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Student Dropout Risk Following the Loss of Need-and Merit-Based Scholarships In Higher Education: A Systematic Literature Review

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Abstract

Need-and merit-based scholarships are important for access to and persistence in higher education. However, losing scholarship status because of policy changes, declining academic performance, or administrative barriers may be associated with increased dropout risk, particularly among low-income and otherwise vulnerable students. Research on this issue spans several disciplines and methodological approaches, underscoring the need for an integrated synthesis. This systematic literature review examines research published in Scopus-indexed sources between 2020 and 2026 on the relationship between scholarship loss and student dropout risk, the factors associated with this relationship, and retention strategies. Scopus AI supported initial literature discovery and thematic mapping, while the authors reviewed the original sources and conducted the thematic synthesis. The reviewed literature suggests that scholarship loss is associated with increased dropout risk, although the strength and nature of this association vary across contexts and student groups. The loss of need-based scholarships is more directly associated with financial insecurity, whereas the loss of merit-based scholarships may be associated with academic adaptations, including reduced course loads and changes of major. Socioeconomic conditions, academic performance, institutional support, and social integration emerge as relevant factors associated with dropout risk and study persistence. Some studies report positive retention outcomes from structured academic interventions, while machine-learning-based early-warning systems and explainable AI may support risk identification and targeted support. The findings have implications for higher-education financial-aid policy, including Indonesia's Smart Indonesia Card for Higher Education (KIP Kuliah) program.

Keywords: Scholarship Loss; Student Dropout; Student Financial Aid; Student Retention; Systematic Literature Review

JEL Codes: I22, I23, I28

1. Introduction

Higher education is a major pathway for social mobility and human capital development, but its benefits can only be realized when students persist through graduation. Access to higher education, both for students from low-income families and high-achieving students, depends substantially on the availability of financial-aid schemes, including need- and merit-based assistance (Bernal et al., 2024; Agasisti et al., 2022). These schemes not only facilitate initial access but also support students' persistence toward degree completion.

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Scholarship status is generally not permanent. Changes in funding policies, declining academic performance, and administrative barriers may cause students to lose eligibility for scholarships that have supported their continued enrollment. Recent studies indicate that scholarship loss can constitute a critical point in students' educational trajectories and is associated with increased dropout risk, particularly among students from vulnerable groups (Quincho Apumayta et al., 2024; Siddiqui et al., 2026; Jansone et al., 2026; da Fonseca et al., 2026).

Previous studies suggest that the consequences of losing need-based scholarships differ from those associated with losing merit-based scholarships. The loss of need-based aid tends to affect students' financial security more directly, whereas the loss of merit-based aid is more often associated with academic adaptation strategies, such as reducing course loads or switching majors, which may in turn increase rather than reduce dropout risk (Chen et al., 2013; Cummings et al., 2022; Modena et al., 2023). These two pathways are often examined separately across different disciplines including education economics, educational psychology, and data science leaving an incomplete integrated understanding of the mechanisms, mediating factors, and effective interventions.

In Indonesia, similar challenges are also relevant to higher-education financial-assistance programs such as Kartu Indonesia Pintar (KIP) Kuliah. KIP Kuliah status is not permanent and may be revoked if students withdraw from higher education, change their study program or institution without official authorization, take academic leave outside the applicable provisions, or fail to improve their cumulative grade point average after receiving two semesters of academic support (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2022). Evidence from the field also indicates that students who fail to meet the administrative requirements of such assistance programs may face difficulties in paying tuition fees, potentially increasing the risk of withdrawal (Ombudsman Republik Indonesia, 2023). This context underscores the relevance of examining the relationship between scholarship loss and dropout risk, both internationally and within Indonesia's higher-education financing policy landscape.

Although scholarship and financial-aid research has examined access, persistence, academic performance, and student attrition, evidence specifically addressing the loss or revocation of need- and merit-based aid remains dispersed across education economics, higher-education research, educational psychology, and learning analytics. Three gaps are particularly relevant. First, these strands are rarely synthesized together to distinguish the financial pathway associated with need-based aid loss from the academic-adaptation pathway associated with merit-based aid loss. Second, studies of dropout mechanisms and predictive models are sometimes discussed alongside studies directly examining scholarship loss, although they provide different types and strengths of evidence. Third, the literature offers limited evaluation of whether early-warning systems and risk-identification tools lead to measurable improvements in retention. This review addresses these gaps through a thematic synthesis organized around five research questions. It distinguishes direct evidence from mechanism, intervention, and prediction evidence; compares the risk pathways associated with need- and merit-based aid; and identifies the gap between predicting dropout and demonstrating the effectiveness of responses. The review therefore maps what the literature can support directly and where conclusions must remain cautious.

RQ1: How does the loss of need- and merit-based scholarships relate to student dropout risk in higher education?

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RQ2: What distinguishes the effects of losing need-based scholarships from those of losing merit-based scholarships?

RQ3: What factors mediate the relationship between scholarship loss and student dropout risk?

RQ4: Which strategies and interventions have been shown to reduce dropout risk following scholarship loss?

RQ5: What research gaps remain in this area, and what are their implications for policy?

2. Research Method

This study employed a systematic literature review (SLR) with thematic/narrative synthesis to map and integrate empirical evidence across disciplines concerning the relationship between scholarship loss and student dropout risk in higher education. The review process followed principles of transparency and traceability in identifying, selecting, evaluating, and synthesizing the literature. The study-selection process followed PRISMA 2020 principles, and thematic synthesis was used because of heterogeneity in research designs, population characteristics, national contexts, types of financial aid, and operational definitions of student dropout.

