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School placement trajectories of students with special educational needs—A longitudinal analysis of administrative data

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Abstract

School transfers may be particularly challenging for students with special educational needs (SEN), and may negatively impact academic and social outcomes for these students. In countries with multiple placement options for students with SEN, although transfers between different types of placements are plausible, studies on this phenomenon are rare. The current study investigates individual placement trajectories over 11 years of compulsory education, using administrative data from a Swiss canton (i.e. federal state) about students with intensive SEN support. We employed sequence analysis to describe individual characteristics of placement trajectories (type of placements attended, number and timing of transfers), and to identify typical placement trajectories. Findings indicate that students with SEN experience frequent placement transfers, however, high variability between individual placement trajectories exists. Four clusters representing typical placement trajectories emerged. The clusters differed in the placements predominately attended by students, the number of transfers experienced, as well as in the distribution of students' age, gender and first language. These differences may reflect variations between clusters in the type and severity of students' SEN. Our study results underscore the importance of understanding the dynamics of placement trajectories for students with SEN, contributing valuable insights into the complexities of their educational journeys.

KEYWORDS
life course perspective, placement trajectories, school transfer, sequence analysis, special educational needs, tracking

Key points

- In many countries, students with SEN can be schooled in different types of placements, such as inclusive schooling in regular schools or separated schooling in special schools. Alternative placements often exist in parallel. Transfers between placements may be challenging for students with SEN and may negatively impact their trajectories.
- In the current study, only a small proportion of students with intensive SEN did not experience any placement transfers during compulsory education. Most underwent one or two placement transfers and about a fifth of students with SEN underwent three or more placement transfers.
- Our results showed that placement trajectories of students with SEN were heterogeneous. Four groups of students with similar trajectories were identified. Differences between these groups may be linked to the type and severity of SEN.

- Given the prevalence of placement transfers and the complexity of placement trajectories for some students with SEN, further research is required to gain a deeper understanding of the underlying reasons and consequences of placement transfers for this group of students.

INTRODUCTION

Many countries in Europe and worldwide offer multiple school placement options for students with special educational needs (SEN); (e.g. European Agency for Development in Special Needs Education, 2003). Consequently, various forms of inclusive school placements, special classes in mainstream schools and special schools often exist in parallel within one country. In countries where students with SEN can be schooled in a variety of placements, transfers between different types of placements are highly probable. However, the literature on transfers between placements by students with SEN is scarce; in particular, longitudinal investigations of individual placement trajectories are missing. While transfers between placements can offer the opportunity to find a school environment that optimally fits students' needs (e.g. Croydon et al., 2019), individuals with SEN generally experience school transfers as more challenging compared to individuals without SEN (e.g. Harris & Nowland, 2020). For example, during the primary to secondary school transition, students with SEN are generally more concerned with support provision and/or bullying in the new school than their peers without SEN (Hughes et al., 2013).

The current paper aims to shed light on individual placement trajectories of students with SEN, focusing specifically on the numbers and timing of transfers between different placements. For this purpose, exemplary longitudinal data from Switzerland, where several placement options are available for students with SEN, is used.

School placements for students with SEN

Definitions of SEN vary across countries and contexts. To capture a broad variety of SEN types, we adopt the operational definition by the European Agency Statistics on Inclusive Education, which defines SEN as '[…] an official decision [that] leads to a child/learner being recognised as eligible for additional educational support to meet their learning needs' (Ramberg & Watkins, 2020, p. 92).

Both SEN definitions and the organisation of SEN service provision differ widely among countries. Thus, the rates of students receiving SEN support and the rates of students in inclusive versus segregated school placements vary substantially across nations (Anastasiou & Keller, 2014; Entrich, 2021). Many countries offer multiple placements for students with SEN. Different types of placements can be roughly grouped into *inclusive schooling* in mainstream classes with SEN support, *separated schooling* in special classes within mainstream schools and *segregated schooling* in special schools (Entrich, 2021; Ramberg & Watkins, 2020). While most school systems have become more inclusive for students with SEN in recent decades, full inclusion has not been attained (Boyle & Anderson, 2020). Additionally, an increase in the proportion of students with SEN in inclusive placements does not necessarily result in a decrease of students in segregated placements. In Germany, for example, the proportion of students with SEN in inclusive placements rose from 2008 to 2013, while the proportion of student with SEN in segregated placements stayed constant (Klemm, 2015). In some countries, separated and segregated placements have seen increased differentiation or expansion in recent years (Banks & McCoy, 2017; Tah, 2019). Thus, the provision of multiple placements for students with SEN persists in many countries.

Transfers between placements

Although it is probable that students with SEN in a multiple track system will transfer between placements, studies on this topic are rare. A cross-sectional study, which used administrative census data about Swiss students, estimated that roughly one fifth of students with SEN transferred placements every year (Snozzi et al., 2023). Transfers between placements for students with SEN occurred at all grades but were more frequent at normative transition points (e.g. from kindergarten to primary school). Except for temporary placements (e.g. some types of special classes can only be attended for a limited time), transfers from inclusion to separation (special classes) or segregation (special schools) were more frequent than those in the other direction. We are not aware of other studies that systematically report descriptive statistics of transfers between placement types (e.g. investigating the frequency, timing or direction of transfers). However, studies on overall school mobility (i.e. investigating all types of school transfers and not focusing specifically on placement transfers) report slightly higher frequencies of school transfers for students with SEN as compared to students without SEN (Barrat et al., 2014; Rübner Jørgensen & Perry, 2021; Strand & Demie, 2006). Furthermore, results from Rübner Jørgensen and Perry (2021) suggest that the variability in patterns of school mobility appears to be higher for students with SEN. In particular, the percentage of students who undergo zero school transfers as well as the percentage of

students experiencing high school mobility (more than three transfers) between ages five and sixteen was higher in students with SEN as compared to students without SEN.

