Pilot findings: Optimizing Schools? Public Perceptions of Algorithmic versus Status Quo Prioritization in K-12 Schooling

We piloted the study with $N = 390$ respondents on Amazon Mechanical Turk (MTurk) in fall of 2019 using a slightly modified vignette where the limited resource was scarce mentors and that lacked a school context manipulation. The text was as follows:

> **What problem is the government trying to solve?** A large urban school district has been struggling with students missing a lot of school and failing classes as a result. The district wants to give some students one-on-one mentors at the beginning of the school year, which evidence shows helps students show up because they know someone cares.
>
> **What money do they have to fix it?** The district just finalized its budget and they have [*more/less]* money to hire mentors this year compared to last year. Given the [*larger/smaller*] budget, they want to make fair decisions about which students to give mentors, since they won't have enough mentors for every student.
>
> **How will they decide how to spend that money?** In the past, the school guidance counselor has [*used other method*] to decide which students get mentors.
>
> This year, the school counselor is thinking about using an algorithm/ predictive model to figure out which students need a mentor the most. The predictive model would use a large amount of data about students–their past years' attendance; their parent's income; how far they live from school–to predict which students will miss a lot of school. The school counselor would give mentors to students the model identifies as needing them the most.
>
> **Summary:** we want your opinion about how the school should decide which students get mentors with the [*larger/smaller*] budget:
>
> - **How they gave mentors last year:** school counselor has [*used other method*]
>
> - **How they might give mentors this year**: school counselor might use an algorithm/predictive model

The italicized parts describe the two dimensions we varied in the initial pilot, which are summarized in Table 1 below.

After reading the vignette, respondents answer an open-ended comprehension question that asks them to describe the predictive models in their own words. Then, they answer a

Table 1: **Two dimensions we vary between respondents (2 x 4 design = 8 conditions): why is the government agency using predictive modeling and what method is that replacing**

Why might the school switch methods? (randomized to one)	
Budget cuts	"less money to hire mentors..."; "Given the smaller budget, they want to make fair decisions about which students to give mentors"
Budget surplus	"more money to hire mentors..."; "Given the larger budget, they want to make fair decisions about which students to give mentors"
What decision-making method does predictive modeling replace? (randomize to one; *variation in italics*)	
Parent requests	"In the past, the school guidance counselor *has used parents' requests for a mentor for their child* to decide which students get mentors."
Lottery	"In the past, the school guidance counselor *has drawn students' names randomly* to decide which students get mentors."
Guidelines (income threshold)	"In the past, the school guidance counselor *has used an income cutoff* to decide which students get mentors."
Counselor judgment	"In the past, the school guidance counselor *has used his judgment* to decide which students get mentors."

series of questions that mix (1) quantitative ratings of the fairness of the school counselor potentially switching to an algorithm compared to the other method they read about (parent requests; lottery; guidelines; judgment) and (2) open-ended questions that ask them to describe their reasoning. Table 2 describes the questions, their order, and the exact wording, with *italics* used to indicate parts that draw from the respondent's randomized condition or earlier response.

Table 2: **Comprehension check and DVs measuring fairness perceptions** 5/6 indicates that the question order was randomized.

Category	Order	Wording
Comprehension check		
Stating in their own words what the predictive model is	1	"Can you explain briefly in your own words what it means for the school counselor to use a predictive model to choose which students get mentors.As a reminder, a predictive model would use a large amount of data about students–their past years' attendance; their parent's income; how far they live from school– to predict which students will miss a lot of school."
Quantitative ratings of fairness		
Forced choice between predictive model and other decision-making method	2	"Which method for deciding which students get mentors is more fair?"
Decision about whether method results in students who deserve mentors getting them	4	"You told us that the [inserts method they chose as more fair] is more fair. Do you think that, if the school counselor picks students this way, the students who deserve mentors will get them?"
Continuous rating of predictive model	5/6	"How fair is it it for the school counselor to pick which students get mentors using [inserts other method]?" Answer choices: 1 = Extremely unfair; 3 = neither fair nor unfair; 5 = Extremely fair
Continuous rating of other decision-making method	5/6	"How fair is it it for the school counselor to pick which students get mentors using a predictive model/algorithm?" Answer choices: 1 = Extremely unfair; 3 = neither fair nor unfair; 5 = Extremely fair
Qualitative responses		
Explanation for why chosen method is more fair	3	"Explain why you think the [inserts method they chose as more fair] is more fair than the [inserts method they said was less fair]"
Views on what input parents should have in process	7	"What input do you think parents should have about whether the district switches to using a predictive model to help the counselor decide who gets mentors?"

