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Spatial Analysis Of Urban Pharmacies In Istanbul

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SPATIAL ANALYSIS OF URBAN PHARMACIES IN ISTANBUL

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Abstract

Although it is believed that pharmacies play an important role in providing information and advice on illnesses to lower income people, it is found that the distribution of urban pharmacists is not balanced with respect to population distribution in Istanbul. This situation can severely limit the accessibility of the poor to pharmacy services. In order to find out the factors which effect the spatial distribution of pharmacies in Istanbul, a multiple regression analysis is used. The number of pharmacies is taken as the dependent variable and hospital beds, population and physicians are taken as dependent variables. According to the results, the number of hospital beds is the most important factor, population is the second and the number of physicians is third factor to effect the location of pharmacies in Istanbul

1. Introduction

Istanbul is the largest city of Turkey with a population of 9.300.000 and the most important socio-economic and cultural center. Istanbul's tremendous growth after the 1950s can be attributed to both natural increase and the flood of rural migration which affected socio-economic and cultural conditions as well as the physical structure of the city.

Continuous expansion of the city, development of multi-center urban structure, decaying inner portions of the city, and changes in population density have affected the spatial distribution of needs and demand for public facilities (Dokmeci and Berkoz (1994)). Especially, the provision of health and educational facilities, has not been able to keep up with rapid development of the peripheral districts (Dokmeci, Dagoglu and Tanyolac (1994)). Although there are some studies about the spatial analysis of health facilities in Istanbul, as part of this system, pharmacies are neglected. Thus, this study is devoted to the spatial analysis of pharmacies in Istanbul.

Especially, in developing countries, pharmacies play an important role, in providing information and advice on health to lower income people. However, unbalanced distribution of pharmacies with respect to population distribution would severely limit the accessibility of the poor to pharmacy services. Such observed scarcities of services poor areas impose additional costs and inconveniences on individuals most in need of medical care and least able to cope with added complications in seeking it. When medical facilities are not available to the residents of low income neighborhoods, their dependence on marginal practitioners increases. This dependence has been cited in theories of illness behavior, and studies have shown a negative correlation between socioeconomic status and reliance on pharmacists for medical advice (Kaplan and Leinhardt (1975)).

According to the literature, the most important characteristic of community pharmacists is their accessibility. Easy access to a community pharmacy means that it is often the first point of contact for people in need of advice or information about medical care (Cunningham-Burley (1988)). Community pharmacies are available to the public during the day (even in Turkey during the night) with no appointments, no receptionists and no direct charges. They are readily available to provide advice on health care, and they offer a service that many general practitioners and consumers both value and use (Selya (1988); Shuval and Gilbert (1978); Dunphy et.al.(1983); Harding and Taylor (1990)).

Local demographic and socio-economic conditions may exert either positive or negative effects, depending on whether the aged or the poor disproportionately dependent on the

services of pharmacies or whether pharmacies avoid locating in these areas out of fear of social bias (Kaplan and Leinhardt (1975)). Hospitals are also lacking in the poor areas. Since pharmacies tend to locate near hospitals, this hospital bias may produce an additional and indirect shortage of pharmacies in poor areas. Other studies illustrate that both direct and indirect biases exist even after controlling for other factors likely to influence the distribution of hospitals and pharmacies.

Some of the previous studies illustrates that pharmacies seem to avoid areas which are predominantly poor. Hospitals also are lacking in the poor areas. Since pharmacies tend to locate near hospitals, this hospital bias may produce an additional and indirect shortage of pharmacies in poor areas. Selya (1988) found that pharmacies in Cincinnati tended to be more equally distributed than physicians were, relative to population. While physicians tended to be located close to hospitals, other physicians and target populations, pharmacies were spread more evenly. Hirschfield et.al.(1994) found that in the Mersey Region in England pharmacies tended to be concentrated in poorer areas and that increases and decreases in pharmacy numbers were strongly correlated with population changes. Waterson(1993) found a very high concentration of pharmacies in the central business district in Melbourne, Australia. Other studies illustrate that both direct and indirect biases exist even after controlling for other factors likely to influence the distribution of hospitals and pharmacies. A neighborhood pharmacy may also be visited while performing other routine shopping chores and may be coupled with the purchase of traditional patent medicine, medical equipment, and non-health related goods sold in pharmacies (e.g., eye glasses; perfumes and beauty products). In the U.S. although neighborhood pharmacies are decreasing in number, locations in shopping centers are increasing and it is in these locations that prescriptions account for the smallest portion of sales volumes (Slavin (1971)). Because of this apparent market orientation, local population size provides a reasonable indicator of the extent of local demand for pharmacy services.

