# The reliability and validity of the age-sex register as a population denominator in general practice

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SUMMARY. I report evidence which raises doubts about the reliability and validity of age-sex registers as true population denominators in general practice in the UK. These have potentially disturbing implications for the interpretation of data based on the presumed precision of age-sex registers. I am undertaking a prospective study to identify and quantify sources of inaccuracy to try to establish a method of estimating the true population at risk and its true age-sex characteristics. This would greatly enhance the utility of the age-sex register as the most valuable tool in general-practice research.

## Introduction

A FUNDAMENTAL requirement for most clinical or epidemiological research is an accurate knowledge of the population at risk. Research in general practice in the UK is greatly aided by the fact that over 98 per cent of the population is registered with a general practitioner within the NHS (Cartwright, 1967), and each individual British general practitioner is responsible for a defined population—the practice list. The list size is given to every general practitioner each quarter by the relevant family practitioner committee (FPC). Recently the number of patients on each list between 65 and 75 years of age, and over 75 years of age, has also been notified each quarter.

Research orientated general practitioners, however, have not been content to know only the total population denominator, that is, the list size. Although selected studies may require a knowledge of the social, ethnic, or occupational characteristics of the practice population, a knowledge of the age-sex structure is essential. Since a method was reported for the determination of the age-sex structure of general practice populations (Medical Research Council, 1960), increasing numbers of general practitioners have constructed age-sex registers in their practices, thus providing an index of their total practice population by age and sex. The original method has since been comprehensively revised (Pinsent, 1968) and costed (Sloan *et al.*, 1977). In 1969 it was estimated that 15 per cent of all practices had an age-sex register compared with 65 per cent of teaching practices (Irvine and Jefferys, 1971). It has been estimated that a minimum of 850 practices now use them (*Journal of the Royal College of General Practitioners,* 1977).

British general practitioners with an age-sex register appear, therefore, to be in a uniquely favourable position to undertake good quality research because of their responsibility for a numerically defined population, and their knowledge of the age-sex distribution of that population. How accurate, however, are these defined populations, and the age-sex registers?

## The practice list

The practice list is not an accurate population denominator for research purposes for several reasons, but principally because of 'list inflation', that is, where the general practitioner holds medical records (FP5 or FP6) for patients who are no longer under his care. Various calculations and estimations have been made as to the extent of list inflation (Tables 1 and 2). Furthermore, list inflation is generally higher in urban than non-urban areas and it is higher in Scotland than in England and Wales (Rees, 1969).

Morrell and colleagues (1970) noted the possibility of 'list deflation': "As many of the patients joining the practice do not register until forced to do so by illness, it would be a serious underestimate, particularly in the more mobile age groups, to calculate the population at risk simply by applying the proportions traced in each age group to the age-sex register." I define list deflation

**Table 1.** Review of calculations of list inflation.

| Year of publication | Author | Inflation (percentage) | Number of practices | Location |
|---|---|---|---|---|
| 1954 | Backett *et al.* | *19* | 1 | London |
| 1964 | Morris | *16* | 1 | London |
| 1966 | Shepherd *et al.* | *8.5* | 12 | London |
| 1969 | Rees | *4.1* | — | England and Wales |
| 1970 | Morrell *et al.* | *20* | 1 | London |
| 1972 | Hannay | *7.5-22** | 8 | Glasgow |
| 1974 | Second National Morbidity Study | *1.1*** | 60 | England and Wales |
| 1976 | Warren | *6* | 1 | Paddock Wood |

*Represents minimum and maximum estimates.
**Represents a rough estimate (the actual figure was higher than this).

as occurring when the general practitioner has a current clinical responsibility, actual or implied, for patients who are not officially registered with him. Further categories contributing to list deflation were the 117,000 recent entrants to England and Wales who were not registered with a general practitioner, and the 173,000 people previously registered with the NHS who had no general practitioner (Rees, 1969).

### Age-sex registers

Since age-sex registers are constructed from the details on patients' medical records in either the general practitioner's surgery or the files of the FPC, their degree of accuracy will depend on the precision of the original source of information for both total numbers and the details of the patients. (The ultimate source of information is, of course, the patient.) The basic information recorded in an age-sex register consists of the patient's name, date of birth, sex, and address. One study demonstrated that incongruities exist for these details between general practitioners' and FPC files (Farmer *et al.*, 1974), the general practitioners' records on the whole being more correct for the patients' names and addresses than the FPC files. Hannay and Maddox (1977), however, found that only 54 per cent of patients were living at the address given on a Glasgow health centre computer file. Richardson and Dingwall-Fordyce (1968) showed that 30 per cent of addresses in FPC files were inaccurate in Aberdeen, and this was confirmed by Gilmore and Caird (1972) in Glasgow. Dawes (1972) found that only 0·3 per cent of record envelopes contained no address but warned that those recorded "may not be accurate". He stated that the sex and names of patients were not a problem, but in a practice with an age-sex register the patient's date of birth was recorded on only 93·7 per cent of records.

