EXHIBIT 9

Abt Associates Inc.

Chronic and Long-term Care in California Prisons: Needs Assessment

Final Report

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1.0 Executive Summary

To fulfill its planning and care delivery responsibilities, the California Prison Health Care Receivership Corporation requires reliable data on the burden of chronic disease, and physical and cognitive functioning in the inmate population. Without such data, the Receivership cannot properly plan for facility and programming needs or deliver quality health services at appropriate levels of care. This Chronic and Long-Term Care Needs Assessment carried out for the Receivership by Abt Associates Inc. and Lumetra represents an important step in closing this data gap and providing estimates and projections needed for the Receivership to plan bed needs at appropriate levels of care.

Currently, the California prison system has about 800 in-house medical beds distributed across 33 facilities housing a total of 170,000 inmates. Inmates with chronic disease or functional impairment requiring LTC are currently housed in general population (GP) or in one of five types of short-term care facilities: 1) general acute care hospitals (GACH), 2) correctional treatment centers (CTC), 3) outpatient housing units (OHU), 4) skilled nursing facilities (SNF), and 5) hospice units. When specialty care is required or when in-house capacity is filled, inmates are transferred to community hospitals with custody supervision.

The Receivership has begun planning construction of new beds to provide LTC to inmates with chronic illness and physical impairment. Because long-term patients with chronic diseases and functional impairments can have a diversity of care needs, the Receivership plans to organize LTC beds into three levels of service intensity. From lowest to highest level of care, these are 1) specialized general population (equivalent to sheltered housing or congregate living), 2) low acuity medical beds (equivalent to assisted living), and 3) high-acuity medical beds (equivalent to skilled nursing beds).

The current needs assessment project provides information to help the Receivership estimate the overall sufficiency of the planned construction, the appropriate distribution of long-term and short-term beds, and the estimated number of LTC patients requiring each of these three levels of service intensity.

The needs assessment project was designed to achieve three goals.

- Develop an assessment tool for this project and for use in the future to assess inmates' health status and assign them to levels of care and programming appropriate to their needs.
- Measure the health status of a sample of CDCR inmates using the assessment tool and, based on that sample, describe the current burden of chronic medical illness and functional impairment in the California prison population.
- Estimate the future long-term and short-term care bed needs by level of care and custody and programming so as to inform new facilities construction.

To achieve these goals, the Abt Associates/Lumetra team has collaborated with the Receivership and CDCR on the following activities:

- Development of the Project Data Set (PDS);
- Development of two assessment tools (Medical Bed Census and General Population Assessment);
- Assessment of all inmates in medical beds (Medical Bed Census);
- Assessment of a sample of general population inmates (General Population Assessments);
- Development of an algorithm for assigning inmates to level of care;
- Estimation of current and projection of future bed need.

Development of Project Data Set

Early in the project, Abt Associates catalogued CDCR data sources anticipating the use of some key CDCR data as inputs to a model projecting the need for medical beds over time. The project data set (PDS) has proved to have multiple uses. First, the PDS helped the team characterize the demographic features and health of the inmate population. Second, by leveraging the data in the PDS, the sample design was improved so that our estimates of disease burden, physical and cognitive functioning, and bed needs are more precise. Third, the PDS may help the Receiver plan a case management system in the future.

Development of the PDS revealed an urgent need for CDCR to improve information technology infrastructure and replace obsolete and homegrown data systems with systems that support case management and quality measurement across the state. Of course, new technology does not guarantee improved care delivery. But, sufficient resources for IT development and operations are necessary for CDCR to achieve a cohesive prison health system in which inmate-patients are housed appropriately and LTC patients receive consistently high-quality case management that is also cost-effective.

Assessment Tool Development

The Abt/Lumetra team designed Assessment Tools for the medical bed census and the general population sample. The overall purpose of the assessment tools was to collect data on the health and functional status of inmates, but the tools may also be used for future assessments of inmate health status and to inform decisions on the assignment of inmates to levels of care and housing appropriate to their needs.

The tool was designed to collect information from medical charts, clinicians, and custody staff pertaining to inmates' chronic disease burden, medical needs, functional limitations, and cognitive status. When available and appropriate we incorporated validated items from the literature. The tool is organized into the following sections: demographics; disease burden (105 chronic conditions, grouped by type of condition, e.g., cardiovascular, respiratory, gastrointestinal); medical-nursing needs/treatments (56 medical and nursing needs and treatments grouped into 12 areas, e.g., vital signs, respiratory, gastrointestinal); activities of daily living (ADLs) (ability to perform six activities, i.e., walking, dressing, eating, toilet use, personal hygiene, bathing/showering); prison activities of daily living (PADLs) (ability to perform six key functional abilities specific to life in a correctional facility that may drive placement of inmates, i.e., ability to get on the floor for alarms, hear orders from staff, stand for head count, go to the dining hall, get onto a top bunk, and climb one flight of

stairs); cognitive status (daily decision-making skills, short- and long-term memory, and ability to make him/herself understood); and a LOC assignment recommendation.

As described below, the assignment recommendation by the assessor was dropped for the general population sample in favor of using an automated assignment algorithm. However, the same levels of care were used in the general population sample and final bed need estimates and projections.

The assessment tool was pilot tested in two facilities and revised prior to its use in the medical bed census and it performed well during that census.

