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Regular Article

Capability inequality: Does disadvantage or plurality matter more for policy? A Swedish cross-sectional study on the population distribution and group differences of capability using CALY-SWE

Kaspar Walter Meili [a,*], Jan Hjelte [b], Lars Lindholm [a], Anna Månsdotter [a]

[a] Department of Epidemiology and Global Health, Umeå University, Umeå, Sweden
[b] Department of Social Work, Umeå University, Umeå, Sweden

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ABSTRACT

A better understanding of population distributions of capability and inequalities is relevant for public health and social welfare. We surveyed 3639 representatively sampled individuals on background characteristics and on self-reported capability using the capability-adjusted life years Sweden (CALY-SWE) questionnaire, which enables aggregating attribute-level answers into a quality weight score.

We analysed the resulting capability distribution by comparing subgroups. Subgroups were formed along axes of inequality that we selected based on theoretical reasoning and relevance. We stratified into groupings of *plurality* and *disadvantage*, based on the human dignity principle and the needs and solidarity principle featured in the Swedish platform for healthcare priority-setting. While *disadvantage* factors come with inherent need-related disadvantages that explain inequality, such as unemployment, no such normatively acceptable reason exist for *plurality* factors, such as gender.

The results averaged per individual showed marked inequalities for the *disadvantage* groups of individuals with poor self-rated health, long-term sick leave unemployment, and payment difficulties. For *plurality* groups, the largest inequalities occurred in groups with lower education and groups residing in urban areas, but generally inequalities were lower than disadvantage groups.

On the population level, the largest aggregated disability inequalities occurred for self-reported ever NEET (persons who were ever involuntarily not in employment, education or training from age 16 to 29) and payment difficulties groups. Additionally, we assessed the contribution of covariates to these inequalities by counterfactually altering one covariate at a time in a multinomial logistic model of the CALY-SWE attribute-level answers. The most relevant covariates were employment situation, financial difficulties, income, and age group.

For policy-making, this indicates the importance of both plurality and disadvantage inequality axes. Prioritization should adopt nuanced contextualizations of inequality when broadening the perspective beyond healthcare to wider public health and social welfare, for example, elderly care and education.

1. Introduction and background

Differences in power and access to resources between population groups have always been of interest in human history, and differences in welfare, as measured by capability, are no exception.

The *capability approach* is a new paradigm going back to Amartya Sen (1980, 1985, 1992). In short, it postulates that welfare should be measured in capability instead of utility or resources. *Capability* denotes all possible things that individuals could be or do, and *functionings* are the capabilities that individuals realize. This ideally gives individuals agency and real freedom to shape their lives according to their values by freely choosing among different capabilities (Sen, 1985, p. 43). The ability of individuals to realize a level of functioning given a level of resources is governed by *conversion factors*, and impeded conversion factors thus limit capability.

The capability approach has in part been developed in response to problems in welfarism, such as giving equal weight to each individual's utility (Sen, 1992, pp. 12–30). Moreover, the question of how much capability individuals should have in relation to their own needs, in relation to the capabilities of other individuals and groups, and in

* Corresponding author.
E-mail addresses: kaspar.meili@umu.se, meilikaspar@yahoo.de (K.W. Meili).

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relation to societal norms, is of central importance.

The capability approach has, for example, gained traction in economics. The need for more informative and sustainable welfare measures that can adequately capture inequality, compared to the GDP, has been continuously raised internationally (Stiglitz et al., 2009) and in Sweden (Swedish Ministry of Finance, 2015). The human development index is well-known and pioneering implementation of the capability approach with the intention to better depict inequality is a central component (Stanton, 2007).

Inequalities in the determinants of health and health outcomes also play a major role in conceptual and explanatory frameworks in the field of public health, for example in the social determinants of health frameworks (Marmot & Allen, 2014; World Health Organization, 2010). The field of social epidemiology in particular has focused extensively on explaining health inequalities connected to the distribution of resources and has produced a variety of theoretical approaches, including materialism and life-course theory (Bartley, 2017).

The public health focus on distributional issues is also evident in policy. The World Health Organization constitution states, for example, that peace and security require adopting the principle of health as a fundamental right independent of race, religion, political belief, or economic or social condition (International Health Conference, 2002). In Sweden, the national public health goal is 'to create societal conditions for good and equitable public health in the population and to reduce the avoidable health gaps within one generation (God och jämlik hälsa - en utvecklad folkhälsopolitik). The policy, which is founded on seeing health as both a resource and a goal, proposes that necessary areas for intervention include education, working conditions, economic resources, and participation.

Ethically motivated inequality considerations can also be found at the core of social care work (Social Service Act, 2001). The Swedish Social Services Act incorporates normative elements related to human rights. It calls upon solidarity, alongside democracy, as the basis for promoting individuals' social and economic security, equality in living conditions, and active participation in society, while respecting independence and integrity (Social Service Act, 2001, para. 1). The ethical code for social work in Sweden details ethical considerations and highlights, among other things, human dignity, solidarity, social justice, and the equal value of all humans as especially important for social work (Akademikerförbundet, 2017, p. 16). However, similarly to the limited scope of economic effectiveness analyses in social care (Meili et al., 2022, pp. 2–3), policy intent to measure and tackle inequalities may be hampered by the lack of appropriate ways to quantify capability in the population.

Another sector in which equality is highly valued is education, as reflected, for example, in Article 26 of the Universal Declaration of Human Rights (The Universal Declaration of Human Rights, 1948, art. 26) and the Swedish Education Act (Skollagen, 2018, para. 4), which states that students' differing preconditions for educational attainment shall be offset.

When determining whether, and if so why, unequal distributions should be of interest for policy-makers and society, it may be valuable to further contextualize inequality axes and different ways to form groups in which capability differences could be unfair.

In the Swedish *ethical platform* for priority-setting in healthcare, the axes of inequality are contextualized using three normative principles (Prioriteringar Inom Hälso- Och Sjukvården, 1997). Those principles then justify prioritization or absence of prioritization along factors related to health inequalities. The first principle, human dignity, states that prioritization is not appropriate along factors such as talent, social standing, and income. The second principle, needs and solidarity, gives priority to individuals with greater health needs (Prioriteringar Inom Hälso- Och Sjukvården, 1997). These principles closely resonate with three of the seven fundamental rights outlined in the Charter of Fundamental Rights of the European Union (Charter of Fundamental Rights of the European Union, 2012) – the first principle with dignity and equality, and the second principle with solidarity – and are similarly indicated througout the UN's Universal Declaration of Human Rights (The Universal Declaration of Human Rights, 1948). The third principle is the principle of cost-effectiveness, and states that cost-effectiveness must be taken into account when choosing healthcare measures.

Nominally, the Swedish ethical platform is limited to healthcare. This kind of explicit priority-guiding is consequently somewhat lacking in public health, municipal social work, and other related areas. Hence, as a point of departure for this study, we chose the human dignity and needs and solidarity principles within the ethical healthcare platform as a way to contextualize inequality axes.

