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Hard to Survey and Negligible? Institutional Populations in Europe and the Risk of Bias in Surveys Due to Their Exclusion

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As of 2011, 1.3% of the European population were living in communal establishments such as retirement and nursing homes, university halls of residence, prisons, or refugee accommodation centers. Their small relative size, and their label as hard to survey are two reasons why many social surveys exclude institutional populations and cover only residents of private households. Using the latest European census data (2011), the present paper provides a quantitative description of these understudied groups with respect to their age, sex, marital status, citizenship, educational attainment, and labor force status. By identifying the cases in which restricting the target population to residents of private households might result in coverage bias, the paper aims to provide a basis for future decisions about the eligibility or ineligibility of institutional populations. Two components of bias are considered: the size of the respective institutional populations and differences in various demographic and socioeconomic variables. The results underline the heterogeneity of institutional populations. Due to the unequal distribution of institutional populations across age groups, I conclude that, to reduce the risk of bias, social surveys should consider extending their target populations to old-age persons living in retirement and nursing homes.

Keywords: coverage bias; institutional populations; exclusion; population statistics; European census data; social surveys

1 Introduction

Most social surveys are designed to allow users to draw inferences for the population living in a given territory at a certain point in time. This goal usually ignores the fact that the majority of social surveys deliberately exclude parts of the population. Schnell (1991) described and quantified this excluded group in the case of Germany: Apart from immigrants with an inadequate command of the survey language(s), functionally illiterate persons, mobile populations, and elites, a large proportion of the excluded group was accounted for by the institutional population. Among others, the latter comprises persons living in correctional and penal institutions, university resident halls, refugee accommodation centers, monasteries, hospitals, or retirement and nursing homes (OECD, 2003). According to the 2011 European census data, about 1% of the European population were living in institutional households at the time of the census. This population comprised 6.6 million people, a group larger than the respective populations of 13 European countries, for example, Lithuania, Ireland, or Denmark.

Persons living in institutions can be described as hard to survey (Tourangeau, 2014). Research has shown that these persons may be hard to reach due to gatekeepers in institutions, and hard to interview due to health impairment, frailty, or language barriers (Schanze & Levinson, 2019; see also Cambois et al., 2016; Feskens, 2009). In addition, the small relative size of the institutional populations—they account for less than 2% of the total population in Europe—might not justify the additional financial effort involved in extending the definition of the target population. Thus, things have not changed dramatically since Schnell's study in 1991. The majority of social surveys – for example, the European Social Survey (ESS), the European Values Survey (EVS), the Generations and Gender Programme (GGP), the German General Social Survey (ALLBUS), and the U.S. General Social Survey (GSS)—and even some health and aging surveys still exclude persons living in institutions (Cambois et al., 2016; Schanze & Levinson, 2019).

On the other hand, Schanze and Levinson (2019) listed more than 150 survey programs that cover residents of institutions. Nearly half of these survey programs focus on nursing and retirement homes. They include, for example, the Survey of Health, Ageing and Retirement in Europe (SHARE), the U.S. Health and Retirement Study (HRS), and the German Ageing Survey (DEAS). Other survey programs, especially in the United States, cover prison inmates, (e.g., the U.S. PIAAC Survey of Incarcerated Adults). Recently, the increasing number of refugees led established German surveys, such as the German Socio-economic Panel (SOEP),

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to cover refugees living in collective accommodation centers and private households. Another group of survey programs cover institutions in general as part of their target populations without specifying certain types of institutions. They include, for example, the European Health Interview Survey (EHIS), the European Labour Force Survey (EU-LFS), and the UK Household Longitudinal Study (UKHLS).

Nonetheless, comprehensive empirical knowledge about institutional populations is limited in most European countries – even in many national statistical offices, as a task force of the United Nations Economic Commission for Europe (United Nations Economic Commission for Europe, 2020) concluded. The present paper uses data from the 2011 European census to answer two research questions. First, in which demographic subgroups do institutional populations reach a substantial share? Second, do institutional residents in Europe differ from their peers living in private households in terms of demographic or socioeconomic characteristics? The latter research question deals with the differentness of institutional residents, as the second part of the formula determining coverage bias. The paper aims to inform decisions about how to deal with institutional populations when defining the target populations for social surveys. It considers only the necessity of including these populations in order to avoid the risk of bias, but not the feasibility of extending coverage in the light of the hard-to-survey nature of institutional residents.

The paper is organized as follows: The next section outlines the theoretical background of coverage bias and explains why the exclusion of institutional residents might increase the risk of bias. The section also contains a definition of institutions and elaborates on how demographic and socioeconomic characteristics are expected to differ by various types of institutions. The third section describes the underlying data and methodology of the paper. As census data play a vital role in this analysis of bias, the paper also mentions potential sources of error within register-based and traditional censuses with respect to collecting data in institutional collective dwellings. The fourth section presents the results of the data analyses. It is divided into two parts: The first part quantifies the size of institutional populations; the second part elaborates on potential empirical differences, comparing their basic demographic and socioeconomic characteristics with those of the population living in private households. The paper concludes by discussing the implications of the results for social survey programs.

2 Coverage Bias and the Institutional Populations

Following Groves et al. (2009), "coverage bias can be described as a function of two terms: the proportion of the target population not covered by the sampling frame, and the difference between the covered and the noncovered population" (p. 55). Most of the literature on coverage error deals with mismatches between the definition of the target population and the coverage in a sampling frame (Groves et al., 2009; Lessler & Kalsbeek, 1992; Lohr, 2010). Undercoverage occurs whenever a part of the population is defined as belonging to the target population but is not included in the sampling frame. In contrast to the previous literature, the present paper does not deal with undercoverage because of incomplete sampling frames, but rather examines the risk of coverage error because of the deliberate exclusion of specific subgroups of the population. The following simple formula adapted from Groves et al. (2009, p. 55) captures coverage bias, and applies also to bias caused by the exclusion of persons living in institutions:

$$\bar{Y}_p - \bar{Y} = \frac{N_i}{N}\left(\bar{Y}_p - \bar{Y}_i\right)$$

Following the adapted formula, the difference in the mean or in any other point estimate drawn from a sample of private households ($\bar{Y}_p$) compared to the respective value in the total population ($\bar{Y}$) is determined by multiplying the share of the institutional population ($\frac{N_i}{N}$) by the aggregate differences between the excluded institutional population ($\bar{Y}_i$) and the included population living in private households ($\bar{Y}_p$). Thus, bias caused by deliberate exclusion gets stronger with the relative size of the institutional population and increasing differences between the two types of housing (see United Nations Economic Commission for Europe, 2020).

Why might institutional residents differ from residents of private households? Leaving a private household and moving to a communal establishment—voluntarily or involuntarily—implies a strong (self–)selection mechanism. Institutional residents may be interested in pursuing higher education, may have to work away from home for economic reasons, may be too frail or sick to live on their own, may have fled their native countries to escape war, or may have committed a crime and end up being given a prison sentence. The plural form of the term institutional population used in this paper expresses the large heterogeneity within the population living in institutions. As a consequence of the (self–)selection and the transformational influence of living in what Goffman (1957) termed "total institutions" (e.g., prisons, monasteries, or mental hospitals), drawing inferential conclusions for the entire population from a sample of private households might result in bias in some attitudinal or behavioral variables.

The following paragraphs briefly summarize data on various types of residential institutions, describe how the variables age and sex are distributed within these institutions, and take a closer look at how institutional residents might differ from residents of private households in terms of their sociodemographic characteristics.

2.1 Defining Institutions and Numbers on Types of Institutions

In the European census conducted in 2011, participating countries were required to apply the "housekeeping concept" to identify private households (Eurostat, 2011). According to this definition, a private household is either (a) a one-person household, "that is, a person who lives alone in a separate housing unit or who occupies, as a lodger, a separate room (or rooms) of a housing unit but does not join with any of the other occupants ... to form part of a multiperson household"; or (b) a multiperson household, "that is, a group of two or more persons who combine to occupy the whole or part of a housing unit and to provide themselves with food and possibly other essentials for living," and who "may pool their incomes to a greater or lesser extent" (p. 92). Institutions or "'collective living quarters' are premises that are designed for habitation by large groups of individuals or several households (Eurostat, 2011, p. 63). Following from the definition of private households, institutions host large groups of mostly unrelated residents without any economic connection in a single dwelling. In institutional households such as nursing homes, residents do not usually do their own housekeeping, but rather are provided with essentials for living, meals, and assistance with activities of daily living (Schanze & Levinson, 2019; U.S. Census Bureau, 2012). Short-term residents of institutions, for example, inpatients in hospitals or prisoners awaiting trial are not included in the institutional population (Eurostat, 2011).

