laboratory (NHL) to establish capacity for real-time PCR testing for influenza.¹¹ This capacity provided the basis for the subsequent expansion of PCR testing during the COVID-19 pandemic.⁸ The Korea International Cooperation Agency contributed significantly to strengthening tuberculosis diagnostic capacity, including for PCR testing.¹² Other investments were supported by the Australian Government's Indo-Pacific Centre for Health Security and the United Kingdom's Fleming Fund, focused on diagnostic microbiology for infectious diseases testing and surveillance.^{7 9 13}

Health workforce development, led by the Ministry of Health (MoH), has been a priority for Timor-Leste since before it regained independence in 2002,¹⁴ with support from the Cuban Medical Brigade, Chinese Medical Team, Royal Australasian College of Surgeons,¹⁵ St John of God Healthcare, Maluk Timor and other partners.¹⁶ In 2020 and 2021, several specialists who had completed overseas training in intensive care and anaesthetics returned to Timor-Leste, and were instrumental in guiding clinical management of COVID-19 in Timor-Leste.

THE ESTABLISHMENT OF EFFECTIVE LEADERSHIP AND COORDINATION STRUCTURES

Effective national-level coordination of the response to the pandemic was important to ensure a cross-sectoral government approach, and because of the imperative of coordinating inputs from multiple development partners operating within Timor-Leste. Early in the pandemic, it was recognised that a new governance structure was needed, and the Integrated Centre for Crisis Management (Centro Integrado de Gestao de Crises (CIGC)) was established, reporting through an interministerial commission to the Prime Minister's office.¹⁷ The CIGC helped to facilitate effective intersectoral coordination between relevant ministries, through regular communication with the Council of Ministers and inclusion of all relevant ministries within the CIGC structure. The CIGC was organised into nine pillars, based on the WHO COVID-19 Strategic Preparedness and Response Plan.¹⁸ This structure embedded national leadership and provided a central point of reference and coordination for COVID-19 response efforts at local and national levels, with support from Government and non-government development partners coordinated through this mechanism. Highlighting opportunities for effective collaboration and ensuring accountability of contributing development partners helped avoid the risks associated with fragmentation of health system capacity building efforts, especially when multiple donors and actors are contributing.^{19 20} However, there were limitations to the

executive power of the CIGC, which in some situations led to inefficiencies in decision-making. A model that vests greater authority for implementation in the CIGC could be considered in future.

THE PROTECTIVE IMPACT OF EARLY INTERNATIONAL BORDER RESTRICTIONS

International border restrictions, limitation on travel and imposition of mandatory quarantine for international arrivals were strategies employed by many countries during the COVID-19 pandemic.²¹ Mandatory quarantine for international arrivals was implemented from 22 March 2020, the day following the first confirmed COVID-19 case in Timor-Leste.⁴ Despite ongoing air travel and a land border with Indonesia, border restrictions were extremely effective in preventing community transmission of COVID-19 in Timor-Leste during 2020. All 49 cases diagnosed in Timor-Leste during 2020 were diagnosed within quarantine facilities, including one healthcare worker. There was no evidence of any community transmission during this period.

It is apparent from the global experience that spread of COVID-19 to all countries was inevitable, however, it is likely the pandemic would have had a more devastating impact on Timor-Leste if community transmission had occurred in 2020. By the time community transmission occurred, laboratory, clinical and surveillance capacity had markedly increased, and the roll-out of COVID-19 vaccines was imminent. The impact of border restrictions once community transmission was established was limited, although it is likely that these delayed the onset of the second wave of COVID-19 in Timor-Leste, caused by the Delta variant, which commenced approximately 3 months after a case with Delta variant was first detected in a quarantine facility in Timor-Leste.

The impact of border restrictions varied in different countries, largely influenced by the timing of implementation. Early restrictions limited transmission in early stages of the global pandemic in countries including Australia and Vietnam,^{22 23} but ongoing restrictions despite community transmission within countries probably did little to stem established waves of transmission.^{21 24} We believe that early application of border controls to delay onset of community transmission in countries like Timor-Leste should be considered in the context of future pandemics, enabling time for adequate preparation and planning for other elements of the pandemic response.

