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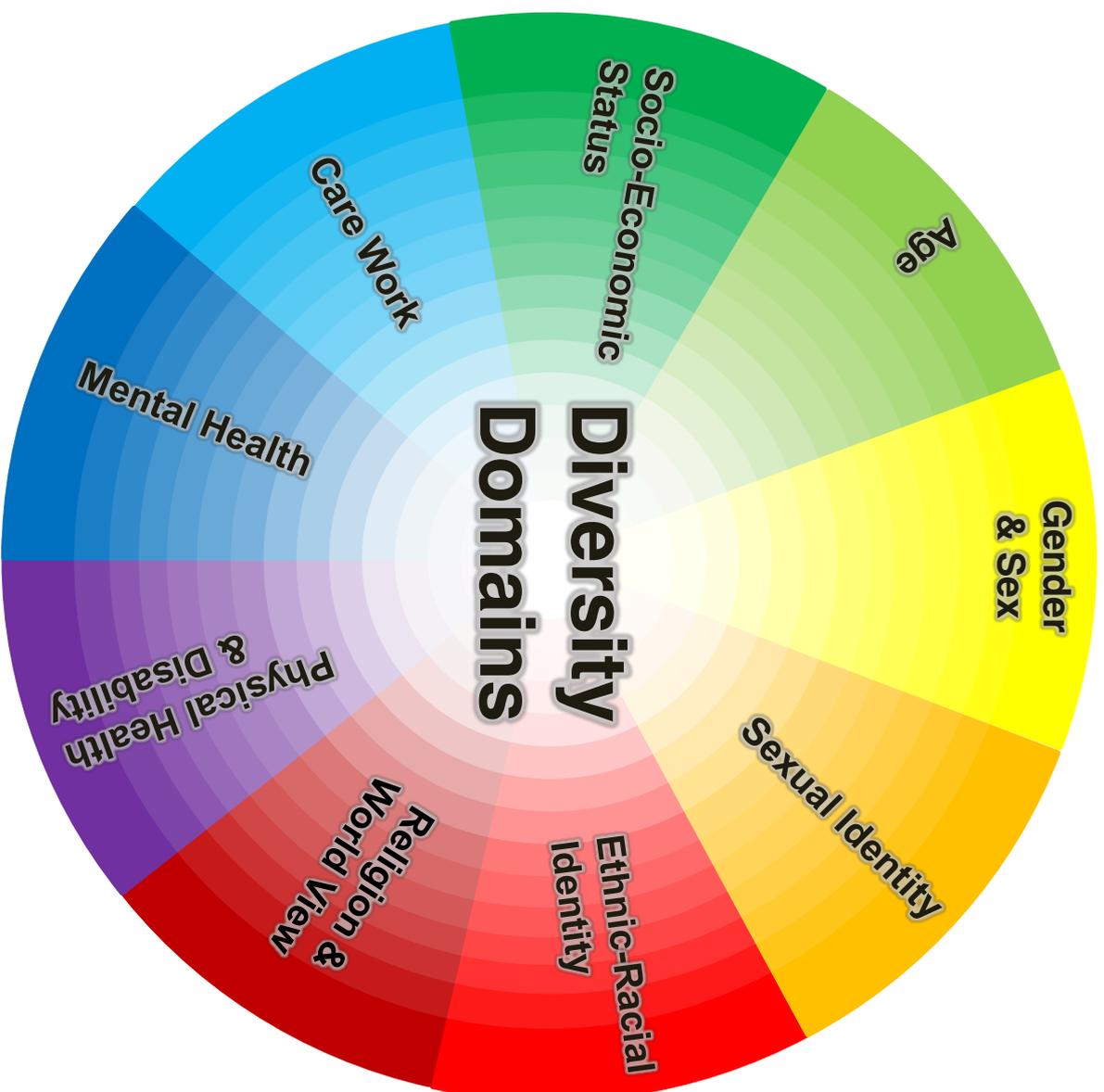
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Highlights

- 2 - The sciences still show data gaps regarding gender and diversity
- 3 - We propose a widely applicable Diversity Minimal Item Set (DiMIS)
- 4 - The DiMIS is brief, easy to use, and captures 9 diversity domains
- 5 - Comparable diversity assessments allow meaningful data combination
- 6 - Combining data allows intersectional analyses promising more diversified innovations

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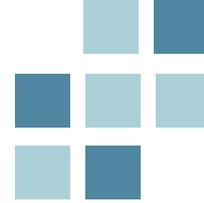
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GENERAL RECOMMENDATIONS FOR MEASURING DIVERSITY

CONSIDER ORDER

- Think about your population and which terms they are familiar with when deciding on answer option order.
- Consider presenting answer options in alphabetical or random order to avoid listing socially dominant options first.
- Maximize useable data collection while minimizing the replication of dominant power structures.



PREFER NOT TO ANSWER

- Add "prefer not to answer" option to allow for more flexibility in responding and to acknowledge participants' privacy



AVOID THE TERM "OTHER"

- Using the term "other" is seen as othering-- avoid it and use alternative wording.



ALLOW FOR SELF-IDENTIFICATION

- Where applicable, add a free-response option for self-identity, which recognizes participants' personal self-definitions (e.g. not applicable for age).



CLEARLY EXPLAIN WHY DATA IS BEING COLLECTED

- If asking for sensitive information, clearly explain why this data is being collected to maintain participant trust.



ALWAYS ANONYMIZE

- It is particularly important to follow stringent data protection measures when working with diverse populations. Make sure participants understand their data will be fully anonymized.



Conflict of Interest

Declaration of interests

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.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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Gertraud Stadler: Conceptualization, Methodology, Investigation, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Supervision, Project administration,

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Abstract

Background: Science strives to provide high-quality evidence for all members of society, but there continues to be a considerable gender and diversity data gap, i.e., a systematic lack of data for traditionally underrepresented groups. Gender and other diversity domains are related to morbidity, mortality, and social and economic participation, yet measures as well as evidence regarding how these domains intersect are missing. We propose a brief, efficient Diversity Minimal Item Set (DiMIS) for routine data collection in empirical studies to contribute to closing the diversity and gender data gap. We focus on the example of health but consider the DiMIS applicable across scientific disciplines. *Methods:* To identify items for the DiMIS across diversity domains, we performed an extensive literature search and conducted semi-structured interviews with scientific experts and community stakeholders in nine diversity domains. Using this information, we created a minimal item set of self-report survey items for each domain. *Findings:* Items covering nine diversity domains as well as discrimination experiences were compiled from a variety of sources and modified as recommended by experts. The DiMIS focuses on an intersectional approach, i.e., studying gender, age, socioeconomic status, care responsibilities, sexual orientation, ethnicity, religion, disability, mental and physical health, and their intersections. It allows for data sets with comparable assessments of gender and diversity across multiple projects to be combined, creating samples large enough for meaningful analyses. *Interpretation:* In proposing the DiMIS, we hope to advance the conversation about closing the gender and diversity data gap in science.

Keywords: diversity science; equity; health disparities; gendered innovation

1 **1. Introduction**

2 The health sciences are exceptionally relevant as a global interdisciplinary partnership to
3 improve the lives of people worldwide. However, researchers need either big data or data
4 stratified by gender and other diversity domains to deliver on the promise of better health for all.
5 There is an urgent call to action to fill the gender and diversity data gap (i.e., a systematic lack of
6 data for traditionally underrepresented groups, such as women and individuals with lower SES in
7 certain research areas) and to promote the United Nations' (UN) Sustainable Development Goals
8 pertaining to equity and equal growth opportunities (Nyasimi & Peake, 2015). However, many
9 researchers do not collect data on the diversity of their sample beyond the domains of binary
10 gender and age, leaving out race (Falasinnu et al., 2018; Loree et al., 2019), income, and
11 minorities (Nicholson et al., 2015). Drawing from multiple disciplines from epidemiology to
12 psychology to medicine, we propose a research tool kit of brief measures of various facets for
13 diversity. Our aim is to facilitate the assessment of gender and other diversity domains and their
14 intersections in order to better address the inequity in available data.

15 In the area of healthcare, Geller and colleagues (Geller et al., 2018) detail how the
16 National Institutes of Health (NIH) Revitalization Act of 1993 increased inclusion of women and
17 racial and ethnic minorities in clinical trials in the US from 1993 to 2009. However, from 2009
18 to 2015 inclusion plateaued, suggesting that even policies dictated by national laws may be
19 insufficient to maintain progress, due to noncompliance with the law and a lack of measured
20 accountability. Duma and colleagues (Duma et al., 2018) reported a decrease in the recruitment
21 of minorities in oncology clinical trials from 2003 to 2016. Recently, women were
22 overrepresented in vaccine clinical trials while ethnic and racial minorities and older adults were
23 underrepresented (Flores et al., 2021). Currently, there is a lack of evidence how gender and

1 other diversity domains intersect in the delivery of more adequate health care. To close the
2 gender and diversity data gap we propose a brief Diversity Minimal Item Set (DiMIS) for
3 empirical studies that assess a broad range of diversity domains for routine data collection and
4 drives diversified innovations in the health sciences.

5 Diversified innovations are evidence-based discoveries, emerging from a systematic description
6 of differences due to gender, other diversity domains, and their intersections. They can pave the
7 way for improvements in prevention, diagnosis, pharmaceutical and nonpharmaceutical
8 treatments, and rehabilitation. Intersectionality refers to the interaction of two (or more) social
9 identities that contribute to multiple systems of disadvantage, which sum up to more than an
10 additive effect of privileged and vulnerable aspects of one's identity (Crenshaw, 1989). For
11 example, from an intersectionality perspective, the markedly higher rate of maternal mortality
12 experienced by Black women compared to white women in the US (Goffman et al., 2007)
13 reveals a form of gendered racism (Patterson et al., 2022). While intersectionality refers to social
14 identities, the setting, or context, also plays an important role. Patricia Hill Collins (1990) refers
15 to the systems in which oppression occurs and is maintained as "the matrix of domination,"
16 consisting of the structural (e.g., institutional), disciplinary (e.g., policies and rules), hegemonic
17 (e.g., cultural ideas and beliefs), and interpersonal (e.g., everyday interpersonal relationships)
18 domains of power. The interaction between the individual and their context is used here as an
19 essential consideration for measure selection.

20 We chose the DiMIS domains based on the anti-discrimination legislations of the United Nations
21 Human Rights Office, with a focus on those with relevance for health and well-being beyond
22 binary gender and age (UN Office of the High Commissioner for Human Rights., 2012).

23 Additionally, we included an item measuring perceived discrimination for these domains. We
24 prioritized items that are used in several languages and can link research projects to population

1 surveys. The DiMIS items are intended to serve as a convenient, readily available toolkit, not
2 best practice recommendations. The “best” diversity measures depend on the specific research
3 questions and context of each project.

4

5 **2. Methods**

6 To develop the DiMIS, we performed an extensive literature search to identify widely used
7 measures in population surveys. Next, we conducted semi-structured interviews with scientific
8 experts about their experiences measuring their speciality diversity domain and discussed
9 suggestions for a minimal item set with them. We then held workshops with diversity researchers
10 in Berlin to gain feedback to further develop the DiMIS. Finally, we used feedback from
11 scientific experts, community stakeholders, and team members to revise our measures, weigh
12 advantages and disadvantages of items, and provide guidance for how to present instructions,
13 questions, and response options inclusively.

14 **3. Results**

15 We investigated nine core domains: gender, age, socioeconomic status, care responsibility,
16 sexual orientation, ethnicity and race, religious affiliation, mental health, physical health and
17 disability, in line with the United Nations Sustainable Development Goals (International Council
18 for Science, 2015, 2015) (e.g., SDG 1 No Poverty; 3 Good Health and Well-Being; 4 Quality
19 Education; 5 Gender Equality; 8 Decent Work and Economic Growth; 9 Industry, Innovation,
20 and Infrastructure; 10 Reduced Inequalities) requiring researchers to assess diversity in order to
21 characterize goal progress and supplemented these by expert interviews. The DiMIS items
22 maximize comparability with general population data, such as the European Health Interview
23 Survey (EHIS), and prioritize brief items available in English and other languages.

1 We provide recommendations for each domain of the DiMIS introduce their relevance, present a
2 suggestion for a brief item, and discuss advantages and disadvantages. Applicable to all are
3 general recommendations for implementing the DiMIS, which are summarized in Figure 1. First,
4 researchers should consider the most appropriate order of items and response options for their
5 target population and which terms participants are familiar with. Response options should be
6 ordered carefully to facilitate collecting valid data while considering the sensibility of different
7 stakeholders, which may be best served by alphabetical or randomized order. Next, present
8 nuanced response options, including (1) add a “prefer not to answer” option to allow for more
9 flexibility in responding, (2) avoid the term “other,” and (3) add an open-response option for
10 self-identification. Finally, provide transparency regarding why sensitive data is being collected
11 and assure anonymity and data protection. These design characteristics and procedures are
12 essential for good scientific practice and for gaining participants’ trust. In the following sections,
13 we introduce each diversity domain of the DiMIS; Table 1 gives an overview of the full item set.

14 *3.1. Gender*

15 The WHO acknowledges the impact of gender, sex, and their interaction on health outcomes.
16 Gender refers "to a person’s deeply felt, internal and individual experience of gender, which may
17 or may not correspond to the person’s physiology or designated sex at birth" (*Gender and*
18 *Health*, n.d.) and to sociocultural norms, identities, and relations (Hyde et al., 2019). Sex refers
19 "to the different biological and physiological characteristics of females, males and intersex
20 persons, such as chromosomes, hormones and reproductive organs" (Hyde et al., 2019).
21 Women have been historically neglected in the health sciences (Dresser, 1992), whereas
22 individuals who identify as non-binary have been largely ignored. Both gender and sex are
23 important determinants of health, treatments, and healthcare (Heidari et al., 2016). Although
24 most studies ask about gender or sex in binary terms, they may not integrate this information into

1 their analysis, even in cases where gender/sex disparities are established (Brady et al., 2021). We
2 modified a single item from NHS England’s LGBT Foundation (NHS England & LGBT
3 Foundation, 2021) providing a list of gender-diverse options. Items measuring gender in surveys
4 should be inclusive and allow visibility for gender minorities. A list that includes multiple
5 categories (e.g., non-binary) offers a balance of recognition, inclusivity, and practicability. We
6 did not query sex assigned at birth as a default, as experts emphasized that this should only be
7 asked if it is relevant for the project’s research questions and may raise additional data protection
8 issues due to small sample sizes. If required by the project at hand, we recommend a two-step
9 approach, wherein sex assigned at birth is queried as a follow up item (NHS England & LGBT
10 Foundation, 2021), with an explanation of why it is important that participants disclose gender,
11 sex, and/or trans status.

12 It is important to note that appropriate terms for gender and sex as well as their response options
13 will vary across languages and cultures and may need to be adapted according to the target
14 population. Moreover, in some languages the same word is used for sex and gender (e.g.,
15 ‘Geschlecht’ in German), making culturally informed translations indispensable. Response
16 options and order should be tailored to the needs and preferences of the participants and
17 stakeholders in a given study. For example, the participants of two German studies of wellness
18 during COVID-19 pandemic found some of the more recent terminology for gender and sexual
19 orientation confusing to the point of being unable to provide accurate data for the item, resulting
20 in the response options displayed in the DiMIS item (Buspavanich et al., 2021; Herrmann et al.,
21 2022). Choosing appropriate measures for gender and sex is essential to measuring their
22 intersections with other diversity domains. For example, Tannenbaum and Day (on behalf of the
23 Matera Alliance, 2017) describe the intersection of sex and age for drug development, citing sex

1 and age differences impacting pharmacokinetics and pharmacodynamics and thus differences in
2 appropriate dosing and drug response.

3 *3.2. Age*

4 Age is commonly collected in research. Despite its ubiquity, individuals at the younger and older
5 ends of the age spectrum have been underrepresented in clinical trials and are generally
6 considered to be vulnerable individuals at very young or old age. This has, for example, resulted
7 in underrepresentation of children in clinical trials of treatments for COVID-19 (Hwang et al.,
8 2020) as well as a lack of evidence upon which to base complex medication choices for older
9 adults (Boyd et al., 2019). Treatment and medication effects and side effects can vary by age
10 (Mangoni & Jackson, 2003) and should therefore be studied systematically.

11 Due to international differences in what age constitutes ‘adult’, ‘older adult’, and other age-
12 category membership, we recommend measuring age continuously in years. Consistent with the
13 European Health Interview Survey (European Commission. Statistical Office of the European
14 Union, 2018) we suggest querying for birth year to study age differences but not birthdate to
15 maximize anonymity. If the research requires assessing age with finer intervals (e.g., among
16 infants) birth month can be added.

17 *3.3. Socioeconomic Status*

18 Research on social determinants of health consistently demonstrates health disadvantages for
19 lower socioeconomic status (SES), both between and within countries (Marmot, 2005). For
20 instance, mortality among middle-aged and older women decreased as SES increased (Manor et
21 al., 2000). Periods of poverty at different childhood ages differentially impacted adult health
22 trajectories (Cohen et al., 2010). Even in European states with universal health insurance
23 systems, socioeconomic inequalities in health continue to be notable (Smith, 2004). However,
24 the best way to measure socioeconomic status in health research is debatable. Mustard and

1 Etches (2003) found that gender differences in socioeconomic inequality in mortality vary
2 depending on the measure of inequality used.

3 The four most commonly used constructs to assess SES are: income, wealth, occupational status,
4 and educational attainment. Each of these constructs has its own benefits and drawbacks for
5 measuring SES. Income is the most direct way of measuring SES, but suffers from low response
6 rates and misreporting of income, and may not be useful beyond a poverty threshold (Marmot,
7 2002). Wealth provides a broader way of viewing an individual's entire SES and correlates with
8 health outcomes (Pollack et al., 2007), but suffers even more from low response rates, as well as
9 the need for lengthy questionnaires to address each type of wealth (e.g., rental properties,
10 dividends, outstanding loans). Occupational status, while fluctuating less than income, lacks
11 precision due to various occupations being subsumed under the same occupational category.
12 However, it is highly standardized and can be measured using internationally recognized
13 questionnaires, such as the International Standard Classification of Occupations (ISCO-08,
14 Ganzeboom, 2010). Educational attainment is one of the more frequently used measures for
15 health disparity research and is predictive of occupational status and income. It also captures
16 lifestyle choices and behavior (Shavers, 2007) and is also highly standardized using the
17 International Standard Classification of Education (ISCED, UNESCO Institute for Statistics,
18 2012) and therefore can be compared across different cultures.

19 Educational attainment has been shown to be more highly correlated with health disparities than
20 income (Herd et al., 2007; Leng et al., 2015; Smith, 2004) and does not suffer from the same
21 limitations in terms of yearly fluctuation and lack of response. Thus, we propose educational
22 attainment to measure SES with a modified EHIS item (European Commission. Statistical Office
23 of the European Union., 2018) to query for the highest degree attained. Response options follow
24 the ISCED (UNESCO Institute for Statistics, 2012) categories and should be adapted locally.

1 Educational attainment is associated with occupational status and income, captures lifestyle
2 choices and behavior (Shavers, 2007), and is more strongly correlated with health disparities
3 than income (Smith, 2004). In our interviews, experts advised again using years of schooling,
4 since they do not capture repeated school years, part-time education, or vocational training, and
5 are less comparable across countries.

6 *3.4. Care Responsibilities*

7 Unpaid care work (i.e., informal, in-home care of children under 18 years of age or adults with
8 health or mobility challenges) is invaluable to social development and economic growth
9 (UNRISD, 2010). Yet, the societal benefits of informal care work may come at the cost of
10 carers' economic opportunities (Hirsh et al., 2020) and have been associated with conflicting
11 carer health outcomes (Masefield et al., 2020; D. L. Roth et al., 2018). The economic and health
12 impacts of care work are known to intersect with gender, sexual orientation, and age. Women,
13 trans and non-binary people with children experience more physical, mental, and psychological
14 stress relative to cis men (European Commission. Statistical Office of the European Union.,
15 2018b; Horne et al., 2022). Older LGBTQI+ caregivers play an important role in informal care
16 provision (Alba et al., 2020). Furthermore, 'sandwich generation' caregivers (i.e., those with
17 both eldercare and childcare responsibilities) experience even worse employment and economic
18 consequences than caregivers with responsibilities for childcare only (Henle et al., 2020). These
19 consequences were more severe for women caregivers than men caregivers.

20 To date, caregiving responsibilities are not routinely part of study demographics, and
21 assessments vary greatly. To allow for a better understanding of care-related associations with
22 health outcomes, we recommend an item integrating aspects of the EHIS (European
23 Commission. Statistical Office of the European Union., 2018) and Diversity and Inclusion
24 Survey (DAISY) items for 'Caring Responsibilities' (Molyneaux, 2020). While the DAISY

1 includes caregiving for children, adults with disabilities, and the elderly, we added care for
2 people aged 18 and older with chronic health conditions following the EHIS. We include
3 multiple care responsibilities via multiple select options.
4 Although this item captures multiple forms of care responsibilities briefly, it has limitations. It
5 presents a proxy for care responsibilities, not an assessment of care provided. Researchers
6 interested in a more detailed picture of care work may add further items on amount of time spent
7 on care work (e.g., EHIS), whether the participant is the primary, joint primary, or secondary
8 caregiver (e.g., DAISY) and/or whether the persons receiving care are family members (e.g.,
9 EHIS).

