

Statistical Modeling and Factors Influencing School Dropout in Indonesia: A Review

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ABSTRACT

The education enrollment rate is crucial for Indonesia to improve its human resources and sustain its economic development. In reality, the dropout student rate is still relatively high. Previous research has highlighted several factors and models related to the dropout student rate in Indonesia. The purpose of the study is to identify the most popular statistical modeling and factors influencing school dropout in Indonesia. We searched in February 2023 using ScienceDirect, ProQuest, and Google Scholar. The exploration was limited to scholarly journal articles that underwent peer review and were published in English between January 2013 and December 2022. This study underwent four stages: identification, screening, eligibility, and inclusion. The study finds that the most popular statistical modeling is the Logistic Regression Model, and the most significant factor increasing the school dropout rate in Indonesia is family and economic factors. The findings suggest that children who were not attending school came from families with lower levels of education. The well-being of these families was directly linked to their children's educational status. The primary reasons for young students dropping out of elementary and junior schools include an inability to pay school fees and a desire to work on farms to support their parents.

Keywords: Statistical modeling, School dropout, Indonesia.

INTRODUCTION

School dropout refers to the abandonment of formal education by children due to various factors. In Indonesia, school dropout cases have been occurring for a considerable period and remain a significant concern. According to statistical records from the Ministry of Education, Culture, Research and Technology (Kemdikbudristek) for the 2020/2021 academic year, approximately 83.7 thousand students dropped out of school across Indonesia. West Java had the highest number of dropout cases at 13.00%, followed by DKI Jakarta at 12.04% and North Sumatra at 11.07%. These statistics serve as a benchmark for the high school dropout rate in Indonesia, highlighting the need for special attention and intervention from various stakeholders, including the government (Ahdiat, 2022).

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It is well recognized in Indonesia that increasing educational participation rates is vital for the country to improve its human capital. Expanding school enrollment rates is certainly not the only goal of education in Indonesia, but it is also to increase efficiency and equitable access to schools, as well as improving the quality and relevance of education in general.

The phenomenon of students leaving formal education prematurely remains a pressing issue, casting shadows on the nation's educational goals and the well-being of its youth. Dropping out of school can have significant long-term consequences, including reduced employment opportunities, lower earning potential, and limited access to higher education. It also affects the overall educational attainment and well-being of individuals and can have broader social and economic implications for communities and societies. Efforts to prevent school dropout often focus on providing support and interventions to address the underlying causes that lead students to leave school prematurely. These interventions may include academic support, counseling services, financial assistance, and initiatives to improve school engagement and retention.

Past research has highlighted several factors and models related to school dropout cases in Indonesia. However, there is no published review article focusing on the most significant factors influencing school dropout rates in Indonesia and the most suitable statistical modeling to apply. The objectives of this review are to identify and review published articles discussing factors and models applied to school dropout cases in Indonesia. To shed light on school dropout cases in Indonesia, the current literature review is based on the following research question: What are the most significant factors influencing school dropout in Indonesia, and which statistical modeling approaches are most commonly used in research?

METHODS

The methodology employed in this study entailed conducting a comprehensive literature review. A literature review encompasses the systematic identification, evaluation, and synthesis of extant research findings, aimed at addressing specific research questions. (Kitchenham & Charters, 2017). The Literature Review method comprises three primary stages for identifying relevant publications for the current research: identification, screening, and eligibility.

1. Identification

The initial stage involves identifying keywords and searching for related and similar terms. Databases were searched using the same keywords: 'school dropout in Indonesia,' 'drop out,' 'dropout,' 'dropping out of school,' and 'drop-out.' Studies may use different terms for school dropout while maintaining the same meaning, such as 'school-leavers' or 'school leavers'. After determining all relevant terms, search strings for ScienceDirect, Google Scholar, and Proquest databases were constructed in February 2023. In the first stage of the review procedure, the current study retrieved 572 articles from both leading and supporting databases.

