SEASONAL PATTERNS OF BIRTHS IN PUERTO RICO

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It has been said that man is the only creature who eats when he is not hungry, drinks when he is not thristy and makes love all the time. If the last of these three characteristics referred to about man were true. one would expect that during, say, a period of one year, the results of this behavior of love making in terms of births would be an uniformly distributed probabilistic phenomenon. However, when the data of births are studied over a certain period of time, there are deviations noted. These deviations in case of births, during the calendar year of 12 months, are markedly different from month to month. When this monthly phenomenon is observed from year to year, there is seen to be a certain fixed pattern in monthly distribution. Does this pattern show any seasonal variation? If it does, man, just like other creatures on this earth. may be following the seasonal conception pattern. Knowing, however, the superiority of man's intelectual capacity, one would attribute this seasonal pattern of conception to the traditional activities for customs which are in turn determined according to the season of the year.

To have an illustration of this pattern, the percent distribution of yearly births by month of the United States from year 1950 to 1961 is shown in Table 1, and Graph 1. The months of August (9.04%) and September (8.92%) are the ones having, on an average, the highest percent of the births during this period under study. The percent goes down later during the year and fluctuates at a lower level during the months from January to April and starts rising again. If one studies such a pattern and tries to fit a cyclic equation, it is possible to arrive at logical, meaningful implications explaining the seasonal phenomenon. In this paper, the authors have made an attempt to present the preliminary overall analysis of the births pattern in Puerto Rico over a period of 22 years, from 1950 to 1971.

Annual Births in Puerto Rico

In year 1960, the registered births in Puerto Rico amounted to slighly over 85,000 (Graph 2). The total of births has been decreasing slowly and except for a few upward values, has been around 70,000 in the last four years. The births rate in Puerto Rico has been on the decline, from 38.5 in 1950 to 25.6 in 1971. (Rates per 1,000 population)

Monthly Percentage Distribution

The pattern of monthly births within the year, however, has a peculiar form. In order to be able to compare such pattern from year to year the registered births by months are distributed as percentage of the yearly total. Table 2 and Graph 3, show these percentages. Deviations of the monthly percentage from the expected value 8.33% can be seen to be markedly similar since 1954 to 1969. It may be noted that the proportion of births increase from July until October and starts declining for the next four months, whereafter the births stay fluctuative at the same low level for the next four months. There are such three distinct seasonal periods in the year. Table 3 and Graph 4 show the average trend of these percentages over a period of 22 years. The figures indicate three distinct seasonal periods of the year, namely

July to October : Increase November to February: Decline March to June: Fluctuating at a low level

Interpretation of the Pattern

In order to interpret the birth pattern, one would go back to the possible time of conception. The normal time of 9 months and 10 days places the highest conception period in case of the above dates, between October to January, the winter time and the lowest one between May to August, the summer time. The winter time generally keeps people more at home with less outdoor activities. Besides, it includes several long periods of social festivities such as Christmas. In Puerto Rico, Christmas celebrations generally start almost in the beginning of the month of December and lasts until the first half of January next year. The summer time is passed more outdoor due to vacation time for children and also adults. These activities accompanied by less privacy may induce low frequency of love-making opportunities and hence of conception compared with the winter time's privacy and the reaction in the mood after the festive days of Christmas time.

Fitting a Cyclic Curve

The pattern is such a regular one, at least for the data on hand that it was decided to determine the equation for this seasonal phenomenon. A sine-cosine curve was tried to fit to the average percentages. The curve fitted turned out to be as follows:

Y = 8.33 - 0.6025 Sin (30x) ⁶+ 0.2439 cos (30x)[°] where Y = percent monthly births and X = coded number of month (January=1, December =12)

The fit is highly significant (Prob. level 1%), 75.2 percent of the variation explained by the time variable, X.

The maximum value of Y occurs at X= 9.7 months. If one considers the middle of the month as the point of coincidence for the coded number, this maximum value would represent the first week of October as the peak point of birth, thus indicating roughly the Christmas time as the highest incidence of conception.

Some Implications of this pattern:

In a democratic society like the one we are living in, one cannot force to change the human behavior which does not interfere in the freedom of the other fellow man. Hence the society has to accept this and must try to meet with the demand it would create in terms of hospital beds, doctors and nurses for the peak delivery period.

On the other hand, the society which is planning a birth control program, may have to carry out this propaganda campaign during this peak period of conception making people more conscious in this matter and may gain some impact on their control program. Anyway, man is supposed to have his own way of living, behaving and carrying on his personal activities as he wishes. However, he is born in a certain type of society with customs and traditions already prevailing from long time before he was born, and therefore, he, in general, is not as free as he thinks he is. He is influenced directly by this society that has customs and traditions which in turn are influenced by the climate and other natural surroundings. Thus, even if man is said to be a creature who makes love all the time, one would say, from the above data, that he may be following, indirectly, some pattern of seasonality of nature like other creatures.

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Table 1 Average Percent Distribution of Births, U.S.A., 1950-61

Month		Average Births (Percent)
January February March April May June July August September October November December		8.19 7.63 8.26 7.64 7.95 8.09 8.84 9.04 8.92 8.76 8.21 8.47
	Total	100.00
Annual Average (1950-1961)		4,042,618

Table 3 Average Percent Distribution of Births Observed and Estimated Puerto Rico, 1950-1971

Month	Average Births Observed	Estimated T re nd Value
	(Percent)	(Percent)
January	8.38	8.24
February	7.40	7.93
March	8.03	7.73
April	7.86	7.69
May	8.11	7.82
June	7.74	8.09
Julv	8.20	8.42
August	8.67	8.73
September	9.21	8.94
October	9.22	8.98
November	8.60	8.85
December	8.58	8.58
Tot a l	100.00	100.00
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Percentage Distribution of Births by month, Puerto Rico from 1950 to 1971

Table 2

GRAPH 4

Average Percent of Yearly Births by Months (Data 1950 to 1971), Puerto Rico

Observed %

Estimated %

Estimated Percent Birth for the Month = 8,333 - 0.6025 Sine ($30 \times$) ° + 0.2439 Cosine ($30 \times$) °

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(X = Number of Month, January=1 December=12)





Average Percent Distribution of Births, U.S.A., 1950 - 61



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GRAPH 3

Percent Distribution of Monthly Births, Puerto Rico, 1950 to 1971

