

Patient movements and the accuracy of the age-sex register

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SUMMARY. This longitudinal study assessed the effects of patient movements on the accuracy of the age-sex register. For one year all patient movements into and out of five teaching practices were monitored and the ways in which inflation and deflation of the register can occur were identified and measured. Inflation has a greater influence than deflation on the accuracy of the register because:

1. Practices can readily identify all new patients as they register and can include them in the age-sex register, but only a minority of patients (23.5 per cent) can be identified when they move away.
2. The time interval between leaving a practice and registering with a new one is much shorter than that between leaving a practice and the practice becoming aware of the fact.

Recommendations are made about how to make the register as accurate as possible.

Introduction

THE usefulness of the age-sex register (ASR) is directly related to its accuracy. It must therefore provide an up-to-date profile of a practice population. Practices with an ASR consequently need satisfactory arrangements to construct an ASR entry for all patients as they apply to register and to remove cards from the ASR when patients leave a practice or die. Failure to do so will cause inaccuracies (inflation and/or deflation) in the ASR, which can be of such magnitude as to "seriously bias their use as population denominators, sampling frames and so on" (Fraser and Clayton, 1981).

However, among practices with an ASR, there is no agreement about the best time in the registration process at which a new patient entry should be made in the ASR: some practices enter a patient as soon as they apply to register; others wait until the FPC officially

acknowledges the registration; some wait until they receive the patient's notes from the previous practice (Goodman, 1975). There have been no studies of the effects of using different entry points. Nor is any information available on the most efficient way of removing ASR cards when patients leave a practice or die.

In order to complement the information derived from a point prevalent study (Fraser and Clayton, 1981), and to investigate the effects and implications of patient movement on the accuracy of the ASR, a longitudinal study with the following aims was undertaken.

Aims

1. To find out how long the various stages of the registration and removal processes take when patients join and leave practices, and to identify the factors at work in this process.
2. To measure the effects of patient movements on the accuracy of the ASR.
3. To identify the best way to enter and remove cards so that the ASR can reflect the current practice population as accurately as possible.

Methods

Hypotheses

The study was carried out in the light of the following hypotheses:

1. Some patients will delay an application to register with a 'new practice' until they require a consultation.
2. Some patients will, consequently, not be represented on the 'new' practice ASR, although belonging to the at-risk population of the practice.
3. Conversely, some patients on changing practice or death will remain on their previous practice ASR, although not at risk of consulting there.
4. General practitioners will mostly be prospectively unaware of the patients' intention to leave the practice.

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Table 1. Age and sex distribution of patient registrations and removals (excluding births and deaths).

Age in years	Male (per cent)	Female (per cent)	Totals (per cent)	Aggregate practice populations (per cent)	Leicestershire (per cent)
0-4	2.4	2.8	5.2	6.1	6.3
5-14	8.7	8.7	17.4	16.3	15.6
15-44	27.3	30.7	58.0	40.9	42.7
45-64	5.9	5.4	11.3	22.6	21.9
65+	3.3	4.7	8.1	14.1	13.5
Totals	47.6	52.4	100	100	100
Number	3007	3307	6314*	51 151	836 300

*The age or sex of 26 patients was not known.
Significance: $\chi^2 p < 0.0005$.

5. The accuracy of an ASR will be affected by the timing of entering cards in it and removing cards from it, as patients join or leave a practice respectively.

For a period of one year, all patients applying to register or identified as having left five Leicestershire teaching practices were recruited to the study. On applying to register with a study practice every individual patient, or family representative, was interviewed by a specially trained member of the practice staff, and appropriate forms were completed. Patients leaving the practices were principally identified from the regular notifications from the FPC (form FP22A). Births and deaths were recorded separately—births because registration was taking place for the first time, deaths because there would be no further registration. Other registrations and removals relate to movements between practices. With the full collaboration of Leicestershire FPC and other FPCs, an ethical system of contacting the patients by post in their new practices was devised.

The information on the recording forms was transferred to punch-cards, verified and then analysed by computer.

A study validation exercise was carried out which demonstrated that 97.5 per cent of all patient movements into and out of the study practices were recruited to the study.