1.1. Disadvantage and plurality

In a more general sense, the first principle of the ethical platform (human dignity) may be related to pluralist values that give equal rights to individuals regardless of their diversity, beliefs, and social position. Human dignity couples rights to an individual's mere existence, and not the individual's properties (Prioriteringar Inom Hälso- Och Sjukvården, 1997, p. 27) . We define plurality factors as individual characteristics for which there is no *a-priori* reason to have a lower capability, for example gender, and where any differences between groups would inherently be defined as unfair, or discriminatory.

The second principle (needs and solidarity) we understand as being related to factors that logically would result in a shortfall of capability and thus constitute a disadvantage, for example a disease or involuntary unemployment. Lower capability in the disadvantaged groups than in the groups not affected by the disadvantage factors is unfair, but not the other way around. In contrast, differences along plurality factors are unfair regardless of the direction.

In light of the above, we argue that information about the distribution of capability among individuals is of value for policy-makers concerned with social welfare and public health, and for society at large. Further, to develop and implement effective interventions in social welfare, it is informative to gain a nuanced understanding of the differences in capability between different population groups. It may be helpful to normatively contextualize the axes of inequality, namely, to categorize them into inequality factors of disadvantage and factors of plurality.

1.2. CALY-SWE

We recently developed CALY-SWE, a capability instrument targeted for use in economic evaluations of social welfare interventions in Sweden (Månsdotter et al., 2017; Meili et al., 2022). In this context, social welfare refers to all societal-level areas that have considerable consequences for individuals, such as healthcare and public health, social services, economic prosperity, and education, and is thus closely related to the economic concept of a social welfare function.

CALY-SWE aims to measure quality of life (QoL) in terms of capability, or in other words, capability-related QoL. CALY-SWE builds on the capability approach following a Swedish government investigation (Swedish Ministry of Finance, 2015) that suggested quality of life in terms of capability to be a relevant for measuring QoL in Sweden. CALY-SWE contains six attributes (financial situation & housing, health, occupation, political & civil rights, security, and social relations), each with three levels: level 1 (do not agree), level 2 (partially agree), and level 3 (completely agree) to state the degree of the perceived capability.

States are defined by the configuration of the six attributes and three dimensions of CALY-SWE. The CALY-SWE questionnaire is constructed so that level three in each attribute corresponds to a threshold where capability is sufficient for a flourishing life. To enable numerical aggregation of capability for population groups, we previously measured preference weights for each of the capability states. The weight score is situated on a scale of 0–1 for each of the 729 possible states (Meili et al., 2023). The state with all six attributes on level 3 are anchored to the

weight 1 that analogously corresponds to the capability for a flourishing live. Weight 0 corresponds to 0 lifetime (Meili et al., 2023). In addition to cost-effectiveness evaluations, CALY-SWE is also intended to be used to measure capabilities in the population.

In this study, we thus aim to use CALY-SWE to describe the distribution of capabilities among the Swedish population.

1.3. Aims

- Explore and gain a nuanced understanding of the distribution of capability-related QoL in the Swedish adult population (measured in CALY-SWE attributes and weight) along individual socioeconomic and demographic factors
- Compare capability between groups, both in terms CALY-SWE attributes and weights
  a) along axes of disadvantage that are hypothesized to be associated with lower levels of capability in comparison with the general population
  b) along axes of plurality that are hypothesized to be associated with inequalities
- Identify relevant factors linked to potential capability differences
- Assess if unequal distributions in capability are more pronounced along axes of hypothesized disadvantage or plurality axes, both at the individual level and aggregated at the population level

2. Methods

2.1. Data collection and questionnaire

The selection of questions used for examining the distribution of capabilities by CALY-SWE was guided by a mix of considerations and inspired by several frameworks. Namely, we considered classical inequality explanation models on public health and health inequalities such as the social determinants of health framework (World Health Organization, 2010), materialism, and life-course theory (Bartley, 2017, Chapter 7). Other important considerations were contemporary policy relevance in Sweden and the avoidance of very sensitive questions, such as detailed questions concerning health or political opinion, to maintain the feasibility of self-administration.

We collected responses from 3639 participants sampled with representative quotas for age group, region of residence, and gender from an online web panel, from July to December 2022, using LimeSurvey (2020). We additionally used valid postcodes provided by participants for grouping according to Nordregio's urban/rural categorization (Östring, 2022). The survey questions are shown in Supplementary Section 1. Participants provided informed consent and the study was conducted in line with the GDPR (General Data Protection Regulation, 2016).

2.2. Forming groups for calculating the distribution of CALYs

To demonstrate policy-relevant differences in capability-related QoL in the Swedish population in an informative manner, we focused on analysing the distribution of capabilities by comparing population groups. Our theoretical framework for the forming of groups and the analyses is shown in Fig. 1.

Following the reasoning outlined in the introduction around the normative policy context, we formed two categories of groups in the population. Firstly, the need and solidarity principle motivated the comparison of the overall population with subgroups that, according to contemporary knowledge and policy, are hypothesized to have disadvantages in capability, henceforth called *disadvantage groups*.

Secondly, the human dignity principle motivated comparisons of population subgroups along grouping factors of social position such as age and gender, henceforth called *plurality groups*.

Based on this theoretical framework (Fig. 1) and the available data we formed the *disadvantage groups* of Ever Not in employment Education, or Training (NEET), unemployed, poor self-rated health, long-term sick leave, payment difficulties, and homeless; and the *plurality groups* of women vs men, lower education vs other education, birthplace in Global South vs other birthplace, not both parents born in Sweden vs both parents born in Sweden, informal work vs other occupations, rural vs urban, and four age groups (see Table 1).

The decisive element if a grouping factor should be categorized under disadvantage is whether the grouping factor constitutes a clear disadvantage that directly affects capability or a conversion factor, resulting in a shortfall of capability-related QoL. For example, having been NEET in the past plausibly reduces chances on the labour market and reduces time spend gaining either work experience or education.

