The Experience of Implementing Urban HEART Barcelona: a Tool for Action

Ana M. Novoa · Glòria Pérez · Albert Espelt · Cynthia Echave · Patricia G. de Olalla ·
M. Jesús Calvo · Maribel Pasarín · Èlia Diez · Carme Borrell ·
Urban HEART Barcelona Working Group · M. Jesús Calvo · Berta Cormenzana ·
Imma Cortés · Èlia Diez · Cynthia Echave · Albert Espelt · Patrícia G. de Olalla ·
Josep Gòmez · Ana M. Novoa · Montserrat Pallarès · Glòria Pérez ·
Maica Rodríguez-Sanz

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Abstract Urban Health Equity Assessment and Response Tool (HEART) is a tool developed by the World Health Organization whose objective is to provide evidence on urban health inequalities so as to help to decide the best interventions aimed to promote urban health equity. The aim of this paper is to describe the experience of implementing Urban HEART in Barcelona city, both the adaptation of Urban HEART to the city of Barcelona, its use as a means of identifying and monitoring health inequalities among city neighbourhoods, and the difficulties and barriers encountered throughout the process. Although ASPB public health technicians participated in the Urban HEART Advisory Group, had large experience in health inequalities analysis and research and showed interest in implementing the tool, it

was not until 2015, when the city council was governed by a new left-wing party for which reducing health inequalities was a priority that Urban HEART could be used. A provisional matrix was developed, including both health and health determinant indicators, which allowed to show how some neighbourhoods in the city systematically fare worse for most of the indicators while others systematically fare better. It also allowed to identify 18 neighbourhoods—those which fared worse in most indicators—which were considered a priority for intervention, which entered the Health in the Barcelona Neighbourhoods programme and the Neighbourhoods Plan. This provisional version was reviewed and improved by the Urban HEART Barcelona Working Group. Technicians with experience in public

A. M. Novoa (✉) · G. Pérez · A. Espelt · P. G. de Olalla ·
M. Pasarín · È. Diez · C. Borrell
Agència de Salut Pública de Barcelona, Pl. Lesseps, 1,
08023 Barcelona, Spain
e-mail: anovoa@aspb.cat

A. M. Novoa · G. Pérez · A. Espelt · P. G. de Olalla ·
M. Pasarín · È. Diez · C. Borrell
Institut d'Investigació Biomèdica (IIB Sant Pau), Pl. Lesseps, 1,
08023 Barcelona, Spain

G. Pérez · C. Borrell
Universitat Pompeu Fabra, Barcelona, Spain

G. Pérez · A. Espelt · C. Borrell
CIBER de Epidemiologia y Salud Pública (CIBERESP),
Barcelona, Spain

A. Espelt
Facultat de Ciències de la Salut de Manresa, Universitat de Vic
Universitat Central de Catalunya (UVicUCC), Av. Universitària,
46, Manresa 08242, Spain

C. Echave
Agència d'Ecologia Urbana, Barcelona, Spain

M. J. Calvo
Gabinet Tècnic de Programació, Ajuntament de Barcelona,
Barcelona, Spain

health and/or in indicator and database management were asked to indicate suitability and relevance from a list of potential indicators. The definitive Urban HEART Barcelona version included 15 indicators from the five Urban HEART domains and improved the previous version in several requirements. Several barriers were encountered, such as having to estimate indicators in scarcely populated areas or finding adequate indicators for the physical context domain. In conclusion, the Urban HEART tool allowed to identify urban inequalities in the city of Barcelona and to include health inequalities in the public debate. It also allowed to reinforce the community health programme Health in the Barcelona Neighbourhoods as well as other city programmes aimed at reducing health inequalities. A strong political will is essential to place health inequalities in the political agenda and implement policies to tackle them.

Keywords Urban health · Social determinants of health · Public health surveillance · Health status indicators · Health policy · Health inequalities · Small-area analysis

Introduction

Social inequalities are the result of the different opportunities and resources related to health that people have depending on their social class, gender, territory or ethnic group, which results in worse health among less privileged social groups [1, 2]. In order to tackle these inequalities, a public health surveillance system is needed to monitor them across different areas or different time periods [3].

Urban HEART (Urban Health Equity Assessment and Response Tool) is a tool developed by the World Health Organization (the WHO Kobe Centre) whose objective is to provide evidence on urban health inequalities so as to help to decide the best interventions aimed to promote urban health equity. An Urban HEART ad-hoc advisory group made up of 12 members worldwide, including one member from the Public Health Agency of Barcelona (ASPB, for its initials in Catalan), provided expert advice. Its recommendations are included in the Urban HEART Guide and User Manual [4, 5]. The Urban HEART can be used to identify and monitor health inequalities, using the Urban HEART matrix and monitor. However, it should not be exclusively used to generate evidence on health inequalities. The response component of the tool is intended to be included

in the local planning and implementation cycle so as to ensure linkage with sectors outside the health sector, inclusion of health equity issues in the political debate and adequate budget allocation. The tool was pilot-tested in 15 cities from 10 low-middle income countries [6–10]. To our knowledge, the only city from a high-income country to have used it previous to Barcelona has been Toronto (Canada) [11].

