Current Research in Behavioral Sciences 5 (2023) 100122

Contents lists available at ScienceDirect

Current Research in Behavioral Sciences

journal homepage: www.elsevier.com/locate/crbeha

Loneliness and intersectionality: A progressive conditional approach

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ARTICLE INFO

Keywords:
Loneliness
Intersectionality
Age
Ethnicity
Country of birth

ABSTRACT

Both loneliness and intersectionality have become well established areas of academic research since the 1970s and 1980s. Nevertheless, only very recently some meaningful connections were made between the two, although researchers have paid attention to the interactive effects of two or more socio-demographic attributes on loneliness. For intersectionality, much of academic research is invested in establishing it as a theoretical approach in tackling social injustice, whilst how it should be studied empirically remains a major challenge. In contrast, research on loneliness has been predominantly empirical, and the small number of studies on loneliness from the intersectional perspective have adopted different research methodologies. This paper proposes and illustrates an approach loyal to the fundamental principles of intersectionality and simple to conduct in empirical investigations at the same time. First, it focuses exclusively on intersectional cross-classifications rather than both the main and the interactional effects; second, it demands a rationale of starting from one attribute and then moving on to include an additional attribute at a time; third, it examines the intersectional cross-classifications and their relationships with the interested outcome systematically without transforming the data in set memberships. The approach is illustrated with analyses of the data collected in Great Britain in the seventh round (2014/15) of European Social Survey. Young people (under 30) of ethnic minority and born inside Great Britain suffered from the highest percentage of frequent loneliness (15%), whilst their counterparts born outside the country enjoyed the lowest rate. Among the middle-aged, ethnicity determined how vulnerable they were to frequent loneliness. For older people (60+) born outside Great Britain, regardless of ethnicity, the percentage of frequent loneliness was 10%.

1. Introduction

As an emotional reaction to unsatisfied relations with other human beings, loneliness has accompanied humanity throughout its history (Alberti, 2019; Lepore, 2020; Worsley, 2018). Nevertheless, it should be fair to say that loneliness did not emerge as the subject of serious academic research until the end of WWII, when scholars such as Riesman et al. (1950) and Moustakas (1961) wrote about loneliness in a concentrated manner. It was in the 1970s, however, that medical researchers started to notice the serious effects of loneliness on morbidity and mortality (Lynch, 1977), and sociologists and psychologists invested in defining, classifying and measuring loneliness (De Jong Gierveld, 1978; Peplau and Perlman, 1982; Weiss, 1973). In the following decades, with a widely accepted definition, at least two gradually refined scales of measurement (the UCLA and the de Jong Gierveld), and the increasingly powerful tools for collecting and analysing large-scale datasets, researchers have been able to demonstrate the respective association between loneliness and its risk factors on the one hand and between loneliness and its consequences on the other. Results from this line of research are so compelling that government agents, public health professionals, the mass media, and the general public have realized the importance of tackling loneliness as a serious issue.

Approximately a decade after the establishment of loneliness as an academic research area, intersectionality emerged as a theoretical approach to understanding and tackling social marginalization and injustice, thanks to the work of some black feminists in the US, particularly the legal scholar Kimberlé Crenshaw (1989; 1991) and the sociologist Patricia Hill Collins (1998; Collins and Bilge, 2020). The fundamental idea of intersectionality is that certain members of a society suffer from discrimination, disadvantage or any other form of social injustice not because of any single socio-demographic attribute but due to their intersectional social positions, which in turn can be explained by the 'interlocking' power systems such as racism, sexism, etc. Through a few legal cases such as DeGraffenreid v. General Motors, Crenshaw and others made a powerful case for the disenfranchisement came to light only after two or more socio-demographic attributes were taken into

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https://doi.org/10.1016/j.crbeha.2023.100122
Received 30 December 2022; Received in revised form 5 April 2023; Accepted 23 May 2023
Available online 1 July 2023

consideration at the same time. Today, intersectionality has become a highly influential 'way of thinking' across almost all areas of research in the social sciences and humanities (Hancock, 2016).

Connecting loneliness to intersectionality will benefit both enterprises. As loneliness is found to be associated with a series of physical and mental illnesses (Heinrich and Gullone, 2006; Yang, 2019), the uneven distribution of loneliness across socio-demographic groups represents a form of social marginalization and disadvantage; therefore, loneliness is an important issue of not only public health but intersectional social justice as well. As such, loneliness in itself is worth examining intersectionally as an unpleasant and unfortunate experience that is distributed unevenly across the population. On the other hand, intersectionality could serve as a guiding principle for the study of loneliness. More specifically, individual differences in exposure to loneliness are multi-faceted, but much research on loneliness has either focused on one facet at a time or examined several facets additively. As discussed below, whilst some researchers examined the prevalence or the chance of loneliness across certain intersectional groups, such work appears to be weak in theoretical justification and methodological rationale. A search with 'intersectional' and 'loneliness' as the key words generated only a handful of publications (to be reviewed below) which have followed inconsistent ways of studying intersectionality and loneliness at the same time. As Karp and Birk pointed out, intersectionality as a theoretical perspective will be valuable for research on human distress in general (2013: 37):

Human distress encompasses an enormous array of hues, intensities, and responses depending upon the intersections of our multiple social locations. Honest social science must create a balance between discovering general social patterns while documenting the many departures from those regularities. Consequently, we need more research that attends to the matter of "intersectionality."

