



Collective Strategies and Spatialities of Neighborhood Food Coproduction during COVID-19 Pandemic

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Abstract. This paper explores the strategies and spatiality of neighborhood food coproduction during the second wave of the COVID-19 pandemic in Indonesia. The COVID-19 pandemic has created global food instability, requiring collective strategies to source and transform food for people in need. This paper is particularly interested in the neighborhood-driven coproduction of food for the rising rate of home-isolated COVID-19 patients, which generates new spatial programming and interconnections between dwellings, the neighborhood, and the city. This paper examines these issues using Twitter data, harnessing 141,208 tweets related to COVID-19 and neighborhoods in Indonesia. These tweets are then further filtered to provide 128 food-related tweets, which are then analyzed using categorical and networked revelation analysis. The analysis demonstrates strategies of food coproduction, including sourcing food ingredients, managing daily food transformation, and creating centralized structures. The spatiality of food coproduction highlights neighborhood accessibility, food placement structures, and dwelling configurations. The food coproduction strategies exist as a dynamic and responsive approach toward the fluctuating conditions of neighborhood dwellers, shaping the spatiality of the neighborhood and heightening the residents' resilience.

Keywords: Coproduction; COVID-19; Food; Neighborhood; Twitter

1. Introduction

In This paper discusses strategies of food coproduction during the COVID-19 pandemic in Indonesia and explores the spatiality of such coproduction in the context of urban neighborhoods. Coproduction has been recognized as a vital aspect of pandemic responses that leans on community empowerment to assist overburdened public services (Berawi et al., 2020; Miao et al., 2021). Food has been an eminent issue of coproduction during the pandemic, with the imbalance of global supply systems and rising issues of unequal access to food (Hobbs, 2020; Sardeshpande et al., 2021). Spatially, discussion about food coproduction during the pandemic has often been limited to the production of raw food material and, therefore, has largely focused on areas outside living spaces to generate food resources, such as urban gardens (Sardeshpande et al., 2021), overlooking the wider complexity of food procurement in relation to other pandemic conditions.

This article explores the strategies and spatiality of food coproduction in the event of a rising rate of home-isolated COVID-19 patients. Addressing such a condition draws

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attention to various food processes other than food gardening. Exploring these processes potentially allows a richer understanding of the different fragments of a city's livelihood. This article considers urban and architectural theories that discuss food, coproduction, and the relevance of coproduction as a neighborhood response during the COVID-19 pandemic. This study utilizes Twitter data harnessed during the surge of the second wave of COVID-19 in Indonesia, which took place between June and July 2021. During this period of enforced limitations on movement, such data provide insights into individual neighborhood experiences in response to the pandemic (Booth et al., 2018). Twitter narratives are explored to highlight important patterns in food coproduction strategies and spatiality, demonstrating the importance of food coproduction during COVID-19 and its implications for the discourse on coproduction in the built environment.

2. Food, Coproduction, and Neighborhood

Our everyday engagement with food reveals the experiential and perceptual boundaries of space, including households, neighborhoods, and the wider global context (Marte, 2007). The physicality of food processes, such as cooking and eating, brings the experience of being on the outside inside and vice versa, blurring spatial boundaries (Franck, 2005; Marlor, 2021; Teston, 2020). As a spatial system, food signifies interconnected activities that enable its continuous existence in society (Franck, 2005; Hobbs, 2020). However, the complexity and intensity of the food system is often hidden, creating an illusion of food as something that is always there (Franck, 2005). The hidden food system also creates a division between spatial scales, where food is produced and sourced, disregarding connections across spatial scales and in between regions (Franck, 2005). The disconnection of food system creates a higher need to value the locality of food production and to better demonstrate the connections between food, context, and community. There has been wide discussion about how the collective production of food in a local context can generate interaction and a sense of community, strengthening social relations and enhancing social cohesion (Borrelli and Mela, 2018).

