

# The connection between slums and COVID-19 cases in Jakarta, Indonesia: A case study of Kapuk Urban Village

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## ABSTRACT

COVID-19 has spread world-wide, and with multiple health, social, and economic ramifications. These present a formidable challenge for those belonging to vulnerable communities, such as those living in slums. There is now a growing literature urging attention to this challenge. However, few studies have examined the actual lived realities within these areas using direct, observational research, notwithstanding commentary elsewhere that such close attention is necessary to ensure effective action. This study took this approach in relation to a particular case-study, Kapuk Urban Village, in Jakarta, Indonesia. Drawing on an existing schema involving three spatial scales of slum areas (environs, settlement, and object), the research confirms how different built and socio-economic features can exacerbate vulnerability, and COVID-19 transmission. We also add to the body of knowledge by contributing a dimension of ‘ground-level’ research engagement. We conclude by discussing related ideas around ensuring community resilience and effective policy implementation, and recommend an “urban acupuncture” approach to encourage government regulations and actions better tailored to such communities.

## 1. Introduction

Novel coronavirus (COVID-19) is a respiratory infection caused by the SARS-CoV-2 virus that transmits rapidly through droplets from an infected person or through contaminated surfaces (Desai & Patel, 2020). It infects indiscriminately and was officially declared a global pandemic by the World Health Organisation in 2020 (Cucinotta & Vanelli, 2020).

At the time of our study, since the first reported case in March 2020 (Tosepu et al., 2020), infections in Indonesia reached 6.03 million cases, with over 156,000 deaths (as of April 2021) (Satuan Tugas Penanganan COVID-19, 2021). At one point (July 2021), Indonesia was also the country with the most additional cases (Gunandha & Hafisa, 2021). The Indonesian government has launched various measures to limit transmission, including a vaccination program and isolation requirements (KPCPEN, 2021).

In addition to research on COVID-19 generally, there has also been an urgency to alert policy makers to the disproportionate effect of the pandemic on people living in slums, particularly in the Global South (Corburn et al., 2020; Franco et al., 2020; Golechha, 2020; Lupia, 2020; Parikh et al., 2020; Patel, 2020; Patranabis et al., 2020; Sethi & Creutzig, 2021; Tampe, 2021; Wilkinson, 2020); with the World Bank (2020:1

stressing, “the challenge facing slums are not new, but during the COVID-19 pandemic they demand solutions more urgently than ever.”

The works cited above canvass key aspects of this compounding dual-aspect and immediate crisis; most also suggest required improved policy initiatives. However also noticed was a seeming absence of any direct on-the-ground observations contemporary with the COVID-19 outbreak (although it is also acknowledged here that much of the cited work is based on earlier pre-COVID and much longer interactions within these settlements). The study described in this paper aims to better understand the actual lived realities of slum dwellers since COVID-19, via a case study locality in Jakarta, the capital and largest city in Indonesia and a direct walk-the-streets experiential approach.

Here, the study was also cognisant of the contention put by Baum (2015) that the effectiveness of much urban management activity falls short because of a neglect, even resistance, amongst urban planners and managers themselves of these more experiential (which he refers to as “emotional”) aspects; given a greater degree of personal comfort with those aspects regarded as more “rational”. The result, he states (2015:513), is that “planners end up thinking with only part of their mind about part of what matters to people, part of why they act as they do, and part of what would move them to act consistently with plans.”

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Here too there is a similarity between Baum's (2015) observations and recent discussion prompted by experiences in the field of "health-supportive built environments" generally about whether even compelling quantitative data alone is sufficient to generate remedial actions (Giles-Corti et al., 2022; Kent, Harris, & Thompson, 2020); with current recognition of the need for a new "implementation science" that looks directly at methods for the "adoption and integration" of evidence-based findings into health prevention practice (Neta et al., 2020:e909); with recent calls for a "social democratic public health", and with a solid theoretical grounding (Speed & McLaren, 2022); and with broad discussion around human rights in the context of COVID-19 responses generally (eg. Gostin et al., 2023).

This research therefore uses a targeted observational methodology, in conjunction with an analysis framework developed specifically as part of this study to ensure focus and robustness (section 4.3). This framework is based on existing (Indonesian) national and international work around slum improvement programs, and the new (at the time of writing) Indonesian government regulations developed to suppress COVID-19 transmission.

The purpose of our paper is to describe this method, for possible adoption elsewhere (with appropriate locality-specific modification).

The research method also purposefully seeks to benefit from a cross-disciplinary approach by drawing on the authors' architectural and urban planning backgrounds. As such, it offers design-led on-the-ground insights into an immediate problem: the need to ameliorate high rates of COVID-19 within the particularly vulnerable communities of slum settlement dwellers.

This immediacy also requires purposeful approaches to the conduct of research itself. Here, the adopted approach has resonance with the idea of 'rapid rural appraisals', well-used in developing countries to provide sufficient information to enable early action on similarly pressing issues. Such appraisals are necessary when the often-substantial resources for more systemic reviews cannot be accessed (Carruthers & Chambers, 1981) (also noting that such reviews can in any case still be undertaken, in parallel or in sequence). In an informative coincidence, rapid appraisals also align with the quick assessments required within the health field in medical emergencies. As Hailey et al. (2000, in Khangura et al., 2012, p. 2, emphasis added) note, "policymakers, decision makers, stakeholders and other knowledge users ... often require access to contextualized resources that succinctly and methodically address a broader scope of scientific evidence quickly."

