Scenario III

Impact on Inpatient & Emergency Services in Los Angeles County

TECHNICAL REPORT

BY

NATIONAL HEALTH FOUNDATION

JANUARY 2003

PREPARED FOR

HOSPITAL ASSOCIATION OF SOUTHERN CALIFORNIA (HASC)
&
LOS ANGELES COUNTY CHIEF ADMINISTRATIVE OFFICE

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Project funded by:

The Hospital Association of Southern California,
California Healthcare Foundation,
and
The California Endowment

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ACKNOWLEDGEMENTS

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The National Health Foundation (NHF) would like to thank the LA County Department of Health Services for convening a Technical Advisory Committee (TAC) to review Model development. The members are listed below and NHF would also like to thank those who gave so generously of their time and support.

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INTRODUCTION TO THE IMPACT MODEL

The findings in this study are based on a stochastic, discrete-event simulation model of inpatient and emergency department care in Los Angeles County (LAC). The Model views each staffed inpatient bed and emergency department bay in the county as a resource capable of serving up to one patient at a time. Additional patients seeking care must wait until appropriate beds become available. From this perspective, the set of hospitals offering bed capacity and patients requiring care within LAC may be thought of as a *queuing system*. Beds offering similar care at any one facility—for example, medical/surgical beds at Harbor-UCLA Medical Center, or emergency department bays at the adjoining ED—comprise a single queue. For example, Harbor-UCLA patients requiring a medical/surgical bed must wait until one becomes available. Patients requiring other types of beds wait in separate queues. In the ED, the wait reflects a real-life circumstance that occurs in the ED waiting room. In contrast, the wait for an inpatient bed is notional; it represents delayed admission due to lack of available capacity, but does not correspond to any physical waiting line. Beyond this simplistic Model of queuing for separate bed types are several complications exhibited by the true system that require consideration in order to predict the impact of bed reductions and hospital closures.

First, queues at inpatient wards and EDs throughout the county are related to one another. That is, patients may move from ED bays to inpatient beds within the same hospital; they may be transferred from the ED of one hospital to an inpatient bed of another; or they may leave the waiting room of one ED for that of another after enduring a lengthy wait at the first. Similarly, patients requiring hospitalization, but not arriving through the ED, may be directed by their physician to a bed at their primary hospital, to a bed at a nearby hospital where the physician has privileges, or to the ED as a last resort if no bed can be found and the patient's condition is urgent. In other words, the system places patients flexibly when beds in one queue or another are scarce. One implication is that conditions at one facility can impact patient outcomes throughout the system. These inter-relationships are the primary rationale behind the systems perspective taken here. Our view is that recognizing these relationships is essential to predicting the impact of capacity reductions at any particular facility or on any particular patient subpopulation.

A second complication arises because patient characteristics and hospital choice are not independent. Insurance type, patient demographics, and geographic location are all correlated with the facility where a patient receives hospitalization.[1] Though it is not our purpose to explain these relationships, for the purpose of modeling they are attributed, crudely, to two mechanisms: first, private hospitals restrict entry on the basis of insurance status[2] and insured patients who end up at public EDs often prefer to be transferred to private hospitals if they require admission; second, various social, economic, and geographic processes lead patients to prefer, or to select, certain hospitals over others. Thus, the Model's initial assignment of patients to facilities and its manner of selecting alternative facilities when no beds are available at the initial facility—conditional on demographic, geographic, and payer characteristics—are important and are the focus of much of the remainder of this technical report.

[1] These correlations are reflected in bi-variate summaries of OSHPD 2000 data, but are not provided here.
[2] Hospitals can restrict entry to inpatient beds but not to emergency departments as a result of the EMTALA law.

Summarized below are these and a few other major aspects of the inpatient and ED care system in LA County incorporated in the Impact Model:

- patients differ in the type of care—and type of bed—they require;
- not all beds are available to all patients; restrictions are based on insurance and geographic location and differ between hospitals and EDs;
- patients are triaged according to the urgency of their condition;
- patients may move from an ED to an inpatient ward within the same hospital or from an ED at one hospital to an inpatient ward at another;[3]
- patients requiring immediate hospitalization, but not arriving through the ED, may be sent to the ED if no inpatient bed is available;[4]
- ED patients may leave prior to receiving care after enduring a lengthy wait; then, they may return to seek care later, seek care elsewhere, or exit the system without seeking care;
- the rate at which patients require care, the type of care they require, and hospital choice are related to the patient's health insurance, geographic location, age, sex, race and ethnicity;
- length-of-stay for inpatient care varies by bed type and urgency of the patient's condition; length-of-stay for emergency care varies by the patient's acuity;
- length-of-stay varies between hospitals due to differences in patient composition and operating procedures.

Impact Mode development was a compromise between the need to represent important system dynamics anticipated to influence the impact of the proposed reductions with a countervailing need for tractability, for a model simple enough to allow easy interpretation of results, and a recognition of limitations in the data available.

Inputs to the Model are staffed bed capacity, utilization rates, length-of-stay, and a rule-set specifying facility choice under various circumstances. Bed capacity is estimated from 2002 NHF survey data (see Appendix C) and OSHPD 2000 data for each of nine bed types described below representing aggregates of OSHPD bed classifications. Inpatient and ED utilization for each ED, inpatient ward, and bed type are estimated from OSHPD 2000 and Census 2000 data as a rate: the number of visits per person in the Census population in 2000, in each of 30 mutually exclusive and exhaustive demographic categories and by patient zip code and SPA. These rates are then multiplied by State Department of Finance (DOF) estimates of the 2002 population to predict utilization in 2002. Length-of-stay in each inpatient bed or ED bay is estimated from OSHPD 2000 data. Random distributions fit to historical data are used to reflect uncertainty regarding parameters estimated from data as well as variation among patients.

The rule-set for specifying facility choice is the result of deliberations by the Technical Advisory Committee (TAC), regarding the following circumstances: leaving the ED without being seen; facility choice for patients requiring admission following an ED stay; facility choice for patients

[3] For example, a private hospital may transfer an ED patient requiring admission to a county hospital.
[4] For example, a physician advising hospitalization may find no bed available at hospitals where he/she has privileges and direct the patient to the ED as the fastest means of receiving care.

not arriving through the ED and requiring inpatient admission when no appropriate bed is available at the initial facility, separately for patients requiring urgent and elective care. In some cases, rules are tailored to pediatric patients and for patients requiring intensive care.

Outputs produced by the Model are occupancy rates, waiting times, and patient placement outcomes. Occupancy rates may be summarized by hospital, bed type, and/or SPA. Patient outcomes may be summarized by these factors as well as payer status, demographic, and geographic characteristics.

Details of the complete conceptual model, data sources, parameter estimation, implementation and limitations of the Model are presented after a brief description of queuing and simulation, for readers unfamiliar with these methods.

QUEUING THEORY

Queuing theory is the mathematical study of queues, or waiting lines (Hillier and Lieberman 1995). Common examples include customers lining up at a bank to conduct a transaction with a teller or at a drive-through window to purchase a fast-food product. Input parameters required to specify a queuing model are the following: the *arrival rate*, or the rate at which customers arrive seeking service; the number of *servers* available; the *service time*, or the time required for a server to serve one customer, the maximum number of customers that can wait in the queue; and the *queuing discipline*, or the rule by which the next customer is selected for service (e.g., first-in, first-out). The arrival rate may be fixed, for example at a constant three arrivals per hour. Or, as is more commonly the case the rate may be specified with a probability distribution causing the time between customer arrivals to be random, but with fixed mean and variation. Service times are specified in similar fashion. More complicated models specify rules governing *balking*, the phenomenon of customers refusing to enter a queue if the expected wait is too long; or *jockeying*, movement between lines.

Outcome measures typically of interest are the following: the average *waiting time*—the time between a customer's arrival and the beginning of service; the average *system time*—the time between a customer's arrival and exit from the system; the *utilization* or occupancy rate—the portion of the time each server is busy; and the fraction of customers who balk. Additional outcome measures for the Impact Model are the *throughput*—the number of patients the system is able to serve annually—and the annual number of patients who receive no service within a specified period of time (e.g., "urgent" inpatients require care more quickly than "elective" inpatients).

The use of random distributions to specify arrival rates and service times in queuing models is notable because the time of arrival and time required to serve a particular customer can rarely be predicted precisely. Random distributions provide a compromise: the time between any two arrivals is random, but the probability it will exceed a particular value is known; the result is that while the system may experience unpredictable surges in demand or idle time in the short run, it behaves predictably with respect to long-term averages. In this way, queuing models mimic historical trends without ignoring natural variation.

For additional detail regarding queuing theory and example models, see Hillier and Lieberman (1995) and Ross (1993). See Bolling (1972) and Cahill and Render (1999) for examples of queuing models applied to hospitals.

STOCHASTIC DISCRETE EVENT SIMULATION

Simple queuing models can be formulated mathematically and solved analytically, but incorporating the features of the inpatient and ED system discussed earlier makes the possibility of a closed form solution unlikely. Instead, the Impact Model is implemented as a *stochastic discrete-event computer simulation* model. "Discrete-event" refers to the fact that the simulation consists of a series of events representing patient arrivals and the movement of patients through the system. Measures of interest (e.g., waiting time) are tracked for each patient as the simulation proceeds. The simulation is "stochastic" because it includes random elements: Monte Carlo methods are employed to sample from distributions estimated from historical data that describe arrival rates, service times, the characteristics of arriving patients, (e.g., acuity) and their paths through the system (e.g., leaving the ED without being seen).

Although one advantage of a stochastic model is the ability to model rare events and account for uncertainty in parameters, a disadvantage is that the simulation must be run multiple times because any particular run represents just one possible realization of the set of possible outcomes. For any outcome of interest, it is useful to think of the input probability distributions as mapping onto a single outcome distribution. This later distribution is unknown, but can be estimated from multiple runs through statistical inference. Each run of the model is treated as an independent observation; together the set of runs comprise a random sample and confidence intervals are typically used to convey the uncertainty associated with each prediction.[5]

CONCEPTUAL MODEL

Patients initially seek emergency care and, separately, patients requiring hospitalization but not passing through the ED—referred to simply as "inpatients"—arrive according to a random process from each zip code to hospitals throughout the county (Figure 1). Each demographic subpopulation within a zip code, jointly identified by an age, sex, race, ethnicity, and payer group (see Table 1), has a distinct ED and inpatient arrival rate.

[5] Additional detail on aspects of simulation touched on here and a comprehensive introduction to the field may be found in Law and Kelton (1991).

