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Fair Innings: An Empirical Test

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Abstract

The fair innings principle states that fairness requires allocating life-saving treatments to younger rather than older patients when each would gain the same extension in longevity. It is motivated by the notion that older patients have already benefited from a longer life and so have less claim to scarce treatment resources than younger patients who have not yet lived their "fair innings." The principle can be theoretically justified by a prioritarian social welfare function applied to lifetime wellbeing. We conducted an online survey to test whether there is support for the principle in the general population (in France). We find substantial but not universal support. When choosing to allocate a treatment that would provide the same life extension to an older or a younger patient, about one-half the respondents would allocate the treatment to the younger patient while about one-third are indifferent to which patient is treated and about one-fifth would allocate treatment to the older patient. Holding the life extension to the older patient fixed, decreasing the life extension to the younger patient decreases (increases) the fraction of respondents that would allocate treatment to the younger (older) patient. These results highlight the tension between principles of equal treatment and of giving priority to those who are worse off that confound healthcare policy.

Keywords: Fair innings, life saving, prioritarianism, health, ethical preferences, questionnaire study, Covid-19.

JEL codes: D61, D63, H4, I18, Q51

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1. Introduction

The question of how to allocate life-saving measures to people of different ages arises in many contexts, including health care, public health, environmental pollution, and transportation safety. The recent Covid-19 pandemic highlighted questions about how to allocate life-saving technologies in limited supply, including ventilators and vaccines. The fair innings principle suggests that, as a matter of fairness, the young should take priority over the old with respect to life-saving measures. The main objective of this paper is to explore whether the general public agrees with this principle.

Bognar (2015) introduces the fair innings concept using questions such as:

"Suppose you have a life-saving drug, and you have to choose between giving it to either

> *(A) a 20-year-old patient, who will live for 10 more years if she gets the drug, and then she dies;*
>
> *(B) a 70-year-old patient, who will live for 10 more years if she gets the drug, and then she dies.*

The drug is indivisible and the person who does not get it will die shortly. Apart from their age, there is no relevant difference between the two patients, and they would both spend the extra ten years in perfect health. Would you give the life-saving drug to A or B?"

Bognar argues that, according to the fairness-based argument for fair innings, you should prefer A to B, namely you should prefer saving the life of the young. The central point is that both patients would receive the same benefit (the same increase in longevity) but the older patient has already experienced a longer life than the younger one. Hence, the fairness argument favoring the young is not the usual efficiency argument based on greater remaining life expectancy.

Adler et al. (2021) build on Bognar's (2008, 2015) interpretation to propose the following definition of fair innings: "*as between a policy that produces a given gain in expected lifetime well-being for a younger person, and an otherwise-identical policy that produces the same gain in expected lifetime well-being for an older person, it is ethically better for society to undertake the first policy.*"

It is important to note that the fair innings principle is not supported by much of the conventional economic literature regarding the valuation of life saving. Indeed, neither utilitarian approaches, benefit-cost analysis, nor cost-effectiveness analysis support in general the idea that gains to the young are socially more valuable than *equal gains* to the old (Adler et al. 2021).

Adler et al. (2021) provide a theoretical basis for the fair innings principle using the prioritarian social welfare function approach. Formally, this approach applies an increasing, concave, and continuous transformation to individual lifetime utilities. It builds on a long tradition in welfare economics (Adler 2012, Adler and Norheim 2022) and in philosophy (Parfit 2000, Holtug 2010). A prioritarian social welfare function attaches greater weight to improvements in wellbeing that are experienced by individuals who are worse off; as a consequence, it ranks mortality risk reduction policies differently than do utilitarianism, benefit-cost analysis, and cost-effectiveness analysis (Adler et al. 2014). From an expected lifetime perspective, younger people are worse off than their elders (holding other factors constant) and hence prioritarianism tends to give more priority to the young.

Our main objective in this paper is to test empirically whether there is public support for the fair innings concept. We designed a survey in which we asked a set of questions similar to Bognar's questions to a representative sample of the French population (N = 2011). Our aim is to study whether survey respondents broadly agree with the fair innings principle. We also examine whether the extent to which a respondent agrees with the principle is related to her sociodemographic characteristics, and estimate the strength of support for fair innings (i.e., the distribution of inequality aversion with respect to longevity) in our sample.

Our main result is that there is substantial but not nearly universal support for the fair innings principle. There is also strong support for treating patients equally and thus not giving priority to either the younger or the older patient. In questions like Bognar's, where treatment would provide the same number of life years to each patient, roughly one-half of the respondents choose to allocate treatment to the younger patient and roughly one-third express indifference about which patient is treated. The fraction of respondents who would allocate treatment to the younger patient is sensitive to differences in the benefit of treatment: one-half would allocate treatment to the younger patient when she would benefit for many more years than the older patient, and only about one-fifth would allocate treatment to the younger patient when she would benefit for many fewer years. In contrast, the fraction of respondents who are indifferent to which patient is treated is scarcely affected by differences in benefit. Indifference to which patient is treated regardless of the size of the benefit (i.e., a refusal to prioritize either patient) seems inconsistent with a consequentialist perspective; it is consistent with a deontological principle of refusing to discriminate between people in the case of life-saving measures. A substantial share of respondents, about one-fifth, choose to allocate treatment to the older patient, counter to the fair innings principle.

2. Related literature

Our paper is related to two strands of the literature: first, the conceptual literature on fair innings, and second, the empirical literature using surveys of citizen preferences regarding health policy and fairness.

A number of scholars in public health or philosophy have discussed the concept of fair innings. Harris (1985) introduced the idea that everyone should have a chance "to reach the appropriate threshold" in terms of life duration. Fundamentally, the fair innings concept concerns priority with respect to age and inequality aversion with respect to completed longevity. Along this line, Williams (1997) argues that fair innings "reflects the feeling that everyone is entitled to some 'normal' span of health." Williams further notes that the fair innings concept has four main characteristics: i) it is outcome based, ii) it is about people's lifetime, iii) it includes an aversion to inequality, and iv) it is quantifiable. Others have endorsed some version of the fair innings concept, including Daniels (1988), Nord (2005), Bognar (2008, 2015) and Ottersen (2013).

As noted in the introduction, Adler et al. (2021) provided a formal interpretation of the fair innings principle.[1] They show theoretically that prioritarian social welfare functions systematically place greater weight on gains to expected lifetime wellbeing accruing to younger rather than to older individuals, consistent with inequality aversion with respect to longevity (see Section 3). Under uncertainty, this result holds whether the prioritarian transformation is applied to individuals' realized lifetime wellbeing (so-called "ex post prioritarianism") or to expected lifetime wellbeing (so-called "ex ante prioritarianism") (on prioritarianism under uncertainty, see Adler 2012, ch. 7). This result demonstrates that the fair innings principle has a rigorous basis in welfare economics.

It is common in policy evaluation to measure the value of reducing mortality risk by the value per statistical life (VSL) in benefit-cost analysis and by the increase in quality-adjusted life expectancy (QALE) in cost-effectiveness analysis. In general, neither approach yields results consistent with the fair innings principle.[2] Both theoretically and empirically, the relationship between VSL and age can be non-monotonic, typically displaying an inverted-U pattern (Aldy and Viscusi 2008). The pattern crucially depends on how individuals can allocate consumption over their lifetimes (Shepard and Zeckhauser 1984) and how they discount future wellbeing (Ng 1992). Under the QALE metric, decreasing mortality risk to younger individuals generally produces greater benefit. But this result

[1] Williams (1997) and Bognar (2015) discuss how the fair innings concept can be operationalized using a non-utilitarian social welfare function applied to individuals' (quality-adjusted) life expectancies.
[2] Benefit-cost and cost-effectiveness analysis can be adapted to respect the fair innings principle by introducing weights that count gains to the young as more important than equal gains to the old.

hinges on the fact that younger individuals have a greater (quality adjusted) life expectancy remaining and thus does not capture the fair innings motive.

