



Social inequalities in quality of life in a cohort of women diagnosed with breast cancer in Barcelona (DAMA Cohort)

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ABSTRACT

Background: Breast cancer is a challenge for women's health-related quality of life (QoL), compromising their physical health and emotional well-being. QoL is equally distributed among different social groups. The aim of this study to analyze the impact of clinical characteristics and social determinants of health on the QoL of a cohort of women diagnosed and/or treated for breast cancer between 2003 and 2013 in one of the main hospitals in Barcelona's public health network.

Methods: We performed a descriptive cross-sectional study in a cohort of 2235 women with various stages of breast cancer at different stages of their disease. Data were obtained using questionnaires QLQ-C30 and QLQ-BR23 from the European Organization for Research and Treatment of Cancer (EORTC), which include a set of functional and symptomatic scales. We conducted descriptive and bivariate analysis using the Chi-Square test and adjusted for relevant variables using logistic regression. The dependent variables were the functional scales of QoL and the independent variables were sociodemographic and clinical variables.

Results: We observed significant differences for most QoL functions. Women from the most disadvantaged class, those in social isolation, or those who had suffered relapses showed the poorest results for most of the function scales. In contrast, age had differential effects depending on the function studied.

Conclusions: The QoL of women diagnosed with breast cancer is closely linked to both their social and economic status, and to their stage of disease progression. It is necessary to explore interventions that focus on the social determinants of health in order to mitigate their effects on breast cancer survivors' QoL.

1. Introduction

Breast cancer is the most common cancer in women worldwide. In Spain, 25,215 women are diagnosed with breast cancer each year, and 6075 die from the disease [1,2]. Although scientific and medical advances in recent years have led to a remarkable increase in the number of survivors [3], breast cancer is still a challenge for women's quality of life (QoL), in terms of both their physical health, which is compromised by the disease as well as the side effects of treatment, and their social and emotional well-being [4–6]. Studies in cancer survivors have shown that their needs in relation to QoL can increase during the post-treatment period, becoming more patent in the medium and long term [7].

Traditionally, QoL has been conceived as a dual element comprising physical and emotional aspects [8]. New trends and needs in the

population have lead to the emergence of new conceptual approaches that incorporate new elements to be considered. The so-called contextual models consider aspects related to the structural environment, which is understood as the cultural, political, social, economic and ecological context [9,10].

Current evidence indicates that QoL is not evenly distributed among different social groups, and that age, socioeconomic status, ethnicity and the presence or absence of social networks, among others, can promote social inequality in QoL [6,11]. In contexts with universal health coverage, the effect of these sociodemographic characteristics on the different components of QoL are more evident during the period after active treatment [12]. Gender roles in the family and social environment are also an influential element in QoL. Family responsibilities, the burden of household chores, or poor labor reconciliation can affect women's perceptions of QoL [4,13–15]. In addition, in the

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case of women with breast cancer, diagnosis in advanced stages, the presence of more aggressive relapses and/or treatments may have a negative impact on QoL.

In our setting, this is the first study on quality of life performed in a cohort of women with breast cancer at different points during disease progression and/or survival period. In addition, this will allow us to understand the processes by which social, economic and structural determinants interfere with women's quality of life and in the emergence of health inequalities in the medium and long term.

This study was conducted within the framework of the DAMA Cohort project, which has collected data from a cohort of 2235 women diagnosed with and/or treated for breast cancer between 2003 and 2013 in one of four reference hospitals in Barcelona's public health network. The general objective of the study was to analyze the impact of social and clinical determinants on the quality of life of women with breast cancer at different times during disease progression, and according to their territorial distribution. This study focuses on the functional aspects of quality of life.

2. Materials and methods

2.1. Design

We conducted a retrospective-prospective cohort study; the initial cross-sectional study included 2235 women with breast cancer at various stages of disease progression.

The study population were all women over 18 years of age who were diagnosed and/or treated for breast cancer in one of the 4 main public hospitals in Barcelona (Hospital Clínic, Vall d'Hebrón, Sant Pau, and Parc de Salut Mar) between January 2003, and December 2013. They were identified from the Minimum Basic Data Set (CMBD), and we selected those who had received a coded diagnosis between values 174.0 and 179.9 in the 9th revision of the International Classification of Diseases (ICD-9). We excluded women who had died for any other cause before the start of the study, and those with a previous diagnosis of another type of cancer before the breast cancer diagnosis.

A total of 9771 women were identified, and subsequently approached via the corresponding hospital. They were informed about the study by letter and were invited to participate; those who accepted were asked to provide written informed consent (IC).

2.2. Sources of information

After receiving the IC, a first telephone contact was made to acknowledge their participation in the study, to explain the subsequent steps, and to administer the survey of sociodemographic and economic data. They were then sent a general health questionnaire by conventional or electronic mail. Finally, from clinical records, relevant information was collected on diagnosis, treatment, relapse, follow-up, etc. Detailed information on the protocol used is provided in our previous paper on the study protocol [16].

Quality of Life (QoL) was studied using the QLQ-C30 and QLQ-BR23 questionnaires proposed by EORTC (European Organization for Research and Treatment of Cancer). These questionnaires are composed of a set of functional and symptomatic scales [17], and have been validated in the Spanish context [18,19].

