

Population Structure in Rural Communities of Córdoba, Argentina: Marriage Patterns and Immigration Effect during Early 20th Century

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Abstract

Besides its cultural and social impact, immigration also has biological consequences. Mate selection may be affected with the arrival of immigrants, altering the identity and genetic variability of the population. In this research, marriage patterns of creoles and immigrants in two rural populations in Córdoba, Argentina were analyzed using data from marriage certificates from three subsequent periods: before, during and after the immigration during the early 20th century. RP, consanguinity coefficients through isonymy, intra-group and inter-group kinship coefficients and Fst were calculated for these periods.

Despite its proximity, the populations showed different behavior. In Morteros, marriage between immigrants was favored, as were marriages between relatives and within family lineages. In Villa Concepción del Tío, marriage between locals was more frequent, as were marriages within family lineages, although in the latter years mixed marriages increased. Differences between the populations may be due to their history and population size as well as group distribution.

Keywords: biodemography, surnames, marriage, homogamy, immigration.

1. Introduction

Human population structure results from the complex interaction of biological and socio-cultural factors. Mate selection is not a random event in most species, and even less in humans (Jaffe, 2002). Several factors ranging from religion, language, social status or physical traits impose preferences and restrictions to mate selection (Marvin, 1918; Davis-Brown, 1987; Buss, 1989; Zavattaro, 1997; Sánchez Alonso, 2000; Rauch & Scholar, 2003; Salces, 2004; van Tubergen & Maas, 2007). These criteria outline marriage circles and determine who will be considered a potential spouse, ultimately affecting the genetic structure of the population as each individual is in turn a unique combination of genes (Kalmijn & Flap, 2001). Therefore, identifying and characterizing marriage patterns help understand a given population's evolution and dynamics.

One of the phenomena that greatly impacts on a population is migration. Besides the cultural and social consequences, immigration implies an input of genes of different origins. Thus, immigration can alter the genetic variability of a population depending on the strength and ties of each group's mate selection criteria. If the marriage patterns proper of each group remain unchanged and intra-group marriage is more frequent, variability decreases. Conversely, when there is little restriction to marrying a member of a different group, the population's gene pool expands (Relethford, 1992; Kalmijn, 1998; Madrigal & Ware, 1999; Manfredini, 2005; Manfredini, 2009;). These two scenarios, and their effects on culture and identity, are consequences of the salad bowl and melting-pot hypotheses (Palmer, 1976; Bisin & Verdier, 2000). The first being the one where groups live together but remain separated when choosing a spouse, while in the latter the groups live together and mingle, resulting in mixed couples.

Surname-related methods are particularly useful to study historic populations and their interactions (Colantonio et al, 2003). Each surname has a definite root and serves as an analogy to an individual's genes. Therefore they can be useful to determine whether two groups of different origins merged or segregated.

The presence of surnames combinations of the same origin would indicate a tendency to endogamy and/or possible family lineage associations which eventually subdivide the population (Lasker & Kaplan, 1985). Endogamy and lineage associations have been frequent in immigrant clusters mainly due to economic and social status motives. Kinship has also been frequent in these cases, particularly between young daughters of prior immigrants and recently arrived relatives.

Some surname methods, such as the isonymy (Crow & Mange, 1965) are used to reveal the existence of kinship among individuals (i.e. spouses, populations) who share the same surname. Simultaneously, possible associations between family lineages can be uncovered using surnames through the repeated pairs (RP) method (Lasker & Kaplan, 1985). Furthermore, the combination of surnames found in married couples can unmask melting-pot or salad-bowl scenarios, assessing the general genetic variability of the group.

The province of Córdoba (Argentina) has received various flows of immigrants through its history. Previous studies have shown that during colonial times, Spanish immigrants and “criollos” (locals) exhibited endogamous behavior. Moreover, among the Spanish immigrants marriage between family lineages was frequent, although kinship was mostly avoided (K üffer et. al, 2007; Colantonio et. al, 2009).

Currently, population groups of different geographic origin coexist in communities surrounding the Laguna Mar Chiquita, San Justo County, in the northeast of the province. San Justo received a large immigrant crowd following the establishment of the railway in the early 1890s. The immigrant group consisted mostly of Italians and Spanish, who also worked in agriculture and stockbreeding. Despite having lived together for over a century, immigrants and locals still maintain distinct patterns of usage of the area’s natural resources (personal communication, Arias Toledo & Trillo, 2012).