We conclude by offering recommendations around community resilience and effective policy responses to COVID-19. Resilience comprises the ability to not only plan for shocks, such as pandemics, but also minimise the negative consequences of such disruptions, recover as quickly as possible, and then adapt and be better prepared by learning the community's own lived-experiences (OECD, 2022). Here we further recommend an 'urban acupuncture' design tactic approach, where each action does not necessarily need to be ample or expensive, but, more importantly, is better tailored and *co-supportive*, providing immediate and effective action within impoverished communities (Cutieru, 2020; Lerner, 2014).

## 2. Background

### 2.1. Slum conditions, and the determinants of health

The presence of slums is now ubiquitous in the Global South, which hosts the predominate share of the one billion slum residents worldwide (UN-Habitat, 2010, 2018). Slums are described diversely depending on the issue or location, now often under the term 'informal settlement' (Mahabir et al., 2016). The UN (2003) definition specifically refers to 'communities characterised by insecure residential status, poor structural quality of housing, overcrowding, and inadequate access to safe water, sanitation, and other infrastructure'.

In Indonesia, the criteria for identifying a slum area comprise

population density, building layout, building construction, building ventilation, building density, street systems, drainage systems, toilets, waste disposal, and street lighting (Perkim.id, 2020).

On a more ontological level, and from work internationally, Kohli et al. (2021) have developed a conceptual schema to assist in determining and then working within slum environments. It comprises three spatial levels: Environs (the setting of the settlement), Settlement (the overall form of the settlement itself), and Object (the make-up components of the settlement); and six indicator criteria (Fig. 1). This schema is utilised in the analysis framework developed in this paper (section 4.3).

Such research is also cognisant of the now well-recognised contribution to health outcomes of social and economic factors, and their multiple determinants; in particular the degree of experienced equality/inequality within those factors (e.g. Marmot et al., 2020). The 'Social Model of Health' (Barton & Grant, 2006; Dahlgren & Whitehead, 1991) for instance provides an extensive mapping of such factors: comprising personal behaviours; cultural (social and community) characteristics; structural factors such as access to adequate housing, employment and services, and wider economic and political processes; and environmental matters. In studying the *relative* importance of these factors YMCA of the USA (2002) suggest that family genetics only play a 30% role in determining of an individual's health; compared to actual medical care (10%), physical and social environmental factors (20%), and personal behaviour (in turn often substantially influenced by the physical and social environment) (40%).

These insights suggest a mutually reinforcing and potentially adverse condition well-worth further understanding: an existing dense-living and poorly serviced urban environment already invariably impacting negatively on residents' health, now combined with a highly contagious life-threatening virus, transmitted by close physical *and* aerosol contact.

Garside (1988) provides a useful historical example of how discussion around such factors played out when developing responses to the (poor) health of residents in such (slum) areas in another jurisdiction: the United Kingdom from 1890 to 1945. Following an often value-laden debate around the relative influence of the personal behaviours and genetics of the residents themselves, the prominence of environmental factors was eventually recognised. This then led to the critical realisation that improved health would necessitate substantial investment in the environmental conditions of those areas.

Finally, and for further context, the Universal Declaration of Human Rights (United Nations, 1948) provides that every individual is born equal in rights, including the right to a standard of living able to achieve adequate health and well-being for themselves and their families. However Patranabis et al. (2020) for instance note that millions of residents in developing cities still lack access to such needs; also identifying a wide inequality between the wealthy and the poor. The number of people living in poverty or in slum areas is at a world average of 29.2%, with this projected to increase (UN-Habitat, 2010, 2018).

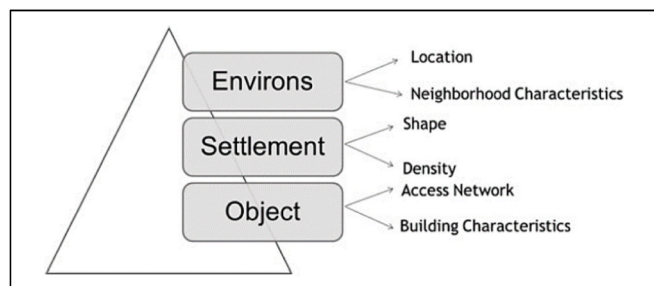


Fig. 1. Three spatial levels and six indicators of slum environments. Source: Kohli et al. (2021).

## 2.2. Slums and COVID-19

COVID-19 not only impacts on health and mortality, it also challenges other aspects of human wellbeing, including its social, economic and environmental components (Darma & Darma, 2020; Gostin et al., 2023; Verma & Prakash, 2020). These impacts are invariably compounded for those who do not have good levels of choice and opportunity in the first place; including from low economic levels and poor existing living conditions.

Strategies for dealing with COVID-19 invariably include voluntary and enforced reductions in physical and social contact, the isolation of suspected and confirmed cases, and physical and regulatory changes to improve hygiene facilities and behaviour (World Health Organization, 2021). These strategies have in turn generated difficulties for many people, including, again, exacerbating the suffering of those living in areas of high density and with an existing low quality of living (Tampe, 2021; UNSD, 2021).

Drawing on her own research and that of extensive others, Wilkinson (2020) has charted the vulnerability to transmission of COVID-19 (and disease generally) within informal settlements, finding that vulnerability is fostered by locally specific social influences and by the ‘shape’ of housing and infrastructure. Factors include density, household and social structures, mobility, livelihood imperatives, ventilation, access to water and toilets, and general sanitation.