Medical Bed Census

On March 14-15, 2007, CDCR medical staff, with technical assistance from the Receivership and the Abt/Lumetra team, conducted a census of all occupied medical beds in the prison system, including OHU, CTC, GACH, SNF, hospice, and community hospital beds. There were 959 occupied medical beds included in the census. After excluding 204 inmates who were in medical beds for psychiatric treatment, 724 inmates receiving treatment for physical illness were assessed and 31 were not assessed due to recent transfer, missing records, or other factors. Of those assessed, 156 were located in community hospital beds.

The results of the medical bed census suggested a fairly high overall concurrence between placement in some type of medical bed and assessed needs for care beyond that available in regular general population. However, the census also revealed substantial discordance between current placement in specific types of medical beds and assessed level of care needs. The results of the medical bed census also suggested that CDCR's health care infrastructure and services could be reorganized to accommodate inmates with chronic disease in specialized general population units where moderate, ongoing care needs could be more efficiently met. Moreover, a new care configuration with both short- and long-term beds and case management would likely reduce CDCR's reliance on relatively expensive community hospital beds and reclaim current CTC and OHU beds for acute infirmary care.

General Population Sample

The general population sample was designed to collect data to inform bed need estimates and projections. We drew a stratified sample of 3,338 general population inmates eligible for assessment was clustered by prison facilities and stratified by risk groups. Two data sources informed the sample stratification: (1) data on age, physical disability, and prior healthcare utilization available for all inmates in the PDS; and (2) correctional officer (CO) nominations. COs in each housing unit of the sampled facilities were asked to identify inmates who they felt should be housed outside general population, in a more supervised housing unit, because of medical, functional, or cognitive problems. We stratified the population as follows: (1) high-risk and nominated; (2) low-risk and nominated; (3) high-risk and not nominated; and (4) low-risk and not nominated. Because the probability of needing LTC was expected to be near zero for the low-risk and not nominated stratum, we did not sample any inmates from this stratum. While this omission causes our estimates to understate bed needs, the bias is small and this study provides a corrective adjustment.

It was determined that our data collection would cover between 6 and 10 prisons, depending on the target sample size at each prison and the prison locations. In the end, we selected the California Medical Facility due to its unique medical mission, and eight other prisons. The prisons were selected to achieve representation of both male and female inmates, geographic distribution across the state, variation in prison population size, custody designations, and variation in levels of overall medical utilization.

During the period May 22-June 14, 2007 teams of 1-4 Lumetra nurses conducted assessments at the nine sampled CDCR facilities:

1. High Desert State Prison (HD)
2. Central California Women's Facility (CCWF)
3. California Correctional Institution (CCI)
4. Salinas Valley State Prison (SV)
5. California State Prison Solano (SOL)
6. Substance Abuse Treatment Facility (SATF)
7. California State Prison Centinela (CEN)
8. California Medical Facility (CMF),
9. Avenal State Prison (ASP)

The general population assessments were completed using data from two sources collected in sequence: medical record review and interviews with COs in the inmates' housing units. COs were used as proxies for information on the functional and cognitive status of general population inmates because they are the prison staff that have the most contact with the inmates and are likely to know them best.

Within the nine sampled prisons, 3,338 inmates belonged to the three strata eligible for assessments. Data collectors randomly selected 1,495 of these inmates for assessment, of whom 1,192 were successfully assessed. The target sample size quotas were met or exceeded in all but one of the sampled facilities and the final total sample exceeded the target of 1,000, thus enabling us to increase the precision of our estimates. Three hundred three selected inmates could not be assessed for a variety reasons including unavailability of the medical chart, inability to locate a proxy who could complete the assessment, and inmate movement to other facilities.

Findings from the General Population Sample

Demographic and custody characteristics of the sampled inmates matched reasonably well with the characteristics of the population of inmates eligible to be sampled, suggesting that no bias was introduced during sample selection. Additionally, we observed a high level of disease burden and functional limitation among the sampled inmates, suggesting that our stratification scheme was effective. The sampled inmates had the following characteristics:

- The top ten diagnoses were hypertension, anxiety disorder, low back pain, hypercholesterolemia/ hyperlipidemia, history of positive PPD test for TB infection, arthritis, hepatitis C, gastroesophageal reflux disease, diabetes mellitus, and ischemic heart disease.

- The top ten nursing/ medical needs were straight cane, chronic pain, wheelchair, blind in both eyes, orthotic device, hearing impaired, daily fingerstick required, sliding scale insulin, routine insulin, and nebulizer treatment.
- Of the sampled inmates in the general population assessment, 202 individuals (19 percent) were not independent in at least one ADL, and 44 individuals needed extensive assistance or were totally dependent in at least one ADL.
- Almost half of the sampled inmates (47 percent) had at least one permanent deficiency in the PADL.
- Most sampled inmates (90 percent) were completely independent in decision-making. Only 5 percent were reported to have short- or long-term memory problems and only 3 percent could only make themselves understood "sometimes" or "rarely."
- CO proxies felt that housing in the general population was not appropriate for 9 percent of sampled inmates due to disease or functional or cognitive factors.

Algorithm for Assigning Inmates to Levels-of-care

Having quantified the chronic disease, medical needs, and physical and cognitive functional status of sampled inmates from general population, we needed to translate these conditions into estimates of LTC needs. To accomplish this, we developed an algorithm which combines clinical criteria with statistical models to generate, for each sampled inmate, probabilities of needing each level of LTC.