Several studies have explored the reasons for transfers from inclusive to segregated placements, and have investigated both academic and social domains. Typical reasons include lack of academic support, perception of an exclusionary school culture and/or emotional strain of SEN students in inclusive school settings (Bastges-Lienshöft et al., 2020; Kelly et al., 2014; Lelgemann et al., 2012; Mann et al., 2018). In hindsight, most students and parents appear pleased with the new placement, regardless of whether it is inclusive, separated or segregated (Croydon et al., 2019; Martin et al., 2019; Pillay & Di Terlizzi, 2009; Rens & Louw, 2021). Nonetheless, the process of transitioning between placements is often experienced as challenging (Kelly et al., 2014; Martin et al., 2019; Rens & Louw, 2021). Students who transferred from regular to special classes reported feeling anxious and stressed, expressing a sense of loss as they left their peers in the mainstream class behind (Rens & Louw, 2021). This finding is in line with other findings showing that normative school transitions (e.g. from primary to secondary school) are more challenging for students with SEN than for students without SEN (Dockett & Perry, 2013; Harris & Nowland, 2020; Jindal-Snape et al., 2019; Malone & Gallagher, 2009).

Placement trajectories for students with SEN

Whereas school *transfers* capture an event at a specific point in time (i.e. cross-sectional analyses), the investigation of school *trajectories* allows for observations about the unfolding of an individual student's placement(s) over time (i.e. longitudinal analyses). As with the literature on school transfers between different placements, research on the placement trajectories of students with SEN is scarce. We found three longitudinal studies on school placements for students with SEN, all of which focused on the period from preschool or kindergarten to the beginning of primary school. Two of these studies were conducted in the United States (Guralnick et al., 2008; Hanson et al., 2001) and one in Sweden (Lundqvist et al., 2015). All three studies found that a substantial proportion of children with SEN who started in (partially) inclusive placements during pre-school or kindergarten, transferred to less inclusive placements during kindergarten or at the beginning of primary school. Transfers to more inclusive placements were rare. Furthermore, Guralnick et al. (2008) found that while students who transferred from fully inclusive to partially inclusive placements did not differ in their skills from those who remained in fully inclusive placements, the few students who transferred to partially specialised placements had significantly lower cognitive and language skills than those remaining in inclusive placements. In the Swedish study, students who transferred to segregated placements had very high support needs (Lundqvist et al., 2015). Hence, in both studies, transfers to segregated (specialised) placements appeared to be linked to more severe support needs.

Some longitudinal studies have investigated changes in SEN status over time (i.e. whether students were eligible for SEN support or not) irrespective of placement type (Dempsey, 2014; Schulte & Stevens, 2015; Woods, 2020). Results from these studies suggest that SEN status often changes over time. In a nationally representative sample in the United States, Woods (2020) found that two thirds of students with SEN entered and/or exited SEN status between kindergarten and eighth grade. Most of these students changed status more than once. Similarly, in a statewide analysis conducted in the United States (Schulte & Stevens, 2015), 6% of students maintained SEN status for every year between third and seventh grade, in contrast to the 16% of students who had a SEN status in at least 1 year during this period. In a longitudinal Australian study, over half of the students with a SEN status lost this status over a four-year period, whereas approximately 10% of students were newly designated with a SEN status during this same period (Dempsey, 2014). Thus, longitudinal analyses capture all students who received SEN support at some point, facilitating a detailed analysis and mitigating potential over- or underestimations resulting from changes in SEN status.

Other sources of information on the school and placement trajectories of students with SEN might be found in social stratification and life course research. However, the effects of disadvantages from disabilities (and associated SEN) on the unfolding of educational and employment trajectories are understudied (Chatzitheochari & Platt, 2019). Studies from England and Ireland showed that students with SEN were more likely to leave school early and also less likely to (plan to) proceed to an academic track, compared to students without SEN (Carroll et al., 2022a; Chatzitheochari & Platt, 2019). These effects could largely be explained by lower academic achievements for students with SEN (primary effects), but appeared to be partially mediated by other factors such as students' lower expectations (Chatzitheochari & Platt, 2019), the quality of inter actions with teachers and primary caregivers or economic vulnerability (secondary effects; Carroll et al., 2022a). Furthermore, secondary effects were more prominent in students with social–emotional difficulties than in students with specific learning or intellectual disabilities (Carroll et al., 2022b).

The current study

As described above, many countries offer multiple tracks for students with SEN. First results from

Switzerland on transfers between placements for students with SEN (Snozzi et al., 2023) and research showing that SEN status and school placements are not stable over time (Dempsey, 2014; Schulte & Stevens, 2015; Woods, 2020), suggest that students do transfer placements. However, to our knowledge, there has been no investigation into the school trajectories of students with SEN based on type of placement. Therefore, the purpose of the current study is to analyse the placement trajectories of students with SEN during compulsory education. The canton (i.e. federal state) of Zurich in Switzerland is used as a case of a region where multiple placements options for students with SEN exist in parallel.

The following two research questions are addressed: (RQ 1) What are the characteristics of placement trajectories for students with SEN? First, we show which placements are attended by students with SEN across the 11 years that comprise compulsory education. Second, we describe individual trajectories of students with SEN in terms of the number and timing of transfers between placements as well as the type of placement(s) attended during 11 school years. (RQ 2) What are typical placement trajectories of students with SEN? This question will be investigated by grouping students with similar placement trajectories. Groups are described by the characteristics of students' placement trajectories and compared according to age, gender and students' first language.

METHODS

Study context

Switzerland is organised in a federalist manner, and responsibility for education lies with each of its 26 cantons. Thus, there are slight variations between cantons regarding the provision of special education support. This study used administrative census data from the canton of Zurich. The canton of Zurich lies in the German-speaking part of Switzerland and has the largest student population of all Swiss cantons (roughly 132,000 students in 2009; Bildungsdirektion Kanton Zürich, 2010).

In the canton of Zurich, SEN support is classified into two levels: standard and intensive SEN support. *Standard SEN support* ('einfache Massnahmen') comprises (a) support measures that are allocated to entire regular school classes (i.e. not to individual students), (b) schooling in special classes within regular schools (separated placement) or (c) therapeutic measures (e.g. speech or psychomotor therapy). *Intensive SEN support* ('verstärkte Massnahmen') encompasses (d) support measures for individual students with SEN who are schooled in regular classes (inclusive placement), (e) special schooling in private schools or (f) schooling in special schools (segregated placement). Therapeutic measures may also be

provided for students with intensive SEN in addition to support measures d, e, and f.

Given that we were interested in individual placement trajectories, and given that standard SEN support is not allocated to individual students, the current study focused on the group of students who received intensive SEN support. These students encompass a heterogeneous group of children and adolescents with various types of disabilities and learning difficulties. In contrast to students receiving standard SEN support, in order to be eligible for intensive SEN support individuals must undergo a mandatory standardised assessment procedure conducted by psychologists or paediatrician (Schweizerische Konferenz der kantonalen Erziehungsdirektoren, 2014). Students with intensive SEN support who are placed in regular classes are individually supported by special education teachers and sometimes classroom assistants. Alternatively, intensive SEN support is provided in special schools and, less commonly, in private schools. Special schools are categorised into three types: type A schools cater to students with learning or behavioural difficulties and with speech development disorders; type B schools serve students with physical, sensory or multiple disabilities; and type C schools cater to students with intellectual disabilities.