2. Screening

The second stage of the literature review is screening, aimed at refining articles published within the last ten years. In this stage, the current study screened the 572

publications retrieved from databases. The screening procedure was conducted automatically for databases equipped with a sorting feature. The inclusion criteria for the current study specify that the search period should fall between January 2013 and December 2022. Additionally, articles must be in English and must utilize statistical modeling to specifically address school dropout in Indonesia. This stage resulted in the removal of 371 articles from the study, as they did not meet the inclusion criteria, leaving 201 articles eligible for further assessment.

3. Eligibility

The third stage of the literature review is eligibility assessment. Following the screening process, the remaining articles undergo manual observation and retrieval. Researchers manually review the titles and abstracts of the papers. Eligible papers are those with titles and abstracts relevant to the issue of school dropout cases in Indonesia. This stage of screening yielded 14 articles, while 187 articles were discarded.

4. Inclusion

The final stage of the method is inclusion, which ensures that all selected articles meet the specified requirements. These requirements include using keywords related and similar to the terms, being published within the last 10 years, having titles and abstracts related to the terms as determined in the previous stage, and having full text available for inclusion. This final stage resulted in the inclusion of 6 articles and the exclusion of 8 articles

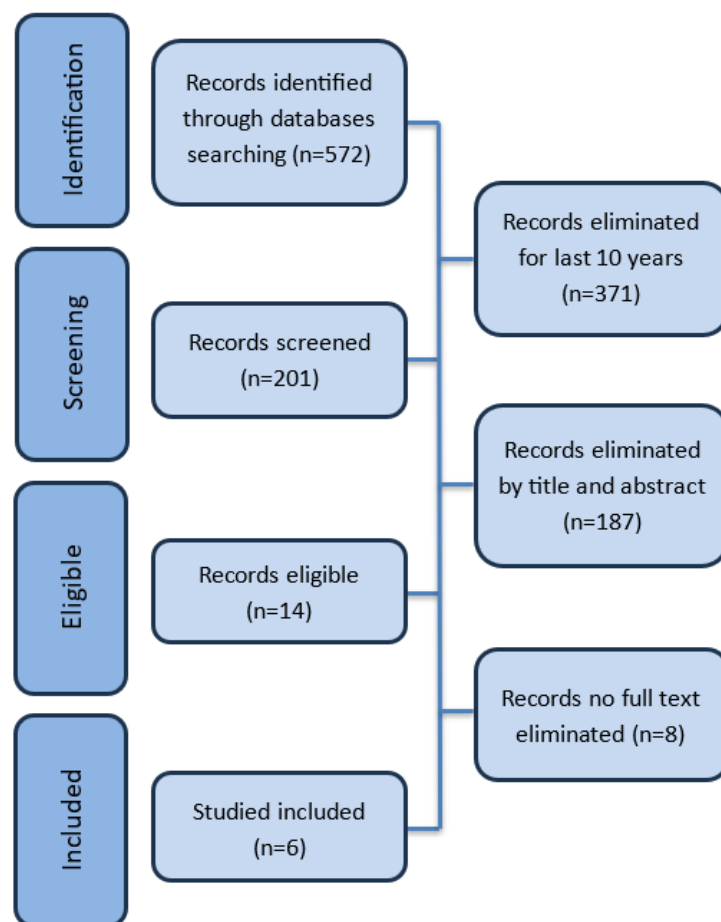


Figure 1. Article Identification Flowchart

RESULTS & DISCUSSION

Literature Search

The flowchart illustrating this literature search is presented in Figure 1. Through keyword searches, we obtained 4 articles from ScienceDirect, 1 from ProQuest, and 1 from Google Scholar.

