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Analyses of Tuberculin Reactor Disclosure Rates in the South East Region using the United States Bureau of the Census Seasonal Adjustment Procedure

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Introduction

To determine the likelihood of any evidence of long term trends in the rate of disclosure of reactor animals to the tuberculin test, data were collected nationally for the years, 1982 to 1993, to investigate this hypothesis.

Methodology

Seasonal adjustment of a time series is based on the assumption that seasonal fluctuations can be measured in the original series, O , and separated from the trend, cyclical and irregular fluctuations.

The seasonal component of a time series, S , is defined as intra-year variation that is repeated constantly from year to year. The trend cycle component, T , includes variation due to long-term trend, while the irregular component, I , is the residual variation. Epidemiological experience suggests that reactor disclosure rates in a time series are related in an additive fashion, i.e. $O = S + T + I$. The U.S. Bureau of the Census *X-11* Seasonal Adjustment Procedure¹ was used to seasonally adjust monthly results of tuberculin disclosure rates for different test types in the South East Region.

Materials

A range of responses were considered for analysis of the data available for the

13-year period. In particular, it was necessary to distinguish between the "Clear" and "Restricted" herds. The following variables were of principal interest: (i) reactor animals per thousand tests (APT) for clear herds only (test types 1, 3, 5, 7 & 8); and (ii) reactor animals per thousand tests (APT) for restricted herds only (test types 4 & 9).

Results

APT values for clear and its corresponding long term trend are presented in Figure 1. APT values for restricted herds, along with the long term trends superimposed for the South East region for the period 1982 -1993, are presented in Figure 2. Figure 3 shows the number of restricted herd tests for the period, 1982-1993. The proportion of herds that were restricted for 2, 3, 4 and more than 4 reactor retests are shown in Table 1.

Table 1. Proportion of herds restricted, based on 2, 3, 4 and greater than 4 reactor retests. South East Region, 1982-1993.

Number of Reactor Retests	No. Herds	Percentage of Herds
2	22767	70.2
3	5555	17.1
4	2255	7.0
> 4	1830	5.7

¹ SAS Institute Inc., Version 6.10

Figure 1. APT values for “Clear” herds in the South East Region, 1982-1993.

