PROGENIC ISONYMY AMONG THE CHAMORRO OF GUAM

By

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ABSTRACT

This study examines several methodological issues pertaining to the application of isonymy techniques to a historical population located on the island of Guam in Micronesia. Since European contact the indigenous Chamorro population of Guam has undergone a series of precipitous population declines. The Spanish colonial administration imposed a dual surname system on the Chamorro. The surname information was compiled into a demographic database representing approximately 39,000 persons traced from late 19th century vital records. Analysis using the methods of isonymy was conducted on lineages established from the four parental surnames. Values were calculated from the progeny in the database, in effect focusing on the effective breeding population. Comparisons were made with inbreeding values obtained using other methods of surname analysis both for single and dual surname systems. In contrast to the paternal lineage, the values for the other lineages were influenced by their shallow temporal depth. The non-paternal lineages showed patterns of assortative mating reflecting choices of mate selection that have the potential to influence levels of inbreeding in the population.

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> "It was urged, that when we had these statistics it would be possible to discover by inquiries in asylums, whether the percentage of the offspring of consanguineous marriages among the diseased was greater than that in the healthy population, and thus to settle the questions as to the injuriousness of such marriages (Darwin 1875:153)."

Chapter 1. **INTRODUCTION**

As a whole humans are not a highly inbred species. In the literature a generally accepted level of consanguinity is slightly under one per thousand (Cavalli-Sforza and Bodmer 1971:352; Morton 1992). In accordance with the Hardy-Weinberg equation one of the assumptions which must be met for a population to remain in stasis is for it to be panmictic, that is with mating at random. However, at the demic level human populations do not mate randomly. Assortative mating often contributes to the episodic formation of breeding isolates through both time and space. Cultural rules of kinship and mate selection may promote the pairing of mates who share some degree of common biological ancestry or consanguinity. While regulations associated with mate selection are primarily cultural, the consequence can be inbreeding which has a potential biological manifestation.

Consanguinity and the implications of inbreeding have long been topics which have attracted the attention of researchers and others

interested in human variation. The principles of inheritance were formally articulated by Gregor Mendel in 1865 when he presented the results of his research before the Brünn Natural Science Association. Well before this time, plant and animal breeders had applied their practical knowledge of heredity to develop genetically consistent strains or varieties of domestic plants and animal species. Charles Darwin supported his theory of natural selection, in part, by citing the work of the established plant and animal breeders of his day (Darwin 1859: 28-56). As illustrated by the introductory quote, his son George pursued a strong research interest in first cousin marriages, the type of marital union that had resulted in his birth. In 1875 he published the first paper on what would become recognized almost a century later as the topic of isonymy. His study and another (Arner 1908) in the United States emphasized approaches which provided information on the frequency of first cousin marriages in the late 19th and early 20th centuries. They document varying levels of consanguinity among the various social classes of England and the United States of America. As is not uncommon with obscure methodological inquiries, these works remained unnoticed until researchers with similar interests uncovered them nearly a half century later.

Most measures of inbreeding rely on information which is associated with biological traits. Isonymy represents a significant departure from

these approaches. Isonymy attempts to assay the level of inbreeding in a human population based on a non-biological characteristic, the frequency of like surnames in a population. Simply put, isonymous marriages are those marriages between individuals of the same surname. The pattern of inter-generational transmission of surnames in many northern-European patrilineal societies is analogous to the mode of genetic inheritance associated with the Y chromosome in humans (Yasuda 1983:263).

Research interest in the topic of isonymy again emerged in the early 1960s. In the seminal modern article in the English language journals on the subject, Crow and Mange (1965) introduced the term isonymy which was suggested to them by their colleague Charles Cotterman. They were apparently unaware of the work of Darwin, Arner, as well as of the Japanese researchers (Yasuda 1983) who in the 1950s studied surnames in association with consanguinity in Japan. Fundamental to their idea of isonymy was that "the frequency of marriages between persons of the same surname could be used to measure the inbreeding coefficient" (Crow and Mange 1965:203) of a population. Crow and Mange viewed isonymy as a means to obtain data on inbreeding when pedigree information was missing or incomplete. In a strict sense, their 1965 article focused on and defined what they referred to as marital isonymy.

What Crow reported as having caught his attention (Crow and Mange 1965:384) is the consistent relationship between the probability of children having the same surname and the inbreeding coefficient of the children. In Chapter 3, Table 3.1 illustrates Crow's observation that no matter the degree of consanguinity of the mating in an isonymyous marriage it is indicative of the same level of inbreeding in the population. While this relationship does not hold true for all the possible pairings, he argued it encompassed the most common marriages.

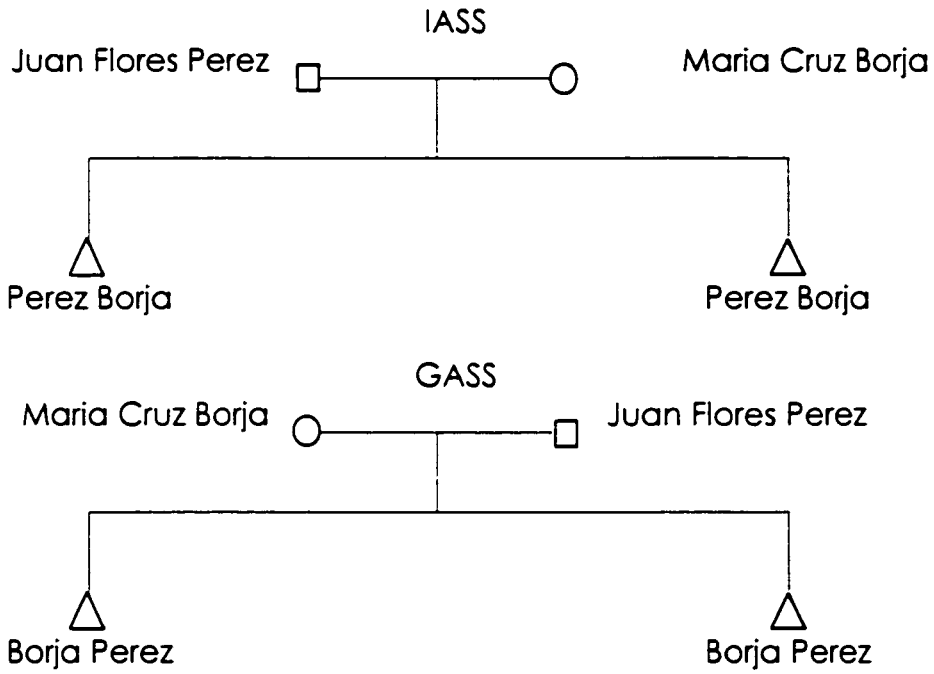
The work of Crow and Mange was the first of many papers to exhibit renewed research interest in the topic of surname analysis. As will be explored in Chapter 3 which addresses previous research, the scope of the investigations expanded significantly beyond marital isonymy to encompass a diversity of issues and methodological approaches. Isonymy has become a topic in its own right as well as a complementary approach to related or associated studies. Such studies include: historical demography, consanguinity, population structure and migration distances *inter alia*. A symposia on isonymy was organized for the Council on Human Biology annual meeting in 1980 with the proceedings published in Human Biology, May of 1983.

Researchers have noted the methods of isonymy are not amenable to all human populations. There are a variety of methodological

conditions that must be effectively dealt with in order to yield productive and valid results from surname analysis (Crow 1980, 1983, 1989 Lasker 1985). Numerous studies have substantiated that isonymy inherently tends to overestimate the coefficient of inbreeding in the study population compared to other methods. Analysis using the methods of isonymy needs to be constructed to mitigate for the effects of biases created by factors such as sample size, polyphyletic surnames, unreported or under reported consanguinity, and inconsistencies in surname recording. Chapter 4 will furnish more insight into these and related issues as they pertain to the population of Guam.

Chapter 2 will provide a cultural, prehistoric and historical context for the Chamorro, the indigenous Oceanic people whose first European contact was with Magellan in 1521. The Chamorro people on the Pacific island of Guam, due to their geographic, cultural and historical circumstances (Rogers 1995), are a population appropriate for the application of the methods associated with surname analysis. The subsequent colonization of Guam by western nations imposed an European surname system on the Chamorro which through local circumstance has become unique to the island. This surname system does not limit the tracing of surnames solely to the paternal lineage, which is the case with a traditional northern European surname system (NESS).

The Guamamerican surname system (GASS) is a variant of the Spanish or Iberoamerican (Pinto-Cisternas, et al. 1985b) surname system (IASS) both of which can be classified as dual surname systems. Both the IASS and



the GASS also provide insight into the maternal lineage because the mother's maiden name is also retained (Shaw 1960). For example a child named "Diego" who is the progeny of Maria Cruz Borja and Juan Flores Perez would have the full name of Diego Borja Perez. All of his sibs would share the Borja Perez dual surname. Consequently, the mother's maiden name is regularly listed in many of the vital records. In addition there is available for the Chamorro people of Guam the requisite demographic, historical, genealogical and census information to support inquiries that the methods of isonymy depend on.

The overall goal of this investigation is to use the methods of isonymy to analyze inbreeding probabilities among the Chamorro of Guam. A set of abbreviated research objectives are outlined below. A more complete rationale for these lines of inquiry are developed in Chapter 4. As noted earlier, prior traditional studies in historical isonymy have emphasized marital isonymy following a single parental surname. This investigation will follow an approach termed progenic isonymy, a method developed and implemented for this research involving four parental surnames. Progenic isonymy is calculated from the progeny in the database, in effect focusing on the effective breeding population (Wright 1922). The research reported here pursued several objectives:

1) To restructure the Guam database to facilitate research using methods of isonymy
2) To adapt the methods of isonymy to progenic rather than marital methodology
3) To calculate and describe progenic isonymy on Guam as a baseline for the research.
4) To compare isonymy values between NESS, IASS and GASS
5) To assess the research implications of the data derived from the methodologies

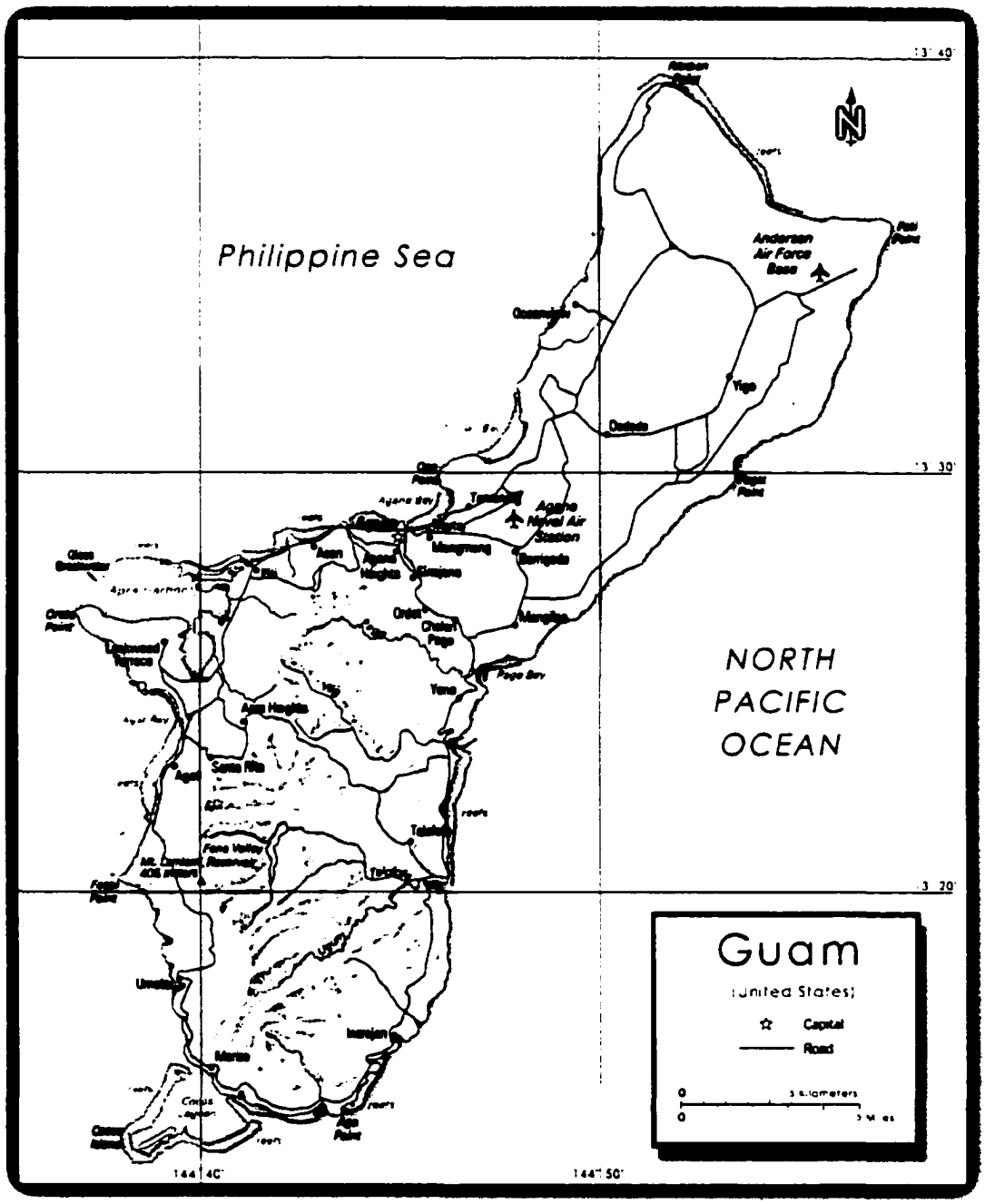
The information utilized for the research is comprised of an approximately 39,400 record database of the Chamorros and their descendants documented in the 1897 Guam census. The database includes birth data recorded until just before the start of World War II. The

information contained in the database was compiled by Dr. Jane H. Underwood. The database has been the basis for recent articles related to the demography of Guam (Underwood 1973). Additional information for the progenic isonymy research was obtained in the summer of 1996 during field work conducted on the island by the author. The original database has been restructured to facilitate undertaking the calculations required in isonymy research. Details of the data set and other related information are found in Chapter 4. A discussion of the results of the research as well as conclusions derived from this study are presented in Chapter 5.

Chapter 2. **BACKGROUND TO THE STUDY**

The island of Guam, situated in the western Pacific Ocean is located approximately 3,700 miles west of the Hawaiian Islands, 6,000 miles from the mainland United States, 1,500 miles east of the Philippine Islands or about three quarters of the way from Hawaii to the Philippines. With coordinates of 13° 28' N and 144° 47' E Guam falls in the northwest portion of Micronesia between the Marshall and Hawaiian Islands in latitude but not as far west as Yap and Palau. Yap, Palau and Guam are separated from the other islands of central and eastern Micronesia by the Andesite Line. Located at the southern end of the 500 mile long Mariana Islands archipelago Guam is the largest island of the fifteen island chain with a total land area of about 210 square miles (see Fig. 2.1). Traveling in a northeast bearing from Guam the other large, more southerly islands are Rota, Tinian and Saipan. The remaining island in the vicinity is Aguijan, a small outlier of Tinian. North of Saipan lay the islands Farallon de Madinilla, Anatahan, Sarigan, Guguan, Alamagan, Pagan, Arihan, Asuncion, Muag and Farallon de Pajaros. Guam is more heavily populated (nearly 155,000 in July of 2000) and larger than any other island in Micronesia and extends about 30 miles in length. The width of the island varies between four and twelve miles at its widest point (Karolle 1993; U.S. Government 2000).

Figure 2.1 Map of Guam (U.S. Government 1991)



Comprised of two extinct volcanoes, Guam lies close to the Mariana Trench, which is located southeast of the island. Guam, which is the uppermost tip of submerged mountains, ascends nearly 38,000 feet

from the floor of the trench which has the greatest recorded ocean depth on the planet. Although situated atop a high underwater mountain, the portion of the island that rises from the ocean has a maximum elevation above sea level of less than 1,350 feet. Guam can be divided into a northern plateau of elevated coralline limestone composition and a series of volcanic hills with inland valleys in the southern third of the island connected by low-rising hills in the center. The cliff lines of the northern plateau which are raised several hundred feet above the shore line, eventually drops off sharply into the ocean. The central plateau, by capturing and holding in its limestone formations some of the nearly 100 inches of annual rainfall provided by the island's tropical marine climate, serves as the freshwater source for Guam. The perimeter of the island is fringed with coral reefs creating protected shallow lagoons in some areas. The geology of Guam is not simple since it is situated along the edge of the Asian Plate with the Pacific plate thrusting under it suggesting ongoing and long term tectonic activity (Tracey Jr., et al. 1964). However, even with a rising post-Pleistocene sea level the relative sea level of Guam has fallen (Easton, et al. 1978) which has implications for the archaeological record of the island (Amesbury, et al. 1996).

Figure 2.2 West Pacific Islands (after Kirch 2000; U.S. Government 1998)

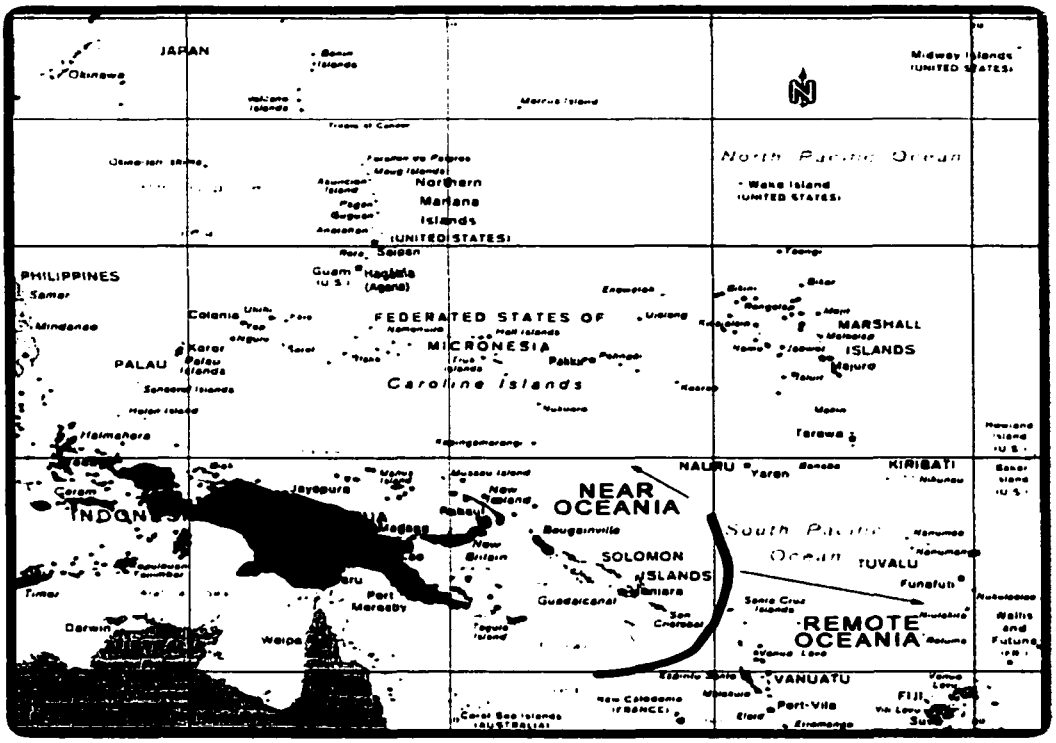
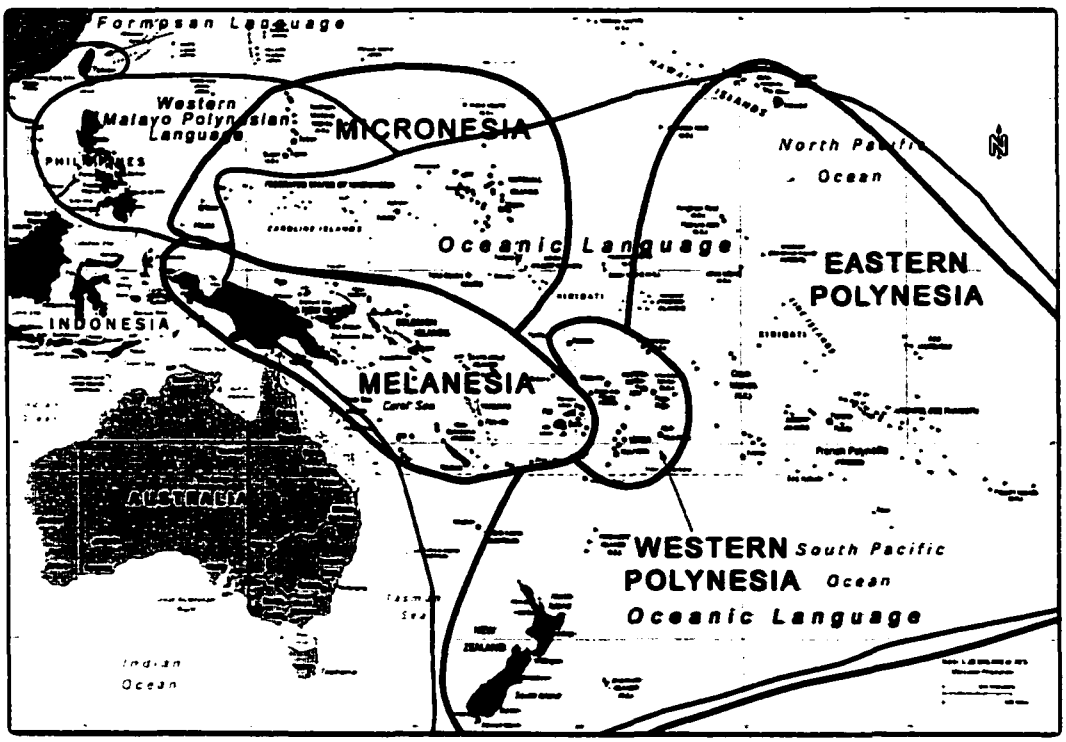


Figure 2.3 Oceania (after Kirch 2000; U.S. Government 1997)



Culturally Guam is located in Micronesia (Fig. 2.2), one of the three major cultural regions of Oceania identified by Dumont d'Urville in the early 1830s (Fig. 2.3). The others, Melanesia and Polynesia are generally located to the south and southeast respectively. Polynesia is often sub-divided into Western (adjacent to Melanesia) and Eastern Polynesia. In a more recent classification (Green 1991), independent of the traditional cultural regions, Oceania is subdivided into Near and Remote Oceania (Fig. 2.2). In Near Oceania the inhabitants speak languages which are either Non-Austronesian (Papuan) or Austronesian in classification (Fig. 2.3). Geographically Near Oceania encompasses the western two thirds of Melanesia including New Guinea and several other island groups. Near Oceania also has the greatest time depth with human occupation dating back to the late Pleistocene (Groube, et al. 1987). A temporal split is sometimes made with the term Old Melanesia implying the Pleistocene populations of the region.

In contrast, Remote Oceania is reported to have more recent dates of discovery after approximately 3,400 B.P. (Green 1995). Interestingly, Guam represents an exception to this classification with an occupation date of possibly two thousand years earlier than that associated with the rest of Remote Oceania. Further, the indigenous inhabitants of Guam do not speak a language that falls within the Oceanic subgroup (Nuclear

Micronesian) of the Austronesian languages as do their fellow Micronesians with the exception of those living on Palau and Yap. A recent summary of Mariana Islands prehistory (Kirch 2000:167) reports on evidence from current linguistic research (Reid 1999; Zobel 1997) with the Chamorro language which lead Kirch to assert ". . . the origins of the Palau and Mariana islanders are to be found in island Southeast Asia." Others contend the linguistic evidence is uncertain enough to allow plausible arguments to be made for a range of locations in insular and even mainland Asia.

From Guam's apparent initial colonization around the middle of the third millennium BP by Oceanic seafarers until its European discovery by the Portuguese explorer Ferdinand Magellan, in 1521 while sailing under the Spanish flag, the indigenous population had no documented contact with non-European societies. However, neither the lack of a written record relevant to the peopling of the Mariana Archipelago or a well developed archaeological record has inhibited explorers, scientists and other researchers from speculating on the origins and routes of the earliest human intrusions into this region of the Pacific.

Since the early days of Pacific exploration numerous ideas have been offered in explanation of the physical and cultural (including linguistic and archaeological) differences readily observable among the

inhabitants of Oceania. In addition to the question of origins researchers argued over related issues such as whether the landfalls on the islands were intentional or not (Sharp 1957). While it is beyond the scope of this research to delve deeply into the issues surrounding the origins and dispersal of Oceanic peoples, a brief overview is presented relevant to northwestern Micronesia and especially the Mariana Islands where Guam is found. The population structure of the indigenous people of Guam, which is the specific focus of this volume, can best be understood in light of the historic and prehistoric factors that have shaped it. The broader issues surrounding human dispersal throughout Oceania are covered in recent works such as *On the road of the winds* (Kirch 2000), *The Pacific from 5000 to 2000* BP (Galipaud and Lilley 1999), *Linguistic, biological, and cultural origins of the initial inhabitants of remote Oceania* (Green 1995), *People of the Great Ocean* (Houghton 1996), *The Prehistoric Exploration and Colonization of the Pacific* (Irwin 1992), *Prehistory In The Pacific Islands* (Terrell 1986), *The Proto-Oceanic language community* (Pawley and Green 1984) and *Man's conquest of the Pacific* (Bellwood 1979). With general comments having been offered above concerning Pacific linguistics, the following sections will include archaeological and biological evidence with emphasis on the Mariana Archipelago.

If respect is measured by the proportional treatment in the literature of a region then Micronesia, especially the northwestern portion, appears to be afforded very little respect relative to overall anthropological research in Oceania. Interestingly, early explanations for the peopling of the Pacific, especially those of the very influential To Rangi Hiroa (Sir Peter Buck), brought Micronesia to the forefront since they attempted to explain human dispersal throughout Oceania with reference to Micronesia (Buck 1938). William Howells in the 1970s attempted to reestablish Micronesia as the route followed by the ancestral Polynesians but without any notable success (Howells 1973; Howells 1979). Once characterized as stepping stones to Polynesia this perspective faded with interests shifting to the Lapita cultural complex as the progenitor of Polynesian culture (Intoh 1997). After the initial recognition phase, curiosity in Micronesia diminished with few researchers expressing interest in its role in the overall framework of Pacific studies. The lack of attention led one researcher to state that by 1965 the area "was a neglected backwater" (Davidson 1988:83).

On the surface this is surprising given some of the unique, distinguishable and notable features or characteristics of the human occupation of this region. These include suggestion of a very early human occupation, a complex stratified society, a language (Chamorro) clearly differentiated from the other Oceanic languages, a very large stable

human population, the cultivation of rice as a food crop, the presence of pottery throughout with obvious changes in the archaeological record and monumental architecture exhibited by the *latte* structures of the later occupation sequences. While these characteristics did not go completely unheralded, their presence did not outweigh other factors which kept the preponderance of research interests focused elsewhere in Oceania until the last two decades of the twentieth century when opportunities and support for renewed investigations in Micronesia emerged.

There are several explanations that can be offered for this historic lack of interest or research focus on Micronesia. Micronesians were reported as having darker skin than Polynesians and hence looking less like Europeans, perhaps diminishing the interest of Europeans in their origins. Parallels can be drawn here with similar attitudes expressed toward Melanesians as the possible progenitors of Polynesians. The reported social complexity and hierarchical structure with a hereditary ruler in Polynesia presented a societal framework that was familiar and recognized early in European Pacific exploration thereby facilitating interaction and interchange. In contrast, the recognition of the social complexity and organization of Micronesian societies was a more protracted process. The establishment of European spheres of political control served as barriers to some types of research as well as to

researchers of certain nationalities. The strict Spanish Colonial control precluded incursions by Anglo and American anthropologists anywhere in the Mariana Archipelago until after the 1898 Spanish-American War. These factors, coupled with the remoteness of the region which compounded the costs of travel relative to less far flung areas, presented real barriers to research.

Changing trends within the discipline contributed further to minimizing interest in Micronesia. With respect to human dispersal into the Pacific, as hard data became available elsewhere in the Pacific, they appeared to discount the role Micronesia played in the process, especially since there was a lack of incontrovertible data from Micronesia. In comparison to Melanesia, there appeared little possibility of a substantial time depth on the high islands while the low islands were felt to be unsuitable for stratigraphic excavation until Davidson's work much later (Davidson 1967). Micronesia was difficult to fit into the emerging paradigms and represented at best an inexplicable anomaly with little perceived relevance to broader research issues of Pacific prehistory, linguistics and physical anthropology. As noted earlier, research priorities emphasized the more compelling issues surrounding Polynesia and Melanesia with respect to the assemblage of artifacts associated with the widespread Lapita cultural complex and a very early human occupation

of old Melanesia extending well back into the Pleistocene (Allen, et al. 1988).

Interest in Micronesia and specifically Guam began to revive early in the last quarter of the twentieth century. There have been several reviews of the prehistory of the region over the last quarter of a century. They are variable in scope ranging from brief summaries to more detailed overviews. They have included contributions by various researchers (Cordy 1980; Cordy 1982; Craib 1983; Craib 1999; Davidson 1988; Hunter-Anderson and Butler 1995; Intoh 1997; Kirch 2000; Rainbird 1994; Takayama 1984). The resurgence was highlighted in the First Micronesian Archaeology Conference and the subsequent publication entitled *Recent Advances In Micronesian Archaeology* which was held at the University of Guam (Hunter-Anderson 1990). It included a range of topics with sessions on the archaeology and physical anthropology of Micronesia.

Table 2.1 Dates for Mariana Islands	
PERIOD	DATES
Early Pre Latte	3500 to 2500 BP
Intermediate Pre Latte	2500 to 1600 BP
Transitional Pre Latte	1600 to 1000 BP
Latte	1000 to 429 BP
Historic	429 to 250 BP
Adapted from (Moore 1988) and (Moore and Hunter-Anderson 1999)	

With respect to the six physical anthropology papers, four discussed some aspect of the physical characteristics of Micronesians. One of the others dealt with epidemiological implications from human remains from Rota (Hanson 1990). The remaining paper emphasized the historical demography of Guam (Underwood 1990). With reference to peopling of the Pacific, it is notable that of the papers discussing the biological characteristics of Micronesians, no author felt the morphological evidence could support a strong genetic connection between Micronesians and Melanesians (Brace, et al. 1990; Howells 1990; Pietrusewsky 1990; Turner II 1990). Their views represent a departure from the views of those biological anthropologists regularly cited in support of a strong Lapita or Melanesian linkage for Micronesians. Those studies (Lum 1998; Lum and Cann 1998) more often than not, utilize mtDNA and Y chromosome data which involve small numbers of individuals with issues of sample size not fully addressed. Recently other researchers using similar analytical techniques point to Taiwan as an alternative homeland (Hagelberg, et al. 1999; Lin 1999; Melton, et al. 1998) for Pacific peoples. The case for a strong connection with Japan, where the earliest known pottery is found, is made by Brace. Hopefully, further studies will help bridge some of the differences between studies of slower changing morphological features and other biochemical human attributes.

Table 2.2 (adapted from Kirch 2000) Selected High Island Archaeological Sites in Micronesia		
Island Group	Site (Island)	Age Range (B.P.)
Marianas	Achugao Point (s)	3,500 plus ?
	Chalan Piao (s)	3,500
	Laulau	3,500 – 3,000 ?
	Taga	Undated
	Tarague Beach	3,400 – 1,100
Chuuk	Fefan	2,000
Palau	Bairulchau	1,800?, 285?
	Melekeok	Undated
	Ngerulmud Hill	2,200
	Uchularois	1,200 - 600
	Tol	400 – 200
Pohnpei	Nan Madol	2,000 – 3,000
Kosrae	Lelu	1,500 – 200
Yap	Pemrang	1,800 - 250

With respect to the prehistory of the Mariana Islands, the archaeological sequence can be broadly divided into Pre *Latte* and *Latte* subdivisions as depicted Table 2.1. The original sequence was based on the ceramic sequence from the site of Chalan Piao on Saipan (Spoehr 1952). The early settlements are reported to be along primarily sandy beaches. The assemblage associated with the early colonization of the southern Mariana Islands includes shell artifacts, both stone and shell adzes, and decorated pottery. The pottery shares many of the characteristics associated with the Lapita pottery. In spite of the similarities, archaeologists have generally been loathe to suggest there is any association between these two ceramics traditions except that they

may have shared a common origin far away at a still undiscovered location to the west. This view may be shifting in light of Craib's observations concerning the early Mariana artifact assemblage . . . "it does at least, demonstrate that by 3,500 years ago, people having an assemblage virtually identical to that found at Lapita sites were moving eastwards into the Pacific" (Craib 1999:47).

Table 2.3 (adapted from Kirch 2000)
Selected Low Island Archaeological Sites in Micronesia

Island Group	Site (Island)	Age Range (B.P.)
Carolines	Bolipi	1,000
	Fais Island	1,700 – recent
	Ngulu Island	1,700?
	Sabaig site	1,000
	Sapwtakai	700 - 300
Marshals	Kwajelein	2,200 – 2,000
	Laura (Majuro)	2,000 – 1,800
	Maloelap	1,900
Nukuoro		1,200 - recent
Kapingamarangi		700 - recent

Although there is evidence (Intoh 1997)of contact north to the Bonin Islands based on stone adzes found there, he feels their presence there is best accounted for by drift and dismisses this route for any systematic or regular voyaging. However, other researchers (Rainbird 1994:335) note north-south movement through Mariana Islands is suggested by sherds and clay sources on Aguijan. Overall, the direct archaeological evidence for exchange between the Mariana Islands and other islands is not strongly compelling. Intoh comments he sees little contact between

Guam, Yap, and Palau since "the material culture other than the pottery of Yap and Palau is significantly different than the Marianas" (Intoh 1997:19).

In the Mariana Islands prior to 1950 primary work was limited to that of Hornbostel (Thompson 1932; Thompson 1940). Osborne conducted some work on Guam in the late 1940s before moving on to Palau (Osborne 1947). Based on his research in the Mariana Islands in the 1950s Spoehr published the first substantial archaeological sequence for the archipelago (Spoehr 1952),(Spoehr 1957) that relegated the Marianas Red Ware to the early period with the Marianas Plain Ware associated with the later *Latte* Period. Both the chronology and the pottery classification schemes have been subsequently refined and updated by later researchers. Spoehr reported dates of some depth on Saipan but these being derived from shell, were not widely accepted. Later excavations eventually yielded much older dates for the Marianas (Butler 1994) from the same sites. In the mid 1960s Reinman's efforts continued the field work on the island of Guam helping to refine the prehistoric occupation of the island through substantiating Spoehr's dates by obtaining similar data on charcoal and his work on sites located in the interior of the island (Reinman 1977).

By the 1970s work in the region was on the increase, fueled in part by the infusion of funding from government mandated projects conducted under the auspices of Cultural Resource Management (CRM) firms. As in other regions of the United States, the role of CRM (Green and Doershuk 1998) has been instrumental in research as funding from traditional sources was increasingly less available. While the profession had again become engaged with issues of prehistory, results of the work have been largely inaccessible to researchers working outside the region who lack the means to access the growing body of gray literature generated through CRM projects. The quality of work produced by the private sector ranged from simple descriptive reports to solid contributions to the scholarly knowledge of the regional prehistory. Many of the CRM researchers have conscientiously published their findings in journals but a large amount of information is only available in the CRM reports. The Hunter Anderson volume noted earlier provided a much needed compendium through 1990. Shortly after publication of the *Micronesica* volume, the assessment of three excavations provided data that altered the interpretation of the Mariana sequence significantly.

In two recent articles, one by Craib and the other by Moore and Hunter-Anderson, overviews of excavations undertaken during the first half of the 1990s are presented which outline important discoveries made at

the sites of Chalan Piao and Achugao on Saipan as well as Unai Chulu on Tinian. These three sites produced dates between 3,000 and 3,600 BP. A unique aspect of these sites is the occurrence of decorated pottery at the earliest levels (Craib 1999). Chalan Piao is the site from which in 1957 Spoehr reported obtaining a very early date. Beyond the presence of early decorated ceramics is documentation of design changes over time in the ceramic assemblages (Moore and Hunter-Anderson 1999). After pottery the next most common artifact reported in the assemblage are shell ornaments made from *Conus*. No adzes were reported in the early deposits.

Independent of archaeological data recovery, core samples provide indirect evidence of human habitation (Athens and Ward 1995). Borings in two separate areas (swamp and inland valley) yielded a spectrum of dates which broadly support the chronology derived from the archaeological excavations. The swamp core samples span 7,000 years with increased charcoal levels beginning at 3,550 BP. Other samples, possibly as early as 4,300 BP in the Pago Valley on Guam suggest earlier human activities on the island than dates derived from the data associated with archaeological sites. In each case, the core samples detect increases in the quantity of charcoal and changes in the pollen profiles suggesting alterations to the ecology of the island consistent with

human occupation. If this line of evidence is substantiated by the recovery of archaeological materials from a similar time frame, researchers may have to adjust their models and explanations of Pacific prehistory to better account for the evidence from the Mariana Archipelago.

Archaeological periods for Guam can be categorized based on the absence or appearance of large stone pillars called *latte*. As a general rule, there is also an associated transition to the use of Mariana Plain-ware in lieu of the Mariana Red-ware common in the pre *latte* period. The *latte* are in effect a marker signifying a transition from the early portion of cultural sequence into the cultural period and traditions that the Spanish encountered during their first forays into the Mariana Archipelago. The *latte* sites exhibit considerable variability in their characteristics. *Latte* sets are characteristically found in clusters. Based on historical accounts from the early Spanish period the *latte* are remnants of dwellings, corroborated by the presence of residential trash deposits in close association with the *latte,* also indicative of a habitation site. However, other functions (such as canoe houses) can not be ruled out.

The end of the *latte* period on Guam is demarked by the arrival of Spanish ships marking the beginning of the ethnohistoric records.