Results

The registrations comprised 554 babies (54 per cent male) and 3,164 other patients; the removals comprised 503 deaths (51 per cent males) and 3,176 other patients. Nearly all deaths (85 per cent) occurred in the 65 and over age group. The total number of registrations (3,718) was only a little more than the total number of patient removals (3,679). The annual patient turnover was 14.7 per cent (practice range 11.6-18.3 per cent).

Table 1 shows the combined age and sex distribution of all patient movements. There was no difference in the age and sex distribution between those joining or leaving. The age distribution of the patients who moved

between practices differed from the age distribution of the total practice populations, because of the higher rates of movement in the 15-24 and 25-34 age groups and lower rates in the 45-64 and 65 and over age groups. All of these age differences were statistically highly significant.

Registrations

Births

Table 2 shows the delays between birth and the date of official registration with the FPC. The stage in the registration process with the largest single delay occurred between birth and the date of receipt of the FP58 in the practice (B-FP58R)—an average of almost seven weeks. Only 5 per cent of FP58s were presented within one week; 50 per cent were received within one month and 88 per cent within three months.

In 54 per cent of instances a consultation was not requested at the time of registration, when the B-FP58R time interval was 38.7 days. When a consultation was requested it was 59.4 days.

After transferring the data to a logarithmic time-scale, the difference in time intervals between the two groups was highly significant ($Z = -7.267$).

The FP58R-FP58S time interval varied considerably between practices. The range of the practice mean was 5-19 days. One practice sent 86 per cent of FP58s to the FPC in the first week and 95 per cent by the end of the second week. Another practice had corresponding figures of 17 per cent and 39 per cent. At the end of the fourth week this practice still retained 12 per cent of FP58s.

The FPC took approximately six weeks (less postal time) to process the registrations. The mean time from birth to receipt of the baby's medical records was just over 16 weeks.

Other registrations

Table 3 shows the time intervals in the various stages of the registration process. All patients were asked to

Table 2. Time intervals in registration process—births.

Component of registration process		Number	Mean time (in days)	Controlling factors
From	To			
Birth	Receipt of FP58	542	47.7	Parents
Receipt FP58	Return FP58	537	11.6	Practice
Return FP58	Notification of registration from FPC	540	40.9	FPC
Birth	Notification of registration from FPC	545	97.4	Parents Practice FPC

Table 3. Time intervals in registration process—other registrations.

Component of registration process		Number	Mean time (in days)	Controlling factors
From	To			
Changing address	Leaving former GP	2438	24.8	Patient
Leaving former GP	Applying to new practice	2463	39.4	
Changing address	Applying to new practice	2574	63.0	
*Leaving former GP	Applying to new practice	368	26.4	Practice
Applying to new practice	Medical card to FPC	3113	10.2	
Medical card to FPC	FPC notifies registration	3092	44.6	FPC
FPC notifies registration	Medical record received	2864	69.8	Previous GP FPC(s)
Applying to new practice	Medical record received	2862	122.9	Practice Previous GP FPC(s)

*No change of address

estimate the date on which they left their previous doctor. (This was defined as the date on which the patients believed that if they became ill, they would have contacted a study practice, even if they had not actually applied to register with one.) The mean delay between leaving the former practice and registering with the new one was 37.7 days. Altogether 2,634 patients (83.2 per cent of all new registrations) applied to register with the study practices following a change of address.

The practice mean for the time between the date of application to register and the date when the new practice sent the medical card to the FPC was between 3.2 to 20 days. One practice sent 88 per cent of medical cards to the FPC in the first week and 97 per cent by the end of the second week. Another practice had corresponding figures of 22 and 39 per cent and still retained 12 per cent of medical cards after four weeks.

Seventy-six per cent of these patients stated that they had notionally changed doctors on the same day as the change of address, although only 3.5 per cent actually applied to register with a study practice on that day. Nevertheless, 52 per cent of all patients who changed address applied to register within one month of moving and 77 per cent within three months. Three months after

the change of address 12 per cent still looked to their previous practice for their medical care, but after six months this had dropped to 4.3 per cent.

