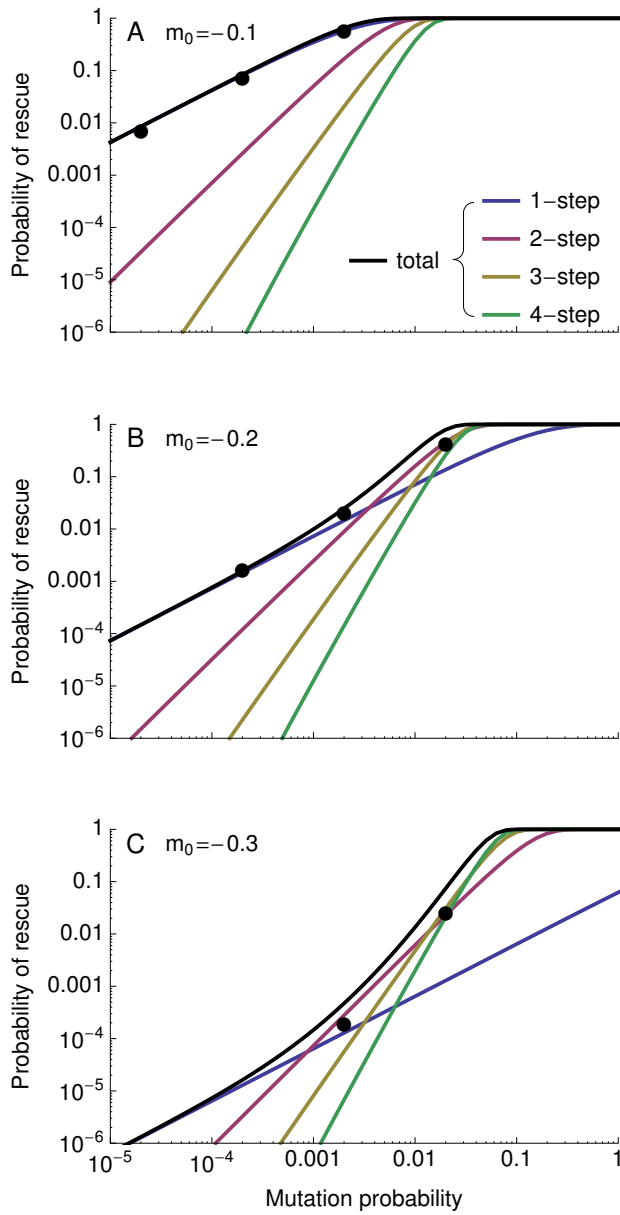
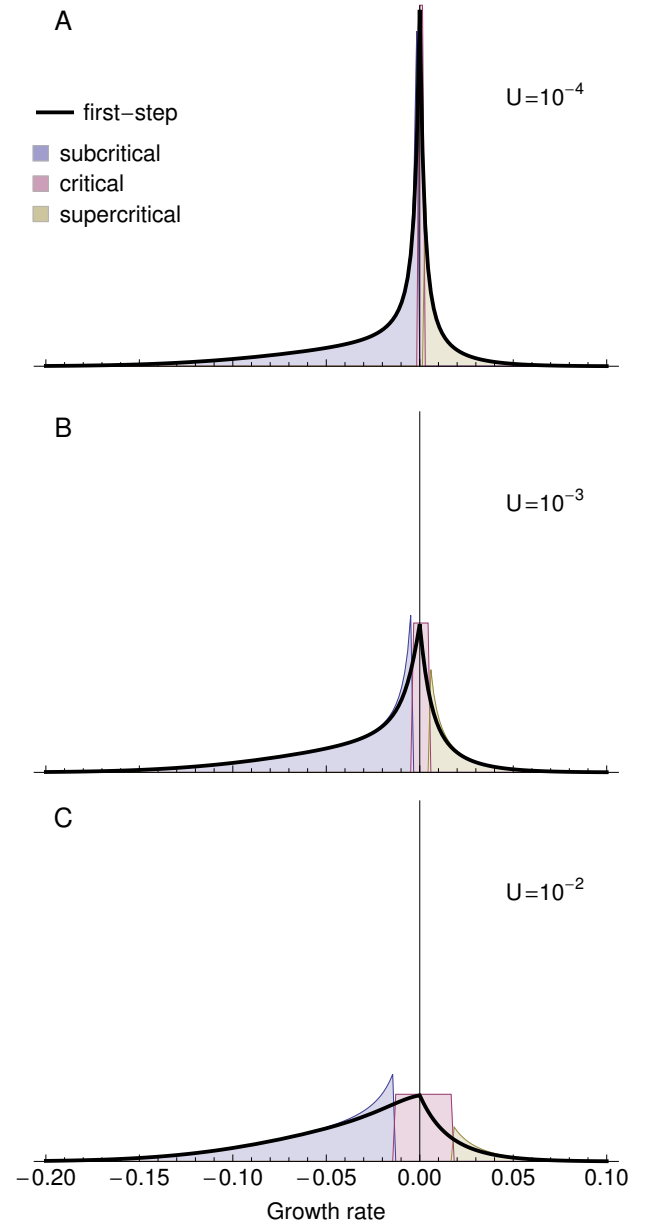


