

# An integrated approach for Long-Term Care planning: Dealing with the multiplicity of decision makers' views, objectives and preferences

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*Abstract - In a context of an increasingly aging population and growing incidence of chronic diseases, an adequate planning of Long-term Care (LTC) becomes a key objective across European countries. Such planning has to take into account the multitude of objectives meant to be achieved, as well as a diversity of stakeholders involved, which have different, and probably conflicting, perspectives. However, there has been little research around such a matter, especially in the LTC sector.*

*This dissertation proposes a new methodology in order to explore the diversity of perspectives among the stakeholders involved in the planning of networks of LTC, regarding the objectives they consider relevant to be achieved, as well as its impact in planning decisions. The proposed method integrates a Delphi Method so as to collect information regarding the objectives considered relevant among the selected participants, and also the importance the participants assign each objective. In order to accomplish this latter feature, the Delphi is integrated with the MACBETH methodology, so as to allow determining the relative importance conferred to each planning objective, in the form of numeric weights. Afterwards, the data obtained is inputted in a mathematical programming model so as to explore the impact of different planning perspectives in planning decisions in the LTC sector.*

*The proposed methodology was applied to a Portuguese case study in the Great Lisbon Region, in order to contribute for a better understanding of the planning setting, and consequently a better and more adequate provision of LTC for the Portuguese LTC patients.*

Keywords — Long-Term Care; Health Planning; Delphi Method; MACBETH Method; Mathematical Programming Model.

## I. INTRODUCTION

Around the world, especially in Europe, there have been occurring some drastic demographic and social changes. One of the major changes lies with the ageing population, that is, the increase of the elder proportion, above 65 years old. The percentage of elderly population reached the value of 18.37%, as an average of the 28 countries of the European Union (EU), which is a huge value if it is accounted that in 1970 this value was of only 11.46% (OECD, 2013). Such increase results from the combination of factors, namely the reduction of mortality associated with the increase of the life span, and the decrease of natality (Grant, 2004).

Besides the economic and social issues originated from the ageing population, one of the major consequences, nowadays, is the need to provide care in the long-term, due to the health needs of such population. These needs arise from the major incidence of chronic diseases in the elderly

population, that harm the health state and can lead to the disabilities, affecting their health, quality of life and activity daily living (Wiener and Tilly, 2002).

Such unfavourable context, paved the way for the arise of a new type of health care – the Long-Term Care (LTC). The LTC consists in an ensemble of diverse health services, aimed to patients who possess disabilities or dependences at the functional, physical and cognitive level. LTC ensures the provision of a wide range of services, from medical services to nursing, rehabilitation, personal care and palliative care, and can be performed at an institutional level or at the patient's domicile, by formal carers or informal carers (usually the patient's family) (ERS, 2015).

Portugal is also affected largely, by an ageing population, associated to an expressive incidence of chronic disease, which increase the need for the LTC. And if it is accounted that the informal care is increasingly less available, namely due to the women's higher presence in the job market,

magnifies even more the need for LTC (Barros et al., 2011; ERS, 2015).

In order to meet the population's needs, the *Rede Nacional de Cuidados Continuados Integrados* (RNCCI) was created in 2006 (ACSS, 2015). The RNCCI, in order to provide the necessary care to the increasing demand of the Portuguese population with the resources available, is required to perform an adequate and rigorous planning, to accomplish such purpose. This LTC planning is performed by a set of multiple stakeholders, who due to their different formation and expertise areas, possess different views and perspectives of the planning's objectives. This variety of mindsets may be a cause of divergences in the planning context, which can then harm the provision of the LTC.

Although is such an important and impactful theme, there is little research regarding the existence of different perspectives in the LTC sector, and especially how can this influence affect the provision of LTC to the population.

