

**Treatment priorities among older people if faced with serious illness: improving the quality of life or extending life?**

**Prioridades de tratamentos de pessoas idosas numa situação de doença avançada: melhorar a qualidade de vida ou prolongar a vida?**

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**ABSTRACT**

**Objective:** This study aimed to analyse older people's end-of-life care priorities and to identify factors associated with these priorities.

**Methods:** A cross-sectional face-to-face survey with 400 individuals aged  $\geq 60$  living in the city of Belo Horizonte, Brazil was conducted. Participants were asked their treatment priorities if faced with a serious illness with limited time to live. Multinomial logistic regressions were used to identify the associated factors. The possible instability of the factors in the final multivariable model were assessed by bootstrap resampling.

**Results:** Most participants (65.3%) chose the option 'improve quality of life for the time they had left'. Only 4% said extending life was the most important priority while the option 'both equally important' (quality and extension) was chosen by 30.8 of respondents. Participants in the age group 60-69 years were more likely to choose both quality and life extension than choose to extend life alone (AOR=0.18, 95% CI:0.05-0.72; ref: 80+ years). The group comprised of single + widowers is more likely to prioritize

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both quality and extension than to prioritize just extending life (AOR=0.28, 95% CI:0.09-0.89; ref: the others marital status) and or just improving the quality of life (AOR=0.62, 95% CI:0.40-0.95; ref: the others marital status).

**Conclusion:** The findings indicated that treatment for improving the quality of life was the most important priority. Two factors influenced the priorities (age group and marital status). To meet people's treatment priorities at end of life, policies need to be formulated to develop palliative care services, train health-care professionals, and educate patients.

**Keywords:** aged, life extension, quality of life, palliative care, public health

## RESUMO

**Objetivo:** O objetivo deste estudo foi analisar as prioridades de cuidados em fim de vida de pessoas idosas e identificar os fatores associados com as prioridades.

**Métodos:** Foi realizado um estudo transversal com 400 indivíduos com idade  $\geq 60$  anos residentes na cidade de Belo Horizonte, Brasil. Foi perguntado aos participantes qual a prioridade de tratamento numa situação de doença grave com tempo de vida limitado. Os dados foram analisados por meio de regressão logística multinomial para identificar os fatores associados. Técnicas de reamostragem bootstrap foram consideradas para avaliar a existência de instabilidade dos fatores no modelo final.

**Resultados:** A maioria dos participantes (65.3%) escolheu a opção “melhorar a qualidade de vida do tempo que lhe restasse”. Apenas 4% responderam que “prolongar a vida” é mais importante, enquanto a opção “ambos são igualmente importantes” (prolongar e melhorar) foi escolhida por 30.8% dos participantes. Os participantes do grupo etário 60-69 anos foram mais propensos a escolher a opção “ambos são igualmente importantes” do que somente “prolongar a vida” (AOR=0.18, 95% CI:0.05-0.72; ref: 80+ anos). O grupo dos solteiros + viúvos são mais propensos a priorizar a opção “ambos igualmente importante” do que priorizar somente a opção prolongar a vida (AOR=0.28, 95% CI:0.09-

0.89; ref: casados/união estável + divorciados/separados) e somente “melhorar a qualidade de vida” (AOR=0.62, 95% CI:0.40-0.95; ref: casados/união estável + divorciados/separados).

**Conclusão:** Os resultados mostraram que os tratamentos que melhoram a qualidade de vida foi a prioridade de cuidado mais importante. Foram encontrados dois fatores que influenciaram as prioridades (grupo etário e estado civil). Para atender às prioridades de tratamentos das pessoas no fim da vida é preciso formular políticas para desenvolver serviços de cuidados paliativos, treinar profissionais de saúde e educar os pacientes.

