

WHEN INFORMATION IS NOT ENOUGH: EVIDENCE FROM A CENTRALISED SCHOOL CHOICE SYSTEM*

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We implemented a large-scale randomised controlled trial encompassing 900 junior high schools in Ghana, a country with universal secondary school choice, to study whether providing students and parents with information on school characteristics and selection strategies improved outcomes in a centralised school selection mechanism. Information changed households' preferences and the characteristics of schools to which they applied. Students gained admission to higher value-added schools, yet they were not more likely to matriculate on time or at all. Incomplete school information was not the only friction. Household shocks and inaccurate preference forecasting likely contributed to continued admission deviations.

JEL codes: H52, I21, I24, I25, I28, J24, O15, O38

Each year, tens of millions of households grapple with the intersection of mechanism design, information and their own preferences as they face the daunting task of selecting a school for their child. Despite recent modifications towards strategy-proof mechanisms with technology-based personalised information provision in some school choice settings, many markets continue to use complicated mechanisms that require strategic sophistication and leave families with limited information to navigate an information-intensive process. In such systems, the potential for information to improve outcomes is substantial. This study focuses on a programme in Ghana, a country with universal secondary school choice, a complicated centralised school choice process and strong evidence of information deficiencies: students are equally likely to deviate from as attend their centralised admissions assignment. The subsequent student churn generates unnecessary uncertainty and student, household and sector expenses. General information provision is low cost, feasible in low-tech settings and a potentially high-impact way to improve outcomes for the 450,000 students per year in Ghana and millions elsewhere who annually engage in the school choice process.

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Theoretically, providing agents with information, especially the information they say that they want, should result in more informed decisions and better outcomes. We focus on three questions: (i) What information do parents and students say they want? (ii) Does receiving this information affect their school choices and educational outcomes? (iii) Does it matter who receives this information? To address these questions, we conducted a randomised controlled trial (RCT) in 900 junior high schools in Ghana, reaching a sample of about 42,000 students.

Information requirements in centralised school choice systems are multi-dimensional: students need (i) information on how to navigate the mechanism, (ii) details about schools, and (iii) an understanding of how their own preferences and admission chances fit with the available options. We provided information on all aspects, with a focus on school-specific content, including school quality and historical admissions thresholds. In collaboration with key stakeholders, we designed and distributed a booklet, produced and screened a video, and facilitated a school-based workshop to close the information gaps that students, parents, educators and researchers identified as barriers to efficient secondary school choice. We then experimentally varied receipt of this information among students in their final year of junior high school across 900 schools: we provided this information to students at 300 schools, provided the same information to students *and parents* at 300 additional schools and left 300 schools as the business-as-usual comparison group. We combine survey and administrative data across multiple rounds starting with a baseline survey in the final year of junior high school (JHS) and concluding with a survey during what should have been students' first year of senior high school (SHS).

We test for the effect of information, drawing four main conclusions. First, this information was welcomed and recognised, as respondents shifted their information source towards the booklet and away from other sources. Second, information changed the characteristics of schools to which students applied and changed what students said they valued in schools. This is consistent with information being a binding constraint and households seeking to avoid a time-consuming *ex post* sorting exercise, the only option for students who seek to attend a school to which they were not assigned. The change in relative valuation of amenities was not a primary goal of the information, but likely a by-product of some characteristics becoming more salient. The net change in application behaviour is the sum of the improved information on amenities and any changes in valuation of those amenities. Third, despite the intervention being received and used, changing the schools to which students applied and increasing the value added of the schools to which students were admitted, by revealed preference, it, at most, marginally improved assignment match quality. Students were not more likely to matriculate to their admitted school, matriculate to any school, nor matriculate on time. Almost all deviating students matriculated at schools to which they could have been admitted through the centralised system, saving both time and money, had they listed that school. Fourth, taken together, students sorted to schools closer to home that they did not originally list, schools about which they likely had more information *ex ante*. Despite participants saying that information was a binding constraint, additional information did not change outcomes. The results are similar whether we targeted parents directly or whether students completed a baseline survey.

The Ghanaian system has both similarities and differences with the often-studied systems in high-income countries, providing additional behavioural insights. First, the truncated deferred acceptance algorithm is similar to other mechanisms in high-income countries, including those in both New Haven and New York City (Abdulkadiroğlu *et al.*, 2009; Arteaga *et al.*, 2022). Students are centrally admitted based on their submitted ordered list of four school-programme choices and test scores on the junior high school leaving exam with higher scoring students receiving

preference.¹ Second, unlike many of the often-studied and economist-improved systems, the Ghana mechanism has high information demands to generate favourable outcomes—students select from 2,300 possible school-programme choices before they know their leaving exam scores and the selection occurs in an information poor environment. Third, *ex post* sorting shows household dissatisfaction with the centralised placements as they exert concrete and costly behaviours to switch schools, confirming the theoretical lack of stability when choice slots are limited (Haeringer and Klijn, 2009). Other binding mechanisms could have similarly displeased households who may lack the costly remedy available in the Ghana system.² Fourth, this very large centralised system relies on low-tech, paper based choice submission, reducing the prospect for technology-intensive interventions.³ Fifth, both distance and cost have a larger variance in the Ghanaian system, more akin to university applications in the United States and other nationwide school choice systems in lower and middle income countries.

In addition to its clear policy relevance as sixty-three countries use a centralised school choice system for education allocation (Neilson, 2021), this paper makes two key contributions to the economics literature.

First, our study includes on-platform non-compliance within a centralised school choice system. It combines elements of the mechanical assignment of centralised systems with elements of decentralised direct application. Typically, non-compliance involves opting out of the placement choice set into a private or local catchment school (Kapor *et al.*, 2020a; Akbarpour *et al.*, 2022). Our setting adds a new dimension—the ability to switch *ex post* off-platform into a different on-platform option. In this context, we show that receiving and acting on information does not result in better outcomes, as our intervention changed the intermediate outcomes, but not matriculation. As with the contemporaneous paper of Ainsworth *et al.* (2023), students in the parent intervention were admitted to higher value-added schools. Binding centralised systems could mask household dissatisfaction that they express in our setting through *ex post* sorting. Moreover, we show that realising the potential of school choice systems to efficiently match students and schools critically depends on whether the mechanisms can generate stable assignments. The Ghana system was designed to limit the number of schools that households could list to encourage households to research schools carefully prior to applying. Instead, the limited number of choices and complexity of the mechanism leads to unstable initial matches and *ex post* sorting even after we lowered the costs and complexity of school searches. Non-compliance is present in many systems and could explain the contrast between our findings and others' findings. The ineffectiveness of information in this centralised system is in contrast to studies of non-centralised systems which have found that information about schools (e.g., Banerjee *et al.*, 2010; Hoxby and Turner, 2013; Mizala and Urquiola, 2013; Andrabi *et al.*, 2017; Allende *et al.*, 2019), higher education financing (Dinkelman and Martinez, 2014; Dynarski *et al.*, 2021), the returns to schooling (Jensen, 2010) or one's own ability (Bobba and Frisanchi, 2019;

¹ While not strategy-proof, it requires less strategy than immediate action mechanisms such as the pre-2005 Boston Mechanism (Abdulkadiroğlu *et al.*, 2006; Haeringer and Klijn, 2009; Abdulkadiroğlu *et al.*, 2011; Pathak and Sönmez, 2013).

² The Ghanaian sorting involves an extensive unofficial second round of directly applying to alternative schools. Students do not have a guaranteed default home school. Schools, parents and students dislike this inefficient and expensive *ex post* sorting that lasts into the second term, thereby delaying learning, yet over 40% of students ultimately use this route for school admissions.

³ As an example of scant available technology, a website was to be built during the period of study to contain time-invariant details about each school, e.g., location and size, but it was never completed. It was not designed to contain admissions information or to be routinely updated.

Barrera-Osorio *et al.*, 2020) improved student application and matriculation decisions.⁴ The existing literature on centralised systems distilled information in already information-rich environments (Hastings and Weinstein, 2008; Corcoran *et al.*, 2018), improved beliefs (Kapor *et al.*, 2020b) or tailored information through technology (Arteaga *et al.*, 2022). Our work increased information and highlights the importance of taking costly non-compliance into account when considering the efficiency of school choice systems.

Second, we identify the potential importance and also non-sufficiency of targeting parents directly. When parents were targeted directly, some aspects of school choices and admissions were different. Yet, parental involvement did not increase a student's likelihood of matriculating or matriculating on time. Previous experimental research on information provision typically targeted the entire household and treated the household as a unitary decision-maker.⁵ In Ghana, students submit their own choices. Parental involvement is encouraged, but not enforced.

Overall, these findings emphasise that multiple barriers, beyond information, are present in school choice settings and involving parents does not overcome the barriers. The theoretical underpinnings of school choice systems rely on households having full information, being able to predict future preferences and having the knowledge to combine those to select their lists optimally. Our intervention targeted the first requirement—information. Yet we see the other two assumptions violated and the potential of the choice mechanism under-realised.

1. Schooling and School Choice in Ghana

1.1. Schooling System

The Ghanaian 6–3–3 system consists of six years of primary school (P1 through P6), three years of junior high school (JHS1 through JHS3) and three years of secondary, i.e., senior high, school (SHS1 through SHS3). This intervention targeted students in JHS3 as they were applying to SHS. Ghana has two types of secondary schools: an academic track and a technical/vocational track. Students in both tracks attend a specific programme within their schools (e.g., general science in an academic track or welding in a technical/vocational track).⁶ Most academic track schools offer boarding options, enabling students throughout the country to attend. The school year starts in September and ends in July.

Students take two nationally standardised exams during their pre-tertiary years of schooling. At the end of JHS3, students take the Basic Education Certificate Examination (BECE). At the end of SHS3, students take the West African Senior School Certificate Examination (WASSCE). Passing these exams is a requirement to earn the equivalent of a diploma, and scores on the exams determine whether and what kind of additional schooling students can pursue.

During the period under study, government primary and junior high schools were tuition-free, but government senior high schools required fees. The government set a single, standard

⁴ See Herbaut and Geven (2019) for a review of outreach and financial aid interventions in higher education, primarily in North America, an information-rich environment.

⁵ Most studies that have tried to estimate the role of parents in students' decision-making did not engage parents directly, instead varying whether students were asked to pass along information to parents (Dinkelman and Martinez, 2014) or varying the addressee on a mailing (Hoxby and Turner, 2013). Only Ajayi *et al.* (2017) and Arteaga *et al.* (2022) targeted students as decision makers distinct from parents. Bonds (2022) implemented individual meetings between a facilitator, a teacher and each household. Other studies involved parents in the education production function more broadly, e.g., Avvisati *et al.* (2013).

⁶ The seven academic programmes are Agriculture, Business, General Arts, General Science, Home Economics, Technical and Visual Arts. Not all schools have all programmes.

approved fee for all government secondary schools.⁷ Some government schools charged additional incidental fees such as parent–teacher association dues, teacher motivation fees, infrastructure improvement levies and exam registration fees.

Both government and Ghanaian curriculum private schools participate in the same school choice process described below.⁸ The most elite secondary schools offering the Ghanaian curriculum are government schools, which are generally preferred to private secondary schools. Private secondary schools charged more than government schools and tended to have equivalent or worse exit exam scores.

1.2. School Choice System

After JHS3, students were admitted to at most one secondary school-programme pair out of 2,300 possible pairs through a centralised admissions process implemented by the Ghana Education Service Computerised School Selection and Placement System (CSSPS). During the second term of JHS3, students registered for the Basic Education Certificate Examination (BECE) and submitted their four selected secondary school-programme pairs to the CSSPS. Each student had to list four choices having followed two rules. First, students could only apply to one programme at each school. Second, schools were designated as one of five ‘option’ types, and students could list at most one Option 3 school (the most competitive) and at most two Option 2 schools (medium competitive).⁹ If students violated either of these rules or did not submit four choices, they were not admitted to any school.