Presently, there are no studies regarding the immediate effects on the population structure of this first immigration flow which extended from the late 19th to the early 20th century. In this research the influence of this first immigration event on the marriage patterns of both, immigrant and local groups, and its possible impact on the future population’s variability will be assessed.

2. Method

Two populations from the San Justo County, in the northeast of Córdoba province, were selected: Morteros (30° 42’ 0” S, 62° 00’ 00” O) and Villa Concepción del Tío (31° 19’ 20” S, 62° 48’ 30” O).

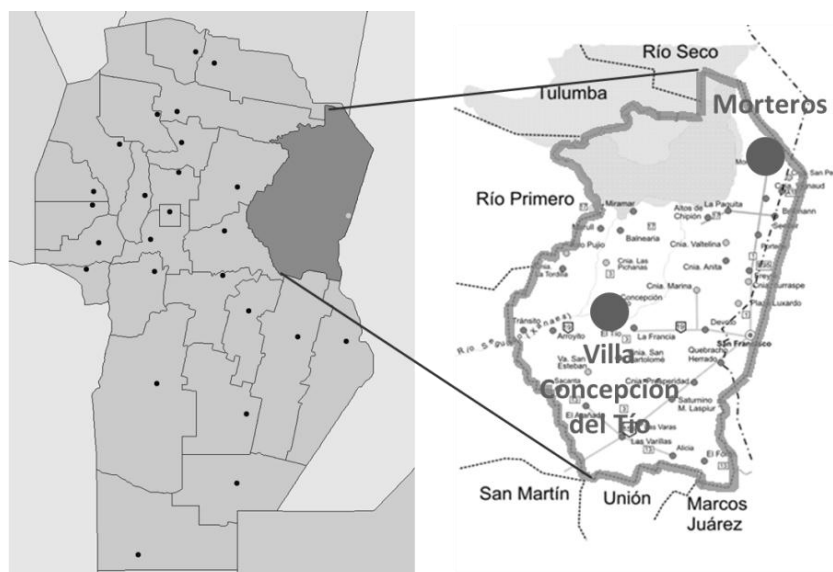


Figure 1. Geographic location of VCT and Morteros (current political division)

Villa Concepción del Tío (VCT) was founded in 1860 and at the time of the first immigration had a larger population than Morteros, which was not founded until 1891. VCT received immigrants before Morteros and in larger amounts, since activities such as agriculture and stockbreeding were more developed there. Moreover, VCT was closer to San Francisco, capital of the County, and main receptive area of immigrants. Furthermore, both locations are of particular interest since they not only received European immigrants, but also criollos from other provinces as well.

In the case of Morteros (Mor), marriage certificates from 1896 until 1922 were taken from the parochial archives

available in the Latter Day Saint Church online database. For Villa Concepción del Tó, marriage certificates from 1888 until 1922 were taken from ecclesiastical records from the local parish. The difference in the start year in the data recollection is due to the unavailability of records from Morteros before 1896, since the parish did not exist until then. However, since the flow of immigrants occurred later in Morteros than in Villa Concepción del Tó, both temporal processes were comparable.

The analyzed time span will hence include a pre-immigration (1896-1900 in Morteros, 1888-1892 in VCT), an immigration (1901-1905 in Morteros and 1893-1905 in VCT) and a post-immigration (until 1922 in both populations) periods in both locations. Information regarding the total population is unfortunately unavailable for either location, since census data did not discriminate by location.

From each marriage certificate we gathered information about surname of both spouses, surname of their parents and wedding date. When available, we also collected information about consanguinity dispensations and degree of kinship among spouses, although this was rather rare. The analysis included all registered marriages where one of the spouses resided in each selected location, independent of their place of birth. The following parameters were calculated for each population:

- Degree of population subdivision using surnames repeated pairs method (RP) (Lasker and Kaplan, 1985; Lasker, 1988). RP expected at random was computed using Chakraborty's (1985) method. Percentage of excess RP above RPr and null hypothesis $RP = RPr$ was tested by z score according to Relethford (1992).
- Consanguinity coefficient using the isonymy method (Crow & Mange, 1965)
- Intra-group and inter-population kinship coefficient following Lasker's method (1977)
- Mean differentiation coefficient (Fst) according to Kashyap and Tyiwari (1980)

