Socio-Demographic Characteristics Associated With Emotional and Social Loneliness Among Older Adults in Five European Countries

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Abstract

Background International studies provide an overview of socio-demographic characteristics associated with loneliness among older adults, but few studies distinguished between emotional and social loneliness. This study examined socio-demographic characteristics associated with emotional and social loneliness.

Methods Data of 2251 community-dwelling older adults, included at the baseline measure of the Urban Health Centers Europe (UHCE) project, were analysed. Loneliness was measured with the 6-item De Jong-Gierveld Loneliness Scale. Multivariable logistic regression models were used to evaluate associations between age, sex, living situation, educational level, migration background, and loneliness.

Results The mean age of participants was 79.7 years (SD = 5.6 years); 60.4% women. Emotional and social loneliness were reported by 29.2% and 26.7% of the participants. Older age (OR: 1.16, 95% CI: 1.06–1.28), living without a partner (2.16, 95% CI: 1.73–2.70), and having a low educational level (OR: 1.82, 95% CI: 1.21–2.73), were associated with increased emotional loneliness. Women living with a partner were more prone to emotional loneliness than men living with a partner (OR: 1.78, 95% CI: 1.31–2.40). Older age (OR: 1.11, 95% CI: 1.00-1.22) and having a low educational level (OR: 1.77, 95% CI: 1.14–2.74) were associated with increased social loneliness. Men living without a partner were more prone to social loneliness than men living with a partner (OR: 1.94, 95% CI: 1.35–2.78).

Conclusions Socio-demographic characteristics associated with emotional and social loneliness differed regarding sex and living situation. Researchers, policy makers, and healthcare professionals should be aware that emotional and social loneliness may affect older adults with different socio-demographic characteristics.

Introduction

Loneliness can be defined as an unpleasant experience, occurring when the quantity or quality of a person’s social relationships is perceived to be deficient (1). In general, feelings of loneliness motivate people to strengthen their existing social relationships or to build new relationships, after which these negative feelings may diminish (2). However, for some people loneliness can become a chronic state.
Persistent loneliness has been associated with negative outcomes for mental and physical health, such as depression, psychological distress, reduced self-esteem, cognitive impairment, functional decline, high blood pressure, cardiovascular diseases, and higher mortality rates (2-7). Based on data collected in the third round (2006-07) of the European Social Survey, Yang and Victor (8) found that the prevalence of frequent loneliness among European citizens aged 60 years and older varied between 19-34% in Eastern Europe, 10-15% in Southern Europe, and 3-9% in Northern Europe. The prevalence of frequent loneliness was highest among adults aged 80 years and older (8). Age-related changes and losses, such as deteriorating health, declining mobility, changing social roles, and the loss of a partner or friends have been associated with an increased susceptibility of loneliness in older age (4). International studies provide an overview of socio-demographic characteristics associated with increased overall loneliness among older adults, such as widowhood, living in disadvantaged socioeconomic circumstances and having a migration background (4, 9-12). However, few studies have distinguished between different dimensions of loneliness, such as emotional and social loneliness (3). In 1973, Weiss proposed that emotional loneliness is related to an absence of intimate attachments to other persons, whereas social loneliness is related to an absence of an engaging social network or a lack of social integration (13). Previous studies indicate that, despite being correlated, emotional and social loneliness can be recognized as distinct states affecting different groups of people (14-21). The distinction between emotional and social loneliness may be relevant for the development of intervention strategies to reduce loneliness. According to the theoretical framework of Weiss, emotional loneliness may only be alleviated by a new or recovered intimate relationship, providing a sense of attachment, and social loneliness may only be alleviated by (re-)entering a social network, providing a sense of social integration (13, 20). Many studies on the effects of intervention strategies did not report the impact on emotional and social loneliness (22). In their meta-analysis, Masi, Chen (22) found that interventions to increase opportunities for social interaction or enhance social support had relatively small effects on reducing overall loneliness, which may be because the specific causes of loneliness have not been taken into account (22). Perissinotto, Holt-Lunstad (23) suggested that many interventions to reduce loneliness focus on the establishment
of new social contacts, while this may only be beneficial for people who experience loneliness due to a lack of social contacts (23). In the current study, we make a distinction between emotional and social loneliness because each dimension may require a specific intervention strategy. We will examine which groups of older adults are at risk of emotional and social loneliness. This provides insight into the potential target groups for intervention strategies addressing emotional and or social dimensions of loneliness. The following research question is answered: Which socio-demographic characteristics are associated with emotional and social loneliness among older adults? The study was conducted in The United Kingdom, Greece, Croatia, The Netherlands and Spain.