Students could select the ‘catchment area’ designation if they only listed schools within 16 km of their JHS. Each Option 1 through 3 senior high school set aside 30% of their seats in each programme for ‘catchment area’ students.¹⁰ Although the school placement system was computerised, students submitted their choices on paper forms, which were manually entered into a database at each school and then electronically transmitted to the CSSPS secretariat.

Students completed this process with limited information. Prior to the CSSPS registration process, each JHS received a paper listing of schools produced by Ghana Education Services (GES), an agency of the Ministry of Education, in their mailbox at the district headquarters. This listing contained school names, the official school code for the CSSPS form, each schools’ district and town or neighbourhood, whether the school was single gender or mixed, the programmes offered, the option designation and whether the school was boarding, day or mixed. Based on conversations with school officials, many schools did not retrieve this register. Schools that retrieved the listing did not make copies to distribute to their students. It was used primarily

⁷ For the 2016–2017 school year, the period of study, approved academic year fees were GHS551.50 (US\$143) for day students and GHS1494.50 (US\$387) for boarding students. Fees were due at the start of each term. Exchange rate based on 1 September 2016 exchange rate of US\$1 equal to GHS3.8665. Expressed in 2016 dollars.

⁸ A separate, elite, international curriculum private school sector caters to wealthy households and foreign nationals. Students apply directly to those schools and typically come from international curriculum junior high schools where students do not take the BECE.

⁹ Options 1 through 3 are public, academic track, secondary schools, with option numbers approximately inversely ranked by historic difficulty of admission, not necessarily recent admissions cut-offs. Government technical/vocational schools are Option 4. All private schools are Option 5. Students can list four Option 1, 4 and 5 schools. Option 4 and 5 schools are typically not oversubscribed and very few students (8% and 1%) list these schools as they can easily gain entry outside of the centralised allocation system. In the CSSPS assignment, almost all students admitted to a private school were those with BECE scores below 250, a level considered marginally passing.

¹⁰ In our sample, 14% of students chose only secondary schools within 16 km of their JHS, and this fraction does not vary by treatment group. We do not have data on whether households physically moved to be within the catchment area of an SHS of their choice.

by school staff to provide school codes to students who were already interested in a particular school. No information about typical incoming test scores or admission chances was provided.

The CSSPS admitted each student to at most one school-programme pair combining student preferences, test scores on the BECE taken at the end of JHS3 and the number of seats available using a single-round deferred acceptance algorithm.¹¹ Schools must submit all seats to the CSSPS and could not reserve seats to admit students independently. Students and schools were told of the matches in September, shortly before the start of the academic year.

Once the school year started, schools assessed how many admitted students failed to matriculate and could fill these seats at their discretion with students who directly applied to the school.¹² This unofficial second round lasted into the second trimester of the school year, resulting in students starting school months late as they and their parents visited different schools trying to find an available match. This unpredictable process gave a student no guarantee of admission at any school other than the centralised assignment school, which was free to release the seat if the student did not matriculate on time.

Centralised school choice is not unique to Ghana. More than sixty-three countries use a centralised school choice process for school admissions (Neilson, 2021). Further, centralised school choice systems operate in some US school districts (e.g., Boston, Cambridge, Charlotte, Columbus, Denver, Minneapolis, New York City and Seattle) with priority determined by exam, lottery, or other household or student characteristics. In many centralised systems, issues of students and households having incomplete information about schooling choices are similar.

The centralised admissions process has some beneficial features for students. First, students can apply to any secondary school in the country. Second, by design, admissions to secondary schools are based on expressed preferences and test scores, not subject to manipulation based on wealth or family connections. Unfortunately, the process can be quite daunting for students. Many students—especially those who are marginalised—make their choices with limited information on even the most basic functioning of the system and schools, resulting in observable choice errors and likely less appropriate matches (Lucas and Mbiti, 2012; Ajayi, 2024).

2. Inefficiencies and Conceptual Framework

In this section we first describe the inefficiencies generated by the low-information environment, then we outline a conceptual framework for how our improved information could remedy some of these issues. Section 3 elucidates the specific ways our intervention addressed each of the information shortcomings.

¹¹ The CSSPS considered the first choices of all applicants. It conditionally admitted the highest scoring applicants up to each school programme's capacity in the first round. For students not admitted to their first choice, it then considered their second choice. It compared students' scores relative to the scores of the conditionally admitted applicants from the first round, and replaced any conditionally admitted applicants from the previous round with students with higher test scores (i.e., through a deferred acceptance algorithm). These displaced students' second choices were then considered. This process repeats for choices 3 and 4. After all preferences have been considered, students with the highest test scores who were not matched to one of their preferred schools were allocated to schools with remaining seats in their preferred districts. This algorithm yields an allocation equivalent to a serial dictatorship where students are ranked by descending score and the preferences of higher scoring students have precedence. Sibling preferences were not considered.

¹² Schools were supposed to report unfilled seats to the CSSPS secretariat for a centralised supplementary allocation of students, but this did not happen in practice.

2.1. *Inefficiencies*

The existing low-information environment generates inefficiencies on two margins: (i) students are admitted to and attend schools that are potentially lower quality or a worse match than those for which they might qualify, and (ii) households and the government waste resources during a costly resorting process that happens after the official admissions round.

2.1.1. *Match quality*

Lack of information can lead to worse matches for students, preventing students from fulfilling their potential. Match quality could be poor because students do not know senior high school characteristics, do not understand the admissions process or their admission chances or make errors that exclude them entirely from the centralised process. The *ex post* sorting demonstrates that households are not indifferent to school characteristics. More information about the mechanism, the schools and admission likelihoods could result in better matches in the centralised system.

Centralised admissions in Ghana are not a zero-sum game (i.e., improving one student's outcome does not necessarily worsen the outcome for another student). First, the CSSPS admitting students to their eventual school would be Pareto improving as it eliminates enrolment delays and *ex post* matching. Second, match quality is multi-dimensional and heterogeneous by student.¹³ Therefore, information could improve one student's centralised match without making another student worse off.

2.1.2. *Wasted resources*

The unnecessary student churn of about 40% of eventual SHS attendees wastes household and public sector time and money. Students selecting their eventual school *ex ante* would improve efficiency even if they end up at the same school *ex post*. To deviate from the central admission decisions, students can seek admission at another school through an elaborate and expensive, in time and money, process of visiting other schools with their parents.¹⁴ Their original school can release their seat at any time and students are not guaranteed admissions elsewhere. The new school is almost always one to which the student could have been admitted if he had listed it originally. This reshuffle of students last months into the school year.¹⁵

At the sector level, the government pays full salaries to teachers teaching to partially empty classrooms and subsidises tuition for students who are not there. School administrators waste time on admissions instead of furthering the schools' educational missions.

Additional resources are wasted if a student fails the WASSCE at the end of SHS. The sector covers the teacher salaries and some expenses while the household covers fees. Failing the

¹³ Regardless of quantitative assessments of school quality, students who are more pleased with their matches put forth more effort (Hastings *et al.*, 2012) and students who are better matches with their college majors have higher labour market returns, even if the average return to the major is low (Kirkeboen *et al.*, 2016).

¹⁴ To deviate from the official admission decision, parents have to appeal directly, in person, to the school principal. Households and schools would prefer to forgo this *ex post* matching as it is both costly and risky—students might not be admitted to another school and their existing seat could be given to someone else. Households can approach any school, even those not on a student's choice list. Principals maintain waiting lists of students to admit once other officially admitted students do not matriculate. Well into the second month of school, schools do not know which students will matriculate. Some students who do not correctly complete their choice forms are forced into this option.

¹⁵ Only about half of students start school during the first six weeks of the school year. Households must pay the full fees regardless of when students start. Secondary school officials lament that students who arrive late are academically behind and arrive with an attitude not conducive to learning because they delayed school entry to try to matriculate to another school.

WASSCE means the household, government and student do not realise their monetary and time investment from three years of SHS since passing is necessary to certify senior high school completion and is required for some types of employment (Duflo *et al.*, 2020).

2.2. Conceptual Framework

A student's matriculation decision reflects their perceived optimised match quality—students attend the school that maximises their expected future benefit subject to their existing constraints. They could be poorly informed about both the benefits, e.g., school quality or the constraints, e.g., schools in their feasible choice set or whether their preferences and their parents' preferences align. Our intervention sought to increase the match quality between students and schools in the first round of automated admissions by providing information about school quality, admissions chances and encouraging household conversations. This should result in more students starting secondary school on time at the school to which they were originally admitted, reducing both household and sector inefficiencies, and resulting in better longer-run student outcomes.

Starting with students considering their choices during JHS3, multiple steps are necessary along the causal chain to affect their SHS matriculation decision. In this subsection we outline the steps of the causal chain and in the next section we explain how our intervention sought to improve each of these steps.

All students in our study, both control and treatment, were enrolled in JHS3, the final year of junior high school, at the start of the study.

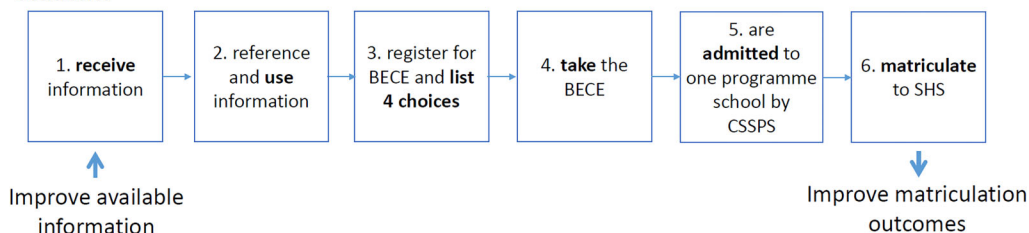
- Step 1: Students receive information about school choices and how to correctly and strategically apply to senior high schools. Our intervention increased both the quality and quantity of information on schools, the choice process and their own admissions chances.
- Step 2: Students use and internalise the information, potentially changing their preferences over school characteristics. They then make more informed decisions about which school-programme pairs to list.
- Step 3: Students register for the BECE and list their four school-programme choices.
- Step 4: Students take the BECE. While not designed to impact BECE scores, information about schools could change student effort on the BECE.
- Step 5: The CSSPS combines students' BECE scores, stated preferences and available spaces in each school-programme pair to admit each student to at most one school-programme pair.
- Step 6: Students matriculate to the school-programme pair to which they were admitted, engage in time intensive *ex post* sorting and matriculate to another school, or do not matriculate at all.

Our intervention occurred in Step 1—receiving information. We collected both administrative and survey data as appropriate for each of the subsequent steps. Figure 1 displays this theory of change.

3. The Intervention

Given the information requirements and existing paucity of information, we collaborated with stakeholders to create a low-tech, light touch (1–2 hours of interaction) intervention that could

Students

Fig. 1. *Theory of Change.*

be easily scalable within existing systems, mimicking the type of programme that a government might implement. The information package included strategies to navigate the mechanism, details about schools and how to assess one's own admissions likelihoods. The second two were specifically requested by students during focus group discussions and piloting. We called the package *GuIDE*—Guidance and Information for Improved Decisions in Education. We designed the intervention to fill gaps in knowledge and encourage students to consider their choices carefully during the initial assignment process to reduce the likelihood of *ex post* sorting.