Our paper is also related to the empirical literature using surveys to elicit preferences over population distributions of health. This literature explores how citizens make choices between hypothetical patients who vary in terms of age and/or severity of disease. Examples include Dolan and Tsuchiya (2005, 2012), Oliver (2009), Robson et al. (2017, 2024), Hurley et al. (2020), and reviews by McNamara et al. (2020), Cadham et al. (2023), and Khor et al. (2023). Overall, the results of these studies support the idea that a compromise must be found between maximizing total health, often measured by QALYs, and a more equal distribution of health. In a systematic review of studies for the United Kingdom, McNamara et al. (2020) report that studies find mixed evidence of inequality aversion, which tends to be stronger for differences in longevity than in quality of health and stronger when health or longevity inequalities are positively associated with inequalities in socio-economic status. Using a survey with nearly 2000 participants in Ontario, Canada, Hurley et al. (2000) found a bi-modal distribution of inequality aversion for health-adjusted life expectancy (i.e., QALE): nearly half their respondents display degrees of inequality aversion less than 1 (possibly zero or even negative) and nearly half have inequality aversion greater than 3 (as measured by the inequality-aversion parameter of the Atkinson social welfare function described in Section 3). The literature shows that citizens' views are diverse; many support giving some form of priority to the worse off, typically to people who would have lived shorter lives if they had died untreated, while others prefer to treat people equally, independently of their characteristics and circumstances.

Recently, surveys were used in the Covid-19 context to better understand citizens' preferences toward the allocation of treatments including respirators and vaccines. Some studies show that the general public predominantly favors treating younger patients among Covid-19 patients with similarly severe symptoms (Emanuel et al. 2020, Huseynov et al. 2020). However, other studies suggest a more complex pattern (Duch et al. 2021) with a frequent preference for no triage (i.e., for a first-come-first-served or random allocation mechanism) in various countries (Awad et al. 2022).

There is also an important empirical literature eliciting ethical preferences. The basic axioms of prioritarianism, including the Pigou-Dalton transfer principle (which states that transferring wellbeing from someone better off to someone worse off, without changing their order of wellbeing, is preferred), are generally *not* supported by a significant fraction of the population (Amiel and Cowell 1999, Schokkaert and Tarroux 2022). Both questionnaire and laboratory studies find a large degree of heterogeneity in ethical preferences (Gaertner and Schokkaert 2012, Schokkaert and Tarroux 2022). An emerging literature in moral psychology and economics highlights significant differences among people making moral decisions, who often rely on both consequentialist and deontological principles (Conway and Gawronski 2013, Chen and Schonger 2022, Feess et al. 2022, Van Leeuwen and Alger 2024). This suggests that deontological principles, such as the belief that every person has an equal right to treatment, may coexist with consequentialist evaluations of health outcomes.

The key innovation of this paper is to use simple questions about allocation of a life-saving treatment between an older and a younger patient to study the extent to which individuals have fair innings preferences, as opposed to other patterns, to measure the strength of these preferences, and to examine the demographic correlates of these preferences.

3. Theoretical background

In this section, we present a sketch of the economic theory of fair innings that underlies our survey and analysis. See Adler et al. (2021) for a general analysis.

A social welfare function (SWF) is a method for evaluating alternative distributions of wellbeing in a society. That is, any distribution of wellbeing can be represented as a vector of wellbeing numbers, where each number corresponds to the wellbeing of one individual. The utilitarian SWF evaluates social welfare as the sum of individuals' wellbeing. Hence it depends on total wellbeing, but not on how wellbeing is distributed within the society. Transferring a unit of wellbeing from one individual to another has no effect on utilitarian social welfare. In contrast, a prioritarian SWF evaluates social welfare as the sum of transformed individual wellbeing, where the transformation function is continuous, strictly increasing, and strictly concave. The prioritarian SWF is inequality averse; prioritarian social welfare is strictly increased by any pure (non-leaky) transfer of individual wellbeing from an individual with higher wellbeing to another with lower wellbeing (while maintaining the order of wellbeing), consistent with the Pigou-Dalton transfer principle.

Let τ be the expected lifetime utility given current age of a young person and $\tau + u$ be the corresponding expected lifetime utility of an old person with $u > 0$. Suppose that a treatment can extend the life of either the young or the old. Denote by $\Delta > 0$ the extra utility associated with this life extension and assume $\Delta < u$ so that, even if treated, the young continues to have less lifetime utility than the old.

Observe that the benefit of treatment (the life extension term Δ) is identical for both persons. This is a central aspect of our comparative statics exercise focusing on the age difference, letting other things be equal. Moreover, observe that we consider the *lifetime* utility, for example the sum of period utility terms accumulated over the course of life. Since the old person has lived longer, and thus has an extra period utility term, u, the current lifetime utility of an old person is always greater than the current lifetime utility of a young person, i.e. $\tau + u > \tau$. For a discussion of the lifetime utility approach, see, e.g., Adler (2012) and Adler and Norheim (2022).

Under utilitarianism, treating the young or the old generates the same social benefit, Δ. Hence, a utilitarian social planner is indifferent between giving the treatment to the young or to the old. But this is not the case under prioritarianism.

Under prioritarianism, if the treatment is given to the young, the social benefit is equal to the difference between the transformed outcomes with and without the gain,

$$S_y = g(\tau + \Delta) - g(\tau), \tag{1}$$

where g is a continuous, strictly increasing and concave transformation function. Alternatively, if the treatment is given to the old, the social benefit is equal to

$$S_o = g(\tau + u + \Delta) - g(\tau + u). \tag{2}$$

Since g is strictly concave, $S_y > S_o$ and it is immediate that the treatment should be given to the young. In Adler et al. (2021), this property is called "priority for the young." It is the crux of our interpretation of the fair innings concept, consistent with Bognar (2015). In the survey, we attempt to test this property by asking survey participants to choose between allocating a hypothetical treatment to either a young or an old person (who are otherwise identical). We ask several questions in the spirit of Bognar's questions, where we vary the ages of the patients and/or the life extension benefit of the treatment, corresponding to changes in the parameters τ, u and Δ. If one assumes that the flow utility is the same at each period of life for the young and the old, then these parameters can respectively be interpreted as the age of the young (τ), the age of the old ($\tau + u$), and the additional number of years that will be lived in the future if treated (Δ).

We also include questions in the survey that enable us to measure the intensity of the fair innings preference. The intensity of the preference can be measured by computing an "age premium" π_j for a prioritarian social planner j. Formally, π_j is given by:

$$g_j(\tau + \Delta - \pi_j) - g_j(\tau) = g_j(\tau + u + \Delta) - g_j(\tau + u). \tag{3}$$

In words, the age premium π_j is the reduction in the life extension treatment benefit to the young that would make the prioritarian social planner with preferences g_j indifferent between giving the treatment to the young or to the old. Obviously, $\pi_j > 0$ when g_j is strictly concave.