Methods

Data

Participants were 2325 community-dwelling older adults included in the baseline measure of the Urban Health Centres Europe (UHCE) project, a pre-post controlled trial to evaluate coordinated preventive care aiming to promote healthy ageing (24). Multiple integrated care pathways were implemented in the urban areas of Greater Manchester, The United Kingdom; Pallini, Greece; Rijeka, Croatia; Rotterdam, The Netherlands; Valencia, Spain. The UHCE study was approved by Medical Ethics Committees in all participating countries. UHCE was registered as ISRCTN52788952 (24). Participants were recruited between May 2015 and June 2017. Eligible participants were (1) aged 75 years or older (≥70 years in Greece and Spain), (2) living independently in selected neighbourhoods, (3) able to understand the local language, and (4) able to cognitively evaluate the risks and benefits of participation. All participants provided written informed consent. A full description of the inclusion process has been provided elsewhere (25). The current study used baseline data collected by self-reported questionnaires. Participants with missing data of the De Jong-Gierveld Loneliness Scale (N = 35) or of socio-demographic characteristics (N = 39), were excluded. Hence, the population for analyses consisted of 2251 participants. Loneliness was measured by the 6-item De Jong-Gierveld Loneliness Scale (26), a valid and reliable instrument to assess emotional and social loneliness among older adults living in diverse countries (27). Emotional loneliness was assessed by the items: (1) ‘I experience a general sense of emptiness’ (2) ‘I miss having people
around’ (3) ‘I often feel rejected’. Social loneliness was assessed by the items: (1) ‘There are many people I can trust completely’ (2) ‘There are plenty of people I can rely on when I have problems’ (3) ‘There are enough people I feel close to’. Response categories were ‘no’, ‘more or less’ and ‘yes’.

Scores for the two domains, calculated according to the guidelines (26), varied between 0 ‘No loneliness’ and 3 ‘Intense emotional or social loneliness’. Scores ≥ 2 were categorized as emotional loneliness or social loneliness. Validated translations of the Loneliness Scale were available in Dutch and in Spanish. Forward-backward translation procedures were applied to translate the items from English into Croatian and Greek; the items were pilot tested among local older citizens. The following socio-demographic characteristics were studied: age (in years), sex (male/female), living situation (living with a partner/ living without a partner), educational level, and migration background.

Educational level was divided into three categories, based on the International Standard Classification of Education (ISCED). ISCED level 0–1 was categorized as ‘primary or lower’; ISCED level 2–5 was categorized as ‘secondary’; ISCED level 6–8 was categorized as ‘tertiary’ (28). Migration background was assessed by country of birth. A country of birth other than the country of residence was categorized as a migration background. The country of residence was included as a covariate.

Statistical analysis
Descriptive statistics were used to characterize the participants. Multivariable logistic regression models were used to assess independent associations between socio-demographic characteristics and emotional or social loneliness. Odds ratios and 95% confidence intervals (95% CI) were calculated for each factor. Moderating effects of sex, living situation, and country were examined for each factor by adding interaction terms to the multivariable models for loneliness. Significant interaction effects were presented according to guidelines of Knol and VanderWeele (29). A sensitivity analysis was conducted to examine whether associations between socio-demographic characteristics and loneliness differed when using a broader (cut-off value ≥ 1) and a stricter definition (cut-off value = 3) of loneliness. Data were analysed in Statistical Package for Social Sciences, version 25 for Windows (IBM SPSS Statistics for Windows, IBM Corp). P-values below .05 were considered to be statistically significant.
Nonresponse analysis
Characteristics of participants with missing data (N = 74) were compared with characteristics of participants with complete data (N = 2251) using chi-squared tests. Participants with missing data more often had a migration background (P < .001), and more often lived with a partner (P = .010) than participants without missing data. There were no differences regarding other socio-demographic characteristics.

