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THE NEIGHBORHOOD DYNAMICS OF HOSPITALS AS LARGE LANDOWNERS

Raphael W. Bostic, LaVonna B. Lewis, and David C. Sloane

The Hospital as an Institution

An enormous engine that consumes over 14 percent of the U.S. gross domestic product (GDP), the health care industry ranges from pharmaceutical and biotechnological companies on the cutting edge of research to family physicians in offices scattered throughout our communities.* A recent study showed that the health care industry, in addition to its obvious importance to individual and public health, is crucial to metropolitan economies (DeVol et al. 2003). This study places Boston, New York, Philadelphia, Chicago, and Los Angeles as metropolitan leaders in the health care economy because of the range and depth of their activities.

The hospital plays a central and multifaceted role in the health care economy. First, hospitals are large employers. For instance, Cedars-Sinai Medical Center in Los Angeles “is the anchor [for] office[s] and [medical] clinics [that have] 8,600 on staff” (DeVol et al. 2003). Hospital employment is only the tip of the iceberg: medical centers such as Cedars-Sinai are often surrounded by other businesses related to the hospital’s mission. Hospitals thus can be important for a community’s economic performance, development, and stability.

Second, hospitals often serve as a focal point for ancillary health

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Figure 3.1 Example of surrounding medical uses, Westwood Surgery Center. Photograph by David C. Sloane

care businesses, including physicians and other practitioners; medical specialists; and supportive services such as physical therapy, testing labs, and medical supply companies (Freeman, Sidhu and Montoya 2006). These complementary activities are essential if a hospital is to have maximal effectiveness, and proximity can further enhance its efficacy. Thus, the demands of these ancillary businesses for space and buildings can potentially affect local land markets in important ways. Driving around virtually any urban hospital, one will find a constellation of other health care services (see figure 3.1). Some will be in commercial rental space, others in buildings that the hospital constructs to improve the efficiency of care for its patients and to provide complementary space for its affiliated health care providers.

Third, because of their role as an important provider of health care services, hospitals are a neighborhood amenity. As with all amenities, the additional benefits of hospitals are capitalized into the value of land near the hospital. Hospitals therefore influence land values in the neighborhoods in which they are located and can differentiate some neighborhoods and communities from others.

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Hospitals in a Neighborhood Context

Finally, and importantly, hospitals are significant institutions for their surrounding neighborhoods because of their role as large landowners. Modern urban hospitals no longer occupy as much land as they did in the late nineteenth century, when concerns about cross-infection mandated pavilion-styled hospitals that could spread over dozens of acres. Advances in health care technology have allowed hospitals to deliver quality services with a smaller amount of land than they once required. Hospitals instead have become centers for a wide range of medical services, including ambulatory care, imaging and diagnosis, and traditional inpatient services. The result has been that hospitals often spread out, appropriating land around them for both current uses and future expansion. Some hospitals, such as Dartmouth-Hitchcock Medical Center, which is located on a 225-acre site in Lebanon, New Hampshire, have created large landholdings for future development. Urban hospitals rarely have such a luxury, but they are constantly expanding incrementally into surrounding neighborhoods (see figure 3.2). In either instance, hospitals span a considerable area and are generally among the largest landowners in their communities.

Despite their obvious salience in terms of the size of their landholdings, hospitals have been understudied from a geographic and land use perspective. For example, DeVol and others (2003) note that “remarkably little quantification of the economic geography of health in the United States” has been reported in the scholarly literature. Health care scholars have traditionally focused on individual economies of health, particularly related to insurance, and the internal distribution of health care expenditures among the various activities of the industry. Notably, the expanded use of prescription drugs and the rise in drug prices have led to a deep literature on prescription drugs. Geography and space have been minor issues in this literature. Similarly, urban and real estate economists, who are more naturally disposed to consider space, have tended to focus on sectors, such as residential and retail, rather than on industries, such as health, whose land use cuts across those sectors.

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Recently, that gap in the literature has slowly begun to fill as a growing body of work looks at the economic impacts of hospitals in California, with particular attention paid to Los Angeles County. The primary reason for this focus is that hospitals in California are un-

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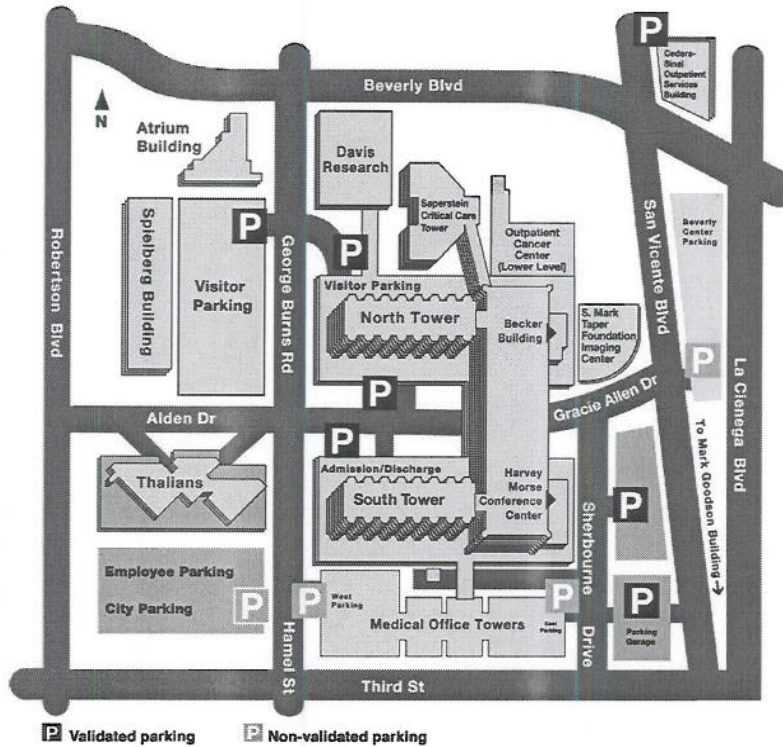


Figure 3.2 Cedars-Sinai campus map. © 2008 Cedars-Sinai Medical Centers. All rights reserved. Reprinted with permission.

der stress for a variety of reasons: limited (often negative) net operating margins, low reimbursement rates for government programs, unfunded mandates such as seismic retrofitting and nurse staffing ratios, uninsured and underinsured patients, and the continuing demand for services. Elected officials, health foundations, and representatives of the hospital industry have all been interested in examining how hospitals have handled these various stressors and the consequences when hospitals are unable to handle them.

These studies have varied in their focus. One area of study has been the impact of hospital closures (Scheffler et al. 2001). In this study, the authors note that from 1995 to 2000, urban Southern California hospitals located in close proximity to other hospitals were most frequently the ones that closed. The authors also report an acceleration in clo-

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tures: more than twice as many occurred in the second half of the period studied as in the first. Finally, the authors note that hospitals with fewer than 100 licensed beds closed more often than any other type of hospital. A second study provides evidence that the closure of hospitals in Los Angeles County has reduced access and increased mortality for individuals residing in surrounding zip codes (Buchmeuller, Jacobson, and Wold 2004).

A second area of study is the impact of emergency department closures and diversions on other area hospitals and communities (Melnick et al. 2004). Here, the focus was more on how the closures and diversions affected the organizational capacity and finances of the other hospitals. Although the authors conclude that the hospital emergency departments in California have maintained capacity and patient access and are contributing to hospitals' profits, several critiques of the research have been presented in the literature.

A third area of study seeks to quantify the role of hospitals as centers of economic activity—hubs of employment, payers of wages, purchasers of goods and services, and generators of tax revenue. Freeman, Sidhu, and Montoya (2006) note that Los Angeles County–area hospitals were directly or indirectly responsible for generating over \$47 billion in revenue in 2004, including direct revenue attributed to hospitals and the hospital-related portion of revenues from doctors' offices and medical labs, and indirect revenue generated when hospitals, doctors' offices, labs, and their employees buy goods and services in the local area.