The algorithm for assigning inmates to levels-of-care was developed with input from three clinicians participating in the project. Alternative specifications of the algorithm were tested for sensitivity (correct identification of those in need of LTC) and specificity (correct identification of those not in need of such care) among patients in the medical bed census for whom assessors had made a level of care placement recommendation. The best performing algorithm was then applied to the inmates in the general population sample in order to assign the main outcome variable (Level of Long-term Care: general population, specialized general population, low acuity long-term care, high acuity long term care).

The algorithm is structured sequentially so that the need for LTC outside the general population is first established based on functional and/or cognitive impairment (inmates must have at least one major ADL or permanent PADL or cognitive problem to be considered for LTC). Then the *probability* of needing LTC and the *level* of that care are estimated for these individuals using statistical models based on observed diagnoses and nursing needs.

To develop the statistical models, we used the medical bed census data. Disease diagnoses and nursing needs on the assessment tool were tested both for correlation with the need for LTC and for correlation with the LOC among inmates identified as needing LTC. Any diseases or nursing needs that were significantly correlated with needing LTC were retained as variables in the logistic model used to predict LTC needs among general population inmates who met the clinical criteria of having functional and/or cognitive limitation. Similarly, any diseases or nursing needs that were significantly correlated with at least one of the levels of care were retained as variables in the multinomial logistic model used to predict level of care.

Estimate of Current Long-term Care Bed Needs

The assignment algorithm was applied to the general population sample and generalized to all general population inmates in the nine sampled prisons with appropriate weighting of inmates by the inverse of their sampling probabilities. The estimates for the sampled facilities, excluding CMF, were then generalized to the general populations of the 24 unsampled facilities, using weighting of inmates by risk strata. Estimate for CMF's general population were treated separately from the other prisons because of the prison's unique medical mission and the concentration of inmates with medical needs within its population. Adding together the general population estimates of all the prisons and the estimated number of inmates needing LTC from the statewide medical bed census produced a total estimate for LTC bed needs across the CDCR system. These estimates are reported in the Table i.

Table i. Estimates of Current Need for Long-Term Care Beds in the California State Prison System*

Sub-population	Level of Long-term Care			TOTAL (number of inmates)**
	Specialized GP (number of inmates)	Low Acuity (number of inmates)	High Acuity (number of inmates)	
Medical Beds - all prisons	183	92	91	366
CMF	173	43	18	233
8 other sampled facilities	567	125	46	738
24 unsampled facilities	934	208	77	1,219
TOTAL- All prisons , unadjusted**	1,856	469	232	2,557
Adjustment Factor for Unsampled Strata				1.19
TOTAL – All prisons, adjusted for LTC need within unsampled stratum	2174	541	259	2974
95 percent confidence Interval (Lower Bound, Upper Bound)				(2713, 3233)

*Based on a population of 135,863 that does not include ~28,000 inmates in reception centers or ~7500 in community corrections.
**Totals may not sum exactly due to rounding.

Approximately 73 percent of the LTC beds are required at the level of specialized general population, 18 percent of the required beds are low-acuity, and 9 percent of the required beds are high-acuity.

The 95 percent confidence interval around the total estimate of 2,577 beds is (2377, 2737). The inmates in need of LTC based on our estimates represent almost 2 percent of the CDCR inmate population. However, this estimate does not include the roughly 28,000 inmates in reception centers or about 7,500 in community corrections. Nor does the confidence interval reflect uncertainty about the number of inmates in the fourth stratum of the sample (low-risk and non-nominated by correctional officers), from which no inmates were sampled.

The base estimate we report assumes that all inmates in the low risk stratum who currently need LTC were identified by CO nominations. To account for the likelihood that some inmates in the unsampled (low-risk and not nominated) stratum do in fact need LTC, we applied an adjustment factor to our base estimates. The adjustment factor of 1.19 was calculated using the medical bed census data for inmates that were low-risk in the nine sampled prisons and the observed sensitivity of CO nominations. In sensitivity analysis, we found that even if the adjustment factor were as high as 1.5, which implies a 1 percent prevalence of LTC need in the "unsampled and not nominated" stratum, the total number of LTC beds currently needed would be 3,836 (95 percent CI: 3349, 4322)

Projections of Long-term Care Bed Needs

The California inmate population is rapidly aging. According to CDCR projections, the total CDCR inmate population is expected to increase by 8 percent through 2012, but the over-60 age group will increase by 80 percent[1]. This project found that the probability of needing LTC increases exponentially with age. Using our base estimates, the fraction of inmates under 50 needing LTC was less than 1 percent. The probability of needing LTC reaches 7 percent for those aged 60-64, 15 percent for those aged 65-69, 27 percent for those aged 70-75, and 34 percent in inmates over 75. The rapid increase in the number of older inmates will drive demand for LTC within the California prison health care system.

