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CONTINGENCY TABLE ANALYSIS IN STUNTING CASES IN LAMPUNG, INDONESIA

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Abstract || Stunting, characterized by the failure of children under the age of five to achieve expected height due to chronic nutritional insufficiencies, spans from prenatal stages to early infancy. The primary objective of this study is to ascertain the correlation between demographic factors across 15 districts/cities and the prevalence of stunting in Lampung province during the year 2023. The utilized data consists of secondary sources obtained via the contingency table analysis method sourced from the Directorate General of Regional Development, Ministry of Home Affairs. Findings from the research, after rigorous testing, indicate a lack of significant association between demographic variables (regency/city) and stunting prevalence rates, as confirmed by the Chi-Square test results yielding a P-Value of 0.2496, surpassing the conventional significance threshold of 0.05. Consequently, it is inferred that no significant relationship exists between demographic variables and the prevalence of stunting.

Keywords || Stunting, Nutrition; Contingency Table

Abstrak || Stunting adalah ketidak mampuan pertumbuhan pada anak-anak di bawah usia lima tahun yang disebabkan oleh defisiensi gizi kronis, mengakibatkan tinggi badan anak lebih pendek dari yang seharusnya untuk usianya. Kondisi kekurangan gizi ini dapat terjadi mulai dari masa kehamilan hingga periode awal kelahiran. Tujuan dari penelitian ini adalah untuk mengetahui hubungan antara variabel demografis 15 kabupaten/kota dengan prevalensi stunting pada tahun 2023 di provinsi lampung. Data yang digunakan adalah data sekunder dengan Metode analisis tabel kontingensi yang diperoleh dari Ditjen bina Pembangunan daerah, kementrian dalam negeri. Hasil penelitian yang telah di uji menyatakan bahwa tidak ada hubungan yang signifikansi antara variabel demografis (kabupaten/kota) dengan Tingkat prevalensi stunting dengan hasil uji Chi-Square yang diperoleh P-Value $0,2496 > (p\text{-value } 0,05)$ jadi dapat disimpulkan bahwa tidak ada hubungan yang signifikansi antara variabel demografis dengan prevalensi stunting.

Katakunci || Stunting, Gizi; Tabel Kontingensi

Introduction

Stunting, defined as the inhibition of children's growth due to insufficient food intake, represents a significant nutritional challenge in Indonesia (Rakhmawati et al., 2021). Its ramifications extend beyond mere physical health, encompassing short-term and long-term welfare considerations such as productivity and quality of life (Syswianti et al., 2023). This underscores the multifaceted nature of the obstacles confronting Indonesian children in realizing their full potential amidst pervasive nutritional uncertainties.

The determinants of stunting transcend mere nutritional inadequacy. For instance, maternal nutritional knowledge deficiency may precipitate inappropriate feeding practices and a lack of awareness regarding the critical importance of nutrition during pivotal stages of child development (Mantasia & Sumarmi, 2022). This underscores the imperative for a comprehensive approach that integrates nutritional education and maternal support to facilitate optimal childcare and nutrition provision.

Furthermore, additional factors including access to quality healthcare, inadequate sanitation, and economic disparity contribute significantly to the prevalence of stunting. For instance, children residing in rural regions may encounter obstacles in accessing healthcare services and procuring sufficiently nutritious sustenance, while those enduring impoverished conditions may confront challenges in affording the requisite nutrients for optimal growth.

Consequently, addressing stunting necessitates a comprehensive approach encompassing not only direct nutritional dimensions but also broader societal concerns such as education, sanitation, and poverty. Collective endeavors from governmental bodies, international organizations, non-governmental entities, the private sector, and civil society are indispensable in formulating holistic and sustainable strategies. This entails investments in robust healthcare infrastructure, initiatives for nutritional enlightenment, augmentation of clean water and sanitation access, and endeavors to mitigate pervasive economic disparities nationwide.