Documentation of early contacts with the Islas de la Ladrones, so named on early European maps, is from a variety of sources. Although the Mariana Islands were not a primary destination, the logs of vessels (Pigafetta 1969), personal journals, accounts of scientific expeditions and various official reports provide important information. There are several publications which have compiled this information into well known secondary sources covering the history of Guam. Most recently this would include *Destiny's Landfall* (Rogers 1995), and three decades earlier *The History of Guam* (Carano and Sanchez 1964) and *Guam Past and Present* (Beardsley 1964). Even though the original documents are often not readily available, there are compendia of source documents which provide transcripts and translations of some primary accounts of events [(Lévesque 1993) and (Safford 1901) are examples of these works]. There have been a range of articles in journals relevant to the early history of Guam although this is not an extensive body of literature. The information which follows generally relies on the chronology and major events presented by Rogers. The census and other data has been extracted from Rogers as well Carano and Sanchez with the understanding that given the nature of the primary sources the data are subject to possible biases and varying interpretations.

After Magellan's initial contact in 1521, Chamorro interactions with the outside European world remained very limited until the establishment of a formal Spanish presence on Guam in 1668. Spanish voyages of 1526 and 1527 reached Guam, the latter capturing eleven Chamorro for slave labor aboard the ship and undoubtedly shaping Chamorro attitudes toward the aliens. The Spanish made formal claim to Guam in January of 1565 when Miguel Lopez de Legazpi landed and remained there for several days. Unfortunately his encounters with the people of Guam, like those of Magellan in 1521, ended in violence toward the islanders. Other Spanish vessels visited the islands in 1566 and 1568. By 1570 the Spanish had firmly entrenched themselves in the Philippines and set up voyaging routes to and from Mexico. Thereafter Spanish galleons continued infrequent but regular contact with Guam as an outgrowth of these voyages, instituting a pattern of bartering objects of iron for local goods. This was a common practice throughout most of the Pacific. Upon reaching the Mariana Islands toward the end of an arduous trans-Pacific journey the laying on of fresh water and supplies was crucial. The normal eastbound route from the Philippines took the vessels well north of the Mariana archipelago. The westbound track, following the northeast tradewinds and north equatorial current, grazed the southern end of the

island chain with some vessels passing between Rota and Guam as Magellan did in 1521.

Not all interactions between the Spanish and the Chamorro were limited to short term bartering and exchange. Of historic significance was the survival of several castaways or deserters, who would later play roles in the Spanish occupation of the archipelago. In 1596 three other Spaniards including one Franciscan friar, were marooned, on the islands for a year after going ashore for a brief visit. Under similar circumstances in 1602 two friars remained for seven months. Shipwrecks such as that of the *Concepción* in 1638 cast survivors ashore to meet their respective fates at the hands of the Chamorro. Their treatment ranged from murder to their being cared for and returned safely to their compatriots. However, even incidental contacts brought to the Mariana Islands exotic animals, plants, and possibly European genes and human diseases that would eventually have a significant effect on the overall ecology of the islands and the indigenous human population. Accounts from people who survived these events indicated little apparent change in Chamorro society as a result of initial European contact. In 1588, 1600, 1616 and 1625 other visitors to the islands included vessels from off and on again antagonists of Spain, notably the British and Dutch.

Colonization and *reducción* (1662-1698). Just over one hundred years after Legazpi claimed the archipelago, the first planned Spanish religious enclave was established in 1668. In response to the lobbying efforts of Fr. Diego Luis de San Vitores he was granted permission to establish a permanent Jesuit mission on Guam. His initial exposure to Guam occurred during a 1662 voyage to Manila. Six years later, with the landing of an approximately fifty person contingent, the incidental contacts with the Chamorro throughout the prior century began to be elevated to a full scale colonization, complete with European domesticated animals. The population of Guam was estimated at 12,000 in 1662 (Rogers 1995:47) with a total population of the archipelago of between 24,000 and 30,000 although other estimates vary (Shell 2001).

With the Spanish foothold on Guam the genocide of the Chamorro through the *reducción*, a strategy that was similarly imposed on other indigenous people throughout the Spanish colonies, could commence. This process would eventually result in the forced resettlement of the Chamorro who survived the next three decades, including those from the entire inhabited Mariana Islands, from their traditional settlements to living in villages located and placed to allow effective centralized control by the Spanish religious and political authorities. This was accomplished by the skillful manipulation of tensions between rival villages, Christian and

non-Christian Chamorro, as well as co-opting the lower status interior dwelling *manachang* to fight against the higher status *chamorri*. The abandonment of traditional lifeways, including village sites, reorganized and redistributed the entire indigenous Chamorro population of the Mariana Archipelago, including Guam.

The murder of San Vitores and Calonsor at the hands of the Chamorro in 1672 set the stage for continuing hostilities between the Spanish and the Chamorro until almost the end of the seventeenth century. During this period the Chamorro population was assailed by Spanish military campaigns, natural disasters, and a series of epidemics with those of 1688, 1689 and 1693 serious enough to be recounted in records of the period. The Chamorro were not passive in response to the actions of the Spanish, with periods of intermittent violence being commonplace and large scale rebellions breaking out in 1670 and 1684. Scorched earth practices and the resultant social upheaval dislocated many Chamorro including a sizable number who fled Guam for the northern islands. Between 1694 and 1698 the remnants of the Chamorro population on the northern islands were forcibly returned to Guam. With the almost complete depopulation of the Chamorro from these islands and their resettlement on Guam *reducción* of the Chamorro was substantially completed. The toll on the human population size was

considerable. In 1690, before the completion of the *reducción* only an estimated 7,000 were living on all of the islands. After the 1693 epidemic it dropped even further (Rogers 1995:72). By 1710 the official Spanish census reports a population of 3,539. This number was further reduced to 1,576 in 1742 according to Jesuit data (Rogers 1995:79).

The period from the start of the eighteenth century until the United States occupation was characterized by withering interest in Guam by the Spanish colonial administrators. Not willing to abandon the Mariana Islands for strategic reasons (including protecting the galleon trade) , the island governors were essentially left to fend for themselves with limited resources available to protect the outpost from the enemies of Spain during episodes of international warfare. In a major religious upheaval, the Jesuits were expelled in 1769, marking the end of a century of Jesuit involvement in the Mariana Archipelago. In 1779 a chickenpox epidemic left the Chamorro population at 1,608. Thus they numbered less than the non-Chamorro residents whose population was reported to be 1,623 in the 1783 census. International geopolitical interest in the Pacific grew in the latter part of the century causing expeditions to be sent out to gather information. Visits from vessels brought additional exposure to disease with little other benefits to the isolated archipelago. A smallpox epidemic lasted for three months during the final quarter of 1794.

Spain was occupied by war and rebellions for the most of the last decade of the century and these conflicts continued well into the nineteenth century. The instability of the times eventually led to the termination of the Pacific galleon trade in 1813. No supplies reached Guam for almost five years and was followed by a period when the colonial administration had to operate on a substantially reduced *situado*, the funds provided by Spain to govern the island. The *situado* was eventually eliminated completely in 1855. The waning of Spain's power left the local officials in a better position to further their own interests. Provisioning whaling ships became important to the local economy at least through the 1840s. A severe influenza epidemic was introduced in 1849 that turned out to be insignificant compared to the devastating smallpox epidemic of 1856. According to one historian (Rogers 1995) the dead, mostly of Chamorro ancestry, totaled 5,534 of the 8,775 total population, leaving 3,241 living. However, this figure is not consistent with census data of 1871 that shows a total population of 6,276 (Underwood 1973). The doubling of the population in only twenty one years does not seem feasible. Other source documents (Safford 1901:445) report a 2/5 mortality from the epidemic without citing actual counts. Regardless of the exact number of deaths, the epidemic of 1856 had a direct impact on

the population that would be reported in the 1897 census recovered when Guam became a U.S. possession in the following year.

The discovery of gold in 1849 generated increased attention from the U.S. government in the west coast states bringing an increased American presence in the Pacific for the last half of the nineteenth century. Toward the end of the 1850s the situation on Guam was grim. Typhoons, epidemics and an earthquake devastated the island. The end of the *situado* left few funds available for reconstruction. The Spanish were planning to transfer large numbers of convicts to Guam as part of a plan to create penal colonies in Micronesia. An influx of *deportados* occurred in 1870 and 1894. The 1887 population estimates were 9,770 with 8,618 listed as Chamorro. While Chamorro affiliation was adopted by some merely to avoid taxation, for most it continued to denote a meaningful cultural identity. The Spanish authorities were never successful in suppressing the Chamorro identity through extermination, immigration, assimilation or other means of blending the Chamorro into a hybridized population. The resilient identity of the Chamorro, reinforced by the Chamorro language, continued to serve effectively as a mechanism of acculturation for each succeeding generation. The Chamorro adopted certain alien customs but retained an identity distinct from the Spanish, Filipino, and Carolinians who also co-inhabited Guam for varying periods

of time. With respect to this study, the adoption of Spanish surnames by an indigenous Oceanic population provides an added dimension for pursuing issues associated with their population structure.

The capture of Guam by the U.S during the Spanish-American War brought the Spanish colonial period to an abrupt end in 1898. Spain divested itself of the other Mariana Islands by selling them to Germany. The Spanish census of the time placed the number of Chamorro at 8,618. An American census in 1901 found 9,630 "citizens of Guam" which excluded American citizens and United States military personnel. Except for the 1918 influenza pandemic the population has continued to increase throughout the twentieth century, avoiding the pattern of growth and crash described by Underwood (Underwood 1973). Unfortunately, most of the indigenous populations across the globe who came into contact with Europeans followed the pattern of population decimation documented for the inhabitants of the Marianas archipelago. In the case of the Chamorro the reduction of the population seems especially dramatic. Estimates of the indigenous population of the Marianas at the time of initial contact is placed variously between 40,000 and 73,000 (Thompson 1945):30. This number dropped precipitously to roughly 1,500 by the late seventeenth century (Underwood 1973). Even using the most

conservative estimates of the pre-contact population, this represents an almost complete extinction of the population in less than a century.

Ethnography. Modern ethnographic resources available for the Chamorro of Guam are at best sparse as is information on the ancient Chamorro. Information available regarding early contact data are neither robust nor extensive. Consequently, knowledge of the early contact Chamorro culture is a blurred mosaic of information gleaned from mainly incidental accounts. While some of the observations were insightful, none are comprehensive or involved with anthropological studies. In *Ancient Chamorro Kinship Organization* (Cunningham 1984) the author attempted to synthesize information on one aspect of pre-contact Chamorro culture. The early archaeological work, with its focus on artifacts, origins and chronology, placed primary emphasis on the material aspects of the prehistoric Chamorro. More recent studies have shifted their emphasis and may reveal important behavioral patterns about the pre-contact Chamorro but they will remain a very poor substitute for information generated by an actual ethnography.

It would be remiss not to point out that the Chamorro at contact were not a static isolated people but had indicators of ongoing change present within their society. Clearly the presence of rice and perhaps iron indicated if not a steady, at least a punctuated pattern of significant

external influences on the culture. The cultivation of rice especially would imply a substantial level of transference of complex knowledge perhaps beyond what can be conveyed via a circuit of simple exchange. Further, historic accounts document landfall on the Mariana Islands of vessels from several distant origins in insular Asia. The replications of Pacific voyaging techniques (Lewis 1992) as well as the development of sophisticated models and computer simulations (Irwin 1992; Irwin 1998) of these journeys underscore the feasibility of similar events occurring in pre-contact times when the necessity and frequency of long range voyaging were probably much higher.

At present there is no complete ethnography of the Chamorro although research is ongoing in several facets of Chamorro contemporary culture. At the turn of the century *The Chamorro: a history and ethnography of the Marianas* was published by Georg Fritz in 1904. It was initially printed in German and not widely available. In 1986 the edited version, an English translation, was released (Fritz 1986). Fritz was posted to the island of Rota as an administrator soon after the acquisition of the island by Germany from the Spanish. The anthropologist Ralph Linton in 1926 made passing mention of the Mariana Islands (Linton 1926). Immediately prior to the second world war Laura Thompson spent a limited amount of time conducting anthropological fieldwork among the

Chamorro. Her research was curtailed with the threat of Japanese invasion in the early 1940s. She first disseminated her work in the Bishop Museum Bulletin series (Thompson 1945). In 1941 the first edition of her book *Guam and Its Peoples* (Thompson 1947) was published providing an overview of her research on the island with an emphasis on educational planning.

Studies by anthropologists after the mid twentieth century focused on demography, population studies, fertility and woman's roles among the Chamorro. Underwood began publishing the results of her initial research in the early 1970s with additional articles throughout the 1990s. Issues relevant to long term fertility trends have been pursued (Levin and Retherford 1986; Tung 1982). Also research in the early 1990s by Workman and Souder contributed to the literature on the Chamorro with articles emphasizing family and women's roles (Souder 1992) in contemporary Chamorro society and related matters of fertility (Pobutsky 2001; Workman 1992). Although, not directly germane to isonymy research, the Micronesian Area Research Center (M.A.R.C.) at the University of Guam does house a number of manuscripts and dissertations (e.g. Sister Teresa del Valle 1979) relevant to Chamorro ethnography. Outside of the traditional anthropological literature, several individuals have developed extensive genealogical data sets on the Chamorro (e.g. Paul. Souder and

Allan Williams). Hard copies and computer files of this data were available at M.A.R.C. in 1996. These genealogical data sets can be extremely informative and immensely valuable for establishing relationships of ancestry and descent for individuals. However, genealogical data sets have only minimal relevance for studies that focus on the intergenerational demographic patterns of superfamilial cohorts and populations. While there is ongoing research and the body of literature is growing, there has been no complete ethnographic or bioanthropological study on Guam or the Chamorro.

Table 2.4 Guam Historic Periods (after Underwood 1973)

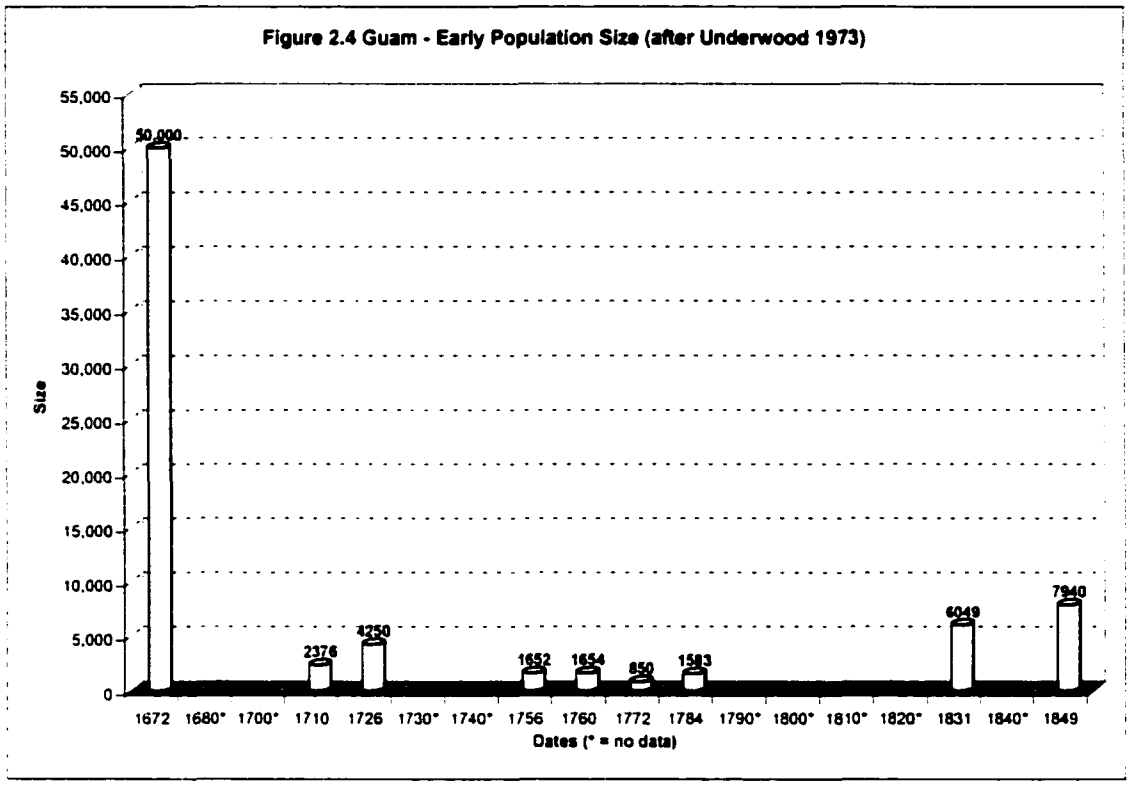
Dates	Events
1521 to 1668	Period of initial contact including intermittent exposure to European influences
1669 to 1786	Colonization, period of intensive control and domination by the Spanish colonial authorities with drastic population declines
1787 to 1898	Re-integration of neo Chamorro culture and numerical recovery of the population
1899 to 1950	Colonial period characterized by rapid population growth and expansion including reoccupation of abandoned islands

The sub-divisions of the population history of the Mariana Islands proposed by Underwood (Underwood 1973) remains appropriate and provides a means of summarizing the information presented in this chapter (see Table 2.3). Only a few decades after colonization the

Chamorro population was in the throws of accommodating to catastrophic demographic changes. There is certainly no doubt of the dramatic degree of the quantitative change the indigenous population of the island chain underwent after contact with Europeans. Through the depopulation process the survivors morphed into what is termed by Underwood the neo-Chamorro (Underwood 1976). What is less clear is to what degree the pre-contact genetic constitution of the population was impacted. Underwood's comment on this point is especially germane: "A number of reports on the early population history of these islands tends to denigrate the relative contribution of indigenes to the gene pool of the neo-Chamorros (Underwood 1976:204)." Underwood is not alone in the view that the admixture of European and Asian genes into the Chamorro has been substantial. Howell's assessment of the anthropometric, genetic and osteological data leads him to state (Howells 1973:247):

> "Nevertheless it may be that the Chamorros have not been as fully denatured as the historical data suggest, if the sample measured on Saipan and used in my analysis still takes the position it does. In addition, blood evidence . . . fails to suggest substantial European or Asiatic hybridizing with the Chamorros."

The remarkable tenacity of the Chamorro culture may have also served to prevent a complete swamping of the indigenous gene pool.



Through the course of events discussed in this chapter the native population of the Mariana Islands has gone through severe bottlenecks and was subsequently reconstituted with its numbers on the increase, with occasional mild setbacks, since approximately 1860. The evidence suggests the rise in population was not from the immigration of outsiders to the Mariana Islands but rather the natural population expansion of the neo-Chamorro community living on Guam. The next chapter presents a review of the literature for the application of isonymy to population structure studies and associated methodology.

Chapter 3. **METHODS AND PRIOR RESEARCH**

Throughout most of it's history the methodology of genetic analysis has traditionally focused almost exclusively on the patterns of inheritance associated with nuclear DNA. However, during the last decades of the twentieth century developments in the intergenerational transmission of DNA outside of the cell nucleus have enabled new lines of research to emerge. In the case of mtDNA studies, they have allowed the construction of lineages of inheritance almost wholly associated with the maternal line of inheritance (Lum and Cann 1998; Sykes, et al. 1995). To complement these matrifocused studies other human geneticists have pursued research strategies that focus on establishing lineages of genetic inheritance solely through the Y chromosome (Su, et al. 2000), *inter alia*.

Interestingly, several researchers observed as early as 1967 that the application of isonymy in patrilineal societies parallels the transmission patterns of neutral alleles of a gene inherited only through the Y chromosome (Cavalli-Sforza and Bodmer 1971; Yasuda, et al. 1974; Yasuda and Furusho 1971; Yasuda and Morton 1967). Recent research (Sykes and Irven 2000) indicates that in a randomly derived sample of males from the British isles having the same surname, almost half shared the same Y-chromosome haplotype, indicating that studies of isonymy are clearly capable of providing meaningful information relevant to the

structure of modern human populations. As noted elsewhere is this document, modern surname analysis finds its antecedents in the era of Charles Darwin (Darwin 1875; Watson and Galton 1875). Since that time surname studies have developed along several paths, including those assessing the implications of marriage partners possessing the same last name. Recently researchers (Barrai, et al. 2001:110) observed that inbreeding estimates based on isonymy often result in overestimates, but that surnames can yield information that would be appropriate "for testing hypotheses about migration, drift and admixture" as well other aspects of human microevolution and population structure.

Not all surname systems are limited to tracing ancestral descent through only a unilineal maternal or paternal pattern. Dual surname systems, typically associated with societies where Spanish or Portuguese is spoken, offer the added dimension of being able to derive matrilineal inheritance data in addition to information on the male lineage. Such surname systems provide researchers with the potential, in a single analytical tool, of extracting information from both the patrilineal and matrilineal lines of descent. In addition, isonymy studies avoid the emphasis on individual oriented analysis associated with the Y chromosome, or with mtDNA, and even pedigree based studies of genetic inheritance. In contrast, isonymy, by its nature, facilitates analysis

at the aggregate or population level. Isonymy has the potential to achieve reasonably close concordance with inbreeding coefficients obtained by traditional methods such as pedigree analysis (Rogers 1987). Close concordance is most likely to be obtained when the underlying assumptions (see below) for the methods of isonymy are met and appropriate care is taken in selecting the samples used for comparison.

Isonymy is a coarse analytical methodology, not in the same league with the sophisticated techniques of modern population genetics. While it is normally preferable to conduct microevolutionary studies using samples and methods offering greater resolution and confidence levels than isonymy provides, overriding factors often prevent initiating a more desirable form of analysis. One of the clear advantages of isonymy studies is that they can often be undertaken when other more refined types of analysis can not. In some cases the population in question lacks the type of genetic or genealogical data needed for a particular analytical method or the data hasn't been collected in an appropriate manner. In other instances it is neither feasible nor cost effective to procure the kind or quantity of data required for a more sophisticated kind of analysis. Under certain circumstances prohibitions on working with human subjects, unfavorable attitudes toward scientific investigations or cultural sensitivities may prohibit or severely restrict genetic or

genealogical research. Studies dealing with historic populations and demographic data, of which Guam is an example, obviously are confined to conducting research on the existing archival data. In a large number of these situations, isonymy is the sole methodology available to the researcher.

Regardless of the surname system associated with the population under study, investigating a population by employing the methods of isonymy is premised on several assumptions. These were first articulated by James Crow and Arthur Mange (Crow and Mange 1965) with later elaboration by Crow throughout the 1980s (Crow 1980; Crow 1983; Crow 1989) as well as contributions and further discussion by Gabriel Lasker in a number of important articles, not to mention the sole book on the topic, *Surnames and Genetic Structure* (Lasker 1985). Although Crow and Lasker have been two of the major researchers in the methods of isonymy, others have made important contributions in isonymy methodology. Isonymy as a tool for investigating facets of population structure has been brought to bear on studies well beyond its original application. Given the range of studies that the methods of isonymy has been applied to, the precise effect of violating any of the assumptions will vary from study to study. Fundamentally, violating the assumptions of isonymy can result in a potential loss in the credibility of the measures calculated.

The most far reaching assumption in isonymy is that surnames must follow biological inheritance with identical surnames indicating common ancestry. This precludes the presence of mechanisms that would have generated identical surnames among people who are not related by descent. The above assumption would be violated if members of the population assumed surnames based on a common identity or affiliation. For example, adoption of the name "Woods" by unrelated people living in forested regions would represent a violation of the assumption. Surnames in a population with a single origin are termed monophyletic and acceptable for studies of isonymy. Obviously names with multiple origins are considered polyphyletic and not suitable for studies based on isonymy.

An associated assumption is that name spellings have not been changed or altered which has been equated to an analogy of mutation. In other words, surnames should not become identical or lose their orthographic equivalence due to cacographic entries. Further, naming protocols within the population should have been consistently honored in order to avoid individuals arbitrarily changing their names during their lifetime. Such changes would have similar consequences to that of an adoptive child assuming the adoptive parental surname.

Other theoretical premises can be difficult to meet when considering inbreeding values from isonymy. One is that isonymy inbreeding estimates are relative to a founding population where each member had a distinct surname and the males and females were equally represented. Finally, if the comparative values calculated refer back to founding populations with differing historical depths, there are possible implications for the validity of the reported values.

Regardless of the perceived limitations by certain researchers, isonymy has been applied to a wide range of studies as evidenced in the earlier chapter on prior research. The misapplication of isonymy by some does not negate the relevance of using isonymy in the appropriate circumstances. As noted above, some of the limitations are with underlying theoretical issues inherent to population studies in general which become more pronounced under the constraints of using isonymy. Most of the difficulties inherent to studies of isonymy have been well articulated, beginning with the Crow and Mange article, providing ample opportunity to those interested in applying the methods to make accommodations. Consequently, there have been numerous studies that have specifically addressed one or more of the limitations of isonymy which have led to important refinements in the methodology since its rise

in popularity (Cabello and Krieger 1991; Kosten and Mitchell 1990; Relethford 1988).

Proponents of isonymy have not been reticent to draw attention to the favorable attributes of this methodology (Crow 1989; Lasker 1985), *inter alia*. They point out that isonymy can measure inbreeding beyond the time depth of pedigree analysis. Similar to the work of Sewall Wright, who partitioned the inbreeding coefficient, isonymy allows the separation of inbreeding values into random and non-random components facilitating a more refined view of population structure. With respect to sampling, the large number of names characteristically employed in studies of isonymy normally lessens concerns about the sample size being adequate. Surnames are a lexical artifact of human societies and are not directly associated with the genetic properties of the population being investigated and hence can be used as neutral traits when appropriate. In contrast to the technologically complex and analytically intensive methods of modern genetic analysis, isonymy remains a relatively direct and cost effective approach to the study of population structure.

Isonymy is most harshly criticized, usually based on instances of questionable theoretical underpinning, when the results are offered as absolute values with respect to levels of inbreeding, especially if used as a measure for comparisons between populations (Rogers 1990). It is difficult

for all of the assumptions of isonymy to be met in a natural population as a baseline for comparing data. However, relative measures provided by isonymy can still be useful. As Relethford (Relethford 1995:481) notes "comparison of values from the same sample over time can still be useful in detecting temporal trends in relative homozygosity". The validity of applying isonymy in this manner is supported by the previously noted works of Lasker and Relethford as well as Mielke and Swedlund who write concerning isonymy:

> "By the careful analysis of actual marriage records in a population it is possible to refine considerably the empirical estimates of inbreeding in a population and also to understand better the processes by which inbreeding comes about."(Mielke and Swedlund 1993:59)

How to use the methods of isonymy most effectively can best be illustrated and justified through a discussion of the methodological approaches which have been utilized in population studies employing isonymy. A review of several selected studies emphasizing their methodology will be offered below. The objective is not to provide a comprehensive compendium of surname studies, which was done in the history of research chapter, but rather to highlight the methods used by the researchers in order to provide a context for the methods employed in the analysis of the Guam population. The first two represent studies that developed critical methodology for investigations employing the

techniques of isonymy. The second set of studies focus on methodological issues associated with investigations in which dual surname systems are present. The work of George Darwin, an early formative isonymy study, was mentioned earlier within the context of the historical development of isonymy.

The defining paper for the modern study of isonymy is *The measurement of inbreeding from the frequency of marriages between persons of the same surname* (Crow and Mange 1965). The authors observed that in many cultures the intergenerational transmission of the surname was done in a fashion and pattern that was consistent with biological ancestry. They noted that, for the most common types of marital unions, isonymous marriages reflected the same level of inbreeding regardless of the actual degree of consanguinity between the marriage partners (see Table 3.1). They proposed that in societies with such a mode of surname transmission "the frequency of marriages between persons of the same name can be used as a measure of inbreeding" (Crow and Mange 1965:200). The isonymy formula developed by Crow and Mange enables the computation of a theoretical inbreeding coefficient. In keeping with the assumptions of isonymy already discussed, the population must be balanced with

respect to the numbers of males and females as well as the number of offspring per couple.

FIGURE 3.1 (after Crow and Mange 1965)			
Relationship of Parents	Probability of having same surname	Inbreeding coefficient of Children	
	P	F	P/F
Sib	1	1/4	4
Half and first cousins	3/8	3/32	4
1st Cousins, double half cousins	1/4	1/16	4
Half cousins, first cousins one removed	1/8	1/32	4

Based on the relationship Crow and Mange elucidated between the inbreeding coefficient and the probability of having the same surname, a formula (1) was offered where the fraction *P* of isonymous relationships is reflective of a population inbreeding coefficient of:

$$F = P/4 \qquad (1)$$

For example, the probability of two first cousins of different genders possessing identical surnames is ¼ and the inbreeding coefficient of their progeny would be 1/16. Likewise, the probability of two second cousins having the same surname is 1/16 and the inbreeding coefficient of their offspring is 1/64. Based on these and other relationships shown in Table 3.1, it is apparent that for the cases presented the probability of an isonymous relationship is four times the inbreeding coefficient. After

establishing the proportion (P) of isonymous marriages in a population, the average inbreeding level could be approximated by dividing P by four.

There are exceptions to this principle as Crow and Mange (1965:200) noted: "it does not apply to marriages where one partner is a direct descendant of the other, such as a father-daughter marriage." or . . . "for some types of cumulative inbreeding, such as two or more generations of sib marriage." While the exceptions to the principle represent a majority of the possible types of relationships, in actuality the exceptions constitute a small minority that are readily identified. Consequently, there has been general concurrence across the spectrum of isonymy studies that the majority of common marital relationships fall under this principle.

Crow and Mange went on to discuss the relationship between the random and non-random components of inbreeding expressed as:

$$\sum p_i q_i \qquad (2)$$

$$F_r = \left(\sum_x^2\right)/4 \qquad (3)$$

$$F_r = \left(\sum p_i q_i\right)/4 \qquad (4)$$

$$F_n = \left(P - \sum p_i q_i\right)/4\left(1 - \sum p_i q_i\right)/4 \qquad (5)$$

$$F = F_r + F_n\left(1 - F_r\right) \qquad (6)$$

Formula 2 is used to calculate the total number of isonymous marriages expected at random in a population. Random isonymy is

calculated by formula 3 and formula 4 for populations with equal or unequal sex distributions respectively. Formula 5 enables the calculation of the non-random component of the inbreeding coefficient. Formula 6 (designated simply as *F* by Crow and Mange) represents total inbreeding and is often designated as F_t. Since the initial formulas were proposed by Crow and Mange modifications and refinements have been offered (Jorde and Morgan 1987; Lasker 1985; Relethford 1988) but the basic calculations are the same as shown in formulas 7-10 which have been used for more recent publications employing isonymy (Hernandez, et al. 2000; Mathias, et al. 2000).

$$F_r = \left(\sum_{\tau}^{2}\right)/4 \qquad (7)$$

$$F_r^{*} = \left(\sum p_i q_i\right)/4 \qquad (8)$$

$$F_n = \left(P - \sum p_i q_i\right)/4\left(1 - \sum p_i q_i\right)/4 \qquad (9)$$

$$F_t = F_r + F_n\left(1 - F_r\right) \qquad (10)$$

A common observation made in population studies using the methods of isonymy was the lack of consistency between values derived from isonymy and other methods. Isonymy derived inbreeding coefficients tended to consistently overestimate the actual inbreeding coefficient for the population in question. This lack of concordance between inbreeding coefficients from isonymy and the inbreeding coefficients calculated from the use of other methods was even reported

for studies based on the same population. The general assumption was that the other methods were less subject to biases and therefore more reliable, yielding more consistent results than those obtained from isonymy. Explanations offered for the discrepancies between isonimic calculations and calculations based on the use of other methods included the presence of polyphyletic names, cumulative inbreeding being expressed in the lineage under study or other violations of the assumptions underlying isonymy.

Table 3.2 Selected Comparisons Of *F* Measured By The Isonymy Method For Different Types Of Samples Circa 1800 (after Rogers 1987)

Sample	N	Method of computing F	Characteristic of computed F	F	Pedigree / Isonymy X 100
Marriage Cohort: 1791-1810 *F* of theoretical children of mating pairs	80	Pedigree	Assumes all couples have equal number of offspring	.0162	102%
Marriage Cohort: 1791-1810 *F* of actual children at birth	189	Pedigree	Based on the actual number of offspring	.0211	133%
Marriage Cohort: 1791-1810 *F* of actual children surviving to age 20	121	Pedigree	Based on the actual number of offspring who survive to 20	.0166	104%

In a study comparing pedigree and isonymy values among the Alexanderwohl Mennonites another category of errors was suggested (Rogers 1987). Her work carefully compared how sample composition with pedigree data could effect inbreeding coefficient values. Rogers'

work elucidated several key issues concerning sample construction with respect to pedigree analysis that are worth noting in light of conducting analysis by isonymy.

Fundamental to the problem is the inherent underlying premise with respect to the analysis being conducted. Isonymy, in its strictest sense, is making a theoretical prediction of the level of inbreeding based on data derived from the parent population. This has led to the label "marital isonymy" often being applied to such studies. According to Rogers, the application of the calculation for the inbreeding coefficient measured by marital isonymy provides a theoretical value for the offspring of the parents that is based on the assumption that all mating pairs have an equal number of progeny and relies on a sample of the parental population. However, many isonymy studies calculate isonymy based on actual marriages which can lead to a disparity between the values obtained compared to the values obtained from pedigree data.

Rogers contrasts this approach with the pedigree method that is based on samples of individuals resulting in an inbreeding coefficient of either the theoretical or actual offspring of mating pairs. Pedigrees by their definition are an amalgamation of information about the descent line of single individuals. Rogers in her work made careful distinctions

when contrasting inbreeding rates of isonymy and pedigrees (see Table 3.2).

Adjustments can be made in the configuration of the sample in pedigree calculations to bring the results of calculations from both methods of deriving inbreeding coefficients into closer agreement. The concordance between isonymy and pedigree derived inbreeding coefficients is expressed as a percentage in the following way:

$$\% \text{ concordance} = \text{pedigree/isonymy} \times 100$$

This figure for the Alexanderwohl Mennonites is shown in the last column in Table 3.2.

Rogers pointed out that the best concordance between the values obtained from isonymy and pedigree data was obtained using a "natural population" when the pedigree side of the assessment was constructed to be comparable with the assumptions and data structure inherent in isonymy studies. By doing this she was able to show a difference in results from the effects of sample selection when undertaking pedigree analysis arguing (Rogers 1984:14)"this difference has not been pointed out in previous studies." Analysis using such an approach recognizes the role cohort composition plays and how the associated variables (individuals, adults, progeny, etc.) can be factors in the degree of concordance exhibited between the samples.

It is also noteworthy that Rogers successfully attempted to adjust the pedigree side of the comparisons to bring better concordance between the samples. She did not make an effort to modify the isonymy side. Perhaps, given her data set, working with the pedigree data was easier or avoided violating some of the assumptions that need to be met in working with isonymy. What her research then failed to pursue is whether alterations could be made in analysis by isonymy to result in better consistency with pedigree data. Given the extensive and complex pedigree data she was working with it is understandable that less emphasis would be placed on the less established techniques of isonymy. One of the fundamental limitations of isonymy research is that marriages do not necessarily depict the process of microevolution which is predicated on differential reproduction through successive generations. This is both a result of the theoretical assumptions implicit in inbreeding coefficients as well as a problem associated with a marital isonymy data set.

Seeking concordance in the values has merit when the researcher has available data from both isonymy and pedigree calculations. However, this is most often not the case and ignores one of the major attractions of calculating inbreeding coefficients by isonymy – its ease and efficiency. While Rogers' approach clarifies some of the means

which can be employed to provide comparable values from calculations based on the pedigree method no suggestions were offered regarding what strategy could be employed to alter isonymy calculations to provide more consistent values. In order to do so, some basic issues need to be addressed. First, a correction should be made to allow conducting the calculations to reflect the results of differential reproduction in order to better align isonymy population calculations with the reality of human microevolution. This can be accomplished by shifting the calculations of the inbreeding coefficient from the parents to the offspring. This can not be accomplished in many of the cohorts used for marital isonymy studies because studies don't have data beyond the parent generation nor do they link parents to offspring.

Further, many studies in isonymy do not approximate natural populations that would be subject to microevolutionary processes but are the product of samples that facilitate the identification of isonymous couples. Such populations are not necessarily indicative of appropriately construed samples for microevolutionary analysis. For example, many of the studies obtain data from church records of ecclesiastical dispensations. It can hardly be argued that a cohort constructed in this manner approximates a natural or valid sample of a population. A close

to an ideal cohort for analysis would be one in which the data set did not require sampling.

Compared to the overall scope of surname and isonymy research, studies using dual surnames are represented by limited numbers of investigations in the English language literature. This is somewhat surprising, given the early (see below) mention of the possible utility of dual surnames in the study of consanguinity. It is common for a researcher to study a population with dual surnames or to note the presence or potential of dual surnames in the population under study (Crow and Mange 1965; Madrigal, et al. 2001; Rodriguez-Larralde and Barrai 1997; Rojas-Alvarado and Garza-Chapa 1994; Shaw 1960) but in few instances does the analysis actually include dual surnames. Limited numbers of total cases, biases inherent to certain sources, (e.g. ecclesiastical dispensations) and illegitimacy can pose problems for populations having dual surnames (Castro De Guerra, et al. 1990; Madrigal and Ware 1997). Several selected dual surname studies using methods of isonymy relevant to the Chamorro population on Guam are discussed below.

Although limited in its scope, the first article written concerning dual surnames (Shaw 1960) brought attention to the role dual surname systems might play in studies of consanguinity. The article was published five years

before the seminal modern isonymy article by James Crow and Arthur Mange that is discussed elsewhere in this chapter. Shaw did not have the advantage of working with a particular population or data set in the way that the researchers who followed him did. He proposed (Shaw 1960:200)"an index of consanguinity based upon the Spanish custom of using both a maternal and a paternal surname." Shaw pointed out that the last names of cousins is dependent upon the gender of the siblings who were the parents. He stressed "in every marriage of first cousins the spouses will have one surname alike." As Shaw himself notes:

> "The method, clearly, is a statistical one. Although the names will not tell whether a given marriage is consanguineous, when large numbers of marriages are considered those in which a surname is the same for the two spouses will be consanguineous much more often than the others. The index, or measure of consanguinity proposed here is thus simply the percentage of marriages in which the parents have one or more surnames alike (201)."

