Forman Journal of Social Sciences- 2023- Vol. 3, Issue 1 (June)
DOI: 10.32368/FJSS.20230208

Socioeconomic School Segregation in Urban Pakistan

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ABSTRACT

Socioeconomic segregation in schools is a critical policy issue since it affects social, educational and professional opportunities children have in society. This study measures the degree of school socioeconomic segregation in Pakistan. We calculated the school segregation using the Pakistan Social and Living Standards Measurements surveys for the years 2001-02 and 2018-19. Segregation was calculated at the national, urban, and city levels. We found elevated degree of segregation in government schools for students from less advantaged backgrounds. School segregation has dramatically increased over time and government schools are more segregated than private schools. In addition, we found that schools in Islamabad (level 1-10) had the highest levels of segregation, followed by Multan, Gujranwala, and Faisalabad. The study concludes with key recommendations for improving integration within government schools of urban Pakistan to reduce inequalities.

Keywords: Segregation, education policy, socioeconomic stratification, inequalities, urban schooling

DOI: 10.32368/FJSS.20230208

INTRODUCTION

Segregation in schools based on socio economic background of children is a significant policy concern due to its potential to restrict social integration and mobility in society. Louf & Barthelemy (2016) defined segregation as a non-random spatial distribution of groups, which diverges significantly from a random distribution. The phenomenon of socioeconomic segregation (SES) in schools can be understood as an imbalanced allocation of students with distinct socioeconomic characteristics across educational institutions (Larraaga & Sanhueza, 2007). The measure of school SES estimates the proportion of disadvantaged students who must transfer or migrate between schools to ensure an even distribution across all schools in a particular geographic area (Valenzuela, Bellei & Ríos, 2014).

In Pakistan, school education has gradually expanded over the years, and school accessibility has improved across social classes; yet the schooling system through which one receives their education remains a significant factor for the current and later opportunities in life. In the context of Pakistan, inequalities in terms of children's access to educational resources, schooling experience, and social integration present complex intersectionality of parents' socioeconomic class, child's gender, ethnicity, geography, and region of residence (Ali & Bakar, 2019; Omer & Jabeen, 2016; Ullah & Ali, 2018). Despite the established link of school SES with lifelong disparities for children, the debate about segregation is widely missing from the Pakistani education policy debate.

Segregation in schools based on socioeconomic status is relevant to education policies in a number of different ways. First, one of the main mechanisms for peer effect is the socioeconomic makeup of the class. Evidence suggests that there is a connection between students' socioeconomic makeup and educational outcomes; integrated schools produce better academic results

for children from all socioeconomic backgrounds (Palardy; 2013, 2008). Over time, inequality in academic achievement results in disparities in earning potential, a major factor in income stratification (Duncan & Murnane, 2011; Owens, 2018). Second, schools serve as a platform for children to socialize and be exposed to the intricacies of everyday life. This socio-civic feature is hindered by school segregation since it limits the engagement and interaction of children with each other from various socioeconomic backgrounds (Larraaga & Sanhueza, 2007). Lastly, school segregation hampers educational policies' efforts to increase educational opportunities for all socioeconomic and ethnic groups. Disadvantaged students' vulnerability to stratification and risk of exclusion is expected to rise due to school segregation (Carlson et al., 2020; Larraaga & Sanhueza, 2007).

The objective of the study is to gauge the degree and evolution of segregation that based on children' s social and economic background in schools in Pakistan. We use evenness, a segregation dimension, to estimate the degree of segregation. Evenness describes how social groups are distributed un/evenly among given geographical units, in this case, schools. Index of dissimilarity will be used to measure the degree of departure from an even distribution and the proportion of disadvantaged students who would need to migrate/shift among schools to achieve an even distribution. Moreover, we are estimating the evolution of socioeconomic school segregation by comparing the degree of segregation for the years 2000-01 and 2018-19.

The study will contribute to the existing body of work in the following ways. In Pakistan, research on SES segregation in schools is still in its early stages. To our knowledge, no other study earlier quantifies the level of SES in urban Pakistan. In Pakistan, where the urban population is expanding quickly, understanding SES is imperative. Second, the study is crucial for de-

DOI: 10.32368/FJSS.20230208

termining the direction of national education policy since it may generate a discussion about Pakistan's non-integrated school systems, which may play a role in enhancing or reducing children's opportunities.

Segregation and Inequalities in Education

Sociological literature sees segregation as a key structural component of social stratification in any society. Segregation is recognized as a fundamental structural element of social stratification (Massey, 2012). From the standpoint of social inequality, segregation of different population groups might not be relevant as long as all groups have equal access to resources (such as social, institutional, and environmental resources) and if those resources are dispersed and distributed equally throughout residential areas (Reardon, 2006). Global studies on segregation, however, show that resources are not distributed fairly. Segregation matters from the perspective of social interaction because it affects the likelihood of intergroup contact among members of opposing social groups, even in situations where resources are distributed equally or in close proximity (Reardon, 2006).