Results
Characteristics of the participants
The socio-demographic characteristics of the participants are presented in Table 1. The mean age of participants was 79.7 years (SD = 5.6 years), 60.4% of the participants were women and 50.4% lived with a partner. Emotional loneliness was reported by 29.2% of the participants and social loneliness by 26.7% of the participants; 13.6% experienced emotional and social loneliness simultaneously, 15.6% experienced emotional loneliness exclusively, and 13.1% experienced social loneliness exclusively. Women (P < .001), participants living without a partner (P < .001), and participants with a lower educational level (P < .001) more often reported emotional loneliness. Participants living without a partner (P = .002), participants with a lower educational level (P = .006), and participants with a migration background (P = .002) more often reported social loneliness.
Table 1
Socio-demographic characteristics of 2251 participants of the UHCE study; by emotional and social loneliness.

| Socio-demographic characteristic | Total (N = 2251) | Emotional loneliness (yes) (N = 657) | Emotional loneliness (no) (N = 1594) | Social loneliness (yes) (N = 600) | Social loneliness (no) (N = 1651) | P-value |
|----------------------------------|-----------------|--------------------------------------|--------------------------------------|----------------------------------|----------------------------------|---------|
| Age (in years)                   | 79.7 (SD = 5.6) | 80.2 (SD = 5.8)                     | 79.5 (SD = 5.6)                      | Mean (SD)                        | Mean (SD)                        | .006    |
| Sex                              |                |                                      |                                      | Mean (SD)                        | Mean (SD)                        |         |
| Female                           | 1360 (60.4%)   | 463 (34.0%)                          | 897 (66.0%)                          | 375 (27.6%)                      | 985 (72.4%)                      | <.001   |
| Male                             | 891 (39.6%)    | 194 (21.8%)                          | 697 (78.2%)                          | 225 (25.3%)                      | 666 (74.7%)                      | .223    |
| Living situation                 |                |                                      |                                      | Mean (SD)                        | Mean (SD)                        | .002    |
| With partner                     | 1135 (50.4%)   | 238 (21.0%)                          | 897 (79.0%)                          | 270 (23.8%)                      | 865 (76.2%)                      |         |
| Without partner                  | 1116 (49.6%)   | 419 (37.5%)                          | 697 (62.5%)                          | 330 (29.6%)                      | 786 (70.4%)                      |         |
| Educational level                |                |                                      |                                      | Mean (SD)                        | Mean (SD)                        | .006    |
| Tertiary                         | 206 (9.2%)     | 43 (20.9%)                           | 163 (79.1%)                          | 41 (19.9%)                       | 165 (80.1%)                      |         |
| Secondary Primary or less        | 1426 (63.3%)   | 397 (27.8%)                          | 1029 (72.2%)                         | 410 (28.8%)                      | 1016 (71.2%)                     |         |
| Migration background             |                |                                      |                                      | Mean (SD)                        | Mean (SD)                        | .499    |
| No                               | 2066 (91.8%)   | 599 (29.0%)                          | 1467 (71.0%)                         | 533 (25.8%)                      | 1533 (74.2%)                     | .002    |
| Yes                              | 185 (8.2%)     | 58 (31.4%)                           | 127 (68.6%)                          | 67 (36.2%)                       | 118 (63.8%)                      |         |
| Country                          |                |                                      |                                      | Mean (SD)                        | Mean (SD)                        | <.001   |
| The UK                           | 548 (24.3%)    | 101 (18.4%)                          | 447 (81.6%)                          | 75 (13.7%)                       | 473 (86.3%)                      | <.001   |
| Greece                           | 345 (15.3%)    | 146 (42.3%)                          | 199 (57.7%)                          | 77 (22.3%)                       | 268 (77.7%)                      |         |
| Croatia                          | 495 (22.0%)    | 202 (40.8%)                          | 293 (59.2%)                          | 278 (56.2%)                      | 217 (43.8%)                      |         |
| The Netherlands                  | 369 (16.4%)    | 95 (25.7%)                           | 274 (74.3%)                          | 79 (21.4%)                       | 290 (78.6%)                      |         |
| Spain                            | 494 (21.9%)    | 113 (22.9%)                          | 381 (77.1%)                          | 91 (18.4%)                       | 403 (81.6%)                      |         |