Shaw felt an advantage of using the index he proposed lies in the ready availability of name lists in many countries where the residents use a dual surname system. He proposed using the system to investigate diseases with unclear etiology where their appearance might be associated with recessive inheritance. Essentially his rationale was very similar to that of George Darwin nearly a century earlier but Shaw recognized that dual surname systems offered a different mechanism to

help identify persons of possible close genetic relationships that might have implications for their own health or the health of their offspring.

Given the brevity of Shaw's publication (one page in length printed over two pages) he presented only cursory information to explain and support the use of his index. The paper did not present any mathematical formulas or go into any details regarding other considerations concerning dual surnames or their implications for the study of population structure . He did address some difficulties he saw with using a surname index of consanguinity in lieu of more traditional techniques.

Eight years after Shaw's publication and three years after the research of Crow and Mange, Gabriel Lasker reported on the analysis of a data set collected from a Peruvian fishing community of approximately 2,200 inhabitants (Lasker 1967). The data was originally collected as part of an anthropometric study in 1958 at which time the surname information was recorded. Lasker acknowledged (Lasker 1967:255) that it was the discussion of inbreeding and isonymy in the Crow and Mange article "which stimulated this preliminary analysis of a fraction of our material". The surname data he collected included both the paternal and maternal surnames for each person. The isonymous relationships were categorized into 18 different types of relationships based on the pedigrees of the 204 informants. These 18 categories included isonymous relationships such as:

ego's father to spouse's father, ego's mother to ego's spouse's mother; ego's father's mother to spouse's mother's mother, etc., etc. The isonymous relationships were organized into a table of associations which is not replicated here in full but combined with data from an associated table. These isonymous relationships are represented by the letters A - R in the table that follows below (see "relationships" column Table 3.3).

Table 3.3 (adapted from Lasker 1967)						
Relation ship	Relationship to Informants to Individuals Pair for Isonymy		Isonymy		Other – Different Other	
	First	Second	Obs.	Exp.	Obs.	Exp.
A	EgoFa	SpoFa	6	7.52	4	3.76
B	EgoFa	SpoMo	11	6.37	8	5.93
C	EgoMo	SpoFa	8	7.17	3	3.24
D	EgoMo	SpoMo	8	6.15	10	5.57
E	SpoFa	SpoMo	5	5.06	12	5.90
F	EgoFa	EgoMo	4	5.53	20	6.94
G	EgoMo	EgoFaMo	5	5.15	15	8.75
H	EgoFa	EgoMoMo	6	5.16	9	6.23
I	EgoFaMo	EgoMoMo	6	5.16	11	7.25
J	EgoFa	EgoFaMo	4	5.33	16	7.38
K	EgoMo	EgoMoMo	8	5.01	16	8.53
L	EgoFa	SpoFaMo	9	5.37	5	6.01
M	EgoMo	SpoMoMo	6	4.61	13	8.33
N	EgoFa	SpoFaFa	3	5.96	8	5.95
O	EgoMo	SpoFaMo	7	4.22	10	8.70
P	EgoFaMo	SpoFaMo	3	1.56	0	0.20
Q	EgoMoMo	SpoMoMo				
R	EgoFaMo	SpoMoMo	3	1.54	0	0.31
Total			100.0	86.86	160	98.98
Fa=father, Spo=spouse, Mo=mother,						

It appears that the organization of the isonymy data was influenced by his collection of other pedigree based data leading to a focus on individual relationships rather than using collective categories for the types of isonymous relationships. Lasker's approach resulted in an effective enumeration of potential isonymous relationships. However, the sample is only a small portion of the total population leaving unanswered questions concerning how representative it was. Further, Lasker cited his prior research documenting an approximately 25% per generation effective immigration rate for the community. This may have implications with respect to confidence in the results, especially in light of the assumptions for isonymy discussed earlier in this section. Lasker did not follow the lead of Crow and Mange by computing inbreeding coefficients of isonymy for the population. As shown in Table 3.3 he limited his calculations to deriving the expected and observed number of isonymous marriages.

In this study Lasker recorded 100 instances of isonymy when 86.86 were expected. Without calculating inbreeding coefficients there was not a means to compare pedigree and isonymy data for inbreeding, an approach that has been used by other researchers (Mathias, et al. 2000; Rogers 1987). However, the systematic manner in which the data was compiled would allow additional calculations to be made concerning inbreeding. The data reported showed the level of isonymy from

generation to generation had increased over time. Although Lasker noted the potential difficulties in using isonymy, with respect to the assumptions already discussed, he commented (254) ". . . these reservations do not preclude the use of measures of isonymy in comparative studies as an index of relative degree of inbreeding in different communities of the same culture."

In another study of dual surnames the surnames were placed in one of three arbitrary divisions. Interestingly, although the Spanish tradition of dual surnames was explicitly mentioned, methods to take advantage of the extra surnames were not used. In the author's words (Pinto-Cisternas, et al. 1985a:354):

> "Following the Spanish tradition, in Venezuela each spouse carries two surnames, the first one corresponds to the father's line and the second one to the mother's line. However, illegitimacies generally carry only one surname: the mother's. This fact was taken into account in our study. So, when first and second surnames were present, we took only the first one. When only one surname was present, it was used. This last situation was present in 7.5% (13/173) of consanguineously- and 17.6% (122/691) of non-consanguineously-married males."

With respect to the assumptions for studies of isonymy "the origin of some surnames are monophyletic, others are polyphyletic. Since we are unable to detect the origin of each surname, in the present study we consider all the surnames as if they were monophyletic (Pinto-Cisternas, et al. 1985a:355)." Further the authors did not feel the presence of either

polyphyletic names or the illegitimacy of some individuals would invalidate their results. As with Lasker, expected and observed isonymy values were reported but in this instance only by the arbitrary divisions of "frequent", "intermediate" and "rare" in two categories of marriages. These included "Class A" (both spouses with same surname frequency class) and "Class B" (each spouse has a different surname frequency class). There was no indication given that pedigree data was collected on any of the subjects or that values from the Crow and Mange formulation were calculated although their work was cited. As a result no values for estimating inbreeding can be derived from this study. While it is laudable that an attempt was made to create surname classes, it would have been helpful if these were more universally applicable to other populations and quantifiable measures were established. Interestingly, the lead author of this study was able to do that in a subsequent article published during the same year, in a different journal, with two different co-authors.

In a sharp departure from his other article in 1985 Pinto-Cisternas, along with new co-authors Pineda and Barrai, published again using a far more sophisticated methodological approach for the analysis of populations employing dual surname systems (Pinto-Cisternas, et al. 1985b). The title, *Estimation of Inbreeding by Isonymy in Iberoamerican*

Populations: an Extension of the Method of Crow and Mange, clearly conveyed the topic and the methodology. Rather than use the arbitrary divisions found in the other paper, between the family names of the spouses four possible types of isonymy were identified. Table 3.5 shows a hypothetical example of relationships and nomenclature applied to the dual surname system.

Table 3.4 (after Pinto-Cisternas, et al. 1985b)			
I.A.S.S. - Iberoamerican Dual Surname System			
HUSBAND		WIFE	
AGUON	BORJA	CAMACHO	DIAZ
1	2	3	4

Following the IASS nomenclature; 1 = the first surname of the husband, 2 = the second surname of the husband, 3 = the first surname of the wife, and 4 = the second surname of the wife. They named this system the Iberoamerican Surname System (I.A.S.S. simplified to IASS herein). The following table follows from this classification system (Note: 1 = 3 is the case equivalent to traditional European isonymy in the northern European surname system (N.E.S.S. simplified to NESS herein). A relevant permutation of this system is found in Brazil where the European population is of Portuguese extraction rather than Spanish. They also employ a dual surname system similar to the Spanish system. In Brazil and Portugal though, the maternal surname comes first, succeeded by the paternal surname. As will be discussed later, the Chamorro on Guam

have a dual surname system equivalent in configuration and function to the Portuguese dual surname system but not of the same origin.

The cases listed in Table 3.5 are examples of simple cases of isonymy in the IASS dual surname system. It is clear that using a dual surname system increases the opportunity of detecting additional cases of isonymy compared to NESS simply because of the increased number of combinations for surnames that are available from the vital records.

Table 3.5 Categories of IASS Isonymous Relationships (after Pinto-Cisternas, et al. 1985b)	
1 = 3	Isonymy when the first surname of the husband and wife are the same
1 = 4	Isonymy when the first surname of the husband and the wife's second name are the same
2 = 3	Isonymy when the husband's second surname and the wife's first surname are the same
2 = 4	Isonymy when the second surnames of the spouses are the same

The data in the next three tables presented here (Tables 3.6, 3.7 & 3.8) are from Isla de Toas, one of the four populations that were studied by Pinto-Cisternas et al. Table 3.6 depicts the process of enumerating the number of isonymous marriages by category. Table 3.7 contrasts the expected and observed numbers of isonymous couples using either the Crow and Mange methodology or the IASS methodology. Table 3.8 presents similar data for the *F* values of the Isla de Toas population.

The overall approach employed in the IASS paper combined the careful recording of the types of simple isonymy relationships with a

system of categorization that allowed the tallying of the instances of isonymy by category (see Table 3.5). It is quite possible to have cases where multiple or compound isonymies are present. This would be the case when, using the IASS nomenclature, 1 = 3 = 4. For example, a marriage between a Cruz - Leon and a Cruz - Cruz would be tallied as a 1=3 plus a 1=4 (see the decades of 1910 through 1940 in Table 3.6). Each of the marital records would be inspected for instances of compound isonymies. Under the IASS these compound isonymies would be "decomposed" into simple ones. The total number of instances of simple isonymy for a single couple would be counted. These counts would then be included in the decade totals (see Total Cases Table 3.6).

Table 3.6 Isla de Toas – Distribution of Individual Types of Isonymous Couples (after Pinto-Cisternas, et al. 1985b)

	Types of Isonymous Couples										
Years	1=3	2=4	1=4	2=3	1=3 =4	1=2 =3	1=2 =4	1=2= 3=4	1=2 & 2=4	1=4 & 2=3	Total
1890-1899	0	3	2	0	0	0	0	0	0	0	49
1900-1909	0	1	3	1	0	0	0	0	0	0	50
1910-1919	1	6	0	2	1	0	0	0	0	0	60
1920-1929	0	2	4	5	2	0	0	0	0	0	100
1930-1939	0	5	4	3	0	1	0	0	0	0	101
1940-1949	5	12	5	8	0	0	0	0	1	0	203
1950-1959	9	18	4	10	0	0	2	0	2	1	435

The result of the IASS approach was to, in effect, increase the sample size by counting isonymy across all four of the parental lineages instead of solely in the maternal:paternal to paternal:paternal lineages available with NESS. Increasing the number of lineages from which to draw isonimic couples most likely eliminated some of the errors found in inbreeding coefficients derived by isonymy due to small sample sizes. Inspection of the data (see Table 3.7 observed cases for Crow and Mange versus IASS) clearly shows IASS tallies generate a more robust data-set for the Isla de Toas population, especially when isonymous marriages are low in number as seen in the earlier decades of the data tables. For example, under NESS only the 1=3 isonymy would be observable in the records which would result in zero counts for the decade of 1890, 1900, 1920 and 1930 shown in Table 3.6. However, Table 3.8 reveals that under IASS counts of 5, 5 ,15, and 14 were recorded for each of the respective decades. The IASS research did not attempt to retain measures from the individual parental lineages in the data presentation but rather employed a cumulative total for each of the categories of isonymous relationships.

The methodology employed with IASS was termed an "extension" of the Crow and Mange formula. The term "extension" refers to modifications of the original Crow and Mange formulas necessitated by

using dual surnames. These changes did not alter the underlying premise of the Crow and Mange formulas; they merely allowed the three additional lineages available to the IASS to be included in the computation of the inbreeding coefficients for the population being investigated. Consequently, the final inbreeding values obtained from the IASS calculations remain equivalent to those of Crow and Mange.

Table 3.7 Expected and Observed Values of Isonymous Couples								
Isla de Toas Population (after Pinto-Cisternas, et al. 1985b)								
	According to Crow & Mange				According to IASS			
	Expected		Observed		Expected		Observed	
Period	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
1880-99	.70	.01428	0	.00000	7.30	.14989	5	.10204
1900-09	.60	.01200	0	.00000	4.90	.09800	5	.10000
1910-19	1.30	.02167	2	.03333	7.20	.12000	11	.18333
1920-29	2.92	.02900	2	.02000	11.50	.11500	15	.15000
1930-39	1.9	.01881	1	.00900	11.30	.11188	14	.13861
1940-49	4.9	.02414	6	.09255	24.40	.12019	32	.15763
1950-59	7.1	.01632	11	.02528	37.40	.08621	53	.12184

In their IASS calculations (see 10 – 12 below) F_t is used to signify the total level of inbreeding in the population. F_n is the nomenclature used to signify the non- random inbreeding and F_r represents the random inbreeding. In order to adjust for the additional surnames included in the IASS methodology the formulas were changed to those shown below:

$$F_r^* = (\Sigma p_i q_i)/16 \qquad (11)$$

$$F_n = (OI - \Sigma p_i q_i)/16(1 - \Sigma p_i q_i)/16 \qquad (12)$$

$$F_t = F_r + F_n(1 - F_r) \qquad (13)$$

Table 3.8 Comparison of Value of F_r, F_n & F_t for NESS & IASS Values Isla de Toas Population (after Pinto-Cisternas, et al. 1985b)

	According to Crow & Mange			According to IASS			a
	F_r	F_n	F^t	F^r	F^n	F_t	a
1880-89	.00358	-.00355	.00003	.00931	-.00345	.00589	.00024
1900-09	.00300	-.00297	.00003	.00613	.00018	.00262	.00008
1910-19	.00542	.00297	.00937	.00750	.00449	.01196	.00560
1920-29	.00725	-.00232	.00495	.00719	.00247	.00964	.00070
1930-39	.00470	-.00227	.00244	.00699	.00188	.00886	.00325
1940-49	.00603	.00141	.00743	.00751	.00266	.01015	.00343
1950-59	.00408	.00229	.00636	.00539	.00243	.00781	.00000

NOTE: Underlined values are closest to the value for a.

The underlined values in the F_t column (Table 3.8) indicate which values are closest to the average inbreeding coefficient for the population as shown in the a column of the table. In most cases, for the Isla de Toas population, the Crow and Mange values lie closer to the a value than do the IASS. In fairness, it should be mentioned that some of the other three IASS populations discussed in the article show more conformity to a than does the Isla de Toas population. It is unclear from the information provided whether any effort was made to control the sample composition for the pedigree calculations. However, the apparent vacillations around the average population inbreeding

coefficient (a) by the isonymy values suggests that there was little structure applied to selecting the samples from the pedigree data.

Since its appearance in the literature in 1985 the IASS methodology does not appear to have been extensively employed although two relatively recent articles have been published (Castro De Guerra, et al. 1990; Madrigal and Ware 1997) that use IASS. Not all studies of populations using isonymy methods where dual surnames are present have made use of multiple names (Hernandez, et al. 2000). This is perhaps due in part to the detailed listing and assessment of names necessary to decompose compound isonymous relationships into simple ones, incomplete recording of all four parental names, the presence of extensive illegitimacy when only the mothers names are recorded, or having data-sets with large enough sample sizes to offset the need to assess each of the four separate surnames.

The Chamorro population of Guam, like most human populations, is unique enough to require adjustments to the conventional methodology in order to obtain the most credible possible results from the data-set. Instead of a conventional marital approach being followed, what is referred to as a progenic approach is being applied. That is, given the nature of the database, isonymous relationships are established by looking back from the progeny to obtain surnames rather than taking the

surnames from marital records. Since the records verify that most people on Guam marry and have children this approach should not compromise the results. Constructing the cohort in this way appears to better meet Rogers' criteria of working with a natural population. Clearly, having a data-set based on progeny more closely approximates an effective breeding population than a sample taken from marital records. The progenic approach does not violate any of the assumptions associated with isonymy and, as will be later discussed, can be shown to provide a data-set that comes closer to meeting the assumptions of isonymy than would otherwise be possible.

Further, no adjustments to the fundamental calculations outlined by Crow and Mange, as refined by later researchers, are necessary. Consequently the following formulas will be followed:

$$F_r = \left(\sum_x^2\right)/4 \qquad (7)$$

$$F_r = \left(\sum p_i q_i\right)/4 \qquad (8)$$

$$F_n = \left(P - \sum p_i q_i\right)/4\left(1 - \sum p_i q_i\right)/4 \qquad (9)$$

$$F_t = F_r + F_n\left(1 - F_r\right) \qquad (10)$$

On Guam a dual surname system is used that parallels those found in Brazil and Portugal. The IASS approach, for Spanish surnames, advocates alterations to the Crow and Mange formulas in the form of:

$$F_r = \left(\sum p_i q_i\right)/16 \qquad (11)$$

$$F_n = (OI - \Sigma p_i q_i)/16(1 - \Sigma p_i q_i)/16 \quad (12)$$

It is important to note that constructing the formulas in this manner makes less visible the dynamics of the individual lineages.

To avoid this situation, for the Guam data it is proposed to sum the *F* value for each of the four separate surname lineages calculated separately by the Crow and Mange formulas as revised (7, 8, 9,10) and then compute the average of the four lineages.

$$F_r = [(\Sigma p_i q_i)/4 + (\Sigma p_j q_j)/4 + (\Sigma p_k q_k)/4 + (\Sigma p_l q_l)/4]/4(1 - \Sigma p_i q_i)/4 \quad (14)$$

This is used in lieu of the value derived by the IASS calculations and may be considered the G.A.S.S. (Guam American Surname System, hereafter GASS) value. The GASS terminology both distinguishes the difference in the structure of the Guam surname system vs. the IASS as well as emphasizes that the GASS value is an average calculated from the sum of the inbreeding coefficients of four separate lineages rather than a cumulative value. In accordance with this distinction the formula for the calculations expressed to show the *F* values of each surname lineage are presented as subtotals. This allows a direct expression of the level of inbreeding of each lineage within the dual surname structure. The final value obtained through the GASS calculation is equivalent to the

result of IASS calculation and no suggestion to the contrary is either implied or suggested.

A primary concern of the GASS approach is to not over-emphasize the composite *F* value but to retain a focus on the four separate surname lineages in a dual surname system. A composite *F* value implies that each of the lineages are of equal weight in the calculation. This is not the case since the individual lineages can be representative of different founding populations since the time depth of the lineages are not necessarily equivalent. Having these values remain apparent can be important in assessing changes in the population structure through assortative mating with possible implications for differential fertility.

The Guam Database. The Guam database is demographic in origin, initially compiled by Dr. Jane Underwood. The database represents all of the Chamorro listed in the 1897 Spanish census. Vital statistics and related information on those individuals and all their descendants through 1941 are included in the database. Consequently, the database is sizable with just under 40,000 individuals represented and over 30 fields of information for each record. The database is complete with data still being entered and updated. Individuals are not referenced by their names but rather an ID number. The overall structure of the Guam database in shown in Table 3.9. In order to calculate inbreeding

coefficients using the methods of isonymy involving dual surnames, four fields (EPATMAT, EPATPAT, EMATPAT and EMATMAT) had to be added to the original database.

The source of the names used in the analysis of the Chamorro surnames was partially derived from the 1897 Spanish census (Mallada 1984). The data in this census was entered into demographic database for Guam by Dr. Jane Underwood (Underwood 1990). Although initially comprised of written tallies, the data was transferred into a computerized version beginning in 1969. Appendix A contains a list of the names and their variants from the 1897 Spanish census.

The information for the 1897 census was supplemented with information obtained from other sources of birth records when they became available. Between 1897 and 1901, when the United States Naval Government instituted a formal system for recording vital statistics, a four year period transpired where no official system was in place. An important contribution to the database was the inclusion of the priest's census of 1920 and vital records from the period ending in 1941 (Underwood, personal communication). These provided additional information as well as a cross check on the information obtained earlier. The Guam database is a demographic database with data structure based on individuals and their vital records. It is not descent or

antecedent structured so consequently it is not organized to provide information on genealogical associations.

Table 3.9 Guam Database Structure

IDENTIFIER	FIELD DESCRIPTION	OTHER NOTATIONS or COMMENTS
EIDN	Ego's ID Number	In one of two formats
EPAT	Ego's Paternal Surnames	Compounded, may be truncated
EPATMAT	Ego's father's mother's surname	
EPATPAT	Ego's father's father's surname	
EMAT	Ego's Maternal Surnames	
EMATPAT	Ego's mother's father's surname	
EMATMAT	Ego's mother's mother's surname	
EFIRST	Ego's First Name	
ESEX	Ego's Gender	
EDOB	Ego's Date of Birth	
EDOD	Ego's Date of Death	
SP1PAT	First Spouse's Paternal Names	Compounded, may be truncated
SP1MAT	First Spouse's Maternal Names	Compounded, may be truncated
SP1FIRST	First Spouse's First Name	
SP1IDN	First Spouse's ID Number	In one of two formats
NK	Number of offspring - 1st Spouse	
SP2PAT	2nd Spouse's Paternal Names	Compounded, may be truncated
SP2MAT	2nd Spouse's Maternal Names	Compounded, may be truncated
SP2FIRST	2nd Spouse's First Name	
SP2IDN	2nd Spouse's ID Number	In one of two formats
NK2	Number of offspring - 2nd Spouse	
MOD	Month of Death	
PAT1	Father's ID Number	In one of two formats
MAT1	Mother's ID Number	In one of two formats
MBO	Mother's Birth Order	
MAGEYOB	Mother's Age at Year of Birth	
MYOB	Mother's Year of Birth	
PBO	Father's Birth Order	
PAGEYOB	Father's Age at Year of Birth	
PYOB	Father's Year of Birth	
EADDOD	Ego's Age at Death	

This dual surname system is structured by having the paternal last name of the groom placed as the first of the two surnames of each

progeny. The paternal surname of the bride is placed in the name in the second position of each of their children. Up until 1920 the Spanish nomenclature was used on Guam for recording surnames. After that date the surnames were recorded in the fashion of the Portuguese tradition but not due to any influence from Portugal or its former colonies. This change was enacted by a decree of Governor Gilmer (Rogers 1995:145) in order to have the paternal name of the individual occupy the last position. Gilmer is said to have felt this system was more in keeping with the surname conventions used in the United States.

According to Underwood all records in the Guam database, regardless of how they were initially recorded, have been standardized with the surnames entered in a consistent manner. The subsequent chapter will assess and discuss the results of the analysis based on these surnames.

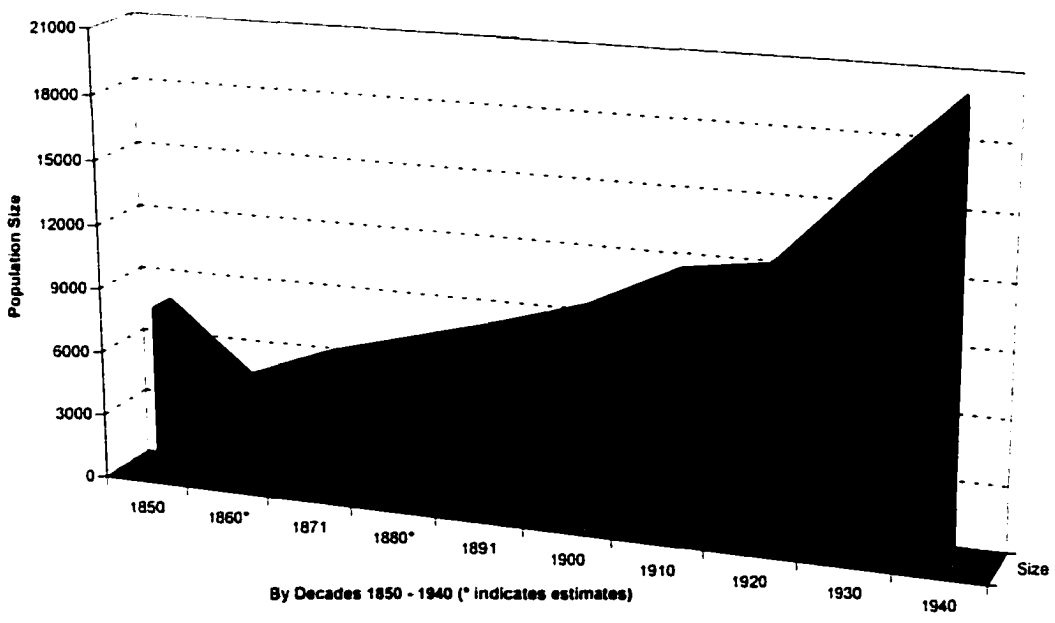
Chapter 4. **DISCUSSION AND RESULTS**

In light of the information presented in association with the methodology of isonymy, a compelling case can be made for the population represented in the Guam database being a reasonable candidate for application of the methods of isonymy. This assertion is most effectively supported through a discussion of the assumptions and conditions which must be met to assure the results of the isonymy study attain an acceptable level of confidence. The factors that must be weighed include the limitations and assets inherent to the data-set, relevant theoretical issues in isonymy and population biology, the nature of the population as well as the applicability of the various isonymy methods. This chapter will assess and discuss the results of the analysis with respect to these matters.

Few, if any populations, fully meet theoretical expectations and, with respect to its human inhabitants, Guam is no exception. Although there are no records prior to the first European contact, the extant Chamorro population certainly is a product of periodic population bottlenecks. The population has undergone a precipitous decline since at least 1521 when the first European contact was recorded. Sixty years before the influenza pandemic of 1918, the neo-Chamorro population emerged from the devastating smallpox epidemic of the 1850s when at

least forty percent of the population perished (Rogers 1995). While after the epidemic the indigenous population was augmented by Filipino *deportados*, according to Spanish accounts, immigration followed by permanent residency on the island was minimal at best. Forced repatriation by the Spanish resulted in the return of most of the *deportados* to the Philippines. Although some gene flow was inevitable there is no evidence of significant replacement of the Chamorro through systematic immigration at any point in the history of the island.

Figure 4.1 Guam Population Growth (data from Underwood '73 & Rogers '96)



	1850	1860*	1871	1880*	1891	1900	1910	1920	1930	1940
Size	7940	4764	6276	7326	8396	9630	11624	12216	16402	20177

The neo Chamorro population encountered by the United States authorities in 1898 was derived from the survivors of the 1856 epidemic as were their surnames. The overall growth of the population is shown in Figure 4.1. The physical geography of Guam provides the context for meeting many of the assumptions implicit to the study of isonymy. The history of the island suggests an overall pattern of depopulation with little permanent emigration that would adversely affect analysis using the methods of isonymy.

From the standpoint of traditional microevolutionary analysis, the most apparent limitation is the historical and demographic nature of the Guam data-set. However, the Guam data-set has several attributes that make it especially suitable for analysis using isonymy. The number of individuals represented in the data-set is extensive, allowing a large sample of persons with complete dual surnames to be studied. The data-set has been generated through a long term data collection process with thorough cross-checks on the information. A major benefit of the demographic nature of the Guam data-set lies in its underlying structure and the ability of database software to effectively and efficiently retrieve information. Finally, the other types of information in the database allow associations and inferences associated with socio-cultural practices to be

pursued that are not normally associated with data-sets limited to names and genealogical information.

Demographic data-sets that approximate natural populations are most appropriate for analysis by isonymy. With the Guam population an attempt was made to structure a sample in keeping with this premise by using a data-set based on births or progeny rather than marital records. The toll on population size was minimal, eliminating just under 6% of the individuals in the population from the database. A cohort based on progeny is comprised of individuals who are the result of productive consensual unions. This type of a population approximates as closely as possible, in a historical data-set that lacks pedigree information, an effective breeding population. Using this type of cohort also enables selecting members on the basis of criteria other than sibships. Sibships are inclusive of individuals with a potentially large span of ages. Constructing a cohort, in part by a controlled range of birth dates, allows the members of the cohort to be more tightly structured temporally. Firm temporal control is essential when conducting a study that compares variables between units of time. In order to prevent multiple records being created from the same parents the maternal birth order field in the Guam database was used. By selecting individuals with a maternal birth order of one, the problem of multiple entries from a set of parents was

circumvented. Using the maternal birth order also brought only fertile couples into the database, thereby further configuring a sample more in keeping with the expectations of an effective breeding population.

Prior isonymy studies of populations with dual surnames have had to contend with the effects of illegitimate births on record keeping. The number of cases with four surnames in a population can be reduced significantly due to high levels of illegitimacy. In most instances of illegitimacy only the maternal names are entered in the birth record. For the Chamorro, illegitimate births and irregular data entries were kept to a minimum by only using records in which all four paternal names are present. In many populations this restriction would place severe restrictions on the sample size. The Chamorro population, however, tallied over twenty thousand records with all four parental surnames present.

The most fundamental basis for conducting any study using isonymy is the accuracy of the names used in the analysis. Correct spelling of names is a major factor in an accurate analysis using isonymy (Crow 1980). Any perusal of historic records will reveal how common it is for spelling changes to occur. This is especially the case when the information is recorded through a process of transcription from oral to written. This process is further complicated if it involves translations from one language to another. The Guam data-set invoked several sets of

procedures to control for differences in spelling. During the initial compilation of the data set by Dr. Underwood, spelling of the names was standardized. Through this process variants in spelling from the original documents were reconciled. Consequently, the spelling of names entered into the Guam data-set were standardized when they were recorded from the original written records. An additional level of filtering for spelling occurred as the names were entered into the original computer database.

A further level of standardization was implemented with the transfer of the original dBase database into one that was compatible with Microsoft Access. Within the Guam database individuals are not referenced by their names but rather an unique ID number. Originally both of ego's paternal names were entered, in order to conserve memory, in a single field as a compound name (garcia delgado = garciadelgado). Ego's maternal names were entered in the same manner. Due to a field length limitation in the original dBase database, certain compound names were truncated resulting in the loss of letters at the end of a name (garciadelgado became garciadelga).

Locating cases of isonymous relations could not be accomplished with the names in their compound form. For the analysis to be undertaken these names had to be split into discrete names with the correct spellings.

In order to restore the correct spelling a library of about 500 root names was created (Appendix A) which contained the paternal and maternal surnames. The root name library was used to parse the compound names in the original database fields (using the root names) into an individual field for each of the four surnames. These fields were used to find the isonymous relationships. The root name library served as a spelling checker to verify the orthographic accuracy of all of the names contained in the newly created surname fields. These fields are labeled mnemonically and designated as EMATPAT, EMATMAT, EPATMAT and EPATPAT (e.g. EPATMAT = ego's maternal paternal or mother's father's surname) to designate the genealogical associations of each of the four fields regardless of how they are ordered or where they are placed in the database. The original compound name fields (EMAT and EPAT) were also retained in the database for reference purposes.

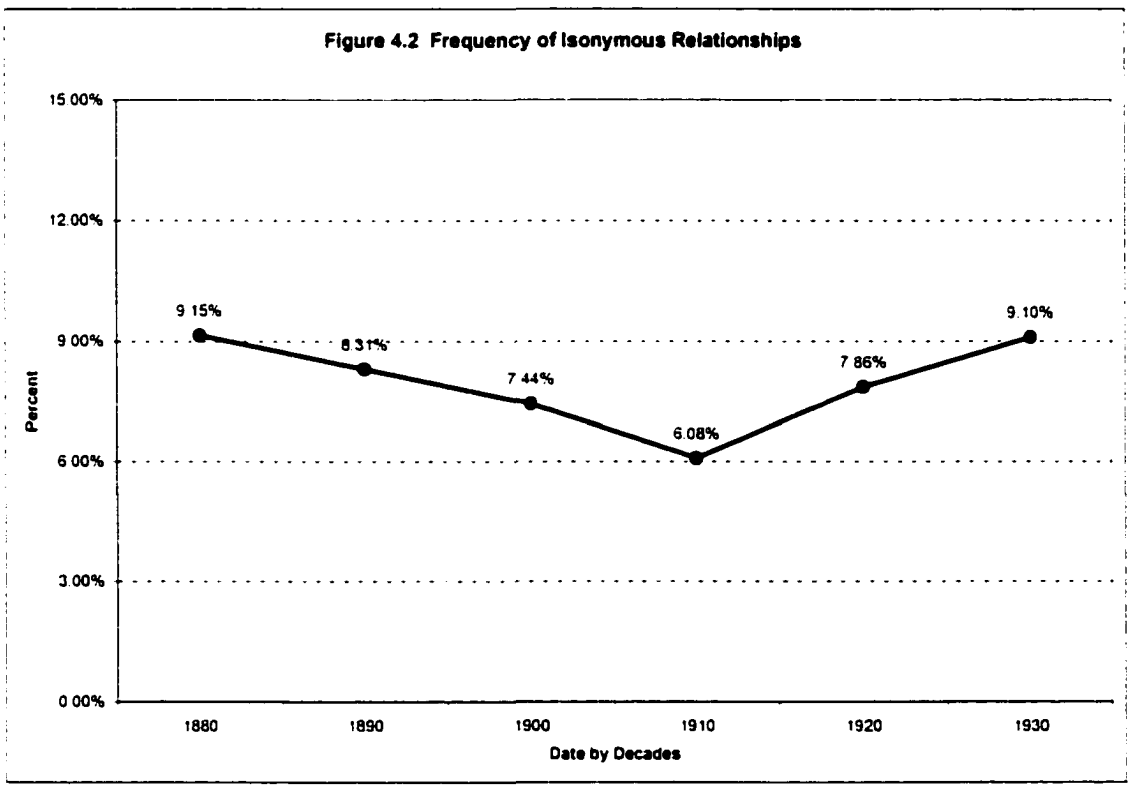
The end result of these procedures was to provide accurate lists of names and count tallies that would serve as the basis for calculating the inbreeding coefficients. For example the $p_i\, q_i$ portion of equations 3(2), 3(4), and 3(5) requires each instance of the i^{th} surname in the population (p for males and q for females) to be calucated as a frequency. Clearly the loss or gain of names through misspellings violates an essential

condition of isonymy methodology. Through this tedious and rigourous set of processess an accurate set of names was assurred.

Beyond the individual merits of each of these issues, the overall goal is to provide consistency for cohort construction throughout the temporal duration of the database. Using a temporal range of one decade for each cohort is consistent with other similar studies (see Fig. 3.8). This in combination with a uniform maternal birth order, as well as elimination of obvious cases of illegitimacy, responds to persistent criticisms of isonymy studies that they fail to control for methodological issues and specific demographic variables within the population. The approach applied to the Chamorro population keeps the cohort parameters straight-forward and avoids the complexity of using sib-ships or other less rigorous groupings for the basis for the cohort. In essence, several filters have been applied to the Guam database that attempt to respond to the underlying shortcoming purported to be inherent in studies involving isonymy.

Having compiled a list of surnames enables a preliminary picture to be drawn of the instances of isonymous relationships. Figure 4.2 shows the changing frequency of isonymous pairs of surnames for the study population based on raw counts of the surnames expressed in percent. It should be noted that the values represent the full cohort of isonymous pairs of surnames expressed as a simple percentage of the total number

of marriages for each decade between 1880 and 1940. How these values relate to the level of inbreeding or other linked processes requires application of the formulas for calculation of inbreeding coefficients from isonymy data.



The population profile of the Chamorro population is depicted in Figure 4.1. The obvious drop in population size in 1860 was the bottleneck most influential in shaping the neo-Chamorro population encountered when the United States claimed the island in 1898. A brief comparison of Figure 4.1 with Figure 4.2 reveals a generally increasing frequency of isonymous relationships over time which is counter intuitive to the generally

accepted premise that inbreeding levels will decrease as the population increases. A more detailed discussion of the process determining inbreeding rates from the methods of isonymy is necessary prior to suggesting possible explanations for this pattern.

A majority of isonymy studies have used the approach devised by Crow and Mange in 1965. Most of these studies involve working with a single surname system and the acronym NESS has been applied. An extension of this system for Spanish speaking societies was given the acronym of IASS. To distinguish the approach used with the Guam data the acronym GASS was devised. Although each system employs slightly modified calculations and different techniques for enumerating instances of isonymy, the inbreeding coefficients obtained are based on the principles outlined by Crow and Mange.

For the GASS data the NESS calculations were used. The partial results of the calculations are shown in Table 4.1. In this table the Guam data is subdivided into the expected and observed categories of isonymous relationships. The "types of isonymous couples" columns in the table below under the "expected" and "observed" columns follow the nomenclature employed in the IASS. For reference: 1 = the first surname of the husband, 2 = the second surname of the husband, 3 = the first

surname of the wife, and 4 = the second surname of the wife. (Pinto-Cisternas, et al. 1985b).

Table 4.1 Guam - Types of Isonymous Couples
Distribution of Individual Types of Isonymous Couples

*Note: Summing the decades under "Expected" in each lineage will not equal the respective value in the combined 1880-1939 period because the calculated values are independent

	Expected				Observed				
Years	1=3	1=4	2=3	2=4	**NESS** 1=3	1=4	2=3	2=4	Number of Marriages
1880-1939*	47.79	47.37	48.25	50.37	57	62	59	56	234
1880-1889	2.44	2.28	2.46	3.10	0	6	5	3	14
1890-1899	5.33	4.60	4.79	5.39	7	9	4	7	27
1900-1909	8.65	7.11	8.78	8.17	9	5	14	6	34
1910-1919	8.98	7.42	9.03	8.38	9	9	5	8	31
1920-1929	10.40	11.32	10.94	12.99	17	17	14	11	45
1930-1939	11.99	14.21	12.22	17.70	19	16	17	21	73

An obvious benefit of the dual surname approach is the increase in sample size compared to using the unilineal NESS based system. For example, under a NESS approach only the instances of isonymy involving one quarter of the cases would be counted (those in the 1=3 category). A revealing example is the rare situation when all four surnames are the same such as in the instance when all four surnames are Cruz (they are

differentiated as Cruz1 through Cruz4 for purposes of this discussion only). Under NESS only the isonimic relationships of Cruz1=Cruz3 would be noticed and tallied. However, in that same relationship additional cases of isonymy are present and can be tallied under a GASS, IASS or equivalent recording system. This approach would also find Cruz1=Cruz4, Cruz2=Cruz3 and Cruz2=Cruz4. In short, instead of finding a single case of isonymy four are found. The dual surname approach, on average, will increase the sample size by a factor of four. In reality, those numbers will vary slightly. The 1890 decade from Guam (see below) is a good case in point. If the isonymy tally had been based solely on the lineage of 1=3 then the number of cases would be zero but if tallied on the 1=4, 2=3 or 3=4 lineages it would be 6, 5, or 3 respectively.