The literature search was conducted in the Scopus database on September 10, 2026, with assistance from Scopus AI, an AI-based literature search and synthesis tool provided by Elsevier. The search query combined terms related to scholarships and financial aid, loss or termination of assistance, educational outcomes involving dropout or continued study, and the higher-education context: ("scholarship" OR "financial aid" OR "grant") AND ("loss" OR "cancellation" OR "revocation") AND ("dropout" OR "attrition" OR "retention" OR "persistence") AND ("higher education" OR "university" OR "college"). The search focused on publications relevant to the objectives of the review, which were subsequently verified based on titles, abstracts, and full texts where necessary.

The inclusion criteria were: (a) journal articles or scholarly conference proceedings indexed in Scopus; (b) a focus on higher education; (c) examination of the loss, revocation, termination, or change in eligibility status of scholarships or financial aid and its relationship to dropout, retention, or persistence; and (d) quantitative, qualitative, or mixed-methods research reporting empirical findings. Documents were excluded if they did not concern higher education, were opinion-based and lacked empirical data, lacked a substantive connection to scholarships or financial aid and retention-related outcomes, or were duplicates.

Study selection followed literature identification, title- and abstract-based screening, full-text eligibility assessment, and final inclusion of studies meeting the criteria for synthesis. Results retrieved through Scopus and assisted by Scopus AI were not treated as research evidence without verification; instead, the authors checked the abstracts and/or full texts of the relevant original sources. Accordingly, Scopus AI served as a tool for initial literature discovery and thematic mapping, while the authors made decisions about relevance, eligibility, and interpretation based on the original scholarly sources.

The review focuses on Scopus-indexed studies published between 2020 and 2026. Earlier publications cited in the manuscript, when retained, provide theoretical or contextual background and are not treated as studies included in the review corpus. Table 1 summarizes the scope of the review; Table 2 presents representative citations by theme rather than a complete article-by-article inventory.

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Table 1. Scope of the Literature Review

Aspect	Description
Publication period	2020–2026
Disciplines	Higher education, education economics, educational psychology, data science, policy analysis
Methodological approaches	Quantitative (machine learning, survival analysis, structural equation modeling), qualitative (interviews, ethnography), and mixed methods
Number of documents	The review corpus is defined by the stated eligibility criteria; Tables 2 and 3 present thematic synthesis and representative evidence, not a complete article-by-article count.
Database	Scopus, with Scopus AI supporting initial literature retrieval and thematic mapping

The analysis used thematic synthesis across five major domains that emerged consistently from the corpus: (1) the general impact of scholarship loss on student dropout; (2) differences between need- and merit-based scholarship effects; (3) factors that explain or shape the relationship between scholarship loss and dropout risk; (4) retention strategies and interventions; and (5) methodological approaches and research gaps. The fifth domain was subsequently divided into two subthemes: methodological approaches and research gaps.

To enhance the traceability of the synthesis, each document used in the discussion was classified according to its evidentiary function. Studies directly examining the relationship between scholarship or financial-aid loss and dropout, retention, or persistence were treated as direct evidence. Studies examining socioeconomic factors, academic performance, institutional support, social integration, or other factors related to dropout mechanisms were used as supporting evidence for the mechanisms underlying the relationship. Studies on early-warning systems, machine learning, predictive analytics, and explainable AI were used to support the synthesis of risk-identification strategies and retention interventions. This classification was intended to avoid assigning equivalent evidentiary weight to studies that directly tested scholarship loss and studies that provided contextual evidence concerning dropout risk.

As part of the verification process, the initial literature retrieval and thematic mapping assisted by Scopus AI were re-examined by the authors against the abstracts and/or full texts of each source to ensure relevance and accurate attribution of findings. The synthesis did not combine effect sizes through meta-analysis because of heterogeneity in research designs, national contexts, population characteristics, types of financial aid, and operational definitions of dropout. Thematic/narrative synthesis was therefore used to integrate patterns across the literature comparatively.

The methodological limitations of the review include reliance on a single primary database, the use of an AI-based tool during the initial literature-search and thematic-mapping stages, and heterogeneity in the quality and designs of the studies included in the corpus. These limitations were considered when interpreting the findings by distinguishing evidence directly concerning scholarship loss from evidence serving as mechanism, contextual, or intervention-related support. The number of included studies and the publication-year range should be checked against the final screening log and Supplementary Table S1 so that the reported corpus, Results, and reference list are consistent.

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3. Results And Discussion

This section presents a thematic synthesis of the reviewed literature and is organized into six subsections. Table 2 summarizes the main themes and provides representative citations; the number of citations displayed in each row should not be interpreted as the total number of studies reviewed. Figure 1 integrates the principal themes identified in the literature.