Therefore, this study proposes to understand the diversity of stakeholders' perspectives existent in the planning context, and to comprehend the impact of the diversity of perspectives in the LTC provision. With such purpose in mind, this thesis aims to:

- i. Identify the key stakeholders of the LTC health planning, and also determine how the different perspectives reflect in different planning objectives and in different importance assigned to those objectives. For such a goal, it's proposed:
  - a. Execution of Stakeholder Analysis (SA), to support the identification and selection of stakeholders to involve in the study, and the determination of the existing relevant objectives in the LTC planning;
  - b. Performance of a participatory method, to deepen the identification of the relevant objectives of the LTC planning, and the attainment of the relative importance of such objectives, according with the stakeholders' perceptions;
- ii. Introduction of the data obtained from the stakeholders in a mathematical programming model developed by Cardoso et al. (2015, 2016), in order to explore how the diversity of objectives and their relative importance, identified in the previous phase, can impact the provision of LTC in the "Lisboa e Vale do Tejo" (LVT) region.

## II. CONTEXT

The RNCCI aims to provide diverse health services and social support, to be able to satisfy the different needs and conditions of the population, improving their health and quality of life (ACSS, 2015). With such purpose, the RNCCI is composed by (ERS, 2015):

- 4 types of internment units: convalescence care (CC), medium-term and rehabilitation care (MTRC), long-term and maintenance care (LTMC) and palliative care (PC);
- Teams who domiciliary care (DC);
- 1 type of unit for ambulatory services, but is yet to be implemented.

RNCCI has been continuously focused in improving the service provided to the population, namely through the increase of beds in internment units, of domicile teams (ACSS, 2015), and also through the increase of the services' scope, particularly providing health mental and paediatric services (Cardoso, 2016).

However, the RNCCI offer still falls short to the population's demand (Barros et al., 2011). There are significant challenges, namely in terms of resources available, increasing demand, lack of professionals fully dedicated to the LTC area, which are leading to a supply below demand (ERS, 2015). Therefore, a better and more adequate planning is needed.

The health planning is performed by the RNCCI's Coordination teams, which are in charge of making and taking the decisions. This Coordination is organized in three levels: national, regional and local (UMCCI, 2009).

In each level, the teams responsible have different scopes and responsibilities (UMCCI, 2009). However, across the levels, all the teams share one feature: multidisciplinary. Although it allows for a wider range of perspectives regarding planning, it may instigate divergences and conflicts, as each individual has its own interests and objectives to pursue, that can possibly clash with the other team elements (Brailsford and Vissers, 2011). Even if the distinct objectives don't collide, each stakeholder grants different importance to the same objective. Such issues can harm the planning process, and consequently, the health services provided to the patients.

Therefore, it's essential, in order to improve the planning process and consequently the provision of LTC, to comprehend the diversity of objectives, regarding the LTC planning and among the stakeholders, and then analyse how the diversity of perspectives can impact the LTC provision.

### III. LITERATURE REVIEW

#### A. *Mathematical Programming Models*

Mathematical programming models have been widely used to support health care planning. These models are capable of integrate important features of the health sector, namely multiples health services, modelling uncertainty and to consider multiple periods of time (important for a deeper planning study) (Benneyan et al., 2012; Costa et al., 2003; Flessa, 2013). However, one of the most critical traits of the health sector to reflect in the models is the existence of a significant number of multiple, and possibly conflicting, objectives (Evans, 1984).

Is in the Objective Function that the objectives expected to be optimized are implemented. Usually, this function is single objective – only one objective is either minimized or maximized- however, given the health sector is characterized by a significant number of different objectives, it is critical to reflect such feature in the model (Evans, 1984). This can be done by implementing all the objectives in a single function, assigning weights to each objective modelled (Cardoso et al, 2016), which is desirable to the context of this work due to the fact that the weight assigning can reflect the preferences of decision-makers (Marler and Arora, 2010).

However, only two studies in the health sector, implemented, in the models, the information provided by decision-makers regarding objectives. It's a quite poor quantity, given the benefits of integrating information and judgements of decision-makers in the models, especially in LTC, which is a very specific health, with lack of information or with incomplete data (Goulet et al., 2009).

#### B. *Stakeholder Analysis*

According to Wang et al. (2015) a stakeholder are all individuals with a reciprocal relationship with the organization, that is, the individual that affect the organization and the organization affects them. It's also worth to mention now that a specialist in an area may not be a stakeholder, and vice-versa.

The SA is composed by a set of different methodologies, which can be utilized to identify

stakeholders, or specific ones that are considered key, in the organization, capture and analyse the perspectives of the stakeholders (namely, how the stakeholders share their perspectives) or to determine the interactions between stakeholders, specifically, if there is conflict or alliances. Given such purposes, it's understandable the importance of applying SA in the health section (Brugha and Varvasovsky, 2000).

