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Cost-effectiveness of a 'Housing First' programme implemented in Spain: An evaluation based on a randomised controlled trial

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Abstract

In the last decades, Housing First model has become a feasible alternative to the traditional "staircase" systems in caring for the most vulnerable homeless people. The analysis that we present in this work is referred to *Hábitat*, a pioneering HF programme in Spain, which has been evaluated attending to both costs and outcomes. A randomised controlled trial was carried out and the collected data was explored through a Cost-Effectiveness Analysis (CEA), including the estimation of Incremental Cost-Effectiveness Ratios (ICER) and acceptability thresholds of the programme's spending. The results highlight the capacity of the programme to significantly improve the participants' life satisfaction levels, reduce the number of homeless nights, and increase the rate of institutional coverage. Even though the programme involves significant short-term expenditure on accommodation, positive effects in net terms are demonstrated supporting the usefulness and viability of HF model.

KEYWORDS

cost-effectiveness analysis, homelessness, housing first, programme evaluation, randomised controlled trial

INTRODUCTION

Homelessness is a very serious social problem, and this is reflected in high profile political initiatives such as the Sustainable Development Goals (SDG) adopted by the United Nations as part of its 2030 Agenda (UN, 2015). SDG 11 aims to "Make cities and human settlements inclusive, safe, resilient and sustainable", which is intricately linked to addressing homelessness. Homelessness also has obvious links with other priority issues such as the eradication of poverty (SDG 1) and the improvement of the health and well-being of all people (SDG 3).

Among the solutions proposed to reduce homelessness and its most negative consequences is the *Housing First* (HF) model. This strategy for action began to be developed more than 30 years ago, with the aim of caring for homeless people—especially those with specific difficulties: mental disorders, drug addiction, etc.—in a way that is different from the traditional "staircase" models that have been questioned (Tsemberis, 2010). HF approaches changed the previous dynamic by first offering permanent housing—the main need—and then all other support services.

Since then, the HF methodology has spread from North America to other countries, including Spain. In

2014, HOGAR SÍ (previously RAIS Fundación), in collaboration with Provivienda, launched the *Hábitat* programme, applying the HF model in 12 Spanish cities. The analysis that we present in this work is the result of an evaluation of this programme and provides evidence on the usefulness and viability of the HF model. The data was obtained through extensive field work that has yielded important primary information, which did not previously exist, regarding two main aspects: first, the impact on homeless people's lives of accessing the programme versus remaining in traditional systems of attention (or treatment as usual, TAU), since a randomised controlled trial design was followed; second, the costs of both options, determined by obtaining the unit costs and frequencies of the participants' reported use of different services. The information obtained in these two areas has been explored through a Cost-Effectiveness Analysis (CEA).

A treatment or intervention is considered cost-effective to the extent that (1) the extra cost of an extra unit of improvement is lower than (2) the decision maker's willingness to pay for it. It is important to note that CEA can report the first block of information required to determine cost-effectiveness (1), but not the second piece of the puzzle (2). To put it another way, the CEA do not tell whether the added effect is worth the added expense because that judgement involves other factors such as budget restrictions (how many resources are available) and preferences (how valuable is the improvement). Nevertheless, the CEA provides not only an estimation of the extra costs to extra effects ratios but also some tools—for example, the cost-effectiveness planes and the acceptability curves—to make careful decisions considering the success likelihood at each spending threshold based on the uncertainty and variability of the estimates.

Over the following pages we show the main results of the CEA made for *Hábitat*, which highlights the capacity of the programme to significantly improve the life satisfaction levels of participants, reduce the number of homeless nights, and increase the rate of institutional coverage. Besides, even though the programme involves significant short-term expenditure on accommodation, it achieves positive effects in net terms, that is, after considering costs and other sociodemographic factors as estimate control variables. Additionally, crucial information for decision-making was obtained by estimating Incremental Cost-Effectiveness Ratios (ICER) and the acceptability thresholds of the programme's spending, which could eventually be compared with the willingness to pay and budget restrictions of the agents considering whether to implement this type of action.

Practitioner points

- Contribution to evidence on the viability of Housing First model for homeless people, based on primary information non previously existing and a randomised controlled trial.
- Robust Cost-Effectiveness Analysis determines positive net effects of the programme evaluated that support the scalation of HF.
- The CEA provides not only an estimation of the extra costs to extra effects ratios but also some tools to make careful decisions considering the success likelihood at each spending threshold based on the uncertainty and variability of the estimates.
- Although it cannot be stated outright that *Hábitat* is always cost-effective, since this will ultimately depend on the amount of money that decision makers are willing to spend on the programme, it seems clear that there is a very wide range of spending possibilities in which it can be considered optimal.

Finally, we discuss the scope of the results and reflect on the limitations to be overcome in future evaluations of similar interventions.

The 'Housing First' model and the *Hábitat* programme

The *Housing First model* was developed in the early 1990 s by the organisation "Pathways to Housing" (Tsemberis & Asmussen, 1999; Tsemberis & Elfenbein, 1999) to care for homeless people facing particular difficulties which the traditional "staircase" care systems (called the *Staircase System* or *linear residential treatment*, hereinafter Treatment as Usual, TAU) were unable to resolve (Tsemberis, 2010). The HF model is aimed at people with more vulnerable profiles, who come directly from the street or who are referred through emergency services. HF provides them with affordable, permanent housing and intensive health and social support. It is an alternative model to the traditional intervention based on "treatment first" (Pauly et al., 2013).

In 2014, HOGAR SÍ launched the first pilot programme in Spain to follow the guidelines of the HF model, called *Hábitat*. This programme strictly adheres to the original HF model. Evaluation was considered a key element of its design from the outset, given the lack of

previous experience in Spain (Panadero Herrero et al., 2021). It is in keeping with the type of randomised controlled evaluation trials recommended for HF programmes (Baxter et al., 2019) and applies—and tries to improve on—the methodology followed in the *Housing First Europe project* (Busch-Geertsema, 2013). Starting from an initial pilot phase, which allowed for fine-tuning of some aspects, an experimental design was followed with an equivalent control group (randomly assigned). Pre- and post-test measurements were taken every 6 months in both groups, for a total duration of 18 months. More details are given in the methods section.

Cost-effectiveness analysis of 'Housing First' programmes

The evidence on the effectiveness of HF in addressing homelessness is consistent (Pleace, 2018; Pleace & Bretherton, 2013; Pleace & Bretherton, 2019), particularly for people with more pronounced or complex needs associated with mental health and/or substance abuse issues (Pleace, 2016; Pleace et al., 2019; Williams, 2020). Since the main objective of HF is to resolve the homelessness situation, the most studied aspects usually relate to accommodation, which shows the greatest degree of consistency across different programmes, countries and contexts. The elevated levels of retention, stability and quality stand out (Adair et al., 2017; Aubry, Nelson, & Tsemberis, 2015; Brown et al., 2016; Panadero Herrero et al., 2021; Pearson et al., 2009; Stefancic & Tsemberis, 2007). As a result of greater housing stability, there are significant improvements in people's satisfaction, which can be framed as gains in effectiveness or well-being (Aubry, Tsemberis, et al., 2015; Tsai et al., 2010). HF programmes also have very positive results in core areas of life, such as the use of social services, safety and discrimination, social relationships, mental health, and well-being (Panadero Herrero et al., 2021).

