PN-ABP-024

INFANT MORTALITY AND SPECIFIC CAUSES: IMPLICATIONS FOR PRIMARY HEALTH CARE

NOVEMBER 1988

JSI JOHN SNOW, INCORPORATED, 1616 N FORT MYER DRIVE, ELEVENTH FLOOR, ARLINGTON, VIRGINIA 22209 USA
TEL: (703) 528-7474 • TELEX: 272896 JSIWUR • FAX: (703) 528-7480

INFANT MORTALITY AND SPECIFIC CAUSES:

IMPLICATIONS FOR PRIMARY HEALTH CARE

Norbert Hirschhorn, M.D.[1]
Mark Grabowsky, M.D.[2]
Robin Houston, M.D.[3]
with
Robert Steinglass, M.P.H.[1]

[1] John Snow, Inc. (Resources for Child Health Project)
[2] Johns Hopkins University, EPI/WHO Geneva
[3] John Snow, Inc. (Nepal Integrated Primary Health Care and Family Planning Project)

ACKNOWLEDGEMENTS

This study was funded by the Agency for International Development contract no. DPE-5927-C-00-5068-00 to John Snow, Inc. for the Resources for Child Health (REACH) project. The findings were presented in November, 1988 at a seminar at Johns Hopkins University School of Hygiene and Public Health. The authors appreciate the comments and criticisms by Kenneth Hill and W.H. Mosely and their colleagues.

INTRODUCTION

"Selective Primary Health Care," as defined by Walsh and Warren (1) emphasizes the use of specific technologies for maximal and rapid reduction of infant and child mortality, and at relatively low cost (2). Oral rehydration therapy and vaccination (particularly against measles and neonatal tetanus) are considered to be particularly effective and most widely practiced; antibiotic treatment of pneumonia, vitamin A supplementation, growth monitoring and nutrition education, and birth spacing are other widely used interventions that are still under study.

Selective primary health care (SPHC), however, is severely criticized for such reasons as:

1) It is argued that SPHC diverts resources and does little to build sustainable primary health care at the community level; moreover SPHC is classically "top-down," creating dependence on outside organization and supply, uncontrolled by families themselves (3). The "military paradigm of EPI" (4), for instance, may preclude a respectful approach to health education and community diagnosis -- replaced, instead, by "manipulative social marketing" (5).

2) Others allege that SPHC focuses too narrowly on infectious disease control, ignoring (and thus, perhaps, abetting) powerful social, economic and nutritional antecedents to illness (6).

3) Finally, SPHC has not yet been shown to have a lasting impact on mortality; a child saved from one bout may only live long enough to succumb to another not dealt with by SPHC, the so-called "replacement mortality" (7).

This study seeks to sharpen the discussion. developing countries are not all the same. They vary widely in such indicators as infant mortality, the incidence and severity of illness, and in their resources and infrastructure. These variations may well influence the impact of SPHC. We have examined the relationship between infant mortality rates and the profile of specific causes of death of infants. If discernible patterns exist for different levels of infant mortality, this may suggest refinements to the SPHC approach which might take into account some of the criticisms noted above.

METHODS

Our analysis of infant mortality rates and infant mortality causes is based on published data.

Two cross-sectional data sets were examined. The first was derived from Preston, Keyfitz, and Schoen (8) who compiled life tables and causes of death from national data of 48 countries (13 from the Third World) between 1946-1964), and a longitudinal analysis of mortality in England and Wales from 1861-1964 (males only). The second data set was obtained by a search of the literature for studies of infant mortality linking the rate with specific

causes. Some came from individual survey and research studies discovered through a literature search going back to 1972; others had already been compiled in World Health Organization collections of vital statistics. (A full listing of these sources is available from the authors.) 117 reports were identified, of which 17 were excluded from analysis for having either a) more than 50% of deaths unassigned by cause, or b) listing fewer than four causes of death.

We have carried out a preliminary metaanalysis: means calculated for all cross-sectional data, curves fitted to longitudinal data, stratification of IMRs (high, medium, low) with display of their corresponding cause-attributable profiles. We have not, for instance, attempted to weight the profiles by respective sample sizes, nor calculated confidence intervals and tests for significance of differences.