Figure 1: Patient Arrivals

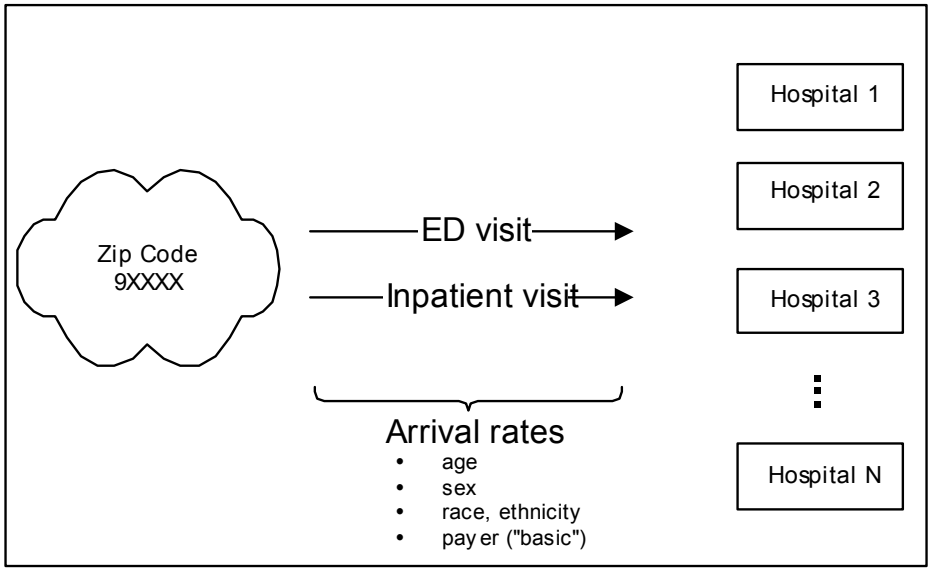


Table 1: Patient Characteristics

Variable	Values/Domain	Type	Units
All Patients			
Sex	male, female	dichotomous	n/a
Age	0-14, 15-19, 20-64, 65+	ordinal	years
Race, ethnicity	Asian/Pacific Islander, Black, Latino, White, Other[6]	categorical	n/a
Zip code	All zip codes at least partially contained in L.A. County[7]	categorical	n/a
SPA	Antelope Valley, San Fernando Valley, San Gabriel Valley, Metro, West, South, East Los Angeles, South Bay	categorical	n/a
Payer, "basic"	uninsured, Medi-Cal, Medicare, privately insured	categorical	n/a
Payer, "detailed"	uninsured, Medi-Cal HMO, Medi-Cal FFS, Medicare HMO, Medicare FFS, Kaiser, other private	categorical	n/a
Inpatients			
Urgency	urgent, elective[8]	dichotomous	n/a
Bed type required	See Table 2	categorical	n/a
Inpatient LOS	$x \in R: x \geq 0$	continuous	days
ED Patients			
Acuity	critical, urgent, non-urgent	categorical	n/a
ED LOS	$x \in R: x \geq 0$	continuous	hours
LWBS threshold	$x \in R: x \geq 0$	continuous	hours
Requires admission	yes, no	dichotomous	n/a

[6] Latino includes Latinos of any race group.
[7] Zip codes representing post office boxes as opposed to geographic areas are not included in the Model.
[8] Urgent status is approximated using the OSHPD indicator, "scheduled within 24 hours." Elective patients are taken to be those not scheduled within 24 hours.

Arriving inpatients are characterized by a number of additional factors. The type of bed they require (Table 2) is correlated with age and the hospital at which they initially seek care, reflecting differences in services offered by each hospital and differences between pediatric and adult patients. The inpatient visit may be elective or urgent,[9] which is correlated with patient age, sex, race, ethnicity, payer status, and SPA, reflecting health disparities between economic, geo- and socio-demographic groups. The required length-of-stay (LOS), measured in days, depends on bed type and initial hospital, reflecting differences in care requirements, service levels, and policies between hospitals conditional on bed type.

Table 2: Inpatient Bed Categories

Impact Model Bed Type	OSHPD Bed Classifications
Adult ICU	Medical/Surgical Intensive Care, Coronary Care, Burn Care, Other Intensive Care
Adult Acute	Medical/Surgical Acute
Pediatric ICU	Pediatric Intensive Care, Neonatal Intensive Care
Pediatric Acute	Pediatric Acute, Pediatric Subacute
Physical Rehabilitation	Physical Rehabilitation Care, restricted to hospitals that use IRFPAI (Inpatient Rehab Facility Patient Assessment Instrument) for Medi-Cal reimbursement
Psychiatric Acute, Adult	Psychiatric Acute – Adult, Psychiatric Intensive Care
Psychiatric Acute, Adolescent & Child	Psychiatric Acute - Adolescent & Child
Other	Skilled Nursing, Definitive Observation, Chemical Dependency, Hospice, Other Acute, Other Subacute, Psychiatric Long-Term Care, Intermediate Care, Residential Care, Other Long-Term Care, Daily Hospital Services, Obstetrics, Alternative Birthing Care

ED patients are characterized by their acuity—critical, urgent, or non-urgent (Table 3)—the time required for emergency care (ED LOS),[10] and whether or not admission to inpatient care is required after the ED LOS has been completed. These characteristics are all correlated with the ED where the patient initially seeks care, reflecting differences in patient composition between EDs.[11] In addition, each patient has an individual waiting time threshold, after which he or she

[9] Urgent status is approximated using the OSHPD indicator, "scheduled within 24 hours." Elective patients are taken to be those not scheduled within 24 hours.
[10] Not including time spent waiting for or time required for triage.
[11] Data available at the time of Model development did not support estimating relationships between these characteristics and others such as payer, age, or other demographics.

leaves the ED without being seen (LWBS). The threshold varies among patients, but is independent of other patient characteristics.

Table 3: ED Acuity Levels

Acuity	OSHPD Definition
Critical	This is a visit by a patient who presents an acute injury or illness that could result in permanent damage, injury or death (head injury, vehicular accident, a shooting). The CPT Code (FY 2001) for this level of service is 99284 (no immediate significant threat to life) or 99285 (immediate threat to life).
Urgent	This is a visit by a patient with an acute injury or illness where loss of life or limb is not an immediate threat to his/her well being, or by a patient who needs a timely evaluation (fracture or laceration). The CPT code (FY 2001) for this level of service is 99282 (low complexity) or 99283 (low to moderate complexity).
Non-urgent	This is a visit by a patient with a non-emergency, illness, or condition; sometimes chronic; that can be treated in a non-emergency setting and not necessarily on the same day they are seen in the EMS Department (pregnancy tests, toothache, minor cold, ingrown toenail). The CPT Code (FY 2001) for this level of service is 99281 (single problem with straightforward medical decision making).

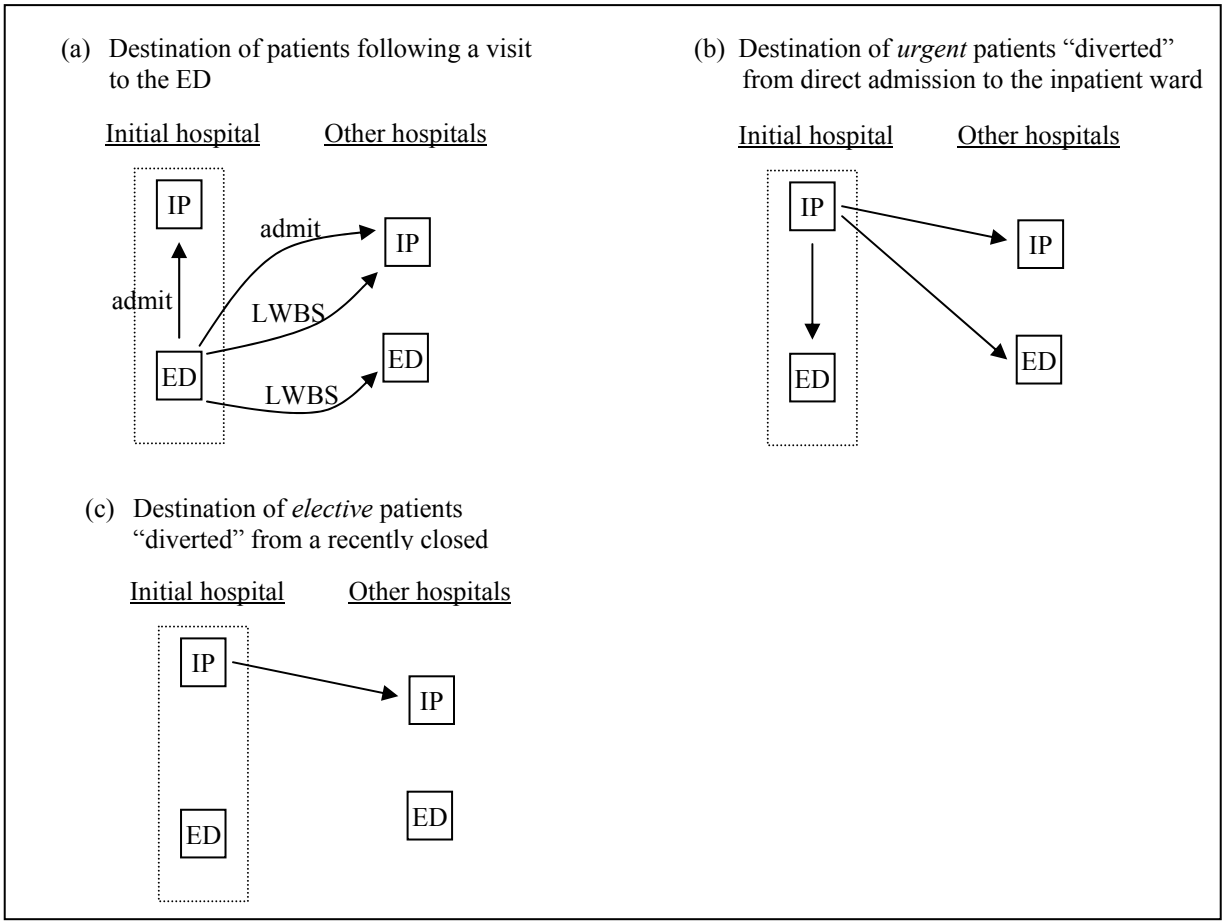
ED patients are triaged according to acuity and are not treated until an ED bay becomes available. Following treatment, patients requiring admission continue to occupy an ED bay until an inpatient bed is found. The patient may be admitted to the hospital that maintains the ED or to another hospital in the county: the final destination will depend on payer status, whether intensive care is required, and the location of the ED. If no hospital that is willing to accept the patient and has an available bed can be found after two days, the patient is discharged. ED patients who leave without being seen may return sometime later to the same ED, to an ED that is closer to the patient's residence[12] and has a shorter queue, to a private clinic (which may result in direct admission to inpatient care), or may choose not to seek care again.

Similarly, inpatients do not receive care until a staffed bed of the appropriate type is available. While elective patients will wait as long as necessary for care, urgent patients require admission within a half a day[13] and always take precedence over elective patients. If the patient's physician sees that no bed will become available in this time at the patient's primary place of inpatient care, an attempt will be made to find a bed at an inpatient ward elsewhere. However, the physician's privileges are assumed to extend over no more than a 15 mile driving radius. If no hospital with an available bed within this distance and willing to accept the patient on the basis of his or payer status can be found within half a day, the physician will attempt to send the patient to the initial

[12] Distance to each ED is measured from the population centroid of the patient's zip code.
[13] Due to the manner in which arrival rates are estimated, this represents half a day *over and above* the time the actual patient observed waited between scheduling an admission and his/her actual admission.

hospital's ED.[14] If the initial hospital has no ED, the patient is directed to the ED nearest to the patient's residence that accepts the patient's insurance within a 15 mile driving radius; if there is no such ED, then the patient is directed to the nearest ED irrespective of insurance status. In all cases, an inpatient directed to an ED is triaged as a critical patient and is assumed to require admission upon completion of emergency care.

Figure 2: Patient Flow Within and Between Hospitals*



ED = emergency department; IP = inpatient ward

* Additional destinations included in the Model, but not represented in the figure are exit from the system following completion of LOS and exit from the system by ED patients who LWBS and decide not to seek care again. Further, urgent inpatients exit the system if no bed is available within half a day of requiring hospitalization. ED patients requiring admission exit the system if no inpatient bed is available within two days of completion of treatment at the ED.