In the trial of method preceding the Second National Morbidity Study (RCGP, OPCS, and DHSS, 1974), discrepancies were noted between the dates of birth on the medical record envelopes and the practice age-sex registers. Illegible handwriting and incorrect transcriptions were also encountered.

Warren (1976) found a discrepancy between the total populations in the age-sex register and the practice list

**Table 2.** Categories which contributed to list inflation in a London general practice (Morris, 1964).

| Category | Number | Percentage |
|---|---|---|
| No trace on other local doctors' lists or in the district | 284 | *49.6* |
| Transferred to another doctor's list | 178 | *31.0* |
| Previously died | 59 | *10.2* |
| Found to be represented by duplicate cards | 53 | *9.2* |
| Total | 574 | *100* |

**Table 3.** Time of recording 1971 data in register (Goodman, 1975).

| | % Practices in National Morbidity Survey n = 43 | % Others n = 116 |
|---|---|---|
| On registration | *51* | *27* |
| On acknowledgement by executive council | *16* | *17* |
| On receipt of EC5 or EC6 | *33* | *48* |
| No information | - | *8* |
| Total | *100* | *100* |

held by the FPC. By checking his study practice population in a postal survey, he managed to approximate the two populations: 9,373 as against the FPC's 9,295.

Goodman (1975) indicated another source of possible discrepancy between the age-sex register and FPC total populations, namely the variable point in the registration process that the patients' details were entered in the age-sex register (Table 3). An extract from the report of the Second National Morbidity Study (RCGP, OPCS and DHSS, 1974), which was carried out in 1970/71, apparently conflicts with Goodman's figures: "The date of entry of new entrants to the list was important for calculating the period at risk in the production of population denominators. It soon became apparent that there was a need to define this date because admission of a person to the practice list by an executive council occurs some time after acceptance of responsibility for that person's medical care by the general practitioner. For the purposes of this survey, the date of entry was taken as the date on which the doctor accepted the person on to his permanent list and assumed responsibility for his medical care."

The age-sex register may also be a source of inaccuracy if improperly constructed or maintained. Pinsent (1968) described a method of completing age-sex register cards on registration and removing cards when the patients' records were recalled by the FPC. There may, of course, be a considerable time-lag between the point when a patient leaves a practice (usually unknown to the general practitioner) and the recall of his medical records by the FPC, during which time his age-sex card will remain in the age-sex register. The frequency and extent of this problem has yet to be quantified. Several authors, however, have emphasized the need to initiate some formal system of keeping practice registers up to date (Farmer *et al.,* 1974; Goodman, 1975; Warren, 1976). Warren, furthermore, discovered that even his revised age-sex register did not contain all the infants registered in the practice, nor their parents.

## Discussion

Many authors have pointed out "the lack of unanimity in defining the population to which the general practitioner is at risk" (Morrell *et al.,* 1970). By using different estimates of his at-risk population, Morrell calculated that the measured consultation rate in his practice varied from 4·4 to 5·5 per patient per year. Discrepancies of this order can have substantial implications for the assessment of workload statistics, morbidity rates, and the accuracy of health care planning. It is interesting to speculate that if Morrell's level of list inflation of 20 per cent were applied to Fry's sensational claim to be able to provide adequate care for 4,000 patients (1972), he could, in fact, have provided care for only 3,200 patients. Similarly, Marsh and Kaim-Caudle's remarkable estimate that their consultation rate was 1·9 per patient per year (1976) would be elevated to the less remarkable rate of 2·3. Not only does the uncertainty of the accuracy of the population at risk cause a substantial difference in the absolute numerical values *within a practice,* it creates uncertainty about the comparability of data *between practices.* Other problems in comparing data collected by different workers have been described in greater detail elsewhere (Lees and Cooper, 1963).

The extent of age-sex register inflation/deflation, however, may not be equally represented between the sexes or age groups, thus compounding the inaccuracies, especially when dealing with population subsets in particular studies. List deflation is most likely to occur with births, while inflation is most likely to occur with deaths. "There is a tendency for registration with a general practitioner to be delayed until there is need for a consultation. Consequently, during the interval between arrival in a new area and registration, the person (or family) remains on the list of the doctor in the previous area, although not at risk of consulting there. In a practice of stable size, this latent element of potential patients *should roughly balance the inflation due to those who have left the area and not yet registered with a new doctor.* But, in expanding or contracting practices, there is likely to be underestimation or inflation respectively" (RCGP, OPCS and DHSS, 1974; my italics). It has not yet been established that population movements into and out of practices 'roughly balance', although this may well be so. Morrell and colleagues (1970) estimated a correction factor for both list inflation and deflation but suggested that their London teaching practice represented "a very special problem" (Morrell, 1975).

