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# Advice given by NHS Direct in Wales: do deprived patients get more urgent decisions? Study of routine data

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## ABSTRACT

**Background** In the UK, National Health Service Direct Wales (NHSDW) uses computerised decision support software to advise patients on appropriate care. However, the effect of deprivation on the advice given is not known. We aimed to estimate the effect of deprivation on advice given by nurses in NHSDW adjusting for confounding variables.

**Methods** We included 400 000 calls to NHSDW between January 2002 and June 2004. We used logistic regression to model the effect of deprivation on advice given by nurses in response to calls seeking advice or information. We analysed two outcomes: receiving advice to phone 999 emergency care rather than to seek other care and receiving advice to seek care face to face rather than self-care.

**Results** After adjustment for covariates, an increase in deprivation from one-fifth of the distribution to the next fifth increased by 13% the probability that those calling for advice rather than information received advice to phone 999 (OR 1.127; 95% CI from 1.113 to 1.143). Deprivation increased the corresponding probability of being advised to seek care face to face rather than self-care by 5% (OR 1.049; 95% CI from 1.041 to 1.058) within advice calls and by 3% (OR 1.034; 95% CI from 1.022 to 1.047) within information calls.

**Conclusions** Deprivation increased the chance of receiving more urgent advice, particularly advice to call 999. While our dataset may underestimate the 'need' of deprived patients, it yields no evidence of major inequity in advice given to these patients.

## INTRODUCTION

One of the founding principles of the National Health Service (NHS) in the UK was equality of access to, and provision of, healthcare.[1 2] Yet, in the UK and internationally, inequalities in health persist with people living in economically deprived areas known to have poorer health, including higher levels of depression[3] and poorer physical function.[4] People living in deprived areas are also less likely to have access to good quality medical care than those in more affluent areas, and consultations with General Practitioners (GPs) and other health practitioners may be less clinically effective.[5] Evidence from providers of healthcare out of hours suggests that those from more deprived backgrounds are recommended more urgent care.[6–8]

In Wales, the national, nurse-led telephone advice and information line NHS Direct Wales (NHSDW) is in theory well placed to help those at socioeconomic disadvantage. For the cost of a local phone call, the service aims to provide accessible, standardised advice and information. Similar services existed in England (NHS Direct) and in Scotland (NHS 24) and now operate through '111' as a simpler number to ease entry into the complex emergency care system.[9] In Wales, '111' is currently being trialled as a method of linking NHSDW and GP out-of-hours services.[10]

In the NHS Direct (NHSD) and 111 services, nurses or trained advisors generally use computerised decision support software (CDSS) to advise callers on the most appropriate form of healthcare or how to treat their symptoms themselves, working through a series of questions and answers to a decision. Although they can override this decision, the aim of this software is to give consistent advice in similar circumstances independent of patient or nurse characteristics.

However, there is evidence about variable provision in NHSD: nurses with over 20 years' experience were more likely to advise callers to care for themselves,[11] and Registered Sick Children's Nurses were more likely to refer children with fever or rash to routine GP appointments.[12] However, both studies lacked evidence about the influence of patient's characteristics on outcomes. Patient's deprivation has differentially affected the use of GP services that provide telephone advice out of hours, with both the likelihood of being subsequently seen by a GP falling with increasing deprivation[13 14] to slightly increasing for those in the most deprived areas.[15] However, once advised to see a GP, those in deprived areas were all more likely to receive home visits.[13–15] We know of no study reporting the effect of patient deprivation on advice given by NHSD nurses or 111 call advisors. This paper therefore aims to describe how deprivation affects advice given by NHSDW controlling for other variables that may affect this advice.

## METHODS

### Time and place

Following approval by The South East Wales Local Research Ethics Committee in September 2004, we obtained anonymous data on all 615 739 calls to NHSDW originating from Wales between January 2002 and June 2004. Before receiving the data, an NHSDW analyst linked each patient's postcode to the corresponding Welsh Index of Multiple