For simplicity, the mechanism of selecting an "alternate" facility is identical when an urgent patient arrives and finds his or her primary place of inpatient care closed due to the capacity reductions effected by the scenario under consideration. When faced with the same situation,

[14] Rehab patients and pediatric patients (ages 0-14) are not sent to EDs. Rehab patients are regarded as receiving no care if an inpatient bed cannot be found. Because pediatric patients are never sent to EDs as a means of receiving immediate care, it is assumed that every attempt will be made to find an available inpatient bed for them: pediatric inpatients are thus exempt from the 15 mile radius restriction described above.

elective patients are "diverted" or "rerouted" differently: they seek care at the hospital nearest to their residence[15] that accepts their health insurance and has any staffed beds of the required type, regardless of whether one is currently available. Figure 2 summarizes the possibilities of patient flow.

Seven *hospital payer* categories (Table 4) are used to describe the type of health insurance each hospital is willing to accept when admitting patients to inpatient care. Hospitals belong to at least one category, but the categories are not mutually exclusive. For example, a hospital may accept both Medicare fee-for-service (FFS) and Medi-Cal FFS patients, thus belonging to both hospital payer categories.

Table 4: Insurance Types Accepted

Hospital payer category	Patient insurance types accepted
County DHS	Any type
Kaiser	Kaiser
Private (not Kaiser)	Private (not Kaiser), Kaiser (if Kaiser hospitals are full)
Medi-Cal FFS	Medi-Cal FFS
Medicare FFS†	Medicare FFS
Medicare HMO	Medicare HMO, Medicare FFS
Medi-Cal HMO	Medi-Cal HMO

† In the Model, all hospitals will accept Medicare FFS patients, but we retain this category for future flexibility.

Within the bounds of these restrictions, the conceptual model also views patients as exhibiting their own *preference ordering* of hospitals (Table 5) when no bed at the patient's primary place of care is available and an alternative facility must be selected (i.e., in the circumstances described previously). Beyond patient choice, the ordering in Table 5 is an attempt to reflect the ability of insurance providers to gain entry for their clients at other hospitals. For example, urgent patients with Kaiser Permanente® coverage are regarded as having access to beds at all Kaiser hospitals; but, if none is available, it is assumed that a non-Kaiser private hospital will agree to accept the patient; if none have beds available, the Kaiser patient's least preferred option is a County DHS hospital. This conceptualization allows considerable flexibility, but does not cover every case. For example, a privately insured patient may seek a particular kind of specialty care available only at a county teaching hospital. No attempt is made to model such cases.

[15] Again, measured from the population centroid of the patient's zip code.

Table 5: The Ordering in Which Patients with a Particular Insurance Type Search for Hospitals when an Alternative Hospital is Needed

Patient insurance type	Hospital payer type, in order of patient's preference
Uninsured	County DHS
Medi-Cal FFS	Medi-Cal FFS, County DHS
Medicare FFS	Medicare FFS, County DHS
Medi-Cal HMO	Medi-Cal HMO, County DHS
Medicare HMO	Medicare HMO, Medicare FFS, County DHS
Kaiser	Kaiser, Private (not Kaiser), County DHS
Private (not Kaiser)	Private (not Kaiser), County DHS

SYSTEM BEHAVIOR NOT SIMULATED BY THE MODEL

It is important to note aspects of behavior known to occur in practice, but not included in the Model. The Model does not simulate the transfer of patients from one inpatient bed to another, for example from intensive care to a medical/surgical bed. While such transfers are common, each bed visited by the patient should appear as a separate entry in OSHPD data so that the number of visits to each bed type will be modeled correctly without explicitly modeling transfer behavior. Second, transfers between EDs for higher levels of care are not modeled for similar reasons. Third, the EMS ambulance routing system is not simulated: the Model does not distinguish between ED walk-ins and EMS transports. Thus, the Model is unable to predict changes in ambulance travel times or time on diversion.[16] Fourth, a major simplification is that in some circumstances patients unable to find care within a given time period simply exit the Model. For example, ED patients requiring admission for whom no bed can be found within two days, and urgent inpatients unable to find any available inpatient bed or ED within the distance threshold described above, exit the system without receiving care. In reality, hospitals may find ways to make space for some of these patients, but how they might do so is unknown.

Fifth, standby EDs are not included in the Model because no reductions in standby ED capacity are proposed in the scenario under consideration and because these facilities are not expected to absorb any considerable portion of patient flow diverted from facilities named in the Scenario. The Model assumes that standby EDs do not represent a viable alternative to other ED or inpatient care. One indication of this is given by LA County EMS Trauma and Emergency Medicine Information System (TEMIS) data, which indicate that in 2000, only 0.21% of EMS transports were delivered to standby EDs.

[16] In fact, a considerable attempt was made to model EMS transports explicitly. The origin location of patients requiring transport was assumed to mirror OSHPD 2000 patient zip codes for admits from the ED, as more direct measures of the geographic distribution of patients requiring transport were lacking. Then, arrival rates for walk-ins and patients requiring transport (by origin zip code) were estimated separately using a combination of OSHPD 2000 and LA County EMS TEMIS data. Finally, a detailed routing algorithm was developed based on LA County EMS guidelines for selecting patient destinations. Unfortunately, applying the routing algorithm to these data failed to produce the correct number of visits at each ED. We conclude that two major assumptions of this approach are faulty, namely (1) that zip codes of inpatients admitted from the ED mirror the true geographic distribution of all patients requiring EMS transport and (2) ambulance routing behavior strictly adheres to the LA County EMS written guidelines in practice.

SOURCES OF DATA

Table 6 lists the sources of data used in development of the Impact Model. As a general rule, the most current data and data specific to the LA County study area were preferred when multiple data sources were available.

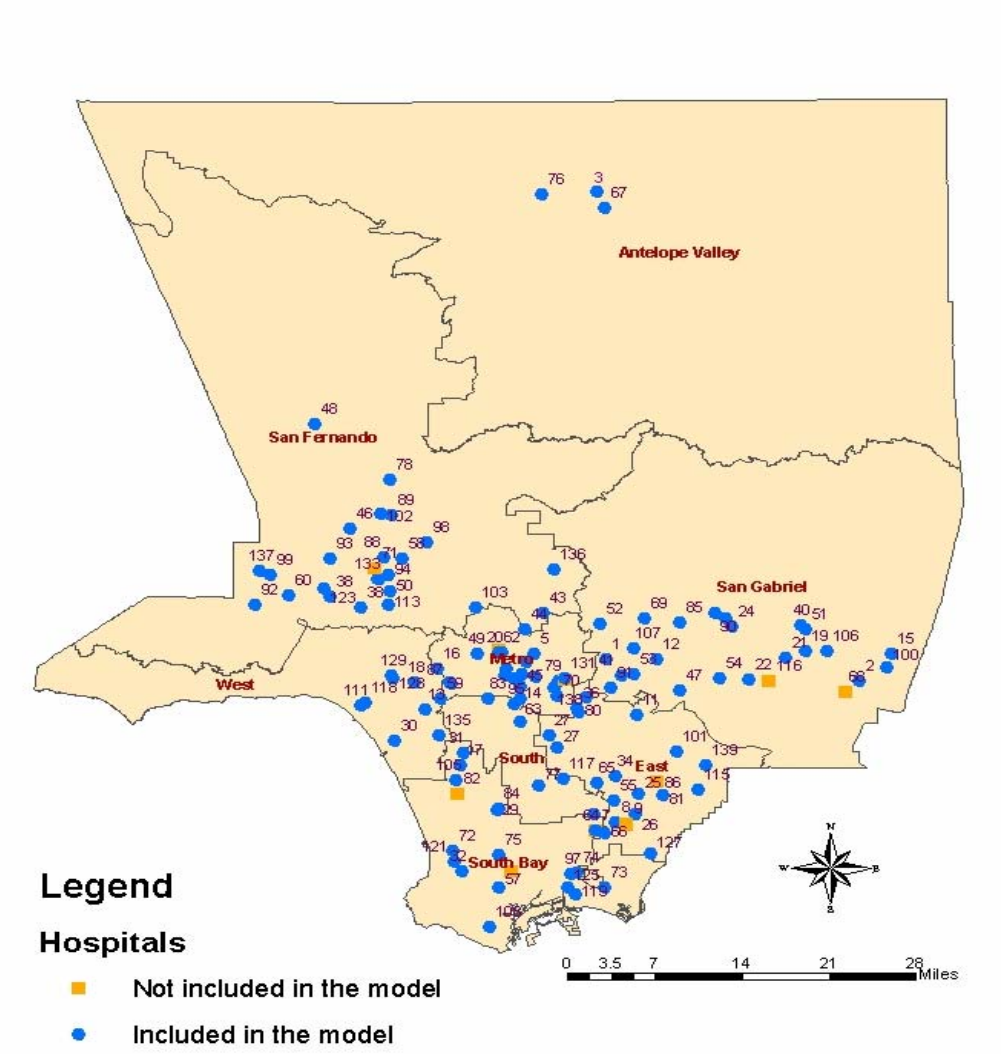
Table 6: Data Sources

Data Source	Data Used For
NHF 2002 Hospital and ED Survey	Number and type of hospital beds, ED treatment bays, inpatient discharges, ED visits, ED waiting times, ED disposition, and LOS values
OSHPD 2000 patient-level discharge data	Patient demographic characteristics, inpatient discharges, scheduled status, type of care, insurance status, and LOS values
OSHPD 2000 facility-level annual utilization and financial data	Number and type of hospital beds, ED treatment bays, inpatient discharges, ED visits, and LOS values
L.A. Health Survey 1999 (Main and Parent Modules)	Insurance payer status stratified by age, race, sex, and SPA
Census 2000 SF1 and 2000 SF3 files	Population counts stratified by age, sex, race, ethnicity, and income
State of California, Department of Finance, *Race/Ethnic Population with Age and Sex Detail, 1970-2040*	Population estimates stratified by age, sex, race, and ethnicity for 2002
Census 2000 TIGER/Line® Data[17]	L.A. County boundaries, 2000 L.A. County Census block boundaries, 2000
ESRI® Data and Maps CD, distributed with ArcView® version 8	Zip code boundaries for California, 1999
Los Angeles Department of Health Services	Service Planning Area (SPA) boundaries, 2002 Hospital street addresses (geocoded using ArcView® version 8)

Fourteen of the 139 hospitals in LA County[18] are not included in the Model (see Figure 3 and Appendix A) based on the application of two exclusion criteria. Hospitals not present in the 2000 OSHPD Discharge data set (13 out of 139) are excluded because the OSHHPD data supply the rate of utilization and patient characteristics necessary to estimate arrival rates.

[17] Internet database hosted by ESRI® at arcdata.esri.com/data/tiger2000/tiger_download.cfm
[18] A master list of hospitals in the county was compiled by DHS and the Healthcare Association of Southern California (HASC), see Appendix A.

