Women's choices for breast cancer surgery in Italy: quality and equity implications

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Research article

Keywords: Breast cancer, patient choice, socioeconomic conditions, quality of care, mixed logit

Posted Date: July 3rd, 2019

DOI: <https://doi.org/10.21203/rs.2.10975/v1>

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Abstract

Background Equity and quality in healthcare are key goals embraced by universal healthcare systems; however, inequalities in access and unwarranted variations in quality of care are well documented in the Italian healthcare system. To reduce unwarranted variation and improve equal utilization of services at hospital level, national quality standards have been applied for selected clinical procedures including oncological surgery for which there is evidence of a positive relationship between volumes and clinical outcomes. However, high dispersion of surgical interventions across hospitals still exists highlighting the need to understand the determinants behind women's choice for hospital for breast surgery. Methods We apply mixed logit regression to investigate the determinants, both at patient and provider level, associated with women's choice of hospital for breast surgery. Patient level non-emergency hospital data are used to model breast cancer surgical choices in Tuscany region, Italy. We considered hospitalizations occurring during 2016. We focused on the effects of travel time and hospital performance for breast cancer treatments (elective surgery) in different patient groups. Hospital quality indicators include structural variables (volumes), measurement of process (timeliness) and quality of surgical procedures as recommended by clinical guidelines (proportion of breast-conservative surgery and execution of the sentinel lymph node biopsy). Results Results reveal that women prefer hospitals nearby, delivering high volumes of interventions with an appropriate surgical approach. Differences in women choice depend on education and age. Highly educated patients travelled further to seek surgical intervention for breast cancer and were likely to select high performing hospitals. Moreover, older women preferred quicker response compared to younger women when awaiting surgical interventions. Conclusions Differences in patient choice highlight equity concerns in access to elective breast cancer surgery. These results could be used to optimize the allocation of resources toward breast cancer units that meet quality and efficacy standards to increase the efficiency and responsiveness of breast cancer care.

Introduction

Equity and quality in healthcare are key goals embraced by universal healthcare systems (1); however, inequalities in access and unwarranted variations in quality of care are well documented in the Italian healthcare system (2–8).

To reduce unwarranted variation and improve equal utilization of services at hospital level, national quality standards have been applied for selected clinical procedures (i.e. deliveries, oncological surgery, vascular surgery, etc.) for which there is evidence of inverse positive relationship between volumes and clinical outcomes. The interpretation of these findings has typically been that the better survival of patients of high volume providers can be attributable to the greater experience and better hospital based services, ensuring also cost-effective working (9).

With relation to breast cancer, a number of studies (10,11), including a meta-analysis have demonstrated better survival (after adjusting for age and tumour grade, stage and adjuvant treatment) among breast cancer patients treated by high volume providers (12). The European Society of Breast Cancer Specialists

(EUSOMA) recommends a minimum caseload of 150 newly diagnosed cases of primary breast cancer each year (13). In light of such evidence, the Italian National Health Service, a regionally based system which provides universal coverage largely free of charge at the point of delivery, indicates a minimum volume standards of 150 incidence breast cancer surgery per year for the identification of Breast Centres (Decree Law 70/2015). In addition, following international clinical guidelines (13,14) evidence-based qualitative and quantitative requirements have been set out for the identification of breast cancer centres, including multidisciplinary team approach with clinical coordinator, dedicated radiologist, dedicated breast surgeon performing ≥ 50 surgeries per year, breast dedicated pathologist, medical oncologist and radiotherapist. These normative assumptions aim at guaranteeing to all women with breast cancer the right to be treated in a network of certified and interdisciplinary breast centres that meet quality and efficacy standards. Reconfiguration of cancer care provision with centralization of cancer care in high volume centres is therefore expected to improve outcomes for many patients.

Nonetheless, although universality should be guaranteed, high dispersion of breast cancer surgical interventions still persists across Italian hospitals (less than 70% of providers from 12 Regions evaluated by the Inter-Regional Performance Evaluation System are above the threshold of 150 incident breast cancer surgery per year – <http://performance.sssup.it/netval>). These variations are also reported at international level both in the United States (15) and Europe (12).

