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HEALTHY LIVING IN SUBSIDIZED HOUSES? EVIDENCE FROM INDONESIA'S FLPP PROGRAM

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ABSTRACT

Government policies to encourage homeownership rates for low-income communities (MBR) are implemented through the Housing Finance Liquidity Facility (FLPP) program, executed since 2010. However, more than half of the built subsidized homes need to meet the minimum construction standards and infrastructure requirements that can impact the health quality of their occupants. This study aims to investigate the impact of government support for purchasing subsidized housing from Indonesia's FLPP program on district/city-level public health. The results of this study indicated that the FLPP program affects home occupancy rates and the FLPP program also has a negative relationship with community morbidity levels in the MBR group. As well, state intervention in the housing sector with the FLPP subsidized housing program can demonstrably improve the quality of public health. This study recommends that the government maintain the FLPP program because, apart from increasing occupancy, it indirectly impacts health quality improvement.

Keywords: *FLPP, Low-Income Group, Public Health, Subsidized Housing, Indonesia*

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Introduction

Article 28H of the 1945 Constitution states that everyone has the right to live in good physical and mental well-being, have a home, enjoy a good and healthy environment, and receive medical care. As housing is a basic need of every human, living in a healthy home and disease-free surroundings is essential. Data from the 2018 National Survey on Health uncovered housing problems in Indonesia, where 14 million households were homeless, and housing arrears persisted (Statistics Indonesia, 2020a). Efforts have been made to address these issues by increasing access to homeownership, particularly in low-income communities. The Indonesian government has attempted to assist low-income communities by providing housing loans (Kredit Perumahan Rakyat) as a national program of approximately 700,000 (Hartono et al., 2022). Based on Housing and Settlement Law No. 1/2011, the government must assist low-income communities in accessing social or public housing.

The Government of Indonesia (GoI) has offered a Housing Finance Liquidity Facility (Fasilitas Likuiditas Pembiayaan Perumahan (FLPP)) since 2010. The GoI allocated Rp 51.4 trillion to the FLPP program to build 725,937 subsidized houses in 2020 (PPDPP, 2021). Most FLPP-built house units are found in West Java (246,847 units), Banten (65,943 units), East Java (47,590 units), and South Kalimantan (42,112 units). Meanwhile, the three provinces with the lowest realization are North Maluku (409 units), Jakarta (398 units), and Maluku (130 units) (PPDPP, 2021). Nonetheless, around 55.4% of subsidized homes must meet the minimum construction and infrastructure requirement standards in the Mortgage Subsidy Regulations (World Bank, 2020). In contrast, this government intervention program aims to encourage home ownership and raise the number of people living in decent homes (Bappenas & World Bank, 2015).

Statistics Indonesia (2020a) indicated an increased number of low-income residents who contract the disease while living at home. Despite the increased budget and the number of constructed houses, health concerns related to this issue have also increased. Nevertheless, the impact of subsidized housing on health has been difficult to measure based on physical construction appearance. The quality of living is a decisive factor for the quality of life. Several studies have examined the relationship between housing and health, including some aspects: housing quality, physical and social conditions, place of residence, and property status (Gibson et al., 2011). Although the normative relationship between these variables has been widely accepted, the actual relationship between the variables still needs to be clarified (Braubach, 2011).

This study examined the impact of the government-subsidized housing program in Indonesia, a developing country, on public health, such as access to healthcare facilities. It is also worth considering the preventive, curative, and rehabilitative approaches. The impact of housing subsidies on health needs to be analyzed before deciding on future policy, especially fiscal policy.

Literature Review

Previous studies (e.g., Fukuzawa & Karnas, 2015; Lubell et al., 2013; Ortiz & Johannes, 2018; Swope & Hernandez, 2019) have shown the relationships between health and housing using several characteristics, including housing class and different types of diseases (e.g., mental, physical, self-confidence, and environmental conditions). However, these studies were conducted in exclusive residential homes in developed rather than developing countries, where the government sets the housing standards and building specifications for subsidized homes.

Several studies have examined the impact of government intervention on housing and health aspects, including Wei and Chiu's (2018) study in China, Wang et al. (2019) research in China, Angel and Bittschi's (2019) study in 21 European countries, and the latest study by Denary et al. (2021) in the USA. However, in the Indonesian context, studies on the relationship between health and government interventions in the housing sector at the national level on a per-district/city basis, especially using econometric methods, are still being determined.