QLQ-C30 is composed of 30 items and evaluates general aspects of QoL in cancer patients. It contains 5 functional scales (physical, role, emotional, cognitive and social), 8 items related to symptomatology (fatigue, nausea/vomiting, pain, dyspnea, insomnia, constipation and diarrhea), 1 scale on general health, and 1 item on the economic impact of the disease. The specific module for breast cancer, QLQ-BR23, consists of 23 questions, also divided into a functional block, consisting of 4 scales (body image, sexual function, sexual enjoyment and perspective of the future), and a symptomatic block, also with 4 scales, related to the secondary effects of systemic therapy, symptomatology of the arm

and chest, and concern about hair loss. All items are formulated as a question and answered using a Likert scale from 1 to 4 (except for the questions on general health, which are scored from 1 to 7). The resulting scores are then converted into a linear scale from 0 to 100 and missings are imputed in cases where this is indicated by the EORTC weighting manual [20]. Higher values indicate more functionality in the functional scales, and higher symptomatology in the symptomatic scales.

As mentioned above, in this study we focus on the functional aspects, mainly because most women were survivors of ≥ 5 years (long-term survival).

The clinical variables were obtained from the clinical histories of the women.

2.3. Study variables

The dependent variables correspond to the 9 functional scales of QoL (QLQ-C30: physical, role, emotional, cognitive and social function; QLQ-BR23: body image, sexual function, sexual enjoyment, and future perspectives).

The independent sociodemographic variables were: a) age; b) social class, based on the woman's occupation or that of the main breadwinner living with her, according to the National Classification of Occupations CNO-2011 grouped into three categories, high (i, ii), medium (iii) and low (iv, v), as proposed by the Spanish Society of Epidemiology [20,21]; c) Social network, measured by the Berkman-Syme Network Index (SNI). This scale allows categorizing individuals within different levels of social connection depending on their marital status, the number of contacts (family, friends, neighbours, etc.) with which they usually relate and their membership to community groups. Finally, a summation is carried out establishing the risk of social isolation in those who report interacting on a daily basis with no more than two people [21]; d) co-habitation at home, according to whether the woman lives alone or accompanied; e) the burden of domestic chores, according to whether they are performed by the woman exclusively or with the support of someone else; f) Available Family Income Index (AFI), as a precarious indicator. The AFI is a composite measure of five socioeconomic indicators: 1) rate of senior graduates in the population under study, 2) labour situation understood as the ratio between unemployed and working-age population, 3) number of cars in relation to the population, 4) power of new cars purchased by residents of the area and 5) prices on the market for second hand homes. Clinical variables were: f) occurrence of relapses and g) number of years elapsed since diagnosis, grouped into 3 categories: recent diagnosis (< 5 years), medium (5–10 years) and old (> 10 years).

2.4. Statistical analysis

The QLQ-C30 and QLQ-BR23 questionnaires were converted into linear scales with values of 0–100 according to the EORTC weighting manual [20]. These scales were then converted into dichotomous variables based on their mean values.

The clinical and sociodemographic characteristics of the sample were studied using a descriptive analysis for each of the dependent variables. The results are presented according to whether they are categorical or quantitative, by means of percentages or means and standard deviations, respectively. Using the Chi-square test, we performed a bivariate descriptive analysis of the 9 QoL scales previously dichotomized by each of the explanatory variables. We then fit multivariate logistic regression models for each of the dependent variables. Finally, we mapped the dependent variables according to the territorial distribution of the districts of Barcelona city related with the AFI.

Statistical significance was established at $\alpha < 0.05$ for all analyses. All analyses were performed using STATA version 13.0, and mapping was conducted using R version 3.2.2.

Table 1
Description of the sociodemographic and clinical variables of the women from the DAMA Cohort.

Socio-demographic and clinical characteristics	N	%		N	%
Total	2,235	100			
Age			Social Network		
Less than 50	321	14.4	Social isolation	480	21.5
Between 50 and 65	1,017	45.5	Different degree of social connection	1,664	74.5
More than 65	896	40.1	Missing	91	4.1
Missing	1	0.04	Stage of tumour at moment of diagnoses		
Studies			In situ	177	7.9
Primary or lower	429	19.2	Initial phase	863	38.6
Secondary or FP	894	40	locally advanced	889	39.8
University or more	766	34.3	Metastatic	24	1.1
Missing	146	6.53	Missing	282	12.6
Social class			Relapse		
Upper class	996	44.6	Yes	210	9.4
Medium	692	30.9	No	1,878	84
Lower class	509	22.8	Missing	147	6.6
Missing	38	1.7	Time over diagnoses		
Employment status			5 years or less	842	37.7
Worker in active employment	833	37.3	Between 5–10 years	952	42.6
Inactive or standing with grant	935	41.8	More than 10 years	425	19
Inactive or standing without grant	342	15.3	Missing	16	0.7
Missing	125	5.6	Neighbourhood		
Domestic tasks				AFI^a	
Women alone	837	37.5	Ciutat Vella	86.9	68
Women helped by another person	1,343	60.9	Eixample	119.3	354
Missing	55	2.5	Sant - Montjuïc	79.1	191
Dependent family members			Les Corts	136	103
Yes	251	11.2	Sarrià - Sant Gervasi	182.4	133
No	1,764	78.9	Gràcia	105.4	173
Missing	220	9.8	Horta - Guinardó	79.2	177
Cohabitation			Nou Barris	55	108
Alone	507	22.7	Sant Andreu	74.5	166
With other people	1,719	76.9	Sant Martí	87.1	297
Missing	9	0.4	Outside Barcelona	465	20.8

^a AFI: Available Family Income Index. Barcelona 2016. Indicator based on the combination of five weighted variables with different weights in relation to an average city centered at 100. The index obtained determines the level of income of each area. The variables comprise the income and expense of the population, and they are (1): the academic qualification of the population, measured with the rate of senior graduates (2); the employment situation, such as ratio between unemployed and working-age population (3); the tourism park in relation to the population (4), the power of new passenger cars purchased by residents, and (5) the residential market prices of second hand.

