

What's going on? A systematic literature review of the causes and consequences of teacher shortages

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Abstract: This systematic review examines factors associated with teacher shortages in developed countries. Searches in Scopus, Web of Science, and ERIC (2007–2024) yielded 1,608 unique records, of which 47 met inclusion criteria after quality appraisal. Using thematic synthesis across the teacher pipeline, we identified four clusters of associated factors: career conditions, classroom issues, demographics, and teacher well-being. Evidence consistently links low relative pay, administrative burden, insufficient support, and early-career stress to higher attrition and turnover. Consequences concentrate in reduced instructional quality, increased workload, and educational inequality. By positioning these findings against prior reviews and international data, the study advances understanding of how shortages emerge and how they affect students, teachers, schools, and society. The review highlights the need for evidence-informed strategies to support teacher recruitment and retention, and points to directions for future research and policy in teacher education and the wider profession.

Keywords: Teacher shortage; Teacher pipeline; Recruitment; Retention; Systematic literature review

1. Introduction

In recent years, many countries worldwide have experienced significant teacher shortages across all educational levels. This issue has reached critical proportions in several developed nations, where a complex set of factors, including inadequate teacher training, increased teacher attrition rates, and changing educational policies, have contributed to the growing crisis in the teaching profession (OECD, 2023). The shortage of teachers is particularly pronounced in

subjects such as science, technology, engineering and mathematics (STEM), special education, and rural areas, where demand far exceeds supply (UNESCO, 2024; Sutchter et al., 2019). Moreover, demographic shifts, such as ageing teaching populations and increasing student numbers, have further exacerbated this situation (UNESCO, 2024; Sutchter et al., 2019). However, the shortage is growing at all levels of education, from primary to tertiary, highlighting the urgent need for a deeper understanding of the factors at



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play.

Teacher shortages are not confined to a single region but are reported across many parts of the world. While the issue is widely recognised, the scale and nature of the challenges vary considerably between countries and contexts. In the Netherlands, for example, the teacher shortage has become a pressing concern too, impacting all levels of education. Here, factors such as low enrolment in teacher training programs, high drop-out rates, and an ageing teaching workforce have contributed to this crisis (Commissie Rinnooy Kan, 2007). This shortage is compounded by high attrition rates, driven by work pressure, demographic shifts, and socio-economic challenges faced by teachers, all of which are further complicated by policy decisions that have not sufficiently addressed the profession's quantitative and qualitative needs (UNESCO, 2024).

While much research has been conducted on teacher shortages, existing studies often have limitations that hinder a comprehensive understanding of the problem. Many literature reviews and studies focus on specific national or regional contexts, such as those in the United States (e.g., Billingsley & Bettini, 2019; Gooden et al., 2023), or specific educational settings, such as STEM or special education (e.g., Dreer, 2021; Peyton et al., 2021). These reviews, while valuable, fail to capture the broader scope of the teacher shortage crisis across developed countries. Moreover, several existing overview studies are geographically limited, focusing on rural areas (e.g., Rhinesmith et al., 2023) or generation-specific challenges (e.g., Gen Z teachers, Eckert, 2020), whereas others primarily emphasize the quantitative aspects of the issue, such as the number of teachers needed or the extent of the shortage, without addressing the underlying causes and far-reaching consequences (e.g., Garcia & Weiss, 2019). In general, many studies fail to provide a broad and deep analysis of the complex and multifaceted nature of the teacher shortage.

This review therefore narrows its scope deliberately to developed countries. These contexts share relatively comparable socio-economic conditions, educational systems, and data availability, making cross-country synthesis both feasible and meaningful. At the same time, teacher shortages in these countries are substantial enough to warrant attention, as evidenced by OECD and UNESCO projections. The aim of this

systematic literature review is therefore to explore and analyse the causes and consequences of teacher shortages in developed countries, which remain insufficiently integrated across contexts. Understanding these factors is critical to developing effective policy interventions that can address the root causes of the crisis and ultimately help find solutions to address the teacher shortage (Garcia & Weiss, 2019; Håkansson Lindqvist & Gidlund, 2024). By focusing on the underlying causes and far-reaching consequences, this review seeks to provide a comprehensive framework that can inform future research and policy decisions.

2. Theoretical Background

2.1 Defining Teacher Shortages

Teacher shortages are multifaceted issues that can be defined in terms of both quantity and quality. From a quantity perspective, a teacher shortage arises when the number of available teachers falls short of the required number to fill teaching positions within a given educational context (Boe, 1996). This definition is rooted in the distinction between teacher need (the desired number of teachers based on student enrolment and teacher–pupil ratios) and teacher supply (the number of teachers available to fill these positions). A shortage in this sense reflects a *quantity* teacher shortage, which is calculated as the number of unfilled teaching positions.

In contrast, *quality* teacher shortage refers to the gap between the qualifications required for teaching positions and the qualifications of available teachers (Boe, 1996). This type of shortage is particularly pronounced when teachers lack the necessary certifications, training, or expertise specific to the subject areas or educational levels in which they are assigned. The quality teacher shortage is significant when, even if there are enough teachers in gross numbers, many do not meet the required standards for their specific teaching assignments.

Research by Boe (1996) underscores that the shortage of these qualified teachers is particularly pressing in certain contexts. The findings revealed that the shortage of qualified teachers was more pronounced among teachers who had not earned degrees in teacher preparation, novice teachers upon entering the profession, employed teachers who had recently changed their teaching assignments (either the subject

matter or school, or both), and teachers of students with disabilities, particularly in special education roles.

Thus, the teacher shortage issue involves not only the question of how many teachers are available but also whether they are adequately prepared to meet the demands of specific teaching assignments. Both the quantity and quality dimensions of teacher shortages highlight the need for targeted interventions to ensure that sufficient qualified teachers are recruited and retained across all subject areas and educational settings.

2.2 Quantity Teacher Shortages Worldwide and in Developed Countries

Teacher shortages are a widespread challenge. According to the UNESCO Global Report on Teachers (2024), 44

million additional teachers will be required globally by 2030 to achieve universal primary and secondary education. This gap is driven primarily by a growing school-age population and high attrition rates, with many teachers leaving the profession due to low wages, challenging working conditions, and insufficient support.

Table 1 shows the regional distribution of recruitment needs. Shortages are not confined to low-income regions: in Europe and Northern America, projections suggest that many countries will fail to meet future demand. This underlines that teacher shortages are a structural issue also in developed contexts (UNESCO & International Task Force on Teachers for Education 2030, 2024; OECD, 2023).

Table 1 Teacher recruitment needs and the expected success rate

Region	Sector ^a	Teachers in 2022(in million)	Additional teachers needed for 2030 (in million)	Countries expected to meet the needs by 2030	Countries not expected to meet the needs by 2030
Europe and Northern America	PRI	4.9	1.7	38%	62%
	SEC	7.8	3.1	25%	75%
Worldwide	PRI	33.7	12.9	40%	60%
	SEC	39.4	31.1	16%	84%

Note. Data were obtained from the *Global Report on Teachers. Addressing teacher shortages and transforming the profession*, by UNESCO and Education 2030, 2024, pp. 36-38. Copyright 2024 by UNESCO.

^a PRI = primary education, SEC = secondary education.

According to UNESCO projections, global teacher recruitment needs are unlikely to be met by 2030. In Europe and Northern America, regions that fall within the scope of this review, success rates are expected to remain relatively low, with only 38% of countries projected to meet primary-level needs and 25% at the secondary level (UNESCO & International Task Force on Teachers for Education 2030, 2024). This highlights the ongoing challenges these developed regions face in addressing shortages, despite their comparatively greater resources.