3.1. *GuIDE Booklet*

First, we created a booklet with information on the CSSPS process and details about each secondary school. The booklet had three parts: information on application rules and strategies, how to calculate a potential BECE score and information about secondary schools in Ashanti Region.¹⁶

The booklet was a mix of information that was likely available from the student's JHS and information that was only available for someone who physically visited each SHS. It also contained simple strategic advice that students might have received from their JHS, but was not codified anywhere. Each treated student received the same booklet.

The first part of the booklet provided students with insight into the mechanism: the CSSPS rules, two simple strategies (do not list more competitive schools after less competitive schools and include a variety of schools in case the student's BECE score was higher or lower than expected), details about the catchment area option and government approved secondary school fees. All schools, regardless of quality, had the same government approved school fees, which only varied based on whether the student was a boarding or day student.¹⁷ Figure 2 is the first page

¹⁶ We limited our intervention to JHS in Ashanti Region and only provided information on the 155 secondary schools in Ashanti Region. At the time, Ashanti was the largest of Ghana's ten regions by population (home to 20% of the population), the second largest region by landmass, contained twenty-seven districts and over 85% of students from Ashanti who attended secondary school did so in Ashanti. Students from other regions were more likely to attend secondary school outside their region.

¹⁷ The approved Term 1 fees were GHS405.50 (US\$103) for day students and GHS724.50 (US\$185) for boarding students (30 September 2016 US\$/GHS exchange rate). Schools were allowed to charge additional, limited, incidental fees, which schools did not publicise. We visited each SHS to learn the total fees from the previous year, but we were not permitted to include the information in the booklet.

Senior High School Information Booklet

Senior high school choices are important but many students choose schools they do not know much about and are then dissatisfied with their admissions outcomes. Making careful choices is one of the best ways to have a good senior high school experience.

How it works:

You will be selecting four choices from second cycle schools of different options. Each option contains a different set of schools.

OPTIONS:

Options 1, 2 & 3: Public Senior High Schools

Option 4: Public Technical/Vocational Institutions

Option 5: Private Senior High Schools + Private Technical/Vocational Institutions

You must:

1. Choose four different schools.
2. Select a programme and an accommodation for each choice.
3. Remember that your choices:
 - Can include **up to four Option 1** schools
 - Can include **up to four Option 4 or 5** schools
 - Can include **up to two Option 2** schools
 - Can include **up to one Option 3** school

How to make good senior high school choices:

1. What is important to you and your family?

- **Staying close to home?** Only select schools in your region or district. If you want to stay within 16km of your JHS, use the CATCHMENT AREA OPTION.
- **Single sex or mixed?** Some schools are mixed and some are girls or boys only.
- **Boarding or day?** Some schools offer both options but some offer only one.
- **Programme type?** Be sure to choose schools that offer your programme of interest.

2. What was your raw BECE score (out of 600) on your mock exams?

- **Use the worksheet** in this booklet to calculate it.
- Be sure to choose **at least one school** where you have a good chance of being admitted.

3. Pick schools you would actually like to attend!

- You can only list four choices, and most students **do not** get placed in their first choice, so **every choice is important**.

4. List your choices in order of preference.

GUIDE

Guidance and Information for Improved
Decisions in Education

of the booklet, outlining the application process and basic recommended strategies for selecting schools.¹⁸

The second section focused on helping students calculate their own expected BECE score, which, when combined with the third part of the booklet, helped them understand their admissions chances.

The third part, and bulk of the booklet, was devoted to statistics about each secondary school in Ashanti Region.¹⁹ For each secondary school, we included information that was potentially available elsewhere, but ours was in a more user-friendly format—the official school code that students submit on the CSSPS form; the school name and nickname if relevant (e.g., Opoku Ware Senior High School is more commonly known as OWASS); the school's district and town or neighbourhood; whether the school is single gender or mixed; whether the school is boarding, day or mixed; and the programmes offered.

We also provided information about each school that was not available elsewhere. Based on administrative data from the CSSPS over the last three years, we included two measures of selectivity of each school-programme pair. We included the average BECE score of admitted students and the BECE score of the 5th percentile admitted student—effectively the score threshold for admission. Finally, we included a measure of school quality. For each school, we provided the number of students who took the WASSCE (the exam at the end of secondary school) and the pass rate. Due to our data sharing agreement, we were unable to include any measures of value added in the booklet. During the *GuIDE* school workshops (see more below), facilitators encouraged students and parents to consider WASSCE pass rates relative to average incoming BECE scores—effectively value added. Figure 3 explains the layout of the school information. Additional information on the booklet design is given in [Online Appendix A.1](#).

3.2. *GuIDE Video*

The second component of the intervention was a video. Following the example of previous studies using videos to present information (e.g., Dupas, 2011; Dinkelman and Martinez, 2014; Banerjee *et al.*, 2015) we wrote and produced a 20 minute video on the school choice process to make the booklet more salient and memorable to students. In our video, a drama club from an Accra junior high school acted out a dramatised version of students using, understanding and benefiting from the booklet, leading them to make more informed school choices. The video also modelled how to have a conversation with parents about choices and priorities. Additional information on the video appears in [Online Appendix A.1](#).

3.3. *GuIDE Workshop*

The third component was a workshop. Facilitators distributed and explained the booklet and screened the video during at-school group workshops for students and teachers in January, near

¹⁸ The next page contained 'additional advice', including 'Think about selecting a variety of choices in case you perform much better or much worse than you did on your mock exam', with details about selecting reach, likely and safety schools and 'Organise your options in terms of BECE score competitiveness'.

¹⁹ In 2016, Ashanti had 155 SHS: eight Option 3 schools (most competitive), twenty-seven Option 2 schools and sixty-seven Option 1 schools. There were three Option 5 schools (public technical/vocational) and fifty Option 5 schools (private).

How to use this booklet:

This booklet contains information on all senior high schools and technical/vocational institutes in **Ashanti region**, to inform you about your local options. You are free to select other schools outside this region if you would like.

Code: Official school code

District: District and town or neighborhood

Gender: Is school boys-only, girls-only, or mixed

Programme: Programmes offered

Low BECE Score: Score exceeded by 95% of admitted students

Candidates: Total number of WASSCE candidates

Code	School Name	District	Gender	Boarding	Programme	BECE Score of Admitted Students		WASSCE Performance		Option
						Average	Low	Pass Rate	Candidates	
XXXXX	EXAMPLE Senior High/Technical School (nickname)	KUMASI METRO Bantama-Kumasi	Mixed	Day / Boarding	Agriculture	339	309	72%	739	1
					Business	368	345			
					General Arts	391	338			
					General Science	403	379			
					Home Economics	376	311			
					Technical	356	328			
					Visual Arts	365	349			

School Name: Official school name and nickname (if any)

Boarding: Is school day, boarding, or both

Average BECE Score: Average score of admitted students

Pass Rate: Percentage of students who passed WASSCE core subjects

A NOTE ON BECE SCORES

These scores from students admitted in the last three years give you a rough guide of how likely you are to be admitted. **If your BECE score is far below the low score**, you have a small chance. **If your score is close to or above the average**, you have a high chance. These **scores change every year**, so even getting a BECE score above last year's scores cannot guarantee your admission, but gives a guide of what to expect.

WASSCE Performance is also based on candidates from the last three years (2013 to 2015).

Fig. 3. Sample Booklet Page.

the start of the second term of the school year, prior to students submitting their choice lists.²⁰ About twenty-nine students participated in each session. During these group workshops, the facilitator also answered students' questions. The total time of the workshop, including viewing the video, was about one hour.

3.4. *GuIDE Workshop for Parents*

Parents are a crucial component of the decision-making process. While the decision can be a bilateral one that involves both students and parents, parents have veto power over any school decision. In the baseline, over 60% of students said that parents would be the most useful people as they considered their school choices. In this context, few parents have prior experience with the process and school leaders can discount their opinions because of their low levels of literacy and experience with school.

In a random half of the treatment schools, an additional workshop was held for parents only, at a time and day that the school expected parents to be available. The parents of all students who attended the student workshop were invited. Getting parents to come to school can be logistically complicated. Schools were sceptical that any parents would attend. On average 15.5 parents attended, or slightly more than half the number of students who attended on average. At the parent workshop, parents watched the same video as the students and interacted with a facilitator. They did not receive an additional booklet.

The household decisions around school choice are multifaceted (Giustinelli and Manski, 2018). Parents are often the key decision makers in the school selection process, but in Ghana students can submit choices without any parental oversight or involvement. By additionally including parents in one of the treatment arms, we learn about the decision-making process and whether the extra hassle of reaching parents directly has any returns. The meetings with parents could have affected choice and matriculation outcomes in at least five ways. First, the involvement of the parents reinforced the message from the video that the choice decisions were bilateral and encouraged an open dialogue between students and parents, potentially reducing the likelihood that students' unilateral submitted choices disagreed with future household bilateral matriculation decisions (Giustinelli, 2016). Second, information directly from a facilitator or the video could have been more easily understood by parents and not subject to misinterpretation by their student intermediary. Third, parents could have been made more aware of the importance of listing careful choices in the centralised search to avoid cumbersome *ex post* sorting. Fourth, the meetings could have facilitated additional peer interactions between parents, giving parents the opportunity to discuss the process with each other. Fifth, this was also an extra dosage of the intervention—a second household member viewed the same video and had an opportunity to ask questions of a facilitator.

By providing students, and sometimes parents, additional information and resources on the school choice process mechanism, how to estimate the scores that are used for admissions, and school details, the intervention assisted students to make choices that would better match their preferences, increasing match quality and reducing costly *ex post* sorting.

²⁰ Teachers were invited to attend the workshops and received their own copy of the booklet, but they did not have any formal role in the workshops. In our piloting of the booklet, teachers were intrigued by the test scores commenting that some schools' test scores confirmed their priors while others were surprising. Teachers appreciated the additional information.

4. Methodology

4.1. Research Design

To test the impact of information on school choice, we conducted a school-level RCT. We randomly assigned 900 junior high schools in Ashanti, Ghana, to one of three groups: T1, information to students and teachers (300 schools); T2, information to students, teachers and parents (300 schools); and T3, the control group (300 schools). We stratified our random assignment of treatment arms by district, ensuring that we had at least one school assigned to each treatment arm in each district. Students and teachers in T1 and T2 schools received the full GullIDE intervention—the booklet, video and workshop during school hours. In addition, in T2 schools, we held parent workshops, providing information directly to parents. Students and parents in T3 schools continued with the status quo, receiving no additional information.

We overlaid this primary randomisation with a secondary experiment on priming. Half of each group participated in a baseline survey in January 2016, prior to any workshops, and half did not. This baseline survey (described in more detail in Section 4.4) may have prompted students to think more about the application process and encouraged them to seek out more information. By administering this survey in a random subset of schools (T1a, T2a and T3a), we can measure how this increased consideration of the process, independent of the provision of additional information, changed students' knowledge and subsequent decisions.

Within our 900 schools, 42,577 students registered for the BECE, indicating their intention to take the BECE and apply to senior high school.

4.2. Empirical Strategy

The primary conceptual difficulty in ascertaining the effect of information on student choices and subsequent outcomes is the typical non-random allocation of information. To overcome this difficulty, we randomly provided information to students and parents in some schools and not others. The resulting empirical estimation strategy is straightforward:

$$Y_{is} = \alpha + \beta_1 \text{InfoStudents}_s + \beta_2 \text{InfoStudentsParents}_s + \mathbf{W}'_{is} \gamma + \varepsilon_{is}, \quad (1)$$

where Y_{is} is the outcome for student i in school s , InfoStudents_s is an indicator for whether school s was a school in which only students and teachers received information (Group T1), $\text{InfoStudentsParents}_s$ is an indicator for whether school s was a school in which students, teachers and parents were targeted to receive information (Group T2), $\mathbf{W}'_{is}$ is a vector of binary variables representing the stratification bin from which school s is drawn, i.e., district, and student gender, and ε_{is} is the idiosyncratic error, assumed to be independent across schools, but allowed to be correlated within a school. Note that the treatment variables are mutually exclusive and not nested.

