Secular trends in the relationship between surnames in a population: Study of a border town

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ABSTRACT

The study of surnames in a territory over time is an opportunity to obtain knowledge of the evolution of allelic frequencies. Geographic and cultural factors influence the renovation of surnames and reflect accelerations or delays in the gene flow. Political borders may also condition the genetic structure of a population. Using isonymy, this paper studies the evolution (from 1750 to 2006) of the frequencies of surnames and the components of inbreeding in Olivenza, a border town whose sovereignty was transferred from Portugal to Spain in 1801. After the change in dominion the number of Portuguese surnames fell sharply and the expected values for a population so close to Portugal recovered only after a long period of time. The results indicate that although the border has made population movement more difficult, and has therefore had an impact on the rate of gene exchange, a certain gene flow with Portugal persisted.

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Introduction

Changes over time in the number of surnames present in a population reflect variations in its allelic frequencies (Lasker, 1977). This allows an estimation of the genetic kinship among the members of a

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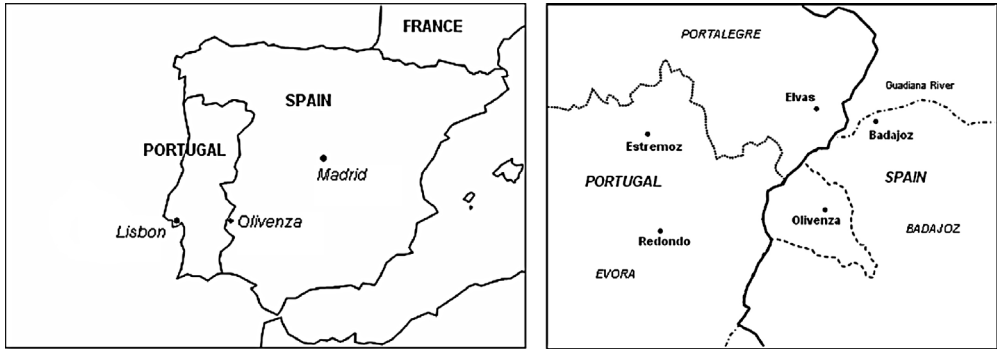*E-mail address:* jmromanb@bio.ucm.es (J. Román-Busto).

Fig. 1. Spanish–Portuguese border and location of Olivenza.

population for different time periods (Küchemann et al., 1979; Lasker and Roberts, 1982). The expected frequencies of genotypes in each new generation, according to the Hardy–Weinberg equilibrium, would remain constant under "ideal" conditions. However, these conditions are not met in human populations: mating is far from random, and consecutive generations overlap. Preferential mating among relatives (consanguinity) runs against this equilibrium because of increased homozygosity. Other requirements to create the ideal conditions are the absence of mutations, and genetic drive or gene flow due to migration which could introduce new alleles (Relethford, 2012a).

These factors and genetic variations in a population over time can be estimated through the change in the frequencies of surnames. Consecutive periods show a greater similarity than non-consecutive ones due to the influence of effective migration in the population and the loss of surnames by individuals leaving the community. Disruptive ecological, social, economic and political circumstances may accelerate the process. The change in the sovereignty of a region or locality may significantly affect the frequency of surnames far beyond the random variation expected in the absence of such political change.

There have been numerous studies based on the frequency of surname distributions in the last few years. Recent publications have focused on populations from all continents: Küffer and Colantonio (2011), Lucchetti et al. (2011), Liu et al. (2012), Niederstätter et al. (2012), Alsmadi et al. (2013), Asghar et al. (2013), Mikerezi et al. (2013), and Capocasa et al. (2014). Taking advantage of the availability of digital databases, studies have appeared on the subject of migration, the correspondence between surnames and chromosome Y genetic markers, the evolution of populations and the dynamics of disordered systems (Rossi, 2013).

The study of inbreeding using isonymic analysis has provided an additional method for characterizing human populations. Crow and Mange (1965) and Crow (1980) defined total inbreeding (F_t) and its two components: random (F_r) and non-random (F_n). The random component of inbreeding is influenced by population size. Random may determine high inbreeding in small populations where people are often related. The non-random component (F_n) also contributes to total inbreeding. F_n is due either to the rejection of or preference for consanguineous marriages (Relethford, 2012a). Both factors (F_r and F_n) tend to decline over time when population size increases and migratory movements occur (Relethford and Jaquish, 1988). The decline may be accelerated or delayed depending on particular ecological or cultural factors characterizing the population.

A political circumstance that led to a change in a segment of the Spanish–Portuguese border may have affected the population structure of Olivenza. This is an agricultural town of about 11,000 inhabitants belonging to the region of Extremadura in southeast Spain (Fig. 1). Olivenza lies in the area of the Iberian Peninsula that has undergone the most recent change in its national affiliation. In 1801 Portugal's sovereignty over Olivenza was transferred to Spain. The biodemographic consequences of this process have been the subject of previous research (Fuster et al., 2007; Guardado-Moreira et al., 2009; Román-Busto et al., 2010).