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ORIGINAL RESEARCH ARTICLE

Weighting Health Outcomes by Socioeconomic Position Using Stated Preferences

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Abstract
Background The trade-off that society is willing to make to promote a more equitable distribution of health can be represented as a social welfare function (SWF). SWFs are an economic construct that can be used to illustrate concerns for total health with aversion to inequalities between socioeconomic groups.
Objective This study used people's preferences to estimate the shapes of health-related SWFs (HRSWFs). We tested the suitability of this method to derive equity weights.
Methods A questionnaire was used to elicit preferences concerning trade-offs between the total level of health and its distribution among two socioeconomic groups. The participant group was a sample of convenience that included a mix of health researchers, academics, clinicians, managers, public servants and research students. The data collected were used to develop HRSWFs with a constant elasticity of substitution. The weight was calculated using the marginal rate of substitution.
Results A marginal health gain to the lowest socioeconomic position (SEP) group was valued 14.1–81.4 times more than a marginal health gain to the high SEP group.
Conclusions Our results provide evidence to support the idea that the public may be willing to make trade-offs between efficiency and equity, and that they value health gains differently depending on which socioeconomic group receives the health gain. Further evidence is required before such indicative weights have practical value.

Key Points for Decision Makers

The public may be willing to sacrifice health gains in order to reduce differences in average life expectancy between socioeconomic position groups.

The objective of economic efficiency may not have primacy compared with other objectives for the general public.

Electronic supplementary material The online version of this article (doi:10.1007/s41669-017-0036-1) contains supplementary material, which is available to authorized users.

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1 Background

In the developed world, the single strongest predictor of an individual's health is their position on the socioeconomic spectrum [1]. This can be measured by income, education, place of residence or occupation. On average, those at the lower end of the spectrum are more likely to suffer from diseases and have higher mortality rates and lower life expectancies [1–5]. Table 1 demonstrates the differences in life expectancy between the highest and lowest socioeconomic groups in Australia. This social gradient of health is also important for many racial and ethnic health differences because socioeconomic position (SEP) can differ substantially by race and ethnicity [6–9]. An important focus of public health policy is the reduction of population health

Table 1 Life expectancy by income quintiles and years of education: males aged 20 years, Australia, 2007 [5]

	Income quintile			Years of education		
	Lowest quintile	Highest quintile	Gap	≤12 years	>12 years	Gap
Life expectancy (years)	74.9	81.1	6.2	75.5	80.1	4.6

inequalities between SEP groups [10]. Addressing this issue is a policy concern in many countries and is reflected in risk factor and disease prevention policy statements [11].

Given health budget constraints, priority setting is an essential task for policy makers. Achieving a balance between maximising health gains per dollar spent and a fair distribution of health gains across socioeconomic groups is an important objective. Policy makers often utilise cost-effectiveness analysis (CEA) to inform resource allocation decisions. The results of CEA are summarised in an incremental cost-effectiveness ratio (ICER) that represents the additional costs and benefits of the intervention relative to a comparator. ICERs are usually presented as a cost per quality-adjusted life-year (QALY), a metric that enables comparison between different interventions, because it combines both mortality and morbidity effects. ICER thresholds are the monetary value below which an intervention is presumed 'efficient'. In Australia, the 'rule of thumb' is <50,000 Australian dollars (A$) per QALY gained [12].

Despite SEP being the strongest predictor of health and recognition of the policy significance of reducing health inequalities between SEP groups, the underlying assumption of economic evaluation methods is to value health gains of SEP groups equally. Where this assumption does not reflect society's concerns about how benefits are distributed, the application of equity weights can compensate for health inequalities by weighting the QALYs according to characteristics of the people receiving them. These weights can quantitatively express the extent to which society is willing to trade overall health benefits in order to promote a more equitable distribution of health. The weights can be applied within economic evaluations either by adjusting the QALY gains within the ICER or by adjusting the ICER threshold [13].