For plurality, the decisive element that the grouping factor does on

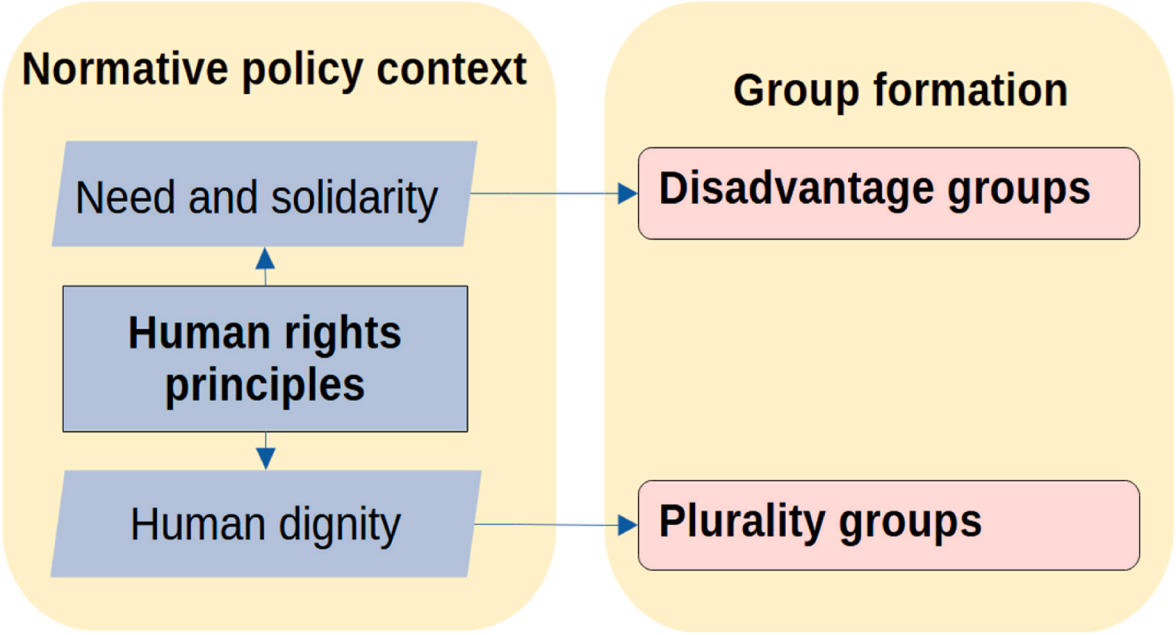

Fig. 1. Theoretical framework for building comparison groups.

Table 1
List of groups. See the full questionnaire in Supplementary Section 1 for details on variables used for group categorizations.

Disadvantage groups	
Group	Definition
Ever NEET	Persons who were ever involuntarily not in employment, education or training from age 16 to 29 for at least one year
Unemployed	Employment situation unemployed
Poor self-rated health	Very bad self-reported health
Long-term sick leave	Employment situation long-term sick leave
Payment difficulties	Several payment difficulties during the last 12 months
Homeless	More or less without housing
Plurality groups	
Group	Definition
Women vs men	Gender question
Lower educated vs other education	Less than 9 years OR 9 years compulsory schooling vs higher degrees of education
Birthplace Global South vs other birthplace	Birthplace Africa, Latin America, or Western, Central or Southern Asia vs other birthplace
Not Swedish-born parents vs Swedish-born parents	Question on parental birthplace, one or both parents not born in Sweden.
Informal work vs other occupations	Employment situation household work OR informal care vs other occupation
Rural vs urban	Type of largest intersection of provided postcode area with Nordregio's (Östring, 2022) urban rural categorization area; *Rural*: sparsely populated rural, rural heartland categories *Urban*: urban, local rural centre, and rural area close to urban area categories
Age groups (18–29, 30–44, 45–64, 65–105)	Age within respective age group vs other ages

the contrary NOT logically lead to a disadvantage, assuming that human dignity is not violated. For example, individuals should have a large degree of freedom to choose their education and lower education should not per se be a disadvantage and a reason to not reach a sufficient level of capability. Any resulting disadvantage would be of discriminative nature according to the human dignity principle.

One consequence is that there is unclarity on whether resulting capability inequalities along plurality factors are a shortfall or an "excess". For example, higher capability in women compared to man can be seen as an unfair excess of capability in women or as an unfair shortfall in men. In contrast, disadvantage facors lead to shortfalls in capability.

2.3. Statistical models

2.3.1. Representativeness and capability distribution description

To assess sample representativeness, we compared strata proportions in the sample to population proportions retrieved from data on birthplace, education, residence region, and gender from Statistics Sweden (2023), using χ^2 tests. We described the distribution of stated capability attribute levels using figures.

2.3.2. Group differences in capability

To assess the relative importance of attributes in contributing to capability differences, we calculated the difference between the observed weight component for each attribute (Weight components are shown in Supplementary Section 5). For disadvantage groups, we calculated the difference to the overall population sample (*including* the disadvantage group), to be able to compare capability shortfalls between disadvantage groups against the unchanged, overall population. In contrast, we directly compared the plurality subgroups with each other (*exclusive* comparison), as the differences between the plurality groupings are of direct interest. The exceptions were the multiple age groups, where we also compared against the population sample to have a common reference. We calculated 95% confidence intervals (95% CI) by bootstrapping observed means of weights and their differences, weight components per level and attribute, and difference in weights between the groups, with 1000 iterations.

2.3.3. Relevance of linked factors for capability differences

To determine the importance of individual covariates in contributing to the capability differences between groups, we used regression analysis with the stated capability attribute level as the outcome and survey data on socioeconomic factors as independent variables. We found the proportional odds assumption to be violated, and thus discarded ordered (Abreu et al., 2008) logistic regression. We instead used multinomial logistic regression (Croissant, 2020; Kwak & Clayton-Matthews, 2002) and estimated different models per attribute but with identical covariates. We tested the independence of irrelevant alternatives (IIA) assumption using the Hausman-McFadden (Croissant, 2020) test and found evidence that IIA does not hold (Croissant, 2020), although the Hausman-McFadden test has been criticized elsewhere (Cheng & Long, 2007).

We considered the variance inflation factor in variable selection (Fox et al., 2023), and dropped or regrouped covariates until all VIFs were below 5 for all attributes to limit collinearity. We estimated a multinomial logistic regression model for each capability attribute and retrodicted participants' log odds of stating level two and three compared to level one.

Using the retrodicted answers, we calculated the expected probability for answering each attribute level and multiplied by the respective CALY-SWE weight coefficient. Then we summed across attributes and levels to calculate the retrodicted expected weight per group and compared it with the observed weight in the sample to assess the model retrodiction.

Next, we calculated the contributions of the covariates to the difference in average capability between two groups in a counterfactual scenario, in which we counterfactually assumed for one covariate at a time that the compared group would have the same proportions for each category as the other group in the comparison. We then assessed how much the average retrodicted CALY-SWE weight changed for this group. We approximated the weight differences' standard errors for confidence intervals using the delta method.

The advantages of this methodology are that the resulting counterfactual differences are independent of model matrix coding and take into account the differences in the distribution of variables between the groups, and that the results can be interpreted on the CALY-SWE weight scale (further details provided in Supplementary Section 3).

2.3.4. Population-level CALY inequalities

To make an assessment of whether inequalities have a larger impact for plurality groups or disadvantage groups, we roughly estimated the overall differences in capability-adjusted time lived over 1 year at the population level: We first calculated the magnitude of the inequalities at the group level by multiplying with the number of people in the group and then scaled up to the population level by multiplying with the inverse proportion of the number of sample participants of the total adult population in 2022 (Statistics Sweden, 2023), assuming that the population contains the same group proportions as in the collected sample.