We are aware, of course, of all the limitations of vital data and cause-specific mortality reports; whether these faults are reduced or magnified by our metaanalysis is not known.

FINDINGS

Figure I, from Preston, et al (8) shows expectation of life at birth (a surrogate measure for IMR) and the average % of each age-cohort dying from specific causes; not surprisingly, neoplasms form a greater proportion of death at higher ages, infectious diseases at lower ages. A suggestive hump in the curve for diarrhea is magnified on Figure II; as IMR falls, deaths from diarrhea first increase proportionally, then decrease. A graph from a study by Mata in Costa Rica shows a compatible trend: as IMR fell, mortality from diarrhea in infants became increasingly correlated with IMR (9).

Figure III shows the longitudinal data form England and Wales from 1861-1964, with the chance of dying by age one. Even though total IMR fell, the absolute contribution of diarrheal deaths appeared to rise and then fall.

We grouped data from 100 populations by their rates of IMR into high (IMR = 120-240, N=16), medium (IMR = 60-119, N=60) and low (IMR = 24-59, N=24). For each group the average contribution of each cause of death was and Figure V shows them in proportional terms. The two figures appear to show the following:

- Deaths from diarrhea increase absolutely and as a proportion of total deaths as IMR falls from the "high" to the "medium" groups.
- Neonatal tetanus deaths fall sharply with decreasing IMR, virtually disappearing at the "low" level group.
- Measles, as a cause of infant mortality, is greatest at the "high" IMR group.
- In the "high" IMR group, infectious and parasitic illnesses make a substantial contribution, including malaria.

- The proportion of perinatal and respiratory deaths remains relatively constant between the high and medium IMR groups.

- In the lower IMR group, the total number of causes contributing substantially to death also declines.

DISCUSSION

If the division of populations into such IMR categories and the cause-attributable profiles are valid, what may we infer from the PHC debate?

It could mean that in high IMR areas, vaccinations against measles and neonatal tetanus are particularly important; and indeed, independent evidence now suggests that a sustained reduction in infant mortality with these two interventions can be achieved (10, 11). Antimicrobials for treatment of pneumonia, malaria, and dysentery need to be available at the community level. vitamin A treatment of measles patients, and home-based ORT may also contribute to reducing IMR. These steps alone are the beginnings of a basic primary care program that includes home-care and community health workers who treat illness with a few basic drugs, and motivate families to immunization.

For medium IMR areas, an ORT program with stress on infant nutrition might reduce IMR significantly (12) and an EPI may reduce morbidity. Prevention of low-birth weight and its complications could reduce perinatal and respiratory deaths.

The findings suggest that in lower IMR areas greater emphasis should be placed on prenatal care to improve perinatal survival. Rush (13) estimates that higher birth weights will affect the IMR substantially more at low IMR than medium IMR. Health education, better hygiene and water supply, good primary, secondary, and tertiary care may be required to lower the residual IMR.

This study also suggest that "replacement mortality" is a lesser factor when there are fewer conditions to do the replacement, but that diarrhea is the predominant "replacing" disease as IMR falls. Preston indicates this as well (14). As diarrhea becomes a larger component of infant mortality it presents more frequently as acute watery diarrhea and hence it is more susceptible to ORT (15).

It is not a coincidence that the falling IMR and changing cause-attributable profiles correlate with the strength of the health system and the ability of the citizenry to demand and choose equitable and quality care, although we cannot conclude a causal relationship. A nation's capacity to effect the different interventions is also related to its resources, political will and how much families know (and how much women know, in particular). PHC or SPHC alone seem unlikely to improve these attributes, unless one can show that citizens, politicians and donors recognize a falling IMR (and improved health) and that this awareness fuels more concern about the social and economic causes of poor health. UNICEF believes this to be true and promotes National Vaccination Days to this end. The dialogue around Child Survival has certainly created more awareness of social development issues.