Previous detailed analyses of institutional populations have been restricted to individual countries and have often been published by national statistical offices. Approximately 2% of the total population were living in institutions in England, France, or Sweden (ONS (2015) and Pirou et al. (2013); data available from Statistics Sweden upon request). In those countries, educational institutions and retirement and nursing homes were the most prevalent types of institutions. Comprehensive cross-national figures on the types of institutions in which institutional residents are living are not available from a single source at the European level. As the following section shows, age and sex are decisive in distinguishing types of residential institutions, thus, both variables serve as proxy variables for types of institutions.

Cross-national data are available for specific groups of institutional residents, such as refugees (Eurostat, 2020a) or prisoners (Eurostat, 2020b). In 2011, Eurostat recorded 320,000 asylum applicants in 30 European countries; by 2016, this number had quadrupled because of various international armed conflicts (Eurostat, 2020a). No information about types of refugee accommodation is available from Eurostat, but it can be assumed that after arriving in Europe, refugees usually live in initial reception centers or collective accommodation centers. In European countries, a lower percentage of the population is incarcerated than is the case in many other countries worldwide (Eurostat, 2020b; Walmsley, 2018). Institutions for elderly people focus on the provision of care and medical services. They are the most common type of institution in Europe. Rodrigues et al. (2012) presented comparative data on the distribution of care for the population aged 65 and years and older in Europe and North America. Whereas roughly 5% of the population in Northern and Western European countries received institutional care, this proportion was smaller in Southern and Eastern Europe.

2.2 Demographic and Socioeconomic Characteristics of Institutional Residents

In this paper, I examine several demographic and socioeconomic variables that are expected to differ between residents of private households and institutions. Table 1 lists different types of residential institutions. It also advances several hypotheses on the expected predominant characteristics of the population living in these institutions. When examining the entire institutional population, sociodemographic particularities might annul each other, for instance, leading to a perfectly balanced sex distribution (ONS, 2015; Pirou et al., 2013) or to low differences in level of education comparing it to private households. Still, the underlying differences across types of institutions can lead to bias in demographic subgroups or for additional variables correlated with those sociodemographic characteristics.

The stylized facts presented in Table 1 are based on previous literature and on my own expectations. Empty cells indicate that it is not possible to postulate any predominant characteristic with the given information. This could be due to inconclusive empirical evidence (e.g., on the association between level of educational attainment and the probability of entering a nursing home) or to a lack of empirical knowledge (e.g., citizenship of residents in religious institutions).

Educational institutions

Residents living in boarding schools and university dorms are of course young. The mean age in French boarding schools was 18 years, while it was 22 years in university resident halls (Pirou et al., 2013). In England and Wales, very few residents of educational institutions are older than 25 years (ONS, 2015). The sex distribution was almost balanced in boarding schools and student dormitories in France, England, and Wales (ONS, 2015; Pirou et al., 2013). It can be assumed that young adults living in educational institutions have mostly never married, which should be similar for their peers living in private households. The English Office for National Statistics reported a high diversity of citizenships in educational institutions (ONS, 2015).

As far as the level of education is concerned, undergraduate or graduate students living in university residence halls have an upper-secondary or a tertiary level of education, and

thus presumably have a higher level of educational attainment, on average, than their counterparts living in private households.

The 2010 U.S. census distinguished between "institutional group quarters" and "noninstitutional group quarters", with the residents in noninstitutional group quarters being "eligible, able, or likely to participate in the labor force while residents" (U.S. Census Bureau, 2012, B–16). Persons living in boarding schools or university residence halls are part of the former group, as they are usually economically inactive.

Military institutions

Residents living in military institutions are younger than 30 years on average and they are predominantly male (ONS, 2015; Pirou et al., 2013). Like for the population living in educational institutions, it can be assumed that residents living in military institutions have mostly never been married due to their young age. It can be assumed that most of those residents hold the citizenship by their respective country, thus, resulting in a lower diversity of citizenship than in the general population in this age group. As military staff, they are economically active and belong to the labor force.

Prisons

In France and England, prisons were predominantly inhabited by men younger than 40 years (ONS, 2015; Pirou et al., 2013). In Europe, only 6% of the prison population was female in 2017 (Walmsley, 2017). In the USA, the PIAAC survey in prisons implies that inmates are likely to have a lower level of education, on average, than the population living in private households (Rampey et al., 2016). The U.S. census counted different types of prisons as institutional group quarters, implying that the population living there is economically inactive (U.S. Census Bureau, 2012). However, depending on national laws, some countries might also count prison labor as economic activity, which is why the respective cell in Table 1 is left empty.

Refugee accommodation centers

Newly arrived refugees in the UK and Germany were predominantly younger than 34 years, only 2% were older than 65 years in the UK (Brücker et al., 2016; Cebulla et al., 2010). In both countries, roughly one third of those persons was female (ibid.). Considering the citizenship of institutional residents in refugee accommodation centers, it is safe to expect a high percentage of non-EU citizens and stateless persons living there. Depending on national laws, most refugees living in accommodation centers might still be economically inactive, as they often wait for their asylum to be granted before entering the labor market.

Workers' group living quarters

In two large European countries, census data showed a prevalence of men living in workers' group living quarters (ONS, 2015; Pirou et al., 2013), who were 45 years on average (ibid.). Approximately half of all residents in French workers' group living quarters have a foreign citizenship (Pirou et al., 2013). According to the definition of the U.S. census, residents of workers' group living quarters are economically active and therefore belong to the labor force (U.S. Census Bureau, 2012).

Health care institutions

In England and Wales, the age distribution in hospitals was mixed; all age groups were represented in 2011, however, a slightly larger share of middle-aged and older residents was reported (ONS, 2015). More men than women inhabited health care institutions (ONS, 2015). Labor force status is uncertain for persons living in health care institutions. They might be economically active (e.g., if they are only on sick leave for a certain period), unemployed, or economically inactive. Therefore, the cell for labor force status in health care institutions in Table 1 is left blank.

Religious institutions

According to French census data, residents of religious institutions were aged 66 years on average and female in 3 out of 4 times (Pirou et al., 2013). While a similar same sex distribution applied to religious institutions in England and Wales, 25% of all residents were younger than 34 years while more than 40% were older than 65 years (ONS, 2015). It can be assumed that residents in religious institutions have mostly never married and are counted as economically active (cf. U.S. Census Bureau, 2012).

Institutions for elderly persons

Several studies have found a clear positive association between higher age and the probability of moving to a retirement or nursing home in Europe (Angelini & Laferrère, 2012; Einio et al., 2012; Geerts & van den Bosch, 2012; Laferrère et al., 2012; Luppa et al., 2010; Martikainen et al., 2009; McCann et al., 2012; United Nations Economic Commission for Europe, 2020). The share of institutional residents within the population aged 85 years and older exceeds 15% in many European regions (Eurostat, 2015, p. 148). In France, the average age of residents of retirement homes was 84 years in 2009 (Pirou et al., 2013). Previous research is inconclusive on whether male or female sex correlates with the event of having to move to a retirement or nursing home (Einio et al., 2012; Luppa et al., 2010; Martikainen et al., 2009; McCann et al., 2012). This is also because gender

Table 1

Stylized Facts About Institutional Populations

Type of institution	Age	Sex	Marital status	Citizenship	Educational attainment	Labor force status
Educational institutions	Young (10–30 years)	Mixed	Never married	-	Medium/high	Inactive
Military institutions	Young (20–40 years)	Men	-	Citizens	-	Employed
Prisons	Young/middle-aged	Men	-	-	Low/medium	-
Refugee accommodation centers	Young/ middle-aged	Mixed	-	Non-European/stateless	-	Inactive
Workers' group living quarters	Middle-aged	Men	-	Mixed	-	Employed
Health care institutions	Middle-aged/old	Mixed	-	-	-	-
Religious institutions	Middle-aged/old	Mixed	Never married	-	-	Employed
Institutions for elderly persons	Old (70+)	Mixed (more women)	Widowed/never married	-	-	Inactive

is correlated with multiple aspects of life, such as education, self-rated health, life expectancy, or family networks (cf. Einio et al., 2012; Castora-Binkley et al., 2014).

