
Article:
Silva-Illanes, N. and Tsuchiya, A. orcid.org/0000-0003-4245-5399 (2025) Equality of opportunity and the intergenerational transmission of lifestyles: some normative implications. The Journal of Economic Inequality. ISSN: 1569-1721

https://doi.org/10.1007/s10888-025-09705-5

The Journal of Economic Inequality
https://doi.org/10.1007/s10888-025-09705-5

RESEARCH

Equality of opportunity and the intergenerational transmission of lifestyles: some normative implications

Nicolás Silva-Illanes[1,2] · **Aki Tsuchiya**[1]

Received: 7 July 2025 / Accepted: 10 July 2025

Abstract
The Equality of Opportunity framework assumes that a given distribution of outcomes is a function of factors for which the individuals should be held accountable (referred to as effort) and factors that are beyond the individuals' responsibility (referred to as circumstances). Circumstances can influence effort by shaping: i) the return to effort (interaction effect) or ii) the distribution of effort (indirect effect). The theoretical literature has mainly focused on the former. This study explores different allocation strategies to mitigate health inequalities due to the unfair indirect effects of circumstances and their alignment with principles of fair allocation. A questionnaire-experimental study is conducted, adapting these concepts to explore public attitudes toward health inequalities resulting from the intergenerational transmission of smoking habits.

Keywords Equality of opportunity · Effort · Reward principle · Empirical social choice

1 Introduction

The framework of equality of opportunity assumes that a given outcome y_i of an individual i is a function of both a vector of circumstances $\mathbf{c}_i$ and responsibility factors or efforts $\mathbf{e}_i$ (Roemer and Trannoy 2015). Circumstances are often categorized into types τ, which represent mutually exclusive combinations of circumstances. Equality of opportunity is achieved when two principles are met: compensation and reward. The compensation principle concerns reducing inequalities among individuals with different circumstances, while the reward principle ensures that differences due to effort or responsibility are respected (Bosmans and Öztürk 2021).

For simplicity, we adopt a unidimensional measure of responsibility e_i as conceptualized by Roemer (1998). Let $y(e_j, \tau_k)$ denote the outcome function of an individual associated with effort e_j and type τ_k, and let $p(e_j; \tau_k)$ represent the proportion of individuals with effort level e_j among those belonging to type τ_k. In this framework, circumstances may influence

✉ Nicolás Silva-Illanes
n.silva.illanes@sheffield.ac.uk

Aki Tsuchiya
a.tsuchiya@sheffield.ac.uk

1 University of Sheffield, Sheffield, UK

2 Universidad de Chile, Santiago, Chile

effort in two ways: through interaction effects and indirect effects. These effects can occur jointly or independently.

We define an interaction effect as the influence of circumstances on the marginal effect of effort on outcomes. This entails that the outcome function $y(e_j, \tau_k)$ cannot be additively decomposed into fractions due to circumstances and effort (Fleurbaey 2008). The theoretical literature has shown that, in such cases, certain compensation and reward axioms are incompatible (Fleurbaey 2008; Fleurbaey and Schokkaert 2009).

The indirect effect occurs when circumstances affect the distribution of effort $p(e_j; \tau_k)$, leading to unequal proportions of individuals across different effort categories depending on their circumstances (Roemer and Trannoy 2015). This paper explores different allocation strategies to mitigate health inequalities arising from the unfair indirect influence of circumstances, examines their compatibility with various principles of fair allocation and explore the support of members of the public towards these principles. Furthermore, we argue that while the indirect effect of circumstances plays a key role in Roemer's theory of equality of opportunity, most theoretical works on compensation and reward axioms primarily focus on the interaction effect and overlook the issue of an unjust distribution of effort (see, for example, Fleurbaey and Peragine 2013, Roemer and Trannoy 2016, Ferreira and Peragine 2016, Bosmans and Öztürk 2021).

Several studies have measured inequality of opportunity in health and examined the effects of both the interaction and indirect effects on these measures (see Jusot and Tubeuf 2019 for a review). When there exists an interaction effect inequality of opportunity cannot be neatly decomposed into a fraction due to circumstances and a fraction due to effort, necessitating estimators that either compromise or prioritize certain axioms over others. To account for the indirect effect of circumstances on effort, empirical analyses often distinguish between observed and accountable effort, with the latter being "cleaned" from the influence of circumstances (Roemer and Trannoy 2015). Following Schokkaert et al. (2004) and Bourguignon et al. (2007), most empirical studies formalize observable effort as a function $e = E(\tau, \epsilon)$, where ϵ denotes accountable effort, which is assumed to be equally distributed across types. Some empirical studies compare the magnitude of inequality of opportunity when responsibility is measured by e or ϵ. However, these studies do not address the normative implications of allocation strategies to reduce inequality stemming from the indirect effects of circumstances.

There are several questionnaire-experimental studies that have assessed respondents' views on responsibility regarding health shortfalls attributable to factors within or beyond individual control (see, for example, Schokkaert and Devooght 2003, Dolan and Tsuchiya 2009, Edlin et al. 2012, Le Clainche and Wittwer 2015, Robson et al. 2025).

In particular Schokkaert and Devooght (2003) and Le Clainche and Wittwer (2015) have explored the attitudes of members of the public toward inequality of opportunity in the presence of interaction and indirect effects. Both studies present respondents with scenarios involving four hypothetical individuals, where each individual's health-related expenditure is influenced by factors that may be considered either beyond or within their control. Schokkaert and Devooght (2003) also explores scenarios where individuals have different incomes. In these studies, respondents were asked to choose among various strategies to allocate a public healthcare budget among the four individuals, or to redistribute income in health- and income-related scenarios, respectively. In the presence of the interaction effect, no allocation strategy can simultaneously satisfy versions of both the compensation and reward axioms, compelling participants to prioritize or compromise when selecting among the available strategies.

The scenarios capture the indirect effect of circumstances as a perfect correlation between circumstances and effort that cannot be separated out from each other. In Schokkaert and Devooght (2003), the scenario involves one individual who works hard because she was raised

in a hardworking family, while another prioritizes leisure due to a family background with less emphasis on work. In Le Clainche and Wittwer (2015), the scenario centers on varying costs of treating anemia, influenced by disease severity (of unspecified cause) and dietary habits, which are explained by childhood family diets. Specifically, children of parents who eat red meat also consume red meat, while those whose parents do not eat red meat follow the same dietary pattern.

If one considers the influence of circumstances on effort to be unjust, these scenarios do not leave room for fair inequality, as the observed effort is entirely attributed to circumstances. The challenges we have identified in allocation strategies to compensate for the indirect effect of circumstances do not arise in such cases. Instead, we are interested in scenarios that, arguably, reflect more realistic situations, where individuals from different backgrounds achieve the same categories of effort but in unequal proportions. In these cases, there will still be fair variability in outcomes among individuals of the same type, corresponding to inequality due to accountable effort.