The preliminary and exploratory nature of existing research on loneliness from the intersectional perspective demands a coherent strategy of connecting the two meaningfully. The aim of this paper is not to produce a systematic review of the existing literature or a new research method but to develop a 'progressive conditional' approach to studying loneliness from the perspectives of intersectionality. As explained with further details later, the approach is 'progressive' as it demands a clear rationale of starting with a single socio-demographic attribute and then moving on to add one more attribute at a time, so that the importance of intersectionality can be demonstrated in an evolving and systematic manner. In the meantime, the strategy is 'conditional' because each newly added attribute can be analysed as a new condition on which previously found patterns operate, and the intersectional attributes as conditions on which the response takes a particular value. Following this, more disciplined, approach will lead to a more nuanced profile of the intersectional groups who are more likely to suffer from loneliness than others. The application of this approach will then be illustrated with simple statistical analyses on the data collected in Great Britain from the seventh round (2014–15) of European Social Survey.

2. Intersectionality: a theoretical approach and the challenge to empirical research

Like other influential concepts of the social sciences, such as class and social capital, whilst advocates of intersectionality may welcome the concept's increasing popularity, how the concept should be defined and studied empirically remains an open question (Collins, 2015). As a theoretical and analytical framework, intersectionality examines how intersecting power relations are responsible for multidimensional and multiplicative disadvantages (Collins and Bilge, 2020: 14). In other words, social inequality and injustice are functions of interlocking systems of privilege and oppression, including racism, classism, sexism, and ageism (Collins, 1990; Crenshaw, 1989; McCall, 2005).

This fundamental idea implies that observed patterns of social inequality and injustice operate at two levels: institutional systems at the higher level make individuals socially located at intersections of multiple socio-economic dimensions particularly vulnerable to marginalization and disadvantage. It is for this reason that theorists of intersectionality stress the following two points. First, intersectionality is not merely about identities; more precisely, it is about how interrelated power systems make people with certain identities suffer from a particular form of disadvantage (Crenshaw, 1991). The membership of a particular intersectional group, such as black females, does not necessarily result in exposes its members to disadvantage because of the system of racism and sexism that the membership in this category deprives its members of the access to power and resources (Ridgeway, 2011). Second, theorists of intersectionality emphasize that such disadvantage is a multiplicative rather than an additive effect (Bowleg and Bauer, 2016; Hancock, 2007).

Studies of intersectionality have been classified into three types: the intercategorical, the intracategorical, and the anti-categorical (McCall, 2005). The majority of existing studies, especially those employing quantitative methods, seem to belong to the first category, which examine how cross-classifications of selected attributes are associated with an interested form of disadvantage, that is, the disadvantage studied in a particular social setting, such as being discriminated against for opportunities of employment. Studies of the second type are mostly qualitative, focusing on a particular intersectional group and examining the group members' lived experiences of suffering from intersectional injustice in details. By definition, the 'anti-categorical' studies aim to criticize the existing categories of socio-demographic attributes for excluding certain intersectional groups and failing to consider the meanings of these categories from the perspective of those who suffer from intersectional injustice. Researchers of the third type urge other researchers to question the validity and legitimacy of existing categories, which especially studies of the first type tend to take for granted.

How to study intersectionality empirically is an unsettled issue. Prominent scholars of intersectionality either used case studies (Crenshaw, 1989, 1991) or have focused their attention on constructing intersectionality as a critical social theory (Collins, 2019). Many qualitative researchers remain doubtful, to say the least, of whether quantitative methods are faithful to the fundamental principles of intersectionality, while quantitative researchers have concentrated on resolving some technical difficulties. For example, Bowleg (2012) pointed out that the interpretation of data within the context of social structures is what makes a quantitative analysis intersectional, not merely the inclusion of multiple categories of race or gender, or the examination of interaction effects. Specifically, it remains a great challenge to collect and analyse data about the 'interlocking systems', which explains the lack of empirical studies on them. Instead, empirical analyses, either quantitative or qualitative, focus on evidence at the individual level as the proxy of higher-level system effects. Researchers are expected to put their analyses in the context of these power systems, which in practice is usually achieved only with assertions, not convincing evidence. This study does not have the ambition of resolving these issues, but it does aim to ease the tension between principles of intersectionality and empirical analyses of evidence by offering a relatively new and simple approach.

3. Loneliness and intersectionality

The establishment of loneliness as an interdisciplinary research area almost paralleled that of intersectionality, with few attempting to consciously connect the two until the past two or three years. This does not mean that researchers of loneliness did not pay serious attention to the effect of intersectional attributes on loneliness; in fact, many studies have analysed the intersections of gender, age, marital status, living alone, health conditions and other factors. For example, Essex and Nam (1987) examined the interactional effects of marital status, disability, and family relations on loneliness amongst older people. More recently,

analysing the data collected from the Community Life Survey (CLS) between August 2016 and March 2017, the UK's Office for National Statistics (ONS, 2018) found that widowed older homeowners living alone with long-term health conditions were amongst the most vulnerable to loneliness, which is an intersectional group of five attributes (marital status, age, homeownership, living arrangement, and health). After the completion of the BBC Loneliness Experiment, Barreto et al. (2021) analysed the responses from 46,054 participants aged 16–99 years, living across 237 areas, representing the full range of individualism-collectivism cultures. They paid special attention to the interactional effect of age, gender, and culture (collectivism and individualism) on loneliness but offered a caveat that 'although those interactions did not qualify the main effects, and simply accentuated them.' They found that 'the most vulnerable to loneliness were younger men living in individualistic cultures.' They analysed the intersections of the three attributes without presenting the results due to statistical insignificance. In the end, they concluded that 'exploration of how those individual differences might work intersectionally to predict loneliness is absent from the literature.' We could classify these studies as the first type of studies that included interactional effects of two or more socio-demographic attributes *without intentionally* analysing and interpreting these effects from the perspective of intersectionality.

