

Statistics in Support of Masonic Historical Studies

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Abstract

This paper addresses two important historical questions regarding Freemasonry in Puerto Rico, with the help of two statistical procedures. The first assesses whether age patterns of candidates have changed in the last 100 years. We analyzed the ages of candidates applying for the organization. We have compared, using a two-sample Kolmogorov-Smirnov test, First Degree (just initiated) members of *Logia Adelfia* in the year 1888 to the ages of applicants to the Grand Lodge of Puerto Rico during the first semester of 2012. Results provide plausibility to the assertion that, in Puerto Rico, the pattern of ages of those joining Freemasonry has remained stable. The second question addresses the main contribution of Freemasonry to the struggle of Puerto Ricans for autonomy under Spain, during the last third of the XIX Century. We analyzed the composition of the island Autonomic Government under Spain, in 1898, regarding Masonic or Non-Masonic affiliation of its members, using a Two Factor Contingency Table. Results show strong association between being a Freemason and a Member of such Government. This supports the plausibility that one of the most important contributions of Freemasons to Puerto Rican struggle for Autonomy was the grooming of political and social leaders.

Key Words: Goodness-of-Fit, Contingency Tables, analysis, historical studies

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1. Introduction

This paper furthers the topic of a previous one, presented to the 2011 ASA/JSM³. Its objective is again to encourage the use of statistical tools in Masonic historical studies.

Statistics and other quantitative techniques are seldom used in masonic historical studies. When used at all, it is at an elementary level, perhaps because traditional historians are not trained in statistics, or few statisticians dwell in historic topics. To illustrate our point, we quote Dr. José A. Ferrer Benimeli, a Spanish Jesuit priest expert in masonic history, and founder of CEHME⁴. In his prologue to a book on the Spanish Grand Lodges in Cuba, Prof. Ferrer Benimeli praises the author's statistical techniques, saying: “[The book] importance lies in the detail analysis of the origins of Freemasonry in Cuba (...) *its graphics, charts and tables of data, are a clear and necessary example of the statistical methodology used*⁵”.

Thence, we currently find two types of statistics in the masonic research literature. One is represented by traditional Academic Historians who mostly implement methods from descriptive statistics –but seldom any hypothesis testing, modeling or data analysis.

The second group is composed by Freemasons who come from quantitative fields, such as math or engineering. These have used statistical methods and models –but mostly to analyze membership trends and other contemporary problems. Examples of these include Belton⁶, in the UK, and Morris⁷, in the US. More recently, Romeu has pioneered the use of statistical methods and models to support masonic historical analyses⁸.

The objective of our present paper is to provide additional examples of the use of statistics, as another tool in the arsenal of the Academic historian. We first compare two samples of ages of new members in masonic lodges, which are 125 years apart. We examine if these could have come from populations with similar age distribution. If so, this would support the plausibility of the theory that age patterns of Puerto Ricans that join Freemasonry has remained the same, throughout the last century.

Secondly, we analyze the composition of the Autonomic Government organized by Spain in Puerto Rico, in 1898, though a Two-Factor Contingency Table. We assess whether the Autonomic Government members who are Freemasons, are more numerous than what would be expected from the weight of their Institution in the general population. If so,

³ Romeu, J. and G. Pardo Valdes. 2011. Demographic study of Cuban Blue Lodge Masons. In *JSM Proceedings, Social Statistics Section*. Alexandria, VA. American Statistical Association. 1067-1080. http://higherlogicdownload.s3.amazonaws.com/AMSTAT/ea9d01bf-dbf6-46f6-a681-fd7890cf1357/UploadedImages/JSM_2011_Romeu_Valdes.pdf

⁴ *Centro de Estudios Historicos de la Masoneria Española*: CEHME, European Academic society of professors and researchers interested in the study of Freemasonry in Spain and its former colonies. <http://www.uned.es/dpto-hdi/museovirtualhistoriamasoneria/0/cehme/cehme.htm>

⁵ See prologue to Castellano's *La Masoneria Espanola en Cuba Durante el Siglo XIX*, Page 16.

⁶ John. Belton is the Editor of the research journal *Ars Quatour Coronatorum*, Grand Lodge of England, London, UK. He has published extensively on membership, using statistical methods.

⁷ Dr. S. Brent Morris is a retired US government mathematician. He is a *Fellow* of the *Scottish Rite Research Society*, and the Editor of *Heredom*, its flagship journal. Morris developed math models for describing and forecasting membership trends in American Freemasonry.

⁸ Several of Romeu's papers on Masonic history are referenced in the Bibliography section.

this this would support the hypothesis that one of the most important contributions of Puerto Rican Freemasonry was the grooming of political and social leaders.