We have seen the gradual incorporation of financial elements into the analysis, that is, the costs incurred. There are a growing number of empirical works that find positive and significant effects in financial aspects related to HF, both in absolute terms and in relation to other alternative services (Gulcur et al., 2003, Tsemberis et al., 2004, Gilmer et al., 2010; Johnson et al., 2012 or Ly & Latimer, 2015). Despite this, the main barrier to these programmes being established as public policies is their high cost in the short term (Panadero Herrero et al., 2021). This difficulty has also been highlighted in some economic analysis that warn that, although the results in terms of people's development seem clear, the cost of the model is sometimes higher than the alternatives (Goering et al., 2014; Rosenheck et al., 2003). The great determining factor is the cost of accommodation, a core element of the programme (Aubry, Tsemberis, et al., 2015; Macnaughton et al., 2015; Tinland et al., 2016; Wright & Peasgood, 2018). However, the existing literature on the financial effects of HF is still relatively sparse compared with other aspects of the model. Consequently, the results are sometimes unclear (Johnson et al., 2012; NASEM, 2018) and tend to focus on specific but increasingly numerous case studies that are generating growing scientific evidence (Gilmer et al., 2010; Gulcur et al., 2003; Ly & Latimer, 2015; Mangano, 2009; Pleace & Bretherton, 2019; Tsemberis et al., 2004).

Of particular interest are the studies that look at both the results and the costs, as recommended also by the *Housing First Guide. Europe* (Pleace, 2016). This was the case of Culhane and Byrne (2010) and Rosenheck (2010) for the USA, focusing on the retention of accommodation. Studies conducted in several European cities (Blood et al., 2017; Busch-Geertsema, 2012; Busch-Geertsema, 2013) have demonstrated that HF can be an efficient use of resources and can even have lower costs than the alternatives (Cohen, 2022; Pleace, 2008; Wright & Peasgood, 2018). Recently, interesting reviews of evaluations providing clearly positive results have appeared in the United States (Jacob et al., 2022) and in France and Canada (Aubry et al., 2021).

In the specific case of Cost-Effectiveness Analysis, two fundamental lines of research have been followed at the methodological level when comparing HF programmes with TAU (Pleace, 2016, p. 69): better results for people, at a lower or equal cost; and less and/or better use of non-specific homeless resources—external cost savings—(NASEM, 2018; Pleace et al., 2013; Wright & Peasgood, 2018).

For the first approach, it has been highlighted that HF does not require the construction of any specialised accommodation, such as shelters or emergency refuges (Culhane, 2008). Partial evidence of the cost-effective nature of the model has been reported by Culhane and Byrne (2010) in relation to chronic homelessness in the United States. In addition, Mason and Grimbeek (2013) pointed out the programme's long-term cost-effectiveness ratio and decreasing cost trend. HF is particularly competitive in addressing the situations of people who frequently abandon traditional stair systems or those who have more difficulties due to their greater severity (Latimer et al., 2019; Lemoine et al., 2021; NASEM, 2018; Pleace, 2018; Y-Foundation, 2017). Blood et al. (2017, pp. 78–84) collected data on the cost-effective nature of

HF demonstrated in various British studies. Shortly after that, Wright and Peasgood (2018) found better results than with TAU for the UK, as did Latimer et al. (2019) for Canada. In Spain, net savings have been discussed in relation to improving the quality of life for users of specific resources in the HF network (Panadero Herrero et al., 2021).

For the second line of research, it has been found that people who participate in HF programmes make less use of resources such as emergency accommodation or emergency medical services and are less likely to be arrested. This translates into a reduction in non-specific costs and greater efficiency compared with the TAU (Basu et al., 2012; Bretherton & Pleace, 2015; Busch-Geertsema, 2012; Busch-Geertsema, 2013; Culhane, 2008; Larimer et al., 2009; Lemoine et al., 2019; Srebnik et al., 2013; Tsemberis, 2010). Another relevant aspect is the cost savings in adults with mental disabilities and/or chronic mental illnesses due to less use of social services (Brown et al., 1991; Gulcur et al., 2003; Stefancic & Tsemberis, 2007).

However, there are also evaluations that are not so positive, finding that cost is sometimes higher than it is for other traditional alternatives, despite the better results for HF participants (Goering et al., 2014; Rosenheck et al., 2003). Some studies report less clear results, with the cost-effectiveness ratio depending on user characteristics (Latimer et al., 2019) or the scenario (Busch-Geertsema, 2013; Pleace & Bretherton, 2019; Wright & Peasgood, 2018). Another concern relates to results that are not easily generalizable (Culhane et al., 2002).

Finally, only a few evaluations have produced negative results for HF programmes. This is specifically because of the costs, both in gross (Gilmer et al., 2010) and net terms (that is, discounting any savings in the use of other resources: Rosenheck et al., 2003). In these cases, the need to carry out sufficiently large and methodologically robust empirical studies is reiterated (NASEM, 2018).

For the evaluation of the *Hábitat* programme, a Cost-Effectiveness Analysis was designed at the beginning to consider this key area relating to the feasibility of implementing this type of intervention. Below we provide more details of the design of the CEA and its results.

METHODS

Design and sampling

The evaluation methodology for the *Hábitat* programme takes the Housing First Europe project (Busch-Geertsema, 2013) as a reference, trying to overcome some of the limitations indicated in its own conclusions. It also considers the results of a previous internal evaluation carried out by HOGAR SÍ in the pilot phase.

An experimental design was chosen in our case, with an equivalent control group (randomly assigned), pre- and post-test measurements, and repeated measures every 6 months for both groups. All participants meet four criteria (Panadero Herrero et al., 2021): legal age, homeless situation, long history of homelessness, and presence of mental problems, addictions or disabilities. The independent variable, which was the basis for defining the two groups, is the intervention received by the participants:

> *Experimental group* (EG): users of *Hábitat*.
>
> *Comparison group* (CG): people who have not obtained a place in the programme, despite meeting the requirements for joining it, and have been placed on the waiting list, so they continue to use other conventional treatment alternatives (TAU).