To illustrate this concern, let us consider health-related lifestyles like smoking, often seen as a matter of personal effort. Within the equality of opportunity framework, parents' lifestyles may be viewed as circumstances, as children cannot be held responsible for their parents' choices. Evidence suggests that children of smoking parents are more likely to pick up the habit themselves (Leonardi-Bee et al. 2011), which corresponds to an indirect effect. Nevertheless, among the children of both smoking and non-smoking parents, there will be both smokers and non-smokers. In a hypothetical scenario, some smokers with smoking parents might not have smoked had their parents been non-smokers. Here, accountable effort can be viewed as a predisposition to smoking that manifests as smoking behavior differently based on the influence of parental lifestyles. This is the working example that was used in our questionnaire-experimental study.

There are numerous principles of compensation and reward, and conducting an exhaustive analysis of each is outside the scope of this paper (for a review of these principles see Bosmans and Öztürk (2021) and Ramos and de Gaer (2016)). Instead, this study explores the implications of applying select principles of compensation and reward in scenarios marked by indirect effects of circumstances. By focusing on specific principles, we aim to offer new insights for future research in this area.

The following section delves into various principles of fair allocation and proposes different allocation strategies, examining whether these strategies align with the principles outlined. Subsequently, Section 3 presents the empirical study, which explores public attitudes towards reducing inequalities stemming from lifestyle transmission. Section 4 provides the concluding remarks.

2 Principles of fair allocation and allocation strategies

This section introduces the base scenario that will be used to illustrate the indirect impact of circumstances on effort distribution. It then outlines the key principles of fair allocation along with five allocation strategies and their alignment with these principles of fair allocation.

2.1 The base scenario

The base scenario, detailed in Table 1, is used to describe the scenario of the indirect effect of circumstances that we would like to explore. This scenario was then used in the questionnaire

Table 1 Distribution of average lifespan according to smoking habits and allocation strategies

Parental smoking habits						Allocation Strategies					
	Row	e	ϵ	$\bar{e}$	n	Base	CfNS	ChSP	S	NS	AG
Smoker Parents	1	S	1	S	50	75	75	77	77	75	76
	2	S	2	NS	50	75	81	77	77	75	76
	3	NS	3	NS	50	85	85	87	85	87	86
Non-Smoker Parents	4	S	1	S	50	75	75	75	77	75	76
	5	NS	2	NS	50	85	85	85	85	87	86
	6	NS	3	NS	50	85	85	85	85	87	86

The table shows the distribution of smokers and non-smokers and their parents' smoking habits. The base scenario shows the average lifespan of smokers and non-smokers. The different allocation strategies (CfNS, ChSP, S, NS, AG) show the average lifespan after the allocation of health gains

Abbreviations: e: observed effort, ϵ: accountable effort, $\bar{e}$: counterfactual effort if parents had been non-smokers, CfNS: counterfactual non-smokers, ChSP: children of smoking parents, S: smokers, NS: non-smokers, AG: all groups

experimental study to understand the attitudes of members of the public towards inequalities of this kind[1].

The scenario involves 150 young adults with smoking parents and 150 with non-smoking parents. The proportion of smokers is higher among children of smoking parents, with two-thirds smoking compared to one-third among children of non-smoking parents. The column "Base" describes the lifespan of individuals depending on their characteristics. We assume a ten-year difference in average lifespan between smokers and non-smokers, as indicated by literature (Cho et al. 2024).

In Table 1, observed effort e reflects each individual's realized smoking behaviour, while accountable effort ϵ reflects their inherent tendency to smoke. The distribution of accountable effort is distributed across people independently of circumstances, but its expression (as smoking behaviour) is influenced by parental smoking behaviour. Counterfactual effort $\bar{e}$ represents the effort expected if children had non-smoking parents (which is the same as observed effort for those with non-smoking parents). Therefore in this scenario, the smoking habits of children are only influenced by i) accountable effort and ii) parents' smoking habits. Then, if all children had non-smoking parents, the observed distribution of smokers and non-smokers would mirror that observed among children of non-smoking parents.

If one considers the impact of circumstances on the distribution of effort as fair, the distribution of life years lost due to smoking shown in the base scenario of Table 1 satisfies equality of opportunity, since, conditional on the same observed effort level, both groups have equal outcomes. However, if the influence of circumstances on the distribution of effort is perceived as unjust, the relevant measure of responsibility should be accountable effort. In such a case there is inequality of opportunity in Table 1, since individuals with an accountable effort level of $\epsilon = 2$ experience worse outcomes if they originate from smoking households. This disparity stems from the likelihood that these individuals, despite their current smoking status, would likely have been non-smokers had their parents adopted non-smoking lifestyles.

[1] As explained in the Methods section, respondents were faced with vignettes that capture some of the information provided in this table, rather than the table itself.

2.2 Allocation principles

This subsection examines five principles of fair allocation, which will later be analyzed in the context of specific allocation strategies. The first principle is equal treatment of equals, a fundamental concept of fair distribution (Moulin 2003). It suggests that individuals with identical relevant characteristics should be treated similarly. This raises the question of which characteristics are pertinent to the allocation problem at hand. In the context of intergenerational transmission of effort, the relevant traits include parental lifestyles and children's accountable effort.

While parental behavior, such as smoking, is observable, accountable effort is not. As such, it becomes difficult to justify discrimination based on unobservable factors, even though it may seem unfair that two individuals with the same accountable effort face different health outcomes due to their parents' choices. For instance, it would be hard to justify treating two smokers differently solely based on their accountable effort if both are children of smoking parents. Therefore, we adapt this principle to equal treatment for equal observed characteristics, advocating for equal transfers to individuals with the same combination of circumstances and observable effort. This principle is consistent with the idea that individuals with identical choices and circumstances should be treated equally.

The second principle, horizontal equity, is a principle that originates in the literature on health equity. Traditionally, it refers to providing identical medical care to individuals with the same medical needs (Wagstaff et al. 1991). Roemer has defended this principle in the context of equality of opportunity and health arguing that it is a social norm that individuals with the same medical condition should not be treated differently depending on it's type (Roemer and Trannoy 2015). In our study, we interpret horizontal equity as ensuring that individuals with similar observed effort (i.e. similar health-related behaviors) are treated equally, regardless of their parents' behavior.

The rest of the principles are taken from the literature on equality of opportunity. The third principle, ex-post compensation, focuses on reducing inequality among individuals with the same level of responsibility (Fleurbaey and Peragine 2013; Bosmans and Öztürk 2021). Here, responsibility corresponds to accountable effort. An ex-post compensation-compatible allocation would aim to minimize inequality among individuals with the same accountable effort.

