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Modeling diversity in drug-resistant populations using multitype branching processes

I will discuss a continuous-time birth-death process model of tumorigenesis where resistance mutations confer random additive fitness (birth rate) changes sampled from a mutational fitness distribution. We investigate the overall growth rate and diversity of the resistant population in the asymptotic limit, and the dependence of these features on parameters of the fitness landscape. We study the generation of resistance from both exponentially increasing sensitive cell populations (pre-treatment) and exponentially declining populations (during treatment). Using experimental data, we apply this model to study characteristics of a drug-resistant subpopulation at the time of diagnosis of chronic myeloid leukemia, and discuss implications for treatment strategies. (Joint work w/R. Durrett, K. Leder, J. Mayberry. F. Michor)