Policies aimed at reducing inequalities between socioeconomic groups might involve a lesser increase in overall health benefits, but if achieving a balance between equity and efficiency is the aim, equity weighting allows for the maximisation of equity-adjusted health outcomes, rather than just the maximisation of health outcomes [13]. One potential outcome of such weighting would be that more resources would be allocated to low SEP groups to reflect this broader concept of benefit. This goes to the heart of what constitutes 'value-for-money' in economic appraisal—what are the elements that should describe community welfare in the social welfare function (SWF)? Expressed another way, what is it that the Australian community wants from its healthcare system? What are we trying to maximise with available resources? The SWF is an economic construct used to define our concept of benefit and its various dimensions.

Interest in people's preferences relating to fairness is increasing and numerous studies have looked at whether people prefer to give priority for health gains to one group over another. For example, people are willing to sacrifice quality-of-life gains to give priority to the most severely ill [5–7], and those with dependents [14], and lower priority to older people [30–36]. Of the 21 studies that have examined giving priority in health services to persons in lower SEP groups [15–35], nine studies found that people would give priority to low SEP groups [20, 21, 27, 28, 30, 32–35]. However, the framing of the questions appears to have influenced the responses. For example, in the studies in which people were explicitly told that low SEP groups have worse health outcomes, the majority of those sampled gave priority to low SEP groups. A health-maximising objective is not supported by survey respondents in many contexts.

Four studies have calculated health weights for SEP using empirical surveys [20, 30, 32, 35]. The weights originated from either public opinion [30, 32, 35] or politicians [20]. There are several ways of estimating weights, such as through willingness-to-pay, person trade-off exercises or discrete choice experiments [36]. Typically, respondents are surveyed and asked to make choices designed to reveal the extent to which they would choose equality (equal benefits received by all groups) or equity (more benefits to the lowest SEP group). The four studies based the weights on stated preferences of whether a low SEP group should be given priority for health programmes over a high SEP group and all studies indicated that people were willing to give priority to the low SEP group.

However, the different approaches employed in both elicitation of preferences and the derivation of weights resulted in quite different magnitudes for the derived weights. Wiseman [30] included questions about how to allocate a budget of AU$10 million to programs benefiting low- and high-income groups, whilst Norman et al. [35] combined various dimensions such as gender, smoking status and income and a separate weight for SEP was not derived. In the Lindholm et al. [20] study, Swedish politicians were asked to choose between programs designed to prevent myocardial infarction deaths amongst blue or white collar workers. The weights derived from the Dolan and Tsuchiya [32] study were based on participants choosing between two health programs that varied in the number of years of life that would be added to low and high SEP groups. Because of the different methods used to calculate weights for SEP, it is not known whether results differ due to method or underlying preferences. Adding to this, results may well be context specific, which makes generalisability more difficult. Unpacking these influences requires further research, particularly research where differences in method are not a confounding factor.

Our aims in this article are to investigate how willing people in Australia are to make trade-offs between maximising health gains and achieving greater health equality for SEP groups, and to derive weights that could potentially be used in CEAs that analyse policies aimed to prevent health conditions that have a social gradient in Australia. We chose to use Dolan and Tsuchiya's [32] methods because of suitability to our context of examining preferences for health gains according to SEP, as well as ease of understanding/execution and the current need for studies with consistent methods. Dolan and Tsuchiya [32] used stated preferences from the general public to estimate the parameters of a health-related SWF (HRSWF) and we wanted to test the suitability of this method to derive equity weights for Australia.

2 Methods

2.1 Participants

The participant group ($n = 131$) was a convenience sample that included a mix of researchers, academics, clinicians, managers, public servants and research students attending either the Australian and New Zealand Obesity Society Annual Scientific Conference (Sydney, NSW, Australia, 16–18 October 2014) or the World Priorities 2014 Conference (Melbourne, VIC, Australia, 10–12 November 2014). Delegates were invited to participate by way of announcements prior to organised sessions. Questionnaires were placed on empty seats at the venue before a session began. Participants were asked to complete the survey and place it in a collection box at the venue. Most participants completed the survey during the session, but some took the survey away and completed it in their own time. Envelopes were provided if people wished to return the questionnaire at a later date.