Factors of School Dropout Cases in Indonesia

Following the Literature Review on the six eligible articles, several factors influencing cases of school dropout in Indonesia were identified, as follows:

1. Economy

Economic factors exert a significant influence on student dropout cases in Indonesia. This factor can be summarized into four subfactors, as follows:

a. Household Economic Status

This subfactor is discussed in the journal article (Lewis & Nguyen, 2020). The article primarily examines the causal impact of compulsory school policy in Indonesia. While the sub-factor of household economic status is briefly addressed in the journal, it is acknowledged as one of the characteristics to be considered when devising effective policies to promote children's school attendance. This sub-factor is of particular focus because inadequate household economic status may hinder the ability of households to afford the costs associated with sending children to school, thereby posing significant challenges to educational attainment within the school environment.

b. Direct Costs of Education

These subfactors are discussed in several academic journals (Lewis & Nguyen, 2020; Utomo, Reimondos, Utomo, McDonald, & Hull, 2014; Guntur & Lobo, 2017). Household economic status strongly influences this subfactor, as lower economic status may hinder households' ability to cover the costs of their children's education. If the required costs exceed the household's economic capabilities, the child may face a higher risk of dropping out of school.

c. Poverty

These subfactors are discussed in academic journals (Guntur & Lobo, 2017; Tsaneva, 2017). Children and youth growing up in poverty are less likely to complete high school. Poverty is often cited as the primary reason for student dropout due to the inability to afford education costs, leading children to prefer working in fields to assist their parents. Survival, particularly meeting uncertain food needs, becomes a priority for both children and parents, often overshadowing the importance of continuing education. Research has consistently identified poverty and financial constraints as the most significant factors contributing to school dropout (Zira & Zumo, 2020). Therefore, it is crucial for parents to strive to provide their children with a quality education, especially financially.

d. The Number of Poor People

These subfactors are discussed in the journal (Guntur & Lobo, 2017). According to data from the Badan Pusat Statistik (Central Statistics Agency) as of September 2022, the number of people living in poverty in Indonesia reached 26.36 million. This figure represents an increase of 0.20 million people compared to March 2022. The significant number of

individuals living in poverty poses challenges for the government in distributing social assistance evenly, which can ultimately contribute to student dropout rates (BPS, 2023).

2. Family

Family factors significantly influence cases of student dropout in Indonesia. Through the results of the Literature Review (LR) conducted, five sub-factors arising from family factors were identified, as follows:

a. Cognitive and Motivational Aspects

These subfactors are discussed in academic journals such as (Maulana, Lorenz, & Grift, 2015; Guntur, & Lobo, 2015; Tsaneva, 2017). A child's most basic education often begins within the family environment, shaping various aspects of their mindset, including cognitive and motivational aspects. Children may develop attitudes towards school based on parental attitudes and involvement in their education. For instance, if parents show little concern for their children's education, it may lead the child to become apathetic towards school attendance.

b. Parents Education and Household Head Gender

This subfactor is addressed in the journal (Lewis & Nguyen, 2020; Utomo, Reimondos, Utomo, McDonald, & Hull, 2014). It has been observed that the level of parental education significantly influences the guidance and direction parents provide to their children regarding education. Parental education level serves as a determining factor in shaping parental perspectives on education and the aspirations they hold for their children. Parents with lower levels of education may have narrower views on educational attainment, often considering high school graduation as sufficient. Conversely, parents with higher levels of education tend to possess broader insights into educational opportunities (Handayani, Wirabrata, & Magta, 2020).

c. Family Members' Ethnicity and Religion

This subfactor is addressed in the journal (Lewis & Nguyen, 2020). Ethnicity and religion within families also influence student dropout rates in Indonesia. Certain ethnicities and religious beliefs may undervalue the importance of education. Additionally, some cultural beliefs may prioritize traditional gender roles, leading to the perception that girls do not need higher education and that elementary school alone is sufficient for their future. Moreover, certain ethnic and religious traditions may require children to drop out of school.

d. The Number and Gender of Children in the Household

This subfactor is discussed in the journals (Parinduri, 2014; Tsaneva, 2017). The number and gender of children in the household can influence the attention and resources children receive from their parents, particularly in terms of education. Parents may allocate varying levels of attention and educational resources based on factors such as gender or birth order, depending on the family's economic circumstances. Consequently, the government of Indonesia implemented the Keluarga Berencana (Family Planning) program aimed at reducing birth rates to align with families' economic conditions (Maulida, Harlen, Sari, & Zacharias, 2023).