Results from a literature search suggest that since 2020 some researchers have made a conscious effort to analyse the experience of loneliness from the intersectional perspective. Of these, two groups could be detected. Those in the first group are not only qualitative and small-scale but also mostly intracategorical; that is, they focus on the loneliness experienced by members of a particular intersectional group. As the number of cases in such studies is usually smaller than the number of possible intersectional groups, it is difficult for the researcher to compare these groups. For example, in one study (Arnoso et al., 2022), the researchers conducted qualitative interviews with eight female adults, while the attributes included age, marital status, socio-economic status, living arrangements, migrant status, health and others. Another small-scale qualitative study (Koehn et al., 2022) examined the experiences of nineteen immigrant older adults in the metropolitan districts of Vancouver and Montreal between 2014 and 2016. The researchers 'sought to capture the diversity of older immigrants in relation to multiple sources of identity, such as age, gender, socio-economic status, country of origin, the mode and timing of their entry to Canada (immigration programme, age at migration), and health and mobility status, amongst others' (ibid.: 1118) and presented four cases to illustrate the diversity of their experiences. In another study of a slightly larger scale (Hatiboğlu-Kısat, 2022), 'A household survey with 167 women living in different clusters of Çankaya was conducted in the quantitative phase' and then 'In the qualitative phase, semi-structured in-depth interviews with 37 people, re-analysed for this study, were carried out via Zoom and WhatsApp between 20 March and 15 May 2020, during the first COVID-19 lockdown in Turkey' (ibid.: 4). The four socio-demographic attributes considered (gender, age, sexual orientation, disability) were not considered consistently for all interviewees; instead, two attributes such as age and sexual orientation were included for some interviewees whilst other attributes were included for interviewing others.

In contrast to the above, the second group of studies that consciously put the study of loneliness in light of intersectionality analyse large scale quantitative data with statistical models. Analysing the data collected from waves 6 (2012) and 7 (2014) of The English Longitudinal Study on Ageing (ELSA), Liu (2021) aimed to discover whether the use of internet was associated with lower chance of feeling lonely. Three socio-demographic attributes (gender, ethnicity, social status) were included in the analysis, and then three variables about the use of internet were added, including use of computer, smartphone use, and regular internet use. After recoding each variable into a binary one, the number of intersectional groups becomes $2^6 = 64$. In spite of the large sample size (around ten thousand), many of these intersectional groups were not presented due to the lack of data (ibid.: Tables 4 and 5). A notable merit of such studies is the systematic examination of all possible intersectional groups in connection with the response variable. During the past few years Claire Evans and her associates have made an innovative use of multilevel models to revolve the challenge of including a large number of intersectional groups in generalized linear regression models (Evans et al., 2018, 2020; Evans, 2019). One study (Li and Spini, 2022) applied this approach to study the intersectional effects of gender, age, education, and nationality on loneliness in the Swiss canton of Vaud in 2019. There were 1360 valid individual responses, and the 36 intersectional groups were transformed into members of a single higher-level unit. The major benefit of doing so is that instead of having to include a large number of dummy variables as the main effects in a linear regression model – in this case, it would be $36 - 1 = 35$ main effects, each representing the intersectional membership is sufficient. As discussed below, while technically this is certainly a smart solution, it may not be completely in line with the spirit of intersectionality.

4. A progressive conditional approach

Intersectionality became an influential approach to revealing social inequality and injustice after a few black feminists demonstrated powerfully the unique disadvantaged position occupied by some members of a society, which would not have been recognized as a disadvantage if only one attribute were considered at a time. In cases such as DeGraffenreid v. General Motors, the judge dismissed the plaintiff's complaint because of the lack of evidence that female *or* black employees were disadvantaged, respectively. Such single-dimensional reasoning ignored the variation within the group of a particular attribute, and the variation can only be revealed by introducing another attribute, thereby turning the reasoning from single-dimensional into intersectional. The fact was that although female *or* black employees might not be disadvantaged, respectively, black female employees were actually disadvantaged when compared with either white females or black males. Therefore, the disadvantage is intersectional, not single-dimensional. Seen in the light of statistical reasoning, intersectionality demonstrates the benefit of analysing conditional relationships and the potential risk of accepting results from analysing marginal relationships alone.

When an existing single-attribute analysis is conditioned on a newly added attribute, our analysis becomes more nuanced because, the number of groups under study will increase multiplicatively rather than additively, and the groups are more specifically defined with cross-classified or intersectional attributes. Of these intersectional groups, it could be tempting to assume that one of them 'must be' disadvantaged; however, it is important to realize that whilst such assumption might be reasonable, the intersectional approach demonstrates its maximum benefit when it reveals a disadvantaged intersectional group that is surprising to us.