CONCLUSION

The debate between advocates of primary health care and those promoting "selective primary health care" has largely focused on the conceptual model that underlies attempts to reduce mortality and morbidity, particularly of children. We suggest here that the level of infant mortality (IMR) and the profile of the causes of death are linked not only to each other but also to the primary care infrastructure. By metaanalysis of published statistics and surveys (national and local) we suggest that as the IMR falls, deaths from diarrhea increase absolutely and as a proportion of total deaths; that neonatal tetanus, measles and probably malaria contribute substantially where the IMR is high; and that as IMR falls the total number of specific causes making substantial contributions to deaths also falls.

These findings lend support to a concept of selective primary health care for infants that builds sequentially: from basic community outreach in areas of high IMR (120-140/1000); to national programs in oral rehydration therapy where diarrhea is the predominant cause of death, at medium levels of IMR (60-119/1000); to advanced public health, primary and secondary care with stress on prenatal care, health education, water and sanitation, where IMR is at lower levels (24-59/1000).

REFERENCES

1. Walsh, J.A., and Warren, K.S. "Selective Primary Health Care: An Interim Strategy for Disease Control in Developing Countries." New England Journal of Medicine, Vol. 301: pp. 967-974,1979.

2. Walsh, J.A. and Warren, K.S., Good Health at Low Cost, Halstead, B.B., Ed., The Rockefeller Foundation, New York, 1985.

3. Newell, K.W. "Selective Primary Health Care: The Counter Revolution," Social Science Medicine, Vol. 26: pp. 903-906.

4. Nichter, M. "Vaccinations in South Asia: False Expectations and Commanding Metaphors," Anthropology and Primary Health Care, J. Coreil and D. Mull, Eds. Kluwer Academic Press, 1988 (in press).

5. Wisner, B. "Gobi versus PHC? Some Dangers of Selective Primary Health Care." Social Science Medicine, Vol. 26, pp. 963-969, 1988.

6. Mosley, W.H., and Chen, L.C. "An Analytical Framework for the Study of Child Survival, " in "Child Survival: Strategies for Research," W.H. Mosley, L.C. Chen, Eds. Population and Development Review, Vol. 10, supplement, pp. 25-48, 1984.

7. Greenwood, B.M., Greenwood, A.M., Bradley, A.K., et al. "Deaths in Infancy and Early Childhood in a Well-Vaccinated, Rural West African Population," Annals of Tropical Pediatrics, Vol. 7, No. 2, pp. 91-99, 1987.

8. Preston, s.H., Keyfitz, N., Schoen, R. Causes of Death: Life Tables for National Populations.

9. Mata, L., "Epidemiology of Acute Diarrhea in childhood, an Overview," Acute Diarrhea: Its Nutritional Consequences in Children, J.A. Belianti, Ed., Raven Press, New York, 1983, pp. 16-17.

10. Aaby, P., Bukh, J., Lisse, I.M. et al. "Measurement of Mortality from Neonatal Tetanus in Burma." Bulletin of the world Health Organization, Vol. 65, pp. 309-316, 1987.

11. Stroh, G.U. Aye Kyu, U. Thaung, et al. "Measurement of Mortality from Neonatal Tetanus in Burma." Bulletin of the World Health Organization, Vol., 65, pp. 309-316, 1987.

12. "National Control of Diarrheal Diseases Project. Impact of the National Control of Diarrheal diseases Project on Infant and Child Mortality in Dakahlia, Egypt," Lancet, Vol. 2, pp. 145-148, 1988.

13. Rush, D. "Nutrition, Birthweight, and Child Mortality in India: the Use of Epidemiology in Setting Priorities," Indian Journal of Community Health, Vol. 12, pp.61-67, 1987.