The sample was configured from the candidates proposed by the referral bodies, after verifying compliance with the four mentioned criteria. The allocation of participants to the study groups was carried out using the proportional stratified random procedure, taking gender into account—in keeping with the proportion of homeless men and women in Spain (Panadero & Vázquez, 2013). A computerised procedure was used to select those people who would join the programme. This was done in a transparent way and the referring entities were able to observe this. It was performed independently for each of the participating cities, although in all cases it was carried out by the Department of Evaluation, Research and Quality at HOGAR SÍ. No professional teams linked in any way to the programme nor any people with a direct relationship with potential users took part in the selection process.

For the experimental group, the target of a minimum sample size of 150 people was established. Eventually, 152 people joined the evaluation after being assigned to *Hábitat*. 114 of these were interviewed 18 months later, so 75% of the initial sample.

For the comparison group, the initial determination of the sample size reflected the fact that locating homeless people or people at serious risk of social exclusion is very complicated due to their great mobility and unstable situation. In anticipation of significant losses of participants and supported by the pilot carried out by HOGAR SÍ, a target ratio of 2.5 times the number of *Hábitat* places was established. In the end, 284 people from the comparison group were interviewed at the beginning of the evaluation, of whom 141 were still part of the study after the 18 months (50% approximately).

TABLE 1 Initial main characteristics of the evaluation participants for whom data is available at 0- and 18-month waves

	Experimental group		Comparison group		
	n	%/M	*n*	%/M	χ^2/*t* tests[a]
Gender					
Males	91	82.0%	102	77.9%	0.631
Females	20	18.0%	29	22.1%	0.631
Age (mean)	111	48.4	130	49.5	−0.941
Nationality					
Spanish	65	58.6%	83	63.4%	2.124
Non-Spanish	46	31.4%	48	36.6%	2.124
Severity profile					
Mental health	30	27.0%	40	30.5%	0.360
Addictions	81	73.0%	108	82.4%	3.150
Disabilities	25	22.5%	31	23.7%	0.044
Time in homeless situation					
Months in homeless situation (mean)	93	129.0	111	124.7	0.282

[a]χ^2-tests were applied in the case of categorical variables and *t*-tests (independent samples) in the case of scale variables. *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

As can be seen in Table 1, the initial conditions of both groups were very similar in terms of their demographic (sex, age and nationality) and social characteristics (high incidence of mental problems, addictions, or disabilities, and long-term homelessness).

Effectiveness variables

Many indicators in multiple areas were used for the evaluation of *Hábitat*. Among these, three variables were selected for the CEA due to their great importance for the objectives of the programme:

- *General life satisfaction* ("What do you think of your life in general?", the first item on the Lehman Qoli scale, 1993), as a measure of improvements in subjective well-being.
- *Homeless nights*, as the sum of the number of days over the last month spent on the street, in places not suitable for human life or in emergency resources (operational categories 1 and 2 of the European Typology of Homelessness and Housing Exclusion—ETHOS: FEANTSA, 2006).
- *Coverage rate/institutional care*, as the proportion of days in the last month they spent sleeping in resources run by the network for homeless people (emergency and homeless shelters, *Hábitat* houses, accommodation paid for by an organisation, accommodation for specific groups). Those nights that did not involve an institutional response, such as being on the street, in unsuitable places, a shack, occupied houses, etc., were excluded.

The selection of variables has considered, on the one hand, the results of the internal analysis carried out throughout the evaluation and, on the other, the specialised literature. There is direct reference to the cost-effectiveness study carried out by Wright and Peasgood (2018), whose outcome variables are days of permanent accommodation (objective) and life satisfaction years (subjective). The number of days of accommodation is a common measurement variable in Housing First studies and it was also used in Latimer et al. (2019), where the target outcome variable was the number of days of permanent accommodation.

Cost estimation

The second source of information for the evaluation, essential for the execution of the CEA, relates to the costs of *Hábitat* and those incurred over the range of situations found in the comparison group.

For cost estimation, the following sequence of calculation stages has been used (complete information in Panadero Herrero et al., 2021):

1. Identification of the service portfolio of the centres used by the participants, based on their direct reporting in the surveys.

2. Calculation of the costs associated with each homeless care service (unit costs), both specific and non-specific (externalities).
3. Recording, from the information contained in the evaluation questionnaires, the use of services (intensity of use) made by each participant.
4. Estimation of the total costs, for each participant and for both groups (*Hábitat* and TAU): sum of unit costs × intensity of use.

The necessary information on costs (point 2 above) has been obtained from various complementary sources. First, through additional specific field work consisting of the use of an online questionnaire with telephone support targeted at the managers of the services and centres mentioned in the evaluation surveys. The sample of centres consisted of 91 organisations (public services, religious entities, civil associations, NGOs, etc.) from 14 Spanish cities. The use of two survey waves permitted us to obtain 29 responses (a rate of 30%) from 11 cities (80% of the cities in the sample). The generation of this primary information is one of the direct results of the research. Second, the data on the cost of health and psychiatric services refer to those financed by the National Health System and have been obtained from the information published by the competent public administrations (Official State Gazette, Official Gazettes of the Autonomous Communities). Finally, the economic repercussion of the legal problems derived from the situation of homelessness (stay in prison and court-appointed lawyer) has been calculated using the Functional Classification of Public Administration Expenditure (COFOG-National Accounting of Spain, 2017), the Report of the General Secretariat of Penitentiary Institutions (2017) and the Free Justice Statistics of the Judiciary General Council (2017).

All costs were calculated for 2018, updating them to that year, if necessary, using the corresponding *Consumer Price Index* (INE, 2019).

Cost variables

The introduction of cost variables into the analysis provides information on the cost-effectiveness ratio of each alternative (study group). The essential reference here is the total individual cost, calculated as the sum of the costs for the use of services and consumption of resources incurred by each participant. The financial analysis has been conducted based on two basic variables:

> *Unit costs of resources*. This is measured per day for services and per intervention for health and legal resources.
>
> *Frequency or intensity of resource use*. This is the number of days per month of service consumption and number of interventions received by the participants (self-reported in the survey).

The combination of these two dimensions allows for the calculation of the monthly cost of the care for the sample of homeless people (Table 2). In addition, costs are also broken down into specific and non-specific (or externalities):

> *Specific costs* are associated with the homeless people referred directly to the evaluated programmes: sum of accommodation, food, cleaning, services, addictions, *Hábitat* support services (if applicable, GE) and indirect costs.
>
> *Non-homeless-specific costs or externalities* are the sum of the costs of health and psychiatric care services, administrative fines and legal problems.

The distinction between specific and non-specific costs (externalities) finds support in the work of Wright and Peasgood (2018). They point out the need to distinguish the long-term fixed cost of accommodation (the determining variable in the HF model) from other components of the total cost, such as those made in this evaluation.

