Historical insights into statistical inference for   
K–12 education

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This presentation outlines a study exploring the role of historical statistics in teaching practices to enhance students’ understanding of statistical inference. Since the early 2000s, efforts have been made to integrate statistical inference into school curricula for a solid foundation in the subject. Using an educational design research approach at primary and secondary school levels, the study aims to develop didactical tools for teaching statistical inference. Preliminary findings from the initial phase suggests that historical perspectives offer didactic potential while highlighting substantial differences from current teaching practices.

## Background and focus of the study

While striving to transform statistical inference (SI) into a teachable topic throughout school before higher education, researchers have explored its application in diverse contexts. For example, everyday language, computer tools, workplace applications, statisticians’ perspectives, and philosophical viewpoints have been researched (Makar & Rubin, 2018). SI’s historical origin and development are closely related to the philosophical roots of inference. By turning to the history of mathematics (HM) (Thomaidis & Tzanakis, 2022), I add a so far unexplored perspective for further ideas on developing inferential statistics education.

Embracing HM in mathematics education serves two primary purposes: firstly, it highlights that mathematics evolves over time and space, and secondly, it can act as a motivational and cognitive support tool for students. In addition to designing and creating historical material and didactic tools for educational purposes, HM is used in mathematics education research to investigate teaching and learning problems (Thomaidis & Tzanakis, 2022).

This study is guided by the research question: How can historical statistical research inspire and support the learning and teaching of statistical inference? To address this question, I employ a small-scale educational design research approach (McKenney & Reeves, 2018). The first ongoing step is to explore and analyse early HM examples from a teaching and learning perspective regarding SI. The second step will be transforming these examples into tentative didactical tools with possible educational interest. The third step will be to carry out intervention studies in the context of teaching.

## Initial findings of exploring historical statistical reasoning

In exploring HM, the first example comes from John Graunt, the British statistician and founder of demography, who pioneered statistical analysis in 1662. He created the first life table, predicting survival rates by age. With limited data, he estimated survival to be 64% at age six and 1% at age 76. Based on these two endpoints, Graunt sought a statistical model as a change factor that could predict the percentage of survivors in each decade. He concluded that the deaths in each decade were about 3/8 of the survivors at the start of each decade (Glass, 1964).

The second example comes from the Swedish astronomer and statistician Pehr Wargentin and his essays on demography. In his paper from 1767, he analysed how the monthly birth data correlates with factors like ‘leisure and cheerful minds’ and ‘intemperance in food and drink’. Based on the seasonal variations in the number of births in 1749–1757, Wargentin concluded that the former factor was more important than the latter for an increased population (Wargentin & Hofsten, 1983).

The above HM examples offer promising opportunities to function as didactic tools for teaching SI. In contrast to early school statistics at present, the first historical period of inferential reasoning was limited to arithmetic without graphical representations, theories of sampling, and probability models such as the normal distribution. Thus, there is potential in designing historical didactic tools, such as tasks where students are offered to grapple with these HM problems by using statistical concepts and methods taught according to current statistics content. Furthermore, the next phase also applies to HM’s role in investigating teaching and learning issues related to SI.

## References

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