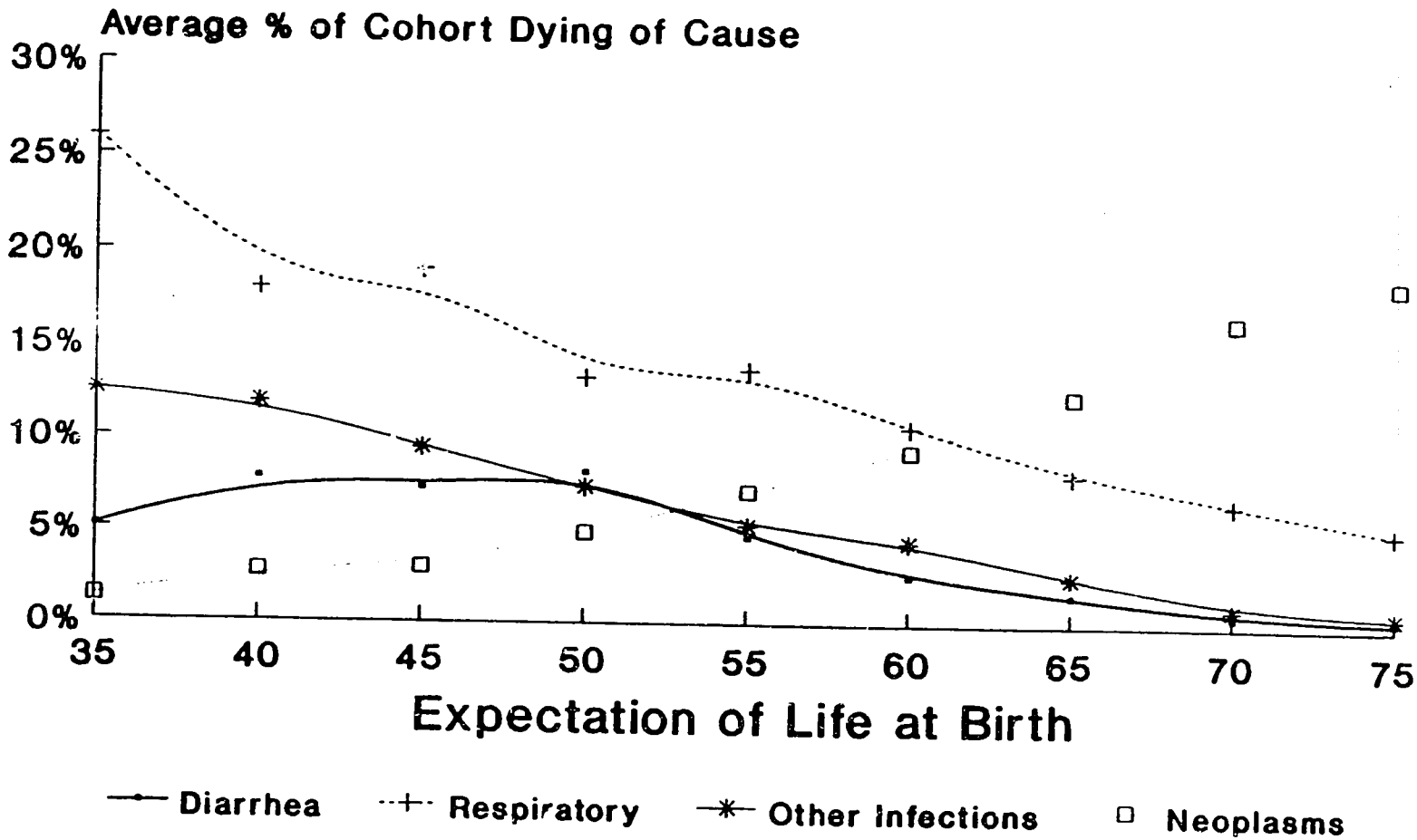
14. Preston, S.H. Mortality Patterns in National Populations with Special Reference to Recorded Causes of Death, Academic Press, New York, 1976, pp. 44-45.

15. Compare, for instance, Bangladesh and Egypt; IMR in the former is nearly twice that of Egypt, diarrhea causes about 15-20% of IMR (compared to 50-60% in Egypt), and about 30% of diarrhea in children in Bangladesh is chronic or dysenteric (compared to about 10% in Egypt).