Table 3 summarizes the combined sample characteristics for the categorical variables, which will be improved by an national sample. Figure 1 shows the pilot results. The results show that (1) presenting a status quo method alongside an algorithm leads respondents to rate the algorithm as significantly more fair than when the algorithm is presented alone, (2) the algorithm was rated as significantly more fair than each of the other methods, and (3) despite research suggesting that parent requests might be the *least equitable* allocation

method, respondents rated giving mentors based on parent requests as the second-fairest method.

Table 3: Demographic characteristics of pilot study respondents (sample window: U.S. residents aged 18-40)

Parenting status	
No children	234
At least one child	156
Highest education completed	
Some high school or less	5
High school diploma or GED	52
Some college or 2-year college	131
4-year college degree	151
Graduate or professional school	51
Gender	
Male	213
Female	177
Political ideology	
Extremely liberal	48
Liberal	98
Slightly liberal	58
Moderate, Middle of road	80
Slightly conservative	42
Conservative	48
Extremely Conservative	16

Figure 1: **Pilot results: fairness perceptions** The *top left* panel shows that respondents rate algorithms as significantly more fair when they are contrasted with other methods ($p < 0.01$). The *top right* panel, focusing on the version where algorithm and status quo are explicitly contrasted, shows descriptive results from the binary question—which is more fair?—and finds that algorithms are always chosen as more fair but that parent requests are rated as second-fairest. The *bottom left* panel confirms this inferentially, showing that presenting parent requests as the status quo method leads to more negative perceptions of algorithms than other methods ($p < 0.01$). The *bottom right* panel shows the Likert-type ratings, and that lottery is the most polarizing method in terms of similar number of respondents rating the method as extremely fair as extremely unfair.