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**Table 1** Codes used in logistic regression analysis

| Study variable | Reference | Explanation |
|---|---|---|
| Advice to seek emergency care | All other care | 999 call or emergency care |
| Advice to seek care face to face | Self-care | Care face to face (including emergency care) |
| Gender | Male | Female |
| Main symptom (from International Classification of Primary Care-2) | Not digestive | Digestive |
| Relationship of patient to caller | Surrogate caller | Self |
| Other ethnic background | White or unknown | Other |
| Ethnicity known | Unknown | Known (white or other) |
| Call occurred on Sunday | All other days | Sunday |
| Call occurred on Monday | All other days | Monday |
| Call occurred on Tuesday | All other days | Tuesday |
| Call occurred on Wednesday | All other days | Wednesday |
| Call occurred on Thursday | All other days | Thursday |
| Call occurred on Friday | All other days | Friday |
| Call occurred on Saturday | all other days | Saturday |
| Deprivation fifth | Least deprived | Second least deprived (2=3rd most deprived; 3=2nd most deprived; 4 = most deprived) |

Deprivation (WIMD)[16] and ward name before removing the postcode from the dataset, thus making the data anonymous. We excluded duplicate calls, calls transferred from Emergency Departments (EDs) or GP out-of-hour services and calls without deprivation scores. Initial exploration revealed that most calls from Flintshire and Rossett in Wrexham were handled by NHSD in England; therefore we excluded all calls from this area. This left 409 611 calls for analysis.

## Data

NHSDW provided data on date (and thus day of call) and its type—whether for advice or information, patient's age, gender, ethnicity, symptom and relationship to caller, and the advice of the NHSDW nurse advisor. We did not receive data on time of call or duration. We coded patient's symptoms according to the International Classification of Primary Care-2 (ICPC-2).[17] We supplemented call data with variables available only at ward level, notably deprivation score, distance to nearest ED and population density.

Table 1 shows how we defined our variables for logistic regression analysis. As preliminary data exploration showed digestive symptoms were most frequent, we grouped the rest to simplify analysis. Similarly, we coded the relationship of caller to the patient as self or surrogate for calls on behalf of someone else. As data on patient's ethnicity were available for only the final year, we created two dummy variables consistent with categories in the 2001 Census: 'white or unknown ethnicity' versus 'any other ethnicity' and 'known' (white or other) versus 'unknown'.

The original dataset contained 244 different types of advice. We were able to reduce these down to 28 using NHSDW's algorithm (see online Supplementary Appendix 1). This algorithm specified the grouping of similar advice into categories, for example, for the advice 'accident and emergency' or 'casualty' the algorithm grouped these into one advice: ED. We then recoded these categories into the six ordered categories used to evaluate NHSD in England[18] and in Wales.[19] These categories are based on resource use with the most expensive services at the top. Using this hierarchy, we ranked advice by urgency as follows: from (1) 999 call, (2) ED or other self-referral to hospital, (3) GP or dentist within 4 hours (labelled as 'emergency'), (4) GP or dentist less urgently, (5) other healthcare and (6) self-care (the least expensive). We added an additional label as '(7) not assessed' to calls with no specific advice, including calls in which the nurse could not contact the caller again after several attempts. More than 50 000 early calls used a previous version of the NHSDW system that recorded up to four different categories of advice per call. To include these calls in analysis, one of us (JP) assigned each to its highest level of advice; for example, a call yielding advice to 'contact GP' and undertake 'self-care' in the mean time received a final classification of 'contact GP'.

### Outcome variables

We treated calls which had been coded as 'not assessed' as self-care as they had not received any other advice from NHSDW. As advice could thus take one of the six forms, we summarised it by two binary variables: first whether the patient received advice to phone 999 versus any other care (contact hospital, GP, dentist, other healthcare or care for oneself) and second whether the advice was to contact any healthcare professional (care face to face) versus self-care. Thus, calls that received advice to phone 999 were always in the more urgent category. Following a previous study,[11] we chose these variables to represent the riskiest decisions for the nurse.

### Ward-level variables

Our main explanatory variable was the summary score of the WIMD, the deprivation index used in Wales during data collection.[16] To each call with a defined postcode (each of which covered an average of 18 residents), the NHSDW data analyst assigned the WIMD score for the corresponding electoral ward (with an average population of 3300). We then assigned each ward to its 'deprivation fifth' within the full range of deprivation scores. We estimated the distance from each ward geographical centroid to the nearest ED[20 21] and estimated population density from the 2001 Census information for the 2003 administrative boundaries, which we converted to 1998 wards by Geoconvert.[22]

As climatic variables like temperature[23 24] and pollutants[25] affect patient's health, we considered including the average of the maximum and minimum monthly temperatures and air