In the rest of this paper we will discuss how the two methods were applied, what other considerations were observed, and what consequences were derived.

2. Goodness-of-Fit Test

In our first example, we analyze two samples of the ages from members joining the Grand Lodge of Puerto Rico (GLSPR). Our first sample comprises ages from members of Adelpia Lodge (Mayaguez, Puerto Rico) circa 1888, contributed by Prof. Luis Otero⁹, the second author of this paper. Adelpia sample members have received the First Degree (Entered Apprentice/EA) of Freemasonry. EA Freemasons have recently joined their Lodge. For, Lodge members with more seniority would have already been passed to the Second Degree (Fellow Craft), or would have even made it to the Third Degree (Master Masons), the last degree attained in Blue Lodge.

In addition, from a sampling point of view, we will consider each masonic lodge as a *conglomerate*, since all lodges exhibit similar organizational characteristics. Thence, we consider *Adelpia* is a legitimate representative of any GLSPR lodge, in the 1880s.

These data are then compared with our Second Sample, consisting of the petitioners to the GLSPR, as reported in the Weekly Bulletins (Circulares Semanales¹⁰) of the GLSPR, which are sent to all its member Lodges.

This second sample was obtained by the first author (Romeu) during the first semester of 2012. These Bulletins include the names and ages of all applicants to any lodge of the GLSPR. They, in turn, will be initiated as Entered Apprentices shortly after petitioning. Given that the average petitioner age is over 30 years, the span of time between petition and initiation is minor. Thence, we consider this second sample as a legitimate representative of ages of Entered Apprentices to the GLSPR, in the XXI Century.

Table 1 shows how Lodge Adelpia had 32 Entered Apprentices with median age of 31 years. There were 187 petitions to the GLSPR during the first semester of 2012, with median age of 33.56. All other descriptive statistics are also close, except Maximum and Minimum values (we will return to this issue, later in the section).

Table 1: Descriptive Statistics of the Original two samples compared.

Variable	N	Mean	Median	StDev	Min	Max	Q1	Q3
GLSPR	187	33.56	32.00	10.28	18.00	63.00	26.0	40.00
Adelpia	32	33.91	31.00	7.15	24.00	50.00	28.0	38.75

Figure 1 shows Box Plots for both analyzed samples. We can observe the similarity of most descriptive statistics. The exceptions are the Maximum and Minimum values.

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¹⁰ All petitioners must be announced here, before being balloted in their respective lodges.

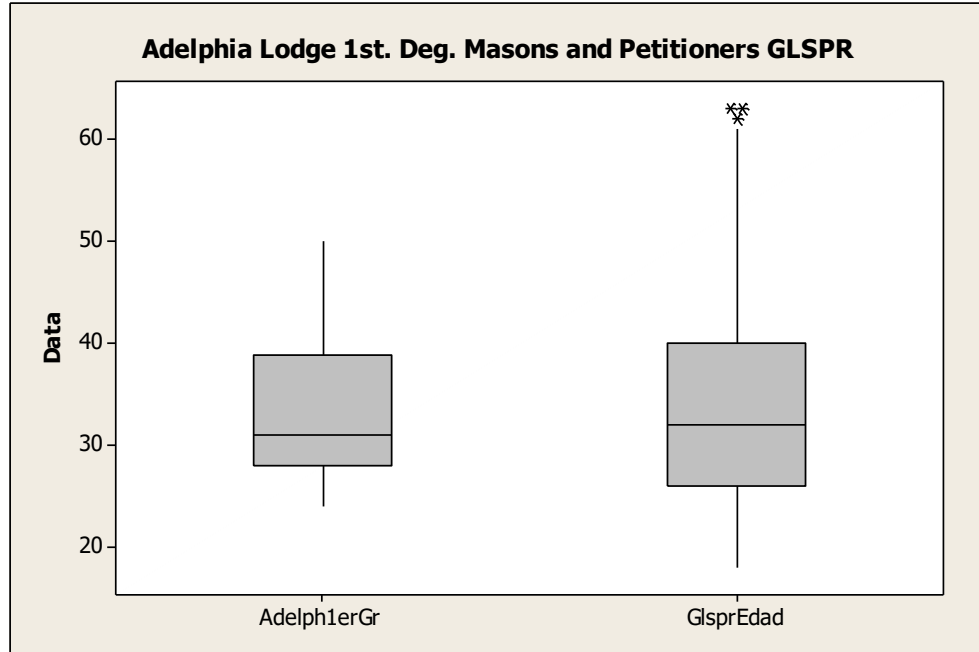


Figure 1: Boxplot of First Degree Masons: Adelphia, & Petitioners GLSPR

Such observations led us to consider whether these two age samples, representative of the two populations (circa 1888 and 2012) could have come from populations with similar distribution parameters. But we needed to address the differences in distribution tails.