Although the focuses of the studies have varied, their conclusions are the same—hospitals are major economic drivers of their respective communities. But two key elements are lacking from the existing research. First, the studies lack a more detailed examination of a hospital's community. In particular, when we explore hospitals through a statewide, regional, or county lens, we miss the impact of the hospital on its surrounding community. Second, previous studies have treated all hospitals equally and have not systematically taken into account the size of the particular facilities. As a result, the economic impacts of small, medium, and large hospitals have been collapsed together. We addressed both issues in selecting the hospitals for our study.

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We are particularly interested in the interaction between neighborhood characteristics (race or ethnicity and income) and the presence

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of a hospital. Does agglomeration of health care businesses occur equally over all places, or is it affected by neighborhood characteristics? Put another way, we seek evidence on whether hospitals are an engine for economic development in consistent ways, or whether a hospital's effect is influenced by social, demographic, and political factors apart from pure economics. Through these questions we hope to uncover the role of the hospital as a large landowner within the local real estate market.

Studying Hospitals: Taking a Neighborhood Census

Our research approach involves conducting a visual census of land uses for parcels located close to the hospital. The objective is to establish the full range of activities taking place around hospitals and then to infer the links between hospitals and their environs. A second objective is to establish the extent to which hospitals anchor agglomerations of health-related activities. Thus, beyond classifying parcels according to broad land use, the census also identifies the type of activity taking place on parcels with health-related activities. This information can provide an indication of the nature of clustering of activities, an important feature of agglomeration economies. A third goal is to establish whether these relationships differ across hospitals located in different types of neighborhoods. This question highlights important distributional issues regarding the benefits hospitals confer on the neighborhoods and populations with which they interact.

Although it is quite labor intensive, the visual parcel-level census approach is appropriate for this research for several reasons. First, almost no dataset provides reliable information on land uses at the parcel level. This is because collecting such information is expensive, and because, even if data are collected, uses can change and these changes can go unnoticed for some time by those collecting the information. Second, individual parcels might feature multiple land uses. For example, parcels may feature housing with retail stores or gas stations and convenience stores. A visual census permits the accurate identification of these mixed uses. Third, the census allows for the identification of business activities that might not be recorded in the phone book or other potential source of information. A dentist, accountant, or massage therapist might have a small operation run out of a home

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or other nontraditional business location. Although it does not eliminate these issues altogether, the parcel-level census approach increases coverage and accuracy and reduces the likelihood that important land uses will be overlooked.

A key issue is how to define a hospital's "neighborhood." We use a one-mile radius around a hospital as the boundary of its neighborhood. This represents a compromise: in some cases this radius will be too large, and in others it will not be large enough. However, given the lack of a consensus view in the literature, the choice of a one-mile radius served to ensure project tractability.

The study focuses on Los Angeles County, which lies at the core of a large, dynamic, and demographically diverse metropolitan area. The second-largest city in the United States and a gateway city that draws population from origins worldwide, Los Angeles is highly varied and thus offers a natural laboratory for evaluating the relationship between hospitals and their surrounding neighborhoods and whether these relationships vary with the hospital's neighborhood.

In terms of health economies, Los Angeles represents an important market. DeVol and others (2003) rank Los Angeles as the fifth-largest metropolitan health care economy in the nation and note that health care employment in Los Angeles dramatically outpaced overall employment between 1980 and 2001, suggesting that although health care has consistently been an important part of the economy, it is steadily growing even more important. The authors, however, provide little sense of the impact of the health economy on local or regional growth or on real estate markets. Thus, our study provides an opportunity to advance our understanding of the region's economy, its potential for growth, and neighborhood and land market dynamics.

We started by stratifying the 124 hospitals in Los Angeles County, using neighborhood characteristics such as income, poverty levels, and racial and ethnic makeup, as well as the scope of services provided. The hospitals range from full-service hospitals with large-scale surgical, orthopedic, and other inpatient services to smaller community hospitals with limited services.

Of the twenty-four hospitals that were randomly selected in the first screen, seven were selected for the more detailed parcel-level land use census because of their distribution along the three selection dimensions. Spatially, they are distributed widely across Los Angeles County

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Table 3.1 Distribution of the census hospitals across the selection criteria

	Service Planning Area (SPA)	Income	Race
City of Angels—Ingle side	Southeast	Lower	High Asian
Elastar	Southeast	Lower	High black and Hispanic
Glendale	Northeast	Lower	High black and Hispanic
Kaiser Sunset	West	Lower	No dominant race
Lakewood	Southeast	High	High black and Hispanic
Lancaster	Northeast	Lower	No dominant race
Van Nuys	Northeast	Moderate	No dominant race

Note: Region is defined using boundaries established via the SPA classification.

and serve diverse communities from racial and income perspectives (see table 3.1).

Brief profiles of the hospitals in the census sample, grouped by their size, follow.

Small Hospitals—Fewer Than 100 Beds

- **City of Angels Medical Center—Ingle side Campus**
City of Angels Medical Center—Ingle side Campus is one of the oldest licensed psychiatric hospitals in California. Founded in 1918, Ingle side is a 70-bed acute psychiatric hospital and full-service mental health center. The campus sits on five acres near the San Gabriel Mountains in the city of Rosemead.
- **Hollywood Community Hospital of Van Nuys**
The Hollywood Community Hospital of Van Nuys in the San Fernando Valley is nestled under the umbrella of Hollywood Community Hospital. The Van Nuys facility is a 59-bed acute psychiatric hospital.

Medium Hospitals—100 to 300 Beds

- **Elastar Community Hospital**
Roughly 80 years old, Elastar in East Los Angeles was a financially troubled 110-bed general acute hospital serving as the principal care destination for Hispanic immigrants when it was ordered to close its doors in August 2004. The hospital was more

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than \$10 million in debt, and it couldn't afford to pay its roughly 400 workers.

- **Lancaster Community Hospital**
Located in Antelope Valley, north of central Los Angeles, Lancaster Community Hospital is a 117-bed general acute hospital owned and operated by a subsidiary of Universal Health Services, Inc., one of the largest hospital management companies. In 2004 the hospital reported just under 6,000 admissions and roughly 33,000 outpatient visits.
- **Lakewood Regional Medical Center**
Lakewood Regional Medical Center was built in 1972 and is a 161-bed hospital with 143 general acute beds and 18 psychiatric beds. The facility is part of Tenet California. In 2004 the facility reported over 10,000 admissions and almost 67,000 outpatient visits.

Large Hospitals—More Than 300 Beds

- **Glendale Memorial Hospital**
Glendale Memorial Hospital opened in 1926 as Physicians and Surgeons Hospital. Originally providing just 47 beds, the hospital is now a 334-bed facility (255 general acute care beds, 49 psychiatric beds, and 30 long-term care beds) that occupies more than three city blocks. The hospital is part of the Catholic Healthcare West system.
- **Kaiser Foundation Hospital—Sunset**
The Kaiser Foundation Hospital on Sunset Boulevard is a 439-bed facility and is part of the Kaiser Permanente Health Plan, which was founded in 1945. In 2004 the hospital reported roughly 22,000 admissions and over 79,000 outpatient visits, which makes it one of the most used facilities in the Kaiser Southern California group of hospitals.

Coding the Land Uses

In conducting the visual parcel-level census of the land uses in the one-mile radius surrounding each of the hospitals, we used the following codes for the parcels:

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FOOD: Restaurants and grocery stores
MED: Medical
RT: Retail
MFG: Manufacturing or general industrial
RES: Residential (single and multifamily)
COM: Commercial (banks, auto repair, office buildings)
GOVT: Government facilities (libraries, courts)
NOPRO: Nonprofit organizations (YMCA, cemeteries)
VACLOT: Vacant lots
MISC: Miscellaneous

If a parcel featured a health-related land use, the type of health care activity was coded using the following scheme:

PRI: Primary care (e.g., internal medicine, immunization clinics)
SPEC: Nonsurgical specialists (e.g., pediatricians, women's health)
SURG: Surgical (surgi-centers)
CAM: Complementary and alternative medicine
EYE: Optometrists, ophthalmologists
DRUG: Drugstores, botanicas, pharmacies
SUP: Personnel and material durable goods, vendors
DENT: Dentists
HOSP: Hospitals
HOME: Nursing homes, skilled nursing facilities, assisted living facilities
DIAG: Imaging and diagnostics
REHAB: Rehabilitation

Using these data, we established the extent to which health-related industries cluster around hospitals and whether the clustering happens equally across hospitals located in neighborhoods with different demographics. All the land uses around each hospital were mapped using geographic information systems (GIS) software. Separate maps were created that showed all the land uses, nonresidential land uses, and both all health-related land uses and specific coded health care uses. The maps for all land uses are not shown here, since the inclusion of the residential obliterates any meaningful distinctions. The findings were also statistically analyzed, although we focus here on the mapped data.