Data

Administrative data for 2009 through 2021 was provided by the canton's office ('Bildungsstatistik Kanton Zürich'). The data consists of annually-collected information about students in compulsory education who received intensive SEN support in at least 1 year between 2009 and 2021. Compulsory education typically consists of 2 years of kindergarten, 6 years of primary school and 3 years of lower secondary school. Note that special classes within mainstream schools are categorised as standard SEN support. Thus, students attending special classes are not part of this sample unless they receive intensive SEN support at another time point within their school trajectory.

Cohorts

For our analyses, we used a subset of three cohorts from the original data set. The transition from kindergarten to primary school was used to determine the cohorts. This approach was favoured over using entry into kindergarten as the defining criterion, given the possibility that some students might shorten or extend kindergarten attendance by 1 year. The three cohorts included students who transitioned from kindergarten to primary school in 2011, 2012 or 2013. To cover the years in compulsory education, sequences of 11 years were chosen. Each sequence started 2 years before the cohort's entry into

primary school (i.e. covering kindergarten) and lasted 9 years after that (i.e. covering primary and lower secondary school). The three cohorts encompassed a total of 2733 students.

Missing values

For some students, data was not complete for the whole sequence of 11 years. One reason for missing values is when students moved away from the canton and were no longer recorded in the statistics of the canton of Zurich. In a few occurrences between 2009 and 2014, a student's placement was unknown, even though these students were registered as attending compulsory education in the canton of Zurich. Individual reasons for missing values could not be determined. All students with missing values ($n=616$ cases out of 2733; 23%) were excluded from the analysis since we were interested in entire placement trajectories. An independent t-test showed no significant differences in age between the students included and excluded from the analysis, $t(874.42)=1.36$, $p=0.175$. Also, Pearson's Chi-squared tests showed no significant differences in gender $\chi^2(1)=0.29$, $p=0.866$ and German as a first language $\chi^2(1)=0$, $p=1$ between students included and excluded from the analysis.

Subset

The final subset of students included in the analysis consisted of 2117 students (see Table 1). A one-way ANOVA showed differences in age between the three cohorts $F(2, 2114)=4.14$, $p=0.016$. Tukey's Honest Significant Difference test for multiple comparisons indicated that the mean age differed significantly between the first (year 2011) and third (year 2013) cohort ($p=0.012$). There was no statistically significant difference in mean age between the first and second (2012) cohort ($p=0.214$) or between the second and third cohort ($p=0.493$). The cohorts did not differ in gender composition, $\chi^2(2)=1.12$, $p=0.571$ or the proportion of students whose first language was German $\chi^2(2)=2.77$, $p=0.251$ (Pearson's Chi-squared tests). The mean age at the start of school was

5.1 years. Girls were with just over 30% underrepresented in the sample. More than half of the students did not speak German as their first language. The overrepresentation of boys and children with a migration background (i.e. those whose first language differs from the one spoken in the local area) in students with SEN has been documented before in other studies (e.g. Campbell, 2023; Müller et al., 2020).

Variables used

Placement
This time-varying variable was created from three variables that specified different aspects of the placement: general type of school (regular versus special school), intensive SEN support in regular schools and type of special school. The latter was a newly created variable, which distinguished between seven possible placement types: regular class, special class (in regular school), inclusive schooling (in regular class), special schooling in private school, special school type A, special school type B and special school type C. Types of special classes were not differentiated because transfers from one type of special class to another were found to be exceedingly infrequent. Note that, similar to other European countries (Buchner et al., 2021), Swiss administration does not collect data on disability categories. Thus, specific support needs can only be broadly inferred from school placement.

Age at school start
Students' individual age was calculated based on their date of birth at the start of their presumed first year of kindergarten (i.e. 2 years before transition from kindergarten to primary school).

Gender
This variable defined whether students were registered as female or male.

First language
A dummy variable was created, specifying whether students' first language was German or a different language.

TABLE 1 Overview and comparison of the three cohorts that constitute the subset of students analysed.

	Cohort[a]		
	2011	**2012**	**2013**
Number of students	732	673	712
Age at the start of the sequence in years: M (SD)	5.04 (0.46)	5.08 (0.51)	5.11 (0.49)
Gender female	31.1%	33.1%	30.6%
First language German %	49.4%	47.4%	45.1%

Note: All students of this subset received intensive SEN support in at least one year.

[a]Cohorts were defined by the year students transitioned from kindergarten to primary school.

Analyses

Sequence analysis was used to answer our research questions. We chose this approach because it is particularly well suited for investigating exploratory and descriptive research questions related to temporally ordered social processes (Raab & Struffolino, 2023), as is the case with school trajectories. Within the sequence analysis framework, sequences are defined as ordered series of states that people go through. In the current study, a sequence represents the placement trajectory of an individual student and consists of the placements attended in each of the 11 years analysed.

Sequences are complex entities that differ on various dimensions such as the duration, timing or order of states (Raab & Struffolino, 2023). These dimensions are not analysed separately. Unlike other methods, sequence analysis does not investigate specific transitions or events, but rather compares sequences in a holistic manner by simultaneously considering the duration, timing, and ordering of states in the sequence (Gauthier et al., 2014; Raab & Struffolino, 2023). In the following, we describe the procedure of our analysis in two parts, each part consisting of two steps.

Characteristics of placement trajectories

First, we described the basic characteristics of the placement trajectories of students with intensive SEN support (RQ 1). For each student, a sequence of placements attended over 11 years (i.e. placement trajectory) was analysed. In a *first step*, we investigated the evolvement of the distribution of placements in each year. Thus, for each placement, we determined the percentage of students attending this placement in each of the 11 years analysed. Even though time is a factor that is considered, strictly speaking, the analysis is cross-sectional, as individual students are not tracked over time (Rajulton, 2001). In a *second step*, we conducted a longitudinal analysis of individual placement trajectories. We used the number of transfers between placements and the number of placements attended by each student to describe each sequence (i.e. trajectory; Ritschard, 2021). For the timing of transfers, we examined whether transfers occurred in early (years one to four; three potential transfers), intermediate (years four to eight; four potential transfers) or late (years 8–11; three potential transfers) timeframes within the placement trajectories.