The fourth principle, ex-ante compensation, aims to reduce inequalities in the opportunities available to individuals with different circumstances, where opportunities are typically measured by the average outcome within a group of individuals sharing the same circumstances (of the same type) (Bosmans and Öztürk 2021).

The fifth and final principle, liberal reward, asserts that outcome differences among individuals with identical circumstances should be respected (Fleurbaey 2008). In other words, individuals within the same group of circumstances should receive an equal transfer, allowing for differences that arise from personal effort.

2.3 Allocation strategies

Suppose it is possible to extend the lifespan of the population depicted in Table 1 by an additional two years per person, equivalent to a total gain of 300 life years across the population. The table outlines five alternative allocation strategies for distributing these health gains.

Table 2 presents the allocation strategies and their alignment with the normative principles discussed in the previous section. The first allocation strategy, CfNS (Counterfactual Non-Smokers), aims to reduce inequalities among individuals with equivalent counterfactual

Table 2 Compatibility between normative principles and allocation strategies

Strategy	Principles				
	EAC	EPC	LR	HE	ETOC
CfNS	✓	✓			
ChSP	✓		✓		✓
S	✓	✓		✓	✓
NS				✓	✓
AG			✓	✓	✓

The table shows which normative principles are compatible with each of the allocation strategies. **Abbreviations:** CfNS: counterfactual non-smokers, ChSP: children of smoking parents, S: smokers, NS: non-smokers, AG: all groups, ETOC: Equal Treatment for Equal Observed Characteristics, LR: Liberal Reward, EPC: Ex-Post Compensation, EAC: Ex-Ante Compensation, HE: Horizontal Equity

effort (those in Row 2 vs. those in Row 5 of Table 1). It allocates all health gains to the offspring of smoking parents with an accountable effort of $\epsilon = 2$ (those in Row 2 of Table 1), who would not have smoked if their parents had been non-smokers. Ex-ante compensation holds in this case since the inequality in average outcomes between children of smoking parents and children of non smoking parents is reduced. It is also compatible with ex-post compensation since it reduces inequality among individuals with the same counterfactual effort. However it violates liberal reward since it reduces inequality among individuals with the same circumstances (i.e., among children of smoking parents). It also fails to respect horizontal equity because it offers different treatment to smokers depending on their parents' behavior.

An allocation strategy aimed at reducing inequality among individuals with the same accountable effort may fail to uphold equal treatment for equal observed characteristics. For instance, under the CfNS strategy, offspring of smoking parents who also smoke receive unequal transfers: half of them (Row 2 in Table 1) gain six years of health, while the other half (Row 3 in Table 1) receive no benefits. This incompatibility between equal treatment for equal observed characteristics and ex-post compensation arises because there is no bijective relationship between observed effort and accountable effort—two different levels of accountable effort can correspond to the same level of observed effort. If each accountable effort category corresponded uniquely to a single observed effort category, it would be possible to reduce inequalities among individuals with the same accountable effort without violating equal treatment fr equal observed characteristics. To the best of our knowledge, this incompatibility has not been described before.

The second allocation strategy, ChSP (Children of Smoking Parents), allocates all health gains to the children of smoking parents. This strategy mitigates inequalities in average outcomes between types, thereby respecting ex-ante compensation. However, it increases between-type inequality among individuals with accountable efforts of $\epsilon = 1$ (those in rows 2 and 5 of Table 1) and $\epsilon = 3$ (those in Rows 3 and 6 of Table 1), contradicting ex-post compensation. Additionally, it respects liberal reward as it offers equal treatment to individuals of the same type. However, it provides different treatment to smokers depending on their parents' behavior, thus violating horizontal equity. It respects equal treatment for equal observed characteristics since individuals with the same observable characteristics receive the same transfers

The third strategy, S (Smokers), allocates all health benefits to smokers, reducing inequality in average outcomes between types and therefore respecting ex-ante compensation.

Moreover, it respects ex-post compensation by addressing inequalities between individuals with accountable effort $\epsilon = 2$. However, it compromises liberal reward by reducing inequality within types. Since this strategy focuses on reducing inequality due to effort irrespective of the information on circumstances or accountable effort, it ensures equal treatment for smokers regardless of their circumstances (i.e. parental behavior), aligning with horizontal equity and it also respects equal treatment for equal observed characteristics since there is no differential treatment among individuals with respect to their accountable effort (i.e. propensity to smoke). Note that this strategy aligns with Roemer's favourite compensation tool which consists of prioritizing the worst-off at each accountable effort category (Roemer 1998).

Additionally, Table 1 presents two strategies that do not address inequality of opportunity. The NS (Non-Smokers) strategy prioritizes non-smokers, while the AG (All Groups) strategy distributes the same health gain to all groups. The NS allocation violates ex-ante compensation since it increases inequalities between types and does not satisfy ex-post compensation, as it heightens inequalities among individuals with the same accountable effort. Liberal reward is also violated since it increases inequalities within types. However, it respects horizontal equity because there is no differential treatment among individuals with the same lifestyles, and it upholds equal treatment for equal observed characteristics since only observable characteristics are considered.

The AG allocation does not respect ex-ante or ex-post compensation since it does not alter inequalities between groups. However, it respects horizontal equity as individuals with the same lifestyles receive equal benefits. Liberal reward holds under this strategy because inequalities within types are preserved, and equal treatment for equal observed characteristics is satisfied as individuals with the same observed characteristics receive the same benefits.

As shown in Table 2, among the strategies that reduce inequality of opportunity, only ChSP and S respect equal treatment for equal observed characteristics. However, these strategies differ in significant ways. Although ChSP appears to be a natural approach to addressing the intergenerational transmission of lifestyles, it fails to respect ex-post compensation since it increases inequality among individuals with the same accountable effort. Furthermore, while ChSP respect liberal reward by not addressing inequality within types, prioritizing smokers (S) goes against this principle. Additionally, ChSP violates horizontal equity by introducing inequality between individuals with the same lifestyles depending on their parents' behaviour.

3 Empirical study

Addressing inequalities due to the intergenerational transmission of effort reveals inherent tensions between different fairness principles. We aim to explore the preferences of the public regarding these allocation strategies to understand which principles they prioritize. Specifically, the research seeks to understand whether among those inclined to reduce such inequalities, there is a preference for an allocation strategy that adheres to the principle of liberal reward (ChSP strategy) or prioritizes ex-post compensation and horizontal equity (S strategy). Research Ethics was obtained at The University of Sheffield.