Figure 3: Location of Hospitals Included In and Excluded From the Model



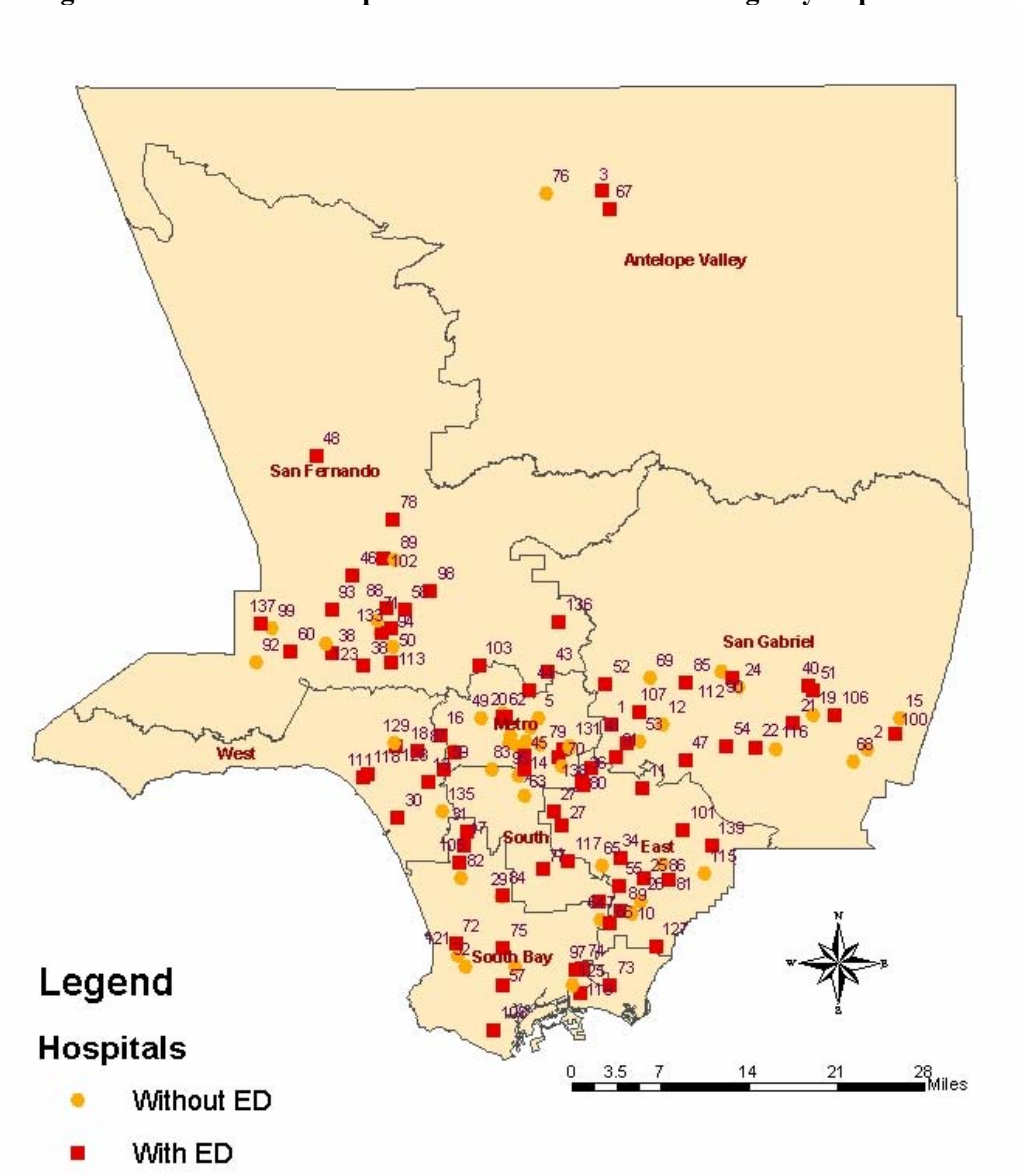
Most of the 13 hospitals also lacked data from the OSHPD Disclosure Report; none responded to the NHF survey. In addition, Avalon hospital is excluded because it is located outside the contiguous borders of the county and the number of patients transferred to and from Avalon is small. Of the 14 hospitals excluded, only one (Avalon hospital) maintains an emergency department.

PARAMETERESTIMATION

Capacity

System capacity is characterized by the number and type of staffed inpatient beds at each of the 125 hospitals in the model, and the number of treatment bays at each of the 82 EDs included in the Model (see Figure 4 and Appendices A and B). The number and type of inpatient beds was obtained from the NHF 2002 Hospital and ED Survey and OSHPD 2000 Utilization and Financial Data. Inpatient beds were grouped into eight categories (Table 2). The categories were aggregated from OSHPD bed classifications in consideration of the bed types named in Scenario III: medical/surgical, psychiatric, and physical rehabilitation.

Figure 4: Location of Hospitals With and Without Emergency Departments



Because the NHF Survey data are more recent by one year than OSHPD 2000 data, capacity as reported by NHF Survey respondents was used when available. When information regarding staffed beds was not available from either source, available beds were used instead (this occurred for two hospitals). When both staffed and available bed capacity information was unavailable, licensed beds were used (one hospital). As described below, inpatient capacity and inpatient arrival rates were reduced to account for utilization by patients originating outside LA County.

Physical Rehab Beds: The Model's physical rehabilitation bed category includes only beds at facilities that can accept Rancho Los Amigos patients, based on licensure status as an acute rehab unit and whether the facility uses the Inpatient Rehab Facility Patient Assessment Instrument (IRFPAI) for Medi-Cal reimbursement. Physical rehabilitation beds at hospitals without these designations (i.e., rehab beds that cannot provide the level of care required by Rancho de Los Amigos patients) were classified as beds in the "other" bed category.

Hallway Beds: The Model does not increase ED capacity to include hallway beds because it is assumed that the number of medical staff does not increase when hallway beds are added. Therefore, even when facilities utilize hallway beds, it is not necessarily the case that patients move through the system more rapidly because there are no additional physicians to tend to them.

Arrival Rates

The Model's parameterization of arrival rates is designed to ensure that each hospital and bed type in the baseline Model receive the number of visits, and distribution of patient characteristics, observed in OSHPD 2000 data, adjusted for Census growth from 2000 to 2002. An important assumption underlying the Model's arrival rates is that the rate of utilization per Census person in each zip code, conditional on sex, age, race, and ethnicity, did not change from 2000 to 2002. For purposes of implementation, the Model generates patient arrivals in three steps. The steps are identical, but conducted separately, for ED and inpatient arrivals.

First, patients characterized by age, sex, race, ethnicity, SPA of residence, and "basic" payer (Table 1) are generated according to a Poisson arrival process parameterized using year 2000 data. Specifically, the mean annual rate of visits for each of the 960 cells jointly characterized by the six patient characteristics is a ratio: the annual number of OSHPD 2000 visits over the number of like individuals in the Census 2000 population (i.e., visits per person).[19] The mean rate, say, for a year 2002 model is then constructed by multiplying the year 2000 rate by a 2002 Census count for a cell in 2002 to obtain the annual number of visits. In fact, the 2000 rates were first smoothed using a hierarchical Gamma-Poisson Bayesian model (Congdon 2002) in order to adjust rates estimated with extremely high variance due to small population counts in the cell. This approach adjusts cells that are estimated with low precision due to small cell size by "borrowing strength" from rates that are estimated more precisely (i.e., those with large cell counts).[20]

[19] A later section describes imputation of payer status for Census counts aggregated to the SPA level by age, sex, race, and ethnicity.

[20] It could be argued that smoothing rates in this way introduces error. However, consider a cell with a small Census population of 25 individuals, with no visits observed in year 2000 according to OSHPD data. Although a zero-visit rate is not uncommon for small cells because hospitalizations are rare events, certainly there is some non-zero

Second, arriving patients are assigned to an "initial" hospital or ED. The assignment is drawn from an empirical distribution; the probability a patient is initially assigned to a given hospital is the hospital's relative share of visits by patients in the relevant geo-demographic-payer category.

Third, a zip code is assigned to the patient, conditional on the arrival's SPA, race (white /non-white), and initial hospital. Other demographic characteristics are not included in this step due to the large number of cells created by interactions with zip code. The indicator white vs. non-white is chosen to predict zip code because using 2000 Census, LA County residents were found to be segregated to a greater extent by their white/non-white status than any other demographic characteristic, including income.[21] Further, conditioning zip code assignment on initial hospital ensures that the geographic distribution of patients at each inpatient ward and ED is recovered.

Finally, the bed type required by the patient is assigned conditional on initial hospital and age (pediatric vs. adult), again from an empirical distribution based on relative shares of visits, as observed in OSHPD 2000 annual data.[22]

Inpatient Arrivals: Several exclusion criteria were applied to the OSHPD 2000 discharge data to identify the set of visits of interest:

1) Visits by non-LA County residents were excluded
2) Patients who were admitted through the ED were excluded
3) Nursery patients were excluded

Non-LA County residents were excluded for several reasons. First, the Model's goal is to measure Scenario III's impact on LA County residents—they are the population of interest. Second, in order to predict the impact in future years (e.g., in 2007 and 2012) and incorporate patient information in the utilization prediction, the Model requires substantial information about population changes over time. For example, utilization in the Model depends upon a patient's geographic residence, age, gender, ethnicity, and payer status, among other factors. Obtaining reasonable estimates for non-LA County areas that may be served by LA County facilities was not feasible during the time period allotted for Model development, and exclusion of non-LAC patients, which account for about 8% of the inpatient population, does not detract from the Model's validity. To account for the system capacity used by non-LA County residents, the number of inpatient beds was reduced—on a hospital-by-hospital basis—to account for non-residents' 2000 utilization. By removing non-LA County inpatients from the arrival rate and

probability that each of these 25 individuals will be hospitalized in the following year. Smoothing provides an estimate of this probability by drawing on cells with larger population counts. Because the adjustment is proportional to the precision of the estimates, the smoothing procedure has only a small and typically unmeasurable impact on rates estimated from cells with large population counts. The Gamma-Poisson model was implemented in WinBUGS 1.3.

[21] This analysis, not reported in detail here, used the dissimilarity index to compute and compare measures of residential segregation separately for each demographic characteristic that appears in the Model.

[22] Unfortunately, OSHPD discharge data sets do not include bed type information. This prevents conditioning the bed type assignment on additional patient demographic information. Given more time, it is possible that bed types could be imputed for the discharge data set based on patient diagnosis and procedure codes.

reducing their bed use**,** the Model effectively assumes that the 2000 rate of utilization for non-LA county residents remains constant over time.

Because hospital admission is one possible disposition for an ED patient, and because the Model separately considers the experiences of ED patients as well as inpatients, inpatients admitted directly by a physician are modeled separately from those admitted through the ED. Inpatients admitted through the ED are a function of the ED arrival rate, described below, and are modeled by assigning each patient who visits an ED a probability of admission that is a function of his or her acuity level. Thus, inpatients admitted through EDs are excluded from the inpatient arrival rate, which reflects the set of patients who are directly admitted by their physicians.

Nursery patients were excluded because they are not affected by the inpatient capacity reductions specified in Scenario III. Because the Model's lowest age category is so broad (ages 0-19), nursery patients would skew this age bin unnecessarily. Uncomplicated newborn nursery patients were identified in the discharge data using a combination of diagnostic variables (i.e., major diagnostic category and ICD-9-CM codes) and excluded from the arrival rate.