However, the SA methods reviewed were shown to be performed with the participation of stakeholders, who provided the needed information (based on the review made of 16 studies, where SA was applied in the health sector). Therefore, given the time consuming and the physical constraints of assembling the participants to execute these methods, it was decided not to further explore them, since the priority of the work is to obtain, from the stakeholders, the relevant objectives (which can be done without the SA) and determine their relative importance.

#### C. *Methods to Collect Information*

As seen in the previous section, the information provided by stakeholders is crucial to perform the SA, and the same can be said regarding the diversity of perspectives and objectives among the stakeholders, as the information collected from them is crucial. Therefore, it's fundamental to explore how to acquire the information needed.

However, it must be already taken into account the physical and time limiting the work. Therefore, methods like the Focus Group (Kitzinger, 1995), Nominal Group Technique (Keeney et al., 2011) and specially the Decision Conference can't be applied in this work, as they rely on the physical gathering of the participants to be performed

Although simple and common methods like surveys/questionnaires and interviews can be executed, such methods are performed individually (Phellas et al., 2011). Therefore, since they don't involve group discussion and communication, the information collected from surveys or questionnaires is considered quite limited (Kitzinger, 1995).

Given the craving for a group method and due to the physical restrictions, such setting arose the need to perform a Delphi Method (Jones and Hunter, 1995).

A Delphi Method is a process that consists in at least 3 rounds, to obtain either or both quantitative and qualitative information. The first round is an exploratory round, where, through a questionnaire,

the objective of the study is selected and background information is collected (exploratory round). With such information, another questionnaire is developed, to obtain the information required. Then, the responses provided are summarized, and the summary is given afterwards to the participants. The participants can visualize and analyse the responses the other participants delivered. Then, the participants, based on the group responses, answer the same questionnaire and can change the response given before (Jones and Hunter, 1995). There can be more rounds, depends on the purpose of the Delphi Method. Although there is no direct interaction between the participants (which can be considered a limitation (Jones and Hunter, 1995)), since the participants receive the summary with the responses given by the group, and can then change their responses, the Delphi Method is considered a group method (Boulkedid et al., 2011).

#### *D. Determination of Objectives' Relative Importance*

The determination of the relative importance of objectives can be accomplished through the calculation of weights. A weight reflects such importance, through a number between 0 and 100. It's crucial to mention that all the weights, to the objectives considered, have to totalize 100 (Yoe, 2002).

This weight can be determined from qualitative or quantitative information. However, given this study is inserted in the health sector and the possible participants are associated to a wide range of areas of expertise, it's advisable to focus in qualitative information rather than quantitative. Furthermore, a review made of 22 studies were information was collected in the health sector, made it clear that the qualitative information (20 studies) is predominantly preferred rather than the quantitative type (figured in only 6).

Therefore, given such consideration, it's crucial to explore the MACBETH method, which is able to determine weights from qualitative information. The MACBETH has more applications, but weight determination is the focus here (Bana e Costa et al., 2012). First, the participants rank the objectives considered, according to the importance of each one passing from the Lower level of reference (for example, a Neutral level or Status Quo) to the Higher level of Reference (example, Good or Target). Then the participant evaluates the importance of each one improving from the lower level to the higher level by using one of 7

judgements of importance: Extreme, Very Strong, Strong, Moderate, Weak, Very Weak or Null. For a deeper and more rigorous weight determination, the participants can also provide judgement of the comparison between pairs of objectives (Bana e Costa et al., 2012). This method can be done through a software called M-MACBETH (Bana e Costa et al., 2012).

#### IV. METHODOLOGY

The Literature Review performed enlightened regarding the path to undertake in this work, in order to accomplish the aim proposed.

Therefore, this study proposes to develop methodology that integrates several questionnaires with a Delphi Method based on the MACBETH approach and with a planning model based on a mathematical programming model. The Delphi method is used to obtain, from selected stakeholders, data regarding the different objectives, which has to integrate the MACBETH, in order to be able to determine the weights from the information collected. Afterwards, the set of weights, determined for each participant, is inputted in the mathematical programming model developed by Cardoso et al. (2015, 2016), for the purpose of exploring how the diversity of perspectives of the stakeholders affect the provision of LTC.

