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ARTICLE

Analysis of the Diversity of Health Status Indices in Sukabumi Regency Using Qualitative Comparative Analysis (QCA)

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Abstract: The public health level is a crucial indicator for evaluating the success of health sector development. In Sukabumi Regency, characterized by diverse geography and socio-economic conditions, there are notable variations in the Public Health Degree Index (PHDI) across regions. This study employs Crisp-Set Qualitative Comparative Analysis (csQCA) using Tosmana QCA software to explore the combinations of factors that influence PHDI outcomes. Data were collected from the Sukabumi District Health Office, the Central Statistics Agency, and other secondary sources. The aim is to analyze regional differences in community health and identify the sets of factors that drive high or low PHDI levels. Results show that Clean and Healthy Living Behaviors (CHLB) and sanitation are the most consistent determinants of high PHDI, even in contexts with limited health facilities and budgets. Conversely, improvements in health infrastructure and financial resources are effective only when paired with strengthened CHLB and sanitation practices. Interestingly, extreme poverty does not necessarily hinder achieving a high PHDI if healthy behaviors and environmental sanitation are well-established. On the other hand, areas with low PHDI typically suffer from a combination of unhealthy behaviors and poor sanitation, despite having adequate infrastructure and funding. These insights highlight the need for targeted, area-specific intervention strategies that prioritize enhancing healthy living behaviors and sanitation, along with optimizing health facilities and financial support.

Keywords: Level of Public Health; Sanitation; Regional Intervention.

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1. Introduction

In 2024, the population of Indonesia will reach 282,477,584 people, which includes 142,569,663 men and 139,907,921 women. The population of West Java is 51,316,378 individuals. Having such a high number of people living in one area undoubtedly creates specific difficulties when it comes to addressing matters of well-being. Sukabumi Regency, which is located in West Java Province, is among the 23 provinces that have reached a full 100% achievement in the area of healthy provinces, regencies, and municipalities. The provinces with the lowest percentage of healthy districts/cities are Central Papua Province (12.50%), West Papua (14.29%), and Southwest Papua (16.67%). Sukabumi Regency has achieved 100% Open Defecation Free status. Buana and Soewondo (2024) emphasized that to achieve a healthy district with a good sanitation system, it is not only necessary to say that the Open Defecation Free condition is 100%.

One of the issues affecting public health is the persistently high level of poverty, with the number of poor people in Indonesia reaching 24.06 million in September 2024. Compared to March 2023, the number of poor people decreased by 1.84 million. The percentage of poor people in 2024 was recorded at 8.57%, a decrease of 0.79 percentage points compared to 2023. In West Java, the figure was 7.08% in 2024, and in Sukabumi Regency, it was 6.68%. To help alleviate poverty, Sukabumi Regency offers numerous social assistance programs, including the Family Hope Program (PKH) and food assistance.

The existence of health service facilities influences the level of public health. Law Number 36 of 2009 concerning Health states that health service facilities are tools and/or places used to organize health service efforts, whether promotive, preventive, curative, or rehabilitative, carried out by the central government, regional governments, and/or the community.

Health is one of the main dimensions of human development and an important indicator of national development success (Faqihudin, 2010; Rustiadi et al., 2021; Yektiningsih, 2018). In this context, health is not only understood as the absence of disease, but includes holistic physical, mental, and social well-being (Hadi et al., 2023). This aligns with the World Health Organization (WHO) definition of health, which emphasizes a state of overall well-being. Therefore, the level of public health reflects various interacting factors, including access to health facilities, clean and healthy living behaviors, environmental conditions, and the socioeconomic status of the population.

Access to health facilities is one of the main pillars in achieving good health (Adhitya et al., 2022). For example, in rural areas, there are often limitations in the number and quality of health facilities. This makes it difficult for communities to access adequate health services. For example, in some sub-districts in Sukabumi Regency, residents must travel considerable distances to reach the nearest community health center (Puskesmas), which can influence their decision to seek care when sick. Furthermore, the quality of available health services also varies; some Puskesmas may be equipped with qualified medical personnel and adequate medical equipment, while others may lack these resources.

The indicators influencing the Public Health Index (IDKM) in Sukabumi Regency are taken from Hendrick L. Blum's 1974 theory, which states that health status is influenced by four factors: genetic factors, behavioral factors, health service factors, and environmental factors. Environmental factors that contribute to disease include poverty and lack of access to health services (Mustar et al., 2018). For example, the habit of washing hands with soap before eating and after using the toilet can reduce

the spread of infectious diseases. In the context of Sukabumi Regency, programs that educate the community about the importance of PHBS can have a positive impact on public health. However, PHBS implementation depends not only on knowledge but also on motivation and support from the surrounding environment. For example, if people live in a dirty environment and do not have good access to clean water, even if they know the importance of handwashing, they may not be able to do it effectively.

Environmental conditions also play an important role in public health (Desfita et al., 2024; Olorunsogo et al., 2024). A clean, healthy environment can promote better health, while a polluted environment can lead to various health problems. In Sukabumi Regency, environmental problems such as water and air pollution can negatively impact public health. For example, industrial waste dumped into rivers can contaminate water sources used by residents for daily needs. This can lead to increased cases of waterborne diseases, such as diarrhea and respiratory infections.