Typical placement trajectories

Second, we explored the typical placement trajectories of students with intensive SEN support (RQ 2). This second part of the analysis consisted of two steps. In the *first step*, algorithms are used to determine the (dis-)similarity between each of the sequences. For this purpose, we used the procedure of optimal matching. Optimal matching was introduced to the social sciences by Abott and Hrycak (1990) and has become widely used in life course

analysis (Gauthier et al., 2014). The degree of dissimilarity between sequences is measured by the costs of alterations needed to transform one sequence into another. Sequences can be altered by substituting different states or by inserting and deleting (abbreviation: indel) states (see, for example, Raab & Struffolino, 2023). Sequences are compared pairwise. The result of this analysis is a dissimilarity matrix that represents the dissimilarity for each pair of sequences.

To determine the so-called costs of alterations needed to transform sequences we used a theoretically derived substitution cost matrix (see Lesnard, 2014). Our substitution cost matrix attributed lower costs to the substitution of placements in regular class and inclusive schooling, compared to the costs for all other substitutions. We defined this cost differential to reflect the fact that placements in regular classes and inclusive schooling have greater proximity than all other placements, because no actual 'transfer' occurs when students switch between these two placements: Students are still schooled in the same class but have a different administrative status and thus receive more (or less; depending on the direction of transfer) intensive SEN support. Specifically, in the substitution cost matrix, we assigned a value of 1 when a substitution of 'regular class' and 'inclusive schooling' occurred and a value of 2 for any other placement substitution. For indel alterations, costs were set constant at a value of 1 (Raab & Struffolino, 2023).

In the *second step*, we used the dissimilarity matrix (calculated in the first step) in a hierarchical cluster analysis to group similar sequences. Ward's agglomerative clustering was used (Murtagh & Legendre, 2014). Determination of the number of clusters was guided by an examination of quality indicators and theoretical considerations pertaining to the interpretation of the clusters. We consulted the four cluster quality indices suggested by Raab and Struffolino (2023): Average silhouette width, point biserial correlation, Hubert's gamma, and Calinski-Harabasz index.

In 2009, information on inclusive placements was not yet recorded in the administrative data used for this analysis. Thus, the first cohort (2011) of students who entered kindergarten in 2009 may potentially differ from the other two cohorts in terms of placement trajectories. We assessed for potential biases in the typology of placement trajectories by conducting a cluster analysis that contained only the second and third cohorts, and then compared the results to the original cluster analysis (i.e. all three cohorts). The comparison revealed only minor differences in cluster assignment in the original analysis versus the analysis with two cohorts only (6% cases with different cluster assignments for the two different analyses). We therefore assume that the missing data on inclusive placements in 2009 did not substantially impact the typology of placement trajectories.

Data analysis was conducted with the software R (R Core Team, 2016) using the TraMineR

package (Gabadinho et al., 2011). The packages ggplot2 (Wickham, 2016) and ggseqplot (Raab, 2022) were used to plot the results.

RESULTS

General description of placements

We first focused on the cross-sectional comparison of the distribution of placements in each year. Figure 1 provides an overview on the evolution of each placement for the group of students with intensive SEN support, by showing the distribution of placements by year. Over time, fewer students attended regular classes without intensive SEN support; however, the number of students in most of the other placements increased. In year one, 78% of students were schooled in regular classes without SEN support, 7% in inclusive schooling, and 16% attended segregated placements (special and private schools). In year 11, 34% of the students were schooled in regular classes, 25% attended inclusive schooling and 40% were in segregated placements.

Overall, *regular class* was the most frequently attended placement for students who received intensive SEN support for at least 1 year during compulsory education. This figure was highest in year one and declined over time and was thus lowest in year 11. The decline of students in regular classes was greatest between years two and three—reflecting the transition from kindergarten to primary school. The placement *special class* was infrequent, ranging from 0% to 2% in most years and with a peak of nearly 6% in year three. In the canton

of Zurich, students may attend a special introductory class for 1 year after kindergarten in order to ease the transition from kindergarten to primary school. Thus, the observed peak in year three likely reflects students who opted to attend a special introductory class. The frequency of students attending *inclusive schooling* started at 6% of all students in year one, reached a peak of approximately 34% in year eight, and dropped to roughly 27% in years 9–11, which would correspond to secondary school for most students. Placement in *private schools* started with 0% in year one and increased to 10% in year 11. Placement in *special school type A* also increases, starting at 7% in years one to three and reaching 16% in year 11. Placement in special school type B stayed around 5% over the entire time span. Placement in *special school type C* started at 4% and increased to almost 10% in year 11.

Characteristics of individual placement trajectories

The next step of the analysis focused on individual characteristics of the placement trajectories of students with intensive SEN support. To shed light on this issue, we investigated the number and timing of transfers between placements and the number of placements attended by each student. Figure 2 shows individual placement trajectories for all students. In the graph, each horizontal line represents the placements attended by an individual in every year considered.

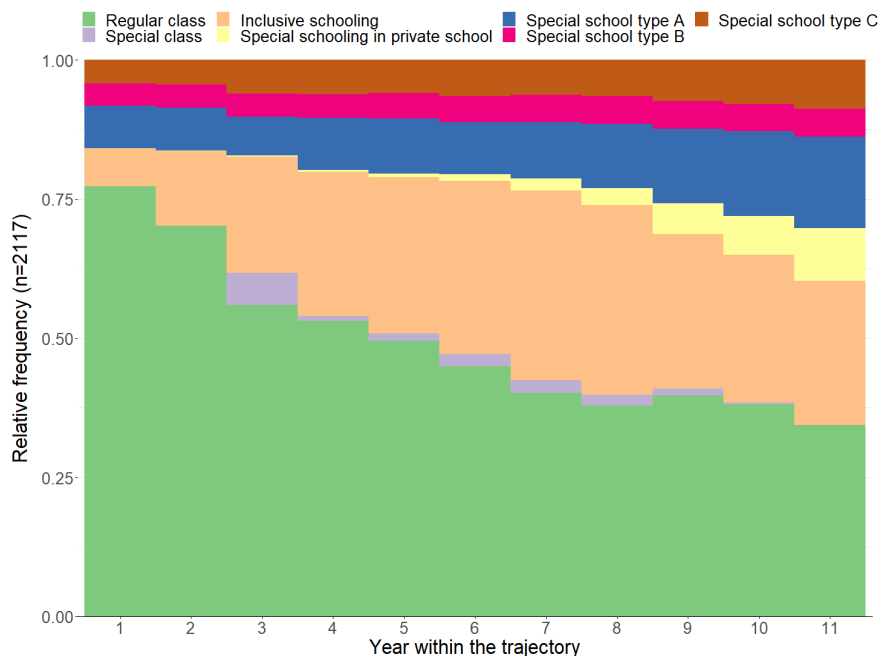The *number of transfers* per student across 11 years ranged from zero to six (Table 2). Although some