Years	1=3	1=4	2=3	2=4	Total
1880-1890	0	6	5	3	14

The IASS approach is purported to bring isonymy inbreeding coefficient values closer to those derived from pedigree studies which is the normal baseline used for evaluating the results obtained from isonymy investigations. However, as the IASS data tables presented in chapter three indicate there are numerous instances, even with the increased sample size associated with the IASS analysis, when this is not the case.

The Rogers 1987 study brings out another factor potentially influencing this discrepancy. The specifics of her research on sample composition were discussed in the methods chapter and will not be repeated here. There is no indication the data sets used in the IASS article employed any of the controls advocated by Rogers. This leaves open the question whether the expected low concordance is due to lack of appropriate structuring of the samples. An additional point Rogers emphasizes is the need for the isonimic population to approximate a natural population which might have not been achieved in the IASS study. The GASS study took appropriate measures to attempt to resolve these potential issues.

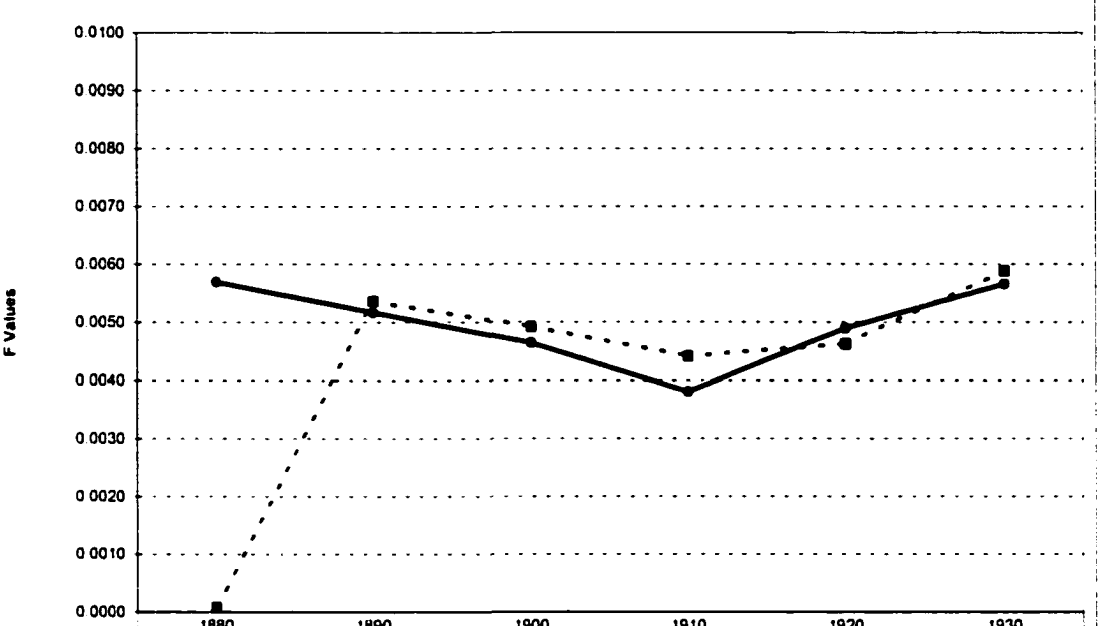
The GASS approach highlights a more subtle factor in IASS vs. NESS values that has to do with the consequences of combining values from lineages that have different time depths (see Figures 4.3 and 4.4). Several researchers have pointed this out as a general issue in using inbreeding coefficients. In the cultures commonly being studied with isonymy, the deepest lineage is the patrilineal one. This lineage arguably extends back the furthest. It is this lineage, as several researchers point out, that due to its potential time depth is most subject to the biases introduced through the effects of cumulative inbreeding and violation of underlying assumptions. The other three lineages in the IASS have a time depth that

is clearly prescribed by the nature of the record keeping. Surnames in two of the lineages are lost after one generation, whereas the other (wife's fathers name) is only carried forward one additional generation.

Without time depth, these values then can only reflect very recent cases of isonimic marriages. As such, their values are not subject to the same influences as the long term patrilineal lineage. Including them in the IASS calculations would affect the overall inbreeding value, possibly randomly altering the IASS value to move it closer to or further away from the pedigree derived value. Based on the GASS data, the values from these lineages vary considerably from decade to decade (see especially the relationships between F_n and F_r in Figures 4.5 to 4.10).

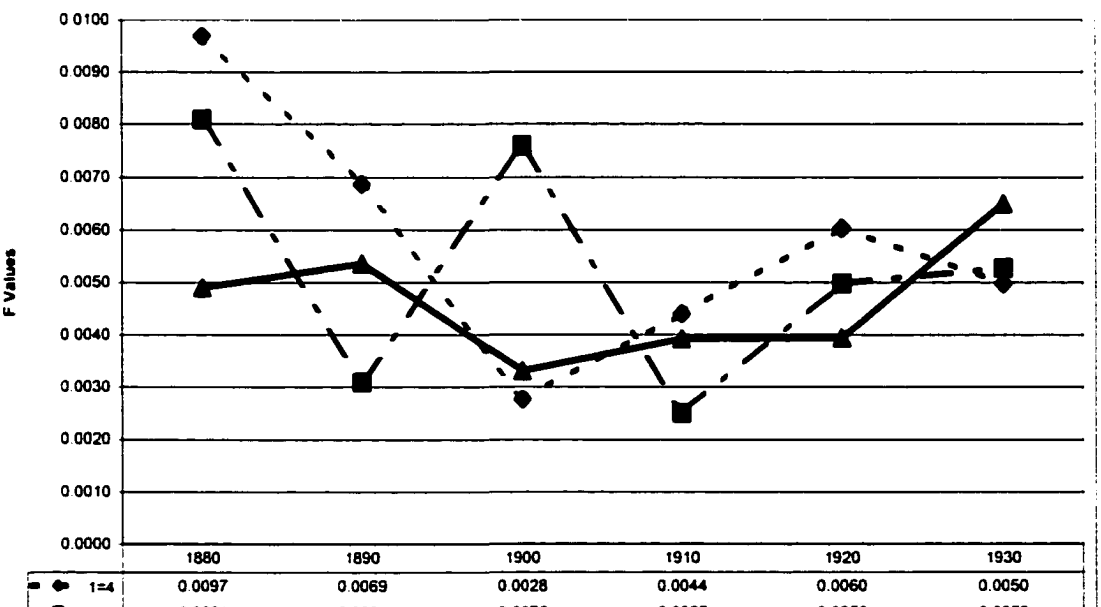
Unlike GASS, IASS pools the data to create a cumulative value. This might be an artifact of the process by which the cases of isonimic relationships were found. If each record was individually reviewed, with the cases of isonymy duly recorded, it would be very convenient to tally the cases by type of isonymy anticipated under IASS. Information collected from genealogical or pedigree formatted data lends itself to this kind of an approach. This may be the best manual process but it de-emphasizes counts of individual lineages in favor of the cumulative value.

Figure 4.3 NESS vs. IASS F_t Values



	1880	1890	1900	1910	1920	1930
NESS	0.0001	0.0054	0.0049	0.0044	0.0046	0.0059
IASS	0.0057	0.0052	0.0046	0.0038	0.0049	0.0057

Figure 4.4 Non-NESS F_t Values



	1880	1890	1900	1910	1920	1930
1=4	0.0097	0.0069	0.0028	0.0044	0.0060	0.0050
*2=3	0.0081	0.0031	0.0076	0.0025	0.0050	0.0053
2=4	0.0049	0.0054	0.0033	0.0039	0.0039	0.0065

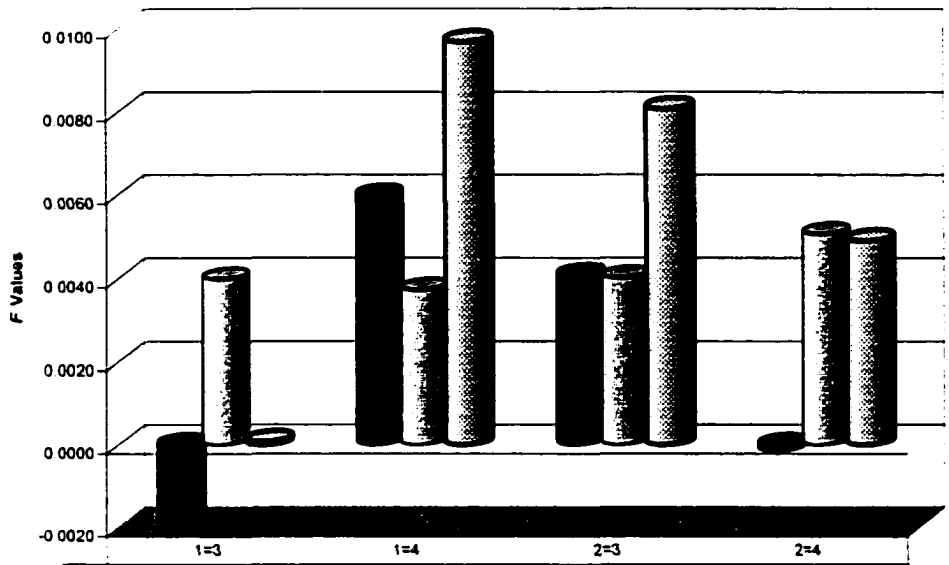
Lineages 1=4, 2=3 & 2=4

The GASS approach employed in the Guam research has been derived from a data-set structured for demographic analysis rather than for pedigree or genealogical purposes. Whether this would have facilitated a traditional IASS analysis with manual tallies is unclear. The approach lends itself to a more automated extraction of cases of isonymy by using conventional database software and a personal computer. Rather than inspecting each of the almost 40,000 records in the Guam database, consensual couples sharing the same last name can be located by searching for such cases through queries that search for the specific types of isonimic relationships. In this fashion simple isonymies can be counted without having to manually decompose them from the individual records as is done with the IASS.

An important aspect of the GASS approach is the additional data contained in the database as well as the ability to associate that data with the cases of isonymy. Conventional isonymy studies are seldom associated with the extensive array of data contained in the Guam database. By directly incorporating the isonimic data into the complete data-set the potential for association with other types of demographic information is facilitated.

The GASS approach also compels totals for each of the lineages to be kept as part of the calculations. Having these totals facilitates an

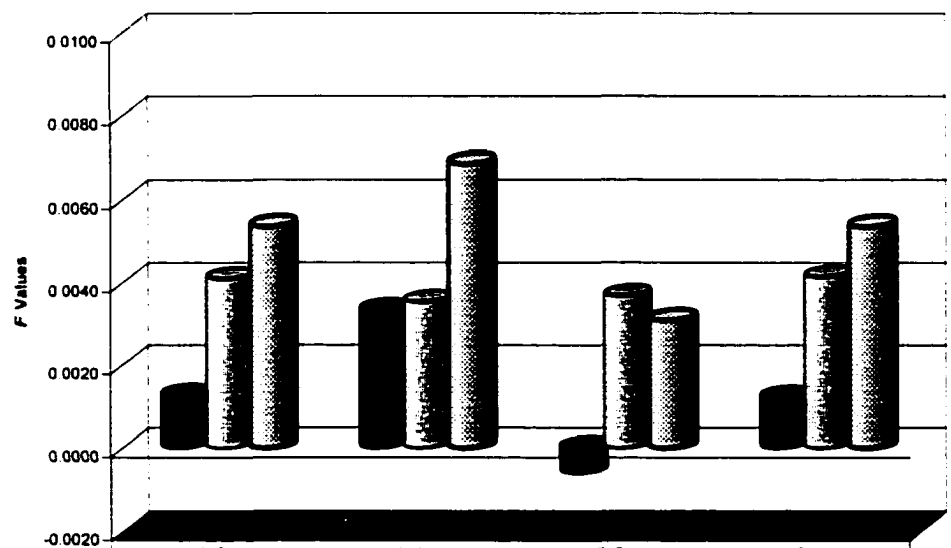
Figure 4.5 F_n, F_r & F_t Values from Isonymy



	1=3	1=4	2=3	2=4
Fn	-0.0039	0.0060	0.0041	-0.0002
Fr	0.0040	0.0037	0.0040	0.0051
Ft	0.0001	0.0097	0.0081	0.0049

1880s Lineages

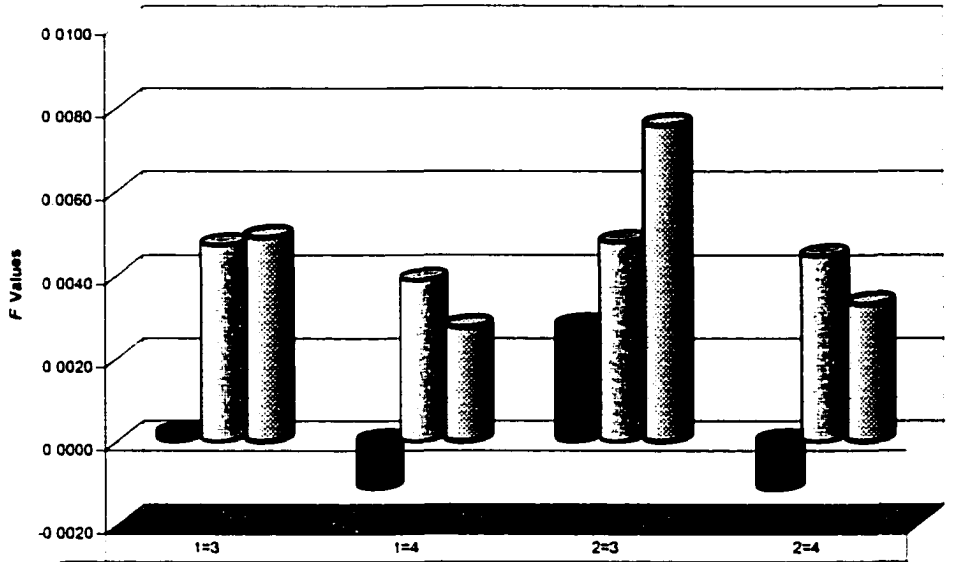
Figure 4.6 F_n, F_r & F_t Values from Isonymy



	1=3	1=4	2=3	2=4
Fn	0.0013	0.0033	-0.0006	0.0012
Fr	0.0041	0.0035	0.0037	0.0041
Ft	0.0054	0.0069	0.0031	0.0054

1890s Lineages

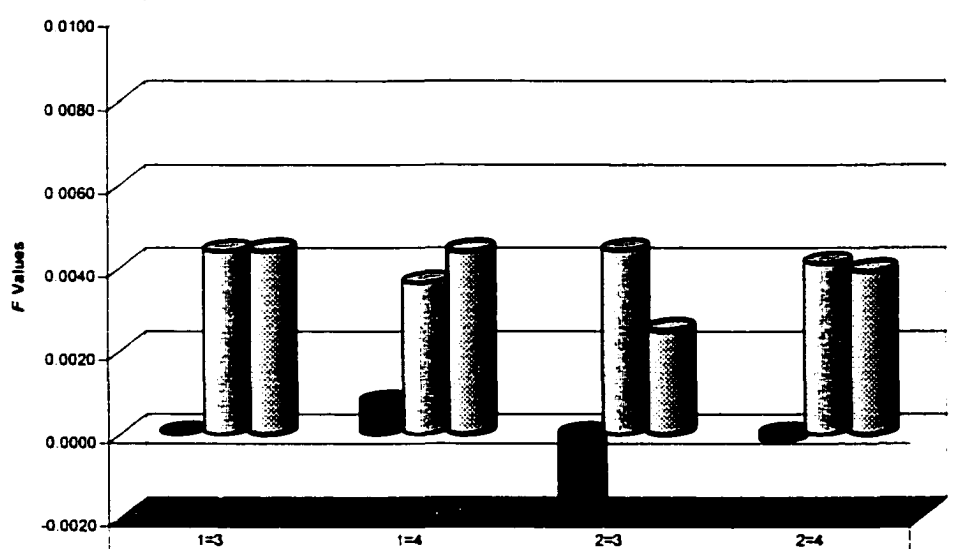
Figure 4.7 F_n, F_r & F_t Values From Isonymy



	1=3	1=4	2=3	2=4
Fn	0 0002	-0 0011	0 0028	-0 0012
Fr	0 0047	0 0039	0 0048	0 0045
Ft	0 0049	0 0028	0 0076	0 0033

1900s Lineages

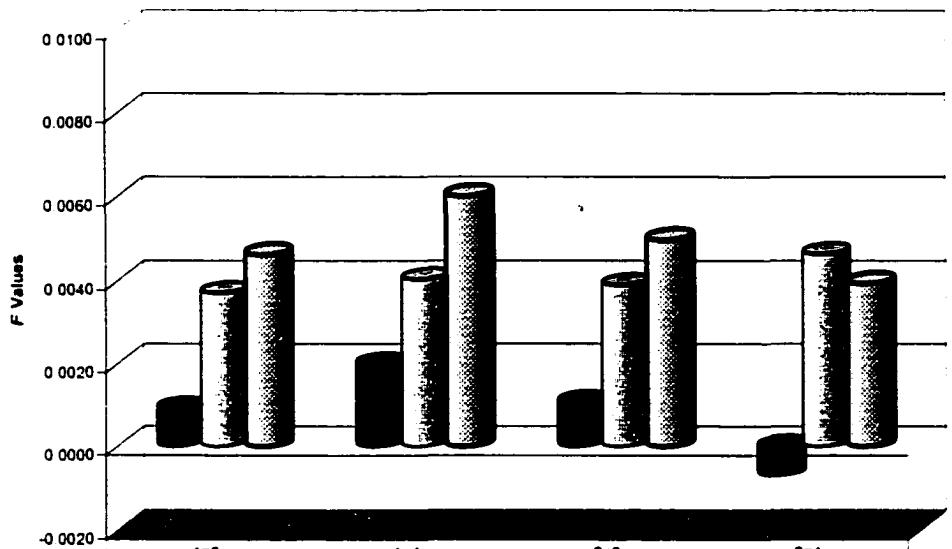
Figure 4.8 F_n, F_r & F_t Values From Isonymy



	1=3	1=4	2=3	2=4
Fn	0.0000	0.0008	-0.0019	-0.0002
Fr	0.0044	0.0036	0.0044	0.0041
Ft	0.0044	0.0044	0.0025	0.0039

1910s Lineages

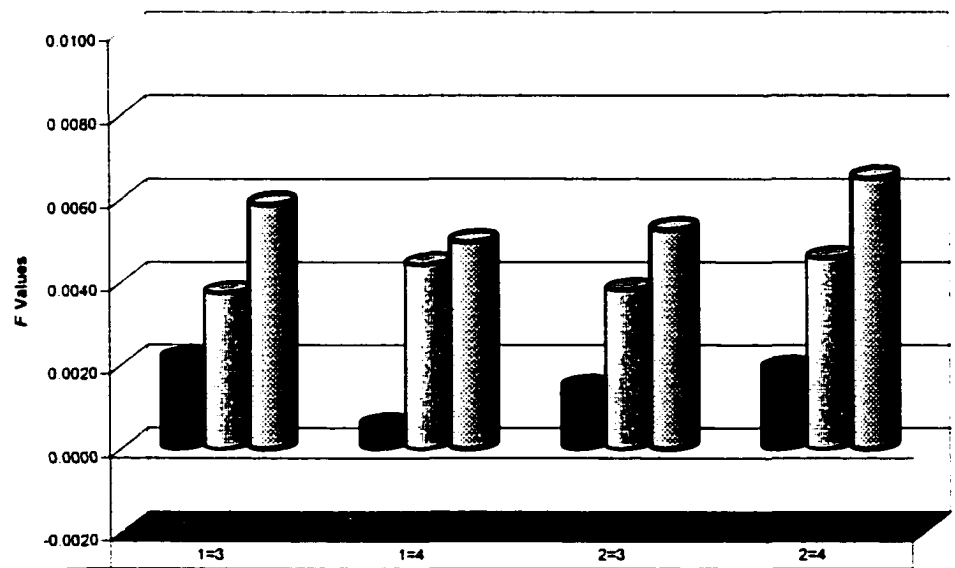
Figure 4.9 F_n, F_r & F_t Values From Isonymy



	1=3	1=4	2=3	2=4
Fn	0.0009	0.0020	0.0011	-0.0007
Fr	0.0037	0.0040	0.0039	0.0046
Ft	0.0046	0.0060	0.0050	0.0039

1920s Lineages

Figure 4.10 F_n, F_r & F_t Values From Isonymy



	1=3	1=4	2=3	2=4
Fn	0.0022	0.0005	0.0015	0.0019
Fr	0.0037	0.0044	0.0038	0.0046
Ft	0.0059	0.0050	0.0053	0.0065

1930s Lineages

Table 4.2 F_n, F_r and F_t Values
Isonymous Consenting Unions on Guam 1880 - 1939

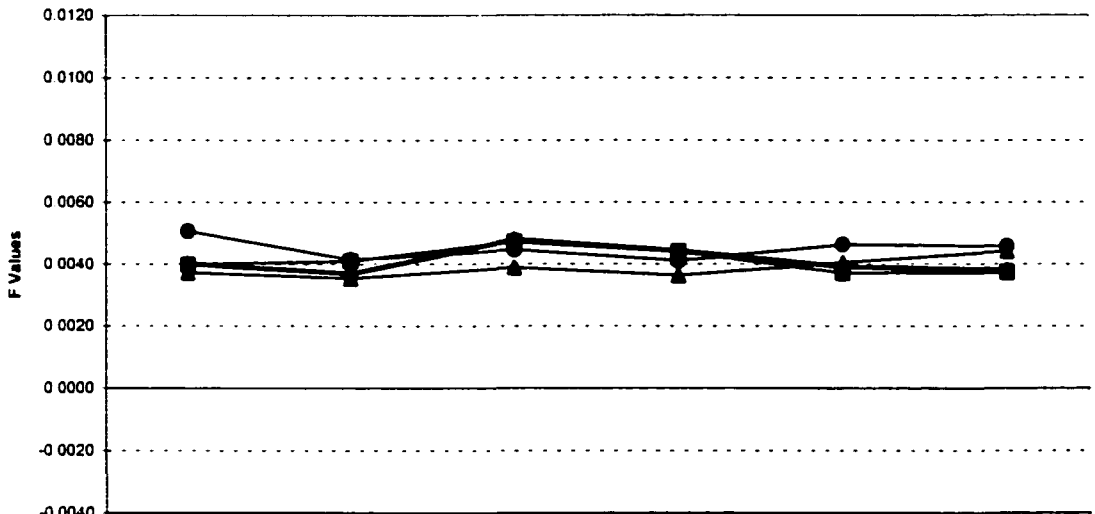
		1=3	1=4	2=3	2=4	Marriages
1880-	Expected	47.4900	47.3700	48.2500	50.3700	
1939	Observed	57.0000	62.0000	59.0000	56.0000	2947
	F_n	0.0008	0.0012	0.0009	0.0005	
	F_r	0.0040	0.0040	0.0041	0.0043	
	F_t	0.0048	0.0052	0.0050	0.0047	
1880s	Expected	2.4400	2.2800	2.4600	3.1000	
	Observed	0.0000	6.0000	5.0000	3.0000	153
	F_n	-0.0039	0.0060	0.0041	-0.0002	
	F_r	0.0040	0.0037	0.0040	0.0051	
	F_t	0.0001	0.0097	0.0081	0.0049	
1890s	Expected	5.3300	4.6000	4.7900	5.3900	
	Observed	7.0000	9.0000	4.0000	7.0000	325
	F_n	0.0013	0.0033	-0.0006	0.0012	
	F_r	0.0041	0.0035	0.0037	0.0041	
	F_t	0.0054	0.0069	0.0031	0.0054	
1900s	Expected	8.6500	7.1100	8.7800	8.1700	
	Observed	9.0000	5.0000	14.0000	6.0000	457
	F_n	0.0002	-0.0011	0.0028	-0.0012	
	F_r	0.0047	0.0039	0.0048	0.0045	
	F_t	0.0049	0.0028	0.0076	0.0033	
1910s	Expected	8.9800	7.4200	9.0300	8.3800	
	Observed	9.0000	9.0000	5.0000	8.0000	510
	F_n	0.0000	0.0008	-0.0019	-0.0002	
	F_r	0.0044	0.0036	0.0044	0.0041	
	F_t	0.0044	0.0044	0.0025	0.0039	
1920s	Expected	10.4000	11.3200	10.9400	12.9900	
	Observed	13.0000	17.0000	14.0000	11.0000	700
	F_n	0.0009	0.0020	0.0011	-0.0007	
	F_r	0.0037	0.0040	0.0039	0.0046	
	F_t	0.0046	0.0060	0.0050	0.0039	
1930s	Expected	11.9900	14.2100	12.2200	14.7000	
	Observed	19.0000	16.0000	17.0000	21.0000	802
	F_n	0.0022	0.0005	0.0015	0.0019	
	F_r	0.0037	0.0044	0.0038	0.0046	
	F_t	0.0059	0.0050	0.0053	0.0065	

added level of data analysis over the IASS approach through which factors affecting each of the individual lineages as well as the cumulative or index value can be assessed. As conveyed in the formulas, the GASS equivalent of the cumulative or index value in IASS can still be obtained by summing, then averaging the totals for the lineage. Under IASS the extensions are provided for the formulas of NESS. GASS retains the formulas used in the traditional NESS calculations. In effect, calculations are run for each of the four lineages (see Table 4.2).

The full sets of values associated with the inbreeding coefficients for the Guam population are presented in Table 4.2. They are segregated by decades between the dates of 1880 and 1939 with the exception of the upper-most division of the table. That portion of the table reflects a cumulative set of values for all six of the decades. The F_t values in the table reflect the total isonymy for the cohort in question. The inbreeding coefficients derived from the isonymy data are commonly partitioned into random and non-random components designated F_r (Figure 4.11) and F_n (Figure 4.12) respectively.

The following figure (4.11) illustrates the random component that comprises the majority of the total isonymy value which refers to homozygosity that takes place through panmictic mating in a population of finite size. The trend lines are smooth indicating few notable changes

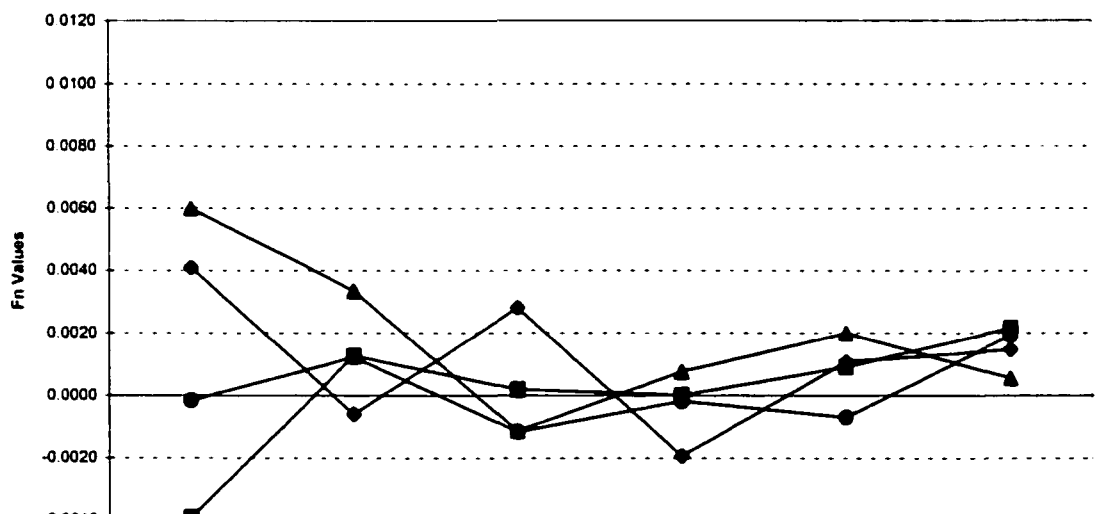
Figure 4.11 Guam *F*, from Isonymy



	1880	1890	1900	1910	1920	1930
1:3	0.0040	0.0041	0.0047	0.0044	0.0037	0.0037
1:4	0.0037	0.0035	0.0039	0.0036	0.0040	0.0044
2:3	0.0040	0.0037	0.0048	0.0044	0.0039	0.0038
2:4	0.0051	0.0041	0.0045	0.0041	0.0046	0.0046

F, Values by Surname Lineage

Figure 4.12 Guam Non-random *F*



	1880	1890	1900	1910	1920	1930
1:3	-0.0039	0.0013	0.0002	0.0000	0.0009	0.0022
1:4	0.0060	0.0033	-0.0011	0.0008	0.0020	0.0005
2:3	0.0041	-0.0006	0.0028	-0.0019	0.0011	0.0015
2:4	-0.0002	0.0012	-0.0012	-0.0002	-0.0007	0.0019

F_n Values by Surname Lineage

across the decades. As noted earlier, the random component usually is a measure of the long term cumulative changes associated with the lineage. In contrast, the non-random component indicates departure from random mating. In NESS the (1=3) lineage is the smoothest, likely due to the greater time depth associated with that lineage relative to the others seen in the figure.

The development of the GASS approach to evaluate the Chamorro data-set brings into question the validity of using a single measure for all four surname lineages within a dual surname system as advocated with the IASS approach. While inbreeding coefficients derived from the NESS lineage can be tainted by various factors, they can potentially measure relative changes for the same population over the period of study in the levels of inbreeding.

The benefits of increasing the sample size by incorporating the isonymous pairs from all four lineages advocated in the IASS approach are less apparent. It would appear, at the least, inappropriate to combine the NESS values with non-NESS lineages because doing so implies they are measuring equivalent entities. Given the temporal limits associated with the non-NESS lineages they certainly can not be measuring inbreeding as implied from an inbreeding coefficient. Further, reporting the composite values from these lineages prohibits investigating

what they may be indicative of, a matter to be explored in the conclusions.

Chapter 5. **CONCLUSIONS**

A favored population for evolutionary studies is one that emulates the conditions of the island model (MacArthur and Wilson 1967). Theoretical population models are used as heuristic devices to assess departures from the ideal with the recognition that actual populations will seldom, if ever, conform to the model. While island populations have been construed out of a variety of environmental settings (mountain peaks as sky islands for example), oceanic islands impart perhaps the greatest potential physical isolation. Lacking the presence of ecotonal intergradations that are common to the fringes of continental populations, the terrestrial inhabitants of oceanic islands are the most isolated.

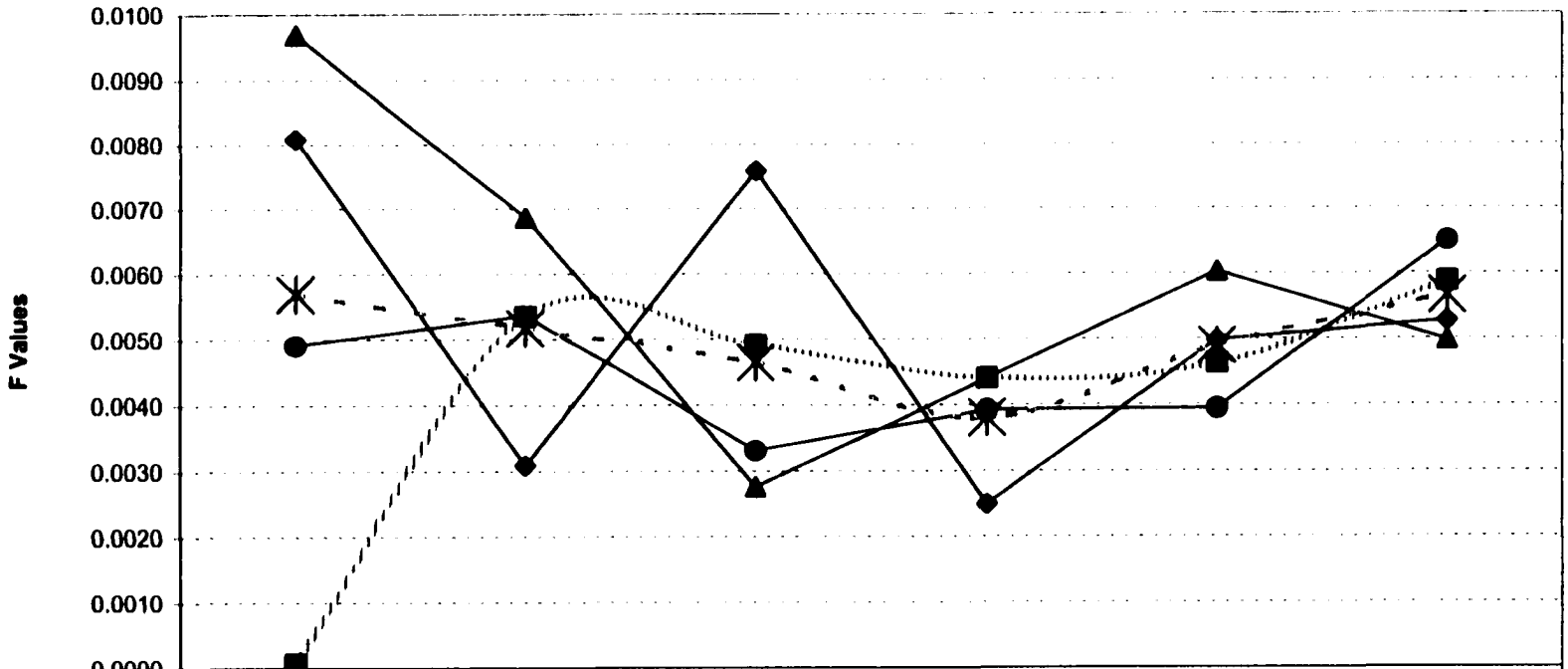
Islands enforce isolation and can amplify the effects of evolutionary forces as well as subject resident populations to events from which there can be no escape or little relief. The evolutionary literature is replete with examples from oceanic islands. Not infrequently, a pattern of catastrophic population declines, recoveries and associated bottlenecks characterize the history of island populations. Having to meet the theoretical standards yet also assure the population is a natural one is an inherent paradox to population studies. While no data-set can meet all of the conditions or assumptions, reasonable precautions can be implemented to control or prevent transgressions.

The GASS methodological approach was devised for the Chamorro population on Guam, an insular and remote population for most of its history. This methodology endeavors to take into account some of the shortcomings particular to working with historical populations through controlling for demographic variables in the composition of the sample, attempting to use a sample that reasonably approximates an effective breeding population, and employing measures cognizant of theoretical and methodological issues associated with isonymy and other determinations of inbreeding.

Surname transmission, similar to genetic gametic inheritance, is a reduction process. In comparison to single surname systems, dual surname systems potentially expand the readily available information prior to this reduction process which, in most human societies, favors a specific matrilineal or patrilineal descent pattern. GASS analysis is structured to take advantage of dual surname systems, potentially providing many more times the amount of surname information than NESS, if all the names are documented fully.

The results that can be drawn from this work portend implications for both the micro and macro-demographic levels of interpretation. The following figure depicts a composite graphing of both individual lineages and the cumulative measures designed G&I (GASS & IASS).

Figure 5.1 F_t Values



	1880	1890	1900	1910	1920	1930
1=3	0.0001	0.0054	0.0049	0.0044	0.0046	0.0059
1=4	0.0097	0.0069	0.0028	0.0044	0.0060	0.0050
2=3	0.0081	0.0031	0.0076	0.0025	0.0050	0.0053
2=4	0.0049	0.0054	0.0033	0.0039	0.0039	0.0065
G&I	0.0057	0.0052	0.0046	0.0038	0.0049	0.0057

The three non NESS (meaning other than 1=3) lineages all show wide fluctuations of F_t compared to the NESS lineage. In addition to the considerable range of these fluctuations, Figures 4.8 to 4.11 show instances of the non-random component dropping to a negative value. During the 1880 to 1939 period of time, each of the non-NESS lineages registers at least one instance of a negative value. Given the restricted time depth of these lineages, these measures can not be indicative of violations of the assumptions pertaining to isonymy in the remote history of the population. Rather than being strictly measures of biological inbreeding, these short term departures from random mating are suggestive of behaviors influencing spouse selection. Within the neo-Chamorro community there are socio-cultural norms that would suggest particular mate selection patterns are reinforced.

Research (del Valle 1979) conducted in the southern Guam community of Umatac reported that there appears to be a dominant pattern for selecting a spouse. In her report del Valle noted that mate selection:

> " . . .is based on bilateral relationships between the spouses. Following in order of decreasing importance are those who both trace their relationship patrilineally, and those who both trace their relationships matrilineally (del Valle 1979:62)."

It would appear that the GASS approach, by teasing out the non-NESS lineages from the cumulative IASS value, is able to discern from the isonimic values the behavioral patterns reported by del Valle. Isonymy then appears to be a useful device for elucidating local predilections of spouse preferences especially when portrayed as the snap-shots represented in Figures 4.5 to 4.10 or in the diachronic perspective used in the other figures. This data appears to corroborate what was expressed directly by one informant (del Valle 1979:57):

> "According to the custom we are not supposed to marry first, second, or third cousins, but many people go ahead and do it any way. For example, my husband's father and my father's father had the same last name, Sanchez."

Obviously, certain consanguineous mate preferences, if sustained over time, would have the potential to influence inbreeding rates whether or not they are accurately represented in the isonymy data.