For research on loneliness, analysing the commonly included socio-demographic attributes as conditions for loneliness may help explain some inconsistent results based on one attribute alone. For example, results for differences across gender groups in terms of the prevalence of loneliness have been inconsistent – although some studies found women were more vulnerable to loneliness than men (Pinquart and Sorensen, 2001; Nikolaisen and Thorsen, 2014; ONS, 2018), a recent meta-analysis (Maes et al., 2019) showed that gender alone cannot explain loneliness. One plausible reason for such inconsistency could be the variation of loneliness *within* women (or men). Similarly, while some studies demonstrated a clear pattern of the relationship between age group and loneliness (Lasgaard et al., 2016; Luhmann and Hawkley, 2016; Yang and Victor, 2011), others reported no significant age differences in loneliness (Griffin, 2010). If we pay attention to age alone and find that the younger generation is lonelier than the middled-aged and the older people, we ignore the fact that many young people are not lonely. Our analysis becomes more 'nuanced' or 'specific' by bringing in another

attribute, such as immigrant status or socio-economic-status. We cannot bring in as many attributes as we think important, unfortunately, as we will soon run out of data for the combined categories of even a small number of attributes. Even when gender or age or any other attribute is related to loneliness with a respective regular pattern, we need to be prepared for seeing the pattern change its direction or magnitude after a newly added attribute makes the analysis intersectional.

Once researchers appreciate the added value of intersectionality, they start to select and analyse a number of socio-demographic attributes in relation to the interested outcome (a certain form of disadvantage). Too often, however, this is done without carefully considering and answering a number of important questions: Which attributes should we start with? Do they really represent any power system that is responsible for the observed disadvantages or inequalities? How many attributes should and can be selected and analysed? Why are these attributes selected rather than the others? To study intersectionality empirically without deviating from its fundamental principles, it is suggested here that researchers answer these questions carefully so that they could demonstrate the intersectional effect of any added attribute in a progressive manner; otherwise, a study of intersectionality of multiple attributes will run the risk of becoming highly intractable and completely data-driven.

Given the dataset at hand, in the first stage of analysis, researchers should identify the response variable that measures a certain form of disadvantage, select a number of explanatory variables (predictors), each of which is theoretically expected to represent a social force responsible for the identified disadvantage. These may be the steps quantitative researchers follow routinely, but the case of each predictor's theoretical significance in the light of intersectionality is not always explicit or strong. Alongside the theoretical justification, the respective relationship between each predictor and the response variable should be analysed in order to determine with which predictors the analysis should start. Besides theoretical considerations, an empirical way of identifying the first predictor is to examine the data and then identify the predictor which would allow us to make the best prediction on the response; the predictor with a flat distribution of the prevalence of the response across its values offers little information for prediction; in contrast, a predictor with the most varying distribution offers the best chance of prediction. Essentially, the predictors should be prioritized by their potential of revealing intersectional disadvantage, and each predictor added to the first one or two will be analysed as a new condition on which the effect of the predictor already selected on the response variable is to be analysed.

Once the set of predictors were selected, researchers usually analyse their relationship with the response variable straightaway, as the studies reviewed previously did. Doing so, the researcher effectively ignores how the intersectional relationship under study has evolved from relatively simpler relations which may reveal important groups vulnerable to a particular intersectional disadvantage. Therefore, the 'progressive conditional' approach recommends that the analysis start with a most important predictor and then add one more predictor at a time so as to examine how intersectionality evolves as a result of introducing a new condition (predictor) into the analysis. When a new predictor is added into the analysis, the researcher should examine the relationship between all intersectional cross-classifications with the response variable to learn which intersectional groups are more vulnerable to the studied disadvantage than the others and how these groups change with the addition of a new predictor or condition. It is not wise for the analyst to assume that each cross-classification necessarily makes sense in reality; for example, it is extremely rare, if possible at all, for children (under the age of 18) to be retired or widowed.

Besides the substantive meaning of each intersectional group (or cross-classification), the researcher should pay attention to the sample size of each group as well. In the study by Li and Spini (2022), some of their intersectional groups have fewer than five cases, which is usually deemed as too few to generate reliable results in statistics. As the number of possible intersectional groups increases multiplicatively with the addition of a new predictor, it is particularly beneficial to check the sample size of each intersectional group progressively – at a certain step in the process, it may become clear to the researcher that no further predictor should be added because the sample sizes of some existing intersectional groups are already below a certain threshold.

The next step is to analyse the relationship between the intersectional classifications and the response variable. For quantitative researchers, a major challenge is the infeasibility of including a large number of interaction terms to represent intersectional groups in a generalized linear regression model – even with a handful of predictors and each having only two or three values, the total number of possible intersectional groups could easily reach thirty to fifty or even more. Recently, some researchers (Evans et al., 2018, 2019; Fisk et al., 2018) have overcome this technical difficulty with the method 'multilevel analysis of individual heterogeneity and discriminatory accuracy' (MAIHDA). Their strategy is to treat the possible intersectional groups as units at a higher level; in other words, the membership of each intersectional group will be recorded as a stratum of the variable at a higher-level. The objective is to partition the total variance into between-strata and within-strata variances to estimate the predictive power of intersectional social attributes on the response. As a result, the substantive question whether intersectionality makes a difference to the response variable is translated into a statistical question of whether any statistically significant differences could be detected between the values of the higher-level variable in relation to the response variable. Suppose there are g intersectional groups, instead of including $g - 1$ interaction terms, as conventional linear regression models do, we only need to add one higher-level variable to the main effects in the model which has $g - 1$ degrees of freedom.