Barcelona, the second largest Spanish urban area, is located on the Eastern coast and made up of more than 1.6 million inhabitants, of which 21.6% are 65 years and older and 22.3% are foreign-born. Like any large urban area, Barcelona has noteworthy social heterogeneity, with high level of welfare areas coexisting with pockets of poverty and marginalization areas. Since the first democratic elections in 1979 and until 2011, the city of Barcelona has been governed by a coalition of left-wing parties led by the Socialist Party, for which public health was a priority. As an example of this priority, geographical health information systems were established, which progressively focussed in the small areas of the city, the Barcelona Health Survey was implemented in 1983 (the first undertaken in Spain) and the health report of the citizens of Barcelona was annually published. All these advances allowed to identify intra-urban socioeconomic health inequalities [12]. The ASPB has broad experience in the study and monitoring of social health inequalities. During the 1980s, research on social health inequalities focused on the study of mortality indicators across the 10 municipal districts (around 100,000 inhabitants) [13, 14]. Later, in the 1990s and later, inequalities were analysed at smaller areas such as neighbourhoods or basic health areas (around 20,000 inhabitants), and for other health outcomes such as AIDS, tuberculosis, drug consumption or teenage pregnancies [15–24]. With the advance of health information systems and methods of analysis, some research projects (MEDEA and INEQ-CITIES) allowed to perform small-area analysis (census tracts of around 1000 inhabitants) [25–28].

The ASPB has also taken part in implementing several interventions to tackle such health inequalities [29], such as the mother and child health programme in the district of Ciutat Vella aimed to reduce inequalities in infant mortality [30], the tuberculosis control among most disadvantaged populations [31, 32], the drug abuse programmes [33] and the reform of primary health care which started in the poorest areas of the city [34]. Also, the “Neighbourhoods Law” began in 2004, an urban

renewal programme focused on the most deprived neighbourhoods [35], which was accompanied by the “Health in the Barcelona Neighbourhoods” programme, whose objective was to reduce inequalities in health by implementing specific interventions in those neighbourhoods [36]. However, although this programme has been ongoing, it has not been until 2015, when the city was governed by a new left-wing party made up of left-wing parties and social movements such as the 15M that it was relaunched with an important resource increase.

The aim of this paper is to describe the experience of implementing Urban HEART in Barcelona city, both the adaptation of the tool and its use as a means of identifying and monitoring health inequalities among city neighbourhoods, as well as the difficulties and barriers encountered throughout the process.

The Political Prioritization of Health Inequalities in Barcelona

After Urban HEART was launched in 2010, the WHO Kobe Centre was interested in having a European country implementing it. At that moment, Barcelona was governed by a coalition of three left-wing parties, which allowed to use Urban HEART but only as a diagnosis tool, without assigning any specific budget aimed at implementing interventions focused on reducing health inequalities more than that assigned to those already ongoing. Since several inequalities diagnosis tools had already been used through the years at the ASPB, the department in charge of developing the Urban HEART decided to postpone its implementation until the response phase was also prioritized and budgeted. In 2011, a nationalist right-wing party won the elections and governed until 2015. During this period, health inequalities were not a political priority and Urban HEART was not an option. Finally, in 2015, a new left-wing coalition party won the elections, prioritized reducing health inequalities in the city [37] and required the ASPB to immediately publish the Urban HEART so as to implement interventions in the most deprived neighbourhoods. The new city council considered the Urban HEART as an adequate tool to decide those neighbourhoods in most need for intervention based on the evidence on health and health determinant inequalities provided by the tool.

The political opportunity to publish Urban HEART Barcelona and a tight time schedule to include it in the forthcoming Barcelona Health Report, one of the ASPB reports with higher mass media impact, resulted in the development of a provisional Urban HEART matrix for which the selection of indicators was based only on readily available data sources and without an in-depth analysis of the indicator requirements indicated in the Urban HEART guidelines. This provisional version included 12 indicators (6 health and 6 health determinant indicators) (see Table 1) for the 73 city neighbourhoods (ranging 550 to 57,000 inhabitants; mean = 22,000) and used percentiles 25 and 75 as objective and standard of comparison for all indicators. All health indicators were calculated for 5-year periods so as to reduce variability of point estimations at the neighbourhood level. The provisional matrix (Fig. 1) allowed to show how some neighbourhoods in the city fare worse (red in the matrix) for most of the indicators, mainly those in the North, North-East, South and South-East of the city (the lower income neighbourhoods in the city), while others fare better (green in the matrix), mainly those in the West of the city (the higher income neighbourhoods). Those neighbourhoods with worse socioeconomic indicators also showed worse health indicators.

The matrix was also used to identify those neighbourhoods with a high priority for intervention to reduce health inequalities in the city. An index was created by assigning a value to each matrix colour (1.5 points for red, 1 points for yellow and 0.5 points for green cells), following the Hanlon methodology [38], and adding the values of every indicator in each neighbourhood. The index allowed to identify 18 neighbourhoods (those in the worst index quartile) which were considered a priority for intervention. Both the provisional matrix and the neighbourhood prioritization were included in the 2014 Barcelona Health Report [39] and given high visibility. The issue had important repercussion in the media.

