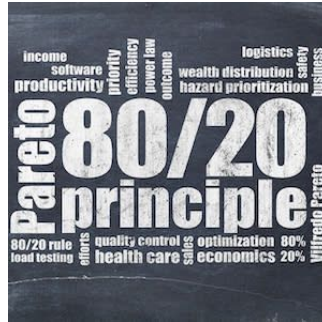


## The Staying Power of the Pareto Principle



Researchers at the University of São Paulo's Institute of Mathematical and Computer Sciences in São Carlos investigated the mathematical patterns associated with the reigns of the Roman emperors, showing that they followed the Pareto Principle or the 80/20 rule. The study is published in Royal Society Open Science.

The Pareto Principle was first observed by Italian economist Vilfredo Pareto (1848-1923) while studying wealth distribution in Europe. He found that 80% of Italy's property belonged to 20% of its population. 80% had few resources, while 20% owned most of the wealth.

The Roman Empire was ruled by 175 men, from Augustus (63 BCE-19 CE) to Constantine XI (1405-53), including the Eastern or Byzantine Empire after the split in 395 CE, but excluding those who did not rule in their own right because they were minors during regencies or co-emperors.

Only 24.8% of the 69 rulers of the Western Empire died of natural causes. All others either died a violent death on the battlefield or in palace plots. Out of the 175 rulers, 30% were murdered, committed suicide or died in battle.

The researchers believe the patterns fall in line with the Pareto Principle. They also assert that power-law distributions of probabilities are found in other phenomena as well, such as lunar crater sizes, earthquake magnitudes, word frequencies in texts, the market value of companies, and the number of followers on social media.

All the phenomena display a pattern that falls in line with the Pareto principle. This means that in all these cases, the probability of a common occurrence is about 80%, and that of a rare event is about 20%. For example, 80% of lunar craters are relatively small, while 20% are really large. In social media, 80% of users have a few dozen followers, while 20% have thousands or even millions. In the case of Roman emperors, 80% died violent deaths while 20% did not.

Another pattern observed by the researchers in the case of the Roman emperors was related to the time to death of each emperor. The risk of dying was high when the emperor took the throne and declined systematically until the emperor reigned for 13 years. At this point, the risk increased again. This sharp downturn at around year 13 is an interesting finding. It may suggest that after a 13-year cycle, the emperor's rivals realised that they could not ascend the throne by natural means. It may be that old enemies regrouped or new rivals came up.

Why the risk changed at 13 years remains a mystery, but researchers show in this paper that statistical analysis can be an important resource when studying historical phenomena. They conclude that unpredictable actions can often produce predictable patterns of collective behaviour that can be further investigated to draw important conclusions.

Source: FUNDAÇÃO DE AMPARO À PESQUISA DO ESTADO DE SÃO PAULO

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