3. Results

3.1. Characteristics of the participants

Of the 2235 women participants, 40.1% were older than 65 years, 22.7% lived alone and 21.5% were at risk of social isolation. 74.3% of women had secondary level education or higher, and 37.3% were in active employment. Regarding social class, 44.6% belong to the upper class, 30.9% to the median and 22.8% to the lower class. In relation to family and domestic burdens, 11.2% of women reported that they were responsible for the care of another person, and 37.4% performed household tasks alone. Finally, in terms of clinical characteristics, 37.7% of cases had been diagnosed with the previous 5 years, 1.2% had metastases and 9.4% had a relapse (Table 1).

3.2. Quality of life

Table 2 shows the results of the univariate analysis of continuous QoL variables (mean, standard deviation and median) following linear weighting of each scale in values from 0 to 100, and categorical variables (frequency and percentage) after dichotomization according to the mean. In most scales, most of the women had values above the mean cut-off, corresponding to high functional QoL. The functions with the highest percentage of women in the higher category were social function (64.9%), physical function (60.6%) and perspectives for the future (60.2%). We observed the opposite trend for cognitive function (48.6%), sexual function (54.2%) and sexual enjoyment (22.1%), where there was a higher proportion of women with low QoL.

In the bivariate analysis, we evaluated the association between the

functional QoL scales and the various explanatory variables. Table 3 shows the relationship between poor QoL (below average values) for the various functions of the QLQ-30 questionnaire and the most relevant independent variables (shown as age-adjusted OR). Table 4 shows the corresponding data for the functions in the QLQ-BR23 questionnaire. From these data, we find that the most statistically significant determinants of poor QoL were having a poor social network, belonging to the most disadvantaged social class, and having suffered a relapse. The women with social isolation presents an OR = 1.63 for emotional function, and the women of lower social class an OR = of 2.38 for future perspectives. Age also appears to be significantly determinant of QoL, except for the functions related to role, emotion and cognition functions. Co-habitation status and the number of years since diagnosis were the variables with least impact on QoL.

Tables 5 and 6 show the results of the multivariate logistic regression analysis of QLQ-30 and QLQ-BR23, respectively. Of all the explanatory variables this model, that for social network was the most strongly associated with all the QoL functions; women without a social network systematically presented the poorest results, ranging from OR = 1.25 for cognitive function to OR = 1.57 for emotional function. Having had a relapse was also negatively associated with QoL, with OR = 2.66 for the future perspectives function and OR = 2.21 for social function, among others. Social class, even though it had no significant results some of the functions, presents a clear trend to get worse as you go down the social ladder. For example, the lower social class has an OR = 1.7 for physical function, and OR = 1.65 for sexual function respect the highest class. Living alone is a risk factor for poor QoL on the sexual function scale (OR = 2.44). In contrast, sexual function was positively associated with the time elapsed since diagnosis.

Table 2

Descriptive analysis of the variables corresponding to the Functional Scales of Quality of Life (QLQ-C30 and QLQ-BR23). Measures are shown for continuous (mean, standard deviation and median) and dichotomous variables (frequencies and percentages).

Functional scales Quality of Life		COHORT DAMA				Values EORTC ^b	
		N	%	Mean (DE) ^a	Median ^a	Mean (DE)	Median
Total		2,235	100				
QLQ-C30	Physical function			83,7 (17,3)	86.66	78,4 (21,3)	86.7
	High	1,353	60.5				
	Lower	739	33.1				
	Ns/Nc	143	6.4				
	Role function			83,4 (24,6)	100	70,9 (29,9)	83.3
	High	1,260	56.4				
	Lower	866	38.7				
	Ns/Nc	109	4.9				
	Emotional function			78 (23,6)	83.33	68,6 (23,8)	75
	High	1,188	53.2				
	Lower	886	39.6				
	Ns/Nc	161	7.2				
	Cognitive function			83,4 (21,8)	83.33	81,5 (21,8)	83.3
	High	1,020	45.6				
	Lower	1,086	48.6				
	Ns/Nc	129	5.8				
QLQ-BR23	Social function			82,3 (25,3)	100	77 (27,1)	83.3
	High	1,450	64.9				
	Lower	668	29.9				
	Ns/Nc	117	5.2				
	Body image			78,64 (26,45)	91.66	82,7 (22,9)	91.7
	High	1,288	57.63				
	Lower	767	34.32				
	Ns/Nc	180	8.05				
	Sexual function			20,04 (22,88)	16.66	19,5 (22,8)	16.7
	High	808	36.15				
	Lower	1,211	54.18				
	Ns/Nc	216	9.66				
	Sexual enjoy function			47,22 (31,71)	50	53,1 (27,1)	66.7
	High	493	22.06				
	Lower	493	22.06				
	Ns/Nc	1,249	55.88				
Future Perspectives				59,17 (31,88)	66.66	47,3 (33,7)	66.7
	High	1,345	60.18				
	Lower	702	31.41				
	Ns/Nc	188	8.41				

QLQ-C30: CV questionnaire for patients with cancer; QLQ-BR23: module specific for breast cancer.

SD: Standard Deviation.

^a Don't include missing values.

^b Reference values defined by EORTC for each scale and function of QoL studied.

Finally, Fig. 1 shows the distribution according to the district of residence of women with poor QoL for each of the functions studied and adjusted for age. Comparing the results with the distribution of the Available Family Income Index (AFI) for 2015 in these territories, we found that participants in areas with the lowest IRFD had the poorest QoL, and vice versa. For example, the Sant Andreu, Ciutat Vella and Nou Barris districts, which have the lowest AFI, contain the highest proportion of below-average values on the QoL scales studied, while Les Corts, Eixample and Sarrià-Sant Gervasi lie at the high end of both indicators.