Marital status has been identified as a predictor of institutional residence for the elderly population. Widows have a greater likelihood of moving to retirement and nursing homes than persons being married (Angelini & Laferrère, 2012; Einio et al., 2012). So, too, do older people living alone without family support (Geerts & van den Bosch, 2012; Laferrère et al., 2012; Luppa et al., 2010; Martikainen et al., 2009; McCann et al., 2012; Pimouguet et al., 2016), for example, because they are divorced or have never been married. If they need care, these people are less likely to receive it informally at home, which is why they are more likely to be living in retirement and nursing homes.

Several European studies on institutional residence among elderly people have identified socioeconomic factors such as income or house ownership as important explanatory variables (Angelini & Laferrère, 2012; Einio et al., 2012; Luppa et al., 2010; Martikainen et al., 2009; McCann et al., 2012). In the present paper, the socioeconomic status of residents is captured only with the variables level of educational attainment and labor force status. Turning to educational attainment first, a study on the care home use of elderly persons in Finland and Belgium found that, for men, a higher level of education was associated with a lower probability of entering a care home (Einio et al., 2012), whereas two other studies using survey data from the USA concluded that a higher level of education was associated with a higher risk of long-term nursing home placement for women (Castora-Binkley et al., 2014) or for both sexes (Thomeer et al., 2015). In a study based on 2011 European census data the educational differences across types of housing gradually disappeared with increasing age in the population aged 70 years and over (United Nations Economic Commission for Europe, 2020), which is why this cell is left empty in Table 1. Regarding labor force status, most institutionalized and non-institutionalized residents in this age group can be expected to be retired and economically inactive.

3 Data and Analyses

3.1 Challenges in Collecting Data on Institutional Populations

Calculating the effect of non-coverage on statistical estimates is impossible in the case of most social survey data because information is missing due to the exclusion of institutional residents. This paper uses administrative census data from 30 European countries to learn more about the population living in institutions. Considering the representation side of the total survey error framework (Groves et al., 2009), census data suffer less from coverage error than any other social survey. This is because censuses are commissioned by governments and national statistical offices and have access to the best administrative sources. Censuses operate with very large sample sizes; traditionally they even cover every single member of the target population. By contrast, survey

samples with 1,000 to 5,000 respondents are not sufficient to allow separate analyses for institutional residents, unless oversampling is used. Moreover, in contrast to voluntary participation in social surveys, participation in censuses is mandatory.

Nevertheless, census data are still prone to some errors, especially for hard-to-survey populations (Abbott & Compton, 2014; Mulry, 2014). Institutionalization implies being in an "atypical living situation" (see Sweet & Alberti, 1994, p. 324): Students living in a university residence hall, prisoners, soldiers, or spouses living in a retirement home risk not being counted or being double counted. For instance, the instructions of the Norwegian population register specify that: "Spouses should normally be registered at the same address in the [register] even if one of them actually is living in an institution such as homes for the elderly. Persons who are not married are normally registered as residents in the institution" (Andersen & Utne, 2011, p. 1166). Consequently, this part of the population is probably underestimated in a fully register-based census. Proxy replies may be another source of inconsistencies and error. In the 2001 English and Welsh census, residents of retirement and nursing homes were falsely recorded as staff of their institutions because some employees filled in their own positions when answering the census form on behalf of residents (Bajekal et al., 2006). Thus, even a census with full coverage of the population might have difficulties covering all groups equally.

Another limitation is the fact that population censuses are conducted only every ten years. Moreover, the information collected is limited to demographic and socioeconomic facts. Information about attitudes or behaviors of respondents is not collected, which is why it is also missing in the present paper. Nonetheless, basic variables such as age, sex, marital status, and educational attainment are important structural variables and are used as explanatory variables in many empirical studies on a wide variety of topics. Any empirical differences for those variables will most probably have an impact on bias in other attitudinal or behavioral variables. Regarding the institutional populations, it is very important to mention that Eurostat does not publish information on the types of institutions.

When comparing census data on institutional populations from various countries, differences in the definition of institutions are another potential source of error. In a recent working paper published by United Nations Economic Commission for Europe (2020), the difficulty in distinguishing various types of institutions across countries was highlighted. In the present paper, the difficulties arise rather from blurred lines between institutions and private households. This is especially the case for the elderly population whenever new forms of assisted living facilities replace traditional nursing homes (Lewinter, 2004; United Nations Economic Commission for Europe, 2020).

3.2 Variables Used in the Analysis

The European Union aims to publish comparable data from national censuses collected with country-specific methods (Eurostat, 2011; Poulain & Herm, 2013; Valente, 2010). In its "Census Hub", Eurostat provides a range of sociodemographic variables and their cross-tabulations (hypercubes), which can be downloaded and used to cross-nationally compare institutional populations and populations in private households (Eurostat, 2016). In addition to the 27 EU member states, this paper also provides information on Iceland, Norway, and the United Kingdom. It compares national data on these two groups with respect to age, sex, marital status, nationality, educational attainment, and the labor force status.

The published census data contain two variables on the type of housing. The first variable, household status, comprises the categories "in private household", "in institutional household" as well as "homeless persons"; the second variable, housing arrangements, comprises the categories "conventional dwelling", "collective living quarters", and "other housing unit and the homeless." In the majority of countries, the number of people living in institutional households or in collective living quarters is exactly the same, or very similar, in the two variables. In five countries, differences larger than 0.5 percentage points could be observed for the two variables. In my analyses, I rely mostly on the housing arrangements variable. However, for analyses on marital status and educational attainment, I use the household status variable because hypercubes for those variables were not available in combination with housing arrangements.

Other variables provided by the Eurostat Census Hub (Eurostat, 2016) are also used. The operationalization of those variables is summarized in Table 2. For citizenship, EU membership as of 2011 is applied. For marital status, citizenship, educational attainment, and labor force status missing values ("no information stated") are more prevalent in some European countries. In the interests of transparency, missing values are not suppressed from graphs or analyses of dissimilarity. In cases of excessive missing values, individual countries are excluded from the analyses.

3.3 Process of Analysis

The analysis began with an overview of the share of the population living in institutions by country, taking into account the age and sex of residents. This overview is a revision and extension of work presented in an earlier study (Schanze & Levinson, 2019). It helps to determine the countries and the age and sex cohorts in which the institutional populations were largest. As mentioned in Section 2.1, in view of the absence of aggregate data on the types of institutions in European countries, age and sex are essential variables.

The second part of the analysis examined marital status,

Table 2

Operationalization of the Variables Used in the Analyses

Variable	Operationalization
Sex	Male; Female
Age	(1) Five-year age brackets (from 0–5 to 95–100+); (2) Six broader age groups (<15; 15–29; 30–49; 50–64; 65–84; > 85)
Marital status	Never married and never in a registered partnership; Married or in a registered partnership; Divorced or registered partnership legally dissolved; Widowed or registered partnership ended with the death of partner
Citizenship	Citizenship of reporting country; Citizenship of another EU member state; Citizenship of another country outside the EU; Stateless
Educational attainment (ISCED 1997)	Low (ISCED 0–2); Medium (ISCED 3–4); High (ISCED 5–6)
Labor force status	Employed; Unemployed; Currently not economically active

citizenship, educational attainment, and labor force status. Eurostat reports census data for most European countries, thus allowing a comparison of those variables for types of housing, age, and sex. As a first step, Duncan's index of dissimilarity was calculated for each variable to obtain a country-specific overview of the joint impact of relative size and differences in various variables. Developed by Duncan and Duncan (1955), this index provides aggregate information on a deviation of proportions within a variable between two groups. In this paper, it was calculated using the following formula:

$$D = \frac{1}{2}\sum_{c=1}^{n} |p_{pc} - p_c|$$

For each category ($c = 1, 2, \ldots, n$) of a given variable, $|p_{pc} - p_c|$ gives the absolute difference between the proportion within the population living in private households (p_{pc}) and the respective proportion within the total population (p_c), namely private household residents and institutional residents. These absolute differences are added up for each variable and divided by 2. I performed this calculation separately for the six age groups in the 30 European countries covered in the paper and for the European aggregate. This index of dissimilarity is non-directional—that is, it does not provide any information about whether a specific category of variable is over– or underestimated if institutional residents are not covered. The scale of the resulting index ranges from 0 to 100, with 0 indicating the absence of dissimilarity and 100 indicating complete dissimilarity. Previous research obtained dissimilarity values between 0 to 10 for a range of sociodemographic variables in survey samples (Biemer et al., 2018; Eckman & Koch, 2019; Koch & Briceno-Rosas, 2021). Those numbers indicate what percentage of residents would have to switch categories in order to yield unbiased results compared to the total population. The comparison of the population in private households with the sum of the population in private households and institutional households implicitly controls for the relative size of institutional populations in addition to empirical differences. This is in line with the formula on coverage bias shown in Section 2. In the Results section, I use mosaic plots as another tool to visualize the relative size and differences between institutional populations and the population living in private households.