For those who did not change address 70 per cent left their previous doctor and applied to register with a study practice on the same day and only 13 per cent had not applied to register within one month.

Of the 3,164 patients applying to register with the study practices, 29 per cent simultaneously requested a consultation. Table 4 indicates that patients who requested a consultation took longer to apply to register with the study practices than those who did not request a consultation. These differences are statistically significant at the 1 per cent level.

Removals

Deaths

Table 5 shows the time intervals in the stages of removing a record card from the ASR following a patient's death. The study practices first learned of the 503 deaths from the following sources: study practice doctor (41 per cent), hospital (32 per cent), FPC (7.5 per cent), relative of deceased (7 per cent), deputizing

Table 4. The effects of requesting a consultation on registration time intervals.

Component of registration process		Consultation requested		Consultation not requested	
		Number	Time (in days)	Number	Time (in days)
From	To				
Changing address	Leaving former GP	691	29.9	1742	22.9
Leaving former GP	Applying to new practice	797	49.4	2028	33.1
Changing address	Applying to new practice	744	79.6	1824	56.2

p = 0.0028; Mann Whitney U.

service (5.5 per cent) and others (7 per cent). The intervals between the date of death and the date when the practice knew about it were shortest when the source of information was the practice doctor or the deceased's relative (same day) and longest when it was the FPC (85.5 days). When a patient died in hospital the mean delay was 12.8 days.

Approximately three months, on average, elapsed between the date on which the practice knew a patient had died and the date on which the patient's medical records were recalled by the FPC. The range in delay between receiving the recall request and the date when the record was sent to the FPC was between 12.6 and 21.3 days.

Other removals

Table 6 shows the intervals involved in removing patients from the ASR when they left the study practices. The mean difference between the date when the addresses changed and the date when the patients left the practices was 29.9 days. The practice range in the gap between the FPC's recall request and the time when the record was dispatched was 12.4 to 29.3 days.

In 93 per cent of removals the patients changed address. Over half moved within Leicestershire and just over a third to areas outside Leicestershire.

On identifying a patient removal, the doctors in each study practice were asked if they had known in advance of the patient's intention to leave the practice. The answer was 'yes' in only 23.5 per cent of instances.

Discussion

The validation exercise indicated that almost all applications to register and all notifications of removal via the FPC were identified and recorded. In the results there are small discrepancies in the numbers in the various categories because of errors or omissions in recording. These discrepancies, however, are minimal and should not influence the significance of the results, which are not only a true reflection of what took place in the overall movement of patients into and out of the study practices, but can also be reasonably regarded as rep-

Table 5. Time intervals in removal process after death.

Component of removal process		Number	Mean time interval in days
From	To		
Death	Practice learning of death	450	6.3
Death	FPC recalls record	419	95.8
FPC recalls record	Record to FPC	460	21.0

resentative of patient movements between practices at large.

Although total practice size tends to be relatively stable from year to year (Kilpatrick, 1981), patients are constantly joining and leaving. The extent of patient movement varies between practices, but each year in England and Wales three million patients change their general practitioner (*British Medical Journal*, 1978).

Ideally, to keep pace with patient movements, patients should be entered in the ASR at the same time as the general practitioner accepts responsibility for their medical care. Conversely, an ASR entry should be removed as soon as patients leave a practice or die. In reality, things are not so simple, and ASR deflation (when patients are not represented in the ASR but are at risk of consulting) and ASR inflation (when patients are entered in the ASR but are not at risk of consulting) do occur.

This study suggests that there is a balance between registrations and removals, not only in total patient numbers but also in age and sex. Patient movement between practices will therefore have little effect on the accuracy of the ASR as a total (or age-sex subset) population denominator, providing levels of inflation and deflation are similar. Under these circumstances the ASR could continue to provide a reasonably accurate representation of the overall age-sex distribution of the practice population, but it would not necessarily represent accurately every individual patient.

Yet the great advantage of the ASR is that it can be used to identify and make contact with individual

Table 6. Time intervals in removal process—other removals.