3. Results

3.1 Population subdivision through repeated pairs' method (RP)

The results in Table 1 show that before the arrival of immigrants, the populations of Morteros and Villa Concepción del Tó were marrying randomly ($z = -0.28$; $p = 0.3897$ for Mor; $z = -0.12$; $p = 0.4522$ for VCT). However, repeated pairs increased in both populations during the immigration ($z = 23.06$; $p \approx 0$ for Mor; $z = 19.64$; $p \approx 0$ for VCT) and particularly in the post-immigration periods ($z = 58.75$; $p \approx 0$ for Mor; $z = 53.92$; $p \approx 0$ for VCT).

Table 1. Evolution of the Index of Repeated Pairs (RP) and the random component (RPr) in the Morteros (Mor) and Villa Concepción del Tó (VCT) populations.

	Pre-immigration		Immigration		Post-immigration	
	Mor (N=64)	VCT (N= 381)	Mor (N=290)	VCT (N=548)	Mor (N=590)	VCT (N=590)
RP	0	6.07×10^{-5}	1.102 $\times 10^{-4}$	1.657×10^{-4}	7.48×10^{-5}	1.496×10^{-4}
RPr	4.26 $\times 10^{-5}$	6.32×10^{-5}	1.8×10^{-6}	5.18×10^{-5}	4.3×10^{-6}	1.48×10^{-5}
ES (RPr)	1.51 $\times 10^{-4}$	2.1×10^{-5}	4.7×10^{-5}	5.8×10^{-6}	1.2×10^{-6}	2.5×10^{-6}
(RP-RPr)/RPr	-1	-0.04	60.23	2.20	16.39	9.11
z =	-0.28	-0.12	23.06*	19.64*	58.75*	53.92*
(RP-RPr)/ES(RPr)						

RP = Observed RP component; RPr = Random RPr component; ES = Standard Error. Significance $p < 0.05$.

Marriage certificates show that in Morteros the majority of these repeated pairs belong to Italian pairs and Spanish pairs of surnames, in both immigration and post-immigration periods. These associations indicate a tendency towards intra-group homogamy by origin among immigrants. Although in lower proportion, repeated pairs of surnames also appear among criollos in the later years of the immigration period and during post-immigration, suggesting the existence of a possible "reflex behavior". The preference of immigrants for intra-group marriage consequently narrowed the marriage market for criollos. It is also likely that the increasing number of immigrants led criollos to marry each other to strengthen their group status and control over their properties and land. Several of the repeated pairs belong to

an immigrant man and a young girl, whose last name is of immigrant origin but who identifies herself as a local resident. This type of behavior is characteristic of immigration marriage patterns with young women, who are daughters of first-flow immigrants, marrying newly-arrived immigrants, to whom sometimes they are even related.

In Villa Concepción del Tío, the larger location, the majority of repeated pairs belong to criollos. However, it is among the immigrants were repeated pairs are overrepresented, observing more of them than randomly expected based on their population size. While not statistically significant, pre-immigration results in VCT show that some repeated pairs existed prior to the immigration, hence it is not surprising that this pattern continued after the arrival of immigrants, despite the seemingly expanded marriage market. During the immigration and post-immigration periods, kinship alliance through marriage grew among immigrants. Within the criollos this trend declined, particularly during the later years of the post-immigration period, suggesting an opening to immigrants as potential spouses.

3.2 Inbreeding through Isonymy

Table 2. Evolution of the inbreeding coefficients from isonymy in the Morteros and VCT populations.

Period	Pre-immigration		Immigration		Post-immigration		
	Population	Morteros (N=50)	VCT (N=182)	Morteros (N=191)	VCT (N=467)	Morteros (N=876)	VCT (N=755)
Fr		0.0028	0.001834	0.000418	0.0020175	0.0005063	0.0008723
Fn		0.0123382	0.0023038	0.0061367	0.0066011	0.0034962	-0.000211
F		0.0151036	0.0041336	0.0065522	0.0086053	0.0040007	0.0006617

Fr = random inbreeding coefficient; Fn = non-random inbreeding coefficient; F = inbreeding coefficient.