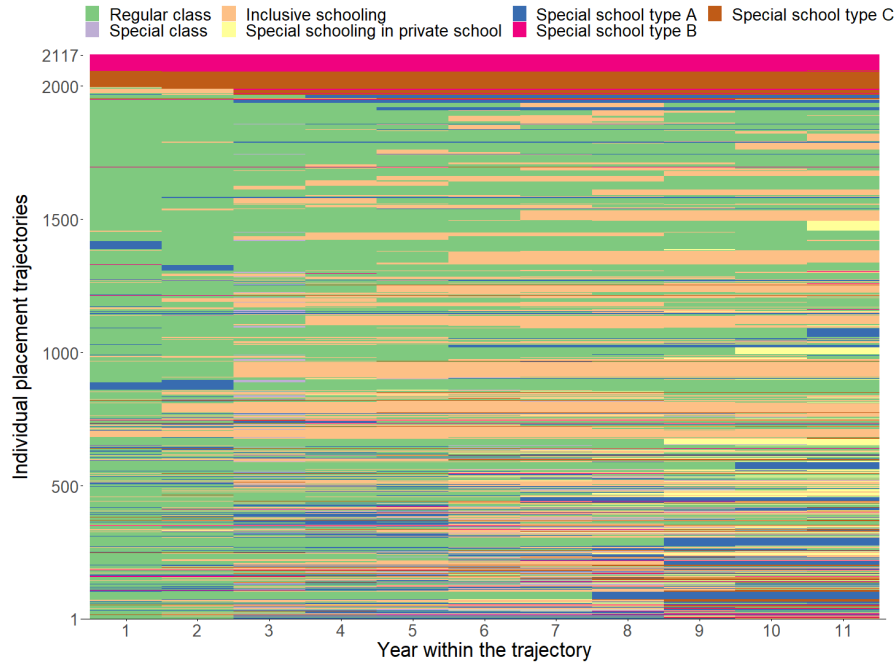**FIGURE 1** Distribution of placements of students with intensive SEN support in each year.

FIGURE 2 Individual placement trajectories of students with intensive SEN support over 11 years.

TABLE 2 Distribution of number of transfers between placements and number of placements attended.

Number of transfers between placements	Number of placements attended					
	All	1	2	3	4	5
All	2117	166	1353	502	89	7
0	166	166	–	–	–	–
1	813	–	813	–	–	–
2	696	–	470	226	–	–
3	285	–	47	199	39	–
4	124	–	19	61	41	3
5	29	–	4	14	7	4
6	4	–	0	2	2	0

Note. Impossible combinations are marked with a dash (e.g. students that have attended three different placements necessarily must have experienced at least two transfers).

FIGURE 3 Quality indices from the cluster analysis, adjusted by mean and standard deviation (z-scores). Legend shows the abbreviation of the quality index with lowest and highest z-scores in brackets. AWS, Average silhouette width; CH, Calinski-Harabasz index; PBC, point biserial correlation; HG, Hubert's gamma.

students remained in the same type of placement for the entire trajectory (stayers, 8%), most students transferred between placements one or two times (movers, 71%). A substantial number of students transferred between placements three or more times during the study period (high movers, 21%). In the group of stayers, 36 students only attended regular classes during the 11 years investigated. These students were an exception: They had been included in the sample because they had attended a special school prior to the start of the chosen sequence (i.e. third year of kindergarten, eight students), after the chosen sequence (i.e. extended secondary school, 25 students) or were labelled as having SEN (behavioural disability, psychic disability, temporary hospitalisation; three students) in 1 year.
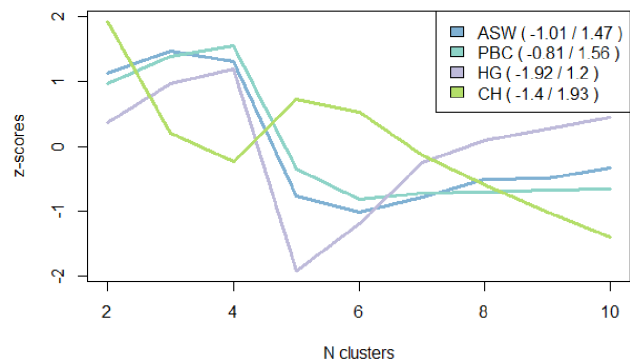
Number of placements attended was closely related to number of transfers (Table 2). Of note, many students attended the same type of placement more than once. For example, of the 1353 students who attended two types of placements, 813 (60%) underwent one transfer (i.e. attended two types of placements once), 470 (35%) underwent two transfers (i.e. attended one type of placement twice) and 70 (5%) underwent three or more transfers (i.e. attended two types of placements at least twice).

Regarding the *timing of transfers*, we found similar frequencies of transfers for the early, intermediate, and late timeframes: 48% of students underwent early transfers, 50% of students underwent intermediate transfers and 42% of students underwent late transfers. Furthermore, 50% of students only transferred in one of the three

timeframes, 36% of students transferred in two different timeframes and 6% of students underwent transfers in all three timeframes.

Typical placement trajectories

The second research question focused on typical placement trajectories for students with intensive SEN support. Overall, the different quality measures of the cluster analysis and theoretical considerations favoured a four-cluster solution (see Figure 3). Average silhouette width reached a maximum for the three-cluster solution but showed a similar value for the four-cluster solution. Point biserial correlation and Hubert's gamma reached a maximum for the four-cluster solution, whereas the Calinski-Harabasz index favoured a five-cluster solution. The types found in the four-cluster solution appeared plausible and of greatest assistance in structuring the complex and heterogeneous placement trajectories.

