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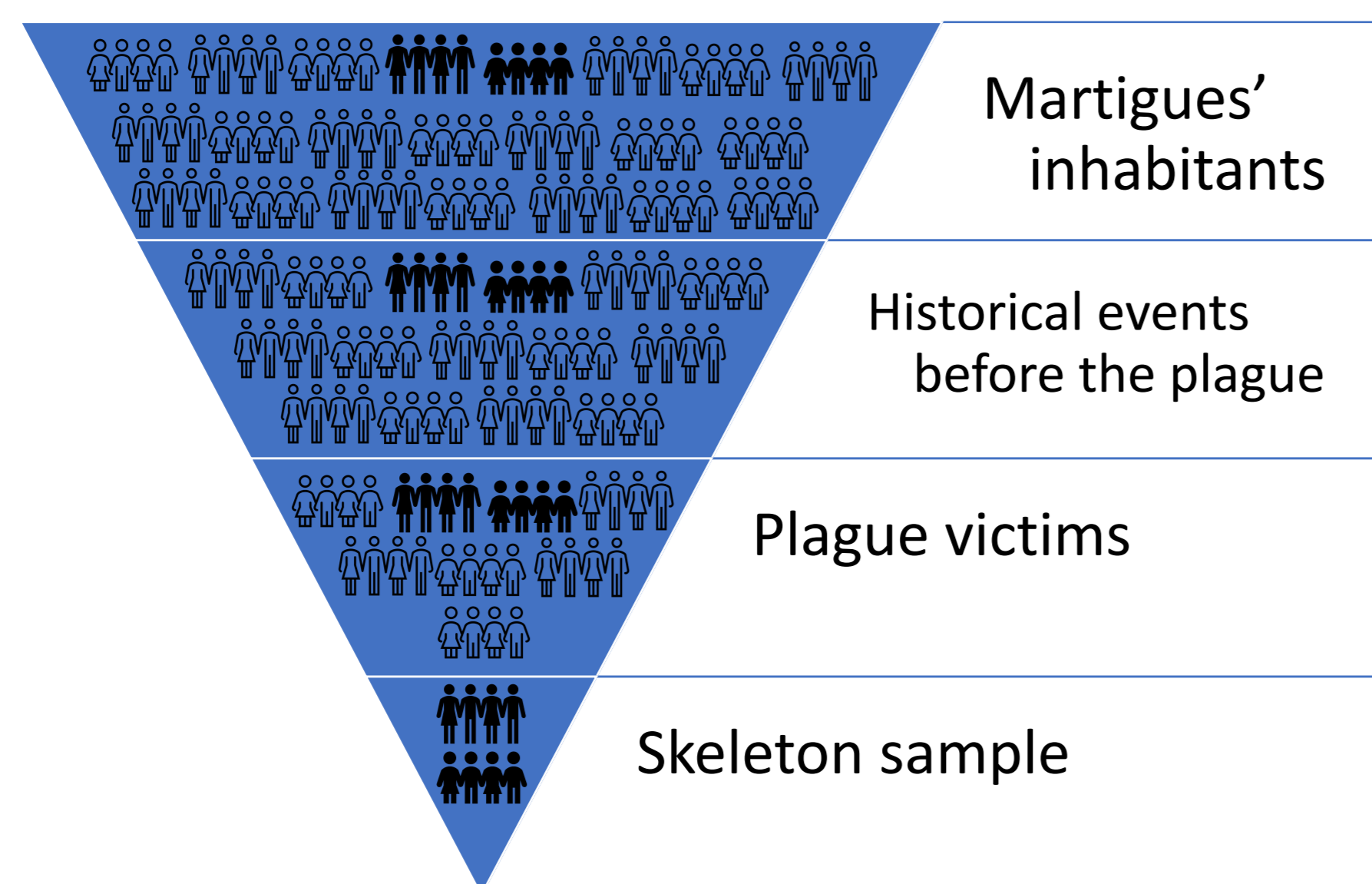
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# A Bayesian method to estimate the representativity of inhumated plague victims: the case of Martigues (south of France, 1720-1721)

Luana Batista-Goulart<sup>1</sup>, Isabelle Séguy<sup>2</sup> and Henri Caussinus<sup>3</sup>

## 1. Introduction



**Problematic:** the studied population representativity is essential to assess the relevance of obtained results.

**Objective:** to propose a method to assess the representativity of a group of skeletons belonging to plague victims.

**Method:** to compare the distribution in age groups obtained by the historical records with the proportion of skeletons belonging to each age group.