Peer impact, interaction effects, the availability of role models, knowledge and social networks, and social capital are just a few examples of the numerous social interactions and experiences that can have a substantial impact on how segregation affects a particular demographic group (Larraaga & Sanhueza, 2007). For instance, the influence of peers can have a lasting effect on the academic performance of children in schools. Duru-Bellat (2015) studied the impact of socio-economic diversity in schools where children's socioeconomic makeup alone causes inequality. Classmates serve as resources for one another; their successes and sources of inspiration are positively influenced by those of their reference group. Additionally, social segregation in

schools contributes to the performance gap in education, as schools with high accomplishment rates frequently have a large percentage of children from privileged families (Butler & Hamnett, 2007). If the influence of peers affects children's performance, then social segregation in schools may exacerbate academic gaps (Jenkins, Micklewright & Schnepf, 2008). It may also be responsible for maintaining and perpetuating social and educational disparities (Maloutas & Ramos Lobato, 2015).

Segregation operates in a complex manner across multiple societal levels to perpetuate inequalities. For instance, there is mounting proof that residential and racial segregation in schools are related. According to Reardon (2006), the location of residence not only influences how easy it is for people to acquire specific resources (including institutional and social ones), but it also provides possibilities for intergroup relationships. Wodtke and colleagues (2011) establish that graduation rates from high school are strongly impacted by extended exposure to underprivileged communities. For black and non-black children, growing up in the most impoverished neighbourhood reduces the chances of completing high school from 96 to 76 percent and 95 to 87 percent, respectively. Additionally, the neighbourhood effect is present both in places where people currently reside and have previously lived (Wodtke, Harding, & Elwert, 2011). Literature on residential segregation on socioeconomically disadvantaged people's opportunities shows that segregation increases the likelihood that children from low-income homes will miss out on pre-kindergarten education, lag in their academic progress, and have a high dropout rate (Larraaga and Sanhueza, 2007).

Approaches adopted by the middle-class parents for their children's education may conduce to widening of educational inequality. These tactics are implemented through a variety of

DOI: 10.32368/FJSS.20230208

structural dynamics, including housing and admissions regulations. Middle-class parents undertake a variety of tactics to ensure that their kids attend proper schools, which ultimately reinforces social disparities (Maloutas & Ramos Lobato, 2015; Reay, Crozier, & James, 2011). The likelihood that parents from low socioeconomic backgrounds will choose a school and emphasize academic performance as a consideration in school selection criteria is slim (Leroux, 2016).

Furthermore, the literature contends that increased social isolation would result from more stringent school admissions standards. Countries with a higher prevalence of school selection tend to have higher rates of segregation (Jen-kins, Micklewright, & Schnepf, 2008). Different strategic options in school systems give room for inequality. These disparities result from distinct trade-offs made by families from diverse social and economic backgrounds for children between the expenses, risks, and potential rewards (Duru-Bellat, 2015).

Education in Pakistan: An Overview of School Market

Government, private, and madrassah (religious schools) are the three main school systems in Pakistan that provide educational services to students. The statistics from the recent Pakistan Social and Living Standards Measurements 2018-19 shows that net enrollment rates in primary (level 1 to 5), middle (level 6 to 8) and matric (level 9 to 10) are 66%, 38%, and 27 % respectively. Of these, 35 percent are attending private education facilities (33 % in private schools, 1% in madrassahs, and 1 % in others) while 65 percent of children are attending the government schools. About 30 percent of children 5 to 16 years old in Pakistan are out of school.

After the Eighteenth Amendment Act of 2010, education falls under the administrative domain of the provinces. However, all government schools in every province offer education either for free or at a significantly reduced rate. Private education is market-based in Pakistan. A

DOI: 10.32368/FJSS.20230208

considerable proportion of school-aged population attend private schools. Prior to 1972, private schools served niche markets that missionaries or local foundations mainly ran. In 1972, private schools were nationalized. However, this policy decision was reversed in 1979 (Andrabi, Das, & Khwaja, 2006). Children from varied socioeconomic background attend private schools, and they are no longer providing education to only children from the upper-middle class.

Organizations and agencies at the international level that provide donor assistance including UNICEF, British Council, DFID, and the World Bank, through various programs, have also helped to raise the children school enrollment in Pakistan. In this regard, several educational programs are functional through a public-private partnership, providing education to children from economically deprived backgrounds. In the province of Punjab, a couple of programs are important, Punjab Education Foundation channeled all of these programs: The Foundation Assisted Schools (FAS) program, voucher programs, and conditional cash transfer programs. Over the years, the expansion of the government school education and such donor-funded programs have resulted in an increase in school enrollments in Pakistan. However, regarding educational outcomes and social integration of children, the impact of educational expansion in the country can be contested. For instant, Murnane & Ganimian (2014) looked at 223 impact evaluations on educational outcomes in developing countries and found that lowering the cost of attending school, whether through lowering direct schooling cost, lowering costs of complements, or improved school amenities, has resulted in increased children's enrollment and attendance in schools. However, they found that greater time spent in education does not always equate to increased accomplishment.