Such differences could be explained by considering how, during the XIX Century, Life Expectancy was lower than in our times (thence, shortening the length of the upper tail of the age distribution). In the 1880s, a man in his 60s was old and often ill. Today, a man of this same age is often still in the labor force, and enjoying health and life.

Also, in the XIX Century, economic conditions for young men were not as advantageous as in our days. Today, young men can obtain an Associate Degree from their Community College and find a job, join the Armed Forces, et. All of this enables them to enter the labor force and acquire an economic position that allows them to join Freemasonry (for it does require investing some time and money). This latter situation would also shorten the lower tail of the age distribution (as young men, in the 1880s, would have had to wait longer before acquiring such enabling economic position than in our days).

Following such explanations, we adjusted both tails of the second sample (i.e. from the 2012 applicants to GLSPR). We now notice (see descriptive statistics in Table 2) how the respective sample parameters are much closer. Adjustments made to the 2012 GLSPR applicants, are commensurable with the sample from Entered Apprentices of Lodge Adelphia. The adjusted GLSPR sample is now referred to as *Adjusted*.

Table 2: Descriptive Statistics of the *Adjusted* two samples compared

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Adelph1erGr	32	33.91	7.15	24.00	28.0	31.00	38.75	50.00
AdjstEdad	140	33.93	7.06	24.00	28.0	32.00	39.00	50.00

The *Kolmogorov Smirnov* Goodness of Fit Test¹¹ for two samples was selected to help us assess if parameters from both distribution were similar, or if they have changed. We selected such *distribution free test*, for we did not want to require a Normality condition for the two samples, as they did not appear Normally distributed (Figure 2).

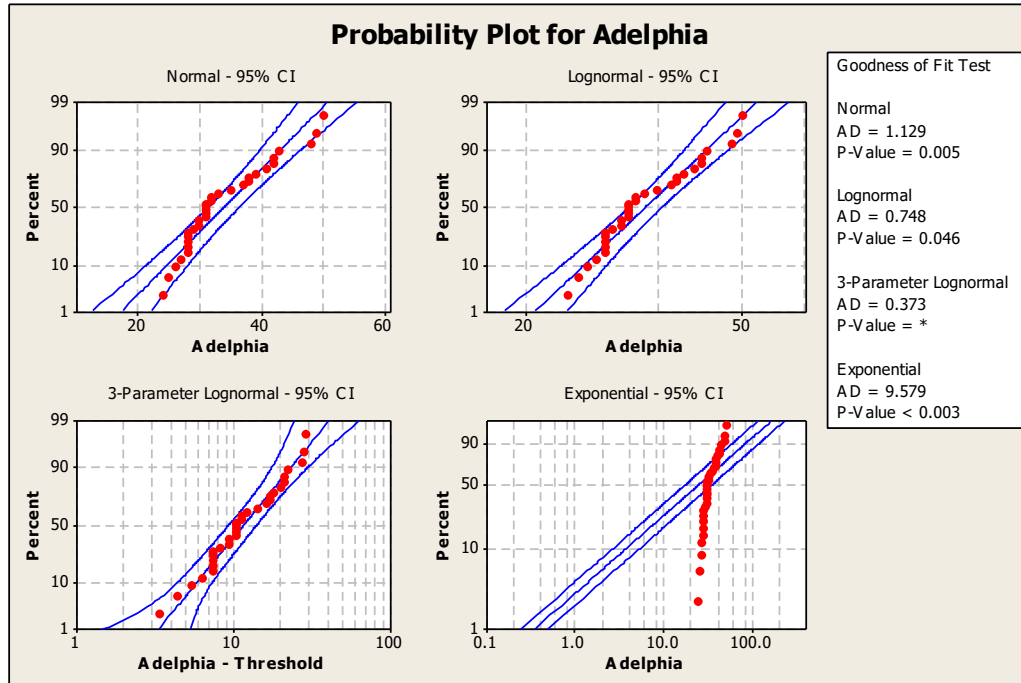


Figure 2: Probability Plots for Lodge Adelpia, under various distributions

We proceeded to obtain the Critical Values (CV) for Two Sample Kolmogorov-Smirnov (KS) Goodness of Fit Test, for samples of different sizes, which are given in Table 3:

Table 3: K-S Critical values of $\alpha = 0.2, 0.1$ and 0.05 , and the sample sizes analyzed.