To generate projections of LTC bed need over the next five years, we partitioned the estimated 2,557 beds currently needed into 10 age categories. We calculated the proportion of the population currently needing LTC within each age category and then applied that estimate of the age-specific prevalence of LTC need to the CDCR's age-structured population projections. Because the CDCR's population projections were only available through 2012, we extrapolated the population projections an additional five years by fitting parametric trendlines to the age-group-specific CDCR projected population growth rates. Table ii shows estimated LTC bed needs through 2017

Since LTC need is so closely correlated with age, the expected aging of the prison population translates into a fairly dramatic increase in projected LTC bed needs—to possibly as many as 4,570 by 2012. Assuming the projected population growth and age-group trends persist for an additional five years to 2017, the continued aging of the population will require between 4,970 and 5,750 beds for inmates with long term care needs.

[1] California Department of Corrections. 2007. "Adult Population Projections 2007-2012" http://www.cdcr.ca.gov/reportsresearch/OffenderInfoServices/Projections/S07Pub.pdf

Table ii. Projected Number of Long-term Care Beds Needed Over the Next Ten Years*

Year	Expected LTC Need	Lower Bound Estimate†	Upper Bound Estimate†
2007	2974	2713	3233
2008	3224	2941	3504
2009	3474	3170	3777
2010	3697	3373	4019
2011	3939	3593	4282
2012	4204	3835	4570
2013	4411	4144	4797
2014	4624	4344	5029
2015	4842	4548	5265
2016	5064	4757	5507
2017	5292	4971	5755

*The estimates for the first 5 years are based directly on the age- and sex- structured population projections developed by CDCR as described in the text. The second five years (2013-2017) are based on extrapolations of the CDCR population projections obtained by fitting parametric trendlines to the age-stratified population growth projections as described in the text.

†The lower bound estimate represents projections based on the lower threshold value in the 95% confidence intervals of the base estimate of current LTC bed need and the upper bound estimate represents projections based on the upper threshold value in the 95% confidence intervals of the base estimate of current LTC bed need adjusted for LTC need in the unsampled strata. The projected trends do not incorporate a measure of increasing uncertainty over time.

Conclusion

The Receiver has proposed the construction of 5,000 new health care beds. Earlier this year, Governor Arnold Schwarzenegger signed into law the Public Safety and Offender Rehabilitation Services Act of 2007, which provides for the immediate construction of 6,000 health care beds plus an additional 2,000 beds conditional on CDCR meeting rehabilitation, management, and construction benchmarks. Our results suggest that over half of these beds should be allocated to LTC in order to meet the growing need as California's prison population ages. Despite the limitations of our analysis and the corresponding uncertainty that remains in our estimate of current and future LTC need, we expect that 5000 beds will be adequate for meeting the LTC need of the California prison population over the 10-year time horizon we considered.

2.0 Purpose and Background

California maintains the largest prison system in the United States and perhaps the most troubled, particularly in terms of the health care provided to its inmates. In placing California's prison health services under receivership, Federal District Judge Thelton Henderson concluded that the existing system operated by the California Department of Corrections and Rehabilitation (CDCR) was "broken beyond repair." The Receiver, who began his stewardship in April 2006, faces daunting challenges with little time to meet them. One of the most basic is the almost total lack of reliable data on the burdens of chronic disease, physical impairment, and co-occurring mental illness in the inmate population. Without such data the California Prison Health Care Receivership Corporation cannot properly plan for facility and programming needs or begin to deliver quality health services at appropriate levels of care. The Chronic and Long-Term Care Needs Assessment sponsored by the Receivership represents a critical step in closing this data gap.

Currently California has about 800 in-house medical beds distributed across 33 state prison facilities housing 170,000 inmates. To supplement prison health care services, CDCR contracts with community health care providers. Inmates with chronic disease or functional impairment requiring long-term care (LTC) are currently housed in general population (GP) or in one of five types of short-term care facilities:

1. general acute care hospitals (GACH),
2. correctional treatment centers (CTC),
3. outpatient housing units (OHU),
4. skilled nursing facility (SNF), and
5. hospice.

The Receiver has begun planning construction of new beds to provide LTC of inmates with chronic illness and physical impairment. Because long-term patients with chronic disease and functional impairment can have a diversity of care needs, the Receiver plans to organize LTC beds into three levels of service intensity. From lowest to highest level of care, they are:

1. specialized general population,
2. low acuity medical beds, and
3. high-acuity medical beds.

The Abt/Lumetra needs assessment project provides data to help the Receiver estimate the overall sufficiency of the planned construction, the appropriate distribution of long-term and short-term beds, and the estimated number of LTC patients requiring each of three levels of service intensity of services required to treat patients in LTC beds.

The needs assessment project was designed to achieve three goals.

- Develop an assessment tool that can be used now and in the future to assess inmates' health status and assign them to levels of care and programming appropriate to their needs

- Measure the health status of a sample of CDCR inmates using the assessment tool and, based on that sample, describe the current burden of chronic medical illness and functional impairment in the California prison population
- Estimate the future long-term and short-term care bed needs by level of care and programming so as to inform new facilities construction.