This article explores the process of food coproduction in society during the COVID-19 pandemic. The idea of coproduction primarily addresses the organization of resources and spaces contributed to by government and non-government (citizen or other types) stakeholders (Stevenson and Petrescu, 2016). Coproduction must be done voluntarily to actively create value (Hays, 2018). Spatially, the process of coproduction not only concerns the possibilities of spatial occupation but also focuses on the way space is developed, managed, and used (Petcou and Petrescu, 2015), providing opportunities for alternative spatial programming. The process of coproduction reflects an immediate response in times of uncertainty and disruption, enabling higher resilience in society (Marte, 2007; Stevenson and Petrescu, 2016).

During the pandemic, coproduction is vital as the crisis has led to higher urgency for shared responsibility, particularly in providing resources and services for health and well-being needs (Steen and Brandsen, 2020; Yatmo et al., 2021). The flows of food in society have been beleaguered by multiple disturbances, such as lagging food processing and disrupted distribution networks, which have created food supply issues (Hobbs, 2020). Constant exposure to threats has also led to changing behaviors in food purchasing and food handling within society, with new emphases on cleanliness and perishability (Candra et al., 2021; Schmidt et al., 2020; Suryantini et al., 2021). Such concerns influence the organization of space to support healthier food processes (Karimah and Paramita, 2020; Suryantini et al., 2021). Changes in domestic space are also reflected in the urban space as both scales

are interwoven (Martinelli, 2019). However, there is currently limited discussion about such multi-scale changes, particularly regarding the evolving conditions of the pandemic.

Consideration of food for home-isolated patients is part of the discussion about food insecurity driven by the COVID-19 pandemic, which also consists of the need for food for vulnerable populations (Adams et al., 2020; Singh et al., 2021). The number of home-isolated patients has risen with high hospital occupancy rates, leading to issues of food procurement and food preparation at home (Mahato and Vardhan, 2021). With its limited risk of food-borne viral distribution, community kitchens have become one coproduction approach to respond to food insecurity and provide food for people in need (Young, 2020). The community kitchen is an effort to produce ready-to-eat meals to be distributed to other members of the community (Lacovou et al., 2013). Such kitchens are often owned by local charities, which accept private or public donations (Young, 2020). However, they may also be driven by a culturally based community or even self-created (Beresford, 2021).

While there has been wide discussion about culture- and charity-based food coproduction structures, there is currently only a limited understanding of the system and spatiality of more localized, neighborhood-based forms of food coproduction, which often become lifelines for home-isolated patients. The neighborhood is a category of urban space in which the similar identity of a group is reinforced (Certeau et al., 1998). It is also a key space for people to access resources (Meegan and Mitchell, 2001). Neighborhood-based food coproduction is important as the neighborhood enables residents to craft relationships to meet their daily needs, maintain collective safety, and demand resources from higher organizational structures (Hays, 2018). Neighborhood-based food coproduction is also arguably more dynamic and responsive than charity- or culture-based food coproduction as these latter sources are not permanently embedded in a fixed food supply chain but instead dynamically evolve according to threats and needs. Spatially, how food is acquired, sorted, and delivered in the neighborhood demands different thinking about the flow and accumulation of material driven by interpersonal relationships and needs (Marco et al., 2021). It is important to reconsider how food coproduction may prompt social and spatial structures to evolve and change in such a context, influencing the resilience of the neighborhood community as a whole in response to the COVID-19 pandemic.

3. Methodology

This paper explores the strategies and spatiality of neighborhood-based food coproduction during the COVID-19 pandemic in Indonesia. It utilizes Twitter data from the second wave of the COVID-19 pandemic, harnessed between June 20 and July 5, 2021. This period intersects with the government's Micro-Scale Public Activity Restrictions (PPKM) regulation, which took place from July 3, 2021 and was scheduled to continue until August 20, 2021. During the second wave, the overall daily number of COVID-19 cases rose to 56,757 on July 15 (KOMPAS, 2021). Such severity led to a high occupancy rate (90%) of hospital beds (The Jakarta Post, 2021a), overwhelming the health system and leading to a high rate of self-isolated patients at home (The Jakarta Post, 2021b). In Jakarta, the capital city of Indonesia, the inability to medically attend to such patients led to high reports of the deaths of home-isolated patients, which reached 2,313 patients by July 22.