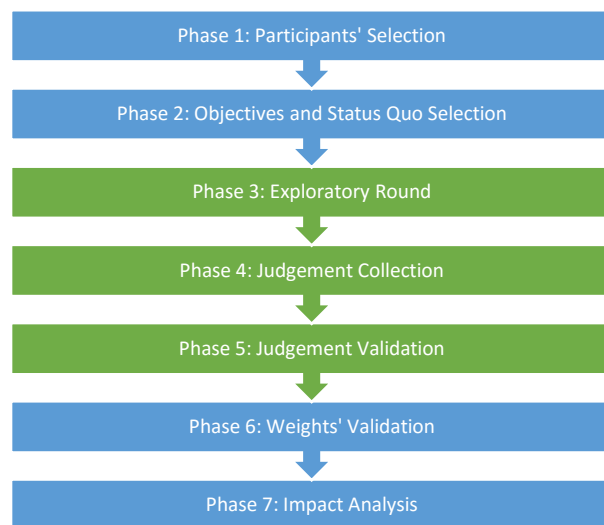


Figure 1 - Methodology devised for the study, with the six phases followed. The green boxes indicate the phases associated with the Delphi Method

To implement the methodology devised, 7 phases will occur. The phases associated to the Delphi

Method were implemented with Qualtrics, a free online survey platform to build the surveys required.

#### A. Phase 1: Participants' Selection

In this phase, the participants of the study are selected and invited. The inclusion criteria for the study is:

- Belong or belonged to the RNCCI Coordination;
- Experts, who have done reports and other types of work regarding the LTC sector.

#### B. Phase 2: Objectives and Status Quo Selection

In this phase, an initial set of objectives, considered relevant to the LTC planning is obtained through research. These objectives are then validated by the participants in the next phase.

Since in this work, it is intended to integrate a MACBETH method, it's necessary to find out the reference levels of the objectives. Given it would be demanding to collect both Status Quo and Target (desired to be achieved in 2020) to each objective considered, it's proposed to only acquire the Target from the participants, as the Status Quo are obtained, through research, in this phase.

#### C. Phase 3: Exploratory Round

The Delphi Method starts in this phase. In this phase, it is purposed to obtain information about which objectives are relevant to the participants, and then find out the targets of the objectives validated by them.

Given the different responses to the targets in each objective, this data has to processed, in order to obtain solely one Target level for each objective. For this, it can be used statistical methods, namely mean, interquartile range, among others.

#### D. Phase 4: Judgement Collection

A second survey is sent to the participants, where they are required to, according to the objectives and the reference levels presented, to rank the objectives according to importance of passing from the Status Quo to the Target, and then to provide qualitative judgements to evaluate this passage, for each objective.

The responses obtained are then summarized, in order to provide to the participant a summary of the responses given by the group. The summary will present the percentage of participants, for each

objective, a given qualitative judgement, in order to provide the diversity of responses.

#### E. Phase 5: Judgement Validation

Based on the summary sent with the group responses, the participants are allowed to change their judgements, in the new survey delivered to them. This survey is personalized to each one, so that they can recall the responses they gave in the previous round.

The Delphi Method won't have more phases, because the purpose of the method in this study is to obtain the diversity of perspectives among the participants, not to reach a consensus.

Therefore, since the qualitative judgements are collected, the weights can now be determined, by inputting those judgements in the M-MACBETH software.

#### F. Phase 6: Weights' Validation

In this phase, the weights obtained for each participant have to be validated. As it's the case throughout the study, the physical restrictions prevent the physical gathering of the participants. Therefore, a validation in the presence of the participants is ruled out.

Hence, to validate the weights determined, is sent a new survey, personalized to each participant (as they are different across the participants). In the questionnaire it's presented a multiple choice question, with 5 options: the original weights calculated, 3 options where in the first option the highest weight was increased, in the second one the second highest weight was improved and in the third option the third weight was amplified, and another choice if the respondent doesn't agree with any option before.

In case the respondent doesn't agree with either option presented, or if that option doesn't fully capture the perspective, there is also an open question, where the participant can write down how the weights should be distributed.