**Palavras-chave:** idoso, expectativa de vida, qualidade de vida, cuidados paliativos, saúde pública

## INTRODUCTION

Brazil is facing an accelerated process of population ageing, with important consequences for end-of-life care provision. It is estimated that in Brazil in 2060, 25.5% of the population will be 65 years or older, while in 2018 this proportion was 9.2%.<sup>1</sup> The global burden of disease is also changing, with more people dying from chronic disease at older ages. The combination of multiple chronic conditions, frailty, and disability in advanced old age inevitably increases the number of older people whom need palliative care.<sup>2</sup> The World Health Organization (WHO) estimates that the most likely (69%) population to need palliative care at end of life is the elderly population.<sup>3</sup> However, studies indicate that older patients with serious conditions frequently receive high-intensity treatment, which burdens them with unnecessary admissions to intensive care units with either incurable disease, administrations of cardiopulmonary resuscitation for terminal patients and initiation or continuation chemotherapy in the last 14 days to 1 month of life.<sup>4-7</sup>

The WHO recommends that palliative care should be integrated into the national health system, however, palliative care is still underdeveloped in many countries around the world, especially outside of North America, Europe and Australia.<sup>3,8</sup> As happened in many other countries, most deaths in Brazil occur among older age groups, often following the terminal stages of advanced chronic diseases, such as cerebrovascular and cardiovascular diseases, chronic obstructive pulmonary disease, cancer, and dementia.<sup>9</sup> Despite this scenario, palliative care services are relatively limited given the size of the Brazilian population and there is limited availability to morphine, which means many people may die without access medicine to relief pain.<sup>3,10</sup> There is an urgent need to implement new palliative care services that can improve the quality of life of people living with life-threatening illness.

The approach of palliative care must be based on respect for personal priorities and preferences regarding future treatments. Since most deaths occur among the elderly, it is crucial to understand the end of life treatments priorities amongst this population for future health-care delivery and planning of the advance care.<sup>11</sup> While some studies have examined end of life preferences, there are few focused specifically on older people.<sup>5</sup> A European population-based study showed that on average 71% (from 81% in Spain to 57% in Italy) of respondents (16 years or over), preferred that treatments improve their quality of life for the time left rather than extending life in a scenario of advanced cancer and old age was a significant predictor of prioritization of quality of life in Spain, Italy, and Portugal.<sup>12</sup> Another study has shown that 54% of older adults (65 years or older) who were accessing specialist palliative care in London, Dublin and New York prioritized improving their quality of life in a scenario of serious illness. Only 3% prioritized life extension.<sup>13</sup>

Estimates show that proximity-to-death have a significant economic impact on the health care expenditures.<sup>3,12,14,15</sup> Elderly with chronic conditions and the implementation of new technologies used in intensive care for advanced diseases are the main factors which increases health expenditures.<sup>12</sup> Therefore, to improve the quality of care in the face of increasing debate about how to control health care costs, the treatments priorities for the planning the future advance care for individuals and populations must be known.<sup>2,12</sup> Understanding these priorities will improve the equitability of the distribution of health care resources. This study examined older people`s treatments priorities in a scenario of a serious illness with a limited time to live and to identify factors influencing these priorities.

## **METHODS**

### **Study design and setting**

We conducted a cross-sectional face-to-face survey based on the methods of the PRISMA telephone survey on public preferences and priorities for end-of-life care.<sup>12</sup>

This study was undertaken in the city of Belo Horizonte, capital of the state of Minas Gerais in Southeast Brazil. The population of Belo Horizonte aged 60+ raised from 8.9% in 2000 to 12.7% in 2010, showing the considerable increase of the elderly population in the city.<sup>16</sup>

### **Sample**

The study sample was defined using stratified sampling and taking into account the older population distribution by three groups (60-69 years; 70-79 years; 80+ years) and gender according to the 2010 Demographic Census. According to that Census, there were 299,177 older people (aged 60+) living in the city of Belo Horizonte. Based on the Krejcie and Morgan table (1970),<sup>17</sup> for a confidence level of 95%, considering a conservative scenario ( $p=0.5$ ), the required size of a random simple sample (with an error margin of

5%) was approximately 400 participants. Hence, the number of respondents in each subsample (stratum) was calculated proportionally to ensure that the sample distribution by age groups and gender was proportional to the sample universe.

### **Data collection**

Data collection occurred between February and July 2015. We have sampled our population from well-established social programs developed by Belo Horizonte's City Council focused on assisting community-dwelling older people (providing services and activities such as physical exercises, computing, handicraft, and singing lessons). This strategy ensured that the potential participants were living in households as opposed to an institution (similar to the population sampled in the PRISMA surveys).

