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## ORIGINAL ARTICLE

# Increased health service use for asthma, but decreased for COPD: Northumbrian hospital episodes, 2013–2014

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**Abstract** The burden of respiratory disease has persisted over the years, for both men and women. The aim of the present study was to investigate the hospital episode rates in respiratory disease and to understand whether and how the use of the health service for respiratory disease might have changed in recent years in the North-East of England. Hospital episode data covering two full calendar years (in 2013–2014) was extracted from the Northumbria Healthcare NHS Foundation Trust, which serves a population of nearly half a million. Hospital episode rates were calculated from admissions divided by annual and small area-specific population size by sex and across age groups, presented with per 100,000 person-years. The use of the health service for influenza and pneumonia, acute lower respiratory infections and chronic obstructive pulmonary disease (COPD) increased with an advancing age, except for acute upper respiratory infections and asthma. Overall, the use of the health service for common respiratory diseases has seemed to be unchanged, except for asthma. There were large increases in young adults aged 20–50 for both men and women and the very old aged 90+ in women. Of note, there were large increases in acute lower respiratory infections for both men and women aged 90+, whereas there was also a large decrease in COPD in women aged 80–90. This is the first study to examine health service use for respiratory diseases by calculating the detailed population size as denominator. Re-diverting funding to improve population health on a yearly basis may serve the changing need in local areas.

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## Introduction

### Evidence before this study

Respiratory disease, as an adult health condition, affects millions of people globally and is the one of the leading causes of health issues in both developed and developing countries [1]. Health service use has increased in older persons and costs millions of pounds in the UK, USA and several European countries, which could prompt considerations on long-term healthcare together with the entire socio-economic structure [2–5]. Hospital admissions have seemed to decrease in some regions, whereas in other regions primary care consultations seem to have increased, likely due to different study populations, study time periods and/or estimation methods in rates [6–28]. Continuously monitoring how people consume the health service because of various health conditions is important in assisting with individual, local and national health profiles and with the re-allocation of medical and social recourse effectively and consequently to prevent from unnecessary pain and spending. Therefore, such clinical evidence is necessary.

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## Knowledge gap

Investigating admission rates and hospitalisation rates could be perceived as a direct way of understanding how many patients are admitted and hospitalised require health service utilisation. Previous research tended to estimate age-standardised rates using the population census in a certain year by accommodating a specific population structure (e.g. Europe) or by adjusting for all ages in a specific study catchment to compare across countries and/or regions. However, looking at the total age-standardised rate by using the population census in a certain year may sometimes mis-lead and misguide the re-allocation of local medical and social resources, as one national, international or global policy does not always fit all owing to different unadjusted historical contexts (i.e. biological or non-biological risk contributor profiles).

## Study aim

Following this context, therefore, the aim of the present study was to investigate the age-specific hospital episode rates in common respiratory diseases by sex and across age groups using an annual and small area-



**Fig. 1** Population size by sex and across age groups in Northumbria
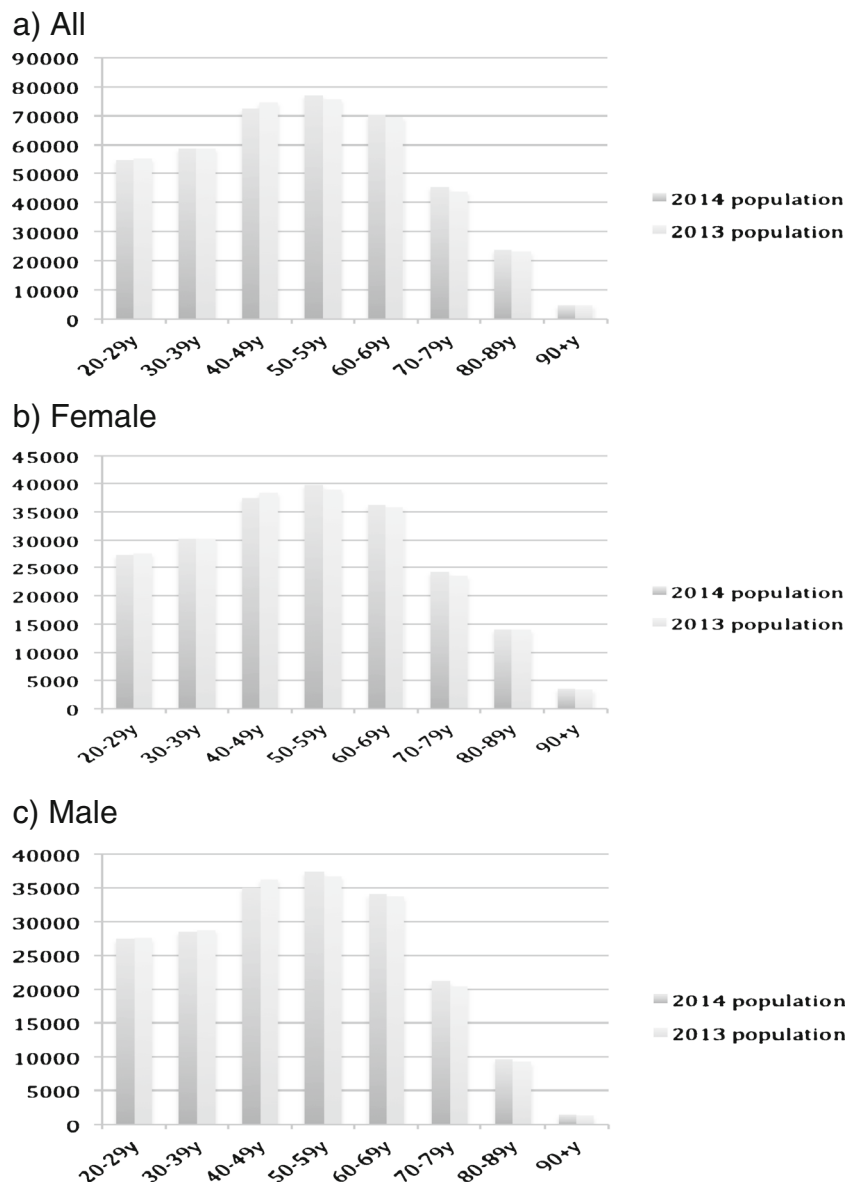
specific population size to understand and establish the monitoring on whether and how the use of the health service for respiratory diseases may have changed in recent years, if at all.