Table 2. Summary of Thematic Findings

Theme	Main finding	Representative references
General impact	Scholarship loss is associated with increased dropout risk, particularly among low-income and vulnerable students.	Salazar Cóndor (2022); da Fonseca et al. (2026); Kaur & Kumar (2026)
Need-based vs. merit-based	Loss of need-based scholarships has stronger financial implications for disadvantaged students; loss of merit-based scholarships is associated with risky academic adaptation.	Chen et al. (2013); Modena et al. (2023); Cummings et al. (2022)
Mechanisms and protective factors	Socioeconomic status, academic performance, institutional support, and social integration are associated with dropout risk and may function as protective factors.	Quincho Apumayta et al. (2024); Jacinto et al. (2026)
Interventions	Institutionally supportive retention programs and early risk identification may support retention, although effectiveness evidence is limited, particularly in the context of merit-based aid loss.	Jia (2019); Romero & Liao (2025)
Methodology	Predictive quantitative approaches show a strong presence; explainable AI may support model transparency and assessment of potential bias.	Nurmalitasari et al. (2023); Camargos & Silveira (2025)
Research gaps	Longitudinal and qualitative research on psychological, cultural, and community dimensions remains limited; mixed-methods approaches incorporating XAI are needed.	Kanzaki et al. (2020); Albugami et al. (2024); Keykha et al. (2026)

Figure 1 illustrates the relationships among the themes identified in the reviewed literature, including risk pathways, contextual and protective factors, and retention responses. It is an interpretive thematic synthesis rather than a causal model; arrows represent pathways discussed in the literature and should not be interpreted as causal effects established by this review.

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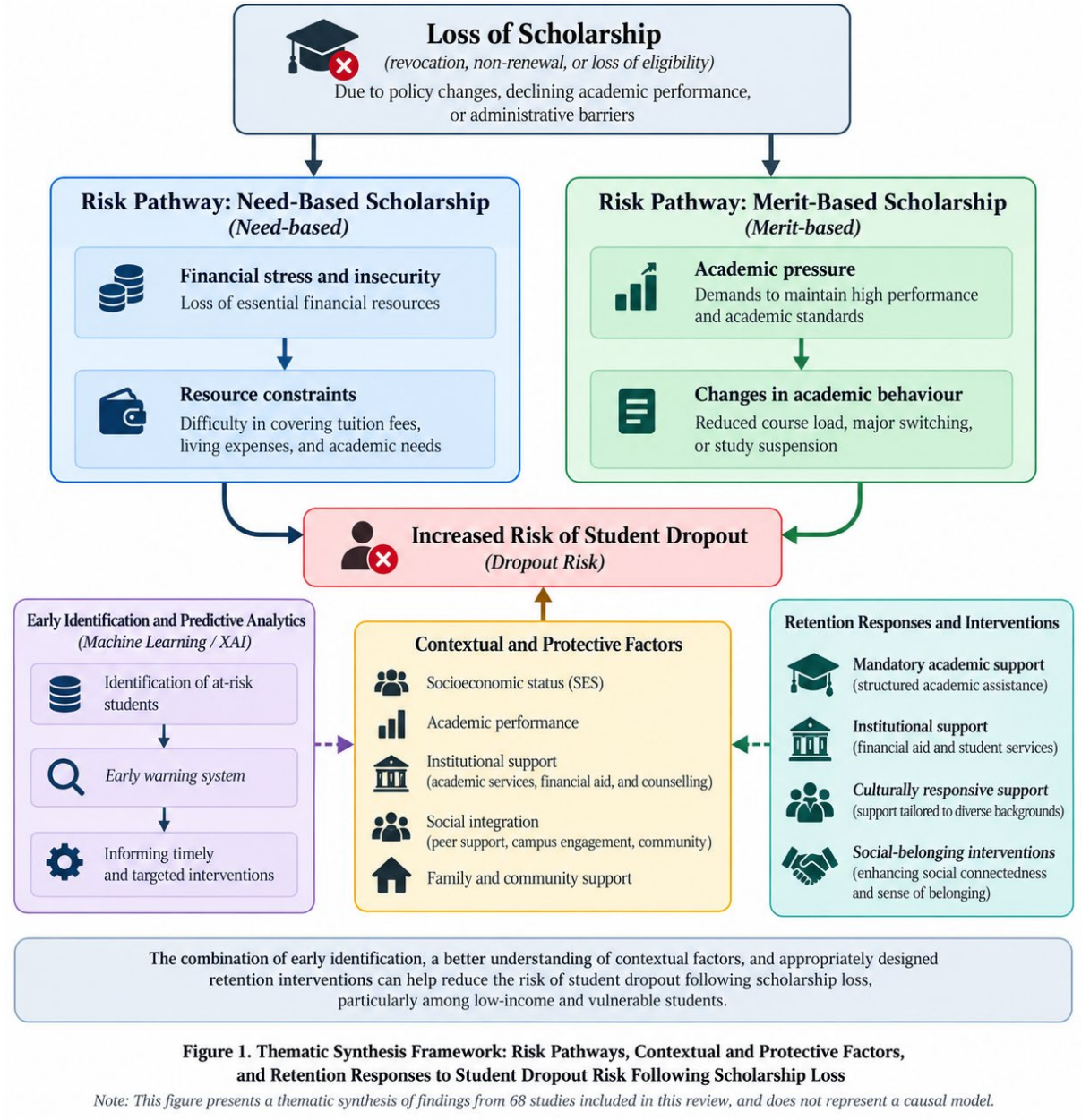


Figure 1. Thematic Synthesis Framework: Risk Pathways, Contextual and Protective Factors, and Retention Responses to Student Dropout Risk Following Scholarship Loss

Note: This figure presents a thematic synthesis of findings from 68 studies included in this review, and does not represent a causal model.