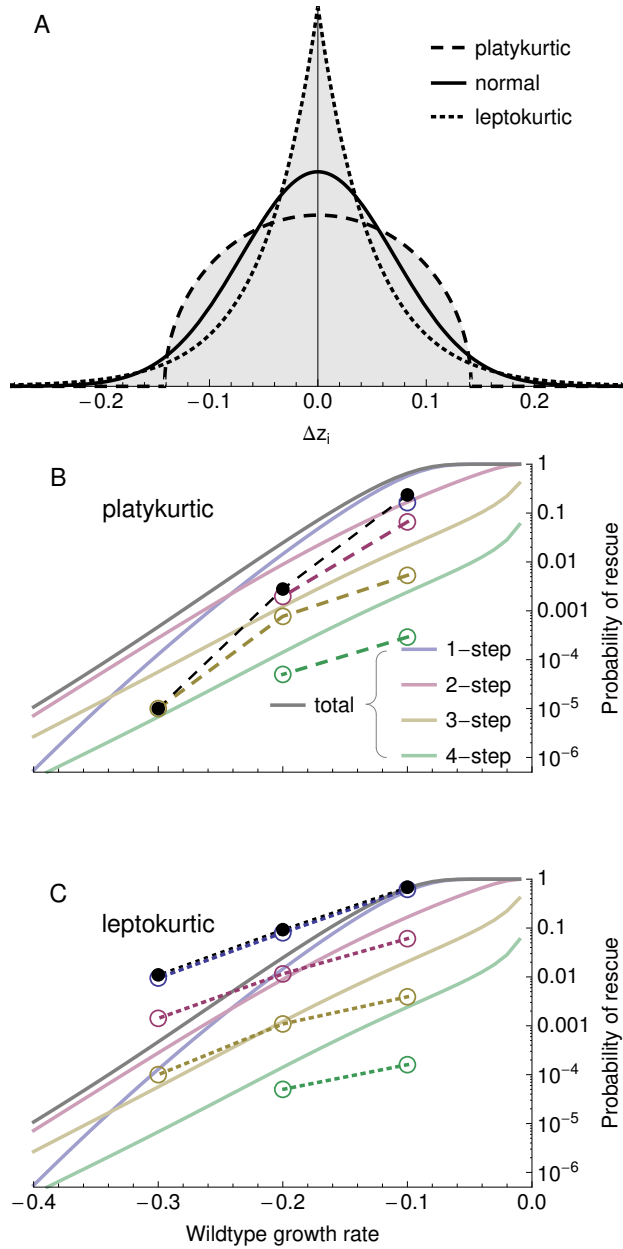
## Supplementary figures



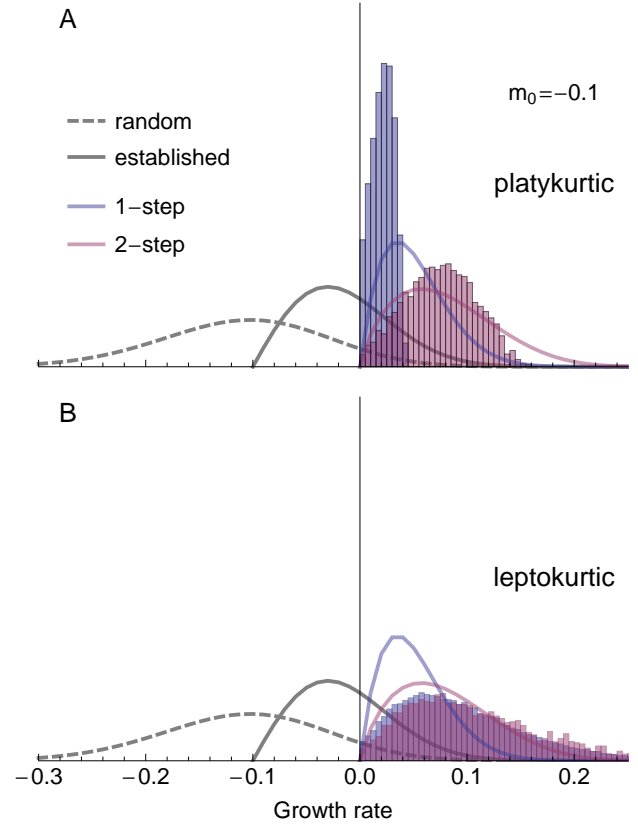
**Figure S1** The probability of rescue as a function of mutation rate for three different levels of initial maladaptation. See Figure 3 for details. Other parameters:  $n = 4$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ ,  $N_0 = 10^4$ .