## Materials and methods

### Study sample

Hospital Episode Statistics (HES; more details via http://www.hscic.gov.uk/hes) is a data warehouse containing details of all admissions, outpatient appointments and A&E attendances at National Health Service (NHS) hospitals in England. These data are collected during a patient's time at hospital and are submitted to allow hospitals to be paid for the care they deliver. HES data are designed to enable secondary use, particularly for non-clinical purposes. Each NHS trust in England collects its own patient data, and the anonymised data are kept locally within each trust and also centrally at the national level. Northumbria Healthcare NHS Foundation Trust (more details via https://www.northumbria.nhs.uk/) covers the health service mostly for Northumberland

**Fig. 2** Distribution of rates of health service use for "J00–J06: acute upper respiratory infections"
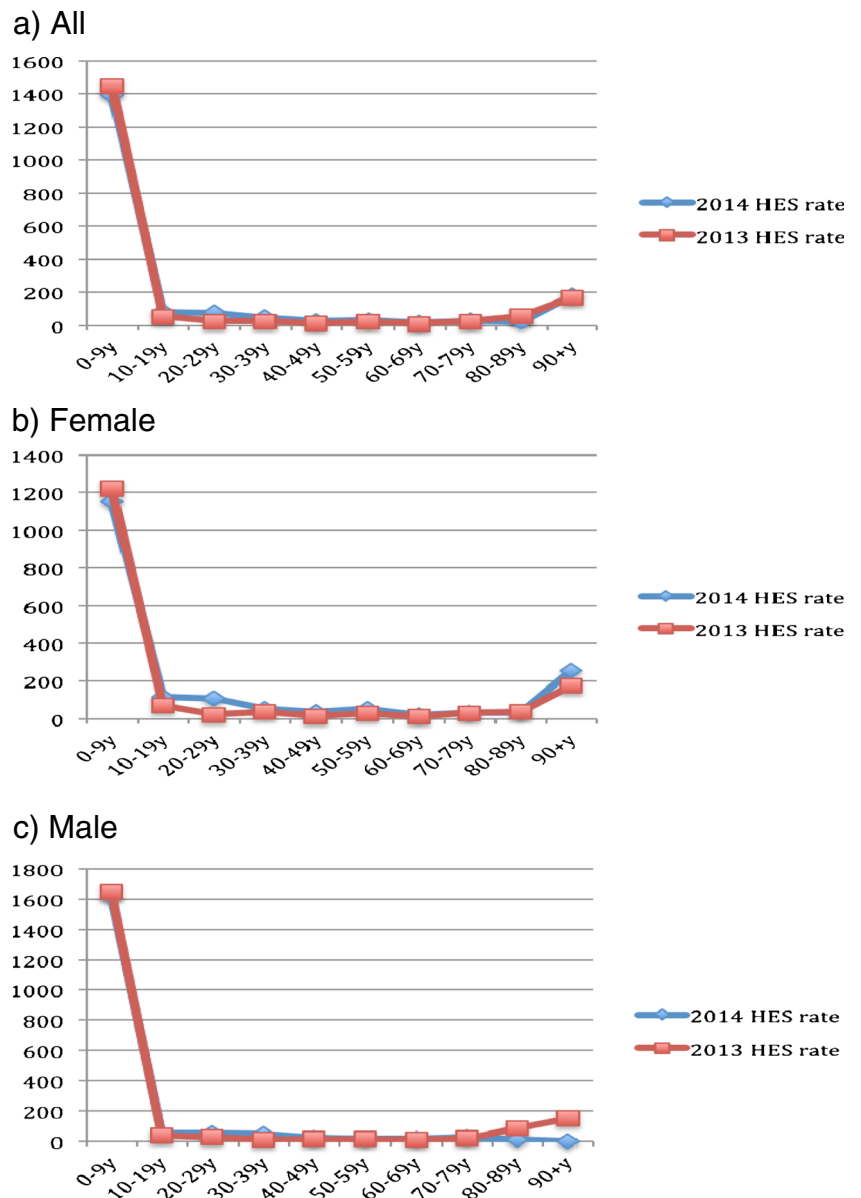
and North Tyneside, including three major hospitals (Hexham General Hospital, North Tyneside General Hospital and Wansbeck General Hospital) and other smaller community hospitals (Alnwick Infirmary, Berwick Infirmary, Blyth Community Hospital, Haltwhistle War Memorial Hospital, Rothbury Community Hospital and Sir G B Hunter Memorial Hospital) facilitating health and social care and well-being for rehabilitation purposes (more details via http://www.nhs.uk/Services/Trusts/Overview/DefaultView.aspx?id=1802) and acts as a foundation trust that has been free from central government control since 2006 (more details via https://www.northumbria.nhs.uk/about-us/being-foundation-trust).

**Fig. 3** Distribution of rates of health service use for "J09–J18: influenza and pneumonia"
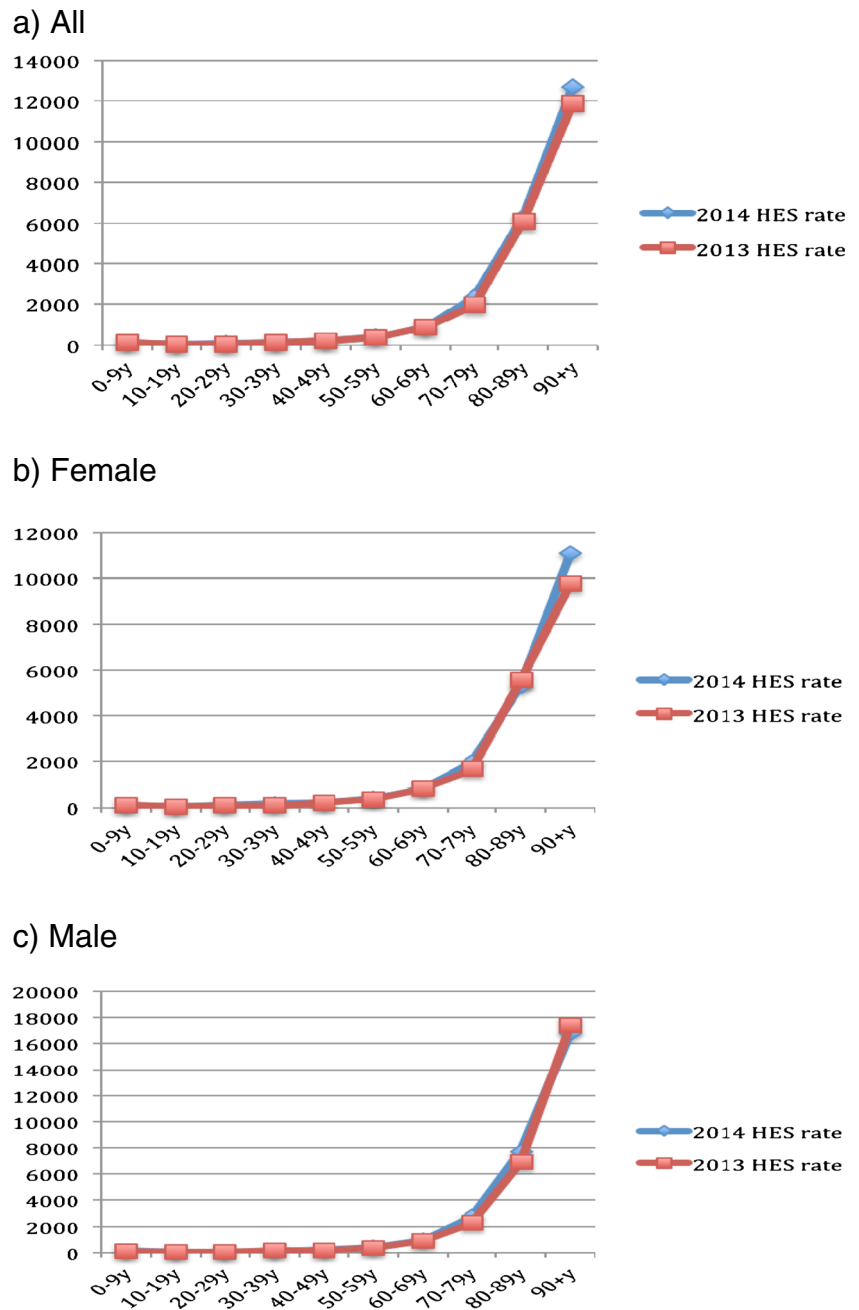
## Variables and analyses