To achieve these goals, the Abt Associates/Lumetra team has collaborated with the Receivership and CDCR on several activities:

- Project Data Set (PDS) development from CDCR data sources
- Assessment tool development
- Primary data collection—medical bed census
- Primary data collection—probability sample of general population inmates
- Data analysis, projection modeling, and reporting

Early in the project, Abt catalogued CDCR data sources anticipating the use of some key CDCR data as inputs to a model projecting the need for medical beds over time. Numerous data sources were identified through this activity and, although caveats regarding poor data quality were frequently attached, the value of formally constructing a comprehensive project data set from these data sources became clear. First, the project data set (PDS) would help the team characterize the demographic features and health of the inmate population. Second, by leveraging the data in the PDS, the sample design for our primary data collection could be improved so that our estimates of disease burden are more precise. Third, the PDS would help the Receiver plan a case management system. By constructing the PDS, we expected to learn more specifically about the quality of health-related CDCR data, the challenges of linking these data sources together, and the value of these data in clinical practice. Although the data within the PDS, by itself, is not sufficient to implement a rational planning process for the reorganization of the prison health care delivery system, the PDS is a valuable supplement to the primary data collected.

Primary data collection occurred in two phases. First, CDCR carried out a census of medical beds to determine whether more correctional medical beds were needed in the short-term. Next Abt and Lumetra conducted assessments of a stratified sample of general population inmates at nine facilities. Data from the medical bed census doubled our sample size and was used, in combination with data in the PDS, to improve the efficiency of the sample of the general population. From the census we identified a set of inmates with LTC needs. Then, through statistical analysis, we found variables in the project data set (such as age, prior hospitalizations, and DPP [Disability placement program] and DDP codes [developmental disabilities program]) that predict long term care need. For the general population data collection we drew a stratified sample based on these variables. The assessments of a sample of general population inmates were conducted at nine facilities in May-June 2007.

The synthesis of information from different sources (the PDS, the medical bed census, and the general population sample) has resulted in a clearer picture of the LTC needs of the CDCR inmate population and the infrastructure and programming required to meet those needs.

This report is organized into nine main sections: Project Data Set, Development of the Assessment Tools and Data Collection Protocol, Primary Data Collection Findings, Development of Algorithm to

Determine Appropriate Level of Care, Projections, Discussion, and Appendices. Abbreviations used frequently in this report are defined in Table 1.

Table 1. Key to Abbreviations

Abbreviations	Definition
CDCR	California Department of Corrections and Rehabilitation
GP	General Population
GACH	General Acute Care Hospital
OHU	Out-patient Housing Unit
CTC	Correctional Treatment Centers
SNF	Skilled Nursing Facility
PDS	Project Data Set
IT	Information Technology
ADL	Activities of Daily Living
PADL	Prison Activities of Daily Living
HD	High Desert State Prison
CCWF	Central California Women's Facility
CCI	California Correctional Institution
SV	Salinas Valley State Prison
SOL	California State Prison Solano
SATF	Substance Abuse Treatment Facility
CEN	California State Prison Centinela
CMF	California Medical Facility

3.0 Project Data Set

Early in the project, the Abt/Lumetra team determined that potentially useful data on custody, health care utilization, and inmate disabilities were available from several separate electronic databases across CDCR (Table 2). With the generous cooperation from CDCR staff noted in Table 2, we extracted data files from several disparate and independently-maintained sources. These databases are described in greater detail in Appendix 1. The only identified source of information we abandoned was the mental health tracking system (MHTS) due to indications from CDCR staff of the poor quality of data and difficulty of aggregating the data from the 33 independent prison-level databases.

Table 2. Extant CDCR Data Sources Considered for Project Data Set

CDCR Database	Acronym	CDCR Contact	Description	Included in PDS
Distributed Data Processing System / Offender-based Information System	DDPS / OBIS	Jay Atkinson, Lori Asuncion, Amnon Igra, Ryan Wong	Demographics, Custody (171,949 inmate-level records)	Yes
Health Care Cost and Utilization Program's Community Medicine Database	CMD	Denny Salade, Dee Carrier	Community Inpatient and Outpatient Episodes (3,932 inpatient records, 2476 unique inmates; 38,780 independent* outpatient records, 7,475 unique inmates)	Yes
Health Care Cost and Utilization Program's CADDIS	CADDIS	Denny Salade, Dee Carrier	In-house medical bed utilization (23,724 records, 12,231 unique inmates)	Yes
Pharmacy Tracking System	PTTS	Rick Pollard (Maxor Pharmacy)	33 separate databases for tracking pharmacy utilization (157,732 records, 44,461 unique inmates)	Yes
Armstrong-Clark Tracking System	ACTS	Individual prison staff coordinated by Ted Rauh	33 separate databases for the Developmental Disabilities Program (DPP) and the Disability Placement Program (DPP) (2,300 records, 1,700 unique inmates)	Yes
Mental Health Tracking System	MHTS	Dr. Henry Willis	33 separate databases for tracking mental health care (size unknown)	Not included due to purported poor quality of data

*outpatient records were considered independent (ambulatory care) if they were not temporally embedded within an impatient stay.

The PDS had two immediate uses in this project: sample design for primary data collection and modeling future long-term care (LTC) needs of the prison population. Data from the PDS were used to develop a model-based stratified sample for the data collection task. By leveraging information in the PDS to predict inmates' likelihood of needing long-term medical care outside of general population, the statistical efficiency of the sample was improved, and our estimates of bed needs are more precise than had we used a simple random sample. PDS data were also used to inform parameters of a model designed to project future LTC needs of the inmate population.