Data on the remaining eligible population were relatively complete, yet in some cases imputation was required to replace missing values for demographic and insurance variables. In each case, the number of missing values was a small percentage (>1%) of the total population. The hotdeck method was used for imputation when there were enough missing values to approximate a stratified distribution; otherwise random assignment was used. The hotdeck procedure is one method to deal with missing data values due to item non-response. Its general principle is to use the current data to impute values for observations with missing values. To do this, the method randomly draws values from a stratified sample of non-missing values for each missing value, with the user specifying the cells produced by the stratification. A major assumption with the hotdeck procedure is that the missing data are missing at random, as it preserves the prior distribution once the missing data are imputed. Out of the 537,662 inpatients in 2000:

1) Six (6) observations missing a sex value were randomly assigned to a sex category according to the global distribution of observed sex values.
2) Eleven (11) observations missing an age value were randomly assigned to an age bin according to the proportions of observed values in our 3 age categories.
3) 4,794 observations with missing or unknown race were hotdecked using SPA-age cells.
4) 3,529 observations with missing or unknown payer values were hotdecked using SPA-age-sex-race-ethnicity cells.

ED Arrivals: Because reliable data on the demographic, geographic, and payer distributions of ED patients is lacking, OSHPD 2000 Discharge Data for inpatients *who were admitted through the ED* were used to construct an empirical distribution of these characteristics to all ED patients. Because not all ED patients are admitted, the demographic and geographic distribution of admits may differ from the entire ED patient population. The number of ED patients at each of the 82 facilities in the Impact Model was drawn from the NHF 2002 Hospital and ED Survey and OSHPD 2000 Utilization and Financial Data.

Predicting insurance status for arrival rate computation: Data from the 2000 Census and the 1999 LA Health Survey were used to estimate insurance status for all residents of LA County. These estimates provide the denominator for the arrival rate, computed as the annual number of visits per person in the census population, separately for cells defined by joint demographic, geographic, and "basic" payer cells (Table 1). First, a multinomial regression equation was estimated to predict "basic" payer status as a function of age, race, sex, household income, and SPA. The Census provided estimates of the age, race, sex, and household income distribution for residents in the eight SPAs; inputting these estimates into the regression equation yielded predictions of insurance status for the LA County population. This method assumes that the relationship between insurance status and age, race, sex, household income, and SPA was unchanged between 1999 and 2002.

"Detailed" payer status (Table 1) is not built into the arrival rate as described above, but instead is assigned to patients conditional on their basic payer category. Detailed payer categories were not used directly in the arrival rate in order to keep cell counts large enough for reliable estimation. An implication of this method is that detailed payer status is a function of basic payer status but is independent of other patient characteristics.

Length-of-Stay

LOS values were estimated separately for inpatient and ED stays.

Inpatient LOS: Inpatient LOS values are drawn from a Gamma distribution whose parameters depend on facility and bed type. Examination of patient-level LOS as reported in OSHPD 2000 discharge data revealed that inpatient LOS is right-skewed and that, for most bed types, the observed mean LOS is approximately equal to its standard deviation. Both factors suggest that inpatient LOS can be modeled adequately by an Exponential or Gamma distribution. The Gamma was selected to allow flexibility in the specification of the distribution for Rehabilitation beds, which exhibited a slight deviation from the exponential (i.e., sd $\cong$ 0.85*mean).[23]

Mean lengths-of-stay for each hospital by bed type were calculated from both the NHF 2002 Hospital and ED Survey and OSHPD 2000 Utilization and Financial Data. The annual number of patient days was divided by the annual number of discharges to yield a hospital-specific LOS value for each bed type. Outliers were identified as those means more than two standard deviations from the countywide mean for a particular bed type. The determination of whether to replace outliers identified in this way with the county-wide average hinged on whether the occupancy rate using the calculated LOS would be unreasonable (e.g., greater than 100%) and whether the hospital in question might reasonably be expected to have a LOS far from the county-wide mean. For example, a pediatric acute bed at Rancho Los Amigos might be expected to have a much longer LOS than other general acute care hospitals. In fact, its LOS was 10 times longer than the countywide average. However, the countywide average produced occupancy rates that were implausibly low. Thus, although initially identified as an outlier, the value was determined to be valid and not the result of data entry or reporting error. Other values deemed spurious were substituted with the countywide mean. This occurred for five out of 483 hospital-bed cells.

[23] For each hospital and bed type pair, the Gamma distribution was parameterized as follows: the scale parameter of the Gamma is the variance divided by the mean; the shape parameter is the mean squared divided by the variance.

ED LOS: ED LOS values are drawn from a Normal distribution that depends on facility and acuity level. While data on mean ED LOS was collected in the NHF 2002 Hospital and ED Survey, recent estimates of the standard deviation of ED LOS could not be found in the literature. Records of ED LOS are not kept by most hospitals and are not in OSHPD data. Therefore, choice of the Normal distribution with standard deviation fixed at 25% of the mean follows the modeling approach of Cahill and Render (1999), but is not the result of a rigorous examination of empirical data.

Because ED LOS values are not routinely collected or reported, it is difficult to obtain high-quality and accurate data for this measure. Accordingly, we did not expect to recover estimates of ED LOS that perfectly matched reality from the NHF 2002 Hospital and ED Survey. However, in addition to LOS values, survey respondents were also asked to report ED wait times for critical, urgent, and non-urgent patients. Preliminary runs of the Model confirmed that in many cases, use of the ED LOS values reported in the NHF survey did not produce waiting times consistent with those reported. After consulting with the TAC and other emergency medicine experts, we concluded that the reported waiting times were likely to be more reliable than the reported ED LOS values. We proceeded by regarding the means of the ED LOS distributions as parameters to be calibrated: for each ED and acuity level, ED LOS was varied systematically until the corresponding waiting time produced by the Model approximated the time reported in the survey.

ED Leaving Without Being Seen (LWBS) Behavior

ED patients are assumed to leave without being seen (LWBS) if forced to endure a sufficiently long wait and outcomes regarding them result from a number of important assumptions. There is little published evidence on the incidence of LWBS across patient subpopulations apart from a decade-old study by Baker et al. (1991). As a result, related parameters in the Model, namely the time patients are willing to wait before leaving the ED, have limited empirical backing.

The distribution of waiting thresholds in the Model follows a Triangular distribution with minimum=5, mode=10, and maximum=24 hours. The maximum is chosen to reflect the finding by Lambe et al. (2003) in which patients at California EDs were observed to wait up to 22 hours and 30 minutes before seeing a physician; we choose a slightly more conservative estimate of 24 hours because Lambe et al.'s observations are right-censored at 24 hours due to the duration of their observation period. Unfortunately, the Baker study does not report data useful for estimating this parameter.

However, given this maximum, a minimum and mode were selected to attain a mean of 13 hours; Baker's mean from a two-week observation period during spring 1990 was 6.4 hours. The more conservative parameter was chosen because when using Baker's figure, the Model produced estimates that were inconsistent with ED waiting times reported in NHF survey data. The waiting threshold distribution was shifted to the right to calibrate the Model to reported ED wait times. Thus, the validity of the LWBS estimates depends ultimately upon the validity of the figures reported in the survey. If, for example, respondents underestimated ED wait times in their surveys returned to NHF, then the Model will underestimate incidence of LWBS.

The Triangular distribution generates the right-skew one would intuitively expect (i.e., a small fraction of individuals are willing to wait a very long time) with parameters that are easily interpreted. Easy interpretation was considered important due to the lack of empirical estimates concerning LWBS behavior.

What happens after patients LWBS? Below, p() indicates a proportion/probability. Among the subjects in Baker et al. (1991) who left without being seen:

a) p(no attempt to see a physician within 1 wk) = 0.41.
b) p(attempt to see a physician within 1 wk) = 0.51
    a. p(return to same ED within 1 wk) = 0.34
    b. p(visit another ED within 1 wk) = 0.37
    c. p(to a private clinic or office within 1 wk) = 0.29
c) p(try and fail to see a physician within 1 wk) = 0.08

These data are incorporated in the Model in the following way:

41% of patients who LWBS exit the system (i.e., make no further attempt to see a physician).

An additional 8% also exit the system either for fault of access to care (trying and failing to see a physician) or lack of awareness of other nearby EDs.

Of the remaining 51%,

- 71% (0.34+0.37) wait a random period of time, distributed uniformly in [24hrs, 1wk] before returning to an ED. The ED they return to is the initial ED with 50% probability or else the most proximate ED in terms of driving distance.

- 29% leave the system for a private clinic or physician's office within one week [24hrs, 1wk]. Those in this group who require admission reenter the system as unscheduled inpatients. The remainder exits the system.

Do patients who LWBS get admitted if they return? Although Baker et al. (1991) report that 16 (11%) of those who LWBS and were contacted by research staff were hospitalized when they first saw a physician, this figure is not used in the Model due to the small sample size and high variance of the estimate. Instead, after LWBS, the 51% of those who seek care retain their initial probability of requiring admission (recall this probability was estimated for ED patients in the Model from OSHPD, NHF Survey, and LA County EMS TEMIS data). Thus, the Model makes a simplifying assumption that the probability of requiring admission does not change following a LWBS episode.

LIMITATIONS OF USING DISCHARGE DATA TO ESTIMATE ARRIVAL RATES

OSHPD discharge data provide the dates of admission and discharge for each inpatient who received care, but not information on patients who sought care and did not receive it, or who might have been hospitalized at some other facility had beds been available. Instead, only the final outcomes of the detailed patient placement process described earlier in the conceptual model are observed. The omission has important implications for interpretation of Model results.

First and foremost, in both the baseline scenario and Scenario III, estimates of the number of inpatients who do not receive care, or who are sent by their physician to the ED, are necessarily underestimates. Consequently, the *relative differences* in this measure (i.e., Scenario III outcome measures as a percent of baseline outcome measures) *cannot be determined from the results of the Model* because the true denominators are unknown. Absolute differences, however, may be computed. That is, the *additional* number of patients who do not receive care, or who experience some other placement outcome, as a result of a reduction in capacity or other change to the system, can be reliably determined from the Model results but the relative difference cannot.

Under the assumption that records of ED visits in OSHPD data include visits by individuals who waited in the ED, but did not stay to receive treatment, the ED LWBS measures produced by the Model do not suffer from this limitation.

GEOGRAPHIC CALCULATIONS

Geographic analyses were required for computation of the arrival rate, which is a ratio of the annual number of visits to census population counts at the zip code and SPA levels, stratified by age, sex, race, and ethnicity; geographic analyses were also required to produce estimates of driving distances (1) between zip code population centroids and hospitals and (2) between hospitals. Distances enter into patient placement rules employed by the Model when an alternative facility is required when, for example, bed availability is lacking at an urgent inpatient's primary hospital, and when patients who leave the ED without being seen seek care at another ED nearby.

The sources of data used to define zip code and SPA boundaries are given in Table 6. Zip code population counts are aggregates of census block population counts, apportioned according to the share of census block area within each zip code; apportioning is necessary because the area comprising a particular block is often contained in multiple zip codes. Apportioning was conducted separately for each of 30 joint age-sex-race-ethnicity subpopulations (Table 1 provides the cell definitions) so that the aggregated counts take residential segregation of individuals by these attributes throughout the county into account. An assumption underlying this apportioning method is that populations are distributed uniformly within census blocks. Zip codes are apportioned to SPAs similarly.

SPA population counts are also aggregated by census blocks, but no apportioning was necessary because SPAs are aggregates of census tracts by design: census units do not cross SPA boundaries.

Zip codes were selected as the highest level of geographic resolution for the Model because they are the only geographic identifiers available in the only source of patient visit (OSHPD) data covering the entire county.