In light of such evidence there is the need to understand the determinants behind women's choice of hospital for malignant breast cancer surgery, including socioeconomic status (SES), distance and provider performance. In other words, we are interested in assessing plausible alternatives for patient selection at high (low) volume hospitals for breast cancer care.

Evidence reports that hospital choice can be based on an heterogeneous set of information, which include the quality of services, standard of facilities and technologies, reputation and image of the provider, attitudes and behaviour of personnel, prior experience and recommendations (Bevan & Evans; Nuti, 2018; Berkowitz & Flexner, 1981; Boscarino & Stebier, 1982; Lane & Lindquist, 1994; Wolinsky & Kurz, 1984). Other dimensions affecting patient-service interaction with health care services include acceptability, affordability (costs), availability, accessibility in terms of both physical accessibility (proximity) and adequacy of service supply in relation to population (20). Previous studies have also shown that certain socioeconomic factors are strong predictors of access and use of health services (21) with impacts on quality of care (22) and outcomes (23).

This study aims to add novel evidence on the determinants of breast-cancer patient choice regarding hospital services, focusing on the trade-offs and relationships between distance and hospital quality for breast cancer treatments (elective surgery) in different patient groups. Quality indicators include structural variables which represent necessary conditions for the delivery of a given quality of health care but are not sufficient (i.e., volume of treated patients), measurement of process of the delivery of care (i.e., timeliness to surgery after clinical evaluation) and proxy indicators of the quality of surgery (i.e., execution of the sentinel lymph node biopsy (SLNB) which during the surgery adds elements for tumour

staging and for the planning of post-surgical treatments and percentage of breast-conserving surgery (BCS)). In the model choice we are interested in analysing how age, co-morbidity and education level affects the access to high (low) performing providers in Tuscany region (Italy).

Methods

Data Sources and study population

The study focuses on Tuscany, a large region in central Italy (over 3.7 million inhabitants or about 6.2% of the Italian population) characterized by a non-competitive health system where patients are free to choose any provider. The regional healthcare system comprises three local health authorities (LHAs) with 38 district general hospitals directly managed by the LHAs, four teaching hospitals and 34 health districts, which are in charge of the organization and delivery of services for local health networks, social care and social integration. In Tuscany, mainly public providers deliver hospital care (in 2016 over 95% of all hospitalization were provided by public hospitals). Hospital care is reimbursed using DRG tariffs, although this method is generally complemented with other forms of payments (such as global budgets for specific care services e.g. emergency, hospital teaching activities, oncological care) and is not applied to hospitals run directly by LHAs.

The study is a retrospective analysis that uses individual anonymized non-emergency hospital admissions data of Tuscany from January 1 to December 31, 2016. Data were anonymized at the Regional Health Information System Office where each patient was assigned a unique identifier that was the same for all administrative databases. This identifier does not disclose the patient's identity or other sensitive data. The study was carried out in compliance with Italian privacy law, and approval by an Ethics Committee was not required.

The dataset includes information on patients' individual demographic characteristics (date of birth, place of residence, education level), hospital of admission, diagnosis and indication of surgical treatment (ICD-9-CM codes), date of inclusion in the operating list (conclusion of the diagnosis) and date of surgery.

We focused on breast cancer patients (both primary and secondary tumour) undergoing surgical treatment (mastectomy, reconstruction or conservative surgery) in all public hospitals in Tuscany. Both resident and non-resident populations are included; outward mobility it is estimated less than 7%, with about 5.5% inward mobility. We included women aged 18 and older hospitalized with a principal or secondary discharge diagnosis of malignant breast cancer. We use the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes 174 (malignant breast cancer), 233.0 (localized malignant breast cancer – *in situ*) and intervention codes 85.2x (conservative surgery), 85.33, 85.34, 85.35, 85.36 (reconstructive surgery), 85.4.x (mastectomy). 3,276 women were included in the study. For the analysis, we excluded public hospitals who registered fewer than 5 breast cancer surgery per year (4 hospitals for a total of 6 patients with breast cancer surgical treatment) and residents from the isle of Elba.