Component of removal process		Number	Mean time (in days)	Controlling factors
From	To			
Change of address	Applying to new practice	1473	55.9	} Patient
Change of address	Leaving study practice	(1586)	(29.9)	
Leaving study practice	Applying to new practice	(1480)	(28.4)	
Applying to new practice	FPC receives request to change practice	1409	31.9	New practice
FPC receives request	FPC recalls record	3007	42.6	FPC
Leaving study practice	FPC recalls record	1620	104.5	Patient
Change of address	FPC recalls record	1690	131.7	New practice FPC
FPC recalls record	Record to FPC	3159	24.0	Study practice

Table 7. Deflation of ASR: unregistered patients.

Notional omissions	Interval	Number of days omitted from ASR
Births	From birth to receipt of FP58	48
Other	From leaving former GP to applying to new practice	38

patients for screening or research purposes. To fulfil this important function a higher degree of accuracy in the ASR is required and levels of deflation and inflation need to be kept to a minimum. Particular problems are likely to be encountered in identifying patients in the highly mobile 15–35 age group.

Although our point prevalent study (Fraser and Clayton, 1981) found that ASR inflation rates (10.6 per cent) are higher than deflation rates (2.3 per cent), a longitudinal study was necessary to identify not only the various ways in which inflation and deflation can arise, but also their relative importance.

Deflation

This can occur in three distinct ways.

1. Unregistered patients (Table 7)

Some patients who have not applied to register with a practice, but who would, nevertheless, look to that practice for their medical care if the need arose, cannot be identified or measured until contact is made with the practice. This type of deflation is patient-determined and (except for babies, with whose mothers the practice is already in contact) cannot be influenced by doctors, and is therefore inevitable. However, in the study practices the majority of patients (50 per cent of babies, 66 per cent of other registrations) applied to register with their new practice within four weeks (mean time

approximately seven weeks) of deciding to change doctor. This is an acceptable margin for most practical purposes. Furthermore, as the majority of patients (54 per cent of babies, 69 per cent of other registrations) registered in anticipation of a future need for medical care, and only a minority delayed registering until the need for a consultation actually arose, this type of deflation is relatively unimportant.

2. Delayed entry of ASR cards for known patients

Some patients will apply to register with a practice but their ASR entry may be delayed until a later stage in the registration process. This type of deflation is doctor-determined and can be eliminated. Table 8 quantifies the delays that would occur, depending on the stage at which the ASR entry is made.

It is evident that practices which enter all cards in the ASR at the earliest possible stage (51 per cent of practices in the National Morbidity Study, 27 per cent of other practices) (Goodman, 1975) will have a zero level of delayed entry inflation. On the other hand, practices which opt to wait until they receive the patient's notes from the previous practice (33 per cent NMS and 48 per cent of other practices) will unnecessarily deflate their ASR for a mean time of 125 days for every new patient registration. As it is known that patients have considerably higher consulting rates in their first year of registration with a new practice (Whitfield, 1972; Bain and Philip, 1975), the accuracy of the ASR as a population denominator, but more importantly as a sampling frame, would be compromised by this level of delay.

3. Permanent omissions of ASR entries of bona fide practice patients

These omissions reflect the efficiency of practice staffs and has been discovered to be 2.3 per cent (Fraser and Clayton, 1981).

Table 8. Deflation of ASR: delays according to point when patient entered.

ASR entry point	Births			Other registrations		
	Interval	Days	Cumulative time from birth	Interval	Days	Cumulative time from leaving GP
Date patient applied to register with practice	To receipt of FP58	0	48*	None	0	38*
Date medical card sent to FPC	From receipt to despatch of FP58	12	60	From applying to new practice to despatch of medical record	10	48
Date FPC acknowledges registration	From despatch of FP58 to notification of registration from FPC	41	101	From despatch of medical record to notification of registration from FPC	45	93
Date practice receives medical record from former GP	—	—	—	Notification of registration from FPC to receipt of medical record	70	163

*See Table 7.

ASR inflation

Inflation can also occur in three distinct ways.

1. Delays in removal of ASR cards representing patients who are known to have moved or died.

This type of inflation applies only to the minority of patient removals (23.5 per cent) and deaths (48 per cent) which are known to the practices at the time they occur. This type of inflation is doctor-determined, as the practice has the opportunity to remove the ASR cards immediately, without waiting until the patient's medical records are recalled by the FPC. The consequences of leaving cards in the ASR until later stages in the removal process are shown in Table 9.