Figure 1. Thematic Synthesis Framework.

3.1 Impact of Scholarship Loss on Student Dropout Risk

Across the reviewed studies, a relatively consistent pattern emerges: the loss of scholarship status whether need- or merit-based is associated with increased dropout risk, with the most pronounced effects observed among students who are already vulnerable, including low-income students, Indigenous students, nontraditional students (older students), and students attending public institutions with limited resources (Salazar Cóndor, 2022; da Fonseca et al., 2026). Financial pressure and declining motivation are frequently identified as factors closely associated with dropout decisions, and scholarship loss may exacerbate both simultaneously (da Fonseca et al., 2026). Data-driven studies further indicate that academic performance and tuition-payment status are strong predictors of dropout, underscoring the importance of

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continuity in financial support (Kaur & Kumar, 2026).

Taken together, these findings point to a compounding pattern of vulnerability rather than a uniform dropout risk. Students who already occupy a precarious position because of low household income, first-generation status, or attendance at a resource-constrained institution appear to experience the loss of a scholarship not as an isolated financial event but as one additional strain layered onto pre-existing disadvantage. This compounding logic helps explain why the magnitude of the association between scholarship loss and dropout varies so widely across the reviewed studies: where a well-resourced institution can partially absorb the shock through emergency aid or advising, a resource-constrained institution frequently cannot, leaving the financial and academic consequences of scholarship loss to fall directly on the student. A further nuance concerns the temporal dimension of risk. Several of the reviewed studies suggest that the dropout risk associated with scholarship loss is not evenly distributed across a student's academic career, but tends to concentrate in the semesters immediately following the loss, before academic and social routines can adjust to the changed financial circumstances (Kaur & Kumar, 2026; da Fonseca et al., 2026). This suggests that the timing of institutional response not only its content may be as important as the type of support offered.

It is also worth noting that the overwhelming majority of the studies identifying this association rely on observational rather than experimental designs, meaning that the reported relationship between scholarship loss and dropout, while consistent in direction, should be interpreted as a robust association rather than unambiguous proof of a direct causal effect. Unobserved factors such as pre-existing financial fragility, family circumstances, or academic motivation may influence both the likelihood of losing a scholarship and the likelihood of dropping out, making it difficult to fully disentangle the causal contribution of scholarship loss itself from the broader circumstances that precede it. This caveat does not undermine the practical relevance of the findings for institutional policy, but it does suggest that claims about the precise magnitude of the causal effect of scholarship loss should be treated with appropriate caution.

Internationally, this pattern appears relatively consistent, although it varies across contexts. In Latin America, the cancellation of combined need- and merit-based scholarships has been associated with lower higher-education aspirations and increased dropout risk among low-income students (Bernal et al., 2024; Laajaj et al., 2022). In Europe, the expansion of merit-based scholarships has been associated with reductions in socioeconomic disparities in access, although gender and field-of-study disparities persist, with STEM students receiving greater benefits (Neumeyer, 2026). A study in Italy found that need-based grant allocation rules targeting students with greater potential for performance improvement were more effective in reducing dropout than merit-based targeting alone (Modena et al., 2023). In the United States, merit-based scholarships have increased enrollment yields among high-achieving students but may also encourage risky academic strategies that weaken study persistence (Zhang et al., 2006; Crowne, 2022).

The effects of scholarship loss also vary across fields of study and demographic groups. STEM students receiving merit-based scholarships tend to maintain higher grade-point averages but may also be more likely to leave academically demanding programs (Zhang et al., 2006). Post-scholarship-loss dropout risk is also higher in Education, Humanities, and Arts than in STEM fields (Salazar Cóndor, 2022), and varies by age, gender, minority status, and Indigenous background (Salazar Cóndor, 2022; Cummings et al., 2022). These findings highlight the need for support services tailored to the characteristics of high-risk groups (Combs et al., 2025).

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A closely related pattern concerns the compounding of vulnerability across multiple dimensions simultaneously. Several of the reviewed studies suggest that students who are low-income and Indigenous, or low-income and enrolled in a resource-constrained public institution, face materially higher dropout risk following scholarship loss than students who share only one of these characteristics (Salazar Cóndor, 2022; Cummings et al., 2022). This intersectional pattern is consistent with the broader observation that dropout risk following scholarship loss is not a fixed probability attached to scholarship type alone, but is instead shaped by how scholarship loss interacts with a student's existing socioeconomic and institutional context, reinforcing the need for support services that are tailored rather than uniform across student groups (Combs et al., 2025).

3.2 Differences Between Need- and Merit-Based Scholarship Effects

The reviewed literature indicates differences in the risk mechanisms associated with the loss of need-based and merit-based scholarships. Loss of need-based aid has stronger implications for low-income and vulnerable students because it directly removes essential financial resources, whereas loss of merit-based aid is more closely associated with behavioral and academic adaptations, such as reducing course loads and switching majors (Ahmed et al., 2022; Chen et al., 2013; Cummings et al., 2022). Tightening merit requirements within need-based aid can improve performance among high-ability students but, conversely, may reduce motivation and increase dropout risk among lower-ability recipients (Agasisti et al., 2022; Montalbán, 2023). Need-based aid schemes combined with performance incentives have been reported to be more effective in reducing dropout than merit-based targeting alone (Modena et al., 2023).