**Table 2** Characteristics of patients and their calls (n=409 611)

| NHSDW call variable | n | % |
|---|---|---|
| Call type | | |
| For advice | 281 223 | 68.7 |
| For information only | 128 388 | 31.3 |
| Day on which call occurred | | |
| Sunday | 66 297 | 16.2 |
| Monday | 61 502 | 15.0 |
| Tuesday | 56 341 | 13.8 |
| Wednesday | 55 863 | 13.6 |
| Thursday | 55 488 | 13.5 |
| Friday | 52 836 | 12.9 |
| Saturday | 61 284 | 15.0 |
| Relationship of caller to patient | | |
| Self | 237 356 | 58.0 |
| Surrogate | 172 064 | 42.0 |
| Not recorded | 191 | <0.1 |
| Gender | | |
| Male | 155 279 | 38.0 |
| Female | 253 843 | 62.0 |
| Not recorded | 489 | 0.12 |
| Ethnicity | | |
| White background | 3929 | 1.0 |
| Any other background | 180 308 | 44.0 |
| Not recorded (mainly before July 2003) | 225 374 | 55.0 |
| Symptom (from ICPC-2) | | |
| Digestive | 67 190 | 16.4 |
| General and unspecified | 32 262 | 7.9 |
| Skin | 30 304 | 7.4 |
| Musculoskeletal | 27 982 | 6.8 |
| Respiratory | 27 325 | 6.7 |
| Neurological | 21 260 | 5.2 |
| Female genital | 6929 | 1.7 |
| Eye | 6390 | 1.6 |
| Ear | 6410 | 1.6 |
| Psychological | 6106 | 1.5 |
| Urological | 5964 | 1.5 |
| Pregnancy and childbearing | 4266 | 1.0 |
| Cardiovascular | 2620 | 0.6 |
| Male genital | 2387 | 0.6 |
| Not recorded (mainly information calls) | 162 216 | 39.6 |
| Advice given | | |
| (1) 999 or ambulance | 12 791 | 3.1 |
| (2) ED or other hospital | 29 865 | 7.3 |
| (3) Emergency GP or dentist | 89 902 | 21.9 |
| (4) Other GP or dentist | 82 149 | 20.1 |
| (5) Other | 27 131 | 6.6 |
| (6) Self-care | 154 584 | 37.7 |
| (7) Not assessed | 13 189 | 3.2 |
| Deprivation (from WIMD) | | |
| Least deprived fifth | 83 071 | 20.3 |
| Second least deprived fifth | 64 652 | 15.8 |
| Third least deprived fifth | 74 167 | 18.1 |
| Fourth least deprived fifth | 85 024 | 20.8 |
| Most deprived | 102 697 | 25.1 |

ED, emergency department; GP, general practitioner, ICPC-2, International Classification of Primary Care-2; NHSDW, National Health Service Direct Wales; WIMD, Welsh Index of Multiple Deprivation.

quality measures including the pollutants ozone, particulate matter 10, sulfur dioxide and nitrogen dioxide for each ward. Unfortunately, the paucity of weather stations (n=24) and air quality measuring stations (n=7) in Wales and on the border reduced the value of these data in initial analysis, so we excluded them from final analysis.

### Statistical methods and sensitivity analyses

As calls made for advice differ in purpose and practice from calls only for information, we analysed these types of call separately using analysis of variance and $\chi^2$ tests. Both also yielded two separate models: for the likelihood of receiving advice to call 999 over any other advice and for receiving face-to-face care (including emergency care) over self-care. We undertook three logistic regressions for each combination of call type and care model: first, we entered all variables except day of the week and deprivation, then we added weekday and finally we entered 'deprivation fifth' as an ordinal variable since that is simpler but less discriminatory than as a continuous variable. By adding deprivation to the statistical model at the final step, we were able to estimate its true contribution after accounting for known potential confounding variables.

For the majority of NHSDW variables, missing data were fewer than 1% with some exceptions. NHSDW collected data on ethnicity only for the final year. As expected, the majority (96.9%) of those calling for information (eg, how to give up smoking or the location of the nearest open pharmacy) did not have a symptom recorded. Thus, when analysing calls for information, we did not include symptom as a potential confounding variable. We conducted all analyses in SPSS V.16.0.