Hospital data were integrated into a Geographic Information System (GIS) environment, in order to visualize the geographical distribution of the healthcare providers ($n=22$) and population. We only model the choice between public providers and did not include the choice to go private or to go outside Tuscany.

Variables

To analyse the time patients travelled to health care services, we use the Euclidean/linear distance or travel time. For this study, the regional road network, available on the Open Toscana website (<http://open.toscana.it/>) was used to calculate the travel distances. Dasymeric mapping was used to identify the centroids of the patients. This gives the best estimates of the distribution of the aggregated population data within each unit of analysis by weighting the number of patients who live in the area over the real residential area (24–26). This estimation was calculated by interpolating areal data in order to extract only the residential urban land use areas from the regional land use data obtained from the available online dataset.

From the hospital administrative data, information on waiting time for surgical procedures was collected. Waiting times are defined by the number of days elapsing between the time the patient is included in the operating list (conclusion of the diagnosis) and the day the patient received the surgical intervention. Median waiting times for each hospital were calculated.

From the same administrative data source, hospital yearly volumes of breast cancer surgical procedures were calculated. A threshold of at least 135 new interventions per year was considered the appropriate value to discriminate between low and high annual volume of treated patients following national indication (National Health Outcomes Programme) and available clinical literature (Vrijens et al, 2012).

Finally, we measured two care process indicators - proxy of the quality of surgical intervention - using hospital discharge records following validated protocols. We considered: intraoperative assessment of the sentinel lymph nodes (SLNs) which during the surgery adds elements for tumour staging and for the planning of post-surgical treatments (Biganzoli et al, 2017) and breast-conserving surgery rate (BCS) over the total number of breast interventions that according to the EUSOMA measure and monitor the capacity of the breast units to ensure high-quality clinical outcomes (27,28). BCS indicator includes nipple-sparing, skin-sparing and skin-reducing mastectomies (29).

The analysis included interactions with patient level variables: age and education level. Education was categorized as “low education” (none or elementary and secondary education) and “high education” (high school, bachelor and post-graduate). Control variables were measured at date of surgery reflecting the patient’s circumstances at the time of the incident breast cancer surgery.

We analyse also comorbidity using Charlson Comorbidity Index (CCI) considering ICD9-CM diagnoses. 86.6% of women do not have any comorbidity ($CCI < 1$), no significant associations between CCI and education level neither between CCI and volumes of surgical interventions were found.

Statistical analysis

We applied mixed logit regression to investigate patients' choice of breast-cancer surgery provider (hospital). By merging the information on hospital performance characteristics and patient demographics, we modelled patient choice between alternative hospitals services as a mutually exclusive choice. To control for effect modification we stratified patients in two groups by age to display mixed logit model results: women < 65 years and >= 65 years.

We focused on the effect of travel time (expressed as the natural log of travel time to allow a nonlinear relationship between utility and travel time), hospital performance indicators (hospital yearly volume of breast cancer surgical interventions, median waiting time for surgery after clinical evaluation and quality of surgical procedures considering SNLB intraoperative and percentage of BCS). The analysis included interactions with patient age and education level.

All the statistical analyses were run using SAS version 9.4 (SAS Institute), the mixed logit regressions were run using user-written “mixlogit” STATA programme (30) and the geographical analyses were run using ArcMap version 10.3.1 (Esri).

Results

In 2016, 3,276 resident women in Tuscany underwent a breast surgery for a primary diagnosis of cancer. On average, patients were 62.5 years old (SD 13.9), with 57.1% of women at low education level (none or elementary and secondary education) and the remaining with a high school, bachelor or post-graduate degree.

22 public hospitals provided breast cancer surgery in Tuscany and the average number of treated patients per year was 160 (SD 186.5). On average, women waited 29.5 days (SD 10.8) to have the surgery - in line with the national and regional target (maximum) waits for the diagnosis and treatment of oncology-related diseases. The mean travel time to the chosen hospital was 18.2 minutes (SD 16.3).

