People with dyslexia and heart, chest, skin, digestive, musculoskeletal, vision, learning, speech and mental disorders were more dissatisfied with neighbourhoods: Scottish Household Survey, 2007–2008

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Abstract Rarely do we know the perception toward neighbourhoods in people specifically with health conditions. Therefore, the aim of the present study was to understand the perception toward neighbourhoods among adults with a series of the existing health conditions in a country-wide and population-based setting. Data were retrieved from and analysed in Scottish Household Survey, 2007–2008. Information on demographics, self-reported health conditions and perception toward neighbourhoods and the surrounding facilities was obtained by household interview. Analysis including chi-square test, t test and logistic regression modelling were performed. Of 19,150 Scottish adults (aged 16–80) included in the study cohort, 1079 (7.7 %) people were dissatisfied with their living areas; particularly for those who experienced harassment (15.4 %), did not recycle or with dyslexia, chest, digestive, mental and musculoskeletal problems. Twenty to forty per cent reported common neighbourhood problems including noise, rubbish, disputes, graffiti, harassment and drug misuse. People with heart or digestive problems were more dissatisfied with the existing parks and open space. People with arthritis, chest or hearing problems were more dissatisfied with the waste management condition. People with dyslexia were more dissatisfied with the existing public transportation. People with heart problems were more dissatisfied with the current street cleaning condition. People with hearing, vision, speech, learning problems or dyslexia were also more dissatisfied with sports and recreational facilities. People with heart, chest, skin, digestive, musculoskeletal, vision, learning, speech and mental disorders and dyslexia were more dissatisfied with their current neighbourhood environments. Upgrading neighbourhood planning to tackle social environment injustice and put pleasant life experience as priority would be suggested.

Keywords Dyslexia · Chronic disease · Mental health · Adult health · Built environment · Neighbourhood satisfaction · Cognition performance

Introduction

Evidence before this study

Effects of neighbourhoods on human health have been described, and the existing literature has documented that problematic neighbourhoods could predict different social and health issues such as drug-use patterns into middle adulthood from local to global levels (Reitzel 2012). Apart from the known risks such as deprivation and crime rates, little is known on the perceived neighbourhood problems which would be of value incorporating place-based approach to optimise health and well-being in regional or national environments (Warr et al. 2009). From a socio-psychological point of view,
Table 1  Characteristics of the Scottish adults aged 16–80 (n = 19,150) and their neighbourhoods

|                          | A good place to live (n = 13,054, 92.4 %) | A poor place to live (n = 1079, 7.7 %) | P value |
|--------------------------|-------------------------------------------|----------------------------------------|---------|
| Sex                      |                                            |                                        |         |
| Male                     | 6615 (93.7 %)                              | 446 (6.3 %)                             | <0.001  |
| Female                   | 6439 (91.1 %)                              | 633 (9.0 %)                             |         |
| Age                      |                                            |                                        | <0.001  |
| 16–39                    | 1896 (86.9 %)                              | 435 (13.1 %)                            |         |
| 40–79                    | 8941 (93.7 %)                              | 601 (6.3 %)                             |         |
| 80                       | 1217 (96.6 %)                              | 43 (3.4 %)                              |         |
| Ethnicity                |                                            |                                        |         |
| White                    | 12,818 (92.4 %)                            | 1057 (7.6 %)                            | 0.644   |
| Others                   | 229 (91.6 %)                               | 21 (8.4 %)                              |         |
| Ever harassment experience |                                          |                                        | <0.001  |
| No                       | 11,263 (94.2 %)                            | 693 (5.8 %)                             |         |
| Yes                      | 1780 (82.2 %)                              | 385 (17.8 %)                            |         |
| How common are neighbourhood problems? |                                       |                                        |         |
| Noisy neighbours         |                                            |                                        | <0.001  |
| No                       | 12,133 (95.1 %)                            | 623 (4.9 %)                             |         |
| Vandalism, graffiti      |                                            |                                        | <0.001  |
| No                       | 11,389 (96.8 %)                            | 373 (3.2 %)                             |         |
| Rubbish around           |                                            |                                        | <0.001  |
| No                       | 9806 (97.1 %)                              | 292 (2.9 %)                             |         |
| Neighbour disputes       |                                            |                                        | <0.001  |
| No                       | 12,455 (94.4 %)                            | 736 (5.6 %)                             |         |
| Intimidating or harassing others |                                       |                                        | <0.001  |
| No                       | 11,868 (96.1 %)                            | 486 (3.9 %)                             |         |
| Drug misuse              |                                            |                                        | <0.001  |
| No                       | 1204 (65.4 %)                              | 637 (34.6 %)                            |         |
| Rowdy behaviours         |                                            |                                        | <0.001  |
| No                       | 10,845 (97.2 %)                            | 318 (6.9 %)                             |         |
| Abandoned/burnt vehicles |                                            |                                        | <0.001  |
| No                       | 11,346 (97.1 %)                            | 336 (2.9 %)                             |         |
| Recycling                |                                            |                                        | <0.001  |
| Glass, jars              | 6791 (94.9 %)                              | 368 (5.1 %)                             |         |
| None                     | 2994 (87.8 %)                              | 416 (12.2 %)                            |         |
| Plastic bottles          | 568 (94.1 %)                               | 358 (5.9 %)                             | <0.001  |
| None                     | 4116 (90.6 %)                              | 426 (9.4 %)                             |         |
| Metal cans               | 5877 (94.5 %)                              | 341 (5.5 %)                             | <0.001  |
| None                     | 3907 (89.8 %)                              | 443 (10.2 %)                            |         |
| Paper, cardboard         | 7948 (94.2 %)                              | 493 (5.8 %)                             | <0.001  |
| None                     | 1837 (86.3 %)                              | 291 (13.7 %)                            |         |
| Local health boards      |                                            |                                        |         |
| Grampian                 | 1329 (95.5 %)                              | 62 (4.5 %)                              | <0.001  |
| Tayside                  | 947 (92.6 %)                               | 76 (7.4 %)                              |         |
| Fife                     | 914 (92.4 %)                               | 75 (7.6 %)                              |         |
| Lothian                  | 1809 (92.3 %)                              | 152 (7.8 %)                             |         |
| Borders                  | 286 (95.0 %)                               | 15 (5.0 %)                              |         |
| Forth Valley             | 763 (91.8 %)                               | 8 (8.2 %)                               |         |
| Lanarkshire              | 1066 (90.9 %)                              | 107 (9.1 %)                             |         |
| Ayrshire and Arran       | 882 (92.1 %)                               | 76 (7.9 %)                              |         |
| Dumfries and Galloway    | 444 (94.7 %)                               | 25 (5.3 %)                              |         |
| Orkney                   | 266 (98.9 %)                               | 3 (1.1 %)                               |         |
| Shetland                 | 219 (98.7 %)                               | 3 (1.4 %)                               |         |
| Western Isles            | 228 (97.4 %)                               | 6 (2.6 %)                               |         |
| Greater Glasgow and Cly  | 2889 (88.8 %)                              | 366 (11.2 %)                            |         |
| Highland                 | 1012 (95.7 %)                              | 45 (4.3 %)                              |         |
tor of subjective well-being as well and consequently quality of life (Chapman and Beaudet 1983). Recently, it has been observed that perceived noise, water, rubbish, traffic and etc. among adults and the very old across Europe have led to poor mental health (Shiue 2014a). Poor perception toward neighbourhoods has also been found to be associated with emotional and behavioural problems in adolescents in the UK (Shiue 2014b).

Knowledge gap

Following this context, however, rarely do we know the perception toward neighbourhoods in people specifically