There is a very wide range of tuition costs charged by the private schools. The tuition is determined-by a number of elements, such as extracurricular and instructional design, facilities,

DOI: 10.32368/FJSS.20230208

location, reputation of the institution, language of teaching, and prior academic standing of the students. Why parents, even those from modest socioeconomic situations, pick private schools for their children when there are free public schools accessible is an important question to consider. Evidence suggests that students in private schools perform better than those in public schools and this disparity remains consistent even when considering household and school variables. Amjad & MacLeod (2014) found that children in low-cost private schools performed better than those in government schools.

Alderman and colleagues (2001) examined the factors influencing poor household's choice of schooling for their children. The results indicate that even the most economically disadvantaged households significantly utilize private schools, and that it rises with household income. According to Siddiqui's (2017a) study on student performance and poverty segregation in Pakistan, segregation based on academic performance is more pronounced compared to segregation by poverty. Furthermore, in private schools, segregation based on poverty is more prevalent, while segregation based on academic performance is higher in government schools. In 2021, the federal government of Pakistan introduced the Single National Curriculum (SNC), which on the theoretical level, is one system of education across school types in terms of curriculum and medium of instruction. SNC is to be enforced gradually in phases in the coming year and is yet to be fully implemented. Moreover, after devolution, provinces can deviate from federal education policies, so the impact of SNC on parental school choices is too early to evaluate.

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Data and Methods

Data and sample

The data utilized in this study were obtained from the Pakistan Social and Living Standards Measurements (PSLM) surveys conducted during the periods of 2000-01 and 2018-19. These surveys, conducted by the Pakistan Bureau of Statistics (Pakistan Bureau of Statistics, 2023), provide representative data at the national, provincial, and district levels, offering information on social and economic indicators. In the 2018-19 survey, a two-stage stratified sampling design was employed, using an adjusted sampling frame derived from the Population and Housing Census of 2017. The sampling framework developed by the Pakistan Bureau of Statistics divides each city/town into enumeration blocks, known as primary sampling units (PSUs), for both urban and rural areas. Data were collected from a total of 24,809 households in 1,802 primary sampling units (PSUs). A more comprehensive explanation of the sampling procedures and data collection methodologies employed in the PSLM surveys can be found elsewhere (PBS, 2023).

Although our analysis estimated school socioeconomic segregation at the national level, the focus of our study primarily revolved around urban primary sampling units (PSUs) in the ten most populous cities. Specifically, our research comprised ten of Pakistan's utmost densely populated cities, namely Karachi (144 blocks), Lahore (113 blocks), Faisalabad (44 blocks), Rawalpindi (36 blocks), Gujranwala (48 blocks), Peshawar (57 blocks), Multan (29 blocks), Hyderabad (43 blocks), Islamabad (16 blocks), and Quetta (45 blocks). The unit of analysis in this study comprises children aged 5-19 who were registered in school last year.

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Measures

Segregation is primarily categorized in literature according to the following factors: exposure, concentration, centralization, and clustering (Massey & Denton, 1988; Reardon & O'Sullivan, 2004). Based on research on the subject, we focused on evenness to estimate the school segregation in Pakistan (Logan, et al., 2001; Owens, 2017). Usually, to measure segregation in schools, evenness and exposure measures are used. As Owens (2017) elucidates, segregation is commonly assessed through exposure indices, which gauge the extent of possible interaction between different groups within neighborhoods. Additionally, evenness indices are employed to evaluate how racial groups are distributed across larger areas, such as cities or metropolitan regions, in a similar manner.

In this study, we are interested in looking at how children are sorted (un/evenly) by their socioeconomic background across school types. The study uses the concept of evenness to understand SES in schools. According to Valenzuela and colleagues (2014, p. 222), evenness is defined as the level of resemblance in the distribution of individual characteristics across various units within a particular geographic region. It pertains to the uneven spatial allocation of a population with specific social attributes. Consequently, evenness pertains to the arrangement of different population groups within the residents of a metropolitan area (Iceland & Weinberg, 2002).

In this study we sued the Dissimilarity Index (D- Index) to calculate the degree of socioeconomic segregation in schools. The D-Index is the most generally used measure of evenness (Iceland & Weinberg, 2002). To calculate unevenness, D-Index is suggested in many studies that carried out a comprehensive analysis of the optimum measures of segregation (Massey, 2012; Massey, White, and Phua, 1996). The D-Index, used in our analysis, calculates the proportion of

disadvantaged students who must transfer or relocate between schools in order to ensure a uniform distribution of all the schools in a particular territory (Valenzuela, Bellei, & Ros, 2014). The value of D-Index goes from 0 to 1, with 0 denoting a completely even distribution and 1 denoting a completely uneven distribution. Hyper segregation is indicated by a value greater than 0.6 (Glaeser & Vigdor, 2001).