All analyses were done in R (2023). Data and R code are available upon reasonable request from the corresponding author.

3. Results

3.1. Sample characteristics

The basic demographics of the sample by gender, age, birthplace, having children, etc. and, when relevant and possible, compared to

population data (Table 2). Chi-squared tests were used to determine sample representativity, and no evidence was found for differences to the population proportions for gender, region, and age group that were used for quota sampling (Table 2). However, there was strong evidence for a different distribution of birthplace compared to the population, with bias towards Swedish-born being overrepresented and Western-Asian-born being underrepresented. Compared to population proportions, there was also strong evidence for bias towards higher education. Similarly, we observed strong evidence for bias towards participants from larger cities compared to cities with less than 100,000 inhabitants (Table 2).

3.2. Overall distribution of capability

The attributes with most answers at level 1 (do not agree) were occupation with 581 (16%) and health with 442 (12.1%) (Fig. 2), while most answers at level 3 (completely agree) occurred for social relations, with 2581 (70.9%), and security, with 2434 (66.9%) answers.

725 participants (20%) stated level three for all attributes, while 2131 (58.6%) participants stated either one or two attributes at level 2 (partially agree) with the other attributes being on level 3. Only 11 (0.03%) participants indicated level 1 for all attributes, and around 105 (2.9%) of participants had at most three attributes on level two while the other attributes were at level 1 (Fig. 2).

The overall mean capability weight was 0.837 (Table 3).

3.3. Disadvantage groups

3.3.1. Ever NEETs

The mean CALY-SWE weight for ever NEETs was 0.762, compared to 0.837 for the general population. The biggest observed weight component differences occurred for financial situation & housing and health, followed by social relations (Table 3 and Supplementary Fig. S1).

The main covariates contributing to negative differences were financial difficulties and self-reported NEET status during the ages of 16–29. Conversely, the employment situation covariable contributed positively towards the difference for the health and occupation attribute (Supplementary Fig. S1).

3.3.2. Unemployed

Unemployed had an average weight of 0.668, with the biggest observed negative differences occurring for the financial situation & housing, health, and occupation weight components (Table 3 and Supplementary Fig. S1).

The main covariates linked to the negative differences were employment situation, income, and financial difficulties (Supplementary Fig. S1).

3.3.3. Poor self-rated health

The poor self-rated health group showed the lowest average capability weight, 0.465 (Table 3), with large negative observed differences in the health weight component. Substantial negative differences also occurred for financial situation & housing, occupation, and social relations (Supplementary Fig. S2).

Financial difficulties, employment situation, and income were the most important covariates for the negative capability differences (Supplementary Fig. S2).

3.3.4. Long-term sick leave

The long-term sick leave group had a low average capability of 0.573 (Table 3), and the main negatively contributing attributes were health and financial situation & housing, and, albeit to a lesser degree, occupation (Supplementary Fig. S2).

The most important contributing covariates were financial difficulties, employment situation, income, and age group (Supplementary Fig. S2).

Table 2
Background variables. The last column, *Strata*, shows the population distribution in proportions from Statistics Sweden (where available). The title row of a category, where comparable population data is available, reports the results of a chi-squared test for difference against population proportions. The *Strata* column indicates if a variable was stratified for further analysis. The lower age group stratification was used in analysis, while the upper age group stratification was used for the population comparison.

Category	Strata	N Sample	(%)	% Population
Basic demographics				
Gender (X^2: 0.56, df: 1)				
Woman	Woman	1833	(50.54%)	49.96%
Man	Man	1791	(49.38%)	50.04%
Other	Other/ Opt-out	12		
Opt-out	Other/ Opt-out	3	(0.08%)	
Total		3639	(100%)	100%
Age group Cint (X^2: 4.9, df: 6)				
18–24		340	(9.34%)	9.79%
25–34		614	(16.87%)	17.57%
35–44		600	(16.49%)	15.9%
45–54		590	(16.21%)	16.02%
55–64		550	(15.11%)	14.93%
65–74		501	(13.77%)	13.06%
75–99		444	(12.2%)	12.73%
Total		3639	(100%)	100%
Age group				
18–29		611	(16.79%)	
30–44		943	(25.91%)	
45–64		1140	(31.33%)	
65–105		945	(25.97%)	
Total		3639	(100%)	
*Birthplace (X^2: 510***)*				
Africa	Other	31	(0.85%)	2.52%
Latin America	Other	26	(0.71%)	1.07%
North America	Other	6	(0.16%)	0.29%
Central Asia	Other	4	(0.11%)	0.78%
Eastern Asia	Other	6	(0.16%)	0.64%
Southern Asia	Other	12	(0.33%)	1.03%
Southeast Asia	Other	8	(0.22%)	1%
Western Asia	Other	66	(1.81%)	5.77%
Europe (East)	Other	62	(1.7%)	3.81%
Other Nordic country	Nordic country	76	(2.09%)	2.56%
Europe (South)	Other	44	(1.21%)	1.73%
Sweden	Nordic country	3206	(88.1%)	77.34%
Europe (West)	Other	58	(1.59%)	1.39%
Rest of the world	Other	24	(0.66%)	0.07%
Opt-out	Other	10	(0.27%)	
Total		3639	(100%)	100%
Any children				
No		1342	(36.88%)	
Yes		2297	(63.12%)	
Total		3639	(100%)	
Monthly income				
<20,000 SEK		1144	(31.44%)	
20,001–29,000 SEK		832	(22.86%)	
>29,000 SEK		1361	(37.4%)	
Opt-out		302	(8.3%)	
Total		3639	(100%)	
Financial difficulties				
No		2120	(58.26%)	
Partially		665	(18.27%)	
Yes		734	(20.17%)	

(continued on next page)

Table 2 (*continued*)