By mitigating stunting, Indonesia not only enhances the well-being of its youth but also fortifies the underpinnings of resilient and sustainable human development, thereby empowering the nation's burgeoning populace to actively contribute to the realization of a promising future for their country. Stunting, characterized by a

disjunction between a child's physical growth and chronological age, constitutes a nutritional challenge with profound repercussions, including heightened susceptibility to illness and diminished quality of life (Zahra et al., 2023). Its ramifications extend beyond mere physical health, encompassing disruptions in children's motor and cognitive advancement (Setyawati et al., 2022). The prominence of this phenomenon stems from its intricate nature, influenced by a spectrum of factors spanning socioeconomic circumstances to insufficient nutritional intake during early childhood (Utami et al., 2024).

The imperative of addressing stunting resides in its substantial impact on children's physical and cognitive maturation (Sari & Prihartini, 2023). These impediments to physical and cognitive development harbor enduring implications for a child's well-being and life quality. Hence, endeavors aimed at thwarting and mitigating stunting assume paramount importance in ensuring equitable opportunities for every child to attain optimal growth and development.

The considerable prevalence of stunting in Indonesia underscores the gravity of this health issue, necessitating earnest attention from governmental bodies, societal stakeholders, and other concerned entities (Fitriani et al., 2022). By comprehending the multifaceted nature of stunting's etiology and consequences, comprehensive and coordinated intervention strategies can be devised to curtail stunting rates and enhance the overall well-being of Indonesian children.

Through a synergistic and concerted approach spanning diverse sectors such as healthcare, education, agriculture, and economic development, tangible strides can be made in combatting stunting and ensuring equitable access to adequate nutrition and nurturing care for all children. Consequently, Indonesia can progress towards a healthier, more productive, and empowered society in the forthcoming years.

In nations like Indonesia, grappling with stunting presents a formidable and enduring challenge, given its profound implications for succeeding generations. The phenomenon of stunting not only underscores disparities in nutritional access but also serves as a crucial metric for assessing a country's welfare and human development levels. The risk factors associated with stunting can be categorized into three primary domains: parental, child, and environmental factors.

Initially, parental factors assume a pivotal role in shaping the likelihood of stunting in children, encompassing neonatal considerations such as maternal health status during the initial 1000 days postpartum, socio-economic differentials, maternal educational attainment, parental occupations, and familial stature (Nurva &

Maharani, 2023). Subsequently, child-related variables also exert significant influence, comprising the child's nutritional status, infection prevalence, duration of breastfeeding exceeding six months, gender, and age. Thirdly, environmental factors wield a non-negligible impact, spanning the accessibility of potable water sources, sanitary provisions like latrines, and prenatal environmental exposures.

Furthermore, certain specific health determinants, notably Low Birth Weight (LBW) and prematurity, emerge as substantial risk factors contributing to stunting among Indonesian children under the age of five. Similarly, variables such as family size, infection prevalence, and breastfeeding practices feature prominently in delineating the vulnerability to stunting in children.

By elucidating the array of factors influencing stunting, holistic and coordinated intervention strategies can be devised to effectively combat this issue. Through the engagement of diverse stakeholders and the adoption of an evidence-based approach, tangible progress can be made in mitigating stunting prevalence rates and enhancing the overall well-being of Indonesian children, thereby laying a robust groundwork for the nation's promising future.

Methodology

A contingency table serves as a statistical tool for concurrently presenting multiple variables (Fam & Pooi, 2012). Its output is depicted in a tabular format illustrating the interrelation of variables across defined categories (Eshima, 2020; Vélez et al., 2016). Often referred to as cross-tabulation, this method facilitates comprehension of the relationships among variables in research contexts Altham & Ferrie (2007), devoid of presumptions regarding causality (Simonoff, 2003). Essentially, a contingency table comprises rows and columns delineating the categories of the categorical variable under scrutiny (Satria et al., 2023). The data utilized for analysis is as follows:

Tabel 1. 2023's stunting case

Regency	Prevalence
Lampung Barat	6.4
Tanggamus	3.7
Lampung Selatan	2.0
Lampung Timur	2.0
Lampung Tengah	4.4
Lampung Utara	3.2
Way Kanan	4.1

Regency	Prevalence
Tulang Bawang	6.9
Pesawaran	4.3
Pringsewu	6.1
Mesuji	8.5
Tulang Bawang Barat	4.3
Pesisir Barat	0.4
Kota Bandar Lampung	3.9
Kota Metro	6.7

Source: Directorate General of Regional Development, Ministry of Home Affairs

The data utilized in this study emanates from secondary sources, specifically the Directorate General of Regional Development, Ministry of Home Affairs. Employing the contingency table methodology, the research evaluates the correlation between demographic variables across 15 districts or cities and the prevalence rates of stunting. Subsequently, the chi-square test is employed to ascertain the statistical significance of the analytical findings.

Analysis and Discussion

The objective of the contingency table analysis conducted in this study is to undertake a thorough examination of the interrelations among demographic variables, encompassing factors such as population demographics, access to healthcare services, income levels, and educational attainment, across 15 districts/cities within Lampung Province, alongside the stunting prevalence rates recorded in 2023. Utilizing the contingency table methodology, this investigation not only delineates the stunting prevalence rates within each district or city but also explores potential associations between prevailing demographic factors and the observed stunting rates.

Through this analytical framework, the study seeks to provide a comprehensive elucidation of the geographic disparities in stunting rates across Lampung Province, while also shedding light on the demographic determinants that may underlie these variations. By discerning this relationship, it is anticipated that more targeted intervention strategies can be formulated and implemented to mitigate stunting rates in areas experiencing the highest burdens, while concurrently fortifying preventative measures in locales exhibiting lower stunting prevalence rates.

Additionally, this analysis can offer insights to policymakers and healthcare practitioners for devising more tailored and efficacious

intervention initiatives, along with optimizing resource allocation for addressing stunting concerns at the grassroots level. Consequently, this research not only enhances the understanding of the stunting issue in Lampung Province but also lays a robust groundwork for future management endeavors that are both effective and sustainable.

Contingency Table Analysis

The subsequent section presents the outcomes of the contingency table analysis facilitated by R-Studio software:

```
> # display contingency table
> print (contingence_table)
```

	0.4	2	3.2	3.7	3.9	4.1	4.3	4.4	6.1	6.4	6.7	6.9	8.5
Bandar Lampung Municipality	0	0	0	0	1	0	0	0	0	0	0	0	0
Metro Municipality	0	0	0	0	0	0	0	0	0	0	1	0	0
West Lampung Regency	0	0	0	0	0	0	0	0	0	1	0	0	0
South Lampung Regency	0	1	0	0	0	0	0	0	0	0	0	0	0
Central Lampung Regency	0	0	0	0	0	0	0	1	0	0	0	0	0
East Lampung Regency	0	1	0	0	0	0	0	0	0	0	0	0	0
North Lampung Regency			1	0	0	0	0	0	0	0	0	0	0
Mesuji Regency	0	0	0	0	0	0	0	0	0	0	0	0	1
Pesawaran Regency	0	0	0	0	0	0	1	0	0	0	0	0	0
West Coastal Regency	1	0	0	0	0	0	0	0	0	0	0	0	0
Pringsewu Regency	0	0	0	0	0	0	0	0	1	0	0	0	0
Tanggamus Regency	0	0	0	1	0	0	0	0	0	0	0	0	0
Tulang Bawang Regency	0	0	0	0	0	0	1	0	0	0	0	1	0
West Tulang Bawang Regency	0	0	0	0	0	0	0	0	0	0	0	0	0
Way Kanan Regency	0	0	0	0	0	1	0	0	0	0	0	0	0

Figure 1. The outcomes of the contingency table analysis

The contingency table depicted above serves as a visual representation elucidating the interplay between two categorical variables, namely “City or Regency” and “Analysis Results,” with the aim of fostering a comprehensive understanding of the distribution and patterns of stunting across diverse locales within Lampung Province. Each cell in the table denotes the count of observations falling within the corresponding combination of categories. For instance, in the row corresponding to “West Lampung” and the column labeled “6.4,” the value 1 signifies the presence of one observation characterized by the classification “West Lampung” and an analysis result of “6.4”.