D- Index for the measurement of segregation is calculated by

$$D = 0.5 \sum_{i=}^{n} \left| \frac{DisAdv_i}{TDisAdv} - \frac{NDisAdv_i}{TNDisAdv} \right|$$

where *i* represents a school within the area of analysis (that is city); *DisAdv* symbolizes the disadvantaged students and *NDisAdv* represents the non-disadvantaged students; whereas *TDisAdv* and *TNDisAdv* EVT are total disadvantaged and total non-disadvantaged students.The D-index was calculated at the nationwide and urban levels.

School Socioeconomic Status Index

Due to the dichotomous variable requirements of the dissimilarity index (Yalonetzky, 2012), we employed principal component analysis (PCA) proposed by (Child, 1970) to generate the school socioeconomic status Index (SES Index). Prior research was primarily used to guide the selection of factors used to generate the SES Index (Valenzuela, Bellei, & Ros, 2014). In this study, the three variables—father's education, mother's education, and per capita family expenditure are combined to calculate the PCA.

Education of mother and father are continuous variables and estimated by years of education completed. We set up the following procedures in case there were discrepancies in the data. When information was unavailable or in cases of parental death, the educational data of the

mother was estimated based on the educational level of the father. Similarly, if data were missing for both the mother and father's education, it was imputed using the educational data of the household head. Per capita expenditures were calculated at the household level. The aggregate nominal consumption expenditure encompassed monthly expenditures on both food and non-food items within the households.

Before the factor analysis, we applied the KMO (Kaiser-Meyer-Olkin) measure of sampling adequacy to access whether the factor analysis is suitable for variables under consideration or not. KMO has a range of 0 to 1, with values closer to 1 suggesting higher factor analysis suitability. In our case, the KMO measure is 0.654, which suggests a moderate level of sampling adequacy. This indicates that there is a reasonable amount of shared variance among the variables, supporting the use of factor analysis.

For PCA, we preprocessed the data by standardizing the variables, ensuring that they were on a similar scale. Next, we computed the covariance matrix to capture the relationships between mother's education, father's education, and per capita household expenses. This matrix provided valuable insights into how these variables co-varied, enabling us to assess the overall SES of the schools.

Subsequently, we performed eigenvalue decomposition on the covariance matrix, which yielded the eigenvectors and eigenvalues. Sorting the eigenvectors based on their corresponding eigenvalues, we selected the principal components that explained the most variance in the data. By choosing the appropriate number of principal components, we determined the optimal trade-off between dimensionality reduction and information preservation. Finally, we projected the original data onto the selected principal components, generating a new representation of the schools' SES. This lower-dimensional representation provided a more concise and meaningful

index, facilitating the comparison and ranking of schools based on their SES. The utilization of PCA in this research enabled us to capture the essential dimensions of SES using father education, mother education, and household expenses, ultimately contributing to a comprehensive assessment of school-level socioeconomic status. After that we split the students into "disadvantage" (30% lowest value of SES Index) and "advantage" (30% highest value of SES Index) groups after ranking the PCA from lowest to highest based on the SES Index.

In terms of school segregation based on socioeconomic status, we focused on children in levels 1 through 10, and we calculated the socioeconomic school segregation at the national level. To account for potential variations in school segregation across different grade levels, we separately estimated socioeconomic segregation for fifth, eighth, and tenth graders at both the national level and across all urban areas.

At the city level, we estimate the socioeconomic school segregation for level 1 to 10 collectively, and for level 5 and 10 separately. Since students from disadvantaged background either have higher odds of not attending school after primary education or are more likely to drop out, it is crucial to look at the degree of segregation at different education levels. We also estimated the level of socioeconomic school segregation by type of schools. Government schools, low-cost private schools, and high-cost private schools comprise our division of the school type. Madrassas are another sort of educational system that is present in the country. Despite the madrassas being an important category to study SES segregation, we excluded the group primarily because of data constraints. Since just 1.6% of the children in our analysis attend madrassas, we are unable to calculate the level of segregation in this group.

In Pakistan, public education is either completely free or very heavily subsidized. Private schools charge a variety of costs; high-cost schools are typically found in rich residential areas

DOI: 10.32368/FJSS.20230208

and can charge up to $500 per month in tuition, while low-cost schools typically charge between $3 and $25 per month (Naviwala, 2016). We categorized private schools into two groups: high-cost private schools and low-cost private schools. Low-cost schools are specifically aimed at serving the low-income population. Our classification of low-cost private schools is based on the definition provided by the Department for International Development (DFID). According to DFID, low-cost schools are determined relative to the income of the individuals intended to benefit from these educational institutions, rather than the operational expenses of the schools themselves. DFID specifies that the costs associated with these schools should not exceed 4% of the household budget of the beneficiaries (Barakat, Hardman, Rohwerder, & Kathryn, 2012). Additionally, expenses associated with schooling go beyond simply the tuition and may include involve uniforms, books, and extracurricular activities. In the analysis, we use the terms affordable schools and low-cost schools, interchangeably.

