Modeling Trends in

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transition matrices to better represent the specific demographics of our unique city.

Specifically, these explorations worked to model the changes in marginal distributions when separations were made in the

population to uniquely consider those using drugs and aqܙ異퀅ၯစ唀

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one's future state while incorporating mathematical ideas of “forgetfulness” as it only consider

i mmediate past state. Using a variety of past l iterature involving classificat ions and degre es of homelessness, for this spe cific model and its application into Portland, ME’s crisis, we depict individuals in one of four states of housing as seen i n t he image below. The first state, stable housing, was determined by analyzing gamma di stributions of inc ome and m onthly rent. Precarious

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consists of individuals in a variety of different situations: renters paying a concerni ngly hi gh percentage of their income for t heir housing, i ndividuals recei ving either state or private a ssistance to facili tate their housing, those rel iant on family members or friends to he lp house them, and others experiencing an insecure housing experience. From here, individuals c an e ither move into one of two different levels of even m ore insecure housing – she lter or encampment, stay in their precarious housing position, or move back into stable housing. The rate parameters of t he Markov Chains that eventually grew into our transition matrix were calculated using past literature and statistics presented by a variet y of Portland’s public and private housing expe rts. Aft er building this simple model, we redeveloped it to consider binary inputs that can begin to sort individuals i nto sma ller demographi c categories. Oftentimes, these smaller demographic groups provided opportunities to specify di ffe rences in rate param eters. Through t hese intri cate changes, we’ve begun to find interesting patterns in how rate parameters can influence marginal distributions of our housing populations over time. Specifica lly, by manipulating our m odel to consider the rates at whi ch individuals may be susceptible to starting drug use given their housing state and to cha nges in rehousing rates dependent on an individual’s drug usage, we can suggest changes to the social supports that are active in these rehousing proc esses. Another intricacy of the model that we’ve explored has been the impact of rehousing rates of asylum seekers. The trajectory of thi s populat ion in our model is vast ly different from the rest of the popula tion as t hey must wait a t least six months to begin worki ng in the Uni ted States. Through manipulations of different rate parameters modeling move ment out of shelters after this six month period, we bett er understand the capacitie s ne eded to ade quately support this population. Looking forwa