Figure 4 shows the distribution of placements in each year for the four clusters. Individual placement trajectories for the four clusters are displayed separately in Figure 5. Detailed information on the characteristics of students and their placement trajectories are presented separately for the four clusters in Table 3. The most notable distinction between the four clusters was primary placement type. As described in the following paragraphs, clusters also differed in the characteristics of the individual sequences.

Cluster 1 (C1) is a small cluster encompassing 173 students (8%). Individuals in this cluster predominantly stayed in special schools Type C. Inclusive schooling (almost 2 years on average) was also quite frequent in this cluster. Approximately one third of the students in C1 were stayers (i.e. stayed in the same placement), while more than half were movers (i.e. transferred placements once or twice). Transfers were most frequent in the early timeframe and least frequent in the late timeframe. *Cluster 2* (C2) is by far the largest cluster, comprised of 1675 students (79%) who were predominantly placed in regular classes with or without intensive SEN support (regular class or inclusive schooling). Approximately 75% of students in C2 were movers and 22% were high movers (i.e. transferred placements more than twice). Transfers happened at a similar rate in all three timeframes. *Cluster 3* (C3) is a small cluster that includes 107 students (5%) who predominantly stayed in special schools type B. Approximately half of students in C3 were stayers and one third were movers. Movers were equally likely to undergo a transfer in all three timeframes. *Cluster 4* (C4) contains 162 students (8%) who were placed predominantly in specials schools type A, but also often stayed in regular classes (on average almost 3 years). Within C4, almost three fourth of students were movers and roughly a forth were high movers. Students in this cluster most often transferred placements during the early and intermediate timeframes. Overall, in all four clusters, the number of placements attended by individual students reflects the number of transfers for each of the clusters.
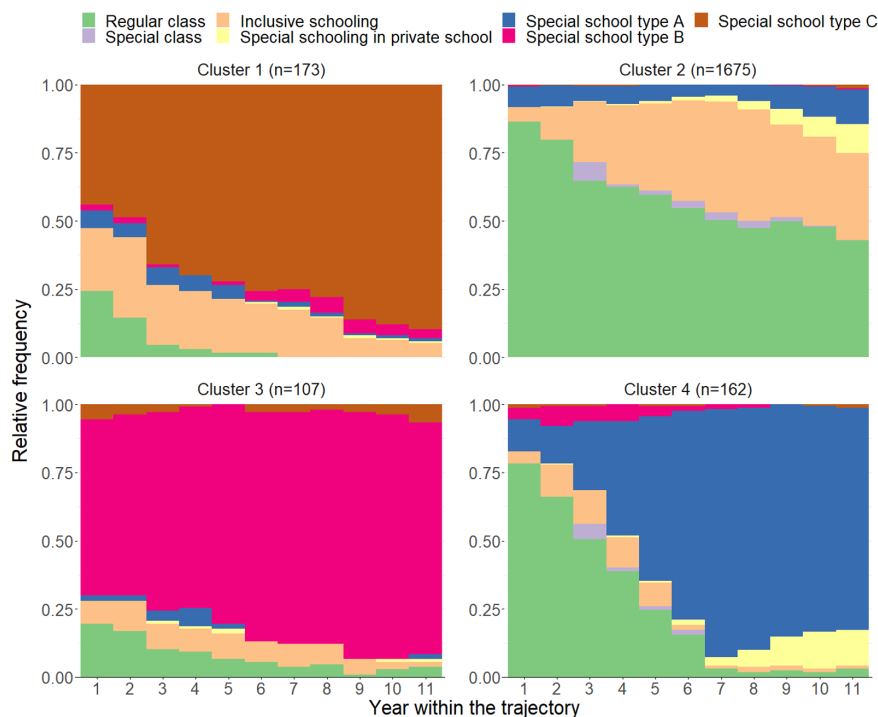

FIGURE 4 Distribution of placements in each year displayed for the different clusters.
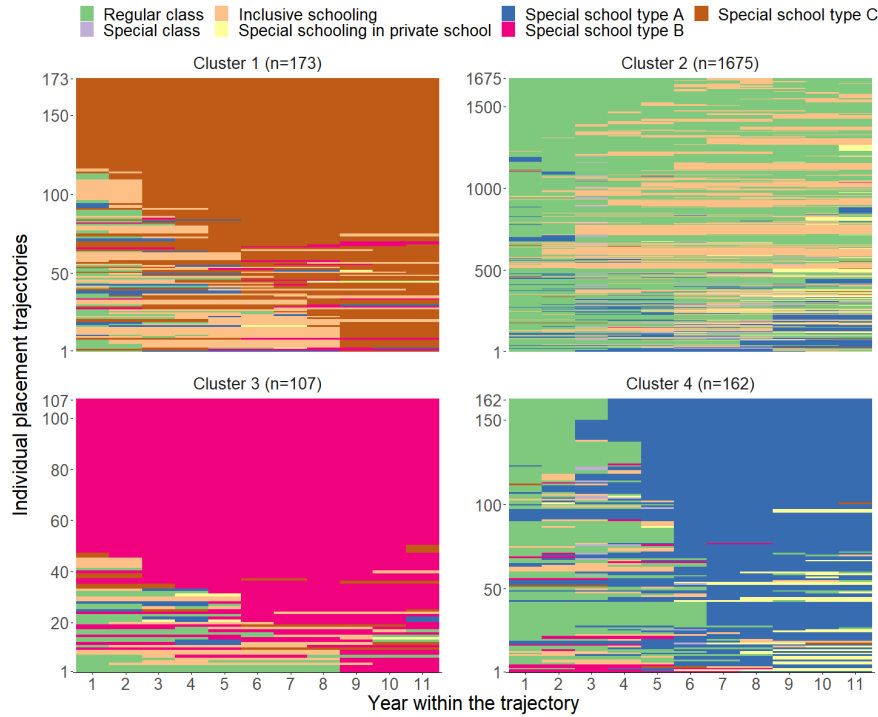
Legend: Regular class, Inclusive schooling, Special class, Special schooling in private school, Special school type A, Special school type B, Special school type C

Cluster 1 (n=173), Cluster 2 (n=1675), Cluster 3 (n=107), Cluster 4 (n=162)

FIGURE 5 Individual placement trajectories over 11 years displayed for the different clusters.

TABLE 3 Overview on characteristics of placement trajectories and student characteristics in the four clusters.