Hinds et al. (2018) employed longitudinal data and administrative databases at an individual level to investigate how public housing affects people's use of healthcare services. This study found that public housing residents tend to be high users of healthcare services over two years, proximal to their move-in data, compared to individuals who have similar socio-economic characteristics but are not public housing residents. On the other hand, Nasim (2022) found that the quality of social housing does not explain children's health problems in

socially rented flats and houses. Headen et al. (2022) investigated six public housing units, showing that public housing is consistently associated with healthcare utilization for women. However, these three studies have focused on the effect of public or social housing on public health in developed countries.

In the Indonesian context, Bappenas & World Bank (2015) reported that only 20% of Indonesian households can afford a house through the formal commercial market. About 40% of all households can only purchase houses with government support. This fact highlights the critical role of housing subsidies for the municipality. However, Soeroto (2016) study discovered that Indonesia's mortgage-to-GDP ratio is only 2.9%, which is lower thanthat of other countries. The low mortgage-to-GDP ratio could be due to limited access to capital markets and fluctuating interest rates. In addition, most workers in the low-income segment work in the informal sector, leaving them ineligible for a formal housing finance mechanism. Furthermore, Hartono et al. (2022) say that concerning ownership choices, low-income communities will have a higher likelihood of owning a house as they have a fixed income and good literacy in housing government programs.

Some earlier studies have examined the Funded Housing Scheme (FLPP) using qualitative and normative approaches (Kusumastuti, 2015; Mangeswuri, 2016), the structural elements of FLPP houses (Azril et al., 2020), and subsidized housing in different cities and regencies (Adianto & Gabe, 2021). However, these studies have yet to examine the public health aspects of the FLPP houses. Therefore, our study aims to contribute to the current gaps in the literature in such areas.

Data and Research Methods

Our study adopted a quantitative approach and the Least Square Dummy Variables (LSDV) regression analysis to estimate the relationship between government subsidy programs and health outcomes while keeping the time-invariant variables in the model to be estimated. To consider the unobserved heterogeneity of district/city characteristics, we used fixed effect district/city. Two hypotheses were tested: (1) FLPP subsidy will increase the proportion of adequate housing, and (2) FLPP subsidy will improve the quality of public health by considering health facilities (community health center and hospital) and health workers in a district/city, based on the two econometric models developed as follows:

$$LnAdequate_{i,t} = \beta_0 + \beta_1 + LnFLPP_{i,t} + \varepsilon \tag{1}$$

$$\begin{aligned} Ln\ Pain_{i,t} &= \beta_0 + \beta_1 LnFLPP_{i,t} + \beta_3 LnAdequate_{i,t} \\ &+ \beta_3 LnOwnership_{i,t} + \beta_4 Puskes_{i,t} + \beta_5 RS_{i,t} + \beta_6 Nakes_{i,t} + \varepsilon \end{aligned} \tag{2}$$

The control variables (healthcare facilities and health workers) in Equation 2 are based on Khoirunurrofik and Raras (2021) models in their study concerning health services provision and the decision to buy the National Health Insurance (Jaminan Kesehatan Nasional (JKN)) in Indonesia. Furthermore, Equation 1 and Equation 2 are connected. If the analysis shows a significant relationship between the FLPP and adequate house variables, an interaction variable (FLPP*House Adequacy) is developed. This new variable will moderate the relationship between adequate housing and levels of public health. The econometric model used to test Hypothesis 2, as shown in Equation 3, is:

$$\begin{aligned} Ln\ Pain_{i,t} &= \beta_0 + \beta_1 LnFLPP_{i,t} + \beta_2 LnOwnership_{i,t} + \beta_3 FLPP * HouseAdequacy_{i,t} + \\ &\beta_4 Puskes_{i,t} + \beta_5 RS_{i,t} + \beta_6 Nakes_{i,t} + \varepsilon \end{aligned} \tag{3}$$