4. Discussion

This study analyzes the association between socioeconomic and clinical characteristics and quality of life in women with breast cancer at different stages of progression of their disease. We obtained data from 2235 women diagnosed with or treated for breast cancer between 2003 and 2013 in the city of Barcelona.

The results of this study show high functional QoL scores compared to the reference values stipulated by the EORTC [22], possibly because the DAMA Cohort includes a significant proportion of women who have been diagnosed more than 5 years ago (61.62%). Some studies that have obtained similar results estimate that after 5 years since diagnosis the effects derived from the severity of the disease and the treatment received are attenuated to the extent that survivors generally have good QoL [5,23,24], and that after 5–10 years QoL scores can be compared to those of the general population [25,26].

Our results suggest that social network is the most influential factor for QoL functions; women with greater social isolation develop poorer results in all functions of both the QLQ-C30 and QLQ-BR23 questionnaires. This is consistent with the results of other studies suggesting that social network influences women's perceptions of disease progression, QoL, and even survival [6,13,27,28]. Similar results have been observed among individuals who live alone, also although in our study this was only statistically significant for sexual function.

Age is also an important factor for the various QoL functions. For the QLQ-C30 scales, younger women had poorer emotional, cognitive and social scores, possibly because of unmet expectations regarding QoL, making it more difficult to cope with the disease [23]. In contrast, older women have lower scores on the physical and role scales. In line with other studies, age was closely related to the time elapsed since diagnosis, with older women presenting the oldest diagnoses and vice versa [25]. Thus, in addition to decreasing over time, the impact of cancer and its treatment on QoL is replaced by the effects of comorbidities and reduced ability to perform daily activities due to age, which would explain the deterioration in the physical and role function in the older population [23,25,28,29].

Similarly, age is a determining factor for the functions of body image, sexuality and future perspectives evaluated by the QLQ-BR23. As in other studies, we found that younger women have poorer QoL in relation to their body image [30,31]. Several authors have attributed this phenomenon to pressure to fit in with social expectations, standards of beauty, and society ideals of femininity, sexuality and fertility [6,31–36]. In contrast, the function and sexual satisfaction are worse in older women; other authors have linked this to lower sexual activity before diagnosis because of advanced age, and not necessarily because of the impact of the disease [6,37,38]. Consistent with previous studies, younger women also have the worst results in terms of future perspectives, which may be due to greater demands of maintaining labor, economic and family stability, especially among women with dependent children [15,25,35].

Regardless of the indicator used to measure social class, several studies have concluded that this is a clearly influential factor for QoL. Thus, belonging to a low social class has a negative impact on health and almost all functions of QoL [23,39,40]. The least favored classes generally have lower purchasing power, which limits their access to non-public therapeutic alternatives that could mitigate the effects of the disease [12], contributes to poor job stability and/or satisfaction, and disturbs psychological well-being [40,41]. This idea is supported by the territorial distribution observed when we map the QoL results onto the various city districts: we find that areas with the greatest socioeconomic deprivation (lower AFI) also have the worst QoL. There are some exceptions, such as low values for physical, cognitive and sexual function in the Sarrià-Sant Gervasi district, which has the highest socioeconomic level in the city. This might be related to the negative effect of age on these QoL functions. In our study, the district of Sarrià-Sant Gervasi (high AFI) has a similar age distribution to that of Ciutat Vella and Nou

Table 3
Bivariate analysis of low functional QoL (QLQ-30) according to sociodemographic and clinical variables.

