

Personalized Recommendations without Inducing Congestion: Mitigating Disparities in the NYC High School Match

ERICA CHIANG, KENNY PENG, Cornell University, USA

REBECCA LICHTENSTEIN, BRIELLE MCDANIEL, KRISTEN O'NEIL, DEJAUNIQUE THOMAS,

LIANNA WRIGHT, New York City Public Schools, USA

JON KLEINBERG, EVA TARDOS, NIKHIL GARG, Cornell University, USA

CCS Concepts: • **General and reference** → **Experimentation**; • **Information systems** → **Personalization**; **Recommender systems**; • **Applied computing** → **Multi-criterion optimization and decision-making**.

Additional Key Words and Phrases: school choice, matching markets, recommender systems, equilibrium effects, randomized controlled trial

ACM Reference Format:

Erica Chiang, Kenny Peng, Rebecca Lichtenstein, Brielle McDaniel, Kristen O'Neil, Dejaunique Thomas, Lianna Wright, and Jon Kleinberg, Eva Tardos, Nikhil Garg. 2026. Personalized Recommendations without Inducing Congestion: Mitigating Disparities in the NYC High School Match. In *The 27th ACM Conference on Economics and Computation (EC '26)*, July 06–10, 2026, Rome, Italy. ACM, New York, NY, USA, 3 pages. <https://doi.org/10.1145/3821539.3827659>

The New York City high school assignment system is a matching market where students submit ranked lists over programs [Abdulkadiroğlu et al., 2005], and a centralized deferred acceptance mechanism [Gale and Shapley, 1962] determines matches. While the system was designed to expand access and enable truthful rankings, *forming preferences* over all 900 programs is a complex, time-intensive process [Marian, 2023]. Prior work shows that these information frictions can lead to disparities in student behavior [Broyard, 2023, Cohodes et al., 2022, Corcoran et al., 2018, Corradini, 2024, Corradini and Idoux, 2025b]. For example, Peng et al. [2025] find that Black, Hispanic, and low-income students in NYC disproportionately *undermatch*, enrolling in less selective or lower-performing programs than options they could have accessed. Such disparities have motivated informational interventions to provide applicants with *non-personalized* lists of nearby, high-performing programs [Cohodes et al., 2022, Corcoran et al., 2018]. However, when every student at a given middle school receives the same list, an intervention must either focus on less competitive programs or risk steering many students towards programs where they are rejected. The former limits the set of high schools that can be included, since many high-performing programs are competitive and require high grades and favorable lottery numbers.

Recent advances in admissions prediction enable moving beyond non-personalized lists. Since 2024, NYC Public Schools (NYCPS) has provided high school applicants with personalized, program-specific *{High, Medium, Low}* offer likelihood estimates during the application process [Corradini and Idoux, 2025a]. Similar tools have recently been integrated into other school matching platforms [Arteaga et al., 2022, Larroucau et al., 2024]. Notably, to our knowledge, none of these systems use



This work is licensed under a Creative Commons Attribution 4.0 International License.

EC '26, Rome, Italy

© 2026 Copyright held by the owner/author(s).

ACM ISBN 979-8-4007-2813-6/2026/07

<https://doi.org/10.1145/3821539.3827659>

offer likelihood estimates to provide applicants with custom program recommendations; students must still search for and identify options themselves.

Recommendation-induced congestion. The above discussion overlooks an important concern: offer likelihoods are *endogenous* to application behavior, and an intervention’s goal is to change behavior. Thus, even personalized interventions may be self-defeating: if many applicants are steered toward the same program, many of them—even those with *High* estimated offer likelihood—may be rejected due to new competition that was not accounted for in the original likelihood estimation. We refer to this phenomenon as *recommendation-induced congestion*. From a platform design perspective, preserving offer likelihoods is crucial for retaining trust in the offer likelihood tool, future interventions, and the match process broadly.

This work. We formalize the challenge of and propose an approach to allocating recommendations in capacity-constrained markets without inducing congestion. Our contributions are as follows.

Characterization of recommendation-induced congestion. Through empirically-calibrated simulations, we show that naively recommending each program to all eligible students can induce congestion at scale, failing to preserve offer likelihoods. The effects are heterogeneous, most affecting applicants with less *ex ante* access to high-performing programs and thus reinforcing disparities. While our discussion is motivated by school placement, these effects may also arise in other capacity-constrained marketplaces, such as labor and dating platforms.