The socioeconomic status of the population is another factor that is no less important in determining public health levels (Rahmadani et al., 2023). People with higher socioeconomic status tend to have better access to health services, education, and information. Conversely, people with lower socioeconomic status often face various obstacles that prevent them from obtaining necessary health care. In Sukabumi Regency, we observe significant differences in public health outcomes between high- and low-income groups. For example, wealthier groups may have better access to private health services, while low-income groups may have to rely on limited public health services.

The research findings show that children and adolescents are a high-risk population for tuberculosis (TB) infection, where this study found that the risk of TB among children is higher in children aged 5–14 years, women, those living in rural areas, and children from lower-middle socioeconomic families, especially those living in poor households, whose heads of households have secondary or primary education and are employed (Rukmini et al., 2025). Differences in socioeconomic conditions and health services across regions influence health outcomes, especially health behaviors and sanitation factors among low-income communities, thereby linking human resource development at the national level to the regional level.

Indonesia's low Human Development Index (HDI) has highlighted the need to improve health outcomes, particularly at the regional level. Disparities in the Public Health Index (PHI) in Sukabumi Regency demonstrate that public health factors do not operate singly, but interact in complex combinations (Alawi et al., 2025) for example, a district with good health facilities may not necessarily have a high HDI if its residents do not practice healthy lifestyles. Conversely, a district with limited health facilities can demonstrate good health if its residents practice healthy lifestyles and maintain a clean environment.

The results of the study by Alawi et al. (2025) showed that the composite index measurements for each dimension are classified into five categories: very high (2.13%), high (29.79%), moderate (40.43%), low (19.15%), and very low (8.51%). The INMO and INMB Cartesian diagrams show that the southern sub-district achieved the highest value of 21.28%, which is in quadrant 1 (both variables are good). The INMO and NSI Cartesian diagrams show that the sub-district in the southern region has the highest value (21.28%) in quadrant 4 (both variables are not good). The INMB and NSI Cartesian diagrams show that the southern sub-district has the highest value (19.15%) in quadrant 3 (INMB is not good and NSI is good) and 19.15% in quadrant 4 (INMB and NSI are not good). This study demonstrates the

uneven distribution of the public health index between the southern and northern regions of Sukabumi Regency, with the southern region scoring higher than the northern region.

This phenomenon of uneven distribution of the public health index requires further analysis using Qualitative Comparative Analysis (QCA) to determine whether the Public Health Index (PHI) requires not only improving health facilities but also educating the public about the importance of healthy lifestyles and improving environmental conditions.

To analyze the complexity of this relationship, this study employed Qualitative Comparative Analysis (QCA). This method allows us to identify various conditional, non-linear causal pathways. Using QCA, we can understand how certain combinations of factors contribute to high or low PHI in different sub-districts. For example, we can identify whether sub-districts with good access to health facilities and healthy lifestyles have higher PHI compared to sub-districts with only one of these two factors. Thus, this study aims to analyze variations in the community health index and identify a combination of factors that influence the high or low IDKM in Sukabumi Regency.

2. Methods

This study employed a descriptive analytical design with a Qualitative Comparative Analysis (QCA) approach. The QCA method was chosen because it is able to capture the combination of causal factors (causal conditions) that influence outcomes conditionally and non-linearly (Mega et al., 2025; Suprihartiningsih et al., 2023). This approach is considered more appropriate than conventional statistical methods such as regression or SEM, which tend to emphasize a single linear relationship, while public health problems are generally complex, interacting, and influenced by various contextual factors. QCA allows the identification of diverse configurations of factors that result in different health outcomes, making it more representative for understanding variation between sub-districts.

This research process began with the selection of Sukabumi Regency, West Java Province, as the study location. This regency comprises 47 sub-districts with diverse geographic, demographic, and socio-economic conditions. This diversity is particularly appealing because it provides a more comprehensive picture of the factors influencing public health. With these diverse backgrounds, each sub-district presents unique challenges and opportunities for improving public health. For example, sub-districts located in mountainous areas may have more difficult access to health facilities than those in the lowlands.

Data collection was conducted from January to March 2023 using secondary data sources from various official agencies. The primary data were obtained from the Sukabumi Regency Health Office, covering health facilities, Clean and Healthy Living Behavior (PHBS) indicators, sanitation conditions, and disease data. This information is crucial because it provides a snapshot of existing health infrastructure and community health behaviors. For example, sub-districts with adequate health facilities and high levels of PHBS implementation tend to have lower disease rates.

In addition, data from the Central Statistics Agency (BPS) was used to obtain information on poverty levels, population density, access to sanitation, and clean water. This data is highly relevant because socioeconomic factors significantly influence public health. For example, districts with high poverty rates typically also have more limited access to clean water and proper sanitation, which in turn can increase the risk of infectious diseases.

Data on the Community Health Development Index (IPKM) and other health indicators were obtained from the Indonesian Ministry of Health. The IPKM is an important measurement tool for assessing the quality of public health in a region. Using these indicators, researchers can identify districts with good or poor health performance. For example, districts with a high IPKM are usually accompanied by better education levels and greater public awareness of health.

The main variables in this study consist of outcomes and causal factors. The outcome analyzed is the Community Health Index (CHSI). The CHSI is a measure of the quality of public health in a region. Meanwhile, the causal factors examined include the availability of primary and referral health facilities, health budget allocation, the level of PHBS implementation, access to proper sanitation, and poverty levels. Each of these factors plays a different role in determining public health. For example, the availability of adequate health facilities can improve public access to health services, while poverty levels can be a barrier to obtaining necessary care.