$$\begin{aligned} \text{KS (CV for } \alpha=0.2) &= 1.07 * \text{SQRT}[(m+n)/mn] = 1.07 * \sqrt{[(140+32)/140*32]} = 0.2098 \\ \text{KS (CV for } \alpha=0.1) &= 1.22 * \text{SQRT}[(m+n)/mn] = 1.22 * \sqrt{[(140+32)/140*32]} = 0.2391 \\ \text{KS (CV for } \alpha=0.05) &= 1.36 * \text{SQRT}[(m+n)/mn] = 1.36 * \sqrt{[(140+32)/140*32]} = 0.2665 \end{aligned}$$

We can verify how the **Máximum Difference** for said KS statistic:

$$\text{Max-Diff KS} = 0.150893$$

Is Smaller than all Critical Values above calculated: 0.2098; 0.2391; 0.2665

K-S test cannot reject the hypothesis that both samples come from an age distribution population with the same parameters. This result supports the plausibility of the theory that the age patters of petitioners (or of Entered Apprentices) to Freemasonry, in Puerto Rico, has not changed in the last one hundred years. In other words, the plausibility that,

¹¹ Rohatki. *An Introduction to Probability Theory*. Pp 557-558

in Puerto Rico, men presently joining Freemasonry follow a similar age pattern, as that followed by those joining our Institution during the XIX Century.

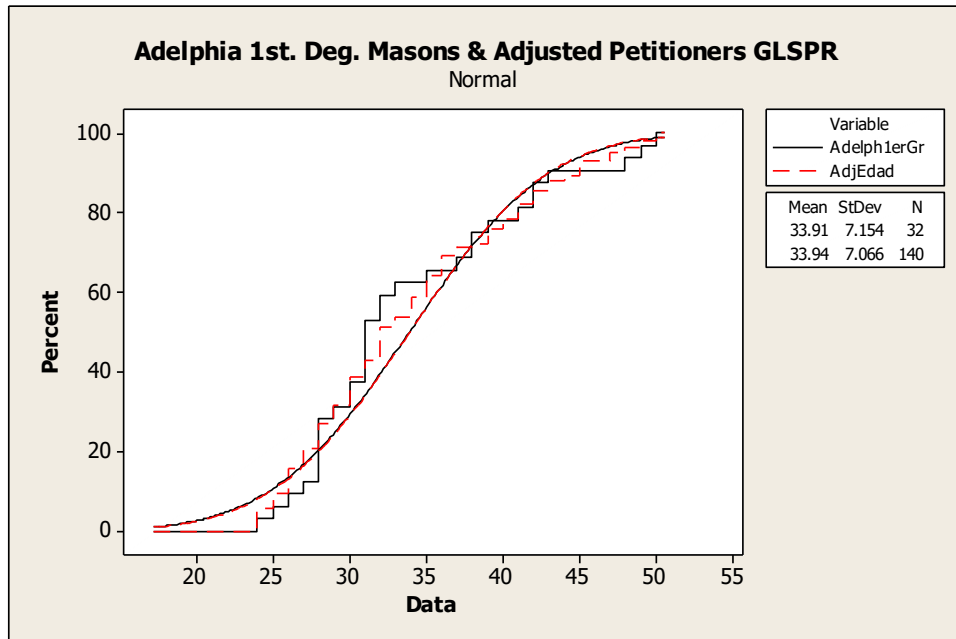


Figure 3: CDF for 1st Degree Masons, Adelphia & Adjusted Petitioners, GLSPR

We also compare the Boxplots of both samples, and verify how similar they now are.