Note that $\pi_2 > \pi_1$ implies

$$\frac{g_2(\tau+\Delta-\pi_1)-g_2(\tau)}{g_2(\tau+u+\Delta)-g_2(\tau+u)} > \frac{g_2(\tau+\Delta-\pi_2)-g_2(\tau)}{g_2(\tau+u+\Delta)-g_2(\tau+u)} = \frac{g_1(\tau+\Delta-\pi_1)-g_1(\tau)}{g_1(\tau+u+\Delta)-g_1(\tau+u)} = 1, \qquad (4)$$

which, by Pratt (1964, Theorem 1) holds if and only if $\frac{-g_2{''}(x)}{g_2{'}(x)} > \frac{-g_1{''}(x)}{g_1{'}(x)}$ for all x in $[\tau, \tau+u+\Delta]$. That is, the age premium reflects the degree of concavity of the prioritarian transformation function.

The degree of priority for the worse off can also be understood in terms of inequality aversion. For a given transformation function $g(\cdot)$, any distribution of well-being among the *n* individuals in a population, described by the vector $\overline{w}$, has an "equally distributed equivalent" (EDE), which is the amount of well-being w* such that social welfare would be the same if each individual had w* as it is given the original distribution $\overline{w}$ (Kolm 1969, Atkinson 1970, Fleurbaey 2010). That is, $ng(w^*) = \sum_{i=1}^{n} g(w_i)$. Because $g(\cdot)$ is concave, if the original distribution of wellbeing is unequal, the EDE is smaller than the average level of wellbeing and $nw^* < \sum_{i=1}^{n} w_i$. Both the difference between the EDE and the average wellbeing, and the ratio of the EDE to the average wellbeing, are measures of inequality aversion; specifically, they measure the absolute or fractional amount by which average wellbeing could be decreased while maintaining social welfare if inequality were eliminated. A more concave transformation function $g(\cdot)$ yields a smaller EDE, and hence a prioritarian decision maker would be willing to sacrifice more total wellbeing for the sake of achieving equality of wellbeing. To quantify inequality aversion using the EDE, we consider two commonly used parametric families of prioritarian SWF, $S(\overline{w}) = \sum_{i=1}^{n} g(w_i)$. For the Atkinson SWF, $g(w) = \frac{w^{1-\gamma}}{1-\gamma}$, where $\gamma > 0$ is a measure of relative inequality aversion (when $\gamma = 1$, $g(w) = log(w)$). For the Kolm-Pollack SWF, $g(w) = -\exp(-\alpha w)$, where $\alpha > 0$ is a measure of absolute inequality aversion. Larger values of γ and of α correspond to greater inequality aversion. Both the Atkinson and the Kolm-Pollack SWFs include the utilitarian SWF as limiting cases when the parameters γ and α go to zero.

4. Methods

We describe the survey and analytic methods in the following subsections.

4.1. The survey

The survey was administered online to a sample of the general French population by BVA (www.bva-group.com) using their existing panel. The sample was constructed in two parts: a target of 2000 respondents intended to be representative of the French population with quotas for completed surveys by age (18 years and older), gender, professional status, geographic region, and population of the city, town, or village of residence; plus a supplemental sample of 100 health-care workers.

Panel members were invited to complete the survey until the quotas for each stratum were obtained. In total, 2144 respondents completed the survey (2030 people targeted in the main sample plus 114 health-care workers).[3]

The survey received research ethics approval from the Toulouse School of Economics Research Ethics Committee for Experimental Research. It was pre-registered (AEARCTR-0008694) in December 2021 and fielded in January 2022. The questionnaire (translated to English) is available as supplementary material.

Each survey participant agreed to take part in the research and no personally identifiable information was obtained. The questionnaire took about 20 minutes to complete. Participants were recruited through loyalty programs across travel, entertainment, retail, and other sectors and were rewarded in the currency of the corresponding program (e.g., shopper points or air miles).

The survey instrument was designed to assess what fraction of the general public would make choices consistent with the fair innings concept when allocating treatment between patients, and to assess the strength of fair innings preference, as measured by the age premium and the concavity of the transformation function $g(\cdot)$ introduced in Section 3. It begins with an introduction that states that the objective is to elicit the respondent's opinion as a citizen on choices about health that raise ethical questions. It explains that citizens' views are important when making social decisions, such as deciding which patients to treat when it is not possible to treat all, as when health authorities did not have enough ventilators available to treat everyone with serious Covid-19 infections. The introduction emphasizes that there are no right or wrong answers to the questions to be asked.

The main part of the survey includes a series of questions similar to Bognar's questions. That is, we ask participants to consider a choice situation of the following type:

"*Two patients need a treatment to survive, but there is only one treatment available. The patients differ only in terms of their age: one patient is 40 years old and the other is 60 years old. They both would live an extra 20 years with the treatment, and die immediately without the treatment. Which patient should receive the treatment?*"

We emphasize in the questionnaire that the only difference between the two patients is their age. We specify that they have both had a pleasant life to date and, in the case of survival, each of them

[3] We thought health-care workers might have a different perspective on allocation of health treatment given their work experience. However, the supplemental sample is small and we omit these respondents from our empirical analysis. Results including the supplemental respondents differ only negligibly from the results reported below.

would spend future years in good health and their lives would be equally pleasant. They also have the same (unspecified) past and future income. We add that each extra year will provide the same quality of life for both patients.

We ask nine Bognar-type questions where the ages or additional years of survival differ. These question parameters correspond to different values of τ, μ, and Δ in Section 3. In each question, the respondent is asked to choose whether she would allocate treatment to the younger patient, the older patient, or whether she is strictly indifferent (there was no fourth option corresponding to “do not know” or ”unsure” and respondents were required to answer to complete the survey). The order of responses was randomized: For half the participants the possible answers were always displayed as “treat young, treat old, indifferent” and for the remaining participants the possible answers were always “treat old, treat young, indifferent.” The first five questions held the patients’ ages and the benefit of treating the older patient constant while decreasing the benefit of treating the younger patient; the last four questions equalized the benefit of treating each patient while varying their ages.[4]

The final part of the questionnaire asks about participants’ sociodemographic characteristics including income, education, religious orientation, health status, and age. It also includes a few questions about their experience with the Covid-19 pandemic (such as whether the participant and/or her relatives had been confronted by a severe form of the disease).[5]

4.2. Analytic methods

We analyze our results using several methods. For each of the Bognar-type questions we report cross tabulations showing the fractions of respondents who choose to allocate treatment to the younger patient, the older patient, or who are indifferent to which patient is treated. We examine how these fractions depend on the ages of the two patients and the number of years each would gain if treated. We test whether the distribution of responses is independent of the patients’ ages and benefits if treated using χ^2 goodness-of-fit tests, and test whether the fraction preferring to treat the young, the old, or expressing indifference differs from the corresponding fraction in other

[4] Using the question labels shown in Tables 1 and 2, the questions were presented in the order 6, 1, 7, 8, 9, 2, 4, 3, 5.

[5] The survey also included seven Bognar-type questions (following the nine questions described above) in which the treatment benefit was probabilistic rather than certain, the patients would live in poor health, or the patients would receive the same longevity gain but differ in income, and a subsequent section eliciting respondents’ views about appropriate principles for a government to follow when allocating health treatment and other aid to individuals in different circumstances. We do not report those results here.

questions using a z-test, where standard errors are calculated assuming the respondents have homogeneous preferences (i.e., the probability of each response is common across respondents).

We characterize the strength of fair innings preference (i.e., inequality aversion with respect to longevity) using results of the questions in which the patients' ages and the benefit of treating the older patient are fixed while the benefit of treating the younger patient varies. As described in Section 3, fair innings preference can be quantified by an age premium for a question or an inequality-aversion parameter in a specified SWF. For each question, a preference for treating the younger patient is consistent with the respondent having an age premium and an inequality-aversion parameter larger than a corresponding critical value. Conversely, a preference for treating the older patient corresponds to having an age premium and an inequality-aversion parameter smaller than the corresponding critical value. For each question, we report the critical values of the age premium and of the inequality-aversion parameters γ and α from the Atkinson and Kolm-Pollack specifications, respectively. We estimate the distribution of inequality aversion in our sample by calculating the fraction of responses consistent with having an inequality-aversion parameter smaller than the critical values.