Through this contingency table analysis, the research endeavors to delve into the spatial intricacies of stunting and the potential demographic determinants underlying disparities in stunting prevalence rates across each city or district. By scrutinizing the relationship

between these categorical variables, the study aspires to unveil latent patterns and factors that may serve as significant determinants of divergences in stunting rates among various regions.

Several key observations can be gleaned from the aforementioned contingency table:

1) Frequency Distribution for Each City

The frequency distribution of analysis results within each city delineates the allocation of analysis result values (e.g., 0.4, 2.0, 3.2, etc.) across the cities enumerated in the contingency table. Essentially, it elucidates the prevalence of each analysis result value within the context of various cities featured in the contingency table. This analysis aids in discerning patterns or trends in analysis results across diverse locations or cities, thereby furnishing deeper insights into the distribution of analysis result values across different locales.

2) Correlation or Relationship between Analysis Results and City Location

The correlation or relationship between analysis results and city locations gauges the proximity or strength of association between analysis result values (e.g., 0.4, 2.0, 3.2, etc.) and the cities featured in the contingency table. In essence, it assesses whether discernible patterns emerge indicating that specific analysis result values manifest more frequently in certain cities vis-à-vis others. Such analyses offer insights into the potential influence of geographical or social factors on observed analysis results, facilitating the identification of pertinent correlations or patterns within a specific context.

3) Identification of Cities with Significantly Observed Analysis Results

This aspect aims to identify patterns or trends wherein a pronounced correlation exists between specific analysis result values and particular cities. When the frequency of observations for a particular combination of analysis results and cities reaches a substantial threshold, it implies that the relationship between analysis results and those cities may hold statistical or practical significance. In essence, this recognition underscores cities where specific analysis result values tend to manifest more prominently than others, thereby informing decision-making processes or facilitating targeted actions within the pertinent context.

Chi-Square Analysis

Chi-square analysis is employed to assess the association between two categorical variables. The ensuing outcomes are outlined below:

	df	p-value
180	168	0.2496

Upon examination of the table above, the following conclusions can be drawn:

- 1) Hypotheses:
 - (H0)=There exists no relationship between demographic variables (district/city) and stunting prevalence.
 - (H1) = There exists a relationship between demographic variables (district/city) and stunting prevalence.
- 2) Level of Significance
 - $(\alpha) = 5\% = 0.05$.
- 3) Test Statistics
 - P-Value = 0.2496.
- 4) Calculation of Statistics:
 - P-Value = 0.2496 > 0.05.

Considering the P-Value of 0.2496, which exceeds the significance level (α) of 0.05, there is insufficient statistical evidence to reject the null hypothesis (H0). Consequently, the null hypothesis cannot be rejected, leading to the conclusion that there is no significant relationship between demographic variables (regency/city) and stunting prevalence rates. The findings of this investigation delineate two distinct data analysis methodologies employed to investigate the relationship between demographic variables (regency/city) and stunting prevalence in Lampung Province. Initially, contingency tables afford a comprehensive visual depiction of stunting distribution patterns across various regions, while chi-square analysis is utilized to assess the significance of the relationship between demographic variables and stunting prevalence.

The contingency table illustrates the frequency distribution of analysis results within each city, revealing the prevalence of analysis

result values across diverse locations. Moreover, it delves into correlations or associations between analysis results and city locations, aiding in the identification of pertinent patterns within the regional context. Additionally, contingency tables pinpoint cities exhibiting a specific analysis result with a noteworthy number of observations, enabling researchers to highlight pronounced correlations between analysis results and particular cities.