This charting also confirms a strong correlation between the indicators of slum areas (Fig. 1), and vulnerability to COVID-19 transmission. And as such present a set of composite guidelines for the analysis and development of appropriate solutions when dealing with COVID-19 in these – particularly vulnerable – localities.

Failure to recognise these interactions can lead to poorly executed responses and unintended negative consequences. Wilkinson (2020) for example notes that enforcement of ‘control measures developed without sufficient recognition of the realities of residents’ social and economic needs, often also coupled with an historical stigmatising of slum communities, can lead to ultimately self-defeating and embedded patterns of avoidance.

The dilemmas here also present as a “wicked problem”, itself a concept originally from the field of urban planning (Rittel & Webber, 1973) but equally applicable in other fields. As in a wicked problem, potential solutions are not readily obvious, they need to be multi-dimensional, and require long-term collaborations in an on-going attentive process (Hocking et al., 2016; Australian Public Service Commission, 2007). Similarly, this paper is not able to offer complete solutions. It does though describe a related process to assist in understanding the problem in the first place; and one that draws on a trans-disciplinary perspective in conjunction with close engaged observations – and as such can also note and draw on locally-based and initiated successes and lessons around COVID-19 within slum communities elsewhere (eg. Franco et al., 2020; Golechha, 2020; Saha et al., 2021).

## 3. Jakarta slums, slum improvements, and COVID-19 interventions

As with many major metropolitan centres internationally, Jakarta has a problematic high urban density (Legarias et al., 2020). It is the most populous city in Indonesia, with (in 2020) 10.5 million inhabitants and a density of 15.9 people/km<sup>2</sup> (Statistics of DKI Jakarta Province 2021). This density contributes to Jakarta also having the highest percentage of slums to land area in Indonesia, at 42.7% (Statistics Indonesia 2017, 2019, 2020). All these characteristics have created significant problems in efforts to now respond to and control the initial spread of COVID-19.

As in Indonesia more broadly (for an overview, see Octifanny & Norvyan, 2021 for example) the Jakarta government has committed to the substantial improvement of these areas within its urban agenda. The (Jakarta) Governor’s Regulation 90/2018 provides a legal mechanism

for a whole-of-government response; including the implementation of safe and healthy housing, fulfillment of the principle of the right of every citizen to a living space, and improvements to facilities and infrastructure and accessibility to services (Jakarta Provincial Governor, 2018).

This regulation also identifies 445 improvement priority areas (called *Rukun Warga*, or citizen associations). These areas then include heavy, medium, light and very light sub-classifications (Directorate of Settlement Development, 2006; (Jakarta Provincial Governor, 2018)

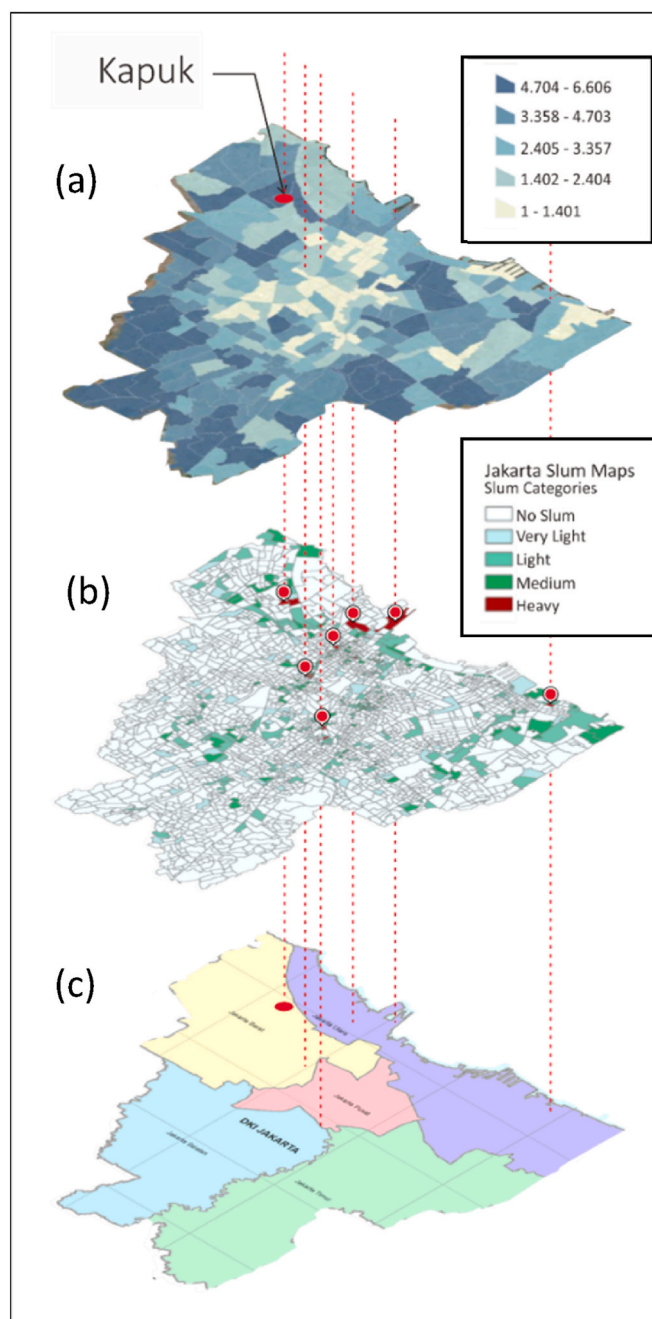


Fig. 2. The process of determination of the case-study (Kapuk Urban Village) Key: (a) relative distribution of cumulative positive cases of COVID-19 across Jakarta\* (b) location of slum areas in Jakarta, with priority rankings for action (c) Jakarta administrative areas.