We identify distinct patterns of responses to the questions in which the benefit of treating the younger patient differs, while the patients' ages and the benefit of treating the older patient are fixed. We identify all patterns of responses to these five questions exhibited by at least one percent of our respondents, and classify them as consistent with fair innings, counter fair innings, indifferent throughout, or utilitarian. A respondent who is indifferent throughout will report indifference in all five questions. A utilitarian respondent will always allocate the treatment to whichever patient benefits more, and will be indifferent when they benefit equally. One who is consistent with fair innings will allocate the treatment to the younger patient whenever the benefit of doing so exceeds a respondent-specific critical value that is strictly less than the benefit of treating the older patient, and will allocate the treatment to the older patient when the benefit of treating the younger patient is less than this value. Such a respondent will be indifferent when the benefit of treating the younger patient is equal to her critical value. Finally, a respondent who is counter fair innings will allocate treatment to the older patient except when the benefit of treating the younger patient exceeds a respondent-specific critical value that is strictly greater than the benefit of treating the older patient, and will be indifferent when the benefit of treating the younger patient is equal to her critical value.

Note that the respondent-specific critical values are equal to the benefit of treating the older patient minus the respondent's age premium for that question.[6]

The respondent-specific critical values associated with the fair innings and counter fair innings response patterns measure respondents' strengths of preference for (or against) the fair innings principle. For example, when the gain from treating the younger patient is much smaller than the gain from treating the older patient, a respondent who strongly supports the principle will allocate treatment to the younger patient while a respondent who weakly supports the principle will allocate treatment to the older patient. The respondent-specific critical value is smaller (and the age premium is larger) for a respondent who strongly supports the principle than for a respondent who weakly supports it.

We analyze the patterns of responses to our questions by estimating multinomial and ordered logistic regression models to examine how the probabilities of choosing to treat each patient or to report indifference depend on the ages of the patients and benefits of treatment to each, and on respondents' sociodemographic characteristics (age, gender, education, income, religion). To account for dependence of responses to the nine questions within respondent, we cluster standard errors by respondent. We estimate similar models to describe how the chance that a respondent fits one of the consistent response categories (fair innings, counter fair innings, utilitarian, or indifferent) depends on her sociodemographic characteristics.

5. Results

In Table A (in the Appendix), we provide descriptive statistics regarding the distribution of participants and the French population by gender, age, income, education, and religion. Compared with the population, our sample includes fewer individuals aged 65 years or older (24 compared with 33 percent of French aged 20 years and above), is more educated (73 compared with 55 percent having completed the baccalaureate, somewhat more than high school graduation), and has higher income (52 compared with 32 percent having monthly household income of at least 2500 €). The higher education and income may reflect the composition of the internet panel or differential completion due to the conceptual and abstract nature of the survey questions (we did not stratify on these attributes).

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[6] In the five questions where we vary the benefit of treating the younger patient, the patients' ages and the benefit of treating the older patient are fixed, so each respondent's critical value should be common across these questions.

We report our analysis of the survey data in the following subsections. In Section 5.1, we describe the extent to which responses are consistent with the fair innings principle, using only the answers to the Bognar-type questions in which the two individuals would gain the same increase in longevity from treatment. In Section 5.2, we describe the strength of fair innings preference, using questions in which one patient would obtain a larger gain in longevity than the other and describe how respondents' choices about treatment allocation depend on the patients' ages, the benefit of treatment, and respondent characteristics. In Section 5.3, we report regression models to describe respondents' choices as a function of the patients' ages and benefits of treatment, and respondents' sociodemographic characteristics. In Section 5.4, we quantify the strength of the fair innings preference using parametric social welfare functions to calculate the degree of inequality aversion that is implied by respondents' choices. In Section 5.5, we divide respondents into subgroups who exhibit consistent preferences across multiple questions (e.g., support fair innings, indifferent throughout) and report regression models that describe the extent to which these preferences are associated with respondents' sociodemographic characteristics.

5.1. Fair innings preference

We begin with some evidence about whether our survey participants choose in accordance with the fair innings principle. We first present responses to the Bognar-type questions. These questions ask respondents to choose between two patients of ages τ and $\tau + \mu$, respectively, given that the treatment would extend each patient's life by Δ years. Each question can thus be represented by a vector $(\tau, \tau + \mu, \Delta)$. For example, the vector (40, 60, 20) describes the question in which the two patients are of ages 40 and 60 years and the treatment would extend life by 20 years for each. Following the theory described in Section 3, support for fair innings is consistent with giving the treatment to the younger of the two patients.

Table 1 reports the results of these questions. Overall, about half (41.4 to 56.2 percent) of the respondents choose to provide the treatment to the younger patient; in contrast, the fraction that would treat the older patient never exceeds one-quarter. Importantly, about one-third of participants are indifferent between giving the treatment to either the younger or the older patient. Because the benefit of treatment is the same, indifference in these questions is consistent with both utilitarianism (maximizing the population total of wellbeing) and with a refusal to give anyone priority in allocating treatment.

Overall, differences in the fractions of respondents allocating treatment to the younger or the older patient are modest. The hypothesis that responses to all five questions are drawn from the same distribution can be strongly rejected using a χ^2 goodness-of-fit test. Taking question 1 (40, 60, 20) as the base case, the fraction choosing to treat the younger patient is substantially larger when the age difference between the patients is greater (i.e., 46.6 percent would allocate the treatment to a 20-year-old rather than a 60-year-old patient in row 2). This is consistent with the notion that the fair innings motivation should be stronger when the patients are less similar in age (it seems obvious that the principle should not be an important determinant when choosing between individuals of nearly the same age).

Increasing or decreasing the ages of both patients (holding the age difference of 20 years constant) yields mixed results. When both patients are 20 years older, the fraction choosing to treat the younger patient is substantially larger, 56.2 percent in question 3 (60, 80, 20) compared with 41.4 percent in question 1, and the fraction choosing to treat the older patient is smaller. One rationale is that some respondents may believe that the 80-year-old patient has already reached the appropriate "threshold" and does not deserve priority, consistent with one interpretation of fair innings (Harris 1985). Alternatively, respondents may not accept the assumption that the increase in longevity will provide the same level of wellbeing to each person, i.e., they may not believe the years lived from age 80 to 100 can produce as much quality of life as those lived from age 60 to 80. In contrast, when both patients are younger (20, 40, 20) in question 4, a the distribution of responses is not significantly different from the distribution in question 1 (40, 60, 20).

Comparing question 5 (20, 40, 40) with question 4 (20, 40, 20) suggests that the benefit of treatment may have little effect on the fair innings preference. There is no significant difference in the fractions of respondents allocating treatment to the younger and older patients whether the benefit of treatment is 20 or 40 years.