| Table 2  | Associations between health conditions and neighbourhood satisfaction in Scottish adults aged 16–80 |
|-----------------|-------------------------------------------------|
|                | A good place to live (n = 13,054, 92.4 %) | A poor place to live (n = 1079, 7.7 %) | OR-1 (95 % CI) | P value | OR-2 (95 % CI) | P value |
| Speech impairment | 41 (87.2 %) | 6 (12.8 %) | 1.26 (0.52–3.04) | 0.612 | 0.95 (0.35–2.61) | 0.922 |
| No               | 3653 (90.0 %) | 408 (10.1 %) | 1.00 | 1.00 |
| Chest/breathing problem | 626 (87.4 %) | 90 (12.6 %) | 1.46 (1.13–1.88) | 0.004 | 1.33 (0.97–1.81) | 0.077 |
| No               | 2068 (90.5 %) | 324 (9.5 %) | 1.00 | 1.00 |
| Diabetes         | 453 (91.2 %) | 44 (8.9 %) | 1.03 (0.73–1.44) | 0.871 | 1.38 (0.94–2.03) | 0.010 |
| No               | 3241 (89.8 %) | 370 (10.3 %) | 1.00 | 1.00 |
| Difficulty hearing | 302 (90.4 %) | 32 (9.6 %) | 1.33 (0.90–1.97) | 0.156 | 1.16 (0.70–1.90) | 0.558 |
| No               | 3392 (89.9 %) | 382 (10.1 %) | 1.00 | 1.00 |
| Difficulty seeing | 280 (90.9 %) | 28 (9.1 %) | 1.11 (0.73–1.68) | 0.625 | 1.04 (0.63–1.71) | 0.886 |
| No               | 3414 (89.8 %) | 386 (10.2 %) | 1.00 | 1.00 |
| Dyslexia         | 22 (66.7 %) | 11 (33.3 %) | 2.27 (1.05–4.90) | 0.038 | 2.63 (1.04–6.62) | 0.040 |
| No               | 3671 (90.1 %) | 403 (9.9 %) | 1.00 | 1.00 |
| Epilepsy         | 86 (81.1 %) | 20 (18.9 %) | 1.32 (0.79–2.22) | 0.294 | 1.54 (0.80–2.93) | 0.193 |
| No               | 3608 (90.2 %) | 394 (9.9 %) | 1.00 | 1.00 |
| Heart/circulatory problem | 1267 (91.5 %) | 118 (8.5 %) | 1.18 (0.93–1.51) | 0.170 | 1.24 (0.94–1.65) | 0.134 |
| No               | 2427 (89.1 %) | 296 (10.9 %) | 1.00 | 1.00 |
| Learning/behavioural problem | 25 (89.3 %) | 3 (10.7 %) | 0.48 (0.14–1.63) | 0.240 | 0.28 (0.04–2.21) | 0.228 |
| No               | 3669 (89.9 %) | 411 (10.1 %) | 1.00 | 1.00 |
| Mental health problem | 350 (78.1 %) | 98 (21.9 %) | 1.57 (1.19–2.06) | 0.001 | 1.21 (0.87–1.69) | 0.266 |
| No               | 3344 (91.45) | 316 (8.6 %) | 1.00 | 1.00 |
| Disability: arms, hands | 421 (87.3 %) | 61 (12.7 %) | 1.39 (1.03–1.87) | 0.030 | 1.23 (0.85–1.77) | 0.265 |
| No               | 3273 (90.3 %) | 353 (9.7 %) | 1.00 | 1.00 |
| Disability: legs, feet | 1019 (91.1 %) | 100 (8.9 %) | 1.01 (0.79–1.29) | 0.911 | 1.09 (0.82–1.45) | 0.559 |
| No               | 2675 (89.5 %) | 314 (10.5 %) | 1.00 | 1.00 |
| Disability: neck, back | 642 (87.8 %) | 89 (12.2 %) | 1.29 (1.00–1.66) | 0.052 | 1.35 (1.00–1.82) | 0.051 |
| No               | 3052 (90.4 %) | 325 (9.6 %) | 1.00 | 1.00 |
| Severe disfigurement, skin condition or allergies | 74 (84.1 %) | 14 (15.9 %) | 1.57 (0.86–2.85) | 0.139 | 1.16 (0.55–2.46) | 0.690 |
| No               | 3620 (90.1 %) | 400 (10.0 %) | 1.00 | 1.00 |
| Severe stomach, liver, kidney or digestive problems | 298 (85.4 %) | 51 (14.6 %) | 1.54 (1.11–2.13) | 0.009 | 1.49 (1.02–2.09) | 0.041 |
| No               | 3396 (90.3 %) | 363 (9.7 %) | 1.00 | 1.00 |
| Some other progressive disability or illness | 211 (89.8 %) | 24 (10.2 %) | 1.04 (0.67–1.63) | 0.847 | 1.15 (0.68–1.95) | 0.593 |
| No               | 3483 (89.9 %) | 390 (10.1 %) | 1.00 | 1.00 |
| Some other health problem or disability | 493 (89.5 %) | 58 (10.5 %) | 0.96 (0.71–1.30) | 0.808 | 0.98 (0.69–1.39) | 0.916 |
| No               | 3201 (90.0 %) | 356 (10.0 %) | 1.00 | 1.00 |
| Arthritis        | 1099 (90.9 %) | 110 (9.1 %) | 1.22 (0.95–1.56) | 0.112 | 1.16 (0.87–1.56) | 0.321 |
| No               | 2595 (89.5 %) | 304 (10.5 %) | 1.00 | 1.00 |

OR-1 adjusted for age and sex, OR-2 adjusted for age, sex and ever harassment
with health conditions due to a lack of research evidence in this area. Therefore, the aim of the present study was to understand the perception toward neighbourhoods among adults with a series of the existing health conditions and disabilities in a country-wide and population-based setting.

### Methods

#### Study sample

Scottish Household Survey (more details via [http://www.scotland.gov.uk/topics/statistics/16002](http://www.scotland.gov.uk/topics/statistics/16002)) has been a

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### Table 3 Associations between health conditions and perception toward dealt neighbourhood issues in Scottish adults aged 16–80

| Health Condition                                | Satisfaction $(n = 6169, 43.6\%)$ | Neutral $(n = 5465, 38.6\%)$ | RRR (95% CI) | Dissatisfaction $(n = 2526, 17.8\%)$ | RRR (95% CI) |
|-------------------------------------------------|-----------------------------------|-------------------------------|-------------|--------------------------------------|-------------|
| Ever harassment                                 | 709 (32.6%)                       | 713 (32.8%)                   | 1.10 (0.98–1.23) | 754 (34.8%)                         | 3.03 (2.69–3.41) |
| No                                              | 5458 (45.6%)                      | 4746 (39.6%)                  |             | 1771 (14.8%)                        |             |
| Speech impairment                               | 22 (45.8%)                        | 16 (33.3%)                    | 0.93 (0.49–1.79) | 10 (20.8%)                          | 0.83 (0.38–1.80) |
| No                                              | 1797 (44.2%)                      | 1433 (35.3%)                  |             | 835 (20.5%)                         |             |
| Chest/breathing problem                         | 334 (46.9%)                       | 208 (20.2%)                   | 0.75 (0.62–0.90) | 170 (23.9%)                        | 1.18 (0.95–1.46) |
| No                                              | 1485 (43.7%)                      | 1241 (36.5%)                  |             | 675 (19.9%)                         |             |
| Diabetes                                        | 239 (48.1%)                       | 168 (33.8%)                   | 0.86 (0.70–1.07) | 90 (18.1%)                         | 0.85 (0.65–1.11) |
| No                                              | 1580 (43.7%)                      | 1281 (35.4%)                  |             | 755 (20.9%)                         |             |
| Difficulty hearing                              | 148 (44.6%)                       | 122 (36.8%)                   | 1.00 (0.78–1.29) | 62 (18.7%)                         | 1.06 (0.77–1.46) |
| No                                              | 1671 (44.2%)                      | 1327 (35.1%)                  |             | 783 (20.7%)                         |             |
| Dyslexia                                        | 8 (24.2%)                         | 11 (33.3%)                    | 1.92 (0.77–4.81) | 14 (42.4%)                         | 2.66 (1.08–6.56) |
| No                                              | 1811 (44.4%)                      | 1438 (35.3%)                  |             | 831 (20.4%)                         |             |
| Epilepsy                                        | 50 (46.7%)                        | 29 (27.1%)                    | 0.76 (0.48–1.22) | 28 (26.2%)                         | 0.97 (0.59–1.59) |
| No                                              | 1709 (44.2%)                      | 1420 (35.5%)                  |             | 817 (20.4%)                         |             |
| Heart/circulatory problem                       | 148 (44.6%)                       | 122 (36.8%)                   | 0.97 (0.83–1.13) | 62 (18.7%)                         | 1.26 (1.05–1.52) |
| No                                              | 1761 (44.2%)                      | 1327 (35.1%)                  |             | 783 (20.7%)                         |             |
| Learning/behavioural problem                    | 12 (40.0%)                        | 12 (40.0%)                    | 1.44 (0.64–3.24) | 6 (20.0%)                          | 0.67 (0.24–1.86) |
| No                                              | 1807 (44.3%)                      | 1437 (35.2%)                  |             | 839 (20.6%)                         |             |
| Mental health problem                           | 189 (42.1%)                       | 130 (29.0%)                   | 0.90 (0.70–1.17) | 130 (29.0%)                        | 0.91 (0.69–1.19) |
| No                                              | 1630 (44.5%)                      | 1319 (36.0%)                  |             | 715 (19.5%)                         |             |
| Disability: arms, hands                         | 202 (41.9%)                       | 181 (37.6%)                   | 1.15 (0.92–1.42) | 99 (20.5%)                         | 1.05 (0.81–1.37) |
| No                                              | 1617 (44.5%)                      | 1268 (34.9%)                  |             | 746 (20.6%)                         |             |
| Disability: legs, feet                          | 478 (42.7%)                       | 431 (38.5%)                   | 1.17 (1.00–1.37) | 634 (21.2%)                        | 1.02 (0.84–1.24) |
| No                                              | 1341 (44.8%)                      | 1018 (34.0%)                  |             | 211 (18.8%)                         |             |
| Disability: neck, back                          | 321 (44.0%)                       | 234 (32.1%)                   | 0.90 (0.75–1.08) | 175 (24.0%)                        | 1.15 (0.93–1.42) |
| No                                              | 1498 (44.3%)                      | 1215 (35.9%)                  |             | 670 (19.8%)                         |             |
| Severe disfigurement, skin condition or allergies| 41 (46.6%)                        | 24 (27.3%)                    | 0.74 (0.44–1.23) | 23 (26.1%)                         | 1.08 (0.63–1.85) |
| No                                              | 1778 (44.2%)                      | 1425 (35.4%)                  |             | 822 (20.4%)                         |             |
| Severe stomach, liver, kidney or digestive problems| 156 (44.6%)                       | 111 (31.7%)                   | 0.88 (0.68–1.14) | 83 (23.7%)                         | 1.09 (0.82–1.46) |
| No                                              | 1663 (44.2%)                      | 1338 (35.6%)                  |             | 762 (20.3%)                         |             |
| Some other progressive disability or illness    | 103 (44.0%)                       | 86 (36.8%)                    | 1.05 (0.78–1.41) | 45 (19.2%)                         | 0.92 (0.63–1.33) |
| No                                              | 1716 (44.2%)                      | 1363 (35.1%)                  |             | 800 (20.6%)                         |             |
| Some other health problem or disability         | 243 (43.9%)                       | 193 (34.9%)                   | 0.99 (0.81–1.22) | 117 (21.2%)                        | 0.96 (0.75–1.23) |
| No                                              | 1576 (44.3%)                      | 1256 (35.3%)                  |             | 728 (20.5%)                         |             |
| Arthritis                                       | 551 (45.5%)                       | 433 (35.7%)                   | 0.93 (0.80–1.09) | 228 (18.8%)                        | 1.01 (0.84–1.23) |
| No                                              | 1268 (43.7%)                      | 1016 (35.0%)                  |             | 617 (21.3%)                         |             |