Other control variables

Socio-demographic and severity variables are also included in the CEA to estimate the net effect of participation in the programme, controlling for other personal or situational circumstances. Three types of variables have been selected, all referring only to the time of the first interview (0 months):

> *Sociodemographic profile*: sex; age.
>
> *Severity profile*: issues related to mental health, addictions, and/or disabilities.
>
> *Location*: city of residence.

Cost-effectiveness analysis with differences-in-differences approach

Comparing *Hábitat* versus TAU in terms of costs and effectiveness, we assess whether the possible higher cost of the intervention is offset by a sufficient improvement

TABLE 2 Distribution of cost values within the sample (monthly average)

	0 months		18 months	
	Comparison group	**Experimental group**	**Comparison group**	**Experimental group**
Specific costs	491,47 €	604,05 €	639,48 €	1.350,75 €
Accommodation	134,17 €	218,71 €	248,56 €	920,09 €
Food	72,17 €	83,11 €	59,75 €	5,00 €
Cleaning	16,97 €	17,31 €	14,93 €	-€
Services (care & support)	207,76 €	202,57 €	244,13 €	36,88 €
Addiction treatment	19,81 €	32,48 €	19,31 €	2,46 €
Indirect costs[a]	40,58 €	49,88 €	52,80 €	102,42 €
Hábitat support services				283,90 €
Non-homeless-specific costs/ externalities	340,81 €	495,99 €	518,36 €	355,89 €
Health services	237,41 €	376,25 €	279,88 €	230,30 €
Psychiatric care services	60,40 €	106,14 €	218,57 €	90,96 €
Administrative fines	14,65 €	2,48 €	9,72 €	20,63 €
Legal problems	28,35 €	11,13 €	10,20 €	14,00 €
Total costs (specific & non-specific)	832,28 €	1.100,04 €	1.157,84 €	1.706,63 €

[a]At 0 months, +9.03% for both CG and EG; at 18 months, +9.03% for CG and +10.62% for EG.

in results. We also try to identify other variables that may influence the success of the programme and the relationship between costs and results.

In the first block, by means of models of repeated measures, we compared the differences experienced by the people in the two participating groups—EG and CG—between the initial follow-up moment and 18 months later. This approach is similar to the use of *difference-in-differences* (Angrist & Pischke, 2008). The estimation models have been developed following successive steps. We created estimation models where we have an effectiveness indicator as a dependent or explained variable and a series of independent or explanatory variables that are introduced progressively. These independent or explanatory variables do, of course, include those related to costs.

In this way, we can estimate the net effect of *Hábitat* on the effectiveness measures and their improvement over time, that is, its real impact once the influence of cost differences is discounted. In addition, by generating a stepwise design we can see how each factor in the model affects the differences between EG and CG. In other words, we can estimate whether these differences between groups are maintained, increased, or reduced depending on the variables used in the model. If, for example, the effectiveness gains from EG were to be reduced once costs were taken into account, we would understand that the difference in its favour in gross terms is largely due to the greater outlay that the programme may entail, rather than to a net benefit of this type of intervention. However, if introducing costs does not completely remove the advantages of EG, it can be assumed that the programme has a positive effect by itself and not only because of the greater expense that it may imply.

Cost-effectiveness analysis with incremental ratios

As a complement to the analysis of repeated measures by steps, we also perform an incremental cost-effectiveness ratios (ICER) calculation, which can be defined as:

$$\mathrm{ICER} = \frac{C_{\mathrm{EG}} - C_{\mathrm{CG}}}{E_{\mathrm{EG}} - E_{\mathrm{CG}}}$$

where C_{EG} is the average cost per person included in the *Hábitat* group; C_{CG} the average cost per person included in the comparison group; E_{EG} the mean effectiveness per person included in the *Hábitat* group; and E_{CG} the mean effectiveness per person included in the comparison group. All these values refer to the 18-month wave.

Applying these ratios to the main variables used in the evaluation, we obtain: (1) the incremental cost per additional unit of life satisfaction; (2) the incremental

cost of reducing each night spent on the street and (3) the incremental cost for each tenth of a point (or percentage point) added in the institutional residential coverage rate. The initial randomisation of the evaluation and the verification that the two study groups have very similar characteristics allow us to omit the starting situation from the analysis (0-months wave) and focus on the comparison at the final moment (18-months wave). The results obtained with this approach are of the type:

1. Increasing the level of satisfaction with life by 1 point (on a scale of 1 to 7) means allocating X additional euros per month if the *Hábitat* option is chosen.
2. Reducing homelessness by one night means allocating X additional euros per month if the *Hábitat* option is chosen.
3. Increasing the rate of institutional assistance by one percentage point (pp) means allocating X additional euros per month if the *Hábitat* option is chosen.

Furthermore, this analysis is not limited to the simple point estimation of the average ICERs. In contrast, we incorporate probabilistic techniques that provide confidence intervals (resampling by *bootstrapping*) and also sensitivity tests on the different spending thresholds at which the programme can be considered cost-effective or acceptable.

The specific process is as follows. First, a set of *apparently unrelated regression models* consisting of four equations is estimated: one with total costs as the dependent variable and the other three with each of the effectiveness indicators as dependent variables. In each of these regressions, belonging to the *Hábitat* group or comparison group is included as an independent variable. We perform these estimations with 1000 *bootstrapping-type simulations or resamples* (using STATA 15), whose objective is to obtain a probabilistic distribution of these estimates. The result of each of these "repeated miniature trials" provides a specific combination of total (incremental) costs and measures of effectiveness (incremental), which in turn yields a specific ICER value. Thanks to the results of these 1000 simulations, we have a database that reflects the variability of possible results and allows us to test the possible scope of the programme more adequately, as we will see in the following steps.

Second, these results are used to obtain a *cost-effectiveness plane* for each effectiveness indicator. These are scatter plots in which each point represents one of the simulations and its particular resulting combination of incremental cost (vertical axis) and incremental effectiveness (horizontal axis). Therefore, in this case we will have 1000 points in each of these planes. The interpretation of the distribution and location of the points across the quadrants of the plane is further explained in the results section, where we comment on Figure 2.

Third, *acceptability curves* are constructed. These graphs (see Figure 3) are derived from the calculation of the percentage of simulations in which the evaluated intervention has an incremental cost-effectiveness ratio below a spending threshold per extra effect unit (λ), and this calculation is repeated for different hypothetical values of that threshold. In other words, this curve represents the probability that the intervention will be acceptable according to distinct levels of willingness to pay that the agents who must decide on its implementation might consider (see the comments on 3 in the results section for further details).