10 *3.5. Sexual Orientation*

11 Historically, sexual orientation was categorized into people who are attracted to members of the
12 same sex, people who are attracted to members of another sex, and people who are attracted to
13 both dichotomous sexes. However, these categories are fraught because sexual orientation exists
14 on a continuum. The categories conflate different aspects of sexual orientation (e.g., sexual
15 behavior, sexual attraction, romantic interests) and refer to gender and sex in binary terms.
16 Individual lived experiences are insufficiently represented. It remains unclear how much
17 differences in lived experiences among sexual minority members are due to a missing consensus
18 of how to measure sexual orientation (Korchmaros et al., 2013). For example, systematic
19 measurement and assessment of sexual orientation and gender predicted lower breast cancer
20 screening intentions among lesbian and bisexual women relative to heterosexual women despite
21 the former having two to three times the risk of breast cancer experienced by heterosexual
22 women (Hart & Bowen, 2009). Sexual orientation also intersects with gender, resulting in
23 differing migration patterns and associated benefits (Ueno et al., 2014).

1 To take into account brevity, population sample comparisons, and inclusive language, we
2 modified an item from the NHS & LGBT Foundation (NHS England & LGBT Foundation,
3 2021) to include sexual orientations beyond heterosexual, lesbian, gay, and bisexual. In addition,
4 terms such as pansexual and queer acknowledge the fluidity and expansiveness of gender
5 expression and attraction to people regardless of gender or sexuality, including attraction to
6 gender-fluid, non-binary, and trans people. Researchers need to take into account national
7 traditions and laws when assessing sexual orientation because while some countries may
8 routinely include the item in surveys (e.g., United States, UK, Council, 2015), respondents in
9 other countries might have to fear legal repercussions.

10 While this modified item fulfils our main priorities, it also has disadvantages. Any single item
11 measure of sexual orientation will fail to capture sexual identity, behavior, and attraction
12 simultaneously, and thus miss unveiling varying needs, experiences of discrimination, and health
13 outcomes. However, using one single-item measure instead of none inches us nearer towards
14 closing the research gap on sexual orientation and perhaps spurring deeper explorations of issues
15 requiring more comprehensive measurement than a single item can offer.

16 *3.6. Ethnicity and Race*

17 Assessing the diversity domain of ethnicity and race is particularly challenging, complex, and
18 context-dependent (Mauro et al., 2022; W. D. Roth et al., 2023) Ethnicity is defined as
19 membership in one or several social groups with a collectively shared cultural heritage, shared
20 values, traditions, and a subjective feeling of belonging (Weber, 1978). The definition of race, on
21 the other hand, is less clear and varies across disciplines and contexts (Glasgow, 2010; Hobbs,
22 2014; Morning, 2011; W. D. Roth et al., 2023), ranging from ancestry and/or phenotype-related
23 conceptualizations towards culturally and/or socially classified groups. Roberts et al. (2020, p.
24 1297) summarize that these differences “highligh[t] the socially constructed nature of the

1 concept". In spite of different conceptualizations, assessing ethnicity and/or race may be useful
2 (Ford & Airhihenbuwa, 2010). For example, some marginalized ethnic/racial groups encounter
3 higher disease risks and impairments than those in the majority, even when controlling for SES
4 and gender (Williams et al., 2016). Yet, we emphasize that ethnicity nor race can understood as
5 risk factors themselves; they are rather markers of racism- or discrimination-related exposures
6 and inequities (Ford & Airhihenbuwa, 2010) and researchers should strive to uncover these
7 underlying processes.

8 In addition to differences in the nominal convention regarding the assessment of ethnic or racial
9 identity, there is currently no agreement on how to assess ethnicity and race across different
10 countries. Approaches vary from routine assessment to very limited assessment to legal bans on
11 assessment. Routine assessment of ethnicity and race is common within an Anglo-Saxon context
12 (including in the US, Canada, UK, Australia). Assessment of ethnicity and race has a long
13 tradition there and is widely implemented, building on widespread use of ethnicity and race to
14 describe individual identities and group memberships in everyday life. Many other countries
15 show limited assessment of ethnicity and race, e.g., most European countries and Latin countries
16 such as Puerto Rico. In these countries, ethnicity and race in particular are considered more of a
17 taboo, based on the historical legacy of genocides based on racial ideologies and colonialism
18 (Juang et al., 2021). This produces a paradox: Members of ethnic minorities and racialized
19 groups encounter plenty of racist experiences and structural impediments, while there is no
20 consensus on how to speak about these. For instance, Juang et al. (2021) discuss in detail how
21 the sociohistorical context of Germany has impacted the study of race and ethnicity in Europe,
22 often making it a taboo to talk about these concepts. While countries of this second group allow
23 the assessment of ethnicity and race, there is no national agreement on how to conduct these
24 assessments, and ethnicity and race are rarely assessed outside of specialist research. One last

1 group of countries, e.g., France, has explicit legal bans for assessing ethnicity and race
2 (McAuley, 2020). Taken together, this results in a particularly large diversity data gap regarding
3 ethnicity and race, limiting the systematic description of racist experiences and structural
4 impediments, as well as the development and testing of interventions to reduce racist
5 discrimination. Clearly, researchers need to take into account national traditions and laws when
6 assessing race and ethnicity as well as their research's impact. In some contexts, the risk of
7 identifying as a member of an ethnic/racial group may put themselves or their group at risk and
8 outweigh the potential benefits of stratified results. Striking a careful balance between history,
9 reproducing ongoing generational trauma, and genuine concern for all persons' health and
10 wellbeing may aid in closing the research gap and increasing our ability to better integrate
11 conflicting data in this area.

12 In brief, it is essential to understand the social construction and context of ethnicity, race, and
13 embedded terms in order to be able to tailor items measuring these constructs to each local and
14 national context. Not all terms and conceptualizations of race and ethnicity have a one-to-one
15 translation in language or social meaning (Juang et al., 2021; Mauro et al., 2022; W. D. Roth et
16 al., 2023). Moreover, what is considered acceptable or even validating in one context may be
17 perceived as offensive or inappropriate in other contexts. It is important to bear in mind the
18 socio-historical factors that led to a term being used by certain people in a certain place and time.
19 Thus, while ethnic identity and racial identity are theoretically distinct, it is often difficult to
20 disentangle the two constructs due to much overlap in how they are experienced, referred to, as
21 well as empirically examined (Umaña-Taylor et al., 2014). Accordingly, the 'Ethnic and Racial
22 Identity in the 21st Century Study Group' suggests focusing on the metaconstruct ethnic-racial
23 identity (Umaña-Taylor et al., 2014), which is in line with our understanding of ethnicity and
24 race as markers of racism- or discrimination-related exposures and inequities.

1 Aiming to uncover structural and processual inequities across various aspects related to race and
2 ethnicity, we suggest a multi-dimensional approach assessing (1) migration history, (2) language,
3 and (3) ethnic-racial identity while keeping local context and stakeholders in mind. This means
4 that items may need to be extended, shortened, or adapted according to the context, legislation,
5 and research population.

6 Definitions of migration history cut across a wide range of indicators (Dyck et al., 2019; Schenk
7 et al., 2006), sometimes focusing more (Destatis, 2020) or less (UN Office of the High
8 Commissioner for Human Rights., 2012) on legal status and family heritage. The interrelation
9 between migration history and health is complex (Schenk et al., 2006). The healthy migrant
10 effect (Ichou & Wallace, 2019; Razum, 2006; Razum et al., 1998; Rechel et al., 2013) finds that
11 populations with migration history have lower mortality compared to those without migration
12 history in their host countries; yet those with migration history generally have lower
13 socioeconomic status than the host population (Ichou & Wallace, 2019). These conflicting
14 phenomena make achieving a scientific consensus on the relationship between migration history
15 and health challenging (Dyck et al., 2019), suggesting a need for additional research.

16 To assess migration history as an aspect of the ethnic-racial identity, we modified the EHIS
17 (European Commission. Statistical Office of the European Union., 2018) item “In which country
18 were you born?” and items regarding the parents’ countries of birth to create a two-step approach
19 that maximizes comparability with population samples and allows different groupings (e.g.,
20 migration from low-, middle- and high-income countries). These modified items capture
21 migration history for participants and each of their parents. For digital implementation, we
22 suggest a drop-down menu with a list of countries. We added gender-neutral terms for parents to
23 include same-sex and non-binary parents.

1 Querying for language and mother tongue can be an additional indicator of migration history that
2 can indicate if a person belongs to further generations of immigrants (Schenk et al., 2006).
3 Moreover, language skills are fundamental for communicating informed consent, research
4 information, and self-reports and to translate research findings into practice, ensuring that they
5 reach all relevant communities. Accordingly, we added two items assessing language skills.
6 Research with stakeholders' language use and preferences should inform these items (Lewis,
7 2021). We include an example based on the geographic context of the United Kingdom, but
8 recommend using the five most common languages for a study's context. Use of this and other
9 items should be done with the safety of the stakeholders in mind, avoiding stigmatizing
10 expressions. If language is relevant to the work at hand and it is safe for participants to indicate
11 this, given its use as a proxy for ethnicity, migration, and acculturation, then this item may be
12 appropriate for the project.

13 Our item assessing ethnic-racial identity prioritizes broader categories over more specific
14 response options that may weaken participant privacy. As such, we give an example for the UK
15 context which was adapted based on the British census. Due to the varying use of ethnicity and
16 race across contexts, we chose an item wording which emphasized self-identification as a
17 member of a social group. We thus propose a wording which can be applied across contexts. We
18 limited our item response options to headers from the 2021 UK census question to minimize
19 triangulation of personally identifying data, put them in alphabetical order to minimize reifying
20 social hierarchies, and included the option to not respond at all. Following the census categories
21 will enable researchers to compare their data with and stratify according to population-based
22 data. Yet, while this choice supports our prioritization of limiting identifying data, many ethnic-
23 racial identities fall within these larger categories. Combining across these ethnicities can
24 obscure inequities owed to some groups. Moreover, we note that the UK census was not

1 developed inclusively. We have not suggested adaptations to the response options as we are not
2 experts on the British context and do not want to reproduce the non-inclusive approach taken
3 during the census development. We strongly encourage researchers to adapt country-specific
4 items in collaboration with ethnic and racial community stakeholders and to follow do no harm
5 policies (Call et al., 2022; NHS England, 2023; Schwabish & Feng, 2021) when using the item in
6 their research. In particular, we suggest a community based participatory research approach
7 (Wallerstein et al., 2020) to ensure that the adaptive process of the assessment, and further, the
8 research question and the communication of research results does not cause harm towards the
9 marginalized racial and ethnic communities - even if the research was conducted with good
10 intentions.

11 Keeping in mind that asking about an individual's ethnic-racial identities is not always possible,
12 established, or wanted, we further present a more broadly applicable option (item 6e), which asks
13 about self-identification as a member of an ethnic minority or racialized group (without
14 indicating the group per se). As outlined above, membership in a marginalized group can serve
15 as a first indicator of shared exposures, such as of discrimination, even in contexts where a more
16 nuanced assessment is not feasible. Thus, this item offers comparability across studies with
17 different social contexts and marginalized groups. Focusing on racialized and discriminatory
18 experiences emphasizes the understanding of ethnic-racial identity as a marker of risk exposures
19 rather than risk factor itself. In addition to the above outlined ethical principles, assessing,
20 analyzing and interpreting ethnic-racial identity data thus requires that researchers reflect upon
21 processes of oppression, discrimination, power and privilege.

22 *3.7. Religion and Worldviews*

1 Religions and worldviews are closely tied to ethnic and cultural background and face similar
2 challenges in the health care setting. Religions and worldviews affect many areas, ranging from
3 reproductive health, practitioner gender preference, attitudes towards physician-assisted suicide,
4 palliative care, and health screenings (Padela et al., 2015). Considering religions and worldviews
5 is part of culturally sensitive healthcare. Religious affiliations and world views, degree of
6 religiosity, and experience of discrimination due to religion can impact attitudes towards the
7 healthcare system and quality of life (Rivenbark & Ichou, 2020).

8 We modified an item from the Pew Research Center Survey of Religion and Social Life
9 Questionnaire for Field Work (Pew Research Center, n.d.). The original item included religious
10 denominations; we retained only the major categories to keep the measure brief. We recommend
11 adapting the measure to assess country-specific religious groups and worldviews. Healthcare
12 professionals may wish to follow up with patients regarding specific denominations to optimize
13 healthcare and treatment choices.

14 *3.8. Mental Health*

15 Mental health is typically absent from census surveys or routine demographics. However, the
16 WHO defines mental health as a key component of health (World Health Organization (WHO),
17 2018). Mental illness is often invisible and is associated with a host of negative health (Lando et
18 al., 2006) and economic (Schurer et al., 2019) risks and outcomes. As an invisible diversity
19 domain, the effects of multiple stigmas may go unnoticed (Staiger et al., 2018) or be
20 misinterpreted as a single visible stigma. By collecting and reporting data in aggregate, we can
21 make mental health visible without endangering individuals' privacy.

22 We aimed to maximize comparability with population studies, capture as many mental health
23 conditions as possible, and maximize caseness (e.g., Major Depressive Disorder, not transient
24 negative affect). A single item from the Commonwealth Fund International Health Policy Survey

1 (Commonwealth Fund, 2016) meets these criteria, is brief, and available in many languages. Yet,
2 this item still has some limitations. Items emphasizing caseness will miss subclinical cases that
3 can cause suffering without meeting diagnostic criteria, excluding individuals who do not – or
4 cannot – access mental healthcare. Balancing the need to capture mental health struggles, but not
5 over-pathologizing individuals is a challenge. Depending on the language used, some
6 translations of this item only included the male form of ‘doctor’ and were adapted. Additionally,
7 limiting the terminology to only include “doctors” versus “healthcare professional” may miss
8 diagnoses by other qualified healthcare workers.

9 *3.9. Physical Health & Disability*

10 The WHO’s classification of health and health-related domains provides a framework for
11 measuring both health and disability (International Classification of Functioning, Disability and
12 Health (Organization, 2002); ICF). Accordingly, we included aspects of both disability and
13 physical health in the DiMIS. Health-related data collected at the population level allows the
14 monitoring of changes in health status over time, helps prioritize health service research, policy
15 and delivery, allows analysis of health interventions, allows comparison of different populations,
16 and helps identify potential health inequalities within populations.

17 We use a DAISY (Molyneaux, 2020) item regarding self-identification as a disabled person,
18 which also captures those who do not access official recognition and government support. Where
19 available, the EHIS is suggested if government disability status is relevant to the research
20 question. To query about chronic diseases, we use an EHIS (European Commission. Statistical
21 Office of the European Union., 2018) item, as we do for subjective health. The latter is based on
22 a 5-point Likert scale to maximize predictive and criterion validity, and minimize floor and
23 ceiling effects. Having participants rate all three aspects separately avoids conflating chronic
24 disease and disability with poor subjective health. Community stakeholders emphasized this

1 aspect, adding that rather than only focusing on individual limitations, attention should be paid to
2 participation restrictions as well as environmental and social barriers. For example, inaccessible
3 environments or language can exacerbate impairments and impact responses. Higher SES
4 individuals may have access to better facilities and experience fewer barriers compared to lower
5 SES individuals. Stigma of health conditions and disabilities can have psychological implications
6 and can affect social participation (Weiss et al., 2006). Where information on environmental or
7 social factors is not collected, data should be analysed with these in mind.

8 With regards to physical health status, researchers might wish to include an objective health item
9 which surveys specific conditions with which participants may live. Both subjective and
10 objective health measures help to obtain a more complete picture of health conditions and level
11 of severity. However, participants' conceptualization of subjective health includes objective
12 health, and both are intertwined with health indicators and social health determinants (Goldman,
13 2004).

14 *3.10. Perceived Discrimination*

15 Studies repeatedly find that discrimination experiences are associated with adverse effects on
16 mental and physical health (Carter et al., 2017; Williams et al., 2019). Structural data may reveal
17 leaky pipelines, glass ceilings, or other forms of unequal behaviors towards marginalized groups
18 (e.g., women and caregivers (Hirsh et al., 2020).) Subjective experiences can provide
19 information that is not captured through the analysis of descriptive categorical data.

20 We prioritized a measure that covers a broad range of discrimination experiences, is flexible
21 across a variety of contexts, and comparable to a population measure. We adapted Item 122 from
22 the SOEP Innovation Sample (SOEP-IS Group, 2019) to cover all DiMIS diversity domains by
23 adding mental health and caregiving, and removed the country-specific anchor in the instructions
24 to allow for more flexible use. This measure fulfils our priorities as it denotes discrimination

1 experiences across multiple domains. This enables researchers to link discrimination experiences
2 with the categorical data of the DiMIS and to analyse discrimination using an intersectional
3 perspective. A disadvantage is that discriminative experiences might be under- or overreported
4 for a variety of reasons, but more evidence is needed to understand processes and contexts of
5 discrimination.

6 **4. Discussion**

7 We propose a brief, economic, and easy-to-use minimal item set that captures diversity across 10
8 intersecting domains for broad use in research, ranging from small studies to large trials and
9 survey data collection. By adding a diversity perspective to their research, scientists can make
10 their research even more innovative and relevant (Lewis, 2021). The promise of this approach
11 ranges from higher research quality to more tailored treatment and policies producing better
12 outcomes. For instance, drug trials have a history of underrepresenting women and minorities
13 (e.g., cardiometabolic clinical trials (Khan et al., 2020) and the elderly (e.g., heart failure
14 (Tahhan et al., 2018)). Sometimes, even when ethnicity data is collected, it is not reported or
15 included in subgroup analyses (Gupta et al., 2019). Broad use of the DiMIS promises to address
16 these and other data gaps regarding diversity domains.

17 Different countries have different legal traditions for assessing the diversity domains we have
18 included. For example, in the U.S., since the 1993 NIH Revitalization Act, inclusion of women
19 and minorities in research is required by law. Since then, more and more countries have followed
20 this lead. In 2016, Canada changed how the Government of Canada collects, uses, and displays
21 sex and gender information. In 2021, Canada implemented the Disaggregated Data Action Plan
22 (DDAP) to support more representative data collection methods and enhance statistics on diverse
23 populations to allow for intersectional analyses. Scandinavian countries and the United Kingdom

1 and Ireland have national health care systems with strong traditions of data safe havens and
2 collecting data on social determinants of health. However, countries like France and Japan have
3 legal barriers to collecting data on ethnic minorities, thus limiting data collection on diversity.
4 Other countries, such as Germany, allow the collection of a minimum set of diversity data but
5 emphasize data parsimony. While the policies instituted at the Canadian Institutes of Health
6 Research (2010), the European Commission (2014), the US National Institutes of Health (2016),
7 and the German Research Foundation (2020) all involve gender analysis in research, we propose
8 incorporating additional diversity domains beyond gender and taking an intersectional approach.
9 A standardized assessment of gender and other diversity domains has several benefits. First, it
10 helps to describe for whom available evidence is valid and for whom it is still missing, thus
11 clearly delineating evidence gaps. Second, comparing smaller data sets to population-level data
12 allows for evaluating data representativeness and generalizability. Similarly, by using
13 comparable items in population surveys and smaller studies, researchers can stratify their sample
14 according to the distribution in the general population. Furthermore, if accurate population data
15 is available, it is possible to model representative samples of underserved populations and
16 maximize external validity by statistical weighting and simulation. Third, it facilitates an
17 intersectional approach requiring moderation analyses with sample sizes that are large enough to
18 provide enough power for studying interactions and subgroups (Shrout & Rodgers, 2018).
19 Combined data sets with comparable assessments of gender and diversity allow researchers to
20 investigate moderator effects in their primary analyses and meta-analyses, while minimizing
21 burden on participants. Fourth, a systematic approach will lead to cumulative evidence about the
22 effect sizes of different diversity domains, thus helping to identify areas where certain diversity
23 aspects really matter and need to be analyzed and where less so.

1 The proposed minimal item set has several limitations. First, the DiMIS is limited to 10 diversity
2 domains. The catalogue of domains is not intended to be exhaustive, but rather to push beyond
3 the measurement of age and binary sex and to capture a wider array of intersections. Second, the
4 DiMIS is intended to provide a brief assessment of various diversity domains and therefore
5 cannot provide a comprehensive examination of each domain. We recommend using additional
6 measures to collect more nuanced data for diversity domains of particular interest. Finally, this
7 version of the DiMIS is intended for adult participants. Certain items in the DiMIS should be
8 modified for minor or student samples, such as socioeconomic status (e.g., to be derived from
9 their parents' educational attainment (Galobardes, 2006), or sexual orientation (e.g. asking about
10 sexual attraction rather than sexual identity (Austin et al., 2007). Furthermore, some response
11 options included in items such as sexual orientation may be unknown to older cohorts and could
12 be adjusted accordingly. We encourage researchers and stakeholders to revise, adapt, and expand
13 the DiMIS to fit their individual questions in research and practice. We invite them to create
14 further local adaptations and share these with fellow professionals and stakeholders.