4 Results

4.1 Risk of Bias Due to the Quantitative Size of Institutional Populations

Figure 1 shows the share of the population living in institutions by country. Starting with the first part of the formula determining coverage bias, namely the relative size of the excluded population, roughly two thirds of all European countries reported a share of institutional residents above 1%. A small number of countries reported a very small share of less than 0.6% of the entire population. The fact that the countries in the former and latter groups were in various parts of Europe (see Figure 1) allows the conclusion that there is no clear geographical pattern in the sense of a "North-South or West-East divide" (Schanze, 2017, p. 9), for example.

Figure 2 shows the share of institutional populations within the respective age and sex cohorts in the six most populated European countries. The proportion is calculated within 21 five-year intervals. Table A1 in the Appendix provides similar numbers for broader age groups for all 30 countries and for Europe as a whole. Nearly all European countries follow one of the patterns shown in Figure 2. Two main groups of countries can be distinguished. In the first group, the share of institutional populations was very small in the young and middle-aged age and sex cohorts, reaching not more than 2%. The share steadily increased among the population aged 70 to 79 years, and reached its maximum in the oldest age groups. I label this group one-peak countries. It comprises 13 countries, namely, Germany, Italy, Spain, Austria, Belgium, Croatia, Cyprus, Finland, Iceland,

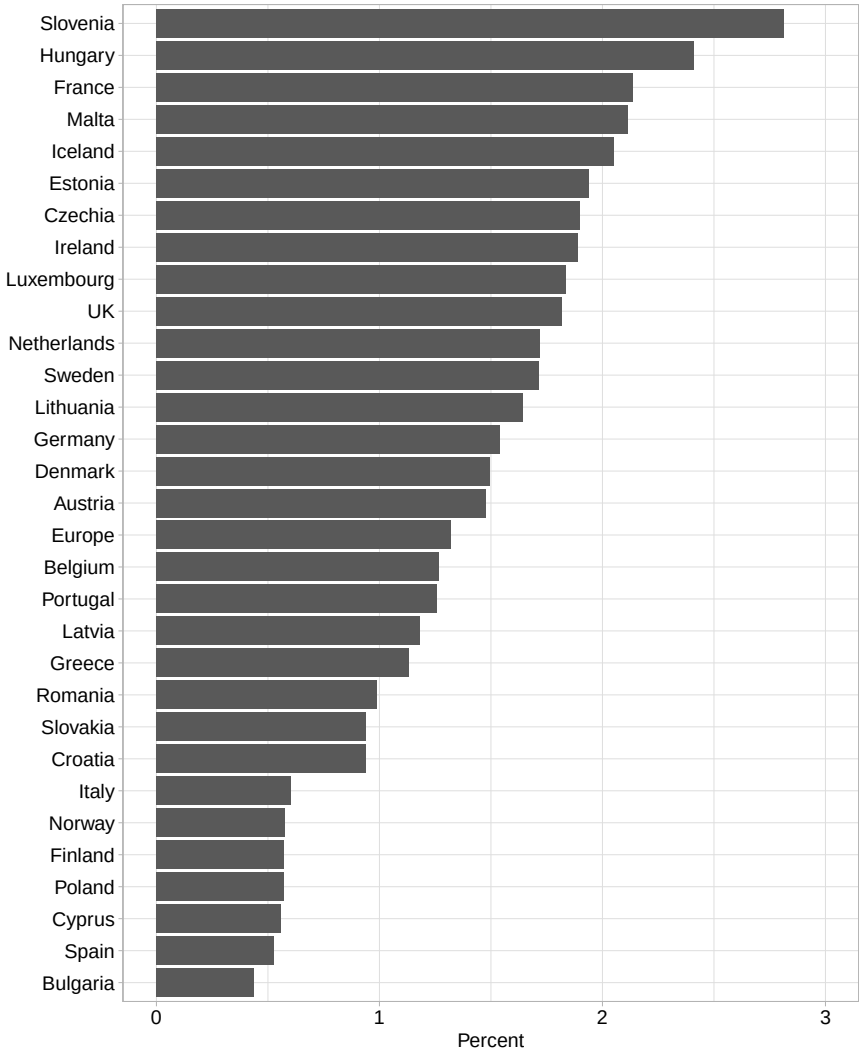

Figure 1

Share of the European population living in institutions in 2011 by country

Ireland, Norway, Portugal, and Slovakia.

The pattern in the second group of countries looks very similar to that in the first group for the middle-aged and elderly populations, but it differs significantly in younger age groups, where a second, smaller peak could be observed for the population aged between 10 and 29 years. France and the UK are two examples of these two-peak countries (see Figure 2). The other two-peak countries are Czechia, Denmark, Estonia, Hungary, Luxembourg, Malta, the Netherlands, Slovenia, and Sweden. Based on earlier findings and on the expectations presented in Table 1 above, it can be assumed that these younger institutional residents live predominantly in educational institutions (e.g., university resident halls or boarding schools), military barracks, or refugee accommodation centers.

A residual group of countries—Bulgaria, Greece, Latvia, Lithuania, Poland, and Romania—do not follow either of the two patterns described above, either because a higher share among young than among old people live in institutions or because very few people live in institutions (see Table A1 in the Appendix). To make the impact of the size of the institutional population on the risk of bias more visible, Figures 3, 5, 7, and 8 below, which show the results on dissimilarity indexes, distinguish between the three groups of countries described here.

4.2 Risk of Bias Due to Demographic and Socioeconomic Differences

This section considers the second component of coverage bias, namely demographic and socioeconomic differences

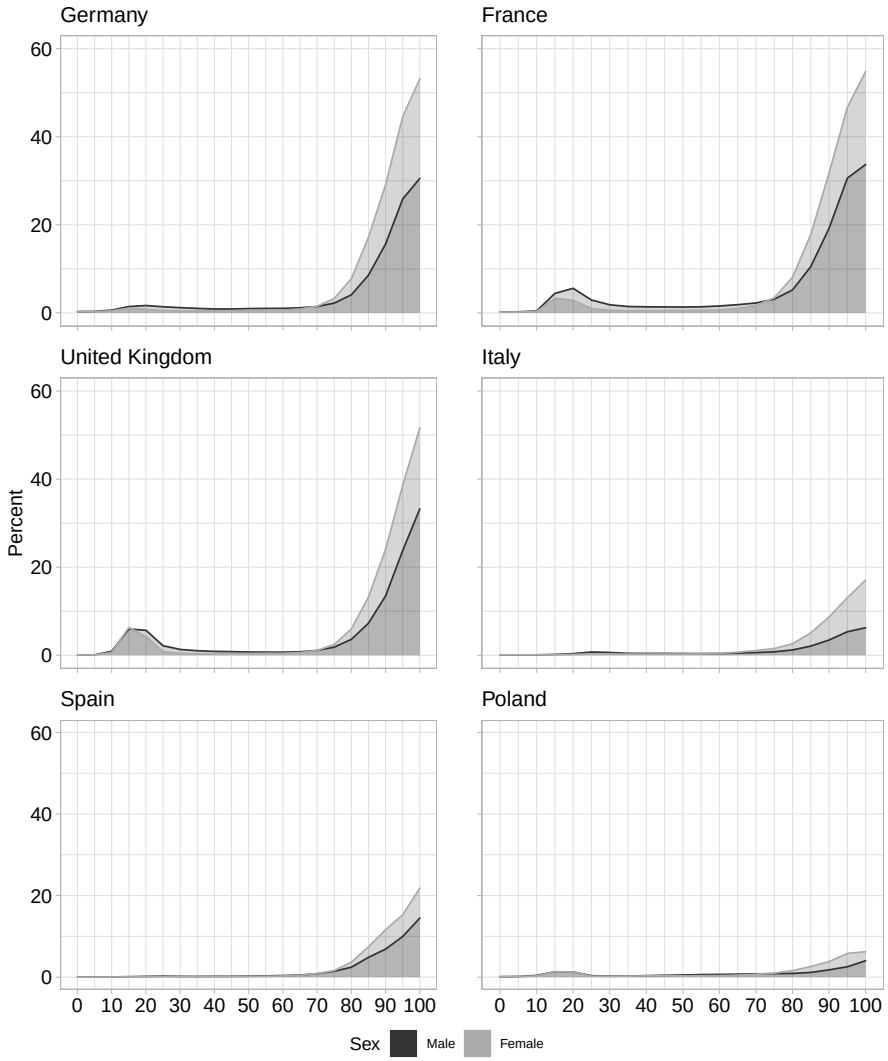

Figure 2

Share of the population in the six most populated European countries living in institutions within respective age and sex cohorts in 2011

between institutional residents and private household residents.