This study used a type of QCA known as crisp set QCA, or csQCA. csQCA requires all data to be converted to binary values (0 or 1), where 1 indicates the presence of the indicator and 0 otherwise. The data calibration process was based on csQCA theory, in which the initial CHSI data were derived from the composite index calculation results, as shown in Figure 1. Data on Health Facilities, Budget, Sanitation, and PHBS were obtained from the Health Office, and Extreme Poverty Data from the Social Service.

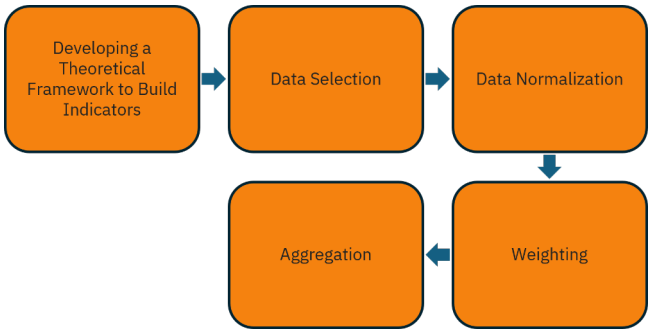

Figure 1. Stages of Index Development

The next step is to construct a truth table that organizes all possible combinations of conditions that explain the outcome (Community Health Index/IDKM). Through this table, researchers can identify consistent configuration patterns that emerge in areas with high and low PHDI.

The final results of the csQCA analysis are interpreted to identify significant configuration patterns, which can then form the basis for evidence-based health policy recommendations. The selection of conditions is based on theoretical references and previous research, with operational definitions and formulations of the causal conditional IDKM as described in Table 1.

Table 1. Definition and Causal Condition Formulation of PHDI

No.	Condition	Reference	Definition	Formulation
1	Health Facilities (V1)	Andersen, (1995). WHO, 2021. Minister of Health Regulation No. 71 of 2013 concerning National Health Insurance (JKN) Health Services – defines primary health care facilities (Community Health Centers, Clinics, Doctors' Practices, etc.) and advanced referrals. Ministry of Health of the Republic of Indonesia. WHO & local standards on bed-to-population ratio, e.g., "number of hospital beds in Sukabumi: 0.87 per 1,000 residents" in the context of West Java.	First level health facilities are Community Health Centers and Clinics and referral health facilities are hospitals in the Community Health Center area.	Health facilities divided by the number of sub-district residents

No.	Condition	Reference	Definition	Formulation
2	Budget (V2)	WHO, 2010; Ministry of Health of the Republic of Indonesia, 2022. WHO and Ministry of Health: Indonesia's report, Strengthening District/City Level Data to Improve Health Cost Tracking and Resource Allocation, demonstrates the importance of health spending at the district/city level and the involvement of health care facilities and transparent allocation of funds.	The health budget at the Community Health Center and Village is used to fund health programs.	The Health Budget is divided into all existing budgets in the Sub-district.
3	Clean and Healthy Living Behavior (PHBS) (V3)	HL Bloom, 1974; Ministry of Health of the Republic of Indonesia, 2018. Ministry of Health – PHBS Indicators in PIS-PK; Permenkes & Riskesdas data mention a number of PHBS indicators measured at the household level (delivery by health personnel, exclusive breastfeeding, healthy toilets, hand washing, etc).	Clean and Healthy Living Behavior carried out by the Community which includes 10 PHBS Indicators, namely childbirth assisted by health workers, providing exclusive breastfeeding, weighing toddlers every month, using clean water, washing hands with soap, using healthy toilets, eradicating mosquito larvae, eating fruit and vegetables every day, doing physical activity, and not smoking in the house.	Achievement of PHBS Households divided into all households in the sub-district area
4	Sanitation (V4)	H.L. Bloom, 1974; WHO/UNICEF JMP, 2021. WHO/UNICEF Joint Monitoring Programme (JMP) standards at the global level; and in Indonesia, indicators of proper sanitation and the use of healthy latrines are included in the PHBS/environmental SAFETY indicators. Village Settlement and Sanitation data are also used by the government. Example: The Ministry of Public Works and Housing and the Ministry of Health play a role in accessing clean water and healthy latrines in the PHBS indicators.	Availability of Family Toilets and Clean Water Facilities owned by households	Sanitation Achievements are divided into all households in the sub-district area.
5	Extreme Poverty (V5)	World Bank, 2018; BPS, 2023. Central Statistics Agency (BPS) – calculation of extreme poverty based on the Susenas survey, using the international poverty line (US$ 2.15 PPP) and the national poverty line. Presidential Instruction No. 8 of 2025 mandates the eradication of extreme poverty.	Conditions of people who fall into the extreme poverty criteria	the number of extremely poor people divided by the total population in the sub-district area

3. Results and Discussion

3.1. Factors Affecting the Public Health Index (PHI)

Mapping the Public Health Index (PHI) in Sukabumi Regency provides a visual depiction of the distribution of health conditions across each sub-district. Figure 2 shows the distribution of the PHI at the sub-district level in Sukabumi Regency. This visualization clearly demonstrates variations in public health conditions, ranging from very high to very low. This map serves as a baseline for understanding spatial disparities in health indicator achievement. Furthermore, it serves as a basis for a more in-depth analysis of the factors causing differences in PHI between regions.