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Hospitals as an Agglomerative Force: The Evidence

General Land Use

The first level of analysis was to describe the patterns in the mapped data. From the parcel-level census one can describe the land uses around each hospital in terms of prevalence and intensity. Figure 3.3 shows the parcel census results for Kaiser Sunset. This map demonstrates the research strategy by highlighting the nature of the spatial parcel sampling boundary. The map shows the variety of land uses within the hospital's radius as well as the intermingling of land uses. Residential, health-related, retail, commercial, and other land uses are proximate to each other, and except in the case of residential land uses, there is a decided lack of spatial concentration of a single land use.

Table 3.2 reports the incidence of land uses within the one-mile radius around each hospital in terms of the percentage of parcels that were devoted to a given land use. Parcels that had multiple land uses were treated as contributing to each relevant land use category. The predominant land use everywhere is residential.

In Lancaster, a remote suburban community in northern Los Angeles County, nearly 90 percent of the parcels around the hospital were used for housing, most frequently in the form of single-family homes. The hospitals with the most intensive nonresidential uses—Glendale, Kaiser, and Van Nuys—are located closer to the metropolitan core, in areas featuring more dense populations. The larger nonresidential presence in these instances might reflect the ability of these more compact communities to support a wider range of activities, among other things.

Two sources of variation are evident in examining the maps. The first significant variation is in the prevalence of nonresidential land use across the hospitals in the sample, which was noted above. The second source of variation pertains to the relative importance of corridors in shaping the spatial layout of commercial activity. For some hospitals, such as City of Angels (see figure 3.4), Lancaster, and Kaiser Sunset, nearly all the commercial activity occurs on main street corridors. By contrast, it is distributed more widely in the areas around the

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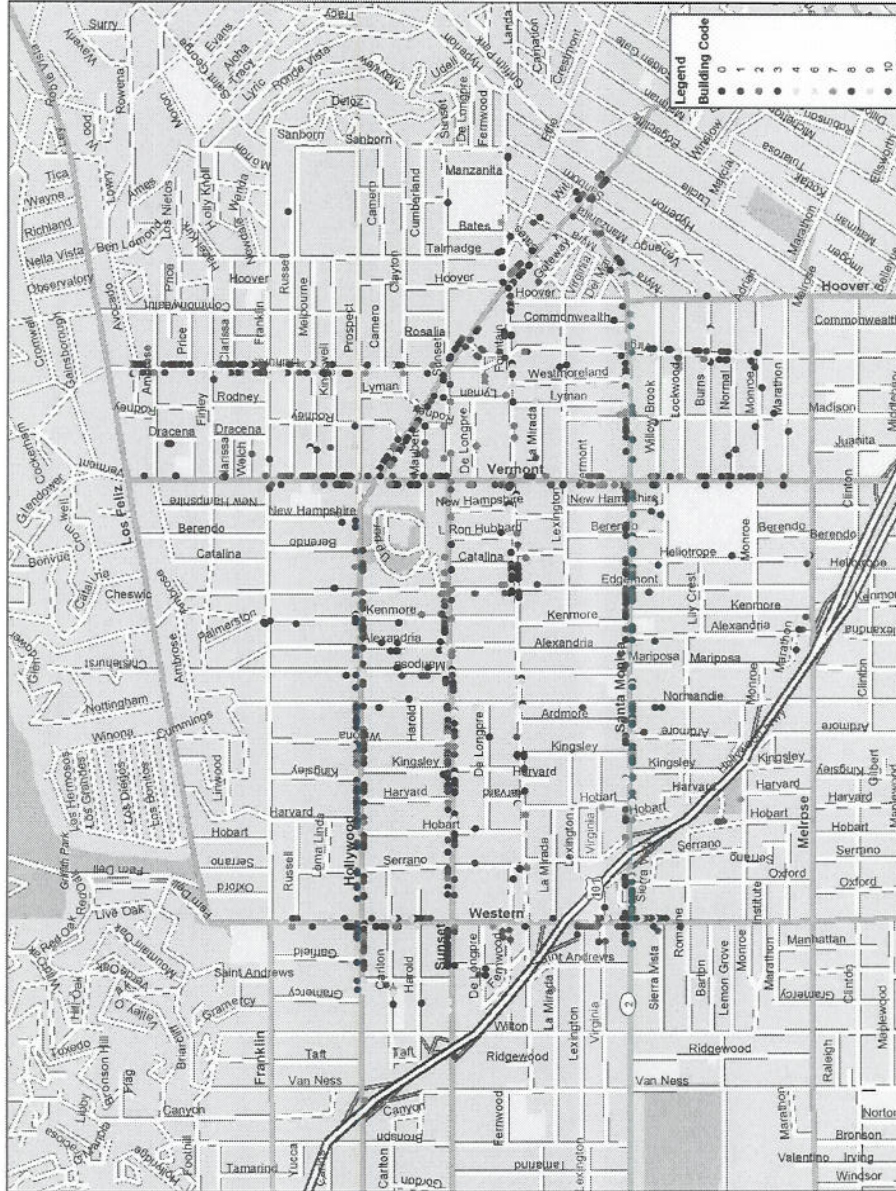


Figure 3.3 All nonresidential land uses in a one-mile radius around Kaiser Sunset.

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Table 3.2 Distribution of nonresidential land use around each hospital (percentage)

	Angels	Elastar	Glendale	Kaiser	Lakewood	Lancaster	Van Nuys
Food	1.7	3.1	2.9	5.1	1.1	0.9	1.7
Medical	3.5	1.4	4.7	3.7	2.3	2.7	1.9
Retail	3.1	3.2	4.6	11.3	1.5	2.3	5.8
Manufacturing/ industrial	0.2	1.1	6.2	0.1	1.1	0.4	3.1
Commercial	3.5	5.2	6.7	3.8	2.7	3.6	7.8
Government	0.3	0.6	0.6	0.3	0.2	0.1	0.7
Nonprofit	0.6	1.9	1.6	1.9	0.7	0.7	0.7
Vacant	0.9	2.6	2.1	1.1	0.3	0.9	0.6
Miscellaneous	0.7	1.5	2.4	1.7	0.6	0.6	2.6
Missing	0.1	0.0	0.2	0.1	0.0	0.6	0.1
Total nonresidential	14.3	20.6	32.0	29.1	10.4	12.8	24.9
Residential	85.7	79.4	68.0	70.9	89.6	87.2	75.1

These differences in the distribution of commercial activity might provide some indication of the economic vitality of these neighborhoods as well as the role of the hospital as an anchor of activity. For instance, those places with less corridor development might “rely” on the hospital more than other locales since the commercial activity seems more directly connected to the hospital’s presence.

We further considered whether the nonresidential land use grew in intensity with proximity to the hospital by considering whether any particular land uses are more intensively located close to the hospital. Table 3.3 shows how nonresidential land uses are distributed across parcels (1) within a half mile of the hospital; and (2) between a half mile and one mile from the hospital. Nonresidential intensity increases with proximity to the hospital in five of the seven cases. Only the Lancaster and Lakewood facilities have more intensive residential uses in close proximity. Strikingly, these two hospitals are both community hospitals located in iconic suburban places; Lakewood is a model city from the 1950s, and Lancaster, from the 1970s.