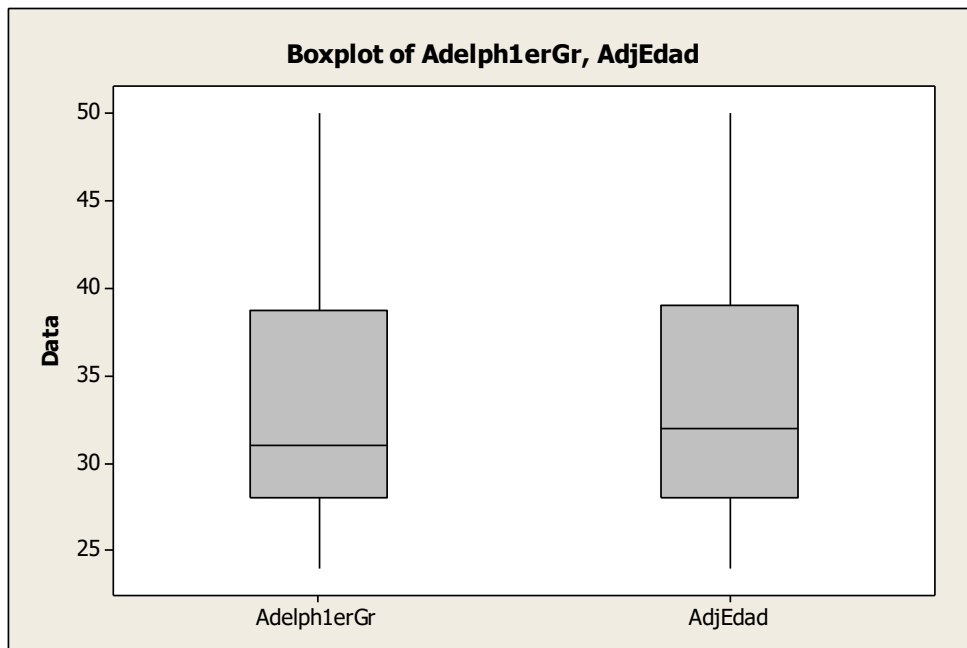


Figure 4: Boxplots 1st Degree Masons, Adelphia & Adjusted Petitioners GLSPR

The logical question that arises next is: *who are these masons?* We analyzed the 187 ages collected from the applicants to the GLSPR during the first semester of 2012. The Histograms and CDF graphs are given in Figures 5 and 6, below.

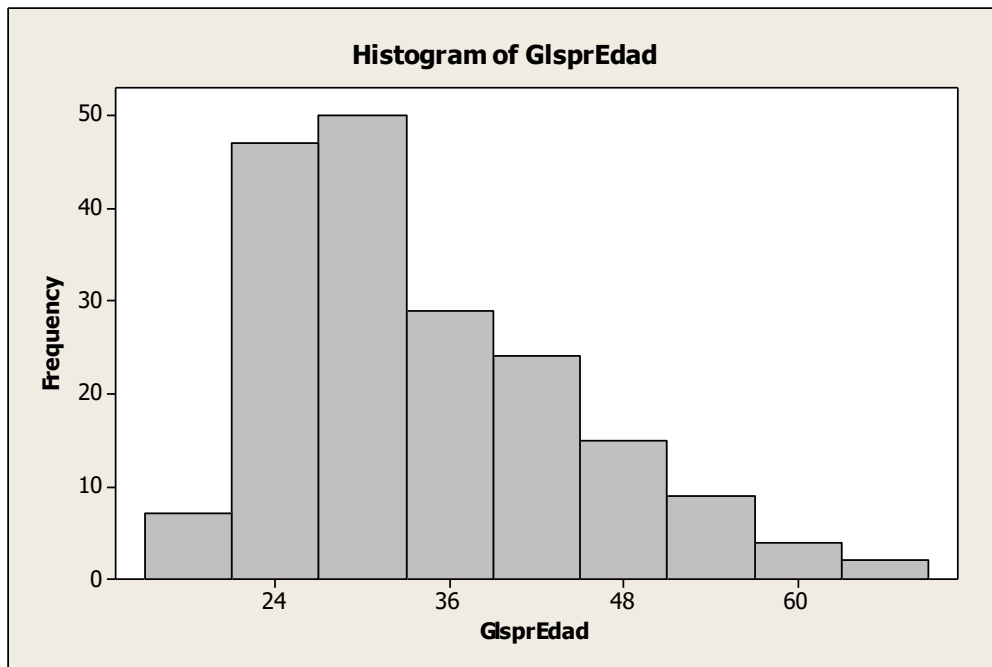


Figure 5: Histogram of the Age of Petitioners to the GLSPR

From the above histogram and descriptive statistics we see how the Mean, Median and Mode of petitioners to GLSPR are in the low 30s. Also, the majority of these petitioners are in the age range of upper twenties to lower forties. Such information can help GLSPR to establish programs that strengthen retention of new members. Such problems have been addressed by Romeu¹².

The CDF of this data set (Figure 6) corroborates the above information. We observe how 80% of individuals in the dataset are 42 years of age, or less. Similarly, 20% of dataset elements are individuals 24 years of age, or less. Thence, approximately 80% of centered applicant cohort falls in the age range 34 to 42 years. Such information is also useful for the better administration of the organization.

¹² In Romeu's 2015 *Lumen* article *Propuesta de Estudio Demografico*.