Theoretically, practices are obliged to return the medical records to the FPC as soon after the death or removal of a patient is known to them. However, this procedure is rarely adhered to because it is expensive. Most practices, understandably, return medical records to the FPC only after they have received an FP22A, because it is felt that delay compensates for the loss of capitation fees for patients in the process of registering. It would, however, be inequitable for practices with an efficient ASR to be penalized financially as a consequence of keeping their register up-to-date. Practices could, however, remove ASR cards when they know that patients have moved or died, and remove the patient's medical records from the files, but wait for the official request before they return the records to the FPC. There is no point in delaying the return of the patient's records to the FPC following the receipt of

Table 9. Inflation of ASR: delays in removing ASR cards.

Removal interval	Deaths (delay in days)	Other removals (delay in days)
From date of death or removal to date practice first knew	6	0
From date of death or removal to date FPC recalls medical record	96	105
From date of death or removal to date of return of medical records to FPC	117	129

the FP22A. These patients have already been removed from the practice list and therefore cease to attract payment.

2. Inevitable delayed removal of ASR cards

Most patients (77 per cent) leave a practice or die without the practice's knowledge. The cards representing these patients must consequently remain in the ASR until the practice is notified by the FPC (Table 8). Unless efforts can be made to encourage more patients to inform practices of any pending removal, ASRs will inevitably, although temporarily, be inflated by, on average, 105 days per patient for three quarters of the patients leaving a practice. This type of inflation is mostly patient-determined, although the speed with

which the administrative processes are accomplished will also play a part.

3. Permanent failure to remove ASR cards for patients known to have left

Some patients may continue to be represented in the ASR even after a practice has been informed by the FPC that they have moved to another practice or died. Point prevalent inflation of this type has been found to be around 5 per cent (Fraser and Clayton, 1981).

Patient movements are more likely to affect the accuracy of an ASR by inducing inflation rather than deflation, some of which will be inevitable, although temporary. Fortunately, maintaining acceptable levels of accuracy of the ASR can be achieved through relatively modest improvements in administrative efficiency.

Recommendations

1. Doctors and/or midwives should encourage early registration of babies, if necessary by personally canvassing completion of FP58s in the immediate post-natal period, during which they will be in close contact with the mother and baby.
2. The point of entry of new patients to a practice ASR should be standardized to the same day as the application to register with the practice is received.
3. ASR entries should be removed as soon as it is known that a patient has moved to another practice or died, without waiting for an official notification of removal from the FPC.
4. Notices should be placed in surgeries and health centres inviting patients to inform a practice of their intention to change doctors. This invitation could also be included in any patient handouts or information leaflets, which many practices already provide for their patients.

Conclusion

If practices with an ASR follow the present recommendations coupled with those previously published (Fraser and Clayton, 1981), they can be confident that they will have done everything practicably possible to ensure that their ASR is accurate.

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Infant mortality

Infant mortality rates in 1971 for babies born to women known to have been in employment in the eight months prior to the birth, particularly those employed shortly before the birth, are higher than those for babies born to women not employed (23/1,000 compared with 14/1,000). These differences cannot be explained in terms of maternal age, number of previous children, housing tenure or husband's social class.

Source: McDowall, M., Goldblatt, P., Fox, J. (1981). Employment during pregnancy and infant mortality. *Population Trends*, 26, 12-15.

Ventricular fibrillation

Fifteen randomized trials of lignocaine prophylaxis were reviewed; most showed no apparent benefit. When the data from all 15 trials were pooled and a summary relative risk estimate calculated, there was a significant benefit of lignocaine treatment in preventing ventricular fibrillation. The failure of most trials to demonstrate such a prophylactic effect is due to small sample sizes and inadequate treatment protocols.

Source: DeSilva, R. A., Hennekens, C. H., Lown, B. *et al.* (1981). Lignocaine prophylaxis in acute myocardial infarction: an evaluation of randomised trials. *Lancet*, 2, 855-858.