Among those hospitals with more intensive proximate nonresidential land use, Glendale hospital has the most intensive nonresidential land use in close proximity. Elastar hospital shows the greatest differential in intensity across the two areas: the frequency of nonresidential land use within a half mile is 81 percent higher than that outside the

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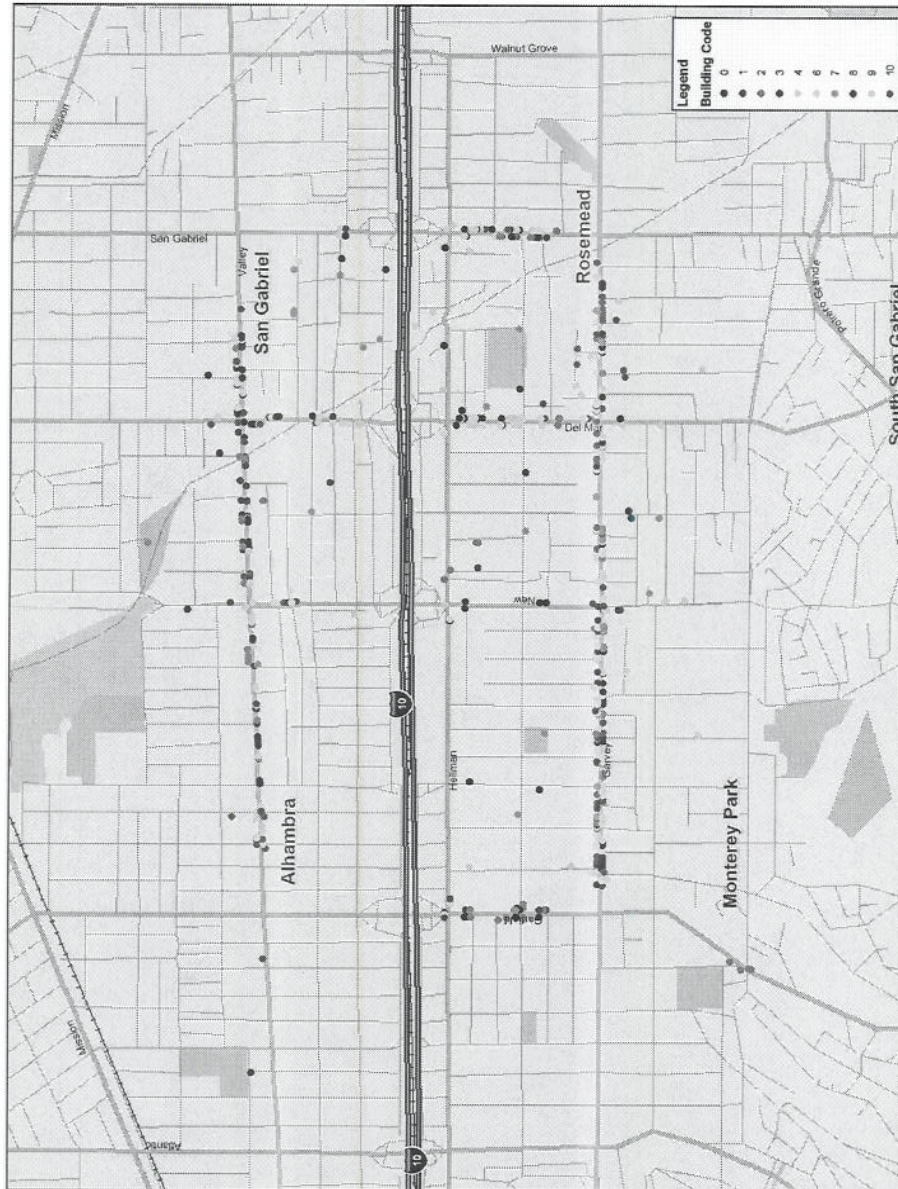


Figure 3.4 Corridor pattern of nonresidential land uses, City of Angels.

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Figure 3.5 Corridor pattern showing broader commercial pattern, Elastar.

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Table 3.3 Land uses by proximity to hospital (percentage)

	Total		Within half-mile		Outside half-mile		Percentage within
	Non-residential	Health	Non-residential	Health	Non-residential	Health	
City of Angels	14.3	3.5	16.6	2.8	13.9	3.6	14.0
Elastar	20.6	1.4	32.7	1.9	18.0	1.3	17.5
Glendale	32.0	4.7	45.4	13.5	30.5	3.9	9.1
Kaiser Sunset	29.1	3.7	31.6	14.6	28.7	3.6	13.9
Lancaster	12.8	2.7	1.4	0.5	14.1	3.1	14.4
Lakewood	28.1	1.9	5.1	1.1	11.1	2.5	8.9
Van Nuys	24.9	1.9	34.7	2.2	24.0	2.0	7.3

half-mile circle. City of Angels and Kaiser Sunset show the smallest within-outside differentials.

Health-Related Land Use

Because of our particular interest in how hospitals may contribute to the local economy, we pay particular attention to health-related land uses within the parcel sample area. Table 3.4 reports the distribution of activities among the health-related parcels within the sample area. Nonsurgical specialists, dentists, primary care facilities, and complementary and alternative medical service providers were the most common health-related land uses across the seven hospitals. The highly specialized imaging and diagnostic businesses, which are frequently embedded in hospitals and medical centers, were the least frequently observed.

The data indicate tremendous variation in the health services provided near hospitals, both in terms of scope and prevalence. In terms of scope, some activities are absent altogether for some hospitals but are important for others. For example, whereas there are no rehabilitation facilities within one mile of Elastar, they represent 8 percent of the parcels around Lancaster. Although nonsurgical specialists were the most common overall, their prevalence varied significantly, ranging from 40.4 percent of the health-related parcels for Lakewood to 8.3 percent for Kaiser. Similar variation is observed across several other categories, suggesting that the health care economy is not uniformly located spatially.

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Table 3.4 Parcels by health-related land use around each hospital (percentage)

	Angels	Elastar	Glendale	Kaiser	Lakewood	Lancaster	Van Nuys	Average
Primary care	8.6	18.0	15.5	17.6	19.3	2.2	16.2	13.9
Nonsurgical specialist	34.2	14.0	25.2	8.3	40.4	13.5	19.0	22.1
Surgical center	6.3	2.0	2.9	1.4	3.7	6.7	1.9	3.6
Complementary/altern. medicine	18.9	6.0	16.0	11.6	9.2	14.6	9.5	12.3
Eye care	4.5	4.0	1.5	3.2	1.8	5.6	1.0	3.1
Pharmacy	6.3	10.0	4.4	7.9	6.4	5.6	5.7	6.6
Personnel/goods	4.1	18.0	6.3	5.1	4.6	3.4	5.7	6.7
Dentist	10.8	20.0	14.6	20.8	7.3	29.2	30.5	19.0
Hospital	0.9	4.0	0.5	13.9	0.9	5.6	1.0	3.8
Nursing home	0.9	4.0	3.9	7.9	2.8	4.5	1.0	3.6
Diagnostic	1.8	0.0	6.8	1.4	0.9	1.1	4.8	2.4
Rehabilitation	2.7	0.0	2.4	0.9	2.8	7.9	3.8	2.9

Order

The variation noted earlier regarding nonresidential land uses around hospitals holds similarly for the health-related land uses. Once again, corridors play an important role for the geography of health around hospitals. For example, nearly all the health-oriented land uses around City of Angels are on main corridors, such as Garvey, Garfield, Valley, and Del Mar avenues (see figure 3.6). Interestingly, the uses seem to be fairly evenly distributed along these corridors, with no particular affinity for them to be located close to the hospital itself. The pattern differs significantly around Kaiser Sunset (see figure 3.7), for which corridors are equally important, but health uses are clustered more heavily near the hospital.

The two exceptions to this general rule are Elastar and Van Nuys hospitals (see figures 3.8 and 3.9). Elastar is the lone hospital in the sample that does not have a strong corridor orientation. Health-related land uses are relatively dispersed, with only limited affinity to Cesar Chavez Boulevard. This weakness in influence might be tied to the poor performance of the hospital, which closed shortly after it was selected for this study.