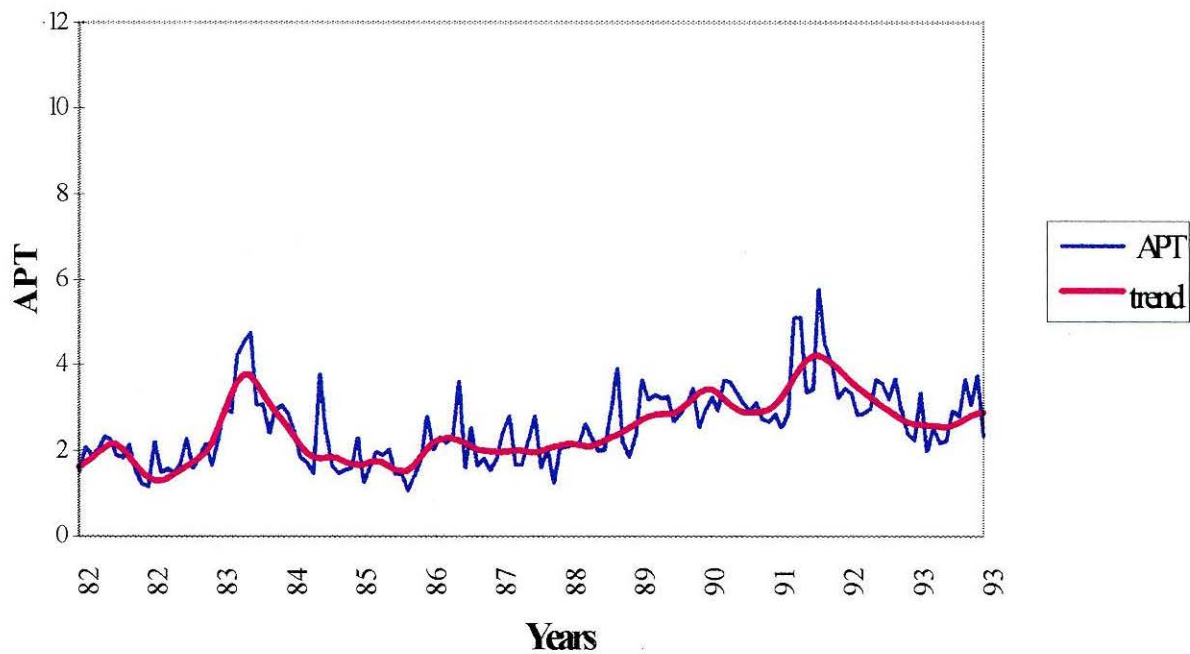


Figure 2. APT values for “Restricted” herds in the South East Region, 1982-1993

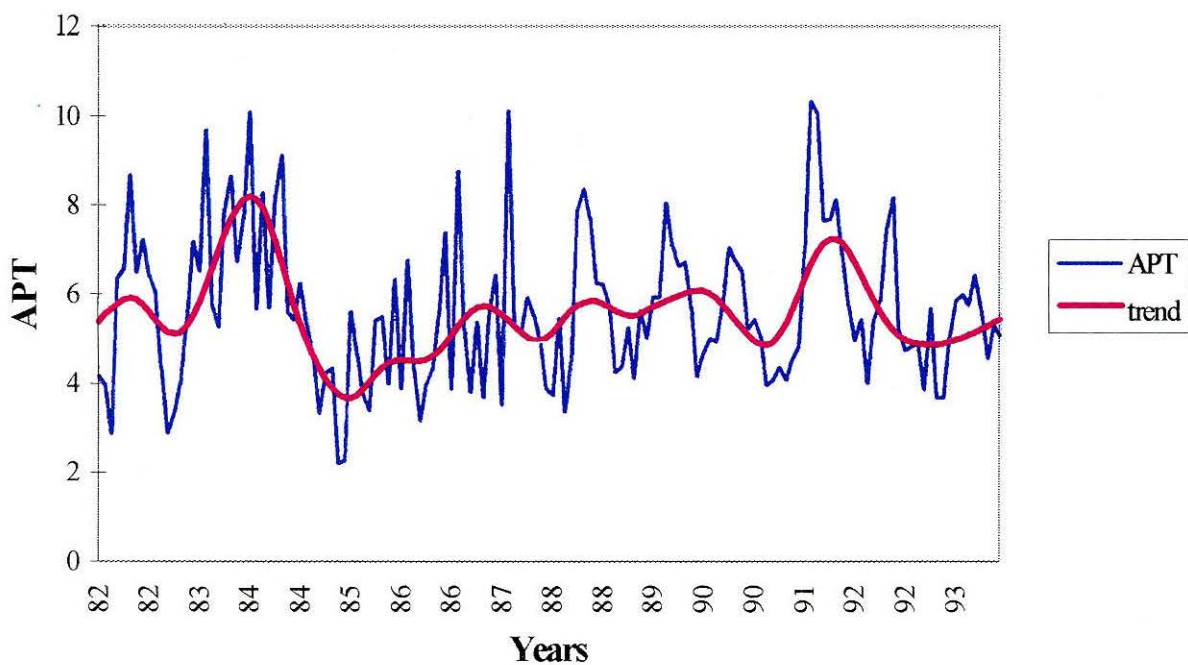
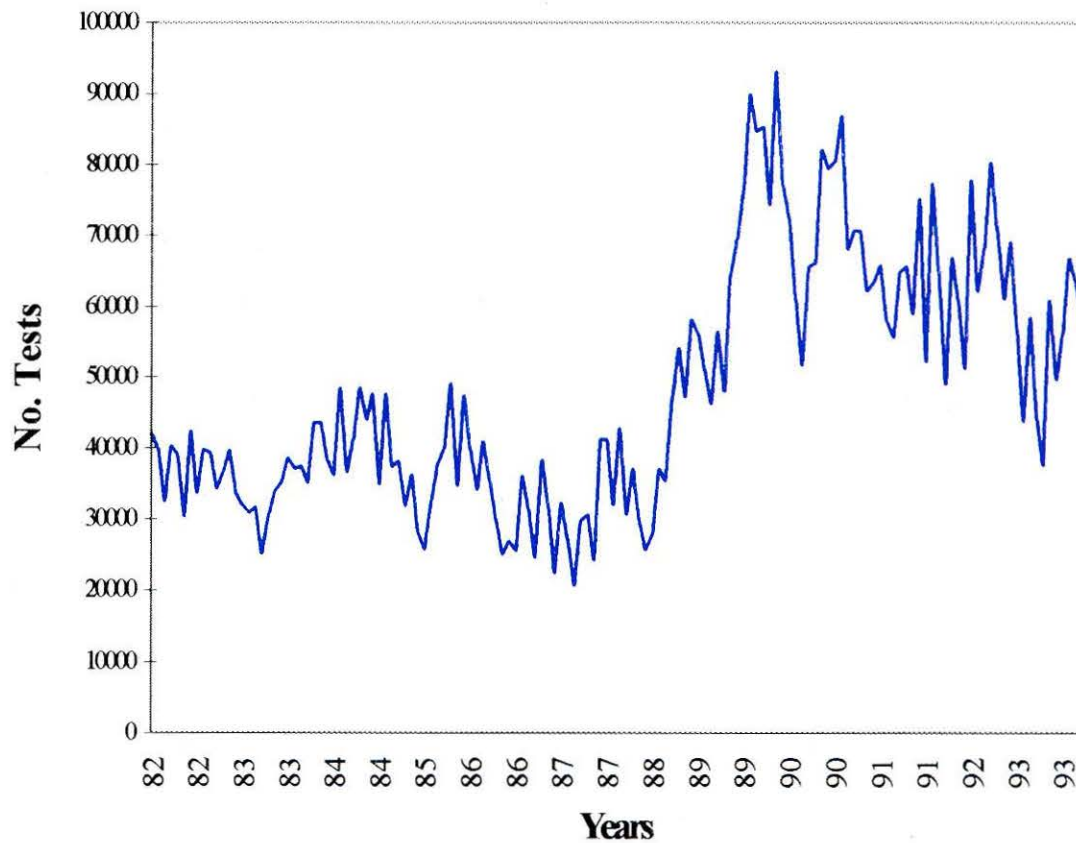


Figure 3. Number of “Restricted” herd tests carried out in the South East Region, 1982-1993.



Conclusions

After applying the *X-11* seasonal adjustment programme to the data from the South East region, there were no clearly apparent patterns or cycles with respect to reactor disclosure rates, as expressed as APT values, in either the “Clear” or “Restricted” herds (Figures 1,2). There was an increase in the number of tuberculin tests of types 4 and 9 carried out from 1989 onwards. This followed a management

decision to focus more resources on the restricted herds (Figure 3). However this did not appear to give rise to any change in the pattern of reactor disclosure. Approximately 95% of all herds that were restricted in the South East between 1982 and 1993 were “derestricted” after no more than 4 reactor retests (Table 1). This suggests that the measures applied during the restriction were effective.