P-values < .05 in bold. P-values for continuous variables were calculated with ANOVA and P-values for categorical variables were calculated with Chi-squared tests. SD = standard deviation.

Associations between socio-demographic characteristics and emotional loneliness

The multivariable model for emotional loneliness is presented in Table 2. Results of the interaction analysis for emotional loneliness are presented in supplementary Table S1. Significant interaction effects were found between sex and living situation (P = .013), and between country and living situation (P < .001). The multivariable model for emotional loneliness showed that older age (OR per 5 years: 1.16, 95% CI: 1.06–1.28) was associated with increased emotional loneliness. Older adults with a primary or lower educational level had 1.82 (95% CI: 1.21–2.73) times higher odds of experiencing emotional loneliness compared to older adults with a tertiary educational level. Having a migration background was not associated with emotional loneliness. Table 3 presents the odds ratios for emotional loneliness by sex and living situation. Women living with a partner had 1.78 (95% CI: 1.31–2.40) times higher odds of experiencing emotional loneliness compared to men living with a partner.
Living without a partner was associated with increased emotional loneliness among men and women. Men living without a partner had 3.10 (95% CI: 2.17–4.40) times higher odds of experiencing emotional loneliness compared to men living with a partner. Women living without a partner had 1.79 (95% CI: 1.37–2.33) times higher odds of experiencing emotional loneliness compared to women living with a partner. Table 4 presents the odds ratios for emotional loneliness by country and living situation. In The United Kingdom (OR: 3.19, 95% CI: 1.85–5.47), Greece (OR: 2.45, 95% CI: 1.51–3.98), The Netherlands (OR: 5.31, 95% CI: 3.00–9.40), and Spain (OR: 1.95, 95% CI: 1.25–3.02), living without a partner was associated with increased emotional loneliness. In Croatia, living without a partner was not associated with increased emotional loneliness (OR: 1.10; 95% CI: .75-1.61).

Table 2
Multivariable logistic regression models on associations between socio-demographic characteristics and emotional and social loneliness among 2251 participants of the UHCE study.

|                          | Emotional loneliness | Social loneliness |
|--------------------------|----------------------|-------------------|
|                          | Multivariable model  | OR (95% CI)       | Multivariable model  | OR (95% CI)       |
| Age (per 5 years)        | 1.16 (1.06–1.28)     | 1.11 (1.00–1.22)  |
| Sex (female)             | 1.38 (1.10–1.72)     | .86 (.69-1.09)    |
| Living situation (without partner) | 2.16 (1.73–2.70) | 1.23 (.98-1.55) |
| Educational level        | ref.                 | ref.              |
| Tertiary                 | 1.22 (.83-1.79)      | 1.31 (.88-1.95)   |
| Secondary                | 1.82 (1.21–2.73)     | 1.77 (1.14–2.74)  |
| Migration background (yes) | .99 (.69-1.41)          | 1.03 (.72-1.48)   |
| Country                  | ref.                 | ref.              |
| The UK                   | 4.33 (2.96–6.34)     | 1.88 (1.24–2.85)  |
| Greece                   | 3.11 (2.32–4.16)     | 8.34 (6.14–11.33) |
| Croatia                  | 1.50 (1.07–2.09)     | 1.66 (1.16–2.37)  |
| The Netherlands          | 1.26 (.86-1.84)      | 1.34 (.89 – 2.00) |

Odds ratios and 95% confidence intervals are derived from multivariable logistic regression analyses for emotional and social loneliness (cut-off value Loneliness Scale ≥ 2). P-values < .05 in bold. OR = odds ratio; CI = confidence interval; ref.=reference group.