Sex distribution

Figure 2 also allows comparisons of age distributions by sex. As Schanze and Levinson (2019, p. 16) noted: "Even more than for age, the gender distribution bears a great resemblance across the European countries." According to the 2011 census data, from birth to age 69 years, the female share among institutional populations was equal or lower than the respective male share in almost all age groups in Europe. Up to age 15, many countries recorded equal proportions of males and females. For the population aged between 15 and 29 years, differences in proportions increased slightly across sexes. Usually, a higher share of males were resident in institutions in this age group. Considering the middle-aged age groups between 30 and 59 years, not a single country recorded a higher share of females among institutional populations than males. In Europe, approximately 1% of males aged 35 to 59 years were living in institutional households as of 2011; this share was 0.4 percentage points lower among women. This widespread sex pattern is consistent with the expectations formulated in Table 1 above.

The pattern of higher proportions of institutional residents among males was completely reversed for the population aged 70 years and older. In 9 out of 10 age groups, the share of institutional residents among females was higher than the respective share among males. Above the age of

80, only Bulgaria reported a higher share for men in a single age group. In Europe, 15% of women aged 85 years and over were resident in institutions as of 2011, whereas this percentage was only half as large for men (8%). As can be seen from the country plots presented in Figure 2, the share of institutional residents successively increased with age, as did the difference between the two sexes. It can be concluded from this that the potential bias introduced into statistics by excluding institutional populations from surveys is most pronounced in the case of elderly people in institutions, especially in the case of elderly women.

Marital status

For marital status, the dissimilarity indexes were rather small for the younger age groups, ranging from 0% to 1% in all countries (see Figure 3). Nearly all persons in these age groups were classified as "never married". The dissimilarity index and the variance across countries increased only for the two oldest age groups in both sexes. The European aggregate reached its maximum in the oldest age group (2%). In Iceland, where over 30% of elderly people were living in institutional households as of 2011, a little over 8% of non-institutional men aged 85 years and over would have had to change marital status categories to yield statistical equality between private households and the total population.

Figure 4 visualizes the risk of bias by showing the distribution of marital status while adjusting the size of the bars to the relative sizes of the four subgroups divided by sex and type of housing. Most social surveys ignore the population captured in the two bars for institutional residents, and interview only persons shown in the two bars for private households. For the population aged 64 years and under, the bars for institutional residents are hardly visible due to their small share. In this age group, a larger share of males and females living in institutions had never been married or were already divorced compared to their counterparts living in private households. The third mosaic plot shows the distributions for the population aged 65–84 years. A stronger difference between the two sexes emerged in this group: Women aged between 65 and 84 years were more often widowed than men, while, for both sexes, residents of institutions were more often widowed than residents in private households. For the European population aged 85 years and older in 2011, men living in institutions were more often widowed than their counterparts living in private households, while the share of widows among women was nearly equal across the two types of housing. Moreover, a larger share of institutional populations in the oldest age group had never been married than the corresponding share among residents of private households. These results are in line with the assumptions made in Table 1 for residents living in retirement and nursing homes. The overwhelming majority of European countries closely follows the patterns observed for the European aggregate.

Citizenship

In contrast to marital status, the variance of the dissimilarity indexes for citizenship was larger for young and middle-aged groups and smaller for the elderly population (see Figure 5). In the youngest age group, 94% of those living in private households were citizens of the reporting country. The equivalent share among institutional residents was about 10 percentage points lower. Eleven percent of the institutional residents aged 15 years and under held a non-EU citizenship. The larger diversity in institutions persisted across most age groups: In the age group 15–49 years, more than 90% of the non-institutional population were citizens of the reporting country, whereas this was the case for approximately 80% of the corresponding institutional population (see Figure 6). This proportion converged towards 100% with increasing age for both types of housing. As of 2011, approximately 2% of all men and women aged 85 years and older were not citizens of the reporting country. Thus, in the two oldest age groups—65–84 years and 85 years and older—the differences across the two types of housing were rather small, which is why the larger relative size of the institutional population in those two age groups does not translate into larger dissimilarity indexes in most countries (see Figure 5).

Many countries—for example, Denmark, Finland, France, Germany, Portugal, and the UK—closely followed the pattern of the European aggregate in the citizenship of their residents. By contrast, several other European countries, namely, Bulgaria, Croatia, Hungary, Latvia, Poland, and Romania, reported a near-zero share of non-citizens in both private and institutional households. Figure 5 also differentiates countries by the quantitative size of their institutional populations. The nexus of size and empirical differences for the extent of bias is evident, as countries with higher dissimilarity indexes in younger age groups were mostly from the group of two-peak countries.

It is quite difficult to infer the type of institution from a high proportion of (non-EU) foreigners in institutions, as these residents might live in refugee accommodation centers, educational institutions, workers' group living quarters, health care institutions, or prisons. The group of stateless persons is less ambiguous; it can be assumed that this group consists mainly of persons living in refugee accommodation centers. The share of stateless persons is small in Europe, reaching a maximum of 0.1% of the institutional population aged 14 years and under. In Austria, Greece, Ireland, Luxembourg, Spain, and Sweden, this share was a little higher within the young institutional population, reaching between 0.5% and more than 2%. It can be expected that the number of stateless persons living in institutions has risen since 2015 in Europe countries because of the increasing immigration of refugees (Eurostat, 2020a).

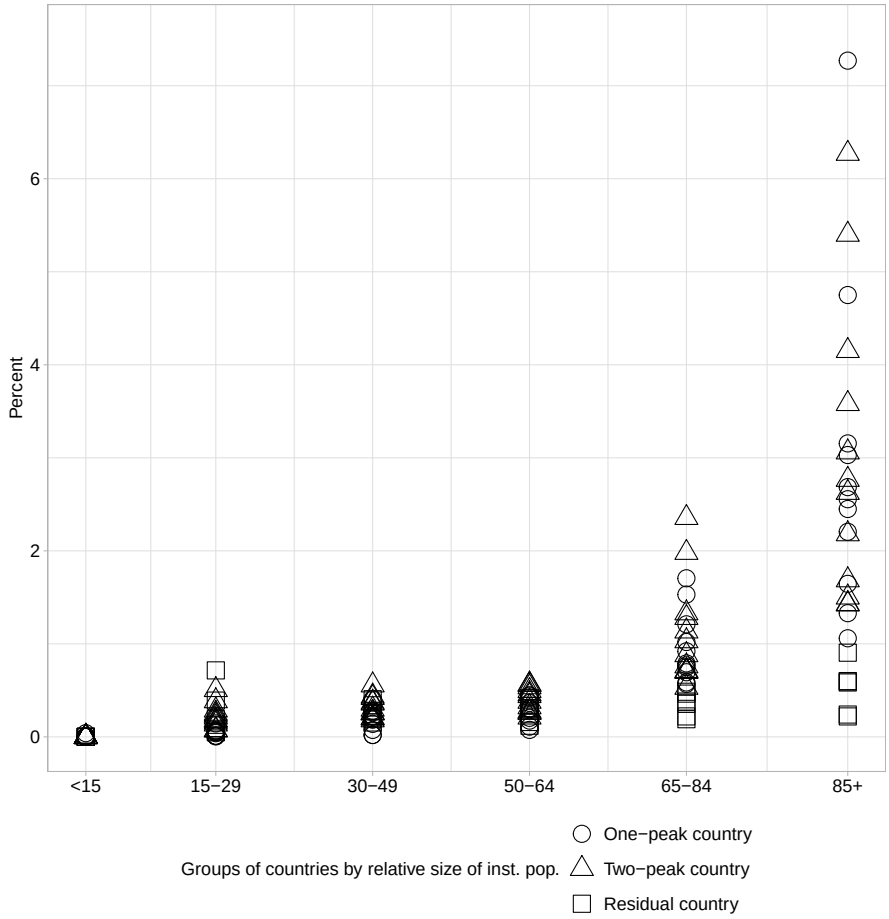

Figure 3

Duncan's index of dissimilarity for marital status, comparing citizens in private households to the total population in 30 European countries in 2011. Note: inst. pop. = institutional population

Educational attainment

The dissimilarity indexes for education in Figure 7 provide an overview of potentially critical age groups in terms of bias due to the exclusion of institutional populations. Most countries were not at risk of bias in the middle-aged part of their populations. Only in some two-peak countries was the risk of bias a little higher for the youngest and oldest age groups when institutional populations were excluded. In Europe, the proportion of persons from 15 to 29 years with a low level of education was smaller among residents of institutions than among private household residents. This finding could be an indication that most institutional residents in those countries live in boarding schools or university resident halls.