Voluntary COVID-19 task forces in local neighborhood administration units (often called *rukun tetangga*) have become the frontline in addressing such second wave battles. This administration units provides a relatively accurate and updated database of patients in the neighborhood and organizing necessary resources to care for such patients, including medicine, food, and even televisions to combat boredom (The Jakarta Post, 2021c). This

paper explores the occurrence of neighborhood-based food coproduction in Indonesia through a narrative compilation of Twitter data. Twitter has been recognized as an important platform that reflects neighborhood civic life (Bingham-Hall and Law, 2015). Utilizing Twitter also enables the analysis of multiple neighborhoods at once (Booth et al., 2018). In total, the study acquired 141,208 tweets posted in the Indonesian language, resulting from 36 COVID-19-related queries, including ‘pandemi’ (pandemic), ‘korona’ (corona), ‘lockdown’, ‘berjemur’ (sun-bathing), and ‘penyebaran’ (spread). The tweets were filtered using spatial terms unique to the Indonesian urban neighborhood context, such as ‘komplek’ (housing complex) or ‘cluster’ (small group of landed houses in an urban context), leading to 781 tweets. Further filtering was done using food-related terms, such as ‘makanan’ (food) or ‘lauk’ (dishes), resulting in the final quantity of 128 analyzed tweets.

The analysis of the 128 tweets was conducted using two main approaches: first, the extracted keywords from each acquired tweet were categorized, and then network revelation analysis of the relationships that occurred within and between the categorized keywords was carried out. These analyses highlighted an array of themes emerging from the comparison, connectivity, and frequency of words collected from the tweets’ narratives, which further revealed the strategies and spatiality of food coproduction in the neighborhood.

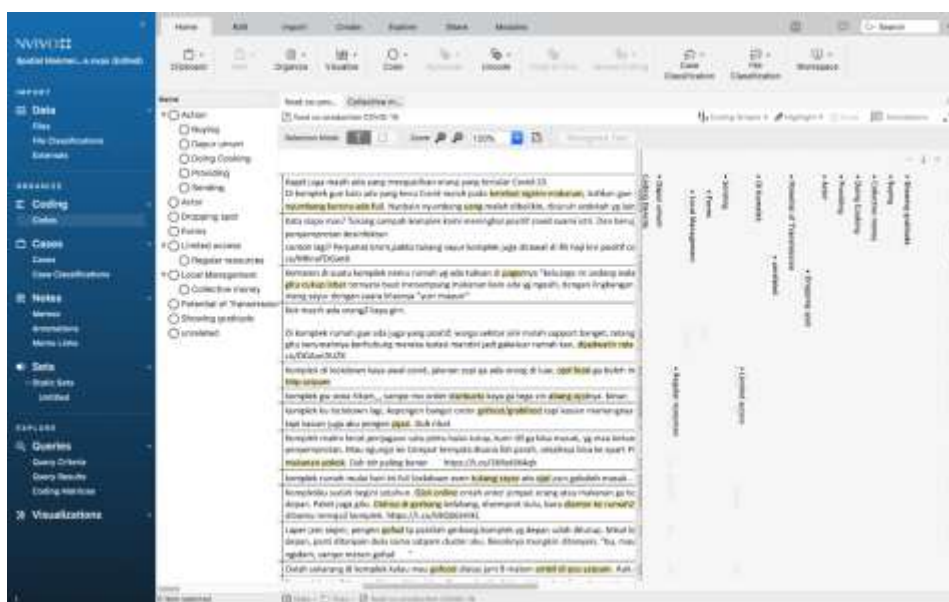


Figure 1 Exploratory analysis of Twitter data using NVivo

The first part of the analysis aimed in a straightforward way to read the relevant keywords or phrases in each tweet concerning food coproduction at the neighborhood scale during the pandemic. The process of categorization allowed us to locate the extracted keywords or phrases from each tweet in their position within the sentence structure of the tweet. It allowed the removal of noisy words from the overall narratives (such as punctuation and conjunctions) to increase the criticality of the analysis. Such processes of extraction and categorization were conducted using both NVIVO and Microsoft Excel. Both software programs were used to highlight and locate the extracted data into categories concerning ways, tools, actors, and places.

