McKeown, T.: Validation of Screening Procedures, in Screening in Medicine: Reviewing the Evidence: A Collection of Essays. (London: Oxford University Press, 1968), pp. 1-13.
Mckeown, T., and E. G. Knox, The Framework Required for Validation of Prescriptive Screening, in Screening in Medicine: Reviewing the Evidence: A Collection of Essays. (London: Oxford University Press, 1968), pp. 159-173.
McKeown, T., and C. R. Lowe: An Introduction to Social Medicine. (Philadelphia: F. A. Davis, 1966), pp. 86-87.
Report of the International Conference on Adverse Reactions Reporting Systems. National Academy of Sciences, Washington, D.C. 1971.

Riggan, W. B., D. I. Hammer, J. F. Finklea, V. Hasselblad, C. R. Sharp, R. M. Burton, and C. M. Shy, CHESS, A Community Health and Environmental Surveillance System. Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability. vol. VI Effects of Pollution on Health. (Berkeley: University of California Press, 1972), pp. 111-123.
Sartwell, P. E. (ed.), Maxcy-Rosenow Preventive Medicine and Public Health, 9th ed. (New York: Appleton-Century-Crofts, 1965), pp. 16-19.
Shapiro, S., P. Strax, and L. Venet. 1971. Periodic breast cancer screening in reducing mortality from breast cancer. J. Am. Med. Assoc., 215:1777-1785.
Terris, M. 1948. Relation of economic status to tuberculosis mortality by age and sex. Am. J. Public Health, 38:1061-1070.
Thorner, R. M. 1969. Whither multiphasic screening? New Engl. J. Med., 280:1037-1042.
Thorner, R. M. and Q. R. Remein, Principles and Procedures in the Evaluation of Screening for Disease. U.S. Department of Health, Education, and Welfare. Public Health Monograph no. 67, 1961.
White, K. L., T. F. Williams; B. G. Greenberg. 1961. The ecology of medical care. New Engl. J. Med., 265:885-892.
Whittenberger, J. L., The physical and chemical environment, in Preventive Medicine, edited by D. W. Clark, B. MacMahon, (Boston: Little, Brown, 1967), pp. 630-638.
Wilson, J. M. G. November 1968.: The evaluation of the worth of early disease detection. J. Roy. Coll. Gen. Pract., Suppl., 2:48-57.
Winkeistein, W., Jr. 1972. Epidemiological considerations underlying the allocation of health and disease care resources. Intern. J . Epidemiology, 1:69-74.

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