2.2 Questionnaire

The questionnaire was based on Dolan and Tsuchiya [32] and the improvements to their questions made by Abasolo and Tsuchiya [27] (outlined in this section). We modified the questionnaires for the Australian context (see Electronic Supplementary Material Online Resource 1). The questionnaire took participants approximately 5 min to complete.

Participants were asked to imagine they were helping the Health Department to choose between alternative health programs that involved a choice between efficiency and health equity. They were told that, on average in Australia, people from high-income groups live around 6 years longer than those from low-income groups (see Electronic Supplementary Material Online Resource 1 for full description). Using graphs, the participant was presented with a 6-year difference in life expectancy between high and low socioeconomic groups (84 and 78 years, respectively). It was explained that SEP is a measure of one's income, education and occupation.

Initially, participants were asked to make a choice between Program A, which increases life expectancy of both groups by 2 years, and Program B, which increases life expectancy of the low SEP group by 4 years and does not change the life expectancy of the high SEP group (thereby reducing the health inequality between the groups). They were told that the two groups were approximately of equal size and the two programs cost the same. Depending on their choice of responses, respondents were directed to follow-up questions.

If participants chose Program B, the follow-up choices have Program A remaining the same as Question 1, but Program B gives reducing levels of life expectancy gains to the low SEP group, with no changes to the life expectancy of the high SEP group, showing the efficiency equity trade-off. The expectation is that the respondent will switch to Program A at a point beyond which further sacrifices in efficiency to improve equity are no longer perceived to be worthwhile [27]. Dolan and Tsuchiya [32] used two versions of the questionnaire, with the alternate version responses decreasing in life expectancy by 1 year or half a year. In order to not dilute the number of responses, we used one version of the questionnaire that included a combination of decreases of 1 year and half years. Table 2 presents all the questionnaire response options.

It might be considered unacceptable that a public policy program should exclude a whole population subgroup from benefiting, irrespective of their SEP. If participants chose Program A in the initial choice, this may be because both population groups receive something, whilst under Program B the better-off will receive no health benefit. Following Abasolo and Tsuchiya's [27] format, the follow-up choices for those who initially choose Program A have Program A remaining the same as in Question 1, but Program B gives 1 year of increased life to the high SEP group and reduces levels of life expectancy gains to the low SEP group as per the previous follow-up choices.

Table 2 Questionnaire response options: number of added years of life associated with the health program

Program A		Program B	
High SEP group: 84 years' life expectancy	Low SEP group: 78 years' life expectancy	High SEP group: 84 years' life expectancy	Low SEP group: 78 years' life expectancy
+2 (86)	+2 (80)	0 (84)	+4 (82)
+2 (86)	+2 (80)	0 (84)	+3 (81)
+2 (86)	+2 (80)	0 (84)	+2.5 (80.5)
+2 (86)	+2 (80)	0 (84)	+2 (80)
+2 (86)	+2 (80)	0 (84)	+1.5 (79.5)
Abasolo and Tsuchiya's [27] amendment so some improvement flows to all SEP			
+2 (86)	+2 (80)	+1 (85)	+3 (81)
+2 (86)	+2 (80)	+1 (85)	+2.5 (80.5)
+2 (86)	+2 (80)	+1 (85)	+2 (80)
+2 (86)	+2 (80)	+1 (85)	+1.5 (79.5)

Numbers in parentheses indicate life expectancy achieved given the added years of life

SEP socioeconomic position

2.3 The Health-Related Social Welfare Function (HRSWF)

The data collected were used to develop an HRSWF. The SWF is taken from Dolan and Tsuchiya [32] and has a constant elasticity of substitution (CES), i.e. the concavity of the curve is constant.