That percentage is also equal to the chances that the incremental net benefit is greater than zero. *Incremental net benefit* (INB) is a measure derived from the cost-effectiveness decision expressed as follows:

$$\mathrm{INB} = \lambda(E_i) - C_i$$

In this formula, λ is the spending threshold, while for each i bootstrapping simulation E_i represents the incremental effectiveness and C_i the incremental cost. The result is expressed as a function of the value of the different possible thresholds, and it is considered to be cost-effective at the points where it is greater than zero. If we were to compare several strategies or interventions, the preferred one would be identified as the one with the highest average net benefit in the set of simulations. However, in this work we only use the visualisation of the acceptability curves as it is enough for the presentation of the main results.

RESULTS

Difference in differences approach

Figure 1 shows estimates of the marginal means in both waves (0 and 18 months) for each group and successive steps of the repeated measures models.

We begin looking at quadrants a1, b1, and c1 which present the results of the simplest models for each of the three effectiveness indicators established as dependent variables. In other words, in those quadrants we see the estimates of the evolution of these indicators, with belonging to the *Hábitat* (EG) or comparison group (CG) as an inter-subject explanatory factor, but without controls for other variables (first step). We can observe that, at the beginning of the study, there were no

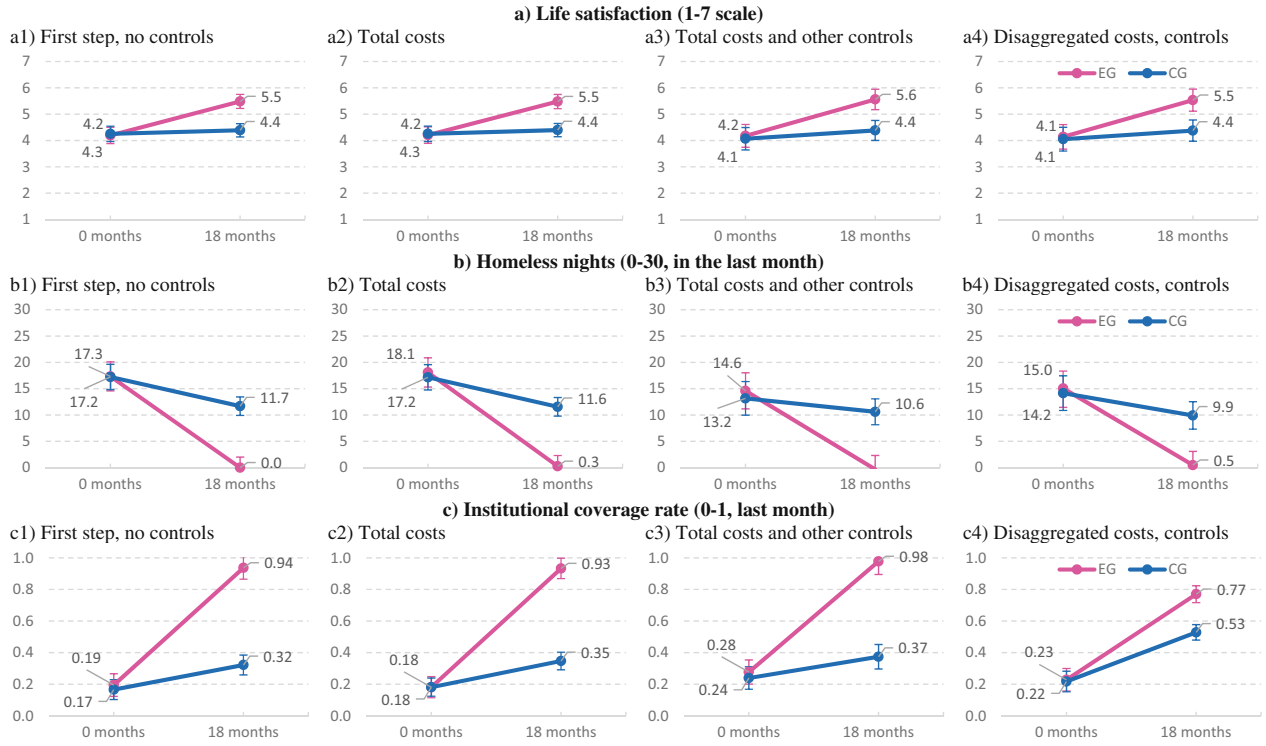

FIGURE 1 Estimated marginal means of each effectiveness variable in successive steps of the repeated measures models, by interview wave and experimental (EG) or control group (CG). Error bars indicate the 95% confidence intervals.

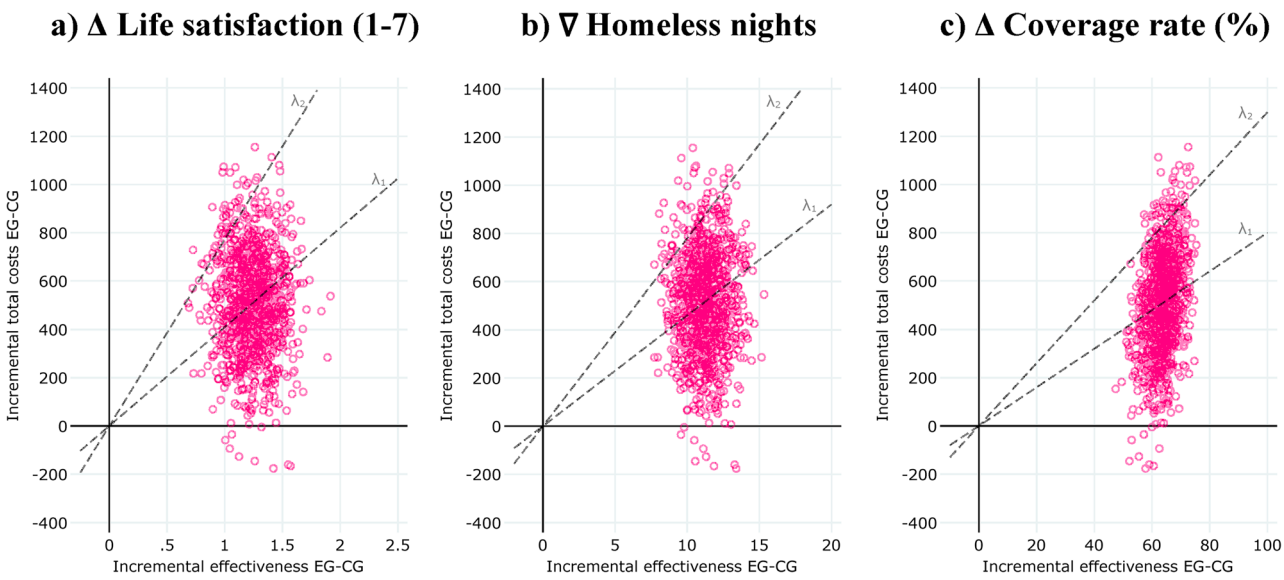

FIGURE 2 Incremental cost-effectiveness planes. Source: In each of the subgraphs, a point represents one of the corresponding 1000 bootstrapping simulations. Total costs are expressed as euros per month. λ_1 and λ_2 represent the corresponding willingness to pay thresholds highlighted in Figure 3. In each subgraph, there are 50% of the simulations below λ_1 and 95% of the simulations below λ_2, so those would be the estimated chances that the programme is cost-effective in case those spending thresholds were adopted.

significant differences in the level of satisfaction, the number of homeless nights or the rate of institutional coverage. However, after 18 months there is a substantial distance between EG and CG. *Hábitat* obtains a higher average satisfaction score (5.5 vs. 4.4), a lower number of homeless nights (0 vs. almost 12) and greater institutional coverage (94% vs. 32%).