Table 1: Research Operational Variables

No.	Variables	Descriptions	Units	Data Sources
1	*Pain*	Community data on low-income community groups (Deciles 3 to 7) who contracted the disease in the last month per district/city	Percentages	National Survey on Health Statistics Indonesia
2	*Adequate*	The proportion of households in the low-income community groups (Deciles 3 to 7) that have access to decent and affordable housing per regency/city	Percentages	National Survey on Health Statistics Indonesia
3	*Ownership*	The proportion of households in the low-income community groups (Deciles 3 to 7) who occupy their own homes	Ratios, Percentages	National Survey on Health Statistics Indonesia
4	*FLPP*	FLPP realization data per district/city	Home Units	BLU PPDPP
5	*Puskes*	Number of community health centers per population in a district/city	Ratios, Percentages	Ministry of Health
6	*RS*	Number of hospitals per population in a district/city	Ratios, Percentages	Ministry of Health
7	*Nakes*	Number of health workers in health centers and hospitals per population in a district/city	Ratios, Percentages	Ministry of Health
8	*i*	District/city		
9	*t*	Year		
10	ε	Error term		

The variables of this study were the foci of hypothesis testing through data collection, data processing, analysis, and interpretation. The results show a comprehensive understanding of the nature and characteristics of the problems. We also utilized a heterogeneity test as a sub-sample analysis of quantitative data, looking at measurable variables and specific analysis tools.

Findings and Discussion

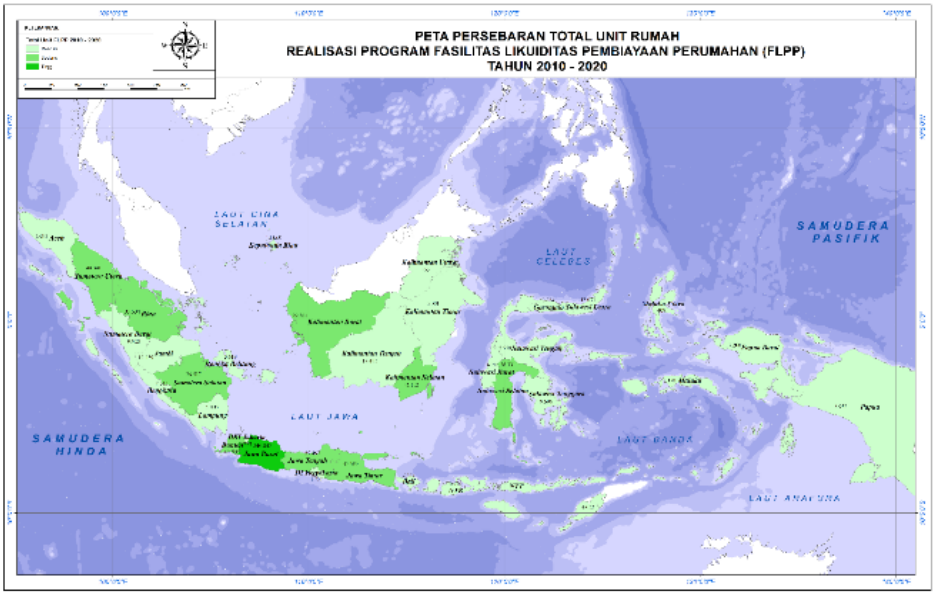


Figure 1: The Total Distribution of FLPP Program Realization from 2010 – 2020
Source: PPDPP (2021)

As shown in Figure 1, West Java demonstrates the most significant realization of the FLPP program in the 2010-2020 period (246,847 units), followed by Banten (65,943 units) and East Java (47,590 units). Meanwhile, outside Java provinces the highest realizations are

in South Kalimantan (42,112 units), North Sumatra (40,341 units), and South Sumatra (36,517 units). The three provinces with the lowest realization rates include North Maluku (409 units), Jakarta (398 units), and Maluku (130 units). Concerning the islands, Java received the highest subsidy (52%), followed by Sumatra (24%) and Kalimantan (12%) of the FLPP houses realized between 2010 and 2020. The remaining islands, Sulawesi, achieved (8%), Bali (2%), and Nusa Tenggara (2%), respectively, while Maluku and Papua realized 2% overall.