Investigating the oldest age group (85+), the dissimilarity index at the European level is well below 0.5 percent, whereas a handful of countries reported numbers that led to dissimilarity indexes higher than 1%. In Luxembourg, the high share was due partly to a rather high share of missing values for institutional and private households. In France, as well as at the European aggregate, the average level of educational attainment of elderly women was higher in institutional settings than in private households. By contrast, in Iceland, the share of males with a higher level of education was lower among institutional residents than among residents of private households. At the European level, men's formal level of educational attainment does not differ across the two types of housing. These contradictory findings across countries and sexes reflect earlier inconclusive results on the association between educational attainment and the risk of care home admission cited in Section 2.2 above.

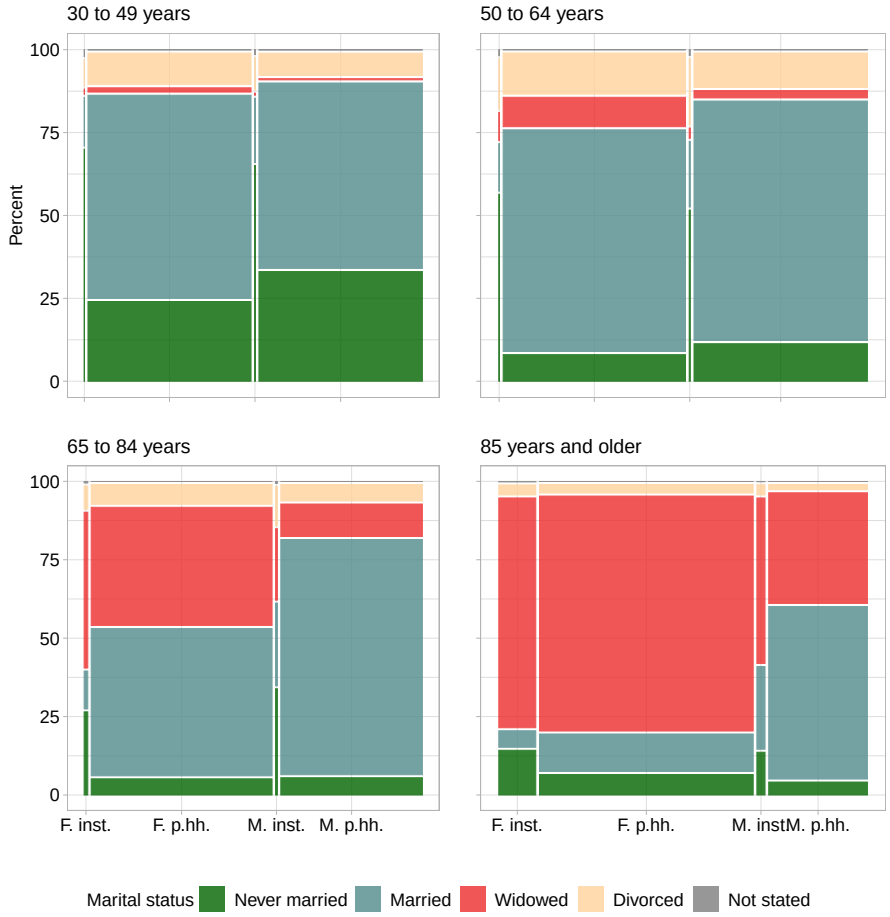

Figure 4

Marital status of the institutional and private household populations in 30 European countries in 2011. Note: F.inst. = Female residents of institutions; F.p.hh. = Female residents of private households; M.inst. = male residents of institutions; M.p.hh. =Male residents of private households

Labor force status

Labor force status was expected to differ markedly across the two types of housing. A larger share of economically inactive and unemployed persons can be expected in institutional settings because residents of many types of institutions are either unable or not allowed to work. The most interesting groups in this regard are young adults and middle-aged persons. Children and the very old population are the mostly economically inactive irrespective of their type of housing (see Figure 8) and will not be considered here.

All patterns in the age groups from 15 to 64 years pointed in the same direction. As of 2011, a higher percentage of non-institutional residents were economically active compared to the institutional populations. The unemployment rates were quite similar across the two types of housing, with a higher share of unemployed persons living in private households than in institutional settings. Several countries reported a large share of missing information in institutions.

The largest differences between institutional and private households were observed in the age groups 30 to 49 years and 50 to 64 years. Approximately 55% of the institution-dwelling men and women aged 30–49 years were economically inactive. This was the case for only 8% of non-institutional men and 19% of non-institutional women in that age group. In institutional households, the share of economically inactive persons increased to more than 70% for the population aged between 50 and 64 years. The respective proportion of inactive persons living in private households was approximately half as large in that age group. Due to the larger relative size of the institutional populations in the age group from 15 to 29 years in many countries, the overall risk of bias was a little larger in that age group than in the two

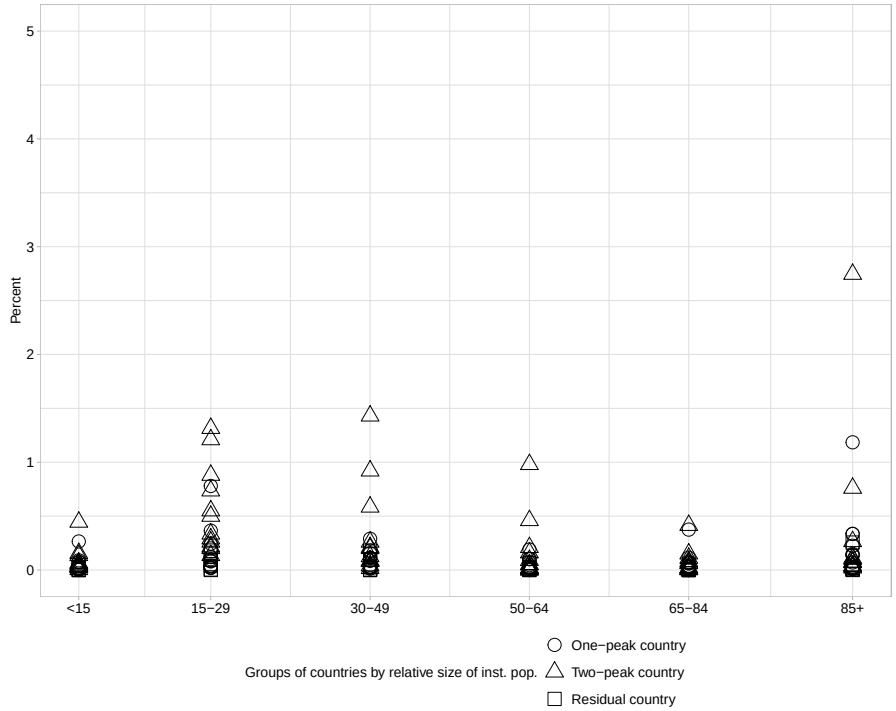

Figure 5

Duncan's index of dissimilarity for citizenship, comparing residents of private households to the total population in 30 European countries in 2011. Note: inst. pop. = institutional population