To control for effect modification we stratified patients in two groups by age to display mixed logit model results: below 65 years and above or equal to 65 years. Two models were fitted for both the age groups (Table 1). The first model included only provider’ characteristics (Model 1); the second model was adjusted for patients’ education (Model 2). P value <=0.05 was considered significant.

Preliminary results reveal that in Model 1 breast cancer patients in both age groups preferred hospitals nearby, delivering high-volume of interventions (>=135 per year) and with appropriate surgical approach (p=0.000). Waiting times are not significant for older women (p=0.441), while younger patients are more prone to wait longer for their surgical intervention (p=0.000). A significant preference heterogeneity among women was found only for the distance travelled, the waiting time and SLNB.

Table 1. Mixed logit regression results.

After the inclusion of patient education (Model 2), volume of interventions was still a significant determinants in hospital choice: women from both age groups were likely to discard hospital delivering low-volume of interventions (<135 per year) ($p=0.000$). Also, distance remains a significant predictor in hospital choice ($p=0.000$): both age groups preferred hospitals nearby with older women showing a higher coefficient compared to younger women.

For women aged ≥ 65 years, the percentage of BSC was no longer associated with the hospital choice and waiting times remained not significant in determining provider selection.

When considering the effect of education, low-educated women were less prone to travel further to receive the surgical treatment for both age groups. In general, the higher the level of education the higher the likelihood to select high-volume hospitals. Waiting times are a significant determinant of hospital choice for patients below 65 years, where more educated women are more prone to wait longer for the surgical intervention compared to their low-educated counterpart. The coefficient is significant ($p=0.005$) but very small (-0.021).

When considering the effect of education, both hospital quality indicators become not significant in hospital selection for younger women whereas older women at increasing level of education seem to select to hospitals showing lower rate of conservative breast surgery but with routine practice of SLNB.

Table 2 shows the estimates of the effect of a change in travel time, waiting time, volume and process indicator on quality of care on hospital choice in the form of the elasticity of demand. Elasticities are calculated at the individual level and results are summarized with average elasticities. We followed the probability weighted elasticity model as proposed by Sivey (31). The number of surgical intervention performed by each hospital are the associated weights.

Table 2. Average elasticities of demand for travel distance, waiting time, volume and quality of care.

The elasticities can be interpreted as the percentage change in demand associated with a 1% change in travel time, waiting time, volume, % of breast-conserving surgery and sentinel lymph node biopsy. Mean elasticities can be interpreted as the value of probability weighted elasticity averaged across all public hospitals. Probability of selecting a specific hospital increase with an increase in waiting times, volume and both process quality indicators. As expected distance have a negative elasticity with respect to hospital choice: an increase of 10% in travel distance for women aged 65 or older predicts that choice of that hospital will fall by 14.03% while a decrease of 13.21% will occur when we consider younger women.

The results hold constant for both age groups and when education level is included as interaction term.

Discussion

We explored the association between patient and hospital characteristics and the choice of provider for breast cancer surgery. Evidence reports that high-volume hospitals suggest a better application of recommended processes of care, justifying the centralization of breast cancer care in such hospitals (9).

From our data, the probability of being treated at a reference hospital with a breast unit and a workload ≥ 135 cases per year decreased with increasing age and distance between residence and these hospitals. Moreover, a reduced likelihood of admission to high-volume hospitals is observed in women with low education compared to those with higher levels of education.

This evidence confirms a previous study on appropriateness of early breast cancer management in relation to patient and hospital characteristics in Northern Italy (32). Differences in the treatment of breast cancer are not only driven by patient characteristics (increasing age and education) but also provider's characteristics such as being treated by hospitals with a low level of specialization, living in distant places from breast cancer centre, having to wait longer for surgery, or poor quality of treatment process. This demonstrates the increasing need to assess the processes of care at the facility level which may be contributing to hospital choice.