## RESULTS

Table 2 describes the characteristics of the individual data. Most calls (69%) were for advice; more than half were made by the caller themselves. Most patients (62%) were female; 55% had no ethnicity recorded and the mean age of patients was 33.4 years. Sunday was the most popular day for calls (16.2%). More symptomatic calls concerned digestive symptoms (16.4%) than any other group. Over 40% of callers were advised to contact a GP or a dentist. When WIMD scores were analysed in fifths, 25.1% of calls came from the most deprived fifth. Distances to ED ranged from 0.2 km (from Aberystwyth East in Ceredigion to Bronglais General Hospital) to 56.0 km (from Aberdaron in Gwynedd to Gwynedd Hospital in Bangor). Population density ranged from 0.04 people/ha in Llanuwchllyn in Gwynedd to 100 in Plasnewydd in Cardiff).

Initial exploration showed statistically significant differences between mean WIMD scores by advice given. Calls for advice gave patients living in deprived areas more chance of being told to phone 999: the mean WIMD score of those so advised was 26.4 (95% CI 26.1 to 26.7), while that of those advised to care for themselves was 22.7 (95% CI 22.6 to 22.9). For information calls, the corresponding mean WIMD scores were 24.4 (95% CI 21.7 to 27.1) and 22.1 (95% CI 22.0 to 22.1). When we classified deprivation scores in fifths, these differences

**Table 3** Advice given by WIMD deprivation fifths

| Advice given | 1 (least deprived) | 2 | 3 | 4 | 5 (most deprived) |
|---|---|---|---|---|---|
| Calls for advice* | n (%) | n (%) | n (%) | n (%) | n (%) |
| (1) 999 or ambulance | 2086 (3.6) | 1540 (3.7) | 2114 (4.3) | 2671 (4.7) | 4235 (5.6) |
| (2) ED or hospital | 6309 (10.9) | 4339 (10.5) | 5077 (10.4) | 6048 (10.6) | 7776 (10.3) |
| (3) Emergency GP or dentist | 17330 (29.8) | 12335 (29.7) | 15164 (31.0) | 17907 (31.3) | 25239 (33.4) |
| (4) Other GP or dentist | 17057 (29.4) | 12203 (29.4) | 13915 (28.5) | 15881 (27.8) | 20388 (27.0) |
| (5) Other professional | 3664 (6.3) | 2531 (6.1) | 2906 (5.9) | 3481 (6.1) | 4545 (6.0) |
| (6) Self-care | 10118 (17.4) | 7356 (17.7) | 8278 (16.9) | 9569 (16.7) | 11385 (15.0) |
| (7) Not assessed | 1494 (2.6) | 1207 (2.9) | 1393 (2.9) | 1601 (2.8) | 2081 (2.8) |
| Total | 58058 (100) | 41511 (100) | 48847 (100) | 57158 (100) | 75649 (100) |
| Calls for information only† | n (%) | n (%) | n (%) | n (%) | n (%) |
| (1) 999 or ambulance | 31 (0.1) | 24 (0.1) | 20 (0.1) | 32 (0.1) | 38 (0.1) |
| (2) ED or hospital | 71 (0.3) | 48 (0.2) | 56 (0.2) | 67 (0.2) | 74 (0.3) |
| (3) Emergency GP or dentist | 355 (1.4) | 281 (1.2) | 339 (1.3) | 424 (1.5) | 528 (2.0) |
| (4) Other GP or dentist | 577 (2.3) | 442 (1.9) | 511 (2.0) | 581 (2.1) | 594 (2.2) |
| (5) Other professional | 2032 (8.1) | 1627 (7.0) | 1746 (6.9) | 2116 (7.6) | 2483 (9.2) |
| (6) Self-care | 20905 (83.6) | 19727 (85.2) | 21560 (85.2) | 23504 (84.3) | 22182 (82.0) |
| (7) Not assessed | 1042 (4.20) | 992 (4.3) | 1088 (4.3) | 1142 (4.1) | 1149 (4.2) |
| Total | 25013 (100) | 23141 (100) | 25320 (100) | 27866 (100) | 27048 (100) |

* $\chi^2$ (df=24)=847; p<0.001.
† $\chi^2$ (df=24)=214; p<0.001.
ED, emergency department; GP, general practitioner; WIMD, Welsh Index of Multiple Deprivation.

became clearer, both for advice and for information (table 3). Only 3.6% of callers for advice from the least deprived areas received advice to call 999, compared with 5.6% from the most deprived areas. Advice to contact an emergency GP or dentist was also more frequent in the most deprived areas (33.4% vs 29.8%). Similarly, the frequency of advice to care for themselves was 17.4% in the least deprived areas but 15.0% in the most deprived areas. For information calls, differences were similar but less marked.