Van Nuys Hospital, conversely, has a clear health cluster just north of the hospital at the intersection of Victory and Van Nuys boulevards.

S Very few health-related land uses fall outside this cluster, and when
R they do, these uses are also bunched to some extent. Van Nuys is the
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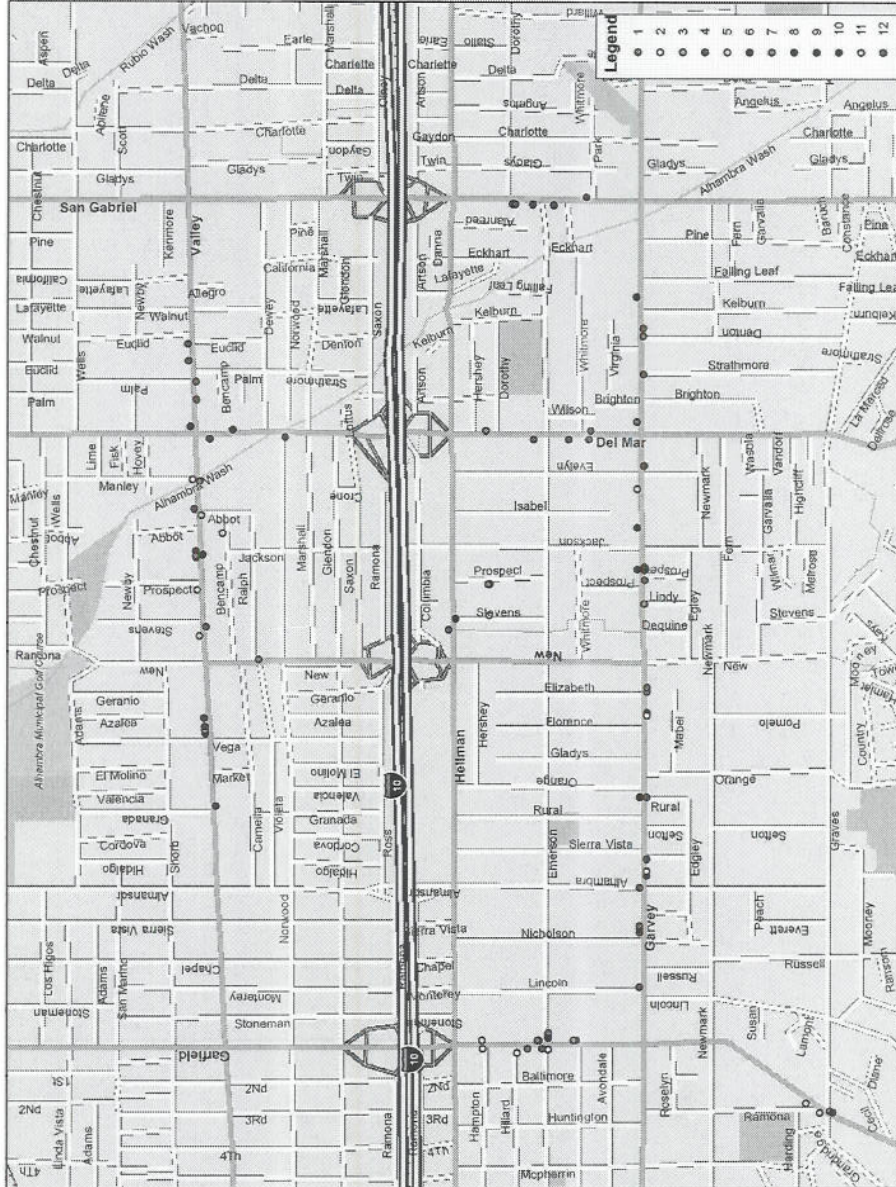


Figure 3.6 Health care land use in a strong corridor pattern, City of Angels.

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Figure 3.7 Health care land use pattern with clusters and corridors, Kaiser Sunset.

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Figure 3.8 Health care land use pattern, not in corridors, Elstar.

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Figure 3.9 Health care land use pattern with strong clustering, Van Nuys.

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only hospital for which a clear clustering is observed within the one-mile radius.

Finally, we replicated the half-mile-radius analysis with a focus on health-related land use (see table 3.3). In all cases except one (Angels), the pattern for health-related land uses mirrors that for nonresidential land uses generally. If nonresidential land uses were more (less) intensive within a half mile of the hospital as compared with the area beyond this boundary, health-related land uses were as well. Of those with greater intensity, the health-intensity differential was greater for Glendale and Kaiser and less for Elastar and Van Nuys. Glendale stands out in particular: the proportion of parcels with health-oriented land uses within the half-mile radius is 3.5 times greater than the proportion outside the radius area.

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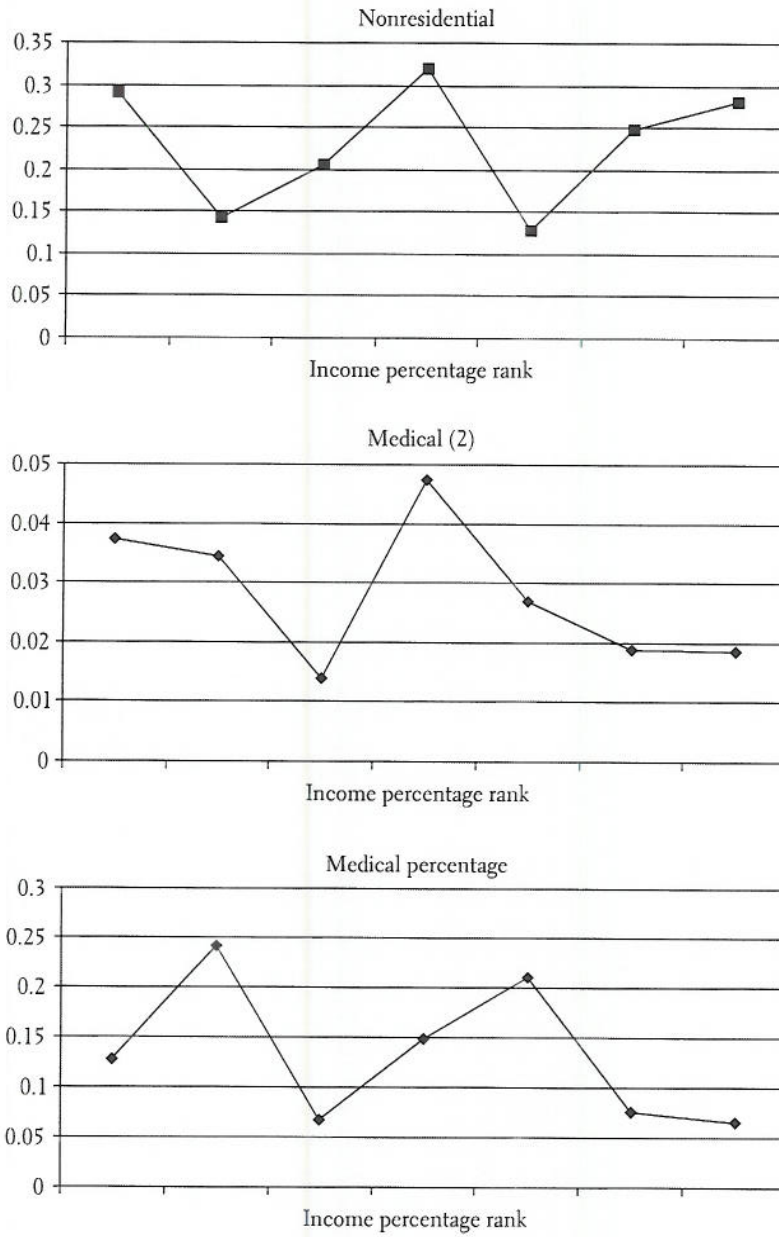
Given these general descriptive results, a key question is whether these effects are correlated with characteristics of the hospitals or their neighborhoods. In an ideal world, such correlations would not exist, since a hospital should play the same role as an economic anchor and catalyst regardless of where it is located. Realistically, we did expect to find differences. Those differences raise questions about the necessary conditions for better economic integration, and the answers might help provide insights into how to maximize a hospital's role as an economic development engine.

