

## Rank-size distribution of person names and place names

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Family names are handed down from ancestors to their descendants in many cultures. Therefore, they can be regarded as a kind of biological heredity. There are many studies on this subject, such as their origin, family histories and extinction phenomena. Among them, Miyazima et al. focused on the statistical distribution of Japanese family names and found several power law behaviors in the rank-size distribution and the relationship between the population and the number of distinct names. The former corresponds to Zipf's law and the latter is Heaps' law. Several works followed with mathematical models, with better fitting or using data of other countries with various exponent values.

Compared with those of family names, systematic studies of the statistical distribution of given names are fewer. We can, however, set the same problems as those for family names, e.g., the rank-size distribution and the relation between the population and the number of distinct names.

In this study, we exemplify a statistical analysis of family names and given names in several countries by using a telephone directory and lists of scientist. A power law behaviour is observed in the rank-size distribution of given names as in the case of family names. It is interesting that their statistical property resembles each other though the elemental processes of naming are different. We introduce a Galton-Watson type model with a generalized Yule-Simon process combined with an Exclusion Principle in Family for the given name distribution. We also discuss about the locality of the name distributions. The size frequency distribution of Japanese place name is also analyzed. The list of municipalities and town-area names are extracted from the zip code table and their rank size distributions are measured. The distribution of town-area names obeys a power law behavior while the distribution of municipality names is well fitted by a log normal distribution. A similar mathematical model of the municipality and town-area evolution and their naming process is suggested.

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