These initial findings continued when we included other explanatory variables within logistic regression analyses. This was particularly true for advice calls (table 4): an increase in deprivation from one-fifth to the next increased by 13% the probability of receiving advice to call 999 (OR 1.127; 95% CI 1.113 to 1.143). Moving from one deprivation fifth to the next also increased the probability in advice calls of receiving advice to seek care face to face but by less (OR 1.049; 95% CI 1.041 to 1.058). For information calls (table 5), the impact of deprivation on the advice to call 999 was not significant (OR 1.024; 95% CI 0.912 to 1.149) although there was a slight increase in the probability of receiving advice to seek face-to-face care with deprivation fifth (OR 1.034; 95% CI 1.022 to 1.047).

For variables which appeared in most models, the direction of effect was mainly consistent with the exception of day of the week. For advice calls, the probability of receiving advice to seek face-to-face care increased on Sunday while the probability of receiving advice to seek emergency care increased on Mondays and Thursdays. In all models, those who called NHSDW for themselves always had less probability of receiving more urgent advice; ORs ranged from 0.420 to 0.888 (tables 4 and 5). In both advice and information calls, those whose ethnic status was recorded as non-white had less chance of receiving advice to seek face-to-face care (advice calls: OR 0.818; 95% CI 0.729 to 0.918; information calls: OR: 0.815; 95% CI 0.672 to 0.988). Most other variables had ORs close to 1, showing little change in the probability of receiving more urgent advice (tables 4 and 5).

## DISCUSSION

### Main findings

Initial analysis showed that those in more deprived areas generally received more urgent decisions. This trend was consistent across both advice and information. However, this trend was generally weaker in the more comprehensive regression models. Indeed, within information calls deprivation did not affect the probability of receiving advice to seek emergency care. Although other findings were all highly significant statistically, most practical differences were quite small, for example, the odds of being advised to seek care face to face by 5% for each transition from one 'deprivation fifth' to the next highest. There was one exception to this: for advice calls, moving from one deprivation fifth to the next increased the probability of receiving advice to call 999 by 13%. Generally, the same explanatory variables appeared consistently across models with no change in direction and little change in effect size. For example, callers who rang NHSDW for themselves consistently had less chance of receiving more urgent advice than callers on behalf of the patient.

### Strengths and limitations of the study

Telephone-based healthcare is an integral part of the urgent and emergency care landscape in Britain both through '111' in England and Scotland and NHSDW in Wales. With those from deprived areas shown have to have less clinically effective consultations with other health practitioners,[5] understanding the outcomes of telephone-based healthcare and how this varies according to patient's characteristics is extremely important. This is the first large study of relationships between patient deprivation and the consequences of telephone-based healthcare, with data on 400 000 calls over 30 months. To explore the influence of deprivation on advice given, we included known

**Table 4** Advice calls: likelihood of advising 999 call rather than any other care and advising care face to face rather than self-care