## 2. Studied sample

### Collection *Capucins de Ferrières*

- Martigues (Provence, 1720-1721)
- Victims of the Great Plague of Marseilles (1720-1722)
- 38 women, 28 men (observable according to our methodology)

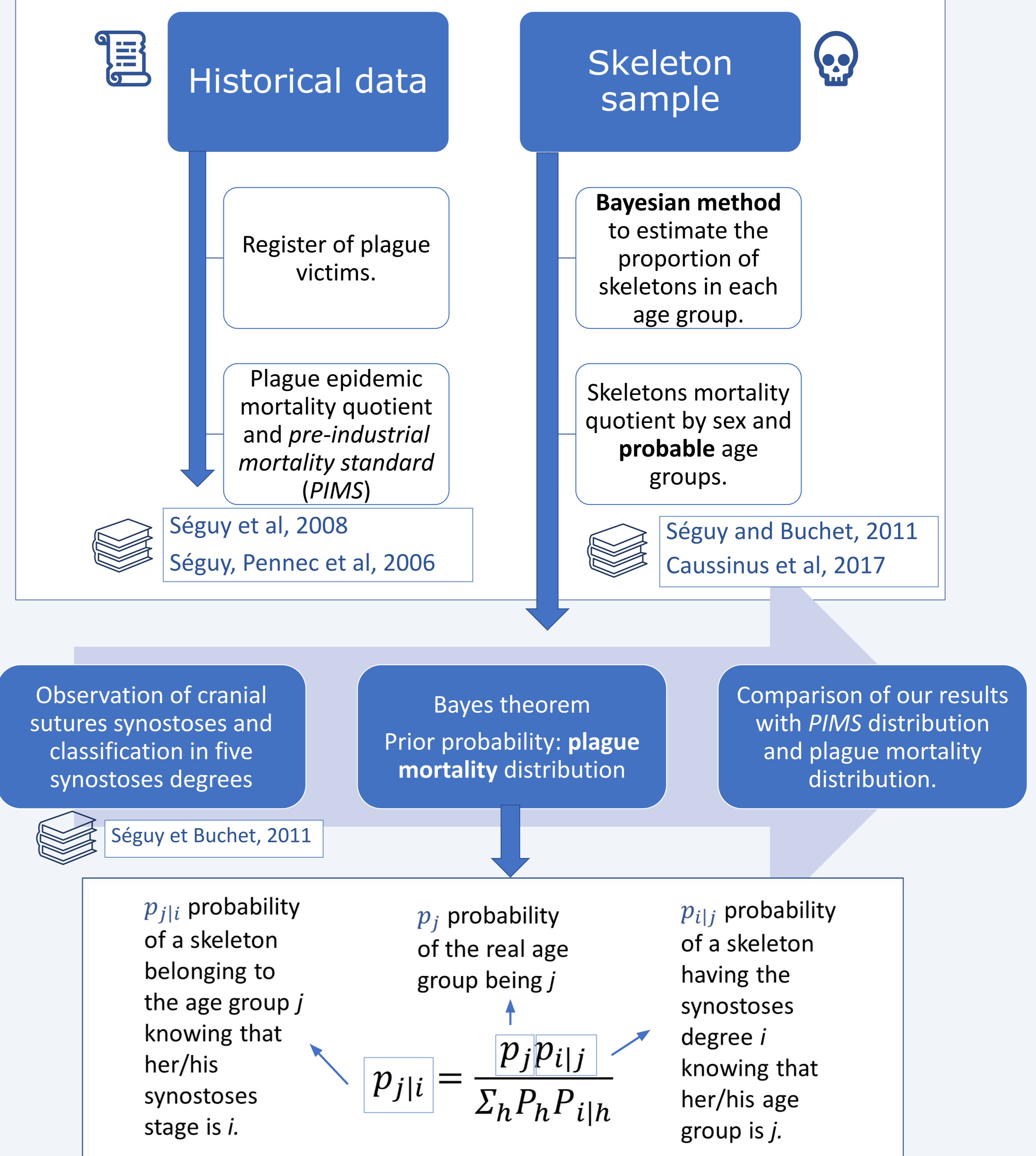


Tzortzis and Signoli, 2009

Figure 1: Location of Martigues and Marseilles.  
Source: package R *ggmaps*



## 3. Methodology



## 4. Results

The skeletons distribution by age group is very similar to the plague mortality distribution.