THE RAPID EXPANSION OF DIAGNOSTIC LABORATORY CAPACITY

Globally, the public health response to the COVID-19 pandemic relied heavily on laboratory diagnosis of COVID-19 to accurately describe the incidence, support surveillance efforts, predict resource requirements and to inform appropriate clinical management of cases. Limitations on international travel and freight made previously used international referral pathways for laboratory

testing less reliable, and Timor-Leste had to decide on its SARS-CoV-2 testing strategy. Early lateral flow assay based rapid tests were designed to detect antibody responses rather than viral antigen, and thus had inadequate accuracy for detection of acute infections,²⁵ compared with molecular platforms.

In March 2020, the decision was made to invest in significant expansion of laboratory capacity, to support the pandemic response and improve capacity for diagnostic testing for other infectious diseases in the future.⁸

PCR testing capacity in Timor-Leste enabled the rapid diagnosis and isolation of COVID-19 cases in quarantine facilities, contributing to the prevention of community transmission during 2020. During the three COVID-19 waves in 2021 and 2022, capacity was further scaled up to respond to increased demand for testing, with capacity for PCR testing established in all 13 municipalities and NHL capability increased such that up to 2000 tests could be conducted daily.⁸ This supported the public health response by identifying positive cases in the municipalities who were either referred to local isolation facilities or instructed to isolate in their homes.

While the demand for large-scale testing for COVID-19 has reduced, the capacity that exists in Timor-Leste for rapid scaling up of PCR testing capacity in a health emergency is a new and valuable strength.⁸ Genomic sequencing capability is being established, which will further strengthen the country's ability to respond to future outbreaks, whether of new variants of COVID-19, or other infections with epidemic or pandemic potential.

THE IMPACT OF EFFECTIVE HEALTH COMMUNICATIONS IN SUPPORTING THE VACCINE ROLL-OUT

The rapid development of effective vaccines was a critical part of the global response to the pandemic, and the available vaccines have saved tens of millions of lives.²⁶ Despite this success of scientific innovation and discovery, the impact of vaccine initiatives globally was limited by poor uptake and delays in vaccine delivery in some settings.²⁷

Timor-Leste received large donations of COVID-19 vaccines (AstraZeneca, Sinovac, Pfizer) through COVID-19 Vaccines Global Access (COVAX) in addition to bilateral donations from Australia, Portugal and China. When vaccination programmes commenced in April 2021, the first wave of community transmission in Timor-Leste had just commenced.⁴ Public health policy-makers were acutely aware of the urgency of the vaccine campaign, and the importance of acquiring adequate supply of vaccines, overcoming logistical barriers to deployment of vaccines within the community, and addressing community perceptions and concerns regarding vaccines.

With technical support from partners including WHO, UNICEF, National Centre for Immunisation Research and Surveillance and Menzies School of Health Research, MoH was able to effectively lead the implementation of

the COVID-19 vaccine programme, with no break in supply of vaccine doses or delivery in community since the programme began in April 2021. The interministerial commission led by the Vice Prime Minister ensured a coordinated approach between relevant ministries, including the MoH and the Ministry of State.

The challenges associated with communicating the importance and relative safety of available COVID-19 vaccines were substantial. In April 2021, reports regarding adverse effects of AstraZeneca were emerging,²⁸ and the impact of fear of side effects was a significant factor contributing to poor vaccine uptake in nearby countries including Australia and Papua New Guinea.^{29 30} The MoH recognised the importance of effective communication, specifically targeting health professionals and community members. Strategies included delivery of symposia and question-and-answer sessions for health professionals, commencing at the national hospital in Dili but expanding to include health professionals from all municipalities. Concurrently, health leaders participated in interviews and panels with media, broadcast throughout the country. Targeted messaging was developed using local languages, to ensure that people who spoke languages other than Tetum (the lingua franca in Timor-Leste) or English also had access to accurate information about COVID-19 vaccination.³¹

The impact of effective health communication regarding the importance of COVID-19 vaccination was evidenced in Timor-Leste by rapid uptake of vaccination among health professionals and in the community. By September 2021, more than 90% of healthcare workers in one study had been vaccinated.³² By the time of the peak of the second wave of community transmission of COVID-19 in Timor-Leste in August 2021, caused by the Delta variant, more than half of the population aged 18 years or older had received at least one vaccine dose.⁴

This is likely to have resulted in a large reduction in the impact of the second and subsequent waves of COVID-19 in Timor-Leste. The experience in Timor-Leste, of effective vaccine communication and delivery, provides a model for implementation of similar urgent vaccination campaigns in the future.