	QLQ-C30									
	Physical Function		Role Function		Emotional Function		Cognitive Function		Social Function	
	n (%)	OR (IC 95%)	n (%)	OR (IC 95%)	n (%)	OR (IC 95%)	n (%)	OR (IC 95%)	n (%)	OR (IC 95%)
Age										
Less than 50	77 (25)	1	120 (38,83)	1	135 (43,69)	1	161 (51,94)	1	126 (40,78)	1
Between 50–65	304 (31,18)	1,36 (1,02 - 1,82)	405 (41,37)	1,11 (0,86 - 1,44)	426 (44,01)	1,01 (0,78 - 1,31)	529 (54,20)	1,1 (0,85 - 1,41)	348 (35,62)	0,80 (0,62 - 1,04)
More than 65	357 (44,18)	2,37 (1,77 - 3,18)	304 (40,62)	1,08 (0,82 - 1,41)	325 (40,93)	0,89 (0,68 - 1,16)	396 (48,35)	0,59 (0,33 - 1,06)	194 (23,35)	0,44 (0,33 - 0,58)
Social class										
Upper class	294 (30,95)	1	375 (39,14)	1	377 (39,94)	1	488 (51,05)	1	298 (31,07)	1
Medium	227 (35,19)	1,11 (0,89 - 1,38)	267 (41,08)	1,07 (0,87 - 1,31)	267 (42,05)	1,11 (0,9 - 1,36)	332 (51,47)	1,03 (0,84 - 1,26)	200 (30,86)	1,07 (0,86 - 1,34)
Lower class	198 (43,04)	1,41 (1,11 - 1,79)	203 (42,20)	1,11 (0,88 - 1,39)	224 (49,02)	1,49 (1,18 - 1,87)	244 (52,14)	1,07 (0,85 - 1,36)	152 (32,14)	1,22 (0,96 - 1,56)
Domestic tasks										
Women helped by another person	495 (39,16)	1	554 (43,15)	1	526 (42,01)	1	664 (52,12)	1	422 (32,97)	1
Alone	226 (29,16)	0,62 (0,51 - 0,75)	291 (36,79)	0,76 (0,64 - 0,92)	340 (44,16)	1,09 (0,91 - 1,31)	394 (50,51)	0,94 (0,79 - 1,12)	227 (28,84)	0,83 (0,69 - 1,01)
Cohabitation										
With some person	551 (33,99)	1	664 (40,34)	1	701 (43,70)	1	837 (51,41)	1	529 (32,32)	1
Alone	185 (40,04)	1,03 (0,83 - 1,29)	199 (42,25)	1,05 (0,85 - 1,3)	182 (39,48)	0,85 (0,69 - 1,06)	244 (52,03)	1,05 (0,85 - 1,3)	138 (29,24)	1,03 (0,82 - 1,3)
Social network										
Different degree social connection	536 (33,42)	1	631 (38,76)	1	636 (40,08)	1	810 (50,28)	1	471 (29,04)	1
Social isolation	188 (41,14)	1,44 (1,16 - 1,79)	220 (47,41)	1,43 (1,16 - 1,76)	237 (52,20)	1,63 (1,32 - 2,01)	260 (56,28)	1,27 (1,03 - 1,56)	186 (40,09)	1,62 (1,3 - 2,01)
Relapse										
No	625 (34,92)	1	718 (39,43)	1	730 (41,03)	1	912 (50,61)	1	543 (29,93)	1
Yes	83 (41,92)	1,43 (1,05 - 1,94)	109 (53,69)	1,8 (1,34 - 2,41)	106 (54,36)	1,71 (1,27 - 2,3)	111 (55,22)	1,2 (0,89 - 1,61)	92 (45,54)	1,92 (1,43 - 2,59)
Time over diagnoses										
Less than 5 years	272 (34,13)	1	331 (41,38)	1	333 (42,47)	1	409 (51,45)	1	274 (34,16)	1
Between 5–10 years	316 (35,39)	0,97 (0,79 - 1,19)	364 (40,22)	0,94 (0,77 - 1,14)	369 (41,60)	0,98 (0,80 - 1,19)	463 (51,44)	1,01 (0,83 - 1,23)	265 (29,51)	0,87 (0,7 - 1,07)
More than 10 years	147 (37,69)	0,96 (0,74 - 1,25)	165 (40,54)	0,94 (0,73 - 1,2)	182 (46,67)	1,21 (0,95 - 1,55)	209 (52,51)	1,06 (0,83 - 1,36)	126 (31,19)	1,03 (0,79 - 1,34)

The observed values correspond to the values below the mean of each of the functional scale of QoL.

QLQ-C30: QoL questionnaire for patients with cancer.

OR: Odds Ratio adjusted by age.

Barris (low AFI), so that there is a higher proportion of older women in all three cases. This leads us to believe that the low quality of life outcomes in the three districts could be influenced by age, which masks the effect of socioeconomic status.

Our observations also show that there is gradient toward progressive worsening of perceived QoL with decreasing socioeconomic status (statistically significant in the lower classes). Although our results were only statistically significant for the physical and emotional functions in QLQ-C30 and for sexual function and satisfaction and future perspectives in the QLQ-BR23, this pattern is highly illustrative and consistent with other studies [28,39,42]. Note that any differences between studies in the magnitude of the association between QoL and social class could be due to differences in the health system and the healthcare cover in different countries [5,15].

Contrary to expectations, our results suggest that women who are solely responsible for domestic tasks generally have better QoL. This could be responding to an inverse relationship between variables, concluding that as woman's health improves, she may begin to incorporate certain activities, such domestic tasks, especially if she is unable to work away from home because of the disease. So that being solely responsible for domestic tasks doesn't implicate higher QoL, but higher QoL can lead to a reincorporation to domestic tasks.

Regarding the clinical variables, our observations indicate that greater disease severity is associated with poorer QoL due to relapses during the clinical course of the disease, reducing QoL for most functions [23]. Regarding the time elapsed since diagnosis, although it only acquires significance in sexual function, quality of life tends to increase when so does the time of diagnosis, as it has been observed in other studies. [5,23].

4.1. Strengths and limitations of this study

The main strength of this study is that it provides information about the quality of life in women with varying length of time since diagnosis with breast cancer, and a large fraction of whom are long-term survivors. This is novel because most previous studies tended to focus on newly diagnosed women. In addition, it has been possible to compare women who have had a relapse to women who have not. Moreover, we have been able to compare these trends with social determinant to evaluate the influence they may have on women's QoL, over and above the disease process itself.

Although self-reported, the QoL questionnaires had a good response rate, except for some scales in QLQ-BR23 (sexual function and pleasure). This could be expected as the sexual function scale is known from

Table 4

Bivariate analysis of low functional QoL (QLQ-BR23) according to sociodemographic and clinical variables.