e. Role of Parents

This subfactor is addressed in the journals (Utomo, Reimondos, Utomo, McDonald, & Hull, 2014; Tsaneva, 2017). The role of parents in continuously supporting and motivating

their children can encourage enthusiasm for learning, leading to academic achievement. High motivation can stimulate children to eagerly attend school, indirectly reducing dropout rates. A study explains that families who consistently guide their children and cultivate high aspirations, while also fostering an environment that promotes learning, can improve academic performance and reduce the likelihood of school dropout (Durisic & Bunijevac, 2017).

3. Environment

Environmental factors also play a significant role in student dropout rates. Based on the reviewed literature, three specific environmental sub-factors have been identified as influential in cases of student dropout in Indonesia.

a. Household Social Status

The influence of family social status on a child's decision to withdraw from education is discussed in the journal (Guntur & Lobo, 2017). Children from families with lower social status may be more inclined to forgo education due to societal perceptions. For instance, farming families, often regarded as having low social status, may encourage their children to prioritize agricultural work over pursuing higher education. This perception can lead children to believe that assisting their parents in the fields is more important than continuing their schooling or attending college.

b. Gender and Location where the Individuals Grew up

These subfactors are outlined in two scholarly articles (Parinduri, 2014; Guntur & Lobo, 2017). The decision to discontinue schooling is often influenced by internal and external factors. These may include poor academic performance in each semester, the belief that women do not need to pursue higher education, familial disharmony or lack of affection, and the pervasive influence of peers who have already abandoned their education and consistently lag behind in school activities. Another contributing factor is the neglect of academic support during school hours. For instance, learning difficulties encountered by students are often overlooked by parents, and extracurricular activities outside the home tend to take precedence over studying. For example, students may prioritize outdoor play over spending quality time with their families

c. Early-age Marriage

The issue of early marriage, as discussed in the journal (Utomo, Reimondos, Utomo, McDonald, & Hull, 2014), is closely intertwined with the escalating rate of school dropouts in Indonesia. According to data from KPAI (Indonesian Child Protection Commission), the prevalence of child marriage stood at 10.8% in 2019, with a targeted reduction to 8.74% by 2024. Furthermore, there has been a significant increase in requests for marriage dispensation from the Indonesian Religious Courts Agency (Badan Peradilan Agama RI), with figures rising from 29,359 in 2019 to 49,684 from January to June 2020. The COVID-19 pandemic exacerbated the situation, leading to reports of increased child marriages driven by economic vulnerability, disruptions in parenting and education during the pandemic, concerns about children's safety when returning home at night, and pressures to conform to

moral and religious norms, prompting parents to arrange marriages for their children (Rahiem, 2021).

4. School

The influence of school-related factors on student dropout rates in Indonesia is substantial. Three subfactors identified in journals (Parinduri, 2014; Utomo, Reimondos, Utomo, McDonald, & Hull, 2014; Tsaneva, 2017) are particularly noteworthy.

a. The Teacher

These subfactors are elucidated in the journal (Maulana, Lorenz, & Grift, 2015). The role of teachers is paramount in mitigating the dropout phenomenon in Indonesian schools. A positive teacher-student relationship is pivotal, with teachers' motivation and attention playing a crucial role. Interviews reveal that students feel more comfortable in an environment where teachers treat all students equally, without favoritism. Moreover, teachers' comprehensive attention to all students fosters greater motivation for learning (Rokhmaniyah, Fatimah, Suryandari, & Mahmudah, 2021).

b. Teaching Behavior

Also highlighted in the journal (Maulana, Lorenz, & Grift, 2015), teaching behavior closely correlates with the first subfactor, the teacher. Teachers' behavior significantly impacts various aspects of a student's experience. For instance, students' enthusiasm for learning and attendance are directly influenced by the behavior they receive from their teachers.

