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Recovering an initial distribution of telomere lengths from measurements of senescence times

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Telomeres are repetitive sequences situated at both ends of the chromosomes of eukaryotic cells. At each cell division, they are eroded until they reach a critical length that triggers a state in which the cell stops to divide: the senescent state. In this work, we are interested in the link between the initial distribution of telomere lengths and the distribution of senescence times. We propose a method to retrieve the initial distribution of telomere lengths, using only measurements of senescence times. Our approach relies on approximating our models with transport equations, which provide natural estimators for the initial telomere lengths distribution. We investigate this method from a theoretical point of view by providing bounds on the errors of our estimators, pointwise and in all Lebesgue spaces. We also
illustrate it with estimations on simulations, and discuss its limitations related to the curse of dimensionality.

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