Table 3
Results of analysis on interaction between sex and living situation for emotional loneliness among 2251 participants of the UHCE study.

| Emotional loneliness | Living with partner | Living without partner | OR (95% CI) for living without partner vs living with partner within strata of sex |
|----------------------|---------------------|------------------------|----------------------------------------------------------------------------------|
|                      | OR (95% CI)         | OR (95% CI)            |                                                                                 |
| Male                 |                     |                        |                                                                                 |
| N lonely/ not lonely | ref.                | 81/151                 | 3.10 (2.17–4.40)                                                                 |
| Male                 | 113/546             | 1.78 (1.31–2.40)       | 3.10 (2.17–4.40)                                                                 |
| Female               | 125/351             | 1.78 (1.31–2.40)       | 1.79 (1.37–2.33)                                                                 |
| OR (95% CI) for female vs male within strata of living situation | 1.78 (1.31–2.40) | 1.02 (.74-1.41) |

Interaction between sex and living situation on the multiplicative scale P = .013. ORs were presented for each stratum with male living with a partner as the reference group. ORs for sex were presented within strata of living situation; ORs for living situation were presented within strata of sex. ORs are adjusted for age, educational level, migration background and country. P-values < .05 in bold. OR = odds ratio; CI = confidence interval; ref.=reference group.
Table 4
Results of analysis on interaction between country and living situation for social loneliness among 2251 participants of the UHCE study.

| Emotional loneliness | Living with partner | Living without partner | OR (95% CI) for living without partner vs living with partner within strata of country |
|----------------------|---------------------|------------------------|--------------------------------------------------------------------------------------|
|                      | N lonely/not lonely | OR (95% CI)            | N lonely/not lonely |
| The UK               | 19/210              | ref.                   | 82/237                  | 3.19 (1.85–5.47)                                                                 |
| Greece               | 81/157              | 5.53 (3.10–9.84)       | 65/42                   | 13.56 (7.11–25.87)                                                              |
| Croatia              | 75/130              | 6.31 (3.63–10.95)      | 127/163                 | 6.93 (4.05–11.85)                                                               |
| The Netherlands      | 19/171              | 1.11 (0.56–2.17)       | 76/103                  | 5.87 (3.31–10.41)                                                              |
| Spain                | 44/229              | 1.78 (0.97–3.28)       | 69/152                  | 3.46 (1.91–6.28)                                                               |

Interaction between country and living situation on the multiplicative scale P < .001.

ORs are adjusted for age, sex, educational level and migration background. P-values < .05 in bold. OR = odds ratio; CI = confidence interval; ref. = reference group.

Associations between socio-demographic characteristics and social loneliness

The multivariable model for social loneliness is presented in Table 2. Results of the interaction analysis for social loneliness are presented in supplementary Table S1. A significant interaction effect was found between sex and living situation (P = .002). The multivariable model for social loneliness showed older age was associated with increased social loneliness (OR per 5 years: 1.11, 95% CI: 1.00-1.22), but non-significant (P = .057). Older adults with a primary or lower educational level had 1.77 (95% CI: 1.14–2.74) times higher odds of experiencing social loneliness compared to older adults with a tertiary educational level. Having a migration background was not associated with social loneliness. Table 5 presents the odds ratios for social loneliness by sex and living situation. Men living without a partner had 1.94 (95% CI: 1.35–2.78) times higher odds of experiencing social loneliness compared to men living with a partner. Among women, living without a partner was not associated with increased social loneliness.
Table 5
Results of analysis on interaction between sex and living situation for social loneliness among 2251 participants of the UHCE study.

| Social loneliness   | Living with partner | Living without partner | OR (95% CI) for living without partner vs living with partner within strata of sex |
|---------------------|---------------------|------------------------|-----------------------------------------------------------------------------------|
|                     | N lonely/ not lonely| OR (95% CI)            | N lonely/ not lonely                                                              |
| Male                | 148/511             | ref.                   | 77/155                                                                            |
| Female              | 122/354             | 1.18 (.87-1.59); .57 (.41-.80) | 253/631                                                                            |

Interaction between sex and living situation on the multiplicative scale \( P = .002 \).