Method for recommendations in equilibrium. To mitigate such effects, we propose a heuristic bilevel optimization approach for allocating recommendations in capacity-constrained settings. We manage congestion by capping the number of nudges sent to each program; we leverage historical data to determine how high nudge capacities can be while meeting congestion objectives, and we optimize nudge allocations given this constraint. Theoretically, we show that under natural assumptions, our approach approximately optimizes our matching desiderata, while preserving offer likelihoods in equilibrium. Empirically, we show that our method achieves target acceptance rates while achieving desired behavioral shifts as effectively as the naive approach.

Deployment and RCT of personalized recommendations. We deployed our method in an informational intervention for the 2025-26 NYC high school admissions cycle, providing applicants from target middle schools with *personalized* recommendations to nearby, high-performing programs they are likely to be admitted to even if recommendations are adopted at scale. We evaluate our intervention through a pre-registered randomized controlled trial (RCT), finding substantial take-up of our recommendations among treatment applicants: 16.4% of the 444 treatment applicants apply to a program they were nudged to, while 10.3% of the 822 control applicants apply to a program they would have been recommended—a 59% increase ($p=0.011$). We find suggestive evidence of an increase in *matches* to nudged programs: 5.6% of treatment applicants match to a nudged program, as opposed to 3.3% for control students, a 70% relative increase ($p=0.074$). Furthermore, no treatment students were rejected from a program they were nudged to, and only one control student was rejected from a program they *would have* been nudged to.¹

A full version of this paper can be found at <https://erica-chiang.github.io/assets/files/chiang-ec26.pdf>.

¹The dropoff between 16.4% and 5.6% comes from students matching to other programs they ranked higher than the nudged program.

References

- Atila Abdulkadiroğlu, Parag A Pathak, and Alvin E Roth. 2005. The New York City High School Match. *American Economic Review* 95, 2 (April 2005), 364–367. doi:10.1257/000282805774670167
- Felipe Arteaga, Adam J Kapor, Christopher A Neilson, and Seth D Zimmerman. 2022. Smart Matching Platforms and Heterogeneous Beliefs in Centralized School Choice*. *The Quarterly Journal of Economics* 137, 3 (03 2022), 1791–1848. arXiv:<https://academic.oup.com/qje/article-pdf/137/3/1791/44839848/qjac013.pdf> doi:10.1093/qje/qjac013
- Bliss Broyard. 2023. NYC high school admissions rewards parents like me. <https://ny.chalkbeat.org/2023/1/30/23574201/nyc-high-school-admissions-inequity-ethics> Section: Front Page.
- Sarah R Cohodes, Sean P Corcoran, Jennifer L Jennings, and Carolyn Sattin-Bajaj. 2022. When Do Informational Interventions Work? Experimental Evidence from New York City High School Choice. *Educational Evaluation and Policy Analysis* (2022), 01623737231203293.
- Sean P Corcoran, Jennifer L Jennings, Sarah R Cohodes, and Carolyn Sattin-Bajaj. 2018. *Leveling the Playing Field for High School Choice: Results from a Field Experiment of Informational Interventions*. Working Paper 24471. National Bureau of Economic Research. doi:10.3386/w24471
- Viola Corradini. 2024. Information and Access in School Choice Systems: Evidence from New York City. (2024). https://opportunityinsights.org/wp-content/uploads/2024/11/JMP_Corradini.pdf
- V. Corradini and C. Idoux. 2025a. School choice under uncertainty: search cost and disappointment aversion. (2025). Working paper.
- Viola Corradini and Clemence M Idoux. 2025b. *Overcoming Racial Gaps in School Preferences: The Effect of Peer Diversity on School Choice*. Technical Report.
- David Gale and Lloyd S Shapley. 1962. College admissions and the stability of marriage. *The American Mathematical Monthly* 69, 1 (1962), 9–15.
- Tomás Larroucau, Ignacio Rios, Anaïs Fabre, and Christopher Neilson. 2024. College application mistakes and the design of information policies at scale. *Unpublished paper, Arizona State University, Tempe* (2024).
- Amelie Marian. 2023. Algorithmic Transparency and Accountability through Crowdsourcing: A Study of the NYC School Admission Lottery. In *Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency*. 434–443.
- Kenny Peng, Emily Ryu, Jon Kleinberg, Eva Tardos, and Nikhil Garg. 2025. Connecting Application Behavior to Under-matching in New York City School Choice. (2025).