Whilst MAIHDA is certainly a smart solution to the technical problem of including a large number of interaction terms, it is not the only solution; for example, some researchers have made use of machine learning techniques to explore the effects of multiple attributes on loneliness (Altschul et al., 2019; Elsjkov et al., 2018). More importantly, the loyalty of MAIHDA to the principles of intersectionality has been either assumed or not considered. The key issue concerning intersectionality is whether an intersectional effect is *added to* the main effects or should be studied *without the need to consider the main effects firstly*. To illustrate with a simple example, suppose the response variable is being made redundancy, and the two attributes are sex (coded as male and female) and race (coded as white and black), then the four intersectional groups (white male, white female, black male, black female) would be the strata of a higher-level variable. The model could be written in words as follows:

$$Redundancy = Sex + Race + Strata$$

It is important to note that the intersectional effect is measured with the Strata variable *after the main effects of Sex and Race have already been taken into account*. It is therefore possible that the intersectional effect is not statistically significant anymore once the main effects could explain much of the variation of the response variable. For example, Ickert et al. (2021) analysed the data collected from the 2015 and 2016 cycles of the Canadian Community Health Survey (CCHS), in which individuals were clustered within thirty-six social strata as cross-classifications of sex (male; female), race (white; visible minority, non-Indigenous; Indigenous), immigration status (Canadian-born; non-Canadian born), and income in Canadian dollars (low, medium, high). The two response variables were perceived health and perceived mental health, recoded as binary to ensure sufficient sample size. The variance partition coefficients (VPC) for the null model indicated that only 12% of the total individual differences in the odds of having good health was attributable to the intersectional strata level. For the model of fixed main effects, the VPC dropped to 1%, 'suggesting that the main effects of race, sex, income and immigration status at the individual level explain most of the differences in perceived health across the social strata' (ibid.: 9). The

model on perceived mental health has similar results. In other words, the vast majority of the response variable's variation (88% and 99%, respectively) was explained by the additive (main) effects of individual attributes, not the intersectional attributes.

It is difficult to imagine that the prominent black feminists would agree that this was what they meant to argue as the core idea of intersectionality. For them, there was no need to distinguish the main effects from the intersectional effects; what they have argued is simply that the intersectional attributes accounted for the disadvantage that those with those attributes experienced. Qualitative comparative analysis (QCA), sometimes also referred to with a broader term 'set-theoretic methods', is a method that follows this fundamental principle (Ragin and Fiss, 2016). There is no place here to explain the details of this method, and the author illustrated how it could be used for analysing the causal conditions for loneliness somewhere else (reference omitted to maintain anonymity). Suffice it here to say that QCA and set-theoretic methods require all variables be calibrated into set memberships, either crip (1 or 0) or fuzzy (a decimal number), which the author of this paper has found not only unnecessarily restrictive but also risky of losing the variables' and their values' original meanings. It is therefore proposed here that the intersectional cross-classifications be analysed directly in connection with the response variable, which will be demonstrated in the subsequent sections.

5. Data and selected variables

To illustrate the approach proposed in the previous section, the author will analyse the data collected from the seventh round (2014 to 2015) of the European Social Survey (European Social Survey Round 7 Data, 2014) in Great Britain. The ESS is a well-established social survey with a reputation of high standards and quality. Its target population includes all persons aged 15 and over residing within private households, regardless of their nationality, citizenship, language or legal status. The seventh round is the most recent that includes a question about loneliness and other items related to the participant's socio-demographic attributes. In Great Britain, the data were collected from the 1st of September 2014 to the 25th of February 2015, and the response rate was 43.6%.

5.1. The response variable on loneliness

Participants of the ESS were asked 'how much of the time during the past week you felt lonely?', with 1 being 'None or almost none of the time', 2 'Some of the time', 3 'Most of the time' and 4 'All or almost all of the time'. To facilitate the subsequent analyses, this variable was recoded into a new binary one which has the value of 1 (frequently lonely) if the original value is either 3 or 4, and the value of 0 (not frequently lonely) if the original value is either 1 or 2. The groups of any single attribute or intersectional attributes will be compared in terms of the prevalence of 'frequent loneliness'.

5.2. Selected variables of intersectional attributes

When considering which socio-demographic attributes to be included in statistical analysis, it is useful for researchers to realize that they may follow one of the following two logics: the first is to select those attributes that are of particular concern from the perspective of intersectionality, such as gender, age, race or ethnicity. The idea is that any significant differences between the intersectional groups would serve as evidence for potential social inequality or injustice. In contrast, empirical researchers may follow a different logic with the aim to select the attributes that are perceived as potentially the most effective of predicting the value of the response variable. It is likely that the variables selected by each rationale may have some overlaps, if not the same, but the motivations behind the choices are different.