#### G. Phase 7: Impact Analysis

Fulfilled the weight validation, the weights can finally be inputted in the mathematical programming model, and by running them, it can be explored how the diversity of weights influence the services provision. The impact resulted can be explored in 3 levels:

- Open and closing of internment units;

- Accomplishment of the objectives considered;
- Difference of the levels obtained to the Target defined by the participants in the Delphi Method.

## V. RESULTS

In this section, the results obtained by applying the proposed methodology to support the planning of the RNCCI in the Great Lisbon Region are presented for each phase.

### A. Phase 1: Participants' Selection

Eight participants, whose name won't be divulged to respect their confidentiality, accepted to integrate the study intended:

- One element from the LVT Regional Coordination;
- One Chief-nurse in a RNCCI unit;
- Four experts, who developed professional and academical works around LTC;
- Two experts from "Entidade Reguladora da Saúde" (ERS).

### B. Phase 2: Objectives and Status Quo Selection and Phase 3: Exploratory Round

Seven objectives that were considered for the study, based on the research performed were:

- Maximization of Equity of Access (EA), described as the maximum transport time of a patient to the desired LTC service;
- Maximization of Geographical Equity (GE), described as the percentage of population, of a given region, satisfied with LTC;
- Maximization of Socioeconomic Equity (SE), described as the percentage of population in worse economic condition, who have its LTC needs satisfied;
- Maximization of Equity of Utilization (EU), described as the percentage of population satisfied with a given LTC service;
- Minimization of Costs (C), described as the total annual costs per patient satisfied;
- Maximization of Health Gains (HG) and Maximization of Wellbeing Gains (WBG), both described as the distribution of the RNCCI services: CC, MTRC, LTMC, PC and DC.

The table below show the Status Quo obtained from research (phase 2), and the Target reference level

determined from the participants' response (phase 3):

Table 1- Status Quo, values provided by the eight participants, and the Target determined by the median of the participants' responses

	EA (min)	GE (%)	SE (%)	EU (%)	C (€)
Status Quo	27	2	26	2	3162
1	30	70	70	50	3000
2	60	100	100	100	2455
3	25	X	40	20	3100
4	20	15	35	20	3050
5	X	70	70	70	X
6	X	25	46	25	2800
7	15	50	60	60	2000
8	X	85	X	85	X
Target	25	59	60	54	2735

The HG are characterized as the improvement of health in the patients, due to the services provided. Is measured by the Quality Adjusted Life Years (QALY). While the WBG is associated to the improvement regarding the well-being of the patient assisted, and is measured by ICECAP-A, which scores the improvement in well-being after the service is provided to the patient. The scores associated to the services, both QALYs and ICECAP-A, are displayed in the table 2 (Cardoso et al. 2015), along with the Status Quo defined (ACSS, 2015) and the Target reference determined (median of the participants' responses).

Table 2 - Status Quo and the Target, calculated by performing the median of the participants' responses, and the values of QALYs and ICECAP-A for the LTC services

		QALYs	Status Quo	Target
HG	CC	0.57	13%	16%
	MTRC	0.86	21%	21%
	LTMC	0.32	19%	10%
	PC	0.21	5%	7%
	DC	0.59	42%	46%
		ICECAP-A	Status Quo	Target
WBG	CC	0.10	13%	11%
	MTRC	0.11	21%	18%
	LTMC	0.20	19%	18%
	PC	0.09	5%	8%
	DC	0.16	42%	46%

Other objectives the participants revealed were namely: Promotion of specialized formation, dedicated to LTC; increase resources available, namely internments beds and domicile services; fomentation of the ambulatory services.

#### C. Phase 4: Judgement Collection and Phase 5: Judgement Validation

Six participants answered to the survey of phase 4, while two dropped out from the study. Table 3 evidenced the number of respondents who provided, for a chosen objective, a given judgement. No participant answered with a judgement below Weak.

No participant, in phase 5, decided to change his judgements.