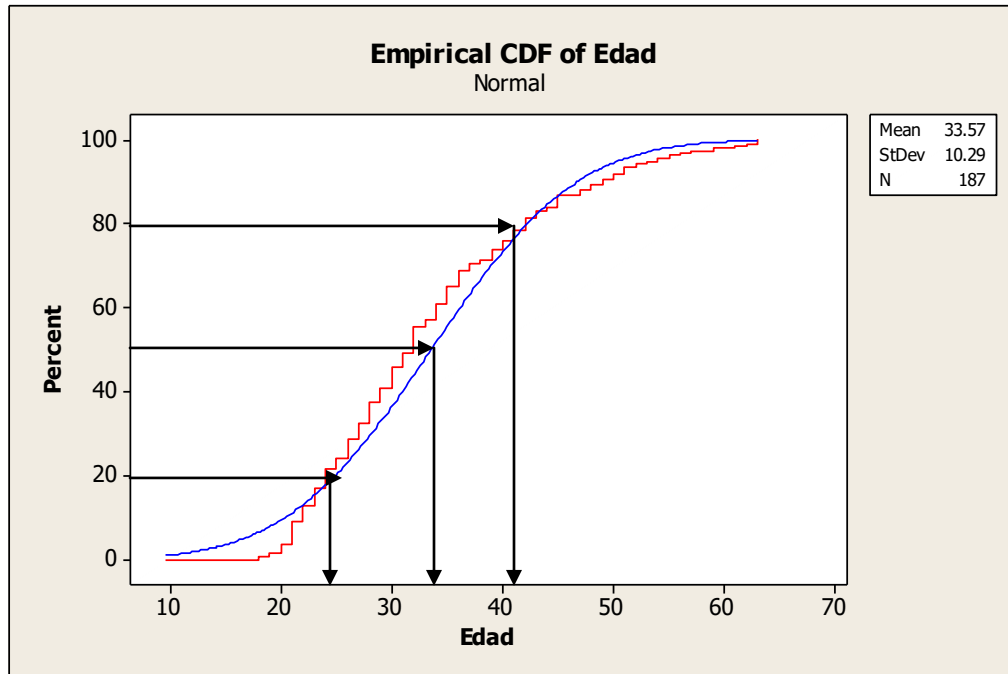


Figure 6: CDF of Ages of Petitioners to GLSPR

3. Contingency Tables Analysis

The last quarter of the XIX Century was spent, in Cuba and Puerto Rico, in a struggle to obtain an Autonomic status from Spain, similar to the one Canada enjoyed with the United Kingdom. In such struggle, Autochthonous Freemasonry played a significant part, as shown by the large numbers of its members, in both islands, that participated in this, not always very peaceful civic conflict, and not exclusively with the Spanish colonial authorities¹³. The fact that the Autonomic political parties of these two Caribbean islands were founded and led by members of their two Autochthonous Grand Lodges¹⁴, speak volumes regarding the participation of such Freemasons.

To explore further the key leadership role of Puerto Rican Autochthonous Freemasonry¹⁵ we implemented a Two-Factor Contingency Table. We analyzed the plausibility of the statistical relationship (association) between factors political leadership (measured by the inclusion, in the autonomic government established by Spain in Puerto Rico in January of 1898, to avoid the Spanish-American War) and membership in the Masonic Institution.

We consider the number of potential candidates (*population at risk*) to the Autonomous Government (i.e. *those men capable*, due to their knowledge, personal qualifications and

¹³ Spanish Grand Lodges in Puerto Rico and Cuba supported the Spanish colonial policies, and opposed the respective Autochthonous Grand Lodges every inch of the way.

¹⁴ The Grand Lodges of Cuba and Puerto Rico were very close. Not only were the populations of these two islands closely knit (this first author is both, of Cuban and Puerto Rican descent), but also the two Grand Lodges. The Grand Lodge of Puerto Rico began as a Provincial Grand Lodge of the Grand Lodge of Cuba, who encouraged it to become an independent entity on its own.

¹⁵ Members were mostly *Creoles*, i.e. those born in these islands –not Spaniards from Europe.

social status, *of becoming members of such*). We will use *Ten Thousand* as population at risk (includes both groups: masons and non-masons) as an initial number¹⁶.

We know, from Prof. Jose A. Ayala's book, that the *total number of Puerto Rican Freemasons was estimated about three thousand*. Assume that all of them had the necessary qualifications to be considered as potential members of said Autonomic government, thence, also of the population at risk (these are optimistic figures).

We can then, using a Contingency Table, assess whether said two-factor association is statistically significant. *We built the Table, in the following manner*: (1) those who did not belong to the Autonomous government, nor to the Freemasons; (2) those who did not belong to the Autonomous government, but were Freemasons; (3) those who belonged to said Autonomous government, but did not belong to the Freemasons; and (4) those who were members of the Autonomous Government, and also of the Freemasons.