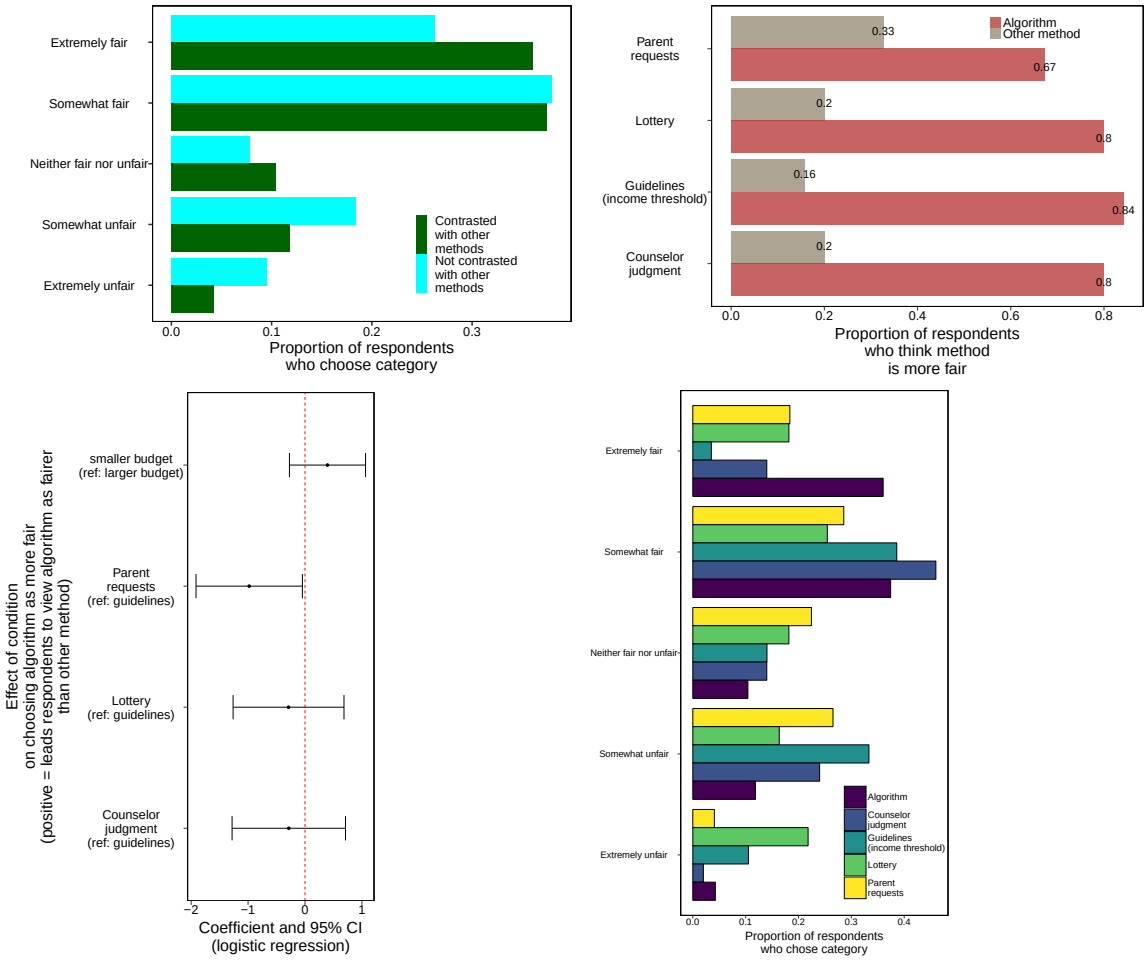

Table 4: **Pilot results on qualitative perceptions of fairness**

Status quo method: parent requests Algorithm is more fair	
Algorithm avoids inequalities in who asks for help	"The predictive model is more fair because the alternative, where the counselor decides based on parents' requests, means that some kids who need help won't get help because their parents may not be active in their lives enough to go out and request help...."; "Parents of student who aren't particularly struggling might request mentors to further improve their children's performance. Other parents of struggling students might be too busy or otherwise unwilling to request a mentor"; "Requesting a mentor via parental involvement is self-selecting for parents that are most involved with their children's education. It is likely that that are students within the school's student body that could benefit even more from mentoring but are not receiving that attention because their parents do not care enough to request a mentor for their child.";
Algorithm avoids emotions and/or favoritism	"Emotion would be taken out of the decisions to pick what students deserve counselors. Parents would not be able to manipulate counselors."
Parent requests are more fair	
Parents know their child's needs better than an algorithm	"The algorithm could be wrong based on certain details while the parents know their children better than an algorithm does"; "Humans are going to be smarter about identifying whether or not a child needs help, moreso when those human are parents."
School should respond to people who ask for help	"The parents take the time to reach out should be given due consideration. It isn't right to disregard the personal opinion of the parent when it comes to their child's education"; "The school should be more responsive to people who actually ask for services."
Status quo method: lottery Algorithm is more fair	
Lottery wastes resources on students who don't need mentors	"I think that drawing a random name is fair but it may not be the name of a student that will actually benefit from having a mentor..."; "Random drawing would result in many kids who neither need nor want a mentor being assigned to one."; "Drawing at random will match a lot of kids up with mentors who might thrive without the additional help. I think it's more fair to help the kids who are less likely to succeed by giving them the extra help."; "Because drawing the students name at random would be unfair to the students who are failing. The mentor programs is for helping them. Selecting students at random would waste the school limited resources."; "Because a student at the bottom of the algorithm list (a student that needs the least help) could get picked over a student at the top of the list (a student that needs the most help) if names were drawn randomly. "
Lottery is more fair	
Importance of giving all students an equal shot	"It's more fair because everyone has the same chance of being drawn. No one has an advantage."; "I think that drawing the names randomly is more fair than using the predictive algorithm because every student will get an equal chance. An algorithm can be wrong and may pass up a student that really needs a mentor. If the drawing is random, then each student will have a fair opportunity."; 'Using a predictive model would be bias against students that have missed school in the past, are low income, etc. Drawing students names means each student has an equal chance of being chosen. "
Algorithm may make computational errors	"I feel like if picked randomly, it would be fair because, well, it would be random...With a predictive algorithm, the code could be wrong, or the computer could mess up"; "I think this is truly the only fair way, there may be some errors in the computer's information."
Status quo method: income cutoffs Algorithm is more fair	