Adjusted for age and sex and ever harassment
country-wide, population-based, multi-year (every 2 years) study since 1999. It covers housing, social justice and transport to effectively evaluate the composition, characteristics, attitudes and behaviours of households and individuals at national and sub-national level in Scotland (more details via http://www.scotland.gov.uk/Topics/Statistics/16002/SurveyOverview/). It aims to allow the relationships between social variables within households to be examined, supporting cross-departmental and inter-departmental policies to optimise the Scottish welfare. In the current analysis, the most recent publicly available data, the 2007–2008 cohort (more details via http://www.scotland.gov.uk/Topics/Statistics/16002/DataAccesAgreements), on demographics, self-reported health conditions and perception toward neighbourhoods and the surrounding facilities among Scottish adults was obtained by household interview.

### Table 4  Associations between health conditions and perception on sports/leisure facilities in Scottish adults aged 16–80

|                           | Satisfaction $(n = 6325, 45.1 \%)$ | Neutral $(n = 6649, 47.4 \%)$ | RRR (95 % CI) | Dissatisfaction $(n = 1046, 7.5 \%)$ | RRR (95 % CI) |
|---------------------------|-----------------------------------|--------------------------------|--------------|----------------------------------|--------------|
| Speech impairment         | 17 (40.5 \%)                      | 25 (59.5 \%)                   | 1.04 (0.53–2.05) | 0 (0 \%)                        | N/a          |
| No                        | 1359 (33.9 \%)                    | 2426 (60.4 \%)                 | 230 (5.7 \%) | 151 (1.03–2.20)                  |
| Chest/breathing problem   | 233 (31.8 \%)                     | 449 (61.3 \%)                  | 1.16 (0.95–1.42) | 51 (7.0 \%)                     | 1.08 (0.67–1.76) |
| No                        | 1143 (34.4 \%)                    | 2002 (60.2 \%)                 | 179 (5.4 \%) | 206 (5.8 \%)                     |
| Diabetes                  | 158 (32.2 \%)                     | 309 (62.9 \%)                  | 1.04 (0.82–1.31) | 24 (4.9 \%)                     | 1.25 (0.68–2.28) |
| No                        | 1218 (34.2 \%)                    | 2142 (60.1 \%)                 | 149 (5.8 \%) | 214 (5.7 \%)                     |
| Difficulty hearing        | 95 (29.0 \%)                      | 217 (66.2 \%)                  | 1.11 (0.83–1.48) | 16 (4.9 \%)                     | 1.69 (0.99–2.89) |
| No                        | 1281 (34.4 \%)                    | 2234 (59.9 \%)                 | 214 (5.7 \%) | 210 (5.6 \%)                     |
| Difficulty seeing         | 91 (28.0 \%)                      | 214 (65.9 \%)                  | 1.14 (0.85–1.53) | 20 (6.2 \%)                     | 2.19 (0.64–7.51) |
| No                        | 1285 (34.4 \%)                    | 2237 (59.9 \%)                 | 210 (5.6 \%) | 211 (5.6 \%)                     |
| Dyslexia                  | 10 (32.3 \%)                      | 17 (54.8 \%)                   | 1.60 (0.65–3.96) | 4 (12.9 \%)                     | 1.20 (0.48–3.02) |
| No                        | 1366 (33.9 \%)                    | 2434 (60.5 \%)                 | 226 (5.6 \%) | 226 (5.6 \%)                     |
| Epilepsy                  | 30 (29.7 \%)                      | 64 (63.4 \%)                   | 1.58 (0.95–2.63) | 7 (6.9 \%)                      | 1.34 (0.95–1.89) |
| No                        | 1346 (34.0 \%)                    | 2387 (60.3 \%)                 | 222 (5.6 \%) | 222 (5.6 \%)                     |
| Heart/circulatory problem | 446 (32.3 \%)                     | 855 (62.0 \%)                  | 0.84 (0.71–0.99) | 79 (5.7 \%)                     | 1.00 (0.99–1.01) |
| No                        | 930 (34.7 \%)                     | 1596 (59.6 \%)                 | 151 (5.6 \%) | 151 (5.6 \%)                     |
| Learning/behavioural problem | 9 (30.0 \%)                      | 19 (63.3 \%)                   | 2.68 (0.93–7.67) | 2 (6.7 \%)                      | 1.67 (0.32–8.82) |
| No                        | 1367 (34.0 \%)                    | 2432 (60.4 \%)                 | 228 (5.7 \%) | 228 (5.7 \%)                     |
| Mental health problem     | 188 (42.4 \%)                     | 220 (49.7 \%)                  | 1.05 (0.81–1.35) | 35 (7.9 \%)                     | 0.74 (0.46–1.18) |
| No                        | 1188 (32.9 \%)                    | 2231 (61.7 \%)                 | 195 (5.4 \%) | 195 (5.4 \%)                     |
| Disability: arms, hands   | 168 (35.2 \%)                     | 280 (58.6 \%)                  | 30 (6.3 \%)  | 0.98 (0.60–1.59)                 |
| No                        | 1208 (33.8 \%)                    | 2171 (61.7 \%)                 | 200 (5.6 \%) | 200 (5.6 \%)                     |
| Disability: legs, feet    | 326 (29.3 \%)                     | 724 (65.2 \%)                  | 1.27 (1.07–1.51) | 61 (5.5 \%)                     | 1.15 (0.81–1.65) |
| No                        | 1050 (35.6 \%)                    | 1727 (58.6 \%)                 | 169 (5.7 \%) | 169 (5.7 \%)                     |
| Disability: neck, back    | 217 (30.4 \%)                     | 457 (63.9 \%)                  | 1.30 (1.06–1.59) | 41 (5.7 \%)                     | 0.96 (0.63–1.46) |
| No                        | 1159 (34.7 \%)                    | 1994 (59.7 \%)                 | 189 (5.7 \%) | 189 (5.7 \%)                     |
| Severe disfigurement, skin condition or allergies | 27 (34.6 \%)                     | 43 (55.1 \%)                   | 1.15 (0.67–1.97) | 8 (10.3 \%)                     | 2.00 (0.87–4.60) |
| No                        | 1349 (33.9 \%)                    | 2408 (60.5 \%)                 | 222 (5.6 \%) | 222 (5.6 \%)                     |
| Severe stomach, liver, kidney or digestive problems | 123 (36.7 \%)                     | 200 (59.7 \%)                  | 1.00 (0.77–1.31) | 12 (3.6 \%)                     | 0.55 (0.28–1.07) |
| No                        | 1253 (33.7 \%)                    | 2251 (60.5 \%)                 | 218 (5.9 \%) | 218 (5.9 \%)                     |
| Some other progressive disability or illness | 75 (31.4 \%)                      | 154 (64.4 \%)                  | 1.22 (0.87–1.70) | 10 (4.2 \%)                     | 0.81 (0.38–1.72) |
| No                        | 1301 (34.1 \%)                    | 2297 (60.2 \%)                 | 220 (5.8 \%) | 220 (5.8 \%)                     |
| Some other health problem or disability | 185 (35.3 \%)                     | 311 (59.4 \%)                  | 0.92 (0.74–1.14) | 28 (5.3 \%)                     | 0.90 (0.58–1.41) |
| No                        | 1191 (33.7 \%)                    | 2140 (60.6 \%)                 | 202 (5.7 \%) | 202 (5.7 \%)                     |
| Arthritis                 | 393 (33.1 \%)                     | 735 (62.0 \%)                  | 0.86 (0.73–1.02) | 58 (4.9 \%)                     | 0.96 (0.67–1.39) |
| No                        | 983 (34.2 \%)                     | 1716 (59.8 \%)                 | 172 (6.0 \%) | 172 (6.0 \%)                     |