The second part of the analysis aimed to identify the potential themes of the narratives, depicted by the networks of relation produced using the categorized data. This part was conducted using Orange Data Mining software. The form of the data in each category was

fragmented into single words, allowing visualizations that show the links of correlations between the data. Based on theoretical understandings from the literature cited above, several categories of data were grouped to be staged within each network revelation diagram.

4. Strategies and Spatiality of Neighborhood Food Coproduction during COVID-19

4.1. Neighborhood Food Coproduction Strategies

During the second wave, a large proportion of the tweets reveal collective initiatives in the neighborhood to cater to the food needs of home-isolated patients. Based on the keywords networked and categorized in the following diagrams, we identified various food coproduction measures that depended on the quantity of the patients to be cared for in the neighborhood and the intensity of the food needs in the neighborhood.

Some keywords found in Figure 2a, such as *'makanan'* (food), *'mateng'* (cooked), *'gofoodin'* (buy food using a delivery application), and *'masakin'* (cook), demonstrate the strategy of delivering home-cooked or purchased ready-to-eat meals daily. This strategy often works when there is a sufficient availability of neighbors with the skills and resources to take turns providing the meal. Some keywords in Figure 2b, such as *'uang'* (money) and *'stok sayur'* (vegetable stock), indicate how neighbors may regularly provide money or raw food ingredients to be cooked by the patients at home. This strategy may cater to patients who are less severely ill or have family members who can cook at home, which is explored further in the actor word cloud diagram.

Figure 2c illustrates the variety of actors that participate in neighborhood food coproduction, both in caring for home-isolated patients and in other activities. Other than the neighborhood leaders themselves, the actor keywords demonstrate the existence of individual assistance in the keywords *'tetangga'* or *'warga'* (individual neighbors), designated voluntary groups based on age and gender, such as *'remaja2'* (teenagers) and *'ibu'* (mothers), and special task forces, such as *'satgas'* and *'security.'* The network revelation diagram in Figure 2d demonstrates how these actors have diverse roles within the scenarios of food coproduction, including cooking and delivering food and coordinating with patients and neighbors.

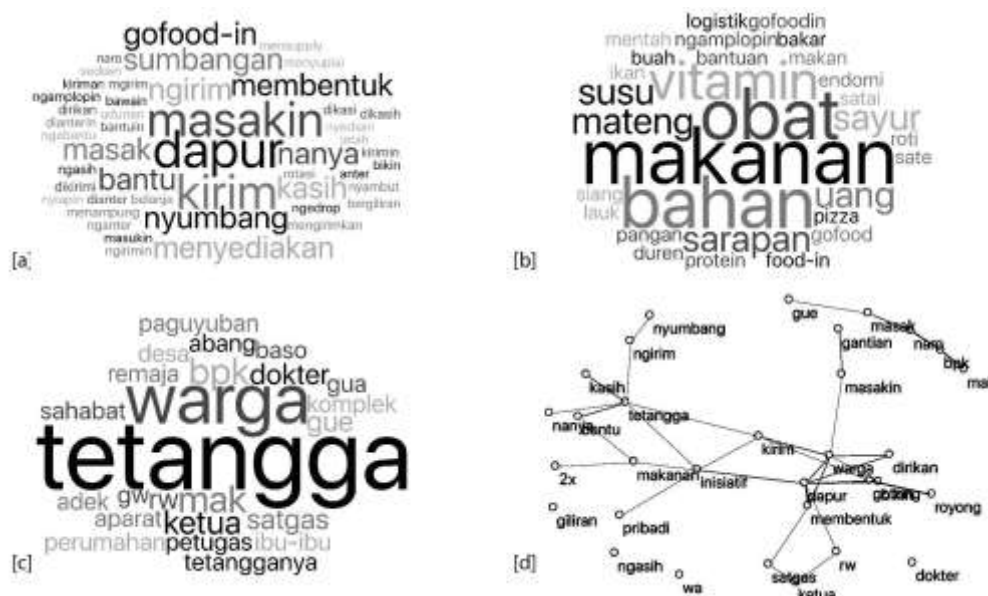


Figure 2 Identifying the acts (a), type of food (b), and actors (c) as part of neighborhood food coproduction strategies (d)