Participants were sampled from the Reference Centre for Older People (CRPI); and 10 older people's community-dwelling groups from the Reference Centre of Social Services (CRAS), managed by the City Council's Sub-Secretariat of Social Services (SMAAS). The SMAAS helped to select ten different groups which covered all nine geographical regions (Barreiro, Centro-Sul, Leste, Nordeste, Noroeste, Norte, Oeste, Pampulha e Venda Nova) in the City of Belo Horizonte and included older people with different levels of social deprivation. The study was approved by the CRPI's coordinator and by the SMAAS Secretary-General.

Participant selection in the centres was by convenience considering eligible participants' availability and willingness to take part in the study. The study's principal investigator, CRPI and CRAs staff introduced the study to potential participants and discussed its objectives and methodology with those interested in taking part. All questionnaires were administered face to face by the first author who had been in contact with members of the PRISMA Research Team based at King's College London and received guidance about the PRISMA methodology. The inclusion criteria were: aged 60+; living in the

community in the city of Belo Horizonte; and being able to give informed consent. With the collaboration of the professionals in the centers, the users considered not to be oriented in time and space were excluded.

### **The survey tool**

The questionnaire was developed as part of PRISMA;<sup>12</sup> which covered England, Flanders (the Dutch speaking part of Belgium), Germany, Italy, the Netherlands, Spain, Portugal. The Portuguese version of the PRISMA questionnaire was culturally adapted to Brazilian Portuguese following robust.<sup>18</sup> This study differed from the original PRISMA methodology adopted in Europe in four ways. Firstly, the questionnaire was administered face-to-face instead of over the telephone as recommended by Brazilian palliative care specialists due to the sensitive nature of the topic. Secondly, the scenario of hypothetical advanced illness was broadened to include other relevant conditions in addition to cancer. Thirdly, similarly to the English questionnaire but differing from the other European versions, a question about the participant's ethnicity was included. Finally, we focused on the older population as age and chronic/life-limiting conditions are more common among older age bands.

The Brazilian version of the questionnaire examines preferences and priorities for end-of-life care in a hypothetical situation of serious illness (such as cancer, dementia, Parkinson's disease, chronic obstructive pulmonary disease, heart disease, renal failure or osteoarthritis), with less than one year to live. The questionnaire consists of two parts. The first part includes 10 questions on preferences and priorities at the end of life. The second part includes sociodemographic questions as well as questions related to experiences with illness, death, dying and general health. Publications on other topics covered by the questionnaire are available.<sup>19-21</sup>

Participants indicated treatment priorities by answering the question below.

*“When people are faced with a serious illness with limited time to live, they may have to make difficult decisions and prioritise some things over others. In this situation, would it be more important to extend your life or to improve the quality of life for the time you had left?”*

Answer options were: *“To extend life”*; *“To improve the quality of life for the time you had left”*; *“Both are equally important”* and *“You don’t know”*.

### **Analysis**

Crude percentages were calculated to describe sample characteristics (Table 1) and treatment priorities considering both age groups and gender (Table 2). There were no cases with missing values. Multinomial logistic regression was used to examine if the outcome variable (treatment priorities) was affected by some those characteristics. Since there were no respondents selecting the fourth answer option (“You don’t know”), the outcome variable was considered with three categories. Preliminarily, a bivariate analysis using Pearson  $\chi^2$  tests was executed as pre-selection strategy to select factors potentially associated with the treatment preference in a multivariate model. Only factors with the lowest p-values from the bivariate analysis were included in the multivariate analysis. As proposed by Hosmer-Lemeshow (2000)<sup>22</sup>, for the bivariate analysis we selected a relaxed significance level, usually [0.15, 0.25]. Taking a significance level of 20%, four factors were selected to be entered in the multivariate model obtained by multinomial logistic regression. However, one of those factors (“permanently sick or disabled in the last 7 days”) was forced to be excluded as explanatory variable in the final multivariate model because almost all respondents (98,8%; 395) said “yes” (Table 1). Moreover, since any single respondent does not opt to extend his/her life, the explanatory variable “marital status” was recoded. It was converted into a binary factor merging “single” and “widower” categories into one class and the remains categories into another class. The adjusted odds

ratios (AOR) and the 95% confidence intervals were calculated in the final multivariate model in order to identify associations of the categorical factors ( $p < 0.05$ ) with the treatment priorities at the end of life. All statistical analyses were performed using IBM SPSS Statistics software, version 23.0 for Windows. At the end, as an internal validation step, a bootstrap analysis to the complete sample was conducted using R v.3.5.2 to explore instability of the selected factors into the final model and their statistical significance. Briefly, 5000 bootstrap samples with replacement were generated and, for each sample, a bivariate analysis as mentioned above was executed to select factors. How many each independent variable was selected to be included in the final multivariate model was calculated. Again, taking 5000 bootstrap replicates, for each of the three factors selected for the final model, statistical significance ( $p < 0.05$ ) was also calculated. These results are summarized in boxplots.