Our outcomes of interest trace the causal chain presented in Figure 1. We test for the effect of the intervention on a student's self-reported receipt of information, changes in the selection process and self-reported priorities, the impact on students' official application choices, any intervention induced changes in students BECE scores, effects in the characteristics of schools to which students were admitted, and whether the intervention affected secondary school matriculation outcomes. We measure these outcomes using a mix of self-reported and administrative data. All self-reported data are from the half of study schools, equally divided among treatment groups, in which we conducted surveys. For estimates with administrative data, we use the entire sample,

testing for the differential impact of being surveyed in the [Online Appendix](#), to ensure that we were not conflating priming students to think about their choices with providing information.

To address concerns about multiple hypothesis testing, in addition to testing individual outcomes, we estimate the effects of the programme on categories of outcome variables, following the mean effects methodology of Kling *et al.* (2007). Each family of outcomes represents a set of related measures following our theory of change (see more details in Section 5.7).

4.3. Sample Selection

We selected our sample from the universe of government JHSs listed on the Ghana Education Management Information System (EMIS) school roster. To be eligible for the sampling frame, a school had to be in Ashanti Region, include all junior high school grades (JHS1 through JHS3), have at least one student who qualified for secondary school admission in 2014, and have between the fifth and ninety-fifth percentile of JHS3 cohort size in Ashanti.

Out of the thirty districts in Ashanti, we excluded one where we piloted the intervention and another with only five JHSs. We randomly selected twenty-two districts out of the remaining twenty-eight for the study.²¹ These selected districts contained 1,024 eligible JHSs.

From this sampling frame, we randomly selected 900 schools to participate in the study, stratified by district, ensuring that we had at least one school assigned to each treatment arm in each district. Some schools had more than one section, or stream as they are known in Ghana, of JHS3. For these schools, we randomly selected a single stream to both survey and treat, returning to the same stream for follow-up visits.

4.4. Data

Our study relies on both hand collected survey data and administrative data. In this subsection we describe both.

We collected data directly from students in two rounds of surveys and from an informed member of the students' households in the final round.

In January 2016, near the start of Term 2 of the 2015–2016 school year, we collected baseline student data in the 450 survey schools, 150 in each treatment arm. The student survey asked questions about demographic characteristics of the students and their families, their previous educational experiences, knowledge of the application procedures and secondary schools, anticipated application choices, and educational and career ambitions. We also asked for contact information for their parents, older siblings with mobile phones and other individuals who might know about their schooling outcomes in the future.²² Only students who were present on the day of the baseline were surveyed.

After the baseline, enumeration teams administered the appropriate intervention based on the school's treatment status.

In March 2016, near the end of Term 2, after students had received the intervention and submitted their choices to the CSSPS, we returned to the same schools to conduct the JHS follow-up. We attempted to reach all the baseline students, asking similar questions as the baseline.

²¹ We limited the study to twenty-two districts to reduce travel costs for the intervention.

²² Because of the high incidence of child fostering in Ghana, we asked for the contact information of parents or guardians and treated them equivalently. For simplicity, we refer to them as parents throughout this paper.

In April 2017, during what should have been the second term of secondary school for students progressing through school on pace, we attempted to contact twenty baseline students' households from each surveyed school using the previously collected contact information.²³ In this round, the SHS follow-up, we asked questions about the student's current schooling or other activities, if not enrolled, and when the student matriculated or dropped out of schooling. In contacting individuals for this round, we sought to speak with a member of the student's household who knew about the student's current schooling or working activities. This individual was most often the parent, older sibling or the student themselves.

We used administrative data both to create the booklet and learn about student outcomes. For the booklet, the CSSPS secretariat provided three prior years of admission scores at the school-programme level. The average of these three years appears in the booklet. The West African Education Council provided data on WASSCE pass rates at the school level, which we also included in the booklet. We further combined the historical BECE admissions data and WASSCE pass rates to calculate a school-level value-added measure that we use for analysis, but did not include in the booklet due to our data use agreement. For each SHS, the value added is the school's residual from a regression of the BECE mean and BECE 5th percentile on the WASSCE pass rate.²⁴

The administrative data for students contain the student name, JHS name, four selected school-programme pairs, BECE identification numbers, BECE scores and the secondary school to which they were admitted. We use their BECE identification numbers to match students across the CSSPS and survey data.²⁵ In our regressions based on student level administrative data, we include all students from a school, even those who were not present on the day of our baseline.

Figure 4 displays a timeline of fieldwork and student activities. We use these multiple collection rounds to measure changes in information, preferences and beliefs and to assess whether information changes choices and eventual outcomes.

To implement our multiple hypothesis testing robustness check, we rescale each of the variables to have a mean of zero and a standard deviation of one. We then make all variables go in the same expected direction by multiplying a subset by negative one when necessary. Then within each category, we take the average and rescale this average to have a mean of zero and a standard deviation of one. This second rescaling of the average allows us to interpret the magnitudes of the estimated effects in terms of standard deviations.

Table 1 contains selected summary statistics and demonstrates baseline balance across the three arms. Of particular note in the summary statistics are parents' education levels—only about 40% of fathers and 23% of mothers have education beyond JHS with about 12% of each not having any formal education. Therefore, most of our sample are first generation secondary school students. Such households could find the process especially daunting.

5. Results

Recall the causal chain outlined in Section 2.2. We address each of these steps in turn—receiving information, using and internalising information, stating choices, taking the BECE, CSSPS

²³ We were only able to reach on average 17.5 households per school within the time allocated for fieldwork. The success rate is not differential by treatment status.

²⁴ On average, Option 3 schools have the highest value added, followed by Option 2 and 1. Private schools (Option 5) on average have value added below Option 2. All four distributions have substantial common support with the exception of some remarkably low value-added estimates for some private schools.

²⁵ We match those with errors in self-reported BECE IDs using their names and JHS.

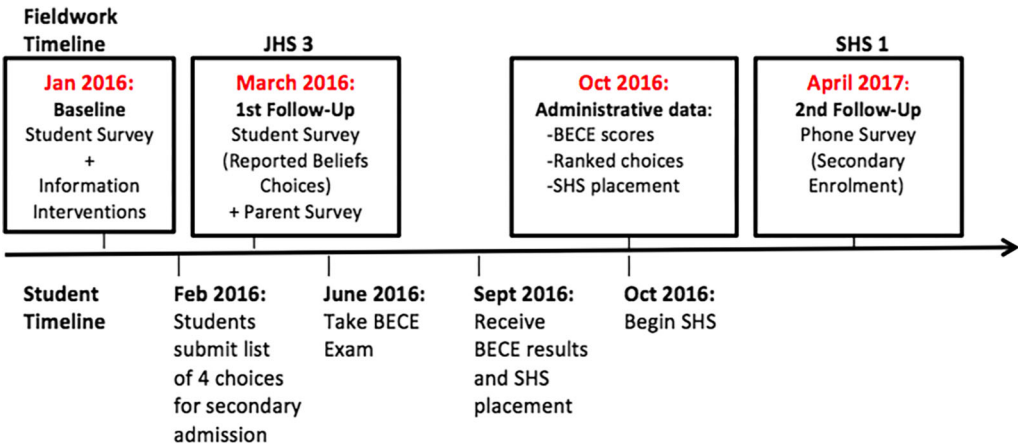


Fig. 4. Study Timeline.

Table 1. Baseline Balance.

	Control (1)	Student info (2)	Parent info (3)	<i>p</i> -value diff. (1) vs (2) (4)	<i>p</i> -value diff. (1) vs (3) (5)
Female	0.43 (0.50)	0.43 (0.50)	0.44 (0.50)	0.96	0.63
Age	15.93 (1.44)	15.81 (1.41)	15.81 (1.43)	0.13	0.13
Days absent	1.66 (3.22)	1.76 (3.29)	1.69 (3.41)	0.52	0.83
Taken mock BECE	0.50 (0.50)	0.49 (0.50)	0.51 (0.50)	0.94	0.78
Expected BECE	11.60 (4.76)	11.55 (4.82)	11.57 (4.81)	0.89	0.92
Believes CSSPS fair	0.61 (0.49)	0.60 (0.49)	0.58 (0.49)	0.78	0.41
Low income	0.27 (0.44)	0.26 (0.44)	0.26 (0.44)	0.76	0.74
Father educated beyond JHS	0.39 (0.49)	0.43 (0.50)	0.41 (0.49)	0.05	0.47
Mother educated beyond JHS	0.23 (0.42)	0.24 (0.43)	0.23 (0.42)	0.41	0.86
Father completed no school	0.12 (0.32)	0.10 (0.30)	0.12 (0.32)	0.29	0.92
Mother completed no school	0.17 (0.37)	0.15 (0.36)	0.16 (0.37)	0.30	0.62
Observations	3,636	3,548	3,633		

Notes: Columns 1–3: sample means with standard deviations in parentheses. Columns 4 and 5: *p*-values of differences based on standard errors adjusted for clustering at the JHS level. Expected BECE measured from 6 (best, 6 exams each with a score of 1) to 54 (worst, 6 exams each with a score of 9). A score of 11 could be one 1 and five 2s.

admissions and matriculation. As we described in the previous section, some outcomes rely on the survey subsample of 450 schools and others use administrative data over the full 900 school sample. In Sections 5.1 through 5.6 we use the largest sample possible. In Section 5.8 we show

Table 2. *Receipt of Information.*

	Seen a booklet (1)	Seen a video (2)	Believe CSSPS fair (3)
Student info	0.140*** (0.017)	0.780*** (0.018)	0.048 (0.030)
Student + parent info	0.151*** (0.017)	0.762*** (0.021)	0.032 (0.029)
Student = parent <i>p</i> -value	0.14	0.39	0.60
Observations	11,692	11,663	11,671
<i>R</i> ²	0.10	0.59	0.06
Control group mean	0.82	0.14	0.53

Note: All outcomes from the first follow-up survey. These outcomes are based on student self-reports of whether they had seen a booklet/video about the secondary school application process. Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses, ****p* < 0.01.

that the effects of the intervention on the administrative data outcomes are not substantively different when students completed the baseline survey.

5.1. *Receipt of Information*

Table 2 contains results of (1) as a linear probability model with whether, during the first student follow-up, students reported having seen a booklet of school choices or a video about the school choice process. The two treatment indicators are mutually exclusive and separate regressors. Being in either treatment increased the likelihood that a student reported having seen a booklet with information about the school choices and the school choice process by about 14 percentage points (column 1). Over 82% of the control group also reported having seen a booklet. This could have been the basic GES listing booklet or our booklet borrowed from a treated student. The video clearly left a strong impression on students, increasing the likelihood that students reported having seen a video with information on the school choice system by over 76 percentage points (column 2).²⁶ In both cases, we fail to reject that the student only or student plus parents intervention had similarly sized effects.²⁷ As a proxy for student comfort level with the mechanism, we estimate whether students believed that the CSSPS was a fair system, finding positive, but statistically insignificant effects (column 3). About half of the students in the sample believed the system was fair.

5.2. *Use of Information*

We next test whether students used the booklet as an information source. Students were asked where they got information about the academic quality of secondary schools, selecting as many

²⁶ Fourteen percent of the control group also reported having seen a video. This could be a combination of being mistaken or having seen a previously produced CSSPS video that explained why the CSSPS was used, but did not provide guidance on navigating the process.

²⁷ Based on data collected in the parent follow-up and analysed in Ajayi *et al.* (2017), parents in each treatment arm were about 11 percentage points more likely than the control group to report having seen a booklet. Parents in the parent treatment were further about 10 percentage points more likely than control parents to report having seen a video.