With only seven hospitals in the sample, a full-blown econometric model is impractical. Instead, we present crosswise comparisons showing how land use intensity varies with particular neighborhood characteristics. In particular, we report how the parcel share for nonresidential and medical-related land uses varies across hospitals ranked from lowest to highest along a given dimension. Even here, though, we caution that the small sample size means that smooth relationships are unlikely, and one must draw conclusions using "rough" bases. The following discussion should be read with this caution in mind.

Figure 3.10 shows how these land uses vary with the relative income of the hospital's surrounding neighborhood. In the figures, the lowest-income neighborhoods are leftmost. The data show no discernable pattern regarding nonresidential land use. Put another way, the degree of nonresidential land use around a hospital does not appear to vary

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S Figure 3.10 Selected land use intensities by neighborhood relative
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systematically with the relative affluence of the hospital's neighborhood.

In contrast, the data suggest a weakly negative relationship between relative neighborhood income and the propensity for medical land uses. Although considerable variation exists between two of the middle-income neighborhoods, the general trend is downward. This suggests that hospitals located in lower-income neighborhoods are more likely to have medical land uses within their proximate area, which could be due to the success of higher-income neighborhoods in keeping such land uses away or to the greater medical needs of residents of lower-income areas.

The data (not shown) also indicate positive relationships between neighborhood income and the presence of several medical land uses. In particular, nonsurgical specialists, rehabilitation centers, and dentists were all proportionately more common as the relative income of a hospital's neighborhood increased. Lakewood Hospital proved to be an exception to this in the case of dentists: its high-income neighborhood has few dentists, possibly because of Lakewood's suburban location.

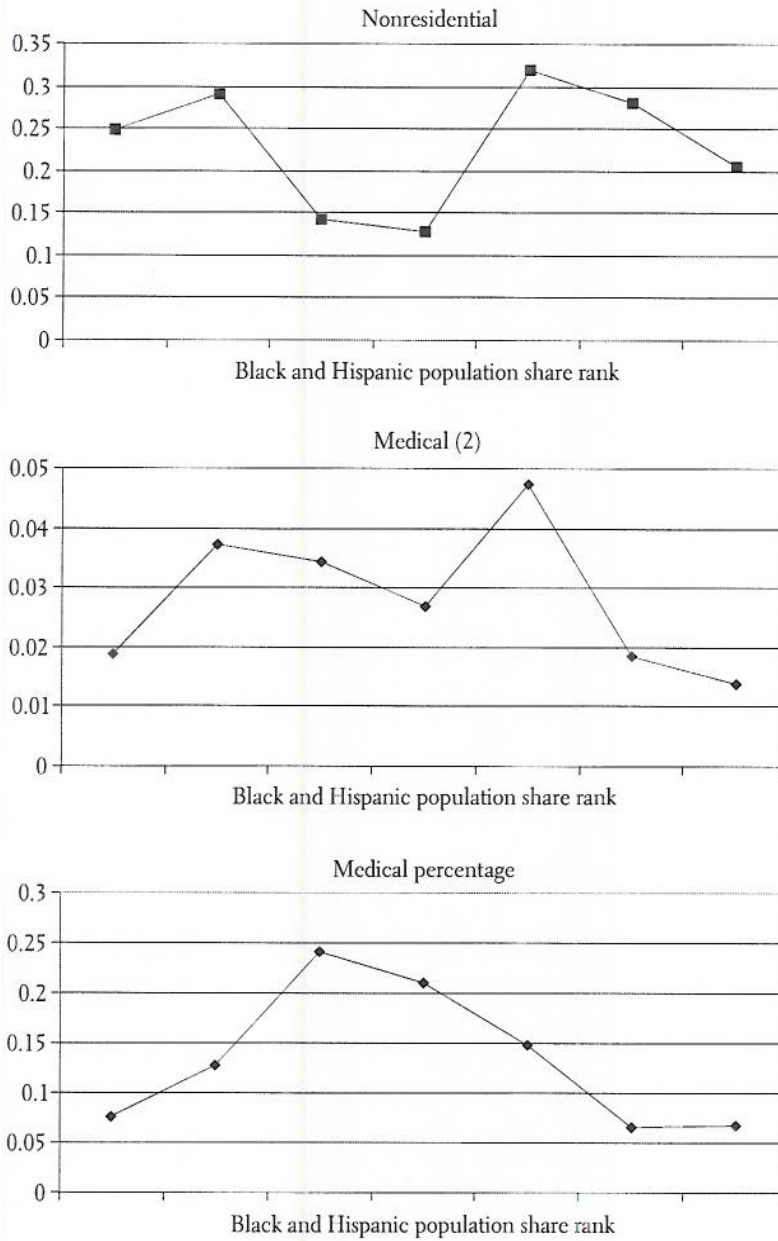
Next, analyses were conducted with a focus on the relative size of the black and Hispanic or Asian populations. The panels of figure 3.11 show patterns similar to those seen for income. No systematic relationship is found with nonresidential land uses, but a weak negative relationship appears between the presence of medical land uses and the proportion of a neighborhood's population that is black or Hispanic. If we exclude two outliers, the clear trend is for declines in the presence of health-related activities as the black and Hispanic population rises.

The data (not shown) for the specific health-related land uses in this regard suggest that this negative relationship is in part due to the lower propensities of black and Hispanic neighborhoods to have personnel and equipment vendors and complementary and alternative medicine service providers. Conversely, drug stores and pharmacies become increasingly more common as a neighborhood's black and Hispanic population increases, a somewhat surprising result.

The patterns for Asian population share, shown in figure 3.12, are quite different from those presented thus far. Nonresidential land use appears to be weakly positively correlated with Asian population share, but the positive relationship is quite strong for health-related uses, in

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Figure 3.11 Selected land use intensities by black and Hispanic population share.

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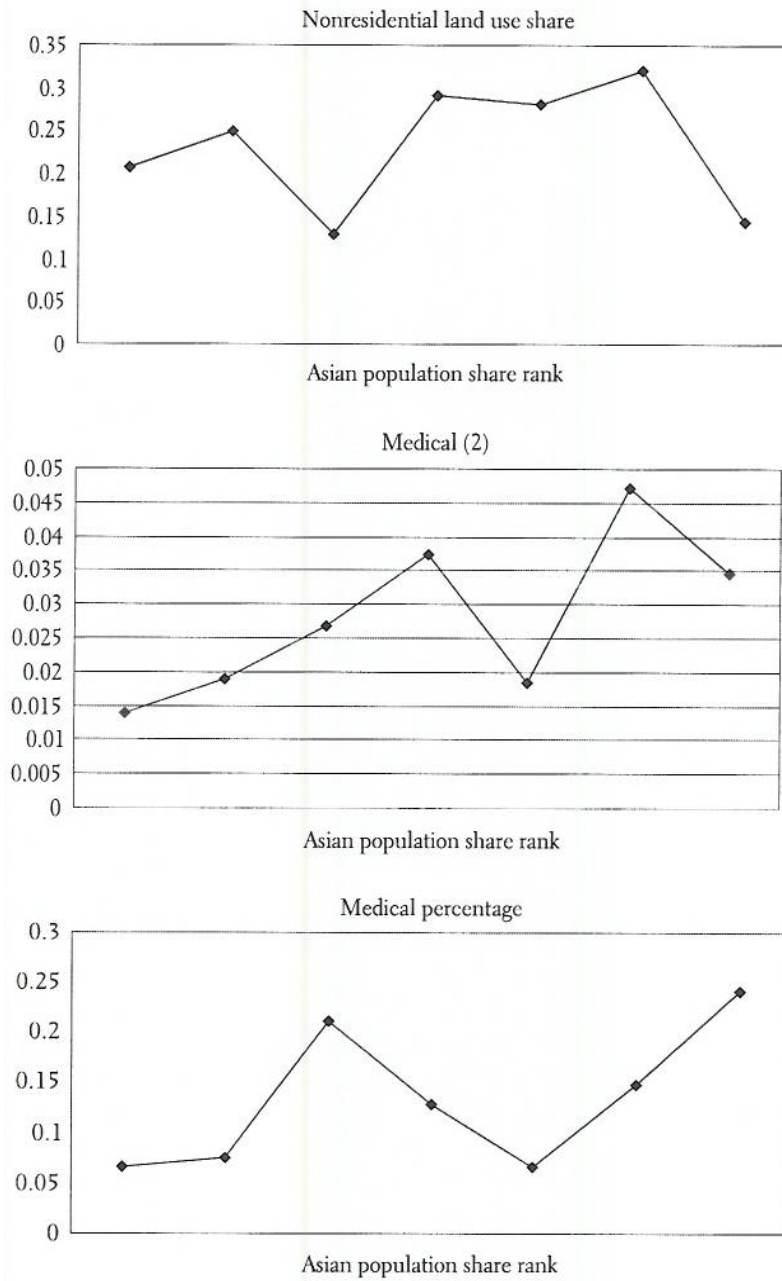


Figure 3.12 Selected land use intensities by Asian population share.