	Body Image Function n (%)	OR (IC 95%)	Sexual Function n (%)	OR (IC 95%)	Sexual Enjoyment n (%)	OR (IC 95%)	Future Perspectives n (%)	OR (IC 95%)
Age								
Less than 50	167 (54,58)	1	128 (41,83)	1	79 (36,57)	1	120 (39,22)	1
Between 50–65	383 (39,94)	0,55 (0,43 - 0,72)	538 (56,16)	1,78 (1,37 - 2,31)	218 (47,39)	1,56 (1,12 - 2,18)	350 (36,65)	0,9 (0,69 - 1,17)
More than 65	216 (27,38)	0,31 (0,24 - 0,41)	544 (72,15)	3,6 (2,73 - 4,75)	195 (63,11)	2,97 (2,07 - 4,25)	232 (29,55)	0,65 (0,49 - 0,86)
Social class								
Upper class	363 (38,54)	1	517 (55,29)	1	208 (43,06)	1	307 (32,56)	1
Medium	240 (38,46)	1,08 (0,87 - 1,33)	364 (60,07)	1,11 (0,9 - 1,37)	143 (49,31)	1,18 (0,88 - 1,59)	199 (32,31)	1,02 (0,82 - 1,27)
Lower class	149 (33,04)	0,92 (0,72 - 1,18)	302 (68,33)	1,44 (1,12 - 1,84)	129 (66,15)	2,26 (1,58 - 3,22)	177 (39,16)	1,43 (1,13 - 1,829)
Domestic tasks								
Women helped by another person	469 (37,82)	1	720 (58,82)	1	281 (47,15)	1	419 (33,79)	1
Alone	283 (36,99)	0,99 (0,82 - 1,2)	461 (61,96)	1,12 (0,92 - 1,35)	202 (55,19)	1,36 (1,04 - 1,77)	270 (35,57)	1,09 (0,9 - 1,32)
Cohabitation								
With some person	609 (37,94)	1	881 (55,27)	1	410 (48,12)	1	553 (34,71)	1
Alone	154 (34,84)	1,07 (0,85 - 1,35)	323 (77,64)	2,31 (1,78 - 2,99)	79 (61,24)	1,46 (0,99 - 2,16)	146 (32,81)	0,98 (0,78 - 1,23)
Social network								
Different degree social connection	558 (35,45)	1	893 (57,91)	1	365 (47,46)	1	505 (32,29)	1
Social isolation	197 (43,88)	1,41 (1,13 - 1,75)	295 (66,29)	1,52 (1,21 - 1,91)	116 (57,43)	1,59 (1,15 - 2,19)	188 (41,69)	1,49 (1,2 - 1,85)
Relapse								
No	628 (35,7)	1	1.028 (59,49)	1	414 (48,42)	1	568 (32,42)	1
Yes	100 (50,76)	1,82 (1,35 - 2,46)	122 (63,54)	1,26 (0,91 - 1,73)	54 (65,85)	2,29 (1,41 - 3,74)	106 (53,54)	2,38 (1,77 - 3,21)
Time over diagnoses								
Less than 5 years	305 (39,30)	1	475 (62,34)	1	187 (49,08)	1	279 (36,05)	1
Between 5–10 years	319 (36,33)	0,96 (0,78 - 1,18)	500 (57,74)	0,7 (0,57 - 0,87)	208 (48,60)	0,84 (0,63 - 1,12)	288 (32,91)	0,89 (0,73 - 1,1)
More than 10 years	140 (36,08)	1,06 (0,82 - 1,37)	231 (61,11)	0,69 (0,53 - 0,91)	95 (55,88)	0,99 (0,68 - 1,45)	131 (34,03)	0,96 (0,74 - 1,25)

The observed values correspond to the values below the mean of each of the functional scale of QoL.

QLQ-BR23: specific module for patients with breast cancer.

OR: Odds Ratio adjusted by age.

other studies to have lower response rates than other scales, and the item on sexual enjoyment was not considered if the patient does not report any sexual activity [5].

In terms of limitations, first, selection bias is likely because we used convenience sampling to select women from public hospitals only, so the sample is unlikely to be representative. Second, there may be volunteer bias because, while we invited all women diagnosed or treated over a 10-year period to participate, not all chose to do so. However, note that we used data from the 4 most important hospitals in Barcelona's public network, which attend the highest proportion of cases (approximately 85% of all diagnoses), and we obtained a high response rate (23%). Third, there may be some information bias because the data were self-reported by the women themselves.

Nonetheless, the Dama Cohort of 2235 women is known to be representative of the age of breast cancer patients in Barcelona city, and of the distribution of tumour stages at which they are diagnosed, except for metastatic tumours, which are generally under-represented in the Dama Cohort.

5. Conclusions

The QoL of long-term survivors of breast cancer is closely linked to both their social and economic status, and to their stage of disease

progression. Having social isolation and belonging to a lower social class seem to have a clear influence on QoL. Another key element in long-term survivors is their history of relapse; with time, QoL becomes increasingly similar to that of the general population but suffering one or more relapses represents a severe disruption in this trend.

On the one hand, these results are a starting point for continued research into other aspects that can influence QoL in breast cancer survivors, and on the other hand, they highlight important determinants that should guide interventions to improve QoL in women in this situation.

Autorship contribution

Ariadna Graells: is a student of Master of Public Health and she did her dissertation work with this study. Under the supervision of Rosa Puigpinós I Riera, principal investigator of the project and director of the dissertation, carried: Bibliographical review, analysis of the data, writing of the manuscript.

Rosa Puigpinós I Riera, as director of the thesis and principal investigator of the project oversaw all phases of the study, revising the results of the analysis and carrying out readings of all the written.

Gemma Serral is an expert in statistical analysis and was therefore the person who ultimately reviewed the most appropriate type of

Table 5
Multivariate logistic regression models. Association between low functional QoL and sociodemographic and clinical variables (QLQ-C30).