4.0 Development of the Assessment Tools and Data Collection Protocol

4.1 Data Collection Tools

The CDCR Care Management Screening and Assessment Tools for the Medical Bed Census and the General Population Assessments were developed to collect data on the health and functional status of inmates. The first version of the assessment tool was used by CDCR to conduct the medical bed census (the Medical Bed Census Assessment Tool may be found in Appendix 2a) and the second version was used by the Abt/Lumetra team to assess a stratified sample of general population inmates at nine facilities (the General Population Assessment Tool may be found in Appendix 2b). Together the medical bed and the general population assessments provide a snapshot of the current health status of the California inmate population and allow projections of the future health care needs of inmates for planning purposes. The tools may also be used by CDCR or researchers for future assessments of inmate health status and to assign inmates to levels of care and housing appropriate to their needs.

The final assessment tools are the result of an iterative process of revisions based on discussions among the Abt/Lumetra team and CPR and CDCR staff about the tool domains and items, and a review of the literature on long-term care (LTC) patient assessment, case management, LOC determinations in other settings (i.e. Medicaid eligibility determinations), and prison health assessment tools used in other states. Throughout the tool development process, the project team and CDCR applied the following criteria:

1) **Rely on secondary data sources (medical records, clinicians, custody staff)** to determine inmates' chronic disease burden, medical needs, functional limitations, and cognitive status. Face-to-face assessments with inmates were not utilized in the data collection because the process is time consuming and expensive, consent from the inmate population is difficult, and the team determined that data obtained from the secondary data sources would be sufficient. Face-to-face assessments of inmates may be feasible in future assessments.
2) **Rely on assessment items that have undergone reliability testing** in other studies/applications.
3) **Collect only those assessment items that meet the goals of the project.** Given the tight turnaround time for data collection and analysis, the assessment tool should include the smallest set of items possible for ease of training, administration, and analysis, and represent the least amount of burden to staff engaged in the process.

4.1.1 Assessment Tool Domains

As the assessment tool was developed, we held many discussions about the various aspects of inmates' health and functional status that would be important for predicting their needs for LTC housing and supports, and reviewed the wide body of literature on health status assessment, as a guide. A review of the literature on aging, need for care and supportive services, and resource use, provides the following insights about which dimensions of health should be measured when assessing LTC needs.

- *Physical Functioning and Cognitive Status*. Physical and cognitive impairment (or memory impairment) are generally thought to drive care needs over time, and are widely used in reimbursement and case management models throughout the healthcare system (Howell-White, et. al. 2006). Most tools and scales that "group" aging patients (or consumers) for LOC placement or reimbursement, rely heavily on activities of daily living and levels of cognitive functioning.
- *Chronic disease*. Chronic illnesses such as heart disease, diabetes, and hypertension, place people at risk of further illness and disability. According to Fried and Guralnik (1997), "chronic conditions can lead to severe and immediate disabilities, such as hip fractures and stroke, as well as progressive disability that slowly erodes the ability of elderly people to care for themselves". Given the link between chronic disease, treatment needs and disability, this dimension of health is important to measure when assessing LTC needs. Moreover, even when chronic disease does not lead to limitations in physical functioning and cognitive status, it has implications for care delivery, case management, and resource utilization.
- *Resource use*. "Resources" signify multiple concepts in health care and LTC, including staff time (e.g., nurses, nurse aides) to care for patients (or in this case, aging inmates), costs of care (i.e., service utilization, expenditures), and supplies (e.g., syringes, oxygen, catheters). In order to group like categories of LTC patients, researchers and policy-makers generally attempt to link patient characteristics to resource utilization, thereby creating classification schemes used for reimbursement, case management, and other activities. In this project, to create estimates of LTC needs, the research team, acknowledging data limitations identified in previous research (Hill et. al. 2006), attempted to measure resource use by inmates through capturing such items as wound care and assistance with medication administration.

The final assessment tools for the Medical Bed Census and the General Population Assessments included six clinical and health service domains. The first six domains are important dimensions of daily functioning, will contribute to the analysis of long-term housing needs of the population, and will lend themselves to repeated measurement over time as inmates age-in-place within the California prison system.

A detailed discussion of the items in each domain and the process of identifying valid measures may be found in Appendix A3.1. The differences between the Medical Bed Census and General Population Assessment Tools are outlined in Appendix A3.2

4.1.2 Level of Care Definitions

The CDCR health care system's current infrastructure and programming is designed to provide acute, infirmary-style care through six levels of care. Anticipating the development of new LTC housing and infrastructure, levels of care were defined for this project using names and criteria that are inclusive of both acute and LTC. The criteria for level of care are shown in Box 1. These definitions of levels care were used as a basis for inmate placement recommendations through the different phases of this project.

Box 1. Criteria for Levels of Care

High-acuity Medical Bed
Non-prison analog: skilled nursing facility

- RN availability 24 hours/day for assessment, monitoring, and/or complex management
- IV hydration for more than three days
- Complex or high-risk medication regimen or blood transfusion
- Complex wound care regimen
- Extensive assistance with ADLs (or totally dependent)

Low-acuity Medical Bed
Non-prison analog: assisted living

- RN availability 8-16 hours/day for assessment, monitoring, and/or management
- IV hydration for less than three days
- Straightforward IV antibiotics (e.g. for osteomyelitis)
- Straightforward wound care regimen
- Supervision or limited assistance with ADLs

Pre-procedure care and routine post-hospital care can usually be done at Specialized GP level.