\* Numbers here as at the time of our study, and illustrated as “interval” categories, as established by the source (Jakarta Smart City et al.).

Source: Compiled by the authors from Legarias et al. (2020) and Jakarta Smart City et al. (2021).



(see Fig. 2b).

In addition to hosting the most slum areas, data to August 2021 also shows that Jakarta leads the 34 provinces in Indonesia in terms of numbers of COVID-19 cases, comprising 21.3% of the national total; with the first case in Indonesia also found in Jakarta (Indonesian Ministry of Health, 2021a, 2021b). These figures correlate with previous international studies which have shown that metropolitan areas with high density and connectivity tend to be both the starting place as well as the centre of spread of COVID-19 in a country (Carozzi et al., 2020; Hamidi et al., 2020; Wong & Li, 2020).

Cumulative positive cases in Jakarta by August 2021 reached 846,900, with a total of 13,203 deaths (Indonesian Ministry of Health, 2021a, 2021b). The distribution of cases is shown in Fig. 2a. Looking closer at the areas in Jakarta with the highest number of cases, it was found that the top five locations were also categorized as slum areas (Jakarta Smart City, et al. 2021; Jakarta Provincial Governor, 2018). Similar correlations have also been found in studies in India and Brazil (respectively, Bhadra et al., 2021; Pequeno et al., 2020).

Regulations relating to the improvement of slum settlements in Indonesia are issued both centrally and regionally. By comparison, policies to date for the handling COVID-19 have been centralized. These follow the directions of the President and a COVID-19 Response Acceleration Task Force, established in March 2020 by Presidential decree (Widodo, 2020).

An immediate response was to place restrictions on activities and to change practices. The nature of this response has varied in relation to differing overall levels of COVID-19 incidence (see Instruction of the Minister of Home Affairs Number 22–23 of 2021: Saptoyo, 2021). However, as noted by Wilkinson (2020) from an international review generally, the principal approaches are the same in any context, namely reducing physical contact and encouraging and improving hygiene. Control measures have included quarantine, lockdowns, self-isolation, advice on working from home, travel bans, and the closure of schools, markets, churches, mass gatherings, food outlets and social spaces.

Given that COVID-19 case numbers are disproportionately higher in slum areas, these ‘hotspot’ localities have been particularly affected in terms of enforced restrictions on community activities. This has generated a new tension and new difficulties for residents, who already face acute challenges around space, water, and sanitation, and precarious livelihoods (Gostin et al., 2023). As Wilkinson (2020) further notes, control strategies based on (standard) assumptions about how household units operate are likely to fail if they do not reflect actual daily lived experiences. This advice has contributed to the direct observational approach taken in this study.

## 4. Research method

### 4.1. Case study selection

Case study research is adopted within numerous disciplines (Yin, 2018; Gerring 2007). It usually comprises multiple data collection methods, including observations, document review, and visual materials. The results are then analysed together to obtain a comprehensive and integrated understanding of the case-study situation, thereby allowing the drawing of more generalised conclusions for potential wider application (Gillham, 2000; Flyvbjerg 2006).

The choice of the case-study locality for our research drew on local data sets from the Indonesian Ministry of Health, the Indonesian Ministry of Public Works and Public Housing, and the metropolitan Jakarta Government in relation to slum areas and associated urban improvement priority categories, and COVID-19 incidence (numbers of cases) sourced from Legarias et al. (2020) and Jakarta Smart City (2021a, 2021b). A locality was selected with high ‘scores’ in both criteria in order to: (i) best reveal the observational and other data sought in relation to the research objectives, and (ii) potentially assist, in priority terms, government objectives to both undertake urban improvements

and address local incidence of COVID-19.

The selection used a series of map overlays showing slum priority areas and COVID-19 incidence (Fig. 2). The chosen locality, Kapuk Urban Village (hereafter, Kapuk), is classified as a ‘heavy’ slum (red colour in Fig. 2b) and as having high COVID-19 cases (being, at the time of our study, within the category of between 4,704 and 6,606 cumulative cases - dark blue in Fig. 2a). The characteristics of Kapuk are further described in section 5.

### 4.2. Observational research and visual aids

Close, on-site observations of Kapuk were conducted by the principal author during a number of site visits to Kapuk in 2021. These were structured around the three spatial levels and six indicators defined by Kohli et al. (2021) (Fig. 1) and recorded in written notes and photographic images.

It was necessary to balance the empathic objectives of the research (whereby the researcher demonstrates an ability to understand and be attentive of others) and the health safety of the researcher. Therefore an appropriate distance was maintained and no participant interviews were conducted (at this point in time). Nevertheless, the observations were made by walking around the area (Fig. 3), thereby still providing a good level of intimacy.

For van Manen (1990:69), close observation involves “an attitude of assuming a relation that is as close as possible while retaining a hermeneutic alertness, constantly step[ing] back and reflect[ing] on the meaning of those situations [we find].” Simons (2014) similarly suggests a combination of visual and then *written* analysis promotes a direct and engaged understanding of activities and conditions within the particular study context. The inclusion of visual evidence (eg. photographs) can then also facilitate the detail, richness and trustworthiness of the subsequent analysis and research findings (Glaw et al., 2017), and subsequent conclusions and recommendations (Holm, 2014). Stankov et al. (2019) also suggest drone technology can give a wider visual and therefore analytical perspective than that obtained (only) through the reach of the human eye at street level; while also noting (albeit only briefly) potential research ethics concerns when using such technology.