The other lines in Figure 5.1 represent the cumulative values of GASS and IASS as well as NESS. Except for the decade of 1880 the NESS line follows the GASS/IASS line fairly closely. However, the 1880 NESS value is a possible example of how a single lineage can be subject to sampling error in a small population. Although the GASS/IASS cumulative values buffer against such effects, the information found in Figure 4.2 is a more direct alternative to use to represent the trend. This figure merely depicts

the percentage changes in the frequency of isonymous relationships. Although this chart shows cumulative totals (similar to GASS or IASS), individual lineages can be broken out. At the least, presenting this information as a percentage does not have the connotations associated with using an inbreeding coefficient.

Reference to Figure 4.2 raises the point made in the discussion chapter concerning the seemingly counter-intuitive simultaneous rise in population size and frequency of inbreeding as measured by isonymy. The del Valle research summarized some relevant information concerning geographic distribution of spouses. The observation was offered that in traditional and modern Umatac spouses were selected locally although that trend has decreased in modern times. In effect, modernization may be expanding the effective range spouses are found within. This phenomenon, coupled with the strong preference for marriage to certain categories of relatives could account for the rise in both inbreeding and population size between 1910 and 1939.

Whether or not NESS with its temporally longer lineage is an unbiased representation of inbreeding for the Guam population can not be resolved by the GASS approach. Resolving this matter will require augmenting the GASS methodology, perhaps requiring some modification of strategies used in other surname studies to work with a population with

dual surnames. Lasker and Kaplan have developed an approach using a methodology called repeated pairs (RP) which may prove productive (Lasker and Kaplan 1985). Crow suggests population structure may be productively approached through methods of gene identity (Crow 1996). More recent approaches to studying changing patterns of mate selection in geographic space (Barrai, et al. 2001) may complement a more traditional approach to isonymy and address some of the factors articulated by the del Valle study. The literature review completed in association with this research does not indicate that alternative approaches to IASS have been developed to study dual surname systems except for GASS. Given the breadth of techniques developed since the first application of IASS, it would be very surprising if other techniques can not be productively tailored to work with dual surname systems.

In summary, the findings from the research with the neo-Chamorro data-set and the associated isonymy database include:

1. the neo-Chamorro are representative of a population for which the methods of isonymy can be productively and appropriately applied;
2. the methods of sample construction employed under the GASS approach bring the neo-Chamorro population as close as possible, using a historical data-set, to constituting an effective breeding population;

3. the IASS approach to dual surname systems, by combining the data from all four paternal lineages, mixes lineages with divergent time depths thereby lessening the credibility of the IASS results;
4. The GASS approach, by distinguishing the separate lineages, enables the NESS lineage to continue to be used as a measure of inbreeding when deemed appropriate;
5. under GASS, the non-NESS lineages provide a measure of assortative mating potentially revealing patterns of preferred mate selection. These patterns may reveal episodes of assortative mating that could support increased levels of inbreeding as indicated by the NESS values;
6. the ethnohistoric and ethnographic records are not contradictory to the information obtained with the application of the GASS methodology;
7. other research methods might be adapted to provide strategies that would complement the GASS approach to dual surname systems.

APPENDIX A. GUAM ROOT NAMES FROM 1897 CENSUS & 2000 DATABASE

abara
abrera
acfalle
achaigua
achuga
acosta
acuda
ada
adamos
adriano
afaisen
afelor
aflague
afilleje
agana
agbay
agualo
aguero
aguigui
aguilar
aguisay
agulto
aguon
ahlam
alcaide
alcantara
alejandro
algaro
alicaya
alicto
alig
allcock
alvarez
anderson
andujar
angeles
angoco
antenor
apuron
aquillano
aquiningoc
aquino
arceo
argarno
ariarte
arriola
arroyo
artero
asano
assinque
asuncion
atoigue
autonate
ayuban
babauta
babe
bae
balajadia
baldoviso
baleto
balgas
ballesta
baltazar
bamba
barcinas
barquilla
baza
bontugan
bautista
bayona
baza
bell
benavente
benito
benjamin
berano
bergquist
bermudez
bernardo
bernas
betarion
binluand
bitanga
blanco
blas [blaz]
bodestin
bondshu
bontugan
bordallo
borja
boton
braga
brauon
brown
buenaventura
butler
caan
caballes
cabo
cabrera
cabrerizo
caguioa
calvo
camacho
camden
campos
candaso
candelario
carbullido
cardenas
cariaga
carlos
castillo
castro
cepeda
cerna
cerpedes

certeza
chaco
champuaco
chance
chang
charfauros]
chargualaf
charguane
charguilla
charsagua
chartage
cheguina
chiboc
chico
colner
combado
concepcion
contreras
cordova
coro
cortes
cortez
crisostomo
cristobal
cruz
cruzar
cuevas
cumbado
custino
damian
danao
davis
dawson
day
degracia
delgado
deogracia
deza
despao
diaz
dydasco
diego
difiz
dimapan
dimapan
diotengco
dison
divera
domanal
domingo
dominguez
dooley
dreannan
duarte
duenas
dumanal
dungca
duy-datco
dydasco
eclavea
eguiguan
eguina
elatico
elia
elliot
ellis
taenao
encarnacion
english
erickson
espinosa
espiritusanto
esquerra
esteban
estrellos
eulalia
eustaquio
evangelista
evaristo
fausto
farfan
farrell
faustino
fausto
fegurgur
fejarang
fernandez]
final
finona
florencio
flores
fox
fraga
francisco
franquez
freegord
freire
fruduu
fuertes
fujikawa
galvez
gamboa
garcia
garrido
garrison
gay
geiken
george
geronimo
gochinco
gofigan
goflage/goflaje
gogo
gogue
gomez
gonzales
gonzalo
gooco
grandwell
gregorio
grey
guachinco
guzman

guantafe
guerrero
guevara
gumabon
gumataotao
gumbo
gutierrez
guzman
guzom
halsey
hamamoto
hamilton
hamrick
haniu
hannah
hantschke
hanzsek
hara
hart
hayne
hennicker
henriquez
hernandez
herrera
herrero
hines
holloway
hongyee
howard
hudson
hughes
ibanez
ibangebata
ibasco
ichihara
iglesias
ignacio
imaisumi
indalecio
infana
ingai
inguillo
inosencio
inouye
iriarte (irriarte)
isezaki
ishizaki
isidro
iturzacta
iwatsu
jackson
james
javier
jesus
jocoq
johnson
johnston
jose
jot
juan
kamminga
kamo
kanagawa
kiga
kong-sum
kraber
kumiyama
lafrosa
lago
laguana
laines
lajo
lampitoc
lara
lascano
latap
lazaro
leask
leddy
leon
leonguerrero
lig
lima
limtiaco
lisoso
litasa
lizama
llano
long
lorenzo
losongco
lucero
lucia
lujan
lukban
luya
maanao
mabayag
macaino
macario
machimiya
macias
madali
mafnas
magdalena
maguadog
makino
malabitan
malijan
mamalo
manajane
manalisay
mandol
manglona
manibusan
manley
mann
manola
mansapit
mantanona
maquintos
marcelo
marehoua

maria
mariano
marion
martinez)
mata
matagulay
matanane
mateo
materne
matias
matsumiya
mauricio
mayekawa
mayhew
mayimie
mayo
mayor
mcdonald
megofna
meloso
mendiola
meno
merfalan
merfalen
mesa
miller
millinchamp
miner
miyasaki
montufal
montufar
morcillas
morita
muna
mundo
munoz
muntara
murphree
naburn
namauleg
nalujo
namasi
nangauta
naputi
nasayof
nauta
navarro
navera
nededog
nego
nelson
nieva
ninaisen
ninete
nodam
notley
novera
obrien
ocampo
ochai
oconnor
ofrecido
gogo
ojeda
okada
okazaki
okiyama
olivares
olive
onodera
ooka
oroso
ortiz
ouka
pablo
pacheco
padagas
padilla
pagal
palacios
paloma
palting
pangelinan
pascual
pasqual
patricio
patricio [patricia]
patterson
paulino
payne
peck
pellacani
pereda
peredo
perez
peterson
petros
pierce
pinaleg
pinaula
pineda
pividal
ploke
pocaigue
ponce
pongco
portusach
posido
prieto
probst
puntog
punzalan
qua
quan
quenga
quichocho
quidachay
quifunas
quinata
quinene
quinshang
quintanilla
quinto

quisalao
quitano
quitonguico
quitunguico
quitugua
rabago
rabon
ramirez
ramos
rapolla
raza
reguina
respicio
reyes
ricardo
rice
rios
rivera
roberto
rodriguez
rogofis
rojas
rola
romero
romualdo
romualda
ronde
roque
rosa
rosario
rosendo
royas
royos
rupply
sablan
saccomani
saenz
saez
safford
safra
sahagon
sakai
sakakibara
salas
salucnamnam
samanego
samanoyo
samudio
sanagustin
sanchez
sanfelipe
sanluis
sanmiguel
sannicolas
sanpedro
santarosa
santiago
santos
sarmiento
saturnino
savory
sayama
scharff
schmitt
schnabel
schwab
semiya
sgambelluri
shimada
shimizu
shimoda
sholing
shori
sicoso
siguenza
siongco
smith
soleta
sombrero
soriano
sotomayor
soyoana
soyona
sternberg
suarez
sudo
sugiyama
susuico
susuioco
suzuki
sypingco
taenao
tagana
tagfuaga
taguacta
taianaona
taienao
taijeron
taijiron
taijito
taimanao
taimanglo
tainatongo
taisacon
taisague
taisipig
taison
taitague
taitano
taitinfong
tajalle
takano
tala
talavera
talelago
tanaka
tanigush
tanona
tantay
tass
tatacaon
tatson
tayama

techaira
tedpahogo
tedpahogo
tedtaotao
tello
teltra
tendo
tenorio
terlaje
texta
tinarteco
tiquiengco
tiquiongco
tolentino
topasna
torres
toves
towner
trips
tudela
tungcap
tydingco
ugua
ulloa
uncangco
underwood
ungacta
unpingco
unsiog
untalan
untalanblas
uson
vail
valenzuela
vanmeter
vaughan
velarde
velasco
veneziano
ventura
vidal
villagomez
villanueva
vinkasa
vinluan
vista
vizle
waet
walker
walters
warquin
webb
white
wilson
wisle
wolford
wongpat
woreo
wusstig
yamaguchi
yamasaki
yamashita
yokoi
yoshida
yoyo
zafra
zamora
zuniga

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1880

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1880	acfalle	0.00	0.00	0.00	0.00	0	0	0	0
1880	acosta	0.00	0.00	0.01	0.00	0	0	0	0
1880	ada	0.00	0.03	0.00	0.07	0	0	0	0
1880	affleje	0.01	0.00	0.01	0.00	0	0	0	0
1880	aflague	0.04	0.00	0.02	0.00	0	0	0	0
1880	agualo	0.00	0.00	0.00	0.01	0	0	0	0
1880	aguigui	0.00	0.00	0.00	0.01	0	0	0	0
1880	aguilar	0.00	0.00	0.00	0.00	0	0	0	0
1880	aguon	0.01	0.03	0.08	0.20	0	0	0	0
1880	alejandro	0.00	0.00	0.00	0.00	0	0	0	0
1880	alvarez	0.00	0.00	0.01	0.00	0	0	0	0
1880	anderson	0.00	0.00	0.00	0.00	0	0	0	0
1880	angoco	0.00	0.00	0.00	0.00	0	0	0	0
1880	arceo	0.00	0.00	0.00	0.00	0	0	0	0
1880	arriola	0.01	0.01	0.00	0.00	0	0	0	0
1880	atao	0.01	0.00	0.00	0.00	0	0	0	0
1880	atoigue	0.03	0.00	0.01	0.00	0	0	1	0
1880	babauta	0.02	0.00	0.01	0.00	0	0	0	0
1880	balajadia	0.00	0.00	0.00	0.00	0	0	0	0
1880	bamba	0.00	0.00	0.00	0.00	0	0	0	0
1880	barcinas	0.00	0.00	0.00	0.00	0	0	0	0
1880	baza	0.00	0.01	0.00	0.01	0	0	0	0
1880	benavente	0.00	0.00	0.00	0.00	0	0	0	0
1880	blanco	0.00	0.00	0.00	0.01	0	0	0	0
1880	blas	0.01	0.03	0.03	0.10	0	0	0	0
1880	borja	0.03	0.03	0.07	0.07	0	0	0	0
1880	cabrera	0.00	0.00	0.00	0.00	0	0	0	0
1880	camacho	0.08	0.04	0.00	0.00	0	0	0	0
1880	campos	0.00	0.00	0.00	0.00	0	0	0	0
1880	carbullido	0.01	0.00	0.00	0.00	0	0	0	0
1880	cardenas	0.00	0.00	0.00	0.00	0	0	0	0
1880	castro	0.14	0.09	0.06	0.04	0	0	0	0
1880	cepeda	0.00	0.00	0.01	0.02	0	0	0	0
1880	chaco	0.00	0.00	0.00	0.00	0	0	0	0
1880	charfauros	0.01	0.01	0.00	0.00	0	0	0	0
1880	chargualaf	0.02	0.08	0.02	0.08	0	0	0	1
1880	cheguina	0.00	0.00	0.00	0.00	0	0	0	0
1880	concepcion	0.00	0.00	0.00	0.00	0	0	0	0

1880	coro	0.00	0.00	0.00	0.00	0	0	0	0
1880	crisostomo	0.01	0.02	0.01	0.02	0	0	0	0
1880	cruz	0.68	0.93	0.89	1.22	0	2	1	1
1880	delgado	0.01	0.03	0.00	0.00	0	0	0	0
1880	deza	0.00	0.00	0.00	0.00	0	0	0	0
1880	diaz	0.00	0.00	0.03	0.20	0	0	0	0
1880	diego	0.00	0.00	0.00	0.00	0	0	0	0
1880	dimapan	0.00	0.00	0.00	0.00	0	0	0	0
1880	duenas	0.00	0.01	0.00	0.01	0	0	0	0
1880	eguiguan	0.00	0.00	0.00	0.00	0	0	0	0
1880	espinosa	0.00	0.00	0.00	0.00	0	0	0	0
1880	espiritusantos	0.00	0.00	0.00	0.00	0	0	0	0
1880	eustaquio	0.00	0.00	0.00	0.00	0	0	0	0
1880	evangelista	0.00	0.00	0.00	0.00	0	0	0	0
1880	farfan	0.00	0.00	0.00	0.00	0	0	0	0
1880	fausto	0.00	0.00	0.00	0.00	0	0	0	0
1880	fegurgur	0.00	0.00	0.00	0.00	0	0	0	0
1880	fejarang	0.05	0.01	0.00	0.00	0	0	0	0
1880	finona	0.00	0.00	0.00	0.01	0	0	0	0
1880	flores	0.08	0.04	0.01	0.01	0	0	0	0
1880	franquez	0.00	0.00	0.00	0.00	0	0	0	0
1880	garrido	0.03	0.03	0.00	0.00	0	0	0	0
1880	gofigan	0.00	0.00	0.00	0.00	0	0	0	0
1880	gogue	0.00	0.00	0.00	0.00	0	0	0	0
1880	gregorio	0.00	0.00	0.00	0.00	0	0	0	0
1880	guerrero	0.03	0.00	0.00	0.00	0	0	0	0
1880	guzman	0.00	0.00	0.05	0.03	0	0	0	0
1880	herrero	0.01	0.00	0.00	0.00	0	0	0	0
1880	iglesias	0.00	0.00	0.00	0.00	0	0	0	0
1880	ignacio	0.00	0.00	0.00	0.00	0	0	0	0
1880	infana	0.00	0.00	0.00	0.00	0	0	0	0
1880	iriarte	0.00	0.00	0.00	0.00	0	0	0	0
1880	isidro	0.00	0.00	0.00	0.00	0	0	0	0
1880	jesus	0.00	0.00	0.00	0.00	0	0	0	0
1880	laguana	0.00	0.00	0.00	0.00	0	0	0	0
1880	leon	0.00	0.01	0.00	0.00	0	0	0	0
1880	leonguerrero	0.12	0.12	0.08	0.08	0	0	0	0
1880	limtiaco	0.00	0.00	0.00	0.00	0	0	0	0
1880	lizama	0.01	0.01	0.03	0.01	0	0	0	0
1880	lujan	0.01	0.01	0.04	0.02	0	0	0	0
1880	maanao	0.00	0.00	0.00	0.00	0	0	0	0

1880	mafnas	0.04	0.02	0.00	0.00	0	0	0	0
1880	maguadog	0.00	0.01	0.00	0.00	0	0	0	0
1880	malabitan	0.00	0.00	0.00	0.00	0	0	0	0
1880	manalisay	0.00	0.00	0.00	0.00	0	0	0	0
1880	manibusan	0.01	0.01	0.00	0.00	0	0	0	0
1880	mantanona	0.00	0.00	0.00	0.00	0	0	0	0
1880	mariano	0.00	0.00	0.00	0.00	0	0	0	0
1880	martinez	0.00	0.00	0.00	0.01	0	0	0	0
1880	materne	0.00	0.00	0.00	0.00	0	0	0	0
1880	megofna	0.01	0.01	0.00	0.00	0	0	0	0
1880	mendiola	0.06	0.06	0.06	0.06	0	0	0	0
1880	meno	0.04	0.00	0.01	0.00	0	0	1	0
1880	merfalen	0.00	0.00	0.00	0.00	0	0	0	0
1880	mesa	0.01	0.01	0.01	0.01	0	0	0	0
1880	miner	0.00	0.00	0.00	0.00	0	0	0	0
1880	muna	0.01	0.00	0.01	0.00	0	0	0	0
1880	namasi	0.00	0.00	0.00	0.00	0	0	0	0
1880	namauleg	0.00	0.00	0.00	0.00	0	0	0	0
1880	naputi	0.02	0.00	0.02	0.00	0	0	0	0
1880	nededog	0.00	0.01	0.00	0.00	0	0	0	0
1880	ocampo	0.00	0.00	0.00	0.00	0	0	0	0
1880	ogo	0.00	0.00	0.00	0.00	0	0	0	0
1880	ojeda	0.00	0.00	0.00	0.00	0	0	0	0
1880	ortiz	0.00	0.00	0.00	0.01	0	0	0	0
1880	pablo	0.01	0.00	0.01	0.00	0	0	0	0
1880	padilla	0.00	0.00	0.00	0.00	0	0	0	0
1880	palacios	0.00	0.00	0.00	0.00	0	0	0	0
1880	paloma	0.04	0.01	0.02	0.01	0	1	0	0
1880	pangelinan	0.03	0.01	0.00	0.00	0	0	0	0
1880	paulino	0.01	0.00	0.00	0.00	0	0	0	0
1880	pereda	0.00	0.00	0.00	0.00	0	0	0	0
1880	pereira	0.00	0.00	0.00	0.00	0	0	0	0
1880	perez	0.12	0.12	0.08	0.08	0	0	0	0
1880	pineda	0.00	0.00	0.00	0.00	0	0	0	0
1880	quichocho	0.00	0.00	0.00	0.00	0	0	0	0
1880	quidachay	0.00	0.00	0.00	0.00	0	0	0	0
1880	quinata	0.01	0.00	0.00	0.00	0	0	0	0
1880	quintanilla	0.00	0.00	0.00	0.00	0	0	0	0
1880	quisalco	0.00	0.00	0.00	0.00	0	0	0	0
1880	quitano	0.00	0.00	0.00	0.00	0	0	0	0
1880	quitugua	0.04	0.06	0.03	0.04	0	0	0	0

1880	reyes	0.02	0.04	0.14	0.27	0	1	0	0
1880	rivera	0.00	0.00	0.03	0.03	0	0	0	0
1880	roberto	0.00	0.01	0.00	0.01	0	0	0	0
1880	rodriguez	0.00	0.00	0.00	0.00	0	0	0	0
1880	rojas	0.00	0.00	0.01	0.00	0	0	0	0
1880	rosa	0.00	0.00	0.00	0.00	0	0	0	0
1880	rosario	0.00	0.00	0.00	0.00	0	0	0	0
1880	sablan	0.02	0.00	0.01	0.00	0	0	0	0
1880	salas	0.00	0.04	0.00	0.04	0	0	0	0
1880	salucnamnam	0.00	0.00	0.01	0.00	0	0	0	0
1880	sanagustin	0.00	0.00	0.00	0.00	0	0	0	0
1880	sanchez	0.00	0.00	0.00	0.00	0	0	0	0
1880	sannicolas	0.00	0.03	0.00	0.01	0	0	0	0
1880	santiago	0.00	0.00	0.00	0.00	0	0	0	0
1880	santos	0.46	0.23	0.52	0.26	0	2	2	1
1880	soriano	0.00	0.00	0.00	0.00	0	0	0	0
1880	taenao	0.00	0.01	0.00	0.00	0	0	0	0
1880	taijito	0.00	0.00	0.00	0.00	0	0	0	0
1880	taitague	0.00	0.00	0.00	0.00	0	0	0	0
1880	taitano	0.01	0.01	0.04	0.02	0	0	0	0
1880	taitinfong	0.00	0.00	0.00	0.00	0	0	0	0
1880	tajalle	0.00	0.00	0.00	0.00	0	0	0	0
1880	tanona	0.00	0.00	0.00	0.00	0	0	0	0
1880	tello	0.00	0.00	0.00	0.01	0	0	0	0
1880	tenorio	0.00	0.00	0.00	0.00	0	0	0	0
1880	terlaje	0.01	0.00	0.00	0.00	0	0	0	0
1880	tiquiengco	0.00	0.00	0.00	0.00	0	0	0	0
1880	torres	0.01	0.04	0.01	0.02	0	0	0	0
1880	toves	0.01	0.00	0.00	0.00	0	0	0	0
1880	tungcap	0.00	0.00	0.00	0.00	0	0	0	0
1880	ulloa	0.00	0.00	0.00	0.00	0	0	0	0
1880	ungcanco	0.00	0.00	0.00	0.00	0	0	0	0
1880	untalan	0.00	0.00	0.00	0.00	0	0	0	0
1880	valenzuela	0.00	0.00	0.00	0.00	0	0	0	0
1880	villagomez	0.00	0.00	0.00	0.01	0	0	0	0
1880	warquin	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	2.44	2.28	2.46	3.10	0	6	5	3

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1890

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1890	abara	0.00	0.00	0.00	0.00	0	0	0	0

1890	acfalle	0.02	0.01	0.01	0.01	1	0	1	0
1890	acosta	0.00	0.02	0.00	0.00	0	0	0	0
1890	ada	0.00	0.00	0.04	0.06	0	0	0	0
1890	afaisen	0.00	0.00	0.00	0.00	0	0	0	0
1890	affleje	0.00	0.00	0.00	0.00	0	0	0	0
1890	aflague	0.01	0.02	0.02	0.03	0	0	0	0
1890	agualo	0.00	0.00	0.01	0.00	0	0	0	0
1890	aguero	0.00	0.00	0.00	0.00	0	0	0	0
1890	aguilar	0.00	0.00	0.00	0.00	0	0	0	0
1890	aguon	0.37	0.18	0.30	0.15	0	0	0	0
1890	alcantara	0.00	0.00	0.00	0.00	0	0	0	0
1890	alejandro	0.00	0.00	0.00	0.00	0	0	0	0
1890	alig	0.00	0.00	0.00	0.00	0	0	0	0
1890	allcock	0.00	0.00	0.00	0.00	0	0	0	0
1890	alvarez	0.00	0.01	0.00	0.01	0	0	0	0
1890	anderson	0.00	0.00	0.00	0.00	0	0	0	0
1890	aquillano	0.00	0.00	0.00	0.00	0	0	0	0
1890	aquiningoc	0.01	0.00	0.01	0.00	0	0	0	0
1890	arceo	0.00	0.01	0.00	0.01	0	0	0	0
1890	arriola	0.00	0.00	0.00	0.00	0	0	0	0
1890	asuncion	0.00	0.00	0.00	0.00	0	0	0	0
1890	atoigue	0.04	0.00	0.00	0.00	0	0	0	0
1890	ayuban	0.00	0.00	0.00	0.00	0	0	0	0
1890	babauta	0.06	0.04	0.05	0.03	0	0	0	0
1890	bae	0.00	0.00	0.00	0.01	0	0	0	0
1890	baldoviso	0.00	0.00	0.00	0.00	0	0	0	0
1890	barcinas	0.00	0.00	0.00	0.00	0	0	0	0
1890	bautista	0.00	0.00	0.00	0.00	0	0	0	0
1890	bayona	0.00	0.00	0.00	0.00	0	0	0	0
1890	baza	0.01	0.01	0.01	0.01	0	0	0	0
1890	benavente	0.01	0.00	0.00	0.00	0	0	0	0
1890	bitanga	0.00	0.00	0.00	0.00	0	0	0	0
1890	blanco	0.00	0.00	0.02	0.04	0	0	0	0
1890	blas	0.06	0.09	0.06	0.09	1	0	2	1
1890	bodestin	0.00	0.00	0.00	0.00	0	0	0	0
1890	bontugan	0.00	0.00	0.00	0.00	0	0	0	0
1890	borja	0.08	0.11	0.09	0.13	0	0	0	0
1890	buenaventura	0.00	0.00	0.00	0.00	0	0	0	0
1890	cabrera	0.00	0.00	0.00	0.00	0	0	0	0
1890	calvo	0.00	0.00	0.00	0.00	0	0	0	0
1890	camacho	0.17	0.06	0.11	0.04	0	0	0	0

1890	campos	0.00	0.00	0.00	0.02	0	0	0	0
1890	candaso	0.00	0.00	0.00	0.00	0	0	0	0
1890	carbullido	0.00	0.00	0.00	0.00	0	0	0	0
1890	cardenas	0.00	0.00	0.00	0.00	0	0	0	0
1890	castro	0.13	0.07	0.11	0.06	0	0	0	0
1890	cepeda	0.04	0.03	0.04	0.03	0	0	0	0
1890	chaco	0.01	0.00	0.00	0.00	0	0	0	0
1890	champuaco	0.00	0.00	0.00	0.00	0	0	0	0
1890	charfauros	0.01	0.00	0.00	0.00	0	0	0	0
1890	chargualaf	0.06	0.06	0.06	0.06	0	1	0	0
1890	charguane	0.00	0.00	0.00	0.00	0	0	0	0
1890	charsagua	0.00	0.00	0.00	0.00	0	0	0	0
1890	cheguina	0.00	0.00	0.00	0.01	0	0	0	0
1890	chiboc	0.00	0.00	0.00	0.00	0	0	0	0
1890	chico	0.00	0.00	0.00	0.00	0	0	0	0
1890	concepcion	0.01	0.04	0.02	0.07	0	0	0	0
1890	cortez	0.00	0.00	0.00	0.01	0	0	0	0
1890	crisostomo	0.01	0.04	0.01	0.05	0	1	0	0
1890	cruz	1.49	1.36	1.42	1.29	2	3	0	0
1890	damian	0.00	0.00	0.00	0.00	0	0	0	0
1890	degracia	0.00	0.00	0.00	0.00	0	0	0	0
1890	delgado	0.00	0.00	0.01	0.04	0	0	0	0
1890	deza	0.00	0.00	0.00	0.00	0	0	0	0
1890	diaz	0.01	0.03	0.02	0.06	0	0	0	0
1890	diego	0.00	0.00	0.00	0.00	0	0	0	0
1890	dimapan	0.00	0.00	0.00	0.00	0	0	0	0
1890	diotengco	0.00	0.00	0.00	0.00	0	0	0	0
1890	duenas	0.15	0.13	0.04	0.04	0	1	0	0
1890	dydasco	0.00	0.00	0.00	0.00	0	0	0	0
1890	eclavea	0.00	0.00	0.00	0.00	0	0	0	0
1890	eguiguan	0.00	0.00	0.00	0.00	0	0	0	0
1890	espinosa	0.01	0.03	0.00	0.01	0	0	0	0
1890	espiritusantos	0.00	0.00	0.00	0.00	0	0	0	0
1890	farfan	0.00	0.00	0.00	0.00	0	0	0	0
1890	fausto	0.00	0.00	0.00	0.00	0	0	0	0
1890	fegurgur	0.00	0.01	0.00	0.02	0	0	0	0
1890	feijo	0.00	0.00	0.00	0.00	0	0	0	0
1890	fejarang	0.04	0.02	0.01	0.01	0	0	0	0
1890	fernandez	0.00	0.01	0.00	0.01	0	0	0	0
1890	finona	0.00	0.00	0.00	0.00	0	0	0	0
1890	flores	0.19	0.00	0.13	0.00	0	0	0	0

1890	francisco	0.00	0.00	0.00	0.00	0	0	0	0
1890	garcia	0.00	0.00	0.00	0.00	0	0	0	0
1890	garrido	0.05	0.09	0.04	0.06	0	0	0	0
1890	gofigan	0.00	0.00	0.00	0.00	0	0	0	0
1890	gogo	0.03	0.00	0.00	0.00	0	0	0	0
1890	gogue	0.00	0.02	0.00	0.00	0	0	0	0
1890	gregorio	0.00	0.00	0.00	0.00	0	0	0	0
1890	guerrero	0.00	0.00	0.03	0.00	0	0	0	0
1890	guevara	0.00	0.00	0.00	0.00	0	0	0	0
1890	gumataotao	0.00	0.00	0.00	0.00	0	0	0	0
1890	guzman	0.00	0.00	0.02	0.04	0	0	0	0
1890	herrero	0.00	0.00	0.00	0.00	0	0	0	0
1890	iglesias	0.00	0.00	0.00	0.00	0	0	0	0
1890	ignacio	0.00	0.00	0.00	0.00	0	0	0	0
1890	indalecio	0.00	0.00	0.00	0.01	0	0	0	0
1890	infana	0.00	0.00	0.00	0.00	0	0	0	0
1890	ingai	0.00	0.00	0.00	0.00	0	0	0	0
1890	inosencio	0.00	0.00	0.00	0.00	0	0	0	0
1890	iriarte	0.00	0.00	0.00	0.00	0	0	0	0
1890	james	0.00	0.00	0.00	0.00	0	0	0	0
1890	javier	0.00	0.00	0.00	0.00	0	0	0	0
1890	jesus	0.00	0.00	0.00	0.00	0	0	0	0
1890	lascano	0.00	0.00	0.00	0.02	0	0	0	0
1890	latap	0.00	0.00	0.00	0.00	0	0	0	0
1890	leon	0.01	0.00	0.02	0.00	0	0	0	0
1890	leonguerrero	0.52	0.40	0.24	0.18	0	1	0	0
1890	limtiaco	0.00	0.00	0.00	0.00	0	0	0	0
1890	lizama	0.01	0.01	0.01	0.02	0	0	0	0
1890	lujan	0.01	0.01	0.02	0.01	0	0	0	0
1890	maanao	0.00	0.00	0.00	0.00	0	0	0	0
1890	mafnas	0.00	0.01	0.00	0.00	0	0	0	0
1890	maguadog	0.00	0.00	0.00	0.01	0	0	0	0
1890	malijan	0.00	0.00	0.00	0.00	0	0	0	0
1890	manajane	0.00	0.00	0.00	0.00	0	0	0	0
1890	manalisay	0.00	0.00	0.00	0.01	0	0	0	0
1890	manglona	0.00	0.00	0.00	0.00	0	0	0	0
1890	manibusan	0.04	0.00	0.02	0.00	0	0	0	0
1890	mantanona	0.00	0.00	0.00	0.00	0	0	0	0
1890	martinez	0.04	0.07	0.02	0.04	0	0	0	0
1890	mata	0.00	0.00	0.00	0.00	0	0	0	0
1890	matanane	0.00	0.00	0.00	0.00	0	0	0	0

1890	materne	0.00	0.00	0.01	0.00	0	0	0	0
1890	megofna	0.00	0.01	0.00	0.00	0	0	0	0
1890	mendiola	0.06	0.21	0.22	0.73	0	0	0	2
1890	meno	0.00	0.00	0.00	0.00	0	0	0	0
1890	mesa	0.00	0.00	0.00	0.00	0	0	0	0
1890	muna	0.00	0.00	0.02	0.00	0	0	0	0
1890	munoz	0.00	0.00	0.00	0.00	0	0	0	0
1890	namasi	0.00	0.00	0.00	0.00	0	0	0	0
1890	namauleg	0.00	0.00	0.00	0.00	0	0	0	0
1890	nangauta	0.00	0.00	0.01	0.00	0	0	0	0
1890	naputi	0.00	0.01	0.00	0.01	0	0	0	0
1890	nego	0.00	0.00	0.00	0.00	0	0	0	0
1890	ogo	0.00	0.00	0.00	0.00	0	0	0	0
1890	pablo	0.00	0.01	0.00	0.01	0	0	0	0
1890	palacios	0.00	0.00	0.00	0.00	0	0	0	0
1890	paloma	0.01	0.01	0.04	0.06	0	0	0	0
1890	pangelinan	0.28	0.11	0.20	0.08	1	0	0	0
1890	paulino	0.00	0.00	0.00	0.00	0	0	0	0
1890	pereda	0.00	0.00	0.01	0.00	0	0	0	0
1890	perez	0.19	0.19	0.14	0.14	1	0	0	0
1890	pineda	0.00	0.00	0.00	0.00	0	0	0	0
1890	quenga	0.00	0.00	0.00	0.00	0	0	0	0
1890	quichocho	0.02	0.01	0.00	0.00	0	1	0	0
1890	quidachay	0.00	0.00	0.00	0.02	0	0	0	0
1890	quinata	0.05	0.01	0.00	0.00	0	0	0	0
1890	quintanilla	0.01	0.01	0.04	0.07	0	0	0	0
1890	quinto	0.00	0.00	0.00	0.00	0	0	0	0
1890	quitugua	0.02	0.01	0.04	0.01	0	0	0	0
1890	rabago	0.00	0.00	0.00	0.00	0	0	0	0
1890	ramirez	0.00	0.00	0.00	0.00	0	0	0	0
1890	rapolla	0.00	0.00	0.00	0.00	0	0	0	0
1890	reyes	0.03	0.03	0.09	0.09	0	0	0	0
1890	rios	0.00	0.00	0.00	0.00	0	0	0	0
1890	rivera	0.02	0.01	0.05	0.01	0	0	0	0
1890	roberto	0.00	0.00	0.00	0.00	0	0	0	0
1890	rodriguez	0.00	0.00	0.00	0.00	0	0	0	0
1890	rojas	0.00	0.00	0.00	0.00	0	0	0	0
1890	rola	0.00	0.00	0.00	0.00	0	0	0	0
1890	rosa	0.00	0.00	0.00	0.01	0	0	0	0
1890	rosario	0.01	0.04	0.01	0.02	0	0	0	0
1890	royos	0.00	0.00	0.00	0.00	0	0	0	0

1890	sablan	0.08	0.03	0.08	0.03	0	0	1	0
1890	sahagon	0.00	0.00	0.00	0.00	0	0	0	0
1890	salas	0.17	0.10	0.09	0.05	1	0	0	0
1890	samudio	0.00	0.00	0.00	0.00	0	0	0	0
1890	sanagustin	0.00	0.00	0.00	0.00	0	0	0	0
1890	sanchez	0.00	0.00	0.00	0.00	0	0	0	0
1890	sanluis	0.00	0.00	0.00	0.00	0	0	0	0
1890	sanmiguel	0.00	0.00	0.00	0.00	0	0	0	0
1890	sannicolas	0.18	0.26	0.06	0.09	0	1	0	0
1890	sanpedro	0.00	0.00	0.00	0.00	0	0	0	0
1890	santos	0.20	0.32	0.52	0.84	0	0	0	3
1890	sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
1890	siguenza	0.01	0.00	0.01	0.00	0	0	0	0
1890	susuico	0.00	0.00	0.00	0.00	0	0	0	0
1890	taenao	0.00	0.00	0.00	0.00	0	0	0	0
1890	tagana	0.00	0.00	0.00	0.01	0	0	0	0
1890	taguacta	0.00	0.00	0.00	0.00	0	0	0	0
1890	taijeron	0.00	0.00	0.00	0.00	0	0	0	0
1890	taijiron	0.00	0.00	0.00	0.00	0	0	0	0
1890	taijito	0.00	0.00	0.00	0.01	0	0	0	0
1890	taimanglo	0.01	0.01	0.00	0.00	0	0	0	0
1890	tainatongo	0.00	0.00	0.00	0.00	0	0	0	0
1890	taisacon	0.00	0.00	0.00	0.00	0	0	0	0
1890	taisague	0.00	0.00	0.00	0.00	0	0	0	0
1890	taison	0.00	0.00	0.00	0.00	0	0	0	0
1890	taitague	0.00	0.00	0.00	0.00	0	0	0	0
1890	taitano	0.01	0.04	0.06	0.18	0	0	0	1
1890	taitinfong	0.00	0.00	0.00	0.00	0	0	0	0
1890	talavera	0.00	0.00	0.00	0.00	0	0	0	0
1890	tanona	0.00	0.00	0.00	0.01	0	0	0	0
1890	tatacaon	0.00	0.00	0.00	0.00	0	0	0	0
1890	tedpahogo	0.00	0.00	0.00	0.00	0	0	0	0
1890	tedtaotao	0.00	0.00	0.00	0.00	0	0	0	0
1890	tello	0.00	0.00	0.00	0.01	0	0	0	0
1890	tenorio	0.02	0.05	0.03	0.08	0	0	0	0
1890	terlaje	0.00	0.00	0.00	0.00	0	0	0	0
1890	tinarteco	0.00	0.00	0.00	0.00	0	0	0	0
1890	tiquiengco	0.00	0.00	0.00	0.00	0	0	0	0
1890	topasna	0.01	0.00	0.00	0.00	0	0	0	0
1890	torres	0.13	0.11	0.02	0.02	0	0	0	0
1890	toves	0.06	0.03	0.02	0.01	0	0	0	0