3.1 Sampling strategy

The study consisted of two phases: a pilot phase and the main study, both conducted in Chile. During the pilot phase, 15 participants aged 30 and older, with secondary education or less,

were interviewed online for approximately one hour. This phase aimed to refine the survey questions and structure. Participants were recruited through social media. The main study recruited adult participants from an existing panel registered with Prolific. There were no sampling quotas for this study. Participants needed to be Chilean residents and at least 18 years of age.

3.2 Survey design

An online survey was conducted using Qualtrics software. The survey has three sections. The first section introduces the study and presents questions about personal and family smoking behaviors, beliefs about smoking determinants, and views on the fairness of intergenerational transmission of smoking habits. The second section introduces the questionnaire-experimental study and provides training questions to help participants better understand the questions of the main task. The third part consists of the main task in which respondents were asked to recommend between several allocation strategies.

3.2.1 First section

In this section, participants were introduced to the survey and informed that evidence suggests children of smoking parents are more likely to adopt smoking behaviors compared to children of non-smoking parents. They were also briefed that they would need to choose between different policy scenarios.

Before participants engaged in the main task, they were presented with questions regarding personal and family smoking behaviors, beliefs about the determinants of smoking, and views on the fairness of intergenerational smoking habit transmission. These questions served a dual purpose. First, they aimed to prompt respondents to reflect on the survey's topic before considering the allocation strategies. Second, this set of questions helped us assess the consistency of respondents' choices.

Of interest was to explore whether individuals with personal experience of adult smoking during childhood or those who smoke in front of their children would show a greater willingness to compensate the children of smoking parents. Furthermore, we would like to explore whether the compensation for smokers who are children of smoking parents varies depending on respondents' beliefs about the influence of parental behavior on children's actions and the perception that smokers bear less responsibility for their choices when influenced by their parents' smoking habits.

Respondents were asked whether they smoke and whether during their childhood, their parents, legal guardians, or other adults living with them smoked, and if these adults regularly smoked around them in various settings: i) open spaces (such as parks or gardens), ii) closed spaces (such as inside the house) during social events, iii) closed areas even when there were no social events, and iv) inside a car or on public transport. Participants with children were also questioned about their own smoking habits and those of other adults living with them and their children, using the same set of settings.

Additionally, the survey inquired about respondents' beliefs regarding the influence of several factors on the likelihood of smoking. Participants were asked to rate the level of influence (none, little, some, moderate, or a lot) that each of the following factors has on the decision to smoke: i) individual preferences on smoking, ii) parents' smoking habits, iii) friends' smoking habits, iv) marketing and social media, v) stress and mental health issues, and vi) lack of understanding of smoking-related health risks.

Finally, respondents were asked two questions about their normative beliefs regarding smoking. First they were asked which of the following statements best reflects their personal

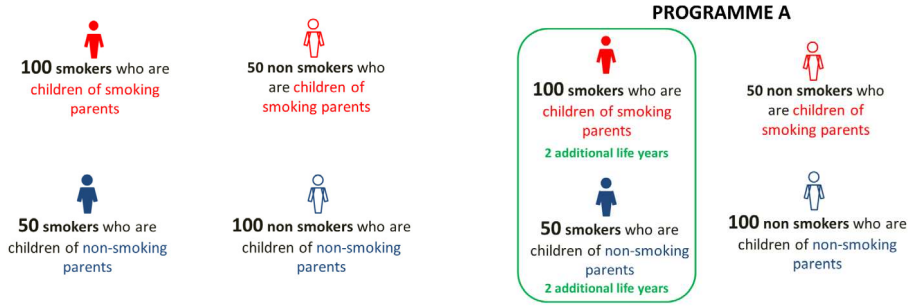
values: i) *Adults who are children of smoking parents have less responsibility for their decision to smoke compared to children of non-smoking parents, as they are influenced by their parents' roles*; ii) *Adults are responsible for their decision to smoke, regardless of their parents' habits*; or iii) *Neither of these statements adequately represent my thoughts*. Second, Participants were asked to imagine two groups of people: one group smokes, while the other does not. Aside from this difference, individuals are identical in all other characteristics (age, gender, education level, etc.). The smokers, on average, will live 10 years less due to the effects of smoking. They were then asked to choose the statement that best reflects their view: i) *It is not unfair that the group of smokers lives 10 years less on average, as they chose to smoke*; ii) *Even though the smokers chose to smoke, it is unfair that they live 10 years less on average*; iii) *Neither of these statements adequately represent my thoughts*.

3.2.2 Second section

This section introduces the main task to the respondents. Participants were asked to imagine four groups of young people who are identical in age, income, occupation, and other characteristics. The only difference between the groups was their own smoking behaviors and their parents' smoking habits. The four groups were: 1. Smokers, who are children of smoking parents, 2. Non-smokers, who are children of smoking parents, 3. Smokers, who are children of non-smoking parents and 4. Non-smokers, who are children of non-smoking parents.

Visual aids (vignettes) were used to illustrate the distribution of smokers and non-smokers: among the children of smoking parents, 100 were smokers and 50 were non-smokers, whereas among the children of non-smoking parents, 50 were smokers and 100 were non-smokers. Panel A on Fig. 1 shows how the information was shown to the participants.

During the pilot, some respondents encountered difficulties in accurately identifying which groups were prioritized under each allocation strategy. To address this, participants were presented with several vignettes where a specific group was highlighted and were asked to correctly identify the group (e.g., smokers, children of smoking parents, etc.). Respondents were required to provide correct answers before proceeding but were allowed unlimited attempts.



Panel A: Base scenario shown to the respondents.

Panel B: "S" allocation strategy.

Original in Spanish.

Fig. 1 An example of the vignettes shown to the respondents

3.2.3 Third section

In the main task, respondents were informed about four programs designed to extend people's lifespan while maintaining good health-related quality of life (e.g., healthy life years). They were asked to recommend one program in several pairwise comparisons. The programs corresponded to the four allocation strategies aligned with ETOC, as shown in Table 1 (S, ChSP, NS, and AG).

The survey aims to identify the preferred allocation strategy for each respondent. Results from the pilot study indicated that most participants felt overwhelmed by the simultaneous comparison of four strategies. To address this, a sequential approach was adopted, where participants were asked to indicate which of two strategies they thought was fairer, along with a third option for indifference or incomplete preferences ("Both programs are equally good, or I do not know how to answer this question."). Instead of the labels used in Table 1, the strategies presented to respondents were designated as A (S), B (ChSP), C (NS), and D (AG).