Table 3. *Use of Information and Selection Process.*

	Self-reported source of information					Reported parent would help choose (6)
	Booklet (1)	Radio/TV/ newspaper (2)	Internet (3)	Other people (4)	Other (5)	
Student info	0.165*** (0.021)	−0.060*** (0.017)	−0.034** (0.017)	−0.050*** (0.013)	−0.009* (0.005)	0.049*** (0.014)
Student + parent info	0.173*** (0.020)	−0.042*** (0.016)	−0.014 (0.017)	−0.032** (0.013)	−0.013*** (0.004)	0.057*** (0.014)
Student = parent <i>p</i> -value	0.72	0.33	0.23	0.13	0.36	0.54
Observations	11,679	11,678	11,678	11,678	11,679	11,449
<i>R</i> ²	0.05	0.02	0.03	0.03	0.00	0.02
Control group mean	0.21	0.68	0.34	0.20	0.03	0.75

Note: Outcomes from the first follow-up survey. Each column represents one regression, which controls for gender and includes strata fixed effects. Linear probability models. Standard errors adjusted for clustering at the JHS level appear in parentheses. Columns 1–5: answers in response to a question regarding where they obtained information about the academic quality of secondary schools. Students could pick multiple. Column 6: the outcome is an indicator variable equal to one if the student reported the parent would help them make their school choices. **p* < 0.1, ***p* < 0.05, ****p* < 0.01.

information outlets as relevant. In both treatment arms, students increased the likelihood that they used a booklet for academic information by about 17 percentage points (Table 3, column 1).²⁸ Even though 82% of the control group (Table 2) reported having seen a booklet, only 21% reported using a booklet for information, and our intervention almost doubled this likelihood. Students in treatment schools were less likely to report that they received information from traditional media (column 2), the internet (column 3), other people (column 4) or another source (column 5). In all cases we fail to reject that the point estimates are the same across the two treatment arms and in almost all cases the changes generated by each treatment are statistically different from 0.²⁹

In addition to information sources changing, parents were more likely to be involved in the process, another aspect that our intervention highlighted. Our booklet encouraged students and parents to jointly consider choices and our video modelled such a conversation. Seventy-five percent of parents were already involved, and the intervention increased this likelihood by about 5 percentage points (Table 3, column 6). Parents in the parent information arm schools reported more involvement in the choice process than either the control group or the student information only arm (Ajayi *et al.*, 2017, tbl.2).

We next examine whether this use of information and parental involvement adjusted what students reported to value in schools. Table 4 shows that the treatment shifted the attributes that students found important towards the information in the booklet. Relative to the control group, students in the student information arm were about twice as likely (3 percentage point increase on a base of 3 percentage points) to say that admissions chance was the most important with a smaller (1 percentage point) effect for the parent information arm (column 1). Students in treatment schools were 4 percentage points (about 80%) more likely to say the most important

²⁸ People noting their use of the booklet emphasises the lack of other high quality information sources.
²⁹ Because of the symmetry of the effects, even though students in the intervention that included parent information might have received an effectively higher dose of the intervention, further changes along the causal chain are likely not the effect of differential dosage, but direct parent involvement.

Table 4. *Stated Preferences—Most Important Factor in Selecting Schools.*

	Admissions chance (1)	Distance (2)	Teacher quality, or how affect future success (3)	School reputation or facilities (4)	Discipline (5)	Academic quality (6)
Student info	0.034*** (0.009)	0.041*** (0.008)	−0.041*** (0.011)	−0.017* (0.010)	−0.010* (0.006)	−0.002 (0.020)
Student + parent info	0.010* (0.006)	0.044*** (0.008)	−0.014 (0.012)	−0.023** (0.010)	−0.011** (0.005)	0.005 (0.018)
Student = parent <i>p</i> -value	0.02	0.75	0.01	0.48	0.88	0.70
Observations	10,507	10,507	10,507	10,507	10,507	10,507
<i>R</i> ²	0.01	0.02	0.01	0.02	0.01	0.04
Control group mean	0.03	0.05	0.13	0.10	0.04	0.61

Notes: Outcomes from the first follow-up survey. These are responses to: ‘what is the most important factor you think about when selecting schools’. The options were: distance from home; cost; chances of being admitted; academic performance of the school; (any of) teacher quality, reputation of the school, facilities and resources; boys or girls only; religious affiliation; family member attended; how it might affect my future success; discipline or behaviour of past students. Each column represents one regression, which controls for gender and includes strata fixed effects. Linear probability models. Standard errors adjusted for clustering at the JHS level appear in parentheses, **p* < 0.1, ***p* < 0.05, ****p* < 0.01.

factor to consider was distance from home (column 2).³⁰ Students in the student only treatment schools were statistically less likely to consider how the school might affect future success (column 3). Students in both arms were less likely to consider the overall reputation or facilities of the school (column 4) and decreased their consideration of the discipline features of the school (column 5). Neither discipline nor reputation were covered in the booklet. The most important consideration for all arms continued to be academic quality and the intervention did not change this (column 6). Overall, students in the treatment arms increased the likelihood that they selected schools based on an attribute which we included in the booklet.³¹

5.3. Application Choices

Students changed their choice behaviour as recorded in administrative data from the CSSPS. Table 5 contains estimates of the effect of treatment on various characteristics of students’ official choices. Students were 4 percentage points more likely to apply only to schools in Ashanti (column 1).³²

Recall in the analysis above that students in treatment schools were more likely to state that they considered their admission chances in selecting schools. In columns 2 through 5, we estimate whether the treatment encouraged students to select schools with historically easier admissions standards, i.e., lower BECE means as reported in the booklet. Consistent with being concerned

³⁰ We did not provide distance from each JHS to each secondary school, but instead elements that would help students calculate distance—the district and neighbourhood of each secondary school and a list of schools sorted by district. For students interested in staying close to home, we included a discussion of the catchment option.

³¹ Students could select other reasons beyond those in the table. As the intervention was not designed to affect these attributes and did not, for parsimony we do not present the effects.

³² Students were also 1 percentage point more likely (off a base of 93%) to select at least one school in Ashanti (results not presented). The booklet only contained information on Ashanti schools, but stated that students were free to select schools from any region. Even though students were more likely to select schools in Ashanti, the distance between a student’s JHS and each choice did not change with the intervention with an average distance of 30 km for choice 1 and about 25 km for the other three choices.

Table 5. *Characteristics of Application Choices.*

	Applied only	1st choice	2nd choice	3rd choice	All applied schools		Value added
	Ashanti (1)	BECE mean (2)	BECE mean (3)	BECE mean (4)	4th choice BECE mean (5)	Mean WASSCE pass rate (6)	
Student info	0.042*** (0.015)	−0.016 (0.030)	−0.032 (0.026)	−0.044 (0.027)	−0.053* (0.030)	−0.523 (0.785)	0.011 (0.030)
Student + parent info	0.039*** (0.014)	−0.028 (0.027)	−0.053** (0.024)	−0.058** (0.025)	−0.049* (0.028)	−0.508 (0.730)	0.025 (0.028)
Student = parent <i>p</i> -value	0.80	0.69	0.41	0.58	0.87	0.99	0.63
Observations	42,848	37,809	38,084	38,350	38,652	42,724	40,777
<i>R</i> ²	0.10	0.18	0.18	0.17	0.18	0.19	0.27
Control group mean	0.68	0.72	0.56	0.47	0.37	58.97	0.00

Notes: Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses. Column 1: the outcome is an indicator for whether all of the schools to which the student applied were in Ashanti. Linear probability model. Columns 2–5: the mean incoming BECE score reported in the booklet of their 1st–4th choice schools. Column 6: the average WASSCE pass rate among all schools to which they applied measured 0 to 100. Column 7: the average value-added score across all schools to which they applied, standardised among schools to be mean 0 and SD of 1. **p* < 0.1, ***p* < 0.05, ****p* < 0.01.

with admissions chances, all point values are negative—students applied to schools with slightly lower historical admissions standards. These point values are statistically different from 0 for choices 2 through 4 for the parent arm (columns 3 through 5), and choice 4 for the student arm (column 5). Students appear to be using the advice in the booklet to select a safety school.³³

Students on average did not apply to schools with higher WASSCE pass rates or value added (columns 6 and 7).³⁴ While the intervention was designed to shift students away from schools with bad WASSCE outcomes, these findings are consistent with the Table 4 finding of students not changing (or perhaps decreasing) their value of the school’s contribution to their future success.

We further test for changes in strategic behaviour in Online Appendix Table A1. We find some evidence that the intervention increased students’ understanding of strategic behaviour. In the intervention that included parents, they applied to a wider portfolio of schools as measured by the variance in choice BECE means.³⁵ The treatment did not change the likelihood of violating the CSSPS rules.³⁶

³³ Results are similar if we consider BECE 5th percentile instead of BECE mean. On average, students selected 2.9 schools for which their actual BECE score would have resulted in admission based on the 5th percentile BECE in the booklet, this is not differential by treatment status.

³⁴ The effects of the intervention on the outcomes in columns 6 and 7 are similarly statistically insignificant for each choice separately (results not presented). Value added was calculated using the WASSCE and BECE data from the booklet (see Section 4.4 for more details).

³⁵ Online Appendix Table A2 contains tests for strategy in subsets of choices and using different measures of strategy, finding no effects. We further test in Online Appendix Table A3 for the influence of the arbitrary location of a school in the booklet relative to page breaks and whether students from the same school list the same choices. By virtue of arbitrary page breaks, some secondary schools may have been more salient than others. The treatment did not change the number of choices that students listed which appeared at the top of a page or the percentage of students from your JHS who listed the same fourth choice (columns 1 and 4). Students in the parent information treatment listed 0.05 more schools from the first page of the GuIDE school listing section, the first fourteen Option 1 (least selective) schools in alphabetical order (column 2).

³⁶ Five percent of students in control schools violated the CSSPS rules and listed too many Option 2 or 3 schools. Female students, students with a higher density of SHS within 10 km of their JHS, and students with higher BECE scores were less likely to make such errors. Students who took the mock BECE were more likely to make an error. Despite these statistically significant relationships, their overall predictive power is low (*R*² = 0.06). Almost all students listed four choices.

Table 6. *Junior High School Exit Exam.*

	Took BECE (1)	BECE score (2)
Student info	−0.004 (0.008)	−0.018 (0.079)
Student + parent info	−0.007 (0.008)	−0.044 (0.073)
Student = parent <i>p</i> -value	0.78	0.72
Observations	42,848	41,778
<i>R</i> ²	0.04	0.12
Control group mean	0.98	0.00

Notes: Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses. Outcomes from CSSPS administrative data.

5.4. *The BECE*

Students’ admission to secondary school depended on the combination of their BECE scores and their listed choices. The intervention was not designed to alter the likelihood that students took the BECE or the effort they put into preparing for and taking the exam. Nevertheless, the extra information that we provided to students could have changed these outcomes. The intervention did not change the likelihood that a student took the BECE as scheduled or the students’ BECE scores (Table 6).³⁷

Given the lack of effect on selection into the BECE or a student’s BECE score, any changes in admissions and matriculation are the result of changes in choices and not test scores or selection into the test.

5.5. *Admissions*

As shown above, the intervention changed who participated in students’ application processes, what they valued in schools and their application behaviours. In this subsection we test whether it changed their CSSPS admissions.

Table 7 shows that the treatment did not change the likelihood that a student was admitted to secondary school (column 1) or admitted to a school from their choice list (column 2) with small, 1 to 3 percentage points, statistically insignificant point values.³⁸ Across both the treatment and control group, about 20% of students were admitted to their top choice school, 14% to their second choice school, 11% to their third choice school and 9% to their fourth choice school. In column 3, we show that our intervention did not change this probability for Choice 1, with similar statistically insignificant effects for other choices (not presented).

