Evaluation of the Cuban Vaccination Campaign Against Disease Caused by *Neisseria meningitidis B* Using Time Series Models.

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Resumen

Evaluación de la campaña cubana de vacunación contra la enfermedad causada por Neisseria meningitidis B, sobre la tasa de incidencia considerando la tendencia de descenso, usando análisis de series de tiempo según Box - Jenkins.
Palabra Clave: Vacunación, Neisseria meningitidis B, tasa de incidencia, análisis de series de tiempo.

Abstract

It was evaluated the impact of vaccination campaign against the disease caused by Neisseria meningitidis B on the incidence rate considering the decreasing trend, using Box - Jenkins time series analysis.
Key words: Vaccination, Neisseria meningitidis B, incidence rate, time series analysis.

INTRODUCTION

Since 1976, meningoccocal disease constitutes a serious problem in Cuba due to the significant rise in incidence of this disease, primarily caused by serogroup B meningococci, over 75% of the meningococci isolated since 1980 have been serogroup B. 1982 and 1983 were the peak epidemic years and the national incidence rate decreased thereafter (Valcárcel et al. 1990). At the end of the 1980's, a new vaccine against *Neisseria meningitidis B* was developed in Cuba, it was proved in a double-blind placebo-vaccine field trial and the results indicate that the vaccine had an efficacy of over 80% (Sierra et al. 1990).

In 1989 and 1990, children under the age of 6 were vaccinated in a national campaign. Since 1983 the national incidence rate was decreasing, therefore the difference in the incidence observed between 1989 and 1990 with 1988 was caused by these two factors: decreasing trend and vaccination campaign.

The present study evaluated the impact of the vaccination on the incidence rate considering the decreasing trend, using the Box-Jenkins time series analysis (Box-Jenkins 1976). The Box-Jenkins methods allow the modeling of seasonal cycles, trends and others patterns in the time series resulting in more accurate estimates of intervention effects. An intervention effects is confirmed when a significant change is evident in the object series (monthly incidence in older than 6 years). Explanations for the changes in the incidence rate must be explanations that would affect only the object and not the control series.

RESULTS AND DISCUSSION

For the preintervention period (January 1983-December 1988) of the incidence rate series, the interactive methods of models identification, fitting and diagnostic checking proposed

Table 1. Parameter Estimates, Standard Error, and t- values yielded by Box-Jenkins Time Series Analysis of the Incidence Series.

Parameter	Parameter Estimates	Standar Error	t
Object Series			
P_1	0.895	0.071	12.600
P_2	0.216	0.150	1.444
q_1	0.323	0.127	2.356
Control Series			
P_1	0.680	0.093	7.338
P_2	0.170	0.126	1.343
q_1	0.406	0.138	2.928

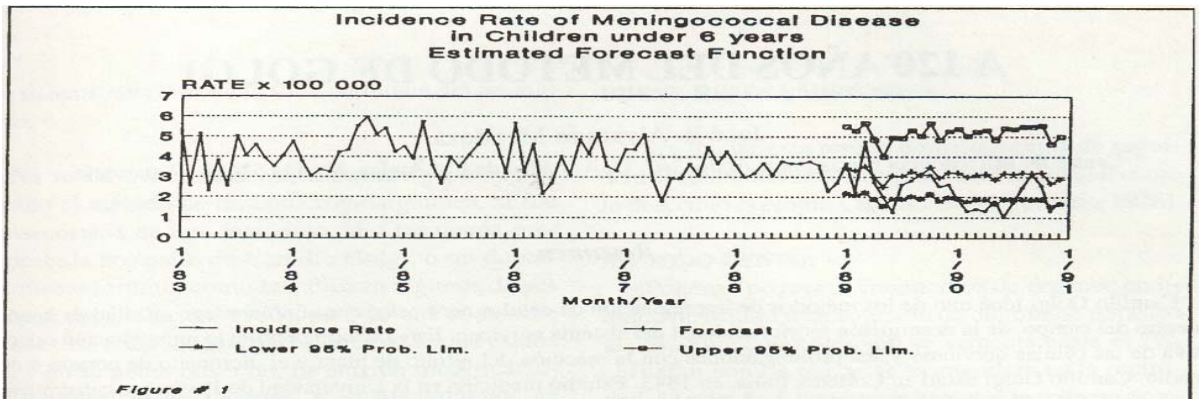

Figure # 1

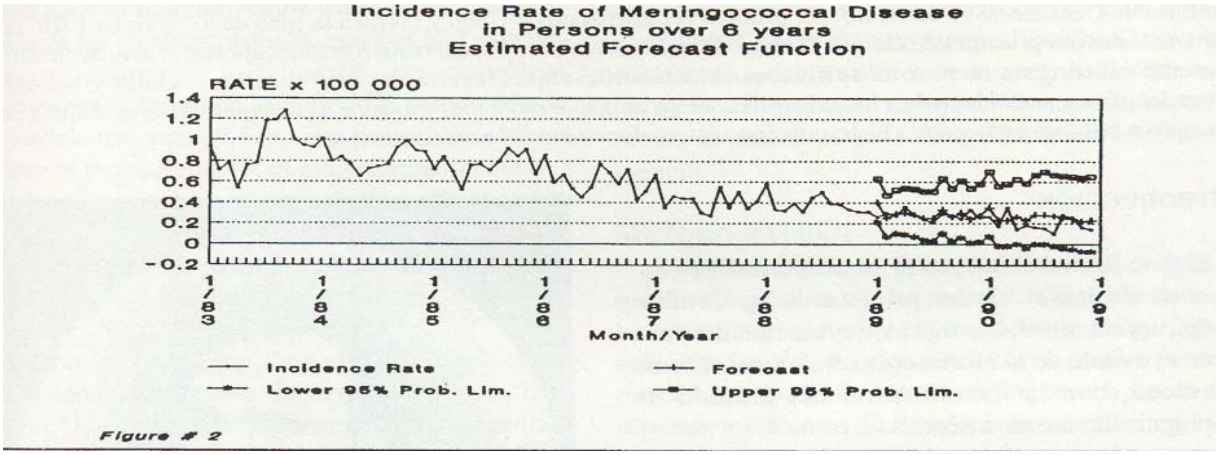

Figure # 2

by Box and Jenkins (1976) was straightforward. The monthly series of incidence rate (Zt) required a following model:

$$Y_t - P_1 \cdot Y_{t-12} - P_2 \cdot Y_{t-24} = a_b - q_1 \cdot a_{t-1}$$
$$Y_t = W_t - W_{t-1} \; W_t = 1n \; (Z_t + c)$$

The at are independent identically distributed random variables with expectation $0.P_1$ and P_2 are seasonal autoregressive parameters; q_1 is the moving average parameter. The parameter estimates yielded for each are presented in Table 1.

Figures 1 and 2 depict the estimated forecast function arising from the preintervention model. In addition, the figures show the 95% probability limits for the individual forecasts, spanning a region where the actual data are expected to be found. The observed differences in the behavior of the incidence rate series show a significant decrement after vaccination campaign in the immunized age group (mean monthly decrement of the incidence 0.85 per 100000) but did not vary in non-immunized age group. These observations may indicate a positive influence of the vaccination campaign on the total decrement.

This result is in agreement with recent results from Terry et al. (1991) concerning the impact of the vaccination campaign after one year, and with results from a study in six provinces with high incidence rate vaccination in 1989 (Valcárcel et al. 1990).

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