| | Advising 999 call rather than any other care | | | Advising care face to face rather than self-care | | |
|---|---|---|---|---|---|---|
| | Stage 1 | Stage 2 | Stage 3 | Stage 1 | Stage 2 | Stage 3 |
| Variable | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** |
| Distance to emergency department (per mile) | 1.006 (1.004 to 1.009) | 1.006 (1.004 to 1.009) | 1.006 (1.003 to 1.008) | 0.990 (0.988 to 0.991) | 0.990 (0.988 to 0.991) | 0.990 (0.988 to 0.991) |
| Population density (people per hectare) | 1.002 (1.001 to 1.004) | 1.002 (1.001 to 1.004) | 1.002 (1.001 to 1.003)** | 1.001 (1.001 to 1.002)** | 1.001 (1.001 to 1.002)** | 1.001 (1.001 to 1.002)** |
| Patient age (per year) | 1.026 (1.026 to 1.027) | 1.027 (1.026 to 1.027) | 1.027 (1.026 to 1.027) | 1.010 (1.010 to 1.011) | 1.010 (1.009 to 1.011) | 1.010 (1.009 to 1.011) |
| Gender | | | | | | |
| Male | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Female | 0.873 (0.839 to 0.908) | 0.874 (0.840 to 0.909) | 0.871 (0.837 to 0.906) | 1.128 (1.100 to 1.156) | 1.126 (1.099 to 1.154) | 1.125 (1.098 to 1.153) |
| Relationship | | | | | | |
| Surrogate caller | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Self-caller | 0.418 (0.401 to 0.436) | 0.414 (0.397 to 0.432) | 0.420 (0.403 to 0.438) | 0.845 (0.821 to 0.869) | 0.860 (0.836 to 0.885) | 0.864 (0.840 to 0.890) |
| Non-white race | | | | | | |
| White or unknown | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Non-white | 1.123 (0.923 to 1.366)* | 1.122 (0.922 to 1.364)* | 1.13 (0.929 to 1.375)* | 0.806 (0.718 to 0.905) | 0.813 (0.725 to 0.913) | 0.818 (0.729 to 0.918) |
| Known race | | | | | | |
| Unknown | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Known (white or other) | 1.212 (1.166 to 1.260) | 1.213 (1.166 to 1.260) | 1.211 (1.165 to 1.259) | 1.169 (1.141 to 1.198) | 1.170 (1.142 to 1.199) | 1.169 (1.140 to 1.197) |
| Symptom | | | | | | |
| All other symptoms | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Digestive symptom | 0.307 (0.289 to 0.326) | 0.305 (0.287 to 0.325) | 0.305 (0.287 to 0.324) | 0.627 (0.612 to 0.643) | 0.632 (0.616 to 0.648) | 0.631 (0.616 to 0.648) |
| Day of call | | | | | | |
| Sunday | Not entered | 1.00 | 1.00 | Not entered | 1.00 | 1.00 |
| Monday | Not entered | 1.075 (1.004 to 1.150)** | 1.076 (1.005 to 1.151)** | Not entered | 0.778 (0.745 to 0.812) | 0.779 (0.746 to 0.813) |
| Tuesday | Not entered | 1.058 (0.986 to 1.135)* | 1.058 (0.986 to 1.135)* | Not entered | 0.779 (0.745 to 0.814) | 0.778 (0.745 to 0.813) |
| Wednesday | Not entered | 1.062 (0.991 to 1.138)* | 1.063 (0.991 to 1.139)* | Not entered | 0.774 (0.740 to 0.809) | 0.774 (0.740 to 0.809) |
| Thursday | Not entered | 1.136 (1.061 to 1.215) | 1.126 (1.053 to 1.205)** | Not entered | 0.832 (0.796 to 0.870) | 0.830 (0.794 to 0.867) |
| Friday | Not entered | 1.054 (0.983 to 1.131)* | 1.056 (0.984 to 1.133)* | Not entered | 0.740 (0.708 to 0.773) | 0.740 (0.708 to 0.773) |
| Saturday | Not entered | 0.903 (0.848 to 0.962)** | 0.902 (0.847 to 0.961)** | Not entered | 0.844 (0.810 to 0.880) | 0.844 (0.810 to 0.879) |
| Deprivation fifth (ordinal) | Not entered | Not entered | 1.127 (1.113 to 1.143) | Not entered | Not entered | 1.049 (1.041 to 1.058) |

*p>0.05 (therefore non-significant); **p<0.05; ***p<0.001 unless otherwise indicated.
ORs are the odds of receiving advice to call 999 or seek care face-to-face relative to their respective baselines in the logistic regression models comprising the above variables.

**Table 5** Information calls: likelihood of advising 999 call rather than any other care and advising care face to face rather than self-care