The data from the Northumbrian Hospital Episodes used in the present study covered two full calendar years (2013–2014). Health service use was determined by each admission coded as J00-06 Acute upper respiratory infections, J09-18 Influenza and pneumonia, J20-J22 Acute lower respiratory infections, G44 Other chronic obstructive pulmonary disease (COPD) and J45 Asthma, based on the International

Classification of Diseases, 10th version (more details via http://apps.who.int/classifications/icd10/browse/2015/en; now re-directed to http://apps.who.int/classifications/icd10/browse/2016/en). To estimate the usage of the health service, age-specific HES rates were calculated from admissions divided by population size for each age group, presented with per 100,000 person-years. Estimates on population size in both 2013 and 2014 were obtained from the UK Office for National

**Fig. 4** Distribution of rates in health service use for "J20–J22: other acute lower respiratory infections"



a) All

b) Female

c) Male
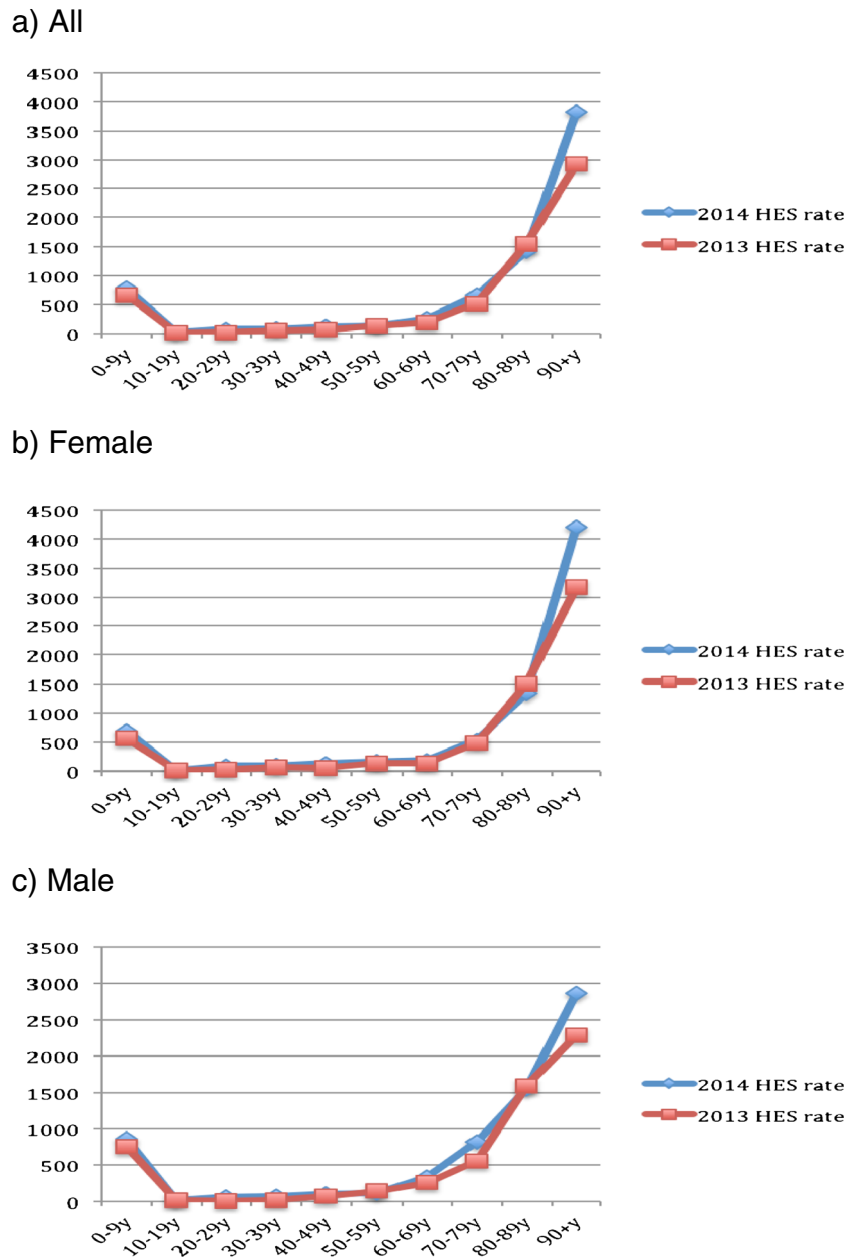
Statistics (more details via http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population). Statistical software STATA version 13.0 (STATA, College Station, Texas, USA; more details via http://www.stata.com/) and Microsoft Excel (more details via https://products.office.com/en-us/excel) were used to perform all the analyses and to generate graphs. As this was only a secondary data analysis with no individual identification in the present study, no further ethics approval was required.

