

# TESTS FOR SPACE-TIME INTERACTION AND A POWER FUNCTION

D. E. BARTON\*

UNIVERSITY COLLEGE, LONDON

F. N. DAVID\*\*

UNIVERSITY COLLEGE, LONDON

and

UNIVERSITY OF CALIFORNIA, BERKELEY

EVELYN FIX\*\*

UNIVERSITY OF CALIFORNIA, BERKELEY

MAXINE MERRINGTON

UNIVERSITY COLLEGE, LONDON

and PIERO MUSTACCHI\*\*\*

UNIVERSITY OF CALIFORNIA MEDICAL CENTER, SAN FRANCISCO

## 1. Introduction

The problem of the detection of low order epidemicity is an old one and has been discussed moderately frequently in epidemiological literature. The first workable test may be that due to Knox [5], [6], [7], who, considering a swarm of points in the three dimensions of time and space, defined somewhat arbitrarily criteria for deciding whether points were adjacent in time and adjacent in space. He conjectured that the small number of points adjacent in both time and space was distributed Poissonwise. It was subsequently shown by Barton and David [2] that his conjecture was substantially correct. In this present paper we show that his test is very sensitive to departures from randomness in time and space commonly associated with epidemic conditions.

Various other test criteria have been proposed. It is clear that they all may be divided into three broad types, and that with appropriate modifications the same ideas regarding the power function for Knox's test can be applied to obtain power functions for any of the others.

## 2. Test criteria

$N$  points  $\{x_i, y_i, t_i\}$  are supposed where  $\{x_i, y_i\}$  are the space points and  $\{t_i\}$  those of time. It will sometimes be convenient to write

\* Now at the Institute of Computer Sciences and Queen Mary College, University of London.

\*\* With the partial support of the National Institutes of Health, USPHS Grant GM-10525.

\*\*\* With the support of National Institute of Health Research Grant 9751.