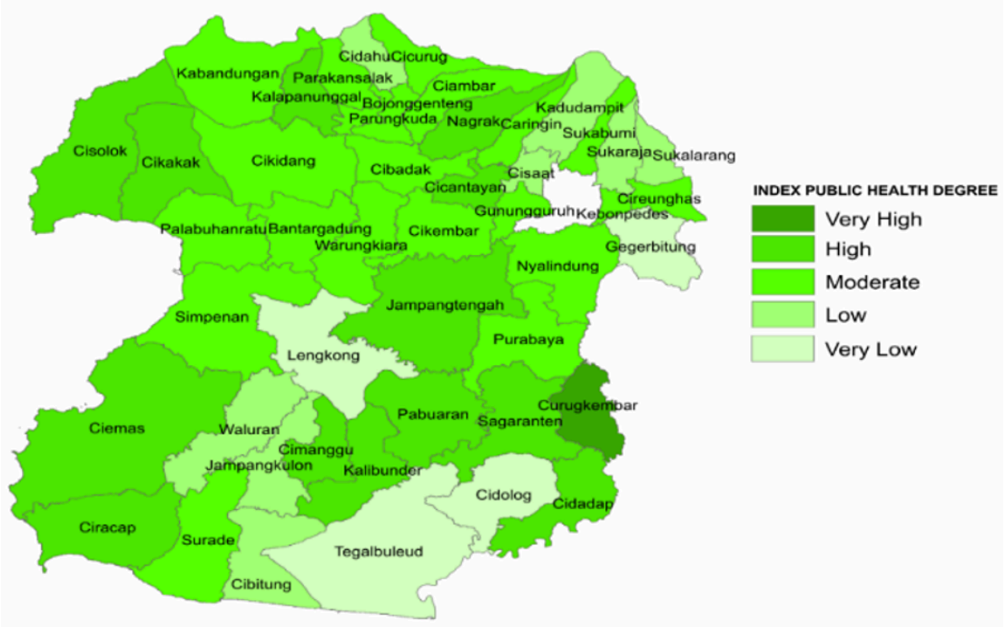

Figure 2. Distribution of the Public Health Degree Index (PHDI) in Sukabumi Regency

The distribution of the PHI in Sukabumi Regency shows significant variation across sub-districts, reflecting diverse public health conditions. The district's average PHI is in the medium category, but the wide distribution of values indicates significant disparities that warrant attention. Sub-districts such as Cibadak, Cicurug, and Palabuhanratu stand out with relatively high PHI scores, indicating enhanced efforts to improve public health. On the other hand, sub-districts such as Cibitung, Cidahu, and Cidolog remain in the low category, indicating that factors hinder health progress in the region.

A single factor cannot explain this variation. Instead, complex interactions between health determinants, such as education, access to health services, and socioeconomic conditions, play a significant role in shaping the IDKM. For example, districts with higher levels of education tend to have better IDKM because their residents are more aware of the importance of health and are better able to access health services. Conversely, districts with lower levels of education often struggle to access the health information needed to improve their health.

To understand the configuration of factors influencing variations in the Public Health Degree Index (PHI) in Sukabumi Regency, Fuzzy Set Qualitative Comparative Analysis (fsQCA) was used. This approach helps identify combinations of conditions that contribute to different levels of health across regions in greater detail. The mapping results were then visualized in diagrams depicting the relationships among key variables, including health facilities (FASKES), budget, PHBS (Healthy Living Behavior), sanitation, and extreme poverty. This visualization allowed researchers to more clearly identify sub-district groups with similar condition configurations and those with significant differences.

Before conducting the fsQCA analysis, causal condition data for the Public Health Degree Index were generated, as shown in Table 2. The data in Table 2 were taken from the IDKM data using a composite index analysis generated through expert assessment. Data on Health Facilities, Budget, PHBS, and Sanitation were obtained from the Sukabumi Regency Health Office, while data on Extreme Poverty were obtained from the Sukabumi Regency Social Office. These data provided the initial information for the fsQCA analysis.

Table 2. Causal Condition for the Public Health Degree Index

Subdistrict		PHDI	Health Facilities	Budget	PHBS	Sanitation	Extreme Poverty
Bantargadung	BGD	74.72	0.26	0.26	53.21	69.31	14.19
Bojonggenteng	BJT	71.85	0.79	0.26	57.52	77.04	12.11
Caringin	CRG	64.59	1.27	0.33	49.83	66.08	13.12
Ciambar	CMB	74.05	0.25	0.32	52.90	78.04	13.95
Cibadak	CBD	69.98	1.11	0.47	64.65	66.64	8.19
Cibitung	CBT	67.18	0.37	0.21	40.92	60.13	12.72
Cicantayan	CCT	80.47	0.87	0.33	85.64	76.59	9.74
Cicurug	CCR	73.09	1.12	0.48	58.63	62.14	6.49
Cidadap	CDP	82.87	0.49	0.17	53.37	75.86	17.35
Cidahu	CDH	65.31	0.45	0.31	27.03	62.68	10.74
Cidolog	CDL	53.51	0.52	0.15	50.72	60.62	12.25
Ciemas	CMS	83.40	0.38	0.33	66.35	71.36	12.18
Cikakak	CKK	77.15	0.49	0.36	63.25	68.11	14.76
Cikembar	CKB	76.59	1.50	0.35	58.85	64.96	8.30
Cikidang	CKD	74.72	0.33	0.38	53.42	67.85	16.71