THE OPPORTUNITY TO BUILD CAPACITY FOR CLINICAL CARE

The COVID-19 pandemic highlighted limitations in critical care in Timor-Leste. At the beginning of 2020, Timor-Leste had only one intensive care unit (ICU), consisting of four beds and two ventilators. There were valid concerns about capacity for local oxygen production and delivery. Infrastructure and training to support infection prevention and control were lacking, triage systems were not well established, and limited basic supportive care was available for acute respiratory distress.

Under the leadership of clinicians from the national hospital and the MoH, processes for triage based on presence of respiratory symptoms and risk factors for COVID-19 exposure were established,³³ and training in

infection prevention and control and basic respiratory supportive care was instituted in all six referral hospitals in Timor-Leste. There were donations of equipment and investment in infrastructure improvements, such that Timor-Leste now has some critical care capacity in referral hospitals in six municipalities. Importantly, beyond the tangible contributions of equipment and buildings, there was recognition of a need for investment in human resources and capacity building. A critical care strategy has been developed, and training has commenced, led by the National Directorate for Hospital Support Services with support from WHO and other development partners.

During the first 6 months of community transmission in Timor-Leste, 294 severe cases of COVID-19 were admitted to dedicated treatment facilities. Case fatality rates were 53% for those admitted to ICU, and 72% for those managed with mechanical ventilation.³⁴ The true incidence of COVID-19 was probably underestimated in Timor-Leste and the number of deaths would have been higher than what was reported.⁴ However, the outcomes for those who were hospitalised were similar to other settings globally.³⁵ There is a need for further improvement in clinical care in Timor-Leste, but the work done to improve capacity during the pandemic had an impact in saving lives, and in providing a foundation for further investments in human resource capacity.

PUBLIC HEALTH AND SOCIAL MEASURES THAT WERE FOUND TO HAVE LIMITED PUBLIC HEALTH IMPACT

Like many other countries, Timor-Leste implemented and enforced WHO-recommended non-pharmaceutical interventions designed to limit the spread of respiratory infections including COVID-19.³⁶ While mask-wearing, maintaining physical distance, ensuring hand hygiene and limiting congregation of people in crowded indoor settings were widely adopted, some of these measures remain controversial, especially when mandated. Well conducted trials of masking and mask mandates are limited, with mixed results reported in the literature.³⁷

Some of the public health interventions employed during the COVID-19 pandemic had little meaningful impact on reducing transmission or limiting severe COVID-19 disease in Timor-Leste. We recognise the importance of articulating these, which provide important lessons for the future. A selection is included in [table 1](#). In future, careful consideration should be taken before enacting similar policies, and data should be used to guide safe, evidence-based policy that minimises unnecessary impacts on people's movements and ability to work and interact socially and culturally.

THE BROADER EFFECTS OF THE PANDEMIC AND THE PUBLIC HEALTH RESPONSE

In Timor-Leste, as in other settings, the COVID-19 pandemic had a major impact on the provision of essential health services.^{38 39} Tuberculosis case detection

rates fell, routine vaccine administration rates reduced, and hospital presentation numbers for other illnesses were dramatically lower in 2020 and 2021, presumably because people were afraid to access health services, either because of fear of COVID-19 exposure, or fear of being tested and isolated if positive. Reduced access to healthcare, lower case detection rates for tuberculosis and other infectious diseases, and reduced coverage for routine vaccinations, are all likely to have health impacts that will extend for several years beyond the pandemic.

COVID-19-related restrictions have also impacted supply chains globally.⁴⁰ In Timor-Leste, while border restrictions were necessary for early response to the pandemic, these probably contributed to some of the challenges in maintaining supply of essential medicines, consumables and even food. Restrictions on movement within the country also significantly impacted many people who encountered barriers to working and providing for their families. The government of Timor-Leste countered this with financial and food-based relief packages that were among the world's largest relative to gross domestic product, but the cost of these initiatives also contributed to the massive overall financial impact of the COVID-19 pandemic.⁴¹

TRANSLATION OF LESSONS FROM COVID-19 TO OTHER PUBLIC HEALTH PRIORITIES

While the COVID-19 response has necessarily been the focus of health system strengthening efforts in recent years, there are many other health needs in Timor-Leste, and a crisis such as this provides an opportunity to solve previously unsolved problems. It is important for Timor-Leste to leverage gains in community engagement, surveillance, laboratory and clinical capacity to respond more effectively to existing and emerging health threats. Some opportunities to achieve this have been realised, and others have been missed. Increased laboratory capacity has been galvanised to establish improved testing capability for other diseases including malaria, tuberculosis, HIV and dengue. Principles of disease surveillance and integrated responses that link laboratory, clinical and public health units can and should be applied to other diseases.⁶ There have been ongoing discussions in Timor-Leste about the need to improve case detection and linkage to treatment for people with tuberculosis, for example. Work that addressed serosurveillance for COVID-19 has also been applied to identify immunity gaps for other vaccine-preventable diseases, including measles, rubella and hepatitis B.^{42 43}