### 4.3. Data analysis and analytical framework

The analysis was undertaken in two complementary stages. The first comprised a descriptive re-writing of the raw observational data, prompted by the question ‘what is happening [here]?’ (Calzon, 2021); using the writing process itself as a tool to garner new and meaningful insights, and not dissimilar to van Manen’s (1990) reference (above) to a fruitful ‘hermeneutic’ awareness.

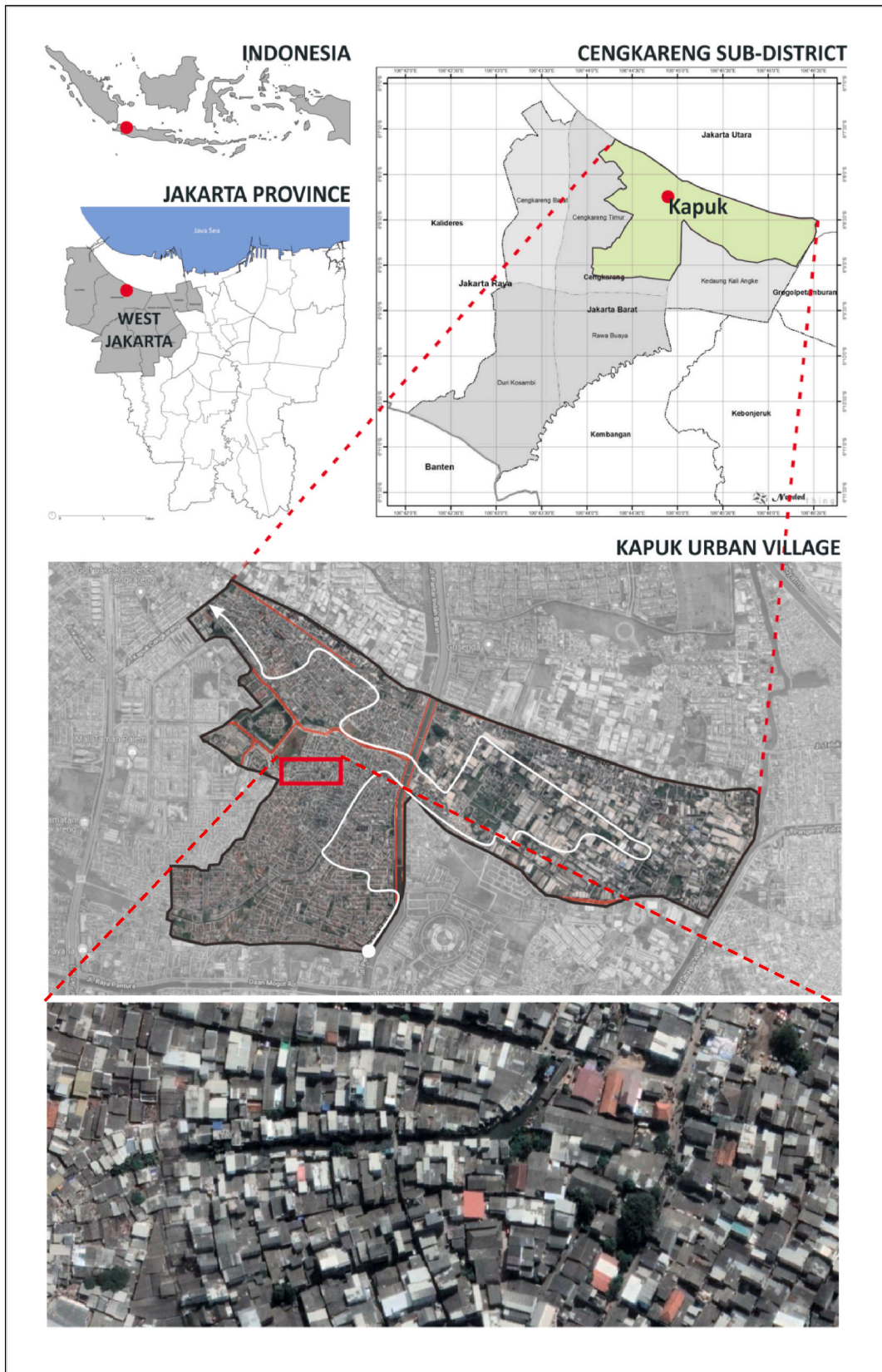
The second stage explored these descriptions more deeply by positioning them within a specific framework, developed as part of the research. This framework combines the earlier background information relating to the characteristics of both the transmission of COVID-19 and of slum areas (Fig. 4; and detailed in the ‘slum environments’ and ‘COVID-19’ columns in Table 1).

The results, as directly related to Kapuk, are described in section 6 and summarized in the ‘connections’ column in Table 1.