#### **Ethics approval and consent to participate**

This study was approved by the Ethics Committee of the Department of Social Sciences and Health of the Faculty of Medicine of the University of Porto/ Portugal (PCEDCSS-FMUP 15/2014) and by the Research Ethics Committee of the Municipal Department of Health of Belo Horizonte (SMSA-BH) (CAAE: 40740914.3.0000.5140). The objectives, methodology, and collaboration in the study were explained to all participants. They were asked if they have any questions and after answering any queries and clarifying any potential concerns due to the nature of the topic, all who agreed to participate in this survey signed informed consent.

#### **RESULTS**

Of the 400 participants interviewed, 53.5% evaluated general health (physical and mental) as good, 19% have been received personally diagnosis of seriously ill in the past 5 years and 66% had already involved in supporting and caring for a close relative or

friend in their last few months of life (Table 1). Overall, 1.3% reported having been sick or disabled in the last 7 days. The oldest participant was 92 years old.

**Table 1. Respondent characteristics (n; %)**

Variables	n	%
Age bands		
60-69 years	217	54.3
70-79 years	121	30.3
80+	62	15.5
Gender		
Female	241	60.3
Education		
No formal schooling	30	7.5
Up to 4 years	149	37.3
Up to 8 years	54	13.5
Up to 12 years	122	30.5
Higher education	45	11.3
Marital Status		
Single	61	15.3
Married or with a partner	167	41.8
Separated or Divorced	50	12.5
Widower	122	30.5
Religion		
Roman Catholic	267	66.8
Protestantism/Evangelical	63	15.8
Spiritism/Afro-Brazilian	37	9.3
Other	11	2.8
No religion	22	5.5
Ethnicity		
White	114	28.5
Black	63	15.8
Brown and other (1: Asian Brazilian; 1: Indigenous)	223	55.8
Activities in the last seven days		
In education (not paid for by employer) even if on vacation	26	6.5
Unemployed	41	10.3
Permanently sick or disabled	5	1.3
In paid work	136	34.0
Retired	323	80.8
Pensioner	102	25.5
Doing housework, looking after children or others	34	8.5
Other	38	9.5
Financial hardship		
Very difficult on present income	24	6.0
Difficult on present income	55	13.8
Coping on present income	207	51.7
Living comfortably on present income	114	28.5
Living arrangements		
Living alone	75	18.8
Health		

Fair	76	19.0
Good	214	53.5
Very good	110	27.5
Experience of illness, death and dying		
Close relative/friend seriously ill in last 5 years	299	74.8
Death of close relative/friend in last 5 years	270	67.5
Diagnosed with serious illness in last 5 years	76	19.0
Cared for close relative/friend in last months of life	264	66.0

In a situation of serious illness with limited time to live, the treatment priorities was for improving the quality of life for the time left (65.3%) rather than extending life (4.0%) (Table 2). Overall, 30.8% of participants thought that extending life and improving quality of life were equally important. Improve the quality of life for the time left was the most preferred option for both gender and in the age groups considered (Table 2). The treatment priorities of participant is not affect by gender ( $\chi^2=2.36$ , p-value= 0.308) neither age group ( $\chi^2=6.13$ , p-value= 0.190). The “experience of illness, death and dying” did not affect the respondent’s priorities at the end of life ( $\chi^2$  oscillating between 0.01 and 1.54, with correspondent p-value between 0.462 and 0.994).