RESULTS

Table 1 presents descriptive statistics for children aged 5-19 who were enrolled in school in the years 2001-02 and 2018-19. In 2001-02, the study comprised 19,807 children, while in 2018-19, the number increased to 27,973 children. The table provides information on various variables and their respective percentages for the two time periods. The first set of variables in the table pertains to students' level. The levels are listed from Level 1 to Level 10/O-Levels. The percentages represent the proportion of children in each level for the two years under consideration, which is decreasing in higher level. For example, in 2001-02, 17.5% of children were in Level 1 and 6.9% in level 10/ O level, similarly, in 2018-19, the percentage of children in Level 1 is 17.1% in Level 1 and in Level 10/O level is 6.5%. These trends indicate the problem of student

DOI: 10.32368/FJSS.20230208

dropout. Factors contributing to dropout rates could include economic constraints, lack of access to quality education, family responsibilities, or obligation to economically support families.

The next set of variables relates to the type of school. The categories include Government schools, Private low-fee schools, and private high-fee schools. The percentages represent the proportion of children enrolled in each school type. In 2001-02, 76.6% of children attended Government schools, whereas in 2018-19, the percentage decreased to 65.9%. Further, the percentage of students attending low-fee private schools increased from 13.4% to 25.4% during the same period. Moreover, the table includes data on parental literacy rates. The categories are Mother literacy rate and Father literacy rate, and the percentages represent the proportion of mothers and fathers, respectively, who were literate. In 2001-02, the mother literacy rate was 27.2%, which increased to 37.6% in 2018-19. The father literacy rate remained relatively stable, with 62.4% in 2001-02 and a slight increase to 63% in 2018-19.

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Table 1
Descriptive statistics for the study, children aged 5 to 19 years and enrolled in a school last year

Variables		**2001-02 (%)**	**2018-19 (%)**
Students Level	Level 1	17.5	17.1
	Level 2	15.1	14.0
	Level 3	12.5	12.7
	Level 4	11.1	10.7
	Level 5	9.8	9.8
	Level 6	8.2	8.3
	Level7	6.7	7.1
	Level8	6.7	6.8
	Level 9/ O- Level	5.5	7.0
	Level10/ O-Level	6.9	6.5
School Type	Government school	76.6	65.9
	Private low fee	13.4	25.4
	Private high fee	10	8.7
Students' Age (years)	5 to 6	8.5	7.5
	7 to 8	20.2	21.5
	9 to 10	22.0	21.8
	11 to 12	19.1	18.6
	13 to 14	15.2	16.2
	15 to 16	10.6	10.8
	17 to 19	4.4	3.6
Parental Literacy	Literacy rate mother	27.2	37.6
	Literacy rate father	62.4	63.3
Average household size		9	8
N (Children)		19,807	27,973

We calculated the degree and evolution of segregation in schools. Table 2 presents the estimated D-index at both the national and urban levels by type of school for the years 2000 and 2018. At the national and urban levels, for the year 2000, the socioeconomic school segregation was 0.27 and 0.26 (level 1-10), respectively.

Table 2:
D-Index- Disadvantage to Advantage for National and Urban Levels by School Type

	Level 1-10	Level 5	Level 8	Level 10	Level 1-10	Level 5	Level 8	Level 10
2018								
Type of School	National Level				Urban Level			
Government schools	0.261	0.272	0.221	0.200	0.261	0.245	0.220	0.200
Low-cost private schools	0.132	0.154	0.091	0.082	0.110	0.100	0.079	0.070
High-cost private schools	0.131	0.120	0.120	0.120	0.141	0.153	0.141	0.130
Total D-Index	0.522	0.531	0.431	0.410	0.510	0.491	0.440	0.400
N	27,991	2,758	1,938	1,726	10,648	1,025	824	792
2000								
Government schools	0.141	0.130	0.122	0.110	0.130	0.161	0.090	0.120
Low-cost private schools	0.081	0.072	0.051	0.041	0.070	0.100	0.041	0.041
High-cost private schools	0.051	0.060	0.071	0.072	0.061	0.070	0.051	0.080
Total D-Index	0.270	0.261	0.231	0.211	0.260	0.320	0.191	0.241
N	19,408	1,907	1,307	1,279	8,316	827	689	715

Interestingly, it is worth noting that these levels experienced an increase to 0.52 and 0.51 in 2018. We observed a substantial increase of 63 % and 65 % points in segregation levels amid 2000 and 2018. It is particularly notable that segregation for both low and high-cost private

schools folded at the national level during this period. Our estimates reveal that for both years the highest level of school segregation occurred at level 5 nationally, however it was considerably lower in 2000. At the national level, the segregation index increased from 0.26 in 2000 to 0.53 in 2018. Segregation levels have risen over time for all levels. There is a high degree of segregation in government schools at every level, both nationally and in metropolitan areas.