## 5. Kapuk Urban Village

Kapuk is one of 262 designated ‘urban villages’ (the third administrative level, after ‘regions’ and ‘sub-districts’) in Jakarta. It has an area of 5.63 km<sup>2</sup> and is the largest identified slum area (Ministry of Public Works and Public Housing, 2017) (Fig. 3). Land use is divided into residential area (72.2%), industry (12.7%) and business (13.8%), with the rest (1.3%) as parks and other uses (Setiawan et al., 2020). Total population is 171,615, and the population density is the highest in the sub-district at 30,482 persons/km<sup>2</sup> (Statistics of Jakarta Barat Municipality, 2021a, 2021b). There is also an absence of basic social and health





**Fig. 3.** Kapuk Urban Village: administrative location, aerial view showing study observation route, and detailed aerial view illustrating density of settlement. Source: Compiled by the authors using base from Indonesian OpenStreetMap Association (2017), DKI Jakarta Spatial Planning Regulation Map (2020) and Google Earth Pro (2022).

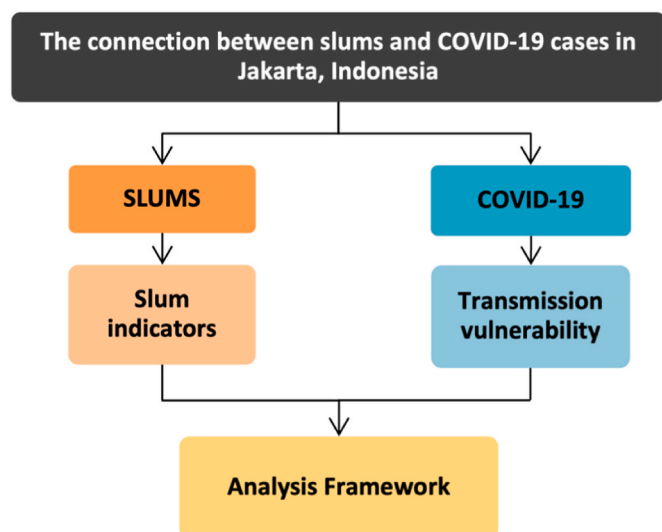


Fig. 4. Developing the analysis framework. Source: Compiled by the authors

infrastructure within Kapuk itself, and ready access to surrounding facilities is limited (Statistics of Jakarta Barat Municipality, 2021a, 2021b).

The choice to live in Kapuk is largely driven by affordability and proximity to work locations (Fitria & Setiawan, 2014). The area is also characterised as having high kinship between communities, and which involve on-going social interactions.

6. Findings

We now summarise the results of the observational research, structured around the three spatial levels of Environs, Settlement and Object, and in reference to the associations around vulnerability to COVID-19 transmission as well as a selection of the photographic data (Fig. 5).

The results are also summarized in column 3 to Table 1 to highlight the connections between the three physical spatial levels and the earlier identified characteristics around COVID-19 transmission.

6.1. Environs

Kapuk is low-lying with many watercourses, making it vulnerable to flooding. Inundation occurs at least once a year during the rainy season (Fitria & Setiawan, 2014; Halim, 2020). Although the photograph in Fig. 5(i) was taken during the dry season and when it was not raining, it still shows many roads inundated due to clogged drains. This, however, does not reduce the need for people to still move around as part of daily activity, including those particularly vulnerable to COVID-19 such as the elderly. Fig. 5(viii, ix, xi, xii, xiv, xvii) shows various activities being undertaken simultaneously in a space with limited ability to social distance, including selling, driving, and sharing food; and with children sitting with their parents (and also not everyone wearing masks).

Characteristic social interactions in Kapuk were clearly observed during the site visits, and which included ‘gatherings’ (which in Indonesian culture refer to a range of activities, including ronda, or daily night patrols by males; arisan, a social gathering of females; Pemberdayaan Kesejahteraan Keluarga, or Family Welfare Programme meetings attended by women and ‘learning communities’, including learning vocational and other skills and religious instruction in mosques) (Halim, 2020). Household and social kinship arrangements also mean that people move between homes and share food and sleeping space. All these characteristics further influence vulnerability to COVID-19 transmission.

Economically, most occupations observed comprised labourers and

Table 1 The connection between slum environments and COVID-19 transmission.

Observation and analytical framework		Applying the framework		
1. Slum Environments		2. COVID-19		3. CONNECTIONS
Indicators/Criteria		Transmission vulnerability		Case study: Kapuk Urban Village
Kohli et al. (2021)		Minister of Public Works and Public Housing (2016)		Wilkinson (2020)
Environs	Location	[ no equivalent ]	Overall geographical setting and features	Flood prone, causing access and sanitation problems.
	Neighborhood (socio-economic) characteristics	[ no equivalent ]	Degree of inter-personal contact in household and social structures	Flexible and intense movement of people between homes given strong social networks.
		[no equivalent ]	Degree of inter-personal contact in work structures/ livelihood imperatives requiring continued work	Most work in the informal sector, involving face-to-face work or other contact, and with incomes equal to or below the minimum wage limiting ability to stop working if infected.
Settlement	Shape (physical layout)	Building, planning, and construction	Standard of ventilation etc between buildings/ prevalence of facilities being communal	The area is not well planned with many illegal or temporary buildings that do not meet standards. Much access to potable water, and many toilets are communal.
	Density	Population and building density	Degree of proximity of people, buildings and community facilities	Little or no physical distance among buildings, lack of vegetation and open space.
Objects	Access network	Street material	Degree and form of mobility/ access to needs and services and propensity to require close interpersonal contact	Lack of proper access to facilities away from the settlement; poor road conditions; unmaintained facilities and infrastructure. Limited, and not well maintained
	Building characteristics	Street lighting Ventilation	Degree of ventilation within buildings	Small-limited ventilation openings and lack of fresh air given close