According to this approach, the most preferred strategy for each participant is the one that is favored over each of the three alternative strategies in subsequent pairwise comparisons, assuming adherence to the principle of expansion consistency (Sen 1971). This requires that respondents' preferences respect acyclicity, while allowing for the violation of transitivity (see the example later in this section). The sequence of pairwise comparisons, referred to as a 'choice path' depended on the sequence of responses to each question (the 'choice pattern') and was designed to minimize the number of scenarios presented to each participant. Depending on the choice path, it would take a respondent between 3 and 6 choice exercises to identify their most preferred strategy. The questionnaire concluded when one strategy consistently prevailed or when a single most preferred alternative could not be determined due to respondents' cyclic choices or indifference between two mutually exclusive pairs of alternatives.

Randomization was employed to mitigate bias. The time it takes for a respondent to identify their most preferred strategy can depend significantly on the order in which the strategies are presented. For example, if the survey begins by comparing alternatives A and B, a respondent who prefers allocation D needs to go through more tasks to express their preferences, as they will encounter a choice path with a greater number of choices before their preferences can be fully elicited. To address this issue, respondents were randomly assigned to one of two survey schemes: in the first arm, the alternatives A, B, C and D corresponded to S, ChSP, NS, AG while, in the second arm, they corresponded to NS, AG, S and ChSP, respectively. There were in total 17 alternative choice paths and 73 possible choice patterns in each arm. From these choice patterns, only 15 correspond to one of the four allocations strategies. The full choice architecture is presented in the Supplementary Information.

Table 3 presents four pairwise choice paths. The first column displays the pairwise choices encountered in each path. The second column provides an example of a corresponding choice pattern. The third column indicates the number of choices presented to the respondent along that path to complete the survey. The fourth column assesses whether a most preferred strategy could be identified based on the choice pattern.

In the first row, strategy A is identified as the most preferred option because it is chosen over B, C, and D. It took three choices to reach this conclusion. The second row presents a different pattern where strategy D emerges as the most preferred, but this required six choices. It's important to note that the choice path varies for each respondent, as it adapts based on their specific answers. In this case, after the third choice, it becomes evident that A, B, and

Table 3 An example of the survey choice architecture

Pairwise Choice Order (Choice Path)	Choice Pattern	Number of Choices Until Completion	Best Strategy Identified?
AB, AC, AD	$A \succ B, A \succ C, A \succ D$	3	Yes, A
AB, AC, CB, CD, DA, DB	$A \succ B, C \succ A, B \succ C, D \succ C, D \succ A, D \succ B$	6	Yes, D
AB, AC, AD, DB	$A \succ B, A \succ C, D \succ A, B \succ D$	4	No
AB, CD	$A \sim B, C \sim D$	2	No

The table shows four of the 73 choice patterns. The full list of patterns is described in the Supplementary Information
Notation: $\succ$: strict preference, $\sim$: indifferent or incomplete preference

C are no longer viable as the most preferred strategies. Therefore the survey proceeds to compare D against the other strategies. Note that transitivity is violated in this choice pattern. For example, if A is preferred to B and C is preferred to A, then by transitivity, C should also be preferred to B. Therefore, if we assume transitivity holds, the comparisons between C and B, could have been skipped.

The third row depicts a scenario where the most preferred strategy cannot be identified due to potential violations of acyclicity. In this case, strategy A cannot be the most preferred option since D is preferred over A. Additionally, neither strategy B nor C can be the best choice, as A is preferred over both B and C. The last choice indicates that B is preferred over D. The survey concludes here because if B were the most preferred strategy, the condition $B \succ A$ should hold, which contradicts acyclicity.

Finally, the last row reveals that the choice pattern does not allow for the identification of the most preferred strategy. Since the respondent expresses indifference (or indicates uncertainty) between A and B, neither can be considered the most preferred strategies. Consequently, the choice path shifts to compare C and D, the two strategies that could potentially be identified as the most preferred. However, as the respondent also expresses indifference (or uncertainty) between C and D, neither of these alternatives can be deemed the most preferred, and the survey concludes at this point.

3.3 Data analysis

In addition to analyzing the distribution of the most preferred strategies identified by respondents, we conducted three additional analyses. First, we employed a probit model to evaluate whether the probability of failing to identify a preferred strategy could be explained by respondent characteristics, specifically sex, age, and education.

Second, two logit models were used to understand the normative positions of respondents regarding i) whether smokers has less responsibility for their choices if they are influenced by their parents' smoking habits (Responsibility ChSP), and ii) if it is just that smokers live 10 years less on average than non-smokers due to smoking-related health problems (Just loss). The explanatory variables included in the model were: if respondents where current or former smokers (Smoke) and whether respondents' parents smoked during their childhood (Parents smoke), whether respondents have children (Children). The model also included several variables capturing respondents' beliefs about the influences on smoking decisions of individual preferences on smoking (Preferences), friends, marketing and social media

(Marketing), parents' smoking habits (Parents), stress and mental health (Mental), and a lack of understanding regarding the negative effects of smoking (Ignorance). For this set of questions the answers were dichotomized into categories of influence (no influence, little influence, some influence versus moderate influence or a lot of influence).

Third, we implemented a multinomial logit model to understand if the selection of the most preferred strategy by the respondents could be explained by the normative ideas related to the equality of opportunity framework. In this case, the allocation strategy prioritized by each respondents was regressed against the set of variables described earlier: Smoke, Parents smoke, Children, Preferences, Marketing, Parents, Ignorance, Responsibility ChSP and Just loss. The effect of these variables on the likelihood of choosing each allocation strategy is the reported as the relative risk ratio (RRR) estimators from the multinomial logistic model, using the "all groups" (AG) strategy as the reference category. This strategy was chosen as the reference for comparison since it is the most preferred one by the respondents and it is also normatively 'neutral' since it does not prioritize any group in particular.

The RRR can be interpreted as the relative likelihood of choosing a given strategy (ChNSP, S, or NS) over the reference category (AG) for a particular category of the independent variable, compared to the chosen reference category of that independent variable, holding all other variables constant. Specifically, a RRR greater than 1 indicates that individuals in the given category of the independent variable are more likely to choose that allocation strategy relative to AG, compared to individuals in the reference category of the independent variable. Conversely, a RRR less than 1 suggests a lower likelihood of choosing that strategy relative to AG. A RRR close to 1 implies little difference in the likelihood of choosing that strategy between the two categories of the independent variable.

3.4 Results

3.4.1 Descriptive statistics

A total of 425 people completed the survey. The majority of respondents were young, male, and students. According to the descriptive statistics shown in Table 4, most respondents were non-smokers (63%); however, a significant proportion had smoking parents (63%) or lived with a smoking adult during childhood (72%).

Responses regarding the drivers of smoking were dichotomized into low influence (answer categories: none, little, some influence) and high influence (answer categories: moderate, a lot). Among the listed factors, respondents identified friends, personal preferences, and mental health as the most influential drivers of smoking. Conversely, only a small proportion considered marketing, social media, or a lack of awareness about smoking's health consequences to be significant factors. The sample was divided in their views on the influence of parental smoking, with 57% considering it a relevant factor.