$$W = \left[\alpha H_a^{-r} + \beta H_b^{-r}\right]^{-\frac{1}{r}}, H_a, H_b \qquad (1)$$

$$\alpha + \beta = 1, \quad r \geq -1, \quad r \neq 0,$$

where W is the HRSWF and H_a and H_b are the average levels of health of groups of equal size. r measures the degree of aversion to inequality and is represented by the convexity of the iso-welfare curves (or social indifference curves). The iso-welfare curves are lines showing different bundles of health between which society is indifferent.

Figure 1 depicts the health possibility frontier (HPF) and iso-welfare curves with differing levels of r. If $r = -1$, there is no aversion to inequality, represented in the iso-welfare curve by a straight line. The 'maximum' point is where health is maximised. If $r > -1$, there is aversion to inequality and a diminishing Marginal Rate of Social Substitution (MRSS) between the health of the two groups, resulting in iso-welfare curves convex to the origin (intermediate point). At the extreme, the worst-off individual is all that matters and r assumes a value of infinity and the SWF will be L-shaped. The larger the value of r, the closer one gets to the equal point, where the health of the low SEP group is the same as the health of the high SEP group. The point at which the iso-welfare curve is tangential to the HPF represents the optimal distribution of health gains across the two groups. The value of r in the baseline CES specification was obtained using the goal seek function in Microsoft Excel® (Microsoft Corporation, Redmond, WA, USA) by determining the value of r that makes W identical at two points, X and Y [32].

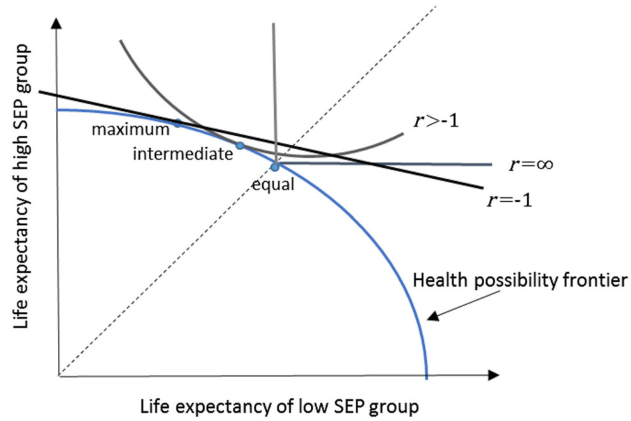

Fig. 1 Alternative iso-welfare curves [38]. *SEP* socioeconomic position

The rate at which the welfare of the groups enters the SWF is represented by the parameters α and β. For example, it could be argued that less weight be given to those who are more responsible for their poor health. In this study, as per Dolan and Tsuchiya [32], anonymity is assumed, implying that both groups are equally 'deserving' of any health gains.

Figure 2a, b illustrates the basis of the questions in the HRSWF framework. In Fig. 2a H_1 and H_2 represent the life expectancy of the high and the low SEP groups along the vertical and horizontal axes, respectively. Point I (84, 78)

