# Who reports address changes through the healthcare system? The characteristics of laggers and non-reporters using the Northern Ireland Longitudinal Study

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## Abstract

**Address information from health service professionals is already important for the delivery of health care and population monitoring and screening. It is also important for statistical purposes such as the estimation of migration and small area populations and its importance could increase as the decade progresses and alternatives are sought to the traditional census. Because of this, it is important to understand more about the accuracy of address information provided through the health care system.**

**This article considers the characteristics of 'laggers' - those who delay in reporting address changes - and 'non-reporters' - those who on occasion fail to report their addresses.**

**The article finds that, as might be expected, laggers and non-reporters tend to be male and resident in urban and deprived areas. However, less expectedly, older people tend to be laggers, as are owner occupiers, those who are not ill, those who have some educational qualifications, and those who are self-employed. Some non-reporters are also more likely to be employed in professional jobs and to be unmarried (for example single, remarried and divorced). This suggests that poor address information is not just a problem associated with the socially deprived and the young but also with some more affluent groups such as those not experiencing limiting long-term illness. The article concludes by arguing that the checking of patients' address information should be collected under the Quality and Outcomes Framework (QOF) as a performance indicator.**

## Introduction

Accurate address information provided through patient registrations with health professionals (HPs) such as general practitioners and dentists is significant on several counts. For health care, knowing where people live is essential for health screening programmes and interventions. Inaccurate information means that some people might be missed out of screening programmes and follow-ups (Silman 1984; McDonald et al 1999). Good address information from HPs is also important for statistical use. Patient registration data is already used by the Office for National Statistics (ONS) to make internal migration estimates and to inform small area population estimates (Smallwood and Lynch 2010). The use and importance of address information from the health care system may increase in the future. The 2011 Census could be the last to take place in its traditional form (Maude 2010). Options being considered to replace (or supplement) a future census include the greater use of administrative data, such as that provided on addresses through administrative systems, including those for health care. Given this, it is valuable to know more about the accuracy of address information provided by HPs.

Some work has been undertaken to assess the accuracy of patient address information. Smallwood and Lynch (2010), using old health authority areas and also regions (for example Yorkshire & Humberside) as the geography for analysis, compare data from the National Health Service Central Register (NHSCR) with census data incorporated in the England and Wales Longitudinal Study. Missing or lagging reports of address changes are identified as being greater for males than females. This observation agrees with the findings of Fotheringham et al (2004) who comment that NHSCR data are likely to undercount males, and young males, in particular.

This article contributes to this literature in two distinct ways and reports the first findings from what is planned to be a longer programme of research. Firstly, it uses Super Output Areas (SOAs) as the geography for analysis, comparing the SOA of residence as reported in the 2001 Census against the SOA of residence identified by the health care system address information. There are 890 SOAs in Northern Ireland (NI). This is therefore a much finer-grained spatial analysis than that of Smallwood and Lynch (2010) and arguably more relevant to small area population estimates. It also makes it possible to explore ecological/neighbourhood characteristics. Secondly, it considered a wider range of individual and neighbourhood factors than earlier studies considering their effects on (a) lags in reporting address changes and (b) the non-reporting of address changes. A multilevel modelling framework was used for the analysis. This approach was made possible by the unique strengths of the Northern Ireland Longitudinal Study (NILS). The article therefore next outlines some of the main features of the NILS and the provision of address information from HPs in NI.

## The NILS data environment

The analysis was based on the NILS. This is a large representative data linkage study that covers about 28 per cent (or around 508,000) of the NI population (O'Reilly 2011). The NILS sample was drawn from the Northern Ireland Health Card Registration (NIHCR) system with NILS members being subsequently matched to records from the 2001 NI Census of Population. Therefore individual social, economic and demographic information that is available in the census could be accessed for NILS members. NILS members were linked to migration and vital events after 2001

through the NIHCR system that is owned and managed by the Health and Social Care Business Service Organisation (BSO) which is equivalent to the NHSCR. Address data from the NIHCR was provided in regular six-monthly downloads from BSO. Therefore when a patient reported a change in address to their health professional it was possible to compare current with previous address and thus capture migration. In turn this information could be compared with the SOA of enumeration reported in the census, allowing the accuracy of the data to be assessed. The availability of full postcode, combined with the large sample size of the NILS, made it possible to examine and to deal flexibly with finely meshed geographies by using look-up tables that link postcode to a variety of administrative and census output geographies. It also meant that it was possible to link spatial information (for example, the deprivation score of the SOA or ward), to NILS members. The NILS data were accessed in a secure setting in the Northern Ireland Longitudinal Study Research Support Unit (NILS-RSU). This is housed in the headquarters of the Northern Ireland Statistics and Research Agency (NISRA). The NILS-RSU is supported by the ESRC and by the NI government.

