Bernoullis Tafelrunde

Math Student and PhD Seminar

Tuesday, 5 November 2024, 12:15-13:00
Seminar Room 00.003, Spiegelgasse 1

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Bernoulli meets Mosquito Control Trials

Abstract

About 17% of all infectious diseases are transmitted by mosquitoes, accounting for more than 700 000 deaths annually. This makes it necessary to continuously discover and test new vector control interventions that interfere with the mosquito life-cycle. However, the design of randomised control trials is complicated by mosquito movement that results in spillover/contamination. The precautionary principles generally used are very large geographical clusters with extensive buffer zones between the different trial arms.

In a new approach presented here, the spillover effect caused by mosquito movement is modelled by approximating mosquito dispersion with the diffusion equation. The mathematical solution is then incorporated into power calculations for cluster randomised trials, which gives expressions for the adjusted power as well as the bias in efficacy estimates, and how they are affected by the sample size of the clusters. Our results suggest that the key to obtaining powerful mosquito control trials is the inclusion of many small clusters rather than designing large clusters with buffer zones. The analytical approach is demonstrated with baseline data from an intervention trial against *Aedes aegypti* mosquitoes in Côte d'Ivoire.