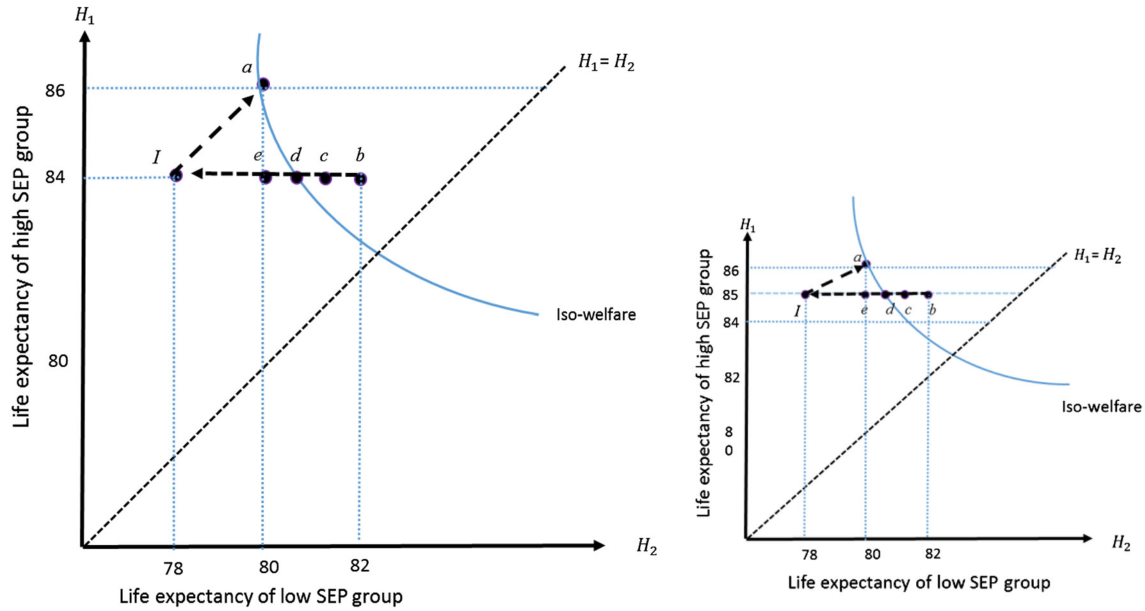

Fig. 2 The iso-welfare curve and the life expectancy questions [30]: *left* life expectancy of the high and the low SEP groups; *right* the basis of the questions in the health-related social welfare function when everyone gets something. In the figures, *a* is the outcome offered by Program A; the *horizontal broken line* represents the set of options (*b* to *I*) offered by the alternative Program B; *d* is the point at which the median respondent is indifferent between the two programs, and thus the point through which the iso-welfare curve crosses the broken line at 84 years on the high SEP group axis. H_1 life expectancy of the more advantaged group, H_2 life expectancy of the less advantaged group, *I* initial point, *SEP* socioeconomic position

represents the initial life expectancy of the two SEP groups. The first question corresponds to a choice between a move from point *I* to point *a* 'Program A' (+2, +2) versus a move from point *I* to point *b* 'Program B' (+0, +4). If the respondents prefer the latter, then the subsequent choices are between a move from *I* to point *a,* versus a move to points to the left of *b* on the horizontal line. The point at which the respondent switches from Program B to Program A indicates where the indifference curve through point *a* (+2, +2) intersects the horizontal line $I - b$. Once indifference between the programs has been established, the MRSS of the SWF can be calculated using the median values from the questionnaires. Figure 2b represents the basis of the questions in the HRSWF when everyone gets something.

The weight inferred to the less advantaged group *a* relative to group *b* is calculated from the MRSS:

$$-\frac{\mathrm{d}H_b}{\mathrm{d}H_a} = \left[\frac{H_b}{H_a}\right]^{(1+r)}. \qquad (2)$$

The CES specification is used as the baseline specification as per Dolan and Tsuchiya's study because it satisfies all the conventional requirements of a SWF: it is individualistic, additive, non-decreasing (or monotonic), strictly concave, exhibits constant relative inequality aversion (or scale independence or homotheticity), and with $\alpha = \beta$ satisfies anonymity [32].

Two alternative SWF specifications were also used: the parabolic and hyperbolic specifications. Under extreme inequality aversion, where a reduction in inequality is preferred even when it results in a loss in the health of the worse off, and therefore the monotonicity principle is violated, the CES specification cannot deal with these preferences. The hyperbolic and the parabolic specifications accommodate these preferences. They are individualistic, additive, inequality averse and symmetric. The parabolic specification satisfies constant relative inequality aversion, while the hyperbolic specification satisfies constant absolute inequality aversion [32]. The mathematical formulas for the hyperbolic and the parabolic specifications can be found in the Electronic Supplementary Material (Online Resource 2).