c. Role of School

These subfactors are delineated in the journal (Maulana, Lorenz, & Grift, 2015). The role of schools holds significant sway over the prevalence of student dropout rates in Indonesia. Enhanced treatment of students correlates with lower dropout rates. Schools fostering positive relationships, characterized by friendly and non-discriminatory behavior from teachers, along with consistent encouragement for students to embrace enthusiasm towards learning and diligent study, contribute to mitigating dropout rates. Moreover, the primary aspect of school involvement in reducing student dropout rates lies in cultivating a comfortable and child-friendly learning environment, offering assistance or scholarships to academically proficient students, and extending financial aid to those in need. These findings are corroborated by several prior studies. One study underscores the efficacy of comprehensive school support in curbing dropout rates and alleviating student stress within the school milieu (John, et al., 2018).

5. Regional Development

Regional development endeavors to enhance the benefits accruing to communities within a given area. The quality of regional development significantly influences various aspects, including the incidence of student dropout rates. Three sub-factors within the realm of regional development have been identified:

a. Access to Knowledge

These sub-factors are elucidated in the journal (Maulana, Lorenz, & Grift, 2015). Children's access to knowledge is pivotal and can significantly impact the prevalence of

student dropout rates in Indonesia. Disparities exist between Western and Asian countries regarding progress and access to knowledge dissemination. While Western nations have made strides in promoting effective teaching behavior, with initiatives like professional development programs for novice teachers, such efforts are still under discussion in Asian countries like Indonesia. Hence, there is an urgent need to support the professional development of inexperienced teachers in the Asian region (Maulana, Lorenz, & Grift, 2015).

b. Economic Status

These sub-factors are outlined in the journal (Guntur & Lobo, 2017). Particularly concerning regional coverage, the economic status of an area profoundly affects its educational infrastructure. Higher economic status correlates with better educational facilities, eliciting a more robust community response towards achieving the objectives of these facilities. Conversely, areas with lower economic status face challenges in meeting the educational needs of their populace.

c. School-to-Student Ratio

These sub-factors are discussed in the journal (Tsaneva, 2017). The school-to-student ratio, or school availability ratio, exerts a substantial influence on student dropout rates. In areas where the number of children exceeds the available schools, there is a noticeable lack of facilities, resulting in many children being deprived of educational opportunities and consequently dropping out of school.

6. Health

Health factors indeed play a role in the number of students dropping out of school in Indonesia. Two sub-factors have been identified within the health factor:

a. Disability

This subfactor is touched on in the journal (Lewis & Nguyen, 2020). Disability is a subfactor of health problems that greatly influences student's dropout from school. Based on the results of a national socio-economic survey conducted by the Badan Pusat Statistik (BPS), it was reported that there were around 4.4 million school age children (7-18 years) who were not in school (Rokhmaniyah, Fatimah, Suryandari, & Mahmudah, 2021).

From this report, children with special needs were also found to contribute significantly to the increase in student dropout rates in Indonesia. Based on the 2017 national socio-economic survey, it is estimated that there are more than 180 thousand children with special needs aged 7-8 years who are not in school. This report was then strengthened by the results of analysis of 2010 Census data carried out by UNICEF. The results of this analysis identified that of all children with disabilities of school age (7-18 years), two thirds (66.5%) of them did not receive formal education at school. Among children with disabilities of primary school age (7-12 years), 54.1% of them do not attend school. Furthermore, 80.9% of children with disabilities of secondary education age (13-18 years) do not attend school. From this data report, it can be said that some of the student's dropout rates are clearly influenced by disabilities. Indonesia also does not have equal public facilities for people with disabilities to be able to carry out independent activities.