Students' academic ability and preparedness also appear to moderate the effects of scholarship loss. Higher-ability students tend to benefit from performance requirements, whereas lower-ability students may experience declining motivation and increased dropout risk (Agasisti et al., 2022; Modena et al., 2023).

The effects on low-income and minority students are also particularly salient. Loss of merit-based scholarships has been associated with significantly higher dropout rates among students in the lowest income groups, particularly in community colleges (Columbus et al., 2025; González Canché, 2023). Conversely, need-based aid has been shown to improve enrollment, persistence, and degree completion among low-income students, especially when combined with reasonable academic requirements (Fack & Grenet, 2015; Montalbán, 2023). Social-belonging interventions have also been shown to improve retention among underrepresented minority students (Patterson Silver Wolf et al., 2021).

An additional layer of nuance emerges when socioeconomic status and scholarship type are considered jointly rather than separately. Low-income students who hold merit-based scholarships appear to face a distinctive form of risk: because their eligibility depends on maintaining academic performance rather than demonstrated need, a temporary decline in grades whether due to financial stress, work obligations, or health-related disruptions can trigger the loss of aid even though the underlying need for financial support has not changed. This creates a feedback loop in which financial hardship increases the likelihood of academic underperformance, which in turn increases the likelihood of losing the very scholarship that was mitigating that hardship. Need-based scholarships, by contrast, are less vulnerable to this particular feedback loop because eligibility is typically tied to financial circumstances rather than academic performance, although they remain vulnerable to administrative and policy-driven forms of loss. This asymmetry suggests that merit-based aid, despite its intent to reward

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academic achievement, may inadvertently penalize the students most susceptible to short-term disruptions in performance precisely the students for whom continued enrollment is often most fragile.

In terms of academic strategies, students who lose merit-based scholarships may reduce their course loads or switch majors to maintain academic eligibility. These strategies can have mixed consequences: they may help students maintain academic standing but may also increase dropout risk, particularly in demanding fields of study (Zhang et al., 2006; Liu et al., 2021). Early academic-performance indicators, such as grade-point average and credit completion, remain critical predictors; declines in performance following scholarship loss may further increase this risk (Dorris et al., 2021).

These contrasting patterns carry an important implication for scholarship design: need-based and merit-based aid are not simply two variants of the same instrument but appear to operate through largely distinct causal pathways, and a single retention strategy is therefore unlikely to be equally effective for both types of recipients. For need-based recipients, the reviewed evidence suggests that interventions addressing the direct financial shortfall emergency grants, fee waivers, or transitional support are likely to be more consequential than academic coaching alone, because the mechanism at risk is resource adequacy rather than academic capability. For merit-based recipients, by contrast, the evidence points toward academic-adaptation behaviors reduced course loads, major switching, or strategic grade management as the proximate mechanism linking scholarship loss to dropout, which suggests that advising and course-planning support may be comparatively more consequential than direct financial assistance. This distinction also has a diagnostic implication for institutions seeking to monitor dropout risk: administrative indicators appropriate for one pathway, such as unpaid tuition balances for need-based aid, may be poor predictors for the other, such as changes in course load or major for merit-based aid, and risk-monitoring systems that rely on a single indicator type risk under-detecting one of the two populations.

The evidence also points to the importance of renewal-cycle design as a determinant of risk. Scholarships that are renewed annually based on a single grade-point-average threshold appear to generate sharper, more concentrated dropout risk at the point of renewal than programs that use rolling, probationary, or graduated renewal criteria, because a single threshold offers little room for temporary underperformance before aid is withdrawn entirely. Programs that instead provide a probationary period, partial aid reduction, or additional support before full withdrawal appear better positioned to retain students who experience a temporary rather than permanent decline in eligibility. This has a direct bearing on the design of KIP Kuliah and comparable Indonesian programs, where academic-support requirements are already structured around a defined support period before withdrawal, an approach broadly consistent with the graduated-renewal pattern associated with better retention outcomes in the reviewed literature.

3.3 Mechanisms and Factors Shaping Student Dropout Risk

Socioeconomic status and academic performance emerge as important factors explaining variation in dropout risk, while institutional support and vocational guidance may serve as protective factors (Quincho Apumayta et al., 2024; Marca Maquera et al., 2025). Parental motivation and household resources, including internet access, may also buffer dropout risk (Marca Maquera et al., 2025). Declining academic performance following scholarship loss is also associated with greater social isolation, which may in turn increase the likelihood of dropout (Valeeva et al., 2017; Salazar-Fernandez et al., 2025).

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Institutional support and retention programs play important roles in reducing dropout risk following scholarship loss. Academic, emotional, and logistical support programs are identified as important components (Romero & Liao, 2025; Montalbán, 2023; Martínez Rojas et al., 2025), while early identification of at-risk students and holistic support covering academic, financial, and social dimensions are emphasized as key elements of dropout prevention (Siddiqui et al., 2026; Jansone et al., 2026). Conversely, weak institutional support and limited retention efforts are associated with higher dropout risk (Odak et al., 2023).

The specific form that institutional support takes also appears consequential. Programs that provide only generic advising, without connecting students explicitly to the reasons their scholarship was affected, tend to be less effective than those that combine academic advising with concrete steps toward aid renewal or alternative funding (Romero & Liao, 2025; Martínez Rojas et al., 2025). This suggests that the perceived relevance of institutional support whether students see it as directly addressing their situation rather than as a generic service may matter as much as the resources allocated to the program itself.