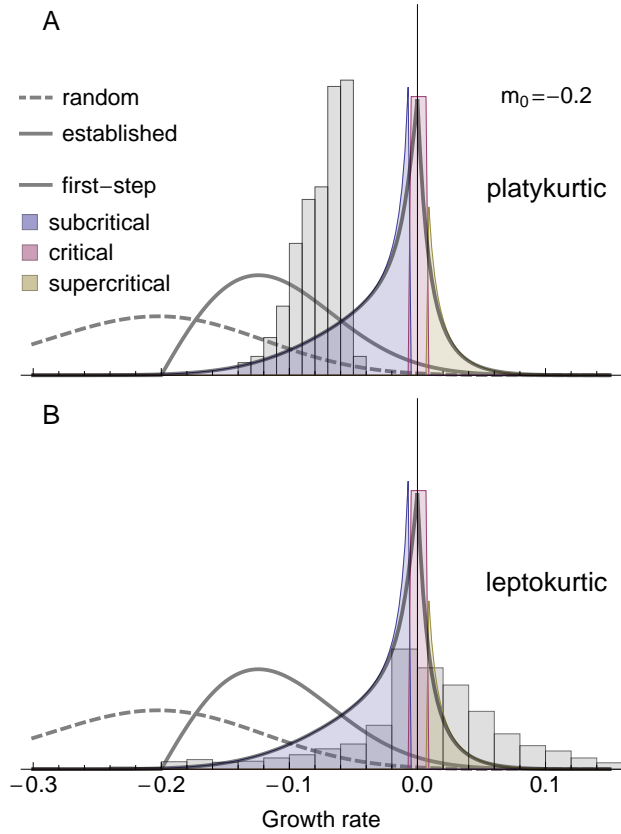
**Figure S2** The distribution of first-step mutant growth rates given 2-step rescue under three mutation rates. See Figure 7 for details. Parameters:  $n = 4$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ ,  $m_0 = -0.2$ .