5.2. Strength of fair innings preference

In Table 2, we explore the intensity of fair innings preference using questions where the benefit of the treatment differs between the patients. These questions ask respondents to choose between two patients of ages τ and $\tau + \mu$, respectively, where the treatment extends life by Δ' years for the young and by Δ years for the old. Each question can thus be represented by a vector (τ, $\tau + \mu$, Δ'/Δ). In all rows of Table 2, the younger and older patients are 40 and 60 years old and the treatment provides 20 years of life to the older patient. Descending the rows, the benefit of treatment to the younger patient decreases from 40 years (question 6) to 1 year (question 9). The hypothesis that responses to all five questions are drawn from the same distribution can be easily rejected. As the benefit to the younger patient decreases between adjacent rows, the fraction of respondents allocating treatment to the younger patient decreases and the fraction allocating treatment to the older patient increases by roughly the same amount. All of these differences are statistically significantly different from zero ($p < 0.01$). In contrast, the share of respondents expressing indifference is nearly the same for all questions, except perhaps the last two (questions 8 and 9) in which the younger patient would gain only 5 years or 1 year from treatment.

In question 1 (the same as in Table 1), both patients receive the same benefit (20 years) from treatment and 41.4 percent of respondents prefer to allocate treatment to the younger patient. In question 6, the younger patient gains twice as many years from treatment as the older patient (40 compared with 20 years); the fraction of respondents preferring to treat the younger patient is larger than when the gains are equal (question 1) but is only 49.7 percent. Even in this case, more than one-third of respondents are indifferent to which patient is treated and almost 15 percent prefer that the older patient be treated.[7]

Moving sequentially to questions 7, 8, and 9, the benefit of treatment to the younger patient decreases to 10, 5, and 1 years, respectively, while the benefit to the older patient remains at 20 years. The fraction of respondents preferring to treat the younger patient decreases and the fraction preferring to treat the older patient increases; moreover, the fraction of respondents who are indifferent decreases slightly when the benefit to the young falls to 5 years or 1 year. These differences are consistent with giving some weight to maximizing the total benefit and some weight to fair innings. Despite this evidence that the size of the benefit matters, the differences in responses between questions in Table 2 seem modest. Even when the younger patient would gain only one year of life, nearly half the respondents would either allocate treatment to the young (17.5 percent) or would be indifferent to its allocation (28.8 percent).

5.3. Fair innings preference by question and respondent characteristics

We characterize the results reported in Tables 1 and 2 using multinomial logistic regression models. We pool the responses to the nine questions. As independent variables, we include four design variables that characterize each question: the age of the younger patient (τ), the age difference (μ), the gain to the younger patient if treated (Δ'), and the difference in the gain if treated ($\Delta' - \Delta$), all measured in years. Results using only these design variables are presented in Table 3, where column (1) corresponds to the probability of allocating treatment to the younger patient and column (2) to the probability of allocating treatment to the older patient, compared with expressing indifference. These show that the probability of allocating treatment to the younger patient increases (and the

[7] In question 6, a preference for treating the young is not implied by the Pigou-Dalton transfer axiom, because the younger patient is no longer the worse off if she is treated. As discussed in Section 5.3, a preference for treating the younger patient is implied by the axiom of anonymity: treating the young produces two lifetimes of 80 and 60 years, which dominates the outcome of treating the old, yielding two lifetimes of 40 and 60 years.

probability of allocating treatment to the older patient decreases) when the patients are older, when the age difference is larger, when the benefit of treatment is larger, and when the difference in the benefit of treatment (in favor of the younger patient) is greater. All four of the estimated coefficients are significantly different from zero. The absolute values of the coefficients on age are larger when comparing the choice to allocate treatment to the young rather than to the old (compared with reporting indifference) while the opposite is true for the coefficients on the benefits of treatment. The magnitudes of the effects are modest. The largest coefficient (in absolute value) is the coefficient on the difference in the benefit of treatment on the probability of treating the older patient, equal to -0.030. An increase of 10 years in this difference is associated with a decrease in the odds of treating the older patient by a factor of exp(-0.030 * 10) = 0.74. A 10 year increase in the age difference between patients is associated with an increase in the odds of treating the younger patient by a factor of exp(0.0215 * 10) = 1.24.

Columns (3) and (4) of Table 3 show the result of adding respondent characteristics to the multinomial model. Adding these characteristics has little effect on the estimated coefficients of the design variables. For almost all of the respondent characteristics, the coefficients estimating the increased chance of choosing the younger or the older patient are of the same sign. Many are not statistically significantly different from zero; of those with the same sign, only the coefficients of male are significantly different from each other. A common sign implies the effect of the characteristic is to alter the probability of refusing to prioritize either patient rather than only to favor allocating treatment to either the younger or the older patient. For each of the respondent-age categories, the estimated coefficients are all less than zero, comparable in magnitude, and statistically significantly different from zero, which implies that respondents older than the omitted category (18-34 years) are less likely to allocate treatment to either patient, i.e., more likely to be indifferent. The relative odds of a respondent older than 34 years allocating treatment to either patient is between 0.43 and 0.55 times as large as for younger respondents (i.e., between exp(-0. 8527) and exp(-0. 6017)).

Compared with female respondents, males are less likely to be indifferent and more likely to favor the older patient; males’ relative odds of allocating treatment to a younger and older patient are 1.28 and 1.60 times as large as females’, respectively. Respondents with a baccalaureate degree or more are more likely to allocate treatment to the younger patient than to report indifference (the odds differ by a factor of 1.26) but the coefficients for those with more education are not statistically significant (implying no difference from respondents holding only a baccalaureate). Having personal income greater than the median (2500 € per month) has no significant effect. Both Muslims and

Catholics are more likely to allocate treatment to the older patient (the odds are larger by factors of 1.80 and 1.44, respectively). Catholics are also more likely to allocate treatment to the younger patient than to be indifferent; the estimated coefficient for Muslims is smaller and not statistically significant.[8]

5.4. Quantifying the strength of fair innings preference

The strength of the fair innings preference (equivalently, the degree of inequality aversion with respect to longevity) consistent with the choices reported in Table 2 can be quantified using any of several metrics. Perhaps the simplest is the age premium, defined in Section 3 as the difference between the gains to the older and younger patients, $\Delta - \Delta'$. In each row of Table 2, an individual who prefers to allocate treatment to the younger patient reveals an age premium greater than $\Delta - \Delta'$, one who prefers to allocate treatment to the older patient reveals an age premium less than $\Delta - \Delta'$, and one who is indifferent reveals an age premium equal to $\Delta - \Delta'$. Alternatively, inequality aversion can be quantified using the value of the inequality-aversion parameter in a parametric SWF or by the EDE for each distribution (which depends on the SWF).

In question 6 (Table 2), allocating treatment to the younger patient is dominant. Doing so provides lifetime utilities of 80 and 60 years to the younger and older patients, respectively. In contrast, allocating treatment to the older patient provides lifetime utilities of 40 and 80 years, respectively. Under the standard assumption of anonymity (that permuting wellbeing levels in the population does not affect social welfare), the first allocation is strictly better than the second as it provides as many life years to one patient and more life years to the other. Indifference between the two allocations in question 6 corresponds to an age premium less than zero (-20) and is inconsistent with any degree of inequality aversion. Either a preference for treating the older patient or indifference to which patient is treated are difficult to justify from a consequentialist perspective; these choices are inconsistent with the combination of anonymity and the Pareto principle. Indifference suggests reliance on a deontological perspective to treat individuals equally, regardless of consequences.[9]

In question 1, each patient would gain the same number of life years. Indifference between the two treatment options corresponds to a utilitarian SWF, which is inequality neutral, i.e., the age premium

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[8] We also estimated ordered logistic regression models parallel to the multinomial logistic models (with indifference as the intermediate response). These impose the restriction that a change in any independent variable has equal and opposite effects on increasing the probability of allocating treatment to the younger or to the older patient, compared with expressing indifference. As shown in Table 3, although the coefficients on the design variables are of opposite sign, most differ in magnitude. Many of the coefficients on respondent characteristics are of the same sign. Hence we reject and do not report the ordered logistic results.