ORs are adjusted for age, educational level, migration background and country. P-values < .05 in bold. OR = odds ratio; CI = confidence interval; ref. = reference group

Declarations
Ethics approval and consent to participate
Ethical committee procedures have been followed in all cities and institutions involved, and approval has been provided. The names of the review board and the approval references are: Manchester, United Kingdom: NRES Committee West Midlands - Coventry & Warwickshire; 06-03-2015; 15/WM/0080; NRES Committee South Central - Berkshire B; 29-20-2014; 14/SC/1349; Pallini, Greece: The Ethics and Scientific board - Latriko Palaiou Falirou Hospital; 04/03/2015; 20150304-01; Rijeka, Croatia: The Ethical Committee - Faculty of Medicine University of Rijeka; 07-04-2014; 2170-24-01-14-02; Rotterdam, The Netherlands: Medische Ethische Toetsings Commissie (METC) - Erasmus MC Rotterdam; 08/01/2015; MEC-2014-661; Valencia, Spain: Comisión de Investigación - Consorcio Hospital General Universitario de Valencia. 29/01/2015; CICHGUV-2015-01-29. Written consent is obtained from all participants.

Consent for publication
Not applicable
Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Sensitivity analysis

The multivariable models using a broader and a stricter definition of loneliness are presented in supplementary Table S2. The associations between socio-demographic characteristics and emotional and social loneliness were similar.

Discussion And Conclusions
Findings
Older age, living without a partner, and having a low educational level were independently associated with increased emotional loneliness among older adults. Women living with a partner were more prone to emotional loneliness than men living with a partner. Older age and having a low educational level were associated with increased social loneliness. Men living without a partner were more prone to social loneliness than men living with a partner. Results of a meta-analysis (9) showed that older age was associated with increased overall loneliness in studies among participants with a mean age > 80 years, but not among participants with a mean age of 60–80 years. In our study, among participants with a mean age of almost 80 years, older age was associated with increased emotional loneliness.
loneliness and with increased social loneliness (borderline significance). Further research could examine possible differences in age-related factors associated with emotional and social loneliness, and their onset. The death of a partner may primarily be associated with emotional loneliness, whereas leaving paid employment and decreasing out-door mobility could be age-related factors primarily associated with social loneliness (30). Some studies report sex differences in loneliness, however these findings are inconsistent (9, 14). In our study, women living with a partner were more prone to emotional loneliness than men living with a partner. This is in line with findings of Dykstra and Fokkema (31), whose study showed that married men were less prone to emotional loneliness than married women. Pinquart and Sorensen (9) identified a stronger association between female sex and increased loneliness in studies including married participants, compared to studies among single, widowed or divorced participants. Therefore, distinguishing between emotional and social loneliness in future studies, and testing for interactions between sex and living situation or marital status, may clarify the association between sex and loneliness. Previous studies found that not having a partner, widowhood, and living alone were associated with increased overall loneliness (4, 9, 12, 32). In line with results of previous studies (14, 17), living without a partner was associated with increased emotional loneliness. In addition, living without a partner was associated with increased social loneliness among men. Again, this corresponds to findings of Dykstra and Fokkema (31), as results of their study showed that divorced men had a greater vulnerability to social loneliness than divorced women. In Croatia, living without a partner was not associated with increased emotional loneliness. The association between living situation and loneliness may be influenced by cultural norms and values, affecting individual expectations of family members (33). Further research is needed to explain cross-country differences in the association between living situation and emotional loneliness. Descriptive statistics on emotional loneliness distinguishing between participants living with/ without children are provided in Supplementary Table S3. In line with previous studies, having a low educational level was associated with increased emotional and social loneliness (4, 9, 14, 32). Older adults with a low educational level are more likely to live in disadvantaged socioeconomic circumstances, which has been associated with chronic stress and a decreased quality of social
relations (34). In addition, living in disadvantaged socioeconomic circumstances has been associated with reduced opportunities for participation in social activities (4). In contrast to previous findings (35, 36), having a migration background was not associated with loneliness. Social loneliness was reported more frequently by participants with a migration background, but there was no independent association. This may have differed between immigrant groups, depending on their command of the local language and the magnitude of cultural differences (35). However, in our study the number of participants with a migration background was too low to distinguish between groups.