3 Results

Of the 131 questionnaires that were returned, three were incomplete, leaving 128 that were analysed. Table 3 presents the demographics of the sample. The sample population was largely females, tertiary educated and with Australia as their place of residence.

The first column of Table 4 presents the implied points of indifference. For the respondents who initially chose

Table 3 Participant demographics ($n = 128$)

Variable	*n* (%)
Gender	
Female	88 (69)
Age (years)	
18–34	44 (36)
35–44	26 (20)
45–54	32 (25)
≥55	24 (19)
Education level	
Trade or associate degree	4 (3)
Bachelor, Masters, professional degree	73 (57)
Doctorate	51 (40)
Country of residence	
Australia	97 (76)
New Zealand	17 (13)
Other countries (USA, UK, Europe, Canada, Africa)	12 (9)
Not stated	2 (2)

Program B but switched at some point to Program A, their point of indifference has been taken to be half-way between the last point at which they chose B and the first point at which they chose A. The 18% of respondents who chose A in the initial pairwise comparison and did not switch to B for any option were assumed to be inequality neutral (first row). For those who always chose B, we assumed that they were indifferent at the implied point presented in the last row of the table, as per Dolan and Tsuchiya's [32] method. The subsequent columns of the table show respondents' associated inequality aversion parameters, and their corresponding implied relative weights to the low SEP group, given the options in Table 2.

The last column of Table 4 presents the distribution of responses. The median responses are that 21% (whole sample) and 22% (females) are indifferent between people in the high and low SEP groups living to be 86 and 80 years, respectively (the outcome for choosing Program A), and these groups living to be 84 and 80.25 years respectively (the outcome for Program B). For males, the median response (23%) was to give equal gains in life expectancy to low and high SEP groups from the beginning.

Depending on the SWF specification (CES, hyperbolic or parabolic), the implication is that a marginal health gain to the lowest SEP group is valued 14.1–81.4 times more than a marginal health gain to the high SEP group. This is the range of the 'relative weight at initial point' of the CES, hyperbolic specification and parabolic specification. Figure 3 shows the three functions graphically.

4 Discussion

In this study, we found that the majority of people (82%) value health gains differently depending on which SEP group is receiving the health gain; a marginal health gain to

Table 4 Inequality aversion parameters, weights and results

Indifference points as inferred from response options	CES		Hyperbolic		Parabolic		Responses ($N = 28$) [*n* (%)]	Responses female ($N = 88$) [*n* (%)]	Responses male ($N = 40$) [*n* (%)]
	Inequality aversion parameter[a]	Relative weight at initial point[b]	Inequality aversion parameter[a]	Relative weight at initial point[b]	Inequality aversion parameter[a]	Relative weight at initial point[b]			
(80,86) ~ (82,84)	–1.00	1.00	0.00	1.00	0.00	1.00	23 (18)	14 (16)	*9 (23)*
(80,86) ~ (81.5,84)	4.61	1.52	5.57	1.52	0.02	1.51	11 (9)	6 (7)	5 (13)
(80,86) ~ (80.75,84)	16.64	3.69	16.25	4.02	0.05	3.87	25 (20)	18 (20)	7 (18)
(80,86) ~ (80.25,84)	*34.68*	*14.07*	*26.34*	*81.41*	*0.08*	*45.80*	*27 (21)*	*19 (22)*	8 (20)
(80,86) ~ (79.75,84)	Unspecified	Unspecified	41.36	–4.76	0.13	–4.96	6 (5)	5 (6)	1 (3)
(80,86) ~ (79.25,84)	Unspecified	Unspecified	67.38	–2.34	0.20	–2.37	15 (12)	11 (13)	4 (10)
(80,86) ~ (81.5,85)	–8.10	0.59	–7.00	0.59	0.02	0.60	0	0	0
(80,86) ~ (80.75,85)	3.65	1.41	4.62	1.41	0.01	1.40	17 (13)	11 (13)	6 (15)
(80,86) ~ (80.25,85)	20.39	4.88	18.49	5.34	0.06	5.06	2 (2)	2 (2)	0
(80,86) ~ (79.75,85)	Unspecified	Unspecified	49.00	–3.45	0.15	–3.57	0	0	0
(80,86) ~ (79.25,85)	Unspecified	Unspecified	196.74	–1.32	0.60	–1.33	2 (2)	1 (1)	0