Category	Strata	N Sample	(%)	% Population
Other/Opt-out		120	(3.3%)	
Total		3639	(100%)	
Employment situation				
Permanent		1717	(47.18%)	
Other/Opt-out		1201	(33%)	
Self-employed		160	(4.4%)	
Student		190	(5.22%)	
Temporary		197	(5.41%)	
Unemployed		174	(4.78%)	
Total		3639	(100%)	
Employment field				
Basic education		1339	(36.8%)	
High education		597	(16.41%)	
Elevated education		1188	(32.65%)	
Other/Opt-out		515	(14.15%)	
Total		3639	(100%)	
Ever NEET				
No		2781	(76.42%)	
Yes		797	(21.9%)	
Opt-out		61	(1.68%)	
Total		3639	(100%)	
Household size				
1		1475	(40.53%)	
2		595	(16.35%)	
3		432	(11.87%)	
4 or more		447	(12.28%)	
Opt-out		690	(18.96%)	
Total		3639	(100%)	
Housing type				
Own flat/house		2054	(56.44%)	
Rent flat/house		1455	(39.98%)	
Homeless		22	(0.6%)	
Other/Opt-out		108	(2.97%)	
Total		3639	(100%)	
Active in association				
No		2816	(77.38%)	
Yes		823	(22.62%)	
Total		3639	(100%)	
Geographical living situation				
*Municipality size (X^2: 570***, df: 4)*				
Less than 20 k inhabitants		518	(14.23%)	21.5%
20 k to 50 k inhabitants		674	(18.52%)	24.73%
50 k to 100 k inhabitants		619	(17.01%)	21.62%
100 k to 300 k inhabitants		882	(24.24%)	16.91%
Big city (Stockholm, Gothenburg, Malmö) with >300 k inhabitants		946	(26%)	15.24%
Total		3639	(100%)	100%
Rural urban				
Invalid postal code		108	(2.97%)	
Rural		285	(7.83%)	
Semi-rural		534	(14.67%)	
Inner urban		1911	(52.51%)	
Outer urban		801	(22.01%)	
Total		3639	(100%)	
Region (X^2: 12, df: 7)				
Central Norrland		141	(3.87%)	3.65%
East-Central Sweden		617	(16.96%)	16.75%
North-Central Sweden		322	(8.85%)	8.35%
Småland and islands		332	(9.12%)	8.41%
South Sweden		542	(14.89%)	14.87%
Stockholm		767	(21.08%)	22.89%
Upper Norrland		200	(5.5%)	5.13%
West Sweden		685	(18.82%)	19.95%
Opt-out		33	(0.91%)	
Total		3639	(100%)	100%

Asterisks signify significance levels:* for 0.05, ** for 0.01, and, *** for 0.001.

3.3.5. Payment difficulties

The mean capability weight for the group with payment difficulties was 0.676 (Table 3) with substantial negative differences for financial situation & housing, health and, to a lesser degree, for social relations, political & civil rights, security, and occupation (Supplementary Fig. S3).

The largest capability weight component differences were linked to financial difficulties for all attributes (Supplementary Fig. S3).

3.3.6. Homeless

The homeless group had only 30 members with a mean CALY weight of 0.702 (Table 3), with largest negative weight component differences observed for social relations and financial situation & housing (Supplementary Fig. S3).

The housing type covariate seemed to be linked to the largest negative differences (which includes a homeless status category), followed by the financial difficulties covariate (Supplementary Fig. S3).

3.4. Plurality groups

3.4.1. Men vs women

Men, with 0.846, had a slightly higher mean capability than women, with 0.829 (Table 3). This difference was due to the largest weight component in health and to some extent also to the larger weight component in financial situation & housing. However, men showed lower capability in the social relations attribute (Supplementary Fig. S4).

The gender covariate was linked to positive differences (of men vs women) for health, but also to negative differences for social relations. Financial difficulties and income covariables also contributed to a higher capability in men compared to women (Supplementary Fig. S4).

3.4.2. Birthplace Global South vs other birthplaces

Participants with a birthplace in the Global South had marginally the same mean weight as participants with other birthplaces (0.833 vs 0.837) and the CI for difference did not contain 0 (Table 3). However, smaller weight components for financial situation & housing and social relations seemed to be compensated by a markedly larger weight component for the health attribute (Supplementary Fig. S4).

The birthplace covariate was linked to lower capability for social relations and security, but notably, employment situation and household size were associated with higher health and occupation capability. Financial difficulties were linked to negative capability differences in the financial situation & housing and health attributes (Supplementary Fig. S4).

3.4.3. Lower education vs other education

A lower observed mean capability weight of 0.778 for the lower education group, compared to a mean of 0.842 for the other education group (Table 3), was largely due to negative differences in weight components for financial situation & housing, health, and occupation (Supplementary Fig. S5).

The most clearly linked covariates were the employment situation with negative contributions health and occupation capability. Negative

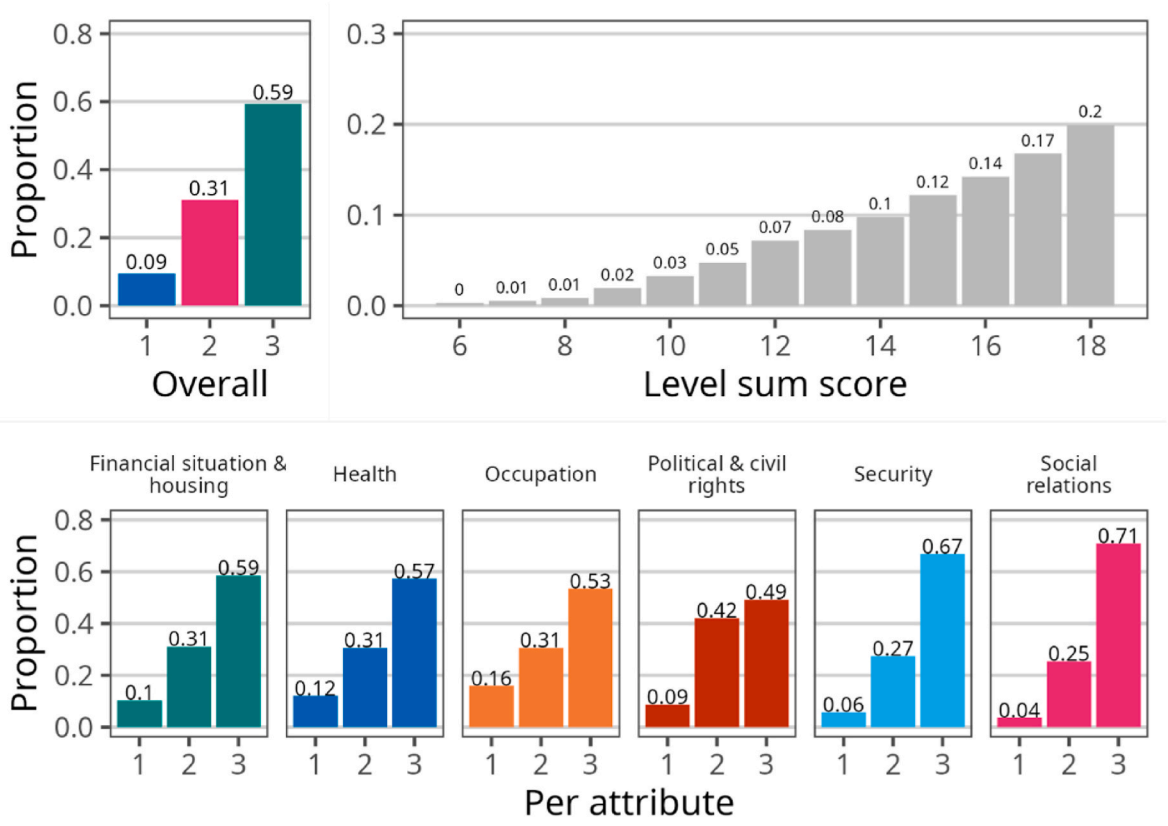

Fig. 2. Distribution of level of attribute capability answers. Number designate proportions. The level sum score corresponds to the sum of the attribute levels of the reported capability state of the participants.