The Use of Urban HEART Barcelona as a Response Tool

The prioritized neighbourhoods entered the ASPB programme Health in the Barcelona Neighbourhoods, in 11 of which the programme was already ongoing and it was reinforced. In the seven remaining neighbourhoods, the programme was implemented. The city council assigned a specific budget for the ASPB programme Health in the Barcelona Neighbourhoods (300,000 €) as well as for the

		Over-aging index, year 2014	% of people aged 75 years or older living alone, year 2014	Family available income index, year 2013	% of people aged 15 years or older with primary level education or less, year 2014	% of registered unemployment among people 16 to 64 years any, any 2014	% of voter abstention at previous municipal election, year 2015	Life expectancy, period 2009–2015	Comparative mortality ratio, period 2009–2015	Premature mortality ratio, period 2009–2015	Tuberculosis rate, period 2010–2014	Adolescent fecundity rate, period 2010–2014	Low birth-weight prevalence, period 2010–2014
DISTRICT	NEIGHBOURHOOD												
Ciutat Vella	El Raval	55.1	34.8	103.6	23.5	12.4	32.9	80.3	116.8	118.7	19.2	3.8	5.9
	El Barri Gòtic	65.1	33.3	103.6	23.5	12.2	32.1	81.3	115.2	118.7	23.1	3.8	5.9
	La Barceloneta	57.7	37.5	80.1	33.2	22.8	38.4	80.4	120.3	119.9	47.8	7.9	6.0
	Sant Pere, Santa Caterina i la Ribera	66.4	30.2	103.6	23.5	12.2	32.1	81.3	115.2	118.7	23.1	3.8	5.9
	El Fort Pienc	53.7	30.2	89.0	28.8	9.7	38.0	84.3	87.2	72.7	13.1	2.9	6.2
	La Sagrada Família	53.7	30.2	89.0	28.8	9.7	38.0	84.3	87.2	72.7	13.1	2.9	6.2
	La Dreta de l'Eixample	55.8	31.1	105.7	12.7	7.1	35.0	82.9	109.2	112.2	13.0	1.9	4.8
	L'Àngela Esquerra de l'Eixample	55.8	31.2	125.1	11.0	7.3	36.1	83.8	102.2	105.1	10.9	2.9	5.5
	La Nova Lloretana de l'Eixample	52.8	30.0	105.7	17.3	8.8	36.1	83.8	102.2	105.1	10.9	2.9	5.5
	Sant Antoni	54.9	32.0	105.7	22.5	9.9	36.0	83.8	106.8	106.8	19.4	6.3	5.8
Sants-Montjuïc	El Poblenou	55.5	31.0	105.7	13.3	11.0	37.3	82.9	106.9	106.9	12.9	3.3	5.7
	La Marina del Port Vell	51.6	30.0	70.9	29.4	12.1	44.5	84.0	95.3	110.8	29.1	10.2	5.8
	El Fort de la Guàrdia	51.5	30.2	77.8	26.4	12.4	41.7	82.7	104.9	98.4	11.7	3.9	5.7
	Hortelaporta	51.7	30.2	77.8	26.4	12.4	41.7	82.7	104.9	98.4	11.7	3.9	5.7
	La Bordada	53.1	29.8	71.4	29.3	10.0	38.9	83.1	97.6	110.2	23.7	6.1	6.6
	Sants-Barceló	50.8	31.5	70.6	25.5	9.3	37.7	83.7	105.1	89.7	17.7	8.5	6.3
	Sants	54.5	29.8	80.6	25.5	9.3	37.7	83.7	105.1	89.7	17.7	8.5	6.3
	Les Corts	48.8	20.0	124.8	18.6	8.8	39.8	85.3	86.3	74.1	15.0	1.6	5.6
	La Maternitat i Sant Ramon	51.9	29.0	118.7	20.2	9.1	35.4	85.8	83.9	75.0	15.2	5.9	5.8
	Pedrabuts	51.9	23.9	243.9	10.1	4.9	36.9	85.9	89.8	73.6	6.8	2.9	5.2
Sant Gervasi-Galvany	Vallcarlos i els Tossalts de les Planes	50.3	30.3	117.8	17.8	10.4	38.4	84.6	104.6	104.6	4.9	4.4	5.4
	Sant Gervasi	55.5	25.1	196.1	12.0	4.4	33.3	84.6	94.5	73.3	12.4	3.9	5.9
	Les Tres Torres	52	32.3	105.7	17.3	9.3	37.0	81.8	102.4	102.4	21.2	1.9	5.7
	Sant Gervasi-La Bonanova	53.8	28.8	108.6	11.9	5.4	36.4	84.4	94.8	74.8	3.9	0.9	4.9
	Sant Gervasi-Cambú	51.1	32.2	145.5	10.5	5.3	33.3	84.6	97.2	102.2	12.9	3.3	6.7
	El Poblet i el Fargó	50.6	30.6	105.7	17.3	9.3	37.0	81.8	102.4	102.4	21.2	1.9	5.7
	Vallcarlos i els Penitents	51.3	30.0	105.7	17.3	9.3	37.0	81.8	102.4	102.4	21.2	1.9	5.7
	El Coll	47	29.2	63.1	23.9	12.3	40.7	81.6	101.7	81.6	3.1	3.9	5.9