We next test whether the intervention changed the characteristics of the school-programme pairs or schools to which students were admitted (Table 8). The intervention did not change the likelihood of students being admitted to a school in Ashanti (column 1). Note the remainder of

³⁷ Other observable and self-reported measures of effort or aspirations were similarly unchanged by the intervention—reported absences, present on the day of the follow-up, aspire to at least complete secondary school or aspire to pursue a university degree (results not presented).

³⁸ Students with sufficiently high BECE scores for secondary school admission whose preferred schools were full were admitted arbitrarily by the CSSPS into a school in their preferred districts that was not yet full. Students with low test scores or those who made choice errors were not admitted.

Table 7. *Admissions.*

	Admitted any school (1)	Admitted any choice (2)	Admitted 1st choice (3)
Student info	0.001 (0.017)	0.006 (0.020)	−0.001 (0.014)
Student + parent info	0.001 (0.016)	0.022 (0.021)	−0.000 (0.014)
Student = parent <i>p</i> -value	0.98	0.42	0.97
Observations	42,848	42,848	42,848
<i>R</i> ²	0.50	0.19	0.12
Control group mean	0.89	0.52	0.20

Notes: Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses. Outcomes from the CSSPS administrative data. Each outcome is an indicator variable. Linear probability models.

Table 8. *Admissions Characteristics.*

	Admitted Ashanti (1)	Admitted SHS BECE mean (2)	Admitted SHS value added (3)
Student info	0.019 (0.019)	−0.050 (0.030)	0.033 (0.025)
Student + parent info	0.026 (0.017)	−0.069** (0.031)	0.086*** (0.023)
Student = parent <i>p</i> -value	0.67	0.49	0.03
Observations	42,848	29,914	29,164
<i>R</i> ²	0.29	0.04	0.08
Control group mean	0.80	0.02	0.00

Notes: Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses. Column 1 is whether the student was admitted to a school in Ashanti. Column 2 is the average of all of the booklet-reported BECE scores for the admitted SHS. Column 3 is the residual from a regression of the school’s booklet-reported Senior School Certificate Examination (SSCE) pass rate on the booklet-reported incoming BECE means and 5th percentiles in each programme. Missing incoming scores (for example, if a school does not offer a programme) are included with the mean for that programme across schools and an indicator for missing that variable. Because the outcomes are based on the school to which a student is admitted, Columns 2 and 3 only include those who were admitted to a school. ***p* < 0.05, ****p* < 0.01.

this table is limited to students who were admitted to a school, which, as was shown in Table 7, is not differential by treatment status. Students were admitted to schools that were less selective by about 0.05 to 0.07 SD, based on the BECE mean presented in the booklet, only statistically different from 0 in the parent information arm (column 2). Students in the student treatment arm were admitted to schools of equal value added to the control arm. Students in the parent arm were admitted to schools that had a 0.09 SD higher WASSCE pass rate value added than the other arms (column 3).³⁹ Even though the measurable differences between the treatment arms were small, students choices and resulting admission realisations could have been better matches for them on margins we cannot measure.

³⁹ The outcomes in Table 8 are at the SHS level as our administrative data did not contain the programme to which students were admitted.

5.6. *Matriculation*

Despite the potential for the intervention to improve match quality due to students making more informed choices and being admitted to higher value-added schools, their matriculation decisions were unchanged (Table 9). For the matriculation results, we rely on outcomes as reported by informed household members during what should have been the student's second term of secondary school.⁴⁰ Sixty percent of control group students were attending secondary school at that time. The treatments did not change the likelihood that a student was attending secondary school (column 1).⁴¹ Further, students in treatment schools were no more likely to have started within the first six weeks of school, approximately on time in the Ghanaian context (column 2). Only 44% of students attending secondary school in the control group started within the first six weeks.⁴² Students in the parent information arm were 3 percentage points more likely than those in the student information only arm or the control group to be attending their admitted SHS (column 3).⁴³ The intervention did not change the SHS booklet BECE mean, SHS value added, whether the SHS was in Ashanti, the distance between their SHS and their JHS or the SHS Term 1 costs, with two exceptions—students in the parent arm were attending slightly (0.08 SD) more competitive schools, and students in the student information arm were attending slightly less expensive schools (GHS10, US\$2.58). Even though parents were more involved in the process in the parent intervention arm (Ajayi *et al.*, 2017), the differences in matriculation outcomes were minimal.

5.7. *Potential Threats to Validity*

5.7.1. *Multiple hypothesis testing*

Given the richness of outcomes that we collected via surveys and from administrative data, one concern could be erroneous discoveries due to testing multiple hypotheses. In Table 10, we group our outcomes into families based on the steps in the causal chain appearing in Figure 1. For each set of outcomes, we include the relevant outcome variables, reversing the sign when necessary for all variables to move in the same intuitive direction. The variables that make up each family of outcomes are listed in detail in the table notes. Both treatments caused large, positive, equivalent and significant effects of the outcome that summarises reporting exposure to the treatment, about 1.5 SD (column 1). The two interventions increased the information sources and priorities index value by about 0.3 SD (column 2). The intervention changed the application choices (e.g., lower admissions thresholds, higher WASSCE pass rates and higher value-added) by 0.1 SD (column 3). As with Table 6, the intervention did not affect the BECE index value (column 4). The parent

⁴⁰ This sample contains fewer students per school, but the same number of schools as the previous samples. Most of the statistical power is from the 450 schools and not the number of students per school. The person with whom we spoke claimed to know about the students' outcomes, but may have been mistaken. Results are similar in magnitude and statistical significance if we limit the sample to households in which we reached either a parent or the student themselves.

⁴¹ Even with the smaller sample size and potential noise from reaching less informed household members, we can rule out positive effect sizes of larger than 1.8 percentage points (3%) in the parental arm and 3.5 percentage points (5.8%) in the student arm. Some of the students who were not attending secondary school could still enrol and complete school on a delayed schedule (Duflo *et al.*, 2017).

⁴² We can rule out positive effects of 3 percentage points (6%) in the student arm and 1.6 percentage points (4%) in the parent arm.

⁴³ Conditional on attending secondary school, students in the parent information schools were 7.5 percentage points more likely to be attending their admitted school. The bulk of switching behaviour (82%) was switching to another school within Ashanti (4% switched among schools outside Ashanti, 8% switched into Ashanti and 5% switched out of Ashanti).

Table 9. *Matriculation.*

	Currently attending SHS (1)	Start on time (2)	Attending admitted SHS (3)	Attending SHS BECE mean (4)	Attending SHS value added (5)	Attending SHS in Ashanti (6)	Distance to SHS (7)	SHS day fees Term 1 (8)
Student info	-0.008 (0.022)	-0.019 (0.024)	-0.002 (0.017)	0.017 (0.035)	-0.065 (0.052)	-0.006 (0.023)	-2.314 (1.803)	-10.245** (4.351)
Student + parent info	-0.025 (0.022)	-0.033 (0.025)	0.033* (0.019)	0.080* (0.043)	0.010 (0.052)	-0.015 (0.023)	-1.509 (1.842)	-5.364 (4.140)
Student = parent <i>p</i> -value	0.47	0.58	0.08	0.16	0.17	0.71	0.56	0.22
Observations	7,804	3,832	7,696	3,666	3,587	7,804	3,597	3,583
<i>R</i> ²	0.06	0.06	0.04	0.12	0.21	0.07	0.19	0.08
Control group mean	0.60	0.44	0.21	0.07	0.00	0.52	23.59	384.85

Notes: Each column represents one regression, which controls for gender and includes strata fixed effects. Standard errors adjusted for clustering at the JHS level appear in parentheses. Outcomes from the secondary school follow-up survey. Columns 1–3 and 6: Linear probability models. Column 1: the outcome is an indicator if the student was attending secondary school at the time of the follow-up. Column 2: the outcome is an indicator for whether the household reported having started secondary school in the first 6 weeks, if the student was enrolled. Column 3: the outcome is an indicator for whether the household reported that they were attending the same school to which they were assigned. Column 4: the outcome is the average of all of the booklet-reported BECE scores for the school that the student is attending. Column 5: the outcome is the residual from a regression of the attended school's booklet-reported SSCE pass rate on the booklet-reported incoming BECE means and 5th percentiles in each programme. Missing incoming scores (for example, if a school does not offer a programme) are included with the mean for that programme across schools and an indicator for missing that variable. Column 6: the outcome is an indicator for whether they are currently attending secondary school in Ashanti. Column 7: the outcome is the distance between a student's JHS and SHS measured in kilometers. Column 8: the outcome is total day fees for Term 1, in GH¢. * $p < 0.1$, ** $p < 0.05$.

Table 10. *Effects By Steps in the Causal Chain.*

	Family 1: exposed (1)	Family 2: info sources and priorities (2)	Family 3: application (3)	Family 4: BECE (4)	Family 5: admissions (5)	Family 6: matriculation (6)
Student info	1.826*** (0.050)	0.390*** (0.034)	0.113*** (0.033)	−0.035 (0.065)	0.053 (0.046)	−0.028 (0.042)
Student + parent info	1.804*** (0.053)	0.322*** (0.035)	0.123*** (0.033)	−0.061 (0.063)	0.081* (0.044)	−0.037 (0.041)
Student = parent <i>p</i> -value	0.66	0.07	0.75	0.71	0.51	0.83
Observations	11,710	11,705	42,848	42,848	42,848	7,804
<i>R</i> ²	0.54	0.04	0.12	0.04	0.42	0.05
Control group mean	0.00	−0.00	0.00	−0.00	0.00	0.00

Notes: Each column represents one regression on the mean effect for a family of outcomes. Family 1: whether the student reported having seen the booklet and having seen the video (the outcomes in Table 2). Family 2: whether the student reported getting information from a booklet; whether they did not report getting information from radio/TV/newspaper, the internet, other people or other; and whether the student prioritised information in the booklet (distance, academic quality and admissions chances) instead of characteristics not available in the booklet (how affect future success, teacher quality or school reputation or facilities, discipline) (outcomes in Tables 3 and 4). Family 3: whether the student applied to only Ashanti schools, the reverse of the mean reported BECE scores in their first, second, third and fourth choice schools, the mean WASSCE pass rate and value-added at all the schools to which they applied (outcomes in Table 5). Family 4: whether the student took the BECE and their BECE score (outcomes in Table 6). Family 5: whether they were admitted to any school, admitted to any of their choices, admitted to their first choice, admitted to a school in Ashanti, the reverse of the admitted SHS BECE mean, the admitted secondary school value-added, the reverse of the assigned programme BECE mean and the assigned programme value added (outcomes in Tables 7 and 8). Family 6: whether they are currently attending secondary school, whether they started on time, whether they are attending the school to which they were admitted, the reverse of the attended programme BECE mean, the attending programme value added and whether they are attending a secondary school in Ashanti (outcomes in Table 9). All estimates control for gender and strata fixed effects. Standard errors adjust for clustering at the JHS level appear in parentheses. **p* < 0.1, ****p* < 0.01.

intervention affected the admissions outcome by 0.08 SD with a smaller and not statistically significant coefficient on the student-only information treatment (column 5). Finally, neither intervention affected overall matriculation (column 6). Therefore, Table 10 confirms the results presented in the previous tables. We plot each of these coefficients in Figure 5.