Table 2 shows the values of random inbreeding (Fr) and non-random inbreeding (Fn) coefficients for both populations during the three subsequent periods.

Results indicate that in the pre-immigration period in Morteros both, random (Fr) and non-random (Fn) inbreeding coefficients are high, indicating a considerable degree of inbreeding within the local population. Though possibly there was a trend to marry a family member, these results are probably more affected by the reduced sample population size. During immigration, Fr is almost seven times smaller, due to the arrival of new surnames with diverse origins, which expanded the population variability. Fn in Morteros decreases by half in the immigration period and to a quarter in the post-immigration, with the estimated inbreeding going from coefficients equivalent to a marriage between second cousins once removed to third cousins. This tendency would signify a gradual opening among groups resulting from the ensuing arrival of immigrants that were seen as potential spouses.

In Villa Concepción del Tío, the pre-immigration Fr shows lower surname variability than Morteros and Fn is equivalent to a marriage between third cousins once removed. Both values indicate that the higher population size was affecting mate selection, producing low inbreeding.

During the immigration period, the Fr remains stable showing that immigrants provided few surname variability, likely due to their tendency to travel in large family groups. Fn, on the other hand, duplicates. Taking into account the pre-immigration value of Fn and if marriage patterns among locals remained the same, this new value indicates that immigrants were responsible for the increase in the population's inbreeding. This would support the idea that not only they moved in large family groups, but their members were considered potential, and preferential, spouses as well. Available data on dispensations show that 25% belonged to marriages between immigrants, while the remaining 75% to locals. Although the percentage is elevated among locals, it is among the immigrants were dispensations are overrepresented (since immigrants were only 10% of the total population under study). Results regarding the local population coincide with those from RP, supporting the explanation that the arrival of immigrants stimulated intra-group marriage, even among related individuals.

During the post-immigration period, Fn and Fr decrease significantly. This shows a growing trend to marry non-related individuals, possibly due to an increase in the number of potential mates after the immigration. As it can be seen in Figure 2, this behavior is present in both locations, although in Morteros it apparently happened earlier, as inbreeding coefficients were lower already in the immigration period.

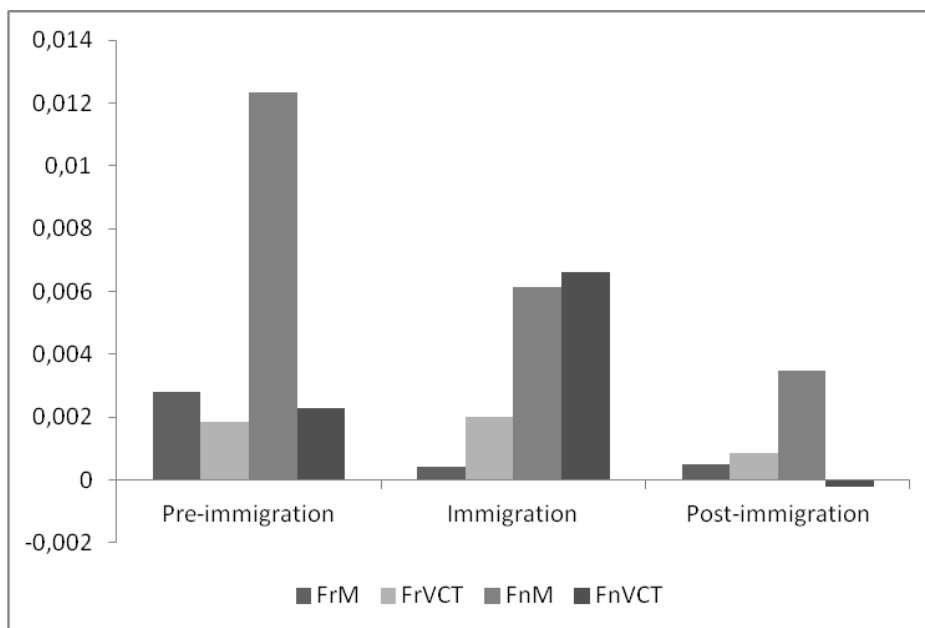


Figure 2. Comparison of random and non-random coefficients in the Morteros and VCT populations.