The FLPP program was created to provide home ownership and promote decent housing for community groups in deciles three through seven. Figure 2 shows the average distribution map of decent homes between 2011 and 2020 and the low Indonesian decent homes with less than 35%. However, the average decent housing in Indonesia increased from 35% in 2011 to 56% in 2020. In 2020, several regions indicated an average occupancy rate of decent homes among low-income communities of over 80%, incorporating Madiun (87%), Banda Aceh (84%), Gianyar (83%), and Sleman (83%).

Figure 2: The Distribution of Adequate Houses in the Low-Income Groups in 2011-2020
Source: Statistics Indonesia (2020a)

Table 2: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Pain	5.065	3.270	0.356	-1.058	4.339
FLPP	2.937	4.055	1.676	.693	9.930
Habitability	4.985	3.555	0.800	-4.327	4.537
Ownership	5.065	4.396	0.179	3.415	4.605
Hospital Availability	4.472	0.0129	0.013	0.0005	0.167
Health Center Availability	5.061	0.0729	0.0683	0.003	0.785
Health Workers	5.038	432.895	332.859	8.764	3515.819

The descriptive statistics in Table 2 are based on the model and variables used in this study. Variables with the highest panel data observation are illness and home ownership, with 5,065 units. On the other hand, the variable with the fewest panel data observations is the realization of FLPP with 2,937 units. The study used an unbalanced panel model, and data from some units of analysis were unavailable or incomplete due to regional expansion since 2010.

Statistics Indonesia (2020a) defines wealthier communities as those demonstrating more frequent illnesses based on their self-reported data. The disease variable data are inversely proportional to the decent housing variable data, showing that wealthier community groups tend to have decent housing. Figure 3 shows the relationship between indicators of appropriate housing and the morbidity variable for each decile of community groups.

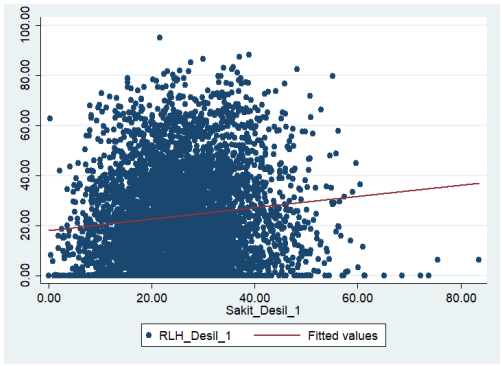
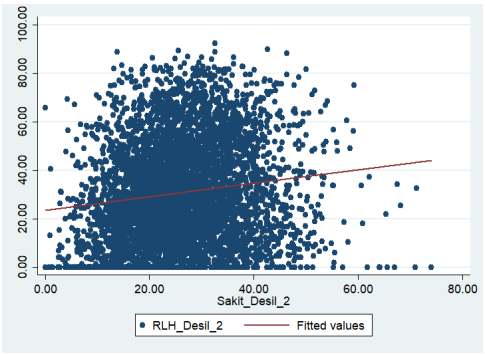
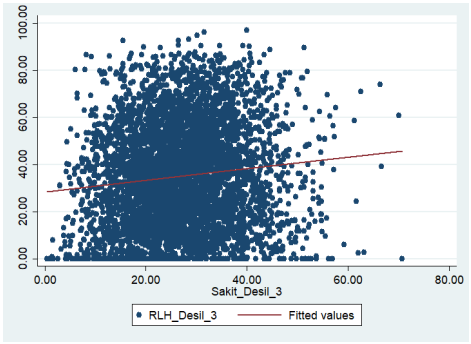
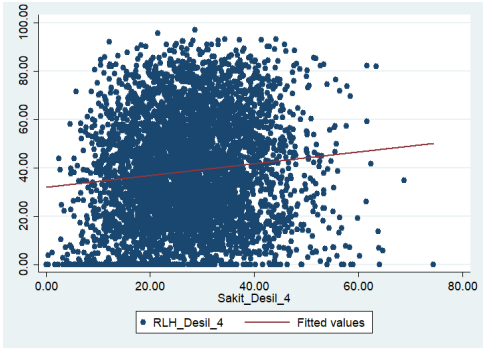
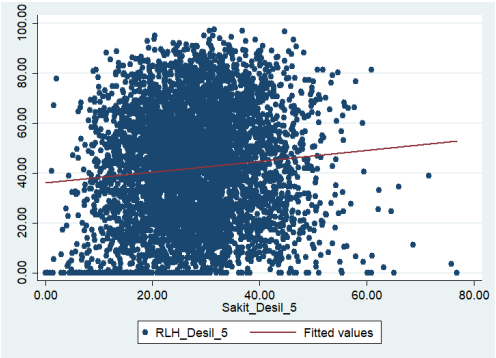
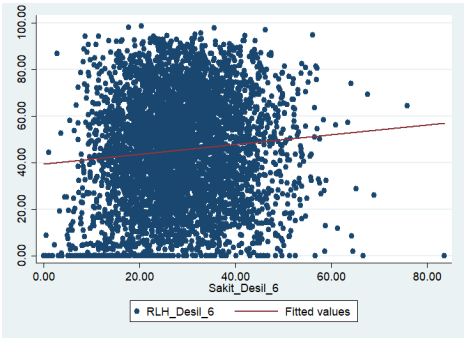
The relationship between house adequacy and illness prevalence on decile 1.	The relationship between house adequacy and illness prevalence on decile 2.
	