**Table 2. Treatment priority: improving quality of life, extending life or both equally important.**

Treatment priority	Male			Female			Total
	60-69	70-79	80+	60-69	70-79	80+	
Extend life	3 (3.2%)	2 (4.3%)	4 (21.1%)	3 (2.4%)	3 (4.1%)	1 (2.3%)	16 (4.0%)
Improve quality of life	64 (68.8%)	30 (63.8%)	11 (57.9%)	75 (60.5%)	48 (64.9%)	33 (76.7%)	261 (65.3%)
Both equally important	26 (28.0%)	15 (31.9%)	4 (21.1%)	46 (37.1%)	23 (31.1%)	9 (20.9%)	123 (30.8%)
You don't know	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

The results found three factors (age group, marital status and preferred place of death) independently associated with treatments priorities, however only age group and marital status were significantly associated with treatment priorities in multinomial logistic model (Table 3). For participants in the age group 60-69 years, compared to oldest participants (80+ years) the odds decrease by a factor 0.18 for being in extending rather than prioritizing both extend and quality as equally important (AOR=0.18, 95% CI:0.05-0.72; ref: 80+ years). For participants in single and widower marital status group, compared to respondents which marital status is married or with a partner or separated or divorced, the odds decrease by a factor 0.28 for being in extending rather than prioritizing both extend and quality as equally important (AOR=0.28, 95% CI:0.09-0.89; ref: the others marital status). And, finally, participants in single and widower marital status group, compared to respondents which marital status is married or with a partner or separated or divorced, the odds also decrease, now, by a factor 0.62 for being in improving the quality of life rather than prioritizing both extend and quality as equally important (AOR=0.62, 95% CI:0.40-0.95; ref: the others marital status). Bootstrap analysis of factor inclusion (bivariate analysis) confirmed the robustness of our final multivariate model. The proportion of bootstrap models including each of the three factors of the final model was: 73% for age group, 83% for marital status and 78% for preferred place of death

(Figure1, in Appendix). Moreover, those three cases reported to have statistical significance in the multinomial logistic model lead to the highest proportion of statistical significance in the bootstrap-corrected model (65% for age group 60-69 years and outcome level 'To extend life', 54% for single and widower marital status group and outcome level 'To extend life', and 69% for this marital group and outcome level 'To improve the quality of life' (Figure 2, in Appendix).

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**Table 3. Factors associated with people's treatment priority of extending life and to improving the quality of life for the time you had left versus both are equally important. P-values obtained in the bivariate analysis are shown in brackets.**

Variable	To extend life	To improve the quality of life
(Ref <sup>n</sup> . Both are equally important)	AOR (95%-CI)	AOR (95%-CI)
Age groups (ref: 80+)	(p-value = 0.190)	
60 – 69 years	<b>0.18</b> (0.05 – 0.72)	0.54 (0.27 – 1.09)
70 – 79 years	0.32 (0.08 – 1.33)	0.59 (0.28 – 1.24)
Marital status (ref: married or with a partner or separated or divorced)	(p-value = 0.049)	
Single or widower	<b>0.28</b> (0.09 – 0.89)	<b>0.62</b> (0.40 – 0.95)
Preference for place of death (ref: hospital- but not palliative care unit, palliative care unit, care home)	(p-value = 0.074)	
Own home and home of relative or friend*	2.53 (0.81 – 7.88)	1.44 (0.93 – 2.23)

\* Because only 2 individuals showed preference for place of death "Home of relative or friend", in subsequent analyses, the answers "Own home" and "Home of relative or friend" were aggregated into a single group.

## DISCUSSION

To our knowledge, this is the first study to investigate treatment priorities of Brazilian older persons living in the community the city of Belo Horizonte in a scenario of serious illness with limited time to live. The results indicate that most respondents favored treatment priority focused on improving their quality of life for the time left (65.3%). Life extension was only favored by a minority of participants (only 16 participants chose this option). No participant chose the answer option 'you don't know', which showed that all the respondents have an opinion on the subject. In addition, this shows that people at end of life know what they want.

As in other nations, most deaths in Brazil occur among people who are older, mainly due to advanced chronic diseases and in hospitals.<sup>9,23,24</sup> In order to prioritize treatments that improve quality of life rather than those that extend life, it is fundamental to implement more care palliative care services and to train professionals for end-of-life care. Physicians should take care to remember to have a conversation with the patient about

the disease and which treatments to prioritize after the diagnosis of a life-threatening illness.<sup>12,21</sup> It is also important for the health-care professionals to encourage the patient to talk about his/her care priorities. Evidence from the same sample of this study shows that 74.0% of older people would always want to be informed if they had limited time left and prefer self-involvement in decision-making about their care (95.3%) in the scenario of serious illness with less than one year to live.<sup>19,21</sup> Our results also suggest the importance of talking about death and end-of-life care with the elderly. Conversation about death and dying are still considered a taboo in Brazilian society, however, it can be very helpful for the patients to express their end-of-life preferences and priorities and access the treatment concordant with their preference.<sup>11</sup> Thus, national policies are needed to train health care providers and population about end-of-life care.