1890	tudela	0.00	0.00	0.00	0.00	0	0	0	0
1890	tydingco	0.00	0.00	0.00	0.00	0	0	0	0
1890	ulloa	0.00	0.00	0.01	0.02	0	0	0	0
1890	ungacta	0.00	0.00	0.00	0.00	0	0	0	0
1890	unpingco	0.01	0.00	0.00	0.00	0	0	0	0
1890	untalan	0.01	0.01	0.00	0.00	0	0	0	0
1890	villagomez	0.00	0.00	0.00	0.01	0	0	0	0
1890	villanueva	0.00	0.00	0.00	0.00	0	0	0	0
1890	wilson	0.00	0.00	0.00	0.00	0	0	0	0
1890	wisle	0.00	0.00	0.00	0.00	0	0	0	0
1890	zuniga	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	5.33	4.60	4.79	5.39	7	9	4	7

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1900

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1900	acfalle	0.00	0.00	0.00	0.00	0	0	0	0
1900	achaigua	0.00	0.00	0.00	0.00	0	0	0	0
1900	achuga	0.00	0.00	0.00	0.00	0	0	0	0
1900	acosta	0.00	0.02	0.00	0.09	0	0	0	1
1900	ada	0.01	0.01	0.02	0.02	0	0	0	0
1900	afaisen	0.00	0.00	0.00	0.00	0	0	0	0
1900	affleje	0.00	0.00	0.00	0.00	0	0	0	0
1900	aflague	0.00	0.00	0.01	0.00	0	0	0	0
1900	agualo	0.00	0.01	0.00	0.00	0	0	0	0
1900	aguigui	0.00	0.00	0.00	0.00	0	0	0	0
1900	agulto	0.00	0.00	0.00	0.00	0	0	0	0
1900	aguon	0.18	0.16	0.07	0.06	0	0	0	0
1900	alcantara	0.00	0.00	0.00	0.00	0	0	0	0
1900	alvarez	0.00	0.00	0.00	0.00	0	0	0	0
1900	anderson	0.00	0.00	0.01	0.00	0	0	0	0
1900	angeles	0.00	0.00	0.00	0.00	0	0	0	0
1900	angoco	0.00	0.00	0.00	0.00	0	0	0	0
1900	aquiningoc	0.01	0.00	0.00	0.00	0	0	0	0
1900	aquino	0.00	0.00	0.00	0.00	0	0	0	0
1900	arceo	0.00	0.00	0.01	0.03	0	0	0	0
1900	arriola	0.00	0.00	0.00	0.02	0	0	0	0
1900	atoigue	0.01	0.01	0.01	0.01	0	0	1	0
1900	babauta	0.12	0.04	0.03	0.01	0	0	0	0
1900	bae	0.00	0.00	0.00	0.00	0	0	0	0
1900	barcinas	0.00	0.00	0.00	0.00	0	0	0	0
1900	bautista	0.00	0.00	0.00	0.00	0	0	0	0

1900	baza	0.03	0.01	0.00	0.00	0	0	0	0
1900	benavente	0.02	0.01	0.02	0.01	0	0	0	0
1900	bernardo	0.00	0.00	0.00	0.00	0	0	0	0
1900	blanco	0.00	0.01	0.00	0.01	0	0	0	0
1900	blas	0.02	0.04	0.03	0.07	0	0	1	0
1900	borja	0.18	0.20	0.16	0.18	0	0	1	1
1900	braga	0.00	0.00	0.00	0.00	0	0	0	0
1900	buenaventura	0.00	0.00	0.00	0.00	0	0	0	0
1900	cabrera	0.00	0.00	0.00	0.00	0	0	0	0
1900	calvo	0.01	0.00	0.00	0.00	0	0	0	0
1900	camacho	0.35	0.11	0.35	0.11	0	0	0	0
1900	campos	0.00	0.00	0.00	0.00	0	0	0	0
1900	carbullido	0.01	0.01	0.00	0.00	0	0	0	0
1900	cardenas	0.00	0.00	0.00	0.00	0	0	0	0
1900	castillo	0.00	0.00	0.00	0.00	0	0	0	0
1900	castro	0.40	0.28	0.14	0.10	2	0	0	0
1900	cepeda	0.00	0.02	0.00	0.01	0	0	0	0
1900	chaco	0.01	0.01	0.00	0.00	0	0	0	0
1900	champuaco	0.00	0.00	0.00	0.00	0	0	0	0
1900	chang	0.00	0.00	0.00	0.00	0	0	0	0
1900	charfauros	0.01	0.00	0.00	0.00	0	0	0	0
1900	chargualaf	0.03	0.08	0.02	0.05	0	2	1	0
1900	charguane	0.00	0.00	0.00	0.00	0	0	0	0
1900	charsagua	0.00	0.00	0.00	0.00	0	0	0	0
1900	cheguina	0.00	0.00	0.00	0.00	0	0	0	0
1900	chiboc	0.00	0.00	0.00	0.00	0	0	0	0
1900	concepcion	0.01	0.02	0.10	0.20	0	1	1	1
1900	cortes	0.00	0.00	0.00	0.00	0	0	0	0
1900	crisostomo	0.04	0.04	0.08	0.08	0	0	0	0
1900	cruz	3.91	2.60	4.69	3.12	4	0	6	2
1900	cruzar	0.00	0.00	0.00	0.00	0	0	0	0
1900	cumbado	0.00	0.00	0.00	0.00	0	0	0	0
1900	custino	0.00	0.00	0.00	0.00	0	0	0	0
1900	delgado	0.00	0.03	0.02	0.12	0	0	0	0
1900	deza	0.00	0.00	0.00	0.00	0	0	0	0
1900	diaz	0.00	0.00	0.01	0.04	0	0	0	0
1900	diego	0.00	0.00	0.00	0.00	0	0	0	0
1900	diotengco	0.00	0.00	0.00	0.00	0	0	0	0
1900	duenas	0.09	0.16	0.14	0.24	0	0	1	0
1900	dungca	0.00	0.00	0.00	0.00	0	0	0	0
1900	dydasco	0.00	0.00	0.00	0.00	0	0	0	0

1900	eclavea	0.00	0.00	0.00	0.00	0	0	0	0
1900	eguiguan	0.00	0.00	0.00	0.00	0	0	0	0
1900	enao	0.00	0.00	0.00	0.00	0	0	0	0
1900	erickson	0.00	0.00	0.00	0.00	0	0	0	0
1900	espinosa	0.00	0.03	0.00	0.03	0	0	0	0
1900	espiritusantos	0.00	0.00	0.00	0.00	0	0	0	0
1900	esteban	0.00	0.00	0.00	0.00	0	0	0	0
1900	farfan	0.00	0.00	0.00	0.00	0	0	0	0
1900	faustino	0.00	0.00	0.00	0.00	0	0	0	0
1900	fegurgur	0.00	0.01	0.00	0.08	0	1	0	0
1900	fejarang	0.02	0.04	0.02	0.04	0	0	0	0
1900	fernandez	0.00	0.00	0.00	0.00	0	0	0	0
1900	flores	0.07	0.05	0.05	0.04	0	0	0	0
1900	fraga	0.00	0.00	0.00	0.00	0	0	0	0
1900	francisco	0.00	0.00	0.00	0.00	0	0	0	0
1900	franquez	0.01	0.00	0.00	0.00	0	0	0	0
1900	fuertes	0.00	0.00	0.00	0.00	0	0	0	0
1900	garcia	0.01	0.00	0.00	0.00	0	0	0	0
1900	garrido	0.00	0.03	0.02	0.21	0	0	0	0
1900	gofigan	0.00	0.00	0.00	0.01	0	0	0	0
1900	gogo	0.00	0.00	0.00	0.00	0	0	0	0
1900	gogue	0.00	0.00	0.00	0.00	0	0	0	0
1900	guantafe	0.00	0.00	0.00	0.00	0	0	0	0
1900	guerrero	0.04	0.03	0.05	0.04	0	0	0	0
1900	guevara	0.00	0.00	0.00	0.00	0	0	0	0
1900	gumataotao	0.01	0.00	0.01	0.00	0	0	0	0
1900	gutierrez	0.00	0.00	0.00	0.00	0	0	0	0
1900	guzman	0.00	0.03	0.00	0.03	0	0	0	0
1900	guzom	0.00	0.00	0.00	0.00	0	0	0	0
1900	hernandez	0.00	0.00	0.00	0.00	0	0	0	0
1900	herrero	0.00	0.00	0.00	0.00	0	0	0	0
1900	iglesias	0.01	0.01	0.01	0.01	0	0	0	0
1900	ignacio	0.02	0.03	0.00	0.01	0	0	0	0
1900	indalecio	0.00	0.00	0.00	0.00	0	0	0	0
1900	infana	0.00	0.00	0.00	0.00	0	0	0	0
1900	iriarte	0.02	0.00	0.04	0.00	0	0	0	0
1900	javier	0.00	0.00	0.00	0.00	0	0	0	0
1900	jesus	0.00	0.00	0.00	0.00	0	0	0	0
1900	jocoq	0.00	0.00	0.00	0.00	0	0	0	0
1900	johnson	0.00	0.00	0.00	0.00	0	0	0	0
1900	jose	0.00	0.00	0.00	0.00	0	0	0	0

1900	laguana	0.00	0.01	0.02	0.03	0	0	0	0
1900	lampitoc	0.00	0.00	0.00	0.00	0	0	0	0
1900	lazaro	0.00	0.00	0.00	0.00	0	0	0	0
1900	leon	0.00	0.00	0.00	0.00	0	0	0	0
1900	leonguerrero	0.25	0.28	0.42	0.47	0	0	0	0
1900	limtiaco	0.00	0.00	0.00	0.00	0	0	0	0
1900	lizama	0.07	0.04	0.02	0.01	0	0	0	0
1900	lorenzo	0.00	0.00	0.00	0.00	0	0	0	0
1900	lucero	0.00	0.00	0.00	0.00	0	0	0	0
1900	lujan	0.03	0.00	0.03	0.00	0	0	0	0
1900	maanao	0.00	0.00	0.00	0.00	0	0	0	0
1900	mafnas	0.04	0.03	0.04	0.03	0	0	0	0
1900	manalisay	0.00	0.00	0.00	0.00	0	0	0	0
1900	manglona	0.00	0.00	0.00	0.00	0	0	0	0
1900	manibusan	0.03	0.04	0.03	0.04	0	0	0	0
1900	mansapit	0.00	0.00	0.00	0.00	0	0	0	0
1900	mantanona	0.03	0.00	0.00	0.00	1	0	0	0
1900	marcelo	0.00	0.00	0.00	0.00	0	0	0	0
1900	mariano	0.00	0.00	0.00	0.00	0	0	0	0
1900	martinez	0.03	0.05	0.04	0.09	0	0	1	0
1900	mata	0.00	0.00	0.00	0.00	0	0	0	0
1900	matanane	0.00	0.00	0.00	0.00	0	0	0	0
1900	materne	0.02	0.00	0.04	0.01	0	0	0	0
1900	megofna	0.00	0.00	0.00	0.04	0	0	0	0
1900	mendiola	0.18	0.12	0.11	0.07	0	0	0	0
1900	meno	0.02	0.00	0.01	0.00	0	0	0	0
1900	merfalen	0.00	0.00	0.00	0.00	0	0	0	0
1900	mesa	0.01	0.02	0.01	0.02	0	0	0	0
1900	millinchamp	0.00	0.00	0.00	0.00	0	0	0	0
1900	miner	0.00	0.00	0.00	0.00	0	0	0	0
1900	muna	0.01	0.02	0.03	0.06	0	0	0	0
1900	mundo	0.00	0.00	0.00	0.00	0	0	0	0
1900	namasi	0.00	0.00	0.00	0.00	0	0	0	0
1900	namauleg	0.00	0.00	0.00	0.00	0	0	0	0
1900	nangauta	0.00	0.00	0.00	0.00	0	0	0	0
1900	naputi	0.01	0.00	0.01	0.00	0	0	0	0
1900	nauta	0.00	0.00	0.00	0.01	0	0	0	0
1900	navarro	0.00	0.00	0.00	0.00	0	0	0	0
1900	navera	0.00	0.00	0.00	0.00	0	0	0	0
1900	nededog	0.00	0.00	0.00	0.00	0	0	0	0
1900	nego	0.00	0.00	0.00	0.00	0	0	0	0

1900	ogo	0.00	0.00	0.00	0.00	0	0	0	0
1900	ojeda	0.00	0.00	0.00	0.00	0	0	0	0
1900	oroso	0.00	0.00	0.00	0.00	0	0	0	0
1900	ouka	0.00	0.00	0.00	0.00	0	0	0	0
1900	pablo	0.01	0.03	0.00	0.00	0	0	0	0
1900	padagas	0.00	0.00	0.00	0.00	0	0	0	0
1900	padilla	0.00	0.00	0.00	0.00	0	0	0	0
1900	palacios	0.00	0.01	0.00	0.01	0	0	0	0
1900	paloma	0.00	0.00	0.01	0.02	0	0	0	0
1900	palting	0.00	0.00	0.00	0.00	0	0	0	0
1900	pangelinan	0.16	0.18	0.16	0.18	0	0	0	0
1900	pasqual	0.00	0.00	0.00	0.00	0	0	0	0
1900	patricio	0.00	0.00	0.00	0.00	0	0	0	0
1900	paulino	0.00	0.00	0.00	0.01	0	0	0	0
1900	payne	0.00	0.00	0.00	0.00	0	0	0	0
1900	pereda	0.02	0.03	0.00	0.00	0	0	0	0
1900	pereira	0.00	0.00	0.00	0.00	0	0	0	0
1900	perez	0.39	0.26	0.25	0.17	0	0	0	0
1900	petronila	0.00	0.00	0.00	0.00	0	0	0	0
1900	pinaula	0.00	0.00	0.00	0.00	0	0	0	0
1900	pividal	0.00	0.00	0.00	0.00	0	0	0	0
1900	portusach	0.00	0.00	0.00	0.00	0	0	0	0
1900	quenga	0.00	0.00	0.00	0.00	0	0	0	0
1900	quichocho	0.00	0.00	0.00	0.00	0	0	0	0
1900	quidachay	0.03	0.00	0.00	0.00	0	0	0	0
1900	quinata	0.01	0.00	0.00	0.00	1	0	0	0
1900	quintanilla	0.03	0.02	0.02	0.01	0	0	0	0
1900	quisa	0.00	0.00	0.00	0.00	0	0	0	0
1900	quitugua	0.03	0.04	0.04	0.06	0	0	0	0
1900	quitunguico	0.00	0.00	0.00	0.00	0	0	0	0
1900	rabago	0.00	0.00	0.00	0.00	0	0	0	0
1900	ramirez	0.00	0.00	0.00	0.00	0	0	0	0
1900	reyes	0.02	0.07	0.03	0.11	0	0	0	0
1900	rios	0.00	0.00	0.00	0.00	0	0	0	0
1900	rivera	0.04	0.02	0.00	0.00	0	0	0	0
1900	roberto	0.00	0.00	0.00	0.00	0	0	0	0
1900	rojas	0.01	0.00	0.01	0.00	0	0	0	0
1900	rosa	0.00	0.01	0.00	0.01	0	0	0	0
1900	rosario	0.08	0.04	0.10	0.05	0	0	0	0
1900	royos	0.00	0.00	0.00	0.00	0	0	0	0
1900	sablan	0.21	0.18	0.03	0.03	0	0	0	0

1900	saccomani	0.00	0.00	0.00	0.00	0	0	0	0
1900	saez	0.00	0.00	0.00	0.00	0	0	0	0
1900	salas	0.29	0.26	0.21	0.19	0	0	0	0
1900	salucnamnam	0.00	0.00	0.00	0.00	0	0	0	0
1900	sanagustin	0.01	0.01	0.00	0.00	0	0	0	0
1900	sanchez	0.00	0.00	0.00	0.00	0	0	0	0
1900	sannicolas	0.24	0.18	0.37	0.28	0	1	1	0
1900	sanpedro	0.00	0.00	0.00	0.00	0	0	0	0
1900	santiago	0.00	0.00	0.00	0.00	0	0	0	0
1900	santos	0.36	0.72	0.41	0.82	1	0	0	1
1900	sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
1900	sgambelluri	0.00	0.00	0.00	0.00	0	0	0	0
1900	sholing	0.00	0.00	0.00	0.00	0	0	0	0
1900	shori	0.00	0.00	0.00	0.00	0	0	0	0
1900	siguenza	0.00	0.00	0.00	0.00	0	0	0	0
1900	soriano	0.00	0.00	0.00	0.00	0	0	0	0
1900	susuico	0.00	0.00	0.00	0.00	0	0	0	0
1900	taijeron	0.01	0.00	0.00	0.00	0	0	0	0
1900	taijiron	0.00	0.00	0.00	0.00	0	0	0	0
1900	taijito	0.00	0.00	0.00	0.00	0	0	0	0
1900	taimanglo	0.00	0.02	0.00	0.01	0	0	0	0
1900	tainatongo	0.00	0.00	0.00	0.00	0	0	0	0
1900	taisague	0.00	0.00	0.00	0.01	0	0	0	0
1900	taitague	0.00	0.00	0.00	0.00	0	0	0	0
1900	taitano	0.18	0.13	0.05	0.04	0	0	0	0
1900	taitinfong	0.01	0.00	0.00	0.00	0	0	0	0
1900	tajalle	0.00	0.00	0.00	0.00	0	0	0	0
1900	tanona	0.00	0.00	0.00	0.00	0	0	0	0
1900	tedpahogo	0.00	0.00	0.00	0.01	0	0	0	0
1900	tedtaotao	0.00	0.00	0.00	0.00	0	0	0	0
1900	tello	0.00	0.00	0.00	0.00	0	0	0	0
1900	teltras	0.00	0.00	0.00	0.00	0	0	0	0
1900	tenorio	0.00	0.04	0.00	0.02	0	0	0	0
1900	terlaje	0.01	0.01	0.02	0.02	0	0	0	0
1900	tinarteco	0.00	0.00	0.00	0.00	0	0	0	0
1900	tiquiengco	0.00	0.00	0.00	0.00	0	0	0	0
1900	tolentino	0.00	0.00	0.00	0.00	0	0	0	0
1900	torres	0.05	0.03	0.09	0.05	0	0	0	0
1900	toves	0.01	0.01	0.03	0.02	0	0	0	0
1900	ulloa	0.00	0.00	0.01	0.01	0	0	0	0
1900	ungacta	0.00	0.00	0.00	0.00	0	0	0	0

1900	ungcanco	0.00	0.00	0.00	0.00	0	0	0	0
1900	unpingco	0.00	0.00	0.00	0.00	0	0	0	0
1900	untalan	0.02	0.01	0.01	0.00	0	0	0	0
1900	valenzuela	0.00	0.00	0.00	0.00	0	0	0	0
1900	villagomez	0.00	0.02	0.01	0.03	0	0	0	0
1900	villanueva	0.00	0.00	0.00	0.00	0	0	0	0
1900	warquin	0.00	0.00	0.00	0.00	0	0	0	0
1900	white	0.00	0.00	0.00	0.00	0	0	0	0
1900	wilson	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	8.65	7.11	8.78	8.17	9	5	14	6

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1910

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1910	acfalle	0.01	0.01	0.00	0.00	0	0	0	0
1910	achaigua	0.00	0.00	0.00	0.00	0	0	0	0
1910	acosta	0.00	0.00	0.00	0.00	0	0	0	0
1910	ada	0.01	0.01	0.02	0.02	0	0	0	0
1910	adriano	0.00	0.00	0.00	0.00	0	0	0	0
1910	afaisen	0.01	0.00	0.00	0.00	0	0	0	0
1910	affleje	0.00	0.00	0.00	0.00	0	0	0	0
1910	aflague	0.02	0.00	0.02	0.00	0	0	0	0
1910	agualo	0.00	0.00	0.00	0.00	0	0	0	0
1910	aguero	0.00	0.00	0.00	0.00	0	0	0	0
1910	aguigui	0.00	0.01	0.00	0.00	0	0	0	0
1910	aguon	0.25	0.13	0.08	0.04	1	1	0	0
1910	alvarez	0.00	0.00	0.00	0.00	0	0	0	0
1910	anderson	0.00	0.00	0.00	0.00	0	0	0	0
1910	angeles	0.00	0.00	0.00	0.00	0	0	0	0
1910	angoco	0.00	0.00	0.00	0.00	0	0	0	0
1910	aquiningoc	0.00	0.00	0.01	0.00	0	0	0	0
1910	aquino	0.00	0.00	0.00	0.00	0	0	0	0
1910	arceo	0.01	0.02	0.01	0.02	0	0	0	0
1910	arriola	0.00	0.00	0.02	0.02	0	0	0	0
1910	atao	0.00	0.00	0.00	0.00	0	0	0	0
1910	atoigue	0.02	0.01	0.05	0.02	0	0	0	0
1910	babauta	0.08	0.13	0.08	0.13	0	0	1	0
1910	balajadia	0.00	0.00	0.00	0.00	0	0	0	0
1910	bamba	0.00	0.00	0.00	0.00	0	0	0	0
1910	barcinas	0.00	0.00	0.00	0.01	0	0	0	0
1910	bayona	0.00	0.00	0.00	0.00	0	0	0	0
1910	baza	0.00	0.02	0.00	0.00	0	0	0	0

1910	benavente	0.01	0.02	0.01	0.01	0	0	0	0
1910	bernardo	0.00	0.00	0.00	0.00	0	0	0	0
1910	blanco	0.00	0.00	0.00	0.01	0	0	0	0
1910	blas	0.09	0.09	0.05	0.05	0	0	0	0
1910	bontugan	0.00	0.00	0.00	0.00	0	0	0	0
1910	borja	0.16	0.24	0.22	0.32	0	0	0	0
1910	bukikosa	0.00	0.00	0.00	0.00	0	0	0	0
1910	cabrera	0.00	0.00	0.01	0.05	0	0	0	0
1910	calvo	0.01	0.00	0.00	0.00	0	0	0	0
1910	camacho	0.14	0.17	0.23	0.28	0	0	0	0
1910	campos	0.00	0.00	0.00	0.00	0	0	0	0
1910	candaso	0.00	0.00	0.00	0.00	0	0	0	0
1910	carbullido	0.00	0.00	0.00	0.00	0	0	0	0
1910	cardenas	0.00	0.00	0.00	0.02	0	0	0	0
1910	cariaga	0.00	0.00	0.00	0.00	0	0	0	0
1910	castro	0.53	0.18	0.46	0.15	1	0	1	0
1910	cepeda	0.03	0.05	0.12	0.21	0	0	0	0
1910	cerna	0.00	0.00	0.00	0.00	0	0	0	0
1910	chaco	0.00	0.00	0.00	0.01	0	0	0	0
1910	champuaco	0.00	0.00	0.00	0.00	0	0	0	0
1910	charfauros	0.08	0.02	0.05	0.02	0	0	1	0
1910	chargualaf	0.19	0.05	0.05	0.01	1	0	0	0
1910	charsagua	0.00	0.00	0.00	0.00	0	0	0	0
1910	cheguina	0.00	0.00	0.00	0.00	0	0	0	0
1910	concepcion	0.07	0.05	0.12	0.08	0	0	0	0
1910	cortes	0.00	0.00	0.00	0.00	0	0	0	0
1910	crisostomo	0.10	0.05	0.31	0.16	0	0	0	0
1910	cristobal	0.00	0.00	0.00	0.00	0	0	0	0
1910	cruz	3.36	2.06	3.27	2.00	4	2	2	1
1910	cruzar	0.00	0.00	0.00	0.00	0	0	0	0
1910	degracia	0.00	0.00	0.00	0.00	0	0	0	0
1910	delgado	0.00	0.01	0.03	0.08	0	0	0	0
1910	deza	0.00	0.00	0.00	0.00	0	0	0	0
1910	diaz	0.00	0.01	0.00	0.00	0	0	0	0
1910	diego	0.00	0.00	0.01	0.01	0	0	0	0
1910	dim	0.00	0.00	0.00	0.00	0	0	0	0
1910	diotengco	0.00	0.00	0.00	0.00	0	0	0	0
1910	duarte	0.00	0.00	0.00	0.00	0	0	0	0
1910	duenas	0.15	0.07	0.11	0.05	0	0	0	0
1910	dungca	0.00	0.00	0.00	0.00	0	0	0	0
1910	dydasco	0.00	0.00	0.00	0.00	0	0	0	0

1910	eclavea	0.00	0.00	0.00	0.00	0	0	0	0
1910	espinosa	0.00	0.01	0.00	0.02	0	0	0	0
1910	espiritusantos	0.00	0.00	0.00	0.00	0	0	0	0
1910	esteban	0.00	0.00	0.00	0.00	0	0	0	0
1910	eustaquio	0.00	0.00	0.00	0.00	0	0	0	0
1910	evangelista	0.00	0.00	0.00	0.00	0	0	0	0
1910	fabian	0.00	0.00	0.00	0.00	0	1	0	0
1910	fausto	0.00	0.00	0.00	0.00	0	0	0	0
1910	fegurgur	0.00	0.00	0.00	0.00	0	0	0	0
1910	feja	0.00	0.00	0.00	0.00	0	0	0	0
1910	fejarang	0.07	0.07	0.07	0.07	0	0	0	0
1910	fernandez	0.00	0.00	0.00	0.00	0	0	0	0
1910	finona	0.00	0.00	0.00	0.00	0	0	0	0
1910	flores	0.24	0.06	0.17	0.05	0	0	0	0
1910	fraga	0.00	0.00	0.00	0.00	0	0	0	0
1910	francisco	0.02	0.00	0.00	0.00	0	0	0	0
1910	franquez	0.01	0.00	0.00	0.00	0	0	0	0
1910	gamboa	0.00	0.00	0.00	0.00	0	0	0	0
1910	garcia	0.02	0.00	0.00	0.00	0	0	0	0
1910	garrido	0.04	0.06	0.04	0.06	0	0	0	0
1910	gofigan	0.00	0.00	0.00	0.00	0	0	0	0
1910	gogo	0.01	0.01	0.02	0.02	0	0	0	0
1910	gogue	0.02	0.02	0.01	0.01	0	0	0	0
1910	gomez	0.00	0.00	0.00	0.00	0	0	0	0
1910	gonzales	0.00	0.00	0.00	0.00	0	0	0	0
1910	guerrero	0.07	0.08	0.11	0.12	0	0	0	0
1910	guevara	0.00	0.01	0.00	0.00	0	0	0	0
1910	gumataotao	0.00	0.02	0.00	0.00	0	0	0	0
1910	gumboc	0.00	0.00	0.00	0.00	0	0	0	0
1910	gutierrez	0.00	0.00	0.00	0.00	0	0	0	0
1910	guzman	0.00	0.00	0.00	0.01	0	0	0	0
1910	guzom	0.00	0.00	0.00	0.00	0	0	0	0
1910	hernandez	0.00	0.00	0.00	0.00	0	0	0	0
1910	herrero	0.00	0.00	0.00	0.00	0	0	0	0
1910	ibanez	0.00	0.00	0.00	0.00	0	0	0	0
1910	idol	0.00	0.00	0.00	0.00	0	0	0	0
1910	iglesias	0.00	0.01	0.01	0.03	0	0	0	0
1910	ignacio	0.00	0.00	0.00	0.00	0	0	0	0
1910	inosencio	0.00	0.00	0.00	0.00	0	0	0	0
1910	iriarte	0.00	0.00	0.01	0.01	0	0	0	0
1910	iturzacta	0.00	0.00	0.00	0.00	0	0	0	0

1910	jesus	0.02	0.00	0.00	0.00	0	0	0	0
1910	kamminga	0.00	0.00	0.00	0.00	0	0	0	0
1910	laguana	0.00	0.00	0.00	0.00	0	0	0	0
1910	laines	0.00	0.00	0.00	0.00	0	0	0	0
1910	leask	0.00	0.00	0.00	0.00	0	0	0	0
1910	leon	0.00	0.00	0.00	0.00	0	0	0	0
1910	leonguerrero	0.73	0.67	0.69	0.63	1	0	0	0
1910	limtiaco	0.00	0.00	0.00	0.00	0	0	0	0
1910	lizama	0.04	0.05	0.05	0.07	0	0	0	1
1910	losongco	0.00	0.00	0.00	0.00	0	0	0	0
1910	lujan	0.08	0.05	0.00	0.00	0	0	0	0
1910	mafnas	0.03	0.04	0.04	0.05	0	0	0	0
1910	maguadog	0.00	0.00	0.00	0.00	0	0	0	0
1910	manajane	0.00	0.00	0.00	0.00	0	0	0	0
1910	manalisay	0.00	0.00	0.00	0.00	0	0	0	0
1910	manglona	0.00	0.01	0.00	0.00	0	0	0	0
1910	manibusan	0.04	0.05	0.04	0.05	0	0	0	0
1910	mansapit	0.00	0.00	0.00	0.00	0	0	0	0
1910	mantanona	0.00	0.00	0.00	0.00	0	0	0	0
1910	martinez	0.01	0.04	0.02	0.06	0	0	0	0
1910	mata	0.00	0.00	0.00	0.00	0	0	0	0
1910	matanane	0.00	0.00	0.00	0.00	0	0	0	0
1910	materne	0.00	0.00	0.00	0.00	0	0	0	0
1910	megofna	0.00	0.00	0.00	0.00	0	0	0	0
1910	meloso	0.00	0.00	0.00	0.00	0	0	0	0
1910	mendiola	0.12	0.14	0.12	0.14	0	0	0	0
1910	meno	0.08	0.07	0.08	0.07	0	0	0	1
1910	mesa	0.01	0.02	0.00	0.00	0	0	0	0
1910	millinchamp	0.00	0.00	0.00	0.00	0	0	0	0
1910	miner	0.00	0.00	0.00	0.00	0	0	0	0
1910	muna	0.01	0.01	0.02	0.01	0	0	0	0
1910	munoz	0.01	0.00	0.00	0.00	0	0	0	0
1910	namauleg	0.00	0.00	0.00	0.01	0	0	0	0
1910	naputi	0.02	0.01	0.01	0.00	0	0	0	0
1910	nauta	0.00	0.00	0.00	0.00	0	0	0	0
1910	navarro	0.00	0.00	0.00	0.00	0	0	0	0
1910	nededog	0.00	0.00	0.00	0.00	0	0	0	0
1910	nego	0.00	0.00	0.00	0.00	0	0	0	0
1910	ninete	0.00	0.00	0.00	0.00	0	0	0	0
1910	ogo	0.00	0.01	0.00	0.00	1	0	0	0
1910	ojeda	0.00	0.00	0.00	0.00	0	0	0	0

1910	pablo	0.00	0.01	0.02	0.02	0	0	0	0
1910	padilla	0.00	0.00	0.00	0.02	0	0	0	0
1910	palacios	0.00	0.00	0.00	0.00	0	0	0	0
1910	paloma	0.01	0.01	0.04	0.07	0	0	0	0
1910	pangelinan	0.11	0.13	0.26	0.32	0	0	0	0
1910	patricio	0.00	0.00	0.00	0.00	0	0	0	0
1910	paulino	0.00	0.00	0.00	0.00	0	0	0	0
1910	pereda	0.01	0.00	0.00	0.00	0	0	0	0
1910	pereira	0.00	0.01	0.00	0.01	0	0	0	0
1910	perez	0.33	0.60	0.33	0.60	0	1	0	1
1910	petros	0.00	0.00	0.00	0.00	0	0	0	0
1910	pineda	0.00	0.00	0.00	0.00	0	0	0	0
1910	pocaigue	0.00	0.00	0.00	0.00	0	0	0	0
1910	pongco	0.00	0.00	0.00	0.00	0	0	0	0
1910	quenga	0.00	0.00	0.00	0.00	0	0	0	0
1910	quichocho	0.00	0.02	0.00	0.01	0	0	0	0
1910	quidachay	0.00	0.01	0.01	0.02	0	0	0	0
1910	quifunas	0.00	0.00	0.00	0.00	0	0	0	0
1910	quinata	0.02	0.02	0.02	0.02	0	1	0	2
1910	quintanilla	0.00	0.02	0.00	0.01	0	0	0	0
1910	quitano	0.00	0.00	0.00	0.00	0	0	0	0
1910	quitugua	0.01	0.02	0.01	0.02	0	0	0	0
1910	ramirez	0.00	0.00	0.00	0.00	0	0	0	0
1910	respicio	0.00	0.00	0.00	0.00	0	0	0	0
1910	reyes	0.08	0.16	0.06	0.12	0	1	0	0
1910	rios	0.00	0.00	0.00	0.00	0	0	0	0
1910	rivera	0.00	0.04	0.00	0.08	0	0	0	0
1910	roberto	0.00	0.01	0.00	0.00	0	0	0	0
1910	rodriguez	0.00	0.00	0.00	0.00	0	0	0	0
1910	rojas	0.00	0.01	0.00	0.01	0	0	0	0
1910	romualdo	0.00	0.00	0.00	0.00	0	0	0	0
1910	rosa	0.00	0.00	0.00	0.00	0	0	0	0
1910	rosario	0.04	0.02	0.02	0.01	0	0	0	0
1910	sablan	0.09	0.13	0.07	0.09	0	0	0	1
1910	salas	0.18	0.10	0.14	0.08	0	0	0	0
1910	salucnamnam	0.00	0.00	0.00	0.01	0	0	0	0
1910	sanagustin	0.01	0.01	0.01	0.01	0	1	0	0
1910	sanchez	0.01	0.00	0.00	0.00	0	0	0	0
1910	sanluis	0.00	0.00	0.00	0.00	0	0	0	0
1910	sannicolas	0.29	0.35	0.16	0.19	0	0	0	0
1910	santiago	0.01	0.00	0.00	0.00	0	0	0	0

1910	santos	0.45	0.56	0.82	1.02	0	1	0	1
1910	sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
1910	saturnino	0.00	0.00	0.00	0.00	0	0	0	0
1910	shimada	0.00	0.00	0.00	0.00	0	0	0	0
1910	siguenza	0.00	0.01	0.00	0.01	0	0	0	0
1910	siongco	0.00	0.00	0.00	0.00	0	0	0	0
1910	soriano	0.00	0.00	0.00	0.01	0	0	0	0
1910	suarez	0.00	0.00	0.00	0.00	0	0	0	0
1910	taenao	0.00	0.00	0.00	0.00	0	0	0	0
1910	taguacta	0.00	0.00	0.00	0.00	0	0	0	0
1910	taijeron	0.02	0.01	0.01	0.00	0	0	0	0
1910	taijiron	0.00	0.00	0.00	0.00	0	0	0	0
1910	taimanglo	0.00	0.01	0.00	0.01	0	0	0	0
1910	taisague	0.00	0.00	0.00	0.00	0	0	0	0
1910	taitague	0.00	0.02	0.00	0.00	0	0	0	0
1910	taitano	0.07	0.07	0.08	0.08	0	0	0	0
1910	taitinfong	0.00	0.00	0.00	0.00	0	0	0	0
1910	tajalle	0.00	0.00	0.00	0.00	0	0	0	0
1910	talavera	0.00	0.00	0.00	0.00	0	0	0	0
1910	tantay	0.00	0.00	0.00	0.00	0	0	0	0
1910	techaira	0.00	0.00	0.00	0.00	0	0	0	0
1910	tedpahogo	0.00	0.00	0.00	0.00	0	0	0	0
1910	tedtaotao	0.00	0.00	0.00	0.00	0	0	0	0
1910	tello	0.00	0.00	0.00	0.01	0	0	0	0
1910	tenorio	0.02	0.01	0.01	0.00	0	0	0	0
1910	terlaje	0.00	0.00	0.01	0.02	0	0	0	0
1910	tiquiengco	0.01	0.00	0.00	0.00	0	0	0	0
1910	tolentino	0.00	0.00	0.00	0.00	0	0	0	0
1910	topasna	0.01	0.00	0.00	0.00	0	0	0	0
1910	torres	0.07	0.11	0.09	0.14	0	0	0	0
1910	toves	0.04	0.04	0.01	0.01	0	0	0	0
1910	tudela	0.00	0.00	0.00	0.00	0	0	0	0
1910	tungcap	0.00	0.00	0.00	0.00	0	0	0	0
1910	tydingco	0.00	0.00	0.00	0.00	0	0	0	0
1910	ulloa	0.00	0.00	0.00	0.00	0	0	0	0
1910	ungacta	0.00	0.00	0.00	0.00	0	0	0	0
1910	ungcanco	0.00	0.00	0.00	0.00	0	0	0	0
1910	unpingco	0.00	0.00	0.00	0.00	0	0	0	0
1910	untalan	0.01	0.01	0.01	0.01	0	0	0	0
1910	uson	0.00	0.00	0.00	0.00	0	0	0	0
1910	valenzuela	0.00	0.00	0.00	0.01	0	0	0	0

1910	villagomez	0.00	0.01	0.00	0.02	0	0	0	0
1910	warquin	0.00	0.00	0.00	0.00	0	0	0	0
1910	white	0.00	0.00	0.00	0.00	0	0	0	0
1910	wilson	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	8.98	7.42	9.03	8.38	9	9	5	8