Challenges are also evident in higher education. For example, in the United States, teacher preparation programmes experienced a 32% drop in enrolments between 2012–2013 and 2018–2019, accompanied by a 28% decline in degree completions. Moreover, 51% of teacher vacancies in higher education were due to attrition and 21% to retirement (Slichko et al., 2023). Such figures underscore that teacher shortages affect the entire pipeline, from initial preparation through retention, and emphasise the need for systemic solutions across all educational levels

In this review, we build on these global insights but deliberately narrow our scope to developed countries. Developed countries typically have similar economic conditions, such as stable GDPs, well-established education systems, and comparable public funding mechanisms for education (World Population Review, 2024). These commonalities allow for a more consistent analysis of teacher shortages, as the underlying factors, such as demographic shifts, teacher salaries, and educational policies, operate within similar frameworks. The countries included are listed in Appendix X (World Population Review, 2024).

2.3 Teacher Shortages across the Teacher Pipeline

The teacher shortage is a multifaceted issue that spans the entire teacher pipeline, affecting recruitment, pre-service teacher training, and in-service teacher retention. The concept of the "leaky pipeline" aptly describes the flow of teachers through these stages, where teachers are lost at various points along the way before they can complete their career trajectory (Barth et al., 2016). As highlighted in the UNESCO Global Report on Teachers (2024), teacher shortages

are a result of systemic challenges at each stage of the teacher pipeline, which can be visualized as a series of

interconnected phases (see **Figure 1**).

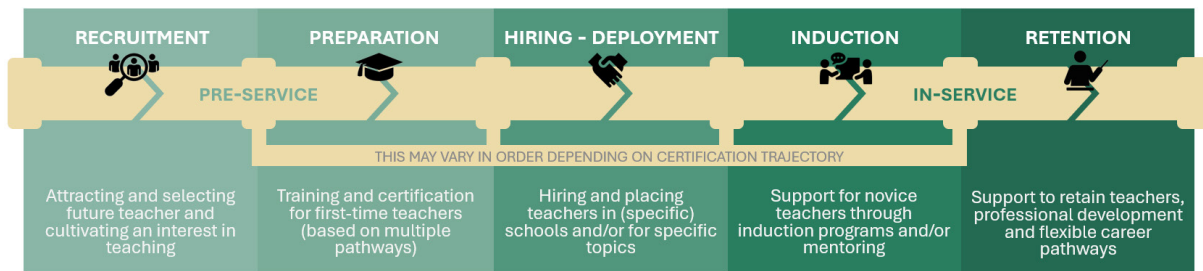


Figure 1. Teacher pipeline

Recruitment phase: One of the most pressing issues contributing to the teacher shortage is the significant decline in the number of students enrolled in teacher preparation programs. This trend has been observed for several years, with fewer high school graduates choosing teaching as a career path (Slichko et al., 2023). Economic pressures and alternative career opportunities with higher salaries are key factors influencing this decline (Ashiedu & Scott-Ladd, 2012). In many cases, prospective teachers are deterred by the prospect of low wages and high student debt, opting for professions with more attractive financial incentives (Ingersoll & Perda, 2010).

Pre-service teacher training: Even among those who do enrol in teacher preparation programs, a considerable number decide not to enter the profession upon graduation. Many of these individuals are deterred by the financial burden of student loans, low initial salaries, and a lack of confidence in their preparedness for the classroom. According to a study by Moeller et al. (2016), financial concerns such as low starting pay and the need to repay student loans were cited as primary reasons for not pursuing teaching positions. Pre-service teachers also often face significant workloads due to the combination of theoretical coursework, practical teaching placements, and the emotional demands of teaching (Bakar & Rauf, 2020).

In-service teacher retention: Teacher shortages are further exacerbated by high attrition rates among those already in the profession. Experienced teachers, particularly those in high-needs subject areas such as STEM and special education, often leave the profession because of factors such as work stress, a lack of administrative support, and poor compensation (Ingersoll & Strong, 2011). According to Slichko

et al. (2023), high turnover rates among teachers are especially problematic in schools that serve disadvantaged communities, as these schools are more likely to employ teachers who are less qualified or who have not completed formal certification.

As illustrated in **Figure 1**, these stages are interconnected, with challenges at each phase compounding the overall teacher shortage. The gaps at each point in the pipeline, from recruitment through to retention, contribute to the widening deficit of qualified teachers. The figure highlights the critical need for systemic interventions at all stages to address these gaps and ensure a sustainable supply of qualified teachers in the long term.

2.4 This Study

As mentioned before, substantial research has focused on specific aspects of teacher shortages, such as the causes or effects on teacher workload, whereas comprehensive, holistic overviews that integrate the various dimensions of this issue, including its causes and consequences, are lacking. This gap becomes especially evident in international comparisons between developed countries, where context-specific studies often focus on isolated elements of the problem. For example, deep analyses of workload or specific policy interventions are common, as are studies on shortages in certain subjects or regions. However, many of these studies are limited in scope, focusing on a single country or education sector (e.g., primary or secondary education), without systematically comparing the effectiveness of solutions across different nations.

The aim of this systematic literature review is to explore and analyse the causes and consequences of teacher shortages, which remain insufficiently addressed in a global context. The main research question for this review is as follows: *What is known about the causes*

and consequences of teacher shortages in primary, secondary, vocational, higher, and special education in developed countries since 2007?

3. Methods

A systematic review was conducted to investigate the causes and consequences related to teacher shortages in developed countries, with a focus on primary, secondary, higher, and special education.

3.1 Search Strategy

A comprehensive search was performed across three databases: Scopus, Web of Science, and ERIC. Initially, a search strategy was developed that combined several key terms and their synonyms, encompassing various concepts related to ‘teacher shortage’ (e.g., ‘teacher deficit’, ‘lack of teachers’), as well as terms associated with ‘primary education’, ‘secondary education’, ‘developed economies’, and variations in ‘causes’ and ‘consequences’. The objective was to identify studies addressing these specific dimensions.

However, during the initial screenings, it became apparent that this focused approach led to the omission of some relevant studies, likely due to variability in how the issue of teacher shortages was described in the academic literature, without necessarily incorporating broader contextual terms such as ‘primary’ or ‘secondary education’. To mitigate this limitation, the search strategy was adjusted to include only the core term ‘teacher shortage’ and its synonyms (‘teacher deficit’, ‘lack of teachers’, ‘educator shortage’, ‘educator deficit’, and ‘lack of educators’). By simplifying the search terms, the aim was to capture all potentially relevant studies and minimize the risk of overlooking important research on teacher shortages across various educational contexts and geographical regions. The refined search query was subsequently translated into inclusion criteria for the review of abstracts.

The searches were limited to peer-reviewed articles and research reports in English or Dutch, covering the period from 2007-2024. This time span from 2007-2024 is based on the 2007 report by the Rinnooy Kan Committee (2007), which highlighted an increasing and urgent shortage of qualified teachers, considered a threat to the Dutch knowledge economy. This year marks a critical starting point for examining the structural causes and potential solutions to the teacher shortage.

3.2 Inclusion Criteria and Exclusion Criteria

Studies were included if they empirically examined the causes and consequences of teacher shortages; were conducted in developed countries; and covered all educational levels. Studies were excluded if they lacked empirical data, focused on developing countries, or did not provide relevant insights into teacher shortages.

During abstract and full-text screening, these criteria were applied iteratively using active learning-based screening in ASReview. At the full-text stage, studies were excluded when they did not empirically address teacher shortages or their causes or consequences, focused on non-developed country contexts, consisted primarily of conceptual or opinion-based discussions, or lacked sufficient methodological or reporting detail to extract relevant information on the teacher pipeline, causes, or consequences.

Because ASReview supports iterative decision-making rather than fixed sequential exclusion steps, exclusion decisions were not recorded as mutually exclusive categories with exact counts. However, all full-text inclusion and exclusion decisions were discussed between the authors to ensure consistent application of the predefined criteria.