Patients are assumed to reside at the population centroid of their reported zip code. The population centroid represents the "expected" or average location of the geographic distribution of individuals within a zip code; for this reason it is preferred to the geometric centroid as an estimator of patient location. Zip code centroids were calculated as population-weighted averages of the geometric centroids of census blocks, scaled by the portion of the block's area contained in the zip code. Hospital locations were obtained by geocoding hospital addresses. Driving distances that take into account the county's transit network were then computed between all pairs of zip code centroids and hospitals, and separately between all pairs of hospitals, using a GIS.

MODEL EXECUTION

Each simulation run consists of a warm-up period followed by an observation period. The warm-up period lasts 40 days of simulated time and is necessary to bring the Model, in which all beds are initially empty, to steady state. The system records outcomes for patients who enter during the observation period (days 60 to 80) and does not terminate until all relevant outcomes (e.g., waiting times, placement outcomes) for these patients have been observed and recorded. Occupancy rates for each bed type at each hospital are tracked from the end of the warm-up period until the simulation terminates (days 41 to 80). A relatively long observation period is required for occupancy rates because they represent averages over time. In comparison, the patient observation window is somewhat shorter due to the memory requirements associated with tracking a large number of patients.

Findings are based on confidence intervals constructed from 35 runs of the Baseline Scenario Model and 29 runs of the Scenario III Model. The Model is implemented using Extend™ 5.0 software from Imagine That, Inc., with an execution time for a single run of approximately five hours.

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APPENDIX A

Hospitals identified in Figures 3 and 4
(* = excluded from the model—see maps)

Model ID	OSHPD ID	Name of hospital
1	190017	Alhambra Hospital
2	194010	American Recovery Center
3	190034	Antelope Valley Hospital Medical Center
*4	190045	Avalon Municipal Hospital
5	190052	Barlow Respiratory Hospital
*6	190057	Bay Harbor
*7	190479	Behavioral Healthcare Systems of Long Beach
8	190066	Bellflower Medical Center
*9	190069	Bellwood General Hospital
*10	194044	Bellwood Health Center
11	190081	Beverly Hospital
12	190020	BHC Alhambra Hospital
13	190110	Brotman Medical Center
14	190125	California Hospital Medical Center - Los Angeles
15	190137	Casa Colina Hospital For Rehab Medicine
16	190555	Cedars Sinai Medical Center
17	190148	Centinela Hospital Medical Center
18	190155	Century City Hospital
19	190163	Charter B H S - Covina
20	190170	Children's Hospital of Los Angeles
21	190413	Citrus Valley Medical Center - IC Campus
22	190636	Citrus Valley Medical Center - QV Campus
23	190661	City of Angels Medical Center
24	190176	City of Hope National Medical Center
25	190766	Coast Plaza Doctors Hospital
26	190184	College Hospital
27	190197	Community & Mission Hospital of Huntington Park
*28	190538	Community & Mission Hospital of Huntington Park
29	190196	Community Hospital of Gardena
30	190500	Daniel Freeman Marina Hospital
31	190230	Daniel Freeman Memorial Hospital
32	190232	Del Amo Hospital
33	190857	Doctors Hospital of West Covina
34	190243	Downey Community Hospital
35	196168	Earl & Lorraine Miller Children's Hospital (Part of Long Beach Memorial)
36	190256	East Los Angeles Doctors Hospital
*37	190260	Edgemont Hospital
38	190280	Encino-Tarzana Regional Medical Center
39	190517	Encino-Tarzana Regional Medical Center
40	190298	Foothill Presbyterian Hospital-Johnston Memorial
41	190315	Garfield Medical Center

Model ID	OSHPD ID	Name of hospital
42	190317	Gateways Hospital & Mental Health Center
43	190323	Glendale Adventist Medical Center - Wilson Terrace
44	190522	Glendale Memorial Hospital & Health Center
45	190392	Good Samaritan Hospital
46	190348	Granada Hills Community Hospital
47	190352	Greater El Monte Community Hospital
48	190949	Henry Mayo Newhall Memorial Hospital
49	190380	Hollywood Community Hospital of Hollywood
50	190814	Hollywood Community Hospital of Van Nuys
51	190328	Huntington East Valley Hospital
52	190400	Huntington Memorial Hospital
53	190410	Ingleside Hospital
54	196035	Kaiser Foundation Hospital - Baldwin Park
55	190430	Kaiser Foundation Hospital - Bellflower
*56	190135	Kaiser Foundation Hospital - Carson
57	190431	Kaiser Foundation Hospital - Harbor City
58	190432	Kaiser Foundation Hospital - Panorama City
59	190434	Kaiser Foundation Hospital - West La
60	191450	Kaiser Foundation Hospital - Woodland Hills
61	190646	Kaiser Foundation Hospital Mental Health Center
62	190429	Kaiser Foundation Hospital Sunset
63	190150	Kedren Community Mental Health Center
64	194981	La Casa Psychiatric Health Facility
65	191306	LAC/Rancho Los Amigos National Rehab Center
66	190240	Lakewood Regional Medical Center - South Street
67	190455	Lancaster Community Hospital
*68	191014	Lanterman Developmental Center
69	190462	Las Encinas Hospital
70	190468	Lincoln Hospital Medical Center
*71	194599	Lions Gate Psychiatric Health Facility
72	190470	Little Company of Mary Hospital
73	190475	Long Beach Community Medical Center
74	190525	Long Beach Memorial Medical Center
75	191227	Los Angeles Co Harbor-UCLA Medical Center
76	191261	Los Angeles Co High Desert Hospital
77	191230	Los Angeles Co Martin Luther King Jr/Drew Med Ctr
78	191231	Los Angeles Co Olive View Medical Center
79	191228	Los Angeles Co USC Medical Center
80	190198	Los Angeles Community Hospital
81	190570	Los Angeles Community Hospital of Norwalk
*82	190523	Los Angeles Metropolitan Hospital-Hawthorne Campus
83	190854	Los Angeles Metropolitan Medical Center
84	190521	Memorial Hospital of Gardena
85	190529	Methodist Hospital of Southern California
*86	190958	Metropolitan State Hospital

Model ID	OSHPD ID	Name of hospital
87	190534	Midway Hospital Medical Center
88	190524	Mission Community Hospital - Panorama Campus
89	190676	Mission Community Hospital - San Fernando Campus
90	190541	Monrovia Community Hospital
91	190547	Monterey Park Hospital
92	190552	Motion Picture & Television Hospital
93	190568	Northridge Hospital Medical Center
94	190810	Northridge Hospital Medical Center - Sherman Way
95	190581	Orthopaedic Hospital
96	190307	Pacific Alliance Medical Center
97	190587	Pacific Hospital of Long Beach
98	190696	Pacifica Hospital of The Valley
99	190605	Pine Grove Hospital
100	190630	Pomona Valley Hospital Medical Center
101	190631	Presbyterian Intercommunity Hospital
102	190385	Providence Holy Cross Medical Center
103	190758	Providence Saint Joseph Medical Center
104	190382	Queen of Angels/Hollywood Presbyterian Med Center
105	190366	Robert F. Kennedy Medical Center
106	190673	San Dimas Community Hospital
107	190200	San Gabriel Valley Medical Center
108	190680	San Pedro Peninsula Hospital
109	190681	San Vicente Hospital
110	190685	Santa Marta Hospital
111	190687	Santa Monica – UCLA Medical Center
112	190691	Santa Teresita Hospital
113	190708	Sherman Oaks Hospital And Health Center
114	190712	Shriners Hospital For Crippled Children - L.A.
*115	190449	Specialty Hospital of Southern California
116	190458	Specialty Hospital of Southern California/SGV
117	190754	St. Francis Medical Center
118	190756	St. John's Hospital & Health Center
119	190053	St. Mary Medical Center
120	190762	St. Vincent Medical Center
121	194967	Star View Adolescent - P H F
122	190599	Suburban Medical Center
123	190782	Tarzana Treatment Center
124	190784	Temple Community Hospital
125	191225	Tom Red gate Memorial Recovery Center
126	190422	Torrance Memorial Medical Center
127	190159	Tri-City Regional Medical Center
128	190796	UCLA Medical Center
129	190930	UCLA Neuropsychiatric Hospital
130	191216	USC Kenneth Norris
*131	194219	USC University Hospital

Model ID	OSHPD ID	Name of hospital
*132	191389	USC University Hospital - Norfolk
133	190812	Valley Presbyterian Hospital
134	190816	Van Nuys Hospital
135	190305	Vencor Hospital - Los Angeles
136	190818	Verdugo Hills Hospital
137	190859	West Hills Hospital & Medical Center
138	190878	White Memorial Medical Center
139	190883	Whittier Hospital Medical Center

APPENDIX B

Hospitals with Emergency Rooms
(* = excluded from the model—see maps)

Model ID	OSHPD ID	Name of hospital
1	190017	Alhambra Hospital
3	190034	Antelope Valley Hospital Medical Center
8	190066	Bellflower Medical Center
11	190081	Beverly Hospital
13	190110	Brotman Medical Center
14	190125	California Hospital Medical Center - Los Angeles
16	190555	Cedars Sinai Medical Center
17	190148	Centinela Hospital Medical Center
18	190155	Century City Hospital
20	190170	Children's Hospital of Los Angeles
21	190413	Citrus Valley Medical Center – IC Campus
22	190636	Citrus Valley Medical Center - QV Campus
25	190766	Coast Plaza Doctors Hospital
27	190197	Community & Mission Hospital of Huntington Park
30	190500	Daniel Freeman Marina Hospital
31	190230	Daniel Freeman Memorial Hospital
34	190243	Downey Community Hospital
36	190256	East Los Angeles Doctors Hospital
38	190280	Encino-Tarzana Regional Medical Center
39	190517	Encino-Tarzana Regional Medical Center
40	190298	Foothill Presbyterian Hospital-Johnston Memorial
41	190315	Garfield Medical Center
43	190323	Glendale Adventist Medical Center - Wilson Terrace
44	190522	Glendale Memorial Hospital & Health Center
45	190392	Good Samaritan Hospital
46	190348	Granada Hills Community Hospital
47	190352	Greater El Monte Community Hospital
48	190949	Henry Mayo Newhall Memorial Hospital
51	190328	Huntington East Valley Hospital
52	190400	Huntington Memorial Hospital
54	196035	Kaiser Foundation Hospital - Baldwin Park
55	190430	Kaiser Foundation Hospital - Bellflower
57	190431	Kaiser Foundation Hospital - Harbor City
58	190432	Kaiser Foundation Hospital - Panorama City
59	190434	Kaiser Foundation Hospital - West LA
60	191450	Kaiser Foundation Hospital - Woodland Hills
62	190429	Kaiser Foundation Hospital Sunset
66	190240	Lakewood Regional Medical Center - South Street
67	190455	Lancaster Community Hospital
72	190470	Little Company of Mary Hospital
73	190475	Long Beach Community Medical Center