Our results are in agreement with the prior literature on hospital choice. Patients usually select the nearest service (i.e. proximity to where they live), or the fastest service available (i.e. the provider with the lowest waiting time), or the best treatment that they think the health system can provide. It is expected that patients and their caregivers, need to make a trade-off between these dimensions.

Much of the prior literature finds that proximity plays a central role in selection of hospital for elective care (17,18,33,34), while quality of care and waiting times information for hospital treatment are more difficult to be ascertained by patients. Although hospitals with poorer than expected outcomes attracted significantly fewer admissions (35) there is limited evidence about the effectiveness of quality information on patient choice (36). As reported by the UK National Health System, most patients (even when involved in provider's choice) tend to rely on informal information sources, such as the opinion of their general practitioner, family, and friends or their own experience rather than detailed data on quality and performance (37). Moreover, the interpretation of provider quality and performance information is not always straightforward or cannot be considered outcome measurements per se. For example, for specific elective surgical procedures waiting times can be subject to an output distortion effects when short waiting times can have a positive effect on patient satisfactions and on some aspects of quality of care (e.g., in-hospital mortality) but they could result in deterioration of other quality indicators such as re-admission (38). In health systems with no (low) patient cost-sharing and constraints on capacity, longer waiting times for elective treatments - as long as not negatively affect the patient's prognosis - can be perceived as a proxy of higher quality of care where higher caseload can be perceived as mean of attractiveness and reputation of provider (39).

An equitable health care system should offer the same probability of access to all women needing breast cancer surgery. However, access and use of health services may be different among people with different socio-demographic backgrounds. Previous studies have shown that certain socioeconomic factors such as income, ethnicity, resident location and distance from hospital are strong predictors of quality of care (22) and outcome (23). Our findings suggest that patient age and education level have a significant effect in the choice of hospital providers by breast cancer patients in Tuscany. Older and lower educated

women appear to receive low quality care for surgical breast cancer treatments. Differences by age are well documented in the literature, with older women less frequently receiving a high standard of care and possibly being exposed to worse outcomes (40). Education is also reported as a factor associated with quality of treatment, where less educated women are more likely to be treated at hospital with lower levels of specialization and, indirectly, are more likely to receive suboptimal care (32).

Implications

The results suggest that improving the performance of women with a low education can contribute to reduce the gap between patients with low and high education and quality of care, by following national and international standards and ensuring the delivery of timely and appropriate breast cancer care to patients with low education.

Identifying groups of people who do not benefit equally from our health system and identifying the root causes of these differences provide important evidence on how to reduce health disparities (41). In this light, the socioeconomic disaggregation of statistical data (vertical equity) highlights the existence of inequalities in access to high performing hospitals in Tuscany. These findings could be used to optimize the allocation of resources toward regional integrated Breast Centres that meet quality and efficacy standards to increase the efficiency and responsiveness of breast cancer care towards low educated and older women. Among the requirements of a specialist Breast Centre we recall a sufficient number of cases to allow effective working and continuing expertise, dedicated specialists working with a multidisciplinary approach, providing all services throughout the patients pathway, and data collection and performance evaluation (13). Indeed, efficacy and compliance have to be constantly monitored to evaluate the quality of patient care and to allow appropriate corrective actions leading to improvements in patient care. Following the EUSOMA international guidelines it is essential that Breast Centres also guarantees the continuity of care for patients with advanced disease, offering treatments according to multidisciplinary competencies and a high quality palliative care service (13).

From a policy point of view, equity goals should be included in the management strategies aimed at achieving quality through evidence-based interventions. Policies promoting concentration of care would be expected to produce a greater number of high-volume facilities. Further research to determine which care processes most account for the better outcome of the high-volume hospitals should be develop to improve outcomes in lower volume facilities. Performance evaluation systems should rely on public reporting of benchmarked performance encouraging competition towards high performing levels driven by professional reputation (42)

In addition, considering the inequality of access, policies that improve the traditional distance-decay model should be supported, for example by providing subsidies for improved provision of patient and caregiver transport and accommodation.