During the third wave of community transmission of COVID-19 in Timor-Leste, caused by the Omicron variant in early 2022,⁴ Timor-Leste experienced its worst outbreak of dengue in many years. In January 2022, there were 20 dengue deaths reported, and no COVID-19 associated deaths.⁴⁴ While the government of Timor-Leste continued to ensure ongoing surveillance of the COVID-19 pandemic, and to promote vaccination

Table 1 Public health and social measures employed in Timor-Leste with limited impact on COVID-19 transmission

Public health intervention	Discussion of limitations
Restrictions on low-risk outdoor activities	For extended periods of mandatory home confinement, designed to limit community transmission of COVID-19, residents in Timor-Leste were not permitted to leave their place of residence for non-essential activities, including non-essential work, religious gatherings, education and exercise. These restrictions had a big impact on people's lives and livelihoods. While the rationale for restricting indoor meetings and activities was strong, there is evidence that transmission is limited in outdoor, well-ventilated settings, ⁴⁵ and it is unlikely that restricting outdoor exercise had a meaningful impact on the rate of COVID-19 transmission in Timor-Leste.
Restrictions on funeral and burial practices	At the time of the first recognised COVID-19 related deaths, tight restrictions were put in place, that limited postmortem care of the body, the number of people who could attend the funeral of people who died with COVID-19 and the location of the burial. While placing limitations on large gatherings had a strong rationale, other aspects of the policy were very controversial, leading to public protests that probably posed an even greater risk to onward transmission of COVID-19 than traditional burial practices would have, especially given the low risk of SARS-CoV-2 transmission once the person is deceased. ⁴⁶
Prolonged isolation of cases with persistent PCR positivity	Timor-Leste initially adopted the WHO policy regarding clearance from isolation, ⁴⁷ but was slow to change to an approach that did not require clearance PCR testing, even when international guidelines changed because of emerging evidence that individuals with COVID-19 were rarely infectious beyond day-10 of their illness. ⁴⁸
School closures after community transmission established	School closures occurred in most countries around the world, but probably had limited impact on reducing COVID-19 transmission, ⁴⁹ while also significantly disrupting educational opportunities for children, who despite being the least likely to suffer severe morbidity or mortality from COVID-19, have been affected disproportionately by measures aimed at reducing transmission, including school closures. ⁵⁰
The continuation of facility-based isolation of cases after community transmission was occurring	Facility-based isolation of cases was integral to the prevention of community transmission of COVID-19 in Timor-Leste in 2020. However, once community transmission was established in 2021, seroprevalence data suggest that a large proportion of the community was affected in a short time period, ⁵ and it is likely that there were more people with undiagnosed COVID-19 in the community, than there were with known COVID-19 in isolation facilities. Mandatory facility-based isolation is expensive for the health system and provides a disincentive for people to be tested or seek medical attention. Once community transmission was established, a more rapid shift to supported home-based isolation would have been more effective.

(including boosters) and non-pharmaceutical interventions to reduce transmission of COVID-19, there was a clear shift in strategic focus, as MoH prioritised responding to the dengue outbreak. COVID-19 isolation facilities were rapidly converted into dengue treatment centres, and clinicians with paediatric expertise were deployed to help manage the large numbers of cases. Training in the clinical management of dengue was delivered, dengue testing capacity (serological and molecular testing) was increased within the NHL, and MoH engaged with development partners to discuss possible future public health strategies to reduce the impact of dengue in Timor-Leste.

CONCLUSION

The experience of the COVID-19 pandemic in Timor-Leste offers important learning that is relevant in Timor-Leste, but also applicable to other countries in the region and around the world. Public health decision-making and health communication have a large effect on public health outcomes, and countries should invest in building the capacity of health leaders with responsibility in these areas. Lower-income and middle-income countries including Timor-Leste rely heavily on support from high-income countries and other health partners in responding to health crises. Despite this, Timor-Leste demonstrated the impact of effective leadership during

the COVID-19 pandemic, and examples of pragmatic policy decision-making from lower-income and middle-income countries also provide valuable learning for high-income countries.

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