Table 3
CALY-SWE weight per group. Disadvantage groups on top, plurality groups on the bottom. Bootstrapped 95% confidence intervals (CI). Weight difference CIs without 0 are shown in italics. Comparison (Cmp.). Confidence Interval (CI).

Name	Cmp.	N	N Cmp.	Tot N	Mean weight	Cmp. weight	Weight Δ
Population sample		3639			0.837 (0.831, 0.841)		
Disadvantage							
Ever NEET	Population sample	797	3639	3639	0.762 (0.746, 0.776)	0.837	*−0.075 (-0.088, -0.064)*
Unemployed	Population sample	167	3639	3639	0.668 (0.637, 0.697)	0.837	*−0.169 (-0.195, -0.141)*
Poor self-rated health	Population sample	102	3639	3639	0.465 (0.431, 0.499)	0.837	*−0.371 (-0.411, -0.342)*
Long-term sick leave	Population sample	87	3639	3639	0.573 (0.531, 0.619)	0.837	*−0.264 (-0.312, -0.215)*
Payment difficulties	Population sample	576	3639	3639	0.676 (0.659, 0.693)	0.837	*−0.16 (-0.176, -0.143)*
Homeless	Population sample	30	3639	3639	0.702 (0.632, 0.765)	0.837	*−0.135 (-0.206, -0.07)*
Plurality							
Women	Men	1833	3624	3624	0.829 (0.82, 0.837)	0.846 (0.837, 0.853)	*−0.017 (-0.031, -0.007)*
Birthplace Global South	Other birthplace	147	3629	3629	0.833 (0.801, 0.853)	0.837 (0.831, 0.843)	−0.004 (−0.035, 0.022)
Lower education	Other education	313	3631	3631	0.778 (0.756, 0.797)	0.842 (0.835, 0.847)	*−0.064 (-0.085, -0.044)*
Not both parents Swedish-born	Swedish-born parents	488	3616	3616	0.814 (0.791, 0.831)	0.84 (0.833, 0.845)	*−0.027 (-0.048, -0.008)*
Rural	Urban	285	3531	3531	0.791 (0.77, 0.816)	0.841 (0.834, 0.845)	*−0.05 (-0.072, -0.026)*
Informal work	Other occupations	48	3613	3613	0.799 (0.74, 0.847)	0.837	−0.037 (−0.096, 0.01)
Age 18–29	Population sample	611	3639	3639	0.842 (0.826, 0.854)	0.837	0.006 (−0.006, 0.018)
Age 30–44	Population sample	943	3639	3639	0.827 (0.814, 0.84)	0.837	*−0.009 (-0.02, -0.001)*
Age 45–64	Population sample	1140	3639	3639	0.817 (0.807, 0.827)	0.837	*−0.02 (-0.027, -0.011)*
Age 65–105	Population sample	945	3639	3639	0.866 (0.856, 0.876)	0.837	*0.03 (0.022, 0.039)*

associations also occurred for income, education, and financial difficulties covariates for the health and financial situation & housing attributes. In contrast, the age covariate was linked to a positive difference for the health attribute (Supplementary Fig. S5).

3.4.4. Not Swedish-born parents vs Swedish-born parents

Participants with non-Swedish-born parents showed a lower mean capability weight of 0.814 compared to 0.840 for those with Swedish-born parents (Table 3). Capability in financial situation & housing in particular showed a slight negative weight component difference (Supplementary Fig. S5). The financial difficulties covariate seemed to have a negative effect on the difference while the employment situation covariate showed a positive effect (Supplementary Fig. S5).

3.4.5. Rural vs urban

Participants living in a sparsely populated urban area showed a mean weight of 0.791, compared to 0.841 for living in an urban area or a rural area in close proximity to urban areas (Table 3). The largest negative

observed weight component differences occurred for health, social relations, and financial situation & housing (Supplementary Fig. S6).

The most important covariate contributing to these differences was the rural/urban categorization, especially for the health and social relations attribute (Supplementary Fig. S6).

3.4.6. Informal work vs other occupations

The mean capability weight was 0.799, compared to 0.837 for other occupations, with the main observed difference pertaining to the weight component for the financial situation & housing attribute. However, the group size was with only 48 individuals and the CI did not contain 0 (Table 3 and Supplementary Fig. S6).

The main covariates linked to negative capability differences were the employment situation and income (Supplementary Fig. S6).

3.4.7. Age categories

There were fewer differences in mean capability weight in age group comparisons, and the 95% CI for the differences did not contain 0 for the lower two age groups. However, the age categories of 30–44 and 45–64 had slightly lower mean capability weights than the general sample (0.827 and 0.817), and the age category of 65–105 had a higher mean capability weight of 0.866 compared to the population sample mean of 0.837 (Table 3).

The lower three age groups (18–29, 30–44, and 45–64) had a lower observed weight component in the financial situation & housing attributes relative to the sample average, while the highest age group (65–105) showed a positive difference. The lowest age group showed a positive weight component for the occupation attribute, while this weight component was negative for the 45–64 age group and did not differ much from 0 for the other age groups. For the 45–64 age group, all weight components were smaller than average. The higher mean capability weight in the highest age group was largely driven by a larger capability in the financial situation & housing weight component and, to some extent, by a higher weight component in social relations. The financial situation & housing weights contributed for the rest of the age groups were lower than the sample averages.

A relevant contributing factor for all age groups was the age group covariate, contributing positively for the lowest and highest age groups, and negatively for the middle two age groups. The employment situation covariate contributed positively to the weight for the lowest three age groups and negatively to the oldest age groups.

For the youngest age group, civil status was linked negatively with social relations capability compared to the overall sample, but had a lesser effect for the other age groups.

The financial difficulties covariate was linked to positive differences in the financial situation & housing attribute. Age group figures for weight components, distribution and counterfactual covariate contribution can be found in Supplementary Figs. S7 and S8. In Supplementary section 4 included are also tables detailing the counterfactual covariate contributions to the difference for each covariate.

3.5. Population-level CALY inequalities

The resulting population-level estimates showed that disadvantage groups would have some of the largest population-scale CALY differences. The largest CALY difference occurred for the payment difficulties (−211.2 k CALYs), ever NEET (−136.2 k CALYs) and poor-SR health groups (−86.7 k CALYs), driven by both considerable weight differences and relatively large group sizes. For plurality groups, women vs men showed the largest negative difference (−71 k CALYs), driven by the large group size, followed by lower vs other education (−55.1 k CALYs), the 45–64 age group (−52.3 k CALYs), and rural vs urban (−45.9 k CALYs). The 65–105 age group had a considerable CALY surplus compared to the population (64.6 k CALYs) (Fig. 3).