Proximity to the central business district (CBD) and to the university medical center (UMC) has been consistently reported to attract more medical resources than would be expected given the extent of commercial activity in the CBD and the number of hospital beds in the UMC. The extensive transportation network servicing the CBD, its large

daytime working and shopping population, and its traditional prestigious quality as a commercial site have enabled the CBD to play a unique role in concentrating medical resources (Kaplan and Leinhardt(1973)). The UMC has also been found to attract an unusually large number of physician offices either because of a physician's association with the medical school or because of the multiple appointments.

The study by Kaplan and Leinhardt(1975) investigates the relationships between the number of pharmacies the number and the number of hospital beds in census tracts, number of beds of university medical center, to be in the CBD, to in different degree of commercial zone, income per capita of people, population in census tract and the number of physicians in the census tract. According to their results, pharmacies cluster about about physician offices. Pharmacies must be capturing the business of patients who are leaving a physician's office with prescriptions or other medical care needs to be filled. The CBD appears as the next most important determinant and this influence is exerted even after they have controlled for the effect of general commercial activity and proximity to physician offices both of which are in the CBD. There do not appear to be any important direct effects which can be attributed to social biases against low-income groups, nonwhite groups, or low-income, nonwhite groups. Pharmacies do not appear to locate near concentrations of the potentially "high risks" young and aged populations .

There are few studies about the spatial distribution of pharmacies in developing countries such as for Nijeria (Igun (1987)), South Africa (Gilbert(1998); Pharasi(1993)) and for India (Kamat (1998)) .A review of the literature illustrates that there are no studies on this subject in Turkey. Thus, this study is aimed to analyze the spatial distribution of pharmacies in Istanbul. Background information is given in section 2. A regression analysis is used in order to analyze the spatial distribution of pharmacies in section 3. The number of pharmacies are taken as the dependent variable, and the population, the number of hospital beds and the number of physicians are taken into consideration as independent variables. The final section is devoted to a conclusion and suggestions for further research.

2. Background

The number and location of pharmacies used to be determined by the State before 1953 in Turkey. Pharmacy licensing was commonly used to provide benefits for pharmacists and to provide equal accessibility to people especially in sparsely populated areas. From 1954 pharmacy distribution was determined by the decisions of individual pharmacies in response to demand for the dispensing of medicines and retail goods. For the last 47 years pharmacists have been able to open pharmacies wherever they think the market can support them. Elimination of licensing system stimulated the growth of pharmacies in Istanbul.

The increase in the number of pharmacies and pharmacists is investigated between 1985 and 1997 in Turkey and in Istanbul. During this period, the number of pharmacies increased from 9755 to 16677 and the number of pharmacists from 12202 to 20443 in Turkey. The growth rate of pharmacies (70%) was greater than the growth rate of pharmacists (67%) and population increase (24%) and the growth rate of hospital beds (42%). Thus, density of pharmacies to population increased from 5195 to 3769.

Meanwhile in Istanbul, the number of pharmacies increased from 2133 to 3688 and the pharmacists from 2508 to 4417 and the population from 5842985 to 9198809. During this period, the growth rate of pharmacies (72%) was lower than the growth rate of pharmacists (76%) and higher than the growth rate of population (57%). There is relatively higher density of pharmacies to population in Istanbul than Turkey. The pharmacy density increased from 2739 to 2494 in Istanbul. Thus, the recent density of pharmacy in Istanbul (2494) is higher than that of Turkey (3769). We can compare this figure with 1515 in the UK(1990), 2380 in the Sweden (1992), 1500 in US (1993) 2227 in Germany (1992) and 14285 in Egypt (1991) (WHO (1993)). It is also possible to investigate the distribution of pharmacies by the use of physician/pharmacy ratio. There were roughly 5.45 physicians per pharmacy in Melbourne whereas in Canada in 1983 (Maule (1984)) there were 7.90 physicians per pharmacy (Waterson (1993)). In Istanbul, this density increased from 3.53 to 2.80 between 1985 to 1997. Thus, the pharmacy density in Istanbul is good with respect to developing countries and even with respect to developed countries. However, the typical

Istanbul pharmacy is a fairly small shop, and one may think that pharmacy numbers are likely to be excessive. However, tastes, population densities and the range of activities differ between countries, making cross-country comparisons problematic.

Local demographic and socioeconomic conditions may exert either positive or negative effects, depending on whether the aged or the poor disproportionately depend on the services of pharmacies or whether pharmacies avoid locating in these areas out of fear of social bias. Also, pharmacies may not be located in low-income areas if proprietors are influenced by the lower discretionary income of the poor (Kaplan and Leinhardt(1975)).

The spatial distribution of pharmacies is analyzed according to concentric rings in Istanbul. The core area is taken up to 3 km. from the center, which corresponds to the old CBD; the first ring is from 3 km. to 12 km. which covers the area occupied by the city in the 1950s; the second ring is taken as the peripheral area beyond the first ring (Figure 1).