## Results

Figure 1 describes the population size by sex and across age groups in mid-2013 to mid-2014. Clearly, the population of young adults (aged 20–49) has decreased, whereas that of older adults (aged 50 and above) has increased. Figures 2–6 show the distribution of rates of health service use for acute upper respiratory infections, influenza and pneumonia, acute



**Fig. 5** Distribution of rates of health service use for "J44: COPD" (chronic obstructive pulmonary disease)
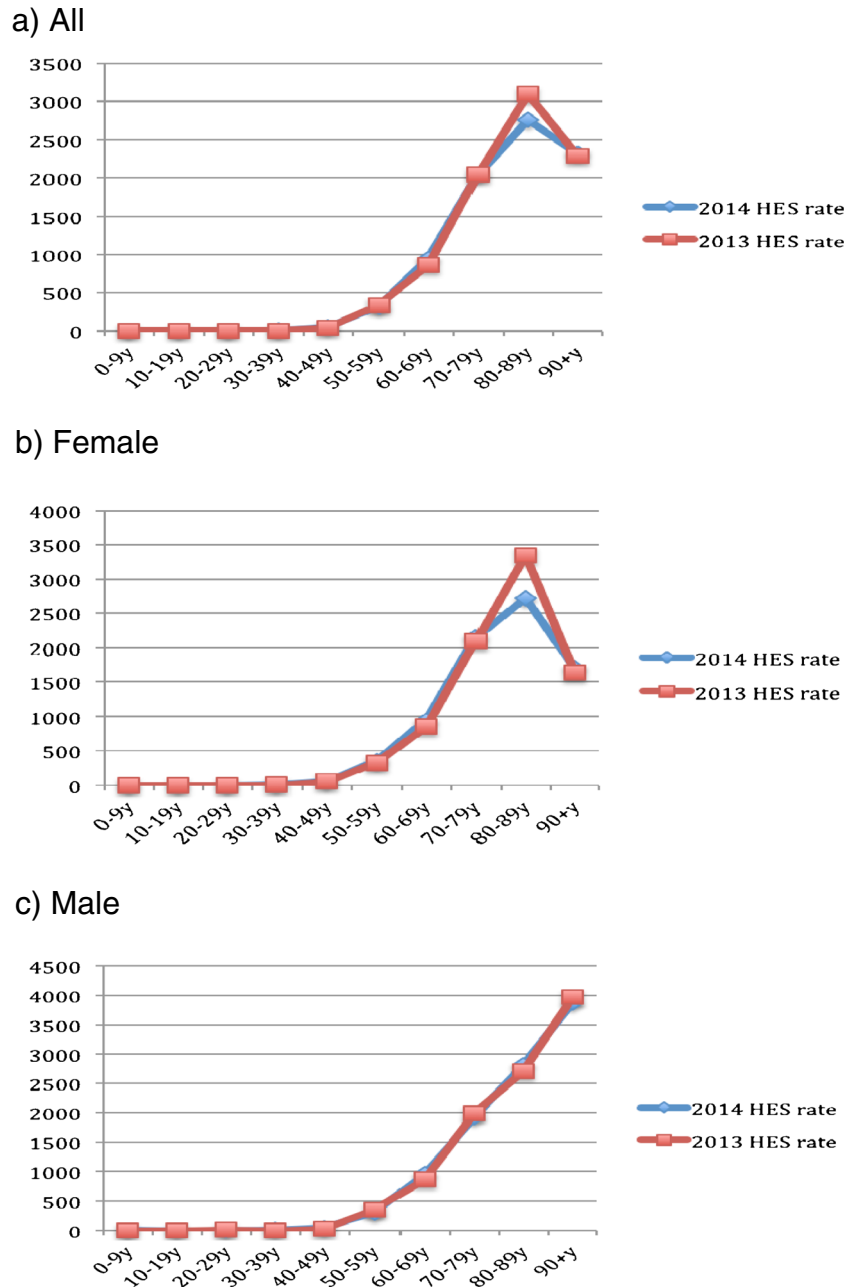
**Fig. 6** Distribution of rates of health service use for "J45: asthma"