QLQ-C30													
Physical Function	Role Function			Emotional Function			Cognitive Function			Social Function			
	n (%)	ORaj (IC 95%)	p-value	n (%)	ORaj (IC 95%)	p-value	n (%)	ORaj (IC 95%)	p-value	n (%)	ORaj (IC 95%)	p-value	
Age	Less than 50	1		120 (38,83)	1		135 (43,69)	1		161 (51,94)	1		
	Between 50-65	304 (31,18)	1,36 (0,99 - 1,86)	0.054	405 (41,37)	1,13 (0,86 - 1,51)	0.375	426 (44,01)	1,08 (0,82 - 1,43)	0.585	529 (54,20)	1,13 (0,86 - 1,49)	0
	More than 65	357 (44,18)	2,19 (1,58 - 3,03)	< 0,001	304 (40,62)	1,06 (0,79 - 1,43)	0.682	325 (40,93)	0,93 (0,69 - 1,25)	0.623	396 (48,35)	0,82 (,62 - 1,1)	< 0,001
Social class	Upper class	294 (30,95)	1		375 (39,14)	1		377 (39,94)	1		488 (51,05)	1	
	Medium	227 (35,19)	1,25 (0,99 - 1,58)	0.054	267 (41,08)	1,08 (0,87 - 1,43)	0.466	267 (42,05)	1,13 (0,91 - 1,41)	0.266	332 (51,47)	1,06 (0,85 - 1,31)	0.684
	Lower class	198 (43,04)	1,7 (1,32 - 2,19)	< 0,001	203 (42,20)	1,18 (0,93 - 1,51)	0.178	224 (49,02)	1,53 (1,2 - 1,96)	0.001	244 (52,14)	1,16 (0,91 - 1,47)	0.092
Domestic tasks	Women helped by another person	495 (39,16)	1		554 (43,15)	1		526 (42,01)	1		664 (52,12)	1	
	Alone	226 (29,16)	0,56 (0,45 - 0,69)	< 0,001	291 (36,79)	0,76 (0,63 - 0,93)	0.008	340 (44,16)	1,04 (0,85 - 1,27)	0.719	394 (50,51)	0,91 (0,75 - 1,11)	0.027
Cohabitation	With some person	551 (33,99)	1		664 (40,34)	1		701 (43,70)	1		837 (51,41)	1	
	Alone	185 (40,04)	1,21 (0,95 - 1,54)	0.114	199 (42,25)	1,1 (0,87 - 1,38)	0.42	182 (39,48)	0,86 (0,68 - 1,08)	0.193	244 (52,03)	1,08 (0,86 - 1,35)	0.917
Social network	Different degree social connection	536 (33,42)	1		631 (38,76)	1		636 (40,08)	1		810 (50,28)	1	
	Social isolation	188 (41,14)	1,36 (1,03 - 1,72)	0.009	220 (47,41)	1,48 (1,19 - 1,85)	< 0,001	237 (52,20)	1,57 (1,25 - 1,96)	< 0,001	260 (56,28)	1,25 (1 - 1,56)	< 0,001
Relapse	No	625 (34,92)	1		718 (39,43)	1		730 (41,03)	1		912 (50,61)	1	
	Yes	83 (41,92)	1,44 (1,03 - 2,01)	0.031	109 (53,69)	1,95 (1,42 - 2,68)	< 0,001	106 (54,36)	1,93 (1,4 - 2,66)	< 0,001	111 (55,22)	1,22 (0,89 - 1,67)	< 0,001
Time over diagnoses	Less than 5 years	272 (34,13)	1		331 (41,38)	1		333 (42,47)	1		409 (51,45)	1	
	Between 5-10 years	316 (35,39)	1,04 (0,84 - 1,3)	0.688	364 (40,22)	0,96 (0,78 - 1,18)	0.704	369 (41,60)	0,93 (0,76 - 1,15)	0.521	463 (51,44)	1,01 (0,82 - 1,24)	0.036
	More than 10 years	147 (37,69)	0,96 (0,72 - 1,28)	0.777	165 (40,54)	0,89 (0,68 - 1,17)	0.399	182 (46,67)	1,04 (0,79 - 1,37)	0.789	209 (52,51)	0,99 (0,76 - 1,3)	0.159

The observed values correspond to the values below the mean of each of the functional scale of QoL.

QLQ-C30: QoL questionnaire for patients with cancer.

ORaj: Odds Ratio adjusted by all independent variables.

Table 6
Multivariate logistic regression models. Association between low functional QoL and sociodemographic and clinical variables (QLQ-BR23).

QLQ-BR23													
	Body Image Function				Sexual Function				Sexual Enjoyment			Future Perspectives	
	n (%)	ORaj	(IC 95%)	p-value	n (%)	ORaj	(IC 95%)	p-value	n (%)	ORaj	(IC 95%)	p-value	
Age													
Less than 50	167 (54,58)	1			128 (41,83)	1			79 (36,57)	1			
Between 50-65	383 (39,94)	0,58	(0,44 - 0,77)	< 0,001	538 (56,16)	1,96	(1,47 - 2,61)	< 0,001	218 (47,39)	1,73	(1,2 - 2,49)	0,003	
More than 65	216 (27,38)	0,34	(0,25 - 0,46)	< 0,001	544 (72,15)	3,61	(2,64 - 4,92)	< 0,001	195 (63,11)	2,98	(1,98 - 4,48)	< 0,001	
Social class													
Upper class	363 (38,54)	1			517 (55,29)	1			208 (43,06)	1			
Medium	240 (38,46)	1,09	(0,87 - 1,36)	0,47	364 (60,07)	1,13	(0,9 - 1,42)	0,31	143 (49,31)	1,14	(0,83 - 1,57)	0,43	
Lower class	149 (33,04)	0,91	(0,7 - 1,18)	0,467	302 (68,33)	1,65	(1,26 - 2,16)	< 0,001	129 (66,15)	2,1	(1,44 - 3,07)	< 0,001	
Domestic tasks													
Women helped by another person	469 (37,82)	1			720 (58,82)	1			281 (47,15)	1			
Alone	283 (36,99)	1	(0,81 - 1,23)	0,986	461 (61,96)	0,93	(0,76 - 1,15)	0,527	202 (55,19)	1,15	(0,85 - 1,55)	0,358	
Cohabitation													
With some person	609 (37,94)	1			881 (55,27)	1			410 (48,12)	1			
Alone	154 (34,84)	1,05	(0,82 - 1,34)	0,716	323 (77,64)	2,64	(2 - 3,5)	< 0,001	79 (61,24)	1,33	(0,85 - 2,06)	0,209	
Social network													
Different degree social connection	558 (35,45)	1			893 (57,91)	1			365 (47,46)	1			
Social isolation	197 (43,88)	1,4	(1,11 - 1,76)	0,004	295 (66,29)	1,44	(1,13 - 1,84)	0,003	116 (57,43)	1,54	(1,09 - 2,17)	0,013	
Relapse													
No	628 (35,7)	1			1.028 (59,49)	1			414 (48,42)	1			
Yes	100 (50,76)	1,96	(1,41 - 2,71)	< 0,001	122 (63,54)	1,53	(1,08 - 2,16)	0,017	54 (65,85)	2,45	(1,45 - 4,13)	0,001	
Time over diagnoses													
Less than 5 years	305 (39,30)	1			475 (62,34)	1			187 (49,08)	1			
Between 5-10 years	319 (36,33)	0,96	(0,77 - 1,2)	0,734	500 (57,74)	0,67	(0,53 - 0,84)	< 0,001	208 (48,60)	0,79	(0,57 - 1,07)	0,129	
More than 10 years	140 (36,08)	0,9	(0,67 - 1,2)	0,46	231 (61,11)	0,62	(0,46 - 0,84)	0,002	95 (55,88)	0,84	(0,56 - 1,28)	0,428	