	La Salut	49.9	32.0	113.5	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	El Camp d'en Grassot i Ordino Nova	52.1	31.3	101.0	17.8	8.7	39.0	84.8	94.6	77.8	20.3	3.9	6.1
Gràcia	La Font d'en Fargues	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	Can Baró	51.7	33.4	74.2	25.5	9.8	41.1	83.8	90.0	102.5	8.9	2.9	5.3
	El Guanyal	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	La Font d'en Fargues	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	El Carmel	48.3	30.1	105.7	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	La Salut	49.9	32.0	113.5	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	Sant Gervasi dels Agudells	50.7	29.3	74.8	34.3	11.0	43.9	83.2	102.8	111.9	22.9	2.9	5.2
	Montbau	47	31.7	71.7	31.1	11.7	42.2	81.7	101.7	81.6	3.1	3.9	5.9
	La Vall d'Hebron	49.7	30.6	87.7	25.5	10.3	34.9	83.2	103.1	83.3	28.3	0.9	2.4
	La Salut	49.9	32.0	113.5	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
Horta-Guinardó	Horta	53	28.8	83.1	31.0	23.7	38.5	84.8	110.1	94.9	18.1	6.1	4.9
	La Font d'en Fargues	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	Alfons i la Torre Llobeta	52.1	31.1	74.1	28.0	12.1	42.6	84.0	101.9	95.9	16.4	1.6	4.9
	El Turó de la Peira	56.4	29.4	31.8	39.9	13.9	42.9	84.8	95.1	116.4	16.6	1.9	4.1
	Can Pedra	51.8	33.4	74.2	25.5	9.8	41.1	83.8	90.0	102.5	8.9	2.9	5.3
	El Carmel	48.3	30.1	105.7	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	Canelles	48	33.3	69.2	33.5	19.3	38.1	83.2	102.0	102.0	18.1	6.1	4.9
	Les Guineuses	51.4	31.4	90.4	44.7	13.9	41.9	83.2	102.8	120.7	21.1	4.4	7.8
	La Salut	49.9	32.0	113.5	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	La Prosperitat	50.7	32.0	90.3	42.8	13.4	42.4	84.0	95.1	99.0	18.1	11.8	7.2
Sant Andreu	La Font d'en Fargues	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	La Font d'en Fargues	53.9	33.0	89.4	23.6	9.7	39.5	84.1	85.0	88.9	15.7	7.7	5.9
	Can Meridiana	43.1	30.4	49.2	49.2	19.8	41.6	83.0	98.1	131.0	29.9	2.9	7.8
	Vallcarlos	51.3	30.0	105.7	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	La Trinitat Vella	47	29.5	39.5	44.7	13.4	40.7	81.6	101.7	81.6	3.1	3.9	5.9
	Barcelonès	52.7	31.8	105.7	17.3	9.3	37.0	81.8	102.1	102.1	15.2	1.9	5.6
	El Bon Pastor	50.6	28.8	71.8	38	12.6	42.8	83.9	97.2	114.5	16.7	10.9	8.2
	Sant Andreu	50.8	29.8	71.8	38	12.6	42.8	83.9	97.2	114.5	16.7	10.9	8.2
	La Sagrada Família	53.7	30.2	89.0	28.8	9.7	38.0	84.3	87.2	72.7	13.1	2.9	6.2
	El Congrés i els Indians	51.8	30.9	75.4	25.8	10.4	38.8	84.1	87.7	87.7	20.2	5.8	6.2
Sant Martí	El Camp de l'Arça del Clot	51.2	32.7	76.5	24.1	10.8	37.4	84.6	90.0	88.5	15.6	11.4	8.0
	El Clot	50.4	30.9	79.5	25.5	10.9	37.5	84.5	89.8	89.8	15.6	11.4	8.0
	El Poblenou	50.5	30.8	93.7	22.3	8.9	37.9	83.4	102.9	100.8	8.8	1.3	6.1
	El Clot	50.4	30.9	79.5	25.5	10.9	37.5	84.5	89.8	89.8	15.6	11.4	8.0
	El Barrio	46.9	28.8	69.6	24.7	9.3	37.9	83.0	104.7	100.3	7.9	6.4	6.4
	Original Mar al Front Maristes del Poblenou	46.9	28.8	69.6	24.7	9.3	37.9	83.0	104.7	100.3	7.9	6.4	6.4
	El Besòs i el Marquès	53.5	31.0	93.4	44.4	24.9	49.2	89.4	104.3	104.3	38.3	23.9	5.5
	Privilegiats del Poblenou	53.5	31.0	93.4	44.4	24.9	49.2	89.4	104.3	104.3	38.3	23.9	5.5
	Sant Martí de Provençals	53.1	30.1	69.2	33.1	13.8	38.7	83.4	98.9	127.8	20.7	4.4	7.5
	La Verneda i la Pau	51.6	27.6	36.1	39.8	19.6	42.2	83.3	101.2	101.2	16.5	8.1	7.9
Percentil 25	50.3	29.0	61.9	20.2	9.0	36.7	82.8	93.9	86.0	17.0	12.6	3.0	5.8
Percentil 75	56.3	33.3	109.0	16.6	12.3	45.8	79.9	120.3	120.3	23.9	13.9	23.9	6.3