a) All



b) Female



c) Male
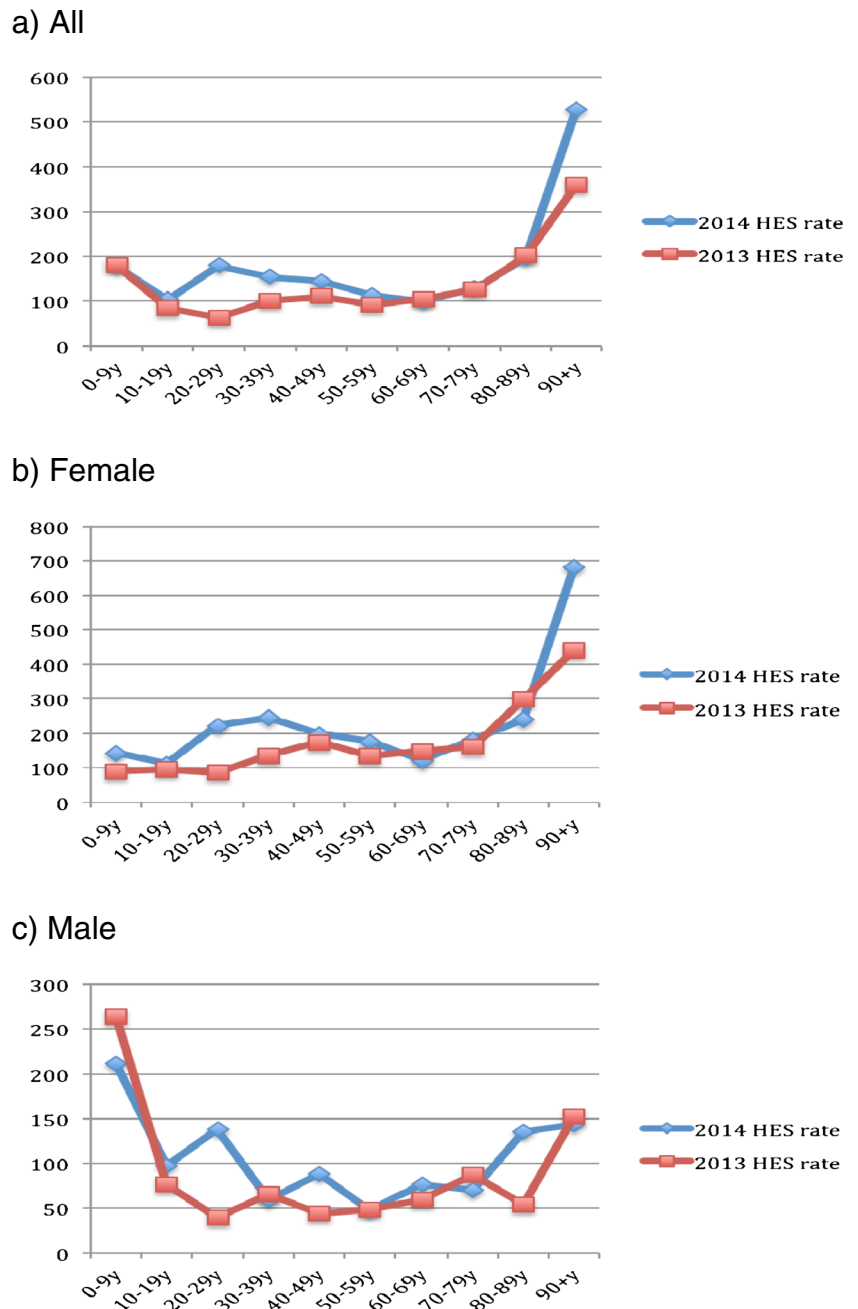


lower respiratory infections, COPD and asthma from 2013 to 2014 by sex and age groups respectively (also see Tables 1–5). Clearly, the use of the health service for influenza and pneumonia, acute lower respiratory infections and COPD increased with an advancing age in both men and women, but not for acute upper respiratory infections and asthma. Following these 2 years, the use of the health service for common respiratory diseases has seemed to be unchanged, except for asthma. There were large increases in young adults aged 20–50 for both men and women and the very old aged 90 and above in women. Of note, there were large increases in acute lower respiratory infections for both men and women aged 90 and above; there was also a large decrease in COPD in women aged 80–90.

**Table 1** Hospital episode statistics for "J00–J06: acute upper respiratory infections"

| 2014 | | | | 2013 | | | |
|---|---|---|---|---|---|---|---|
| All (years) | Episode | Population | 2014 HES rate | All age groups (years) | Episode | Population | 2013 HES rate |
| 0–9 | 775 | 55,577 | 1394.461738 | 0–9 | 802 | 55,550 | 1443.744374 |
| 10–19 | 47 | 55,577 | 84.567357 | 10–19 | 30 | 56,221 | 53.36084381 |
| 20–29 | 44 | 54,879 | 80.17638805 | 20–29 | 14 | 55,221 | 25.3526738 |
| 30–39 | 30 | 58,734 | 51.07774032 | 30–39 | 14 | 58,955 | 23.74692562 |
| 40–49 | 21 | 72,433 | 28.99231013 | 40–49 | 10 | 74,655 | 13.3949501 |
| 50–59 | 27 | 77,070 | 35.0330868 | 50–59 | 16 | 75,724 | 21.12936453 |
| 60–69 | 13 | 70,296 | 18.49322863 | 60–69 | 7 | 69,558 | 10.06354409 |
| 70–79 | 14 | 45,482 | 30.78140803 | 70–79 | 11 | 44,044 | 24.97502498 |
| 80–89 | 6 | 23,764 | 25.2482747 | 80–89 | 13 | 23,324 | 55.73658035 |
| 90+ | 9 | 4,919 | 182.9640171 | 90+ | 8 | 4,716 | 169.6352841 |
| Total | 164 | 40,7577 | 40.23779556 | Total | 93 | 406,197 | 22.89529465 |
| Female (years) | | | | | | | |
| 0–9 | 309 | 26,728 | 1156.090991 | 0–9 | 327 | 26767 | 1221.653529 |
| 10–19 | 32 | 26,938 | 118.7912985 | 10–19 | 19 | 27247 | 69.73244761 |
| 20–29 | 30 | 27,406 | 109.4650806 | 20–29 | 6 | 27663 | 21.68962152 |
| 30–39 | 17 | 30,170 | 56.34736493 | 30–39 | 11 | 30200 | 36.42384106 |
| 40–49 | 14 | 37,372 | 37.4612009 | 40–49 | 5 | 38432 | 13.00999167 |
| 50–59 | 22 | 39,723 | 55.38353095 | 50–59 | 11 | 38943 | 28.24641142 |
| 60–69 | 7 | 36,233 | 19.31940496 | 60–69 | 4 | 35817 | 11.16788117 |
| 70–79 | 8 | 24,226 | 33.02237266 | 70–79 | 7 | 23546 | 29.72904103 |
| 80–89 | 5 | 14,148 | 35.3406842 | 80–89 | 5 | 14045 | 35.5998576 |
| 90+ | 9 | 3,525 | 255.3191489 | 90+ | 6 | 3407 | 176.1080129 |
| Total | 112 | 212,803 | 52.63083697 | Total | 55 | 212053 | 25.936912 |
| Male (years) | | | | | | | |
| 0–9 | 466 | 28,849 | 1615.30729 | 0–9 | 475 | 28,783 | 1650.279679 |
| 10–19 | 15 | 28,609 | 52.43105317 | 10–19 | 11 | 28,558 | 38.51810351 |
| 20–29 | 14 | 27,473 | 50.9591235 | 20–29 | 8 | 27,558 | 29.02968285 |
| 30–39 | 13 | 28,564 | 45.51183308 | 30–39 | 3 | 28,755 | 10.43296818 |
| 40–49 | 7 | 35,061 | 19.9652035 | 40–49 | 5 | 36,223 | 13.80338459 |
| 50–59 | 5 | 37,347 | 13.38795619 | 50–59 | 5 | 36,781 | 13.59397515 |
| 60–69 | 6 | 34,063 | 17.61442034 | 60–69 | 3 | 33,741 | 8.891259892 |
| 70–79 | 6 | 21,256 | 28.22732405 | 70–79 | 4 | 20,498 | 19.51409894 |
| 80–89 | 1 | 9,616 | 10.39933444 | 80–89 | 8 | 9,279 | 86.21618709 |
| 90+ | 0 | 1,394 | 0 | 90+ | 2 | 1,309 | 152.7883881 |
| Total | 52 | 194,774 | 26.69760851 | Total | 38 | 194,144 | 19.57310038 |

## Discussion

Methodologically, there are a number of ways of examining hospital admissions, i.e. the use of the health service, in the population. To be specific, we could look historically at the trends by day of the week, by month, by season or by year. We could also examine geographically by hospital, by city, by region or by country. Mathematically, we could estimate by number, by rate or by standardisation. Politically, we could assess by practice, by policy or by reform. For example, respiratory admissions declined accompanying an increase in smoke-free areas or with the introduction of immunisation [29–33]. Understanding the use of the health service in the bigger picture is critical for health service providers and policy makers to effectively re-allocate medical and social resources (from prevention to rehabilitation) respectively. The targeted at-risk population may shift following the change in investment in health and nursing