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1920

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1920	acfalle	0.00	0.00	0.00	0.00	0	0	0	0
1920	achaigua	0.00	0.00	0.00	0.00	0	0	0	0
1920	acosta	0.00	0.01	0.01	0.02	0	0	0	0
1920	ada	0.00	0.01	0.00	0.00	0	0	0	0
1920	adriano	0.00	0.00	0.00	0.00	0	0	0	0
1920	afaisen	0.00	0.00	0.00	0.00	0	0	0	0
1920	affleje	0.01	0.00	0.01	0.00	0	0	0	0
1920	aflague	0.01	0.04	0.01	0.03	0	0	0	0
1920	agualo	0.00	0.00	0.00	0.00	0	0	0	0
1920	aguero	0.00	0.00	0.00	0.00	0	0	0	0
1920	aguigui	0.00	0.00	0.00	0.00	0	0	0	0
1920	aguon	0.26	0.14	0.29	0.16	2	0	0	0
1920	alcantara	0.00	0.00	0.00	0.00	0	0	0	0
1920	alvarez	0.01	0.00	0.00	0.00	0	0	0	0
1920	anderson	0.03	0.01	0.00	0.00	0	0	0	0
1920	angeles	0.00	0.00	0.00	0.00	0	0	0	0
1920	angoco	0.00	0.00	0.00	0.00	0	0	0	0
1920	aquiningoc	0.00	0.01	0.01	0.02	0	0	0	0
1920	aquino	0.00	0.01	0.00	0.01	0	0	0	0
1920	arceo	0.00	0.00	0.00	0.00	0	0	0	0
1920	arriola	0.00	0.00	0.01	0.01	0	0	0	0
1920	atao	0.00	0.00	0.00	0.00	0	0	0	0
1920	atoigue	0.02	0.02	0.01	0.01	0	0	0	0
1920	autonate	0.00	0.00	0.00	0.00	0	0	0	0
1920	babauta	0.04	0.02	0.06	0.03	0	0	1	0
1920	bae	0.00	0.00	0.00	0.00	0	0	0	0
1920	balajadia	0.00	0.00	0.00	0.00	0	0	0	0
1920	baleto	0.00	0.00	0.00	0.00	0	0	0	0
1920	bamba	0.00	0.00	0.00	0.00	0	0	0	0
1920	barcinas	0.00	0.00	0.01	0.00	0	0	0	0
1920	bautista	0.00	0.01	0.01	0.01	0	0	0	0
1920	bayona	0.00	0.00	0.00	0.00	0	0	0	0
1920	baza	0.04	0.02	0.01	0.01	0	0	0	0

1920	bell	0.00	0.00	0.00	0.00	0	0	0	0
1920	benavente	0.00	0.08	0.00	0.10	0	0	0	0
1920	bernardo	0.00	0.00	0.00	0.00	0	0	0	0
1920	blanco	0.00	0.00	0.00	0.00	0	0	0	0
1920	blas	0.14	0.21	0.09	0.14	1	0	0	0
1920	bodestin	0.00	0.00	0.00	0.00	0	0	0	0
1920	bontugan	0.00	0.00	0.00	0.00	0	0	0	0
1920	bordallo	0.00	0.00	0.00	0.00	0	0	0	0
1920	borja	0.24	0.17	0.30	0.21	0	0	0	0
1920	bukikosa	0.00	0.00	0.00	0.00	0	0	0	0
1920	cabo	0.00	0.00	0.00	0.00	0	0	0	0
1920	cabrera	0.01	0.02	0.03	0.06	0	0	0	0
1920	calvo	0.00	0.00	0.00	0.00	0	0	0	0
1920	camacho	0.22	0.41	0.24	0.44	1	0	1	0
1920	campos	0.00	0.00	0.00	0.00	0	0	0	0
1920	candaso	0.00	0.00	0.00	0.00	0	0	0	0
1920	carbullido	0.02	0.00	0.00	0.00	0	0	0	0
1920	cardenas	0.00	0.00	0.00	0.01	0	0	0	0
1920	castro	0.32	0.23	0.28	0.20	2	0	0	1
1920	cepeda	0.02	0.06	0.05	0.15	0	0	0	0
1920	certeza	0.00	0.00	0.00	0.00	0	0	0	0
1920	chaco	0.01	0.00	0.00	0.00	0	0	0	0
1920	champuaco	0.00	0.00	0.00	0.00	0	0	0	0
1920	charfauros	0.01	0.03	0.00	0.01	0	0	0	0
1920	chargualaf	0.02	0.02	0.05	0.05	0	0	0	0
1920	charguane	0.00	0.00	0.00	0.00	0	0	0	0
1920	charsagua	0.00	0.00	0.00	0.00	0	0	0	0
1920	cheguina	0.00	0.01	0.01	0.02	0	0	0	0
1920	concepcion	0.02	0.06	0.07	0.19	0	0	0	1
1920	cortes	0.00	0.00	0.00	0.00	0	0	0	0
1920	crisostomo	0.08	0.11	0.02	0.03	0	0	0	0
1920	cruz	3.86	4.55	3.86	4.55	4	8	6	4
1920	damian	0.00	0.00	0.00	0.00	0	0	0	0
1920	degracia	0.00	0.00	0.00	0.00	0	0	0	0
1920	delgado	0.00	0.00	0.02	0.01	0	0	0	0
1920	deza	0.00	0.00	0.00	0.00	0	0	0	0
1920	diaz	0.04	0.02	0.07	0.03	0	0	1	0
1920	diego	0.00	0.00	0.00	0.00	0	0	0	0
1920	dim	0.00	0.00	0.00	0.00	0	0	0	0
1920	dimapan	0.00	0.00	0.00	0.00	0	0	0	0
1920	diotengco	0.00	0.00	0.00	0.00	0	0	0	0

1920	drennan	0.00	0.00	0.00	0.00	0	0	0	0
1920	duenas	0.17	0.30	0.24	0.41	0	0	0	0
1920	dumanal	0.00	0.00	0.00	0.00	0	0	0	0
1920	dungca	0.00	0.00	0.00	0.00	0	0	0	0
1920	dydasco	0.00	0.00	0.00	0.00	0	0	0	0
1920	eclavea	0.00	0.00	0.00	0.00	0	0	0	0
1920	espinosa	0.01	0.01	0.00	0.00	0	0	0	0
1920	espiritusantos	0.00	0.00	0.00	0.00	0	0	0	0
1920	esteban	0.00	0.00	0.00	0.00	0	0	0	0
1920	eustaquio	0.00	0.00	0.00	0.00	0	0	0	0
1920	evangelista	0.00	0.00	0.00	0.00	0	0	0	0
1920	farfan	0.00	0.00	0.00	0.00	0	0	0	0
1920	fausto	0.00	0.00	0.00	0.00	0	0	0	0
1920	fegurgur	0.00	0.00	0.00	0.00	0	0	0	0
1920	fejarang	0.03	0.05	0.02	0.03	0	1	0	0
1920	fernandez	0.01	0.01	0.00	0.00	0	0	0	0
1920	finona	0.00	0.00	0.00	0.00	0	0	0	0
1920	flores	0.19	0.27	0.13	0.17	0	0	0	0
1920	fraga	0.00	0.00	0.00	0.00	0	0	0	0
1920	francisco	0.00	0.00	0.00	0.00	0	0	0	0
1920	franquez	0.00	0.00	0.00	0.00	0	0	0	0
1920	garcia	0.01	0.01	0.01	0.01	0	0	0	0
1920	garrido	0.08	0.01	0.10	0.01	0	0	0	0
1920	gofigan	0.00	0.00	0.00	0.00	0	0	0	0
1920	gogo	0.00	0.00	0.03	0.05	0	0	0	0
1920	gogue	0.02	0.00	0.00	0.00	0	0	0	0
1920	gomez	0.00	0.00	0.00	0.00	0	0	0	0
1920	gonzales	0.00	0.00	0.00	0.00	0	0	0	0
1920	guerrero	0.03	0.04	0.21	0.30	0	0	0	1
1920	guevara	0.00	0.01	0.00	0.01	0	0	0	0
1920	gumataotao	0.01	0.00	0.00	0.00	0	0	0	0
1920	gutierrez	0.00	0.00	0.00	0.00	0	0	0	0
1920	guzman	0.00	0.00	0.00	0.00	0	0	0	0
1920	guzom	0.00	0.00	0.00	0.00	0	0	0	0
1920	haniu	0.00	0.00	0.00	0.00	0	0	0	0
1920	hernandez	0.00	0.00	0.00	0.00	0	0	0	0
1920	herrero	0.00	0.00	0.00	0.00	0	0	0	0
1920	hongyee	0.00	0.00	0.00	0.00	0	0	0	0
1920	ibasco	0.00	0.00	0.00	0.00	0	0	0	0
1920	iglesias	0.00	0.00	0.01	0.02	0	0	0	0
1920	ignacio	0.01	0.00	0.03	0.01	0	0	0	0

1920	indalecio	0.00	0.00	0.00	0.00	0	0	0	0
1920	iriarte	0.01	0.01	0.01	0.01	0	0	0	0
1920	isidro	0.00	0.00	0.00	0.00	0	0	0	0
1920	jackson	0.00	0.00	0.00	0.00	0	0	0	0
1920	james	0.00	0.00	0.00	0.00	0	0	0	0
1920	javier	0.00	0.00	0.00	0.00	0	0	0	0
1920	jesus	0.01	0.00	0.00	0.00	0	0	0	0
1920	kamminga	0.00	0.00	0.00	0.00	0	0	0	0
1920	lago	0.00	0.00	0.00	0.00	0	0	0	0
1920	laguana	0.00	0.00	0.00	0.00	0	0	0	0
1920	lampitoc	0.00	0.00	0.00	0.00	0	0	0	0
1920	lazaro	0.00	0.00	0.00	0.00	0	0	0	0
1920	leddy	0.00	0.00	0.00	0.00	0	0	0	0
1920	leon	0.00	0.01	0.00	0.02	0	0	0	0
1920	leonguerrero	0.52	0.37	0.76	0.54	1	1	1	0
1920	limtiaco	0.01	0.00	0.00	0.00	0	0	0	0
1920	lizama	0.07	0.08	0.03	0.03	0	0	0	0
1920	lujan	0.03	0.10	0.03	0.12	0	1	0	0
1920	lukban	0.00	0.00	0.00	0.00	0	0	0	0
1920	maanao	0.00	0.00	0.00	0.00	0	0	0	0
1920	macias	0.00	0.00	0.00	0.00	0	0	0	0
1920	mafnas	0.01	0.00	0.01	0.01	0	0	0	0
1920	maguadog	0.00	0.00	0.00	0.00	0	0	0	0
1920	malijan	0.00	0.00	0.00	0.00	0	0	0	0
1920	manalisay	0.00	0.00	0.00	0.00	0	0	0	0
1920	manglona	0.00	0.00	0.00	0.00	0	0	0	0
1920	manibusan	0.07	0.06	0.07	0.06	0	0	0	0
1920	mantanona	0.03	0.03	0.01	0.01	0	0	0	0
1920	marcelo	0.00	0.00	0.00	0.00	0	0	0	0
1920	maria	0.00	0.00	0.00	0.00	0	0	0	0
1920	mariano	0.00	0.00	0.00	0.00	0	0	0	0
1920	marion	0.00	0.00	0.00	0.00	0	0	0	0
1920	martinez	0.02	0.01	0.03	0.02	0	0	0	0
1920	matanane	0.00	0.01	0.00	0.00	0	0	0	0
1920	mateo	0.00	0.00	0.00	0.00	0	0	0	0
1920	materne	0.00	0.00	0.00	0.01	0	0	0	0
1920	megofna	0.00	0.00	0.00	0.00	0	0	0	0
1920	mendiola	0.33	0.38	0.17	0.20	0	0	0	0
1920	meno	0.09	0.10	0.09	0.10	0	1	0	0
1920	merfalen	0.00	0.00	0.00	0.00	0	0	0	0
1920	mesa	0.18	0.06	0.01	0.00	0	0	0	0

1920	miner	0.00	0.00	0.00	0.00	0	0	0	0
1920	morcillas	0.00	0.00	0.00	0.00	0	0	0	0
1920	muna	0.01	0.00	0.02	0.00	0	0	0	0
1920	mundo	0.00	0.00	0.00	0.00	0	0	0	0
1920	munoz	0.01	0.00	0.00	0.00	0	0	0	0
1920	namauleg	0.00	0.00	0.00	0.00	0	0	0	0
1920	nangauta	0.00	0.00	0.00	0.00	0	0	0	0
1920	naputi	0.03	0.01	0.04	0.02	0	0	0	0
1920	nauta	0.00	0.00	0.00	0.00	0	0	0	0
1920	nededog	0.00	0.01	0.00	0.00	0	1	0	0
1920	nego	0.00	0.00	0.00	0.00	0	0	0	0
1920	nelson	0.00	0.00	0.00	0.00	0	0	0	0
1920	ninaisen	0.00	0.00	0.00	0.00	0	0	0	0
1920	ogo	0.00	0.00	0.00	0.00	0	0	0	0
1920	ojeda	0.00	0.00	0.00	0.00	0	0	0	0
1920	oroso	0.00	0.00	0.00	0.00	0	0	0	0
1920	pablo	0.03	0.01	0.01	0.01	1	0	0	0
1920	padilla	0.00	0.00	0.00	0.01	0	0	0	0
1920	paloma	0.03	0.04	0.04	0.05	0	0	0	0
1920	palting	0.00	0.00	0.00	0.00	0	0	0	0
1920	pangelinan	0.20	0.26	0.44	0.57	0	1	2	0
1920	pasqual	0.00	0.00	0.00	0.00	0	0	0	0
1920	paulino	0.01	0.02	0.01	0.01	0	0	0	0
1920	pellacani	0.00	0.00	0.00	0.00	0	0	0	0
1920	pereda	0.02	0.03	0.00	0.00	0	0	0	0
1920	pereira	0.00	0.00	0.00	0.00	0	0	0	0
1920	perez	0.34	0.46	0.36	0.49	0	0	1	0
1920	pinaula	0.00	0.00	0.00	0.00	0	0	0	0
1920	pocaigue	0.00	0.00	0.00	0.00	0	0	0	0
1920	punzalan	0.00	0.00	0.00	0.00	0	0	0	0
1920	quenga	0.06	0.00	0.00	0.00	0	0	0	0
1920	quichocho	0.04	0.06	0.02	0.03	0	0	0	0
1920	quidachay	0.01	0.02	0.02	0.04	0	0	0	0
1920	quinata	0.01	0.01	0.02	0.03	0	0	0	2
1920	quinene	0.00	0.00	0.00	0.00	0	0	0	0
1920	quintanilla	0.04	0.03	0.02	0.01	0	0	0	0
1920	quitano	0.00	0.00	0.00	0.00	0	0	0	0
1920	quitugua	0.03	0.12	0.07	0.24	0	0	0	1
1920	quitunguico	0.00	0.00	0.00	0.00	0	0	0	0
1920	rabago	0.00	0.00	0.00	0.00	0	0	0	0
1920	rabon	0.00	0.00	0.00	0.00	0	0	0	0

1920	ramos	0.00	0.00	0.00	0.00	0	0	0	0
1920	rapolla	0.00	0.00	0.00	0.00	0	0	0	0
1920	respicio	0.00	0.00	0.00	0.00	0	0	0	0
1920	reyes	0.06	0.12	0.14	0.28	0	0	0	0
1920	rios	0.01	0.00	0.00	0.00	0	0	0	0
1920	rivera	0.01	0.03	0.03	0.14	0	0	0	0
1920	roberto	0.00	0.00	0.00	0.00	0	0	0	0
1920	rojas	0.00	0.00	0.00	0.00	0	0	0	0
1920	romero	0.00	0.00	0.00	0.00	0	0	0	0
1920	rosa	0.00	0.00	0.00	0.00	0	0	0	0
1920	rosario	0.08	0.01	0.10	0.01	0	0	0	0
1920	rupply	0.00	0.00	0.00	0.00	0	0	0	0
1920	sablan	0.19	0.24	0.06	0.07	0	1	0	0
1920	saccomani	0.00	0.00	0.00	0.00	0	0	0	0
1920	sahagon	0.00	0.00	0.00	0.00	0	0	0	0
1920	salas	0.17	0.21	0.19	0.22	0	0	0	0
1920	salucnamnam	0.00	0.00	0.00	0.00	0	0	0	0
1920	sanagustin	0.04	0.01	0.02	0.01	0	0	0	0
1920	sanchez	0.02	0.00	0.02	0.00	0	0	0	0
1920	sanmiguel	0.00	0.00	0.00	0.00	0	0	0	0
1920	sannicolas	0.54	0.26	0.43	0.21	0	0	0	0
1920	santiago	0.00	0.00	0.00	0.00	0	0	0	0
1920	santos	0.47	0.69	0.94	1.37	1	1	1	0
1920	sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
1920	sgambelluri	0.00	0.00	0.00	0.00	0	0	0	0
1920	shimizu	0.00	0.00	0.00	0.00	0	0	0	0
1920	siguenza	0.01	0.00	0.00	0.00	0	0	0	0
1920	soriano	0.00	0.00	0.00	0.00	0	0	0	0
1920	susuico	0.00	0.00	0.00	0.00	0	0	0	0
1920	taenao	0.01	0.00	0.00	0.00	0	0	0	0
1920	taguacta	0.00	0.00	0.00	0.00	0	0	0	0
1920	taijeron	0.00	0.00	0.01	0.01	0	0	0	0
1920	taijito	0.00	0.00	0.00	0.00	0	0	0	0
1920	taimanglo	0.02	0.02	0.02	0.02	0	1	0	1
1920	tainatongo	0.00	0.00	0.00	0.00	0	0	0	0
1920	taitague	0.00	0.00	0.01	0.01	0	0	0	0
1920	taitano	0.14	0.07	0.03	0.02	0	0	0	0
1920	taitinfong	0.00	0.01	0.00	0.02	0	0	0	0
1920	tajalle	0.00	0.00	0.00	0.00	0	0	0	0
1920	talavera	0.00	0.00	0.00	0.00	0	0	0	0
1920	tanaka	0.00	0.00	0.00	0.00	0	0	0	0

1920	tedpahogo	0.00	0.00	0.00	0.00	0	0	0	0
1920	tello	0.00	0.00	0.00	0.00	0	0	0	0
1920	tenorio	0.03	0.08	0.02	0.05	0	0	0	0
1920	terlaje	0.01	0.00	0.00	0.00	0	0	0	0
1920	tiquiengco	0.00	0.00	0.00	0.00	0	0	0	0
1920	tolentino	0.00	0.00	0.00	0.00	0	0	0	0
1920	topasna	0.00	0.01	0.00	0.00	0	0	0	0
1920	torres	0.08	0.14	0.14	0.25	0	0	0	0
1920	toves	0.13	0.10	0.09	0.07	0	0	0	0
1920	tudela	0.00	0.00	0.00	0.00	0	0	0	0
1920	tungcap	0.00	0.00	0.00	0.00	0	0	0	0
1920	tydingco	0.00	0.00	0.00	0.00	0	0	0	0
1920	ulloa	0.00	0.01	0.00	0.01	0	0	0	0
1920	ungacta	0.00	0.00	0.00	0.00	0	0	0	0
1920	ungcanco	0.00	0.00	0.00	0.00	0	0	0	0
1920	unpingco	0.00	0.01	0.00	0.01	0	0	0	0
1920	untalan	0.03	0.00	0.00	0.00	0	0	0	0
1920	valenzuela	0.00	0.00	0.00	0.00	0	0	0	0
1920	velarde	0.00	0.00	0.00	0.00	0	0	0	0
1920	villagomez	0.00	0.01	0.00	0.00	0	0	0	0
1920	villanueva	0.00	0.00	0.00	0.00	0	0	0	0
1920	walters	0.00	0.00	0.00	0.00	0	0	0	0
1920	warquin	0.00	0.00	0.00	0.00	0	0	0	0
1920	white	0.00	0.00	0.00	0.00	0	0	0	0
1920	wisle	0.00	0.00	0.00	0.00	0	0	0	0
1920	zuniga	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	10.40	11.32	10.94	12.99	13	17	14	11

APPENDIX B. ISONYMOUS MARRIAGES BY DECADE - 1930

Decade	Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
1930	acfalle	0.00	0.01	0.00	0.01	0	0	0	0
1930	achaigua	0.00	0.00	0.00	0.00	0	0	0	0
1930	acosta	0.01	0.00	0.01	0.00	0	0	0	0
1930	ada	0.01	0.01	0.01	0.01	0	0	0	0
1930	adriano	0.00	0.00	0.00	0.00	0	0	0	0
1930	affleje	0.01	0.00	0.00	0.00	0	0	0	0
1930	aflague	0.01	0.04	0.03	0.10	0	0	0	0
1930	agualo	0.00	0.01	0.00	0.00	0	0	0	0
1930	aguigui	0.00	0.00	0.00	0.00	0	0	0	0
1930	aguon	0.34	0.50	0.26	0.38	0	0	1	1
1930	alcantara	0.00	0.00	0.00	0.00	0	0	0	0

1930	alicto	0.00	0.00	0.00	0.00	0	0	0	0
1930	alig	0.00	0.00	0.00	0.00	0	0	0	0
1930	alvarez	0.00	0.00	0.00	0.00	0	0	0	0
1930	anderson	0.00	0.00	0.01	0.01	0	0	0	0
1930	angeles	0.00	0.00	0.00	0.01	0	0	0	0
1930	angoco	0.00	0.00	0.00	0.00	0	0	0	0
1930	apuron	0.00	0.00	0.00	0.00	0	0	0	0
1930	aquiningoc	0.02	0.01	0.03	0.02	0	0	0	0
1930	aquino	0.00	0.00	0.00	0.00	0	0	0	0
1930	arceo	0.01	0.01	0.00	0.00	0	0	0	0
1930	arriola	0.00	0.00	0.01	0.02	0	0	0	0
1930	artero	0.00	0.00	0.00	0.00	0	0	0	0
1930	asanoma	0.00	0.00	0.00	0.00	0	0	0	0
1930	atao	0.00	0.00	0.00	0.00	0	0	0	0
1930	atoigue	0.01	0.01	0.02	0.02	0	0	0	0
1930	babauta	0.08	0.07	0.06	0.05	1	0	1	0
1930	balajadia	0.00	0.01	0.00	0.00	0	0	0	0
1930	baleto	0.00	0.00	0.00	0.00	0	0	0	0
1930	bamba	0.00	0.00	0.00	0.00	0	0	0	0
1930	barcinas	0.00	0.00	0.00	0.00	0	0	0	0
1930	bautista	0.00	0.00	0.01	0.00	0	0	0	0
1930	baza	0.01	0.00	0.02	0.01	0	0	0	0
1930	bell	0.00	0.00	0.00	0.00	0	0	0	0
1930	benavente	0.05	0.13	0.07	0.17	0	0	0	0
1930	bernardo	0.00	0.00	0.00	0.00	0	0	0	0
1930	bitanga	0.00	0.00	0.00	0.00	0	0	0	0
1930	blanco	0.00	0.00	0.00	0.00	0	0	0	0
1930	blas	0.11	0.06	0.10	0.05	0	0	0	0
1930	bodestin	0.00	0.00	0.00	0.00	0	0	0	0
1930	bontugan	0.00	0.00	0.00	0.00	0	0	0	0
1930	borja	0.18	0.38	0.15	0.31	1	1	0	0
1930	cabo	0.00	0.00	0.00	0.00	0	0	0	0
1930	cabrera	0.00	0.00	0.01	0.05	0	0	0	0
1930	calvo	0.01	0.01	0.00	0.00	0	0	0	0
1930	camacho	0.34	0.49	0.44	0.63	1	0	0	2
1930	campos	0.00	0.00	0.00	0.00	0	0	0	0
1930	candaso	0.00	0.00	0.00	0.00	0	0	0	0
1930	carbullido	0.02	0.00	0.01	0.00	0	0	0	0
1930	castro	0.29	0.20	0.60	0.42	1	1	0	2
1930	cepeda	0.06	0.08	0.06	0.08	0	0	0	0
1930	chaco	0.00	0.00	0.00	0.00	0	0	0	0

1930	champuaco	0.00	0.00	0.00	0.00	0	0	1	0
1930	chance	0.00	0.00	0.00	0.00	0	0	0	0
1930	charfauros	0.01	0.01	0.01	0.01	0	0	0	0
1930	chargualaf	0.10	0.10	0.07	0.07	0	0	0	0
1930	charguane	0.00	0.00	0.00	0.00	0	0	0	0
1930	cheguina	0.00	0.00	0.00	0.00	0	0	0	0
1930	combado	0.00	0.00	0.00	0.00	0	0	0	0
1930	concepcion	0.04	0.06	0.07	0.10	0	0	0	0
1930	crisostomo	0.07	0.11	0.04	0.06	0	0	0	0
1930	cruz	3.62	4.85	3.74	5.01	8	5	5	5
1930	cruzar	0.00	0.00	0.00	0.00	0	0	0	0
1930	cumbado	0.00	0.00	0.00	0.00	0	0	0	0
1930	damian	0.00	0.00	0.00	0.00	0	0	0	0
1930	day	0.00	0.00	0.00	0.00	0	0	0	0
1930	delgado	0.00	0.00	0.01	0.00	0	0	0	0
1930	diaz	0.00	0.00	0.01	0.01	0	0	0	0
1930	diego	0.00	0.00	0.00	0.00	0	0	0	0
1930	dim	0.00	0.00	0.00	0.00	0	0	0	0
1930	dimapan	0.00	0.00	0.00	0.00	0	0	0	0
1930	diotengco	0.00	0.00	0.00	0.00	0	0	0	0
1930	divera	0.00	0.00	0.00	0.00	0	0	0	0
1930	duenas	0.14	0.43	0.08	0.25	1	0	0	0
1930	dumanal	0.00	0.00	0.00	0.00	0	0	0	0
1930	dungca	0.00	0.00	0.00	0.00	0	0	0	0
1930	dydasco	0.00	0.00	0.00	0.01	0	0	0	0
1930	eclavea	0.00	0.00	0.00	0.00	0	0	0	0
1930	espinosa	0.00	0.00	0.00	0.00	0	0	0	0
1930	esteban	0.00	0.00	0.00	0.00	0	0	0	0
1930	eustaquio	0.00	0.00	0.00	0.00	0	0	0	0
1930	evangelista	0.00	0.00	0.00	0.00	0	0	0	0
1930	farfan	0.00	0.00	0.00	0.00	0	0	0	0
1930	farrell	0.00	0.00	0.00	0.00	0	0	0	0
1930	fegurgur	0.00	0.00	0.00	0.00	0	0	0	0
1930	fejarang	0.08	0.02	0.03	0.01	0	0	0	0
1930	fernandez	0.01	0.00	0.00	0.00	0	0	0	0
1930	finona	0.00	0.00	0.00	0.00	0	0	0	0
1930	flores	0.22	0.35	0.11	0.17	0	0	0	0
1930	francisco	0.00	0.01	0.00	0.01	0	0	0	0
1930	franquez	0.02	0.01	0.02	0.01	0	0	0	0
1930	garcia	0.00	0.00	0.01	0.03	0	0	0	0
1930	garrido	0.12	0.07	0.06	0.03	0	0	1	0

1930	george	0.00	0.00	0.00	0.00	0	0	0	0
1930	gofigan	0.00	0.00	0.00	0.00	0	0	0	0
1930	gogo	0.00	0.00	0.00	0.01	0	0	0	0
1930	gogue	0.01	0.00	0.01	0.00	0	0	0	0
1930	guerrero	0.24	0.13	0.37	0.20	0	0	0	0
1930	guevara	0.00	0.00	0.01	0.00	0	0	0	0
1930	gumabon	0.00	0.00	0.00	0.00	0	0	0	0
1930	gumataotao	0.00	0.00	0.00	0.00	0	0	0	0
1930	gutierrez	0.00	0.00	0.00	0.00	0	0	0	0
1930	guzman	0.01	0.00	0.00	0.00	0	0	0	0
1930	haniu	0.00	0.00	0.00	0.00	0	0	0	0
1930	hara	0.00	0.00	0.00	0.00	0	0	0	0
1930	hernandez	0.00	0.00	0.00	0.00	0	0	0	0
1930	herrero	0.00	0.00	0.00	0.00	0	0	0	0
1930	hines	0.00	0.00	0.00	0.00	0	0	0	0
1930	hongyee	0.00	0.00	0.00	0.00	0	0	0	0
1930	ibasco	0.00	0.00	0.00	0.00	0	0	0	0
1930	ichihara	0.00	0.00	0.00	0.00	0	0	0	0
1930	iglesias	0.01	0.01	0.01	0.01	0	0	0	0
1930	ignacio	0.00	0.00	0.01	0.01	0	0	0	0
1930	indalecio	0.00	0.00	0.00	0.00	0	0	0	0
1930	inouye	0.00	0.00	0.00	0.00	0	0	0	0
1930	iriarte	0.00	0.02	0.00	0.03	0	0	0	0
1930	javier	0.00	0.00	0.00	0.00	0	0	0	0
1930	jesus	0.00	0.00	0.00	0.00	0	0	0	0
1930	kamminga	0.00	0.00	0.00	0.00	0	0	0	0
1930	kamo	0.00	0.00	0.00	0.00	0	0	0	0
1930	kumiyama	0.00	0.00	0.00	0.00	0	0	0	0
1930	laguana	0.00	0.01	0.00	0.00	0	0	0	0
1930	lazaro	0.00	0.00	0.00	0.00	0	0	0	0
1930	leddy	0.00	0.00	0.00	0.00	0	0	0	0
1930	leon	0.00	0.00	0.00	0.01	0	0	0	0
1930	leonguerrero	0.42	0.57	0.65	0.88	0	1	0	0
1930	limtiaco	0.01	0.00	0.01	0.00	0	0	0	0
1930	lizama	0.01	0.06	0.02	0.08	0	0	0	0
1930	lorenzo	0.00	0.00	0.00	0.00	0	0	0	0
1930	losongco	0.00	0.00	0.00	0.00	0	0	0	0
1930	lujan	0.10	0.15	0.10	0.15	0	0	0	1
1930	maanao	0.00	0.00	0.00	0.00	0	0	0	0
1930	mafnas	0.05	0.03	0.05	0.03	0	0	0	0
1930	malijan	0.00	0.00	0.00	0.00	0	0	0	0

1930	manalisay	0.00	0.00	0.00	0.00	0	0	0	0
1930	manglona	0.00	0.00	0.00	0.00	0	0	0	0
1930	manibusan	0.10	0.01	0.08	0.01	1	0	0	0
1930	mansapit	0.00	0.00	0.00	0.00	0	0	0	0
1930	mantanona	0.01	0.01	0.01	0.02	0	0	0	0
1930	marcelo	0.00	0.00	0.00	0.00	0	0	0	0
1930	mariano	0.00	0.00	0.00	0.00	0	0	0	0
1930	martinez	0.02	0.03	0.02	0.03	0	0	0	0
1930	mata	0.00	0.00	0.00	0.00	0	0	0	0
1930	matanane	0.00	0.00	0.00	0.01	0	0	0	0
1930	materne	0.00	0.00	0.00	0.02	0	0	0	1
1930	matias	0.00	0.00	0.00	0.00	0	0	0	0
1930	mcdonald	0.00	0.00	0.00	0.00	0	0	0	0
1930	mendiola	0.22	0.30	0.19	0.26	0	0	1	0
1930	meno	0.09	0.13	0.13	0.19	1	2	1	2
1930	merfalen	0.00	0.00	0.00	0.00	0	0	0	0
1930	mesa	0.07	0.04	0.01	0.01	0	0	0	0
1930	morita	0.00	0.00	0.00	0.00	0	0	0	0
1930	muna	0.02	0.02	0.03	0.03	0	0	0	0
1930	munoz	0.01	0.00	0.00	0.00	0	0	0	0
1930	namauleg	0.00	0.00	0.00	0.01	0	0	0	0
1930	naputi	0.04	0.03	0.05	0.04	0	0	0	0
1930	nauta	0.00	0.00	0.00	0.00	0	0	0	0
1930	navarro	0.00	0.00	0.00	0.00	0	0	0	0
1930	nededog	0.00	0.00	0.00	0.00	0	0	0	0
1930	nego	0.00	0.00	0.00	0.00	0	0	0	0
1930	nelson	0.00	0.00	0.00	0.00	0	0	0	0
1930	ninaisen	0.00	0.00	0.00	0.00	0	0	0	0
1930	ninete	0.00	0.00	0.00	0.00	0	0	0	0
1930	ofrecido	0.00	0.00	0.00	0.00	0	0	0	0
1930	ogo	0.00	0.00	0.00	0.00	0	0	0	0
1930	ojeda	0.00	0.00	0.00	0.00	0	0	0	0
1930	okada	0.00	0.00	0.00	0.00	0	0	0	0
1930	onodera	0.00	0.00	0.00	0.00	0	0	0	0
1930	oroso	0.00	0.00	0.00	0.00	0	0	0	0
1930	pablo	0.04	0.04	0.02	0.02	0	0	0	0
1930	padagas	0.00	0.00	0.00	0.00	0	0	0	0
1930	palacios	0.00	0.00	0.00	0.00	0	0	0	0
1930	paloma	0.01	0.02	0.02	0.04	0	0	0	0
1930	pandato	0.00	0.00	0.00	0.00	0	0	0	0
1930	pangelinan	0.26	0.21	0.42	0.33	0	0	0	0

1930	pasqual	0.00	0.00	0.00	0.00	0	0	0	0
1930	paulino	0.02	0.01	0.01	0.00	0	0	0	0
1930	payne	0.00	0.00	0.00	0.00	0	0	0	0
1930	pellacani	0.00	0.00	0.00	0.00	0	0	0	0
1930	pereda	0.03	0.00	0.01	0.00	0	0	0	0
1930	pereira	0.00	0.00	0.00	0.00	0	0	0	0
1930	perez	0.71	0.58	0.36	0.29	2	0	1	0
1930	peterson	0.00	0.00	0.00	0.00	0	0	0	0
1930	petros	0.00	0.00	0.00	0.00	0	0	0	0
1930	pinaula	0.00	0.00	0.00	0.00	0	0	0	0
1930	pineda	0.00	0.00	0.00	0.00	0	0	0	0
1930	pocaigue	0.00	0.00	0.00	0.00	0	0	0	0
1930	portusach	0.00	0.00	0.00	0.00	0	0	0	0
1930	quan	0.00	0.00	0.00	0.00	0	0	0	0
1930	quenga	0.02	0.00	0.00	0.00	0	0	0	0
1930	quichocho	0.02	0.02	0.05	0.05	0	0	0	0
1930	quidachay	0.02	0.04	0.02	0.04	0	0	0	0
1930	quinata	0.12	0.07	0.07	0.04	2	3	1	2
1930	quinene	0.00	0.00	0.00	0.00	0	0	0	0
1930	quintanilla	0.01	0.01	0.00	0.01	0	0	0	0
1930	quitano	0.00	0.00	0.00	0.00	0	0	0	0
1930	quitugua	0.03	0.03	0.13	0.13	0	0	1	0
1930	ramirez	0.00	0.00	0.00	0.00	0	0	0	0
1930	rapolla	0.00	0.00	0.00	0.00	0	0	0	0
1930	respicio	0.00	0.00	0.00	0.00	0	0	0	0
1930	reyes	0.10	0.15	0.10	0.15	0	0	0	0
1930	rice	0.00	0.00	0.00	0.00	0	0	0	0
1930	rios	0.00	0.00	0.00	0.00	0	0	0	0
1930	rivera	0.11	0.03	0.14	0.04	0	0	0	0
1930	roberto	0.00	0.00	0.00	0.00	0	0	0	0
1930	rodriguez	0.00	0.00	0.00	0.00	0	0	0	0
1930	rogofis	0.00	0.00	0.00	0.00	0	0	0	0
1930	rojas	0.01	0.01	0.00	0.01	0	0	0	0
1930	rosario	0.04	0.10	0.04	0.10	0	0	0	0
1930	royos	0.00	0.00	0.00	0.00	0	0	0	0
1930	sablan	0.45	0.25	0.34	0.19	0	0	0	1
1930	sahagon	0.00	0.00	0.00	0.00	0	0	0	0
1930	sakakibara	0.00	0.00	0.00	0.00	0	0	0	0
1930	salas	0.34	0.32	0.50	0.47	0	1	0	0
1930	salasfeg	0.00	0.00	0.00	0.00	0	0	0	0
1930	salasperez	0.00	0.00	0.00	0.00	0	0	0	0

1930	salucnamnam	0.00	0.00	0.00	0.00	0	0	0	0
1930	sanagustin	0.03	0.00	0.03	0.00	0	0	0	0
1930	sanchez	0.00	0.00	0.01	0.00	0	0	0	0
1930	sanmiguel	0.00	0.00	0.01	0.01	0	0	0	0
1930	sannicolas	0.63	0.72	0.50	0.57	0	2	0	1
1930	santiago	0.01	0.00	0.00	0.00	0	0	0	0
1930	santos	0.90	1.46	0.78	1.26	0	0	1	1
1930	sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
1930	sgambelluri	0.00	0.00	0.00	0.00	0	0	0	0
1930	shimizu	0.00	0.00	0.00	0.00	0	0	0	0
1930	sholing	0.00	0.00	0.00	0.00	0	0	0	0
1930	siguenza	0.00	0.00	0.00	0.00	0	0	0	0
1930	soriano	0.00	0.00	0.00	0.01	0	0	0	0
1930	sugiyama	0.00	0.00	0.00	0.00	0	0	0	0
1930	susuico	0.00	0.00	0.00	0.00	0	0	0	0
1930	taenao	0.00	0.00	0.00	0.00	0	0	0	0
1930	taijeron	0.01	0.01	0.01	0.01	0	0	0	0
1930	taijito	0.00	0.00	0.01	0.01	0	0	0	0
1930	taimanglo	0.01	0.01	0.01	0.02	0	0	0	0
1930	tainatongo	0.00	0.00	0.00	0.00	0	0	0	0
1930	taisague	0.00	0.00	0.00	0.00	0	0	0	0
1930	taison	0.00	0.00	0.00	0.00	0	0	0	0
1930	taitague	0.01	0.00	0.01	0.00	0	0	0	0
1930	taitano	0.21	0.14	0.21	0.14	0	0	1	0
1930	taitinfong	0.00	0.00	0.00	0.02	0	0	0	0
1930	tajalle	0.00	0.00	0.00	0.00	0	0	0	0
1930	talavera	0.00	0.00	0.00	0.00	0	0	0	0
1930	tanaka	0.00	0.00	0.00	0.00	0	0	0	0
1930	tani	0.00	0.00	0.00	0.00	0	0	0	0
1930	tayama	0.00	0.00	0.00	0.00	0	0	0	0
1930	techaira	0.00	0.00	0.00	0.00	0	0	0	0
1930	tedpahogo	0.00	0.00	0.00	0.00	0	0	0	0
1930	tedtaotao	0.00	0.00	0.00	0.00	0	0	0	0
1930	tenorio	0.02	0.01	0.05	0.02	0	0	0	0
1930	terlaje	0.03	0.02	0.01	0.01	0	0	0	0
1930	tiquiengco	0.00	0.00	0.00	0.00	0	0	0	0
1930	tolentino	0.00	0.00	0.00	0.00	0	0	0	0
1930	topasna	0.00	0.00	0.00	0.00	0	0	0	0
1930	torres	0.12	0.17	0.26	0.37	0	0	1	2
1930	toves	0.01	0.02	0.01	0.03	0	0	0	0
1930	towner	0.00	0.00	0.00	0.00	0	0	0	0