[9] We note that the interpretation of our findings as possibly pertaining to deontological preferences arose post hoc; it was not pre-registered.

and the degree of inequality aversion in the Atkinson SWF γ both equal zero (in the Kolm-Pollack SWF, inequality neutrality is the limiting case as the degree of inequality aversion α approaches zero). Treating the younger patient yields an outcome in which both patients live for 60 years; in contrast, treating the older patient yields an outcome in which the younger patient lives 40 years and the older patient lives 80 years. Since the first outcome can be achieved by a transfer of life years from the longer- to the shorter-lived individual, it is strictly preferred by a prioritarian SWF. A preference for treating the younger patient implies that both the age premium and the degree of inequality aversion (γ, α) for a respondent are strictly positive, although they could be arbitrarily small.

Preferences for treating the younger patient in questions 7, 8, and 9 correspond to increasing degrees of inequality aversion. A respondent who prefers to allocate treatment to the younger patient in question 7, 8, and 9 reveals an age premium greater than 10, 15, and 19 years, respectively. For the Atkinson SWF, the degree of inequality aversion γ is greater than 1.58, 2.84, and 5.71, respectively. For the Kolm-Pollack SWF, the degree of inequality aversion α is greater than 0.0281, 0.0519, and 0.1079, respectively.

Although the scales of the inequality-aversion parameters in the two SWFs are not comparable, the associated measures of inequality (based on the fraction or magnitude of total longevity that could be sacrificed if it were equally distributed) are similar. Using the Atkinson (Kolm-Pollack) SWF and setting the inequality parameter γ (α) to its value such that treating the young or the old patient is equally good, the EDEs are 54.6 (54.6) in question 7, 51.0 (51.1) in question 8, and 46.0 (46.3) in question 9, respectively.

The distribution of inequality aversion in our sample is broad and, given the large number of respondents who report indifference throughout, not well-estimated. We can interpret responses to the questions in which the benefits of treating the patients differ as consistent with a prioritarian SWF with some degree of inequality aversion. To illustrate, estimates of the frequency distribution of inequality aversion as measured by the parameter γ for the Atkinson SWF are presented in Table 4. Consider the last row. From Table 2, 17.5 percent of respondents allocate treatment to the younger patient in question 9. This implies their degree of inequality aversion $\gamma > 5.71$ and hence the fraction of respondents for whom $\gamma \leq 5.71$ is 1 – 0.175 = 0.825. The fraction of respondents who allocate treatment to the older patient in question 9, for whom $\gamma < 5.71$, is 0.536. Together, these observations suggest that the fraction of respondents whose inequality-aversion parameter $\gamma = 5.71$ is 0.289 (= 0.825 – 0.536), which is an implausibly large spike in the frequency distribution of inequality aversion. We reconcile these observations by concluding that the fraction of respondents whose inequality aversion $\gamma \leq 5.71$ is between 0.536 and 0.825, reported in columns (3) and (4), respectively. Values for the other questions are calculated similarly (and similarly imply implausibly large spikes in the frequency distribution of inequality aversion). Results corresponding to question 1 show that the fraction of respondents whose inequality aversion $\gamma \leq 0$ is between 0.237 and 0.586. The fraction who allocate treatment to the older patient choose as if they are inequality seeking, which implies $\gamma < 0$.

Taking the midpoint of the two estimates (column (5)) suggests that about two-fifths of respondents are not inequality averse, the median inequality aversion is about 1.5, three-fifths have inequality aversion less than 2.8, and two-thirds have inequality-aversion parameters less than 5.7.

5.5. Who supports fair innings?

In this section, we identify common patterns of responses to the questions that vary the benefit of treating the younger patient, holding other parameters fixed, and associate these patterns with fair innings and alternative principles for allocating treatment. We then report descriptive analyses of the associations between these response patterns and respondents' sociodemographic characteristics.

We begin by identifying the most common patterns of responses to the five questions that describe strength of fair innings preference, reported in Table 2. In these questions, the ages of the younger and older patients are fixed (40 and 60 years, respectively) and the treatment always provides 20 years to the older patient. The only difference is the number of years the treatment would provide to the younger patient, decreasing from 40 years in the first row to 1 year in the last row. We include all response patterns exhibited by at least one percent of respondents, which yields 17 distinct patterns.

As summarized in Table 5, these 17 patterns account for 1379 respondents (68.6 percent of the total). We classify these patterns as consistent with fair innings, utilitarianism, counter fair innings, indifference throughout, or as inconsistent with any apparent principle. A respondent whose preferences are consistent with our prioritarian interpretation of fair innings would allocate the treatment to the younger patient in questions 6 and 1 of Table 2; depending on the strength of her fair innings preference relative to concern about maximizing total benefit, she might also allocate the treatment to the younger patient in rows 7, 8, and 9. In any case, she may switch her allocation from the younger to the older patient exactly once; if she allocates the treatment to the older patient in any row, she must do the same in all subsequent rows. Alternatively, she can be indifferent to treatment allocation in exactly one of questions 7, 8, and 9, allocating treatment to the young in all preceding rows and to the old in any following rows.

Analogously, a respondent whose preferences are counter fair innings would have an opposite response pattern: she would allocate the treatment to the older patient in questions 1, 7, 8, and 9; in question 6, she could allocate treatment to either patient or report indifference depending on the strength of her counter fair innings preference relative to concern about maximizing total benefit. A utilitarian respondent would choose to allocate treatment to maximize the total benefit, allocating it to the younger patient in question 6, the older patient in questions 7, 8, and 9, and being indifferent to the allocation in question 1. Finally, a respondent could refuse to give priority to either patient and would be indifferent in all five questions. The response patterns we classify as inconsistent are those in which the respondent switched her allocation between patients more than once (these include three distinct patterns).[10]

As shown in Table 5, 1303 respondents (64.8 percent) exhibited one of the 14 patterns we characterize as consistent. Of these, 39.7 percent gave responses consistent with fair innings[11] and 30.5 percent expressed indifference in all five questions. An additional 9.9 percent of consistent respondents refused to prioritize except when the difference in benefit was large, i.e., these respondents reported indifference in all cases except they allocated treatment to the younger patient when the benefit was 40 years (question 6) or to the older patient when the benefit to the younger patient was no more than 10, 5, or 1 years (questions 7, 8, and 9). Only 3.4 percent of consistent respondents exhibited a utilitarian choice pattern, allocating treatment to whichever patient would benefit more and expressing indifference when the patients would benefit equally (question 1). Finally, 16.6 percent of consistent respondents exhibited a counter fair innings pattern, allocating treatment to the older patient except, perhaps, when the gain to the younger patient was 40 years (question 6).

We examine the relationship between selected response patterns and respondents' sociodemographic characteristics. Specifically, we estimate multinomial logistic regression models

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[10] Two of the three inconsistent patterns allocate treatment to the younger patient in questions 6 and 7, and to the older patient in questions 1 and 8; they differ in that one pattern allocates treatment to the younger patient in question 9 (32 respondents) and the other allocates treatment to the older patient in question 9 (20 respondents). The third pattern is indifferent in question 6, allocates treatment to the young in question 1, and to the old in questions 7, 8, and 9 (24 respondents).