5.7.2. Attrition

As with any empirical study, an additional potential threat to internal validity is differential attrition by treatment status causing bias in our outcomes of interest. Across surveys and administrative data, we do not find differential attrition between the study arms (Online Appendix Table A4). Attrition between the baseline and the JHS follow-up (19%) and between the baseline and the SHS follow-up (41%, larger because of the subsampling design, see Section 4 for details) is symmetric. For the administrative sample, 98% of baseline students took the BECE, and this was not differential by treatment status (Table 6). The administrative sample includes many students who, by design, did not complete the baseline. The likelihood that a student from the administrative sample completed the baseline, the JHS follow-up or the SHS follow-up is symmetric across the treatment and control groups.⁴⁴ Further, the symmetric attrition does not change

⁴⁴ We match almost all our baseline students to the administrative data through student identifiers and names—thirty-four of our baseline students, symmetric across study arms, do not appear in the administrative data. This high rate of matching is likely because we collected both student identifiers and names, our baseline was near the date of the BECE registration deadline, and our baseline sampled only present students. Regular attenders of the final year of JHS are very likely to register for the BECE.

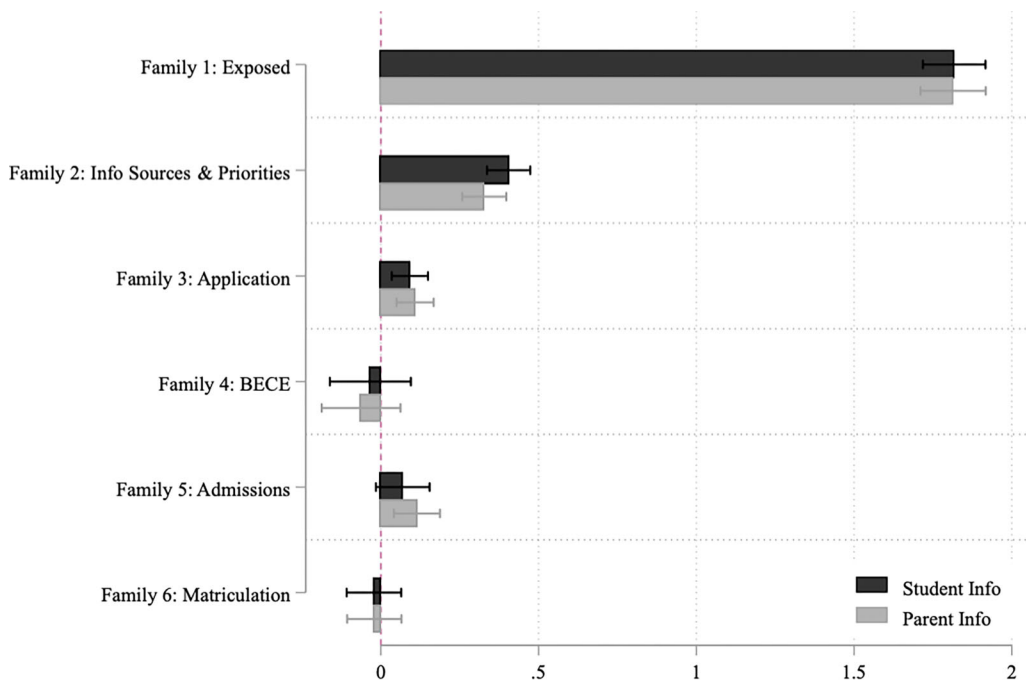


Fig. 5. *Effects by Steps in the Causal Chain.*

Notes: The figure presents coefficients from mean effects estimates on families of outcomes. Family 1: whether the student reported having seen the booklet and having seen the video (the outcomes in Table 2). Family 2: whether the student reported getting information from a booklet; whether they did not report getting information from radio/TV/newspaper, the internet, other people or other; and whether the student prioritised information in the booklet (distance, academic quality and admissions chances) instead of characteristics not available in the booklet (how affect future success, teacher quality or school reputation or facilities, discipline) (outcomes in Tables 3 and 4). Family 3: whether the student applied to only Ashanti schools, the reverse of the mean reported BECE scores in their 1st, 2nd, 3rd and 4th choice schools, the mean WASSCE pass rate and value-added at all the schools to which they applied (outcomes in Tables 5 and 6). Family 4: whether the student took the BECE and their BECE score (outcomes in Table 7). Family 5: whether they were admitted to any school, admitted to any of their choices, admitted to their first choice, admitted to a school in Ashanti, the reverse of the admitted SHS BECE mean, the admitted secondary school value-added, the reverse of the assigned programme BECE mean and the assigned programme value added (outcomes in Tables 8 and 9). Family 6: whether they are currently attending secondary school, whether they started on time, whether they are attending the school to which they were admitted and whether they are attending a secondary school in Ashanti (outcomes in Table 10). All estimates control for gender and strata fixed effects. Confidence intervals adjust for clustering at the JHS level.

the student characteristics across the three survey rounds in an economically meaningful way (Online Appendix Table A5).⁴⁵

⁴⁵ Columns 1–3 contain the means from each survey round. In columns 4 and 5 we tested whether among those who completed the baseline, each characteristic was correlated with appearing in each follow-up survey. Any differences in sample characteristics are small. Relative to the baseline, the JHS follow-up is 1 percentage point more likely to be female, 0.07 years younger, reported 0.2 fewer days of absenteeism, were 1 percentage point less likely to have taken a mock BECE, expected 0.1 point better BECE score, and less than 1 percentage point difference in the likelihood of identifying as low income relative to other households in Ghana, having a father who was educated beyond JHS or having a father who had not completed any schooling. At the second follow-up, relative to the baseline, the sample was

5.8. *Heterogeneity*

Even though mean effects can hide important distributional effects of the intervention, in our intervention the effects were largely homogeneous with a few exceptions noted below. For parsimony, we test for heterogeneity on each outcome family as defined in the previous subsection. For each test of heterogeneity we include an interaction between the heterogeneity measure of interest and each of the treatment variables as separate regressors in (1).

For outcomes that relied on administrative data (application, BECE and admissions), we first test whether students in the schools with the baseline survey, who could have been primed to think more carefully about their choices, have different outcomes than students in those schools without baseline surveys. As shown in [Online Appendix Table A6](#), taking part in the survey did not differentially affect any of these indices.

We further test for heterogeneous effects by gender. Across the six outcome families, the only differential effects by gender are in information sources and priorities (girls in the parent information arm change their sources about 0.12 SD less, [Online Appendix Table A7](#)).

Households with higher educated parents might have needed the intervention less as they could have been more familiar with the system. Alternatively, those households could have found a booklet easier to navigate. [Online Appendix Table A8](#) tests for differential effects based on whether at least one parent completed junior high school. The results support the former hypothesis—households with higher educated parents reported lower levels of exposure in the parent arm, changed their application decisions less and had smaller admissions changes.

We additionally test for heterogeneity by BECE score, as this intervention might have had a different salience for students at different places in the test score distribution ([Online Appendix Table A9](#)). For students in the intervention that included parents, the exposure index is decreasing with BECE score. Application changes were increasing with BECE score (0.05 SD, $p < 0.05$) consistent with other findings that households of students with higher test scores value test score outcomes more (Beuermann *et al.*, 2022). In the student only intervention, the matriculation index was increasing in BECE score (0.07 SD).

We also test for differential effects by the number of secondary schools within 10 km of a student's JHS finding almost none ([Online Appendix Table A10](#)).⁴⁶

We finally test for heterogeneity by whether the student reported having taken a mock BECE exam at the baseline. About 50% of students report having taken a mock BECE exam at baseline. The mock BECE exams were invigilated by the school and not centrally graded. The largest determinant of whether students took a mock exam was their school—at a given school almost all students reported having taken (or not) a mock exam.⁴⁷ All students could guess their BECE scores based on their performance in their courses. The rule of thumb is that your BECE score is approximately your class score in percentages, e.g., for a student with an 80% in math, 80 is a decent approximation for the BECE math score. Students who took the mock BECE might have had a better estimate of their true BECE score, making more accurate comparisons between their expected score and the information in the booklet. Students could have known that having

1 percentage point more female, 0.03 years younger, reported 0.1 fewer days of absenteeism at the baseline and had mothers who were 1 percentage point more likely to have completed some schooling.

⁴⁶ The average student had thirteen schools within 10 km of their JHS. For students in the intervention that only targeted students, the BECE index and information sources was decreasing in the number of schools (-0.009 SD and -0.003 SD, $p < 0.10$).

⁴⁷ Two proxies for income were correlated with whether a student took a mock exam—students whose mom did not attend school were less likely and students at junior high schools with more secondary schools nearby were more likely. Therefore, any heterogeneity could be the result of these correlations and not the mock BECE per se.

a mock BECE score resulted in improved accuracy. We find almost no heterogeneity on this margin (Online Appendix Table A11). Having a more realistic view of their likely BECE score from a mock BECE exam did not differentially change their exposure, information sources and priorities, application, admission or matriculation because of the intervention.⁴⁸

6. Discussion

The motivation for this research was to test whether information could reduce inefficiencies and wasted resources at both the household and education sector level in an information poor, low-tech environment. While choice and admissions outcomes changed, the likelihood of attending SHS or starting SHS on time did not. Students, even those admitted to their first choice schools, continued to switch at approximately the same rate even with the improved information. The two observable switching behaviours, which were symmetric across the treatment arms, were that students switched away from schools that charged more incidental fees and to schools that were closer to their JHS. Below we set out several potential hypotheses as to why improved information did not affect matriculation outcomes more broadly. The continued deviations were likely the results of unanticipated shocks, updated information about own ability and fees, and re-prioritisation of school amenities, with the switching behaviour most consistent with the final explanation.

We can rule out some hypotheses based on the results above. First, we can reject that households did not receive, understand or value the content of the material by our strong results along the causal chain.⁴⁹ Therefore, while households might also consider other aspects of schools (Beuermann *et al.*, 2022), the information in our materials was an important input into the selection process. Second, while we treated 43% of JHSs in our study districts, the observed differences in having seen the booklet implies that the control group was not effectively treated via sharing.⁵⁰ Third, households could have consciously used the choice listing as an opportunity to establish a lower level of admissions, planning to attempt to switch to a more selective school later. This level of strategy would be enhanced with the additional information in our booklet—prior to the booklet households would not have known which schools were less selective—resulting in increased switching behaviour. Instead, we found that students in the treatment arms were equally (student information) or even marginally more likely (student and parent information) to attend the school to which they were assigned, relative to the control group. Fourth, the intervention did not induce congestion at particular schools (Online Appendix Table A3). Finally, the change in intermediate outcomes shows that households did not wish to rely exclusively on *ex post* sorting.

We can rule out other hypotheses with additional analysis. Students were not using the *ex post* sorting to switch to a better option type—almost all students stayed within the same option as their admitted school, similar across all arms. Additionally, switching was not about disappointment in being admitted to a third or fourth choice school. The percentage of students who deviated from

⁴⁸ Students in the student information arm who report having taken a mock BECE test had a 0.32 SD ($p < 0.10$) increase in the BECE family (which includes taking the test and test score). Students with a mock BECE score could have been inspired to study harder while those without that score might have doubted the accuracy of their estimates, not believed their scores would be sufficient or thought they would naturally perform better in the exam.

⁴⁹ In in-depth interviews, respondents mentioned that often ‘parents are too naive’ and blame others when ‘it was their own mistake’. One mentioned that she studied the booklet ‘so when it was time for selecting, I knew what I was doing’. Students also noted how important it was to ‘know your standard and academic performance and compare it with the schools’ acceptable grades’.

⁵⁰ Among participants in the control group neither the distance to the closest JHS nor the distance to the closest treated JHS predicts the likelihood of reporting having seen the booklet or having seen the video.

their admitted schools was relatively stable across choices and interventions—45% of students admitted to their first-choice school deviated and 50% of students admitted to their fourth-choice school deviated.