The spatial distribution of pharmacies and their growth rates differ in different sections of the city. Between 1985-1997, the number of pharmacies increased 5% in the core, despite the fact that the population of the core decreased 12%. While the number of pharmacies increased 51% in the first ring and 83% in the second ring, the population increase was 16% and 98% in these rings, respectively. As a result, the pharmacy densities increased from 2900 to 2435 in the core, from 3285 to 2534 in the first ring and from 4902 to 2038 in the second ring. Thus, pharmacy densities are increasing in each concentric zone in Istanbul.

If we look at the spatial distribution of pharmacy densities according to the districts, the discrepancies become even wider. While an old district from the core (Eminonu) has the highest pharmacy density (1165) due to its CBD characteristics, an old and poor district from the first ring (Eyup) has the lowest density (14942), an old district from the first ring (Fatih) with large hospital complexes has 1395 and a rich district from the first ring (Kadikoy) has one of the highest 1895 densities. Some of the peripheral districts such as Kartal has low densities 12072 and also some of the summer resorts such as B.Cekmece

has low densities (12503). In most of the districts, the number of pharmacies is increasing which results in density increase. Thus, most of the pharmacies are concentrated in districts with high number of hospital beds.

The number of pharmacies cannot be increased unlimited way. There are sources of economies of scale which means that a pharmacy has to have a certain size of market in order to survive. In practice, and in theory, there is a trade-off between the benefits to consumers of being near to pharmacies, and costs due to the limited advantage which is taken of scale economies. New pharmacies can enter the trade, and will in theory do so until zero economic profits are earned. Although there is a general increase in the number of pharmacies in Istanbul, there are also some bankruptcies. In order to provide background to develop efficient policies to control the number of pharmacies, it is necessary to investigate the relationships between the characteristics of the districts and the number of pharmacies. For this purpose, a multiple regression analysis is used in the following section.

3. Model

In this study, the relationships between the number of pharmacies and the characteristics of the districts such as population, the number of physicians, and the number of hospital beds are investigated in Istanbul. It is well known that the pure market mechanism can give rise to a density which may not be socially optimal. Thus, in order to develop more efficient policies, there is need to study the forces which are attracting the pharmacies to certain districts at the expense of others.

The number of pharmacies, population, the number of doctors and the number of hospital beds are given for each district in table 1 for the years 1985, and 1997.

The model is taken into consideration in the following way:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3$$

Where

Y_i = number of pharmacies in the district

X_1 : number of hospital beds in the district

X2 : number of population in the district

X3 : number of physicians in the district

According to the regression results, the number of hospital beds is the most important factor, population is the second important and the number of physicians is the third important factor which effect the number of pharmacies in the districts of Istanbul.

$$Y_i = - 30.878 + 0.0050256 X_1 + 0.000442X_2 - 0.00459 X_3$$

3. Conclusion

In this study the spatial distribution of pharmacies is investigated in Istanbul. The health system in Istanbul is characterized by gross disparity between the different districts due to their rapid development. As part of the health system, these differences also reflect mal distribution of pharmacies as demonstrated in this paper.

The number of pharmacies is increasing in Turkey and as well as in Istanbul. A wide range of retail goods stocked in pharmacies, and the ability to employ non-pharmacist staff, allow greater numbers of pharmacies in Istanbul.

A multiple regression is used to show the relationships between the characteristics of the districts and the number of pharmacies. Our analysis indicate that pharmacies respond to general market conditions by dispersing over an urban area to promote accessibility by potential clientele. There do not appear to be any important direct effects which can be attributed to social biases against low-income groups. In general, these groups do not suffer any comparative geographical disadvantage relative to accessibility of pharmacies when compared with the accessibility of other segments of the urban population. Pharmacies do not appear to locate near concentrations of the potentially 'high risk' young and aged populations.

The results we have obtained shows that the spatial location of urban pharmacies, like the spatial distribution the physicians, responds to similar factors. The number of hospital beds is the most important factor to attract urban pharmacies. The population appears as next

most important determinant. The number of physicians is the third factor. High income districts have more pharmacies than low income districts. This finding is within

The study of Elesh and Scholaert (1972) who found that pharmacies were scarce in low income areas.

Further research is suggested to do investigation about locational factors of pharmacies by interviewing pharmacists.

The role of pharmacies in the medical delivery system is peripheral but important. Further research is suggested in order to determine the optimum number of pharmacies by taking into consideration the characteristics of the districts.