**Table 2** Hospital episode statistics for "J09–J18: influenza and pneumonia"

| 2014 | | | | 2013 | | | |
|---|---|---|---|---|---|---|---|
| All (years) | Episode | Population | 2014 HES rate | All age groups (years) | Episode | Population | 2013 HES rate |
| 0–9 | 67 | 55,577 | 120.5534664 | 0–9 | 66 | 55,550 | 118.8118812 |
| 10–19 | 26 | 55,577 | 46.78194217 | 10–19 | 16 | 56,221 | 28.4591167 |
| 20–29 | 41 | 54,879 | 74.70981614 | 20–29 | 31 | 55,221 | 56.13806342 |
| 30–39 | 73 | 58,734 | 124.2891681 | 30–39 | 75 | 58,955 | 127.215673 |
| 40–49 | 147 | 72,433 | 202.9461709 | 40–49 | 147 | 74,655 | 196.9057665 |
| 50–59 | 312 | 77,070 | 404.8267808 | 50–59 | 272 | 75,724 | 359.1991971 |
| 60–69 | 620 | 70,296 | 881.9847502 | 60–69 | 600 | 69,558 | 862.5894937 |
| 70–79 | 1,069 | 45,482 | 2,350.38037 | 70–79 | 868 | 44,044 | 1,970.756516 |
| 80–89 | 1,494 | 23,764 | 6,286.820401 | 80–89 | 1,420 | 23,324 | 6,088.149546 |
| 90+ | 625 | 4,919 | 12,705.83452 | 90+ | 561 | 4,716 | 11,895.6743 |
| Total | 4,474 | 407,577 | 1,097.706691 | Total | 4,056 | 406, 197 | 998.5302698 |
| Female (years) | | | | | | | |
| 0–9 | 28 | 26,728 | 104.7590542 | 0–9 | 27 | 26,767 | 100.8704748 |
| 10–19 | 10 | 26,938 | 37.12228079 | 10–19 | 9 | 27,247 | 33.03115939 |
| 20–29 | 25 | 27,406 | 91.22090053 | 20–29 | 24 | 27,663 | 86.75848606 |
| 30–39 | 46 | 30,170 | 152.4693404 | 30–39 | 29 | 30,200 | 96.02649007 |
| 40–49 | 76 | 37,372 | 203.3608049 | 40–49 | 80 | 38,432 | 208.1598668 |
| 50–59 | 156 | 39,723 | 392.7195831 | 50–59 | 141 | 38,943 | 362.0676373 |
| 60–69 | 300 | 36,233 | 827.9744984 | 60–69 | 300 | 35,817 | 837.591088 |
| 70–79 | 482 | 24,226 | 1,989.597953 | 70–79 | 398 | 23,546 | 1,690.308333 |
| 80–89 | 750 | 14,148 | 5,301.102629 | 80–89 | 780 | 14,045 | 5,553.577786 |
| 90+ | 391 | 3,525 | 11,092.19858 | 90+ | 333 | 3,407 | 9,773.994717 |
| Total | 2,264 | 212,803 | 1,063.894776 | Total | 2,121 | 212,053 | 1,000.221643 |
| Male (years) | | | | | | | |
| 0–9 | 39 | 28,849 | 135.1866616 | 0–9 | 39 | 28,783 | 135.4966473 |
| 10–19 | 16 | 28,609 | 55.92645671 | 10–19 | 7 | 28,558 | 24.51152041 |
| 20–29 | 16 | 27,473 | 58.23899829 | 20–29 | 7 | 27,558 | 25.40097249 |
| 30–39 | 27 | 28,564 | 94.52457639 | 30–39 | 46 | 28,755 | 159.9721788 |
| 40–49 | 71 | 35,061 | 202.504207 | 40–49 | 67 | 36,223 | 184.9653535 |
| 50–59 | 156 | 37,347 | 417.7042333 | 50–59 | 131 | 36,781 | 356.1621489 |
| 60–69 | 320 | 34,063 | 939.4357514 | 60–69 | 300 | 33,741 | 889.1259892 |
| 70–79 | 587 | 21,256 | 2,761.573203 | 70–79 | 470 | 20,498 | 2,292.906625 |
| 80–89 | 744 | 9,616 | 7,737.104825 | 80–89 | 640 | 9,279 | 6,897.294967 |
| 90+ | 234 | 1,394 | 16,786.22669 | 90+ | 228 | 1,309 | 17,417.87624 |
| Total | 2,210 | 194,774 | 1,134.648362 | total | 1,935 | 194,144 | 996.6828746 |

programs and the subsequent risk contributor profile (biologically or non-biologically). Therefore, the performance review of such ought to be documented regularly, preferably annually.

### Strengths and limitations

The present study has a few strengths. First, the data are from recent years. Therefore, the results provide information on recent health policy use. Second, the study period covers full calendar years. In addition, the population size was estimated on a yearly basis. Therefore, selection bias could be avoided in the presentation of trends and the estimation of rates could be more accurate than using the population census from a single year. However, mis-classification may not be completely avoidable [34, 35]. Third, this is the first HES study looking at the use of the health service in