Subdistrict		PHDI	Health Facilities	Budget	PHBS	Sanitation	Extreme Poverty
Cimanggu	CMG	80.40	0.42	0.22	62.40	67.47	11.98
Ciracap	CRC	79.09	0.39	0.27	58.32	78.24	8.38
Cireunghas	CRH	74.07	0.29	0.24	54.56	84.83	10.61
Cisaat	CST	67.23	1.29	0.5	68.44	65.23	7.44
Cisolok	CSL	83.12	0.30	0.43	56.37	67.88	13.52
Curugkembar	CRK	85.29	0.33	0.24	52.51	69.48	15.04
Gegerbitung	GGB	58.84	0.25	0.32	48.69	46.14	13.96
Gunungguruh	GNG	76.21	0.53	0.33	73.15	83.99	3.95
Jampangkulon	JPK	64.44	1.11	0.34	42.24	65.84	8.97
Jampangtengah	JPT	79.15	0.73	0.37	43.75	66.85	15.34
Kabandungan	KBD	77.78	0.50	0.32	62.49	92.91	15.77
Kadudampit	KDT	65.62	1.28	0.36	49.99	61.23	12.57
Kalapanunggal	KLP	82.20	0.82	0.31	63.69	67.9	14.03
Kalibunder	KLB	81.08	0.34	0.34	24.50	71.09	11.60
Kebonpedes	KBP	76.54	0.68	0.25	52.90	94.12	6.86
Lengkong	LGK	61.20	0.31	0.24	31.00	61.41	13.91
Nagrak	NGR	79.60	0.47	0.36	69.86	72.78	12.08
Nyalindung	NYL	72.78	0.40	0.44	55.40	69.13	15.38
Pabuaran	PBR	78.08	0.46	0.30	52.01	77.04	14.68
Palabuhanratu	PLR	72.74	1.14	0.38	57.23	50.37	6.05
Parakansalak	PRK	70.27	0.93	0.46	49.30	71.07	11.58
Parungkuda	PRU	76.25	0.79	0.29	51.31	84.39	8.66
Purabaya	PRB	72.58	0.23	0.34	57.78	67.83	14.20
Sagaranten	SGR	78.49	1.16	0.31	32.29	68.30	10.83
Simpenan	SMP	75.41	0.76	0.33	67.74	72.10	10.05
Sukabumi	SKB	71.86	1.19	0.33	67.14	65.52	7.21
Sukalarang	SKL	65.30	1.98	0.33	49.85	65.27	8.82
Sukaraja	SKR	69.10	0.95	0.42	55.72	66.95	7.62
Surade	SRD	75.62	0.38	0.41	69.88	72.66	7.64
Tegalbuleud	TGB	52.57	0.65	0.27	23.16	63.39	12.53
Waluran	WLR	67.06	1.06	0.27	48.84	60.23	13.10
Warungkiara	WRK	71.77	0.83	0.39	58.27	78.61	14.21

Source: *Research finding.*

Table 2 provides information from the csQCA analysis results, indicating that 1 indicates a good Community Health Index (IDKM). The analysis revealed that 7 cases produced an IDKM and 3 cases did not.

Table 3 explains how IDKM is produced in the Truth Table Diversity Degree of Public Health analysis results from the csQCA application: most combinations yield outcome 1 (positive), indicating that the majority of areas have relatively good public health conditions or a good Health Degree Index. In addition, the results of the analysis provide information that the combination with high sanitation support (v4 = 1) and PHBS (v3 = 1) tends to produce a positive outcome (1) even though health facilities (v1) and budget (v2) are still weak, as stated in number 2.

Table 3. Truth Table Diversity Degree of Public Health

No.	v1	v2	v3	v4	v5	IDKM	id (SUB-DISTRICT)
1	0	0	0	0	1	0	CBT, CDH, CDL, GGB, LGK, TGB, WLR
2	0	0	1	1	0	1	CRC, CRH, KBP, PRU
3	0	0	1	1	1	1	BGD, BJT, CMB, CDP, CMG, CRK, KBD, KLP, PBR
4	0	1	0	1	1	1	JPT, KLB, PRK
5	0	1	1	1	0	1	CCT, GNG, SMP, SKR, SRD
6	0	1	1	1	1	1	CMS, CKK, CKD, CSL, NGR, NYL, PRB, WRK
7	1	0	0	1	1	1	SGR
8	1	1	0	0	0	0	JPK, SKL
9	1	1	0	0	1	0	CRG, KDT
10	1	1	1	0	0	1	CBD, CCR, CKB, CST, PLR, SKB

Description V1: Health Facilities, V2: Budget, V3: PHBS, V4: Sanitation, V5: Extreme Poverty

In Figure 3, the green color represents a configuration of conditions that consistently support achieving a higher IDKM category. In comparison, the red color indicates a configuration that tends towards a lower IDKM category. The visualization in Figure 3 shows that differences in achieving the Public Health Index in Sukabumi Regency do not stand alone but are influenced by a combination of interacting factors. The configuration pattern that emerges shows that areas with adequate health facilities, better sanitation, and support from other social factors tend to be in the group with a relatively high IDKM. Conversely, areas that still face limitations are more often classified as low.