**Methodological considerations**

Older adults living in urban areas in Southern, Western and Eastern European countries were represented in the sample, which has increased the external validity of the results. Using a broader and a stricter definition of loneliness yielded similar results, indicating that the findings are applicable to older adults experiencing loneliness at different intensities. Nevertheless, several limitations need to be considered when interpreting the findings. First, a sampling bias cannot be ruled out. Older adults with poor health may have been less likely to participate in the UHCE study (25), and participants with a migration background were more often excluded from the analyses due to missing data. This has reduced the representativeness of the sample, and should be considered when the findings are generalized. Secondly, sociocultural differences in the way questions were interpreted may have caused unintended variability. Even though previous studies reported good psychometric properties of the De Jong-Gierveld Loneliness Scale among culturally diverse groups, further validation among Greek and Croatian citizens is recommended. Lastly, causal directions of the associations between socio-demographic characteristics and loneliness could not be examined. Longitudinal research is needed to evaluate (bi-)directional associations between living situation, educational level, migration background and loneliness.

**Implications for policy and practice**

Our findings may be relevant to identify potential target groups for intervention strategies aimed at the emotional or social dimension of loneliness. Intervention strategies aiming to address a specific dimension of loneliness might be more effective in reducing these feelings of loneliness. Future
studies need to investigate which types of interventions are most effective in reducing emotional and/or social loneliness (22).

Conclusions
Older adults of higher age, women living with a partner, older adults living without a partner, and older adults with a low educational level may be at increased risk of emotional loneliness. Older adults of higher age, men living without a partner, and older adults with a low educational level may be at increased risk of social loneliness. More research in diverse populations, using longitudinal designs, is needed to confirm these findings. In the meantime, healthcare professionals and policy makers are advised to pay attention to an increased susceptibility of emotional and social loneliness in the above mentioned sub groups. We recommend to further develop effective and feasible interventions to prevent and alleviate specific dimensions of loneliness among older adults.

Declarations

Ethics approval and consent to participate
Ethical committee procedures have been followed in all cities and institutions involved, and approval has been provided. The names of the review board and the approval references are: Manchester, United Kingdom: NRES Committee West Midlands - Coventry & Warwickshire; 06-03-2015; 15/WM/0080; NRES Committee South Central – Berkshire B; 29-20-2014; 14/SC/1349; Pallini, Greece: The Ethics and Scientific board - Latriko Palaiou Falirou Hospital; 04/03/2015; 20150304-01; Rijeka, Croatia: The Ethical Committee - Faculty of Medicine University of Rijeka; 07-04-2014; 2170-24-01-14-02; Rotterdam, The Netherlands: Medische Ethische Toetsings Commissie (METC) – Erasmus MC Rotterdam; 08/01/2015; MEC-2014-661; Valencia, Spain: Comisión de Investigación - Consorcio Hospital General Universitario de Valencia. 29/01/2015; CICHGUV-2015-01-29. Written consent is obtained from all participants.

Consent for publication
Not applicable

Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding
author on reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

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**Authors’ contributions**

IF analysed and interpreted the data and was a major contributor in writing the manuscript. SS was a major contributor in writing the manuscript. GW, TA, EK, LB, AV, AM, FMR, CF and HR have contributed to the design and the data collection of the Urban Health Centers Europe study, have revised the current manuscript, and have approved the final version of the manuscript.

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