**Table 3** Hospital episode statistics for "J20–J22: other acute lower respiratory infections"

| 2014 | | | | 2013 | | | |
|---|---|---|---|---|---|---|---|
| All (years) | Episode | Population | 2014 HES rate | All age groups (years) | Episode | Population | 2013 HES rate |
| 0–9 | 436 | 55,577 | 784.4971841 | 0–9 | 372 | 55,550 | 669.6669667 |
| 10–19 | 10 | 55,577 | 17.99305468 | 10–19 | 9 | 56,221 | 16.00825314 |
| 20–29 | 40 | 54,879 | 72.8876255 | 20–29 | 10 | 55,221 | 18.10905272 |
| 30–39 | 48 | 58,734 | 81.72438451 | 30–39 | 28 | 58,955 | 47.49385124 |
| 40–49 | 83 | 72,433 | 114.5886543 | 40–49 | 49 | 74,655 | 65.63525551 |
| 50–59 | 105 | 77,070 | 136.239782 | 50–59 | 102 | 75,724 | 134.6996989 |
| 60–69 | 180 | 70,296 | 256.0600888 | 60–69 | 134 | 69,558 | 192.6449869 |
| 70–79 | 304 | 45,482 | 668.3962886 | 70–79 | 229 | 44,044 | 519.9346108 |
| 80–89 | 339 | 23,764 | 1,426.527521 | 80–89 | 359 | 23,324 | 1,539.187103 |
| 90+ | 188 | 4,919 | 3,821.915023 | 90+ | 138 | 4,716 | 2,926.208651 |
| Total | 1,733 | 407,577 | 425.1957299 | Total | 1,430 | 406,197 | 352.0459285 |
| Female (years) | | | | | | | |
| 0–9 | 186 | 26,728 | 695.8994313 | 0–9 | 153 | 26,767 | 571.5993574 |
| 10–19 | 3 | 26,938 | 11.13668424 | 10–19 | 3 | 27,247 | 11.01038646 |
| 20–29 | 23 | 27,406 | 83.92322849 | 20–29 | 8 | 27,663 | 28.91949535 |
| 30–39 | 27 | 30,170 | 89.49287372 | 30–39 | 21 | 30,200 | 69.53642384 |
| 40–49 | 46 | 37,372 | 123.086803 | 40–49 | 22 | 38,432 | 57.24396336 |
| 50–59 | 63 | 39,723 | 158.5982932 | 50–59 | 50 | 38,943 | 128.3927792 |
| 60–69 | 65 | 36,233 | 179.3944747 | 60–69 | 46 | 35,817 | 128.4306335 |
| 70–79 | 129 | 24,226 | 532.4857591 | 70–79 | 114 | 23,546 | 484.1586681 |
| 80–89 | 190 | 14,148 | 1,342.945999 | 80–89 | 211 | 14,045 | 1,502.313991 |
| 90+ | 148 | 3,525 | 4,198.58156 | 90+ | 108 | 3,407 | 3,169.944232 |
| Total | 880 | 212,803 | 413.5280048 | Total | 736 | 212,053 | 347.0830406 |
| Male (years) | | | | | | | |
| 0–9 | 250 | 28,849 | 866.581164 | 0–9 | 219 | 28,783 | 760.8657888 |
| 10–19 | 7 | 28,609 | 24.46782481 | 10–19 | 6 | 28,558 | 21.00987464 |
| 20–29 | 17 | 27,473 | 61.87893568 | 20–29 | 2 | 27,558 | 7.257420713 |
| 30–39 | 21 | 28,564 | 73.51911497 | 30–39 | 7 | 28,755 | 24.34359242 |
| 40–49 | 37 | 35,061 | 105.5303614 | 40–49 | 27 | 36,223 | 74.53827679 |
| 50–59 | 42 | 37,347 | 112.458832 | 50–59 | 52 | 36,781 | 141.3773416 |
| 60–69 | 115 | 34,063 | 337.6097232 | 60–69 | 88 | 33,741 | 260.8102902 |
| 70–79 | 175 | 21,256 | 823.2969514 | 70–79 | 115 | 20,498 | 561.0303444 |
| 80–89 | 149 | 9,616 | 1,549.500832 | 80–89 | 148 | 9,279 | 1,594.999461 |
| 90+ | 40 | 1,394 | 2,869.440459 | 90+ | 30 | 1,309 | 2,291.825821 |
| Total | 853 | 194,774 | 437.9434627 | Total | 694 | 194,144 | 357.4666227 |

respiratory disease from the Northumbria area, which is free from central governmental control. However, there are also a few limitations that cannot be ignored. First, it was not possible to link with population surveys to understand patient risk contributor profiles, whether biological or non-biological. However, the entire study focus was to investigate if and how different age groups could present any change in health service use in recent years. Second, only two genders were identified. In other words, transgender was not properly coded.

Therefore, no results on transgender people could be obtained (more details via http://www.ons.gov.uk/ons/about-ons/business-transparency/freedom-of-information/what-can-i-request/previous-foi-requests/health-and-social-care/transgender-population-figures/index.html). Third, some coding errors might not be 100% avoidable, which would affect the estimates. Taken together, future studies retaining the strengths and overcoming the limitations mentioned above to continuously monitor and document such clinical

**Table 4** Hospital episode statistics for "J44: COPD" (chronic obstructive pulmonary disease)

| 2014 | | | | 2013 | | | |
|---|---|---|---|---|---|---|---|
| All (years) | Episode | Population | 2014 HES rate | All | Episode | Population | 2013 HES rate |
| 0–9 | 1 | 55,577 | 1.799305468 | 0–9 | 0 | 55,550 | 0 |
| 10–19 | 0 | 55,577 | 0 | 10–19 | 0 | 56,221 | 0 |
| 20–29 | 0 | 54,879 | 0 | 20–29 | 2 | 55,221 | 3.621810543 |
| 30–39 | 6 | 58,734 | 10.21554806 | 30–39 | 1 | 58,955 | 1.696208973 |
| 40–49 | 35 | 72,433 | 48.32051689 | 40–49 | 30 | 74,655 | 40.18485031 |
| 50–59 | 245 | 77,070 | 317.8928247 | 50–59 | 255 | 75,724 | 336.7492473 |
| 60–69 | 670 | 70,296 | 953.1125526 | 60–69 | 598 | 69,558 | 859.7141953 |
| 70–79 | 930 | 45,482 | 2,044.764962 | 70–79 | 902 | 44,044 | 2,047.952048 |
| 80–89 | 656 | 23,764 | 2,760.478034 | 80–89 | 722 | 23,324 | 3,095.523924 |
| 90+ | 114 | 4,919 | 2,317.544216 | 90+ | 108 | 4,716 | 2,290.076336 |
| Total | 2,657 | 407,577 | 651.9013585 | Total | 2,618 | 406,197 | 644.5148536 |
| Female (years) | | | | | | | |
| 0–9 | 0 | 26,728 | 0 | 0–9 | 0 | 26,767 | 0 |
| 10–19 | 0 | 26,938 | 0 | 10–19 | 0 | 27,247 | 0 |
| 20–29 | 0 | 27,406 | 0 | 20–29 | 0 | 27,663 | 0 |
| 30–39 | 4 | 30,170 | 13.25820351 | 30–39 | 2 | 30,200 | 6.622516556 |
| 40–49 | 20 | 37,372 | 53.51600128 | 40–49 | 21 | 38,432 | 54.64196503 |
| 50–59 | 136 | 39,723 | 342.3709186 | 50–59 | 127 | 38,943 | 326.1176591 |
| 60–69 | 342 | 36,233 | 943.8909282 | 60–69 | 304 | 35,817 | 848.7589692 |
| 70–79 | 521 | 24,226 | 2,150.582019 | 70–79 | 493 | 23,546 | 2,093.773889 |
| 80–89 | 385 | 14,148 | 2,721.232683 | 80–89 | 471 | 14,045 | 3,353.506586 |
| 90+ | 60 | 3,525 | 1,702.12766 | 90+ | 56 | 3,407 | 1,643.674787 |
| Total | 1,468 | 212,803 | 689.8398989 | Total | 1,474 | 212,053 | 695.1092416 |
| Male (years) | | | | | | | |
| 0–9 | 1 | 28,849 | 3.466324656 | 0–9 | 0 | 28,783 | 0 |
| 10–19 | 0 | 28,609 | 0 | 10–19 | 0 | 28,558 | 0 |
| 20–29 | 0 | 27,473 | 0 | 20–29 | 2 | 27,558 | 7.257420713 |
| 30–39 | 2 | 28,564 | 7.001820473 | 30–39 | 0 | 28,755 | 0 |
| 40–49 | 15 | 35,061 | 42.78257893 | 40–49 | 9 | 36,223 | 24.84609226 |
| 50–59 | 109 | 37,347 | 291.857445 | 50–59 | 128 | 36,781 | 348.0057638 |
| 60–69 | 328 | 34,063 | 962.9216452 | 60–69 | 294 | 33,741 | 871.3434694 |
| 70–79 | 409 | 21,256 | 1924.162589 | 70–79 | 409 | 20,498 | 1,995.316616 |
| 80–89 | 271 | 9,616 | 2818.219634 | 80–89 | 251 | 9,279 | 2,705.03287 |
| 90+ | 54 | 1,394 | 3873.74462 | 90+ | 52 | 1,309 | 3,972.49809 |
| Total | 1,189 | 194,774 | 610.4510869 | Total | 1,145 | 194,144 | 589.7684193 |