For the years 2018 and 2000, we calculated levels of school segregation for the 10 most populated cities. We were unable to estimate the segregation for various school levels due to numerous missing cases; Islamabad (level 5, level 10) Rawalpindi (level 5, level 10) for the year 2018 and Rawalpindi (level 10, Hyderabad (level10), Quetta (level 5), Multan (level 10) for the year 2000. The estimated school segregation for the years 2000 and 2018 is presented in Table 3. For levels 1 to10 combined, the maximum level of segregation is observed in Islamabad for the year 2018. The segregation index for the city reaches 0.70, indicating a case of hyper segregation. Additionally, Multan, Gujranwala, and Faisalabad also exhibit elevated levels of school segregation, with segregation indices of 0.61, 0.54, and 0.49, respectively. For level 1-10, the lowest D-index has been observed for Rawalpindi i.e. 0.33.

We found that government schools are highly segregated at all levels. Low- and high-cost private schools are less segregated compared to the government schools in all ten cities. Islamabad (0.35) has the highest level of segregation in government schools, followed by Multan (0.31), Gujranwala (0.27), and Faisalabad (0.24). Unlike Hyderabad and Quetta, low-cost private schools have the lowest segregation levels in all the cities.

In 2000, the overall D-index for levels 1-10 in most cities analyzed was relatively low compared to 2018, indicating an exacerbation of segregation levels over the years. For instance, in Lahore, the D-index value is 0.22 in 2000, while it increased to 0.39 in 2018, demonstrating an

DOI: 10.32368/FJSS.20230208

escalation in segregation levels. Interestingly, Karachi maintained the same level of school segregation (0.39) during both periods. In 2000, notable high school segregation for levels 1-10 was observed in Multan (0.54) and Peshawar (0.35). Over time, the D-index value for Multan and Peshawar increased to 0.61 and 0.43, respectively, in 2018. Government schools exhibited higher levels of segregation compared to private schools, with high-cost private schools displaying greater segregation than low-cost private schools.

For 5th graders, schools in Karachi were found to have the highest socio-economic segregation, followed by schools in Quetta, Multan, and Faisalabad. The segregation index was 0.61 for Karachi and 0.53 for Quetta. Notably, government schools showed higher segregation compared to low-cost and high-cost private schools in all sampled cities, except for Multan where segregation levels were the same for public and low-cost private schools. Some cities, including Rawalpindi, Peshawar, Multan, and Hyderabad, experienced a decrease in segregation levels for 5th graders in 2018 compared to 2000. In the year 2000, Hyderabad had exceptionally high school socio-economic segregation for 5th graders, reaching 0.82. The D-index for Multan and Peshawar was also high, at 0.68 and 0.63, respectively.

The two cities with the greatest levels of segregation for 10th graders were Peshawar (0.62) and Faisalabad (0.58). Multan (0.83) and Hyderabad (0.75) displayed the highest school segregation, while Quetta had the highest D-index for 10th graders in 2000. Across all levels, government schools exhibited the highest levels of segregation compared to low-cost and high-cost private schools. Furthermore, high-cost private schools displayed slightly higher segregation levels than low-cost private schools in most cities.

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Table 3:
D-Index- Disadvantage to Advantage at the City Level by School Type