Additionally, under these conditions, we can verify that the basic structures and characteristics of these models pass the coherence and reliability tests, allowing

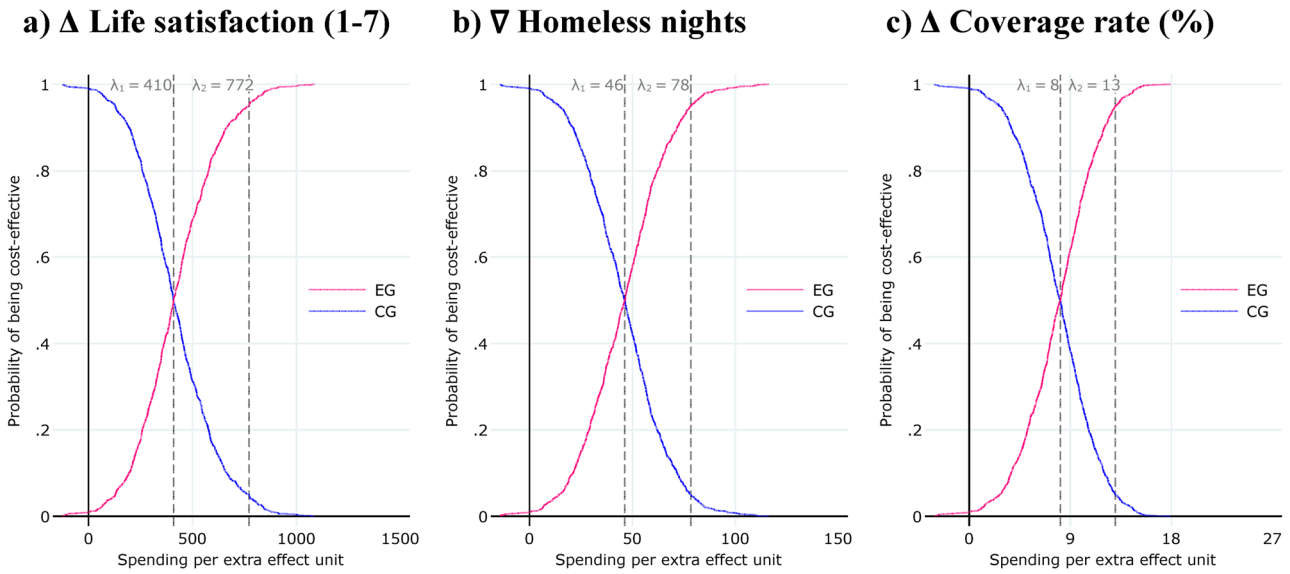

FIGURE 3 Cost-effectiveness acceptability curves. Source: The spending dimension is expressed as euros per month. The two dotted lines drawn in each subgraph indicate the threshold levels at which the *Hábitat* programme reaches a probability of 0.5 or 50% (λ_1) and 0.95 or 95% (λ_2) of being the cost-effective option, that is, of giving a positive incremental net benefit.

a sufficient degree of confidence in their estimates (detailed tables in the Data S1).

Next, we check the behaviour of these indicators by also considering the costs of care for the people in both study groups (quadrants a2, b2, and c2). To do this, we introduce the respective total monthly cost variables into the models (second step), first checking that the appropriate conditions are maintained to consider them reliable (detailed tables in the Data S1). The result is that these new economic variables contribute relatively little to the fit of the model and only the costs of the initial period seem to have a slightly positive effect on the level of satisfaction (a greater expense is related to greater satisfaction only at the initial moment of the evaluation).

As can be seen in that second column of Figure 1, the introduction of total costs does not greatly change the estimates of the interaction between waves and EG or CG membership. Similar levels to those in the previous step are obtained: the level of satisfaction at 18 months for GE continues to be higher than for CG (5.5 vs. 4.4), the number of homeless nights is lower (0 vs. 12) and the rate of coverage greater (93% vs. 35%). This suggests that the added costs may play an important role, but that they are not the only reason explaining the substantial positive effect that participation in the *Hábitat* programme has on these effectiveness indicators.

It is significant that the introduction of the control variables (third step) has little impact on the estimates of satisfaction levels for each group (EG and CG) over time. In fact, the results in quadrant a3 of Figure 1 is almost identical to the previous ones—both in figures and in trends—which indicates that the effect of the programme on the level of satisfaction remains stable and evident (5.6 vs. 4.4), even having controlled for all other factors.

A similar pattern is also observed in homeless nights (b3 in Figure 1), with only slight changes in the figures: at the beginning of the study both groups are at around 13–14 nights (on average) homeless, but after 18 months the EG group continues at around zero nights (as expected) while the CG group drops to just under 11 nights. In other words, taking the rest of the factors into account reduces the differences to a certain extent, but not to such a substantial extent that it prevents us from thinking that the effect of the programme is quite large in these aspects.

In addition, the estimated coverage rates rise for both groups with the new model (c3 in Figure 1). However, the increase is much greater for the EG: at the beginning they are at a level between 28% and 24%, respectively, but 18 months later they rise to 98% and 37%, which represents a difference in favour of *Hábitat* of 60 percentage points.

The last check we carry out for the models of effectiveness indicators consists of distinguishing between the costs of more specific care services for homeless people (accommodation and care) and non-specific ones (externalities to the care network for homeless people). The objective of this fourth step is, once again, to look in more depth at the analysis of the impact of the different cost components, separating the core components of the *Hábitat* programme and its alternatives from those of a general nature. In doing so, we check that the models

show a good specification and that they meet the minimum consistency criteria (tables in Data S1). Regarding the cost variables, these show a certain level of significance, particularly those of a specific type.

The results after introducing the disaggregated costs (quadrants a4, b4, and c4 in Figure 1) are that at 18 months the differences in the level of satisfaction are maintained (5.5 points in the *Hábitat* group compared with 4.4 in the comparison group), as are those in homeless nights (0 vs. 10), but the coverage rate gap is reduced (77% vs. 53%). In the latter case, the reduction in the difference between the groups would indicate that costs, especially specific ones, play a very important role in determining institutional coverage. Having said that, this impact is not strong enough to eliminate the whole of the difference that the programme generates by itself (up to 24 more percentage points), as discussed throughout the analysis.