Variables of Model

Districts	Population	No. of Pharmacies	No. of Beds	No. of Doctors
Beyoğlu	231826	125	897	541
Eminönü	65246	92	342	95
Bayrampaşa	240427	92	256	121
Beşiktaş	202783	175	173	77
Eyüp	254028	17	345	68
Fatih	432590	385	8038	3326
Kadıköy	699379	571	2657	503
Kağıthane	317238	70	285	95
Şişli	257049	207	2655	975
Üsküdar	472124	246	2196	1447
Zeytinburnu	228786	75	1120	257
Adalar	16171	12	549	94
Avcılar	214621	106	167	46
Bakırköy	222336	147	2908	835
Bahçelievler	442877	224	891	266
Beykoz	193067	36	581	138
B.çekmece	287569	83	92	34
K.çekmece	460388	120	310	85
Esenler	344428	136	115	31
GOP	649648	199	346	128
Güngören	273915	72	153	36
Kartal	362175	123	1398	623
Maltepe	335539	60	1718	189
Pendik	339759	156	189	74
Sarıyer	229600	74	382	145
Silivri	98873	38	158	47

Şile	27385	4	25	23
Bağcılar	163916	43	139	43

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	DOCTOR, POPULATI, BED	,	Enter

a All requested variables entered.

b Dependent Variable: PHARMACH

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,856	,734	,700	65,5224

a Predictors: (Constant), DOCTOR, POPULATI, BED

b Dependent Variable: PHARMACH

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	283705,138	3	94568,379	22,028	,000
	Residual	103036,576	24	4293,191		
	Total	386741,714	27			

a Predictors: (Constant), DOCTOR, POPULATI, BED

b Dependent Variable: PHARMACH

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-30,878	25,669		-1,203	,241
	POPULATION	4,422E-04	,000	,598	5,325	,000
	BED	5,025E-02	,027	,681	1,883	,072
	DOCTOR	-4,594E-02	,064	-,258	-,723	,477

a Dependent Variable: PHARMACH

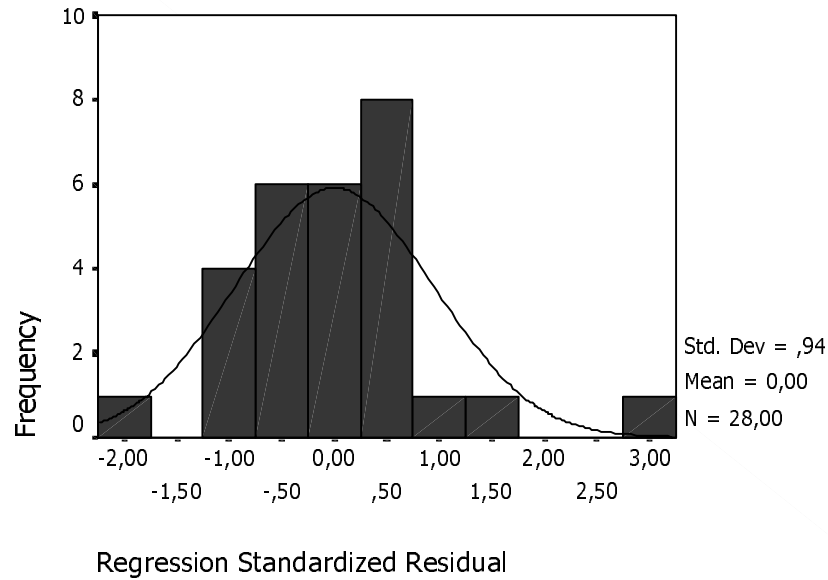
Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-18,5680	411,5645	131,7143	102,5066	28
Residual	-135,1623	182,1711	-1,5226E-14	61,7752	28
Std. Predicted Value	-1,466	2,730	,000	1,000	28
Std. Residual	-2,063	2,780	,000	,943	28

a Dependent Variable: PHARMACH

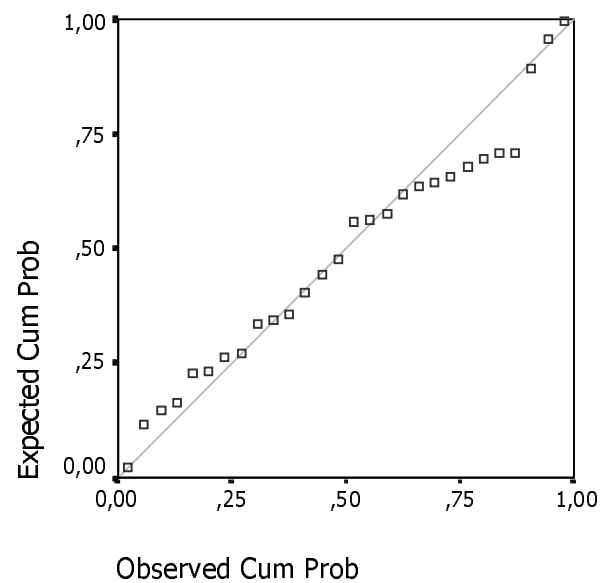
Histogram

Dependent Variable: PHARMACH



Normal P-P Plot of Regression Standa

Dependent Variable: PHARMACH



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