Median respondent and corresponding inequality aversion parameter and weights in italics

CES constant elasticity of substitution

[a] Inequality aversion parameter is r for the CES and C for the hyperbolic and the parabolic functions

[b] Relative weight at initial point is the implied equality weight given to group B relative to group A at the initial point where life expectancy for groups A and B are 84 and 78 years, respectively

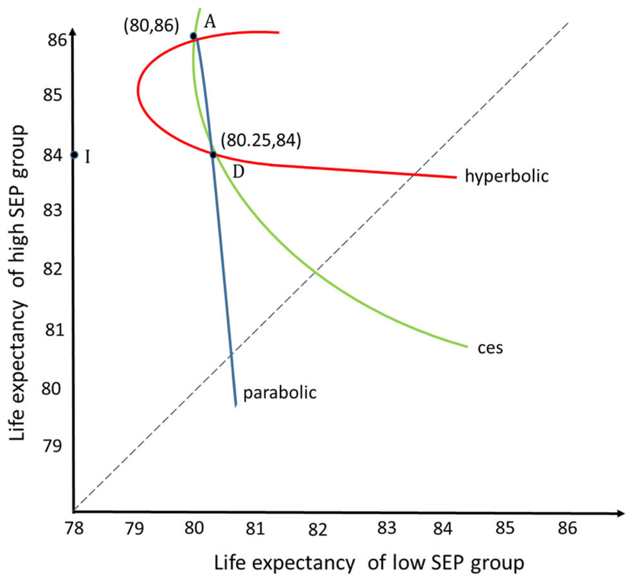

Fig. 3 Graphical depiction of the constant elasticity of substitution, parabolic and hyperbolic functions. *A* life expectancy at Program A (80, 86), *ces* constant elasticity of substitution, *D* median response with corresponding life expectancy (80.25, 84), *I* initial point (78, 84), *SEP* socioeconomic position

the low SEP group is valued more than a marginal health gain to the high SEP group. When there is a choice between a program that reduces inequalities in life expectancy, whilst possibly foregoing the opportunity to improve the health of those who are better off, or a program that offers equality of health gain to both groups, over 80% of participants chose the former option. Females were more likely than males to value health gains differently. Our results correspond to previous studies whose findings indicate that in different contexts the public may prefer a more equitable distribution of healthcare resources for those in more disadvantaged groups [20, 21, 27, 28, 30, 32–35].

The median marginal health gain to the low SEP group compared with the high SEP group, or the relative weight, was valued at between 14.1 and 81.4; these results entail both a large range and high values compared with Dolan and Tsuchiya's obtained values of between 6.8 and 9.9. As per Dolan and Tsuchiya's study [32], CES was used as the baseline specification, but very different weights were obtained using the hyperbolic and parabolic specifications, hence the wide range in values. These latter specifications were used to accommodate the situation where a reduction in inequality is preferred, even when it results in a loss in the health of the worse off, which the CES specification cannot deal with. The weights are intended to be applied to the health gains in an ICER or to the ICER threshold, and these weights are simply too large to be of practical use.