Table 3 - Percentage of participants that provided, for each objective considered, a given qualitative judgement

	Extrem e	Very Stron g	Stron g	Moderat e	Wea k
AE	17%	17%	33%	33%	
GE	33%		50%	17%	
SE	17%	17%		33%	33%
UE	33%	17%		17%	33%
C	17%	50%	17%	17%	
HG	50%	33%	17%		
WB G	33%	33%		17%	17%

#### D. Phase 6: Weights' Validation

Table 4 – Weights, in percentage, calculated with M-MACBETH (first line) and weights validated (second line), for each of the six participants

	EA	GE	SE	EU	C	HG	WBG
1.	21	17	19	7	10	14	12
	21	16	20	7	10	14	12
2.	20	18	16	14	12	11	9
	20	18	16	14	12	11	9
3.	14	11	8	5	16	24	22
	13	10	8	5	20	23	21
4.	11	20	9	17	14	23	6
	11	22	9	16	13	23	6
5.	12	15	8	5	22	18	20
	12	14	8	5	26	17	18
6.	7	12	10	14	17	21	19
	7	12	10	14	16	21	20

After inputting the judgements provided in the M-MACBETH software, and validating them with the participants, the table 4 discloses the weights obtained. Only one respondent didn't change the weights determined initially.

#### E. Phase 7: Impact Analysis

Finally, the weights determined for each participant are integrated in the mathematical programming model.

The results are displayed below. In the tables 5 and 6, it can be observed the total number of internments units opened and closed for each participant.

Table 5 - Total number of Internment units opened from 2017 to 2019, for each participant

	Total number of Opened Internment Units			
	CC	MTRC	LTMC	PC
1	4	4	2	2
2	4	4	2	2
3	5	4	2	2
4	4	5	1	2
5	4	2	3	2
6	4	4	2	2

Table 6 - Total number of Internment units closed from 2017 to 2019, for each participant

	Total number of Closed Internment Units			
	CC	MTRC	LTMC	PC
1	2	3	6	5
2	2	3	6	5
3	1	3	6	5
4	1	3	6	5
5	2	5	6	5
6	2	3	6	5

Table 7 - Levels obtained in the model, for each participant, regarding the objectives GE, SE, EU and EA, along with the Target utilized in the Delphi Method

	GE (%)	SE (%)	EU (%)	EA (%)
1	40	70	80	25
2	46	60	82	25
3	20	57	80	15.1
4	46	62	82	15
5	20	50	75	15.1
6	17	75	82	14
Target	59	60	54	

Regarding the objective levels resulted from the model, first is shown, in table 7, the levels obtained for the Equity objectives, and the Target levels of reference defined by the participants. It's not presented the Target for EA, because the level obtained is defined differently than the Target.

Then, it's presented the levels obtained from the HG, WBG and the Costs incurred, in the table below.

Table 8 - Total HG, total WBG and Totals costs, from 2017 to 2019, obtained from the model, for each participant

	Total HG	Total WBG	Total Costs (M €)
1	110434	16576	223
2	90120	14427	201
3	72357	13479	258
4	75640	13786	189
5	51429	12117	132
6	73567	13546	167

## VI. DISCUSSION

### A. Results

The results shown, demonstrate the wide diversity of views from the participants involved in the study. This diversity manifests itself instantly in the definition of the Target level for the objectives considered, which reveals a lack of common vision regarding the level to be achieved. Also, the significant difference between the Status Quo and the Target exposes that there is still a long path ahead to the LTC planning.

From the Target setting, it's demonstrated the importance assigned to the Domicile and the PC Services, with the lower QALYs and ICECAP-A scores, as the respondents increase their distribution, revealing the concern for these specific type of care in the LTC service scope.

With the judgements provided and the consequent weights calculated from them, it's observed the general trend to value more the HG and Costs objectives, rather than the objectives associated to Equity, which only two participants assign more importance to the Equities. Such trend can be attributed then to a significant concern with the quality of the care provided, at the lowest cost possible. However, it's also worth to mention that the HG are the most valued, more than the Costs, which highlights that the provision of a better care,

associated to more gains to the patients, overcomes the costs' concern.

However, the other gain, that is, the WBG, is not as important to the participant as the HG. Furthermore, it's quite a divergent objective to the participants, as this objective has a wide range of weights associated.