The relationship between house adequacy and illness prevalence in decile 3.	The relationship between house adequacy and illness prevalence in decile 4.
	
The relationship between house adequacy and illness prevalence in decile 5.	The relationship between house adequacy and illness prevalence in decile 6.
	

Figure 3: The Relationship between Hospitals and Adequate Houses Based on Deciles

The graph depicting the relationship between the indicator of adequate housing and the indicator of illness for each decile shows a typical pattern for all deciles. However, the red line shows an increasing trend. The charts indicate an inadequate relationship between the disease and indicators of adequate housing, although adequate housing is expected to reduce disease prevalence. This condition shows that the regression estimation in Model 2 will create a new interaction variable between the variables of FLPP and the variables of reasonable housing. This new interaction variable will consider all possible relationships between these variables and improve the predictive ability of the proposed model.

Table 3: The Estimation of FLPP Relationship with Adequate Houses

	Number of Adequate Houses
FLPP	0.0176**
	(0.0050)
_cons	3.6724**
	(0.0209)
N	2934
F	12.3220
r2	0.0049
r2_a	-0.1596

Standard errors in parentheses, * $p < 0.10$, * $p < 0.05$. ** $p < 0.01$

The estimation results in Table 3 show a positive relationship between FLPP and decent homes, suggesting that increasing the number of FLPP units will likely lead to improved home livability in a regency/city. The positive relationship between FLPP and the adequate homes indicator in the first model contrasts with the World Bank (2020) data, which states that 55.4% of subsidized public housing units built by private development actors are below minimum construction and infrastructure requirements standards.

Table 4: The Estimation of FLPP and Adequate Housing on Illness Prevalence

	Illness prevalence	Illness prevalence
	Model1	**Model2**
FLPP	0.0176**	-0.0431**
	(0.0050)	(0.0131)
FLPP*House Adequacy		0.0122**
		(0.0033)
Ownership		-0.0416
		(0.0769)
Hospital Availability Ratio		0.3923
		(1.0242)
Health Center Availability Ratio		0.2385
		(0.3074)
Health Workers		0.0001**
		(0.0000)
_cons	3.6724**	3.4337**
	(0.0209)	(0.3389)
N	2934	2778
F	12.3220	9.5438
r2	0.0049	0.0236
r2_a	-0.1596	-0.1441

t statistics in parentheses; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

The following aspects corroborate the positive relationship between FLPP and housing quality. First, the construction of FLPP-sponsored houses is subjected to a series of tests. The building permit process requires all promoted developers to comply with the specified standards. During the construction process, surveyors and local governments carried out a thorough inspection of the building. Before entering the construction loan agreement, the bank reviews the construction specifications and applies FLPP funds to the central government. Consumers must then reconfirm building materials before purchasing a house. In addition, the FLPP program aims to increase both homeownership rates and adequacy. From 2010 till 2020, the demand for the FLPP realization increased, leading to more intense competition among subsidized housing developers. This competition later improves the quality of FLPP household products for better adequacy. Second, the primary data analyzed in this study were the FLPP homes built or sold to consumers. All the FLPP data comprising the general FLPP household production, excluding the unsold houses, were analyzed. Conversely, the World Bank (2020) study included data on unsold homes.