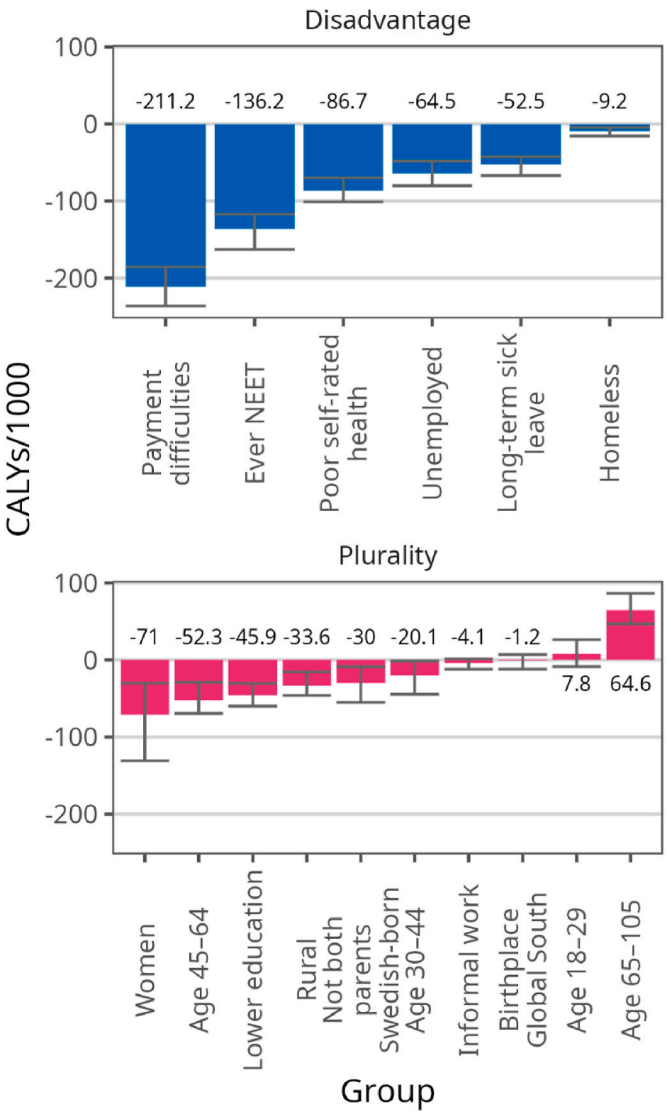

Fig. 3. Inequality consequences on the population level for one year in terms of CALYs (in 1,000s). With bootstrapped 95% confidence intervals.

4. Discussion

This is the first study to provide a detailed cross-sectional overview of the distribution of capabilities along important axes of inequality in a representative Swedish population sample using the CALY-SWE instrument. Around 20% of the sample indicated full capability in all six attributes, and around 50% had a maximum of two attributes at level 2. The distribution of self-reported capability was highest for the social relation attribute, while the capability distribution for the occupation was the lowest. We find that the largest individual capability inequalities occurred for groupings along axes of disadvantage for groups of poor self-rated health, long-term sick leave, unemployed, and payment difficulties. Self-indicated NEET status was also associated with considerably lower capability. Along axes of plurality, the largest inequalities occurred for lower vs other education and living in urban vs rural areas. Similarly, projected onto the population level, the disadvantage groups of payment difficulties and ever NEET had the largest negative CALY differences of all groups. Important factors linked to lower capability were employment situation, financial difficulties, income, and age group.

4.1. Comparisons with other literature

A few other studies have analysed capability distribution between groups. Tomi Mäki-Opas et al. (2022), investigating capability and QoL in disadvantaged groups with structural equation modelling (SEM), show a positive effect of household income and female gender on capability, as in our regression results. Conversely, they found a negative impact of age on capability, whereas our results suggest a positive association of age, and slight positive but uncertain association of education (Supplementary Section 2). This study was assessed four Finnish disadvantaged population groups, while our study is based on a larger population sample with more covariates, and thus may allow for a more detailed picture.

Also using SEM, Yeung and Breheny (2016), in a sample of New Zealanders aged 50 plus, found a link between economic living standard and capability, but that this association was slightly lower in higher age groups. Our results insofar agree, as we observed a higher aggregated capability in the 65-plus age group than at other ages, even though this age group stated lower financial situation & housing capability.

Al-Janabi (2018), using ICECAP-A in a UK convenience sample, found higher capability for individuals with full health and higher education, slightly higher capability in men, and lower capability for informal caregivers, which is in line with our study. Capability in people aged 50 or more was similar to younger people, while we found higher aggregated capability weights in the 65-plus age group. Flynn et al. (2011), using ICECAP-O in a UK sample, also found an association between health and reported capability.

Ferschl et al. (2022), in a large cohort of young Swiss males, found that economic capital showed a positive association with capability, followed by social capital and attending grammar school, thus also confirming the substantial correlation of financial factors with capability.

The age-related results may be remarkable given that higher age does not automatically link to lower capability. Because capabilities are self-reported, one possible explanation is a form of adaptation of the excepted relative capability level based on experience and to changing (bodily) circumstances throughout the lifecourse. While counterarguments against adaptive preferences are traditional yielded against welfarism and as a justification for the capability approach (Nussbaum, 2000, Chapter 2; Sen, 1992, p. 55), maybe not all adoptions, such as the one due to higher age, may be seen as illegit (Elster, 1982; Mitchell, 2018).

Hall et al. (2013) employed a capability perspective to the social determinants of health framework and, similarly to the present study, found protective effects of higher income, autonomy at work, and social resources on self-rated health. However, this study did not include a direct measure of capability.

Some studies analysed capability in relation to the COVID-19 pandemic. Himmler et al. (2023), in a large study using ICECAP-A in multiple European countries, found positive effects of higher education, financial security, and better health on capability, as in the present study. In a previous study using a similar list of capabilities in the Swedish population, we found a similar positive association with financial status (Meili et al., 2021) during the pandemic; lower income and owning housing was linked to higher odds for a negative change in perceived capability.

Persevering scarring effects of youth unemployment over the life course, similar to the NEET disadvantage group here, have also been shown by Strandh et al. (2014) in a 27-year prospective Swedish cohort, although the outcome of this study concerned mental health.

In summary, a few other studies have analysed capability distribution in the population. However, comparing the results of these studies with those of our study is not straightforward since concepts, comparison groups, methodologies, and capability measures differed.