There are some possible explanations for the differences in the weights we obtained. First, we used Australian life expectancy figures, which were higher, and the difference between groups was 6 years compared with Dolan and Tsuchiya's 5 years. Second, Dolan and Tsuchiya used two rounds of questions, each on a different sample of people with different options: one that decreased by half a year each time and one that decreased by 1 year; this resulted in Dolan and Tsuchiya's [32] study offering different response options to each subgroup of the sample as well as more evenly spread weight values. We opted to do one version of the questionnaire in order to not further dilute the number of responses. Our questionnaire decreased life expectancy mostly by half a year each time. The large increase in the value of the weights from 4.02 and 81.41 using the parabolic function and from 3.87 to 45.86 using the hyperbolic function can be explained as a mathematical artefact.

The additional questions involved the option of 'everyone gets something', such that the high SEP group also gets a small health gain. These were included because it might be considered unacceptable that a population-level public policy program should exclude a whole population subgroup from benefiting. This resulted in a larger spread of responses, with 17% of the group choosing one of these options. In contrast, respondents in Dolan and Tsuchiya's [32] study were later asked if they would change their mind if given the 'everyone gets something' option and none chose to revise their answers. Giving all the benefits to the low SEP groups was not acceptable to 17% of our sample.

We used a convenience rather than a representative sample—a limitation of the study. Our sample was chosen for practicality reasons, but also because the participants worked in health-related areas and were assumed to have the ability to complete the questions independently. In Dolan and Tsuchiya's [32] study, 54% were employed and 60% had the minimum level of education. This sampling effect may be reflected in a number of ways. A larger proportion of Dolan and Tsuchiya's [32] sample chose the egalitarian option (36 vs. 20%) and this may be a consequence of the academic sample in our study. It has been suggested that an academic sample is less likely to choose the simple decision-making heuristic of 'always choose the more egalitarian option' [37]. Deliberating ethical trade-offs between improving health and reducing health inequality may be considered cognitively demanding and the difference in choices in our study may be explained by how participants understood and processed the questions. Around 19% of participants violate the monotonicity principle, the case when any increase in individual health is not considered an increase in social welfare and concern for equality dominates the concern for efficiency. This breaks away from the assumptions of a conventional SWF in economics, but in the field of health economics is not inconceivable [38].

Deriving weights based on empirical surveys of stated preferences poses several problems. There are inherent issues with this type of data, such as the framing effects, context and design of the questions. The participants may not have carefully considered judgements about complex distributive issues and could benefit from a deliberative setting. Majority opinion can potentially be morally questionable [39], and it has, therefore, been suggested that ethical analysis of empirical results also be carried out [40]. Public opinion by itself may not be appropriate to determine the specific value of weights [39].

Equity weights for SEP groups have proven to be difficult to apply in a practical way; there are no published studies that have used weights for SEP in a CEA. It has been suggested that weight data may simply be used to help inform decision makers about which equity considerations are valued the most, while allowing scope for the decision maker to decide how much weight to place on these data in particular circumstances [36].

Other methods, such as deriving weights from peoples' preferences using regression analysis should be further explored in future studies. Deriving weights for SEP using, probit models [35], for example, could result in more acceptably sized weights to use for weighting cost-effectiveness analyses.

5 Conclusions

The equity weights derived imply that a marginal health gain to a low SEP group is valued more than a marginal health gain to a high SEP group. However, the range in the relative weights obtained was too wide to be of use for the intended purpose of applying them to CEAs of policies aimed to prevent health conditions that have a social gradient in Australia. Our results provide evidence to support the idea that the public may be willing to sacrifice health gains in order to reduce differences in average life expectancy between SEP groups, and therefore that the objective of economic efficiency may not have primacy with the general public.

Author Contributions AL: conception of the work, data collection, data analysis and interpretation, drafting article; MS: data analysis; MM: critical revision of the article; AP: critical revision of the article; RC: critical revision of the article.

Compliance with Ethical Standards

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Conflicts of interest AL, MS, MM, AP and RC declare that they have no conflicts of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of Deakin University Ethics committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

Data Availability Statement All data generated or analysed during this study are included in this published article (and its Electronic Supplementary Material).

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