## Analytical framework

The analysis in the article concentrates on migrants aged 25–74 years old. The rationale for this was that the 16–24 age group tend to be involved in further and higher education and therefore 2001 Census data on their educational qualifications and economic status was likely to become outdated quickly. Furthermore, the migration patterns of the 16–24 age group are atypical in that higher education usually dominates migration decisions for younger people and this has quite specific social and spatial incidences. Only NILS members with a 2001 Census record were included in the analysis since without this it was impossible to derive explanatory variables. Residents of communal establishments were excluded too. Immigrants and emigrants since 2001 were also not considered, as there was no information on their origins and destinations respectively. Older people were also excluded on the basis that the greater incidence of communal living (for example in residential homes) means that this group was different from those aged 25–74. The analysis therefore focuses on those who have completed their transition from education and who are in the prime years for economic activity and family formation.

The explanatory variables used in the analysis were selected from the 2001 Census, with reference to the factors that make populations hard to enumerate in censuses and which also shape migration propensities (Fotheringham et al 2004; Champion 1998). These factors might also influence engagement with the NIHCR system, both as another administrative branch of government, but also in influencing mobility - many changes of address and transience could limit engagement with HPs too. The neighbourhood variables were also computed from the census or taken, as in the case of the Northern Ireland Multiple Deprivation Measure 2005, from other administrative data sources. When used in the multivariate analysis, the individual variables were specified as dummies against a reference category since they were categorical variables. The neighbourhood variables were SOA scores so they were used unchanged in the analysis.

The outcome variables - (a) lagging in reporting an address change - and (b) the non-reporting of an address change were defined as follows. A lag in reporting an address change was considered to have occurred when (a) a change of address (for example from SOA X to SOA Y) in the year before the census and recorded in the census one-year migration question was reported more than one year after the census through the BSO and (b) when no migratory move to the 2001 SOA of

census enumeration was reported in the one-year census migration question but a move to SOA of enumeration was later reported through the BSO. This was likely to be the case when there was an address change before April 2000 (and so not captured by the census). Because there was no migration data from the census that covers the period before 2000, and there was also no BSO data for this period, it was impossible to know when some of the earlier address changes took place. This restricted information on the length of lag. A non-reported move occurred when it was reported by the BSO that an individual had changed address between 2001 and 2007 but neither the origin SOA nor the destination SOA matched that of the SOA at which they were enumerated in the 2001 Census suggesting that another move had been made which had not been previously reported.

All analysis took place in the secure environment of the NILS-RSU. Descriptive analysis was undertaken followed by multivariate analysis. A multilevel framework was used for this with individuals (Level 1) being nested in SOAs (Level 2). Logistic regression was used since the outcome variables were specified as binaries (for example 1 = lag in reporting an address change, 0 = no lag). The level of statistical significance was taken to be $p<0.05$. The presentation of results concentrates on the multivariate output.

## Results

These results are shown in Table 1. A plus sign (+) is included in the table when there is a statistically significant positive difference between a category and its reference category; a negative sign (-) is included when there is a statistically negative significance between a category and its reference category. The statistically significant coefficients for lags in reporting address changes are given in columns 2 and 3. Increasing the chances of lagging is being male relative to female. This finding agrees well with those of Smallwood and Lynch (2010) and Fotheringham et al (2004). All age groups (relative to those aged 25–34) are more likely to lag in reporting. Other positive effects that increase the chances of lagging are being single (as compared with being married); being self-employed (relative to those in routine work); being identified as having an 'other' community background (relative to Catholics); and living in socially-deprived, densely-populated and more Catholic areas. Effects that decrease the chances of lagging are having a limiting long-term illness (relative to those without a limiting long-term illness); being uneducated (relative to the educated); being remarried (relative to the married); and being in social rented and private rented occupations (relative to owner occupiers).

The statistically significant coefficients for non-reporting are given in columns 4 and 5 of Table 1. Increasing the chances of non-reporting are being male (relative to being female); being single, separated, divorced, or widowed (relative to the married); and living in more deprived, densely populated and Catholic areas. Decreasing the chances of non-reporting are falling into the 35–44 and 65–74 age groups (relative to those aged 25–34); having a limiting long-term illness (relative to those without a limiting long-term illness); being in lower supervisory work or routine work (relative to professionals); and being in social renting or private renting (compared with owner occupiers).