15 A broad use of the DiMIS has implications for the health sciences and beyond. The SAGER
16 criteria give recommendations for sex and gender-sensitive reporting (Heidari et al., 2016) and
17 Tannenbaum and colleagues offer guidelines across disciplines (e.g., artificial intelligence, ocean
18 climate science, and human therapeutics) for integrating age, sex, and gender into study design,
19 analysis, and reporting of results (Tannenbaum et al., 2019; Tannenbaum & Day, 2017).

20 Similarly, the DiMIS could be used across disciplines with adapted versions for different
21 disciplines and national contexts, and inform diversity-sensitive reporting guidelines. Unlocking
22 the power of heterogeneity, we can foster innovations across disciplines to better benefit
23 individuals (European Commission. Directorate General for Research and Innovation., 2020;
24 Tannenbaum et al., 2019).

1 We hope to set off a cascade of effects from better diversity data to wider societal benefits, but
2 this is not possible without oversight, accountability, and structural support (e.g., funding bodies,
3 ethics review boards). The research community, funders, and publishers must agree to improve
4 diversity data collection to avoid plateaus in progress and unfulfilled promises to funders and
5 research stakeholders. A first step is to collect and analyse diversity data widely in completed
6 and ongoing studies. Using literature already published and available, researchers could conduct
7 meta-analyses on gender and other diversity domains and their intersections to provide the
8 gender disaggregated results currently rarely available in research reports. Some examples of
9 these are sustainable urban planning (e.g., provision of public toilets for women (Greed, 2020),
10 access to essential medicines and reproductive healthcare (Cottingham & Berer, 2011), reducing
11 gender and racial bias in AI (for review, see Tannenbaum et al, 2019).

12 Importantly, when asking about participants' identification with marginalized identities, earning
13 participants' trust and protecting their data is essential. Researchers should maximize
14 transparency wherever possible regarding why they are enquiring about deeply personal – often
15 stigmatized – information and how the data will be stored and/or aggregated and de-identified.

16 As a research community, we need to ensure that information is used ethically and that we
17 minimize opportunities for misuse. Ensuring safe data storage is essential to earning participants'
18 trust and ensuring compliance with the Belmont Report and the Declaration of Helsinki (Paxton,
19 2020; World Medical Association., 2001). Compiling a larger database of otherwise small
20 samples may help aggregate enough participants that they can effectively achieve anonymity.

21 Researchers and clinicians may develop and evaluate tailored treatments and interventions to
22 address gaps which could be translated into guidelines and policies, political action, and societal
23 innovation.

1 To make real progress on this ambitious task, researchers must start by addressing diversity as
2 part of their routine data collection. With the DiMIS, we offer a toolkit for researchers across
3 disciplines and for projects where diversity is not the main focus, but may begin to fill a diversity
4 data gap. The goal is to become inclusive, transparent, and respectful of sometimes conflicting
5 stakeholder values and priorities to answer the research question at hand. We hope to encourage
6 discourse on good practices to close the gender and diversity data gap in the health sciences.
7 While there is no single best method for this approach, the DiMIS might serve as a first step
8 towards improved gender and diversity data collection and analysis and more diversified
9 innovations.

10

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18

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- 7

1 **Figure 1: General recommendations for measuring diversity**

2 ----- Insert Figure here -----

3

1 **Table 1: Diversity Minimal Item Set (DiMIS) for Routine Data Collection**

Item	Reference	Domain
<p>Individual instructions with notes on data protection and reasons for collecting the data, e.g. personalized information and interventions. We recommend a clarification that the research team undertaking this research project is committed to improving the quality of life for underrepresented groups.</p>	..	Instructions
<p>1 Regarding gender identity, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Cis <input type="checkbox"/> Dyadic <input type="checkbox"/> Inter <input type="checkbox"/> Non-Binary <input type="checkbox"/> Questioning <input type="checkbox"/> Trans <input type="checkbox"/> Prefer to self-identify: _____ <input type="checkbox"/> Prefer not to answer</p> <p><i>If it is important to the research question to include information on participants' sex, consider adding question 1b along with an explanation of why it is important that participants disclose sex, gender, and/or trans status.</i></p> <p>1b What sex were you assigned at birth? (For example, on your birth certificate.)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Intersex <input type="checkbox"/> Don't Know <input type="checkbox"/> Prefer not to answer</p>	Adapted from NHS & LGBT Foundation	Gender
<p>2 What is your month and year of birth?</p> <p>▼ [Drop down menu with month list] ▼ [Drop down menu with year list]</p> <p><input type="checkbox"/> Prefer not to answer</p>	Adapted from EHS	Age
<p>3 What is the highest level of education you have successfully completed?</p> <p><input type="checkbox"/> Less than General Certificate of Secondary Education (GCSE) or equivalent (less than upper secondary education, ISCED level 0-2) <input type="checkbox"/> General Certificate of Secondary Education (GCSE) or equivalent (upper secondary education, ISCED level 3) <input type="checkbox"/> Vocational degree or equivalent (post-secondary non-tertiary degree, ISCED level 4) <input type="checkbox"/> Post-graduate certificate or equivalent (short-cycle tertiary degree, ISCED level 5) <input type="checkbox"/> Bachelor's degree (for example: BA, AB, BS) [ISCED level 6] <input type="checkbox"/> Master's degree (for example: MA, MS, MENG, MED, MSW, MBA) [ISCED level 7] <input type="checkbox"/> Doctorate degree or equivalent level (for example: PHD, EDD, MD, JD) [ISCED level 8] <input type="checkbox"/> Another degree, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	Adapted from EHS and ISCED	Socioeconomic Status
<p>4 Do you have any of the following care responsibilities? (check as many as apply)</p> <p><i>This does not include caregiving, nursing services or support you provide in connection with your profession.</i></p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes, for a child or children (under 18 years old) with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes, for one or more adults (age 18 years and above) with challenges of old age or frailty <input type="checkbox"/> Yes <input type="checkbox"/> No with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Prefer not to answer</p>	Adapted from DAISY and EHS	Care Responsibilities

<p>5 Regarding sexual orientation, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Heterosexual <input type="checkbox"/> Asexual <input type="checkbox"/> Bisexual <input type="checkbox"/> Gay <input type="checkbox"/> Lesbian <input type="checkbox"/> Pansexual</p> <p><input type="checkbox"/> Another sexual orientation, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from NHS & LGBT Foundation</p>	<p>Sexual Orientation</p>
<p>6a In which country were you born?</p> <p>▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>6b In which country/countries were your parents born?</p> <p>Parent 1/Mother: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>Parent 2/Father: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>6c-1 How well do you speak...</p> <p>English [official language] :</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>Welsh [second official/most common language]:</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>6c-2 Do you speak any other languages? If yes, please indicate your language skills.</p> <p>▼ Drop-down menu with list of relevant spoken languages in the research context (e.g. Arabic, Hindi, Mandarin, Spanish, ...) as well as sign language and option to fill in any language not listed</p> <p>[language] <input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well</p> <p><i>[responsive design with additional row appearing upon entry]</i></p> <p>6d Do you identify as...?</p> <p><i>(Note: UK example; adapt to local research context)</i></p> <p><input type="checkbox"/> Asian or Asian British</p> <p><input type="checkbox"/> Black, Black British, Caribbean or African</p> <p><input type="checkbox"/> Multiple ethnic groups</p> <p><input type="checkbox"/> White</p> <p><input type="checkbox"/> Prefer to self-identify: _____</p> <p><input type="checkbox"/> Prefer not to answer</p> <p><i>(Note: In contexts, where a more nuanced assessment of ethnicity and/or race is not possible, consider asking the following question as a marker of racism- or discrimination related exposures.)</i></p> <p>6e Do you identify as a member of an ethnic minority or racialized group?</p> <p><i>A racialized group is a societal group which is affected by racism or discrimination. The racialization may be based on skin colour, origin, religion, language, etc.</i></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>6a and 6b adapted from EHIS</p> <p>6c adapted from the Census 2021 Individual Questionnaire (England)</p> <p>6d generated by the working group</p> <p>6e adapted from the Census 2021 Individual Questionnaire (England)</p>	<p>Ethnic-Racial-Identity</p>

<p>7 What is your present religious identity or world view, if any?</p> <p><input type="checkbox"/> Buddhist <input type="checkbox"/> Christian <input type="checkbox"/> Hindu <input type="checkbox"/> Jewish <input type="checkbox"/> Muslim</p> <p><input type="checkbox"/> Atheist (do not believe in God) <input type="checkbox"/> Agnostic (not sure if there is a God)</p> <p><input type="checkbox"/> Another religion, please specify: _____</p> <p><input type="checkbox"/> Nothing in particular <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from Pew Research Center: Survey of Religion and Social Life Questionnaire for Field Work. Western Europe Survey 2017.</p>	<p>Religion and Worldview</p>
<p>8 Have you ever been told by a doctor or health care professional that you have depression, anxiety or other mental health problems?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from Commonwealth Fund International Health Policy Survey</p>	<p>Mental Health</p>
<p>9a Do you consider yourself to have a disability?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9b Do you have any chronic illness or longstanding health problem? By longstanding we mean illnesses or health problems, which have lasted, or are expected to last, for 6 months or more.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9c How is your health in general?</p> <p><input type="checkbox"/> Very good <input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Bad <input type="checkbox"/> Very bad <input type="checkbox"/> Prefer not to answer</p>	<p>9a adapted from DAISY 9b and 9c adapted from EHIS</p>	<p>Physical Health and Disability</p>

<p>Now we are talking about the topic of discrimination. Discrimination means that a person is treated worse than other people based on characteristics such as gender, sexual identity, or age, without there being any reasonable justification for it. Discrimination can be practiced in very different ways, for example through insults, exclusion, sexual harassment and even violence. But it is also discrimination when people are disadvantaged by rules and laws.</p> <p>Have you personally been discriminated against in the last 24 months [in/location/institution] for the following reasons? (Check as many as apply.)</p> <p>10 Have you personally been discriminated against in the last 24 months [in/location/institution] for the following reasons? (check as many as apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Due to being older in age <input type="checkbox"/> Due to being younger in age <input type="checkbox"/> Due to gender <input type="checkbox"/> Due to a low level of education <input type="checkbox"/> Due to low income <input type="checkbox"/> Due to non-occupational care responsibilities <input type="checkbox"/> Due to of sexual orientation (e.g., gay, lesbian, bisexual) <input type="checkbox"/> Due to racist attitudes, belonging to an ethnic group or background from another country <input type="checkbox"/> Due to religion or worldview <input type="checkbox"/> Due to a mental health problem <input type="checkbox"/> Due to a disability <input type="checkbox"/> Due to a chronic disease <input type="checkbox"/> Due to another reason (please specify): _____ <input type="checkbox"/> Prefer not to answer 	<p>Adapted from SOEP</p>	<p>Perceived Discrimination</p>
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Note. DAISY Diversity and Inclusion Survey; EHIS European Health Interview Survey; NHS National Health Service; LGBT lesbian, gay, bisexual and trans; SOEP Socio-Economic Panell.

1 **Supplement 2: DiMIS-DE: A locally adapted version of the DiMIS for**
2 **the German context**

3 **2a Diversitäts-MindestIndikatorenSatz - Deutschsprachige Version**
4 **(p. 1-28)**

5 **2b English Translation of Supplement 2 (p. 29-42)**
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10 **Diversitäts-MindestIndikatorenSatz - Deutschsprachige Version**

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4

5 **Abkürzungsverzeichnis**

6 AGG Allgemeines Gleichbehandlungsgesetz

7 DAISY Diversity and Inclusion Survey

8 DFG Deutsche Forschungsgemeinschaft

9 DGPs Deutsche Gesellschaft für Psychologie

10 DiMIS Diversitäts-MindestIndikatoren-Satz

11 EHIS European Health Interview Survey, siehe GEDA

12 GEDA Studie 'Gesundheit in Deutschland aktuell', dt. Version der EHIS

13 ISCED International Standard Classification of Education

14 LGBT lesbian, gay, bisexual, and transgender

15 NHS National Health Service, staatliches Gesundheitssystem in Großbritannien und Nordirland

16 SOEP-CORE Hauptmoduls des sozio-oekonomischen Panels

17 SOEP-IS Innovationsmodul des sozio-oekonomischen Panels

18 UK United Kingdom

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1 **Erfassung von Geschlecht und anderen Diversitätsbereichen in Deutschland**

2 Für eine innovative und inklusive Gesundheitsversorgung ist es unabdingbar,
3 Vielfältigkeit in Gesundheitsdaten sichtbar zu machen. Nur wenn Diversitätsbereiche
4 erfasst werden, können ungleiche Gesundheitschancen systematisch analysiert und
5 abgebaut werden (siehe Artikel für Hintergründe und Beispiele). Erst dann wird deutlich,
6 wie verschiedene Diversitätsdomänen sowie deren Intersektionen Gesundheit und das
7 Gesundheitssystem prägen und diese Informationen für Innovation, Inklusion und
8 Wandel nutzen.

9 In Deutschland ist eine systematische Berücksichtigung individueller
10 Unterschiede in der Gesundheitsforschung und -versorgung derzeit noch nicht etabliert.
11 Vielmehr gibt es eine beträchtliche “Geschlechter- und Diversitätsdatenlücke” (*gender*
12 *and diversity data gap*), die Evidenzgrundlagen für diversitätssensible Medizin sind
13 derzeit noch sehr begrenzt. Doch derzeit setzen sich viele gesellschaftliche Akteure für
14 einen Wandel ein. Wir stellen dazu einige Initiativen aus Politik, Forschungsförderung
15 und beruflichen Fachverbänden vor. Die deutsche Bundesregierung hat sich in ihrem
16 Koalitionsvertrag 2021 das Ziel gesetzt, ein “diverseres, inklusives und barrierefreies
17 Gesundheitswesen” (SPD, Bündnis 90/Die Grünen und FDP, 2021, p. 85) zu erarbeiten.
18 Neben geschlechtsbezogenen Unterschieden in Versorgung, Gesundheitsförderung
19 und Prävention sollen auch weitere Aspekte von Diversität zukünftig verstärkt
20 berücksichtigt werden und Zugangsbarrieren, Diskriminierung und Stigmatisierung im
21 Gesundheitswesen abgebaut werden (SPD, Bündnis 90/Die Grünen und FDP, 2021).
22 Weiterhin empfiehlt die Deutsche Forschungsgemeinschaft seit 2020 die Reflektion der
23 Bedeutung von Geschlecht und Vielfältigkeit in der Vorbereitung eines jeden

1 Forschungsprojekts als Bestandteil guter wissenschaftlicher Praxis (Deutsche
2 Forschungsgemeinschaft, 2020). Während die Relevanz von Geschlecht und Diversität
3 international bereits von vielen Förderorganisationen abgefragt wird, nimmt die DFG
4 damit im deutschen Wissenschaftssystem eine Vorreiterrolle ein. Weiterhin hat die
5 DGPs im Mai 2022 eine neue Kommission mit dem Schwerpunkt "Diversität, Inklusion
6 und Chancengleichheit" eingerichtet (Deutsche Gesellschaft für Psychologie, 2022). Für
7 einen nachhaltigen Fortschritt ist jedoch umfassenderer Wandel hin zu einer
8 diversitätssensiblen Gesundheitsversorgung notwendig, der mit dem Schließen der
9 Diversitätsdatenlücke beginnt. Um dieses Vorhaben möglichst schnell umzusetzen und
10 damit die Grundlage für eine gleichberechtigte und innovative Gesundheitsversorgung
11 zu ermöglichen, schlagen wir die routinemäßige Erhebung von Diversitätsdaten in
12 empirischen Studien der Medizin und Lebenswissenschaften vor.

13 Um die Umsetzung dieses Vorhaben zu erleichtern, haben wir einen
14 DiversitätsMindestIndikatoren-Satz (DiMIS; *Diversity Minimal Item Set*) mit nationalen
15 und internationalen Expert*innen der Diversity Assessment Working Group und
16 Unterstützung der Berlin University Alliance entwickelt, den Forschende leicht in ihre
17 routinemäßige Datenerhebung integrieren können. Der DiMIS umfasst die im
18 Allgemeinen Gleichbehandlungsgesetz (AGG; Antidiskriminierungsstelle des Bundes,
19 2006) und den *Sustainable Development Goals* der Vereinten Nationen verankerten
20 Antidiskriminierungsbereiche und ergänzt diese zu einem umfassenden Spektrum.
21 Insgesamt werden neun Diversitäts- und Gleichstellungsbereiche abgebildet:
22 Geschlecht, Alter, sozioökonomischer Status, Sorgearbeit, sexuelle Orientierung,
23 Ethnizität, Religion und Weltanschauung, psychische Gesundheit, Behinderung und

1 körperliche Gesundheit. Zusätzlich wurde ein Item zu wahrgenommener
2 Diskriminierung in diesen Bereichen aufgenommen. Damit ermöglicht der DiMIS eine
3 Vielzahl an Erkenntnissen zu einzelnen Diversitätsbereichen sowie intersektionale
4 Perspektiven. Kriterien für die Itemauswahl waren (1) eine größtmögliche Inklusivität bei
5 (2) möglichst kurzer Ausfülldauer, (3) die Vergleichbarkeit der Items mit Daten der
6 Allgemeinbevölkerung sowie (4) die Verfügbarkeit der Items in Englisch und anderen
7 Sprachen (z.B. Studie „Gesundheit in Deutschland Aktuell“, GEDA; European Health
8 Interview Survey, EHIS; Robert-Koch-Institut, 2021).

9 Im Folgenden stellen wir den für den deutschen Kontext adaptierten DiMIS (s.
10 Tabelle S1) vor und erläutern, welche Anpassungen wir jeweils getroffen haben.
11 Weiterführende Informationen zur Erstellung des DiMIS, allgemeine Empfehlungen zur
12 Implementierung, eine Erläuterung der Relevanz jedes Diversitätsbereichs sowie eine
13 Diskussion der Ergebnisse stellen wir im Hauptartikel vor.

14 [Tabelle S1 hier einfügen]

15 **Erläuterungen zu Anpassungen für den deutschen Kontext**

16 Für die deutschsprachige Version des DiMIS wurde auf internationale
17 Vergleichbarkeit sowie kultur- und kontextsensible Antwortformate geachtet. Wo
18 möglich, wurde die deutschsprachige Version eines international verfügbaren Items
19 verwendet. In den Fällen, in denen keine offizielle deutsche Übersetzung verfügbar war,
20 haben wir vorzugsweise ein Item gewählt, das einer inhaltlichen Übersetzung der
21 englischen Version entspricht, mit einer Bevölkerungsumfrage verknüpft werden kann
22 und unsere im Artikel dargestellten Prioritäten erfüllt. Bei einigen Items haben wir

1 Anpassungen mit Blick auf den deutschen Anwendungskontext vorgenommen, die wir
2 im Folgenden erläutern:

3 *Geschlecht (Gender)*

4 Für die deutschsprachige Version des DiMIS Gender-Items haben wir den
5 Fragewortlaut der GEDA 2019-EHIS übernommen. Die Antwortoptionen spiegeln die
6 des englischsprachigen DiMIS-Items wider und können in die GEDA 2019-EHIS
7 Antwortoptionen transformiert werden, wenn ein Vergleich mit einer deutschen
8 Bevölkerungsmessung gewünscht ist. Seit 2018 sieht die deutsche Gesetzgebung die
9 Option 'divers' als Geschlechtseintrag vor. Außerdem besteht die Möglichkeit den
10 Eintrag offen zu lassen. Der Begriff 'divers' ist innerhalb der nicht-binären Community
11 jedoch umstritten, da dieser sich auf eine rechtliche Kategorie
12 ('personenstandsrechtlicher Geschlechtseintrag', juristisches Geschlecht) bezieht und
13 nicht auf eine Geschlechtsidentität (gender). Entsprechend haben wir diese
14 Antwortoption auf Rat der hinzugezogenen Expert*innen nicht in das DiMIS gender-Item
15 aufgenommen.

16 Für Forschungsfragen, mit dem biologischen Geschlecht einer Person
17 zusammenhängen, empfehlen wir die Abfrage des biologischen Geschlechts (sex)
18 sowie der Geschlechtsidentität (gender) in zwei Schritten (siehe optionale Erweiterung
19 Item 1b). Der Fragewortlaut zur Erfassung des biologischen Geschlechts entspricht
20 dabei dem Item der GEDA 2019-EHIS, welche das in die Geburtsurkunde eingetragene
21 Geschlecht abfragt. Die Antwortoptionen entsprechen den in der deutschen
22 Gesetzgebung (s.o.) verankerten Eintragungsoptionen.

