Figure 4. Analysis of Chemical Treatment Sensitivities by Monte Carlo Simulation with the Stochastic Cell-State Transition Model

(A) Cell-state proportions after a 6 day treatment with either paclitaxel or 5-FU are shown for SUM159 and SUM149 populations.

(B) A schematic showing how differential chemical treatment sensitivities can be incorporated into the Markov stochastic model. The matrix of transition probabilities is premultiplied by a differential viability matrix. The diagonal entries of this matrix, (v_B, v_S, and v_L), encode the survival probabilities of basal, stem-like and luminal cells in the presence of chemical treatment. These entries are normalized to sum to 1. Monte Carlo simulation is performed by random sampling of differential viability vectors.

(C) The results of Monte Carlo simulation, shown as ternary density contour plots in which coloration represents the normalized difference (see the Experimental Procedures for the metric used) between experimentally observed and predicted cell-state proportions following chemical treatment. Ten thousand random points within the triangle simplex were sampled, each representing a distinct choice of differential viability vector, (v_B, v_S, v_L), with entries ranging from zero (sensitive) to one (resistant).