Social integration and peer support also emerge as important protective factors. Peer support and a sense of belonging are associated with lower dropout intention, both directly and through improved subjective well-being (Jacinto et al., 2026; Berríos-Riquelme et al., 2025). Integration with peers and supportive academic environments are associated with lower dropout rates (Franz & Paetsch, 2023; Bulotaitė et al., 2024), while social support moderates the relationship between burnout, academic pressure, and dropout intention (Mostert & Pienaar, 2020). Parental motivation and household resources including higher family socioeconomic status and access to technology may also support students' persistence following scholarship loss (Lavecchia et al., 2016).

Across these studies, socioeconomic status, academic performance, institutional support, and social integration do not appear to operate independently but rather interact with one another in shaping dropout risk. A student with strong social integration but weak institutional support, for instance, may still be at elevated risk if peer networks alone cannot substitute for structured academic or financial guidance; conversely, strong institutional support appears to be more effective when it is complemented by opportunities for social belonging rather than delivered as a purely administrative service. This interdependence suggests that the mechanisms identified in the reviewed literature are better understood as a layered protective system than as a checklist of independent risk factors. It also implies that institutions seeking to reduce dropout risk following scholarship loss may achieve more durable results by coordinating financial, academic, and social support simultaneously rather than addressing them through separate, uncoordinated programs an implication that is consistent with the finding that weak institutional support and limited retention efforts are jointly associated with higher dropout risk (Odak et al., 2023).

3.4 Targeted Retention Strategies and Interventions

Retention programs that demonstrate institutional care and provide academic-skill development may improve outcomes for students who lose merit-based scholarships, while policy features such as greater flexibility in renewal requirements and more generous scholarship amounts are also associated with improved retention (Jia, 2019).

For Indigenous and other vulnerable students, comprehensive, culturally responsive, and community-based retention strategies including social support, cultural awareness, and flexible

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approaches to course delivery have been reported to reduce dropout risk (Bruce, 2024; Sharrock & Lockyer, 2008; da Silva Izepato et al., 2026). Family and community support, institutional recognition of culture, and tailored support systems are identified as essential elements (Rousey & Longie, 2001; López-López et al., 2026). Scholarship receipt itself has been associated with a reduction in the likelihood of dropout of nearly 40%, whereas scholarship loss is associated with a significant increase in risk, particularly among vulnerable groups (Romero & Liao, 2025).

These culturally responsive approaches also illustrate a broader principle evident across the intervention literature: retention strategies tend to be more effective when they are adapted to the specific social and cultural context of the population they serve, rather than applied as a standardized template across all student groups. A support program that succeeds for Indigenous students by incorporating cultural recognition and community engagement, for instance, may not transfer directly to first-generation, low-income students in an urban commuter institution, whose barriers are more likely to be logistical and financial than cultural. This suggests that institutions implementing retention strategies following scholarship loss should treat program design as an adaptive process informed by the specific composition and needs of their student population, rather than as a one-time adoption of practices documented as effective elsewhere.

Early-warning practices also emphasize the role of machine learning and predictive analytics in identifying at-risk students at an early stage so that timely and tailored interventions can be implemented (Minirani et al., 2025). Multitiered support frameworks, such as the Multi-Tiered System of Support (MTSS) and the 4T-CABS model, combine universal screening with targeted interventions (Stegers-Jager et al., 2017). Combining objective data (administrative databases) with subjective data (questionnaires) may also improve the effectiveness of risk identification and intervention (Paija et al., 2026).

An important pattern across the intervention literature is the distinction between reactive and proactive retention strategies. Reactive strategies such as retention programs activated only after a student has already lost a scholarship or shown signs of academic difficulty appear consistently in the reviewed studies, but they intervene relatively late in the risk trajectory, after financial or academic strain has already accumulated. Proactive strategies, by contrast, such as early-warning systems and multitiered support frameworks, are designed to identify at-risk students before a crisis point is reached, which the reviewed evidence suggests may allow lighter-touch, less costly interventions to be effective (Minirani et al., 2025; Stegers-Jager et al., 2017). This distinction has direct relevance for resource-constrained institutions, including many in the Indonesian higher-education system, where the cost of large-scale reactive retention programs may be prohibitive but the cost of an early-warning system built on existing administrative data may be comparatively modest. At the same time, the reviewed literature offers relatively little evidence on the long-term sustainability of these interventions once initial funding or pilot-program support ends, which represents a gap between demonstrated short-term effectiveness and confirmed long-term institutional viability.

3.5 Methodological Approaches and Research Gaps

Methodologically, research in this domain shows a strong tendency toward predictive quantitative approaches, including Random Forest, XGBoost, and TabNet, as well as survival analysis and structural equation modeling for predicting student dropout risk (Nurmalitasari et al., 2023; Hinojosa et al., 2022; Paura et al., 2025; Sosa-Alonso et al., 2026). These predictive models commonly combine academic, socioeconomic, demographic, and financial variables,

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with scholarship status serving as one of the key predictors (Quincho Apumayta et al., 2024; Romero & Liao, 2025; Vo et al., 2026). Some studies use causal-inference methods, such as propensity score matching, to estimate the effects of scholarship receipt on student dropout (Romero & Liao, 2025).