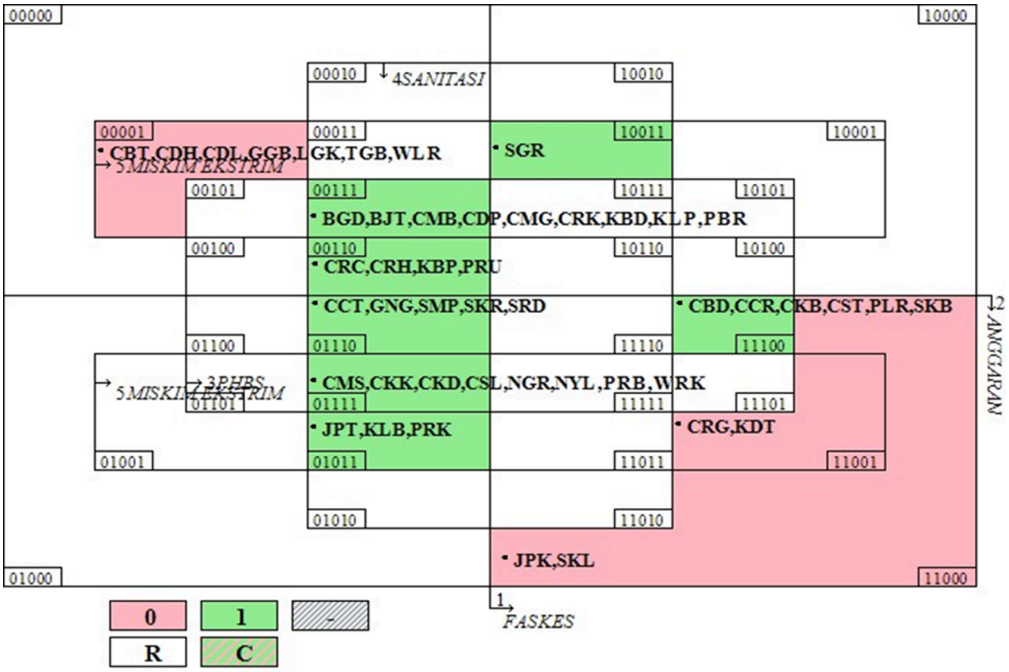

Figure 3. Visualization of the Configuration Results of the csQCA Analysis of Sukabumi Regency

These findings provide an important foundation for further analysis of the factors that shape public health outcomes. Therefore, the following section will describe in more detail the resulting configuration of conditions, the characteristic differences between sub-districts, and the strategic implications that can serve as a basis for health development planning in Sukabumi Regency.

The pattern of factor combinations with high IDKM indicates that seven main configurations can contribute to achieving it. First, the combination of high levels of

clean and healthy living behaviors (PHBS), good sanitation, and low poverty is sufficient to produce a high IDKM, despite relatively limited health facilities and budgets. For example, sub-districts such as Ciracap, Cireunghas, Kebonpedes, and Parungkuda demonstrate that with healthy behaviors and good sanitation, communities can achieve satisfactory levels of health despite inadequate infrastructure support. Consistent with these configuration findings, (R. Wilkinson & Marmot, 2003) that health is determined by social, economic, behavioral, and environmental conditions, not solely by medical services.

Second, the combination of high PHBS (Healthy Living Environment), good sanitation, and extreme poverty demonstrates that poverty is not always a barrier to good health. Examples include Bantargadung, Bojonggenteng, Cidadap, Cimanggu, Curugkembar, Kabandunga, Kalapanunggal, Pabuaran, and Ciambar, where, despite extreme poverty, healthy lifestyles and a clean environment have a positive impact on public health. This demonstrates that health policies must consider the broader socioeconomic context and not focus solely on poverty reduction as the sole solution.

Third, a high budget and good sanitation can also promote high IDKM (Healthy Living Environment), even when PHBS levels are low. Districts such as Jampang Tengah, Kalibunder, and Parakansalak demonstrate that with adequate investment in sanitation infrastructure, public health can be significantly improved. This underscores the importance of appropriate budget allocation to the health sector, even if community behavior needs improvement.

Fourth, the ideal combination of a high budget, high PHBS, and good sanitation has the most consistent impact on high IDKM. Districts such as Cicantayan, Gunungguruh, Sukaraja, Surade, and Simpenan are examples where all these factors contribute synergistically to achieving optimal public health. This demonstrates the importance of a holistic approach to health policy formulation.

Fifth, in areas like Sagaranten, high-quality health facilities and good sanitation can offset the negative impacts of extreme poverty. This demonstrates that despite economic challenges, access to adequate health services can help communities stay healthy. Sixth, despite low sanitation, the combination of high-quality health facilities, adequate budgets, and good PHBS practices can still result in high IDKM. Relevant examples include Cibadak, Cicurug, Cisaat, Palabuhanratu, Sukabumi, and Cikembar, where good health facilities provide crucial support for the community.