1 *Sozioökonomischer Status*

2 Analog zur englischsprachigen Version des DiMIS empfehlen wir für den DiMIS
3 die Erfassung des Bildungsniveaus als Indikator für die soziale Lage einer Person.
4 Aufgrund der Vielzahl an Ausbildungswegen und nicht-linearer Bildungsbiografien im
5 deutschen Bildungssystem schlagen wir für den deutschen Kontext vor, die schulische
6 und berufliche Ausbildung in zwei separaten Items, angelehnt an die GEDA 2019-EHIS
7 zu erfassen. Auf Grund des Feedbacks unserer Expert*innen haben wir einige
8 Antwortoptionen modifiziert. Für internationale Vergleichbarkeit können die Abschlüsse
9 in die Kategorien der Internationalen Standardklassifikation für das Bildungswesen
10 (ISCED; Bundesministerium für Bildung und Forschung, 2022) transformiert werden.

11 *Sexuelle Orientierung*

12 Für das deutschsprachige Item zu sexueller Orientierung haben wir den Wortlaut
13 des SOEP-CORE (Kantar Public, 2020) Items übernommen, welches inhaltlich dem
14 Item des englischsprachigen DiMIS entspricht. Die Antwortoptionen des
15 deutschsprachigen DiMIS-Items stimmen mit jenen aus dem englischsprachigen DiMIS
16 überein und können bei Bedarf in die Form der SOEP-Antwortoptionen transformiert
17 werden, sofern ein Vergleich mit der deutschen Bevölkerung gewünscht ist.

18 *Ethnizität*

19 Im Hauptartikel diskutieren wir die Relevanz sowie Herausforderungen der
20 regionalen Adaptation des ethnicity/race items. Exemplarisch präsentieren wir hier
21 Items, die wir für den deutschen Kontext angepasst haben. Wie in der
22 englischsprachigen Fassung schlagen wir die Erfassung der Migrationsgeschichte in
23 der eigenen und Elterngeneration, Sprachkompetenzen und Zugehörigkeit zu

1 relevanten gesellschaftlichen Gruppen vor. Expert*innen schlugen für den deutschen
2 Kontext vor, den Ost-West-Bezug aufzunehmen (siehe auch Vogel & Zajak, 2020).
3 Daher geben Teilnehmende an, inwieweit sie sich als ostdeutsche Person einordnen
4 (Item 6a-1 bis 6a-4). Zur Erfassung der Sprachkenntnisse geben wir im DiMIS Item 6c-2
5 beispielhaft die in deutschen Haushalten am häufigsten gesprochenen Fremdsprachen
6 (Arabisch, Polnisch, Russisch, Türkisch, geordnet in alphabetischer Reihenfolge) an
7 (DESTATIS, 2022). Dabei ist hervorzuheben, dass die präsentierten Optionen je nach
8 Forschungskontext und den diesbezüglich relevanten Fremdsprachen angepasst
9 werden sollten. Analog zur englischsprachigen Fassung empfehlen wir, die für den
10 Forschungskontext relevanten Sprachen, Deutsche Gebärdensprache sowie eine
11 Möglichkeit zum Selbsteintrag im Dropdownmenü zu präsentieren. Weiterhin empfehlen
12 wir, ein responsives Design zu implementieren, welches bei Angabe einer
13 Sprachkompetenz jeweils ermöglicht, einen weiteren Eintrag hinzuzufügen.

14 Da es bisher kein etabliertes Item zur Erfassung der Zugehörigkeit zu relevanten
15 Gruppen in Deutschland gibt, das in Bevölkerungssurveys verwendet wird, schlagen wir
16 ein neu entwickeltes Item vor. Der Wortlaut der Eingangsfrage ist adaptiert von einem
17 Item zu Gesellschaftsgruppen (Buspavanich, persönliche Kommunikation). Die
18 Antwortoptionen sind angelehnt an im angloamerikanischen Raum breit verwendete
19 Gruppenbezeichnungen (z.B. African American, Asian American, Latino/Hispanic,
20 White), welche wir für den deutschen Kontext adaptierten und um häufig vertretene
21 Bevölkerungsgruppen ergänzten, (z.B. Polnisch-deutsch, Türkisch-deutsch). Diese
22 Antwortoptionen sind alphabetisch präsentiert. Im Entwicklungsprozess wurde
23 Feedback von der Arbeitsgruppe sowie von Community Stakeholdern eingearbeitet. Die

1 Validierung des Items ist geplant. Im Rahmen des Berliner Partizipations- und
2 Integrationsgesetzes soll die Einwanderungsgeschichte zukünftig freiwillig bei
3 Beschäftigten in der öffentlichen Verwaltung abgefragt werden. Auch für diesen Kontext
4 der gesetzlichen Abfrage bietet sich das Item sehr gut an, da es auch Eingewanderte
5 und ihre Nachkommen über die zweite Generation hinaus erfassen kann.

6 *Religion und Weltanschauung*

7 Analog zur englischsprachigen Version des DiMIS empfehlen wir zur Erfassung
8 der Zugehörigkeit zu einer religiösen Gemeinschaft oder Weltanschauung das deutsche
9 Item der Pew Research Center Survey of Religion and Social Life Questionnaire for
10 Field Work (2017). Wir haben das Item für den deutschsprachigen Kontext in
11 geschlechterneutraler Sprache adaptiert.

12 *Körperliche Gesundheit und Behinderung*

13 Wenn der gesetzliche Status bezüglich der Behinderung für die Forschungsfrage
14 relevant ist und ein Vergleich mit einer deutschen Bevölkerungsstichprobe gewünscht
15 ist, schlagen wir ein Item aus der deutschsprachigen Version der GEDA 2014/16-EHIS
16 (Robert Koch-Institut, 2017) vor, welches eine vom Versorgungsamt amtlich anerkannte
17 Behinderung erfasst (vgl. Tabelle S2). Das Item wird in der GEDA 2019-EHIS Welle
18 jedoch nicht mehr abgefragt, stattdessen werden Beeinträchtigungen in basalen und
19 instrumentellen Aktivitäten des täglichen Lebens erfasst. Dieses umfassendere
20 Vorgehen schlagen wir Forschenden mit vertieftem Interesse an der Erfassung von
21 Beeinträchtigungen und Behinderungen vor.

22

1 **Diskussion und Ausblick**

2 Im Hauptartikel präsentieren wir eine umfassende Diskussion des DiMIS.
3 Dennoch merken wir auch für den deutschsprachigen DiMIS abschließend an, dass
4 dieser aufgrund seiner Kürze einzelne Diversitätsdomänen nicht im Detail erfassen
5 kann und je nach Forschungsfrage angepasst, vertieft und ergänzt werden sollte. Für
6 jede der abgebildeten Diversitätsdomänen wäre eine vertiefende Erhebung möglich und
7 je nach projektspezifischer Fragestellung auch angebracht. Gleichzeitig gibt es häufig
8 auch innerhalb wissenschaftlicher Fachgruppen keinen etablierten Konsens zur
9 bestmöglichen Erfassung einzelner Diversitätsaspekte. In diesem Sinne ist der DiMIS
10 ein pragmatisches, kurzes und breit einsetzbares Messinstrument zur umfassenderen
11 Erhebung von Diversitätsdaten mit dem Ziel, systematisch die Diversitätsdatenlücken
12 im deutschsprachigen Raum zu verringern. Es ist uns ein großes Anliegen, dass
13 Interessenvertreter*innen, Communities und Forschende diese Arbeit der partizipativen
14 Entwicklung der einzelnen Items fortsetzen. Wir sind uns bewusst, dass insbesondere
15 die Items, deren Erhebung bislang nicht etabliert ist, weiterer Diskussion und laufender
16 Adaption bedürfen. Auch sind die Bereiche von Diversität im DiMIS nicht erschöpfend
17 erfasst. Wir freuen uns auf einen produktiven Austausch mit allen Stakeholdern, um
18 gemeinsam die Items weiterzuentwickeln. Wir sind uns sicher, dass dem DiMIS
19 Bereiche hinzuzufügen sind, die für verschiedene Forschungsfragen und Anliegen
20 relevant sind.

21

22

1 Quellen

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1 **Tabelle S1: Diversitäts-MindestIndikatorenSatz (DiMIS) - Deutschsprachige**
 2 **Version**

<p>Individuelle Instruktionen mit Hinweisen zum Datenschutz und zu Gründen für die Erhebung der Daten, z.B. personalisierte Informationen und Interventionen. Wir empfehlen eine Selbstverpflichtung des Forschungsteams einzuschließen: Das Forschungsteam in dieser Studie setzt sich für die Verbesserung der Lebensqualität unterrepräsentierter Gruppen ein.</p>		
Item	Referenz	Bereich
<p>1 Welchem Geschlecht fühlen Sie sich zugehörig? (Mehrfachauswahl möglich)</p> <p><input type="checkbox"/> Weiblich <input type="checkbox"/> Männlich <input type="checkbox"/> Cis <input type="checkbox"/> Endo* <input type="checkbox"/> Inter* <input type="checkbox"/> Nicht-binär <input type="checkbox"/> Questioning <input type="checkbox"/> Trans* <input type="checkbox"/> Bevorzuge Selbstbezeichnung als: _____ <input type="checkbox"/> Keine Angabe</p> <p><i>Falls Informationen bzgl. biologischem Geschlecht relevant sind für die Forschungsfrage, kann Frage 1b zusammen mit einer Erklärung, weshalb es wichtig ist, soziales Geschlecht, biologisches Geschlecht und/oder trans Status zu erheben, hinzugefügt werden.</i></p> <p>1b Welches Geschlecht wurde bei Ihrer Geburt in Ihre Geburtsurkunde eingetragen?</p> <p><input type="checkbox"/> Weiblich <input type="checkbox"/> Männlich <input type="checkbox"/> Divers <input type="checkbox"/> Kein Eintrag <input type="checkbox"/> Ich weiß nicht <input type="checkbox"/> Keine Angabe</p>	<p>In Anlehnung an GEDA 2019/2020-EHIS</p>	<p>Geschlecht (gender)</p>
<p>2 Wann sind Sie geboren?</p> <p>▼ Drop-down-Menü mit Geburtsmonat ▼ Drop-down-Menü mit Geburtsjahr</p> <p><input type="checkbox"/> Keine Angabe</p>	<p>GEDA 2019/2020-EHIS</p>	<p>Alter</p>
<p>3a Welchen <u>höchsten</u> allgemeinbildenden Schulabschluss haben Sie?</p> <p><input type="checkbox"/> Keinen, bin noch in schulischer Ausbildung <input type="checkbox"/> Keinen allgemeinbildenden Schulabschluss <input type="checkbox"/> Abschluss nach höchstens 7 Jahren Schulbesuch</p>	<p>In Anlehnung an GEDA 2019/2020-EHIS</p>	<p>Sozioökonomischer Status</p>

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<p><input type="checkbox"/> Haupt- /Volksschulabschluss, Polytechnische Oberschule mit Abschluss der 8. Oder 9. Klasse</p> <p><input type="checkbox"/> Realschulabschluss, Mittlere Reife, Polytechnische Oberschule mit Abschluss der 10. Klasse</p> <p><input type="checkbox"/> Abitur, fachgebundene Hochschulreife oder Fachhochschulreife</p> <p><input type="checkbox"/> Anderer Abschluss _____</p> <p><input type="checkbox"/> Keine Angabe</p> <p>3b Welchen <u>höchsten</u> beruflichen Ausbildungs- oder Hochschul-/Fachhochschulabschluss haben Sie?</p> <p><input type="checkbox"/> Keinen, bin noch in beruflicher Ausbildung (Auszubildende, Studierende)</p> <p><input type="checkbox"/> Keinen beruflichen Abschluss und bin nicht in beruflicher Ausbildung</p> <p><input type="checkbox"/> Beruflich-betriebliche Berufsausbildung (Lehre) abgeschlossen</p> <p><input type="checkbox"/> Beruflich-schulische Ausbildung (Berufsfachschule, Handelsschule) abgeschlossen</p> <p><input type="checkbox"/> Ausbildung an Fachschule, Meister-, Technikerschule, Berufs- oder Fachakademie</p> <p>abgeschlossen</p> <p><input type="checkbox"/> (Fach)Hochschulstudium, nicht abgeschlossen</p> <p>Abgeschlossenes (Fach)Hochschulstudium:</p> <p><input type="checkbox"/> Bachelor <input type="checkbox"/> Master <input type="checkbox"/> Diplom <input type="checkbox"/> Magister <input type="checkbox"/> Staatsexamen</p> <p><input type="checkbox"/> Promotion</p> <p><input type="checkbox"/> Habilitation</p> <p><input type="checkbox"/> Einen anderen beruflichen Abschluss, und zwar: _____</p> <p><input type="checkbox"/> Keine Angabe</p>		
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<p>4 Leisten Sie Betreuungs-, Pflege- oder Sorgearbeit? (Mehrfachauswahl möglich)</p> <p><i>Nicht gemeint sind Betreuungsaufgaben, Pflegeleistungen oder Unterstützung, die Sie im Zusammenhang mit Ihrer beruflichen Tätigkeit erbringen.</i></p> <p><input type="checkbox"/> Nein</p> <p><input type="checkbox"/> Ja, für ein oder mehrere Kinder (unter 18 Jahre)</p> <p style="padding-left: 40px;"><i>wenn ja:</i></p> <p style="padding-left: 80px;"><input type="checkbox"/> mit Behinderung</p> <p style="padding-left: 80px;"><input type="checkbox"/> mit chronischer Erkrankung</p> <p><input type="checkbox"/> Ja, für ein oder mehrere Erwachsene (18 Jahre und älter)</p> <p style="padding-left: 40px;"><i>wenn ja:</i></p> <p style="padding-left: 80px;"><input type="checkbox"/> mit altersbedingten Beschwerden oder Gebrechlichkeit</p> <p style="padding-left: 80px;"><input type="checkbox"/> mit Behinderung</p> <p style="padding-left: 80px;"><input type="checkbox"/> mit chronischer Erkrankung</p> <p><input type="checkbox"/> Keine Angabe</p>	<p>In Anlehnung an DAISY and GEDA 2019/2020-EHIS</p>	<p>Sorgearbeit</p>
<p>5 Als nächstes würden wir Ihnen gerne eine Frage zu Ihrer sexuellen Orientierung stellen. Was würden Sie selbst sagen: Sind Sie ...? (Mehrfachauswahl möglich)</p> <p><input type="checkbox"/> Heterosexuell <input type="checkbox"/> Asexuell <input type="checkbox"/> Bisexuell <input type="checkbox"/> Lesbisch <input type="checkbox"/> Schwul</p> <p><input type="checkbox"/> Pansexuell <input type="checkbox"/> Sexuelle Orientierung nicht aufgeführt: _____</p> <p><input type="checkbox"/> Keine Angabe</p>	<p>In Anlehnung an SOEP-Core</p>	<p>Sexuelle Orientierung</p>
<p>6a In welchem Land sind Sie geboren?</p> <p>▼ Drop-down-Menü mit Länderliste</p> <p><input type="checkbox"/> Land nicht aufgeführt: _____ <input type="checkbox"/> Keine Angabe</p> <p>Wenn in Deutschland geboren:</p>	<p>6a in Anlehnung an GEDA 2019/2020-EHIS</p> <p>6a-1 bis 6a-4 entwickelt von dem Arbeitskreis „Diversität sichtbar machen: messen und verbessern“</p>	<p>Ethnizität</p>

<p>6a-1 Haben Sie in der DDR gelebt?</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p> <p>6a-2 Wurden Sie in der DDR beziehungsweise im Gebiet der ehemaligen DDR geboren?</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p> <p>6a-3 Haben Ihre Eltern in der DDR gelebt?</p> <p><input type="checkbox"/> Ja, beide Elternteile <input type="checkbox"/> Ja, ein Elternteil <input type="checkbox"/> Nein, kein Elternteil</p> <p><input type="checkbox"/> Keine Angabe</p> <p>6a-4 Identifizieren Sie sich persönlich als ostdeutsche Person?</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p> <p>6b In welchem Land/Ländern sind Ihre Eltern geboren?</p> <p>Elternteil 1/Mutter: ▼ Drop-down-Menü mit Länderliste</p> <p><input type="checkbox"/> Land nicht aufgeführt: _____ <input type="checkbox"/> Keine Angabe</p> <p>Elternteil 2/Vater: ▼ Drop-down-Menü mit Länderliste</p> <p><input type="checkbox"/> Land nicht aufgeführt: _____ <input type="checkbox"/> Keine Angabe</p> <p>6c-1 Wie gut sprechen Sie folgende Sprachen?</p> <p>Deutsch: <input type="checkbox"/> Muttersprache <input type="checkbox"/> Sehr Gut <input type="checkbox"/> Gut <input type="checkbox"/> Wenig <input type="checkbox"/> Gar nicht</p> <p>Englisch: <input type="checkbox"/> Muttersprache <input type="checkbox"/> Sehr Gut <input type="checkbox"/> Gut <input type="checkbox"/> Wenig <input type="checkbox"/> Gar nicht</p> <p>6c-2 Sprechen Sie sonstige Sprachen? Wenn ja, bitte geben Sie Ihre entsprechenden Kenntnisse an.</p> <p>▼ Drop-down-Menü mit den [im Forschungskontext] am häufigsten Sprachen sowie Deutsche Gebärdensprache und der Option, weitere Sprachen in einem Freifeld zu ergänzen.</p> <p>[Sprache ▼] <input type="checkbox"/> Muttersprache <input type="checkbox"/> Sehr Gut <input type="checkbox"/> Gut <input type="checkbox"/> Wenig</p>	<p>6b in Anlehnung an GEDA 2019/2020-EHIS</p> <p>6c-1/2 in Anlehnung an UK Census 2021</p> <p>6d entwickelt von dem Arbeitskreis „Diversität sichtbar machen: messen und verbessern“</p>	
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<p><i>[Dropdownauswahl z.B. Arabisch, Polnisch, Russisch, Türkisch, Deutsche Gebärdensprache, sonstige Sprache (bitte angeben); responsive Design, Ergänzung um weiteres Feld bei Eintrag]</i></p> <p>6d Würden Sie sich selbst einer oder mehreren der folgenden Gesellschaftsgruppen zuordnen? (Mehrfachauswahl möglich)</p> <p><input type="checkbox"/> Afrodeutsch <input type="checkbox"/> Arabisch-deutsch <input type="checkbox"/> Asiatisch-deutsch <input type="checkbox"/> BIPOC (Black, Indigenous, People of Color) <input type="checkbox"/> Ehemals Jugoslawisch-deutsch <input type="checkbox"/> Lateinamerikanisch-deutsch <input type="checkbox"/> Polnisch-deutsch <input type="checkbox"/> Russisch-deutsch <input type="checkbox"/> Osteuropäisch-deutsch <input type="checkbox"/> Türkisch-deutsch <input type="checkbox"/> Schwarz <input type="checkbox"/> Weiß <input type="checkbox"/> Bevorzuge andere Selbstidentifikation, bitte angeben _____ <input type="checkbox"/> Keine Angabe</p> <p><i>(Hinweis: In Kontexten, in denen eine differenziertere Erhebung nicht möglich ist, kann ggf. die folgende Frage als Indikator für rassismus- oder diskriminierungsbedingte Expositionen dienen.)</i></p> <p>6e Würden Sie sich selbst einer ethnischen Minderheit oder rassifizierten Gruppe zuordnen?</p> <p><i>Eine rassifizierte Gruppe ist eine gesellschaftliche Gruppe, die von Rassismus oder Diskriminierung betroffen ist. Die Rassifizierung kann auf Hautfarbe, Herkunft, Religion, Sprache usw. beruhen.</i></p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p>		
<p>7 Welcher religiösen Gemeinschaft oder Weltanschauung fühlen Sie sich derzeit zugehörig, wenn überhaupt?</p> <p><input type="checkbox"/> Buddhistische <input type="checkbox"/> Christliche <input type="checkbox"/> Hinduistische <input type="checkbox"/> Jüdische <input type="checkbox"/> Muslimische <input type="checkbox"/> Atheistische (glaube an keinen Gott) <input type="checkbox"/> Agnostische (bin mir nicht sicher, ob es einen Gott gibt) <input type="checkbox"/> religiöse Gemeinschaft/Weltanschauung nicht aufgeführt: _____ <input type="checkbox"/> Keine bestimmte religiöse Gemeinschaft/Weltanschauung <input type="checkbox"/> Keine Angabe</p>	<p>In Anlehnung an Pew Research Center Survey of Religion and Social Life 2017</p>	<p>Religion und Weltanschauung</p>
<p>8a Wurde bei Ihnen jemals eine Depression, Angsterkrankung oder ein anderes psychisches Problem von medizinischem oder psychologischem Fachpersonal diagnostiziert?</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p>	<p>8a in Anlehnung an Commonwealth Fund International Health Policy Survey</p>	<p>Psychische Gesundheit</p>
<p>9a Leben Sie mit einer Behinderung?</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p>	<p>9a in Anlehnung an DAISY</p>	<p>Körperliche Gesundheit und Behinderung</p>

<p>9b Haben Sie eine chronische Krankheit oder ein lang andauerndes gesundheitliches Problem? Damit gemeint sind Krankheiten oder gesundheitliche Probleme, die mindestens 6 Monate andauern oder voraussichtlich andauern werden.</p> <p><input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe</p> <p>9c Wie ist Ihr Gesundheitszustand im Allgemeinen?</p> <p><input type="checkbox"/> Sehr gut <input type="checkbox"/> Gut <input type="checkbox"/> Mittelmäßig <input type="checkbox"/> Schlecht <input type="checkbox"/> Sehr schlecht <input type="checkbox"/> Keine Angabe</p>	<p>9b and 9c in Anlehnung an GEDA 2019/2020-EHIS</p>	
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<p>Nun geht es um das Thema Diskriminierung. Diskriminierung bedeutet, dass eine Person aus bestimmten Gründen schlechter behandelt wird als andere Menschen, ohne dass es dafür eine sachliche Rechtfertigung gibt. Diskriminierung kann auf sehr unterschiedliche Weisen ausgeübt werden, etwa durch Beleidigung, Ausgrenzung, sexuelle Belästigung bis hin zu Gewalt. Es handelt sich aber auch um Diskriminierung, wenn Menschen durch Regeln und Gesetze benachteiligt werden.</p> <p>10 Sind Sie persönlich in den letzten 24 Monaten [in/am Ort/Institution] aus den folgenden Gründen diskriminiert worden? (Mehrfachauswahl möglich)</p> <p><input type="checkbox"/> Aufgrund zu hohen Alters</p> <p><input type="checkbox"/> Aufgrund zu niedrigen Alters</p> <p><input type="checkbox"/> Aufgrund des Geschlechts</p> <p><input type="checkbox"/> Aufgrund eines niedrigen Bildungsstandes</p> <p><input type="checkbox"/> Aufgrund eines geringen Einkommens</p> <p><input type="checkbox"/> Aufgrund von außerberuflichen Betreuungs- oder Pflegeaufgaben</p> <p><input type="checkbox"/> Aufgrund der sexuellen Orientierung (z.B. schwul, lesbisch, bisexuell)</p> <p><input type="checkbox"/> Aus rassistischen Gründen, wegen der Zugehörigkeit zu einer ethnischen Gruppe oder der Herkunft aus einem anderen Land</p> <p><input type="checkbox"/> Aufgrund der Religion oder Weltanschauung</p> <p><input type="checkbox"/> Aufgrund einer psychischen Erkrankung</p> <p><input type="checkbox"/> Aufgrund einer Behinderung</p> <p><input type="checkbox"/> Aufgrund einer chronischen Krankheit</p> <p><input type="checkbox"/> Aus einem anderen Grund: _____</p> <p><input type="checkbox"/> Keine Angabe</p>	<p>In Anlehnung an SOEP-IS</p>	<p>Wahrgenommene Diskriminierung</p>
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1 *Anmerkung.* DAISY Diversity and Inclusion Survey; EHIS European Health Interview Survey; GEDA Gesundheit in Deutschland
 2 aktuell; LGBT refers to lesbian, gay, bisexual and trans communities; NHS National Health Service; SOEP Sozio-Oekonomisches
 3 Panel; UK United Kingdom.