Adjusted for age and sex and ever harassment
### Table 5  Associations between health conditions and perception on library facilities in Scottish adults aged 16–80

| Condition                                | Satisfaction (n = 7769, 55.4 %) | Neutral (n = 5883, 42.0 %) | RRR (95 % CI) | Dissatisfaction (n = 368, 2.6 %) | RRR (95 % CI) |
|------------------------------------------|---------------------------------|-----------------------------|---------------|----------------------------------|---------------|
| Speech impairment                        | 13 (31.0 %)                     | 29 (69.1 %)                 | 3.34 (1.61–6.93) | 0 (0 %)                          | N/a           |
| No                                       | 2114 (52.7 %)                   | 1793 (44.7 %)               | 108 (2.7 %)    |                                  |               |
| Chest/breathing problem                  | 361 (49.3 %)                    | 353 (48.2 %)                | 11.1 (0.93–1.34) | 19 (2.6 %)                       | 0.89 (0.51–1.57) |
| No                                       | 1766 (53.1 %)                   | 1469 (44.2 %)               | 89 (2.7 %)     |                                  |               |
| Diabetes                                 | 259 (52.8 %)                    | 218 (44.4 %)                | 0.99 (0.80–1.23) | 14 (2.9 %)                       | 0.70 (0.33–1.47) |
| No                                       | 1868 (52.4 %)                   | 1604 (45.0 %)               | 94 (2.6 %)     |                                  |               |
| Difficulty hearing                       | 157 (47.9 %)                    | 166 (50.6 %)                | 1.14 (0.88–1.48) | 5 (1.5 %)                        | 0.69 (0.27–1.75) |
| No                                       | 1970 (52.8 %)                   | 1656 (44.4 %)               | 103 (2.8 %)    |                                  |               |
| Difficulty seeing                        | 141 (43.4 %)                    | 169 (52.0 %)                | 1.44 (1.10–1.88) | 15 (4.6 %)                       | 2.54 (1.38–4.66) |
| No                                       | 1986 (53.2 %)                   | 1653 (24.3 %)               | 93 (2.5 %)     |                                  |               |
| Dyslexia                                 | 11 (35.5 %)                     | 17 (54.8 %)                 | 1.79 (0.78–4.14) | 3 (9.7 %)                        | 2.95 (0.62–14.03) |
| No                                       | 2166 (52.6 %)                   | 1805 (44.8 %)               | 105 (2.6 %)    |                                  |               |
| Epilepsy                                 | 42 (41.6 %)                     | 57 (56.4 %)                 | 1.79 (1.13–2.86) | 2 (2.0 %)                        | 0.98 (0.23–4.19) |
| No                                       | 2085 (52.7 %)                   | 1765 (44.6 %)               | 106 (2.7 %)    |                                  |               |
| Heart/circulatory problem                | 738 (53.5 %)                    | 602 (43.6 %)                | 0.87 (0.74–1.01) | 40 (2.9 %)                       | 1.35 (0.87–2.10) |
| No                                       | 1389 (51.9 %)                   | 1220 (45.6 %)               | 68 (2.5 %)     |                                  |               |
| Learning/behavioural problem             | 12 (40.0 %)                     | 15 (50.0 %)                 | 1.70 (0.66–4.34) | 3 (10.0 %)                       | 3.91 (0.79–19.39) |
| No                                       | 2115 (52.5 %)                   | 1807 (44.9 %)               | 105 (2.6 %)    |                                  |               |
| Mental health problem                    | 240 (54.2 %)                    | 187 (42.2 %)                | 1.03 (0.81–1.33) | 16 (3.6 %)                       | 1.07 (0.57–2.01) |
| No                                       | 1887 (52.2 %)                   | 1635 (45.2 %)               | 92 (2.6 %)     |                                  |               |
| Disability: arms, hands                  | 1872 (52.3 %)                   | 1612 (45.0 %)               | 1.03 (0.83–1.28) | 95 (2.7 %)                       | 1.06 (0.57–1.98) |
| No                                       | 255 (53.4 %)                    | 210 (43.9 %)                | 13 (2.7 %)     |                                  |               |
| Disability: legs, feet                   | 559 (50.3 %)                    | 526 (47.3 %)                | 1.13 (0.97–1.33) | 26 (2.3 %)                       | 0.83 (0.51–1.36) |
| No                                       | 1568 (53.2 %)                   | 1296 (44.0 %)               | 82 (2.8 %)     |                                  |               |
| Disability: neck, back                   | 375 (52.5 %)                    | 315 (44.1 %)                | 0.98 (0.82–1.18) | 25 (3.5 %)                       | 1.27 (0.78–2.08) |
| No                                       | 1752 (52.4 %)                   | 1507 (45.1 %)               | 83 (2.5 %)     |                                  |               |
| Severe disfigurement, skin condition or allergies | 47 (60.3 %) | 30 (38.5 %) | 0.80 (0.49–1.31) | 1 (1.3 %) | 0.40 (0.05–2.93) |
| No                                       | 2080 (52.3 %)                   | 1792 (45.0 %)               | 107 (2.7 %)    |                                  |               |
| Severe stomach, liver, kidney or digestive problems | 178 (53.1 %) | 147 (43.9 %) | 1.02 (0.79–1.32) | 10 (3.0 %) | 1.19 (0.60–2.35) |
| No                                       | 1949 (52.4 %)                   | 1675 (45.0 %)               | 98 (2.6 %)     |                                  |               |
| Some other progressive disability or illness | 130 (54.4 %) | 101 (42.3 %) | 0.99 (0.72–1.35) | 8 (3.4 %) | 1.43 (0.67–3.06) |
| No                                       | 1997 (52.3 %)                   | 1721 (45.1 %)               | 100 (2.6 %)    |                                  |               |
| Some other health problem or disability | 1850 (52.4 %)                   | 1587 (44.9 %)               | 1.11 (0.90–1.36) | 96 (2.7 %)                       | 0.86 (0.46–1.60) |
| No                                       | 277 (52.9 %)                    | 235 (44.9 %)                | 12 (2.3 %)     |                                  |               |
| Arthritis                                | 1495 (52.1 %)                   | 1297 (45.2 %)               | 0.88 (0.75–1.03) | 79 (2.8 %)                       | 0.83 (0.51–1.33) |
| No                                       | 632 (53.3 %)                    | 525 (44.3 %)                | 29 (2.5 %)     |                                  |               |

Adjusted for age and sex and ever harassment

### Variables and analyses

Self-reported health conditions included arthritis, speech impairment, chest or breathing problems; diabetes; difficulty hearing; difficulty seeing (even when wearing glasses/lenses); dyslexia; epilepsy; heart, blood pressure or circulatory problems; learning or behavioural problems; mental health problems; problems or disability related to arms, hands, legs, feet, back or neck; severe disfigurement, skin condition, allergies stomach, liver, kidney or digestive problem; some other progressive disability or illness or some other health problem or disability (Question: Which of the conditions listed on this card best describes the...
ill-health or disability that the person has?). Study outcome variables included perception toward the way local agency dealing with neighbourhood issues, sports/leisure facilities, library facilities, museum/gallery facilities, theatre facilities, parks and open space, local health services, police service, fire service, refuse collection, local schools, social care or social work services, public transport and street cleaning (Question: Overall, how satisfied or dissatisfied are you with each of these services?). Potential covariates including age, sex and experience of harassment were adjusted. Effects were estimated by using odds ratios (OR) or relative risk ratios (RRR) and 95 % confidence intervals (CI) depending on the study outcome variables being binary or categorical, with \( P < 0.05 \) considered statistically significant. Statistical software STATA version 13.0 (STATA, College Station, Texas, USA) was used to perform all the analyses.