Limitations

The findings present various limitations due to data availability which could improve the model and explanation of patient choice. The study could benefit from improved information on additional clinical and patient characteristics, such as patient knowledge of alternative providers, job, income, migrant status, family circumstances (e.g., cohabitation status), and social networks. Overall, the model only ascertained where patients had been treated and not whether they made an active choice (33).

Furthermore, we were not able to determine to what extent primary care physicians or other specialists such as radiologist influenced these choices or whether prior hospitalization or a recommendation by family or friends influenced the decision. For a meaningful understanding of patient choice, future study should direct the attention toward the patient, embracing the value creation paradigm whereby performance systems for coordinated care should aim to include the systematic assessment of the patient experience, the level of participation in shared decision-making between patients and providers (43) by also taking into account differences in socioeconomic status.

Finally, quality indicators intended to monitor the capacity of the Breast Centers might still suffer from variability in coding practices in the hospital discharge records databases (see Murante et al. BSC coding practice variability across hospitals in Tuscany (29)), thus limiting their validity and interpretation. Despite these qualifiers and future improvements, one strength of this study is that administrative datasets were used at the individual level to highlight access issues that warrant further investigation. The study also offers a regional perspective on the geographical access to elective surgical care where evidence-based clinical and appropriateness standards should apply.

CONCLUSION

Applying minimum requirements and quality indicators is essential to improve organisational performance, outcomes and equity in breast cancer care. Understanding how women behave in the selection of hospital for breast cancer surgery can help managers and policy makers identify strategies to reduce patients' unmet needs (44) and equity gaps. These findings highlight the importance of using administrative data to provide valuable information for monitoring and assessing the quality of care at population level, to efficiently gather data on individual patterns of care, and also to shed light on inequalities in access to appropriate medical care. To a lesser extent detailed hospital performance information support patients' choices (37); proximity, hospital volume and sociodemographic conditions appear to be core determinates in hospital choice for breast cancer surgery in Tuscany. The variability in the results presented in this study and obtained by a universal regionally-based health care system raises the question of the efficacy of the Beveridge system in reducing inequalities. As mentioned, this variability in cancer care also exists at the international level both in the United States (15) and around Europe (12). The conclusion is therefore that the choice of a Beveridge-like healthcare system is important but in itself does not guarantee equity of access for citizens. What is key in every healthcare system is the capacity to monitor and manage variability by means of performance assessment, which help both policy makers

and professionals to accurately focus their actions in order to improve equity and reduce unwarranted variation (45,46).

List Of Abbreviations

BCS breast-conserving surgery

CCI Charlson Comorbidity Index

EUSOMA European Society of Breast Cancer Specialists

GIS Geographic Information System

LHA local health authority

SD standard deviation

SES socioeconomic status

SLNB sentinel lymph node biopsy

Declarations

Ethics approval and consent to participate: Anonymized individual-level administrative were used. Data were anonymized at the Regional Health Information System Office of the Tuscany Region where each patient was assigned a unique identifier, which does not disclose the patient's identity and was the same for all administrative databases. The study was performed in full compliance with Italian laws and approval by an Ethics Committee was unnecessary.

Consent for publication: Not applicable.

Availability of data and material: Third-party data were used to generate the results reported in this paper, specifically the authors used administrative individual-level data of Tuscany region (Italy) which are not publicly available. The authors have access privileges to individual healthcare data of the region under an agreement ^aDelibera 229 of 22.03.2016 signed between Scuola Superiore Sant'Anna of Pisa and the regional administration – Direzione Diritti di Cittadinanza e Coesione Sociale – of Tuscany (Italy) for supporting the regional bodies in the performance evaluation of the healthcare system. The data that is accessible to interested researchers is aggregate. Additional information can be requested to the author Chiara Seghieri chiara.seghieri@santannapisa.it and to the Laboratorio Management e Sanità (Institute of Management) direzionemes@santannapisa.it or to the Data Protection Officer of the Scuola Superiore Sant'Anna of Pisa dpo@santannapisa.it. Further information are available at www.regione.toscana.it/sst/organizzazione/assessorato-e-direzione-generale.