In addition, Table 4 below shows that the regression analysis results reveal a significant effect of FLPP implementation on reducing disease prevalence as demonstrated by P > | occupies t | Value of 0.001 which is less than the 0.05 significance level. On the other hand, the homeownership variable does not significantly affect the lower disease prevalence since P > | t | Value is 0.588 greater than 0.05. The average habitability of homes owned by low-income populations in Indonesia was just 54% in 2020, suggesting that nearly half of them live in substandard housing.

There is a positive correlation between the hospital rate and the health center rate variables with disease prevalence. However, both variables have insignificant ratios with p-values (P > |t|) of 0.702 and 0.438, respectively. On the other hand, although the proportion of health centers is positively related to disease prevalence, the relationship is insignificant.

Hypothesis testing of the second model showed that FLPP and property variables are negatively related to disease prevalence. Increasing FLPP and home ownership variables will be followed by lower disease prevalence. However, the proportion of hospitals, public health centers, and health workers has positive but insignificant influences, as shown by the small coefficients. The number of health professionals remains disproportionate to the national and regional populations.

The second model estimate is consistent with Khoirunurofik & Raras (2021) findings, stating that the availability of health facilities and personnel and illness prevalence are positively correlated. Khoirunurofik & Raras (2021) found that the number of medical doctors and health workers in health centers and hospitals is positively associated with one's participation in the JKN. Public health centers need more health workers, 52 districts/cities do not have hospitals, and doctors must be appropriately distributed across districts or cities (Khoirunurofik & Raras, 2021).

Similar to the findings of a study by Denary et al. (2021), this present study showed that government housing assistance positively affects the public health status in the United States within the context of the house rental program. Their study showed that individuals on the waiting list have worse health outcomes. Consistent with this study, Azril et al. (2020) found various technical problems in the construction of subsidized houses in Indonesia. Although our study barely focused on the technical aspects of city housing, it examined the impact of subsidized housing for low-income communities on their health at the district/city level.

A heterogeneity test was also performed by comparing the cities and districts and between districts/cities on and outside Java and Bali islands. Table 5 shows that the influence of FLPP and residential ownership in districts and Java-Bali has similarities at the national level. This trend likely occurs as the FLPP program is widely implemented in districts and Java-Bali.

The similarity in variable characteristics of FLPP in districts or regencies in Java-Bali and those at the national level could be due to the significant distribution of FLPP in Java-Bali from 2011 to 2020, which accounted for 394,641 units or 54.4% of the total national distribution. Furthermore, at the district level, the distribution of FLPP reached 577,146 units, or 79.5% of the total distribution.

The similarities in variable homeownership characteristics may relate to the average homeownership rate, which reached 87.1% in 2020. In urban areas, while the current average ownership rate is 64.4%, Java-Bali showed an ownership rate of 82.4% and non-Java-Bali 82.9% in 2020 (Statistics Indonesia,2020b). In addition to testing the impact of the FLPP

model, a robustness test was also performed using infrastructure support, facilities, and utilities (PSU) as variable controllers for FLPP. PSU support is a government-provided incentive for developers collaborating on subsidized public housing projects. The robustness test can describe the suitability of the FLPP house construction. Based on the estimates in this model, the PSU variables, ownership, the proportion of public health centers, and the proportion of health workers have a negative relationship with the disease prevalence variables.

Compared to the previous estimate of the econometric Model 2, a difference was found only in the ratio of the health center variables and the ratio of health workers, with the equation showing a positive association. In contrast, hypothesis testing of the econometric model found a negative association with Model 2. The PSU support program is granted based on the program design characteristics as an incentive for companies that build subsidized restaurants. Although not all housing contractors building subsidized restaurants receive PSU support due to tax restrictions, the government's PSU-stimulating support impacts and improves the environmental quality at the subsidized housing site built by development actors.