Model ID	OSHPD ID	Name of hospital
74	190525	Long Beach Memorial Medical Center
75	191227	Los Angeles Co Harbor-UCLA Medical Center
77	191230	Los Angeles Co Martin Luther King Jr/Drew Med Ctr
78	191231	Los Angeles Co Olive View Medical Center
79	191228	Los Angeles Co USC Medical Center
80	190198	Los Angeles Community Hospital
81	190570	Los Angeles Community Hospital of Norwalk
84	190521	Memorial Hospital of Gardena
85	190529	Methodist Hospital of Southern California
87	190534	Midway Hospital Medical Center
88	190524	Mission Community Hospital - Panorama Campus
91	190547	Monterey Park Hospital
93	190568	Northridge Hospital Medical Center
94	190810	Northridge Hospital Medical Center - Sherman Way
97	190587	Pacific Hospital of Long Beach
98	190696	Pacifica Hospital of The Valley
100	190630	Pomona Valley Hospital Medical Center
101	190631	Presbyterian Intercommunity Hospital
102	190385	Providence Holy Cross Medical Center
103	190758	Providence Saint Joseph Medical Center
104	190382	Queen of Angels/Hollywood Presbyterian Med Center
105	190366	Robert F. Kennedy Medical Center
106	190673	San Dimas Community Hospital
107	190200	San Gabriel Valley Medical Center
108	190680	San Pedro Peninsula Hospital
110	190685	Santa Marta Hospital
111	190687	Santa Monica - UCLA Medical Center
112	190691	Santa Teresita Hospital
113	190708	Sherman Oaks Hospital And Health Center
117	190754	St. Francis Medical Center
118	190756	St. John's Hospital & Health Center
119	190053	St. Mary Medical Center
122	190599	Suburban Medical Center
126	190422	Torrance Memorial Medical Center
127	190159	Tri-City Regional Medical Center
128	190796	UCLA Medical Center
133	190812	Valley Presbyterian Hospital
136	190818	Verdugo Hills Hospital
137	190859	West Hills Hospital & Medical Center
138	190878	White Memorial Medical Center
139	190883	Whittier Hospital Medical Center

APPENDIX C
HASC Hospital Survey
Trauma Center Version

HOSPITAL AND EMERGENCY DEPARTMENT SURVEY

Impact Study of Scenario III on The Los Angeles County Hospital Delivery System

Background

The LA County Board of Supervisors (Board) has requested that the National Health Foundation (NHF) and the LA County Department of Health Services (LAC DHS) together update the inpatient and emergency services component of a Supply and Demand Model previously used in County health services planning. The Board has requested a quick turnaround time for an initial analysis of the impact of Scenario III of LAC DHS's Restructuring Recommendations.

To effectively contribute to the impact assessment, this modeling tool must be restructured and must use up-to-date information. This survey has been developed by NHF and the Hospital Association of Southern California to gather data to supplement publicly available historical data and to gain a better understanding of your future plans.

The survey questions are grouped into five sections so that the most appropriate individuals can complete each section. For most hospitals, someone from the ED (preferably the director) should complete sections C and D. The sections are:

A. Hospital identifying information (4 questions)
B. Hospital inpatient information (17 questions)
C. Emergency department information (19 questions)
D. Psychiatric emergency department information (11 questions)
E. Anticipated response to Scenario III (2 questions)

All information obtained from the survey will be kept strictly confidential and will only be publicly presented in aggregate.

Thank you for participating in this process, which is vital to planning for the upcoming changes to Los Angeles County's health care delivery system. If you have any questions, please call Julia Pennbridge at 213-538-0747 or Quinnie Le at 213-538-0743.

Please submit your survey by September 6, 2002 to:

Julia Pennbridge, PhD
515 S. Figueroa St., Suite 1300
Los Angeles, CA 90071
Fax 213-629-4272

A. HOSPITAL IDENTIFYING INFORMATION

Please complete every line.

A1. Hospital Name: _____

A2. System Affiliation: _____

A3. Designated Contact Person: _____

Title: _____

Phone Number: _____

A4. OSHPD Facility ID Number: _____

B. HOSPITAL INPATIENT SECTION

This survey refers to FY 2001. If your hospital collects data for the calendar year rather than the fiscal year, please report that information instead.

B1. How many licensed, available, and staffed beds (on average) of the following bed types did your hospital have in FY 2001?

Bed Type	Licensed Beds	Available Beds*	Staffed Beds
Medical/Surgical Intensive Care	_____	_____	_____
Medical/Surgical Acute (includes GYN)	_____	_____	_____
Pediatric Intensive Care	_____	_____	_____
Pediatric Acute	_____	_____	_____
Pediatric Sub-Acute	_____	_____	_____
Neonatal Intensive Care	_____	_____	_____
Coronary Care	_____	_____	_____
Other Intensive Care	_____	_____	_____
Perinatal (include OB & Alternate Birthing Centers)	_____	_____	_____
Physical rehabilitation Center	_____	_____	_____
Psychiatric intensive (Isolation) Care	_____	_____	_____
Psychiatric Acute – Adult	_____	_____	_____
Psychiatric Acute – Adolescent & Child	_____	_____	_____
Skilled Nursing Care	_____	_____	_____
Other (please specify): _____	_____	_____	_____
Other (please specify): _____	_____	_____	_____

*Available Beds: The average complement of beds (excluding bassinets) physically existing and actually available for overnight use, regardless of staffing levels. Beds in suspense and beds in nursing units converted to uses other than inpatient overnight accommodations (which cannot be placed back into service within 24 hours) are not included.

B2. How many beds do you anticipate adding or reducing **prior to 2007** as a result of your hospital's capital planning cycle or the need to meet seismic requirements?

Please use "+" to indicate additions and "-"to indicate reductions (e.g., +7 beds, -10 beds)

❒ Not applicable / No changes anticipated

Bed Type	Beds
Medical/Surgical Intensive Care	_____
Medical/Surgical Acute (includes GYN)	_____
Pediatric Intensive Care	_____
Pediatric Acute	_____
Pediatric Sub-Acute	_____
Neonatal Intensive Care	_____
Coronary Care	_____
Other Intensive Care	_____
Perinatal (include OB & Alternate Birthing Centers)	_____
Physical rehabilitation Center	_____
Psychiatric intensive (Isolation) Care	_____
Psychiatric Acute - Adult	_____
Psychiatric Acute – Adolescent & Child	_____
Skilled Nursing Care	_____
Other (please specify): _____	_____
Other (please specify): _____	_____

B3. If you are adding or reducing capacity **prior to 2007**, how do you plan to do it? *(Check all that apply)*

❒ Additional building/wing
❒ Using existing building
❒ Closing building
❒ Converting building
❒ Increasing staff
❒ Decreasing staff
❒ Not applicable / No changes planned

B4. How many beds do you anticipate adding or reducing **between 2007 and 2012** as a result of your hospital's capital planning cycle or the need to meet seismic requirements?

Please use "+" to indicate additions and "-"to indicate reductions (e.g., +7 beds, -10 beds)

❒ Not applicable / No changes anticipated

Bed Type	Beds
Medical/Surgical Intensive Care	_____
Medical/Surgical Acute (includes GYN)	_____
Pediatric Intensive Care	_____
Pediatric Acute	_____
Pediatric Sub-Acute	_____
Neonatal Intensive Care	_____
Coronary Care	_____
Other Intensive Care	_____
Perinatal (include OB & Alternate Birthing Centers)	_____
Physical rehabilitation Center	_____
Psychiatric intensive (Isolation) Care	_____
Psychiatric Acute - Adult	_____
Psychiatric Acute – Adolescent & Child	_____
Skilled Nursing Care	_____
Other (please specify): _____	_____
Other (please specify): _____	_____

B5. If you are adding or reducing capacity **between 2007 and 2012**, how do you plan to do it? *(Check all that apply)*

❒ Additional building/wing
❒ Using existing building
❒ Closing building
❒ Converting building
❒ Increasing staff
❒ Decreasing staff
❒ Not applicable / No changes planned

B6. How many patients were discharged from your hospital for each bed type in FY 2001? What was the total number of patient days for each bed type?

Bed Type	Patient Discharges in FY 2001	Total Patient Days in FY 2001

Bed Type	Patient Discharges in FY 2001	Total Patient Days in FY 2001
Medical/Surgical Intensive Care	_____	_____
Medical/Surgical Acute (includes GYN)	_____	_____
Pediatric Intensive Care	_____	_____
Pediatric Acute	_____	_____
Pediatric Sub-Acute	_____	_____
Neonatal Intensive Care	_____	_____
Coronary Care	_____	_____
Other Intensive Care	_____	_____
Perinatal (include OB & Alternate Birthing Centers)	_____	_____
Physical rehabilitation Center	_____	_____
Psychiatric intensive (Isolation) Care	_____	_____
Psychiatric Acute – Adult	_____	_____
Psychiatric Acute – Adolescent & Child	_____	_____
Skilled Nursing Care	_____	_____
Other (please specify): _____	_____	_____
Other (please specify): _____	_____	_____

B7. For efficiency or other reasons, does your hospital attempt to keep its occupancy rate **below** a target level? Occupancy rate = (# occupied beds / # staffed beds)

❒ No

❒ Yes – If 'Yes', what is your maximum desired occupancy rate?

_____ % occupancy

B8. In what **month** did your highest average daily census occur in FY 2001?

_____ , FY 2001

B8b. What was the average daily census in the month you indicated in B8?

_____ # patients

B9. Does your hospital have a call panel that covers neurosurgical services?

❒ No *(Skip to B12)*

❒ Yes

B10. How many days per week does your call panel cover neurosurgical services?

_____ # days per week

B11. How many neurosurgeons are on your call panel?

_____ # neurosurgeons

B12. What percentage of your clinical and administrative staff can competently communicate with patients who only speak Spanish?

_____ % clinical and administrative staff

B13. For which of the following languages do you have immediate translation services? *(Check all that apply)*

- ❒ Armenian
- ❒ Cantonese
- ❒ Farsi
- ❒ Hmong
- ❒ Khmer
- ❒ Korean
- ❒ Mandarin
- ❒ Russian
- ❒ Spanish
- ❒ Tagalog
- ❒ Vietnamese

❒ None of the above

B14. Is your hospital a private, non-county facility?

❒ No *(Skip to Section C)*

❒ Yes

B15. Does your hospital have a Medi-Cal contract?

❒ No

❒ Yes

B16. If you have funding for uninsured indigent inpatients, about how many of these patients does the funding typically cover each year (please indicate a range if necessary—e.g., 100-200)?

_____ # patients

❒ Not applicable / No funding for uninsured indigent inpatients

B17. If you have funding for uninsured (not indigent) inpatients, how many of these patients does the funding typically cover each year (please indicate a range if necessary—e.g., 100-200)?

_____ # patients

❒ Not applicable / No funding for uninsured inpatients

C. EMERGENCY DEPARTMENT SECTION

This survey refers to FY 2001. If your hospital collects data for the calendar year, please report that information instead.

Please **refer to logs and other standardized records** your ED maintains to the extent possible. These questions are designed to understand how your ED might be impacted by changes in demand, and will **not** be used to compare your operating characteristics to those of other facilities.

For this survey, "trauma patient" means any patient who meets LAC EMS guidelines for immediate transport to a designated Trauma Center (see Appendix B for these guidelines).

All information obtained from the survey will be kept strictly confidential and will only be publicly presented in aggregate.

If your hospital does not have an ED, please check the box below and skip to Section E, page 17.

❒ No ED

C1. If your ED is a standby facility, do you receive patients via EMS transport?

❒ No

❒ Yes

❒ Not applicable / Not a standby ED

C2. How many treatment bays do you have in your ED?

_____ # treatment bays

C3. How many treatment bays are available for use in your ED?