[11] Of the respondents whose answers are consistent with fair innings, between 27.9 and 34.2 percent reveal an inequality-aversion parameter $\gamma \leq 1.58$ (6.3 percent expressed indifference in question 7), 57.8 percent reveal $\gamma \leq 2.84$, and 74.1 percent reveal $\gamma \leq 5.71$ (none of these respondents expressed indifference in questions 8 or 9). By construction, all have $\gamma > 0$. Among this subset, the median value of γ is roughly 1.5 and about three-quarters have values less than 5.7.

where the dependent variable is one of three response patterns: consistent with fair innings, with counter fair innings, and with indifferent/refuse to prioritize (the omitted category). The relatively small share of respondents who exhibited the utilitarian or the indifferent/utilitarian response patterns are omitted from this analysis (13.3 percent of the consistent responses).[12]

Estimates are reported in Table 6. The model in columns (1) and (2) includes indicator variables for three age groups: 35-49, 50-64, and 65 years and older (the omitted category is ages 18-34). The estimated coefficients in column (1) suggest that respondents older than the omitted category are less likely to choose consistently with fair innings (the odds are smaller by a factor of 0.40 to 0.52), while those in column (2) suggest that older patients are also less likely to exhibit the counter fair innings pattern (excluding the oldest respondents, aged 65 years and above, the odds are smaller by a factor of 0.55 to 0.57). The estimated coefficients are larger in magnitude for ages 50-64 years than for ages 35-49 years, and are smallest in magnitude for ages 65 years and older, suggesting effects that increase then decrease with age.

Adding other respondent characteristics in columns (3) and (4) does not substantially change the estimated effects of age. Men are more likely than women to choose consistently with counter fair innings and also, to smaller extent, with fair innings (the relative odds are 2.16 and 1.41 times as large, respectively). More education is associated with the fair innings response pattern (having a baccalaureate increases the odds by a factor of 1.48 and having more than a baccalaureate increases them by an additional factor of 1.42). Higher income (greater than the median) is associated with an increase in the odds of supporting fair innings by a factor of 1.30. Catholics and Muslims are associated with the counter fair innings pattern (the relative odds are 1.71 and 1.86, respectively) although the estimated coefficient for Muslims is not statistically significant.

6. Conclusion

Our main conclusion is that there is substantial support for the fair innings principle in the general population, but this support is far from universal and may not even constitute a majority opinion. When asked their preference about allocating a treatment that will provide the same increase in longevity to either of two patients who differ only in age, between 41 and 56 percent of respondents would choose to allocate the treatment to the younger patient. This preference is stronger when the difference in age is larger and when the older patient is older. Excluding the question in which the

[12] We also estimated ordered logistic models, with indifference as the intermediate category. As shown in Table 6, estimated coefficients of the multinomial logistic model are inconsistent with the constraint imposed by the ordered logistic model (that the coefficients increasing the probability of fair innings or counter fair innings preference be equal in magnitude and opposite in sign). Hence we reject and do not report ordered logistic results.

older patient is 80 years old, no more than 47 percent of respondents would allocate treatment to the younger patient.

A large fraction of respondents do not support allocating the treatment to either patient. Between 30 and 36 percent express strict indifference to which patient receives the treatment, even in cases where one patient would gain many more years of life than the other. Finally, between 14 and 24 percent of respondents prefer to provide treatment to the older patient when each would gain the same number of years.

Among the 65 percent of respondents whose responses match one of the five consistent response patterns we identify, 40 percent give responses that are consistent with the fair innings motivation (but differ in the weight they give this motivation relative to maximizing the total benefit). This suggests that only about one-quarter of all respondents consistently support fair innings. A smaller but substantial group (30 percent) refuse to prioritize even when the difference in benefit is as large as 20 years to the older and only one year to the younger patient; an additional 10 percent refuse to prioritize except when the difference in benefit is large. Together, these two groups constitute another quarter of our full sample. Seventeen percent of consistent respondents (one-tenth of the full sample) have counter fair innings preferences (giving priority to the older patient if the gain is at least as large as for the younger patient). Only a tiny fraction (2 percent of all respondents) make choices consistent with utilitarianism (maximizing the total benefit).

Support or opposition to the fair innings principle is not strongly associated with sociodemographic characteristics. We find some evidence that support is consistent with self-interest (greater support among younger, and greater opposition among older, respondents) but the oldest age group seems more supportive of giving priority to the young than are some younger groups. More-educated respondents are also more likely to support fair innings. Males are more likely than females to allocate treatment to a patient rather to be indifferent; they are also relatively more likely to favor the older patient.

Interpretation of the roughly one-third of respondents who express indifference to which patient is treated is impeded by our failure to provide response options that differentiate respondents who believe neither patient should be prioritized from those who are uncertain or do not wish to be required to choose between patients.[13] Respondents older than 35 years and females are more likely to express indifference, as are those who are neither Catholic nor Muslim. Refusing to

[13] Respondents chose between allocating treatment to the younger or older patient, or the option “Vous n'avez pas de préférence” (literally, “you have no preference”).

prioritize either patient is consistent with a deontological principle of refusing to discriminate between people in the case of life-saving measures but inconsistent with a consequentialist evaluation of whole lifetimes.

We evaluate the distribution of inequality aversion toward longevity in our sample using a common parametric specification (Atkinson). We conclude that about two-fifths of respondents are not inequality averse, the median value of the inequality-aversion parameter is about 1.5, three-fifths have inequality aversion less than 2.8, and two-thirds have inequality-aversion parameters less than 5.7. For comparison, Hurley et al. (2020) report that nearly half their respondents have inequality-aversion parameters (for health-adjusted life expectancy) less than 1 and nearly half have values greater than 3.

Our study employs extremely simple, stylized questions to estimate the degree of support for fair innings. The questions concern allocation of a single life-saving treatment between two patients where the benefit of treatment is large, often 20 years. Despite this simplicity, only about two-thirds of respondents answered the nine questions in accordance with a coherent pattern (e.g., fair innings, counter fair innings, utilitarian, or indifference throughout). To some extent, limited data quality is inherent in online surveys of a general population (and samples from an internet panel may not be broadly representative). Our results may reflect that many citizens do not have stable, well-considered views on the allocation of life-saving treatments. Moreover, respondents may not have accepted our instruction to assume that each life year would provide the same quality of life to both individuals. Other question formats, such as questions about allocating small reductions in mortality risk, might elicit different responses. Preferences about allocating treatments that improve health quality but not mortality might differ as well. We did not ask follow-up questions that might have clarified the rationale for refusing to allocate treatment to one patient or the other: it could have been motivated by the deontological principle to treat everyone equally or used to express uncertainty or to object to the premise of the survey (that triage might be necessary). We framed the questions as benefiting only the patients themselves without specifying how saving one or the other might affect any children or other people who might depend on the patients. Surveys in other countries might produce different results.

Health-policy decisions often require mediating between two attractive principles: fair innings (or more broadly giving priority to helping those who are worse off and hence diminishing inequality) and giving the same treatment to all. The large and rather similar levels of support for these conflicting principles that we find highlights why many health-policy decisions are controversial.

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Table 1. Bognar-type questions with same longevity gain (percentage)

Qx	(Age young, age old, longevity gain)	Choose younger patient	Indifferent	Choose older patient
1	(40, 60, 20)	41.4	35.0	23.7
2	(20, 60, 20)	46.6***	32.8	20.6**
3	(60, 80, 20)	56.2***	29.8***	14.0***
4	(20, 40, 20)	43.6	34.7	21.7
5	(20, 40, 40)	44.6**	36.3	19.1***

N = 2011. ***, **, * denote significantly different from fraction in question 1 with p < 0.01, 0.05, 0.10, respectively. The hypothesis that the distribution of responses in all rows is the same can be strongly rejected ($\chi^2 > 100$ with 8 degrees of freedom).