1930	tudela	0.00	0.00	0.00	0.00	0	0	0	0
1930	tydingco	0.00	0.00	0.00	0.00	0	0	0	0
1930	ulloa	0.01	0.00	0.01	0.01	0	0	0	0
1930	uncangco	0.00	0.00	0.00	0.00	0	0	0	0
1930	underwood	0.00	0.00	0.00	0.00	0	0	0	0
1930	ungacta	0.00	0.00	0.00	0.00	0	0	0	0
1930	ungcanco	0.00	0.00	0.00	0.00	0	0	0	0
1930	unpingco	0.00	0.00	0.00	0.01	0	0	0	0
1930	untalan	0.01	0.00	0.01	0.00	0	0	0	0
1930	valenzuela	0.00	0.00	0.00	0.00	0	0	0	0
1930	villagomez	0.00	0.00	0.00	0.00	0	0	0	0
1930	white	0.00	0.00	0.00	0.00	0	0	0	0
1930	wongpat	0.00	0.00	0.00	0.00	0	0	0	0
1930	wusstig	0.00	0.00	0.00	0.00	0	0	0	0
1930	yamaguchi	0.00	0.00	0.00	0.00	0	0	0	0
1930	yamanaka	0.00	0.00	0.00	0.00	0	0	0	0
1930	yamashita	0.00	0.00	0.00	0.00	0	0	0	0
1930	yokoi	0.00	0.00	0.00	0.00	0	0	0	0
1930	yoshida	0.00	0.00	0.00	0.00	0	0	0	0
1930	zamora	0.00	0.00	0.00	0.00	0	0	0	0
	Total for Decade	11.99	14.21	12.22	14.70	19	16	17	21
	Grand Totals	47.79	46.94	48.22	52.74	57	62	59	56

APPENDIX C. 1880 – 1939 ALL ISONYMOUS MARRIAGES

Name	1=3 Exp	1=4 Exp	2=3 Exp	2=4 Exp	1=3 Obs	1=4 Obs	2=3 Obs	2=4 Obs
abara	0.00	0.00	0.00	0.00	0	0	0	0
acfalle	0.03	0.03	0.02	0.02	1	0	1	0
achaigua	0.00	0.00	0.00	0.00	0	0	0	0
achuga	0.00	0.00	0.00	0.00	0	0	0	0
acosta	0.01	0.03	0.04	0.09	0	0	0	1
ada	0.03	0.06	0.06	0.13	0	0	0	0
adriano	0.00	0.00	0.00	0.00	0	0	0	0
afaisen	0.01	0.00	0.00	0.00	0	0	0	0
affleje	0.04	0.00	0.02	0.00	0	0	0	0
aflague	0.09	0.09	0.12	0.12	0	0	0	0
agualo	0.00	0.01	0.00	0.02	0	0	0	0
aguero	0.00	0.00	0.00	0.00	0	0	0	0
aguigui	0.00	0.01	0.00	0.00	0	0	0	0
aguilar	0.00	0.00	0.00	0.00	0	0	0	0
agulto	0.00	0.00	0.00	0.00	0	0	0	0
aguon	1.43	1.19	1.06	0.88	3	1	1	1
alcantara	0.00	0.00	0.00	0.00	0	0	0	0
alejandro	0.00	0.00	0.00	0.00	0	0	0	0
alicto	0.00	0.00	0.00	0.00	0	0	0	0
alig	0.00	0.00	0.00	0.00	0	0	0	0
allcock	0.00	0.00	0.00	0.00	0	0	0	0
alvarez	0.01	0.01	0.01	0.01	0	0	0	0
anderson	0.04	0.01	0.02	0.01	0	0	0	0
angeles	0.00	0.00	0.00	0.01	0	0	0	0
angoco	0.01	0.01	0.00	0.00	0	0	0	0
apuron	0.00	0.00	0.00	0.00	0	0	0	0
aquillano	0.00	0.00	0.00	0.00	0	0	0	0
aquiningoc	0.05	0.02	0.08	0.03	0	0	0	0
aquino	0.00	0.00	0.01	0.01	0	0	0	0
arceo	0.02	0.04	0.02	0.04	0	0	0	0
arriola	0.01	0.02	0.04	0.06	0	0	0	0
artero	0.00	0.00	0.00	0.00	0	0	0	0
asanoma	0	0	0	0				
asuncion	0.00	0.00	0.00	0.00	0	0	0	0
atao	0.00	0.00	0.00	0.00	0	0	0	0
atoigue	0.12	0.07	0.10	0.06	0	0	2	0
autonate	0.00	0.00	0.00	0.00	0	0	0	0
ayuban	0.00	0.00	0.00	0.00	0	0	0	0

babauta	0.39	0.30	0.28	0.21	1	0	3	0
bae	0.00	0.00	0.00	0.00	0	0	0	0
balajadia	0.01	0.01	0.00	0.00	0	0	0	0
baldoviso	0.00	0.00	0.00	0.00	0	0	0	0
baleto	0.00	0.00	0.00	0.00	0	0	0	0
bamba	0.00	0.00	0.00	0.00	0	0	0	0
barcinas	0.01	0.01	0.02	0.02	0	0	0	0
bautista	0.01	0.01	0.01	0.01	0	0	0	0
bayona	0.00	0.00	0.00	0.00	0	0	0	0
baza	0.09	0.07	0.05	0.03	0	0	0	0
bell	0.00	0.00	0.00	0.00	0	0	0	0
benavente	0.10	0.23	0.10	0.24	0	0	0	0
bernardo	0.00	0.00	0.00	0.00	0	0	0	0
bitanga	0.00	0.00	0.00	0.00	0	0	0	0
blanco	0.00	0.01	0.02	0.06	0	0	0	0
blas	0.45	0.53	0.39	0.46	2	0	3	1
bodestin	0.00	0.00	0.00	0.00	0	0	0	0
bontugan	0.00	0.00	0.00	0.00	0	0	0	0
bordallo	0.00	0.00	0.00	0.00	0	0	0	0
borja	0.86	1.11	0.96	1.24	1	1	1	1
braga	0.00	0.00	0.00	0.00	0	0	0	0
buenaventura	0.00	0.00	0.00	0.00	0	0	0	0
bukikosa	0.00	0.00	0.00	0.00	0	0	0	0
cabo	0.00	0.00	0.00	0.00	0	0	0	0
cabrera	0.01	0.02	0.09	0.12	0	0	0	0
calvo	0.03	0.01	0.00	0.00	0	0	0	0
camacho	1.28	1.28	1.41	1.41	2	0	1	2
campos	0.00	0.01	0.00	0.01	0	0	0	0
candaso	0.00	0.00	0.00	0.00	0	0	0	0
carbullido	0.06	0.02	0.00	0.00	0	0	0	0
cardenas	0.00	0.00	0.00	0.01	0	0	0	0
cariaga	0.00	0.00	0.00	0.00	0	0	0	0
castillo	0.00	0.00	0.00	0.00	0	0	0	0
castro	1.80	1.08	1.61	0.97	6	1	1	3
cepeda	0.16	0.27	0.27	0.48	0	0	0	0
cerna	0.00	0.00	0.00	0.00	0	0	0	0
certeza	0.00	0.00	0.00	0.00	0	0	0	0
chaco	0.02	0.01	0.01	0.01	0	0	0	0
champuaco	0.00	0.00	0.01	0.01	0	0	1	0
chance	0.00	0.00	0.00	0.00	0	0	0	0
chang	0.00	0.00	0.00	0.00	0	0	0	0

charfauros	0.09	0.06	0.05	0.04	0	0	1	0
chargualaf	0.38	0.36	0.30	0.29	1	3	1	1
charguane	0.00	0.00	0.00	0.00	0	0	0	0
charsagua	0.00	0.00	0.00	0.00	0	0	0	0
cheguina	0.01	0.01	0.01	0.03	0	0	0	0
chiboc	0.00	0.00	0.00	0.00	0	0	0	0
chico	0.00	0.00	0.00	0.00	0	0	0	0
combado	0.00	0.00	0.00	0.00	0	0	0	0
concepcion	0.16	0.26	0.38	0.63	0	1	1	2
coro	0.00	0.00	0.00	0.00	0	0	0	0
cortes	0.00	0.00	0.00	0.00	0	0	0	0
cortez	0.00	0.00	0.00	0.00	0	0	0	0
crisostomo	0.34	0.39	0.36	0.41	0	1	0	0
cristobal	0.00	0.00	0.00	0.00	0	0	0	0
cruz	16.93	16.27	17.79	17.10	22	20	20	13
cruzar	0.00	0.00	0.00	0.00	0	0	0	0
cumbado	0.00	0.00	0.00	0.00	0	0	0	0
custino	0.00	0.00	0.00	0.00	0	0	0	0
damian	0.00	0.00	0.00	0.00	0	0	0	0
day	0.00	0.00	0.00	0.00	0	0	0	0
degracia	0.00	0.00	0.00	0.00	0	0	0	0
delgado	0.03	0.06	0.09	0.22	0	0	0	0
deza	0.00	0.00	0.00	0.01	0	0	0	0
diaz	0.05	0.10	0.10	0.21	0	0	1	0
diego	0.01	0.01	0.01	0.01	0	0	0	0
dim	0.00	0.00	0.00	0.00	0	0	0	0
dimapan	0.00	0.00	0.00	0.00	0	0	0	0
diotengco	0.00	0.00	0.00	0.00	0	0	0	0
divera	0.00	0.00	0.00	0.00	0	0	0	0
drennan	0.00	0.00	0.00	0.00	0	0	0	0
duarte	0.00	0.00	0.00	0.00	0	0	0	0
duenas	0.74	1.08	0.63	0.91	1	1	1	0
dumanal	0.00	0.00	0.00	0.00	0	0	0	0
dungca	0.00	0.00	0.00	0.00	0	0	0	0
dydasco	0.01	0.00	0.01	0.01	0	0	0	0
eclavea	0.00	0.00	0.00	0.00	0	0	0	0
eguiguan	0.00	0.00	0.00	0.00	0	0	0	0
enao	0.00	0.00	0.00	0.00	0	0	0	0
erickson	0.00	0.00	0.00	0.00	0	0	0	0
espinosa	0.02	0.05	0.01	0.03	0	0	0	0
espiritusantos	0.00	0.00	0.00	0.01	0	0	0	0

esteban	0.00	0.00	0.00	0.00	0	0	0	0
eustaquio	0.00	0.00	0.00	0.00	0	0	0	0
evangelista	0.00	0.00	0.00	0.00	0	0	0	0
fabian	0.00	0.00	0.00	0.00	0	1	0	0
farfan	0.00	0.00	0.00	0.00	0	0	0	0
farrell	0.00	0.00	0.00	0.00	0	0	0	0
faustino	0.00	0.00	0.00	0.00	0	0	0	0
fausto	0.00	0.00	0.00	0.00	0	0	0	0
fegurgur	0.00	0.01	0.01	0.04	0	1	0	0
feijo	0.00	0.00	0.00	0.00	0	0	0	0
feja	0.00	0.00	0.00	0.00	0	0	0	0
fejarang	0.29	0.21	0.18	0.13	0	1	0	0
fernandez	0.01	0.01	0.01	0.01	0	0	0	0
finona	0.00	0.00	0.00	0.00	0	0	0	0
flores	0.99	0.78	0.58	0.46	0	0	0	0
fraga	0.00	0.00	0.00	0.00	0	0	0	0
francisco	0.02	0.01	0.01	0.00	0	0	0	0
franquez	0.03	0.01	0.01	0.00	0	0	0	0
fuertes	0.00	0.00	0.00	0.00	0	0	0	0
gamboa	0.00	0.00	0.00	0.00	0	0	0	0
garcia	0.02	0.02	0.02	0.02	0	0	0	0
garrido	0.28	0.34	0.28	0.34	0	0	1	0
george	0.00	0.00	0.00	0.00	0	0	0	0
gofigan	0.00	0.01	0.00	0.01	0	0	0	0
gogo	0.01	0.01	0.06	0.06	0	0	0	0
gogue	0.04	0.04	0.02	0.02	0	0	0	0
gomez	0.00	0.00	0.00	0.00	0	0	0	0
gonzales	0.00	0.00	0.00	0.00	0	0	0	0
gregorio	0.00	0.00	0.00	0.00	0	0	0	0
guantafe	0.00	0.00	0.00	0.00	0	0	0	0
guerrero	0.37	0.31	0.72	0.59	0	0	0	1
guevara	0.01	0.01	0.01	0.01	0	0	0	0
gumabon	0.00	0.00	0.00	0.00	0	0	0	0
gumataotao	0.02	0.01	0.01	0.01	0	0	0	0
gumboc	0.00	0.00	0.00	0.00	0	0	0	0
gutierrez	0.01	0.00	0.00	0.00	0	0	0	0
guzman	0.02	0.04	0.04	0.07	0	0	0	0
guzom	0.00	0.00	0.00	0.00	0	0	0	0
haniu	0.00	0.00	0.00	0.00	0	0	0	0
hara	0.00	0.00	0.00	0.00	0	0	0	0
hernandez	0.01	0.00	0.00	0.00	0	0	0	0

herrero	0.01	0.01	0.01	0.00	0	0	0	0
hines	0.00	0.00	0.00	0.00	0	0	0	0
hongyee	0.00	0.00	0.00	0.00	0	0	0	0
ibanez	0.00	0.00	0.00	0.00	0	0	0	0
ibasco	0.00	0.00	0.00	0.00	0	0	0	0
ichihara	0.00	0.00	0.00	0.00	0	0	0	0
idol	0.00	0.00	0.00	0.00	0	0	0	0
iglesias	0.04	0.04	0.06	0.07	0	0	0	0
ignacio	0.03	0.02	0.04	0.03	0	0	0	0
indalecio	0.00	0.00	0.00	0.00	0	0	0	0
infana	0.00	0.00	0.00	0.01	0	0	0	0
ingai	0.00	0.00	0.00	0.00	0	0	0	0
inosencio	0.00	0.00	0.00	0.00	0	0	0	0
inouye	0.00	0.00	0.00	0.00	0	0	0	0
iriarte	0.03	0.03	0.04	0.04	0	0	0	0
isidro	0.00	0.00	0.00	0.00	0	0	0	0
iturzacta	0.00	0.00	0.00	0.00	0	0	0	0
jackson	0.00	0.00	0.00	0.00	0	0	0	0
james	0.00	0.00	0.00	0.00	0	0	0	0
javier	0.00	0.00	0.00	0.00	0	0	0	0
jesus	0.03	0.01	0.01	0.00	0	0	0	0
jocoq	0.00	0.00	0.00	0.00	0	0	0	0
johnson	0.00	0.00	0.00	0.00	0	0	0	0
jose	0.00	0.00	0.00	0.00	0	0	0	0
kamminga	0.00	0.00	0.00	0.00	0	0	0	0
kamo	0.00	0.00	0.00	0.00	0	0	0	0
kumiyama	0.00	0.00	0.00	0.00	0	0	0	0
lago	0.00	0.00	0.00	0.00	0	0	0	0
laguana	0.01	0.02	0.01	0.02	0	0	0	0
laines	0.00	0.00	0.00	0.00	0	0	0	0
lampitoc	0.00	0.00	0.00	0.00	0	0	0	0
lascano	0.00	0.00	0.00	0.00	0	0	0	0
latap	0.00	0.00	0.00	0.00	0	0	0	0
lazaro	0.00	0.00	0.00	0.00	0	0	0	0
leask	0.00	0.00	0.00	0.00	0	0	0	0
leddy	0.00	0.00	0.00	0.00	0	0	0	0
leon	0.01	0.02	0.02	0.04	0	0	0	0
leonguerrero	2.53	2.43	2.87	2.76	2	3	1	0
limtiaco	0.03	0.01	0.01	0.00	0	0	0	0
lizama	0.19	0.28	0.16	0.23	0	0	0	1
lorenzo	0.00	0.00	0.00	0.00	0	0	0	0

losongco	0.00	0.00	0.00	0.00	0	0	0	0
lucero	0.00	0.00	0.00	0.00	0	0	0	0
lujan	0.27	0.28	0.25	0.26	0	1	0	1
lukban	0.00	0.00	0.00	0.00	0	0	0	0
maanao	0.01	0.00	0.00	0.00	0	0	0	0
macias	0.00	0.00	0.00	0.00	0	0	0	0
mafnas	0.15	0.12	0.15	0.12	0	0	0	0
maguadog	0.00	0.00	0.00	0.00	0	0	0	0
malabitan	0.00	0.00	0.00	0.00	0	0	0	0
malijan	0.00	0.00	0.00	0.00	0	0	0	0
manajane	0.00	0.00	0.00	0.00	0	0	0	0
manalisay	0.01	0.01	0.01	0.01	0	0	0	0
manglona	0.01	0.01	0.00	0.01	0	0	0	0
manibusan	0.29	0.20	0.24	0.16	1	0	0	0
mansapit	0.00	0.00	0.00	0.00	0	0	0	0
mantanona	0.04	0.04	0.03	0.03	1	0	0	0
marcelo	0.00	0.00	0.00	0.00	0	0	0	0
maria	0.00	0.00	0.00	0.00	0	0	0	0
mariano	0.00	0.00	0.00	0.00	0	0	0	0
marion	0.00	0.00	0.00	0.00	0	0	0	0
martinez	0.14	0.20	0.17	0.25	0	0	1	0
mata	0.00	0.00	0.00	0.00	0	0	0	0
matanane	0.00	0.01	0.01	0.02	0	0	0	0
mateo	0.00	0.00	0.00	0.00	0	0	0	0
materne	0.01	0.01	0.03	0.06	0	0	0	1
matias	0.00	0.00	0.00	0.00	0	0	0	0
mcdonald	0.00	0.00	0.00	0.00	0	0	0	0
megofna	0.01	0.01	0.01	0.02	0	0	0	0
meloso	0.00	0.00	0.00	0.00	0	0	0	0
mendiola	0.99	1.35	0.88	1.19	0	0	1	2
meno	0.29	0.28	0.29	0.28	1	3	2	3
merfalen	0.00	0.00	0.00	0.00	0	0	0	0
mesa	0.25	0.16	0.05	0.04	0	0	0	0
millinchamp	0.00	0.00	0.00	0.00	0	0	0	0
miner	0.00	0.00	0.00	0.00	0	0	0	0
morcillas	0.00	0.00	0.00	0.00	0	0	0	0
morita	0.00	0.00	0.00	0.00	0	0	0	0
muna	0.06	0.04	0.14	0.11	0	0	0	0
mundo	0.00	0.00	0.00	0.00	0	0	0	0
munoz	0.02	0.00	0.00	0.00	0	0	0	0
namasi	0.00	0.00	0.00	0.00	0	0	0	0

namauleg	0.00	0.01	0.02	0.03	0	0	0	0
nangauta	0.00	0.00	0.00	0.00	0	0	0	0
naputi	0.12	0.07	0.13	0.07	0	0	0	0
nauta	0.00	0.00	0.01	0.01	0	0	0	0
navarro	0.00	0.00	0.00	0.00	0	0	0	0
navera	0.00	0.00	0.00	0.00	0	0	0	0
nededog	0.01	0.01	0.00	0.00	0	1	0	0
nego	0.00	0.01	0.00	0.01	0	0	0	0
nelson	0.00	0.00	0.00	0.00	0	0	0	0
ninaisen	0.00	0.00	0.00	0.00	0	0	0	0
ninete	0.00	0.00	0.00	0.00	0	0	0	0
ocampo	0.00	0.00	0.00	0.00	0	0	0	0
ofrecido	0.00	0.00	0.00	0.00	0	0	0	0
ogo	0.01	0.01	0.01	0.00	1	0	0	0
ojeda	0.00	0.00	0.00	0.00	0	0	0	0
okada	0.00	0.00	0.00	0.00	0	0	0	0
onodera	0.00	0.00	0.00	0.00	0	0	0	0
oroso	0.00	0.00	0.00	0.00	0	0	0	0
ortiz	0.00	0.00	0.00	0.00	0	0	0	0
ouka	0.00	0.00	0.00	0.00	0	0	0	0
pablo	0.11	0.09	0.08	0.06	1	0	0	0
padagas	0.00	0.00	0.00	0.00	0	0	0	0
padilla	0.00	0.00	0.00	0.01	0	0	0	0
palacios	0.00	0.00	0.00	0.01	0	0	0	0
paloma	0.07	0.09	0.18	0.23	0	1	0	0
palting	0.00	0.00	0.00	0.00	0	0	0	0
pandato	0.00	0.00	0.00	0.00	0	0	0	0
pangelinan	0.99	0.91	1.53	1.41	1	1	2	0
pasqual	0.00	0.00	0.00	0.00	0	0	0	0
patricio	0.00	0.00	0.00	0.00	0	0	0	0
paulino	0.05	0.04	0.02	0.02	0	0	0	0
payne	0.00	0.00	0.00	0.00	0	0	0	0
pellacani	0.00	0.00	0.00	0.00	0	0	0	0
pereda	0.08	0.05	0.01	0.01	0	0	0	0
pereira	0.01	0.01	0.01	0.02	0	0	0	0
perez	2.12	2.23	1.61	1.70	3	1	2	1
peterson	0.00	0.00	0.00	0.00	0	0	0	0
petronila	0.00	0.00	0.00	0.00	0	0	0	0
petros	0.00	0.00	0.00	0.00	0	0	0	0
pinaula	0.00	0.00	0.00	0.00	0	0	0	0
pineda	0.00	0.00	0.00	0.00	0	0	0	0

pividal	0.00	0.00	0.00	0.00	0	0	0	0
pocaigue	0.00	0.00	0.00	0.00	0	0	0	0
pongco	0.00	0.00	0.00	0.00	0	0	0	0
portusach	0.00	0.00	0.00	0.00	0	0	0	0
punzalan	0.00	0.00	0.00	0.00	0	0	0	0
quan	0.00	0.00	0.00	0.00	0	0	0	0
quenga	0.05	0.00	0.00	0.00	0	0	0	0
quichocho	0.09	0.10	0.06	0.07	0	1	0	0
quidachay	0.06	0.09	0.07	0.10	0	0	0	0
quifunas	0.00	0.00	0.00	0.00	0	0	0	0
quinata	0.18	0.10	0.11	0.07	3	4	1	6
quinene	0.00	0.00	0.00	0.00	0	0	0	0
quintanilla	0.08	0.10	0.08	0.10	0	0	0	0
quinto	0.00	0.00	0.00	0.00	0	0	0	0
quisa	0.00	0.00	0.00	0.00	0	0	0	0
quisalco	0.00	0.00	0.00	0.00	0	0	0	0
quitano	0.00	0.00	0.00	0.00	0	0	0	0
quitugua	0.16	0.25	0.31	0.47	0	0	1	1
quitunguico	0.00	0.00	0.00	0.00	0	0	0	0
rabago	0.00	0.00	0.00	0.00	0	0	0	0
rabon	0.00	0.00	0.00	0.00	0	0	0	0
ramirez	0.00	0.00	0.00	0.00	0	0	0	0
ramos	0.00	0.00	0.00	0.00	0	0	0	0
rapolla	0.00	0.00	0.00	0.00	0	0	0	0
respicio	0.00	0.00	0.00	0.00	0	0	0	0
reyes	0.32	0.58	0.50	0.91	0	2	0	0
rice	0.00	0.00	0.00	0.00	0	0	0	0
rios	0.01	0.01	0.00	0.00	0	0	0	0
rivera	0.16	0.16	0.27	0.27	0	0	0	0
roberto	0.01	0.01	0.01	0.01	0	0	0	0
rodriguez	0.00	0.00	0.00	0.00	0	0	0	0
rogofis	0.00	0.00	0.00	0.00	0	0	0	0
rojas	0.02	0.02	0.02	0.02	0	0	0	0
rola	0.00	0.00	0.00	0.00	0	0	0	0
romero	0.00	0.00	0.00	0.00	0	0	0	0
romualdo	0.00	0.00	0.00	0.00	0	0	0	0
rosa	0.00	0.00	0.01	0.01	0	0	0	0
rosario	0.26	0.19	0.25	0.19	0	0	0	0
royos	0.00	0.00	0.00	0.00	0	0	0	0
rupply	0.00	0.00	0.00	0.00	0	0	0	0
sablan	1.04	0.83	0.52	0.41	0	1	1	2

saccomani	0.00	0.00	0.00	0.00	0	0	0	0
saez	0.00	0.00	0.00	0.00	0	0	0	0
sahagon	0.00	0.00	0.00	0.00	0	0	0	0
sakakibara	0.00	0.00	0.00	0.00	0	0	0	0
salas	1.12	1.05	1.08	1.01	1	1	0	0
salasfeg	0.00	0.00	0.00	0.00	0	0	0	0
salasperez	0.00	0.00	0.00	0.00	0	0	0	0
salucnamnam	0.00	0.00	0.01	0.01	0	0	0	0
samudio	0.00	0.00	0.00	0.00	0	0	0	0
sanagustin	0.10	0.04	0.04	0.02	0	1	0	0
sanchez	0.03	0.02	0.03	0.01	0	0	0	0
sanluis	0.00	0.00	0.00	0.00	0	0	0	0
sanmiguel	0.00	0.00	0.00	0.00	0	0	0	0
sannicolas	1.91	1.77	1.43	1.33	0	4	1	1
sanpedro	0.00	0.00	0.00	0.00	0	0	0	0
santiago	0.02	0.00	0.00	0.00	0	0	0	0
santos	2.84	4.08	3.91	5.61	2	4	4	7
sarmiento	0.00	0.00	0.00	0.00	0	0	0	0
saturnino	0.00	0.00	0.00	0.00	0	0	0	0
sgambelluri	0.00	0.00	0.00	0.00	0	0	0	0
shimada	0.00	0.00	0.00	0.00	0	0	0	0
shimizu	0.00	0.00	0.00	0.00	0	0	0	0
sholing	0.00	0.00	0.00	0.00	0	0	0	0
shori	0.00	0.00	0.00	0.00	0	0	0	0
siguenza	0.02	0.01	0.01	0.01	0	0	0	0
siongco	0.00	0.00	0.00	0.00	0	0	0	0
soriano	0.00	0.00	0.00	0.01	0	0	0	0
suarez	0.00	0.00	0.00	0.00	0	0	0	0
sugiyama	0.00	0.00	0.00	0.00	0	0	0	0
susuico	0.00	0.00	0.00	0.00	0	0	0	0
taenao	0.02	0.00	0.00	0.00	0	0	0	0
tagana	0.00	0.00	0.00	0.00	0	0	0	0
taguacta	0.00	0.00	0.00	0.00	0	0	0	0
taijeron	0.04	0.03	0.03	0.02	0	0	0	0
taijiron	0.00	0.00	0.00	0.00	0	0	0	0
taijito	0.00	0.00	0.02	0.02	0	0	0	0
taimanglo	0.05	0.07	0.04	0.06	0	1	0	1
tainatongo	0.00	0.00	0.00	0.00	0	0	0	0
taisacon	0.00	0.00	0.00	0.00	0	0	0	0
taisague	0.00	0.00	0.00	0.01	0	0	0	0
taison	0.00	0.00	0.00	0.00	0	0	0	0

taitague	0.03	0.03	0.03	0.03	0	0	0	0
taitano	0.59	0.45	0.56	0.43	0	0	1	1
taitinfong	0.01	0.02	0.01	0.02	0	0	0	0
tajalle	0.00	0.00	0.01	0.00	0	0	0	0
talavera	0.00	0.00	0.00	0.00	0	0	0	0
tanaka	0.00	0.00	0.00	0.00	0	0	0	0
tani	0.00	0.00	0.00	0.00	0	0	0	0
tanona	0.00	0.00	0.00	0.00	0	0	0	0
tantay	0.00	0.00	0.00	0.00	0	0	0	0
tatacaon	0.00	0.00	0.00	0.00	0	0	0	0
tayama	0.00	0.00	0.00	0.00	0	0	0	0
techaira	0.00	0.00	0.00	0.00	0	0	0	0
tedpahogo	0.01	0.01	0.00	0.01	0	0	0	0
tedtaotao	0.00	0.00	0.00	0.00	0	0	0	0
tello	0.00	0.00	0.00	0.01	0	0	0	0
teltras	0.00	0.00	0.00	0.00	0	0	0	0
tenorio	0.11	0.18	0.10	0.16	0	0	0	0
terlaje	0.06	0.05	0.05	0.04	0	0	0	0
tinarteco	0.00	0.00	0.00	0.00	0	0	0	0
tiquiengco	0.01	0.00	0.00	0.00	0	0	0	0
tolentino	0.00	0.00	0.00	0.00	0	0	0	0
topasna	0.01	0.01	0.00	0.00	0	0	0	0
torres	0.45	0.59	0.64	0.83	0	0	1	2
toves	0.22	0.19	0.16	0.14	0	0	0	0
towner	0.00	0.00	0.00	0.00	0	0	0	0
tudela	0.00	0.00	0.00	0.00	0	0	0	0
tungcap	0.00	0.00	0.00	0.00	0	0	0	0
tydingco	0.00	0.00	0.01	0.00	0	0	0	0
ulloa	0.01	0.02	0.03	0.06	0	0	0	0
uncangco	0.00	0.00	0.00	0.00	0	0	0	0
underwood	0.00	0.00	0.00	0.00	0	0	0	0
ungacta	0.00	0.00	0.00	0.00	0	0	0	0
ungcanco	0.01	0.00	0.00	0.00	0	0	0	0
unpingco	0.01	0.01	0.01	0.01	0	0	0	0
untalan	0.08	0.03	0.03	0.01	0	0	0	0
uson	0.00	0.00	0.00	0.00	0	0	0	0
valenzuela	0.00	0.01	0.00	0.01	0	0	0	0
velarde	0.00	0.00	0.00	0.00	0	0	0	0
villagomez	0.01	0.04	0.01	0.05	0	0	0	0
villanueva	0.00	0.00	0.00	0.00	0	0	0	0
walters	0.00	0.00	0.00	0.00	0	0	0	0

warquin	0.00	0.00	0.00	0.00	0	0	0	0
white	0.00	0.00	0.00	0.00	0	0	0	0
wilson	0.00	0.00	0.00	0.00	0	0	0	0
wisle	0.00	0.00	0.00	0.00	0	0	0	0
wongpat	0.00	0.00	0.00	0.00	0	0	0	0
wusstig	0.00	0.00	0.00	0.00	0	0	0	0
yamaguchi	0.00	0.00	0.00	0.00	0	0	0	0
yamanaka	0.00	0.00	0.00	0.00	0	0	0	0
yamashita	0.00	0.00	0.00	0.00	0	0	0	0
yokoi	0.00	0.00	0.00	0.00	0	0	0	0
yoshida	0.00	0.00	0.00	0.00	0	0	0	0
zamora	0.00	0.00	0.00	0.00	0	0	0	0
zuniga	0.00	0.00	0.00	0.00	0	0	0	0
Grand Total	47.49	47.37	48.25	50.37	57	62	59	56

APPENDIX D. GUAM SURNAMES FROM 1897 CENSUS

- acfalle
- achaigua
- achuda
- achuga
- acosta
- acuda
- ada
- adriano
- afaisen
- aflague
- aflleje
- agualo
- aguero
- aguigui
- aguilar
- agunay
- aguon (agun)
- agusto (aguste, agurto, agurte)
- alcantara
- alejandro
- alig
- alvarez (alvares)
- anderson
- angeles
- angoco
- aningui
- antenor
- apatan
- aqui
- aquiningoc (aquiningog)
- aquino
- arceo
- argarao
- arriola
- asuncion (ascencion)
- atalig
- atao
- atoigue (atogue)
- ayuru
- babaota (babauta, babautia)
- bae
- balajadia
- balensuela
- baleto
- ballesta
- bamba
- barcinas
- barduviso
- basa (baza)
- bautaga (bontugan)
- bautista
- bay
- bayogo
- bayona
- benabente (benavente)
- benjamin
- betanon
- billagomes (billagomez, bellogomes)
- bitanga
- blanco
- blas [blaz]
- borja
- boton
- buenaventura
- caballes
- cabo
- cabrera
- cabresa
- calvo (calbo)
- camacho
- cambado
- camilo
- campos
- can
- candaso
- candilaria
- carbullido
- cardenas
- carlas
- castro
- cepeda
- chaco
- charfaros (charfauros) [charfaros]
- chargualaf
- charguane (carguane)
- charguilla
- charsagua
- chartage
- cheguina (chiguina)
- chico
- chua puaco (champuaco)
- clubog
- concepcion
- cordova
- coro
- cortes [cortez]
- crisostomo (chrisostimo)
- cruz
- de leon
- degracia
- delgado
- demapan (dimapan)
- desa [deza]
- despao
- diaz (dias)
- didasco
- diego
- dijico
- dim
- diotengco
- divera
- domanal
- domingo
- dominguez
- dua
- duenas
- dungca
- duy-datco
- ebangelista (ibanangelista)
- eclavea
- eguiguan
- encanes (encanco)
- encarnacion
- endalecio (indalecio)
- espinosa
- espiritusanto
- esteban
- eustaquio
- evaristo
- fajusto
- farfan
- fausto

- fegurgur (fegurgor)
- feja
- fejarang (fejerang, feyeran)
- fernandes (fernandez)
- final
- flores (florez)
- francisco
- franquez
- fuerte
- garcia
- garrido
- george
- gochinco
- gofigan
- gogo
- gogue
- gomez
- gonzalez (gonzales)
- gregorio
- guachinco
- guaman (gusman) [guzman]
- guantafe
- guerrero
- guibara (guevara, guibarra)
- guitano
- gumataotao
- gutierrez
- hernandez (hernandes)
- herrera
- herrero
- hocog
- ibasco
- iglesias
- ignacio
- ilano
- infana
- inocencio
- inos
- irabon
- iriarte (irriarte)
- isidro
- jat
- javier
- jesus
- jocoq
- juan
- kamingan (camingan)
- lafrosa
- laguana
- lajo
- lasaro
- lascano
- leonguerrero
- lim-tiaco (limtiaco)
- lizama (lisama)
- lorenzo
- lujan
- lu-sonco
- maanao
- macario
- mafnas
- magna
- maguadog (manuado)
- maina
- malijan
- mamalo
- manalisay
- manalo
- manglona
- manibusan
- mansapit
- mantanona
- maquintos (macintosh)
- maratita
- marcelo
- marchana (marchoma)
- maria
- mariano
- martinez (martines)
- masga
- mata
- matanane
- matantaotao
- materne
- megofna (magofna)
- mellao
- mendiola
- meno
- merfalan (merfalen)
- mesa (meza)
- mesgon (mesngon)
- millinchamp
- montufal [montufar]
- muna
- mundo
- munoz
- naimauleg (namauleg, namulig)
- nalujo
- namasi
- nangaota
- naputi (napute)
- narraje
- nauta
- navarro (navaro)
- nededog (nedidog)
- nego
- nieva
- ninaisen
- ninete
- nineton
- ogo
- ojeda
- oracion
- orong
- oroso
- ozan
- pablo
- pacheco
- padilla
- pagal
- palacio (palacios)
- palomo [paloma]
- pangelinan
- pascual (pasqual, pasgual)
- patricio [patricia]
- paulino
- pereda [peredo]
- pereyra (peraira)
- perez
- petros
- pinaula

- pineda
- pocahigue [pocaigue?]
- po-coco
- portusach
- posido
- qua
- quenga (quinga)
- quichocho
- quidachay
- quiega
- quifunas
- quinata
- quinene
- quintanilla
- quisalao
- quitano (quitaro)
- quitonguico (quitunguico)
- quitugua (quidagua)
- rabago
- ramirez (rameris)
- ramos
- rapolla
- rapollero
- respicio
- reyes
- rios
- rivera (ribera)
- roberto (roverto)
- rodriguez (rodrigues)
- rojas
- romualdo (romualda)
- roque
- rosa
- rosario
- rosendo
- royos
- sablan
- safra
- sagon
- saguanamnan
- salas
- salucnamnam (salucnamnam)
- samanigo
- sanagustin
- sanchez (sanches)
- sanluis
- sanmiguel
- sannicolas
- sanpedro
- santiago
- santos
- sarmiento
- sicoso
- siguenza
- sococo
- songao
- songsong
- soo
- soriano (suriano)
- sotomayor
- soyoana
- suarez
- su-suyco
- suya
- sy-pingco
- taenao
- taga
- taguacta
- taianaona
- taijeron (taijiron)
- taijito
- taimanao
- taimanglo
- taisacan
- taisague
- taisipig (taisipic)
- taitague
- taitano (taiteno)
- taitinfon (taitinfong)
- tajalle
- tala
- talabera [talavera]
- tanona
- tatacaon
- te-dingco
- tedpahogo (terpaago, teppaogo)
- tedtaotao
- tello
- teltros[teltras]
- tenorio
- terlaje (tarlaje, tertaje)
- timatongo (tinatongo)
- tinarteco
- tiquiongco
- tolentino
- topasna
- torre (tore)
- torres (torrez)
- toves (tobes, toves)
- tresta
- trips
- tudela
- tuncap
- ugua
- ulloa
- unchangco (ungcangco)
- ungacta
- ung-siocg (unsioc)
- unpingco (ung-pinco, u-piangco, un-pingco)
- untalan
- valenzuela
- villagomez (villagomes)
- villanueva
- vizle
- waet
- warquin
- wilson
- zuniga

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