Our results found that participants in the age group (60-69 years) were more likely to prioritize both quality and extend life rather than prioritize extend life alone in comparison with those aged 80+. It is possible that life extension is the most important priority for the oldest age group (80+ years) due to the fact that they are closer to the end of life than the youngest age group (60-69 years) and, therefore, they are more afraid of death. People aged 60-69 years wanted to extend life but also want to live the remaining years with a high quality of life. Another explanation for the observed preferences may be that the oldest group is less familiar with the idea of quality of life than youngest group. However, more studies are needed to better understand all the implications of these results.

Single or widowed participants more frequently prioritized both options equally (quality of life + extend) rather than prioritizing just life extension or just quality of life than individuals who are married/have a partner or are separated/divorced. One possible explanation is due to the fact that the elderly singles are already used to living alone, therefore, they do not intend to have a partner in the future, which also holds most of the

widows. Thus, the group of widows + single is comprised of individuals who feel they have to make decisions for themselves. Participants who are divorced or separated, who mostly belong to the 60-69 age group, tend to think about living with someone else again. Thus, the group of married or with a partner or separated or divorced tend to make decisions as a couple; or at least to think about how their choice can affect their partner (in general, they do not want to be a burden). On the other hand, for participants of the group of widowed + single, the standard of making decision may be differentiated from the previous group but more standardized or similar among them, leading to detect the marital status (with two classes) as a significant factor in our analysis. The fact that the majority of the divorced and separated are in the 60-69 age group may be important to detect this behavior and may justify these findings. It is worth to mention that other recordings of the marital status factor were considered and statistical significances were not detected suggesting that there are no clear patterns of treatment priorities for other regroupings of the status marital. This subject should be further studied to clarify why the joining of these two marital states captures significance in the multinomial model.

It is important to acknowledge that our data were collected in places where elderly people are offered various services, including physical activities, literacy, and computer science, and programs to ensure the promotion and defence of their rights. Older people who attend these places are likely to have a more active lifestyle and be more likely to take care of their health, and thus still have the capacity to stay involved with their treatments. Although a large subset of bootstrap replications have been identified in which our multinomial model is substantially stable, this study had some notable limitations. The preferences of older people without autonomy or some functional dependencies (mainly related to institutionalized older people) or those who are more fragile may have been underrepresented. Future studies should include participants with greater functional

dependence. None of the participants rated their overall health as bad or very poor, so the participants may have found it difficult to imagine themselves as having a serious illness with limited time to live. However, 19.0% of the participants had already had a serious illness in the last five years, and  $\geq 66.0\%$  have had, in the last five years, a close relative or friend with a diagnosis of severe illness, or who lived close to the death of family/friend or who have been involved in the care or support of a family/friend in the last months of life. Overall, the participants' experiences with severe illness and death helped to contextualize the hypothetical scenario used in the questionnaire. It is recommended that in the future, studies be conducted with elderly people with advanced disease to see if treatments priorities change when they are confronted with a poor diagnosis. In addition, qualitative studies are needed for a better understanding of the factors associated with these priorities.

## **CONCLUSION**

Improving the quality of life for the time left was the most common treatment priority for the respondents. Our results showed that the treatment priorities for participants in the age group 60-69 years are different from the group of older participants (80+ years). Younger participants gave equally preference for extending life. Our analysis showed that the group comprised of single + widowers is more likely to prioritize both quality and extension than to prioritize just extending life. This subject should be further studied to clarify why the joining of these two marital states captures significance in the multinomial model. Although it is necessary to increase the sample size, bootstrap analysis reinforced our conclusions. Policy changes in Brazil are needed to reorient clinical practice to deliver the patient's treatment priorities and education of the general population about palliative care. More studies on the influence of age group and marital status on treatment priorities for older people are also required.

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### **Competing interests**

The authors declare that they have no competing interests.