Algorithm captures multiple factors that affect need *in addition to* income	"I've known rich at-risk kids and poor kids who could make it just fine. An income cutoff would eliminate the higher income kids who may need mentoring even more than the poor kids, because everyone assumes the higher income kids have resources and mentors lined up. That's not always the case. A predictive model would do a better job of finding those kids and getting them access to the services they need."; "It allow the counselor to take many different factors into account rather simply just simplifying the situation to just income which is not the sole factor at play here. The more data available to make the decision the better of a prediction that can be made..."; "I believe that there are more indicators to need than income alone. The predictive model would be able to identify students most at risk...There are many at risk students who come from wealthy households who would be under the radar of an income-based model."
Income is the wrong measure of need	"I think its more fair because income doesn't directly determine their commitment to school."; "Just because a student has low income it does not mean they will miss school."
Income cutoff is more fair	
Income is a sufficient measure of need	"Students with more means wouldn't have need of a school mentor program. They or their families should be able to provide that for them if needed. Also, not every student that lives far away would miss school so the data isn't exactly the fairest model."
A hard income cutoff is more difficult to game than an algorithm	"The predictive model can be gamed to favor certain students in a discriminatory way. The income cutoff is a quick pass/fail test that can not be gamed to favor certain student groups"

Status quo method: counselor judgment Algorithm is more fair	
Algorithm removes feelings/emotion that can create general bias or avoids specific biases (e.g., race)	"Data is always better than gut feelings. More information and science involved."; "Statistics and facts are more fair than feelings"; "Emotions do not get in the way and the selection is based off set facts/data points"; 'Because if the counselors use their own judgement they will be biased.Unconscious bias is always present even with the most well intended people, they can't help it."
Algorithm saves counselor time	"I think it would be easier to apply predictive models than learning about each individual student. It would be easier in the sense of using time efficiently so you can create a school program or class that would help more students in a similar situation. It takes too much time to sit down with each student in order to know their individual stories."; "Because there are so many kids.. this way its easier to figure it out."
Basis for algorithm's recommendation is more transparent	"I'm not sure it is. But, having no information on this counselor's methodology for using his judgment, and not knowing his success in previous years, I will reluctantly choose the computer algorithm.
Counselor judgment is more fair	
Algorithm overgeneralizes in a way that counselor won't	"Because a predictive algorithm can only control for the same kinds of data across all students, whereas a person can lead an interview and dig into issues that may not be covered by a simple, generic survey and fewer kids will slip under the cracks that way. "; "I think the councelor [sic] can use their judgement [sic] and decide exactly which students need the extra help. There are more to students than just raw data and numbers. Algorithm does not take into account emotions, personality, relationships "
Students should be able to argue their case for a mentor	"I think it is more fair because students will be able to express their reasoning for needing a mentor face to face, and the counselor has more of a reason to get to know each of them. An algorithm is not able to fully understand human circumstances."