| Health Condition | Satisfaction \((n = 5629, 40.2 \%)\) | Neutral \((n = 7906, 56.4 \%)\) | RRR \((95 \% CI)\) | Dissatisfaction \((n = 485, 3.5 \%)\) | RRR \((95 \% CI)\) |
|------------------|---------------------------------|----------------------------|-----------------|---------------------------------|-----------------|
| Speech impairment| 11 (26.2 \%)                    | 30 (71.4 \%)              | 1.95 (0.89–4.31) | 1 (2.4 \%)                      | 1.26 (0.16–10.19) |
| No               | 1347 (33.6 \%)                  | 2547 (63.4 \%)            | 121 (3.0 \%)    |                                 |                  |
| Chest/breathing problem | 245 (33.4 \%)                       | 467 (63.7 \%)            | 0.95 (0.79–1.16) | 21 (2.9 \%)                      | 0.90 (0.52–1.55) |
| No               | 1113 (33.5 \%)                  | 2110 (63.5 \%)            | 101 (3.5 \%)    |                                 |                  |
| Diabetes         | 181 (36.9 \%)                   | 294 (59.9 \%)             | 0.80 (0.64–0.99) | 16 (3.3 \%)                      | 0.75 (0.39–1.45) |
| No               | 1177 (33.0 \%)                  | 2283 (64.0 \%)            | 106 (3.0 \%)    |                                 |                  |
| Difficulty hearing | 97 (29.6 \%)                        | 221 (67.4 \%)             | 1.11 (0.84–1.47) | 10 (3.1 \%)                      | 1.26 (0.60–2.61) |
| No               | 1261 (33.8 \%)                  | 2356 (63.2 \%)            | 112 (3.0 \%)    |                                 |                  |
| Difficulty seeing | 91 (28.0 \%)                        | 220 (67.7 \%)             | 1.35 (1.01–1.81) | 14 (4.3 \%)                      | 2.23 (1.18–4.21) |
| No               | 1267 (34.0 \%)                  | 2357 (63.2 \%)            | 108 (2.9 \%)    |                                 |                  |
| Dyslexia         | 14 (45.2 \%)                    | 15 (48.4 \%)              | 0.49 (0.21–1.13) | 2 (6.5 \%)                       | 1.52 (0.33–7.00) |
| No               | 1344 (33.4 \%)                  | 2562 (63.2 \%)            | 120 (3.0 \%)    |                                 |                  |
| Epilepsy         | 33 (32.7 \%)                    | 67 (66.3 \%)              | 1.27 (0.78–2.07) | 1 (1.0 \%)                       | N/a              |
| No               | 1325 (33.5 \%)                  | 2510 (63.5 \%)            | 121 (3.1 \%)    |                                 |                  |
| Heart/circulatory problem | 444 (32.2 \%)                        | 888 (64.4 \%)             | 1.02 (0.87–1.20) | 48 (3.5 \%)                      | 1.31 (0.85–2.03) |
| No               | 914 (34.1 \%)                   | 1689 (63.1 \%)            | 74 (2.8 \%)     |                                 |                  |
| Learning/behavioural problem | 3 (10.0 \%)                        | 27 (90.0 \%)              | 6.02 (1.39–26.13) | 0 (0 \%)                        | N/a              |
| No               | 1355 (33.7 \%)                  | 2550 (63.3 \%)            | 122 (3.0 \%)    |                                 |                  |
| Mental health problem | 153 (34.5 \%)                        | 279 (63.0 \%)             | 1.11 (0.86–1.43) | 11 (2.5 \%)                      | 0.61 (0.29–1.30) |
| No               | 1205 (33.3 \%)                  | 2298 (63.6 \%)            | 111 (3.1 \%)    |                                 |                  |
| Disability: arms, hands | 153 (32.0 \%)                        | 303 (63.4 \%)             | 1.18 (0.93–1.49) | 22 (4.6 \%)                      | 1.98 (1.16–3.38) |
| No               | 1205 (33.7 \%)                  | 2274 (63.5 \%)            | 100 (2.8 \%)    |                                 |                  |
| Disability: legs, feet | 333 (30.0 \%)                        | 740 (66.6 \%)             | 1.22 (1.03–1.44) | 38 (3.4 \%)                      | 1.71 (1.11–2.63) |
| No               | 1025 (34.8 \%)                  | 1837 (62.4 \%)            | 84 (2.9 \%)     |                                 |                  |
| Disability: neck, back | 232 (32.5 \%)                        | 456 (63.8 \%)             | 1.14 (0.93–1.38) | 27 (3.8 \%)                      | 1.49 (0.92–2.43) |
| No               | 1126 (33.7 \%)                  | 2121 (63.5 \%)            | 95 (2.8 \%)     |                                 |                  |
| Severe disfigurement, skin condition or allergies | 30 (38.5 \%)                        | 46 (59.0 \%)              | 0.94 (0.57–1.56) | 2 (2.6 \%)                       | 0.83 (0.19–3.59) |
| No               | 1328 (33.4 \%)                  | 2531 (63.6 \%)            | 120 (3.0 \%)    |                                 |                  |
| Severe stomach, liver, kidney or digestive problems | 116 (34.6 \%)                        | 212 (63.3 \%)             | 1.02 (0.78–1.33) | 7 (2.1 \%)                       | 0.54 (0.21–1.36) |
| No               | 1242 (33.4 \%)                  | 2365 (63.5 \%)            | 115 (3.1 \%)    |                                 |                  |
| Some other progressive disability or illness | 87 (36.4 \%)                         | 147 (61.5 \%)             | 0.87 (0.63–1.19) | 5 (2.1 \%)                       | 0.78 (0.31–1.98) |
| No               | 1271 (33.3 \%)                  | 2430 (63.7 \%)            | 117 (3.1 \%)    |                                 |                  |
| Some other health problem or disability | 173 (33.0 \%)                         | 336 (64.1 \%)             | 1.12 (0.90–1.39) | 15 (2.9 \%)                      | 1.12 (0.63–2.00) |
| No               | 1185 (33.5 \%)                  | 2241 (63.4 \%)            | 107 (3.0 \%)    |                                 |                  |
| Arthritis        | 399 (33.6 \%)                   | 753 (63.5 \%)             | 0.96 (0.82–1.14) | 34 (2.9 \%)                      | 1.00 (0.63–1.59) |
| No               | 959 (33.4 \%)                   | 1824 (63.5 \%)            | 88 (3.1 \%)     |                                 |                  |

Adjusted for age and sex and ever harassment
Ethics consideration

Since there is only secondary data analyses employed without any participant personal information identified by extracting statistical data from the UK Data Archive website in the present study, no further ethics approval for conducting the present study is required (more details via http://www.ethicsguidebook.ac.uk/Secondary-analysis-106).

Results

Descriptive statistics

Of 19,150 Scottish adults (aged 16–80) included in the study cohort, 1079 (7.7%) people were dissatisfied with their living areas; particularly for those who had experienced harassment (15.4% of all adults), did not do recycling or with dyslexia, chest, digestive, mental

Table 7  Associations between health conditions and perception on theatre facilities in Scottish adults aged 16–80

| Health Condition | Satisfaction (n = 5789, 41.3%) | Neutral (n = 7630, 54.4%) | Dissatisfaction (n = 601, 4.3%) |
|------------------|---------------------------------|-----------------------------|------------------------------|
| Speech impairment | 12 (28.6%)                     | 30 (71.4%)                  | 1.71 (0.80–3.65)             |
| No               | 1383 (34.5%)                   | 2506 (62.4%)                | 126 (3.1%)                  |
| Chest/breathing problem | 232 (31.7%)             | 480 (65.5%)                  | 1.17 (0.96–1.42)             |
| No               | 1163 (35.0%)                   | 2056 (61.9%)                | 105 (3.2%)                  |
| Diabetes         | 187 (38.1%)                    | 290 (59.1%)                  | 0.84 (0.67–1.05)             |
| No               | 1208 (33.9%)                   | 2246 (63.0%)                | 112 (3.1%)                  |
| Difficulty hearing | 103 (31.4%)                  | 217 (66.2%)                 | 1.05 (0.80–1.38)             |
| No               | 1292 (34.7%)                   | 2319 (62.2%)                | 118 (3.2%)                  |
| Difficulty seeing | 105 (32.3%)                   | 208 (64.0%)                 | 1.04 (0.79–1.36)             |
| No               | 1290 (34.6%)                   | 2328 (62.4%)                | 114 (3.1%)                  |
| Dyslexia         | 8 (25.8%)                      | 18 (58.1%)                  | 1.07 (0.42–2.71)             |
| No               | 1387 (34.5%)                   | 2518 (62.5%)                | 121 (3.0%)                  |
| Epilepsy         | 27 (26.7%)                     | 72 (71.3%)                  | 1.80 (1.06–3.05)             |
| No               | 1368 (34.6%)                   | 2464 (62.3%)                | 124 (3.1%)                  |
| Heart/circulatory problem | 492 (35.7%)            | 846 (81.3%)                  | 0.83 (0.71–0.97)             |
| No               | 903 (33.7%)                    | 1690 (63.1%)                | 84 (3.1%)                   |
| Learning/behavioural problem | 2 (6.7%)                   | 28 (93.3%)                  | 10.90 (1.45–81.82)           |
| No               | 1393 (34.6%)                   | 2508 (62.3%)                | 126 (3.1%)                  |
| Mental health problem | 140 (31.6%)             | 290 (65.5%)                  | 1.26 (0.97–1.64)             |
| No               | 1255 (34.7%)                   | 2246 (62.2%)                | 113 (3.1%)                  |
| Disability: arms, hands | 148 (31.0%)                | 312 (65.3%)                  | 1.39 (1.09–1.76)             |
| No               | 1247 (34.8%)                   | 2224 (62.1%)                | 108 (3.0%)                  |
| Disability: legs, feet | 349 (31.4%)                | 732 (65.9%)                  | 1.30 (1.10–1.54)             |
| No               | 1046 (35.5%)                   | 1804 (61.2%)                | 96 (3.3%)                   |
| Disability: neck, back | 232 (32.5%)                 | 460 (64.3%)                  | 1.28 (1.05–1.56)             |
| No               | 1163 (34.8%)                   | 2076 (62.1%)                | 103 (3.1%)                  |
| Severe disfigurement, skin condition or allergies | 29 (37.2%) | 47 (60.3%) | 0.95 (0.58–1.58) |
| No               | 1366 (34.3%)                   | 2489 (62.6%)                | 124 (3.1%)                  |
| Severe stomach, liver, kidney or digestive problems | 120 (35.8%) | 208 (62.1%) | 0.98 (0.75–1.27) |
| No               | 1275 (34.3%)                   | 2328 (62.6%)                | 119 (3.2%)                  |
| Some other progressive disability or illness | 82 (34.3%) | 148 (61.9%) | 1.02 (0.74–1.40) |
| No               | 1313 (34.4%)                   | 2388 (62.6%)                | 117 (3.1%)                  |
| Some other health problem or disability | 185 (35.3%) | 324 (61.8%) | 0.95 (0.77–1.17) |
| No               | 1210 (34.3%)                   | 2212 (62.2%)                | 111 (3.1%)                  |
| Arthritis        | 435 (36.7%)                    | 715 (60.3%)                 | 0.88 (0.74–1.03)             |
| No               | 960 (33.4%)                    | 1821 (63.4%)                | 90 (3.1%)                   |

Adjusted for age and sex and ever harassment
and musculoskeletal problems. 20–40% reported common neighbourhood problems including noise, rubbish, disputes, graffiti, harassment and drug misuse (see Table 1). Women or people with a younger age could be more dissatisfied with their neighbourhoods, compared with their counterparts. Geographically, the top 3 sub-regions with higher proportion of dissatisfaction with neighbourhoods are Greater Glasgow and Cly (11.2%), Lanarkshire (9.1%) and Forth Valley (8.2%).