Table 1 Indicators included in the provisional and final versions of Urban HEART Barcelona

Urban HEART domains	Provisional version	Final version
Health	Life expectancy	Premature mortality rate
	Comparative mortality ratio	Tuberculosis rate
	Comparative premature mortality ratio	Gonococcal rate
	Tuberculosis rate	Teenage fecundity rate
	Teenage fecundity rate	Problematic drug consumption index ^c
	Low birth-weight prevalence	
Physical environment and infrastructure	–	Neighbourhood area allocated to urban parks and gardens (%)
		Vegetation index (NDVI) ^d
		Vehicle-km travelled
Social and human development	People aged 15 years or older with primary level education or less (%)	Ratio % of housing with > 4 residents per housing mean area
	Over-ageing index ^a	Rate of people assisted by Social Services excluding those attributable to the Dependency Law
	People aged 75 years or older living alone (%)	Rate of people aged 17 years and younger assisted by the Child and Teenage Assistance Team
		People 16 to 29 years old with primary level education or less (%)
Economics	Family available income index ^b	Family available income index ^b
	Registered unemployment among people aged 16 to 64 years (%)	Registered unemployment among people aged 16 to 64 years (%)
Governance	Voter abstention in the previous municipal elections (%)	Voter abstention in the previous municipal elections (%)

^a Proportion of people aged 75 years or older over the number of people aged 65 years or older

^b Compound index that reflects the distribution of the neighbourhood mean family income compared to the city mean and that includes 5 indicators (people aged 25 years or more with university level education (%), registered unemployment among people aged 16 to 64 year (%), number of cars per inhabitant, new cars (less than 2 years) with more than 16 hp (%) and second-hand housing prices)

^c Compound index that includes 4 indicators related to drug consumption (rate of new treatments due to drug consumption, mortality rate due to drug overdose, rate of emergency visits among drug consumers, number of syringes found on the street)

^d Normalized Difference Vegetation Index (NDVI), indicator that reflects the amount of vegetation by assessing the amount of green observed from a satellite picture

(which generate economic and demographic indicators, among others) or environment and urbanism. The selection of Urban HEART Barcelona indicators was carried out in four stages.

Stage 1. Identification of available indicators

Based on the urban health determinants and inequalities framework (Fig. 2) [41] and the Urban HEART policy domains specified in the Urban HEART user manual (health, physical environment and infrastructure, social and human development, economics and governance), available indicators at the neighbourhood level and obtained from routine sources of information

were searched for. The UHB Working Group defined a list of potential indicators which had to meet the following criteria: (1) data representative at the neighbourhood level; (2) enough data variability to capture inequalities; (3) data quality and validity; (4) obtained from routine data sources. Indicators were classified according to the Urban HEART domains. Thirty-seven indicators were identified, 11 of which were health status indicators and 26 health determinants indicators (Table 2). Forty-nine percent of these indicators were elaborated in institutions other than the ASPB (social services, education, ecology, among others). In order to guarantee representativeness at the neighbourhood level, the UHB Working Group decided to calculate most health indicators

Fig. 2 Determinants of health inequalities in urban areas [41]

using period-aggregated data instead of yearly data. A 3-year period was chosen instead of a 5-year period (used in the provisional version) to facilitate capturing changes of the indicators in time (responsiveness requirement). Overall rates were chosen instead of sex-, age- or other inequality axis-specific rates.

Stage 2. Indicator selection and scoring

Following a similar methodology as that used in Toronto [11], technicians with experience in public health and/or in indicator and database management were invited to participate in an online survey in which they were asked to (1) indicate if suggested indicators met with established requirements (Table 3) and to (2) score them (1 to 10) according to indicator relevance for the city of Barcelona in terms of health and social inequalities. Participants were provided with a brief explanation of the Urban HEART and some instructions on how to answer the survey, as well as a technical datasheet which included, for each indicator, a text

description along with a series of statistics, graphs and maps. Thirty-seven technicians participated in the on-line survey (92.5% response rate). Table 2 shows suitability and relevance of suggested indicators according to respondents. Across all domains, most indicators showed suitability proportions of 80% or more and a relevance score of 7.5 or higher. The physical environment and infrastructure domain was the one with the lowest suitability proportions and relevance scores, as well as traffic-related indicators.