In this study, loneliness is taken as an unfortunate experience and a symptom of potential discrimination or marginalization in society, and an objective of this study is to explore which intersectional groups are more vulnerable to loneliness. Therefore, some common socio-demographic attributes, not those believed to be better at predicting loneliness, will be selected. When it comes to determine whether a particular attribute belongs to the first or the second group of attributes, initially researchers may not agree with one another, but it is hopeful that their choices will converge over time. More specifically, marital status, living alone, and participation in social activities are considered here as potential predictors of loneliness, not attributes of concern with intersectionality. In contrast, age, sex, ethnicity and immigration are selected because people of a particular age, sex, ethnicity or immigration status should not be more vulnerable to loneliness; if they are, we shall have some evidence for intersectional inequality or injustice. Sexual orientation should be included as well; unfortunately, the ESS contains only a variable on the participant's sex, whose binary coding excludes other gender or sexual orientation categories and remains so even in the most recent Round 10 (2020/2021). In the end, the following variables have been selected to analyse the relationship between intersectional attributes and frequent loneliness in Great Britain:

- Age: original values in year are recoded into three categories: young (under 30), middle-aged (30 – 59), older (60+).
- Sex: male and female.
- Ethnicity: 1 if the participant belongs to a minority ethnic group, 0 otherwise.
- Country of birth (as a proxy of immigration): 1 if the participant was not born in Great Brain, 0 otherwise.

Therefore, the number of possible intersectional groups is $3 \times 2 \times 2 \times 2 = 24$. It is important to note that the ESS has classified sex, ethnicity and country of birth with binary values, thereby either excluding or concealing other categories of each attribute, which consequently restricts further analysis from the perspective of intersectionality.

6. Results

Following the 'progressive conditional' approach proposed above, the statistical analysis will start with examining the respective relationship between each of the four socio-demographic attributes selected in the previous section and the prevalence of frequent loneliness. Then one of the remaining attributes will be brought into the analysis each time in order to study how the relational patterns change on the one hand and monitor the sample size of each intersectional group at the same time. All results were computed with the design weight. The design weights correct different probabilities that participants are selected into the sample due to the sampling design used, and they allow for the construction of design unbiased estimators.

6.1. Prevalence of frequent loneliness by each socio-demographic attribute

Following the progressive conditional approach developed earlier, an empirical analysis of intersectional effects should start with the analysis of the relationship between each selected attribute and the response variable before moving on to the intersectional effects of two or more attributes, so let's take a first look at the distribution of frequent loneliness across each selected socio-demographic attribute (Table 1):

The total valid sample size ranges between 2220 and 2260, of which 6.1% were frequently lonely. The figures in Table 1 clearly show that for each attribute, the prevalence of frequent loneliness is close to the overall percentage and within a small range, from 4.3% amongst the middle-aged to 6.6% amongst people of ethnic minority. Moreover, none of the association statistics (either Gamma for age group and loneliness or odds ratio for the relationship between each of the binary variables and loneliness) is statistically significant; that is, when only a

Table 1
Frequent loneliness by each selected socio-demographic attribute.

Attribute	Groups	n	% frequently lonely	Gamma with p-value for age or odds ratio with 95% CI
Age	Under 30	362	5.2	0.095 (0.27)
	30 – 59	1143	4.3	
	60+	729	6.2	
Gender	Female	1205	5.3	1.073 (0.747, 1.563)
	Male	1047	5.0	
Ethnicity	Ethnic minority	212	6.6	0.738 (0.414, 1.315)
	Ethnic majority	2017	5.0	
Country of birth	Great Britain	1910	4.9	1.347 (0.834, 2.177)
	Another country	341	6.5	

single attribute is considered, there is no evidence for a particular group being particularly vulnerable to frequent loneliness.

6.2. Prevalence of frequent loneliness by two intersectional socio-demographic attributes

As those who are ethnic minority or born outside Great Britain have the highest percentages of frequent loneliness, it is reasonable to test the following hypothesis: of the four possible intersectional groups of ethnicity and country of birth, frequent loneliness will be the most prevalent amongst those who were born outside Great Britain *and* belong to an ethnic minority group. Results presented in Table 2 show whether the data support such hypothesis:

It is unsurprising that those who were born in Great Britain and not members of ethnic minority groups enjoyed the lowest percentage of frequent loneliness, but it is surprising to see that it is the ethnic minority who were born *in* Great Britain, *not* those ethnic minority born *outside* Great Britain, that had the highest prevalence of frequent loneliness. Other studies (e.g., Ajrouch, 2008; Madsen et al., 2016) have found that loneliness amongst migrants is lower when they are second rather than first generation migrants, but it is worth noting that the generation of immigration may not be equivalent to country of birth; for example, those born outside the hosting country could be either the first or the second generation as migrants, depending on how old they were when they started to live in the hosting country. Although the differences are not statistically significant, the difference between ethnic minority and ethnic majority, all born in Great Britain, is clearly notable. It is also worth noting that the number of individuals who were members of ethnic minority, born in Great Britain and frequently lonely is already as low as 5 (or 7.4% of 68).

6.3. Prevalence of frequent loneliness by three intersectional socio-demographic attributes

To add another attribute to the above analysis, we need to choose between sex and age, for which previous findings have been inconsistent. As age groups show much bigger variation than sex groups with frequent loneliness, it should be more useful to bring in age group as another condition. This is a difficult decision to make because it was made not based on any theory but the variation of a variable. A theory should have guided the selection of the next variable to be included, but unfortunately, as pointed out earlier, existing studies have found neither age nor sex to be consistently associated with loneliness, and no existing theory could determine the relative importance of one variable over the other. Therefore, a statistical rationale is adopted here: analysing the relationship between a variable with a bigger variation with the response variable offers a better chance to discover a more specific intersectional group in the next round of analysis. Table 3 presents the percentages of frequent loneliness amongst these 12 intersectional groups:

Table 2
Frequent loneliness by the intersectional attributes of ethnicity and country of birth.