3.3 Screening and Selection

Figure 2 shows the selection process of this literature review. The initial search yielded 1,608 unique records: 1,426 from ERIC, 283 from Scopus, and 201 from the Web of Science. We used ASReview software for active learning-based screening, following the SAFE procedure of Boetje et al. (2024). We set up ASReview using TF-IDF for extracting features from the data, a naive Bayes classifier for making predictions, a maximum query strategy for selecting the most informative samples, and dynamic re-sampling (double) to maintain a balanced dataset. First, 1% of the dataset was manually scanned together to identify an initial relevant abstract, ensuring consensus before proceeding. This trained the ASReview model, which was then used for active learning-based screening. Screening proceeded until 404 abstracts (25.1%) were reviewed, ceasing after encountering 60 consecutive irrelevant abstracts, as specified by SAFE heuristics. A total of 102 abstracts (6.3%) were deemed relevant and were included in the full-text review.

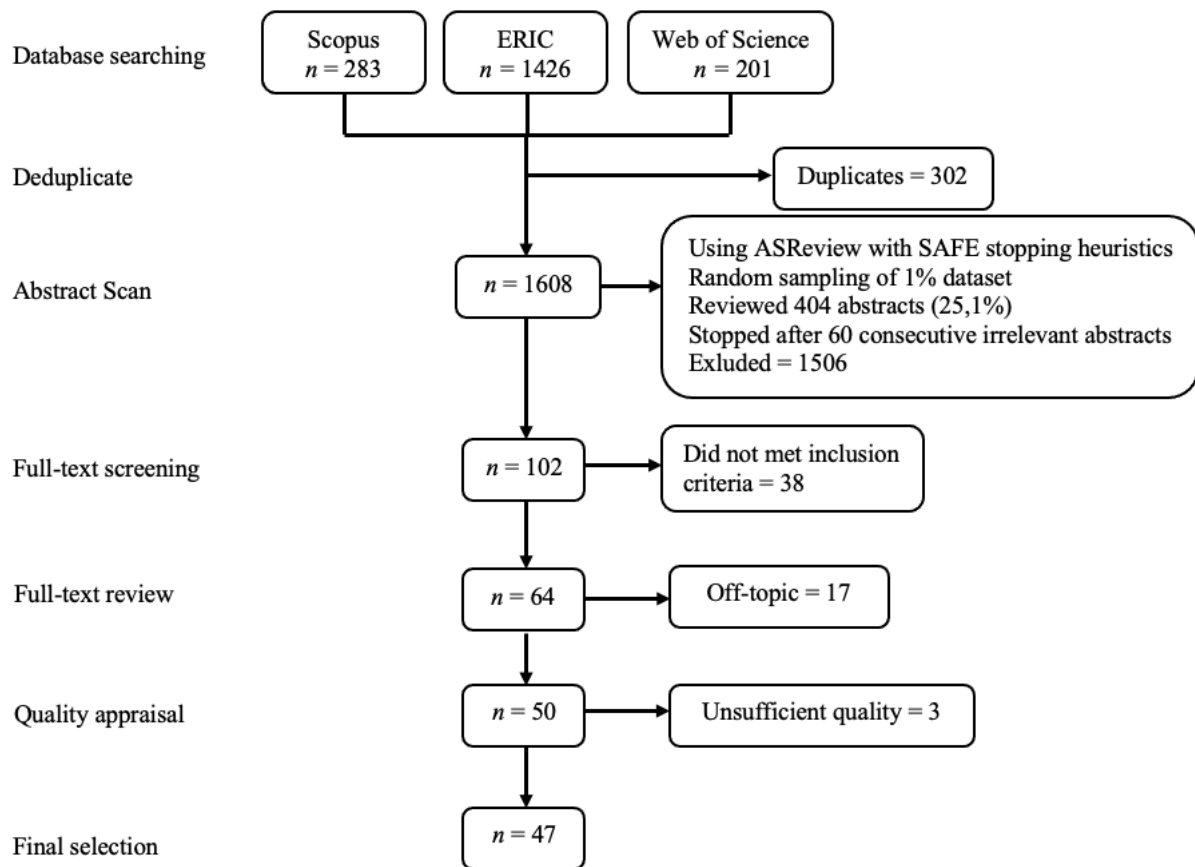


Figure 2 PRISMA flowchart selection process

Full-text screening was performed collaboratively via a structured coding scheme to ensure consistent data extraction. The collected data included the country; educational sector (primary, secondary, vocational, higher, special); educational pipeline focus (enrolment, preservice or in-service teachers); and causes and consequences. Additional categories captured implications and recommendations. After jointly screening the entire set of 102 full-text articles, 38 studies were excluded on the basis of criteria such as lack of relevance to developed countries. This initial screening allowed us to establish a consensus on the inclusion criteria and assessment methods. Once alignment was achieved, the remaining 64 articles were divided for individual review. Following screening, 50 articles met the inclusion criteria. Exclusions were due to a lack of relevance to teacher shortage topics or an insufficient empirical basis.

Risk of bias was assessed by examining potential reporting biases and inconsistencies in study outcomes. To reduce bias, the screening and coding processes were conducted collaboratively to ensure inter-rater

reliability and mitigate subjective influences.

3.4 Quality Appraisal

To assess the methodological robustness of the included review studies, we applied the Joanna Briggs Institute (JBI) critical appraisal checklist (2017). We focused on the first nine indicators of the checklist, as these address core aspects of methodological quality such as clarity of review questions, transparency of inclusion criteria, appropriateness of search strategies, and consistency between methods and conclusions.

All studies were appraised independently by both authors. Quality appraisal scores were calculated as the proportion of criteria met. To guide inclusion decisions and ensure a robust synthesis, we applied predefined quality thresholds commonly used in recent systematic review literature (e.g., Carcelén-Fraile et al., 2023; Kundu et al., 2024). Reviews meeting at least 70% of the applicable criteria were classified as high quality, while those meeting between 50% and 70% were classified as moderate quality. Reviews scoring below 50% of the criteria were excluded from further analysis.

due to insufficient methodological rigour.

For scoping reviews, the same procedure was followed, with the exception that JBI indicators related to meta-analytic procedures were omitted, as these are not applicable to that review type. Disagreements in quality ratings were resolved through discussion until consensus was reached. Based on this appraisal process, three studies were excluded, resulting in a final sample of 47 studies included in the synthesis.

3.5 Data Analysis

Data were analysed using a thematic synthesis approach, combining open and axial coding to identify recurring patterns and relationships across studies. Atlas.ti was used to support the systematic organisation and comparison of codes and themes.

To enhance the credibility and consistency of the coding process, an initial subset of the included studies (approximately 10%) was coded jointly by both authors. This calibration phase was used to align interpretations, refine code definitions, and develop a shared coding framework.

Following this phase, the remaining studies were

divided between the authors for individual coding. Throughout the analysis, regular discussions were held to compare interpretations, resolve ambiguities, and iteratively refine higher-order themes. Rather than calculating formal inter-rater reliability coefficients, we employed a consensus-based approach to ensure analytical consistency and transparency.

4. Results

4.1 Overview of the Included Studies

The aim of this systematic literature review was to explore and analyse the causes and consequences of teacher shortages. **Table 2** presents the 47 included studies that focused on these causes and/or consequences. The studies are listed alphabetically by the author and include information on the authors, the countries involved in each study, the education sectors investigated (primary, secondary, vocational, special, and/or higher education), the research methodology employed (mixed methods, quantitative, qualitative, or literature review), and the position within the teacher pipeline (recruitment/enrolment, pre-service teachers, and/or in-service teachers).