Table 4: Freemasons and Political Leadership: theoretical statement

		Factor A:	Masons	
Factor B:		Not Masons	Masons	Total Factor-B
Participation in Autonomic	Outside the Government	Persons not in the government, nor masons	Masons Outside the Government	Total Outside the Government
Puerto Rican Politics	In the Government	Not Masons inside the government	Masons inside the government	Total of Government Secretaries
	Total Factor-A	Total of Non Masons	Total of Masones	General Total

We also know, *from Prof. Ayala's book*, that *out of eleven Secretaries* established by the Autonomous Government in Puerto Rico in 1898, *eight were confirmed Freemasons*¹⁷.

¹⁶ Puerto Rican population census, for the 1880s, assert over 700,000 inhabitants.

¹⁷ Prof. Ayala writes: "The first [Puerto Rican] Autonomous Government was formed on February 10. 1898. *Out of its Six Secretaries, at least four were Freemasons. Out of its five sub-secretaries, four were also Freemasons*". La masonería puertorriqueña de obediencia española p. 30

Table 5: Freemasons and Political Leadership: Observed Values

	Factor A:	Masoneria	
Factor B:	Not Masons	Masons	Total-B
Outside the Government	6997	2992	9989
In the Government	3	8	11
Total-A	7000	3000	10000

Tables 4 & 5 show the Chi Square Minitab results with Theoretical & Expected Values¹⁸. Notice how values *in Government* cells, *assuming* that there is *no association* between Freemasonry and Leadership, are substantially different.

Table 6: Freemasons and Political Leadership: Expected Values

	Factor A:	Masoneria	
Factor B:	Not Masons	Masons	Total-B
Outside the Government	6992.3	2996.7	9989
In the Government	7.7	3.3	11
Total-A	7000	3000	10000

Under the hypothesis of *no relationship between the two factors mentioned*, the number of members in the *Autonomic Government*, who are *Freemasons*, should have been only 3.3. However, *there were over twice that many*. In addition, the Contingency Table statistic *Total Sum* is 9.57, also over twice *Critical Value* of 3.84, obtained assuming no association between these two factors. The p-value is 0.002. There is one cell with an Expected Value of less than five, failing a requirement of the Chi Square test.

¹⁸ Multiplying, for each cell in the table, the line total by the column total, and dividing this result by the general total. For example: $9989 \times 7000 / 10000 = 6992.3$ is the entry for the table's first cell.

Therefore, the *Null Hypothesis of NO association between Membership in Freemasonry and Membership in the Autonomic Government, is rejected*. There is an association. And we conclude that the hypothesis of Freemasons grooming Leaders is plausible.

We then explored the situation assuming that there were only 1100 persons, in all Puerto Rico, that held the status and know-how to be candidates to the Autonomic Government (i.e., at risk). Of these, 1000 were non-masons, and only 100 were Freemasons.

Under the hypothesis of *no relationship between the two mentioned factors, the number of members in the Autonomic Government, who are Freemasons, should have been only ONE* (Tables 7 & 8). In addition, the Contingency Table *statistic Total Sum is 54.4, with a p-value of 0.000*. There is one cell with an Expected Value of less than five, failing a requirement of the Chi Square test.

Table 7: Freemasons and Political Leadership: Observed Values

	Factor A:	Masoneria	
Factor B:	Not Masons	Masons	Total-B
Outside the Government	997	92	1089
In the Government	3	8	11
Total-A	1000	100	1100

Table 8: Freemasons and Political Leadership: Expected Values

	Factor A:	Masoneria	
Factor B:	Not Masons	Masons	Total-B
Outside the Government	990	99	1089
In the Government	10	1	11
Total-A	1000	100	1100

The Chi Square test results are now even stronger. The *hypothesis of NO association between Membership in Freemasonry and also in the Autonomic Government* is again *rejected*. We conclude that the assertion of Freemasons grooming Leaders is plausible.

Such statistical results do not constitute a historical proof. However, they help support the assertion that one of *the most important contributions made by GLSPR, the Puerto Rican Autochthonous Grand Lodge*, to the island's struggle for Autonomy *was the grooming of the main political and social leaders of such movement*.

4. Discussion

As shown in this paper, statistics is a useful tool in the arsenal of the historian. Even when all theoretical requirements for the application of statistical procedures are not totally met, as occurred with the Contingency Tables example¹⁹, these are still very useful tools that add depth and breadth to the historical analysis.

The present historical analysis is concerned with Puerto Rican Freemasonry. Thence, its results are not necessarily valid for Grand Lodges in other countries. In addition, there were also Spanish *Obediences* (i.e. Grand Lodges) in Puerto Rico. Since their membership composition and social conditions differed from the Autochthonous Grand Lodge, the present results may not be extended to these others, either.