evidence from the local setting to the national setting would be recommended.

### Research, practice and policy implications

From 2013 to 2014, there has been unchanged use of health service utilisation with regard to common respiratory diseases, except for asthma. Respiratory disease is a common condition that has a large and negative impact on quality of life and life expectancy, with high financial costs. To direct future research, local health policy and guidelines could benefit from annual clinical records on health service use for respiratory diseases. From the practice and policy perspectives, re-organising and re-diverting funding to improve population health on a yearly basis, including improving the role of health and nursing professionals in reducing the burden of

**Table 5** Hospital episode statistics for "J45: asthma"

| 2014 | | | | 2013 | | | |
|---|---|---|---|---|---|---|---|
| All (years) | Episode | Population | 2014 HES rate | All | Episode | Population | 2013 HES rate |
| 0–9 | 99 | 55,577 | 178.1312413 | 0–9 | 100 | 55,550 | 180.0180018 |
| 10–19 | 58 | 55,577 | 104.3597171 | 10–19 | 48 | 56,221 | 85.3773501 |
| 20–29 | 99 | 54,879 | 180.3968731 | 20–29 | 35 | 55,221 | 63.3816845 |
| 30–39 | 91 | 58,734 | 154.9358123 | 30–39 | 60 | 58,955 | 101.7725384 |
| 40–49 | 105 | 72,433 | 144.9615507 | 40–49 | 83 | 74,655 | 111.1780859 |
| 50–59 | 88 | 77,070 | 114.1819125 | 50–59 | 70 | 75,724 | 92.44096984 |
| 60–69 | 70 | 70,296 | 99.57892341 | 60–69 | 73 | 69,558 | 104.9483884 |
| 70–79 | 59 | 45,482 | 129.7216481 | 70–79 | 56 | 44,044 | 127.1455817 |
| 80–89 | 47 | 23,764 | 197.7781518 | 80–89 | 47 | 23,324 | 201.5091751 |
| 90+ | 26 | 4,919 | 528.562716 | 90+ | 17 | 4,716 | 360.4749788 |
| Total | 742 | 407,577 | 182.0514897 | Total | 589 | 406,197 | 145.0035328 |
| Female (years) | | | | | | | |
| 0–9 | 38 | 26,728 | 142.1730021 | 0–9 | 24 | 26,767 | 89.6626443 |
| 10–19 | 30 | 26,938 | 111.3668424 | 10–19 | 26 | 27,247 | 95.42334936 |
| 20–29 | 61 | 27,406 | 222.5789973 | 20–29 | 24 | 27,663 | 86.75848606 |
| 30–39 | 74 | 30,170 | 245.276765 | 30–39 | 41 | 30,200 | 135.7615894 |
| 40–49 | 74 | 37,372 | 198.0092048 | 40–49 | 67 | 38,432 | 174.3338884 |
| 50–59 | 70 | 39,723 | 176.2203258 | 50–59 | 52 | 38,943 | 133.5284904 |
| 60–69 | 44 | 36,233 | 121.4362598 | 60–69 | 53 | 35,817 | 147.9744256 |
| 70–79 | 44 | 24,226 | 181.6230496 | 70–79 | 38 | 23,546 | 161.3862227 |
| 80–89 | 34 | 14,148 | 240.3166525 | 80–89 | 42 | 14,045 | 299.0388038 |
| 90+ | 24 | 3,525 | 680.8510638 | 90+ | 15 | 3,407 | 440.2700323 |
| Total | 493 | 212,803 | 231.6696663 | Total | 382 | 212,053 | 180.1436433 |
| Male (years) | | | | | | | |
| 0–9 | 61 | 28,849 | 211.445804 | 0–9 | 76 | 28,783 | 264.0447486 |
| 10–19 | 28 | 28,609 | 97.87129924 | 10–19 | 22 | 28,558 | 77.03620702 |
| 20–29 | 38 | 27,473 | 138.3176209 | 20–29 | 11 | 27,558 | 39.91581392 |
| 30–39 | 17 | 28,564 | 59.51547402 | 30–39 | 19 | 28,755 | 66.07546514 |
| 40–49 | 31 | 35,061 | 88.4173298 | 40–49 | 16 | 36,223 | 44.17083069 |
| 50–59 | 18 | 37,347 | 48.1966423 | 50–59 | 18 | 36,781 | 48.93831054 |
| 60–69 | 26 | 34,063 | 76.3291548 | 60–69 | 20 | 33,741 | 59.27506594 |
| 70–79 | 15 | 21,256 | 70.56831012 | 70–79 | 18 | 20,498 | 87.81344521 |
| 80–89 | 13 | 9,616 | 135.1913478 | 80–89 | 5 | 9,279 | 53.88511693 |
| 90+ | 2 | 1,394 | 143.472023 | 90+ | 2 | 1,309 | 152.7883881 |
| Total | 249 | 194,774 | 127.8404715 | Total | 207 | 194,144 | 106.6218889 |

rehabilitation and raising public awareness, attitude and knowledge may serve the changing need in local areas.

**Compliance with ethical standards**

**Conflicts of interest** None.

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