Table 2 Overview of the included studies

No.	Authors (year)	Country	Sector ^a	Method	Teacher pipeline ^b
1	Admiraal (2022)	Belgium, Netherlands	PRI, SEC	Quantitative	3
2	Admiraal (2023)	Belgium, Netherlands	PRI, SEC	Quantitative	3
3	Bates et al. (2024)	Australia	HIG	Mixed methods	2
4	Billingsley and Bettini (2019)	United States	SPE	Literature review	3
5	Birch et al. (2021)	European countries	SEC, HIG	Quantitative	1,2,3
6	Boström (2023)	Sweden	SEC	Qualitative	2
7	Brownell et al. (2018)	United States	SPE	Qualitative	3
8	Buchanan (2012)	Australia	SEC	Qualitative	1,2,3
9	Burke and Ceo-DiFrancesco (2022)	United States	PRI, SEC	Qualitative	2
10	Chapman et al. (2021)	United States	SPE	Qualitative	3
11	De Witte et al. (2023)	European Union	PRE, SEC	Literature review	1,3
12	Dreer (2021)	Germany	SEC	Quantitative	3
13	Dupriez et al. (2016)	Belgium	PRI, SEC	Quantitative	2,3
14	Eckert (2020)	United States	SEC, HIG	Literature review	1,2,3
15	Garcia and Weiss (2019)	United States	PRI, SEC	Mixed methods	1
16	Gooden et al. (2023)	United States	SEC	Literature review	3
17	Gorard et al. (2007)	England, Wales	SEC, HIG	Mixed methods	1,2,3
18	Gorard et al. (2021)	United Kingdom	HIG	Quantitative	1,2
19	Hudson and Hudson (2019)	Australia	PRI	Qualitative	2
20	Hutchison (2012)	United States	SEC	Qualitative	1,2

Continuation Table:

No.	Authors (year)	Country	Sector ^a	Method	Teacher pipeline ^b
21	Ingersoll and Tran (2023)	United States	PRI, SEC	Quantitative	3
22	Inspectie van Onderwijs (2023)	Netherlands	PRI, SEC, SPE	Qualitative	3
23	Kuijpers et al. (2024)	Netherlands	SEC	Mixed methods	2
24	Lampert et al. (2023)	Australia	SEC	Qualitative	3
25	Lindqvist and Gidlund (2024)	Worldwide	n.s.	Literature review	1,2,3
26	Love and Love (2022)	United States	SEC	Quantitative	1
27	Martinie et al. (2023)	United States	SEC	Qualitative	1,2,3
28	McHenry-Sorber et al. (2023)	United States	PRI	Qualitative	3
29	Meijer (2021)	Netherlands	PRI, SEC, VOC, HIG	Literature review	1,2,3
30	Mendez (2023)	United States	PRI, SEC	Qualitative	3
31	Morettini (2014)	United States	SEC	Qualitative	2
32	Patil (2023)	Australia	SEC	Literature review	1,2,3
33	Pauwels et al. (2022)	Belgium	SEC	Quantitative	1,2
34	Peyton et al. (2021)	United States	SPE	Quantitative	3
35	Podolsky et al. (2016)	United States	PRI, SEC	Literature review	3
36	Rahimi and Arnold (2024)	Australia	SEC	Quantitative	3
37	Rhinesmith et al. (2023)	United States	PRI, SEC	Literature review	2,3
38	Richards and Gurley (2023)	United States	PRI, SEC	Qualitative	3
39	Sakuma and Shimazaki (2024)	Japan	PRI, SEC	Qualitative	3
40	See and Gorard (2019)	United Kingdom	SEC	Quantitative	1,2,3
41	Shine (2015)	Australia	SEC	Qualitative	3
42	Sims (2020)	United Kingdom	SEC	Quantitative	3
43	Stokes (2007)	Australia	SEC	Quantitative	1,2
44	Straková and Simonová (2024)	Czech Republic	SEC	Quantitative	2,3
45	Struyven et al. (2013)	Belgium	PRI	Quantitative	2
46	Sutcher et al. (2019)	United States	PRI, SEC	Quantitative	1,2,3
47	Van Rooij et al. (2020)	Netherlands	SEC	Quantitative	2,3

^a PRI = primary education, SEC = secondary education, HIG = higher education, SPE = special education, VOC = vocational education.

^b 1 = Recruitment/enrolment, 2 = Preservice teachers, 3 = In-service teachers.

The causes of teacher shortages identified in the literature are grouped into four overarching categories: (1) career conditions, (2) classroom issues, (3) demographics, and (4) well-being. The consequences of teacher shortages, as discussed in these studies, can be classified into four main categories: (1) impact

on students, (2) impact on teachers, (3) impact on schools, and (4) impact on society. These causes and consequences are organized according to the stages of the teacher pipeline in **Tables 3** and **4**, which are discussed in detail in the following paragraphs.

Table 3 Causes of teacher shortages across the teacher pipeline

Causes	Recruitment/enrolment	Pre-service	In-service
Career conditions			
Administrative burdens (<i>n</i> =9)			■
High demands (<i>n</i> =2)			■
Insufficient resources (<i>n</i> =6)			■
Insufficient support* (<i>n</i> =17)			■
Low salaries (<i>n</i> =30)	■		

Continuation Table:

Causes	Recruitment/enrolment	Pre-service	In-service
Perception of the profession (<i>n</i> =18)	■		
Poor career perspective (<i>n</i> =17)	■		■
Teacher turnover* (<i>n</i> =13)			■
Unfilled positions (<i>n</i> =3)			■
Classroom issues			
Group sizes (<i>n</i> =2)		■	■
Insufficient schooling* (<i>n</i> =19)		■	■
Student population* (<i>n</i> =17)			■
Demographics			
Ageing workforce (<i>n</i> =6)			■
Location (rural/urban) (<i>n</i> =24)			■
Low enrolment (<i>n</i> =11)	■		
Well-being			
Autonomy (<i>n</i> =7)			■
Job satisfaction* (<i>n</i> =12)			■
Stress* (<i>n</i> =23)			■
Other			
Government policies (<i>n</i> =7)			■
High retention (<i>n</i> =19)	■		■

* These factors play a particularly significant role in the early stages of a teaching career.

Table 4 Consequences of teacher shortages across the teacher pipeline

Consequences	Recruitment/enrolment	Pre-service	In-service
Impact on students			
Decreases in quality of education and teaching (<i>n</i> =32)			■
Decreases in students' guidance, performance and well-being (<i>n</i> =30)			■
Educational inequality or instability (<i>n</i> =17)			■
Impact on teachers			
Ongoing teacher attrition and/or career change (<i>n</i> =18)			■
Increased workload for remaining teachers (<i>n</i> =14)			■
Stress and/or burnout (<i>n</i> =11)			■
Demoralization and dissatisfaction (<i>n</i> =7)	■		■
Classroom issues and poor work environment (<i>n</i> =7)			■
Impact on schools			
Less or under-qualified teacher employment (<i>n</i> =16)	■		■
Increased class sizes (<i>n</i> =8)			■
Increased financial costs (<i>n</i> =6)	■	■	■
Impact on society			
Negative public perceptions of the profession (<i>n</i> =5)	■		■
Poorly educated workforce and/or citizens* (<i>n</i> =3)	■	■	

* The poorly educated workforce and/or citizens are also part of the category 'impact on society' within the consequences but falls also outside the teacher pipeline.

4.2 Causes of Teacher Shortages

4.2.1 Career conditions

Across the teacher pipeline, career conditions

are frequently reported as contributing to teacher shortages. The included studies describe a broad range of employment-related factors that affect both

recruitment into the profession and retention over time. These factors concern workload and task composition, organisational conditions, financial compensation, professional status, and career prospects. Although the relative emphasis differs across contexts and education sectors, career conditions recur consistently across the reviewed studies.

4.2.1.1 Administrative burdens

Nine studies report administrative burdens as a contributing factor to teacher shortages. Teachers are described as spending substantial time on non-instructional tasks, such as documentation, accountability procedures, and the development of individualised education plans. Within this group of studies, administrative demands are reported to be intensified by limited administrative support, resulting in reduced time for teaching, preparation, and interaction with students.

These findings are reported across studies conducted in the United States, Australia, and several European contexts (e.g., Billingsley & Bettini, 2019; Podolsky et al., 2016; Patil, 2023).

4.2.1.2 High demands

Two studies report high overall job demands as a factor associated with teacher shortages. These studies describe an expansion of teachers' responsibilities beyond instructional tasks, including responding to inclusive education policies, addressing socio-emotional student needs, and managing behavioural challenges. Additional demands related to classroom management, lesson planning, and communication with parents are also reported. These demands are described as particularly challenging for teachers entering the profession through non-traditional pathways.

Evidence for high job demands is reported in studies from different education contexts (e.g., Meijer, 2021; Richards & Gurley, 2023).