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1 **Tabelle S2: Erhebung einer staatlich anerkannten Behinderung**

Item	Referenz	Bereich
9a-1 Haben Sie eine Behinderung, die vom Versorgungsamt amtlich anerkannt ist? <input type="checkbox"/> Ja <input type="checkbox"/> Nein <input type="checkbox"/> Keine Angabe	In Anlehnung an GEDA 2014/2015- EHIS	Behinderung

2 *Anmerkung.;* EHIS European Health Interview Survey; GEDA Gesundheit in Deutschland aktuell.

1 Liste der Mitgliedsstaaten der Vereinten Nationen

- 2 Afghanistan
- 3 Ägypten
- 4 Albanien
- 5 Algerien
- 6 Andorra
- 7 Angola
- 8 Antigua und Barbuda
- 9 Äquatorialguinea
- 10 Arabische Republik Syrien
- 11 Argentinien
- 12 Armenien
- 13 Aserbaidshan
- 14 Äthiopien
- 15 Australien
- 16 Bahamas
- 17 Bahrain
- 18 Bangladesch
- 19 Barbados
- 20 Belarus
- 21 Belgien
- 22 Belize
- 23 Benin
- 24 Bhutan
- 25 Bolivien (Plurinationaler Staat)
- 26 Bosnien und Herzegowina

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- 1 Botsuana
- 2 Brasilien
- 3 Brunei Darussalam
- 4 Bulgarien
- 5 Burkina Faso
- 6 Burundi
- 7 Cabo Verde
- 8 Chile
- 9 China
- 10 Costa Rica
- 11 Côte d'Ivoire
- 12 Dänemark
- 13 Demokratische Republik Kongo
- 14 Demokratische Volksrepublik Korea
- 15 Demokratische Volksrepublik Laos
- 16 Deutschland
- 17 Dominica
- 18 Dominikanische Republik
- 19 Dschibuti
- 20 Ecuador
- 21 El Salvador
- 22 Eritrea
- 23 Estland
- 24 Eswatini
- 25 Fidschi
- 26 Finnland

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- 1 Frankreich
- 2 Gabun
- 3 Gambia
- 4 Georgien
- 5 Ghana
- 6 Grenada
- 7 Griechenland
- 8 Guatemala
- 9 Guinea
- 10 Guinea-Bissau
- 11 Guyana
- 12 Haiti
- 13 Honduras
- 14 Indien
- 15 Indonesien
- 16 Irak
- 17 Iran (Islamische Republik)
- 18 Irland
- 19 Island
- 20 Israel
- 21 Italien
- 22 Jamaika
- 23 Japan
- 24 Jemen
- 25 Jordanien
- 26 Kambodscha

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- 1 Kamerun
- 2 Kanada
- 3 Kasachstan
- 4 Katar
- 5 Kenia
- 6 Kirgisistan
- 7 Kiribati
- 8 Kolumbien
- 9 Komoren
- 10 Kongo
- 11 Kroatien
- 12 Kuba
- 13 Kuwait
- 14 Lesotho
- 15 Lettland
- 16 Libanon
- 17 Liberia
- 18 Libyen
- 19 Liechtenstein
- 20 Litauen
- 21 Luxemburg
- 22 Madagaskar
- 23 Malawi
- 24 Malaysia
- 25 Malediven
- 26 Mali

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- 1 Malta
- 2 Marokko
- 3 Marshallinseln
- 4 Mauretanien
- 5 Mauritius
- 6 Mexiko
- 7 Mikronesien (Föderierte Staaten von)
- 8 Monaco
- 9 Mongolei
- 10 Montenegro
- 11 Mosambik
- 12 Myanmar
- 13 Namibia
- 14 Nauru
- 15 Nepal
- 16 Neuseeland
- 17 Nicaragua
- 18 Niederlande
- 19 Niger
- 20 Nigeria
- 21 Nordmazedonien
- 22 Norwegen
- 23 Oman
- 24 Österreich
- 25 Pakistan
- 26 Palau

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- 1 Panama
- 2 Papua-Neuguinea
- 3 Paraguay
- 4 Peru
- 5 Philippinen
- 6 Polen
- 7 Portugal
- 8 Republik Korea
- 9 Republik Moldau
- 10 Ruanda
- 11 Rumänien
- 12 Russische Föderation
- 13 Salomonen
- 14ambia
- 15 Samoa
- 16 San Marino
- 17 São Tomé und Príncipe
- 18 Saudi-Arabien
- 19 Schweden
- 20 Schweiz
- 21 Senegal
- 22 Serbien
- 23 Seychellen
- 24 Sierra Leone
- 25 Simbabwe
- 26 Singapur

Diversified Innovations in the Health Sciences: Proposal for a Diversity Minimal Item Set (DiMIS)

- 1 Slowakei
- 2 Slowenien
- 3 Somalia
- 4 Spanien
- 5 Sri Lanka
- 6 St. Kitts and Nevis
- 7 St. Lucia
- 8 St. Vincent und die Grenadinen
- 9 Südafrika
- 10 Sudan
- 11 Südsudan
- 12 Suriname
- 13 Tadschikistan
- 14 Thailand
- 15 Timor-Leste
- 16 Togo
- 17 Tonga
- 18 Trinidad und Tobago
- 19 Tschad
- 20 Tschechische Republik
- 21 Tunesien
- 22 Türkei
- 23 Turkmenistan
- 24 Tuvalu
- 25 Uganda
- 26 Ukraine

Diversified Innovations in the Health Sciences: Proposal for a Diversity Minimal Item Set (DiMIS)

- 1 Ungarn
- 2 Uruguay
- 3 Usbekistan
- 4 Vanuatu
- 5 Venezuela (Bolivarische Republik)
- 6 Vereinigte Arabische Emirate
- 7 Vereinigte Republik Tansania
- 8 Vereinigte Staaten von Amerika
- 9 Vereinigtes Königreich Großbritannien und Nordirland
- 10 Vietnam
- 11 Zentralafrikanische Republik
- 12 Zypern

1 *Note: Supplement 2 presents a German language version of the DiMIS and explains changes*
2 *that were made to adapt the items according to the local context. Below we present a translation*
3 *of Supplement 2 to enable readers without German language skills to understand the local*
4 *adaptations that were made.*

5 **English Translation of Supplement 2**

6

7 **Supplement 2: DiMIS-DE: A locally adapted version of the DiMIS for** 8 **the German context**

9

10 **Diversity Minimal Item Set - German language version**

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26

1 **List of abbreviations**

2 AGG General Equal Treatment Act

3 DAISY Diversity and Inclusion Survey

4 DFG German Research Foundation

5 DGPs German Association for Psychology

6 DiMIS Diversity Minimal Item Set

7 EHIS European Health Interview Survey, siehe GEDA

8 GEDA Study 'Gesundheit in Deutschland aktuell', German version of EHIS

9 ISCED International Standard Classification of Education

10 LGBT lesbian, gay, bisexual, and transgender

11 NHS National Health Service

12 SOEP-CORE core module of the German Socio-Economic Panel

13 SOEP-IS innovation module of the German Socio-Economic Panel

14 UK United Kingdom

15

16 **Measuring gender and diversity in Germany**

17 To enable innovative and inclusive health care, it is essential to make diversity visible in health
18 data. When diversity domains are captured unequal health opportunities can be systematically
19 analyzed and reduced (see main article for background and examples). Only then will it become
20 clear how diversity domains, as well as their intersections, shape health and the health system
21 and how to elevate this information for innovation, inclusion, and change.

22 In Germany, a systematic consideration of individual differences in health research and care
23 has not been established. Instead, there is a considerable 'gender and diversity data gap', and
24 thus the evidence base for diversity-sensitive medicine is currently very limited. However, many

1 societal actors are currently advocating for change, including political initiatives, research
2 funding and professional associations. In its 2021 coalition agreement, the German government
3 set the goal of developing a "diverse, inclusive and barrier-free healthcare system" (SPD,
4 Bündnis 90/Die Grünen and FDP, 2021, p. 85). This includes examining not only gender-related
5 differences in care, health promotion and prevention, but also other aspects of diversity, with the
6 aim of reducing barriers to access, discrimination and stigmatization in the health care system
7 (SPD, Bündnis 90/Die Grünen and FDP, 2021). Furthermore, since 2020, the German Research
8 Foundation (DFG) recommends reflecting on the relevance of gender and diversity in the
9 preparation of any research project as part of good scientific practice (Deutsche
10 Forschungsgemeinschaft, 2020). While the relevance of gender and diversity is already queried
11 internationally by many funding organizations, the DFG is currently taking a pioneering role in
12 the German science system. Furthermore, in May 2022, the German Psychological Association
13 (DGPs) established a new commission focusing on "Diversity, Inclusion and Equal
14 Opportunities" (Deutsche Gesellschaft für Psychologie, 2022). However, more comprehensive
15 change toward diversity-sensitive health care is needed for sustainable progress, and this
16 change begins with closing the diversity data gap. To implement this endeavor as quickly as
17 possible and thereby enable the foundation for equitable and innovative health care, we
18 propose the routine collection of diversity data in empirical studies of medicine and the life
19 sciences.

20 To facilitate the implementation of this endeavor, we have developed a Diversity Minimal Item
21 Set (DiMIS) with national and international experts from the Diversity Assessment Working
22 Group and support from the Berlin University Alliance, which researchers can easily integrate
23 into their routine data collection. The DiMIS encompasses the anti-discrimination areas included
24 in the General Equal Treatment Act (AGG; Antidiskriminierungsstelle des Bundes, 2006) and
25 the Sustainable Development Goals of the United Nations, forming a comprehensive spectrum.
26 In total, ten diversity and equality domains are mapped: Gender, age, socioeconomic status,

1 care work, sexual orientation, ethnicity, religion and belief, mental health, disability, and physical
2 health. In addition, an item on perceived discrimination in these areas is included. Thus, the
3 DiMIS allows for a variety of findings on individual diversity domains as well as intersectional
4 perspectives. Criteria for item selection were (1) the greatest possible inclusivity along with (2)
5 the shortest possible completion time, (3) comparability of the items with data from the general
6 population, and (4) the availability of the items in English and other languages (e.g., study
7 "Gesundheit in Deutschland Aktuell," GEDA; European Health Interview Survey, EHIS; Robert
8 Koch Institute, 2021).

9 In the following, we present the DiMIS adapted for the German context (see Table S1) and
10 explain which adaptations we made in each case. Further information on the creation of the
11 DiMIS, general recommendations for implementation, an explanation of the relevance of each
12 diversity domain, and a discussion of the results are presented in the main article.

13

14 [Insert S1 table here]

15

16

17 **Explanation of adaptations for the German context**

18 For the German-language version of the DiMIS, attention was paid to international comparability
19 as well as to culturally and context-sensitive response formats. Where possible, the German
20 language version of an internationally available item was used. In cases where no official
21 German translation was available, we preferably chose an item that was equivalent to a content
22 translation of the English version, could be linked to a population survey, and met our priorities
23 outlined in the main article. For some items, we made adjustments with respect to use in the
24 German context, which we explain below:

25 *Gender*

1 For the German-language version of the DiMIS Gender item, we adopted the question wording
2 of the GEDA 2019-EHIS. The response options mirror those of the English-language DiMIS item
3 and can be transformed into the GEDA 2019-EHIS response options if a comparison with a
4 German population measure is desired. Since 2018, German legislation provides the option of
5 'diverse' as an entry for 'Geschlecht,' as well as the option to not report 'Geschlecht' in the birth
6 certificate (note: the German language does not differentiate between sex and gender, both are
7 referred to as 'Geschlecht'). However, the term 'diverse' is controversial within the non-binary
8 community as it refers to a legal category ('personenstandsrechtlicher Geschlechtseintrag', legal
9 "Geschlecht") and not to a gender identity. Based on the advice of the experts consulted, we
10 hence did not include the option 'diverse' in the DiMIS gender item.

11 For research questions related to a person's biological sex, we recommend asking for both
12 biological sex (biologisches Geschlecht) and gender identity (Geschlechtsidentität) in two steps
13 (see Table S2). The question wording for recording the biological sex corresponds to the item of
14 the GEDA 2019-EHIS, which asks for sex assigned on the birth certificate. The response
15 options correspond to the entry options anchored in German legislation (see above).

16 *Socioeconomic status*

17 Analogous to the English-language version of the DiMIS, we recommend that the DiMIS record
18 educational attainment as an indicator of a person's social status. Due to the variety of
19 educational pathways and non-linear educational biographies in the German education system,
20 we suggest to record schooling and vocational training in two separate items for the German
21 context, following the GEDA 2019-EHIS. Based on feedback from our experts, we modified
22 some response options. For international comparability, the degrees can be transformed into
23 the categories of the International Standard Classification of Education (ISCED; Federal Ministry
24 of Education and Research, 2022).

25 *Sexual Orientation*

1 For the German-language item on sexual orientation, we adopted the wording of the SOEP-
2 CORE (Kantar Public, 2020) item, which corresponds in content to the item of the English-
3 language DiMIS. The response options of the German-language DiMIS item match those from
4 the English-language DiMIS and can be transformed into the form of the SOEP response
5 options if a comparison with the German population is desired.

6 *Ethnicity*

7 In the main article, we discuss the importance as well as challenges of adapting the
8 ethnicity/race item regionally. As an example, we present items that we have adapted for the
9 German context. As in the English version, we propose recording various constructs that might
10 be of interest such as migration history in participants' own and parents' generation, language
11 skills, and membership in relevant social groups. For the German context, experts suggested
12 including a question about East vs. West German identity (see also Vogel & Zajak, 2020).
13 Therefore, participants also indicate to what extent they perceive themselves as East German
14 (items 6a-1 to 6a-4) or not. To capture language proficiency, we present DiMIS item 6c-2 as an
15 example of the foreign languages most commonly spoken in German households (Arabic,
16 Polish, Russian, Turkish, arranged in alphabetical order), as well as German sign language and
17 an option for self-entry (DESTATIS, 2022). It should be emphasized that the options presented
18 should be adapted depending on the research context and the relevant foreign languages.

19 As there is no established item in population surveys for recording membership in ethnic
20 groups in Germany, we propose a newly developed item. The wording of the initial question is
21 adapted from an item on social groups (Buspavanich, personal communication). The response
22 options are adapted from group labels widely used in the Anglo-American context (e.g., African
23 American, Asian American, Latino/Hispanic, White), which we adapted for the German context
24 and supplemented with commonly represented population groups, (e.g., Polish-German,
25 Turkish-German). These response options are presented alphabetically. Feedback from the
26 working group as well as community stakeholders was incorporated during the development

1 process. Validation of the item is planned. As part of Berlin's Participation and Integration Act,
2 employees in public administration will be now asked to (voluntarily) report on immigration
3 history. The item is also suitable for this context, as it captures immigration beyond the second
4 generation.

5 *Religion and worldview*

6 Analogous to the English-language version of the DiMIS, we recommend the German item from
7 the Pew Research Center Survey of Religion and Social Life Questionnaire for Field Work
8 (2017) to capture membership in a religious community or worldview. We adapted the item with
9 gender-neutral language for the German context.

10 *Physical health and disability.*

11 If legal status regarding disability is relevant to the research question and a comparison with a
12 German population sample is desired, we propose an item from the German-language version
13 of the GEDA 2014/16-EHIS (Robert Koch Institute, 2017), which captures a disability officially
14 recognized by the pension office (see Table S2). However, this item is no longer used in the
15 GEDA 2019-EHIS wave; instead, impairments in basal and instrumental activities of daily living
16 are recorded. We suggest this more comprehensive approach to researchers with a deeper
17 interest in capturing impairments and disabilities.

18

19 **Discussion**

20 In the main article, we present a comprehensive discussion of the DiMIS. Nevertheless, we
21 want to conclude here as well by noting that the German-language DiMIS cannot capture
22 individual diversity domains in detail due to its brevity and should be adapted, deepened and
23 supplemented according to the research question. A more in-depth survey would be possible for
24 each of the diversity domains depicted. At the same time, there is often no established
25 consensus, even within scientific groups, on the best possible coverage of individual diversity
26 aspects. We offer the DiMIS as a pragmatic, short, and broadly applicable measurement tool for

Diversified Innovations in the Health Sciences: Proposal for a Diversity Minimal Item Set (DiMIS)

1 a more comprehensive collection of diversity data with the goal of systematically reducing
2 diversity data gaps in the German-speaking world. It is of great concern to us that stakeholders,
3 communities and researchers continue this work of participatory development of individual
4 items. We are aware that especially the items whose collection is not yet established need
5 further discussion and ongoing adaptation. Finally, diversity is not exhaustively covered in
6 DiMIS. We look forward to a productive exchange with all stakeholders in order to further
7 develop the DiMIS. We are certain that there are additional areas not currently included in the
8 DiMIS that are relevant to various research questions and concerns and look forward to any
9 feedback regarding how to make the DiMIS as relevant and useful as possible.