Subsequently, chi-square analysis was conducted to assess the hypothesis positing no relationship between demographic variables (regency/city) and stunting prevalence. The findings indicate that the p-value (0.2496) exceeds the specified significance level ($\alpha = 0.05$), signifying insufficient statistical evidence to refute the null hypothesis. Consequently, it is inferred that no significant relationship exists between demographic variables (regency/city) and stunting prevalence rates.

The utilization of contingency tables offers the advantage of providing a lucid visual representation of stunting distribution patterns in specific areas, along with the capacity to unveil concealed correlations or patterns (Altham & Ferrie, 2007; Simonoff, 2003; Vélez et al., 2016). Conversely, chi-square analysis furnishes a robust statistical framework for assessing the significance of relationships between categorical variables, thereby underpinning substantive conclusions regarding the relationship between demographic variables and stunting prevalence. Hence, the integration of contingency table analysis and chi-square analysis engenders a comprehensive approach to comprehending the relationship between demographic variables and stunting prevalence in Lampung Province, facilitating deeper research insights and more targeted decision-making endeavors in combating stunting within the region.

The outcomes of this research serve as a foundational framework for crafting policies and intervention initiatives aimed at addressing the stunting issue in Lampung Province more effectively. By garnering enhanced insight into the demographic determinants influencing stunting prevalence, policies can be tailored to target the most vulnerable areas and bolster prevention endeavors in locales exhibiting lower stunting rates.

Moreover, the findings derived from this research facilitate the more efficient and targeted allocation of resources for stunting mitigation efforts. Policymakers can utilize information regarding stunting distribution and associated factors to allocate resources equitably, ensuring that areas necessitating heightened assistance

receive requisite prioritization. Contingency table and chi-square analyses emerge as effective methodologies for elucidating patterns and relationships between demographic variables and stunting prevalence. This enables the formulation of more precise and impactful intervention programs, accounting for demographic nuances and local contextual factors in each region.

However, it is imperative to acknowledge potential limitations inherent in this study. The quality and availability of the utilized data may constrain the validity of research findings, particularly in instances of incomplete or inaccurate data. Additionally, other unaccounted factors could exert influence on stunting prevalence, such as local cultural practices, healthcare accessibility, and dietary habits, which were not explicitly considered in this study. Furthermore, the analytical methods employed may possess inherent limitations; for instance, the contingency table analysis approach may not fully capture the complexity of relationships among observed variables.

Conclusion

Based on the aforementioned research, it is concluded that there exists no discernible relationship between the 15 demographic variables (regency/city) and the level of stunting prevalence in Lampung. This conclusion is drawn from the P-Value analysis results, which yielded a value of $0.2496 > 0.05$, thus resulting in the complete failure to reject the null hypothesis (H_0). Contingency table analysis furnishes a comprehensive visual depiction of stunting distribution patterns across various regions within Lampung Province. These findings not only ascertain stunting prevalence rates in each city or district but also scrutinize potential associations between demographic factors and observed stunting rates.

The contingency table facilitates the identification of the frequency distribution of analysis results within each city, the correlation or relationship between analysis results and city location, and the identification of cities exhibiting specific analysis results with a substantial number of observations. This facilitates a deeper comprehension of spatial stunting patterns and demographic influences contributing to variations in stunting rates among regions. The amalgamation of contingency table analysis and chi-square analysis affords a holistic approach to understanding the relationship between demographic variables and stunting prevalence in Lampung Province. This enables more comprehensive research insights and more targeted

decision-making endeavors aimed at mitigating stunting within the region.

Meanwhile, future research endeavors could benefit from utilizing more extensive and representative datasets. This may entail the acquisition of additional data or the utilization of a broader spectrum of data sources to attain a more nuanced understanding of the factors influencing stunting prevalence. Additionally, future research could broaden its scope to encompass other factors, such as cultural, social, and economic variables, which may influence stunting prevalence. Such expanded investigations can contribute to a more thorough comprehension of the multifaceted nature of the stunting problem.

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