### Probable age at death distribution:

**PIMS-dist** – PIMS distribution

**Plague-dist** – Martigues plague mortality distribution

**Results:**

**Plague-res** – result of the estimation considering Martigues plague mortality distribution as prior probability.

**PIMS-res** – result of the estimation considering PIMS distribution as prior probability.

### Probable distribution in age groups

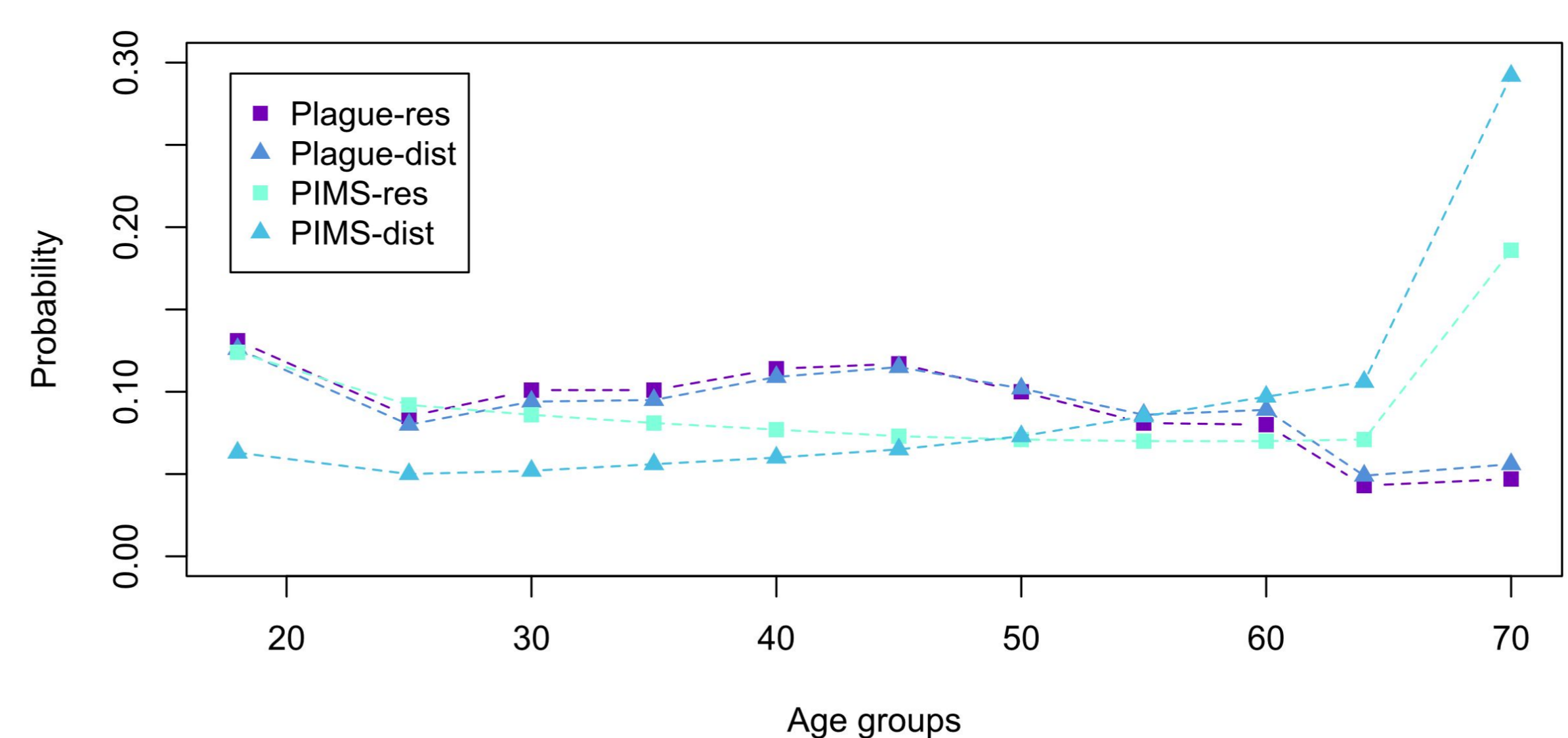


Figure 2: comparison between mortality distributions.

## 5. Discussion and conclusion

First adaptation of the Bayesian inference method to a well-documented plague context (Caussinus and Courgeau, 2010 Séguy and Buchet, 2013 Caussinus et al, 2017).

The Bayesian inference method can be applied to other plague sites, using their specific plague mortality functions calculated from their historical data, Séguy et al, 2013 did for other contexts.

If it is not possible to work out the local plague mortality distribution, it is preferable to use the Martigues plague mortality distribution rather than the PIMS one.

Our skeleton sample is statistically representative of Martigues' plague victims (age, sex and social class), itself statistically representative of Martigues living population (Batista-Goulart, 2021).

That means that conclusions from osteological analyzes could be extrapolated to:

- Adult plague victims (under hypothesis).
- Adult living population (under binding assumptions).