1 Table S1: Diversity Minimal Item Set: Back-translation of the German language
2 version

3 *To facilitate the comparison process, items that are locally adapted in the German DiMIS*
 4 *version (and do not backtranslate to the English language version 1:1) are highlighted in blue.*
 5 *Adaptations are explained in the supplement text.*

Individual instructions with notes on data protection and reasons for collecting the data, e.g. personalized information and interventions. We recommend a clarification that the research team undertaking this research project is committed to improving the quality of life for underrepresented groups.		
Item	Reference	Domain
<p>1 Regarding gender identity, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Cis <input type="checkbox"/> Dyadic <input type="checkbox"/> Inter <input type="checkbox"/> Non-Binary <input type="checkbox"/> Questioning <input type="checkbox"/> Trans <input type="checkbox"/> Prefer to self-identify: _____ <input type="checkbox"/> Prefer not to answer</p> <p><i>If it is important to the research question to include information on participants' sex, consider adding question 1b along with an explanation of why it is important that participants disclose sex, gender, and/or trans status.</i></p> <p>1b What sex were you assigned at birth? (For example, on your birth certificate.)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Diverse <input type="checkbox"/> No entry <input type="checkbox"/> Don't Know <input type="checkbox"/> Prefer not to answer</p> <p><i>[note that 'diverse' and 'no entry' are legislation-specific options for sex assigned at birth in Germany]</i></p>	Adapted from GEDA 2019/2020-EHIS	Gender
<p>2 What is your month and year of birth?</p> <p>▼ [Drop down menu with month list] ▼ [Drop down menu with year list]</p> <p><input type="checkbox"/> Prefer not to answer</p>	Adapted from GEDA 2019/2020-EHIS	Age

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<p>3a What is the highest level of school education you have successfully completed?</p> <p><i>(note: some terms specific to the German education system do not have an official English equivalent and hence could not be translated)</i></p> <p> <input type="checkbox"/> I am still in school <input type="checkbox"/> No school degree <input type="checkbox"/> Graduation after a maximum of 7 years of school attendance <input type="checkbox"/> Secondary school degree, polytechnic secondary school with completion of 8th or 9th grade <input type="checkbox"/> Realschulabschluss, Mittlere Reife, Polytechnische Oberschule with completion of 10th grade <input type="checkbox"/> High school degree, fachgebundene Hochschulreife oder Fachhochschulreife <input type="checkbox"/> Another degree, please specify: _____ <input type="checkbox"/> Prefer not to answer </p> <p>3b What is the highest level of professional/occupational education you have successfully completed?</p> <p><i>(note: some terms specific to the German education system do not have an official English equivalent and hence could not be translated)</i></p> <p> <input type="checkbox"/> I am still in professional/occupational training <input type="checkbox"/> No professional/occupational training <input type="checkbox"/> Completed Beruflich-betriebliche Berufsausbildung (Lehre) <input type="checkbox"/> Completed beruflich-schulische Ausbildung (Berufsfachschule, Handelsschule) <input type="checkbox"/> Completed training at Fachschule, Meister-, Technikerschule, Berufs- or Fachakademie <input type="checkbox"/> Some college <input type="checkbox"/> Completed college/university education <ul style="list-style-type: none"> <input type="checkbox"/> Bachelor's <input type="checkbox"/> Master's <input type="checkbox"/> Diplom <input type="checkbox"/> Magister <input type="checkbox"/> Staatsexamen <input type="checkbox"/> Doctorate degree <input type="checkbox"/> Habilitation <input type="checkbox"/> Another professional degree, please specify: _____ <input type="checkbox"/> Prefer not to answer </p>	<p>Adapted from GEDA 2019/2020-EHIS</p>	<p>Socioeconomic Status</p>
<p>4 Do you have any of the following care responsibilities? (check as many as apply)</p> <p><i>This does not include caregiving, nursing services or support you provide in connection with your profession.</i></p> <p> <input type="checkbox"/> No <input type="checkbox"/> Yes, for a child or children (under 18 years old) <ul style="list-style-type: none"> with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes, for one or more adults (age 18 years and above) </p>	<p>Adapted from DAISY and GEDA 2019/2020-EHIS</p>	<p>Care Responsibilities</p>

Diversified Innovations in the Health Sciences: Proposal for a Diversity Minimal Item Set (DiMIS)

<p>with challenges of old age or frailty <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Prefer not to answer</p>		
<p>5 Regarding sexual orientation, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Heterosexual <input type="checkbox"/> Asexual <input type="checkbox"/> Bisexual <input type="checkbox"/> Gay <input type="checkbox"/> Lesbian <input type="checkbox"/> Pansexual</p> <p><input type="checkbox"/> Another sexual orientation, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from SOEP-Core</p>	<p>Sexual Orientation</p>
<p>6a In which country were you born?</p> <p>▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p><i>If born in Germany:</i></p> <p>6a-1 Have you lived in the GDR?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>6a-2 Were you born in the GDR or in the region of the former GDR?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>6a-3 Did your parents live in the GDR?</p> <p><input type="checkbox"/> Yes, both parents <input type="checkbox"/> Yes, one parent <input type="checkbox"/> No parent</p> <p><input type="checkbox"/> Prefer not to answer</p> <p>6a-4 Do you identify as an East-German person?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>6b In which country/countries were your parents born?</p> <p>Parent 1/Mother: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>Parent 2/Father: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	<p>6a adapted from GEDA 2019/2020-EHIS</p> <p>6a-1 bis 6a-4 developed from the Diversity Assessment Working Group</p> <p>6b adapted from GEDA 2019/2020-EHIS</p> <p>6c-1/2 adapted from UK Census 2021</p> <p>6d developed from the Diversity Assessment Working Group</p>	<p>Ethnicity</p>

<p>6c-1 How well do you speak...</p> <p>German [official language] :</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>English [second official/most common language]:</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>6c-2 Do you speak any other languages? If yes, please indicate your language skills.</p> <p>▼ Drop-down menu with list of relevant spoken languages in the research context (e.g. Arabic, Polish, Russian, Turkish,...) as well as sign language and option to fill in any language not listed</p> <p>[Language▼] <input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well</p> <p><i>[responsive design with additional row appearing upon entry]</i> 6d Do you identify as a member of one or more of the following social groups? (check as many as apply)</p> <p><i>Note: In German it is uncommon to refer to one's identity by the terms race or ethnicity</i></p> <p><input type="checkbox"/> Afro-German <input type="checkbox"/> Arabic-German <input type="checkbox"/> Asian-German <input type="checkbox"/> BIPoC (Black, Indigenous, People of Color) <input type="checkbox"/> Former Yugoslav-German <input type="checkbox"/> Latinamerican-German <input type="checkbox"/> Polish-German <input type="checkbox"/> Russian-German <input type="checkbox"/> Eastern European-German <input type="checkbox"/> Turkish-German <input type="checkbox"/> Black <input type="checkbox"/> White <input type="checkbox"/> Prefer to self-identify: _____</p> <p><input type="checkbox"/> Prefer not to answer</p> <p><i>(Note: In contexts, where a more nuanced assessment of ethnicity and/or race is not possible, consider asking the following question as a marker of racism- or discrimination related exposures.)</i></p> <p>6e Do you identify as a member of an ethnic minority or racialized group?</p> <p><i>A racialized group is a societal group which is affected by racism or discrimination. The racialization may be based on skin colour, origin, religion, language, etc.</i></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>		
<p>7 What is your present religious identity or world view, if any?</p> <p><input type="checkbox"/> Buddhist <input type="checkbox"/> Christian <input type="checkbox"/> Hindu <input type="checkbox"/> Jewish <input type="checkbox"/> Muslim</p> <p><input type="checkbox"/> Atheist (do not believe in God) <input type="checkbox"/> Agnostic (not sure if there is a God)</p> <p><input type="checkbox"/> Another religion, please specify: _____</p> <p><input type="checkbox"/> Nothing in particular <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from Pew Research Center Survey of Religion and Social Life 2017</p>	<p>Religion and Worldview</p>

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<p>8 Have you ever been told by a doctor or health care professional that you have depression, anxiety or other mental health problems?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>8a adapted from Commonwealth Fund International Health Policy Survey</p>	<p>Mental Health</p>
<p>9a Do you consider yourself to have a disability?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9b Do you have any chronic illness or longstanding health problem? By longstanding we mean illnesses or health problems, which have lasted, or are expected to last, for 6 months or more.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9c How is your health in general?</p> <p><input type="checkbox"/> Very good <input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Bad <input type="checkbox"/> Very bad <input type="checkbox"/> Prefer not to answer</p>	<p>9a adapted from DAISY</p> <p>9b and 9c adapted from GEDA 2019/2020-EHIS</p>	<p>Physical Health and Disability</p>
<p>Now we are talking about the topic of discrimination. Discrimination means that a person is treated worse than other people based on characteristics such as gender, sexual identity, or age, without there being any reasonable justification for it. Discrimination can be practiced in very different ways, for example through insults, exclusion, sexual harassment and even violence. But it is also discrimination when people are disadvantaged by rules and laws.</p> <p>10 Have you personally been discriminated against in the last 24 months [in/location/institution] for the following reasons? (check as many as apply)</p> <p><input type="checkbox"/> Due to being older in age</p> <p><input type="checkbox"/> Due to being younger in age</p> <p><input type="checkbox"/> Due to gender</p> <p><input type="checkbox"/> Due to a low level of education</p> <p><input type="checkbox"/> Due to low income</p> <p><input type="checkbox"/> Due to non-occupational care responsibilities</p> <p><input type="checkbox"/> Due to of sexual orientation (e.g., gay, lesbian, bisexual)</p> <p><input type="checkbox"/> Due to racist attitudes, belonging to an ethnic group or background from another country</p> <p><input type="checkbox"/> Due to religion or worldview</p> <p><input type="checkbox"/> Due to a mental health problem</p> <p><input type="checkbox"/> Due to a disability</p> <p><input type="checkbox"/> Due to a chronic disease</p> <p><input type="checkbox"/> Due to another reason (please specify): _____</p> <p><input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from SOEP-IS</p>	<p>Perceived Discrimination</p>

1 Note. DAISY Diversity and Inclusion Survey; EHIS European Health Interview Survey; GEDA Gesundheit in Deutschland aktuell;
 2 LGBT refers to lesbian, gay, bisexual and trans communities;.NHS National Health Service; SOEP Sozio-Oekonomisches Panel;
 3 UK United Kingdom.

1 **Table S2: Assessment of ‘officially recognized disability’**

Item	Reference	Domain
<p>9a-1 Do you live with a disability that is recognized by the German Pension Office?</p> <p><i>(Note: This “official recognition” by the German Pension Office/Versorgungsamt is specific to the German context)</i></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from GEDA 2014/2015- EHIS</p>	<p>Disability</p>

2 Note. EHIS European Health Interview Survey; GEDA Gesundheit in Deutschland aktuell.

3

4

5 **List of UN member states**

6 Would translate to the English list presented in the main article

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6

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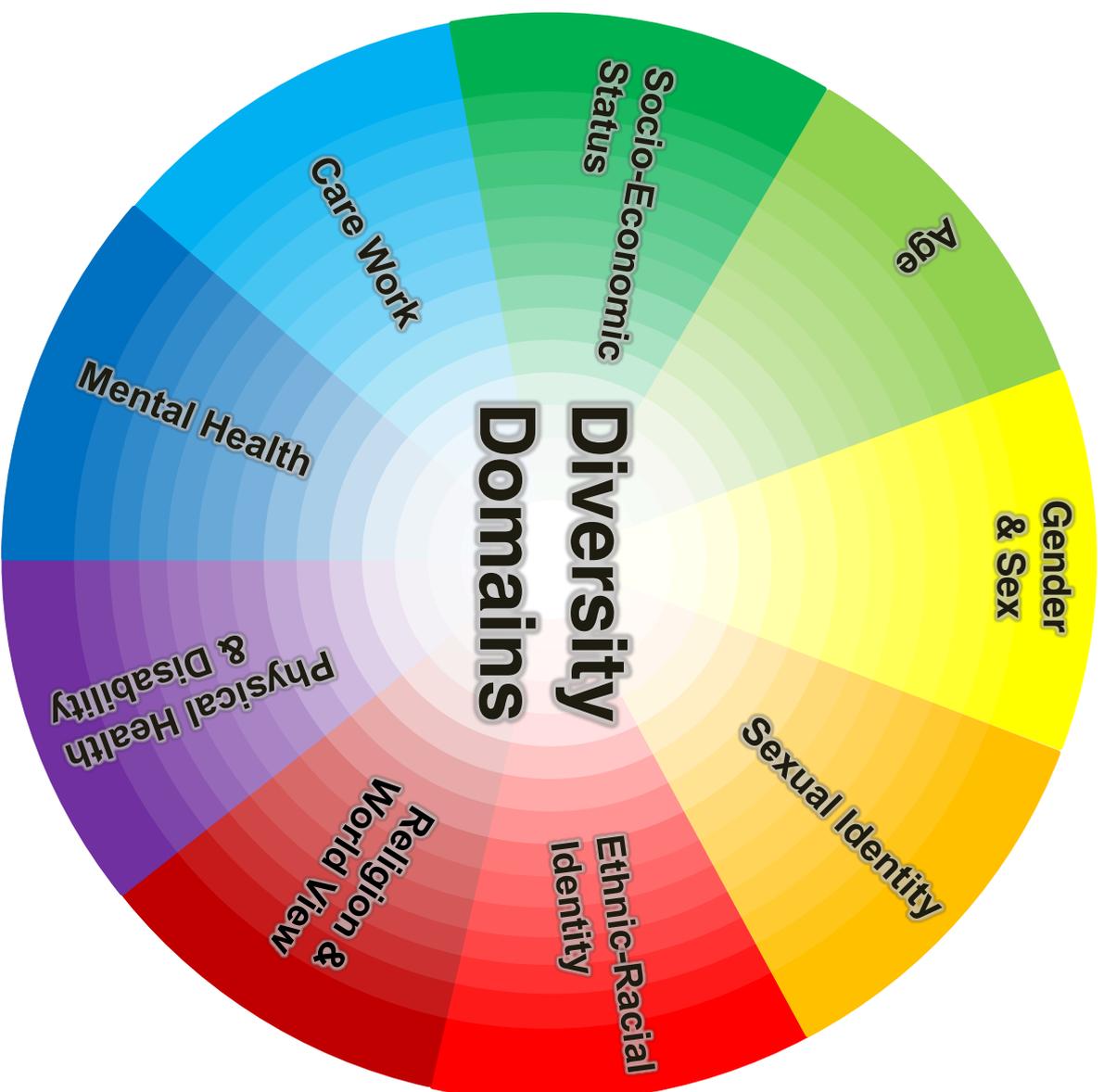
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Highlights

- 2 - The sciences still show data gaps regarding gender and diversity
- 3 - We propose a widely applicable Diversity Minimal Item Set (DiMIS)
- 4 - The DiMIS is brief, easy to use, and captures 9 diversity domains
- 5 - Comparable diversity assessments allow meaningful data combination
- 6 - Combining data allows intersectional analyses promising more diversified innovations

7

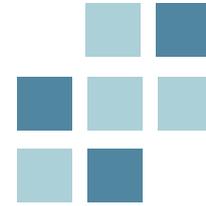
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GENERAL RECOMMENDATIONS FOR MEASURING DIVERSITY

CONSIDER ORDER

- Think about your population and which terms they are familiar with when deciding on answer option order.
- Consider presenting answer options in alphabetical or random order to avoid listing socially dominant options first.
- Maximize useable data collection while minimizing the replication of dominant power structures.



PREFER NOT TO ANSWER

- Add "prefer not to answer" option to allow for more flexibility in responding and to acknowledge participants' privacy



AVOID THE TERM "OTHER"

- Using the term "other" is seen as othering-- avoid it and use alternative wording.



ALLOW FOR SELF-IDENTIFICATION

- Where applicable, add a free-response option for self-identity, which recognizes participants' personal self-definitions (e.g. not applicable for age).



CLEARLY EXPLAIN WHY DATA IS BEING COLLECTED

- If asking for sensitive information, clearly explain why this data is being collected to maintain participant trust.



ALWAYS ANONYMIZE

- It is particularly important to follow stringent data protection measures when working with diverse populations. Make sure participants understand their data will be fully anonymized.



Conflict of Interest

Declaration of interests

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.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Contributors

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Stephanie Haering: Conceptualization, Methodology, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Project administration **Julia Roseman:**

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Abstract

Background: Science strives to provide high-quality evidence for all members of society, but there continues to be a considerable gender and diversity data gap, i.e., a systematic lack of data for traditionally underrepresented groups. Gender and other diversity domains are related to morbidity, mortality, and social and economic participation, yet measures as well as evidence regarding how these domains intersect are missing. We propose a brief, efficient Diversity Minimal Item Set (DiMIS) for routine data collection in empirical studies to contribute to closing the diversity and gender data gap. We focus on the example of health but consider the DiMIS applicable across scientific disciplines. *Methods:* To identify items for the DiMIS across diversity domains, we performed an extensive literature search and conducted semi-structured interviews with scientific experts and community stakeholders in nine diversity domains. Using this information, we created a minimal item set of self-report survey items for each domain. *Findings:* Items covering nine diversity domains as well as discrimination experiences were compiled from a variety of sources and modified as recommended by experts. The DiMIS focuses on an intersectional approach, i.e., studying gender, age, socioeconomic status, care responsibilities, sexual orientation, ethnicity, religion, disability, mental and physical health, and their intersections. It allows for data sets with comparable assessments of gender and diversity across multiple projects to be combined, creating samples large enough for meaningful analyses. *Interpretation:* In proposing the DiMIS, we hope to advance the conversation about closing the gender and diversity data gap in science.

Keywords: diversity science; equity; health disparities; gendered innovation

1 **1. Introduction**

2 The health sciences are exceptionally relevant as a global interdisciplinary partnership to
3 improve the lives of people worldwide. However, researchers need either big data or data
4 stratified by gender and other diversity domains to deliver on the promise of better health for all.
5 There is an urgent call to action to fill the gender and diversity data gap (i.e., a systematic lack of
6 data for traditionally underrepresented groups, such as women and individuals with lower SES in
7 certain research areas) and to promote the United Nations' (UN) Sustainable Development Goals
8 pertaining to equity and equal growth opportunities (Nyasimi & Peake, 2015). However, many
9 researchers do not collect data on the diversity of their sample beyond the domains of binary
10 gender and age, leaving out race (Falasinnu et al., 2018; Loree et al., 2019), income, and
11 minorities (Nicholson et al., 2015). Drawing from multiple disciplines from epidemiology to
12 psychology to medicine, we propose a research tool kit of brief measures of various facets for
13 diversity. Our aim is to facilitate the assessment of gender and other diversity domains and their
14 intersections in order to better address the inequity in available data.

15 In the area of healthcare, Geller and colleagues (Geller et al., 2018) detail how the
16 National Institutes of Health (NIH) Revitalization Act of 1993 increased inclusion of women and
17 racial and ethnic minorities in clinical trials in the US from 1993 to 2009. However, from 2009
18 to 2015 inclusion plateaued, suggesting that even policies dictated by national laws may be
19 insufficient to maintain progress, due to noncompliance with the law and a lack of measured
20 accountability. Duma and colleagues (Duma et al., 2018) reported a decrease in the recruitment
21 of minorities in oncology clinical trials from 2003 to 2016. Recently, women were
22 overrepresented in vaccine clinical trials while ethnic and racial minorities and older adults were
23 underrepresented (Flores et al., 2021). Currently, there is a lack of evidence how gender and

1 other diversity domains intersect in the delivery of more adequate health care. To close the
2 gender and diversity data gap we propose a brief Diversity Minimal Item Set (DiMIS) for
3 empirical studies that assess a broad range of diversity domains for routine data collection and
4 drives diversified innovations in the health sciences.

5 Diversified innovations are evidence-based discoveries, emerging from a systematic description
6 of differences due to gender, other diversity domains, and their intersections. They can pave the
7 way for improvements in prevention, diagnosis, pharmaceutical and nonpharmaceutical
8 treatments, and rehabilitation. Intersectionality refers to the interaction of two (or more) social
9 identities that contribute to multiple systems of disadvantage, which sum up to more than an
10 additive effect of privileged and vulnerable aspects of one's identity (Crenshaw, 1989). For
11 example, from an intersectionality perspective, the markedly higher rate of maternal mortality
12 experienced by Black women compared to white women in the US (Goffman et al., 2007)
13 reveals a form of gendered racism (Patterson et al., 2022). While intersectionality refers to social
14 identities, the setting, or context, also plays an important role. Patricia Hill Collins (1990) refers
15 to the systems in which oppression occurs and is maintained as "the matrix of domination,"
16 consisting of the structural (e.g., institutional), disciplinary (e.g., policies and rules), hegemonic
17 (e.g., cultural ideas and beliefs), and interpersonal (e.g., everyday interpersonal relationships)
18 domains of power. The interaction between the individual and their context is used here as an
19 essential consideration for measure selection.

20 We chose the DiMIS domains based on the anti-discrimination legislations of the United Nations
21 Human Rights Office, with a focus on those with relevance for health and well-being beyond
22 binary gender and age (UN Office of the High Commissioner for Human Rights., 2012).

23 Additionally, we included an item measuring perceived discrimination for these domains. We
24 prioritized items that are used in several languages and can link research projects to population

1 surveys. The DiMIS items are intended to serve as a convenient, readily available toolkit, not
2 best practice recommendations. The “best” diversity measures depend on the specific research
3 questions and context of each project.

4

5 **2. Methods**

6 To develop the DiMIS, we performed an extensive literature search to identify widely used
7 measures in population surveys. Next, we conducted semi-structured interviews with scientific
8 experts about their experiences measuring their speciality diversity domain and discussed
9 suggestions for a minimal item set with them. We then held workshops with diversity researchers
10 in Berlin to gain feedback to further develop the DiMIS. Finally, we used feedback from
11 scientific experts, community stakeholders, and team members to revise our measures, weigh
12 advantages and disadvantages of items, and provide guidance for how to present instructions,
13 questions, and response options inclusively.

14 **3. Results**

15 We investigated nine core domains: gender, age, socioeconomic status, care responsibility,
16 sexual orientation, ethnicity and race, religious affiliation, mental health, physical health and
17 disability, in line with the United Nations Sustainable Development Goals (International Council
18 for Science, 2015, 2015) (e.g., SDG 1 No Poverty; 3 Good Health and Well-Being; 4 Quality
19 Education; 5 Gender Equality; 8 Decent Work and Economic Growth; 9 Industry, Innovation,
20 and Infrastructure; 10 Reduced Inequalities) requiring researchers to assess diversity in order to
21 characterize goal progress and supplemented these by expert interviews. The DiMIS items
22 maximize comparability with general population data, such as the European Health Interview
23 Survey (EHIS), and prioritize brief items available in English and other languages.