Seventh, the combination of inadequate health facilities, high budgets, high PHBS, high sanitation, and high poverty can result in high IDKM. This includes the areas of Ciemas, Cikakak, Cikidang, Cisolok, Nagrak, Nyalindung, Purabaya, and Warungkiara, where budgets, clean and healthy lifestyles, and environmental protection provide crucial support for the community, thereby improving public health. These findings confirm that PHBS and sanitation are the most consistent factors across various combinations, aligning with research by Safitri (2020), which demonstrated the importance of healthy behaviors and a clean environment as key determinants of public health. Therefore, interventions focused on improving PHBS and sanitation need to be prioritized in efforts to improve public health in Sukabumi Regency.

3.2. Analysis of the Diversity of Health Status Indices in Sukabumi

The discussion section of this study's findings reveals that the Combination of Factors with Low IDKM patterns indicates three main patterns associated with low IDKM. First, poor facilities, low budgets, low PHBS (Healthy Living Environment), and

poor sanitation almost always result in low IDKM. Districts such as Cibitung, Cidahu, Cidolog, and Gegerbitung are clear examples of this pattern. Limitations across all these aspects create a vicious cycle that is difficult to break, in which communities lack adequate access to the health services, education, and information needed to improve their health.

Second, there are areas with high facilities and high budgets but low PHBS and sanitation. Districts such as Jampangkulon and Sukalarang demonstrate that having good infrastructure is insufficient without accompanying changes in behavior and a healthy environment. This emphasizes the importance of a comprehensive approach to improving public health that also considers individual behavior.

Third, the combination of high facilities, high budgets, poor sanitation, and extreme poverty suggests that extreme poverty can exacerbate the negative impact of sanitation on public health. Examples from Caringin and Kadudampit show that, even with good infrastructure, difficult economic conditions can hinder efforts to improve health.

The Synthesis of Findings and Theoretical Discussion indicates that the QCA results confirm several important points. First, PHBS (Healthy Living Behavior) and sanitation are the most consistent factors in producing high IDKM, even when health facilities and budgets are limited. This suggests that interventions focused on behavior change and improved sanitation should be a top priority in health policy.

Second, health facilities and budgets are only effective when accompanied by healthy lifestyles or good sanitation. This underscores the importance of a more holistic approach to health policy formulation, one that considers all determinants of health simultaneously. Research by Hadi et al. (2023) identified health facilities as a crucial factor in improving public health. Research by Arieffiani and Ekowanti (2024) found that the Posyandu Prima program has proven successful in reducing stunting rates and improving the quality of public health services in Surabaya. Furthermore, collaborative efforts among community stakeholders, health service providers, and government agencies underscore the crucial role of multisectoral partnerships in addressing complex public health issues such as stunting. This synergy fosters a comprehensive approach that combines local knowledge, resources, and policy support to effectively combat stunting and improve community well-being. Third, extreme poverty is not always a barrier to achieving high health, provided that behaviors and the environment are supportive. This suggests that interventions focused on improving healthy behaviors can help communities trapped in poverty achieve better health. Conversely, the combination of poor behaviors and poor sanitation is a major bottleneck leading to low IDKM, despite the availability of infrastructure and budgets. This finding reinforces the causal configuration theory (Ragin, 2008) which emphasizes that no single factor is sufficient to explain an outcome; rather, various combinations of factors can lead to different outcomes (equifinality).

Poverty management in Indonesia, particularly in Sukabumi Regency, involves providing social security, social protection, community empowerment, and social rehabilitation for low-income residents. Found that areas experiencing stunting are characterized by relatively high poverty rates, poor access to sanitation, and low adaptive capacity. Research by Erlianti et al. (2025) found that poverty remains a significant barrier to inclusive development in Indonesia, particularly in limiting access to education, health services, and economic opportunities for low-income families. The study findings indicate that while the Family Hope Program (PKH) has had a positive impact on education participation and access to health services

among beneficiaries, its effectiveness is hampered by administrative weaknesses, including inconsistent beneficiary targeting, limited public awareness, and fragmented coordination between agencies. Areas with stronger infrastructure and proactive governance demonstrate better outcomes, while remote and underdeveloped areas continue to face significant implementation barriers. This study provides policy recommendations to strengthen data verification systems, increase community engagement, and improve inter-agency coordination. By addressing these challenges, the program can become a more effective tool in achieving long-term poverty reduction. This research contributes to the broader discourse on social policy effectiveness and offers practical insights for optimizing conditional cash transfer programs in developing countries.

Conversely, the combination of poor behavior and inadequate sanitation is a major barrier contributing to low IDKM, even when infrastructure and budget are available. This finding reinforces Ragin (2008) causal configuration theory, which emphasizes that no single factor is sufficient to explain an outcome; rather, various combinations of factors can produce different outcomes (equifinality).

Empirically, this finding is consistent with studies in developing countries showing that basic behavioral and environmental interventions have stronger health impacts than infrastructure-based interventions alone (Safitri, 2020). Therefore, effective health policies must consider the complexity of health determinants and respond to the specific needs of each sub-district.

The policy implications of this study are crucial for formulating health policies in Sukabumi Regency. Health intervention programs need to be designed based on the specific factor configuration of each sub-district, rather than a uniform approach that may be ineffective. Sub-districts with low infrastructure and budget but with potential for healthy behaviors should focus on strengthening PHBS and sanitation. In contrast, sub-districts with adequate infrastructure but low IDKM should focus on behavioral change and environmental improvement. This area-based approach better aligns with the complexity of health determinants and can be an effective strategy for reducing health disparities between sub-districts. By understanding and analyzing the factors that contribute to public health, health policies can be more targeted and have a greater impact on improving the quality of life of people in Sukabumi Regency.