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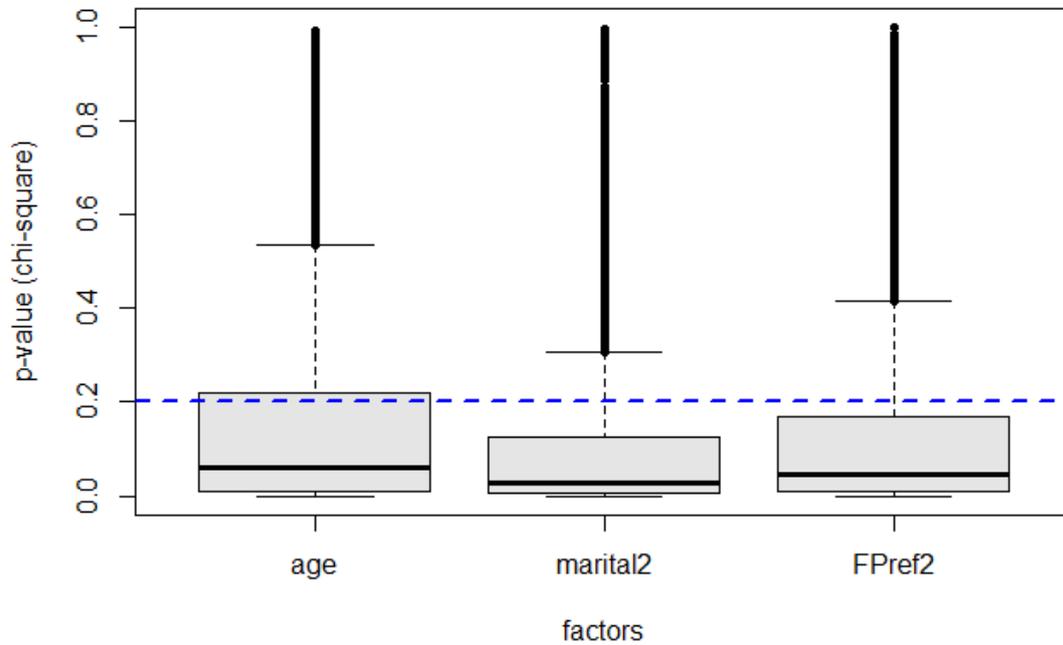
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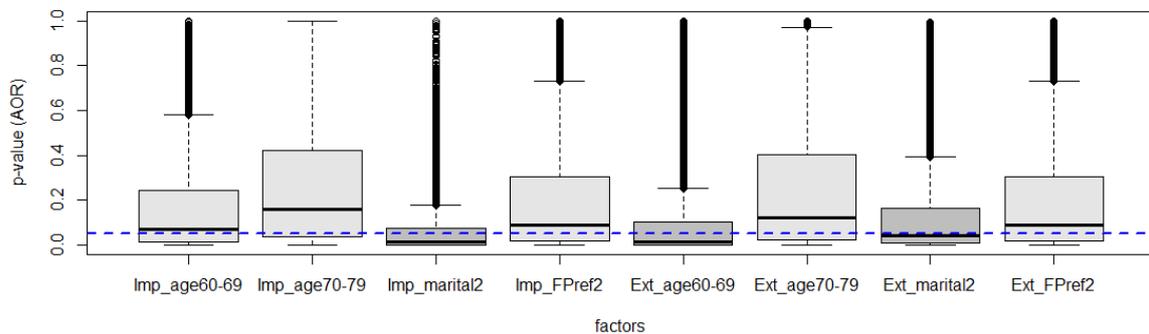
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## Appendix



**Figure 1** P-values related to the Pearson  $\chi^2$  tests (bivariate analysis) obtained from 5000 bootstrap replications for each of the three factors: age bands (age), marital status -2 levels- (marital2), preference for place of death -2 levels-(FPref2) entered in the final multivariate model ( $p < 0.20$ ).



**Figure 2** P-values related to the statistical significance of AOR for each factor/level in each bootstrap-corrected multinomial logistic model (Ref<sup>st</sup>. Both are equally important) calculated from 5000 generated bootstrap sample. Dark gray boxplots correspond to the

three cases (factor/level) which are significantly associated ( $p < 0.05$ ) with treatment priorities in the multinomial logistic model featured in Table 3. The abbreviations 'Imp' and 'Ext' stand for 'To improve the quality of life' and 'To extend life', respectively.

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