Stage 3. Definitive selection of indicators

The UHB Working Group decided the definitive list of indicators that would be included in the definitive version of Urban HEART Barcelona based on the survey results and on a working group discussion in which the following aspects were taken into consideration: (1) a limited number of indicators should be selected; (2) efficiency: no redundancies should exist among the indicators; (3) exhaustivity: indicators should measure

Table 2 Indicators' suitability and relevance scores. Results from the online survey

	Suitability			Relevance	
	Yes	No	NR/DK	Percent*	Mean (SD)
Health domain					
Life expectancy	35	2	0	94.6	8.9 (1.1)
Comparative mortality rate	26	7	4	78.8	7.5 (1.2)
Comparative premature mortality rate	30	5	2	85.7	8.1 (1.0)
Tuberculosis rate	31	2	4	93.9	7.7 (1.4)
HIV rate	28	5	4	84.8	7.8 (1.4)
Gonococcal rate	22	6	9	78.6	7.5 (1.4)
Teenage fecundity rate	33	2	2	94.3	7.9 (1.3)
Low birth-weight prevalence	25	5	7	83.3	7.1 (1.8)
Problematic Drug Consumption Index ^a	33	3	1	91.7	8.0 (1.2)
Traffic-injured people by vehicle-km travelled ratio	20	10	7	66.7	7.0 (1.5)
Traffic-injured people by road length ratio	16	10	11	61.5	6.6 (1.8)
Mental disability prevalence	21	10	6	67.7	7.1 (1.3)
Physical environment and infrastructure domain					
Neighbourhood area allocated to urban parks and gardens (%)	32	4	1	88.9	7.5 (1.3)
Vegetation index (NDVI) ^b	20	5	12	80.0	7.5 (1.5)
Vehicle-km travelled	20	14	3	58.8	7.3 (1.5)
Residents living close to public transportation (%)	25	9	3	73.5	7.4 (1.7)
Adequately accessible streets (%) ^c	23	8	6	74.2	7.4 (1.9)
Neighbourhood area allocated to road network (%)	21	12	4	63.6	6.4 (2.3)
Ratio of educational equipment for those aged 17 years and younger	27	8	2	77.1	7.4 (1.9)
Participation equipment per inhabitant ratio	26	7	4	78.8	6.7 (2.3)
Play area equipment per inhabitant ratio	25	5	7	83.3	7.5 (1.5)
Social and human development domain					
Ratio % of housing with > 4 residents per housing mean area	31	4	2	88.6	7.5 (1.4)
Rate of people assisted by Social Services	28	5	4	84.8	7.4 (1.5)
Rate of new people assisted by Social Services	29	6	2	82.9	7.6 (1.6)
Rate of people assisted by Social Services with a community kitchen prescription	25	7	5	78.1	7.8 (1.4)
Rate of people aged 17 years and younger assisted by the Child and Teenage Assistance Team	32	3	2	91.4	7.8 (1.5)
People 16 to 29 years old with primary level education or less (%)	37	0	0	100.0	8.4 (1.2)

Table 2 (continued)

	Suitability			Relevance	
	Yes	No	NR/DK	Percent*	Mean (SD)
People 25 to 34 years old with college education or more (%)	31	6	0	83.8	7.5 (1.2)
Over-ageing index ^d	29	6	2	82.9	8.1 (1.3)
Foreign-born, excluding those from developed countries (%)	27	5	5	84.4	7.8 (1.4)
People aged 75 years or older living alone (%)	35	2	0	94.6	8.0 (5.0)
Economics					
Family available income index ^e	34	2	1	94.4	8.9 (1.1)
Registered unemployment among people aged 16 to 64 years (%)	37	0	0	100.0	8.7 (1.3)
Rate of people aged 65 years or older with a non-contributory retirement pension	32	3	2	91.4	7.5 (1.5)
People aged 60 years or older with an income < 1IPREM (%)	28	4	5	87.5	8.0 (1.6)
Rate of people assisted by Social Services with an economic aid	28	4	5	87.5	7.7 (1.8)
Governance					
Voter abstention in the previous municipal elections (%)	25	6	6	80.6	7.2 (1.5)

NR/DK no response/do not know, IPREM reference index used as the income threshold to receive different types of assistance

*Calculated excluding NR/DK responses

^aCompound index that includes 4 different indicators related to drug consumption

^bNormalized Difference Vegetation Index (NDVI), indicator that reflects the amount of vegetation by assessing the amount of green observed from a satellite picture

^cDefined as having a sidewalk width of ≥ 2.5 m on one side and of ≥ 1.8 m on the other side and < 6% sidewalk slope

^dProportion of people aged 75 years or older over the number of people aged 65 years or older

^eCompound index that attempts to reflect the neighbourhood mean family income

Requirement	Description
Clear	Easy to understand and interpret
Actionable	Sensitive to changes derived from policy interventions
Responsive	Can show changes in a timely manner
Comparable	Can be compared in time and among areas
Analytically sound	Well-grounded in theory and in fact
Meaningful for Barcelona	Points to health and health determinant's issues relevant for the city of Barcelona

from developed countries) and the proportion of people aged 75 years or older living alone were excluded since they were considered to be descriptive of the neighbourhood population and not actionable. With regard to the voter abstention indicator, the UHB Working Group considered that its ability to capture citizen political participation was rather limited and its availability every 4 years was an important limitation. However, it was finally included since no other indicators were identified in the governance domain. In addition, the working group decided that, for those neighbourhoods with less than 3000 inhabitants (6 out of 73 neighbourhoods), all health indicator estimations (with the exception of the drug consumption index, which was not subject to small number issues) would be replaced with that of neighbourhood of the city district with a similar income index. Finally, it was decided that calculating health indicators for 3- instead of 5-year periods would improve the responsive requirement and would have little impact on the variability of point estimations at the neighbourhood level.