The relevance of the Autochthonous Grand Lodge of Puerto Rico (GLSPR) as the organization that groomed the most important leaders of the struggle for political autonomy is unquestionable. At that time (end of the XIX Century) there was no university and few higher education facilities in the island –let alone civil society. It was in the Lodge that many –if not most- such men developed knowledge and honed their speaking, writing and debating skills. It was also the place where these men met others who shared their ideals, where they refined them, and made them known.

A select list of Puerto Rican leaders at the end of the XIX Century, who were also members of the GLSPR, is shown in Table 9. It includes many of the most relevant men of science, arts, education, and other fields of the intellectual life in the island.

Table 9: Relevant Puerto Rican, both Freemasons and Civic Leaders

Eugenio Ma. Hostos	Santiago R. Palmer
Ramón E. Betances	R. Matienzo Cintron
Roman Baldorioty	Segundo Ruiz Belvis
Federico Degateau	Antonio Ruiz Quinones
Cayetano Coll y Toste	Luis Munoz Rivera
Francisco. M. Quinones	Manuel Fernandez Juncos ²⁰
Antonio Cordero	José Celso Barbosa
José De Diego	José Claudio Vera

¹⁹ Those of us who work in industrial statistics know that theoretical conditions are infrequently met in practice. Still, statistics is used. And its results are carefully considered and interpreted.

²⁰ The only member not born in Puerto Rico (he immigrated as a child), or who did not belong to the GLSPR but to a Spanish Grand Lodge in the Island. However, he was a Puerto Rican in his heart, and is well-remembered. One of the most important avenues in San Juan carries his name.

Among this list of intellectuals, political leaders and members of the Autonomist Party we find: Hostos and Baldorioty, renowned educators; Betances and Barbosa, medical doctors; Coll y Toste, historian; De Diego, poet; Ruiz Belvis, Quinones and Betances; abolitionists; Munoz Rivera and Fernandez Juncos, newspaper editors and members of the Autonomous Government of 1898, under Spain.

Such a list should suffice to show how GLSPR, the Autochthonous Grand Lodge of Puerto Rico, was instrumental in grooming the island's leaders. But, in the historical arena, such is *considered subjective* evidence. Other historians would show several, equally renowned individuals, who were not members of the GLSPR.

The *function of statistics* in this context consists in *providing additional, objective evidence*, regarding *how the contribution* of the Autochthonous Grand Lodge, was *way beyond its specific weight in the Puerto Rican society* of its time.

Acknowledgements

There is an active and close-knit group of masonic researchers at the Jose G. Bloise Research Lodge (<http://www.opusartis.net/RLIJGB113/Portal.html>), Grand Lodge of Puerto Rico (<http://www.granlogiapr.org/>). They include, among others, Jorge L. Romeu, Luis A. Otero, Miguel A. Pereira, Luis Santiago Ramos and Ramon C. Barquin. We gladly acknowledge these Brothers for their valuable input, information sharing, research collaboration, and constant encouragement.

Finally, on June 24th Freemasonry arrived to its 300th anniversary. In 1717, four London lodges met to create the first Grand Lodge. Long before that, Masonic Lodges had existed, but operated independently of each other. The new Grand Lodge provided Freemasonry with a structure, common rules, visitation rights and a modern philosophy of Enlightenment. It was the beginnings of modern Civil Society.

Freemasonry introduced a set of revolutionary concepts, for their time and place: men were assessed by their merits, not their wealth or social status. Lodge leadership was elected –not hereditary. And members observed religious tolerance. Such ideas had a strong impact in the development of modern Western thought.

We would like to dedicate our paper to commemorate such anniversary.

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Appendix

Chi-Square Test #1: Non-Mason, v. Mason

Expected counts are printed below the observed counts
 Chi-Square contributions are printed below expected counts
 Notation: 1) Outside; 2) Inside the Autonomic Government

	NonMason	Mason	Total
1	6997 6992.30 0.003	2992 2996.70 0.007	9989
2	3 7.70 2.869	8 3.30 6.694	11
Total	7000	3000	10000

Chi-Sq = 9.573, DF = 1, P-Value = 0.002
 1 cells with expected counts less than 5.

Chi-Square Test #2: Non-Mason, v. Mason

Expected counts are printed below the observed counts
 Chi-Square values are printed below expected counts
 Notation: 1) Outside; 2) Inside the Autonomic Government

	NonMason	Mason	Total
1	997 990.00 0.049	92 99.00 0.495	1089
2	3 10.00 4.900	8 1.00 49.000	11
Total	1000	100	1100

Chi-Sq = 54.444, DF = 1, P-Value = 0.000
 1 cells with expected counts less than 5.