A minority of respondents believed that children of smoking parents were less responsible for their smoking behavior compared to children of non-smoking parents (15%) or that the 10-year lifespan gap between smokers and non-smokers was unjust (14%). The logit models analyzing the factors influencing responses to these normative questions are presented in the Supplementary Information. Results indicate that respondents who perceive parental smoking habits as a strong influence on an individual's decision to smoke are more likely to attribute less responsibility to children of smoking parents (see Table S5). Additionally, compared to respondents without smoking parents, those with smoking parents are more likely to view the

Table 4 Descriptive statistics

Variable	Category	Frequency	Proportion
Age	Min	18	
	Max	68	
	Mean	29.21	
Sex	Male	284	0.66
	Female	139	0.33
	Prefer not to say	4	0.01
Parents smoke	No	159	0.37
	Yes	268	0.63
Children	No	375	0.88
	Yes	52	0.12
Smoke	No	159	0.37
	Yes	159	0.37
Preferences	Low influence	107	0.25
	High influence	320	0.75
Parents	Low influence	183	0.43
	High influence	244	0.57
Friends	Low influence	70	0.16
	High influence	357	0.84
Mental health	Low influence	114	0.27
	High influence	313	0.73
Marketing	Low influence	308	0.72
	High influence	119	0.28
Ignorance	Low influence	271	0.64
	High influence	156	0.36
Responsibility ChSP	Same	337	0.79
	Less	64	0.15
	Skip	26	0.06
Just loss	Just	267	0.62
	Unjust	58	0.14
	Skip	102	0.24

10-year lifespan gap between smokers and non-smokers as unjust (see Table S6). No other factors were found to be statistically significant in either model.

3.4.2 Main task

Among all the respondents who completed the survey task, 22% provided preferences that did not allow the identification of a most preferred strategy according to expansion consistency. Within this group, 1.6% reported being either indifferent or unable to choose between two mutually exclusive options, while 20.4% of respondents displayed choice patterns that violated acyclicity. Thus, the remaining 78% were distributed across some of the choice patterns that correspond to one of the four allocation strategies.

In the Supplementary Information, we present the results of the probit model, which was used to examine whether adherence to the survey's decision rules was influenced by sex, education, or age. This model assessed the influence of these factors on the probability of identifying a preferred strategy versus failing due to acyclicity (this excludes the 7.5% who reported being either indifferent or unable to choose between two mutually exclusive options), yet none of these covariates showed a statistically significant effect.

The main results of the analysis sample (n=333) show that majority of respondents (56%) selected to allocate the health benefits evenly between the four groups (strategy AG), which does not reduce inequalities stemming from the indirect effects of circumstances (Table 5). Notably, the next most preferred strategy was to prioritize non-smokers (strategy NS), which actually increases inequalities due to circumstances. Between the two strategies that are consistent with reducing inequalities (ChSP and S), prioritizing smokers was more than twice as popular as prioritizing children of smoking parents. This suggests a preference for strategies aligning with horizontal equity and ex-post compensation, even if contradicting liberal reward. The results were consistent across the two study arms, suggesting that respondents' choices were not strongly influenced by the order in which choice paths were presented across the two arms (see Supplementary Information).

3.4.3 Further analysis

Table 6 presents the RRR estimators from the multinomial logistic model, using the "all groups" (AG) strategy as the reference category. Few of the explored variables had a statistically significant effect on the choice of allocation strategies.

Compared to those with non-smoking parents, the respondents with smoking parents were less likely to prioritize smokers over all groups. In contrast to those who perceived personal preferences as a weak influence on smoking behaviour, those who perceived personal preferences as a strong influence were less likely to prioritize non-smokers and more likely to prioritize the children of smoking parents over all groups. Additionally, compared to those who believed that mental health and stress has a weak influence in the decision to smoke,the respondents who believed mental health had a strong influence were more likely to allocate health benefits to all groups rather than exclusively to non-smokers and were also more likely to prioritize the children of smoking parents over all groups.

Regarding the effect of normative beliefs, respondents who considered smokers to be less responsible for their behavior if they had smoking parents—compared to those with non-smoking parents—were more likely to prioritize smokers over all groups. Compared to respondents who viewed the average 10-year lifespan gap experienced by smokers as just,

Table 5 Distribution of best strategies

Category	Frequency	Proportion	Lower CI	Upper CI
AG	188	0.56	0.51	0.62
ChSP	21	0.06	0.01	0.12
NS	73	0.22	0.17	0.28
S	51	0.15	0.10	0.21
Analysis sample	333	1.00		

The table shows the distribution of best allocation strategies selected by respondents. Simultaneous confidence intervals are shown in the table. **Abbreviations:** AG: all groups, ChSP: children of smoking parents, NS: Non-smokers, S: smokers, CI: confidence interval

Table 6 Regression results: relative risk ratios

	Allocation strategy:		
	ChSP	NS	S
Constant	0.28 (0.01, 8.81)	1.23 (0.22, 7.06)	0.68 (0.09, 5.06)
Age	0.95 (0.87, 1.03)	1.02 (0.97, 1.06)	0.99 (0.94, 1.05)
Sex: Male	0.58 (0.19, 1.79)	1.19 (0.64, 2.24)	1.01 (0.51, 2.02)
Parents smoke: Yes	1.07 (0.38, 3.05)	0.82 (0.45, 1.51)	0.46 (0.24, 0.9)**
Children: Yes	4.12 (0.83, 20.44)	1.77 (0.65, 4.83)	1.68 (0.5, 5.62)
Smoke: Yes	1.52 (0.55, 4.25)	0.86 (0.46, 1.61)	0.56 (0.27, 1.16)
Preferences: High influence	0.26 (0.09, 0.82)**	0.39 (0.2, 0.78)**	0.82 (0.37, 1.84)
Parents: High influence	1.13 (0.38, 3.36)	0.88 (0.47, 1.63)	1.01 (0.49, 2.06)
Friends: High influence	0.5 (0.14, 1.86)	1.11 (0.48, 2.55)	0.62 (0.26, 1.48)
Mental health: High influence	8.3 (1.01, 67.95)**	0.52 (0.27, 1)	0.86 (0.4, 1.83)
Ignorance: High influence	0.67 (0.23, 1.93)	0.7 (0.37, 1.3)	0.97 (0.5, 1.9)
Marketing: High influence	0.93 (0.29, 2.96)	0.84 (0.42, 1.7)	1.68 (0.81, 3.5)
Responsibility ChSP: Less	3.14 (0.88, 11.21)	1.56 (0.63, 3.84)	2.68 (1.1, 6.55)**
Responsibility ChSP: Neither	1.19 (0.12, 11.6)	1.97 (0.59, 6.63)	1.66 (0.45, 6.11)
Just loss: Unjust	0.8 (0.24, 2.69)	0.34 (0.16, 0.73)**	1.5 (0.71, 3.17)
Just loss: Neither	0.72 (0.14, 3.67)	0.24 (0.08, 0.74)**	1.6 (0.66, 3.9)
Note:	**p<0.05		

The table shows the results of the multinomial logit model. Each column of the table reports the RRR taking as the reference category the equall allocation among groups (AG strategy). Confidence intervals are shown in brackets. To stabilize the results of the sex covariate two observations with sex corresponding to "prefer not to say" were dropped from the analysis. **Abbreviations:** RRR, relative risk ratio, ChSP: children of smoking parents, NS: Non-smokers, S: smokers

those who perceived it as unjust or who did not find an answer that aligned with their views, were less likely to prioritize non-smokers over all groups.

