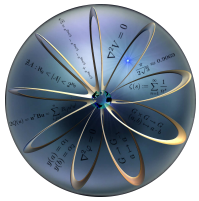

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example of fundamental theorem of demography

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Assume a population with a (age, sex, etc.) that is described by a vector $x(t)$, where $x_1(t), \ldots, x_n(t)$ represents the number of individuals in the population who possess the characteristic at a level $1, \ldots, n$, at time t.

For example, consider age-groups, and assume $x_0(t)$ is the number of individuals in the population that are aged 0 to 1 year, $x_1(t)$ is the number of individuals aged 1 to 2 years, etc.

Suppose that the transition from one class to another is described by a matrix $A(t)$. In the case of age-groups, this matrix will for example describe mortality in a given age-group. This matrix, in the case of non deterministic modelling, will define a Markov chain.

The fundamental theorem of demography then states that if the matrix $A(t)$ satisfies the required properties, then the distribution vector $x(t)$ converges to the eigenvector associated to the dominant eigenvalue, *regardless* of the behavior of the total population $\|x(t)\|$.

Hence, in the case of age-groups, the *proportion* of individuals aged, say, 1 to 2 years, tends to a fixed value, even if the total population increases.