4.2.1.3 Insufficient resources

Six studies report insufficient material and organisational resources as a contributing factor to teacher shortages. Reported constraints include inadequate teaching materials, limited access to facilities, and insufficient staffing levels. Within this group of studies, resource shortages are reported to be more pronounced in rural or remote settings. Across contexts, insufficient resources are associated with difficulties in carrying out teaching tasks

and with increased dissatisfaction among teachers.

These findings are reported in studies from Europe, Australia, and the United States (e.g., Sakuma & Shimazaki, 2024; Ingersoll & Tran, 2023; Mendez & Thompson, 2023).

4.2.1.4 Insufficient support

Seventeen studies identify insufficient professional and collegial support as a factor associated with teacher shortages. These studies report limited access to mentoring, induction programmes, and leadership support, particularly for beginning teachers. A lack of clear guidance and feedback is frequently described. Insufficient support is reported across education sectors and is especially visible in schools operating in challenging contexts, such as rural areas or schools serving diverse student populations.

These findings are reported in studies from multiple developed-country contexts, including Western Europe, Australia, and the United States (e.g., European Commission/EACEA/Eurydice, 2021; Buchanan, 2012; Admiraal, 2023; Lampert et al., 2024).

4.2.1.5 Low salaries

Low salaries are reported in 30 studies as a contributing factor to teacher shortages. Across contexts, teacher compensation is described as relatively low compared with other professions requiring similar levels of education. Within this group of studies, financial considerations are reported to influence both decisions to enter the teaching profession and decisions to remain employed as a teacher. Limited salary progression over time and high living costs are also reported as reducing the long-term attractiveness of teaching. Regional differences in teacher pay are described as contributing to mobility between schools or sectors.

These findings are reported across studies conducted in the United States, Australia, and several European countries (e.g., García & Weiss, 2019; Sutcher et al., 2019; Admiraal, 2022; Ingersoll & Tran, 2023).

4.2.1.6 Perception of the profession

Eighteen studies report that perceptions of teaching as a profession contribute to teacher shortages. Teaching is described as having relatively low societal status and limited recognition. Within this group of studies, perceptions of teaching are linked to media and political discourse focusing on workload, accountability pressures, and working conditions. Negative professional images are

reported to influence both enrolment in teacher education programmes and the retention of practising teachers.

These findings are reported in studies from Europe, Australia, and the United States (e.g., Martinie et al., 2023; Admiraal, 2022; Gorard et al., 2007; Stokes, 2007).

4.2.1.7 Poor career perspective

Seventeen studies report limited career perspectives as a factor associated with teacher shortages. Teaching is described as offering restricted opportunities for career advancement and professional development. Within this group of studies, these limitations are reported to be particularly salient in rural contexts, where professional mobility and development opportunities are constrained. Poor career prospects are reported to reduce the long-term attractiveness of the profession.

Evidence for limited career perspectives is reported across studies from developed-country contexts (e.g., van Rooij et al., 2020; Love & Love, 2023; Hutchison, 2012; Smith et al., 2023).

4.2.1.8 Teacher turnover

Thirteen studies report high levels of teacher turnover as a factor closely associated with shortages. Turnover is reported as particularly pronounced in rural and high-needs schools. These studies describe early-career attrition, with teachers leaving the profession within the first years of employment. High turnover is reported across education sectors and contexts.

These findings are reported in studies from the United States, Australia, and Europe (e.g., Brownell et al., 2018; Martinie et al., 2023; Ingersoll & Tran, 2023).

4.2.1.9 Unfilled positions

Three studies report persistent unfilled teaching positions. Vacancies are described as varying by subject area, school type, and time of year. These studies note that shortages may be partially concealed through temporary staffing arrangements, increased class sizes, or the deployment of under-qualified personnel, suggesting that official vacancy figures may underestimate shortages in practice.

Evidence on unfilled positions is reported in studies from Europe and Asia (e.g., Inspectie van Onderwijs, 2023; Sakuma & Shimazaki, 2024; Ingersoll & Tran, 2023).

4.2.2 Classroom issues

Classroom-related issues are frequently reported as

contributing to teacher shortages, particularly for pre-service and in-service teachers. The included studies describe challenges that directly affect teachers' daily instructional practice and their preparedness for classroom work. These issues primarily relate to class size, adequacy of training and professional preparation, and characteristics of the student population. Although the salience of specific issues varies across contexts and education sectors, classroom-related challenges recur across the reviewed literature.

4.2.2.1 Group sizes

Two studies report group size as a factor associated with teacher shortages. These studies describe increased class sizes resulting from rising student enrolment and policy decisions affecting staffing levels. Large class sizes are reported to increase instructional workload and reduce opportunities for individual student support. Persistent large classes are described as affecting perceptions of the profession and contributing to difficulties in retaining teachers.

Evidence on group size is reported in studies from European contexts (e.g., De Witte et al., 2023; Stokes, 2007).

4.2.2.2 Insufficient schooling

Nineteen studies report insufficient initial training and professional development as a factor associated with teacher shortages. These studies describe teachers entering the profession feeling inadequately prepared due to limited pedagogical training, restricted classroom experience, and insufficient early-career support. Challenges are reported particularly among teachers entering through non-traditional certification pathways.

Within this group of studies, limited preparation is reported to affect core teaching competencies, such as classroom management, lesson planning, and administrative tasks. In addition, insufficient access to ongoing professional development is described as contributing to feelings of being unsupported. High costs of teacher education and certification requirements are also reported as barriers to entry, particularly in subjects such as STEM and in rural contexts.

These findings are reported across studies from the United States, Europe, and Australia (e.g., Chapman et al., 2021; García & Weiss, 2019; Richards & Gurley,

2023; Sims, 2020; Hutchison, 2012; Buchanan, 2012).

4.2.2.3 Student population

Seventeen studies report characteristics of the student population as a factor associated with teacher shortages. These studies describe challenges related to student behaviour, motivation, and socio-economic disparities, particularly in high-poverty schools. Such classroom environments are reported to increase job demands and reduce job satisfaction.

Within this group of studies, additional challenges are reported in special education settings, where teachers work with diverse learning needs across multiple grade levels. Teachers entering the profession through non-traditional pathways are also reported to experience difficulties managing classroom behaviour, which is associated with early attrition.

Evidence on student population-related challenges is reported across studies from the United States, Europe, and Australia (e.g., García & Weiss, 2019; Shine, 2015; Brownell et al., 2018; Richards & Gurley, 2023).

4.2.3 Demographics

Demographic factors are frequently reported as contributing to teacher shortages across the teacher pipeline. The included studies describe demographic dynamics that affect both the supply of new teachers and the sustainability of the existing workforce. These dynamics primarily relate to workforce ageing, geographical distribution of teachers, and enrolment patterns in teacher education. While the relative impact of these factors varies across contexts, demographic pressures recur consistently across the reviewed literature.

4.2.3.1 Ageing workforce

Six studies report an ageing teaching workforce as a factor associated with teacher shortages. These studies describe a large proportion of teachers approaching retirement age, leading to a growing replacement demand. In several contexts, retirements have resulted in staff compositions in which relatively few highly experienced teachers remain.

In addition, some studies report pre-retirement turnover, with teachers leaving the profession before formal retirement age. This pattern is reported particularly in contexts characterised by challenging working conditions.

Evidence on workforce ageing and retirement-related

dynamics is reported across studies from Europe, Australia, and the United States (e.g., De Witte et al., 2023; Sakuma & Shimazaki, 2024; Ingersoll & Tran, 2023; Birch et al., 2021).

4.2.3.2 Location: Rural versus urban

Twenty-four studies report geographic location as a key factor associated with teacher shortages. These studies consistently describe difficulties in attracting and retaining teachers in rural and remote areas. Reported challenges include geographic and social isolation, limited access to professional development, and constrained organisational resources.

