Reply

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It is clear that a conclusion of independence hinges on the degrees of freedom (d.f.) taken. According to Wine (1966), when the frequencies on the hypothesis of independence are obtained by using the marginal totals, the degrees of freedom are given by \((c - 1)(r - 1)(l - 1)\), i.e., \(1, c, r,\) and \(l\) being 2 each since the division is by the median, in the case of three-dimensional contingency table. The cell frequencies are given by \([(N/2) (N/2) (N/2)/N^3] N, i.e., N/8\). In the same way, for a four-dimensional contingency table, d.f. would be 1 and cell frequency would be \([(N/2) (N/2) (N/2)/N^4]N, i.e. N/16. With 1 d.f. and the values of chi-square obtained for the three-dimensional and four-dimensional contingency tables, monthly rainfall is seen to be non-independent, tripletwise and quadrupletwise.

If the number of degrees of freedom for four-dimensional contingency tables is 11, then as seen from Table 7 from Mooley (1971), chi-square is significant at the 5% level for three stations only, viz., Bombay, Jaipur and Menado, i.e., for \(-8%\) of the stations considered and this is what we would expect by chance. Hence, the hypothesis of independence cannot be taken to be contradicted, and as such quadrupletwise independence could be taken to hold. Quadrupletwise independence implies tripletwise independence.

The question of the appropriate degrees of freedom for three-dimensional contingency tables needs to be examined critically. It is possible that in applying the formula for the degrees of freedom, as given by Wine (1966) for three and higher dimensional contingency tables, I might have committed an error, leading to interpretation of tripletwise and quadrupletwise non-independence.

REFERENCES