	Level 1-10	Level 5	Level 10	Level 1-10	Level 5	Level 10	Level 1-10	Level 5	Level 10	Level 1-10	Level 5	Level 10
	2001			2018			2001			2018		
School Type	**Karachi**						**Faisalabad**					
Government schools	0.19	0.06	0.30	0.16	0.30	0.10	0.09	0.20	0.08	0.24	0.21	0.29
Low-cost private schools	0.07	0.03	0.07	0.01	0.06	0.14	0.04	0.13	0.08	0.11	0.05	0.06
High-cost private schools	0.13	0.03	0.22	0.16	0.24	0.24	0.05	0.08	0.00	0.13	0.16	0.23
Total D-Index	0.39	0.11	0.59	0.33	0.61	0.48	0.19	0.41	0.17	0.49	0.42	0.58
	Lahore						**Rawalpindi**					
Government schools	0.09	0.08	0.08	0.20	0.20	0.09	0.02	0.27	-	0.12	-	-
Low-cost private schools	0.11	0.07	0.11	0.09	0.18	0.07	0.02	0.23	-	0.04	-	-
High-cost private schools	0.02	0.00	0.03	0.11	0.01	0.16	0.00	0.04	-	0.16	-	-
Total D-Index	0.22	0.15	0.22	0.39	0.39	0.32	0.03	0.54	-	0.33	-	-
	Gujranwala						**Peshawar**					
Government schools	0.12	0.00	0.21	0.27	0.20	0.26	0.18	0.31	0.15	0.21	0.20	0.31
Low-cost private schools	0.11	0.04	0.08	0.08	0.13	0.05	0.12	0.25	0.00	0.04	0.01	0.08
High-cost private schools	0.01	0.04	0.13	0.19	0.07	0.21	0.06	0.06	0.15	0.17	0.19	0.23
Total D-Index	0.24	0.08	0.42	0.54	0.40	0.51	0.35	0.63	0.30	0.43	0.39	0.62
	Multan						**Hyderabad**					
Government schools	0.27	0.34	-	0.31	0.24	0.25	0.01	0.09	-	0.22	0.09	0.20
Low-cost private schools	0.15	0.21	-	0.41	0.24	0.04	0.08	0.41	-	0.14	0.01	0.07
High-cost private schools	0.12	0.13	-	0.61	0.00	0.21	0.09	0.32	-	0.08	0.10	0.13
Total D-Index	0.54	0.68	-	0.61	0.48	0.50	0.18	0.82	-	0.44	0.20	0.40
	Islamabad						**Quetta**					
Government schools	0.05	0.23	0.04	0.35	-	-	0.08	-	0.20	0.17	0.26	0.17
Low-cost private schools	0.00	0.02	0.02	0.14	-	-	0.07	-	0.10	0.11	0.15	0.13
High-cost private schools	0.05	0.25	0.02	0.21	-	-	0.00	-	0.10	0.06	0.12	0.04
Total D-Index	0.11	0.50	0.07	0.70	-	-	0.15	-	0.40	0.34	0.53	0.35

DOI: 10.32368/FJSS.20230208

Table 4 shows a significant increase in income inequalities for all the cities in our sample over these years. Notably, disturbingly high levels of economic disparity were observed in 2018 in several cities, including Karachi, Lahore, Rawalpindi, Gujranwala, Multan, Hyderabad, and Quetta.

Table 4:
The Gini coefficient measuring income inequality in Pakistani cities.

Cities	2001-02	2018-19
Karachi	0.42	0.96
Lahore	0.40	0.97
Faisalabad	0.39	0.96
Rawalpindi	0.33	0.84
Gujranwala	0.45	0.94
Peshawar	0.43	0.88
Multan	0.41	0.92
Hyderabad	0.34	0.94
Islamabad	0.40	0.80
Quetta	0.33	0.91

Note: The Gini coefficient is used to calculate individual income disparity at the city level. The measure is derived by comparing the cumulative proportions of the population to the cumulative proportions of income they receive, and it varies between 0 in the scenario of complete equality and 1 in the scenario of complete inequality.

DISCUSSION

We calculated the magnitude of school segregation in Pakistan. In conclusion, our research indicates that Pakistan has a significant degree of socioeconomic school segregation. Government schools now have much more segregation than they did twenty years ago. Government schools at

DOI: 10.32368/FJSS.20230208

national (aggregate Urban and Rural), all urban, and city levels (ten most populous cities, separately) have a high dissimilarity index which means that disadvantaged students are more concentrated in government schools than in high or low-cost private schools. The results of our study show that Islamabad has the highest degree of SES in schools (level 1-10), followed by Multan, Gujranwala, and Faisalabad. Estimates for level 5 indicate that Karachi, Quetta, Multan, and Faisalabad have the highest degree of school segregation. For level 10, Peshawar has the most segregated schools.

Despite the fact that access to schooling have increased over the years, the concentration of children from low socioeconomic background only in government schools reflects the enduring disparities in Pakistan. The study's findings can be interpreted in several different yet connected ways. To begin with, the wealth gap in the ten Pakistani cities has grown considerably during these two time periods, which may be one of the key factors contributing to high school segregation in 2018–19 as compared to 2001–2002. Second, another important element contributing to schools' high levels of SES may be parental decision-making for children education. Results show that children from low socioeconomic origins are disproportionately represented in government schools. It is easy to understand why parents of low socioeconomic status send their kids to government schools. The fact that public schools are almost free or heavily subsidized is one of the key causes. Parents are nevertheless obligated to pay for tuition and supplies at private schools. According to Alderman and colleagues (2001), the choice of school is quite sensitive to cost, location, and quality in socially disadvantaged households. The concentration of children from disadvantaged socio-economic backgrounds in government schools is overly concerning as children who attend private schools perform better than their peers who attend public ones (Amjad & MacLeod, 2014).