Across the reviewed studies, higher turnover rates are reported in rural contexts compared with urban or suburban settings. In addition, high-poverty schools, both rural and urban, are described as facing persistent staffing challenges. Regional imbalances in teacher distribution are also reported, particularly in high-demand subject areas such as STEM.

These findings are reported across studies conducted in Europe, Australia, and the United States (e.g., Ingersoll & Tran, 2023; Brownell et al., 2018; Buchanan, 2012; García & Weiss, 2019; Birch et al., 2021).

4.2.3.3 Low enrolment

Eleven studies report declining enrolment in teacher education programmes as a factor contributing to teacher shortages. These studies describe reduced interest in teaching as a career among secondary school graduates and early-stage higher education students.

Reported factors associated with declining enrolment include low expected salaries, limited career progression opportunities, and negative perceptions of the profession. Within this group of studies, enrolment challenges are reported to be particularly pronounced in specific subject areas, such as STEM and world languages. Competition from alternative career pathways with higher financial returns is also reported.

Evidence on declining enrolment is reported across studies from Europe, the United States, and Australia (e.g., Pauwels et al., 2022; Burke & Ceo-DiFrancesco, 2022; Eckert, 2020).

4.2.4 Well-being

Well-being is frequently reported as a factor associated with teacher shortages, particularly affecting in-service teachers. The included studies describe aspects

of teachers' professional well-being that relate to autonomy, job satisfaction, and experienced stress. These factors are reported to influence teachers' decisions to remain in or leave the profession across different educational contexts.

4.2.4.1 Autonomy

Seven studies report reduced teacher autonomy as a factor associated with teacher shortages. These studies describe increasing external regulation, accountability measures, and policy pressures that limit teachers' control over instructional decisions and classroom practices.

Reduced autonomy is reported across education sectors and is particularly visible in high-needs contexts, where administrative demands and external oversight are described as more pronounced. Within this group of studies, limited professional autonomy is reported to be associated with lower satisfaction with the teaching role.

Evidence on reduced autonomy is reported across studies from Europe, Australia, and the United States (e.g., Podolsky et al., 2016; See & Gorard, 2019; Gooden et al., 2023)

4.2.4.2 Job satisfaction

Twelve studies report low job satisfaction as a factor associated with teacher shortages. These studies describe dissatisfaction related to working conditions, including high workloads, limited administrative support, and insufficient resources. Low job satisfaction is reported particularly in rural and high-poverty schools, where teachers face additional professional challenges.

Within this group of studies, associations are reported between low job satisfaction and increased turnover, especially among early-career teachers and those entering through non-traditional certification pathways.

Findings related to job satisfaction are reported across studies from the United States, Europe, and Australia (e.g., Ingersoll & Tran, 2023; Sims, 2020; Richards & Gurley, 2023; Gooden et al., 2023).

4.2.4.3 Stress

Twenty-three studies report high levels of stress as a factor associated with teacher attrition and shortages. Reported sources of stress include high workloads, administrative demands, insufficient support,

challenging classroom environments, and emotional labour. Stress is described as particularly prevalent in schools serving disadvantaged student populations.

Within this group of studies, prolonged exposure to high stress is reported to be associated with an increased likelihood of leaving the profession. Stress levels are also reported to have intensified during the COVID-19 pandemic, coinciding with increased workload pressures and organisational uncertainty.

Evidence on teacher stress is reported across studies from Europe, Australia, and the United States (e.g., Billingsley & Bettini, 2019; Meijer, 2021; Podolsky et al., 2016; Gooden et al., 2023; Mendez, 2023).

4.2.5 Additional factors contributing to teacher shortages

In addition to the main categories of causes, several studies report factors that cut across multiple domains of the teacher pipeline. These factors relate to the role of government policies and to high levels of teacher attrition, which are described as closely intertwined with other causes of teacher shortages.

4.2.5.1 Government policies

Seven studies report government policies as a factor associated with teacher shortages. These studies describe policy decisions that affect teacher demand, workload, and working conditions. Examples include class size reduction policies and extensions of compulsory schooling, which are reported to increase teacher demand without corresponding adjustments in recruitment or retention capacity.

Within this group of studies, policy-related challenges such as rigid entry requirements, centrally defined recruitment targets, and frequent policy reforms are reported to complicate alignment between teacher supply and school-level needs. In addition, accountability policies and regulatory pressures are reported to be associated with increased administrative demands and reduced professional autonomy.

Evidence on the role of government policies is reported across studies from Europe, Australia, and the United States (e.g., De Witte et al., 2023; Gorard et al., 2007; Gooden et al., 2023; See & Gorard, 2019).

4.2.5.2 High attrition

Nineteen studies report high levels of teacher attrition as a factor associated with teacher shortages. Early-career attrition is described in ten studies, with

teachers leaving the profession within the first years of employment. These studies report that teachers in special education and those with limited student-teaching experience are particularly vulnerable to early departure.

High attrition is not limited to early-career teachers. A number of studies also report attrition among experienced teachers prior to retirement age. Across contexts, high attrition is described as contributing to shortages while simultaneously reflecting existing pressures within the teaching workforce.

Findings related to teacher attrition are reported across studies from Europe, Australia, and the United States (e.g., European Commission/EACEA/Eurydice, 2021; Sims, 2020; Morris & Cavendish, 2021; Ingersoll & Tran, 2023).

4.3 Consequences of Teacher Shortages

4.3.1 Impact on students

Teacher shortages are widely reported to have consequences for students' educational experiences and outcomes. The included studies describe effects on the quality of instruction, students' academic performance and well-being, and patterns of educational inequality. These consequences are reported across educational contexts, with variation by school type, subject area, and student population

4.3.1.1 Decreases in the quality of education and teaching

Thirty-two studies report decreases in the quality of education and teaching as a consequence of teacher shortages. These studies describe schools implementing emergency measures, such as combining classes, hiring under-qualified staff, or reducing instructional time. Such measures are reported to limit instructional differentiation, narrow subject offerings—particularly in STEM, arts, and languages—and disrupt instructional continuity.

Within this group of studies, shortages of qualified teachers are reported to result in non-instructional staff assuming teaching responsibilities. High teacher turnover is also reported to contribute to instructional disruption and loss of experienced teachers. These consequences are described as particularly pronounced in rural and high-poverty schools.

Evidence on reduced educational quality is reported across studies from Europe, Australia, and the United

States (e.g., Admiraal, 2022; Inspectie van Onderwijs, 2023; Bates et al., 2024; Gorard et al., 2007; Ingersoll & Tran, 2023).

4.3.1.2 Decreases in students' guidance, performance and well-being

Thirty studies report negative effects of teacher shortages on students' guidance, academic performance, and well-being. These studies describe reduced access to socio-emotional support and personalised instruction, particularly in contexts with large class sizes.

Within this group of studies, high teacher turnover is reported to disrupt student-teacher relationships, which are described as important for both academic and emotional development. Lower academic performance is reported, especially in foundational subject areas such as mathematics and reading. Shortages of experienced teachers in subjects such as STEM are also reported to contribute to gaps in subject-specific learning opportunities. In addition, several studies report that schools prioritise core subjects at the expense of extracurricular and enrichment activities.

Findings related to student guidance, performance, and well-being are reported across studies from Europe, Australia, and the United States (e.g., Billingsley & Bettini, 2019; Richards & Gurley, 2023; De Witte et al., 2023; Hutchison, 2012; Van Rooij et al., 2020).

4.3.1.3 Educational inequality or instability

Seventeen studies report that teacher shortages contribute to educational inequality and instability. These studies describe disproportionate impacts on disadvantaged and rural schools, which are more likely to rely on less experienced or uncertified teachers.

Within this group of studies, high teacher turnover is reported to disrupt learning environments and reduce instructional continuity in high-needs schools. Inequities in access to qualified teachers are reported to widen achievement gaps between students in low-income and more affluent contexts. Shortages in specialised subject areas, such as STEM and special education, are also reported to intensify disparities in educational opportunities for vulnerable student populations.