For some students, improved information did not remove all additional barriers to SHS. Some students were likely never going to matriculate regardless of their match—76% of students not attending SHS said that fees were the most important barrier. Focusing on those students for whom fees were not an insurmountable barrier to SHS, i.e., students who matriculated to an SHS, the persistent switching behaviour—48% of attending students switched—could be the result of several simultaneous phenomena related to changing constraints, additional information and preference forecasting. First, households could have experienced a shock between February (preference listing) and October (starting school) that altered their budget or other constraints, leading to a re-optimisation and change in their desired school.

Second, households received two pieces of information after submitting choices—exact school fees and BECE scores. Households could have learned that the school to which their student was admitted charged additional fees that they did not anticipate. The booklet included the government school fees, but some schools charged incidental fees that students would only have learned through direct contact with the school. These fee differences were mostly small—in the prior year, for 75% of schools the Term 1 charges were within 9% of the government approved fees for day students and 4% of government approved fees for boarding students (Online Appendix Figures A2 and A3).⁵¹ Students were more likely to switch from schools with higher costs, but the elasticity is low—0.3 percentage points more likely to switch for every additional GHS10 (US\$2.58) in school fees or 10 percentage points more likely to switch from a 99th percentile cost school than from a 25th percentile cost school. The second piece of information received was an actual BECE score, updating students' beliefs about their own scholastic strength. By design, the system of preference listing should accommodate students performing better or worse than their expectations, but learning their actual score could have caused them to revise their preferred school. By virtue of admissions being made based on BECE score, students who performed worse than expected would not have been admitted to a school where their score was too low. Students who performed better than expected might have made too conservative of choices.

Third, preferences stated in February were inaccurate forecasts of realised October preferences, potentially exacerbated by the potential to *ex post* sort. This could be because student or household tastes might have changed, independent of any shocks or new information. The re-optimisation we observe is consistent with several explanations proposed in the psychology and economics literature: (i) learning more precisely about trade-offs (Hoeffler and Ariely, 1999)—choosing a school in February could be abstract, but matriculation at a specific school codifies school-specific trade-offs, such as what it might feel like to be farther from home; (ii) limited attention (Sims, 2003; Masatlioglu *et al.*, 2012)—given the large choice set, students might pay attention to a limited number of alternatives when selecting in February, but might be more motivated to consider all feasible alternatives when faced with the impending reality of attending a school in October; or (iii) immediacy (Kahneman and Krueger, 2006)—stated preferences are more accurate closer in time to the actual event. Despite households reporting in piloting that they wanted to avoid *ex post* sorting, the potential for *ex post* non-compliance could have magnified these behavioural limitations to preference forecasting as households did not invest the cognitive

⁵¹ Average total Term 1 fees were about 8% higher for Option 2 schools relative to Options 1 and 3.

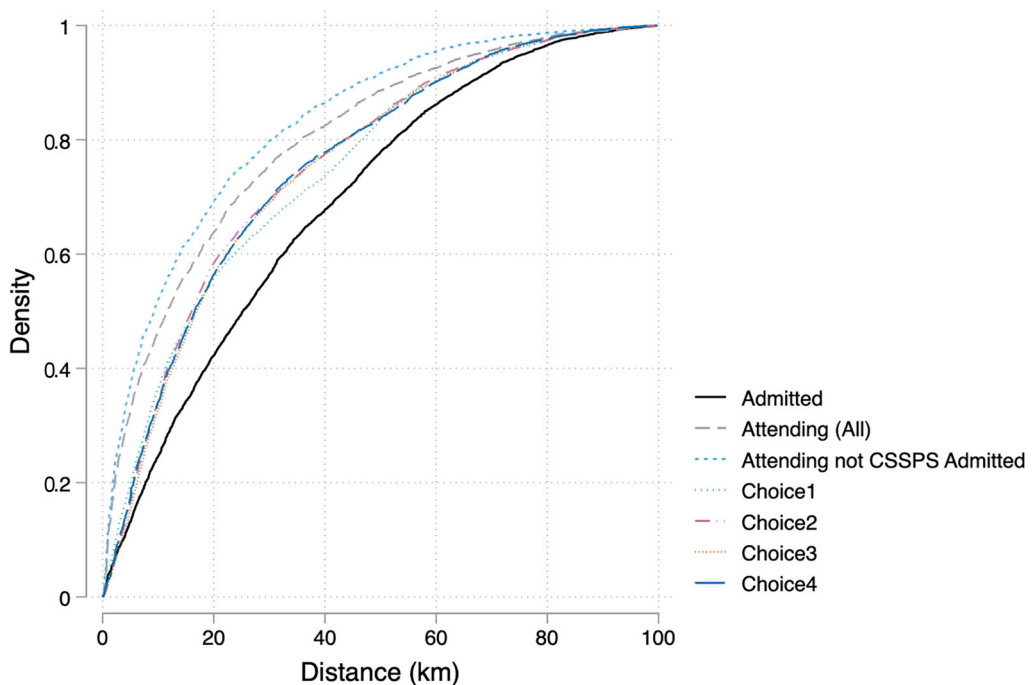


Fig. 6. *Distance Between JHS and Secondary School.*

Notes: The figure illustrates the distribution of distances between students' junior high schools and their admitted secondary schools, the secondary schools they are currently attending (split by those to which students were and were not admitted) and the secondary schools listed for each choice.

effort to understand and express accurate October preferences in February. Encouraging students to think more carefully in February would likely not decrease the re-optimisation as our cross-randomised baseline survey, which primed students to spend additional time thinking about choices, had no effect.

While we cannot empirically rule out the first two, the magnitude of the switching, even for those admitted to their first choice school, seems most consistent with inaccurate preference forecasts. Almost half of households receiving an unanticipated negative shock seems unlikely. The observed difference between fees and students' switching elasticities were unlikely to generate the extensive switching behaviour. Students systematically moving to SHS closer to their JHS is most consistent with inaccurate forecasts, whether due to changing tastes or knowing the potential for future non-compliance and underinvesting in forecasting preferences.⁵² Students underestimated how much they would value being close to home, even though the district of each SHS was a characteristic that was presented in the booklet. For students who were attending a different school than the one to which they were admitted, 24% cited distance as the reason for the school change.⁵³ Figure 6 presents the distribution of distances between a student's JHS

⁵² Generally, people both dislike commuting and underestimate how much they will dislike commuting (Kahneman and Krueger, 2006; Frey and Stutzer, 2014). This change was not a re-prioritisation of distance over quality—the closer schools are similarly selective with similar WASSCE scores.

⁵³ Almost all the academic track secondary schools in our data had both a boarding and day option, therefore distance was not a strictly limiting factor when considering potential choices.

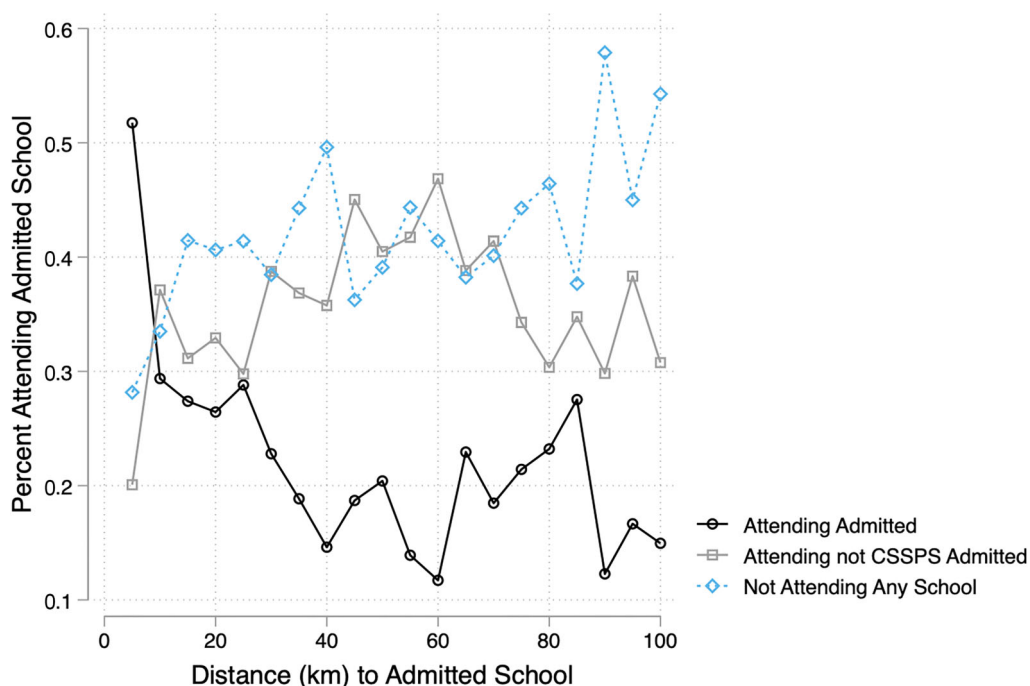


Fig. 7. Matriculation and Distance.

Notes: Figure shows the likelihood of students attending their admitted school, the likelihood of attending a school to which the student was not admitted, and the likelihood of not attending any school, by distance between a student's junior high school and their admitted secondary school.

and their choices, admitted schools and attending schools. Overall, students concentrated their choices relatively close to their JHS with similar distances across all choices (26 km for choices 2–4 and 30 km for choice 1). They attended schools even closer (24 km), especially those who deviated from their CSSPS assignment.

This movement towards home is further confirmed by the percentage of students who attend their admitted school as a function of distance between their JHS and admitted SHS. The distance between a students' JHS and their admitted school predicted whether they chose to attend that admitted school. Figure 7 shows those who were admitted to schools closer to their JHS were substantially more likely to be attending that school—over 50% of students admitted to a school within 5 km attended that school.⁵⁴

Students did not anticipate how much distance would matter—only 5% said it was the most important factor. Our intervention increased the likelihood that students realised this in advance by 75%. Nevertheless, students selected schools at a greater distance than they were willing to attend, pointing to priorities changing between selection and matriculation.

⁵⁴ When considering proximate schools, most students had multiple choices: 42% had at least one school within 2 km of their JHS, the average student had thirteen government academic track schools within 10 km and 52% of students had five or more such schools within 10 km of their JHS.

7. Conclusions

As the increase in primary school enrolment and completion since the mid-1990s moves into the secondary school sector, and an increasing number of countries move to make secondary school free, efficiently using available resources is crucial. This paper examines the role of information in a low-tech, universal school choice setting. To improve the efficiency in the transition between junior high and secondary school in Ghana, we provided students and parents with information about the available secondary schools and the centralised system that allocates students to schools. To test the effects of this information, we conducted a 900-school RCT, enabling us to compare outcomes across three treatment groups. For 300 schools, students alone received information. In another 300 schools, students and parents received information. In a final 300 schools, neither students nor parents received additional information.

Based on both survey and administrative data, students and parents wanted and received our information. Further, the characteristics of the schools to which students applied marginally changed, and they were admitted to higher value-added schools. Nevertheless, the improved information did not improve education outcomes—students were no more likely to start school on time or enrol at all, with persistently high rates of non-compliance with school assignments. Based on interviews with students and parents after the intervention, many said that they remembered the intervention, especially the video. In-depth interviews and additional analysis point to inaccurate preference forecasting, especially around distance, and household shocks as likely reasons for continued deviations. Therefore, while universal school choice systems theoretically benefit students, information alone, an obvious potential solution in a low-tech system, was insufficient to overcome other barriers and households continued to engage in an expensive *ex post* sorting exercise to change schools. Our results reinforce the importance of analysing and addressing understated frictions in future work on centralised school choice.

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Additional Supporting Information may be found in the online version of this article:

Online Appendix Replication Package

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