DOI: 10.32368/FJSS.20230208

A respectable number of students attend private schools. The increased desire for private education among parents is probably a result of the superior educational options and quality of private schools when compared to public ones (Alderman, Orazem, & Paterno, 2001). Additionally, the economic and social standing of the parents may influence their decision on education. Evidence shows that there is a positive correlation between parents' levels of formal education and the enrollment of their kids in private schools. Parents' fewer years in formal education is inked to the enrollment of children in low-cost private schools, government schools or Madrassahs (Siddiqui, 2017b). As a result, the parent's selection of a school is not a free choice but is determined by the interaction of different factors, including parental socio-economic positioning, the geography of residence, and school institutional arrangements.

Only the expansion of education at elementary and secondary school levels is not sufficient, but socially integrated schools are one of the crucial factors to improve economic and social outcomes later in children' lives. Greater educational accessibility may not always lead to social mobility or alter the social stratification structure (Boudon, 1974; Thompson & Simmons, 2013). Additionally, the decline in social mobility disparity does not inevitably follow a reduction in educational opportunity inequality; similarly, economic progress and a more equitable distribution of educational shares do not necessarily result in an automatic alteration of the stratification structure (Boudon, 1974). If we examine Pakistan's educational system for the previous 20 years, the coverage has expanded significantly. For example, the net enrollment rate at the primary level was 55% in 2002 and has increased to 67.5 % in 2018. However, it is debatable to what extent children are socially integrated in schools. It is concerning that there are so many children from underprivileged homes attending government schools. According to studies, segre-

gation affects how well children learn (Palardy, 2008; 2013). According to research from Pakistan, children in private schools do better than those in public ones and earn more when they find employment as adults (Asadullah, 2009).

We also found that there is a significant increase in income inequalities for all the cities in our sample over the years. Other studies that look at income segregation and school choices show similar findings. Income polarization affects the ways parents choose schools. Furthermore, in the long run, segregation in schools leads to achievement gaps among children from different socio-economic and racial backgrounds (Duncan & Murnane, 2014; Owens, 2018; Yoon, Lubienski, & Lee, 2018). While examining trends in income segregation of schools and districts in the US, Owens, Reardon, and Jencks (2016) discovered that rising income disparity was a factor in the rise in income segregation amongst school districts. There may be effects on children's access to resources that have an impact on their academic performance as a result of the rise in income segregation among school districts.

Limitations

The study has a number of limitations. Importantly, data constraints restrict us from inferring more robust causal relationships; the segregation study of census data will provide more accurate results. The analysis for this study is done based on cross-sectional data for two different years because of the unavailability of census data. For children of disadvantaged social background, educational inequality in school systems may restrict their chances for upward social mobility and better earnings in future. To comprehend the dynamics of school segregation, we suggest further research on the regional educational market and provincial educational policies.

DOI: 10.32368/FJSS.20230208

CONCLUSION

There could be several considerations for policymakers to promote integration within government schools. It is imperative to mention that the recommended policy options may not inherently increase integration in schools, but they can give decision-makers access to tools that could facilitate integration. Parental preference for private schools may be due to the fact that those who attend private schools have better returns to education later in life. The popular perception is that the quality of private schools is better than that of government schools, which includes but is not limited to innovative teaching methodology, up-to-the-mark curriculum, extracurricular activities, low student-teacher ratio, medium of instruction (mainly English), and teachers' reasonable behavior with children in classrooms. Unsurprisingly, children from low socioeconomic backgrounds attend government schools because the education there is highly subsidized or free. For the reintegration of schools with children of diverse socioeconomic backgrounds, government schooling in Pakistan needs to be reimagined with a major focus on the quality of education rather than just only on educational expansion.

Secondly, research at the city level is needed to understand which government schools have relatively more concentration of disadvantaged students. After identifying the most socioeconomically segregated schools, interventions such as free lunch, free books/stationary, health checkups, and appointments of trained educationists (fresh graduates) in these schools would be beneficial policy options. Such interventions would help address the disparities of disadvantaged children, and also attract children from diverse socioeconomic backgrounds for enrollment in government schools. With rising living costs in Pakistan and inflationary pressures, a better qual-

ity public educational sector would also be a relief for parents and the preferred choice for children's admission. Lastly, there must be introduction of a policy option for better reintegration through a public-private partnership of the education sector. A quota of admission in private schools for the children of low socioeconomic background living in school districts with a high concentration of disadvantaged children can be sponsored or mandated by the government.

Conflict of Interest Statement
There is no conflict of interest to declare.

Funding
This study has not received funding.

Ethics and permissions
Secondary datasets/surveys with no identifying information have been used for the study. No specific permissions were required for accessing and downloading these datasets. Data are publicly available for researchers on the Pakistan Bureau of Statistics website (PBS). The institute (PBS) collects these datasets following the data ethics framework that protects the privacy, confidentiality, rights, and freedom of data subjects.

Data sharing and availability statement
Data is available from the corresponding author based on request.

Author Contributions Statement
Both authors conducted the study and developed the manuscript together, with equal contribution.

DOI: 10.32368/FJSS.20230208

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