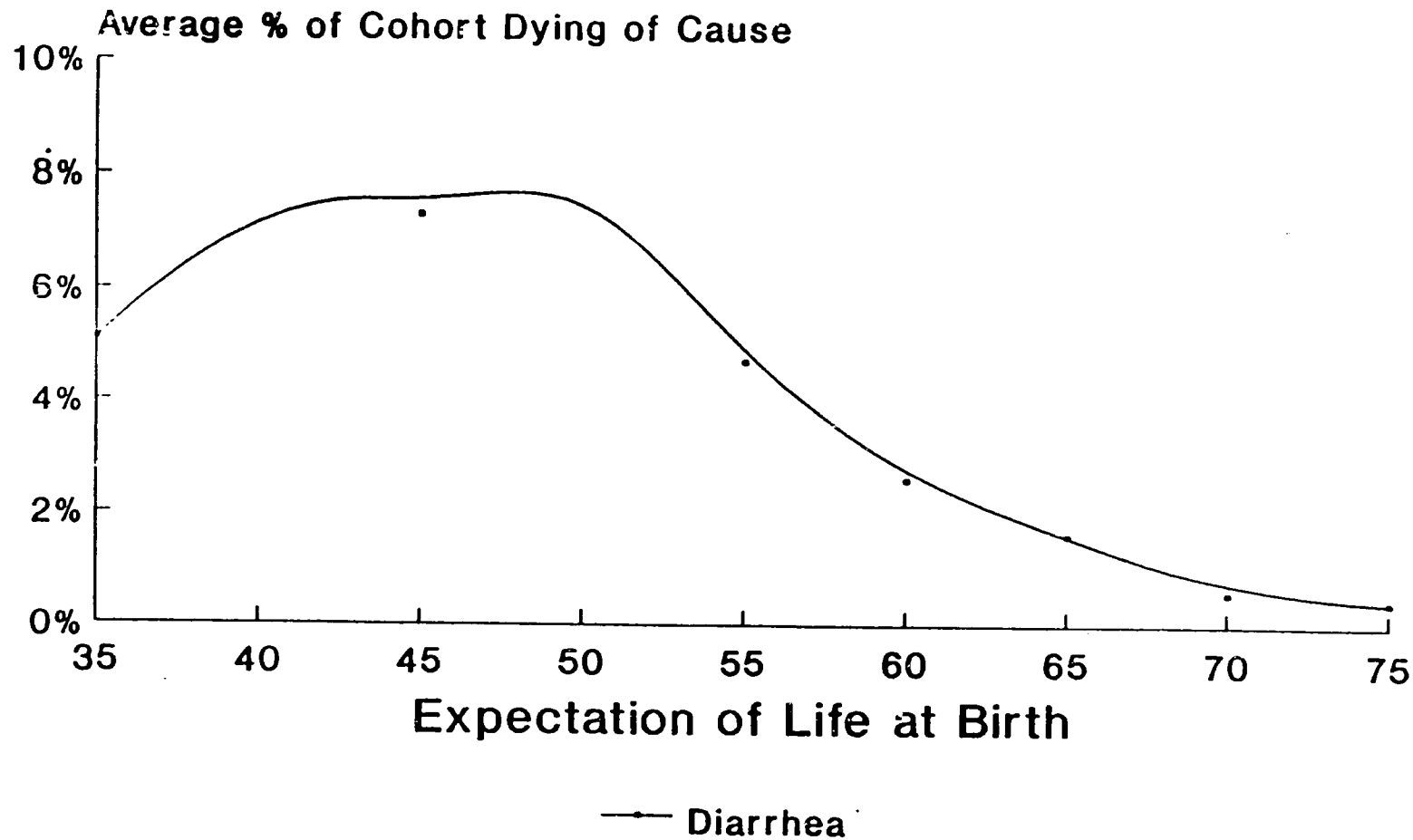
Bangladesh: Johns Hopkins University, School of Hygiene and Public Health, Institute for International Programs. Bangladesh Diarrheal Morbidity and Treatment Survey. 1987/88, unpublished.

Egypt: "The Clinical Epidemiology of Acute Diarrhoeal disease in Egyptian Children (NCDDP)," Journal of Tropical Pediatrics, Vol. 34, 150-157, 1988.