Cluster	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Number of students (n)	173	1675	107	162	2117
Characteristics of placement trajectories					
Transfers: M (span)	1.1 (0–5)	1.9 (0–6)	0.8 (0–5)	1.8 (0–5)	1.8 (0–6)
Placements attended: M (span)	2.0 (1–5)	2.3 (1–5)	1.7 (1–4)	2.5 (1–4)	2.3 (0–5)
Stayers (no transfers): n (%)	57 (33%)	48 (3%)	57 (53%)	4 (2%)	166 (8%)
Movers (1–2 transfers): n (%)	96 (56%)	1260 (75%)	37 (35%)	116 (72%)	1509 (71%)
High movers (>2 transfers): n (%)	20 (12%)	367 (22%)	13 (12%)	42 (26%)	442 (21%)
Early transfers (year 1–4): n (%)	78 (45%)	823 (49%)	27 (25%)	91 (56%)	1019 (48%)
Intermediate transfers (year 4–8): n (%)	59 (34%)	870 (52%)	27 (25%)	108 (67%)	1064 (50%)
Late transfers (year 8–11): n (%)	34 (20%)	807 (48%)	23 (21%)	32 (20%)	896 (42%)
Years in regular class: M (span)	0.5 (0–6)	6.5 (0–11)	0.8 (0–8)	2.9 (0–6)	5.4 (0–11)
Years in inclusive schooling: M (span)	1.8 (0–8)	3.2 (0–11)	0.8 (0–8)	0.6 (0–5)	2.7 (0–11)
Years in special school type A: M (span)	0.4 (0–6)	0.8 (0–7)	0.2 (0–4)	6.6 (1–11)	1.2 (0–11)
Years in special school type B: M (span)	0.3 (0–7)	0.0 (0–2)	8.8 (2–11)	0.3 (0–7)	0.5 (0–11)
Years in special school type C: M (span)	7.9 (2–11)	0.0 (0–4)	0.3 (0–6)	0.1 (0–3)	0.7 (0–11)
Student characteristics					
Age at school start: M (SD)	5.44 (0.56)	5.02 (0.42)	5.39 (0.84)	5.04 (0.44)	5.07 (0.48)
Gender female	35%	32%	41%	19%	32%
First language German	56%	46%	51%	52%	47%

Regarding student characteristics, the mean age at school start was slightly higher for C1 and C3 than for C2 and C4 (see Table 3). A one-way ANOVA showed differences in students' age between the four clusters $F(3, 2113) = 58.5$, $p < 0.001$. Tukey's Honest Significant Difference test for multiple comparisons showed that the mean age was significantly higher in C1 and C3 as compared to C2 and C4 ($p < 0.001$). There was no statistically significant difference in mean age between C1 and C3 ($p = 0.815$) or between C2 and C4 ($p = 0.971$). The higher age may be due to students starting kindergarten later or spending three instead of 2 years in kindergarten.

The percentage of female students was highest in C3 (approximately 40%), and was 25% in C2, 23% in C1 and 19% in C4. A Pearson's Chi-squared test found a significant difference in the gender distribution of the clusters, $\chi^2(3) = 18.45$, $p < 0.001$. The percentage of students for whom German was their first language was slightly

lower in C2 (46%) than in C1 (56%), C3 (51%) and C4 (52%). However, a Pearson's Chi-squared test showed that the difference between the clusters was not significant $\chi^2(3) = 5.49$, $p = 0.139$.

DISCUSSION

Students with SEN are often schooled in different types of placements. We investigated the placement trajectories of students who received intensive SEN support for at least 1 year during their compulsory education in the canton of Zurich in Switzerland. Employing sequence analysis, we examined the characteristics of longitudinal placement trajectories (RQ 1) and described typical placement trajectories of students with intensive SEN support (RQ 2). Three sets of results are discussed below: (1) Frequency of transfers between placements, (2) timing of transfers and evolvement of students' placements over time and (3) typical placement trajectories for students with SEN.

Stayers, movers and high movers

As part of our first research question, we investigated the number of placement transfers each student with SEN experienced. Our findings confirm previous results from a cross-sectional study on school transfers between different types of placements in all of Switzerland (Snozzi et al., 2023) by showing that students transfer frequently between placements. Furthermore, our findings extend these previous results by detailing transfer frequency over an 11-year period. The majority of students who received intensive SEN support (71%) experienced one or two placement transfers. Approximately one fifth of students (21%) transferred placements more than twice, whereas a small group (8%) did not experience any placement transfers.

As we have not been able to identify any other studies that specifically report on the frequency of transfers between different types of placements for students with SEN, the current findings can be only compared with overall school mobility for students in England, as reported by Rübner Jørgensen and Perry (2021). Both studies cover a similar time span of 11 years (i.e. during compulsory education). However, it is important to note that, unlike our study, Rübner Jørgensen and Perry (2021) investigated the frequency of all types of school transfers. The distributions of transfer frequencies found in the two studies are similar, with a large majority of students experiencing one or two transfers. Yet overall, Rübner Jørgensen and Perry (2021) report slightly higher school mobility, which may be explained by the different types of school transfers considered. Our study is more conservative because transfers between different types of placements for students with SEN are very specific. It

is reasonable to expect that overall school mobility will be higher, as it will include school transfers that do not involve a change in placement type.

Our analysis of administrative data does not allow for conclusions about the impact to students of the number of transfers between placement types. Nevertheless, in consulting the existing literature, we expect that students may experience placement transfers as demanding. Research on school transitions (e.g. transition from primary to secondary school) shows that these transitions can be challenging for students with SEN (e.g. Dockett & Perry, 2013; Harris & Nowland, 2020). Furthermore, increased school mobility (i.e. frequent school transfers) correlates with lower academic performance, heightened emotional or behavioural issues, and increased challenges in social adjustment (Dinnen et al., 2020; Dupere et al., 2015; Mehana & Reynolds, 2004). For students with SEN who move between placement types, the transition experience has been described as demanding (Kelly et al., 2014; Martin et al., 2019; Rens & Louw, 2021). Thus, particularly complex placement trajectories, for example those experienced by this study's high movers, may correlate with elevated levels of stress and increased risk of social and academic challenges. However, studies also suggest that, despite the challenges, most parents and students retrospectively evaluate the new placement positively (Croydon et al., 2019; Martin et al., 2019; Pillay & Di Terlizzi, 2009; Rens & Louw, 2021).