Regarding the results obtained with the model, it's revealed that the diversity of weights affects significantly how many internment units are opened and closed, especially the Costs weight. It's in the participant with the highest Cost's weight (26%), which induces to open fewer units and to close more, to prevent the investment costs of opening a service and also the expenses of the service's operations. Furthermore, is noticed a trend of prioritizing the MTRC units, more units opened and fewer closed, over LTMC, because the first ones are associated to higher HG (highest QALYs), which is more valued generally as seen before.

The levels obtained to the Equity related objectives showcase the higher the weights attributed to the them, the higher the levels occurred. Therefore, the respondents 1 and 2, who assigned, generally, higher weights to the Equities, have the better levels.

However, it has to be referred that the diversity of views doesn't affect strongly the objectives related to EA and EU, as there is no significant difference of results across the participants.

Regarding the Targets levels, it's noticeable that SE and EU overcome these levels, even though they can be considered to be the objectives with the lower weights, and consequently of less importance (in terms of the passage from the current level to the target). However, the same can't be said about the GE objective. In this case, not even the participant with the highest weight assigned, is able to surpass or even come near of the Target defined, due to the weights of the Costs, HG and WBG. Therefore, for a better performance of GE, it's necessary to introduce new measures.

Finally, in terms of the Total Gains obtained, the participants with the higher weights assigned to the Gains have the lower levels, while the ones with the lower weights (participant 1 and 2), who valued more the Equities objectives, have the best performance. This is due to the fact that the Total Gains are determined by the sum of the gains acquired by providing care to the patients assisted. Therefore, as the Equity objectives ensure that



more patients are able to receive care, then more gains are obtained. It is hypothesized then that the path to obtain more Gains, in the population, is by certifying that the more patients receive care. However, it must be accounted these leads also to the increase of the costs associated.

Analysing the levels of WBG, they are shown to be quite low, and their difference between participants is weak. This is due to the low scores of ICECAP-A associated to the services, demonstrating the significant gap between the HG and WBG.

### B. Limitations of the Study

Although the goals of the study were accomplished and it was able to draw some important conclusions, it must be taken into account the limitations, which hindered this work:

- The existence of physical and time restrictions, which hindered the performance of both, the SA preventing a deeper exploration of the stakeholders and their perspectives;
- The limited population in quantity, and with only one element of the RNCCI's Coordination;
- In order to prevent the overload of the participants and consequent abandonment of the study, a less complete fulfillment of the MACBETH method was made. It wasn't required to the participants to evaluate pairs of objectives nor to perform another objective ranking in the third round of the Delphi Method.

## VII. FINAL REMARKS

In this study, it was reviewed the main concepts and methods of collecting information from stakeholders, and then to process it, in order to figure out and explore the diversity of planning objectives and its relative importance across the stakeholders. Moreover, it was researched the main notions regarding Mathematical Programming Models, and its utility and value of applying them in Health issues.

The literature review made it clear that there has been little research on studying the diversity of objectives and how they vary in the planning context, especially in the LTC sector. Furthermore, integrating the knowledge, obtained from stakeholders, in mathematical programming models hasn't been done in the LTC sector.

Therefore, in the chapter IV, it's proposed a different and innovative methodology to collect qualitative information from stakeholders, and convert such knowledge in weights, reflecting the relative importance assigned to the multiple objectives considered relevant to the LTC's planning. Such methodology is able to prevent the need for physical gathering of stakeholders, which is useful especially when they are geographically dispersed. Furthermore, the information collected is then integrated in a Mathematical Programming Model, which enables to study and explore how the diversity of perspectives from stakeholders can influence the provision of LTC.

This way, this study can contribute to a better understanding of how the diversity of stakeholders' objectives and interests can affect the LTC planning and consequently the LTC performance, and it can help the stakeholders to comprehend the importance of a shared vision and to fulfil the most important objective – the health and quality of life of the patients.

As future work, some considerations are made, which may elevate the study contribution to the LTC planning:

- Performance of Stakeholder Analysis, for a better and more rigorous identification of stakeholders and perspectives;
- Involvement of LTC's stakeholders with no direct influence in the LTC planning, namely patients and the health providers;
- Modelling other relevant objectives, which were obtained from research and also from the study's participants, for example the increase of internment beds or the promotion of ambulatory services;
- Extending the application of the Model to other Portuguese regions, beyond LVT.

## VIII. REFERENCES

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