Table 1     **Statistically significant variables**

| | Lag | | Unreported | |
|---|---|---|---|---|
| | **Positive** | **Negative** | **Positive** | **Negative** |
| Cons | | - | | - |
| **Gender: reference category female** | | | | |
| Male | + | | + | |
| **Age: reference category age 25<35** | | | | |
| 35<45 | + | | | - |
| 45<55 | + | | | |
| 55<64 | + | | | |
| 65<75 | + | | | - |
| **Limiting long-term illness: reference category not ill** | | | | |
| Ill | | - | | - |
| **Education:** Educational qualifications | | | | |
| No educational qualifications | | - | | |
| **Marital status: reference category married** | | | | |
| Single | + | | + | |
| Remarried | | - | | |
| Separated | | | + | |
| Divorced | | | + | |
| Widowed | | | + | |
| **Socio-economic status : reference category professional** | | | | |
| Intermediate | | | | |
| Self employed | + | | | |
| Lower supervisory | | | | - |
| Routine | | | | - |
| Not working | | | | |
| Student | | | | |
| **Housing tenure: reference category owner occupier** | | | | |
| Rented | | - | | - |
| Private rented | | - | | - |
| **Community background: reference category Catholic** | | | | |
| Protestant & other Christian | | | | |
| None | | | | |
| Other | + | | | |
| **Ecological variables** | | | | |
| Logtenmdm | + | | + | |
| Logtendens | + | | + | |
| Cath-42.99 | + | | + | |

Note: The sign of statistically significant variables at the 5 per cent level is indicated with a plus or a minus sign

## Discussion

There are some similarities between the results for lagging and non-reporting address changes. Being male, for instance, has the same sign and significance for both outcome variables as has being single, having a limiting long-term illness, and living in more socially-deprived, densely-populated and Catholic areas. The positive effect (increasing the chances of lags in reporting and in non-reporting address changes) of being male are similar to those seen in other analyses. The

positive effect of being single can be understood as being related to transience - single people are often more mobile than the married - and thus perhaps harder to capture in official data systems; something of this may also be captured by the ecological variables which identify deprived urban areas with highly-mobile populations as having problems. These coefficients could also be interpreted as a social deprivation effect. However, the negative sign for limiting long-term illness, decreasing the probabilities of lagging and non-reporting address changes relative to those with no long-term illness, shows that lagging and non-reporting of address changes is not just a matter of social disadvantage. This effect for illness can be rationalised as a result of engagement with HPs - those with limiting long-term illnesses are much more likely to remain in contact with GPs, dentists and others. This suggests that accurate patient registration data might be harder to come by for those with better health. The negative signs for private and social rented tenure also indicates that lags in reporting address changes and non-reporting is more than a matter of social deprivation as both these tenure categories are less likely to be problematic than owner occupiers. The positive sign for self-employment for both outcome variables is also intriguing - are the self-employed less likely to engage with state agencies for ideological or attitudinal reasons?

These complexities become clearer when the differences between laggers and non-reporters are compared. Laggers differ from non-reporters with regard to age (the chances of lagging increase with age), education (lagging is associated with having an educational qualification), and being from the 'other' community background. Taken together with Table 1 and the earlier discussion of results, these findings are suggestive of some laggers being older healthier people, with qualifications, no limiting long-term illness, and in owner-occupied housing. They might be better-off people who do not visit their GPs or other HPs often but when they do, they report address changes. The findings for non-reporters differ with regard to age (increasing age means a decrease in non-reporting, which is what might have been expected), but the coefficients for socio-economic status are interesting as they strengthen the picture of affluent non-engagement with HPs since lower supervisory and routine workers are less likely to fail to report address changes than professionals. As before, having a limiting long-term illness decreases the chances of non-reporting.

## Conclusion

It is difficult to draw definite conclusions from this first analysis. Further work will be needed to understand more about the processes and patterns of lagging and non-reporting of address changes. However, even given this caveat, the findings are suggestive in several ways. Firstly, it seems that although the social and demographic characteristics of non-reporters and laggers overlap in important ways, there are some differences between the groups. Those who delay in reporting address changes are not quite the same as those who never report address moves. Secondly, while it is difficult to say much about the detailed circumstances and causes of lagging and non-reporting it seems that there are broadly two types of context. There is one where there are problems in coverage for males and residents of urban deprived areas. This might have been expected. However, there is another context which appears to be associated with more healthy and more affluent people. Given that the address information being evaluated originates from the health system, this should also perhaps not be unexpected since healthier people, everything else being equal, are less likely to engage with HPs and therefore report address information to them.

One recommendation arising from these findings is that GPs and other HPs should not only seek to get information from those normally seen as problematic (for example younger people and males) but also from older members of their patient list and those who have not visited them for several years. This requirement might usefully be included as an element in the Quality and Outcomes Framework (QOF) for GPs. Further work on this topic using the NILS is planned to extend the analysis to all age groups, to non-migrants as well as migrants, and to explore the institutional and other factors that influence non-reporting and lagging in the reporting of address changes.

## Acknowledgements

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