When a higher number of patients requires daily meals support (15 patients and above), some tweets point to the need to build a community kitchen in the neighborhood to cook a larger amount of food. Such kitchens are also often present outside the neighborhood to cater to patients outside the neighborhood and receive outside donations of money and food. Despite the practicality of a community kitchen, some tweets indicate that the food in the community kitchen showed less consideration of food variety and nutrients, while the tweets discussing home-cooked or purchased meals indicate types of food that are less repetitive and more dense in nutrients. There is also some fear that the community kitchen might exacerbate transmission risks. By contrast, some tweets discuss how frequent daily food delivery by neighbors created social burden and stress for the neighbors, particularly when food resources are limited in the neighborhood.

4.2. Neighborhood Food Coproduction Spatiality

The tweets harnessed in this study demonstrate a shift in food processes during the surge of home-isolated COVID-19 patients (Figure 3), indicating the process of coproduction. Further analysis of the tweets demonstrates that the spatiality of neighborhood food coproduction highlights neighborhood accessibility in managing the flow of food sources, spatial structures required for food placements, and the spatial experience of food.

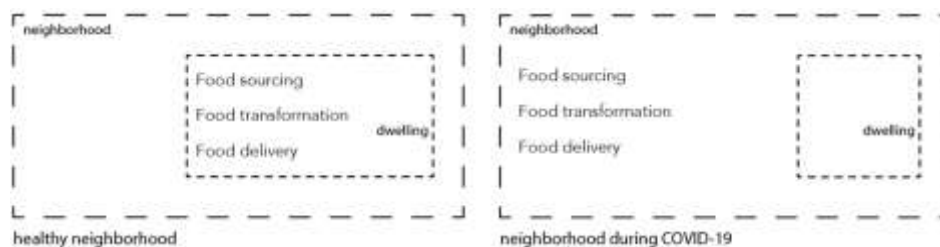


Figure 3 Shift in the spatiality of food processes during the COVID-19 surge

The diagrams in Figure 4 demonstrate keywords that reflect neighborhood accessibility and food purchases during the pandemic. Keywords from the diagrams in Figure 4a imply difficulties of food sourcing in the event of road blockages, which leads to collective strategies in managing food distribution. Keywords such as *'portal'*, *'ditutup'* (closed), *'muter'* (turn around), and *'cari'* (looking) imply difficulties reaching the neighborhood due to road closures, while keywords such as *'kedepan'* (to the front), *'titip'* (deposits), *'ambil'* (acquire), *'pos'* (post), and *'gerbang'* (gates) suggest that the closure of the neighborhood requires residents to acquire their own packages at various neighborhood pick-up points. The network revelation diagram in Figure 4b illustrates the connections between these points, including neighborhood gates, security posts, and even the alley's portal. The accessibility measures at these points may occur for prolonged periods or according to particular time schedules, such as during the night.

Other strategies utilized in managing a safe food sourcing and distribution involve additional procedures required to gain entry to the neighborhood, which tended to be imposed on visitors. For example, some tweets indicate that vegetable vendors need to show a swab test results letter or that guests are required to pass through a disinfection chamber before entering. Such conditions of accessibility influence the availability of food sources by, for example, limiting food vendors from staying around the area, influencing food ingredient purchases by giving preference to less-perishable foods, and reducing food order frequency due to longer delivery times. This different availability of food in turn influences the extent to which food can be coproduced for patients in need as well as the

composition of the food offered.

Within the dwelling itself, the existence of spatial structures in which to place food becomes an important aspect of food coproduction where the domestic and the neighborhood space intersect. Figure 4c demonstrates the distribution intensity of the most important keywords highlighted in the tweets with regard to particular spatial elements within or around the dwelling that are valuable for accommodating food provision for home-isolating dwellers. Examples are 'teras' (terrace), 'pagar' (gate), 'box', 'cantolin' (hang), 'gagang' (handle), 'pintu' (door), and 'jendela' (window). The network revelation diagram in Figure 4d demonstrates the connectivity between and proximity of these spatial elements, which are informed further by the narratives on how the utilization of these elements may vary depending on the objective of the food. Some residents hang boxes outside the gates of their dwelling with an updated announcement about the condition of the home's residents. In some cases, when food is not provided by the neighbors, they ask for donations from neighbors and passersby to be placed in the designated boxes. Deliveries of food ingredients and ready-to-eat meals tend to be placed in areas that are more secure and easily reached from inside the dwelling, such as terrace tables or front door handles.

