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Minimizing Entry Into Homelessness Following Eviction Through Predictive Modeling

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Extended Abstract

Each year, 3.6 million eviction cases are filed by landlords across the United States [5]. Often, those who are evicted lack the resources to secure alternative housing, which forces them and their families into homelessness. Eviction is a known pathway into homelessness [1, 3]. Today, in the United States, the majority of poor renting families spend over half of their income on housing, with one in four spending as much as 70% of their joint income on accommodation alone [4]. In precarious situations like these, even small shocks, such as temporary unemployment or sickness, can cause families to fall into homelessness.

In an effort to minimize entry into homelessness following eviction, many local governments have implemented rental assistance programs that provide temporary financial support to individuals that are struggling to pay their rent [2]. While the goal of such programs is to minimize this pathway into homelessness by providing tenants with short-term rental assistance to keep them stably housed, most such systems are not designed to achieve that task. Instead, they allocate resources to people facing evictions using simple heuristic approaches (such as first-come first-serve) or subjective decisions not explicitly aimed at prioritizing individuals who will most likely end up homeless.

In this paper, we describe our collaboration with Allegheny County Department of Human Services (ACDHS) to better allocate rental assistance to the most in-need individuals in order to keep them from falling into homelessness. Because of resource constraints, ACDHS can only provide rental assistance to about 100 individuals every month. Ideally, ACDHS wants the allocation of their limited funds to be *efficient*, prioritizing those at highest risk, *effective*, preventing them from entering into the homeless system, and doing so in a manner that is *equitable* across different demographic groups. Their current process of allocating rental assistance is reactive, however, requiring individuals who are facing an eviction to call the Allegheny Link[1] and, if they meet the eligibility requirements, apply for rental assistance in order to be placed on a waitlist. From there, each individual is considered on a first-come-first-served basis. This system not only requires additional effort and knowledge on the part of the individual facing eviction, but also misses out on those who need help urgently or do not reach out. It is also unclear how effective this current selection process is at achieving the goal of identifying (and allocating resources to) those individuals most at risk of falling into homelessness in the near future.

In this project, we use machine learning (ML) to *assist* social workers in allocating rental assistance to high-risk individuals. More specifically, our project consists of three interconnected goals: (1) to more *efficiently* allocate rental assistance by prioritizing those at highest risk of entering into homelessness, (2) to more *effectively* reach those people with the available resources, and (3) to do so *equitably*. To achieve these goals, we use ACDHS' data warehouse, which includes information on individuals who have previously interacted with ACDHS programs such as previous evictions, homeless spells, interactions with mental, behavioral, and

[1] `https://www.alleghenycounty.us/Human-Services/About/Contact/Link/Contact.aspx`

physical health institutions, address changes, demographic information, as well as enrollment in a variety of other ACDHS and state programs. We use historical data dating back to 2011 to train and select ML models that predict an individual's risk of entering homelessness in the next 12 months among all those with a recent eviction filing.

Our paper makes the following contributions:

1. **Improving the status quo:** We find that our ML-based approach achieves a 10-fold improvement in terms of efficiency compared to the current process. Furthermore, we show that the current process can be improved 7-fold using a simple data-driven heuristic.
2. **Equitable:** We ensure our model is equitable across race and gender, as well as evaluate how well our models perform w.r.t. individuals who have not been previously homeless, since first-time homelessness is more difficult to predict (see Figure 1).
3. **Real-world impact:** We validate our solution on recent, previously unseen data. Next, ACDHS will be starting a field trial and plans to deploy our model after validation is complete. Our solution aims to move ACDHS from a reactive rental assistance process towards more proactive outreach.

Beyond these contributions, we also believe that our work is a case study for fellow researchers and practitioners that outlines a systematic approach to using ML in supporting high-stakes decisions. Our approach, from project scoping to problem formulation, data analysis, model selection, evaluation, and bias audit, provides an example of an end-to-end pipeline for the application of predictive modeling to urgent social problems, bridging the gap between researchers, practitioners, and end users.

Reproducibility. Our code is open-sourced at `https://anonymous.4open.science/r/acdhs_housing_IJCAI`.

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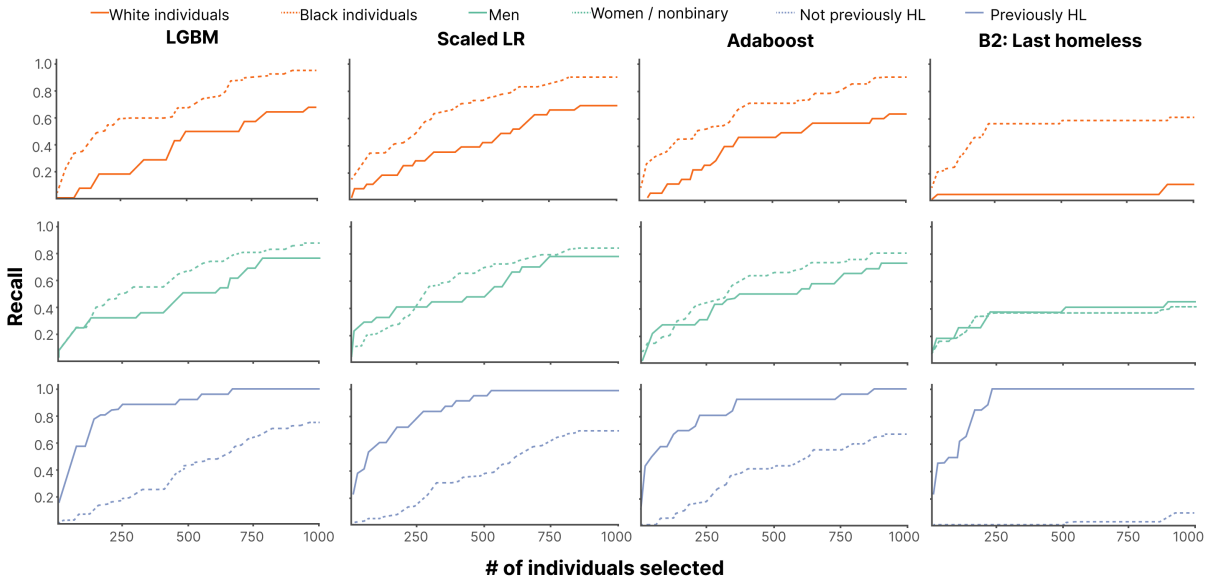

Figure 1: Recall across different demographic groups (race, gender, existence of previous homelessness spell) for the three best-performing models (LGBM, Scaled LR, Adaboost) and the best baseline (B2: Last homeless). Dashed lines represent populations of interest, i.e., black individuals, women, and those who have not been homeless before.