4 Discussion

While empirical studies on equality of opportunity often assume that both the interaction and indirect effects of circumstances have illegitimate effects, the theoretical literature has predominantly focused on the former, neglecting discussions on interpreting equality of opportunity axioms based on the legitimacy of unequal effort distribution across different groups.

This paper highlights that, in cases where the indirect effect of circumstance are deemed unfair, an ex-post compensation approach aimed to reduce inequalities among individuals with equal accountable effort may not be compatible with the equal treatment of observed characteristics and with horizontal equity. From the reviewed allocation strategies, prioritizing smokers is the only strategy allowing to reduce inequality of opportunity while respecting these principles. As it was mentioned in Section 2.3, prioritizing smokers coincides with Roemer's preferred compensation strategy which aims to maximize the outcomes of the worst-off at each level of accountable effort.

It is important to consider the assumptions made in this study regarding the correlation between circumstances and observed effort. In the base scenario examined in this paper, there

is no perfect correlation between circumstances and observed effort, unlike in the studies by Schokkaert and Devooght (2003) and Le Clainche and Wittwer (2015). A perfect correlation here would imply that all smokers are children of smoking parents, and all non-smokers are children of non-smoking parents. In such a case, compensating the children of smoking parents would be possible without violating equal treatment of observed characteristics or horizontal equity. However, most real-world scenarios are likely closer to cases where this perfect correlation does not hold.

The results suggest that only a minority of respondents believe smokers bear less responsibility for their decision to smoke when they are children of smoking parents *vis-à-vis* children of non-smoking parents. Within the equality of opportunity framework, this implies that the majority of respondents view the intergenerational transmission of effort in smoking behavior as legitimate.

Overall, 21% of respondents choose a strategy that will reduce inequality of opportunity due to the inter-generational transmission of smoking habits (i.e. prioritizing smokers or the children of smoking parents). In a study carried out in Chile using a similar design, it was found that when respondents were asked to allocate life years gained between two groups differing only in smoking status—without any information on parental smoking status—36% of respondents allocated life years equally between smokers and non-smokers, 31% favored non-smokers, and 34% prioritized smokers (Silva-Illanes and Tsuchiya 2023). Comparing these findings with the current study, we observe that fewer respondents were willing to prioritize smokers, even when informed that most smokers were influenced by their parents' smoking habits and a higher proportion choose an equal allocation. This supports the finding that respondents in the current sample are generally reluctant to compensate for the indirect effects of parents' smoking habits.

When it comes to selecting compensation strategies to address inequalities based on indirect circumstances, there is a notable preference for prioritizing smokers than prioritizing the children of smoking parents. If we were to interpret these results in line with the equality of opportunity framework we would conclude that members of the public prefer approaches aligned with horizontal equity despite deviating from liberal reward.

However, a key limitation of our study design—and more broadly, of questionnaire-based experimental studies of this kind—is that we cannot assert that respondents selected their preferred allocation strategy after deliberate reflection on the principles of equality of opportunity. Nevertheless, the introductory questions in the survey may have facilitated this process. By presenting these questions at the beginning, respondents were encouraged to consider issues related to smokers' responsibility and the fairness of intergenerational transmission of smoking habits. Additionally, these questions provided insight into some of the factors respondents may have considered when choosing between allocation strategies.

In this regard, the results of the multinomial logistic model provide some support for the idea that respondents consider normative principles of equality of opportunity. Specifically, respondents who believed that children of smoking parents were less responsible for their smoking choices than children of non-smoking parents were more willing to prioritize smokers but not necessarily more inclined to prioritize the children of smoking parents over an equal distribution of benefits across all groups. Similarly, the greater support for prioritizing children of smoking parents—and the lower support for prioritizing non-smokers—among respondents who viewed mental health as a major influence on smoking behavior may reflect a perception of intergenerational transmission of mental stressors that increase the likelihood of smoking.

Moreover, normative principles other than the equality of opportunity framework could also explain some of the results. The study uncovers a prevailing inclination among members of the public to either perpetuate or exacerbate lifestyle-related inequalities, despite acknowledging the transmission of lifestyles across generations. The inclination to exacerbating inequalities due to smoking (i.e. prioritizing non-smokers) departs from the equality of opportunity framework. This strategy, which has been defined as "countercompensation" by Schokkaert and Devooght (2003), strategy has been described previously in several questionnare-experimental studies (Dolan and Tsuchiya 2009; Schokkaert and Devooght 2003; Silva-Illanes and Tsuchiya 2023; Robson et al. 2025; Schokkaert and Devooght 2003). Prioritizing non-smokers could be linked to a ethics of virtue where there is a duty to behave in certain way or otherwise be punished.

The respondent being the child of a smoker also influences allocation strategies. Respondents with smoking parents are more likely to perceive the lifespan gap between smokers and non-smokers as unjust, yet they are less willing to prioritize smokers. At first glance, this may seem contradictory. However, these findings reveal a more complex relationship. Individuals who view the lifespan gap due to smoking as unjust are generally less inclined to widen inequalities by prioritizing non-smokers. Among those who consider this health disparity unfair, only 6% of respondents with smoking parents choose to prioritize non-smokers, compared to 17% of those with non-smoking parents (see Table S7 in the Supplementary Information). Similarly, a higher proportion of respondents with smoking parents prioritize the children of smokers (6%), whereas none of the respondents with non-smoking parents do. Furthermore, among those who perceive the inequality as unjust, respondents with smoking parents are more likely to favor an equal allocation strategy over prioritizing smokers.