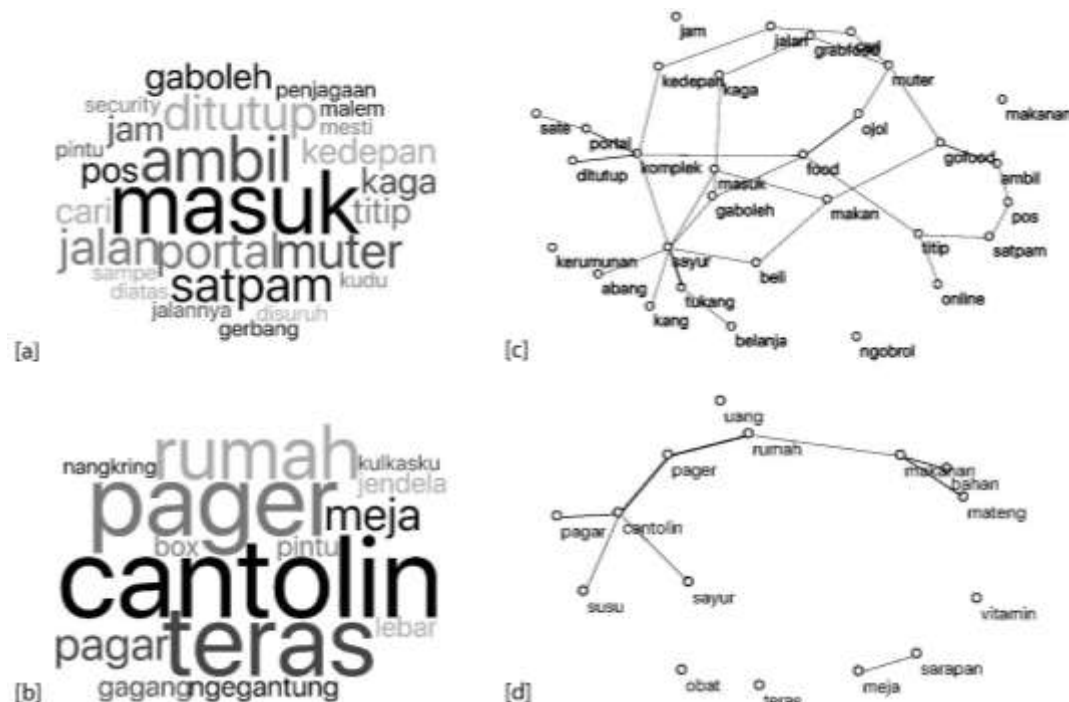


Figure 4 Network revelation of the spatiality of neighborhood food coproduction

Food placement structures enable the severity of the patient's illness to be monitored. A tweet reports that after food on a door handle was left untouched after two deliveries, neighbors broke into one of the dwellings and found that one of the dwellers had died. In addition to donation and daily deliveries, other tweets also report that such spatial elements are used for other food purposes, such as providing food gifts from people other than the neighbors or welcoming gifts from neighbors after the resident returns from hospitals. The utilization of these spatial elements demonstrates the multiple events of food production during the pandemic, the variability of residents' conditions, and the secured storage of the food.

The spatial experience of food coproduction in the neighborhood highlights various interactions between inside and outside stakeholders and spaces. A tweet reports that

some residents would regularly shout from the dwelling's garden to a next-door neighbor who was in isolation, checking regularly if the neighbor still had sufficient food. Some tweets state that some home-isolating residents sunbath together while snacking and chatting with their nearby neighbors. Other tweets highlight interactions between home-isolating dwellers and friends and family who deliver food, specifying that the conversation happens across the window that separates them. Furthermore, other tweets express worry about home-isolated patients whose windows are located next to the neighborhood food stall, fearing transmission risks while the window is open for air circulation.