| | Advising 999 call rather than any other care | | | Advising care face to face rather than self-care | | |
|---|---|---|---|---|---|---|
| | Stage 1 | Stage 2 | Stage 3 | Stage 1 | Stage 2 | Stage 3 |
| Variable | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** | OR (95% CI)*** |
| Distance to ED (per mile) | 0.989 (0.970 to 1.009)* | 0.991 (0.972 to 1.010)* | 0.991 (0.971 to 1.01)* | 0.986 (0.984 to 0.988) | 0.988 (0.986 to 0.990) | 0.988 (0.986 to 0.990) |
| Population density (people per hectare) | 1.003 (0.993 to 1.014)* | 1.003 (0.992 to 1.014)* | 1.003 (0.992 to 1.014)* | 1.003 (1.002 to 1.005) | 1.003 (1.002 to 1.004) | 1.003 (1.002 to 1.004) |
| Patient age (per year) | 1.013 (1.005 to 1.021)** | 1.013 (1.005 to 1.021)** | 1.013 (1.005 to 1.021)** | 1.001 (1.000 to 1.002)** | 1.001 (1.000 to 1.002)** | 1.001 (0.973 to 1.049)** |
| Gender | | | | | | |
| Male | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Female | 1.036 (0.726 to 1.479)* | 1.03 (0.721 to 1.470)* | 1.029 (0.721 to 1.470)* | 1.018 (0.980 to 1.057)* | 1.011 (0.973 to 1.050)* | 1.010 (0.973 to 1.049)* |
| Relationship | | | | | | |
| Surrogate caller | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Self-caller | 0.431 (0.296 to 0.627) | 0.458 (0.314 to 0.669) | 0.460 (0.315 to 0.672) | 0.673 (0.644 to 0.704) | 0.713 (0.682 to 0.746) | 0.716 (0.685 to 0.749) |
| Non-white race | | | | | | |
| White or unknown | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Non-white | 0.888 (0.122 to 6.449)* | 0.904 (0.124 to 6.566)* | 0.906 (0.125 to 6.585)* | 0.794 (0.655 to 0.963)** | 0.811 (0.669 to 0.983)** | 0.815 (0.672 to 0.988)** |
| Known race | | | | | | |
| Unknown | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Known (white or other) | 0.762 (0.542 to 1.070)* | 0.766 (0.546 to 1.076)* | 0.766 (0.545 to 1.076)* | 0.950 (0.917 to 0.983)** | 0.955 (0.922 to 0.989)** | 0.954 (0.921 to 0.988)** |
| Symptom | | | | | | |
| All other symptoms | Not entered | Not entered | Not entered | Not entered | Not entered | Not entered |
| Digestive symptom | Not entered | Not entered | Not entered | Not entered | Not entered | Not entered |
| Day of call | | | | | | |
| Sunday | Not entered | 1.00 | 1.00 | Not entered | 1.00 | 1.00 |
| Monday | Not entered | 0.734 (0.388 to 1.389)* | 0.735 (0.388 to 1.390)* | Not entered | 0.598 (0.560 to 0.639) | 0.599 (0.561 to 0.639) |
| Tuesday | Not entered | 0.622 (0.316 to 1.224)* | 0.623 (0.317 to 1.225)* | Not entered | 0.590 (0.551 to 0.630) | 0.590 (0.552 to 0.631) |
| Wednesday | Not entered | 0.912 (0.487 to 1.705)* | 0.912 (0.488 to 1.706)* | Not entered | 0.625 (0.585 to 0.668) | 0.625 (0.585 to 0.669) |
| Thursday | Not entered | 0.591 (0.294 to 1.187)* | 0.591 (0.294 to 1.188)* | Not entered | 0.669 (0.626 to 0.715) | 0.670 (0.627 to 0.716) |
| Friday | Not entered | 0.889 (0.470 to 1.680)* | 0.889 (0.470 to 1.681)* | Not entered | 0.626 (0.585 to 0.670) | 0.627 (0.585 to 0.670) |
| Saturday | Not entered | 1.349 (0.724 to 2.513)* | 1.349 (0.724 to 2.513)* | Not entered | 1.007 (0.941 to 1.078)* | 1.007 (0.941 to 1.078)* |
| Deprivation fifth (ordinal) | Not entered | Not entered | 1.024 (0.912 to 1.149)* | Not entered | Not entered | 1.034 (1.022 to 1.047) |

*p>0.05 (therefore non-significant); **p<0.05; ***p<0.001 unless otherwise indicated.
ORs are the odds of receiving advice to call 999 or seek care face-to-face relative to their respective baselines in the logistic regression models comprising the above variables.

confounding variables from previous studies of deprivation and healthcare.[13–15] We used accepted methods to overcome methodological issues like ranking advice by urgency and inferring distances to hospitals. We modelled the relationships between deprivation and advice by separating calls for advice from those for information only. The main limitation was the lack of any measure of symptom severity. Although we used the ICPC-2 coding system to summarise patient symptoms, this does not address severity. Thus, this dataset cannot tell whether two different callers with 'digestive' symptoms had similar levels of dysfunction. Similarly, we do not know whether those calling from deprived areas had worse health and how this affected the advice given. Another limitation was the absence of personal addresses from our dataset, with the result that inferences about individual characteristics stemmed from ward-level data.[26] Although we have used proxies like the geometric centre of a ward to calculate distance to ED, this method does not discriminate between types of journey, for example, mountainous or motorway. Finally, we could not include those 59 523 calls (12%) without recorded wards; these may represent a distinctive group of callers, for example, genuine emergencies without time to collect all information or uncooperative callers who refused to give their address. Despite these limitations, our findings have remained consistent: in this national dataset, there is a small to moderate effect of deprivation on the advice given.