**Table 8**  Associations between health conditions and perception on parks and open space in Scottish adults aged 16–80

| Health Condition                     | Satisfaction (n = 9014, 64.3%) | Neutral (n = 4073, 29.1%) | RRR (95% CI)       | Dissatisfaction (n = 933, 6.7%) | RRR (95% CI) |
|--------------------------------------|---------------------------------|---------------------------|---------------------|---------------------------------|--------------|
| Speech impairment                    | 21 (50.0%)                      | 19 (45.2%)                | 1.52 (0.77–3.00)    | 2 (4.8%)                        | 1.00 (0.23–4.36) |
| No                                   | 2225 (55.4%)                    | 1549 (38.6%)              |                     | 241 (6.0%)                      |              |
| Chest/breathing problem              | 377 (51.4%)                     | 1261 (37.9%)              | 1.14 (0.94–1.38)    | 49 (6.7%)                       | 1.26 (0.88–1.82) |
| No                                   | 1869 (56.2%)                    | 3077 (41.9%)              |                     | 194 (5.8%)                      |              |
| Diabetes                             | 2724 (55.8%)                    | 189 (38.5%)               | 0.95 (0.76–1.20)    | 28 (5.7%)                       | 1.02 (0.64–1.62) |
| No                                   | 1972 (55.3%)                    | 1379 (38.7%)              |                     | 215 (6.0%)                      |              |
| Difficulty hearing                   | 159 (48.5%)                     | 152 (46.3%)               | 1.08 (0.82–1.41)    | 17 (5.2%)                       | 1.18 (0.68–2.04) |
| No                                   | 2087 (56.0%)                    | 1416 (38.0%)              |                     | 226 (6.1%)                      |              |
| Difficulty seeing                    | 157 (48.3%)                     | 146 (44.9%)               | 1.30 (0.99–1.70)    | 22 (6.8%)                       | 1.41 (0.83–2.37) |
| No                                   | 2089 (56.0%)                    | 1422 (38.1%)              |                     | 221 (5.9%)                      |              |
| Dyslexia                             | 20 (64.5%)                      | 10 (32.3%)                | 0.97 (0.40–2.40)    | 1 (3.2%)                        | 0.43 (0.06–3.28) |
| No                                   | 2226 (55.3%)                    | 1558 (38.7%)              |                     | 242 (6.0%)                      |              |
| Epilepsy                             | 58 (57.4%)                      | 35 (34.7%)                | 1.19 (0.73–1.94)    | 8 (7.9%)                        | 0.89 (0.34–2.28) |
| No                                   | 2188 (55.3%)                    | 1533 (38.8%)              |                     | 235 (5.9%)                      |              |
| Heart/circulatory problem            | 749 (54.3%)                     | 539 (39.1%)               | 0.87 (0.74–1.02)    | 92 (6.7%)                       | 1.44 (1.05–1.98) |
| No                                   | 1497 (55.9%)                    | 1029 (38.4%)              |                     | 151 (5.6%)                      |              |
| Learning/behavioural problem         | 14 (46.7%)                      | 13 (43.3%)                | 1.55 (0.59–4.08)    | 3 (10.0%)                       | 1.41 (0.3–6.53) |
| No                                   | 2232 (55.4%)                    | 1555 (38.6%)              |                     | 240 (6.0%)                      |              |
| Mental health problem                | 263 (59.4%)                     | 136 (30.7%)               | 1.07 (0.82–1.41)    | 44 (9.9%)                       | 1.24 (0.81–1.90) |
| No                                   | 1983 (54.9%)                    | 1432 (39.6%)              |                     | 199 (5.5%)                      |              |
| Disability: arms, hands              | 258 (54.0%)                     | 182 (38.1%)               | 1.07 (0.84–1.34)    | 38 (8.0%)                       | 1.47 (0.98–2.22) |
| No                                   | 1988 (55.6%)                    | 1386 (38.7%)              |                     | 205 (5.7%)                      |              |
| Disability: legs, feet               | 554 (59.9%)                     | 490 (44.1%)               | 1.30 (1.10–1.53)    | 67 (6.0%)                       | 1.23 (0.89–1.71) |
| No                                   | 1692 (57.4%)                    | 1078 (36.6%)              |                     | 176 (6.0%)                      |              |
| Disability: neck, back               | 384 (53.7%)                     | 288 (40.3%)               | 1.21 (1.00–1.47)    | 43 (6.0%)                       | 1.07 (0.74–1.56) |
| No                                   | 1862 (55.7%)                    | 1280 (38.3%)              |                     | 200 (6.0%)                      |              |
| Severe disfigurement, skin condition or allergies | 42 (53.9%) | 29 (37.2%) | 1.11 (0.66–1.87) | 7 (9.0%) | 1.63 (0.71–3.73) |
| No                                   | 2204 (55.4%)                    | 1539 (38.7%)              |                     | 236 (5.9%)                      |              |
| Severe stomach, liver, kidney or digestive problems | 173 (51.6%) | 132 (39.4%) | 1.20 (0.92–1.58) | 30 (9.0%) | 1.71 (1.09–2.67) |
| No                                   | 2073 (55.7%)                    | 1436 (38.6%)              |                     | 213 (5.7%)                      |              |
| Some other progressive disability or illness | 127 (53.1%) | 98 (41.0%) | 1.19 (0.87–1.63) | 14 (5.9%) | 0.68 (0.32–1.43) |
| No                                   | 2119 (55.5%)                    | 1470 (38.5%)              |                     | 229 (6.0%)                      |              |
| Some other health problem or disability | 300 (57.3%) | 195 (37.2%) | 0.90 (0.73–1.12) | 29 (5.5%) | 0.79 (0.51–1.23) |
| No                                   | 1946 (55.1%)                    | 1373 (38.9%)              |                     | 214 (6.1%)                      |              |
| Arthritis                            | 628 (53.0%)                     | 474 (40.0%)               | 0.93 (0.79–1.10)    | 84 (7.1%)                       | 1.34 (0.97–1.85) |
| No                                   | 1618 (56.4%)                    | 1094 (38.1%)              |                     | 159 (5.5%)                      |              |

Adjusted for age and sex and ever harassment

**Analytical statistics**

In Table 2, associations between existing health conditions and perception toward the way that the local agency dealt with neighbourhood issues are shown while in Tables 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, associations between existing health conditions and perception toward specific neighbourhood facilities are presented accordingly. In general, people with heart or digestive problems were more dissatisfied with the existing parks and open...
Table 9  Associations between health conditions and perception on refuse collection in Scottish adults aged 16–80