Geographically, the reviewed corpus is also unevenly distributed: a substantial share of the predictive-modeling studies originate from contexts with well-developed administrative data infrastructure, such as large public university systems in the United States, parts of Europe, and increasingly Latin America, while studies from Southeast Asia including Indonesia remain comparatively scarce. This imbalance matters because predictive models trained on administrative data from one institutional and policy context may not transfer well to a different context, particularly where data infrastructure, scholarship eligibility rules, or student demographics differ substantially. For Indonesian higher-education institutions considering the adoption of predictive or early-warning systems, this suggests a need for local validation and recalibration rather than direct adoption of models developed elsewhere.

In contrast, qualitative and mixed-methods studies using semi-structured interviews, ethnography, and thematic analysis identify motivational, health-related, financial, social, and institutional factors that influence student dropout (Odak et al., 2023; Spanu & Chicioreanu, 2020). Longitudinal qualitative research highlights the importance of sociocultural norms and structural constraints (Keykha et al., 2026), while mixed-methods studies combining surveys, registration data, and interviews can capture the complexity of dropout decisions more comprehensively (Lykkegaard & Qvortrup, 2024). Nevertheless, qualitative and mixed-methods studies remain substantially less common than predictive quantitative studies.

Explainable artificial intelligence (XAI), including SHAP and LIME, has emerged as a promising approach for improving model interpretability and transparency, supporting the assessment of potential bias in predictive-model applications, and generating actionable insights for scholarship-related interventions (Camargos & Silveira, 2025; Unnati et al., 2026; Moon & Lee, 2026). XAI can help identify key risk factors such as attendance, academic performance, family income, and tuition-payment status and support the design of equity-oriented policies (Phung, 2026; Silva et al., 2025). Hybrid models and user-friendly dashboards may further improve accessibility for nontechnical users and facilitate early intervention (Buñay-Guisñan et al., 2026).

The most prominent research gaps are the limited integration of qualitative perspectives and insufficient attention to psychological, cultural, and community factors (Kanzaki et al., 2020; Albugami et al., 2024; Keykha et al., 2026). Transdisciplinary, longitudinal, and mixed-methods research is needed to develop a more comprehensive understanding of student dropout dynamics and to inform policy (Kanzaki et al., 2020). In addition, relatively few studies evaluate the effectiveness of interventions after risk identification; frameworks for translating predictive results into measurable outcomes remain underdeveloped (Schmidt et al., 2025).

This methodological imbalance has substantive, not merely technical, consequences for the field's understanding of scholarship-related dropout. Predictive quantitative studies are well suited to identifying which students are statistically at risk and with what probability, but they are comparatively poorly suited to explaining why a given student, once flagged as at risk, ultimately does or does not withdraw. Qualitative and mixed-methods studies, though less numerous, are the primary source of insight into these explanatory mechanisms for example, how students interpret the loss of a scholarship, how family expectations shape their response,

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or how institutional communication about aid renewal is experienced yet they remain a minority of the corpus reviewed here. This creates a risk that predictive systems, however statistically accurate, are deployed without a clear understanding of which interventions will actually change student behavior once risk has been identified. The relative scarcity of intervention-evaluation studies compounds this concern: a system that accurately predicts dropout risk offers limited practical value if it is not paired with evidence on which responses are effective for the specific population it identifies. Closing this gap between prediction and actionable intervention therefore appears to be one of the more consequential priorities for future research in this area.

Viewed as a whole, the synthesis in this section suggests that scholarship loss functions less as a single trigger for dropout and more as an entry point into a broader risk process shaped by financial capacity, academic adaptation, institutional response, and social support. The five research questions guiding this review are therefore best understood not as independent lines of inquiry but as interconnected facets of the same underlying phenomenon: RQ1 and RQ2 establish that scholarship loss matters and that its effects differ by type; RQ3 identifies the mechanisms through which that effect is transmitted; RQ4 identifies where institutions can intervene in that transmission process; and RQ5 identifies where the evidence base supporting such interventions remains thin. This integrated reading is intended to inform the policy implications discussed in the following section.

4. Policy Implications For Higher Education And Indonesia

The synthesis above yields several policy implications. First, scholarship programs should consider prioritizing need-based targeting, applying performance incentives cautiously, and allowing sufficient flexibility to balance equity and efficiency (Modena et al., 2023). Greater flexibility in renewal requirements and adequate scholarship amounts are associated with improved retention and degree completion (Jia, 2019). Second, strengthening institutional support through integrated academic, financial, and social support systems, early-warning mechanisms, and culturally responsive interventions is important (Montalbán, 2023; Stegers-Jager et al., 2017). Third, higher-education institutions may invest in predictive analytics and multitiered support frameworks to identify and assist at-risk students more proactively. Fourth, equity for vulnerable groups including low-income students, minority students, and Indigenous students should be supported through fair, transparent, and culturally responsive policies, together with family and community engagement (Salazar Cóndor, 2022; Romero & Liao, 2025; Pusztai et al., 2022).

Operationalizing these implications requires institutions to first identify which mechanism is most salient for a given group of recipients before selecting an intervention, rather than applying a uniform retention strategy across all scholarship holders. For example, an institution observing that most scholarship losses among its need-based recipients are driven by unpaid tuition balances would be better served by expanding emergency financial assistance than by expanding academic advising capacity, whereas an institution observing that most losses among merit-based recipients follow declining grades in specific high-demand courses would be better served by targeted academic support in those courses. This diagnostic step identifying the dominant mechanism before designing the intervention appears to be a precondition for the effectiveness of any of the strategies discussed above, yet it is rarely made explicit in the reviewed literature.