4.2. Policy implications

The results of the present study show that there are considerable inequalities in capability between different Swedish population groups. A next step in the discussion on the analysed capability inequalities may be to determine what a fair distribution between those groups might entail. Initially, policy-makers should decide if the relevant issue is equality in outcomes or equality in conditions (Commission for Equity in Health, 2020, p. 531). This distinction concerning capabilities may be vague, however, because a capability attribute could be a relevant outcome of other capability attributes, and the causality chain may be too complex to disentangle. Instead, one may ask whether it is equality in outcomes or functions that matters (Robeyns & Byskov, 2023, sec. 4). We argue in agreement with Sen (1980, 1992) that it is capability itself that matters, and that equality of opportunity should be aimed for, because individuals should in principle be given the freedom to realize the functions that they value.

A straightforward argument can then be made regarding the disadvantage groups. In cases of a shortfall in capability, they should receive priority for societal action. These groups should be prioritized up to a level that is sufficient for a flourishing life, before such action is advised for non-disadvantaged groups. The reason for this is that the disadvantage factor directly and unfairly hinders either their capability or their ability to convert resources into functionings. It may be even necessary to favour disadvantaged individuals in terms of resources to achieve an equal level of capability, for example to offset lower conversion factors. The classical example, in which a person in a wheelchair needs to spend more money to achieve an equal level of mobility as a person who can walk, is an illustration of this. The person in the wheelchair needs additional support to compensate for the higher expenses to achieve an equal level of financial capability. This argument for the disadvantage groups corresponds to the need and solidarity principle of the Swedish healthcare prioritization platform.

How policy-makers should tackle inequalities in capability between plurality groups, or if they should at all, may be more contentious, as those inequalities are less tightly connected to needs or solidarity, and unfairness may occur, but its degree may vary. As capabilities are, per definition, closely related to opportunities, it may be fair to prioritize along axes of plurality if such a policy is democratically grounded. Affirmative action in gender equality, for example, has the goal to further equalize opportunities between women and men. Another such case could be rurality, where resources are diverted from urban areas to increase the occupational capabilities of those living in rural areas to approach the capability of those living in urban areas.

However, a democratic society may not feel obliged to create a level playing field for individuals in all matters. If individuals voluntarily, without systematic discrimination, chose paths that result in less capability in particular areas, they should not be prioritized. The reasons to consider should be normative, such as the degree of inequality aversion in society. For example, it may be socially accepted that a musician has a lower financial capability than a medical doctor as long as they were given reasonable freedom to choose their profession without discrimination along plurality factors, and as long as the sufficiency threshold is reached.

To keep in mind is that, as hinted earlier, the CALY-SWE instrument itself is built on a principle of distributive justice, namely sufficientarianism. The CALY-SWE scale aims to measure capability only up to a level that is sufficient for a flourishing life (Meili et al., 2022). While this, in theory, should enable the measurement and detection of any unfair disadvantages and hence inform prioritization policies, it may not always be sufficient to detect inequality along axes of plurality. This limitation entails that if all compared groups have capability beyond the sufficiency level, unequal distributions above this threshold would not be detected. These inequalities may weigh less severely but, on the other hand, they may still be unjust and potential targets for policy measures. Even forms of equalitarianism might be conceivable to reduce capability

inequality above the sufficiency threshold: Equalitarianism may not be as controversial as for capability levels below the threshold.

Another concern for policy-makers should be trading off between efficiency and equity. Resources are scarce and must be used effectively, including in social welfare. This is one of the main motivations behind the CALY-SWE measure (Meili et al., 2022). Other sectors, such as the judiciary system or defence, also need to be funded, and the most effective spending of resources in terms of output produced is an ethical responsibility, both to limit the financial burden for taxpayers, and to achieve the greatest effect for as many beneficiaries as possible. In the Swedish healthcare priority-setting platform, cost-effectiveness is the third principle, and in health economics, there is increasing recognition that the equity impact of cost-effectiveness decisions should be considered (Cookson et al., 2017).

Based on this reasoning, it seems necessary to consider the social position of individuals in the prioritization formulae for broader public health and social welfare if inequalities between groupings along social positions, such as plurality groups, are deemed unfair. In contrast, the human dignity principle for healthcare prioritization in Sweden has legal precedence and disallows prioritization along the social position, to prevent those with a better social position being favoured (Brülde, 2011, Chapter 5). In extension, this may also entail a more elaborate trade-off consideration between the ethical principles than strict lexical order in the healthcare prioritization platform.

4.3. Strengths and limitations

The strengths of this study include a large representative sample of 3639 participants, according to age, gender and region. Simultaneously, however, other characteristics, such as birthplace or education, were not representative of the population. Further, we used a broad range of indicators and methodology that allowed the assessment of contributions of individual covariates to capability differences between groups.

Limitations include the cross-sectional design, self-reporting of capability and other items, the usage of an online panel with no direct contact with participants and thus limited control over data quality, some degree of multicollinearity in the multinomial regression model and probable violation of the IIA assumption, usage of a main-effects-only model without interactions, and the focus on binary comparison groups that may have resulted in a simplified picture for non-binary grouping factors such as age. While participants were representatively sampled from the web panel according to age, sex, and region of residence, the panel population may differ in important aspects form the general population. For example, digital aptness might be associated with both better socio-economic status and higher probability of participating in a web panel, thus contributing to higher capability-related QoL as observed in this study. Furthermore, the counterfactual estimates for the contribution of individual covariates showed relatively high uncertainty. Similarly, the population-level inequality differences are only rough estimates. The reasons for this are that sample proportions of the groups probably introduce additional uncertainty and bias, as they are likely not entirely representative of the population, although the representative sampling quotas may have increased the representativity. Another limitation is that the CALY-SWE instrument aims to measure capability, but participants might report partial functions instead (Al-Janabi, 2018). The collapsing of capability attributes into a single index itself may also be criticized as too simplifying (Sen, 1992, pp. 48–49).

5. Conclusions

In present-day Sweden, there are considerable differences in capability between different population groups. Individual average-capability inequalities for groupings characterized by disadvantage such as poor self-rated health, unemployment, and sick leave seem to be generally larger than for groupings along plurality factors such as gender and birthplace. Moreover, at the population levels, resulting aggregated CALYs over one year were lowest for the disadvantage groups, especially for payment difficulties, NEET status and poor self-rated health. Important factors associated with capability are financial difficulties, unemployment, and poor self-rated health.

The results of this study suggest that capability measures such as CALY-SWE could form a basis for distribution policy in, for example, social care, regional development for rural vs urban areas, gender equality, education, public health, labour market policies, education, etc. Such policy should be empirically grounded, anchored in ethical reasoning and sensitive to the differing characteristics of inequality, such as inequalities along axes of plurality or disadvantage, towards a fairer and more democratic prioritization of social welfare.

Ethical approval

Ethical approval for this study was provide by the Swedish Ethical Review Authority [number undisclosed because of peer-review process anonymity].

Informed consent

Informed consent was obtained from all participants.

CRediT authorship contribution statement

Kaspar Walter Meili: Writing – review & editing, Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jan Hjelte:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Lars Lindholm:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Anna Månsdotter:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssaho.2024.100961.

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