_____ # treatment bays available for use

C4. In addition to your treatment bays, we know EDs expand into other areas when they have to. What is the maximum number of beds your other areas can hold?

_____ # beds

C5. How many treatment bays do you anticipate adding or reducing in the future, as a result of your hospital's capital planning cycle or the need to meet seismic requirements?

Please use "+" to indicate additions and "-" to indicate reductions (e.g., +7 beds, -10 beds)

_____ # treatment bays to be (added / eliminated) prior to 2007

_____ # treatment bays to be (added / eliminated) between 2007-2012

❒ Not applicable / No changes anticipated

C6. How many neurosurgeons do you typically have on-call who provide services to patients arriving through the ED?

_____ # neurosurgeons on-call

C7. How many trauma patients presented to your ED in FY 2001?

_____ # trauma patients

C8. Of the non-trauma patients who presented to your ED in FY 2001, how many were critical*, urgent, and non-urgent?

_____ # critical patients

_____ # urgent patients

_____ # non-urgent patients

C8b. Please indicate whether your responses to C8 above were obtained directly from your records or whether they represent your best estimates.

❒ Directly from records

❒ Best estimate

C9. Of the trauma patients who presented to your ED in FY 2001, how many were 14 years of age or younger?

_____ # trauma patients 14 or younger

* See Appendix A for OSHPD definitions of *critical*, *urgent*, and *non-urgent*.

C10. Of the non-trauma patients who presented to your ED in FY 2001, how many were 14 years of age or younger?

_____ # patients 14 or younger

C11. How many patients presented to your ED by EMS transport vs. "walk-in" each month in FY 2001?

Month in FY 2001	Walk-in (registered)	EMS Transport
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
Total		

❒ The responses above were taken directly from our records

C12. Of the patients who presented to your ED in FY 2001, how many were:

_____ # admitted to an ICU/CCU bed

_____ # admitted to a non-ICU/CCU inpatient bed

_____ # discharged without being admitted/transferred

_____ # transferred to an inpatient bed at another hospital

_____ # transferred to another ED due to a need for specialty emergency care that was unavailable at your ED

C13. How many patients were transferred **from another ED** to your ED in FY 2001 for a higher level of specialty care that was unavailable at the other ED?

_____ # patients transferred from another ED

C14. What was the average waiting time per patient (the time between when a patient registers and is first seen by a medical provider) in FY 2001? What was the maximum waiting time?

Critical*	Avg: _____ (minutes per patient) Max: _____ (minutes per patient)
Urgent*	Avg: _____ (minutes per patient) Max: _____ (minutes per patient)
Non-urgent*	Avg: _____ (minutes per patient) Max: _____ (minutes per patient)

If this information is not available by acuity level, please report for all patients instead:

All patients	Avg: _____ (minutes per patient) Max: _____ (minutes per patient)

❒ The response above was taken directly from our record

C15. For trauma* patients only, what was the average, minimum, and maximum **length of stay for a patient** (the time between when a patient registers and is discharged or admitted) in FY 2001?

Avg: _____ (minutes per trauma patient)

Min: _____ (minutes per trauma patient)

Max: _____ (minutes per trauma patient)

* See Appendix A for OSHPD definitions of *critical*, *urgent*, and *non-urgent*.

* Please see Appendix B for the L.A. County EMS definition of "trauma".

C16. For non-trauma patients only, what was the average, minimum, and maximum **length of stay for a patient** (the time between when a patient registers and is discharged or admitted) in FY 2001?

Critical	Avg: _____ (minutes per patient) Min: _____ (minutes per patient) Max: _____ (minutes per patient)
Urgent	Avg: _____ (minutes per patient) Min: _____ (minutes per patient) Max: _____ (minutes per patient)
Non-urgent	Avg: _____ (minutes per patient) Min: _____ (minutes per patient) Max: _____ (minutes per patient)

If this information is not available by acuity level, please report for all patients instead:

All patients	Avg: _____ (minutes per patient) Min: _____ (minutes per patient) Max: _____ (minutes per patient)

❒ 1The responses above were taken directly from our records

C17. What percentage of patients who registered with the ED left without being seen by a medical provider during FY 2001?

_____ % of patients

C18. What was the highest percentage of patients **in a given month** who left without being seen by a medical provider during FY 2001?

_____ % of patients

C19. Which of the following reasons for exceeding capacity have prompted your hospital to request a diversion? (Check the boxes and complete the blanks, with ranges if necessary—e.g., 5-7)

Diversion is typically triggered when the number of:

- ❒ Critical patients being treated ……exceeds: _____
- ❒ Urgent patients being treated …….. exceeds: _____
- ❒ Urgent patients waiting to be seen ……exceeds: _____
- ❒ ED patients waiting to be admitted ……exceeds: _____
- ❒ ICU/CCU beds full
- ❒ Other (Please provide as much detail as possible.)

_____

_____

_____

_____

_____

_____

_____

❒ We do not divert because we have a secure catchment area.

D. PSYCHIATRIC EMERGENCY DEPARTMENT INFORMATION

For the questions below, "psychiatric patients" means patients whose chief complaint or primary diagnosis was a psychiatric problem.

Some of the information below may not be readily available. Please estimate where possible.

D1. Does your hospital provide psychiatric services to psychiatric patients who arrive through the ED?

- ❒ No
- ❒ Yes

D2. Does your hospital have a call panel that covers psychiatric services?

- ❒ No *(Skip to D5)*
- ❒ Yes

D3. How many days per week does your call panel cover psychiatric services?

_____ # days per week

D4. How many psychiatrists are on your call panel?

_____ # psychiatrists

D5. Does your ED/hospital have an area where psychiatric patients who arrive through the ED can be specially treated by a psychiatrist or other mental health provider?

- ❒ No
- ❒ Yes

D6. What is the maximum number of psychiatric patients that can safely wait in your ED and/or special psych area to see a psychiatrist or other mental health provider?

_____ # maximum psychiatric patients that can wait at one time

D7. How many psychiatric patients presented to your ED in FY 2001 (please separate walk-ins from EMS transports if possible)?

_____ # of psychiatric ED patients in total

_____ # of psychiatric ED patients who arrived by walk-in

_____ # of psychiatric ED patients who arrived by EMS transport

❒ The responses above were taken directly from our records

D8. Of the total number of psychiatric patients who presented, how many were determined to require admittance or transfer to a psychiatric inpatient bed?

_____ # of psychiatric ED patients who required admittance/transfer

❒ The response above was taken directly from our records

D9. What was the average, minimum, and maximum length of time a psychiatric patient's examination lasted in FY 2001 (the time between when a patient is first seen by a mental health provider and is discharged or begins waiting for admission)?

Avg: _____ (minutes per patient)

Min: _____ (minutes per patient)

Max: _____ (minutes per patient)

❒ The response above was taken directly from our records

D10. For roughly what percentage of psychiatric patients were you unable to determine or did you have difficulty determining a disposition?

_____ % of psychiatric ED patients

D11. Of the total number of psychiatric patients who presented, how many were insured?

_____ # of psychiatric ED patients with insurance?

❒ The response above was taken directly from our records

E. ANTICIPATED RESPONSE TO SCENARIO III

Scenario III of the DHS system redesign plan for L.A. County proposes a number of changes to county hospitals and other facilities partially funded by DHS:

- *Closure of psychiatric beds in county hospitals (Harbor/UCLA, LAC+USC, MLK/Drew, Olive View /UCLA)*
- *Closure of all inpatient beds at High Desert Hospital*
- *Reduction of 100 other inpatient beds at LAC+USC*
- *Alternate governance or closure of Rancho Los Amigos National Rehabilitation Center*
- *Closure of some health centers and reduction in ambulatory visits*

E1. If your hospital is familiar with the details of this scenario, please describe any changes you are considering in your policies or operations in the event Scenario III is carried out as planned. *(Check all that apply)*

- ❒ Close your ED
- ❒ Expand your ED
- ❒ Limit your ED's capacity to care for psychiatric patients
- ❒ Expand your ED's capacity to care for psychiatric patients
- ❒ Reduce the number of psychiatric inpatient beds
- ❒ Increase the number of psychiatric inpatient beds
- ❒ Limit inpatient care provided to the uninsured and indigent
- ❒ Increase inpatient care provided to the uninsured and indigent
- ❒ Other (please specify)

_____

_____

_____

- ❒ None of the above

E2. We realize it may be difficult to speculate on your facility's actual response to Scenario III given uncertainty about future conditions your hospital may face. Please indicate your level of confidence in the response you provided to question E1 above.

Not at all Confident	*Somewhat Confident*	*Very Confident*
❒	❒	❒

(Appendix A of Survey) OSHPD DEFINITIONS

Critical: This is a visit by a patient who presents an acute injury or illness that could result in permanent damage, injury or death (head injury, vehicular accident, a shooting). The CPT Code (FY 2001) for this level of service is 99284 (no immediate significant threat to life) or 99285 (immediate threat to life).

Urgent: This is a visit by a patient with an acute injury or illness where loss of life or limb is not an immediate threat to his/her well being, or by a patient who needs a timely evaluation (fracture or laceration). The CPT Code (FY 2001) for this level of service is 99282 (low complexity) or 99283 (low to moderate complexity).

Non-Urgent: This is a visit by a patient with a non-emergency, illness, or condition; sometimes chronic; that can be treated in a non-emergency setting and not necessarily on the same day they are seen in the EMS Department (pregnancy tests, toothache, minor cold, ingrown toenail). The CPT Code (FY 2001) for this level of service is 99281 (single problem with straightforward medical decision making).

(Appendix B of Survey) LA COUNTY EMS TRAUMA GUIDELINES*

Critical trauma patients include, but are not limited to, those with major blood loss and/or shock as a result of vehicular accidents, gunshot or knife wounds, falls, or other violent incidents who require prompt surgical intervention.

Trauma Criteria - Requires immediate transport to a designated Trauma Center

Patients who fall into one or more of the following categories are to be transported directly to the area's designated Trauma Center, if transport time does not exceed 30 minutes:

- Adults with B/P <90 systolic or child with B/P < 70 systolic
- No spontaneous eye opening
- Penetrating cranial injury
- Penetrating thoracic injury between the midclavicular line
- gunshot wound to the trunk
- Blunt injury to chest with unstable chest wall (flail chest)
- Penetrating injury to neck
- Diffuse abdominal tenderness
- Patients surviving falls from heights > 15 feet
- Intrusion of the motor vehicle into passenger space
- Cardiopulmonary arrest with penetrating torso trauma
- blunt head injury associated with altered consciousness (GCS equal to or less than 14), seizures unequal pupils, or focal neurological deficit
- Injury to the spinal column associated with sensory defect or weakness of one or more extremities

Triage Guidelines - At the discretion of the base hospital, a patient who falls into one of the following categories may be directed to a Trauma Center.
Mechanism of injury is the most effective method of selecting critically injured patients before unstable vital signs develop. Paramedics and base hospital personnel should consider mechanism of injury when determining patient destination. Transportation to a Trauma Center is advisable for patients such as:

- Surviving victims of vehicular accidents in which fatalities occurred and who complain of injury
- Pedestrians struck by automobiles
- Patients ejected from vehicles
- Patients requiring extrication
- Very young and very old patients and those with precarious previous medical histories

* As described on County of Los Angeles – Department of Health Services Emergency Medical Services Agency Trauma Hospital System web page: http://www.dhs.co.la.ca/ems/trauma/trau_hsp.htm