A method of estimating the true population at risk and its true age-sex characteristics which may have more general application to other practice populations is required. It should at least be possible to recommend a uniform system for the compilation of age-sex registers which most accurately reflect a practice population. In order to achieve this, a study is to be financed by the Trent Regional Health Authority and carried out in the five teaching practices linked with the Department of Community Health at the University of Leicester. The combined practice population represents 50,000 patients in urban, rural, and mixed practices. For a period of one year, all patients registering or leaving the practice will be monitored to determine total practice inflation and deflation, and an attempt will be made to identify special factors associated with these movements by patients. Particular scrutiny will be exercised after births and deaths. In addition, samples will be drawn from the FPC records, the practice medical records, and the practice age-sex registers, with reference to the patient's name, address, sex, and date of birth. These details will be cross-checked by contacting the patients directly, thus providing a measure of the relative accuracy of the various sources of information. In this way, it is hoped to provide a

quantitative estimate of the reliability and validity of the age-sex register as a population denominator in general practice.

## References


Backett, E. M., Heady, J. A. & Evans, J. C. G. (1954). *British Medical Journal,* **1,** 109-115.

Cartwright, A. (1967). *Patients and their Doctors.* London: Routledge and Kegan Paul.

Dawes, K. S. (1972). *British Medical Journal,* **3,** 219-223.

Farmer, R. D. T., Knox, E. G., Cross, K. W. & Crombie, D. L. (1974). *British Journal of Preventive and Social Medicine,* **28,** 49-53.

Fry, J. (1972). *Journal of the Royal College of General Practitioners,* **22,** 521-528.

Gilmore, A. J. J. & Caird, F. I. (1972). *Age and Ageing,* **1,** 30-32.

Goodman, M. (1975). *Journal of the Royal College of General Practitioners,* **25,** 379-382.

Hannay, D. R. (1972). *Lancet,* **ii,** 371-373.

Hannay, D. R. & Maddox, E. J. (1977). *Community Health,* **8,** 210-216.

Irvine, D. H. & Jefferys, M. (1971). *British Medical Journal,* **4,** 535-543.

*Journal of the Royal College of General Practitioners* (1977). Editorial, **27,** 515-517.

Lees, D. S. & Cooper, M. H. (1963). *Journal of the College of General Practitioners,* **6,** 233-241.

Marsh, G. & Kaim-Caudle, P. (1976). *Team Care in General Practice.* London: Croom Helm.

Medical Research Council Committee for Research in General Practice (1960). Report. *British Medical Journal,* **1,** 1496-1497.

Morrell, D. C. (1975). Personal communication.

Morrell, D. C. Gage, H. G. & Robinson, N. A. (1970). *Journal of the Royal College of General Practitioners,* **19,** 331-342.

Morris, J. N. (1964). *Uses of Epidemiology.* 2nd edition. Edinburgh and London: Livingstone.

Pinsent, R. J. F. H. (1968). *Journal of the Royal College of General Practitioners,* **16,** 127-134.

Rees, M. S. (1969). *Journal of the Royal Statistical Society,* Series A, **132,** 526-542.

Richardson, I. M. & Dingwall-Fordyce, I. (1968). *Lancet,* **ii,** 1290-1293.

Royal College of General Practitioners, Office of Population Censuses and Surveys & Department of Health and Social Security (1974). *Morbidity Statistics from General Practice. Second National Study 1970-71.* London: HMSO.

Shepherd, M., Cooper, B., Brown, A. C. & Kalton, G. (1966). *Psychiatric Illness in General Practice.* London: Oxford University Press.

Sloan, R. E. G., Norman, M. & Adams, D. (1977). *Journal of the Royal College of General Practitioners,* **27,** 532-533.

Warren, M. D. (1976). *Journal of the Royal College of General Practitioners,* **26,** 828-836.


## Primary medical care

All staff whether resident or non-resident are now strongly encouraged to register with a family doctor and the response to this has been excellent. We have arranged for resident staff to be visited in their homes by their family doctors where necessary. The various casualty departments have co-operated with us in the initial treatment of staff injured at work and we are grateful to them.

### Reference


Salford Area Health Authority (Teaching) (1976). *Annual Report of the Occupational Health Department,* p. 5.