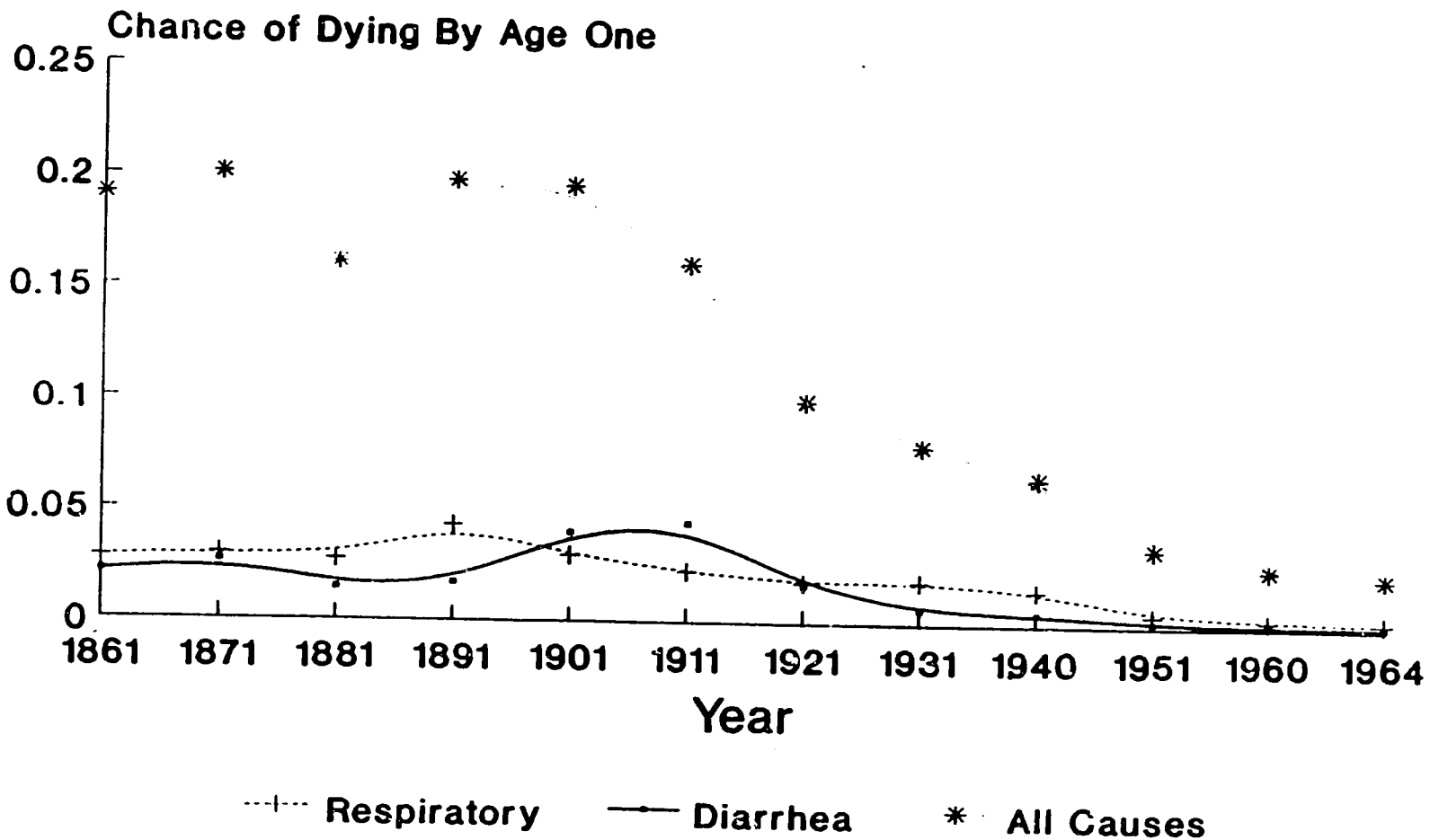
Cause of Death of Newborns By Expectation of Life at Birth