Intersectional groups	n	% frequently lonely
Ethnic minority and born in Great Britain	68	7.4
Ethnic majority and born outside Great Britain	184	6.5
Ethnic minority and born outside Great Britain	144	6.3
Ethnic majority and born in Great Britain	1833	4.8

The rows in Table 3 are ranked in a descending order by the percentage of frequent loneliness in each intersectional group. The reader will see the most striking result if they compare the first row with the last – both groups are young and members of ethnic minority, but those born in Great Britain suffer from the highest percentage of frequent loneliness, whilst those born outside the country enjoy the lowest, and the sample sizes of the two groups are close. In fact, the 11.8% in the second row for white young people who were born outside Great Britain tells the same story – *young people would be more vulnerable to frequent loneliness if they were born in a country in which they found themselves ethnically different from most of the others*.

In contrast, the next most vulnerable group are older people born outside Great Britain, regardless of whether they are ethnic minority or not – both intersectional groups have a percentage of frequent loneliness as high as around 10% (the third and fourth rows). In other words, for older people, what matters to frequent loneliness is not whether they belong to an ethnic minority group but that they were born in another country. This is not to say that ethnicity is irrelevant to older people's loneliness; when they are analysed together in this case, it is country of birth, not ethnicity, that affects the prevalence of frequent loneliness amongst older people in Great Britain. It is important to point out that the 0% for older ethnic minorities born in Great Britain is not really meaningful – most older people of ethnic minority were born outside Great Britain, which is why this intersectional group has the smallest sample size, and none of them happened to feel frequently lonely.

Unsurprisingly, the three ethnic majority groups (rows 7 to 10) constitute the largest shares of the total sample size, and the prevalence of frequent loneliness amongst these intersectional groups are very close to the national average.

For the middle-aged groups, it is important to observe that frequent loneliness is much more prevalent (6% to 7%) amongst the two ethnic minority groups (born either in or outside Great Britain, rows 5 and 6) than it is amongst the two white groups (rows 9 and 10, 3% to 4%). In short, for the middle-aged, it is ethnicity rather than country of birth that determines how vulnerable they are to frequent loneliness.

Now the question is whether sex should be brought into the analysis, which may make the results even more 'nuanced'. However, in spite of the relatively large sample size of more than 2200, of the twelve possible intersectional groups, eight already have the number of cases fewer than five, and another has exactly five cases. It should be wise to stop here.

Table 3
Frequent loneliness by ethnicity, country of birth, and age.

Row	Intersectional groups	n	% frequently lonely
1	Ethnic minority+Born in GB+Under 30	20	15.0
2	Ethnic majority+Born outisde GB+Under 30	34	11.8
3	Ethnic majority+Born outside GB+60+	38	10.5
4	Ethnic minority+Born outside GB+60+	21	9.5
5	Ethnic minority+Born in GB+30–59	42	7.1
6	Ethnic minority+Born outside GB+30–59	94	6.4
7	Ethnic majority+Born in GB+60+	666	6.0
8	Ethnic majority+Born in GB+Under 30	276	4.3
9	Ethnic majority+Born in GB+30–59	885	4.0
10	Ethnic majority+Born outside GB+30–59	111	3.6
11	Ethnic minority+Born in GB+60+	5	0.0
12	Ethnic minority+Born outside GB+Under 30	25	0.0

Clearly, this shows a notable limitation of studying intersectionality by analysing a secondary dataset that was not designed to represent a variety of intersectional groups.

7. Discussion

This paper aims to develop an approach to studying intersectionality empirically with a substantive focus on loneliness representing a form of disadvantage. It should be useful to explicitly summarize the key principles of this approach here:

1 When deciding on which socio-demographic attributes to be included in empirical analysis, consider how, in the spirit of intersectionality, the association of the disadvantage under study and each selected attribute would represent a certain form of social inequality or injustice; this consideration of choosing the attributes is significantly different from that of choosing variables that may best predict the response variable. Intersectionality is most powerfully demonstrated if the distribution of certain disadvantage is strikingly uneven across intersectional groups when, from the perspective of social justice, the two should not have been associated. For example, from the perspective of social justice, single mother with disability should not be discriminated against when applying for jobs, but if we find they are, then the benefit of internationality is most clearly revealed.
2 After presenting and analysing the relationship between each selected attribute and the response variable of disadvantage, analyse the intersectional effect by starting with the two attributes that have the most potential of demonstrating social inequality or injustice, then add one more attribute at a time in a progressive manner so that the researcher could examine the changing relationship between intersectional attributes and the studied disadvantage.
3 At each step of the above analysis, systematically present all possible intersectional groups (or cross-classifications), consider their meaning in the context of social reality, check the sample size of each group, and study the prevalence of the studied disadvantage in each group. These are important because not all possible intersections make sense and individuals tend to cluster in certain intersectional categories. The importance or vulnerability of a particular intersectional group should not be assumed and must be demonstrated by comparing all groups in terms of the studied disadvantage.
4 Clarify whether the intersectional effect is analysed as an effect *in addition to* the main (single-dimensional) effects, or an effect that does not distinguish the two. It is this author's understanding that intersectionality as a theoretical approach would prefer the latter to the former, which is why generalized linear regression models were not used in this study, but this may remain as a matter of the researcher's choice or theoretical debate.
5 Consider whether it truly helps to transform the data so that set-theoretic methods could be used. Whilst these methods do offer some benefits, including the systematic examination of the possible intersections and their direct relations with the outcome, identification of different combined conditions, and the simplification of solutions, it is the author's view that it is not always necessary or beneficial to turn the data into sets because the transformed data may lose original meaning and their original relations in social reality.