Specialized General Population
Non-prison analog: sheltered living or congregate living

- Vision, hearing, or mobility impairment preventing residence in regular GP
- HIV/AIDS
- Pregnancy
- Frailty due to age or medical condition

If need for supervision or limited assistance is inmate's only reason for not being in regular GP, then that inmate can be in sheltered housing with ADLs provided by cellie, buddy system, or inmate helper program.

Regular GP

- Inmates requiring only oxygen, CPAP, or dialysis or who can do their own catheter/colostomy care can be in regular GP.

Hospice

- Patient has life expectancy of less than six months and has nursing needs requiring non-GP level of care.

4.1.3 Preparation for Data Collection

Data Collectors and Data Sources

The Medical Bed Census and the General Population Assessments were completed in similar fashion.

- *Assessors* completed the form. CDCR nurses and nurse-consultants served as assessors for the Medical Bed Census and Lumetra nurses for the General Population Assessments.
- *Inmate medical records* were reviewed for information to complete Sections 1-3.
- *The Project Data Set* was used to pre-populate assessment forms with certain demographic and custody-related items in the General Population Assessments.

- *Proxies* provided data on inmate's functional and cognitive status and assessed the appropriate level-of-care. CDCR unit nurses (not the same nurse as the assessor) served as proxies for the Medical Bed Census and CDCR housing unit correctional officers served as proxies for the General Population Assessments.

Pilot Testing

The Abt/Lumetra Team conducted a pilot test of the draft assessment tool at the California Medical Facility (CMF) and California State Prison, Solano on February 27-29, 2007 with assistance from CPR and CDCR staff. The pilot test was conducted to determine: 1) the average time required to complete each form, 2) whether the data elements on the form could be obtained from the medical record and/or the correctional officer proxies, and 3) how well the assessment items performed in the field. The tool was revised based on the experience of the pilot test. The pilot test protocol and results are described in Appendix A3.3.

Human Subjects Approvals

The Abt Associates Intuitional Review Board (IRB) reviewed and approved the protocols and assessment tools for all three data collection efforts—the pilot test, the Medical Bed Census and the General Population Assessments.

4.2 Data Collection Protocol

4.2.1 Medical Bed Census

On March 14-15, 2007, CDCR medical staff, with technical assistance from CPR and Abt Associates/Lumetra conducted a census of all occupied medical beds in the prison system, assessing 724 inmates. Outpatient housing unit (OHU), correctional treatment center (CTC), general acute care hospital (GACH), skilled nursing beds (SNF), hospice, and community hospital (CH) beds were included in the census. Beds being used by inmates with mental health conditions (Mental Health Crisis beds), even when classified as "medical beds" were not included since the project's focus is LTC needs for physical health problems only. The number of inmates in each type of medical bed, by CDCR facility, is shown in Table A3.2.

Medical Bed Census Assessment Training

CPR, CDCR and Lumetra staff conducted a training for CDCR nurse assessors on the assessment tool and the protocol for implementing the medical bed sweep. Nurses and supervisors from each prison participated in the training in person or via teleconference.

Medical Bed Census Protocol

CDCR nurse assessors completed the demographics, chronic conditions and medical needs/treatments sections of the assessment based on information gathered from medical records. Medical unit nurses providing care to the inmates served as proxy data sources and were asked to: (1) confirm the information from the medical record on chronic conditions and medical treatments/needs, (2) provide information on the inmate's functional and cognitive status, and (3) make a determination of what level of care the inmate should be assigned to and whether they should be at that level of care for more or less than the next three months.

The CDCR assessor then reviewed each completed form and made a determination of the inmate's appropriate LOC and duration of such care (i.e. , more or less than the next three months). Completed assessments were reviewed by CDCR staff and sent to Abt Associates for data entry.

4.2.2 General Population Assessments

From May 22-June 14, 2007, teams of between one and four Lumetra nurses visited a sample of nine CDCR facilities and conducted assessments on a stratified sample of 1,192 inmates. The nine CDCR facilities visited were:

1. High Desert State Prison (HD)
2. Central California Women's Facility (CCWF)
3. California Correctional Institution (CCI)
4. Salinas Valley State Prison (SV)
5. California State Prison Solano (SOL)
6. Substance Abuse Treatment Facility (SATF)
7. Centinela State Prison (CEN)
8. California Medical Facility (CMF)
9. Avenal State Prison (ASP)

As stated earlier, the focus of the general population assessments was to determine the potential long-term-care needs of a stratified sample of inmates living in general population units at these nine facilities.

General Population Assessment Training

A one day training was conducted at the Lumetra office by Lumetra and CPR staff and was attended by all nurses assigned to the project. Abt Associates project staff attended via teleconference. The training materials (developed by the Abt/Lumetra Team) addressed: (1) the purpose of the project; conducting research in correctional facilities; (2) a detailed review of the assessment tool and how to complete it; the protocol for completing the assessment tool and; (3) questions and answers from Lumetra nurse assessors.

General Population Assessment Protocol

The General Population Assessment Tool was completed using data from two sources: the medical record and interviews with correctional officers (COs) supervising the units where each inmate is housed. Abt Associates provided each facility with a list of the sampled inmates several weeks in advance. The nine facilities prepared for the visit by 1) pulling medical records from the list of sampled inmates in advance of the data collection visit, and 2) assigning two correctional staff escorts to the research team to facilitate the data collection process. Teams of Lumetra nurses visited each of the nine facilities for three to nine days to conduct assessments. Correctional staff escorts determined current housing placement for the assessed inmates and coordinated the proxy interview process by escorting the research team through the facility and identifying CO proxies.