(continued on next page)

**Table 1** (continued)

Observation and analytical framework		Applying the framework
1. Slum Environments	2. COVID-19	3. CONNECTIONS
Indicators/Criteria	Transmission vulnerability	Case study: Kapuk Urban Village
Toilets	Degree of communal sharing of toilets	<i>proximity of other buildings. Both private and public toilets, with poor water treatment system. Use of the public toilets means interactions with others. Inadequate disposal of wastewater, highly polluted and non-draining waterways - meaning (variously) pooling of stagnant water and some pollution of the river.</i>
Drainage system Waste management	General sanitation levels within buildings	
Clean water management	Degree of communal sharing of water access points/ whether water has to be privately purchased	<i>Limited access to clean water direct into homes, meaning much use of public access water points and therefore interactions with others. Some purchase water privately, requiring also a social interaction.</i>

Source: Compiled by authors

informal workers such as motorcycle taxi drivers, construction workers and street vendors. Incomes range from equal to or below the minimum wage (Halim, 2020). Employment in these informal sectors, and with irregular incomes means a need to prioritise work to sustain an often precarious ‘hand-to-mouth’ existence (Fitria & Setiawan, 2014; Halim, 2020).

The photographs illustrate how such livelihood imperatives encourage interactions outside the home, such as scavenging and food selling, and how it is not possible for much of the population to work individually from home as suggested by the government in its COVID strategy (Saptoyo, 2021). For this population, health and a continuation of their work activities are both important for their survival.

The community is thus highly vulnerable to shocks like COVID-19, with lockdowns and travel bans having an immediate impact on individual livelihoods. With very limited savings or capacity to save, any loss of income can mean basic provisions, including clean water, cannot be purchased. Data external to our study has shown that many post-COVID interventions have increased the poverty rate in West Jakarta (where Kapuk is located), doubled unemployment, and contracted economic growth (Herman, 2020; Statistics of Jakarta Barat Municipality, 2021a, 2021b).

## 6.2. Settlement

In urban settlement terms, Kapuk is organically formed around the local water channel features. Fig. 5(v, vii) for example illustrates how insubstantial buildings frame the existing water flow. Given the informal status of the settlement, building structures and facilities typically do not comply with government regulations and building standards. Buildings are set close to each other, with little or no space between and an absence of open space and vegetation. The resultant level of building density clearly reflects the overall problem of a high human density in Kapuk, and in slums in general.

These overall layout and density characteristics are invariably obvious from aerial photographs and mapping (Fig. 3), which can be viewed remotely from the settlement itself. Arguably however, neither perspective is as effective in revealing the actual lived reality of these characteristics compared to the view from the street when walking around the area. As well illustrated in the photographs, not only is density a key variable in identifying slums (Kohli et al., 2021), such density easily drives higher and faster peaks in epidemic incidence due to high levels of social mixing and interaction. These illustrations also confirm the difficulty in enforcing (making realistic) imposed social restrictions and isolation requirements.

The residents of such settlements will thus continue to witness more cases and higher fatality rates, not (only) because they are poor but also because of the overall physical settlement form and the nature of their social and economic environments.

## 6.3. Object

The final observations relate to the ‘components’ of the settlement, the object level. There are several elements. Good access will support mobility and connections within the settlement and externally (Wilkinson, 2020). Such access is particularly important where, as observed in Kapuk, there are limited public services within the settlement itself; as well as for employment.

In strict medical terms, good access is vital for effective handling of COVID-19, such as for ambulance entry and to facilitate the distribution of aid and vaccinations. In contrast, Kapuk exhibits the opposite, with few entry points, poor road surface conditions, unsafe connecting bridges between houses, and un-maintained (broken) streetlights recorded during the site visits, which clearly makes movement difficult (Fig. 5(ii, iii, iv)).

Similarly, good internal building layout can support the health of residents, especially when preventing COVID-19 transmission through isolation. Those who are infected and sick need space, hygiene cleanliness and ventilation to assist their own recovery and to stop virus spread. However, the characteristics of the buildings found in Kapuk from the street-level observations are limited in their ability to meet these needs: the front is often used as a shop, thus encouraging visitation; upstairs areas are often used for drying clothes, thereby affecting air-flow, reducing space, and hindering free internal movements; the buildings themselves are narrow but full of people; there are minimal windows for ventilation (Fig. 5(viii, ix, x)). Inadequate wastewater disposal and non-standard waste treatment exacerbates water pollution around settlements and brings out a strong odour; such conditions pose additional health risks and therefore reduced resilience (Fig. 5(v, vi, vii)). Considering that the spread of coronavirus can also be through droplets, these conditions can drive the potential for further transmission (MacIntyre, 2020).

Access to clean water was also observed to be inadequate, thus inhibiting easy adoption of simple hand-washing and other hygiene measures. As Wilkinson (2020) notes, if clean water then needs to be purchased (Fig. 5(xiii)), the cost of this can often then limit generous use, and use for handwashing. Communal water access points, as well as the actual purchase of water from vendors, also obviously pose risks for social distancing and adhering to isolation requirements. Communal





Fig. 5. Images of Kapuk Urban Village.  
Source: principal author



(shared) toilets can also result in risks of virus transmission for similar reasons, as well as from the increased likelihood of touching contaminated surfaces (Fig. 5(xv, xvi, xvii)).