This technically simple study has demonstrated how the intersectionality approach could help the research on loneliness move forward. Although some researchers already produced studies that paid attention to the interactional effects of multiple attributes, they might not have done that by consciously or seriously following the principles of intersectionality. What motivated these studies, especially those applying linear regression models, was to make the models more effective of predicting the response variable; in doing so, statistical considerations have eclipsed the concern with intersectional justice. For example, many studies have included gender, age, marital status, living arrangement, health conditions, social relations and activities, etc., as important predictors of loneliness, and their purposes are either to predict the probability of feeling frequently or severely lonely or to construct a more precise profile of the loneliest, which are not necessarily in line with what intersectionality would like to achieve. In this sense, any clear evidence that older females are most vulnerable to frequent or severe loneliness may not demonstrate intersectional injustice because their loneliness is simply an outcome of biological mechanisms – females tend to live longer than males and therefore are more likely to live alone when getting older, which most likely triggers a sense of loneliness. This is the reason why in this study the empirical analysis did not start with these two attributes.

Similar to the unsettled matter over which predictors should be included in a generalized linear regression model, studies on loneliness such as reviewed previously in this paper have chosen different socio-demographic attributes, either for measuring the effect of a single predictor or for revealing any intersectional effect. Whilst each study has justified its choices, there has been no agreement on which socio-demographic attributes should be included for studying the relationship between intersectional attributes and loneliness. It is certainly understandable that the intersectional groups most vulnerable to frequent or severe loneliness may vary from one context to another, which makes it hard, if possible at all, to identify a small number of 'common attributes'. On the other hand, agreement will bring certainty and clarity. Practitioners, professionals, and policy makers would appreciate if academic researchers could help practitioners identify a small number of intersectional groups that are most vulnerable to frequent or severe loneliness in a particular country and at a particular time. This study has identified the following intersectional groups in Great Britain in 2014 to 2015, for whom the percentage of frequent loneliness is between 10% to 15%, much higher than the national average of 6%: young people (under 30), except for those who were ethnic minority born outside Great Britain, and older people (aged 60 and above) who were born outside Great Britain, regardless of their ethnicity.

The analyses conducted in this study are constrained with two limitations. The first is the limited number of socio-demographic attributes included in the analyses, which restricted the intersectional groups to be studied. For example, the target population of the ESS does not include adolescents which other studies (Qualter et al., 2013) included, and this study focused on Great Britain, excluding national culture as a potential intersectional attribute (Barreto et al., 2021). It is worth noting, however, that this theoretical and substantive issue comes partly from the potential sparseness of data. One benefit of following the progressive conditional approach is to keep a close eye on the sample size of each intersectional group to avoid the issue of sparse data. With only four attributes, the sample sizes of some intersectional groups quickly approach to a very small number, and the reliability of any data when the sample size becomes lower than 30 becomes questionable (Hogg et al., 2019). When linked to the prevalence of frequent loneliness, the number of cases could soon come below five, a threshold that some statisticians would advise as the minimum (Agresti, 2017). In addition, the percentage of the sample size for each cell or intersectional group out of the entire sample size should be considered as well. Nevertheless, this is a simple question that would entail complicated and controversial answers, which cannot be resolved here. Even when there is a strong theoretical case for including more attributes, the practical constraints imposed by the sample's unbalanced structure make it effectively impossible to include more attributes. To make the analysis statistically powerful enough to detect the effect of intersectional groups, the sample must have been drawn to ensure that each intersectional group would be represented with a sufficient number of cases, a technical issue to be resolved in the near future.

The other limitation is technical – the analyses in this study may appear to be too simple for some researchers. This study aims to present

and examine the direct relationships between the intersectional groups and the interested value of the response variable. On the one hand, the author did not employ multilevel models as they require the inclusion of main (single-dimensional) effects, which the author believes is inconsistent with the spirit of intersectionality. On the other hand, for concerns with the restrictions brought about by transforming the data into set memberships, the author did not make use of set-theoretic methods either, although they do map out and analyse the direct relationship between the intersectional attributes and frequent loneliness.

8. Conclusion

By demonstrating the particularly disadvantaged position of certain intersectional groups, which would not have been discovered had only one attribute been considered, intersectionality has become a guiding theoretical approach to studying and tackling social equality and injustice in many areas. During the past two or three years a few researchers employed intersectionality as an explicit approach to studying loneliness, but how this should be done remains a question to be explored and debated in the coming years. The major challenge is to keep the empirical analysis on the track of intersectionality, with every strategy and method being evaluated both technically and in line with intersectionality's fundamental principles. Following a progressive and conditional approach, this study illustrated a strategy of meeting up this challenge and identified a few intersectional groups in Great Britain who were more vulnerable to frequent loneliness than the other groups in the years of 2014 and 2015.

Data and code availability statement

The data analysed in this paper are freely available at Data and Documentation | European Social Survey (ESS)

The author used SPSS 28 to analyse the data and would be happy to provide the code for producing the results upon request.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data freely available online

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