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Probing the network structure of health deficits in human aging (I)

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Human aging leads to the stochastic accumulation of damage. We model an aging population using a stochastic network model. Individuals are modeled as a network of interacting nodes, representing health attributes. Nodes in the network stochastically damage and repair, with rates dependent on the state of their neighbors. Damaged nodes represent health deficits. Overall damage in the network is measured with the Frailty Index (FI), a quantitative measure of deficit accumulation used in observational studies of aging to assess health and predict mortality. We use our understanding of the mechanisms of aging in our model to understand observational health data where the mechanisms are unknown. With stochastic simulations and mean-field theory we show how the underlying network structure controls the behaviour of the FI and how damage propagates within the network, leading to individual mortality.

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