The observed values correspond to the values below the mean of each of the functional scale of QoL.

QLQ-BR23: specific module for patients with breast cancer.

ORaj: Odds Ratio adjusted by all independent variables.

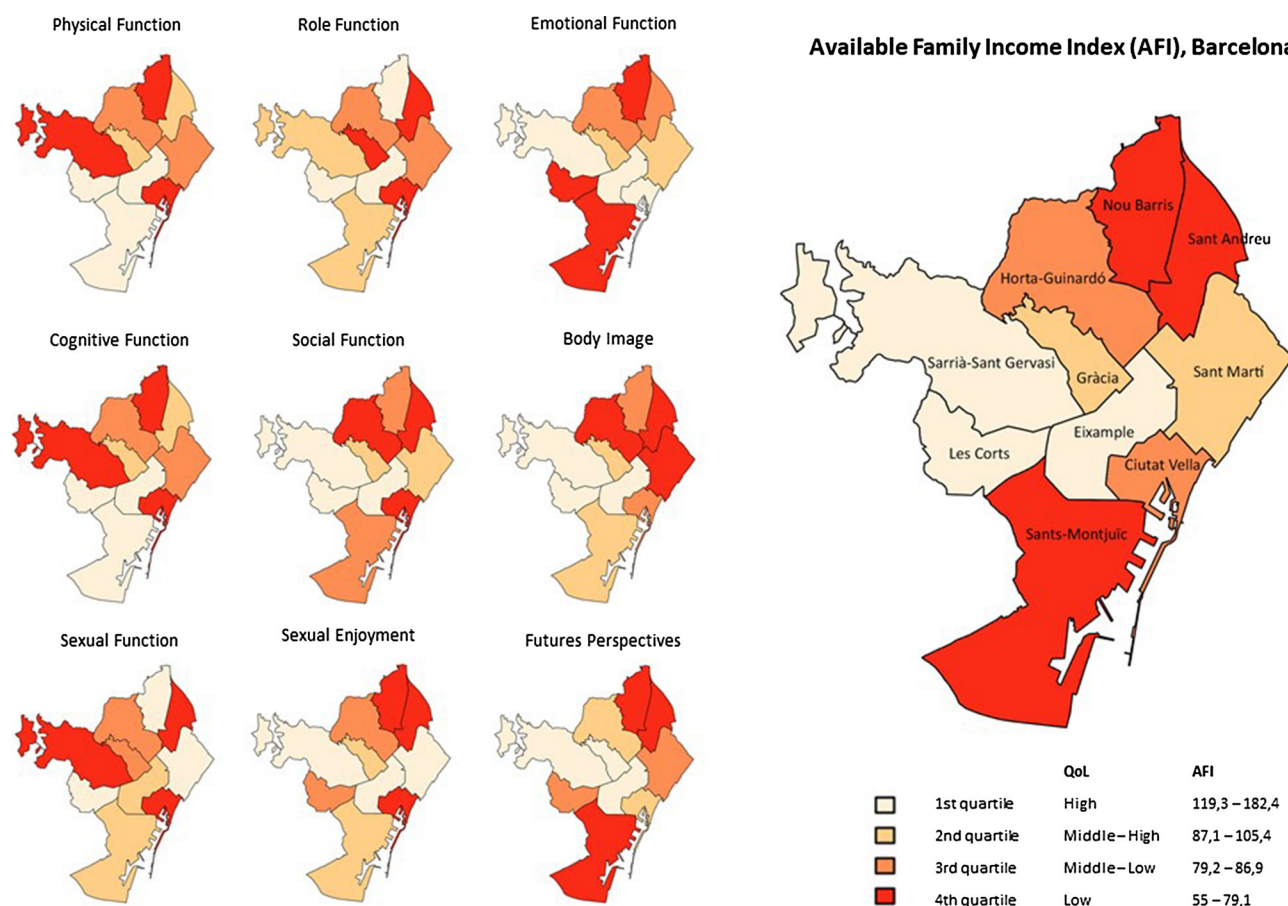


Fig. 1. Territorial distribution according to districts of the city of Barcelona of the proportion of women with below-average scores in each of the QoL functions studied using the QLQ-C30 and QLQ-BR23 questionnaires.

analysis that needed to be carried out.

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Conflicts of interest

The authors have no conflicts of interest to declare

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