A search of the literature was carried out to identify national, regional or local objectives for each of the

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Fig. 4 Neighbourhood distribution of five of the Urban HEART matrix indicators

Fig. 5 Urban HEART Barcelona monitor for premature mortality rate, teenage fecundity rate, tuberculosis rate and gonococcal rate indicators

indicators, although no clear cut-off values were identified. Also, different alternatives using internal Barcelona data (statistics such as percentiles, mean, and others) were taken into consideration. After trying different cut-off points, the UHB Working Group decided to use the 25 and 75 percentiles of each indicator, as had been done in the provisional version.

The definitive version of the Urban HEART Barcelona matrix is shown in Fig. 3, and one indicator from each domain has been mapped (Fig. 4). Although more than half of the indicators had changed in the new matrix, results were similarly to those observed with the provisional version (i.e., the neighbourhoods which fared worse and better were the same). However, four indicators showed a different behaviour. Red cells for gonococcal rates were concentrated mainly in the South-East and in the centre of the city, neighbourhoods with a larger proportion of men that have sex with men. All three physical environment and infrastructure domain indicators also showed a different pattern, being red cells distributed more heterogeneously, and some of which even concentrated in better performing neighbourhoods, as in the case of the vehicle-km travelled indicator. The distribution of these indicators seems to reflect differences in the urban compactness level and in mobility patterns across the city neighbourhoods more than differences in socioeconomic characteristics.

The definitive version of Urban HEART Barcelona was used to attempt to analyse inequalities trend. The Urban HEART Monitor was applied to those indicators from the health domain for which information was available 5 years previously (Fig. 5). Premature mortality rate, teenage fecundity rate and tuberculosis rate indicators showed a reduction of inequalities as well as an improvement of the indicator at the city level. On the contrary, the gonococcal rate indicator showed an inequality increase as well as a worsening of the indicator at the city level.

Discussion

The implementation of Urban HEART in Barcelona had to overcome several difficulties, most importantly the lack of political will to tackle socioeconomic inequalities in health. Although the ASPB had participated in the Urban HEART Advisory Group and its public health technicians had large experience on health inequalities, implementation of Urban HEART Barcelona was not possible until 2015, when the city was governed by a new left-wing political party based on social movements which had reducing health inequalities as a political priority. The fact that several public health technicians took part in developing the electoral programme and that the city council health commissioner belonged to

the political party at government (which was not the case in the left coalition that governed the city prior to 2011) might have helped implementing Urban HEART in Barcelona. Available evidence shows that, although most politicians are aware of health inequalities and their social causes, their inclusion in the political agenda is unusual [42, 43]. These studies and the experience in Barcelona show that strong political will is needed to place socioeconomic health inequalities in the municipal government's agenda and in city plans.

The provisional version of Urban HEART Barcelona matrix allowed to confirm the presence of inequalities among Barcelona neighbourhoods, results which were also confirmed with the definitive version of the matrix. The tool highlights the presence of inequalities in health and its determinants, which can help including health inequalities in the public debate, and therefore in the political agenda [43]. The fact that the matrix includes not only health indicators but also their social determinants can highlight the need for a Health in All Policies approach to tackle health inequalities [44]. However, in Barcelona, information collected by the tool was considered insufficient to decide the best interventions to tackle inequalities. Instead, a more in-depth analysis of the situation including a larger number of indicators was believed necessary.

Although not included in the Urban HEART User Manual, in Barcelona, an index summarizing Urban HEART matrix was developed to perform neighbourhood prioritization, which was required by the city government to guide the political action in the 2016–2019 period. A similar methodology was used in Toronto with the objective of facilitating the interpretation of the wealth of information included in the matrix [11]. Similarly, the New York City Equality Indicators Project [45] summarizes 96 health and health determinant indicators in a static and a dynamic score across six thematic areas with the purpose of capturing change over time in progress towards equality. If the Urban HEART Advisory Group considered an index calculation as of interest for Urban HEART, it would be desirable to include advice on the recommended methodology in the user manual. In Barcelona, the index allowed to prioritize 18 neighbourhoods in most need, among which the Health in the Barcelona Neighbourhoods programme and the Neighbourhoods Plan were implemented. Assessment of the reduction of health inequalities following the implemented interventions will be necessary.

The definitive version of Urban HEART Barcelona improved the previous version in several requirements, including efficiency (only one of the three mortality-related indicators included in the provisional version was chosen), exhaustivity (all domains included one or more indicators, including the physical environment and infrastructure domain, in which no indicators had been included in the provisional version) and actionability (non-actionable indicators were removed, such as over-ageing index and people 75 years and over living alone). This version will allow for a better follow-up of health inequalities in the city of Barcelona. In addition, the development of this version allowed to engage with sectors other than health, which can contribute to increase the understanding of health inequalities and their social causes among technicians and officers [42].