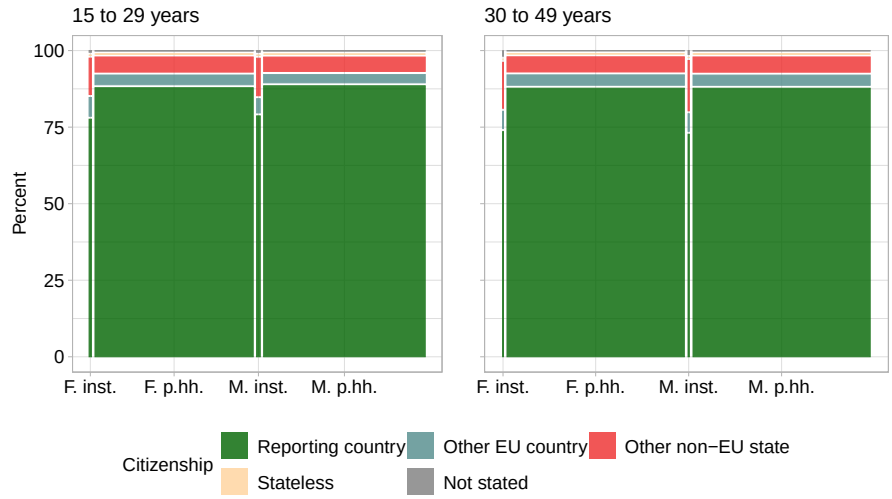

Figure 6

Citizenship of the institutional and private household populations in 30 European countries in 2011. Note: F.inst. = Female residents of institutions; F.p.hh. = Female residents of private households; M.inst. = male residents of institutions; M.p.hh. =Male residents of private households

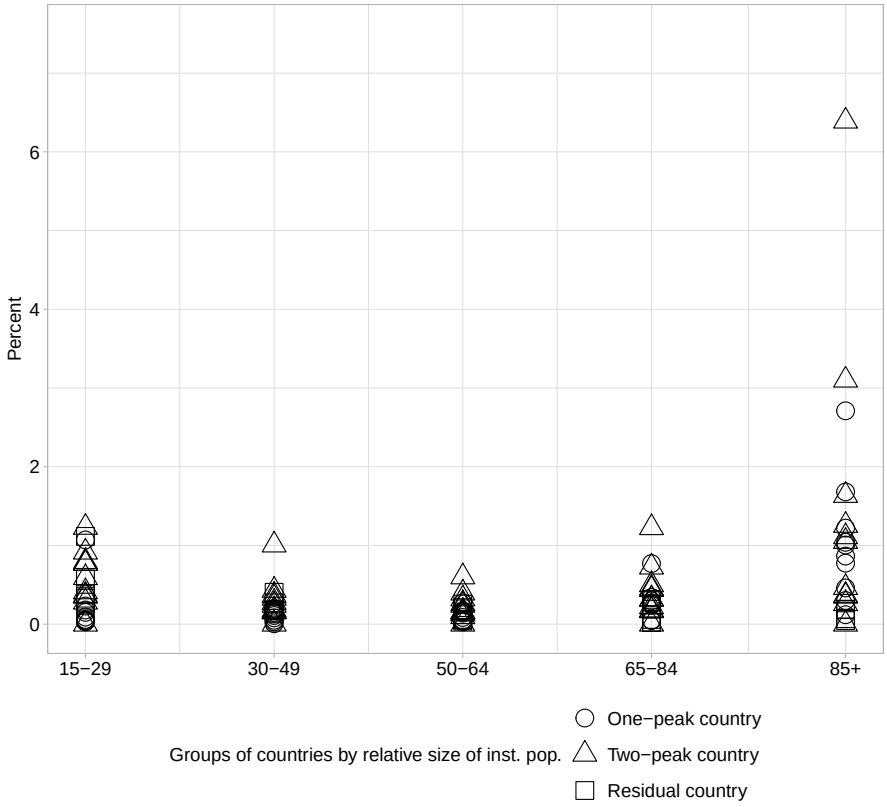

Figure 7

Duncan's index of dissimilarity for level of educational attainment, comparing residents of private households to the total population in 30 European countries in 2011. Note: inst. pop. = institutional population

subsequent age groups (see Figure 8). A few countries with comparably high dissimilarity indexes were from the group of two-peak countries (e.g., Hungary, the UK) or from the residual group with a higher share of young adults living in institutions (e.g., Greece, Romania).

Regarding the labor force status of institutional residents aged 15 to 29 years, countries could be divided in two groups. In the first group, which comprises 20 countries (e.g., Hungary, Greece, the UK), most institutional residents were economically inactive. In the second group of countries, most institutional residents were economically active. Cyprus, France, Germany, Iceland, Ireland, Latvia, Slovenia, Spain, and Malta are countries with a high share of economically active persons living in institutions. Based on the assumptions made in Table 1, institutional residents from the second group of countries might live in military barracks, workers' group living quarters, or religious institutions. Moreover, differences in the labor force status of institutional residents across the two groups of countries might be explained by different underlying definitions. Although the European Union advanced a detailed definition of labor force status (Eurostat, 2011, p. 72), countries might differ in the extent to which they can operationalize this definition, especially when considering the special living circumstances of the institutional population. For instance, in some countries, prisoners might be defined as economically active because they were working in the prison, whereas other countries do not count prison labor as economic activity.

5 Conclusion

The present paper analyzed 2011 census data on the institutional populations in 30 European countries. These populations are often excluded from social surveys, which might cause bias in estimates derived from the survey data. Bias is driven, first, by the relative size of the excluded populations, and, second, by empirical differences between excluded populations and the covered population. Both factors were analyzed in this paper.

Considering the relative size of institutional populations within age and sex cohorts, three groups of countries could be identified. The first group, comprising 13 European coun-

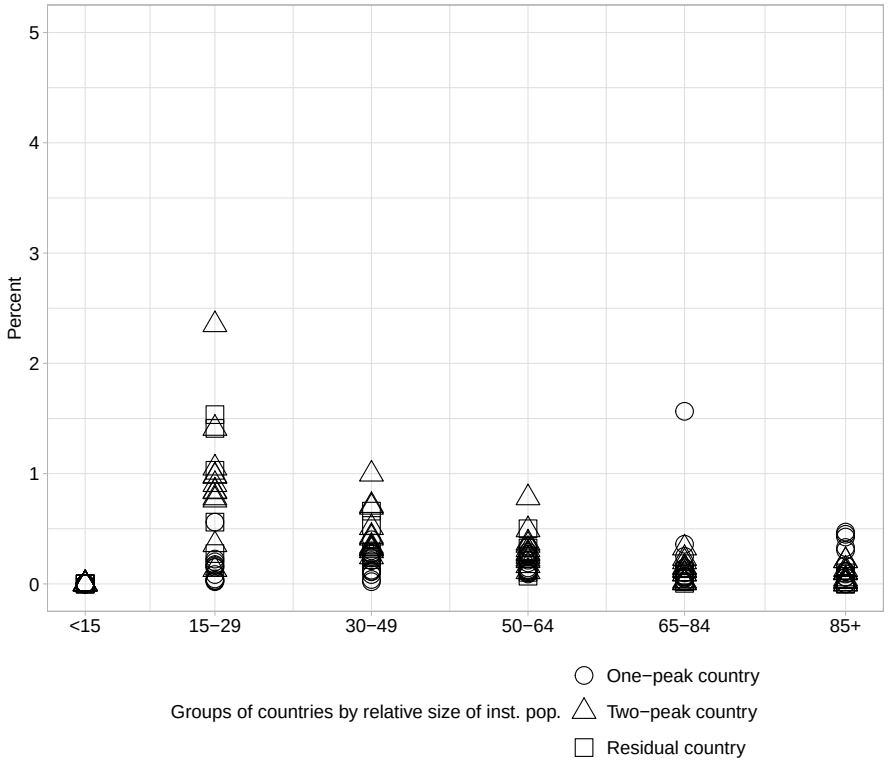

Figure 8

Duncan's index of dissimilarity for labor force status, comparing citizens in private households to the total population in 30 European countries. Note: inst. pop. = institutional population

tries, were labeled one-peak countries because institutional populations usually accounted for less than 1% of the age and sex cohorts up to the age of 70 years. Only in older age cohorts did the share of institutional residents increase successively, reaching 10%, 20%, or even over 30%. The second group, which comprised 11 European countries, were labeled two-peak countries because, in addition to a similar increase in the number of institutional residents in older age groups, this group of countries recorded a second, smaller peak among younger residents: In the group aged 20–29 years, between 3% and 8% of the population were resident in institutional dwellings. In a third, residual, group, which comprised six countries, less than 10% of the population in all age groups were living in institutional settings at the time of the 2011 census.

The size of institutional populations serves as a first indicator for the risk of bias in respective age and sex cohorts. Social survey programs conducted in one-peak countries should not be too concerned about bias introduced by excluding institutional residents aged 69 years and under, as their negligible share of the institutional population will not lead to significant bias even though these institutional residents might be statistically quite different from the population living in private households.