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contrast to the results seen along both the income and black and Hispanic population dimensions. The positive relationship appears to be strongly driven by similar strong relationships for the presence of nonsurgical specialists, surgical centers, and complementary and alternative medicine service providers. This latter relationship is very consistent with the conventional wisdom regarding the role of such medical services for Asian communities.

Possible by-products of the strong presence of complementary and alternative medicine in these neighborhoods are the negative relationships between Asian population and primary care facilities, drug stores, and pharmacies. In this view, these latter land uses are substituted for by complementary and alternative services.

In addition, we observe a negative relationship between Asian population intensity and the relative presence of dentists. That finding reflects concerns recently raised by a study conducted through the Center for the Advancement of Underserved Children, a cooperative endeavor between the Medical College of Wisconsin and Children's Hospital of Wisconsin, that found that the fraction of Asian American children with teeth in less than excellent condition was 80 percent greater than among children in the general population, the highest disparity among surveyed minority groups (Flores and Tomany-Korman 2008).

Although the single-dimension neighborhood results provide insights regarding land uses, we believe that we can elicit further information by categorizing hospitals according to whether they are located in lower-income, high-minority neighborhoods and comparing the land use patterns (see figures 3.13–3.15). We take the average land use over all hospitals falling in a given category. In categorizing hospitals, we considered a neighborhood “high minority” if more than 30 percent of its population is of a particular ethnic or racial minority. As above, we do separate runs for Asians, and blacks and Hispanics.

We start with a comparison of land use patterns around hospitals located in lower-income neighborhoods with Asian communities (see figure 3.13). City of Angels Medical Center is the only hospital located in a lower-income Asian community as defined. Our low-income Asian community has a far lower nonresidential land use intensity, yet the medical presence in that nonresidential land use greatly exceeds the medical presence for the other hospital neighborhoods

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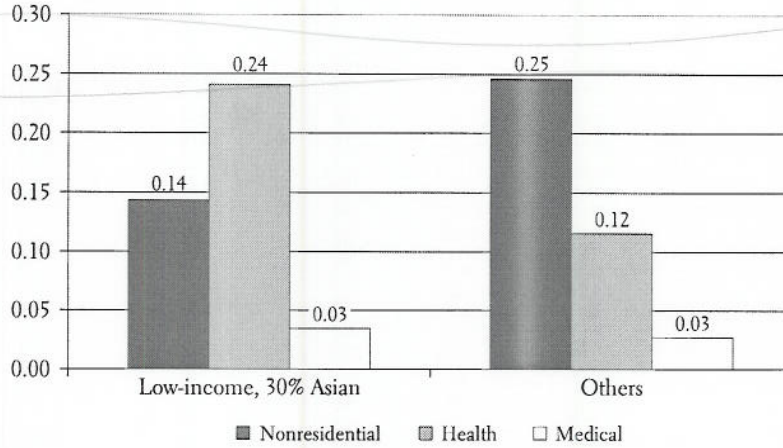


Figure 3.13 Land use intensity by relative income and high Asian population.

(24 percent versus 12 percent). Clearly, low-income Asian households see proportionally more health-related service providers than do households in other communities given their access to local nonresidential land uses.

Figure 3.14 shows the comparison between land use patterns around hospitals located in lower-income neighborhoods with a black and Hispanic population of at least 30 percent (Elastar and Glendale hospitals) and the others in the sample. The comparison is strikingly different from that for the Asian community. Here, nonresidential land use is more common in the lower-income black and Hispanic neighborhoods than elsewhere (26 percent of parcels versus 22 percent), a finding consistent with other research showing that lower-income minorities often live in areas surrounded by commercial activities (Avery et al. 1999).

Despite a greater commercial presence, the intensity of medical-related uses is lower in the black and Hispanic neighborhoods. Medical-related land uses in the lower-income black and Hispanic neighborhoods account for only 11 percent of the commercial land use parcels, whereas they represent 14 percent of the commercial land use in the neighborhoods around the other hospitals. Thus, health-related

Health care markets

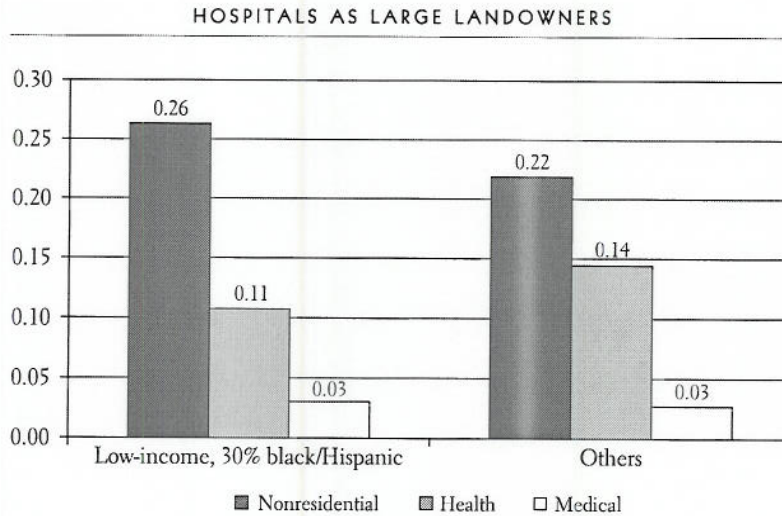


Figure 3.14 Land use intensity by relative income and 30% black and Hispanic population.

activities are underrepresented in these communities, despite the fact that these communities are more commercially oriented.

The third figure again assesses lower-income black and Hispanic neighborhoods, this time with the population threshold raised to 50 percent (see figure 3.15). Only Elastar falls in this category. In this case, the lower-income black and Hispanic community has both lower nonresidential land use intensity and, within its nonresidential land uses, relatively less health-related land use activity. Tentatively, we conclude that this case represents a community in health-related crisis. Given that Elastar closed shortly after our sample selection, the findings here strongly suggest that crisis was a prevailing condition. Elastar's closing, coupled with the land use findings shown in figure 3.14, suggests that a healthy, functioning hospital might contribute to a vibrant, stable, and healthy local economy more broadly.