## 6. Bibliographical references

- Batista-Goulart L. 2021. *L'impact biologique et social des catastrophes : bioarchéologie des victimes de peste à Martigues (XVIIIe siècle, Bouches-du-Rhône)*. PhD thesis, Université Côte D'Azur.
- Caussinus, H., Buchet, L., Courgeau, D., & Séguy, I. (2017). Un problème clé de la paléodémographie: comment estimer l'âge au décès?. *Journal de la Société Française de Statistique* 158(2), 43-71.
- Caussinus H, Courgeau D. 2010. Estimer l'âge sans le mesurer en paléodémographie. *Population* 65:117.
- Séguy I, Buchet L, Bringé A. 2008. Model life tables for pre-industrial populations: first applications in paleodemography. In: Bocquet-Appel J-P, editor. *Recent advances in paleodemography. Data, techniques, patterns*. Dordrecht: Springer-Verlag. p 109-141.
- Séguy I, Buchet L. 2013. *Handbook of Palaeodemography*, Springer.
- Séguy I, Caussinus H, Courgeau D, Buchet L. 2013. Estimating the age structure of a buried adult population: a new statistical approach applied to archaeological digs in France. *American journal of physical anthropology* 150:170-82.
- Séguy I, Pennec S, Tzortzis S, Signoli M. 2006. Modélisation de l'impact démographique de la peste à travers l'exemple de Martigues (Bouches-du-Rhône). In: Buchet L, Dauphin C, Séguy I, editors. *La paléodémographie, mémoire d'os, mémoire d'hommes*. Antibes: Editions APDCA. p 323-330.
- Tzortzis S, Signoli M. 2009. Les tranchées des Capucins de Ferrières (Martigues, Bouches-du-Rhône, France). Un charnier de l'épidémie de peste de 1720 à 1722 en Provence. *Comptes Rendus - Palevol* 8:749-760.

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