Evidence on inequality and instability is reported across studies from Europe, Australia, and the United States (e.g., Ingersoll & Tran, 2023; De Witte et al., 2023; Sutchter et al., 2019; See & Gorard, 2019; Brownell et al., 2018).

4.3.2 Impact on teachers

Teacher shortages are widely reported to have consequences for teachers' professional experiences and career trajectories. The included studies describe effects on workload, stress and burnout, job satisfaction, and decisions to leave the profession or pursue alternative careers. These consequences are reported across education sectors and are particularly salient for early-career teachers and those working in high-needs contexts.

4.3.2.1 Ongoing teacher attrition and/or career change

Eighteen studies report ongoing teacher attrition and career change as consequences associated with teacher shortages. These studies describe increased pressure on remaining staff, particularly among early-career teachers. In several national contexts, substantial proportions of novice teachers are reported to leave secondary education within the first five years of employment.

Within this group of studies, shortages are reported to require remaining teachers to assume additional responsibilities, contributing to increased workload. Career change among both early-career and experienced teachers is also reported, particularly in relation to sustained job demands. Attrition is described as contributing to continued staffing instability within schools.

Evidence on attrition and career change is reported across studies from Europe, Australia, and the United States (e.g., García & Weiss, 2019; Pauwels et al., 2022; Mendez, 2023; Sims, 2020).

4.3.2.2 Increased workload for remaining teachers

Fourteen studies report increased workload for teachers as a consequence of teacher shortages. These studies describe teachers taking on additional classes, covering for absent colleagues, and assuming extra administrative responsibilities. Reduced time for lesson preparation and professional development is frequently reported.

Within this group of studies, larger class sizes resulting from shortages are described as limiting opportunities for individual student support. Increased workload is reported across education contexts and school types.

Findings related to increased workload are reported across studies from Europe, Australia, and the United States (e.g., Lampert et al., 2023; Hudson & Hudson,

2019; Birch et al., 2021).

4.3.2.3 Stress and/or burnout

Eleven studies report stress and burnout among teachers as consequences associated with teacher shortages. These studies describe increased demands related to managing larger classes, teaching outside areas of expertise, and performing non-instructional tasks.

Within this group of studies, symptoms such as emotional exhaustion and reduced job satisfaction are reported, particularly in schools facing persistent staffing challenges. Stress and burnout are reported across education sectors and contexts.

Evidence on stress and burnout is reported across studies from Europe, Australia, and the United States (e.g., Billingsley & Bettini, 2019; Podolsky et al., 2016; Mendez, 2023; Sims, 2020).

4.3.2.4 Demoralization and dissatisfaction

Seven studies report demoralization and dissatisfaction among teachers as consequences of teacher shortages. These studies describe feelings of limited professional recognition and insufficient support, particularly in under-resourced schools.

Within this group of studies, difficulties in maintaining instructional standards and managing increasing job demands are reported to affect teachers' morale. Reduced satisfaction with the teaching role is described across education contexts.

Findings related to demoralization and dissatisfaction are reported across studies from Europe, Australia, and the United States (e.g., Ingersoll & Tran, 2023; Rahimi & Arnold, 2024; Dreer, 2021; García & Weiss, 2019).

4.3.2.5 Classroom issues and poor work environment

Seven studies report classroom challenges and deteriorating work environments as consequences of teacher shortages. These studies describe larger class sizes, limited teaching resources, and increased use of under-qualified staff.

Within this group of studies, difficulties in maintaining classroom order and sustaining productive teacher–student interactions are reported. Challenging classroom conditions are described across education contexts and are associated with reduced quality of the working environment.

Evidence on classroom issues and work environment is reported across studies from Europe, Australia,

and the United States (e.g., Hudson & Hudson, 2019; Richards & Gurley, 2023; Van Rooij et al., 2020)

4.3.3 Impact on schools

Teacher shortages are widely reported to have consequences at the school and organisational level. The included studies describe effects on staffing practices, class organisation, and financial resources. These consequences are reported across educational contexts and are particularly pronounced in schools operating in rural, remote, or high-poverty settings.

4.3.3.1 Less or under-qualified teacher employment

Sixteen studies report that teacher shortages lead schools to employ less qualified or under-qualified teachers as a temporary staffing measure. These studies describe the use of out-of-field teachers, inexperienced staff, or personnel without full teaching certification.

Within this group of studies, such staffing practices are reported to affect instructional consistency and adherence to educational standards. Challenges are reported particularly in subject areas such as STEM and special education, where specialised expertise is required. Schools in rural and high-poverty contexts are described as being disproportionately affected due to persistent difficulties in attracting fully qualified teachers. Some studies also report that reliance on under-qualified staff may become a sustained staffing practice over time.

Evidence on under-qualified teacher employment is reported across studies from Europe, Australia, and the United States (e.g., Boström, 2023; Stokes, 2007; See & Gorard, 2019; Van Rooij et al., 2020; Ingersoll & Tran, 2023; Billingsley & Bettini, 2019).

4.3.3.2 Increased class sizes

Eight studies report increased class sizes as a consequence of teacher shortages. These studies describe schools merging classes or increasing student–teacher ratios to address staffing gaps.

Within this group of studies, larger class sizes are reported to limit opportunities for individualised instruction and to complicate classroom management. Challenges related to maintaining instructional quality and addressing diverse student needs are also reported. Increased class sizes are described across education contexts.

Findings related to increased class sizes are reported across studies from Europe, Australia, and the United

States (e.g., Birch et al., 2021; Gorard et al., 2007; Pauwels et al., 2022; Inspectie van Onderwijs, 2023).

4.3.3.3 Increased financial costs

Six studies report increased financial costs for schools as a consequence of teacher shortages. These studies describe expenses related to recruitment, induction, and training, particularly in contexts with high turnover rates.

Within this group of studies, budgetary pressures are reported to result in reallocation of resources away from other areas, such as student support services or extracurricular activities. Additional costs related to recruitment and retention are reported particularly in rural contexts. Financial pressures are described as contributing to disparities between schools with differing resource levels.

Evidence on increased financial costs is reported across studies from Europe, Australia, and the United States (e.g., Birch et al., 2021; Bates et al., 2024; Brownell et al., 2018; Ingersoll & Tran, 2023).

4.3.4 Impact on society

Teacher shortages are also reported to have consequences at the societal level, extending beyond schools and classrooms. The included studies describe effects on public perceptions of the teaching profession and on broader educational and workforce-related outcomes. Although this evidence base is smaller than for student- or school-level impacts, societal consequences are reported across multiple contexts.

4.3.4.1 Negative public perceptions of the profession

Five studies report negative public perceptions of the teaching profession as a consequence of teacher shortages. These studies describe how reliance on under-qualified staff, high attrition rates, classroom challenges, and reported declines in educational outcomes shape perceptions of teaching as an unstable or undervalued profession.

Within this group of studies, negative public perceptions are reported to influence interest in teaching as a career. Media coverage highlighting issues such as workload, stress, burnout, and salary levels is also described as contributing to the public image of the profession.

Evidence on public perceptions of teaching is reported across studies from Europe, Australia, and the United States (e.g., Gorard et al., 2007; Shine, 2015;

Birch et al., 2021; García & Weiss, 2019).

4.3.4.2 Poorly educated workforce and/or citizens

Three studies report broader societal consequences of teacher shortages related to educational and workforce outcomes. These studies describe associations between shortages of qualified teachers and reduced educational attainment, particularly in subject areas such as STEM.

Within this group of studies, limited access to qualified instruction is reported to affect skill development relevant to labour market participation. Some studies also describe associations between educational shortages and broader societal outcomes, including economic capacity and civic participation.

Findings related to workforce and societal outcomes are reported in studies from Europe and North America (e.g., Hutchison, 2012; De Witte et al., 2023; Bates et al., 2024).

4.3.5 Synthesis of consequences and emerging challenges

This review has uncovered several key insights and challenges regarding teacher shortages that emerge across student-, teacher-, school-, and societal-level consequences. These challenges span both the content and execution of studies, as well as the complex nature of the teacher shortage itself.