3.3 Inter-population kinship coefficient (Rij). Mean differentiation coefficient (Fst)

Table 3. Inter-population kinship (Rij) and mean differentiation (Fst) coefficients.

Period	Rii		Inter-population kinship coefficient (Rij)	Fst
	Morteros	VCT		
Pre-immigration	0,00560000	0,00366804	0,00247253	0,00204653
Immigration	0,00083605	0,00403505	0,00044704	0,00155367
Post-immigration	0,00101254	0,00174466	0,0034879	0,00067465

Table 3 shows the values of inter-population kinship coefficients (Rij) for both populations during the three analyzed periods. Primary results would indicate a decrease of kinship between them during the immigration period, and a considerable increase during post-immigration.

It would be expected to observe a progressive increase in the Rij as immigrants present in VCT may have arrived in Morteros as well, or vice versa, which is not the case. The observed behavior can be explained through the Rii values from both locations independently. Values from Rii show an opposing tendency, as during immigration group kinship in Morteros decreases while in VCT it increases. This is due to the unequal representation of marriages involving immigrants and locals in these locations. While marriages among immigrants were quite frequent in Morteros during the immigration period, they were scarce in VCT. The reverse situation applies to locals, with a high number of marriages among criollos during the immigration period in VCT, while in Morteros they were uncommon. Consequently, if we compare the pool of surnames of spouses in Morteros to that of VCT during that period, it will be undoubtedly different.

First glance Fst results show low values and a decreasing trend, revealing that both populations come to share more surnames. The higher value of Fst prior to the arrival of immigrants supports the idea that at this time Morteros and VCT (although with similar origins) were working as two relatively isolated populations. However, immigrants who were no strangers to dispersing in search of land or work could reach both locations and hence the reduction of Fst values in the two subsequent periods. Due to the low values of Fst, it could be argued that big family groups that arrived in other places such as the nearby city of San Francisco migrated to VCT and to Morteros, or vice versa. Inflow of locals from other provinces is also a possibility. Post-immigration values of Fst support this explanation of a shared variability. Since it is the lowest Fst value among the three periods, it shows that several surnames from both creoles and immigrants were present in both locations simultaneously at this time.

Immigration, therefore, caused Morteros and VCT to be less isolated, which coincides with certificates that show spouses from one location marrying in the other. However, despite frequent mixed marriages, immigrants and criollos mostly selected a mate from their own group, favoring overall endogamy. The constant arrival of immigrants, particularly of later major flows, and of locals from other provinces nourished each group with variability, potentially maintaining the genetic reservoir and preventing fixation of certain surnames/alleles.

A clear explanation for the opposite behavior in two seemingly similar locations seems intricate, but it could be argued that it is connected to their history. Morteros was a recently established population, offering more land and jobs opportunities than VCT, and constituting in this way a more attractive area for foreigners. VCT was already an established community when the immigrants arrived, offering less “empty niches” for them and preventing their mass settlement.

4. Discussion and Conclusions

Our results show that the arrival of immigrants undoubtedly altered, if only temporarily, the marriage patterns of locals in both locations. Despite their geographic proximity, the two populations had marked differences. Morteros exhibits a higher number of marriages between immigrants, while in VCT it is the criollos the ones who marriage the most, likely due to different population sizes, immigration rates, historical factors or a combination of these.

Nevertheless, both populations show similarities in their choice criteria. It is clear that geographic origin marked a preference when choosing a spouse in both groups and in both locations. In addition, in both locations kinship marriages were more frequent among foreigners, which generally happens to keep identity and status, or it simply was a common pattern in their countries of origin. Both trends were less important during the later periods, as a result of a continuous in-flow of immigrants (new surnames appear) and an increase in mixed marriages. However, it should be noted again that in both locations there is a strong preference for intra-group marriage, indicating that a salad bowl scenario prevailed during these years.

Due to the multidimensional analysis that marriage patterns and immigration require, further studies are needed to establish the role of other factors. Age and the place of residence, among others, are two factors that could be affecting mate selection. An initial assessment would indicate that similar age was not a factor among the immigrants, as marriage between a young woman and an older adult were frequent, while for criollos it was more common to marry someone from their same age-group. In order to further evaluate the consequences of this first immigration, marriage certificates of subsequent decades should be analyzed as well.

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