b. Infectious Disease

These subfactors are summarized in a journal (Maulana, Lorenz, & Grift, 2015). Infectious diseases can lead to various problems, one of which is an increase in the number of students dropping out of school. This is not only a direct consequence of infected individuals being unable to continue their education, but it also triggers a domino effect. For instance, consider the impact of the COVID-19 pandemic. The COVID-19 pandemic has precipitated numerous changes in human life, particularly in the realm of education, where the teaching and learning processes have shifted to remote or virtual platforms. Consequently, students are faced with the risk of experiencing learning setbacks or a decline in academic proficiency. Moreover, there is a looming threat of increased school dropout rates among students (Yuliyanto & Yamin, 2022). In December 2020, UNICEF reported that 938 children in Indonesia had discontinued their education due to the COVID-19 pandemic. Alarming, 75% of these children were unable to resume their studies (UNESCO; UNICEF, 2021).

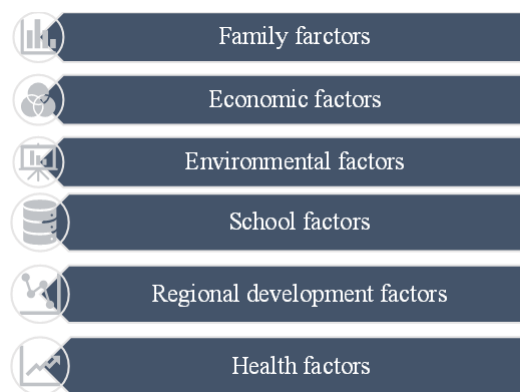


Figure 2. Factor Sequence Mapping

Figure 2 shows a mapping of the sequence of factors that influence cases of students dropping out of school in Indonesia, starting from the largest factor to the smallest according to the magnitude of its influence on the case. Table 1 presents a mapping of factors influencing cases of student dropout in Indonesia, as found in each reviewed journal.

Table 1. Mapping Factors of Student Dropout Cases

Factors	Journals						Total
	1	2	3	4	5	6	
Economy							7
1. Household Economic Status		✓					1
2. Direct Costs of Education		✓		✓	✓		3
3. Poverty				✓		✓	2
4. The Number of Poor People					✓		1
Family							10
1. Cognitive and Motivational Aspects	✓				✓	✓	3
2. Parents Education and Household Head Gender		✓		✓			2

3. Family Members' Ethnicity and Religion		✓					1
4. The Number and Gender of Children in the Household			✓			✓	2
5. Role of Parents				✓		✓	2
Environment							4
1. Household Social Status					✓		1
2. Gender and Location where the Individuals Grew up			✓		✓		2
3. Early-Age Marriage				✓			1
School							3
1. The Teacher	✓						1
2. Teaching Behavior	✓						1
3. Role of School	✓						1
Regional Development							3
1. Access to Knowledge	✓						1
2. Economic Status					✓		1
3. School-to-Student Ratio						✓	1
Health							2
1. Disability		✓					1
2. Infectious Disease	✓						1

Statistical Models

A mapping of the statistical models used in each journal addressing dropout student cases in Indonesia that have been reviewed is given in Table 2.

Table 2. Statistical Models of Dropout Student Cases in Indonesia

Models	Journals						Total
	1	2	3	4	5	6	
Multilevel Regression Modelling	✓						1
Rasch Modelling	✓						1
Regression Discontinuity Model		✓					1
Fuzzy Regression Discontinuity Design			✓				1
Logistic Regression Model				✓	✓		2
Instrumental Variables Regression						✓	1

As per the findings of the Literature Review, six statistical models concerning dropout cases among students in Indonesia were identified and are summarized in Table 2. The subsequent section provides an explanation of each statistical model.

Multilevel Regression Modelling

In the (Maulana, Lorenz, & Grift, 2015), the researchers conducted a two-level multilevel analysis, with classes/teachers at level 2 and pupils at level 1. The modeling was performed using a stepwise procedure, and estimation was conducted separately for controlled and autonomous motivation using the statistical program MlwiN. According to the results of the multilevel analyses, for controlled motivation, 12% of the variance was attributed to the class/teacher level, while 88% was attributed to the pupil level. For autonomous motivation,

10% of the variance was accounted for at the class/teacher level, with 90% attributed to the pupil level.