### Findings in context

One of the difficulties in analysing advice given using routine data from NHSD is the focus on one simplified outcome. Many aspects of calls, for example, time or psychological state of the caller, could have influenced the final advice. Although we have analysed the most urgent advice given, any other advice given within the phone call disappears unless specifically recorded. We do not know who made the final decision—the CDSS or the nurse advisor by overriding that system. Furthermore, as we cannot identify repeat callers, we cannot infer how the advice affected future contacts.

Although data are from a period of time when NHSDW was relatively new, there has been no new research or policy changes related to socioeconomic deprivation that suggest our findings are not still relevant. Indeed, our findings are generally consistent with literature suggesting that those more deprived receive more urgent outcomes, both from other emergency healthcare services[6–8] and from telephone-based healthcare.[27] In particular, our findings resemble those of O'Reilly and colleagues[15] who reported that the probability of seeing a GP out of hours is only slightly increased by deprivation. In short, by specifying a fuller range of independent variables, our models better estimate the true effect of deprivation.

### Implications

The tendency for those living in more deprived areas to receive more urgent outcomes from NHSDW has important consequences for policy, practice and research. Although all differences were small, they were highly significant statistically. With those living in deprived areas known to have poorer health, there is a need for further research to understand these findings. For example, do these differences result from inequalities in health or in healthcare-seeking behaviour: is this tendency a true consequence of poorer health or an artefact of the pattern of communication between nurse advisor and caller? Are callers from more affluent areas more likely to define their concerns more clearly, thus avoiding the need for care face to face? There is also a need to characterise and quantify these types of results in terms of financial effects on the NHS and individual patients. Though we compared advice to call 999 with all other forms and care face to face with self-care, we recommend future researchers model the full range of advice and thus continue to build fully specified regression models of advice given in telephone healthcare out of hours. Qualitative interviews with callers and nurse advisors and analysis of call transcripts should explore reasons for contact with NHSD, explanations for variations in advice given across groups and the relationship between nurse advisors and patients.

### Conclusions

Telephone advice for first contact healthcare is now playing a large and growing role in the emergency care landscape. In order to provide better care and to address public health priorities related to inequalities, it is vital to understand and to respond to these new findings about the level of advice given to people living in deprived areas. We do not know from this study whether the advice is warranted and therefore is an indicator of good practice or is a reaction to unknown factors which do not reflect clinical need. While our findings show that NHSDW is not disadvantaging to those living in deprived areas, there is a strong need for further research in this area.

#### What is already known on this topic

- National Health Service (NHS) Direct and other providers of healthcare by telephone use computerised decision support software to advise patients on the care most appropriate to their needs.
- Those living in deprived areas generally receive more urgent healthcare out of hours, but the effect of deprivation on advice given by NHS Direct is not known.

#### What this study adds

- Analysis of over 400 000 calls to National Health Service (NHS) Direct Wales showed that after adjustment for confounding variables, increased patient deprivation had a small to moderate positive effect on receiving more urgent advice.
- Other factors that made patients more likely to receive advice to take urgent action included calls made on their behalf, calls on Sundays, and calls about white patients.
- While this study suggests that advice given by NHS Direct Wales is more equitable than feared, it advocates more research into the influence of patient and call characteristics.

**Contributors** JP and HS designed the study. JP cleaned, managed and analysed the data, drafted and revised the paper. She is the guarantor. SM provided expertise in informatics, SR expertise in medical geography, IR and AW expertise in statistics and HS expertise in the field of emergency care research. All authors revised the draft paper.

**Competing interests** None declared

**Patient consent** Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information backs up the case the authors are making.

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deprivation scores: Analysis of calls to NHS Direct Wales 2002–2004'. Please contact j.peconi@swansea.ac.uk for more details.



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