Therefore, we can conclude that costs do not explain all the impact that participation in the *Hábitat* programme has on the effectiveness indicators, not even when these costs are broken down into specifics and externalities. In this sense, the analysis of differences in differences with repeated measures seems to indicate that the *Hábitat* programme has a net positive effect.

Incremental cost-effectiveness ratios approach

To complete the cost-effectiveness analysis, we also present the results of the incremental cost-effectiveness ratios (ICER) and other associated sensitivity tests. Table 3 shows, first, the increase in values observed in the sample between the EG and the CG, both for total costs and for the three effectiveness indicators. The table also shows the ICERs derived from these values, since they are the ratio between the difference in costs and the difference in the effectiveness of each indicator.

In summary, the data indicates that, on average, the *Hábitat* programme represents a higher cost of around €525 per month, but at the same time it provides an improvement in satisfaction with life of 1.25 points (on a scale of 1 to 7), a reduction of 11.25 homeless nights per month, and an increase of 64.80 pp in the institutional residential coverage rate. As a consequence, the ICERs of the *Hábitat* programme compared with the control group are: €421.78 per point of additional satisfaction, €46.72 per night of homelessness each month that is reduced, and €8.23 per additional pp increase in the institutional residential coverage rate. Furthermore, the confidence intervals indicate that it is quite likely that all of these values are greater than zero.

In order not to limit ourselves to simple point estimates, and with the aim of looking further at the degree of certainty and the quantified relevance of the increased cost-effectiveness ratios that the *Hábitat* programme entails, we will use two tools: the cost-effectiveness planes and the curves of acceptability.

The cost-effectiveness planes (Figure 2) allow us to analyse the impact of uncertainty on the model's result through the distribution of the points—or bootstrapped simulations—using the coordinates of incremental cost and incremental effectiveness. It can be clearly observed that the variability is much lower in the three effectiveness indicators (horizontal axis) than in total costs (vertical axis). Regarding the location of the clouds of plotted points, they are mostly located in the upper-right or northeast quadrant, which represents positive incremental effectiveness and positive incremental costs. In addition, there are also a few points in the lower-right or southeast quadrant, where effectiveness increases and

TABLE 3 Incremental cost-effectiveness ratios (ICER) baseline estimations

Comparison indicator between EG and CG	Observed value	Standard error (bootstrap)	Confidence intervals	
			Lower bound	Upper bound
Δ Total costs (€ per month)	525.53	214.07	105.95	945.11
Δ Life satisfaction	1.2	0.2	0.9	1.6
∇ Homeless nights in the last month	11.2	1.3	8.8	13.7
Δ Institutional coverage rate (%)	63.8	4.5	54.9	72.7
ICER: Δ Total costs/Δ Life satisfaction	421.78	190.7	48.1	795.5
ICER: Δ Total costs/∇ Homeless nights	46.72	20.0	7.5	85.9
ICER: Δ Total costs/Δ Institutional coverage rate	8.23	3.2	1.9	14.6

Note: Sample size for the observed values is $n = 228$. Standard errors of each indicator came from 1000 bootstrapping simulations. Confidence intervals (95% level) calculated using the standard errors from the bootstrap resampling.

cost decreases, implying unequivocal advantages for the intervention because it yields better results at a lower cost than TAU. Likewise, it is important to note that the points are very far from being in the upper-left or northwest quadrant (the worst-case scenario with less effectiveness and higher cost) or in the lower-left or southwest area (less effectiveness but lower cost).

All this consolidates the idea that *Hábitat* undoubtedly provides higher levels of effectiveness, even if it entails a higher cost. Therefore, the final decision on whether to adopt the programme will depend on the spending threshold (λ) that is considered feasible or acceptable. To provide more information for such a decision, Figure 3 shows the acceptability curves. These curves are estimates of the chances that, for each expenditure threshold λ that may be considered, the programme is cost-effective—that is, that it provides a positive incremental net benefit. The agents who must make the decision to invest in the programme under evaluation can thus compare their willingness (or their capability) to pay for each unit of improvement and have an idea of the probability of success that they can expect.

Specifically, the graphs show the following. Regarding life satisfaction, the *Hábitat* programme could be considered cost-effective from a spending threshold of €410 per additional point of improvement (monthly) since this is where the estimated probability of providing a positive net benefit exceeds 50% (λ_1). Below that level of willingness to pay, however, adoption of the programme would be more questionable. In contrast, as the willingness to pay increases, the programme receives greater reinforcement, reaching a resounding 95% acceptability when a threshold of €772/month per point of additional satisfaction is set (λ_2).

Regarding the number of homeless days per month, the *Hábitat* programme would be cost-effective from a spending threshold of €46 per each homelessness night reduced (monthly), since at that point the estimated probability that it contributes a positive net gain is 50% (λ_1). In contrast, the adoption of the programme would be more questionable if the willingness to pay were below that amount. In the other direction, by increasing the threshold, the programme improves its degree of acceptability to a clear 95% on reaching €78 per day of homeless situation reduced over the month (λ_2).

Finally, with regard to the institutional residential coverage rate, the *Hábitat* programme would have considerable acceptability from a spending threshold of €8/month for each additional pp in the coverage rate, since there is a 50% of chances that it yields a positive net gain at that point (λ_1). By raising the threshold above that level, the programme improves its degree of cost-effectiveness up to 95% at €13/month per pp added in the institutional residential coverage rate (λ_2).

Therefore, although it cannot be stated outright that *Hábitat* is always cost-effective, since this will ultimately depend on the amount of money that decision makers are willing to spend on the programme, it seems clear that there is a very wide range of spending possibilities in which it can be considered optimal.

DISCUSSION

HF programmes have provided an important boost for evaluations such as the one presented here since they serve as support for the dissemination and consolidation of the model. However, as has been seen with *Hábitat*, their execution is difficult and costly. If we also consider the inherent difficulties that characterise the lives of these people and any studies of them, the result is that evaluations are still relatively scarce (Brown et al., 2020; Goering & Streiner, 2015; Tinland et al., 2013).

For the evaluation of the *Hábitat* programme, the aim was to provide evidence on the usefulness and viability of this example of HF in Spain. Based on the results, our research is in keeping with the majority of evaluations that find HF programmes cost-effective (Basu et al., 2012; Blood et al., 2017; Bretherton & Pleace, 2015; Chalmers McLaughlin, 2011; Goering et al., 2014; Latimer et al., 2019; Lemoine et al., 2019; Martinez & Burt, 2006; Mason & Grimbeek, 2013; Perlman & Parvensky, 2006; Srebnik et al., 2013). It has been verified that *Hábitat* provides a large positive difference compared with its alternatives in terms of the aspects evaluated, both subjective (quality of life) and objective (avoid homeless situations or providing institutional accommodation). Even despite *Hábitat*'s higher specific costs, the coverage of homelessness is superior in net terms, an advantage that is maintained regardless of other personal or geographical circumstances. These differences are not only due to *Hábitat*'s larger budget, but mostly to its qualitative conditions, because as we have shown with the CEA, the decisive factors are the characteristics of the programme.