| Condition                              | Satisfaction (n = 11,332, 80.8 %) | Neutral (n = 938, 6.7 %) | RRR (95 % CI) | Dissatisfaction (n = 1748, 12.5 %) | RRR (95 % CI) |
|----------------------------------------|-------------------------------------|--------------------------|---------------|------------------------------------|---------------|
| Speech impairment                      | 34 (81.0 %)                         | 4 (9.5 %)                | 1.82 (0.63–5.24 | 4 (9.5 %)                          | 1.17 (0.40–3.39) |
| No                                     | 3359 (83.7 %)                       | 258 (6.4 %)              | 0.79 (0.53–1.19 | 398 (9.9 %)                        |               |
| Chest/breathing problem                | 608 (83.0 %)                        | 35 (4.8 %)               | 0.79 (0.53–1.19 | 90 (12.3 %)                        | 1.46 (1.09–1.94) |
| No                                     | 2785 (83.8 %)                       | 227 (6.8 %)              | 1.00 (0.63–1.57 | 312 (9.4 %)                        |               |
| Diabetes                               | 409 (83.3 %)                        | 28 (5.7 %)               | 0.97 (0.55–1.71 | 348 (9.8 %)                        |               |
| No                                     | 2984 (83.7 %)                       | 234 (6.6 %)              |               | 374 (10.0 %)                       |               |
| Difficulty hearing                     | 283 (86.3 %)                        | 17 (5.2 %)               |               | 28 (8.5 %)                         | 0.93 (0.57–1.53) |
| No                                     | 3110 (83.4 %)                       | 245 (6.6 %)              |               |                                   |               |
| Difficulty seeing                      | 262 (80.6 %)                        | 20 (6.2 %)               | 1.00 (0.57–1.76 | 43 (13.2 %)                        | 1.73 (1.16–2.58) |
| No                                     | 3131 (83.9 %)                       | 242 (6.5 %)              |               | 359 (9.6 %)                        |               |
| Dyslexia                               | 26 (83.9 %)                         | 0 (0 %)                  | N/a           | 5 (16.1 %)                         | 0.39 (0.09–1.69) |
| No                                     | 3367 (83.6 %)                       | 262 (6.5 %)              |               | 397 (9.9 %)                        |               |
| Epilepsy                               | 80 (79.2 %)                         | 7 (6.9 %)                | 0.98 (0.41–2.31 | 14 (13.9 %)                        | 0.64 (0.29–1.44) |
| No                                     | 3313 (83.8 %)                       | 255 (6.5 %)              |               | 388 (9.8 %)                        |               |
| Heart/circulatory problem              | 1186 (85.9 %)                       | 73 (5.3 %)               | 0.92 (0.66–1.27 | 121 (8.8 %)                        | 1.10 (0.83–1.44) |
| No                                     | 2207 (82.4 %)                       | 189 (7.1 %)              |               | 281 (10.5 %)                       |               |
| Learning/behavioural problem           | 25 (83.3 %)                         | 3 (10.0 %)               | 1.06 (0.24–4.69 | 2 (6.7 %)                          | 0.27 (0.04–2.07) |
| No                                     | 3368 (83.6 %)                       | 259 (6.4 %)              |               | 400 (9.9 %)                        |               |
| Mental health problem                  | 334 (75.4 %)                        | 38 (8.6 %)               | 1.08 (0.69–1.69 | 71 (16.0 %)                        | 1.00 (0.70–1.42) |
| No                                     | 3059 (84.6 %)                       | 224 (6.2 %)              |               | 331 (9.2 %)                        |               |
| Disability: arms, hands                | 388 (81.2 %)                        | 41 (8.6 %)               | 1.34 (0.90–2.02 | 49 (10.3 %)                        | 1.05 (0.73–1.52) |
| No                                     | 3005 (84.0 %)                       | 221 (6.2 %)              |               | 353 (9.9 %)                        |               |
| Disability: legs, feet                 | 931 (83.8 %)                        | 82 (7.4 %)               | 1.18 (0.86–1.62 | 98 (8.8 %)                         | 0.95 (0.72–1.25) |
| No                                     | 2462 (83.6 %)                       | 180 (6.1 %)              |               | 304 (10.3 %)                       |               |
| Disability: neck, back                 | 598 (83.6 %)                        | 48 (6.7 %)               | 0.96 (0.66–1.40 | 69 (9.7 %)                         | 0.93 (0.68–1.28) |
| No                                     | 2795 (83.6 %)                       | 214 (6.4 %)              |               | 333 (10.0 %)                       |               |
| Severe disfigurement, skin condition or allergies | 65 (83.3 %) | 6 (7.7 %) | 0.82 (0.29–2.28 | 7 (9.0 %) | 0.75 (0.32–1.78) |
| No                                     | 3328 (83.6 %)                       | 256 (6.4 %)              |               | 395 (9.9 %)                        |               |
| Severe stomach, liver, kidney or digestive problems | 283 (84.5 %) | 15 (4.5 %) | 0.78 (0.45–1.37 | 37 (11.0 %) | 1.11 (0.74–1.66) |
| No                                     | 3110 (83.6 %)                       | 247 (6.6 %)              |               | 365 (9.8 %)                        |               |
| Some other progressive disability or illness | 192 (80.3 %) | 16 (6.7 %) | 0.88 (0.46–1.70 | 31 (13.0 %) | 1.15 (0.70–1.88) |
| No                                     | 3201 (83.8 %)                       | 246 (6.4 %)              |               | 371 (9.7 %)                        |               |
| Some other health problem or disability | 432 (82.4 %) | 34 (6.5 %) | 0.98 (0.65–1.49 | 58 (11.1 %) | 0.99 (0.71–1.40) |
| No                                     | 2961 (83.8 %)                       | 228 (6.5 %)              |               | 344 (9.7 %)                        |               |
| Arthritis                              | 987 (83.2 %)                        | 78 (6.6 %)               | 1.27 (0.92–1.75 | 121 (10.2 %)                       | 1.32 (1.01–1.74) |
| No                                     | 2406 (83.8 %)                       | 184 (6.4 %)              |               | 281 (9.8 %)                        |               |

Adjusted for age and sex and ever harassment

space. People with arthritis, chest or hearing problems were more dissatisfied with the refuse collection condition. People with dyslexia were more dissatisfied with the existing public transportation. People with heart problems were more dissatisfied with the current street cleaning condition. People with hearing, vision, speech, learning problems or dyslexia were also more dissatisfied with sports and recreational facilities.

In addition, people with vision (RRR, 1.80 (95 % CI, 1.02–3.19); P = 0.043) and legs (RRR, 1.69 (95 % CI, 1.18–2.42); P = 0.004) problem and possibly heart problem (RRR, 1.42 (95 % CI, 0.99–2.04); P = 0.056) were more dissatisfied with the community centres and facilities, compared with people without such health conditions (data now shown). People with vision (RRR, 1.36 (95 % CI, 1.02–1.80); P = 0.034) and neck (RRR, 1.36 (95 % CI, 1.11–1.66); P = 0.003) problem, other progressive illness (RRR, 1.43 (95 % CI, 1.03–2.00); P = 0.034), other disability (RRR, 1.36 (95 % CI, 1.01–1.81); P = 0.041) and possibly heart problem (RRR, 1.25 (95 % CI, 0.99–1.59); P = 0.059) were also more dissatisfied with the police service. Furthermore, people with vision (RRR, 1.43 (95 % CI, 1.10–1.85); P = 0.007) problem were dissatisfied with the local fire service.
Discussion

Waste management

Health hazards from waste management have been studied among waste management workers (Sigsgaard 1999). During sorting and recycling, there could be bioaerosol exposure (e.g. airborne bacteria, endotoxin etc.) revealed (Poulsen et al. 1995). The typical health risks are gastrointestinal symptoms, respiratory problems and irritation of the eyes and skin. In the present study, dissatisfaction among people with arthritis, chest or hearing problems was also observed. This might be as a result of local improper waste management leading to the impact on these people with the exciting health conditions or they have found it difficult/challenging for them to do refuse collection in the neighbourhood. Unfortunately, it is not possible to find out the real cause from the current limited dataset.

Public transportation

Although the relationship of traffic (congestion) and mental health could have been less studied, compared with

| Health condition | Satisfaction (n = 6292, 44.9 %) | Neutral (n = 7400, 52.8 %) | RRR (95 % CI) | Dissatisfaction (n = 325, 2.3 %) | RRR (95 % CI) |
|-----------------|-------------------------------|------------------------|-------------|-------------------------------|-------------|
| Speech impairment | 11 (26.2 %) | 31 (73.8 %) | 1.82 (0.87–3.80) | 0 (0 %) | N/a |
| No | 1493 (37.2 %) | 2433 (60.6 %) | 88 (2.2 %) | 23 (0.6 %) | N/a |
| Chest/breathing problem | 263 (35.9 %) | 453 (61.8 %) | 1.00 (0.83–1.21) | 17 (2.3 %) | 1.11 (0.60–2.02) |
| No | 1241 (37.4 %) | 2011 (60.5 %) | 71 (2.1 %) | 34 (1.1 %) | 0.93 (0.61–1.43) |
| Diabetes | 183 (37.3 %) | 302 (61.5 %) | 0.87 (0.69–1.08) | 6 (1.2 %) | 0.47 (0.17–1.31) |
| No | 1321 (37.1 %) | 2162 (60.7 %) | 82 (2.3 %) | 46 (1.5 %) | 0.65 (0.36–1.17) |
| Difficulty hearing | 101 (30.8 %) | 221 (67.4 %) | 1.17 (0.88–1.55) | 6 (1.8 %) | 1.43 (0.59–3.47) |
| No | 1403 (37.6 %) | 2243 (60.2 %) | 82 (2.2 %) | 54 (1.9 %) | 0.97 (0.88–1.09) |
| Difficulty seeing | 90 (27.7 %) | 229 (70.5 %) | 1.49 (1.11–1.98) | 6 (1.9 %) | 0.98 (0.35–2.79) |
| No | 1414 (37.9 %) | 2235 (59.9 %) | 82 (2.2 %) | 53 (1.9 %) | 0.97 (0.88–1.09) |
| Dyslexia | 6 (19.4 %) | 23 (74.2 %) | 3.91 (1.42–10.77) | 2 (6.5 %) | 5.37 (0.98–29.40) |
| No | 1498 (37.2 %) | 2441 (60.7 %) | 86 (2.1 %) | 42 (1.5 %) | 2.15 (0.92–5.02) |
| Epilepsy | 35 (34.7 %) | 60 (59.4 %) | 1.26 (0.77–2.05) | 6 (5.9 %) | 2.59 (0.95–7.08) |
| No | 1469 (37.1 %) | 2404 (60.8 %) | 82 (2.1 %) | 55 (2.1 %) | 1.67 (0.86–3.25) |
| Heart/circulatory problem | 503 (36.5 %) | 855 (62.0 %) | 0.82 (0.70–0.96) | 22 (1.6 %) | 0.79 (0.45–1.38) |
| No | 101 (37.4 %) | 1609 (61.1 %) | 66 (2.5 %) | 42 (1.6 %) | 1.40 (0.68–2.89) |
| Learning/behavioural problem | 10 (33.3 %) | 20 (66.7 %) | 1.53 (0.61–3.83) | 0 (0 %) | N/a |
| No | 1494 (37.1 %) | 2444 (60.7 %) | 88 (2.2 %) | 56 (2.2 %) | 1.40 (0.68–2.89) |
| Mental health problem | 177 (40.0 %) | 252 (56.9 %) | 1.40 (1.09–1.81) | 14 (3.2 %) | 0.70 (0.34–1.36) |
| No | 1327 (36.7 %) | 2212 (61.2 %) | 74 (2.1 %) | 40 (1.5 %) | 0.88 (0.50–1.55) |
| Disability: arms, hands | 175 (36.6 %) | 288 (60.3 %) | 1.05 (0.83–1.32) | 15 (3.1 %) | 1.81 (0.98–3.35) |
| No | 1329 (37.1 %) | 2176 (60.8 %) | 73 (2.0 %) | 40 (1.5 %) | 0.88 (0.50–1.55) |
| Disability: legs, feet | 386 (34.7 %) | 694 (62.5 %) | 1.04 (0.88–1.23) | 31 (2.8 %) | 2.03 (1.24–3.32) |
| No | 1118 (38.0 %) | 1770 (60.1 %) | 57 (1.9 %) | 34 (1.2 %) | 1.67 (0.86–3.25) |
| Disability: neck, back | 279 (39.0 %) | 411 (57.5 %) | 0.94 (0.78–1.14) | 25 (3.5 %) | 1.91 (0.95–2.73) |
| No | 1225 (36.7 %) | 2033 (61.5 %) | 63 (1.9 %) | 41 (1.5 %) | 1.67 (0.86–3.25) |
| Severe disfigurement, skin condition or allergies | 28 (35.9 %) | 44 (56.4 %) | 1.06 (0.63–1.78) | 6 (7.7 %) | 3.98 (1.55–10.23) |
| No | 1476 (37.1 %) | 2420 (60.8 %) | 82 (2.1 %) | 55 (2.2 %) | 1.40 (0.68–2.89) |
| Severe stomach, liver, kidney or digestive problems | 128 (38.2 %) | 197 (58.8 %) | 0.96 (0.74–1.25) | 10 (3.0 %) | 1.36 (0.65–2.83) |
| No | 1376 (37.0 %) | 2267 (60.9 %) | 78 (2.1 %) | 52 (1.9 %) | 1.40 (0.68–2.89) |
| Some other progressive disability or illness | 84 (35.2 %) | 149 (62.3 %) | 1.11 (0.81–1.54) | 6 (2.5 %) | 1.16 (0.45–3.02) |
| No | 1420 (37.2 %) | 2315 (60.7 %) | 82 (2.2 %) | 54 (2.0 %) | 1.40 (0.68–2.89) |
| Some other health problem or disability | 212 (40.5 %) | 296 (56.6 %) | 0.80 (0.65–0.99) | 15 (2.9 %) | 1.07 (0.57–2.00) |
| No | 1292 (36.6 %) | 2168 (61.4 %) | 73 (2.1 %) | 62 (2.4 %) | 1.30 (0.76–2.21) |
| Arthritis | 417 (35.2 %) | 742 (62.6 %) | 0.95 (0.80–1.11) | 26 (2.2 %) | 1.30 (0.76–2.21) |
| No | 1087 (37.9 %) | 1722 (60.0 %) | 62 (2.2 %) | 54 (2.0 %) | 1.40 (0.68–2.89) |