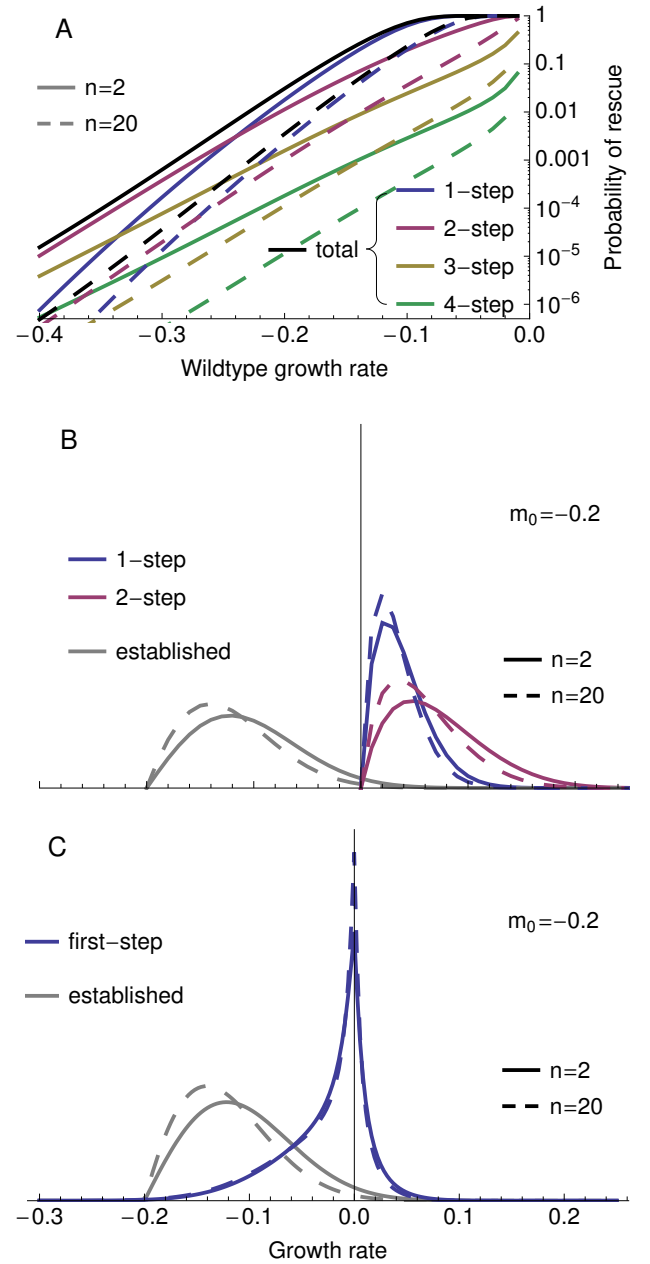
**Figure S3** (A) One-dimensional slices of multidimensional platykurtic (dashed; semicircle), normal (solid; as used in main text), and leptokurtic (dotted; Laplace) mutational distributions with the same (co)variance but varying kurtosis. (B,C) The probability of 1-, 2-, 3-, or 4-step rescue with platykurtic and leptokurtic mutational distributions, respectively. The dots and broken lines represent simulation results ( $10^5$  replicates for each wildtype growth rate). The solid lines are the numerical results for the normal mutational distribution (as in Figure 3). Parameters:  $N_0 = 10^4$ ,  $U = 2 \times 10^{-3}$ ,  $n = 4$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ .



**Figure S4** The distribution of growth rates among rescue genotypes under 1-step (blue) and 2-step (red) rescue with (A) platykurtic and (B) leptokurtic mutational distributions (see Figure S3A). The solid lines are predictions for a normal mutational distribution (as in Figure 6). The histograms show the distribution of growth rates among rescue genotypes observed across  $10^5$  replicate simulations. Parameters:  $N_0 = 10^4$ ,  $U = 2 \times 10^{-3}$ ,  $n = 4$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ ,  $m_0 = -0.1$ .



**Figure S5** The distribution of growth rates among first-step mutations that lead to 2-step rescue with (A) platykurtic and (B) leptokurtic mutational distributions (see Figure S3A). The curves and shadings are predictions for a normal mutational distribution (as in Figure 7). The histograms show the distribution of growth rates observed across  $10^5$  replicate simulations. Parameters:  $N_0 = 10^4$ ,  $U = 2 \times 10^{-3}$ ,  $n = 4$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ ,  $m_0 = -0.2$ .



**Figure S6** The effect of the number of phenotypic dimensions,  $n$ , on (A) the probability of  $k$ -step rescue, (B) the distribution of growth rates among rescue genotypes, and (C) the distribution of growth rates among first-step mutants that lead to 2-step rescue. Curves are numerical results, as in Figures 3, 6, and 7. Parameters:  $N_0 = 10^4$ ,  $U = 2 \times 10^{-3}$ ,  $\lambda = 0.005$ ,  $m_{max} = 0.5$ .