Age trend

Overall, we found that the number of students with intensive SEN support in inclusive and segregated placements increased over time, namely as students grew older. Whereas in year one (i.e. kindergarten), a majority of students (nearly 80%) attended regular classes without receiving intensive SEN support, this pattern inverted by their last school year, with most students in the sample receiving some form of intensive SEN support (approximately 75%). Moreover, transfers occurred with equal frequency in the early, intermediate and late timeframe. Although we did not explicitly investigate normative transition points (i.e. transition from kindergarten to primary school and from primary to secondary school), two observations hint to an increased likelihood of placement transfers at these timepoints. First, the number of students in regular classes without intensive SEN support decreased markedly at the transition from kindergarten to primary school. Second, the percentage of students in inclusive schooling dropped around the transition from primary to secondary school (i.e. years 6–7).

Our results are in line with studies that reported frequent transfers from inclusive to more segregated

placements for young children with SEN in preschool, kindergarten and the beginning of primary school (Guralnick et al., 2008; Hanson et al., 2001; Lundqvist et al., 2015). Our results indicate that this pattern continues even beyond the initial years of primary school. This interpretation is in line with statistics showing that, in many European countries, the rates of students with SEN in segregated placements are higher in secondary school than primary school (Buchner et al., 2021; Ramberg & Watkins, 2020). Contrary to an Australian study (Dempsey, 2014), we found that more students overall entered intensive SEN support than left it. This discrepancy may stem from differences in the provision of SEN support between Australia and Switzerland.

Typical placement trajectories and type of SEN

Placement trajectories were heterogeneous for the students in this sample. Differences were found in the number and timing of placement transfers as well as in the types and ordering of placements attended. Employing sequence analysis, we were able to identify four groups of students with similar trajectories.

Clusters one and three differed in their predominant placement type, but also shared some similarities. Both clusters only had a few high movers, and a substantial proportion of students stayed in the same type of special school for the entire study period. These types of special schools cater to students with intellectual disabilities (cluster one) or students with physical, sensory or multiple disabilities (cluster three). It can therefore be expected that students in these clusters generally have more severe and complex support needs that cannot easily be met by regular schools. Our finding would be in line with research from the United States, which shows that students with severe disabilities are more likely to be schooled in segregated placements (Kleinert et al., 2015; Kurth et al., 2014). Data on Swiss special schools for students with intellectual disabilities somewhat supports this expectation, as children and adolescents enrolled in these types of schools were found to exhibit low adaptive skills and high mean levels of behavioural problems, requiring intensive support (Müller et al., 2020).

Students in clusters one and three had a higher mean age than students in the other two clusters. Administrative data from Germany indicates that children with early-diagnosed disabilities (or those at risk) tend to spend a longer time with their parents before enrolling in preschool or kindergarten. On average, they also appear to start primary school at a later age as compared to children without disabilities (Lotte, 2015). Thus, the higher age of students in these two clusters might be another hint that these individuals have more severe SEN and are thus diagnosed early.

Interestingly, gender was much more balanced in the third cluster than in all the other clusters. Since students in this cluster primarily attend special schools for students with physical, sensory or multiple disabilities, this finding might reflect smaller gender differences for physical and sensory impairments than in other types of SEN (Daniel & Wang, 2023).

In clusters two and four, most students were schooled in regular classes without intensive SEN support during the early school years. Both clusters had very few stayers and there was a substantial proportion of high movers. Students in cluster two tended to stay close to regular school, with many receiving intensive SEN support in an inclusive placement in primary and/or secondary school. In contrast, most students in cluster four had transferred from regular to special school type A (that cater to students with behavioural or learning problems) by year seven, where they remained in subsequent years. Given the arguments presented earlier in the discussion of clusters one and three, one may expect that students in these two clusters may have less severe SEN compared to individuals in clusters one and three, falling within the category of high incidence disabilities. High incidence disabilities typically include emotional and/or behavioural disorders, learning disabilities and mild intellectual disability (Gage et al., 2012). As suggested by Woods (2020), the onset of SEN support might be delayed for these students as compared to students with low-incidence (more severe) disabilities, because their support needs might take longer to manifest. The late onset of SEN support also partly explains the higher school mobility that we observed for students in clusters two and four. Almost all students in these two clusters started in regular classes without SEN support and thus underwent at least one transfer to one of the SEN placements. Furthermore, the higher school mobility would be in line with reports of higher school mobility for students with emotional disturbances (Barrat et al., 2014; Malmgren & Gagnon, 2005).

It should be noted that our findings regarding typical placement trajectories are purely descriptive. Nevertheless, it is possible that the clusters identified may reflect differences in SEN type and severity.

Strengths, limitations and future directions

To our knowledge, this study is the first to investigate the individual placement trajectories of students with SEN, distinguishing between placement types such as inclusive schooling and schooling in different types of special schools, and to do so over an extended period and in a large sample. While the administrative data used allowed us to longitudinally investigate three cohorts of students throughout compulsory education, some limitations in the data set should be noted.

First, the data was restricted to a single Swiss canton, which we used as an example of a region with a multi-track system for SEN provision. Thus, caution should be exercised in generalising these results to other regions or educational systems. Second, similar to other European regions (Buchner et al., 2021), the proportion of students in inclusive placements in the canton of Zurich has increased considerably between 2009 and 2021 (Bildungsstatistik Kanton Zürich, 2024). Given these changes, the selected cohorts may be somewhat constrained in their representativeness of current student placement trajectories. Third, school trajectories could only be analysed for the type of placements attended. It is important to keep in mind that school trajectories might be influenced by additional measures, including school transfers within the same type of placement or transfers between classes within the same school (e.g. grade repetition). Last, we only had limited information on student characteristics. For example, information on academic performance as well as type and severity of disability was not available. Thus, our analyses and results are mostly descriptive and do not allow for causal interpretations.

In summary, our study suggests that school transfers between placements for students with SEN are relatively common in multi-track systems. Additional research is warranted to explore the experiences of students with SEN and other stakeholders during these transfers. Moreover, targeted investigation into the placement trajectories of high movers may help to better understand the factors contributing to highly complex placement pathways. Based on such findings, specific support measures might be developed to facilitate successful placement transfers for students with SEN.

CONFLICT OF INTEREST STATEMENT

We have no known conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Bildungsstatistik Kanton Zürich. Restrictions apply to the availability of these data, which were used under license for this study. Requests for data usage can be submitted through Bildungsstatistik Kanton Z. rich's website: https://pub.bista.zh.ch/de/kontakt/.

ETHICS STATEMENT

Ethics approval was not required for this study.

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