The teacher shortage is an inherently complex issue, with a wide array of factors affecting both recruitment and retention. The teacher pipeline includes multiple interrelated dimensions, such as career conditions, classroom issues, demographic dynamics, and teacher well-being. In addition to these internal dimensions, government policies and political decisions are repeatedly reported as shaping the manifestation and persistence of shortages. The interaction of these factors creates a challenging landscape, limiting the effectiveness of one-size-fits-all solutions. Indeed, the findings indicate that teacher shortages are not uniformly distributed across regions, subject areas, or school types (United Nations Department of Economic and Social Affairs, 2019; OECD, 2023).

Rural and high-needs schools, in particular, experience more acute shortages, suggesting that responses must be sensitive to contextual differences and local needs (McHenry-Sorber et al., 2023). Importantly, while many factors contributing to shortages become visible later in the teacher pipeline,

several barriers already operate at earlier stages. Low salaries, limited career prospects, and negative perceptions of the profession deter potential candidates even before entry into teacher education. These findings underscore the relevance of early intervention at the recruitment stage.

A notable insight emerging from this synthesis is the limited attention given to the pre-service phase within the existing literature. Studies predominantly focus on in-service teachers or recruitment and enrolment patterns, while fewer address how experiences during teacher education shape persistence in the profession. Evidence from research on classroom management, stress, and burnout suggests that not only in-service teachers, but also pre-service teachers disengage due to high stress, insufficient preparation, and early exposure to challenging practice contexts (e.g., Evertson & Weinstein, 2006; Murray-Harvey et al., 2000). This highlights the importance of strengthening teacher education alongside recruitment and retention efforts, and raises critical questions about how future teachers can be better prepared for the realities of professional practice.

5. Conclusion and Discussion

The aim of this systematic literature review was to explore and analyse the causes and consequences of teacher shortages. The findings confirm that teacher shortages constitute a complex and multifaceted problem, shaped by an interplay of structural, professional, and socio-economic factors across the teacher pipeline. Rather than being driven by a single cause, shortages emerge from the cumulative interaction of conditions affecting recruitment, preparation, retention, and long-term sustainability of the teaching workforce.

Across the reviewed literature, four overarching categories of causes were identified: career conditions, classroom issues, demographic factors, and teacher well-being. These categories recur consistently across contexts and together provide a comprehensive framework for understanding how shortages develop and persist over time.

5.1 Overarching causes of teacher shortages

Career conditions constitute a central category in the literature. Excessive administrative burdens, high workload demands, inadequate resources, insufficient

professional support, low salaries, negative perceptions of the profession, and limited career prospects are repeatedly reported as contributing to teacher dissatisfaction and attrition. The cumulative effect of these conditions reduces the attractiveness of teaching as a career and discourages both entry into and persistence within the profession.

Classroom-related issues form a second major category. Large class sizes, insufficient preparation, and challenges associated with managing increasingly complex student populations place substantial demands on teachers, particularly in high-poverty and rural schools. Teachers entering through non-traditional pathways are reported to face additional difficulties related to limited pedagogical preparation, which is associated with higher rates of early departure from the profession.

Demographic factors further exacerbate shortages. An ageing teaching workforce increases replacement demand, while regional disparities in teacher distribution result in persistent staffing challenges in rural and high-needs schools. Declining enrolment in teacher education programmes limits the supply of new teachers entering the profession, intensifying shortages as experienced teachers retire or leave early. In addition, government policies—such as rigid entry requirements, frequent curriculum reforms, and accountability pressures—shape both recruitment and retention dynamics.

Finally, issues related to teacher well-being are prominent across the literature. High levels of stress, burnout, declining job satisfaction, and reduced professional autonomy are consistently reported as factors associated with teachers' decisions to leave the profession. Teaching in challenging environments, combined with limited professional recognition and support, contributes to sustained attrition and workforce instability.

5.2 Interrelated and reinforcing dynamics

While the reviewed studies do not establish causal relationships, the synthesis reveals that many of the identified factors are closely interrelated and operate in reinforcing ways across the teacher pipeline. For example:

- Low salaries and high workloads contribute to negative perceptions of the profession, making it less attractive for new candidates and leading to declining

enrolment in teacher education programs.

- Excessive administrative burdens and insufficient support increase teacher stress and burnout, resulting in high attrition rates, particularly among early-career teachers.

- An ageing workforce and declining enrolment mean fewer incoming teachers to replace retirees, intensifying shortages in already struggling regions.

- Difficult working conditions, particularly in rural and high-needs schools, lead to high turnover, reinforcing regional disparities in teacher distribution.

- Teachers who struggle with classroom management and workload can create a negative perception of the teaching profession among students, which in turn can lead to limited enrolment in teacher training programmes.

5.3 Weighing key drivers of shortages

Based on the emphasis across the reviewed literature, several factors emerge as particularly prominent drivers of teacher shortages. Low salaries consistently reduce the attractiveness of teaching relative to other professions, limiting recruitment and encouraging career change. High stress levels and administrative burdens contribute to burnout, especially among early-career teachers, increasing the likelihood of early attrition. In addition, negative public and professional perceptions of teaching as an undervalued and demanding occupation discourage new entrants and weaken long-term retention.

A recurring theme is the lack of sufficient support for beginning teachers. Many studies report that inadequate mentoring, induction, and professional guidance increase vulnerability to early career exit. These findings underscore that shortages are not only a matter of supply, but also of how teachers are supported throughout their professional trajectories.

5.4 Consequences across multiple levels

The consequences of teacher shortages extend across students, teachers, schools, and society. At the student level, shortages are associated with reduced instructional quality, limited guidance and support, and negative effects on academic performance and well-being. These impacts are particularly evident in disadvantaged and rural contexts, where shortages contribute to widening educational inequalities.

For teachers, shortages are associated with increased

workload, stress, burnout, and declining job satisfaction. These conditions are closely linked to ongoing attrition and career change, further intensifying staffing challenges. At the school level, shortages result in organisational strain, including reliance on under-qualified staff, increased class sizes, and financial pressures that constrain investment in support services and enrichment activities.

Although less frequently studied, societal-level consequences are also reported. These include negative public perceptions of the teaching profession and concerns about workforce preparedness and civic capacity, particularly in relation to shortages in critical subject areas such as STEM.

5.5 Limitations and future research

A recurring issue across the studies reviewed is the blending of results with discussions, which complicates the process of distilling clear, actionable conclusions. In many cases, studies present their findings and immediately provide interpretations or speculative conclusions, making it unclear what was directly investigated and what is simply an opinion. This lack of clarity makes it difficult to assess the true scope and reliability of the evidence presented. Future research should prioritize clearer separation between results and discussion to enhance the transparency and rigour of findings.

A limitation in the current literature is the reliance on cross-sectional studies, which provide a snapshot of the teacher shortage at a particular point in time. Longitudinal studies tracking teacher shortages and the impact of specific interventions over time are scarce. Future research should focus on longitudinal data to better understand the long-term trends and causes of teacher shortages, as well as the effectiveness of policies and interventions aimed at alleviating the crisis.

Furthermore, future research should pay more attention to pre-service teachers, as the current literature focuses mainly on in-service teachers. Understanding the factors that influence the decision to complete training and enter the teaching profession may have an impact on teacher shortages. By also focusing on pre-service teachers, future research can help develop targeted interventions that prevent dropout before it starts, ultimately strengthening the teacher pipeline.

5.6 Concluding remarks

Teacher shortages constitute a complex, system-wide challenge that affects the entire teacher pipeline. To prevent further “leaks,” it is essential to adopt context-specific approaches that address recruitment, pre-service preparation, and in-service support in an integrated manner. This review provides a comprehensive synthesis of the causes and consequences of teacher shortages and highlights the need for coordinated multi-level responses. Without sustained investment in qualified and supported teachers, the quality and long-term resilience of education systems cannot be ensured.

Declaration of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A List of developed countries

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Iceland, Norway, Switzerland, Australia, Canada, Japan, New Zealand, and the United States (World Population Review, 2024).