These results support the commitment to scaling the model beyond the numerous pilot phases implemented in many different areas. Allocating resources to HF systems is more efficient than continuing to spend on traditional alternatives to reduce homelessness (Culhane, 2008; Ly & Latimer, 2015). Not all ways of spending more resources will yield better results but spending them on programmes like *Hábitat* will. Although HF programmes may be more expensive in the short term, in the long term they are an efficient way of using resources, akin to making an investment. This is the situation with *Hábitat*, a programme that

offers a high-quality institutional response, with a significant comparative advantage over other alternatives and to which, therefore, it is efficient to allocate funding, since it provides better results at reasonable costs.

However, as Busch-Geertsema (2012), Parsell et al. (2013) or Pleace and Bretherton (2019) have pointed out, HF is not a panacea capable of solving every problem. Rather, it is an efficient tool that must be considered within a broad system of care for homeless people and that is especially useful in certain contexts and for cases with more extreme profiles.

One problematic aspect regarding the extension of the HF model is that the scientific evidence on the financial aspect continues to be limited (Johnson et al., 2012; NASEM, 2018; Williams, 2020). There is a need to continue emphasising the usefulness of performing additional and more in-depth research that makes it possible to identify the potential for this type of programme to help solve the homeless problem in an effective and efficient way (Busch-Geertsema, 2012; Busch-Geertsema, 2013; Doberstein & Smith, 2019; Pleace, 2016; Pleace et al., 2019; Wright & Peasgood, 2018).

We conclude by stating that our results support the positions of those who understand that the time has come for Housing First programmes to become a structural response to homelessness (Pleace, 2016; Pleace et al., 2019).

Limitations of the evaluation and future tasks

The analysis carried out involves some elements that it has not been possible to fully develop or that have had to be left to one side for the time being. As in all research, the methodological design involves making decisions in which we have opted for some strategies rather than other alternatives that could have been valid as well. The nature of the study group and the conditions for the field work explain this situation to a large extent. As a consequence, the evaluation performed is not free of limitations that suggest areas for future work of great interest, both from the methodological point of view and from the deepening of the results.

In particular, the sample size of the evaluation limits the ability to generalise the analysis with optimal representativeness and robustness. This is exacerbated in some items through a reduced response rate or for some subsamples such as the city. The treatment of these variables would have entailed risks to the validity of the results, and this indicated the wisdom of not including them.

Overall, the evaluation carried out is innovative given the scarcity of studies on the effectiveness of HF programmes in Spain due to the still incipient nature of these actions in the country and the many difficulties inherent to the study group. This work shows the feasibility, albeit with some difficulties, of carrying out this type of evaluation: more than 430 homeless people with significant problems have been interviewed throughout the evaluation process, managing to locate 255 of them after 18 months. Hence, the primary information generated has in itself provided an important added value, which is even greater for the financial estimation, where the lack of specific studies is even more pronounced. Since this is a state level evaluation, it contributes to taking the debate on homelessness from the usual consideration of a local problem to a broader field of discussion.

Although the sample does not match the size of the largest studies carried out internationally (Rosenheck et al., 2003: $N = 460$; Goering et al., 2014: $N = 2148$; Lemoine et al., 2019: $N = 703$), it far exceeds those of the studies carried out in Spain (Bernad et al., 2016: $N = 62$; Housing First Guide Europe, 2016: $N = 38$). One of the characteristics of homeless population studies is the difficulty of tracking people over time (*traceability*). Different works have achieved follow-up percentages at 12 months of close to 50% (e.g., Nuttbrock et al., 1999; Toro et al., 1997), although for some works higher follow-up percentages have been obtained, even reaching 80% (e.g., Braucht et al., 1996; Devine et al., 1995; Shern et al., 1997; Tsemberis et al., 2004). Longitudinal studies in Spain have been very scarce, most likely due to the high operational cost of this type of work. The percentage participation in follow-up evaluations has ranged from 27% between 11 and 24 months (Muñoz et al., 2003) to 42% after 12 months (Panadero, 2004). Compared with these figures, this evaluation has reached rates of 75% in the *Hábitat* group and 50% in the comparison group.

Lastly, it should be noted that market prices for privately owned houses have been used in the calculation of the cost of the accommodation of the EG. Finding more affordable residential alternatives through the creation of a robust series of public policies (subsidy programmes, use of empty housing stock owned by financial entities, public housing policies, etc.), would probably make the cost of programmes like *Hábitat* substantially lower.

CONCLUSIONS

The CEA evaluation of the *Hábitat* programme and its alternatives has yielded highly significant conclusions on the relationship between the results for people and the costs of their care.

Above all, it highlights that *Hábitat* provides a great improvement in results, both subjective (user

satisfaction) and objective (avoiding homeless situations or use of institutional accommodation). Although it has a higher monetary cost than its alternatives as a whole, it offers a far superior performance in terms of stability and quality of hosting and personalised assistance. The dynamic perspective applied in this evaluation confirms the trend of a reduced monetary impact of the programme over time: once it is up and running, the cost of *Hábitat* tends to fall as a result of progressively reducing the consumption of services and resources (especially those external to the care network for the homeless), while its alternatives increase these costs. This also points to the ultimate goal of "normalising" people's lives, to the extent that they cease to be homeless and, therefore, to use specific resources for this collective.

Although there are no differences between groups at the beginning, at the end of the evaluation EG far outstrips its alternatives in eliminating homelessness, regardless of other personal or geographical circumstances. Despite its higher specific costs, it provides complete residential coverage, much greater than the institutional response of its alternatives, so it is superior in net terms. These differences are not only due to the higher cost of *Hábitat*, but mostly to its qualitative conditions. It is the characteristics of the programme that are decisive. Not all ways of spending more resources will yield better results but spending them on *Hábitat* does. It can be stated that HF is a high-quality and effective institutional response to which it is worth dedicating funding, providing significant advantages over other alternatives.

However, in the final decision about its implementation, the wide range of spending thresholds that the agents in charge of its provision may have and the feasible or acceptable willingness to pay must be taken into account. The big question remains as to whether the decision makers and stakeholders in social affairs are going to value the high incremental effectiveness shown by *Hábitat* over its higher average costs sufficiently to adopt such a programme, or they are going to prioritise the cost minimisation that TAU implies, even though that also means to keep many homeless people in a worse situation than they could get in a HF programme.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Fresno Consulting S.L. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the author(s) with the permission of Fresno Consulting S.L.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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