Table 5: Heterogeneity Test

	(1)	(2)	(3)	(4)	(5)
	National	**Cities**	**Counties**	**Java-Bali**	**Outside Java- Bali**
FLPP	-0.0431**	0.0028	-0.0539**	-0.1481**	0.0006
	(0.0131)	(0.0469)	(0.0136)	(0.0224)	(0.0163)
Ownership	-0.0416	0.2267*	-0.2482*	-0.1013	-0.0411
	(0.0769)	(0.1327)	(0.0982)	(0.1440)	(0.0915)
Hospital Availability Ratio	0.3923	-0.4716	2.1573	-0.5092	0.5731
	(1.0242)	(1.5752)	(1.4780)	(2.3935)	(1.1654)
Health Center Availability Ratio	0.2385	0.8654	-0.1291	3.0066	0.2927
	(0.3074)	(0.5560)	(0.3789)	(5.7078)	(0.3225)
Health Workers	0.0001**	0.0001**	0.0001*	0.0002**	0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
FLPP House Habitability	0.0122**	-0.0000	0.0154**	0.0345**	0.0041
	(0.0033)	(0.0112)	(0.0034)	(0.0055)	(0.0041)
_cons	3.4337**	2.2008**	4.3957**	3.8034**	3.3253**
	(0.3389)	(0.5596)	(0.4371)	(0.6427)	(0.4015)
N	2778	561	2217	965	1813
F	9.5438	4.3403	7.3507	14.8447	4.8653
r2	0.0236	0.0517	0.0229	0.0956	0.0188
r2_a	-0.1441	-0.1110	-0.1481	-0.0343	-0.1689

t statistics in parentheses; * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Conclusion

This study investigated the impact of government support for purchasing subsidized housing from the FLPP program on district/city-level public health aspects in Indonesia. The FLPP program significantly impacts housing adequacy and negatively correlates with disease prevalence in low-income communities. Therefore, government intervention through the FLPP subsidized housing program can advance the quality of public health. FLPP substantially impacts housing adequacy and disease prevalence among low-income individuals. In addition, homeownership in low-income communities is significantly associated with health status. The positive relationship between health facilities, health workers, and disease prevalence could have resulted from the unequal distribution of health workers, especially in health centers, and the unavailability of hospitals in some counties/cities. This study suggests that the housing and human settlement sectors need amelioration to augment public health. Similarly, the subsidized housing program for low-income communities needs enhancement, and the program should be made eligible for all community segments. The government must prioritize housing programs, which will ultimately affect the quality of public health.

The findings of this study have several policy implications concerning the design of the current FLPP program for better health quality:

1. The different definitions of low-income communities and target groups between FLPP programs and recipients of social assistance programs create a problem. Therefore, FLPP programs should be tied to social assistance programs, especially those related to public health. This approach helps develop a more effective management style, accurate program implementation, and integration of government programs. These health programs include the Family Welfare Program (Keluarga Harapan) and the National Health Insurance (JKN). These aids are desired to help those needing settlement and health support, which can also improve the well-being of low-income communities.

2. The technical standards for the construction of modest houses are regulated by the Decree of the Minister of Settlements and Regional Infrastructure No. 403/2002 on the technical guidelines for the construction of healthy modest houses, according to which adjustments should be made. The significant issue of sanitation related to home adequacy requires further action.

3. A valid database of FLPP program beneficiary profiles should be safeguarded and regularly updated, as the data will be used to assess the effectiveness of the FLPP program concerning the beneficiaries' welfare and health. The JKN must accompany any transfer of land rights, including the purchase of subsidized housing and proof of membership in the JKN scheme. Therefore, it is essential to regularly monitor and assess the health-related status of low-income households as the beneficiaries of the subsidized housing program.

The data of this study were limited to the self-declared data reported by Statistics Indonesia. Hence, research participants might make a more socially acceptable answer rather than being truthful. Long-latency diseases were not identified because they correlated with poor housing quality. This study assessed only the variable's impact on health quality in a district/city rather than the health quality of FLPP program beneficiaries. Therefore, it is challenging to identify the impact of the FLPP program on the health of FLPP program beneficiaries.

Declarations

Declarations include Conflict of Intersts, Availability of Data and Materials, Author's Contribution, Funding Sources, and Acknowledgements.

Conflict of Interests

There are no conflicts of interests.

Availability of Data and Materials

Data available on request

Author's Contributuon

Adhamaski Pangeran: Conceptualization, Investigation, Methodology, Validation, Writing–original draft. Khoirunurrofik: Conceptualization, Supervision, Methodology, Validation, Writing– review and editing.

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