1 We provide recommendations for each domain of the DiMIS introduce their relevance, present a
2 suggestion for a brief item, and discuss advantages and disadvantages. Applicable to all are
3 general recommendations for implementing the DiMIS, which are summarized in Figure 1. First,
4 researchers should consider the most appropriate order of items and response options for their
5 target population and which terms participants are familiar with. Response options should be
6 ordered carefully to facilitate collecting valid data while considering the sensibility of different
7 stakeholders, which may be best served by alphabetical or randomized order. Next, present
8 nuanced response options, including (1) add a “prefer not to answer” option to allow for more
9 flexibility in responding, (2) avoid the term “other,” and (3) add an open-response option for
10 self-identification. Finally, provide transparency regarding why sensitive data is being collected
11 and assure anonymity and data protection. These design characteristics and procedures are
12 essential for good scientific practice and for gaining participants’ trust. In the following sections,
13 we introduce each diversity domain of the DiMIS; Table 1 gives an overview of the full item set.

14 *3.1. Gender*

15 The WHO acknowledges the impact of gender, sex, and their interaction on health outcomes.
16 Gender refers "to a person’s deeply felt, internal and individual experience of gender, which may
17 or may not correspond to the person’s physiology or designated sex at birth" (*Gender and*
18 *Health*, n.d.) and to sociocultural norms, identities, and relations (Hyde et al., 2019). Sex refers
19 "to the different biological and physiological characteristics of females, males and intersex
20 persons, such as chromosomes, hormones and reproductive organs" (Hyde et al., 2019).
21 Women have been historically neglected in the health sciences (Dresser, 1992), whereas
22 individuals who identify as non-binary have been largely ignored. Both gender and sex are
23 important determinants of health, treatments, and healthcare (Heidari et al., 2016). Although
24 most studies ask about gender or sex in binary terms, they may not integrate this information into

1 their analysis, even in cases where gender/sex disparities are established (Brady et al., 2021). We
2 modified a single item from NHS England’s LGBT Foundation (NHS England & LGBT
3 Foundation, 2021) providing a list of gender-diverse options. Items measuring gender in surveys
4 should be inclusive and allow visibility for gender minorities. A list that includes multiple
5 categories (e.g., non-binary) offers a balance of recognition, inclusivity, and practicability. We
6 did not query sex assigned at birth as a default, as experts emphasized that this should only be
7 asked if it is relevant for the project’s research questions and may raise additional data protection
8 issues due to small sample sizes. If required by the project at hand, we recommend a two-step
9 approach, wherein sex assigned at birth is queried as a follow up item (NHS England & LGBT
10 Foundation, 2021), with an explanation of why it is important that participants disclose gender,
11 sex, and/or trans status.

12 It is important to note that appropriate terms for gender and sex as well as their response options
13 will vary across languages and cultures and may need to be adapted according to the target
14 population. Moreover, in some languages the same word is used for sex and gender (e.g.,
15 ‘Geschlecht’ in German), making culturally informed translations indispensable. Response
16 options and order should be tailored to the needs and preferences of the participants and
17 stakeholders in a given study. For example, the participants of two German studies of wellness
18 during COVID-19 pandemic found some of the more recent terminology for gender and sexual
19 orientation confusing to the point of being unable to provide accurate data for the item, resulting
20 in the response options displayed in the DiMIS item (Buspavanich et al., 2021; Herrmann et al.,
21 2022). Choosing appropriate measures for gender and sex is essential to measuring their
22 intersections with other diversity domains. For example, Tannenbaum and Day (on behalf of the
23 Matera Alliance, 2017) describe the intersection of sex and age for drug development, citing sex

1 and age differences impacting pharmacokinetics and pharmacodynamics and thus differences in
2 appropriate dosing and drug response.

3 *3.2. Age*

4 Age is commonly collected in research. Despite its ubiquity, individuals at the younger and older
5 ends of the age spectrum have been underrepresented in clinical trials and are generally
6 considered to be vulnerable individuals at very young or old age. This has, for example, resulted
7 in underrepresentation of children in clinical trials of treatments for COVID-19 (Hwang et al.,
8 2020) as well as a lack of evidence upon which to base complex medication choices for older
9 adults (Boyd et al., 2019). Treatment and medication effects and side effects can vary by age
10 (Mangoni & Jackson, 2003) and should therefore be studied systematically.

11 Due to international differences in what age constitutes ‘adult’, ‘older adult’, and other age-
12 category membership, we recommend measuring age continuously in years. Consistent with the
13 European Health Interview Survey (European Commission. Statistical Office of the European
14 Union, 2018) we suggest querying for birth year to study age differences but not birthdate to
15 maximize anonymity. If the research requires assessing age with finer intervals (e.g., among
16 infants) birth month can be added.

17 *3.3. Socioeconomic Status*

18 Research on social determinants of health consistently demonstrates health disadvantages for
19 lower socioeconomic status (SES), both between and within countries (Marmot, 2005). For
20 instance, mortality among middle-aged and older women decreased as SES increased (Manor et
21 al., 2000). Periods of poverty at different childhood ages differentially impacted adult health
22 trajectories (Cohen et al., 2010). Even in European states with universal health insurance
23 systems, socioeconomic inequalities in health continue to be notable (Smith, 2004). However,
24 the best way to measure socioeconomic status in health research is debatable. Mustard and

1 Etches (2003) found that gender differences in socioeconomic inequality in mortality vary
2 depending on the measure of inequality used.

3 The four most commonly used constructs to assess SES are: income, wealth, occupational status,
4 and educational attainment. Each of these constructs has its own benefits and drawbacks for
5 measuring SES. Income is the most direct way of measuring SES, but suffers from low response
6 rates and misreporting of income, and may not be useful beyond a poverty threshold (Marmot,
7 2002). Wealth provides a broader way of viewing an individual's entire SES and correlates with
8 health outcomes (Pollack et al., 2007), but suffers even more from low response rates, as well as
9 the need for lengthy questionnaires to address each type of wealth (e.g., rental properties,
10 dividends, outstanding loans). Occupational status, while fluctuating less than income, lacks
11 precision due to various occupations being subsumed under the same occupational category.
12 However, it is highly standardized and can be measured using internationally recognized
13 questionnaires, such as the International Standard Classification of Occupations (ISCO-08,
14 Ganzeboom, 2010). Educational attainment is one of the more frequently used measures for
15 health disparity research and is predictive of occupational status and income. It also captures
16 lifestyle choices and behavior (Shavers, 2007) and is also highly standardized using the
17 International Standard Classification of Education (ISCED, UNESCO Institute for Statistics,
18 2012) and therefore can be compared across different cultures.

19 Educational attainment has been shown to be more highly correlated with health disparities than
20 income (Herd et al., 2007; Leng et al., 2015; Smith, 2004) and does not suffer from the same
21 limitations in terms of yearly fluctuation and lack of response. Thus, we propose educational
22 attainment to measure SES with a modified EHIS item (European Commission. Statistical Office
23 of the European Union., 2018) to query for the highest degree attained. Response options follow
24 the ISCED (UNESCO Institute for Statistics, 2012) categories and should be adapted locally.

1 Educational attainment is associated with occupational status and income, captures lifestyle
2 choices and behavior (Shavers, 2007), and is more strongly correlated with health disparities
3 than income (Smith, 2004). In our interviews, experts advised again using years of schooling,
4 since they do not capture repeated school years, part-time education, or vocational training, and
5 are less comparable across countries.

6 *3.4. Care Responsibilities*

7 Unpaid care work (i.e., informal, in-home care of children under 18 years of age or adults with
8 health or mobility challenges) is invaluable to social development and economic growth
9 (UNRISD, 2010). Yet, the societal benefits of informal care work may come at the cost of
10 carers' economic opportunities (Hirsh et al., 2020) and have been associated with conflicting
11 carer health outcomes (Masefield et al., 2020; D. L. Roth et al., 2018). The economic and health
12 impacts of care work are known to intersect with gender, sexual orientation, and age. Women,
13 trans and non-binary people with children experience more physical, mental, and psychological
14 stress relative to cis men (European Commission. Statistical Office of the European Union.,
15 2018b; Horne et al., 2022). Older LGBTQI+ caregivers play an important role in informal care
16 provision (Alba et al., 2020). Furthermore, 'sandwich generation' caregivers (i.e., those with
17 both eldercare and childcare responsibilities) experience even worse employment and economic
18 consequences than caregivers with responsibilities for childcare only (Henle et al., 2020). These
19 consequences were more severe for women caregivers than men caregivers.

20 To date, caregiving responsibilities are not routinely part of study demographics, and
21 assessments vary greatly. To allow for a better understanding of care-related associations with
22 health outcomes, we recommend an item integrating aspects of the EHIS (European
23 Commission. Statistical Office of the European Union., 2018) and Diversity and Inclusion
24 Survey (DAISY) items for 'Caring Responsibilities' (Molyneaux, 2020). While the DAISY

1 includes caregiving for children, adults with disabilities, and the elderly, we added care for
2 people aged 18 and older with chronic health conditions following the EHIS. We include
3 multiple care responsibilities via multiple select options.
4 Although this item captures multiple forms of care responsibilities briefly, it has limitations. It
5 presents a proxy for care responsibilities, not an assessment of care provided. Researchers
6 interested in a more detailed picture of care work may add further items on amount of time spent
7 on care work (e.g., EHIS), whether the participant is the primary, joint primary, or secondary
8 caregiver (e.g., DAISY) and/or whether the persons receiving care are family members (e.g.,
9 EHIS).

10 *3.5. Sexual Orientation*

11 Historically, sexual orientation was categorized into people who are attracted to members of the
12 same sex, people who are attracted to members of another sex, and people who are attracted to
13 both dichotomous sexes. However, these categories are fraught because sexual orientation exists
14 on a continuum. The categories conflate different aspects of sexual orientation (e.g., sexual
15 behavior, sexual attraction, romantic interests) and refer to gender and sex in binary terms.
16 Individual lived experiences are insufficiently represented. It remains unclear how much
17 differences in lived experiences among sexual minority members are due to a missing consensus
18 of how to measure sexual orientation (Korchmaros et al., 2013). For example, systematic
19 measurement and assessment of sexual orientation and gender predicted lower breast cancer
20 screening intentions among lesbian and bisexual women relative to heterosexual women despite
21 the former having two to three times the risk of breast cancer experienced by heterosexual
22 women (Hart & Bowen, 2009). Sexual orientation also intersects with gender, resulting in
23 differing migration patterns and associated benefits (Ueno et al., 2014).

1 To take into account brevity, population sample comparisons, and inclusive language, we
2 modified an item from the NHS & LGBT Foundation (NHS England & LGBT Foundation,
3 2021) to include sexual orientations beyond heterosexual, lesbian, gay, and bisexual. In addition,
4 terms such as pansexual and queer acknowledge the fluidity and expansiveness of gender
5 expression and attraction to people regardless of gender or sexuality, including attraction to
6 gender-fluid, non-binary, and trans people. Researchers need to take into account national
7 traditions and laws when assessing sexual orientation because while some countries may
8 routinely include the item in surveys (e.g., United States, UK, Council, 2015), respondents in
9 other countries might have to fear legal repercussions.

10 While this modified item fulfils our main priorities, it also has disadvantages. Any single item
11 measure of sexual orientation will fail to capture sexual identity, behavior, and attraction
12 simultaneously, and thus miss unveiling varying needs, experiences of discrimination, and health
13 outcomes. However, using one single-item measure instead of none inches us nearer towards
14 closing the research gap on sexual orientation and perhaps spurring deeper explorations of issues
15 requiring more comprehensive measurement than a single item can offer.

16 *3.6. Ethnicity and Race*

17 Assessing the diversity domain of ethnicity and race is particularly challenging, complex, and
18 context-dependent (Mauro et al., 2022; W. D. Roth et al., 2023) Ethnicity is defined as
19 membership in one or several social groups with a collectively shared cultural heritage, shared
20 values, traditions, and a subjective feeling of belonging (Weber, 1978). The definition of race, on
21 the other hand, is less clear and varies across disciplines and contexts (Glasgow, 2010; Hobbs,
22 2014; Morning, 2011; W. D. Roth et al., 2023), ranging from ancestry and/or phenotype-related
23 conceptualizations towards culturally and/or socially classified groups. Roberts et al. (2020, p.
24 1297) summarize that these differences “highligh[t] the socially constructed nature of the

1 concept". In spite of different conceptualizations, assessing ethnicity and/or race may be useful
2 (Ford & Airhihenbuwa, 2010). For example, some marginalized ethnic/racial groups encounter
3 higher disease risks and impairments than those in the majority, even when controlling for SES
4 and gender (Williams et al., 2016). Yet, we emphasize that ethnicity nor race can understood as
5 risk factors themselves; they are rather markers of racism- or discrimination-related exposures
6 and inequities (Ford & Airhihenbuwa, 2010) and researchers should strive to uncover these
7 underlying processes.

8 In addition to differences in the nominal convention regarding the assessment of ethnic or racial
9 identity, there is currently no agreement on how to assess ethnicity and race across different
10 countries. Approaches vary from routine assessment to very limited assessment to legal bans on
11 assessment. Routine assessment of ethnicity and race is common within an Anglo-Saxon context
12 (including in the US, Canada, UK, Australia). Assessment of ethnicity and race has a long
13 tradition there and is widely implemented, building on widespread use of ethnicity and race to
14 describe individual identities and group memberships in everyday life. Many other countries
15 show limited assessment of ethnicity and race, e.g., most European countries and Latin countries
16 such as Puerto Rico. In these countries, ethnicity and race in particular are considered more of a
17 taboo, based on the historical legacy of genocides based on racial ideologies and colonialism
18 (Juang et al., 2021). This produces a paradox: Members of ethnic minorities and racialized
19 groups encounter plenty of racist experiences and structural impediments, while there is no
20 consensus on how to speak about these. For instance, Juang et al. (2021) discuss in detail how
21 the sociohistorical context of Germany has impacted the study of race and ethnicity in Europe,
22 often making it a taboo to talk about these concepts. While countries of this second group allow
23 the assessment of ethnicity and race, there is no national agreement on how to conduct these
24 assessments, and ethnicity and race are rarely assessed outside of specialist research. One last

1 group of countries, e.g., France, has explicit legal bans for assessing ethnicity and race
2 (McAuley, 2020). Taken together, this results in a particularly large diversity data gap regarding
3 ethnicity and race, limiting the systematic description of racist experiences and structural
4 impediments, as well as the development and testing of interventions to reduce racist
5 discrimination. Clearly, researchers need to take into account national traditions and laws when
6 assessing race and ethnicity as well as their research's impact. In some contexts, the risk of
7 identifying as a member of an ethnic/racial group may put themselves or their group at risk and
8 outweigh the potential benefits of stratified results. Striking a careful balance between history,
9 reproducing ongoing generational trauma, and genuine concern for all persons' health and
10 wellbeing may aid in closing the research gap and increasing our ability to better integrate
11 conflicting data in this area.

12 In brief, it is essential to understand the social construction and context of ethnicity, race, and
13 embedded terms in order to be able to tailor items measuring these constructs to each local and
14 national context. Not all terms and conceptualizations of race and ethnicity have a one-to-one
15 translation in language or social meaning (Juang et al., 2021; Mauro et al., 2022; W. D. Roth et
16 al., 2023). Moreover, what is considered acceptable or even validating in one context may be
17 perceived as offensive or inappropriate in other contexts. It is important to bear in mind the
18 socio-historical factors that led to a term being used by certain people in a certain place and time.
19 Thus, while ethnic identity and racial identity are theoretically distinct, it is often difficult to
20 disentangle the two constructs due to much overlap in how they are experienced, referred to, as
21 well as empirically examined (Umaña-Taylor et al., 2014). Accordingly, the 'Ethnic and Racial
22 Identity in the 21st Century Study Group' suggests focusing on the metaconstruct ethnic-racial
23 identity (Umaña-Taylor et al., 2014), which is in line with our understanding of ethnicity and
24 race as markers of racism- or discrimination-related exposures and inequities.

1 Aiming to uncover structural and processual inequities across various aspects related to race and
2 ethnicity, we suggest a multi-dimensional approach assessing (1) migration history, (2) language,
3 and (3) ethnic-racial identity while keeping local context and stakeholders in mind. This means
4 that items may need to be extended, shortened, or adapted according to the context, legislation,
5 and research population.

6 Definitions of migration history cut across a wide range of indicators (Dyck et al., 2019; Schenk
7 et al., 2006), sometimes focusing more (Destatis, 2020) or less (UN Office of the High
8 Commissioner for Human Rights., 2012) on legal status and family heritage. The interrelation
9 between migration history and health is complex (Schenk et al., 2006). The healthy migrant
10 effect (Ichou & Wallace, 2019; Razum, 2006; Razum et al., 1998; Rechel et al., 2013) finds that
11 populations with migration history have lower mortality compared to those without migration
12 history in their host countries; yet those with migration history generally have lower
13 socioeconomic status than the host population (Ichou & Wallace, 2019). These conflicting
14 phenomena make achieving a scientific consensus on the relationship between migration history
15 and health challenging (Dyck et al., 2019), suggesting a need for additional research.

16 To assess migration history as an aspect of the ethnic-racial identity, we modified the EHIS
17 (European Commission. Statistical Office of the European Union., 2018) item “In which country
18 were you born?” and items regarding the parents’ countries of birth to create a two-step approach
19 that maximizes comparability with population samples and allows different groupings (e.g.,
20 migration from low-, middle- and high-income countries). These modified items capture
21 migration history for participants and each of their parents. For digital implementation, we
22 suggest a drop-down menu with a list of countries. We added gender-neutral terms for parents to
23 include same-sex and non-binary parents.

1 Querying for language and mother tongue can be an additional indicator of migration history that
2 can indicate if a person belongs to further generations of immigrants (Schenk et al., 2006).
3 Moreover, language skills are fundamental for communicating informed consent, research
4 information, and self-reports and to translate research findings into practice, ensuring that they
5 reach all relevant communities. Accordingly, we added two items assessing language skills.
6 Research with stakeholders' language use and preferences should inform these items (Lewis,
7 2021). We include an example based on the geographic context of the United Kingdom, but
8 recommend using the five most common languages for a study's context. Use of this and other
9 items should be done with the safety of the stakeholders in mind, avoiding stigmatizing
10 expressions. If language is relevant to the work at hand and it is safe for participants to indicate
11 this, given its use as a proxy for ethnicity, migration, and acculturation, then this item may be
12 appropriate for the project.

13 Our item assessing ethnic-racial identity prioritizes broader categories over more specific
14 response options that may weaken participant privacy. As such, we give an example for the UK
15 context which was adapted based on the British census. Due to the varying use of ethnicity and
16 race across contexts, we chose an item wording which emphasized self-identification as a
17 member of a social group. We thus propose a wording which can be applied across contexts. We
18 limited our item response options to headers from the 2021 UK census question to minimize
19 triangulation of personally identifying data, put them in alphabetical order to minimize reifying
20 social hierarchies, and included the option to not respond at all. Following the census categories
21 will enable researchers to compare their data with and stratify according to population-based
22 data. Yet, while this choice supports our prioritization of limiting identifying data, many ethnic-
23 racial identities fall within these larger categories. Combining across these ethnicities can
24 obscure inequities owed to some groups. Moreover, we note that the UK census was not

1 developed inclusively. We have not suggested adaptations to the response options as we are not
2 experts on the British context and do not want to reproduce the non-inclusive approach taken
3 during the census development. We strongly encourage researchers to adapt country-specific
4 items in collaboration with ethnic and racial community stakeholders and to follow do no harm
5 policies (Call et al., 2022; NHS England, 2023; Schwabish & Feng, 2021) when using the item in
6 their research. In particular, we suggest a community based participatory research approach
7 (Wallerstein et al., 2020) to ensure that the adaptive process of the assessment, and further, the
8 research question and the communication of research results does not cause harm towards the
9 marginalized racial and ethnic communities - even if the research was conducted with good
10 intentions.

11 Keeping in mind that asking about an individual's ethnic-racial identities is not always possible,
12 established, or wanted, we further present a more broadly applicable option (item 6e), which asks
13 about self-identification as a member of an ethnic minority or racialized group (without
14 indicating the group per se). As outlined above, membership in a marginalized group can serve
15 as a first indicator of shared exposures, such as of discrimination, even in contexts where a more
16 nuanced assessment is not feasible. Thus, this item offers comparability across studies with
17 different social contexts and marginalized groups. Focusing on racialized and discriminatory
18 experiences emphasizes the understanding of ethnic-racial identity as a marker of risk exposures
19 rather than risk factor itself. In addition to the above outlined ethical principles, assessing,
20 analyzing and interpreting ethnic-racial identity data thus requires that researchers reflect upon
21 processes of oppression, discrimination, power and privilege.