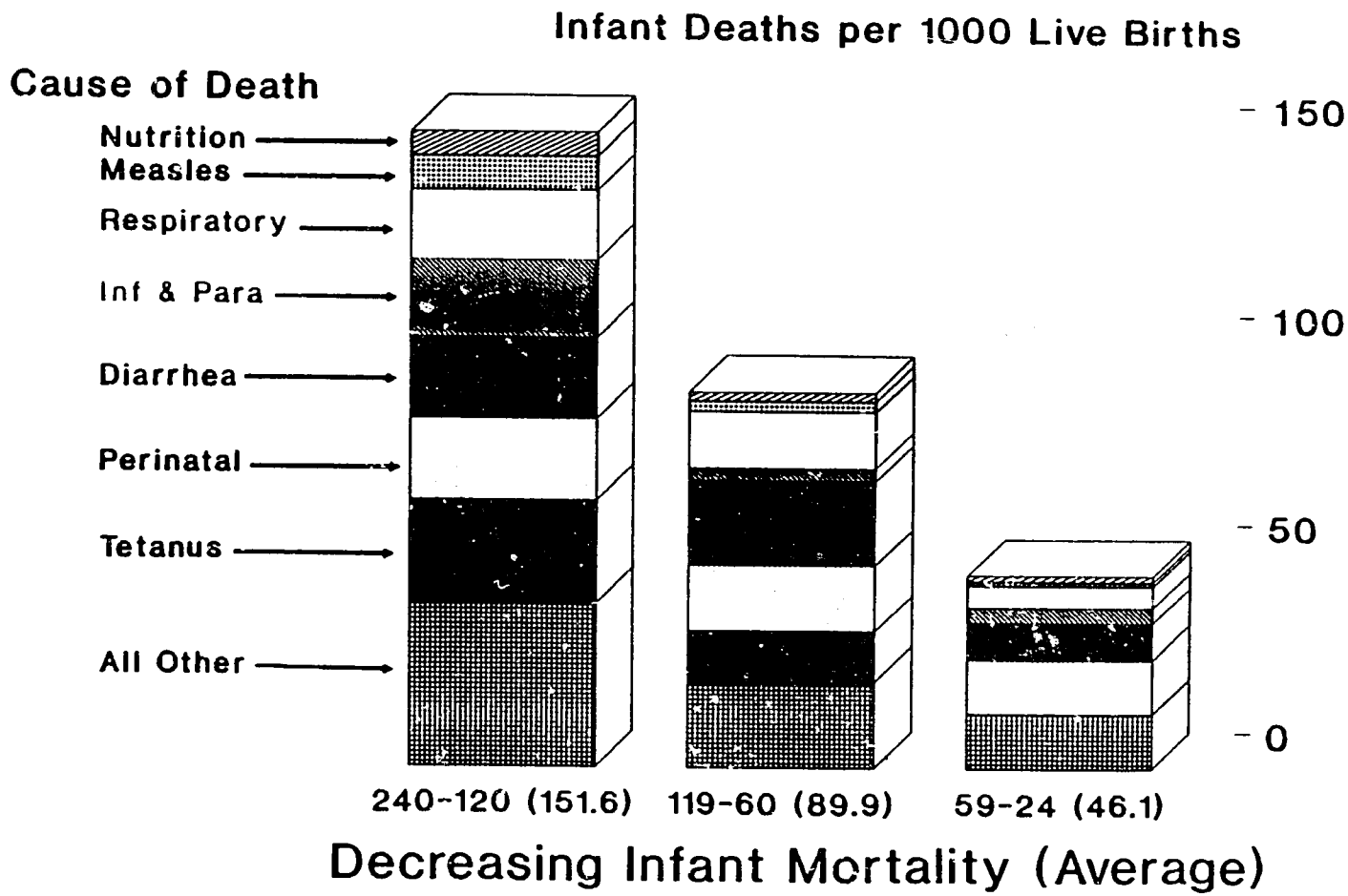
Cause of Death of Newborns By Expectation of Life at Birth