Rasch modelling

In the study (Maulana, Lorenz, & Grift, 2015), the Rasch model, as a member of the item response theory (IRT) family, is utilized. The Rasch model imposes more stringent assumptions compared to classical test theory (CTT). Prior to conducting the Rasch analysis, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to assess the unidimensionality and local stochastic independence assumptions. Subsequently, the Rasch model was applied. Given the sensitivity of Rasch model estimation to large sample sizes, the researchers opted for a random sample of 400 cases from the total sample. Using this sample, they fitted the Rasch model and subsequently calibrated the items.

Regression Discontinuity Model

In the study (Lewis & Nguyen, 2020), the researchers employ regression discontinuity (RD) methods to leverage the timing of the 1994 nine-year compulsory education policy and establish its causal effect on junior secondary school completion rates. Within the RD model, an individual's date of birth (month and year) serves as the running variable, with the specific date of 1 September 1978 acting as the threshold or cut-off point. In RD terminology, students exposed to the compulsory schooling policy constitute the treatment group, while those not exposed form the control group

Fuzzy Regression Discontinuity Design

In the study (Parinduri, 2014), the researcher employs a fuzzy regression discontinuity (RD) design. This choice is made because the assignment to the longer school year is not deterministic: while almost all individuals in the 1972 or younger cohorts did not experience the longer school year, not all individuals in the 1971 or older cohorts did, as some dropped out of school before 1978. The RD design capitalizes on an arbitrary rule that assigned students to the longer school year in Indonesia during 1978–1979. The findings indicate that the longer school year increases educational attainment by an average of 0.7–0.9 years and raises the probability of completing junior high and senior high schools by 15–18% and 21–29%, respectively.

Logistic Regression Model

In the study (Utomo, Reimondos, Utomo, McDonald, & Hull, 2014), the researchers employed logistic regression with robust standard errors to address the clustering of observations across time within individuals, allowing them to explore the factors associated with early school-leaving in urban Indonesia.

In the study (Guntur & Lobo, 2017), logistic regression was utilized to assess the likelihood of school dropout among children, with consideration given to various controlled variables. The outcomes of both partial and simultaneous parameter examinations within the logistic regression framework revealed that children residing in rural locales, emanating from economically deprived households, and being of male gender, emerged as the three principal

factors significantly affecting the incidence of school dropout within the specified age cohort.

Instrumental Variables Regression

In the study (Tsaneva, 2017), the researcher employs an instrumental variables approach to account for endogeneity in the schooling decision, thereby mitigating omitted variable bias. They utilize age and gender-specific differences in predicted and observed non-enrollment rates in 1998 (during the crisis) as sources of identifying variation. The researcher finds that the probability of dropout is highest among students in junior or senior high school as of 1997. Additionally, females are not found to be significantly more likely to drop out than males.

CONCLUSIONS

Based on the results of the review, six factors have been identified as contributing to student dropout rates in Indonesia: economic, family, environmental, school, regional development, and health factors. Among these factors, family-related issues emerge as the primary cause of student dropout cases, followed by economic challenges, environmental factors, school-related issues, regional development disparities, and health-related concerns. The prominence of family-related factors cannot be overlooked, given the pivotal role of the family in a child's life and their influence in shaping the child's trajectory. Additionally, economic hardships significantly contribute to the dropout rates, reflecting the mismatch between the economic conditions in Indonesia and the financial burdens associated with education.

In this literature review, it was observed that six statistical models were employed across the reviewed journals to analyze the relationship between covariates and instances of student dropout in Indonesia. These models encompass Multilevel Regression Modeling, Rasch Modeling, Regression Discontinuity Model, Fuzzy Regression Discontinuity Design, Logistic Regression Model, and Instrumental Variables Regression. Among these models, the Logistic Regression Model emerged as the most frequently utilized statistical approach.

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