Apropos of the positive correlation found between an increase in prosperity and an increase in the infant mortality rate in Miss Thomas’s study of the Social Aspects of the Business Cycle, may I suggest that it by no means follows that increased prosperity necessarily signifies an increase in the average economic status of families in which births occur. If in times of prosperity births occur preponderantly in families of lower economic status, it is quite possible that the average economic position of families in which infants are born may actually be lower in times of prosperity than in times of depression. In other words, this relation between prosperity and infant mortality may be simply another example of those familiar statistical paradoxes where variables in prevalence and variables in causation are involved simultaneously.

This leads to the further suggestion that the need is not for the application of more “partial correlation,” which is in general inappropriate to the analysis of this type of problem, but for data with which to determine the actual factors at work, to trace their effects, and to measure their importance. For example, if marriages are postponed by the unemployed, by workers in the lower and in the higher economic strata during periods of depression, how numerous are they and what effect would they have upon the birth-rate when they are consummated on the upswing of the prosperity cycle? Are births in these different groups actually postponed during periods of depression and, if so, in what numbers? Are births actually increased in these groups during periods of returning prosperity, and, if so, at what stage of the cycle? The problem is thus seen to be very complex, and its solution requires data that help to measure the specific factors at work.

To the possibility that increased prosperity may be accompanied by an increased prevalence of artificial feeding and that this may contribute to increased mortality, I am disposed to give much greater weight than does Professor Hankins in his review of Miss Thomas’s book, published in the September number of this Journal. The conclusion of the Galton Laboratory upon which he relies is so at variance with the modern teaching and practice of physicians and infant welfare specialists that it could be accepted only if supported by the most trustworthy evidence analyzed by the most significant methods.

If the statement that “the Galton Laboratory studies ... also showed that bottle feeding is an almost negligible factor when account is taken of the physique and intelligence of the mother” means that increased prevalence of artificial feeding is correlative with weaker physique or lesser intelligence of the mother and that these correlated factors explain the increased mortality found associated with artificial feeding, it appears to be inapplicable to the present problem. For it does not throw any light upon whether or not a change from breast to artificial feeding, independent of the mother’s health or intelligence, will increase infant mortality. In other words, it does not throw light upon the causal influence of feeding upon mortality. The Galton Laboratory, so far as I am aware, has never analyzed data on infant feeding and mortality by the methods required to show the true causal relationship. This analysis requires as a first step that deaths be compared to the time exposed to risk and that both be classified by type of feeding.

But other evidence is available which bears specifically upon the problem. The analysis of the data on feeding gathered by the United States Children's Bureau (see the writer's *Causal Factors in Infant Mortality*, Children's Bureau Publication No. 142, and also *Infant Mortality and Its Causes*, Chapter V), in which deaths were compared to exposure classified according to types of feeding, indicated a markedly increased mortality associated with artificial feeding. Special attention should be directed to the evidence which showed a tendency for infants transferred from breast to artificial feeding during the early months of life to be subject to an increasing mortality during the months immediately following the change. This is, of course, directly contrary to the general tendency for the rate to fall with increasing age during infancy. Convincing indirect evidence of the importance of a change in feeding is found in the decreased infant mortality experienced in Paris during the siege and in Lancashire during periods of industrial unemployment - a decrease attributed to the increase in breast feeding necessitated by the environing conditions.

But to return to the business cycle, definite evidence is needed to show whether in times of prosperity there is actually any considerable increase in artificial feeding and, if so, whether it would adequately account for the increased mortality.

There remains, of course, the possibility that after all possible explanations are tested the correlation between prosperity and increased infant mortality may have to be set down as one of those “nonsense” correlations which Mr. Yule has so brilliantly described in the January, 1926, number of the *Journal of the Royal Statistical Society*.

Robert M Woodbury
Institute of Economics, Washington D.C.

II

I am not at all disposed to take exception to most of what Dr. Woodbury has said. I am certainly far from saying that artificial feeding has nothing to do with infant mortality. It does seem to me, however, that Dr. Woodbury takes great pains to prove the substance of the quotation from my review to which he appears to be taking exception. That quotation did not say that artificial feeding was of no significance, but that it was of less importance than the physique and intelligence of the mother. Both he and I then argue that, if the lower grade mothers are more likely than others to lose their jobs when business declines, and if marriages and births are less frequent proportionately among individuals of low physique and intelligence during such periods, and if the reverse conditions prevail with an upswing of prosperity, then the inverse correlation of infant mortality and business finds some explanation. He finds this explanation in the increased tendency of the mothers to nurse their infants during periods of depression. I do not doubt this is a factor; but on the whole I consider it less significant from the standpoint of social philosophy than the quality of the parents, which Pearson finds to be more intensely associated with infant mortality than the method of feeding. No doubt the whole matter needs further investigation, but Dr. Woodbury is wholly mistaken if he thinks the matter has been exhausted when we find that artificial feeding is a factor. This may be taken for granted. Intelligent and sensitive mothers will, however, preserve a greater proportion of their offspring with artificial feeding than ignorant and indifferent ones with breast feeding. There are a great many ways in which infants can be destroyed besides feeding them out of a bottle.

Moreover, when Dr. Woodbury says that the correlation method is not a suitable method, I should be disposed to say that it is the only method whereby the relative weights of different factors can be made clear. It has been shown that such conditions as housing, wages of the father and numerous other environmental factors are “causes” of infant mortality, and I know of no one who doubts them. But if we find that the physique and intelligence of the mother is associated with infant mortality many more times as closely as the method of feeding, then we may say that, while method of feeding is itself a “cause,” much of its apparent importance is attributable to the physical and mental qualities of the mother which make the artificial method necessary or desirable. Similarly, we should like to know how much of the correlation between low wages of the father and infant mortality can be attributed to the fact that low wages are closely associated with physical and mental traits. It is rather unfortunate that the Children’s Bureau investigations, praiseworthy as they undoubtedly are, could not have given more attention to such correlations, and perhaps less to phases of the subject which appeal more directly to humane sentiments.

FH Hankins
Smith College