These tweets address certain issues that highlight connectivity between spaces. The configuration and proximity of dwellings in the neighborhood is important to enable daily check-ups and daily interaction related to food availability and consumption. The visibility of the home from the outside becomes important to providing a contained but observable area for neighbors and visitors during food provision. The configuration of dwellings and other food activity spaces in the neighborhood also require an orientation that ensures safe airflow.

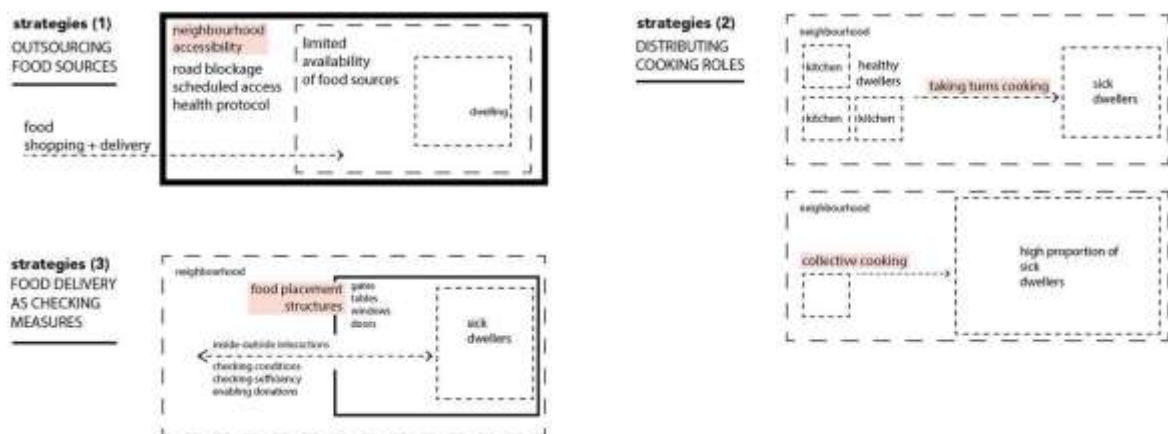


Figure 5 Strategies and spatiality of neighborhood food coproduction during the COVID-19 surge

Based on the study, Figure 5 outlines a new spatial programming that occurs between the dwelling, neighborhood, and city. Such programming is influenced by the following three main food coproduction strategies: 1) the outsourcing process of food sources; 2) the distribution of cooking roles across the neighborhood or through a centralized structure; and 3) the process of food delivery checking measures. These strategies can be used in an integrative way or interchangeably, depending on the severity of patients' conditions and the rising number of patients in the neighborhood.

5. Conclusions

This article explores neighborhood food coproduction strategies and spatiality in response to the varied conditions of home-isolating patients in neighborhoods in Indonesia. The Twitter study visualized in Figures 2 and 4 highlights the organization of different food process strategies happening in the neighborhood in light of the patients' differing conditions and the availability of resources. The study concludes by addressing how these strategies inform new spatial programming between the dwelling, neighborhood, and the city.

The spatial programming of these food coproduction strategies enables a particular

flow of food and people through the organization of neighborhood accessibility, food placement structures, and dwelling configuration and orientation. Neighborhood accessibility enables the frequency and variety of food sourcing possibilities. Food placement structures become an important intersection between public and private areas, influencing the direction of food flow, as well as the frequency of the food provider. The food coproduction process also provides an important opportunity to observe the patient's condition. The orientation of the dwelling and the visibility of the surfaces create opportunities for interaction and observation during food delivery, ensuring regular updates on the patient's health condition.

Neighborhood food coproduction demonstrates dynamic possibilities for managing the community's food needs based on the precarious conditions of the patients. It shows that the flows and processes of food are shaped by the complex spatial interrelation between the dwelling, neighborhood, and wider city context, which continuously changes during the pandemic. Further exploration of the Twitter narratives may uncover further social and spatial processes happening in society during the pandemic.

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