In our final exercise, we grouped the hospitals according to their size, which we defined on the basis of the number of beds: small hospitals had fewer than 100 beds; medium-sized hospitals 100 to 300 beds, and large hospitals more than 300 beds. We thus have two small hospitals (City of Angels and Van Nuys), three medium-sized hospitals (Elastar, Lakewood, and Lancaster), and two large hospitals (Glendale

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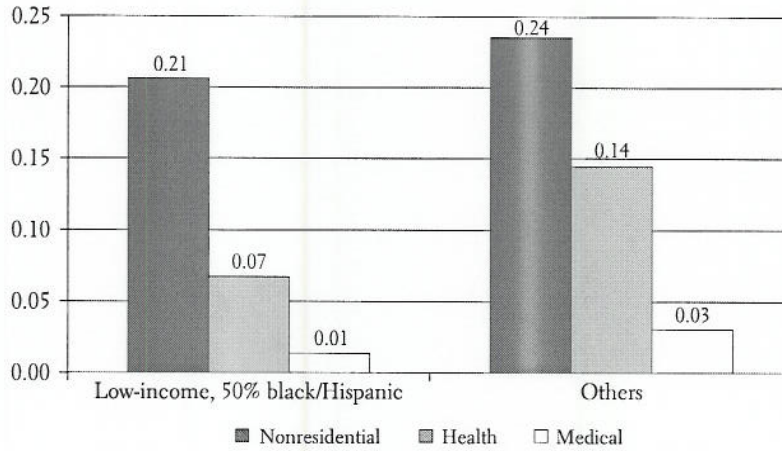


Figure 3.15 Land use intensity by relative income and 50% black and Hispanic population.

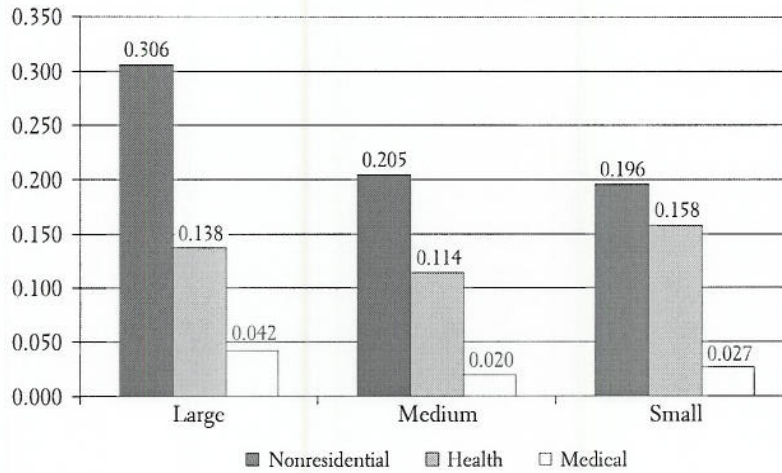


Figure 3.16 Land use intensity by size of hospital facility.

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and Kaiser). The results, presented in figure 3.16, indicate that large hospitals are located in neighborhoods that have more intensive non-residential land uses relative to smaller hospitals. The comparison found relatively little difference in nonresidential intensity between medium-sized and small hospitals. Perhaps surprisingly, given a level of nonresidential land use, the greatest medical-related intensity was found among the small hospitals in the sample. We present this finding cautiously, since it represents a further division of our small sample of hospitals.

Conclusions

The purpose of this study was to analyze the contribution of hospitals to community economies by using data collected in a census of land use—with a particular focus on health-related land uses—for parcels surrounding hospitals in a stratified set of neighborhoods. We hypothesized that neighborhood differences would affect the presence of non-residential land uses and the agglomeration of health care land uses, as would the type and size of the hospital.

The results described here confirm at least part of our hypothesis. First, health care economies, as represented by the economic activity around hospitals, do differ across neighborhoods. Not surprisingly, hospitals in the urban core were surrounded by a greater percentage of nonresidential uses. Similarly, the pattern of the health-related land uses also differed across space, as great variation was found in the amounts and types of health care businesses. Some activities were simply absent in one place, particularly present in others.

Second, for most of the hospitals, nonresidential and health-related land uses increased with proximity to the hospital. This finding suggests that “land use gradients” may exist around hospitals, hospitals playing the same role that central cities or cluster nodes play in neo-classical models of urban areas (Mills 1967; Giuliano and Small 1991). If this is found to be generally true, it would imply that hospitals are an important anchor for local economies. There were two exceptions to this pattern: Lakewood and Lancaster. These two hospitals are embedded in suburban communities, where perhaps the relationship of the hospital to other nonresidential activity is affected by the style of development and explicit zoning strategies.

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Third, and somewhat surprisingly, the patterns of the nonresidential and health-related land uses around each hospital fell into discernible and distinct patterns. We found a clear difference between hospitals with distinct corridor and cluster patterns. Regarding health-related land uses, only Kaiser Sunset had both a strong cluster and a strong corridor pattern, perhaps influenced by the presence of another hospital, Children's Hospital Los Angeles, nearby. Only Elastar did not have a strong corridor orientation, symptomatic, we believe, of its general weakness as an economic engine in this poor and heavily minority community. Overall, these distinctions might indicate that in the places with weak corridor development, surrounding land uses are more closely tied to the hospital than in places with strong commercial corridors.

Fourth, although the degree of nonresidential land use around a hospital did not vary with the relative affluence of a neighborhood, the health-related land uses had a weak negative relationship. Hospitals in lower-income neighborhoods are more likely to have such uses nearby, which suggests the importance of the hospital as an economic engine in these neighborhoods. However, we also found that some health-related land uses were more likely to exist in wealthier neighborhoods. Not surprisingly, these uses included nonsurgical specialists and rehabilitation centers, often more expensive medical providers that many poorer residents would not be able to afford.

Fifth, considering the relationship between race and ethnicity and health-related land uses, the patterns across the races were somewhat contradictory. On one hand, we found a weak negative relationship between the presence of health-related land uses and the proportion of the neighborhood's black and Hispanic population. On the other hand, we found a strong positive relationship between the presence of health-related land uses and the proportion of the neighborhood's Asian population. The positive relationship was driven particularly by the presence of nonsurgical specialists, surgical centers, and complementary medical providers, even in the absence of primary care facilities and pharmacies. Though only univariate, these results are consistent with considerable evidence suggesting that neighborhood racial composition is an important factor shaping neighborhood outcomes and that disadvantage is more prevalent in black and Hispanic areas.

Sixth, we attempted to move beyond the single-dimension studies by

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comparing the three hospitals in low-income, high-minority communities with the other sampled hospitals in terms of the intensity of non-residential and health-related land uses. The Asian community had a strong health-related economy that was far more intense than the remainder of the nonresidential land uses. However, the two black and Hispanic communities had a dramatically different story, exhibiting a weak health-related land use pattern. Such weakness is made particularly evident by looking at Elastar Hospital, which was located in a very heavily black and Hispanic neighborhood. This hospital was surrounded by a very weak health-related economy, which was symptomatic of its larger financial problems. Elastar's closing, coupled with the other land use findings, points to a conclusion that a healthy, functioning hospital might contribute to a vibrant, stable, and healthy local economy more broadly.

Given the small sample represented in this study, these results can be viewed only as suggestive rather than definitive. However, we believe that they clearly point to the important role that hospitals play in local economies and suggest that the influence and importance of hospitals extend beyond their impact on health outcomes and into a broader economic context. Although studies have demonstrated that health-related land uses are economic engines for regional economies, we argue that a healthy hospital is not only crucial to a community's health, but also strongly related to its economic health. In light of the hospital industry's expectations that further hospital closings will occur, this broader context is extremely important, and more research is needed in this area to inform academics, industry practitioners, and policy makers.

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GLOSSARY

BDA	Bangalore Development Authority
BMA	Bangalore Metropolitan Area
BBMP	Bruhat Bangalore Mahanagara Palike
BMRDA	Bangalore Metropolitan Regional Development Authority
BUA	Bangalore Urban Agglomeration
CDP	Comprehensive development plan
DMRC	Delhi Metro Rail Corporation
DDA	Delhi Development Authority
DUA	Delhi Urban Agglomeration
DUEIIP	Delhi Urban Environment and Infrastructure Improvement Project
INR	Indian rupee
IT	Information technology
ITES	Information technology and enabled services
KEONICS	Karnataka State Electronics Development Corporation Limited
KIADB	Karnataka Industrial Areas Development Board
KSCB	Karnataka Slum Clearance Board
MoUD	Indian Ministry of Urban Development
MRTS	Delhi Mass Rapid Transit System (or Delhi Metro)
NCRPB	National Capital Region Planning Board
NCTD	National Capital Territory of Delhi
NDMC	New Delhi Municipal Corporation
TCPO	Town and Country Planning Organisation

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