Competing interests: The authors declare they have no competing interests to declare.

Funding: The authors received no specific funding for this work.

Authors' contributions: Francesca Ferrè: conceptualization, writing original draft, review & editing; Chiara Seghieri: methodology, data curation, formal analysis, review & editing; Sabina Nuti: conceptualization, review & editing

Acknowledgments: This study was supported by the regional administration - Direzione Diritti di Cittadinanza e Coesione Sociale – of Tuscany (Italy). The authors acknowledge all researchers from Laboratorio Management e Sanità, Institute of Management, Scuola Superiore Sant'Anna - Pisa, for their constant support and useful comments.

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Tables

Table 1. Mixed logit regression results.

Variable	Model 1 (≥ 65)			Model 1 (< 65)		
	Coeff.	SE	Sign.	Coeff.	SE	Sign.
Waiting time	0.003	0.004	ns	0.031	0.003	***
Ln (Travel time)	-4.062	0.163	***	-3.198	0.110	***
Volume	1.882	0.124	***	2.058	0.107	***
% BSC	0.049	0.008	***	0.074	0.006	***
% SLNB	0.051	0.009	***	0.063	0.010	***
<i>SD of coefficients</i>						
Ln (Travel time)	1.435	0.116	***	1.285	0.093	***
Waiting time	0.103	0.012	***	0.052	0.006	***
% SLNB	0.035	0.006	***	0.040	0.007	***
Observations	33,858			33,858		
Log-likelihood	-1649.854			-2261.946		

Significance levels:

*** $p \leq .001$

** $p \leq .01$

* $p \leq .05$

ns $> .05$

Variable	Model 2 (>=65)			Model 2 (<65)		
	Coeff.	SE	Sign	Coeff.	SE	Sign.
Waiting time	-0.000	0.008	ns	0.039	0.004	***
Ln (Travel time)	-3.578	0.271	***	-2.930	0.115	***
Volume	2.564	0.372	***	2.291	0.133	***
% BSC	0.261	0.056	***	0.071	0.008	***
% SLNB	-0.010	0.017	ns	0.065	0.012	***
<i>Interaction terms</i>						
Waiting time*Education (Ref. High)	0.005	0.010	ns	-0.021	0.007	***
Ln (Travel time) *Education (Ref. High)	-0.519	0.241	*	-0.609	0.132	***
Volume* Education (Ref. High)	-0.876	0.385	*	-0.548	0.183	***
% BSC* Education (Ref. High)	-0.204	0.058	***	0.006	0.013	ns
% SLNB* Education (Ref. High)	0.054	0.016	***	-0.005	0.013	ns
<i>SD of coefficients</i>						
Ln (Travel time)	1.595	0.129	***	1.228	0.091	***
Waiting time	0.029	0.012	**	0.048	0.007	***
% SLNB	0.032	0.011	***	0.041	0.008	***
Observations	33,858			33,858		
Log-likelihood	-1573.881			-2231.894		

Significance levels:

*** $p \leq .001$

** $p \leq .01$

* $p \leq .05$

ns $> .05$

Table 2. Average elasticities of demand for travel distance, waiting time, volume and quality of care.

	(>=65)		(<65)	
	Average elasticity of demand	SD	Average elasticity of demand	SD
Ln(Travel time) - model 1	-1.403	1.160	-1.321	0.956
Ln(Travel time) - model 2	-1.033	2.962	-1.173	0.935
Waiting time - model 1	0.192	0.443	0.543	0.637
Waiting time - model 2	0.1668	0.418	0.665	0.706
Volume - model 1	0.619	0.683	0.686	0.710
Volume - model 2	0.765	0.827	0.765	0.798
% BSC - model 1	1.795	1.468	2.910	2.065
% BSC - model 2	0.871	0.690	2.756	2.012
% SLNB - model 1	1.695	1.491	2.119	1.590
% SLNB - model 2	2.061	1.755	2.181	1.684