## 7. Conclusions

The connection between individual and community health and the physical, social, and economic characteristics of where we live and work is now well-established. So too is the imperative to undertake fundamental remedial improvements within those areas where these factors are adverse in terms of human health. This has been true within so-called slum neighbourhoods both historically and now, and in developed as well as developing countries. The demonstrated connection between slum areas and high rates of COVID-19 transmission now adds a further and immediate dimension.

In addition, the multifaceted characteristics at play compound the difficulties in taking action. As Handel et al. (2020) note, it is often difficult to know where to start and to focus. This study has sought to address this dilemma by bringing together existing schemas around the factors contributing to slum environments and to the transmission of COVID-19 into a composite model to guide interventions at the site level.

The results confirm the high potential or vulnerability of such areas to the transmission of COVID-19 as well as indicate those aspects of the local and living conditions most deserving of attention.

The findings are similar to those elsewhere in the literature. This is useful knowledge in itself in terms of future actions. However, the intention here has been to add another dimension – the empathic awareness that might then encourage the required *implementation* of actions, and which can arise from direct experience of the matter at hand.

Based on this work, we propose two broad recommendations. They are necessarily interrelated.

First, the observational data confirms that not all current government strategies and restrictions responding to COVID-19 can be readily applied within Kapuk. Restrictions on activities, social distancing requirements, and the mandate to self-isolate at home seem implausible when precarious subsistent livelihoods, overcrowded and substandard living conditions, and lack of basic health facilities prevail.

Policymakers need to consider locally appropriate strategies, introducing additional or specific regulations that are suitable to the conditions of each area, rather than just enacting a centralized or national policy. Further, there needs to be specific and considered interventions in the condition of the local environment at each of environs, settlement and object levels, including the upgrading, re-purposing and re-arranging of buildings as well as the provision of facilities and other assistance able to facilitate residents to achieve social restrictions and quarantine requirements at the same time as fulfilling daily social and economic needs.

Here it is worth noting three examples of a positive symbiosis (or potential ‘co-benefit’) within such actions. They arise, as noted by Octifanny and Norvyani (2021) and Patel and Shah (2021), for instance, from the essentially connective and networked systems reality of urban areas.

The first is that, as noted in the literature already cited (including Garside’s (1988) historical example), there is a fundamental connection between long-term improvements in the conditions of slum residents and resilience to disease events generally. The second is that the approach adopted in this research, and resultant suggestions for improvements, can also directly contribute to the planning generally of slum areas, thereby (in this case) supporting parallel Indonesian government intentions to shape better and more resilient urban environments overall (and in conjunction now with other appraisals around such actions by, for example, Das (2015), Minnery et al., 2013, Octifanny & Norvyani, 2021, and Reerink & van Gelder, 2010). The third is that, as stressed by Patel and Shah (2021) generally (and also by

Golechha (2020) and Saha et al. (2021) specifically in relation to experiences in Dharavai in Mumbai, India), existing community-based structures, now at times enhanced from dealing with COVID-19 locally, can offer their own resilience measures, as well as opportunities for longer-term improvements. In turn, a resultant improved resilience will increase the capacity of individuals and communities to respond more effectively to future challenges, such as those brought on by the pandemic. All this requires not just sound data and analysis, but also a *ground-level* approach to evidence gathering to ensure effective action (OECD, 2022, emphasis added).

There is now also a helpful “repertoire” of potential actions to draw on, as suggested for example by Franco et al. (2020), and Golechha (2020) and Saha et al. (2021) when reviewing COVID-19 responses in, respectively, South America and Mumbai, India. Here also, and in the spirit of the multi-disciplinary orientation of this paper, a final practical (albeit pre-COVID) example is cited: the concept of “urban acupuncture” (Lerner, 2014), and which has received specific notice given work in Curitiba, also in South America, and which, like Jakarta, includes many poorly-serviced settlements. Drawing on the approach within medical acupuncture, multiple areas of need have been addressed, notwithstanding otherwise constrained resources, via ‘insertions’ of well-considered and targeted actions: finding the best points within the overall system (here, by analogy, the city) to initiate an intervention (here, city-management resources) able to achieve compound benefits. The benefits of urban acupuncture as a design tactic is that it supports the idea that intervention does not need to be ample or expensive to have transformative impact. It therefore has ready applicability to the more impoverished slum context (Cutieru, 2020).

Our second broad observation is that despite the commitment in the Jakarta Provincial Governor’s (2018) regulation to slum area improvement, action to date has been relatively limited. Whilst the general importance of slum improvements is well understood, this study highlights the urgent need to prioritise investment immediately, to promote overall community and health system resilience to crisis.

Here it is hoped the close observational approach described in this paper might help to encourage increased action. Here also, further site-level case-studies are worthwhile, within additional locations and, when health and safety issues permit, which include more diverse and collaborative methods, such as interviews and other individual and household-level surveys - to better advise on the direct daily lived-experience perspective of residents and other actors. And in doing so, work towards the human rights and local knowledge-based socially democratic public health cited earlier in this paper.

Such studies could equally incorporate other aspects such as security of tenure, economic security, and local socio-political relations (as cited in the more general studies of slum-improvement experiences); thus, also potentially expanding the composite schema used in the observational research here and adding to the breadth and depth of subsequent findings and resultant actions.

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## Author contributions

Maria Vika Wirastrri: Conceptualization, Methodology, Data curation, Investigation, Formal analysis, Visualization, Writing – original draft.

Prof. Nicky Morrison: Supervision, Writing – review and editing.

Greg Paine: Visualization, Writing – review and editing.

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