22 *3.7. Religion and Worldviews*

1 Religions and worldviews are closely tied to ethnic and cultural background and face similar
2 challenges in the health care setting. Religions and worldviews affect many areas, ranging from
3 reproductive health, practitioner gender preference, attitudes towards physician-assisted suicide,
4 palliative care, and health screenings (Padela et al., 2015). Considering religions and worldviews
5 is part of culturally sensitive healthcare. Religious affiliations and world views, degree of
6 religiosity, and experience of discrimination due to religion can impact attitudes towards the
7 healthcare system and quality of life (Rivenbark & Ichou, 2020).

8 We modified an item from the Pew Research Center Survey of Religion and Social Life
9 Questionnaire for Field Work (Pew Research Center, n.d.). The original item included religious
10 denominations; we retained only the major categories to keep the measure brief. We recommend
11 adapting the measure to assess country-specific religious groups and worldviews. Healthcare
12 professionals may wish to follow up with patients regarding specific denominations to optimize
13 healthcare and treatment choices.

14 *3.8. Mental Health*

15 Mental health is typically absent from census surveys or routine demographics. However, the
16 WHO defines mental health as a key component of health (World Health Organization (WHO),
17 2018). Mental illness is often invisible and is associated with a host of negative health (Lando et
18 al., 2006) and economic (Schurer et al., 2019) risks and outcomes. As an invisible diversity
19 domain, the effects of multiple stigmas may go unnoticed (Staiger et al., 2018) or be
20 misinterpreted as a single visible stigma. By collecting and reporting data in aggregate, we can
21 make mental health visible without endangering individuals' privacy.

22 We aimed to maximize comparability with population studies, capture as many mental health
23 conditions as possible, and maximize caseness (e.g., Major Depressive Disorder, not transient
24 negative affect). A single item from the Commonwealth Fund International Health Policy Survey

1 (Commonwealth Fund, 2016) meets these criteria, is brief, and available in many languages. Yet,
2 this item still has some limitations. Items emphasizing caseness will miss subclinical cases that
3 can cause suffering without meeting diagnostic criteria, excluding individuals who do not – or
4 cannot – access mental healthcare. Balancing the need to capture mental health struggles, but not
5 over-pathologizing individuals is a challenge. Depending on the language used, some
6 translations of this item only included the male form of ‘doctor’ and were adapted. Additionally,
7 limiting the terminology to only include “doctors” versus “healthcare professional” may miss
8 diagnoses by other qualified healthcare workers.

9 *3.9. Physical Health & Disability*

10 The WHO’s classification of health and health-related domains provides a framework for
11 measuring both health and disability (International Classification of Functioning, Disability and
12 Health (Organization, 2002); ICF). Accordingly, we included aspects of both disability and
13 physical health in the DiMIS. Health-related data collected at the population level allows the
14 monitoring of changes in health status over time, helps prioritize health service research, policy
15 and delivery, allows analysis of health interventions, allows comparison of different populations,
16 and helps identify potential health inequalities within populations.

17 We use a DAISY (Molyneaux, 2020) item regarding self-identification as a disabled person,
18 which also captures those who do not access official recognition and government support. Where
19 available, the EHIS is suggested if government disability status is relevant to the research
20 question. To query about chronic diseases, we use an EHIS (European Commission. Statistical
21 Office of the European Union., 2018) item, as we do for subjective health. The latter is based on
22 a 5-point Likert scale to maximize predictive and criterion validity, and minimize floor and
23 ceiling effects. Having participants rate all three aspects separately avoids conflating chronic
24 disease and disability with poor subjective health. Community stakeholders emphasized this

1 aspect, adding that rather than only focusing on individual limitations, attention should be paid to
2 participation restrictions as well as environmental and social barriers. For example, inaccessible
3 environments or language can exacerbate impairments and impact responses. Higher SES
4 individuals may have access to better facilities and experience fewer barriers compared to lower
5 SES individuals. Stigma of health conditions and disabilities can have psychological implications
6 and can affect social participation (Weiss et al., 2006). Where information on environmental or
7 social factors is not collected, data should be analysed with these in mind.

8 With regards to physical health status, researchers might wish to include an objective health item
9 which surveys specific conditions with which participants may live. Both subjective and
10 objective health measures help to obtain a more complete picture of health conditions and level
11 of severity. However, participants' conceptualization of subjective health includes objective
12 health, and both are intertwined with health indicators and social health determinants (Goldman,
13 2004).

14 *3.10. Perceived Discrimination*

15 Studies repeatedly find that discrimination experiences are associated with adverse effects on
16 mental and physical health (Carter et al., 2017; Williams et al., 2019). Structural data may reveal
17 leaky pipelines, glass ceilings, or other forms of unequal behaviors towards marginalized groups
18 (e.g., women and caregivers (Hirsh et al., 2020).) Subjective experiences can provide
19 information that is not captured through the analysis of descriptive categorical data.

20 We prioritized a measure that covers a broad range of discrimination experiences, is flexible
21 across a variety of contexts, and comparable to a population measure. We adapted Item 122 from
22 the SOEP Innovation Sample (SOEP-IS Group, 2019) to cover all DiMIS diversity domains by
23 adding mental health and caregiving, and removed the country-specific anchor in the instructions
24 to allow for more flexible use. This measure fulfils our priorities as it denotes discrimination

1 experiences across multiple domains. This enables researchers to link discrimination experiences
2 with the categorical data of the DiMIS and to analyse discrimination using an intersectional
3 perspective. A disadvantage is that discriminative experiences might be under- or overreported
4 for a variety of reasons, but more evidence is needed to understand processes and contexts of
5 discrimination.

6 **4. Discussion**

7 We propose a brief, economic, and easy-to-use minimal item set that captures diversity across 10
8 intersecting domains for broad use in research, ranging from small studies to large trials and
9 survey data collection. By adding a diversity perspective to their research, scientists can make
10 their research even more innovative and relevant (Lewis, 2021). The promise of this approach
11 ranges from higher research quality to more tailored treatment and policies producing better
12 outcomes. For instance, drug trials have a history of underrepresenting women and minorities
13 (e.g., cardiometabolic clinical trials (Khan et al., 2020) and the elderly (e.g., heart failure
14 (Tahhan et al., 2018)). Sometimes, even when ethnicity data is collected, it is not reported or
15 included in subgroup analyses (Gupta et al., 2019). Broad use of the DiMIS promises to address
16 these and other data gaps regarding diversity domains.

17 Different countries have different legal traditions for assessing the diversity domains we have
18 included. For example, in the U.S., since the 1993 NIH Revitalization Act, inclusion of women
19 and minorities in research is required by law. Since then, more and more countries have followed
20 this lead. In 2016, Canada changed how the Government of Canada collects, uses, and displays
21 sex and gender information. In 2021, Canada implemented the Disaggregated Data Action Plan
22 (DDAP) to support more representative data collection methods and enhance statistics on diverse
23 populations to allow for intersectional analyses. Scandinavian countries and the United Kingdom

1 and Ireland have national health care systems with strong traditions of data safe havens and
2 collecting data on social determinants of health. However, countries like France and Japan have
3 legal barriers to collecting data on ethnic minorities, thus limiting data collection on diversity.
4 Other countries, such as Germany, allow the collection of a minimum set of diversity data but
5 emphasize data parsimony. While the policies instituted at the Canadian Institutes of Health
6 Research (2010), the European Commission (2014), the US National Institutes of Health (2016),
7 and the German Research Foundation (2020) all involve gender analysis in research, we propose
8 incorporating additional diversity domains beyond gender and taking an intersectional approach.
9 A standardized assessment of gender and other diversity domains has several benefits. First, it
10 helps to describe for whom available evidence is valid and for whom it is still missing, thus
11 clearly delineating evidence gaps. Second, comparing smaller data sets to population-level data
12 allows for evaluating data representativeness and generalizability. Similarly, by using
13 comparable items in population surveys and smaller studies, researchers can stratify their sample
14 according to the distribution in the general population. Furthermore, if accurate population data
15 is available, it is possible to model representative samples of underserved populations and
16 maximize external validity by statistical weighting and simulation. Third, it facilitates an
17 intersectional approach requiring moderation analyses with sample sizes that are large enough to
18 provide enough power for studying interactions and subgroups (Shrout & Rodgers, 2018).
19 Combined data sets with comparable assessments of gender and diversity allow researchers to
20 investigate moderator effects in their primary analyses and meta-analyses, while minimizing
21 burden on participants. Fourth, a systematic approach will lead to cumulative evidence about the
22 effect sizes of different diversity domains, thus helping to identify areas where certain diversity
23 aspects really matter and need to be analyzed and where less so.

1 The proposed minimal item set has several limitations. First, the DiMIS is limited to 10 diversity
2 domains. The catalogue of domains is not intended to be exhaustive, but rather to push beyond
3 the measurement of age and binary sex and to capture a wider array of intersections. Second, the
4 DiMIS is intended to provide a brief assessment of various diversity domains and therefore
5 cannot provide a comprehensive examination of each domain. We recommend using additional
6 measures to collect more nuanced data for diversity domains of particular interest. Finally, this
7 version of the DiMIS is intended for adult participants. Certain items in the DiMIS should be
8 modified for minor or student samples, such as socioeconomic status (e.g., to be derived from
9 their parents' educational attainment (Galobardes, 2006), or sexual orientation (e.g. asking about
10 sexual attraction rather than sexual identity (Austin et al., 2007). Furthermore, some response
11 options included in items such as sexual orientation may be unknown to older cohorts and could
12 be adjusted accordingly. We encourage researchers and stakeholders to revise, adapt, and expand
13 the DiMIS to fit their individual questions in research and practice. We invite them to create
14 further local adaptations and share these with fellow professionals and stakeholders.

15 A broad use of the DiMIS has implications for the health sciences and beyond. The SAGER
16 criteria give recommendations for sex and gender-sensitive reporting (Heidari et al., 2016) and
17 Tannenbaum and colleagues offer guidelines across disciplines (e.g., artificial intelligence, ocean
18 climate science, and human therapeutics) for integrating age, sex, and gender into study design,
19 analysis, and reporting of results (Tannenbaum et al., 2019; Tannenbaum & Day, 2017).

20 Similarly, the DiMIS could be used across disciplines with adapted versions for different
21 disciplines and national contexts, and inform diversity-sensitive reporting guidelines. Unlocking
22 the power of heterogeneity, we can foster innovations across disciplines to better benefit
23 individuals (European Commission. Directorate General for Research and Innovation., 2020;
24 Tannenbaum et al., 2019).

1 We hope to set off a cascade of effects from better diversity data to wider societal benefits, but
2 this is not possible without oversight, accountability, and structural support (e.g., funding bodies,
3 ethics review boards). The research community, funders, and publishers must agree to improve
4 diversity data collection to avoid plateaus in progress and unfulfilled promises to funders and
5 research stakeholders. A first step is to collect and analyse diversity data widely in completed
6 and ongoing studies. Using literature already published and available, researchers could conduct
7 meta-analyses on gender and other diversity domains and their intersections to provide the
8 gender disaggregated results currently rarely available in research reports. Some examples of
9 these are sustainable urban planning (e.g., provision of public toilets for women (Greed, 2020),
10 access to essential medicines and reproductive healthcare (Cottingham & Berer, 2011), reducing
11 gender and racial bias in AI (for review, see Tannenbaum et al, 2019).

12 Importantly, when asking about participants' identification with marginalized identities, earning
13 participants' trust and protecting their data is essential. Researchers should maximize
14 transparency wherever possible regarding why they are enquiring about deeply personal – often
15 stigmatized – information and how the data will be stored and/or aggregated and de-identified.

16 As a research community, we need to ensure that information is used ethically and that we
17 minimize opportunities for misuse. Ensuring safe data storage is essential to earning participants'
18 trust and ensuring compliance with the Belmont Report and the Declaration of Helsinki (Paxton,
19 2020; World Medical Association., 2001). Compiling a larger database of otherwise small
20 samples may help aggregate enough participants that they can effectively achieve anonymity.

21 Researchers and clinicians may develop and evaluate tailored treatments and interventions to
22 address gaps which could be translated into guidelines and policies, political action, and societal
23 innovation.

1 To make real progress on this ambitious task, researchers must start by addressing diversity as
2 part of their routine data collection. With the DiMIS, we offer a toolkit for researchers across
3 disciplines and for projects where diversity is not the main focus, but may begin to fill a diversity
4 data gap. The goal is to become inclusive, transparent, and respectful of sometimes conflicting
5 stakeholder values and priorities to answer the research question at hand. We hope to encourage
6 discourse on good practices to close the gender and diversity data gap in the health sciences.
7 While there is no single best method for this approach, the DiMIS might serve as a first step
8 towards improved gender and diversity data collection and analysis and more diversified
9 innovations.

10

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18

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- 7

1 **Figure 1: General recommendations for measuring diversity**

2 ----- Insert Figure here -----

3

1 **Table 1: Diversity Minimal Item Set (DiMIS) for Routine Data Collection**

Item	Reference	Domain
<p>Individual instructions with notes on data protection and reasons for collecting the data, e.g. personalized information and interventions. We recommend a clarification that the research team undertaking this research project is committed to improving the quality of life for underrepresented groups.</p>	..	Instructions
<p>1 Regarding gender identity, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Cis <input type="checkbox"/> Dyadic <input type="checkbox"/> Inter <input type="checkbox"/> Non-Binary <input type="checkbox"/> Questioning <input type="checkbox"/> Trans <input type="checkbox"/> Prefer to self-identify: _____ <input type="checkbox"/> Prefer not to answer</p> <p><i>If it is important to the research question to include information on participants' sex, consider adding question 1b along with an explanation of why it is important that participants disclose sex, gender, and/or trans status.</i></p> <p>1b What sex were you assigned at birth? (For example, on your birth certificate.)</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Intersex <input type="checkbox"/> Don't Know <input type="checkbox"/> Prefer not to answer</p>	Adapted from NHS & LGBT Foundation	Gender
<p>2 What is your month and year of birth?</p> <p>▼ [Drop down menu with month list] ▼ [Drop down menu with year list]</p> <p><input type="checkbox"/> Prefer not to answer</p>	Adapted from EHS	Age
<p>3 What is the highest level of education you have successfully completed?</p> <p><input type="checkbox"/> Less than General Certificate of Secondary Education (GCSE) or equivalent (less than upper secondary education, ISCED level 0-2) <input type="checkbox"/> General Certificate of Secondary Education (GCSE) or equivalent (upper secondary education, ISCED level 3) <input type="checkbox"/> Vocational degree or equivalent (post-secondary non-tertiary degree, ISCED level 4) <input type="checkbox"/> Post-graduate certificate or equivalent (short-cycle tertiary degree, ISCED level 5) <input type="checkbox"/> Bachelor's degree (for example: BA, AB, BS) [ISCED level 6] <input type="checkbox"/> Master's degree (for example: MA, MS, MENG, MED, MSW, MBA) [ISCED level 7] <input type="checkbox"/> Doctorate degree or equivalent level (for example: PHD, EDD, MD, JD) [ISCED level 8] <input type="checkbox"/> Another degree, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	Adapted from EHS and ISCED	Socioeconomic Status
<p>4 Do you have any of the following care responsibilities? (check as many as apply)</p> <p><i>This does not include caregiving, nursing services or support you provide in connection with your profession.</i></p> <p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes, for a child or children (under 18 years old) with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes, for one or more adults (age 18 years and above) with challenges of old age or frailty <input type="checkbox"/> Yes <input type="checkbox"/> No with disabilities <input type="checkbox"/> Yes <input type="checkbox"/> No with chronic health condition <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Prefer not to answer</p>	Adapted from DAISY and EHS	Care Responsibilities

<p>5 Regarding sexual orientation, which of the following options best describes how you think of yourself? (check as many as apply)</p> <p><input type="checkbox"/> Heterosexual <input type="checkbox"/> Asexual <input type="checkbox"/> Bisexual <input type="checkbox"/> Gay <input type="checkbox"/> Lesbian <input type="checkbox"/> Pansexual</p> <p><input type="checkbox"/> Another sexual orientation, please specify: _____ <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from NHS & LGBT Foundation</p>	<p>Sexual Orientation</p>
<p>6a In which country were you born?</p> <p>▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>6b In which country/countries were your parents born?</p> <p>Parent 1/Mother: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>Parent 2/Father: ▼ [Drop down menu with country list]</p> <p><input type="checkbox"/> Another country, please specify: _____ <input type="checkbox"/> Prefer not to answer</p> <p>6c-1 How well do you speak...</p> <p>English [official language] :</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>Welsh [second official/most common language]:</p> <p><input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well <input type="checkbox"/> Not at all</p> <p>6c-2 Do you speak any other languages? If yes, please indicate your language skills.</p> <p>▼ Drop-down menu with list of relevant spoken languages in the research context (e.g. Arabic, Hindi, Mandarin, Spanish, ...) as well as sign language and option to fill in any language not listed</p> <p>[language] <input type="checkbox"/> Native speaker <input type="checkbox"/> Very well <input type="checkbox"/> Well <input type="checkbox"/> Not Well</p> <p><i>[responsive design with additional row appearing upon entry]</i></p> <p>6d Do you identify as...?</p> <p><i>(Note: UK example; adapt to local research context)</i></p> <p><input type="checkbox"/> Asian or Asian British</p> <p><input type="checkbox"/> Black, Black British, Caribbean or African</p> <p><input type="checkbox"/> Multiple ethnic groups</p> <p><input type="checkbox"/> White</p> <p><input type="checkbox"/> Prefer to self-identify: _____</p> <p><input type="checkbox"/> Prefer not to answer</p> <p><i>(Note: In contexts, where a more nuanced assessment of ethnicity and/or race is not possible, consider asking the following question as a marker of racism- or discrimination related exposures.)</i></p> <p>6e Do you identify as a member of an ethnic minority or racialized group?</p> <p><i>A racialized group is a societal group which is affected by racism or discrimination. The racialization may be based on skin colour, origin, religion, language, etc.</i></p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>6a and 6b adapted from EHIS</p> <p>6c adapted from the Census 2021 Individual Questionnaire (England)</p> <p>6d generated by the working group</p> <p>6e adapted from the Census 2021 Individual Questionnaire (England)</p>	<p>Ethnic-Racial-Identity</p>

<p>7 What is your present religious identity or world view, if any?</p> <p><input type="checkbox"/> Buddhist <input type="checkbox"/> Christian <input type="checkbox"/> Hindu <input type="checkbox"/> Jewish <input type="checkbox"/> Muslim</p> <p><input type="checkbox"/> Atheist (do not believe in God) <input type="checkbox"/> Agnostic (not sure if there is a God)</p> <p><input type="checkbox"/> Another religion, please specify: _____</p> <p><input type="checkbox"/> Nothing in particular <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from Pew Research Center: Survey of Religion and Social Life Questionnaire for Field Work. Western Europe Survey 2017.</p>	<p>Religion and Worldview</p>
<p>8 Have you ever been told by a doctor or health care professional that you have depression, anxiety or other mental health problems?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p>	<p>Adapted from Commonwealth Fund International Health Policy Survey</p>	<p>Mental Health</p>
<p>9a Do you consider yourself to have a disability?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9b Do you have any chronic illness or longstanding health problem? By longstanding we mean illnesses or health problems, which have lasted, or are expected to last, for 6 months or more.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Prefer not to answer</p> <p>9c How is your health in general?</p> <p><input type="checkbox"/> Very good <input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Bad <input type="checkbox"/> Very bad <input type="checkbox"/> Prefer not to answer</p>	<p>9a adapted from DAISY 9b and 9c adapted from EHIS</p>	<p>Physical Health and Disability</p>

<p>Now we are talking about the topic of discrimination. Discrimination means that a person is treated worse than other people based on characteristics such as gender, sexual identity, or age, without there being any reasonable justification for it. Discrimination can be practiced in very different ways, for example through insults, exclusion, sexual harassment and even violence. But it is also discrimination when people are disadvantaged by rules and laws.</p> <p>Have you personally been discriminated against in the last 24 months [in/location/institution] for the following reasons? (Check as many as apply.)</p> <p>10 Have you personally been discriminated against in the last 24 months [in/location/institution] for the following reasons? (check as many as apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Due to being older in age <input type="checkbox"/> Due to being younger in age <input type="checkbox"/> Due to gender <input type="checkbox"/> Due to a low level of education <input type="checkbox"/> Due to low income <input type="checkbox"/> Due to non-occupational care responsibilities <input type="checkbox"/> Due to of sexual orientation (e.g., gay, lesbian, bisexual) <input type="checkbox"/> Due to racist attitudes, belonging to an ethnic group or background from another country <input type="checkbox"/> Due to religion or worldview <input type="checkbox"/> Due to a mental health problem <input type="checkbox"/> Due to a disability <input type="checkbox"/> Due to a chronic disease <input type="checkbox"/> Due to another reason (please specify): _____ <input type="checkbox"/> Prefer not to answer 	<p>Adapted from SOEP</p>	<p>Perceived Discrimination</p>
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Note. DAISY Diversity and Inclusion Survey; EHIS European Health Interview Survey; NHS National Health Service; LGBT lesbian, gay, bisexual and trans; SOEP Socio-Economic Panell.