Adjusted for age and sex and ever harassment
other neighbourhood risks such as air quality, crime, noise etc., a few community studies have observed that transport team members had higher incident mental health episodes while there was observed an association between high vehicle traffic density in residential area and reduced quality of life and mental health in women across several countries as well (Tvaryanas and Maupin 2014; Gundersen et al. 2013; Yamazaki et al. 2005). Primary school children could have suffered from transportation noise resulting in neuro-behavioural conditions (van Kempen et al. 2010). People with dyslexia could have been further impacted by the lack of clear aid in the public space leading to long time frustration in streets (Bentzen et al. 2007; Brachacki et al. 1995) or the loss of driving ability to adapt the rapid changing environments on roads (Sigmundsson 2005; Groeger and Maguire 1996). Following these observations and the results from the present study, a universal public transportation development plan to include the needs of people with dyslexia could be suggested.

### Table 11: Associations between health conditions and perception on public transportation in Scottish adults aged 16–80

| Health Condition                          | Satisfaction | Neutral | RRR (95% CI) | Dissatisfaction | RRR (95% CI) |
|------------------------------------------|--------------|---------|--------------|----------------|--------------|
| Speech impairment                        | 26 (61.9%)   | 13 (31.0%) | 1.56 (0.78–3.14) | 3 (7.1%) | 0.71 (0.21–2.40) |
| Chest/breathing problem                  | 2508 (62.5%) | 1027 (25.6%) | 0.93 (0.75–1.15) | 479 (11.9%) | 0.92 (0.69–1.23) |
| Diabetes                                 | 310 (63.1%)  | 128 (26.1%) | 1.01 (0.79–1.30) | 53 (10.8%) | 0.94 (0.66–1.33) |
| Difficulty hearing                       | 2224 (62.4%) | 912 (25.6%) | 1.07 (0.80–1.44) | 429 (12.0%) | 0.92 (0.59–1.43) |
| Difficulty seeing                        | 2334 (62.6%) | 946 (25.4%) | 1.14 (0.85–1.52) | 448 (12.0%) | 0.98 (0.64–1.51) |
| Dyslexia                                 | 2336 (62.6%) | 949 (25.4%) | 1.14 (0.85–1.52) | 446 (12.0%) | 0.98 (0.64–1.51) |
| Dyslexia (Stage 1)                       | 13 (41.9%)   | 7 (22.6%) | 1.35 (0.46–3.92) | 11 (35.5%) | 3.13 (1.27–7.73) |
| Dyslexia (Stage 2)                       | 2521 (62.6%) | 1033 (25.7%) | 1.35 (0.46–3.92) | 471 (11.7%) | 0.93 (0.46–1.88) |
| Epilepsy                                 | 59 (58.4%)   | 29 (28.7%) | 1.39 (0.83–2.33) | 13 (12.9%) | 0.93 (0.46–1.88) |
| Heart/circulatory problem                | 2475 (62.6%) | 1011 (25.6%) | 0.96 (0.81–1.14) | 469 (11.9%) | 0.86 (0.67–1.11) |
| Learning/behavioural problem             | 1656 (61.9%) | 680 (25.4%) | 1.14 (0.85–1.52) | 340 (12.7%) | 0.92 (0.67–1.11) |
| Mental health problem                    | 2515 (62.5%) | 1033 (25.7%) | 1.14 (0.85–1.52) | 478 (11.9%) | 0.92 (0.67–1.11) |
| Disability: arms, hands                  | 2250 (62.3%) | 944 (26.1%) | 1.55 (1.22–1.97) | 419 (11.6%) | 0.82 (0.56–1.20) |
| Disability: legs, feet                   | 2266 (63.3%) | 877 (24.5%) | 1.55 (1.22–1.97) | 435 (12.2%) | 0.82 (0.56–1.20) |
| Disability: neck, back                   | 1922 (65.3%) | 659 (22.4%) | 1.74 (1.46–2.08) | 364 (12.4%) | 1.02 (0.79–1.32) |
| Severe disfigurement, skin condition or allergies | 2117 (63.4%) | 839 (25.1%) | 1.24 (1.01–1.53) | 385 (11.5%) | 1.14 (0.86–1.51) |
| Severe stomach, liver, kidney or digestive problems | 52 (66.7%) | 19 (24.4%) | 0.95 (0.54–1.67) | 7 (9.0%) | 0.73 (0.32–1.63) |
| Adjusted for age and sex and ever harassment |

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It has been observed the links between air quality and health conditions such as heart disease, asthma and cancer (Ernst et al. 2003; Evans Kantrowitz 2002), in particular in populations with specific occupations (Biggi et al. 2008). In addition to regulating chemical emission from industry or buildings, a recent trial on intense street cleaning was found to be effective to lessen pollutants in public space and consequently health risk effects (Amato et al. 2010). Current urban design could have still ignored the complete consideration of well-functioning neighbourhoods (Jackson 2003). Such investment should therefore be put into environmental and social policies as to delay or prevent health problems that might deteriorate human capital in the long run.

**Strengths and limitations**

The present study has a number of strengths. Firstly, it was conducted in a representative study sample (country-wide and population-based) and in recent years.
Secondly, it was also the first time to analyse how people with long-term standing illness and disability could perceive their living neighbourhoods in a large study sample in Scotland. However, there are also a few limitations worthy of being noted. First, the list of items in assessing satisfaction towards neighbourhood facilities was not standardised. Future studies including epidemiologists, architects and civil engineers working together from developing a complete questionnaire to managing built environment toward the universal design would be suggested. Second, although there were some significant associations observed, the statistical modelling could still have been suffering from small number of cases in some sub-scales. Third, the causality cannot be established due to the cross-sectional study design in nature. Taken together, future research retaining the strengths and overcoming these limitations mentioned above with a long-term monitoring would be suggested.

Directions for future research, practice and policy

In sum, people with heart, chest, skin, digestive, musculoskeletal, vision, learning, speech and mental disorders and dyslexia were more dissatisfied with their current neighbourhood environments. For future research, studies moving from etiological factors to problematic neighbourhood management and restoration in a well-established surveillance for both urban and town reviving would be recommended in order to ensure the neighbourhood equality for all residents. For clinical practice, upgrading neighbourhood planning to tackle social environment injustice would be suggested in order to have a balanced focus on both places and people (Shiue 2016). For policy making, regular monitoring on the neighbourhood condition for proper maintenance and preservation might be necessary in order to ensure that the health and well-being of all residents could be maintained and optimised and no one would be left behind to amount health and social care services use exceedingly due to the vicious circle.

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