Several limitations should be noted. First, the sample was recruited non-probabilistically and was relatively small, which may limit the generalizability of the findings. Second, we relied on expansion consistency to infer preferences. While we attempted to have respondents choose among four alternative strategies during the pilot phase, this proved challenging, as respondents struggled with the complexity of evaluating multiple options simultaneously. Third, as it was mentioned, we cannot measure to what extent respondents may have used alternative normative frameworks besides equality of opportunity when choosing between allocation strategies. Additional questions could have been included in the survey to address this or alternative qualitative complementary methods such as Fairness Dialogues (Asada et al. 2022) could de used to further explore the normative values of respondents .

Despite these limitations, this study offers novel evidence regarding the normative principles applicable when aiming to reduce inequality arising from an unequal distribution of effort, as well as insights into the attitudes of the general public towards such inequalities.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10888-025-09705-5.

Acknowledgements We would like to thank Kristof Bosmans, Erik Schokkaert, Alain Trannoy, and Gurleen Popli for their valuable comments on an earlier version of this paper. We are also grateful to two anonymous referees for their insightful suggestions, which helped us improve the manuscript.

Author Contributions N.SI: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - Original draft, Reviewing and Editing, Project administration. A.T: Conceptualization, Methodology, Investigation, Writing - Original draft, Reviewing and Editing.

Funding This work was supported by the Wellcome Trust [108903/B/15/Z].

Data Availability The datasets used in the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests The authors declare no competing interests.

References

Asada, Y., Brown, M., McNally, M., Murphy, A., Urquhart, R., Warner, G.: Personal responsibility for health: Exploring together with lay persons. Public Health Ethics **15**(2), 160–174 (2022). https://doi.org/10.1093/phe/phac009

Bosmans, K., Öztürk, Z.E.: Measurement of inequality of opportunity: A normative approach. J. Econ. Inequal. **19**(2), 213–237 (2021). https://doi.org/10.1007/s10888-020-09468-1

Bourguignon, F., Ferreira, F.H.G., Menéndez, M.: Inequality of opportunity in brazil. Rev. Income Wealth **53**, 585–618 (2007). https://doi.org/10.1111/j.1475-4991.2007.00247.x

Cho, E.R., Brill, I.K., Gram, I.T., Brown, P.E., Jha, P.: Smoking cessation and short- and longer-term mortality. NEJM Evid **3**(3), EVIDoa2300272, (2024). https://doi.org/10.1056/EVIDoa2300272. (Epub 2024 Feb 8)

Dolan, P., Tsuchiya, A.: The social welfare function and individual responsibility: Some theoretical issues and empirical evidence. J. Health Econ. **28**(1), 210–220 (2009). https://doi.org/10.1016/j.jhealeco.2008.10.003 Retrieved from https://www.sciencedirect.com/science/article/pii/S0167629608001379

Edlin, R., Tsuchiya, A., Dolan, P.: Public preferences for responsibility versus public preferences for reducing inequalities. Health Econ. **21**(12), 1416–1426 (2012). https://doi.org/10.1002/hec.1799

Ferreira, F.H.G., Peragine, V.: Individual Responsibility and Equality of Opportunity. In: Adler, M.D., Fleurbaey, M. (eds.) vol. 1. Oxford University Press (2016)

Fleurbaey, M.: Fairness, Responsibility, and Welfare. Oxford University Press (2008)

Fleurbaey, M., Peragine, V.: Ex Ante versus Ex Post Equality of Opportunity. Economica **80**(317), 118–130 (2013). https://doi.org/10.1111/j.1468-0335.2012.00941.x

Fleurbaey, M., Schokkaert, E.: Unfair inequalities in health and health care. J. Health Econ. **28**(1), 73–90 (2009). https://doi.org/10.1016/j.jhealeco.2008.07.016 Retrieved from https://doi.org/10.1016/j.jhealeco.2008.07.016

Jusot, F., Tubeuf, S.: Equality of opportunity in health and healthcare. Oxford University Press (2019). Retrieved from https://oxfordre.com/economics/view/10.1093/acrefore/9780190625979.001.0001/acrefore-9780190625979-e-3

Le Clainche, C., Wittwer, J.: Responsibility-Sensitive Fairness in Health Financing: Judgments in Four European Countries. Health Econ. **24**(4), 470–480 (2015). https://doi.org/10.1002/hec.3038 Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/24577735http://doi.wiley.com/10.1002/hec.3038

Leonardi-Bee, J., Jere, M.L., Britton, J.: Exposure to parental and sibling smoking and the risk of smoking uptake in childhood and adolescence: a systematic review and meta-analysis. Thorax **66**(10), 847–855 (2011). https://doi.org/10.1136/thx.2010.153379

Moulin, H.: Fair division and collective welfare. MIT Press (2003)

Ramos, X., de Gaer, D.V.: Approaches to inequality of opportunity: Principles, measures and evidence. J. Econ. Surv. **30**(5), 855–883 (2016). https://doi.org/10.1111/joes.12121

Robson, M., O'Donnell, O., & Van Ourti, T.: Responsibility-sensitive welfare weights for health. J. Health Econ. **102**, 103018. (2025). https://doi.org/10.1016/j.jhealeco.2025.103018

Roemer, J.E.: Equality of opportunity. Harvard University Press (1998)

Roemer, J.E., Trannoy, A.: Equality of Opportunity. In: Atkinson, A.B., Bourguignon, F. (ed.) Handbook of income distribution, vol 2, pp. 217–300. Oxford, Amsterdam: North-Holland (2015)
Roemer, J.E., Trannoy, A.: Equality of Opportunity: Theory and Measurement. J. Econ. Literat. **54**(4), 1288–1332 (2016). https://doi.org/10.1257/jel.20151206
Schokkaert, E., Devooght, K.: Responsibility-sensitive fair compensation in different cultures. Social Choice and Welfare **21**(2), 207–242 (2003). https://doi.org/10.1007/s00355-003-0257-3 Retrieved from http://link.springer.com/10.1007/s00355-003-0257-3
Schokkaert, E., Van de Gaer, D., Vandenbroucke, F., Luttens, R.I.: Responsibility sensitive egalitarianism and optimal linear income taxation. Math. Soc. Sci. **48**(2), 151–182 (2004). https://doi.org/10.1016/j.mathsocsci.2004.05.001
Sen, A.K.: Choice Functions and Revealed Preference. Rev. Econ. Stud. **38**(3), 307 (1971). https://doi.org/10.2307/2296384
Silva-Illanes, N., Tsuchiya, A.: Liberal reward and healthy lifestyles: A questionnaire experimental study. Tenth ECINEQ meeting (2023)
Wagstaff, A., van Doorslaer, E., Paci, P.: Horizontal equity in the delivery of health care. J. Health Econ. **10**(2), 251–256 (1991). https://doi.org/10.1016/0167-6296(91)90009-C Retrieved from https://www.sciencedirect.com/science/article/pii/016762969190009C