Table 2. Strength of fair innings preference (percentage)

Qx	(Age young, age old, longevity gain young/old)	Choose younger patient	Indifferent	Choose older patient
6	(40, 60, 40/20)	49.7	35.4	14.9
1	(40, 60, 20/20)	41.4***	35.0	23.7***
7	(40, 60, 10/20)	30.4***	36.1	33.5***
8	(40, 60, 5/20)	23.1***	33.0**	43.9***
9	(40, 60, 1/20)	17.5***	28.8***	53.6***

N = 2011. ***, **, * denote significantly different from fraction in previous row with p < 0.01, 0.05, 0.10, respectively. The hypothesis that the distribution in all rows is the same can be strongly rejected ($\chi^2 > 1000$ with 8 degrees of freedom).

Table 3. Multinomial logistic regression of individual choices

	Model 1		Model 2	
	(1)	(2)	(3)	(4)
	Treat young	Treat old	Treat young	Treat old
Age (young)	0.0112***	-0.0046***	0.0111***	-0.0044***
	(0.0011)	(0.0012)	(0.0012)	(0.0013)
Age difference	0.0215***	-0.0079***	0.0205***	-0.0075***
	(0.0019)	(0.0025)	(0.0020)	(0.0025)
Gain (young)	0.0141***	-0.0166***	0.0129***	-0.0167***
	(0.0020)	(0.0025)	(0.0021)	(0.0027)
Gain (y) – gain (o)	0.0065***	-0.0300***	0.0073***	-0.0298***
	(0.0024)	(0.0036)	(0.0025)	(0.0038)
Age 35-49 years			-0.6017***	-0.6464***
			(0.1296)	(0.1333)
Age 50-64 years			-0.8527***	-0.8053***
			(0.1323)	(0.1361)
Age ≥ 65 years			-0.7505***	-0.6043***
			(0.1345)	(0.1387)
Male			0.2506***	0.4700***
			(0.0888)	(0.0926)
Edu: Baccalaureate			0.2290*	0.1106
			(0.1229)	(0.1269)
Edu: > Bac			0.1272	-0.0044
			(0.1150)	(0.1186)
Income			0.0887	0.0241
			(0.0658)	(0.0680)
Catholic			0.2381**	0.3649***
			(0.0933)	(0.0962)
Muslim			0.12912	0.5876**
			(0.2330)	(0.2301)
Other religion			-0.0627	0.2985
			(0.2104)	(0.2178)
Intercept	-0.9737***	0.2398**	-0.9109***	0.3128
	(0.1084)	(0.1206)	(0.2021)	(0.2108)
N		18,099		16,830

Notes: Regression coefficients. Standard errors clustered by respondent. ***, **, * denote p < 0.01, 0.05, 0.10, respectively. Default categories: age (18-34), education (less than baccalaureate), income (less than median), religion (none). Sample sizes are smaller in columns (3) and (4) because respondents who did not answer questions about included variables are dropped.

Table 4. Distribution of inequality aversion

(1) Qx	(2) Inequality aversion γ^*	(3) Fraction (less inequality averse)	(4) 1 – fraction (more inequality averse)	(5) Midpoint
1	0	0.237	0.586	0.412
7	1.58	0.335	0.696	0.516
8	2.84	0.439	0.769	0.604
9	5.71	0.536	0.825	0.681

Note: Column (2) is the value of the inequality-aversion parameter such that an individual would be indifferent to treating the two patients in the corresponding question in Table 2. Column (3) is the fraction who allocate treatment to the older patient, column (4) is 1 minus the fraction of respondents who allocate treatment to the younger patient, and column (5) is the mean of columns (3) and (4).

Table 5. Response patterns to questions in Table 2

Response pattern (number of patterns)	N	Percentage
Fair innings (5)	517	39.7
Indifferent throughout (1)	397	30.5
Indifferent/utilitarian (4)	129	9.9
Utilitarian (1)	44	3.4
Counter fair innings (3)	216	16.6
Consistent (14)	1303	100
Inconsistent (3)	76	
Total (17)	1379	

Note: 1379 of 2011 respondents (68.6 percent) provided consistent responses to questions reported in Table 2. Indifferent/utilitarian includes respondents who reported indifference except when the opportunity cost was large (young would gain 40 or no more than 10 years). Counter fair innings includes respondents who are indifferent or allocate treatment to young when young would gain 40 years.

Table 6. Multinomial logit model of consistent response pattern

	Model 1		Model 2	
	(1)	(2)	(3)	(4)
	Fair innings	Counter FI	Fair innings	Counter FI
Age 35-49 years	-0.721***	-0.558**	-0.780***	-0.679**
	(0.265)	(0.265)	(0.222)	(0.290)
Age 50-64 years	-0.924***	-0.590**	-0.965***	-0.704**
	(0.261)	(0.261)	(0.228)	(0.293)
Age ≥ 65 years	-0.662**	-0.012	-0.783***	-0.269
	(0.263)	(0.263)	(0.241)	(0.296)
Male			0.342**	0.769***
			(0.146)	(0.183)
Edu: Baccalaureate			0.392*	0.316
			(0.203)	(0.245)
Edu: > Bac			0.352*	0.109
			(0.182)	(0.226)
Income			0.263**	-0.063
			(0.103)	(0.133)
Catholic			0.214	0.535***
			(0.152)	(0.193)
Muslim			-0.030	0.622
			(0.460)	(0.520)
Other religion			-0.096	0.138
			(0.358)	(0.447)
Intercept	0.894***	-0.275	-0.091	-0.758**
	(0.161)	(0.207)	(0.288)	(0.364)
N		1130		1052

Notes: Regression coefficients. Standard errors clustered by respondent. ***, **, * denote p < 0.01, 0.05, 0.10, respectively. Default categories: age (18-34), education (less than baccalaureate), income (less than median), religion (none). Sample sizes are smaller in columns (3) and (4) because respondents who did not answer questions about included variables are dropped.

Appendix

Table A. Descriptive statistics (percentage) and comparison with French population

	Sample	French population
Male	47.1	48.4
Age (years)[a]		
18-24	9.6	7.1
25-34	14.5	13.8
35-49	26.4	22.6
50-64	25.7	23.4
65+	23.9	33.2
Net monthly household income[b]		
Less than 1500€	25.1	19
1500-2499€	27.8	49
2500-3499€	23.7	18
3500€-5999€	24.2	11
6000€ or more	3.9	3
Declined to answer	3.8	
Education[c]		
No elementary school diploma/certificate	2.7	15.8
BEPC – Brevet des collèges	4.6	5.0
CAP/BEP	19.4	24.7
Bac	26.2	17.7
Bac + 2	25.7	14.4
Bac + 4 or more	21.3	22.4
Declined to answer	0.3	
Religion[d]		
Catholic	47.6	48
Muslim	4.5	4
Protestant	1.5	3
Jewish	0.8	1
Other	1.9	4
Declined to answer	3.6	7
No religion	40.0	34
Sample size	2011	

Notes: Population data by age and gender from INSEE, Estimations de population, https://www.insee.fr/fr/statistiques/2381474).
a. National population aged 20 years or older.
b. Observatoire des inégalités, https://www.inegalites.fr/Salaire-etes-vous-riche-ou-pauvre.
c. Authors' calculations from education data by age group (25-64) and gender (INSEE, France, portrait social Édition 2019, https://www.insee.fr/fr/statistiques/4238409?sommaire=4238781).
d. Viavoice / Observatoire de la laïcité 2019, https://www.gouvernement.fr/rapport-des-francais-a-la-religion-et-aux-convictions-chiffres-cles