In this context, the local government must conduct regular evaluations of implemented health programs. These evaluations will not only help identify successes and failures but also provide valuable insights for future policy improvements. For example, by regularly monitoring the progress of the Health Index (IDKM) in each sub-district, the government can identify sub-districts experiencing stagnation or decline in health outcomes and immediately take necessary corrective measures.

One step is to strengthen collaboration across sectors, including education, health, and the economy. For example, health awareness programs in schools will not only educate children about the importance of health but also involve their parents in the learning process. This can foster a healthier culture in the community as a whole. Furthermore, the government needs to ensure access to health services. Even though health facilities are available, access to them remains a challenge. This can be due to geographic factors, transportation costs, or a lack of information about available services. Therefore, efforts to improve accessibility, such as providing free transportation for people living in remote areas, can be an effective way to advance the IDKM. Furthermore, it is important to involve the community in every stage of

health policy formulation. Community participation can offer diverse perspectives and help the government understand the community's needs and challenges. By involving the community, the government can also build a sense of ownership of the health programs it implements, which in turn can increase their effectiveness.

Community involvement can also be achieved through training and empowerment. For example, training village-level health cadres to become agents of change in their communities. These health cadres can help disseminate information on healthy lifestyles and sanitation, and act as liaisons between the community and health services. In this way, communities become not only beneficiaries but also actively play a role in improving health in their areas. Equally important is the development of sustainable health infrastructure. The development of health facilities must consider long-term needs, not just physical construction. For example, health facilities must be equipped with adequate human resources, modern equipment, and an efficient management system. This will ensure that they can function well and provide quality services to the community.

In the context of health policy, it is crucial to integrate an evidence-based approach. The use of data and research in policy formulation will help identify the most pressing health problems and formulate more effective interventions. For example, health data analysis can help identify vulnerable groups that require special attention, enabling interventions to be more appropriately targeted. Furthermore, it is crucial to raise awareness of the importance of mental health within the broader public health context. Mental health is often overlooked in health policy, despite its significant impact on people's quality of life. Therefore, comprehensive health programs must include mental health aspects, such as providing counseling services and psychological support for the community. Recently, national news reported a case of a child dying from worms in Sukabumi Regency, necessitating swift policy action to address the health problem in Sukabumi Regency. As reported in the Kompas newspaper, sepsis, or severe infection, was the cause of death for a toddler from Sukabumi, with severe malnutrition and stunting, the underlying cause being tuberculosis meningitis.

As explained above, the distribution of IDKM in Sukabumi Regency reflects the complexity and challenges of improving public health. The variations demonstrate that there is no single solution to health problems; a holistic and integrated approach is needed. By understanding the various determinants of health and involving the community in every stage of policy formulation, it is hoped that efforts to improve public health will be more effective and sustainable. Responsive and evidence-based health policies will be key to achieving better health goals for all people in Sukabumi Regency.

4. Conclusion

This study shows significant variation in the Public Health Index (PHSI) across sub-districts in Sukabumi Regency. This disparity reflects the different combinations of health determinants in each region. Crisp-Set Qualitative Comparative Analysis (QCA) revealed that clean and healthy living behaviors (PHBS) and sanitation are the most consistent determinants supporting high PHSI. Meanwhile, health facilities and budgets are only effective when accompanied by strengthening healthy behaviors and environments. Furthermore, extreme poverty did not significantly influence the Public Health Index (PHSI) in areas with good health behaviors and sanitation.

Based on these findings, three main policy recommendations are presented. First, local governments need to prioritize the development and equitable distribution of

access to adequate sanitation in sub-districts with low PHSI. Second, programs to improve clean and healthy living behaviors should be strengthened through education, community empowerment, and cross-sector collaboration. Third, health intervention approaches should be designed on a regional basis, taking into account the configuration of local causal factors, so that interventions are more targeted and effective in reducing health disparities between sub-districts.

This study has several limitations. First, the data used is entirely secondary, thus heavily dependent on the quality, completeness, and consistency of data available from relevant agencies. Second, the variables analyzed are still limited to five main factors (health facilities, budget, PHBS, sanitation, and extreme poverty), while other determinants such as the quality of health workers, local culture, or community participation are not yet covered. Third, the csQCA method provides a picture of causal configurations, but is not fully capable of explaining temporal dynamics or changes in factors over time.

To strengthen these findings, it is recommended to conduct further research:

a. For conditions of PHBS and High Sanitation, Low Facilities and Budget, focus on mobilizing village health cadres to maintain healthy behavior and non-physical incentive support, such as PHBS education and training, as well as optimizing telemedicine or mobile services (Mobile Health Centers).
b. For PHBS and High Sanitation, High Extreme Poverty, integrate poverty alleviation programs by improving the local economy or providing assistance to empower Micro, Small, and Medium Enterprises.
c. High Budget and Good Sanitation, and Low PHBS to carry out Community-based Behavior Change Campaigns (Behavior Change Communication) and Integration of PHBS education into routine health services.
d. All Strong Factors, to be used as a pilot model for other sub-districts and peer-learning programs between sub-districts through cross-regional coordination forums.
e. The research results can be the basis for making regional development planning policies, especially the Sukabumi Regency RPJMD, through a program to strengthen innovation in improving public health in Sukabumi Regency.

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