The situation is different in the case of the two-peak countries and of some of the countries in the residual group: As the figures on the dissimilarity indexes show, the larger share of young institutional residents between the ages of 10 and 29 years should be cause for concern for survey researchers. Because of their small relative size, the institutional populations aged between 30 and 69 years are not relevant for social surveys in European countries. The conclusion differs markedly for the elderly institutional populations: Social survey programs should be cognizant of the sizeable proportion of old-age institutional residents in nearly all European countries. Older institutional residents account for a substantial share of their respective age cohorts (see Eurostat, 2015, p. 148), and this share will continue to increase in many European countries due to demographic aging (Rodrigues et al., 2012).

Turning to the analysis of the empirical differentness of institutional populations, it can be assumed that entering a refugee accommodation center, prison, or nursing home implies a very strong selection mechanism, potentially leading

to differences across the two types of housing. Depending on the topic examined, data users might underestimate or overestimate certain behaviors, attitudes, or characteristics. This paper analyzed basic variables such as marital status, educational attainment, and labor force status to determine whether and to what extent institutional populations in different age and sex cohorts differed from the population living in private households. Institutional residents aged between 15 and 29 years differed slightly from their non-institutional counterparts in terms of citizenship, and labor force status. Young institutional residents were more often citizens of non-EU countries and economically inactive than their non-institutional counterparts.

Looking at the population aged 85 years and older, small to no differences between residents of institutions and private households could be observed in terms of citizenship, level of educational attainment, and labor force status. A higher share of institutional residents in this age group had never been married than was the case among the population living in private households; institution-dwelling men aged 85 years and older were more often widowed than men living in private households. For marital status, many countries achieved dissimilarity indexes between 2% to 5% in this age group, which is just as high as the demographic bias observed in earlier studies of survey samples (Biemer et al., 2018; Eckman & Koch, 2019; Koch & Briceno-Rosas, 2021). It can be assumed that this cohort of the institutional population lives predominantly in retirement and nursing homes.

This paper comes with several limitations, mainly due to the type of data analyzed here. Even though the European Union issued legislation on the contents and operationalization for national statistical offices, countries collect census data independently, with different methods and sometimes with different definitions. Those differences can hardly be mitigated during output harmonization, and they limit the comparability of results and could be better documented at a national level. Second, the census data does not contain any indicator on the types of institutions, which is why this paper had to make use of age and gender as imperfect proxies. Third, the census data only contains information about demographic and socioeconomic characteristics of the European population. Therefore, it does not allow any analysis of bias in attitudinal or behavioral variables, which would be of great interest to users of social surveys. Fourth, the census data are collected every ten years in Europe. As aggregate data from the 2021 census will not be published in the next few years, this paper used data collected more than ten years ago in 2011. Considering changing societal circumstances, such as ageing populations in most European countries or increased migration to Europe due to various international crises since 2011, future research on institutional populations with census data and survey data will be of great interest and relevance.

In sum, this comparative analyses of 30 European countries revealed an astonishing homogeneity of many age– and sex-related patterns across European countries. Moreover, the analyses indicate that institutional populations in young and middle-aged age cohorts are of greater interest for researchers with more specific research interests, such as the educational aspirations of young adolescents, the integration of refugees, or the social inclusion of disabled persons. Because institutional populations reach a substantial size of over 10% of the European population only in older age groups, social survey programs in almost all European countries should assess whether their survey topics are prone to bias due to differences between the residents of the two types of housing in these age groups. Even basic variables such as marital status or citizenship differ slightly between old-age residents of institutions and private households. Small differences in these demographic variables might cause further bias in behavioral or attitudinal variables in addition to the impact of institutional residence as such.

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Appendix
Table

Table A1

Relative Share of Institutional Populations in Age and Sex Cohorts in 2011, by Country

Country	Share of total	Share of male population (%) by age						Share of female population (%) by age					
	population(%)	0-15	15-29	30-49	50-64	65-84	>85	0-15	15-29	30-49	50-64	65-84	>85
Austria	1.4	0.5	1.6	1.0	0.9	1.7	9.0	0.5	1.1	0.5	0.6	2.9	19.6
Belgium	1.2	0.1	0.6	0.6	0.7	1.9	11.7	0.1	0.3	0.2	0.5	3.7	24.9
Bulgaria	0.4	0.7	0.9	0.6	0.3	0.4	1.5	0.5	0.3	0.1	0.1	0.5	1.7
Croatia	0.9	0.2	0.7	0.7	0.8	1.6	8.0	0.2	0.4	0.3	0.6	2.6	11.5
Cyprus	0.5	0.1	0.3	0.5	0.4	0.9	7.6	0.1	0.2	0.3	0.4	1.7	14.1
Czechia	1.9	0.6	3.0	2.7	1.8	1.7	7.3	0.6	1.8	1.1	0.9	2.4	13.9
Denmark	1.5	0.3	4.5	0.7	0.6	1.2	7.8	0.2	3.7	0.4	0.4	1.6	12.1
Estonia	1.9	0.7	3.6	1.9	2.1	2.6	5.7	0.6	2.9	0.7	1.0	2.1	9.0
Finland	0.6	0.1	0.6	0.2	0.3	0.9	5.1	0.1	0.5	0.1	0.2	1.3	8.5
France	2.1	0.3	4.3	1.5	1.4	2.8	13.3	0.2	2.4	0.5	0.6	3.3	24.0
Germany	1.5	0.4	1.5	1.0	1.0	1.9	10.7	0.4	0.8	0.5	0.6	2.9	22.1
Greece	1.1	0.2	6.1	1.0	0.6	0.6	1.5	0.2	1.0	0.3	0.4	0.8	3.3
Hungary	2.4	1.2	6.3	1.5	1.5	2.1	6.4	1.1	5.8	0.6	0.7	2.8	12.0
Iceland	2.0	0.2	0.9	0.9	0.9	5.7	35.3	0.1	0.8	0.5	0.7	8.3	46.7
Ireland	1.9	0.4	1.7	1.4	1.6	4.8	19.6	0.4	1.1	1.0	1.4	5.8	28.8
Italy	0.6	0.1	0.4	0.5	0.4	0.7	2.5	0.1	0.2	0.3	0.3	1.4	6.7
Latvia	1.2	0.5	2.1	1.7	1.3	1.8	2.5	0.4	0.9	0.4	0.6	1.3	4.3
Lithuania	1.6	1.2	3.5	1.6	1.2	1.2	1.8	1.1	3.4	0.9	0.6	1.0	3.4
Luxembourg	1.8	0.7	2.2	0.9	0.7	2.8	19.6	0.6	0.9	0.4	0.6	5.7	37.2
Malta	2.1	0.8	2.3	1.8	0.9	2.7	19.1	0.7	0.9	0.6	0.8	6.0	35.1
Netherlands	1.7	0.3	3.1	1.1	0.9	1.7	13.2	0.3	2.9	0.6	0.6	2.8	23.2
Norway	0.6	0.0	0.1	0.1	0.2	1.1	8.7	0.0	0.1	0.0	0.1	1.7	15.9
Poland	0.6	0.2	0.9	0.3	0.6	0.8	1.3	0.2	0.9	0.3	0.3	0.9	3.0
Portugal	1.2	0.4	0.8	0.7	0.6	2.0	11.8	0.4	0.5	0.3	0.5	3.2	18.7
Romania	1.0	0.4	3.6	0.7	0.4	0.4	0.9	0.3	3.2	0.3	0.2	0.4	1.4
Slovakia	0.9	0.6	0.6	0.7	1.0	1.9	5.5	0.6	0.5	0.5	0.7	2.5	8.5
Slovenia	2.8	0.6	5.0	3.5	2.9	2.6	11.7	0.6	4.2	0.6	0.6	3.8	21.2
Spain	0.5	0.0	0.2	0.2	0.3	1.1	5.6	0.0	0.1	0.1	0.2	1.5	9.2
Sweden	1.7	0.2	4.1	0.8	0.5	1.4	9.6	0.1	3.7	0.5	0.3	1.9	16.9
UK	1.8	0.3	4.6	1.0	0.7	1.5	9.6	0.3	3.7	0.4	0.4	2.1	18.7
Europe	1.3	0.3	2.4	0.9	0.8	1.5	7.9	0.3	1.7	0.4	0.5	2.2	15.4