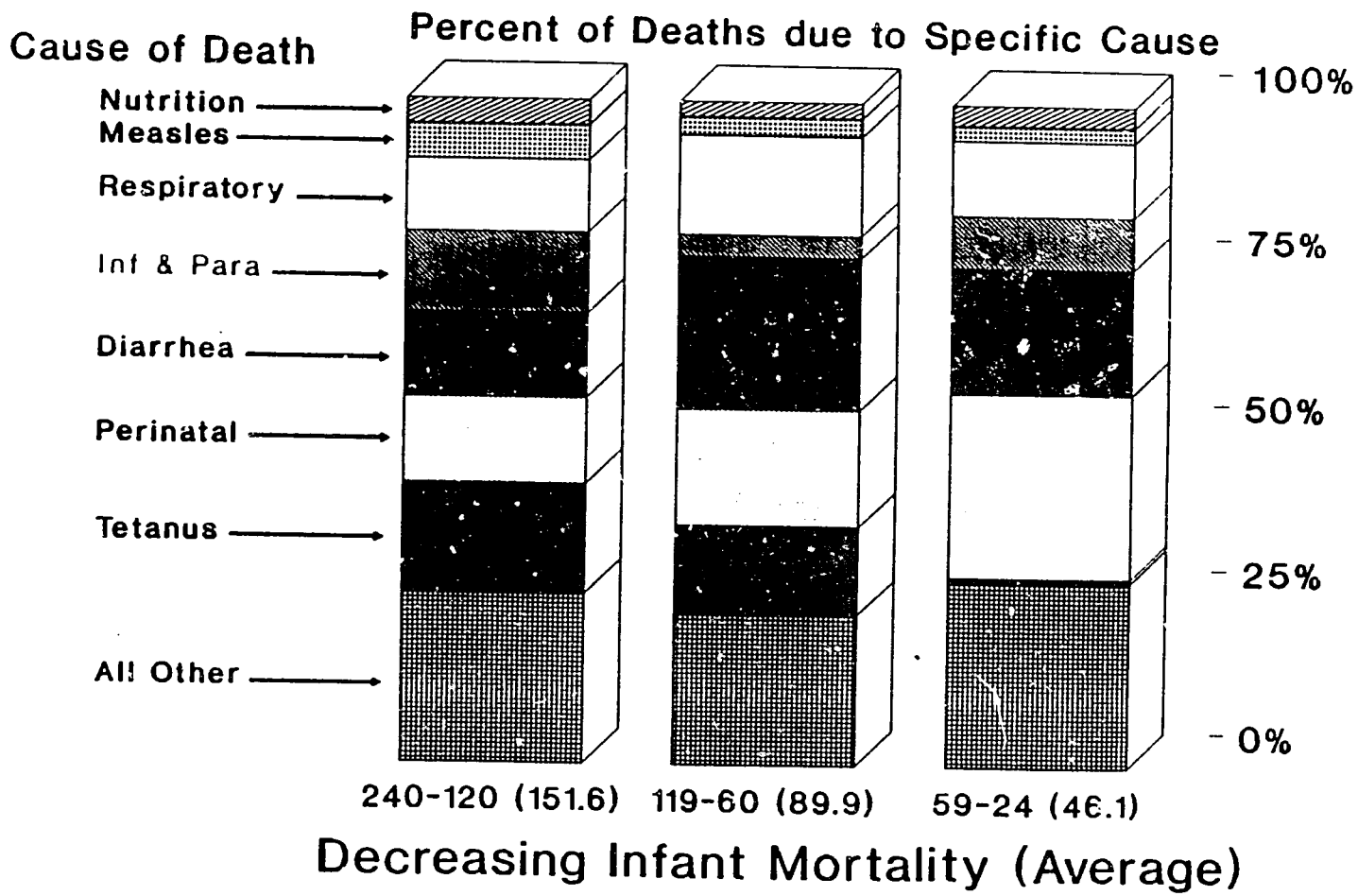
Infant Deaths, England & Wales, 1861-1964
Cause Specific Life Table Analysis



Infant Mortality Profiles:
Cause of Infant Death at Varying Levels



Infant Mortality Profiles:
Cause of Infant Death at Varying Levels



CAPTIONS FOR ILLUSTRATIONS

1. Cause of death of newborns by expectation of life at birth, from life tables of national populations (8).

2. Cause of death of newborns by expectation of life at birth, diarrhea only (the vertical scale is expanded) (8).

3. Infant deaths, (chance of dying by age one) England and Wales (1861-1964), cause specific (8).

4. Infant mortality cause-specific profiles (multiple sources, averaged) by three arbitrary levels of IMR, in absolute numbers.

5. Infant mortality cause-specific profiles in proportion to total mortality at three arbitrary levels of IMR.