Some barriers were encountered during the adaptation of Urban HEART Barcelona. For instance, working at the neighbourhood level implied having to estimate indicators in some areas with a small population. The UHB Working Group decided to overcome this issue by replacing the values of scarcely populated neighbourhoods with that from a similar neighbourhood. Also, 3-year-period indicators were calculated to reduce variability in the estimations while trying to minimize the impact on the responsiveness requirement. Alternative solutions could also be useful, such as estimating indicators using Bayesian methods [46]. Given that this situation is most probably common across many cities, advice from the Urban HEART Advisory Group on this issue would be desirable. Another barrier was the difficulty in finding adequate physical context indicators at the neighbourhood level available periodically. Many relevant indicators, such as air pollution or housing, were not available at the neighbourhood level. Although some adequate quality indicators were identified, most had to be discarded since they were not based on routine data or were census-based, which in Spain is only carried out every 10 years and for which the later edition was sample-based. Others based on routine data, such as air pollution, were only available at the city level. However, changes in time among physical context indicators are expected to be small or negligible, and several follow-up years will be necessary to detect significant changes in this type of indicators. The Urban HEART Advisory Group should reconsider if annual periodicity of physical context indicators is necessary or a larger periodicity could be sufficient. Data availability was also a barrier in other domains, such as the health domain, for which no mental health indicator other than

drug consumption was available periodically at the neighbourhood level and none of the healthcare-based data could be considered, since healthcare divisions are not based on neighbourhood but rather on Basic Health Areas (ABS for its initials in Spanish). With respect to indicator selection, the UHB Working Team had doubts regarding what type of inequalities had to be considered when designing the Urban HEART. The user manual only specifies that socioeconomic inequalities have to be taken into account, from which it can be derived that any inequality axis could be considered. The gonococcal rate included in the Barcelona Urban HEART in fact reflects inequalities by sexual option, since half of gonorrhoea cases correspond to men who have sex with men [47]. The group discussed whether or not this indicator should be included, since the remaining indicators are mostly explained by income inequalities, and finally decided its inclusion because adding another inequality axis to the matrix was perceived as an added value.

Regarding health inequalities monitoring, Urban HEART User Manual recommends the use of the Urban HEART Monitor, which depicts the two neighbourhoods with the worst and best values for an indicator, as well as the city mean and the indicator's benchmark and standard of comparison. However, this methodology has some limitations. Mainly, that it focuses exclusively on two neighbourhoods. First, this does not take into consideration the remaining neighbourhoods when monitoring health inequalities. In addition, changes could be more attributable to the instability of point estimations than to real changes in the indicator at the neighbourhood level, especially among scarcely populated neighbourhoods. It would be advisable that additional inequality measures [48] would be included in the user manual, including both absolute and relative measures. Given that significant changes in the indicators cannot be expected in the short term and the instability in the point estimations at the neighbourhood level, advice on the periodicity with which inequalities should be measured would also be desirable to be included in the user manual.

There are other health inequality monitoring experiences, such as the Health Equity Monitor from the WHO Global Health Observatory [49] or the Health Inequalities Interactive Tool [50] or the Health Profiles online tool published by Public Health England [51]. In the ASPB, which has a long history of analysing intra-city health inequalities, its annual Health Report and other health reports show health indicators stratified by

gender, country of origin or educational attainment, among other inequality axes. Small-area level analysis, beyond what has been done in research studies, has been incorporated recently in inequality analysis at the ASPB. As an example, InfoBarris is an online platform which displays 64 health and health determinants indicators for each of the 73 Barcelona city neighbourhoods, through graphics, maps and tables, with the objective of facilitating health surveillance at the neighbourhood level [52]. Similar platforms have been developed abroad, such as that in the King County in the USA [53]. Compared to all these tools, the Urban HEART summarizes health inequalities in only one figure (i.e., the matrix), which shows both health and health determinant inequalities in a simple and easy to interpret way. In the case of Barcelona, Urban HEART Barcelona only focuses on the neighbourhood as the disaggregation variable, without considering other inequality axes. However, the Barcelona Council, in collaboration with the ASPB, is also working in developing a Health Inequalities Observatory, which will take into consideration other inequality axes, as well as health inequalities monitorization.

Conclusions

Implementation of Urban HEART in Barcelona was only possible when the municipal council was governed by a political party for which health inequalities are a priority, and which budgeted interventions to attempt to reduce them. Therefore, tackling health inequalities requires not only being aware of such inequalities but also a strong political will.

The Urban HEART allowed to identify urban inequalities in the city of Barcelona, to prioritize those neighbourhoods in most need, as well as to include health inequalities in the public debate. The way this tool depicts indicators' results, in a very simple and visual way, facilitates understanding and highlighting health inequalities and its social causes among a non-expert audience. It also allowed to reinforce the community health programme Health in the Barcelona Neighbourhoods as well as other city programmes aimed at reducing health inequalities.

The revision of Urban HEART Barcelona allowed to refine the indicators included to better comply with the established requirements, and it also allowed to widen the number and type of stakeholders involved and

familiar with Urban HEART and with health inequalities, which can make health equity interventions easier to implement at the local level.

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