In the Indonesian context, these findings are relevant to strengthening the governance of higher-education financial-assistance programs such as KIP Kuliah. The policy of providing two

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semesters of mandatory academic support before scholarship withdrawal (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2022) reflects an institutionally supportive approach to retention. This policy could be further supported by data-based early-warning systems (predictive analytics) and XAI approaches to identify at-risk students more precisely and transparently (Romero & Liao, 2025; Phung, 2026), alongside psychosocial support and stronger social integration, given the relevance of these factors to student persistence and dropout risk (Jacinto et al., 2026; Berríos-Riquelme et al., 2025).

These implications are not mutually exclusive and are likely to be most effective when pursued together rather than in isolation. A need-based targeting reform implemented without a corresponding early-warning system, for example, may still leave institutions unable to identify which students are approaching a renewal deadline without adequate academic progress; conversely, an early-warning system implemented without a flexible renewal policy may correctly identify at-risk students but offer institutions little room to act on that information before scholarship withdrawal becomes automatic. For the Indonesian context specifically, this suggests that KIP Kuliah and similar programs may benefit from treating academic-support requirements, predictive monitoring, and psychosocial support not as separate policy levers but as components of a single, coordinated retention architecture an approach that would also allow institutions to allocate limited administrative resources more efficiently by targeting the specific mechanism, whether financial, academic, or social, most relevant to each recipient's risk profile.

Table 3 synthesizes these findings against the five research questions guiding this review, distinguishing the type of evidence available for each and its interpretive weight.

Table 3. Evidence Synthesis Matrix

RQ	Synthesis focus	Evidence type	Main finding	Interpretation
RQ1	Impact of scholarship loss	Direct evidence	Scholarship loss is associated with increased dropout risk	Relatively consistent
RQ2	Need-based vs. merit-based	Direct + mechanism evidence	Need-based → financial pressure; merit-based → academic adaptation	Different mechanisms are evident
RQ3	Factors shaping risk	Mechanism evidence	SES, academic performance, institutional support, social integration	Related/protective factors
RQ4	Retention intervention	Intervention evidence	Institutional support may contribute to retention; the strength of intervention-effectiveness evidence varies	Evaluative evidence remains limited
RQ4	Early warning	Prediction evidence	ML/analytics support identification of at-risk students	Not direct evidence of reduced dropout
RQ5	Research gap	Gap evidence	Limited longitudinal, qualitative, mixed-methods research and post-intervention evaluation	Priority area for future research

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5. Conclusion

This systematic review indicates that scholarship loss, whether involving need- or merit-based aid, is associated with student dropout risk in higher education through multidimensional mechanisms. Need-based scholarships appear particularly protective for vulnerable students, whereas loss of merit-based scholarships is often associated with academic adaptations that do not necessarily prevent dropout. These risks are related to socioeconomic conditions, academic performance, institutional support, and social integration, which function as mechanisms or protective factors in supporting study persistence.

Methodological approaches continue to evolve, particularly through the use of explainable artificial intelligence (XAI), which offers opportunities for earlier risk identification and more targeted interventions, although substantial research gaps remain regarding psychosocial and cultural dimensions.

A recurring theme across the reviewed literature is that dropout risk following scholarship loss is rarely attributable to a single cause, but instead emerges from the interaction of financial, academic, and social factors that accumulate over time. This has an important practical implication: interventions that treat scholarship loss as a purely financial event, or purely an academic one, are likely to address only part of the underlying risk. The findings synthesized in this review therefore point toward retention strategies that are deliberately multidimensional, sequenced to intervene before rather than after a crisis point, and calibrated to the specific mechanism financial, academic, or social most relevant to a given student population.

By integrating evidence from education economics, educational psychology, and data science, this review also illustrates the value of cross-disciplinary synthesis for problems that no single field addresses fully on its own. Economic studies clarify the financial mechanisms linking aid loss to withdrawal, psychological and sociological studies clarify the motivational and social mechanisms, and data-science studies clarify how these risks can be identified and monitored at scale. None of these perspectives alone offers a complete account of scholarship-related dropout, and the findings synthesized here suggest that future research, as well as future policy design, stands to benefit from deliberately combining these perspectives rather than treating them as separate literatures.

For higher-education administrators and policymakers including those responsible for KIP Kuliah and comparable financial-aid schemes in Indonesia the review suggests: (a) prioritizing need-based aid designs with proportionate performance incentives; (b) providing structured academic support before aid withdrawal; (c) integrating data-based early-warning systems; and (d) strengthening psychosocial support and social integration for financial-aid recipients.

Future research should integrate longitudinal qualitative investigations of psychological, cultural, and community dimensions; develop mixed-methods approaches that combine XAI with in-depth qualitative insights; and evaluate the effectiveness of interventions tailored to vulnerable groups and specific institutional contexts. This review is limited by its reliance on a single database (Scopus), the use of an AI-based system during initial literature identification, and the absence of a formal quality appraisal or risk-of-bias assessment of the included studies. Future reviews should strengthen the evidence base through a formal PRISMA protocol and flow diagram, dual independent review, systematic quality or risk-of-bias assessment, and the inclusion of additional databases (e.g., Web of Science, ERIC, or Indonesian databases such as Garuda/Sinta).

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