COs were used as proxies for information on the functional and cognitive status of general population inmates because they are the prison staff who have the most contact with the inmates and likely know them best. Given that most inmates are generally healthy, we assumed that nursing staff would not be

familiar with the majority of the inmates in our sample. The questions on the tool that COs answered were relatively simple, did not require medical training, and related to behavior that COs would have observed in the housing unit (e.g., inability to perform ADLs such as showering or grooming, inability to perform prison-ADLs such as following orders or standing for head count, inability to make daily decisions, memory problems). Proxies were asked a screener question for each inmate to determine if they felt they knew the inmate well enough to answer these questions. If they responded that they did not know the inmate well enough, or if they could not answer the questions, the inmate was dropped from the sample. An earlier Lumetra study used COs as proxies and the assessors were able to either obtain adequate responses from the COs or determine that they could not provide data. The burden on each CO was relatively light as there were only a few sampled inmates per housing unit (and not every housing unit had sampled inmates), and no medical information about the inmate was shared with the CO.

Each team was provided with an assessment tool for each sampled inmate prepopulated with information and demographic data elements from the Project Data Set. The assessor confirmed the pre-printed demographic data during the medical record review. Medical records were reviewed according to the sample order and assessors completed the Demographics, Disease Burden and Medical-Nursing Needs Treatments sections. Following completion of medical record review, the nurse assessors interviewed CO proxies about the inmates in order to complete the Activities of Daily Living/Mobility, Prison Activities of Daily Living, Cognitive Status, and LOC Assignment assessment sections.

Following interviews with each proxy, assessors asked whether there were any other inmates in the unit who the proxy felt should not be in general population because of a disease or a functional or cognitive problem.

At the end of each facility visit, the lead Lumetra nurse conducted a quality check of the completed assessment forms to ensure that all questions were answered properly and responses were legible. The completed assessment forms were sent to Abt Associates for data cleaning and entry.

A detailed discussion of the performance of the assessment tool and limitations of the data collection may be found in Appendix A3.5 and A3.6.

5.0 Primary Data Collection Findings

As discussed above, data were gathered on the disease burden, treatment needs, and functional and cognitive status of CDCR inmates through the Medical Bed Census and the General Population Assessments.

5.1 Findings from the Medical Bed Census

There were 959 inmates included in the medical bed census, of which 724 were assessed. Of the 235 not assessed, a reason was given in 215 cases. In nine cases the reason was recent discharge or transfer. In the remaining 206 cases the inmate was not assessed because his or her admission to a medical bed was for psychiatric treatment. All of these inmates were receiving treatment within a prison facility. None of the inmates in community hospital beds identified for the census were admitted for psychiatric treatment. It is not clear whether the medical staff specifically excluded inmates in community hospitals for psychiatric treatment (i.e. they are not counted in the 959) or whether, in fact, no inmates in community hospitals on the day of the census had been admitted for psychiatric treatment. A low prevalence of psychiatric patients in community hospitals is consistent with the utilization data in the PDS, so either explanation is plausible.

5.1.1 Demographic and Custody Characteristics

In Table 3, the general characteristics of the 724 assessed inmates are summarized and compared to the full inmate population. Medical bed patients were more likely to be white or black, to have life sentences, and be registered as a sex offender. The mean age of inmates in medical beds was 50, compared to 36 for the full prison population.

5.1.2 Chronic Diseases

Medical diagnoses for inmates were abstracted from medical records. The assessment tool focused on 105 diagnoses of particular interest to this project because of their expected high prevalence among the inmate population or because of their relevance to long-term care coordination.

Inmates in medical beds had an average of 3.8 disease diagnoses identified by medical record review and proxy interview. The top ten diagnoses are listed in Table 4 (a full list is shown in Appendix 4, Table A4.1). These diseases are not necessarily the primary diagnosis for the current medical bed stay. Primary diagnosis was recorded as a free-text entry and will be used by CDCR and CPR staff reviewing patient placement. However, primary diagnosis data was not analyzed for this report. Unfortunately, the diversity of diseases affecting the inmates in the census resulted in a considerable number of "write-in" diagnoses in the free text fields for diagnoses not included in the master list.

Table 3. Medical Bed Census Demographics

Characteristic	Value	Medical Bed Count (Pct)	Full Population Count (Pct)
Population		722	171,959
Gender			
	Male	655 (93)	160,165 (93)
	Female	51 (7)	11,768 (7)
Race/Ethnicity			
	Black	239 (35)	49,550 (29)
	White	259 (37)	47,172 (27)
	Hispanic	64 (9)	27,296 (16)
	Mexican	106 (15)	38,545 (22)
	Other	38 (5)	9,340 (5)
Age			
	17-34	107 (11)	80,554 (47)
	35-44	165 (17)	50,799 (26)
	45-54	193 (20)	30,866 (18)
	55-64	128 (13)	7,841 (5)
	65-74	74 (8)	1,542 (1)
	75+	292 (30)	347 (0)
	Mean Age	50.0	36.5
Bed Type			
	GACH	234 (32)	234 (0)
	CTC	179 (25)	179 (0)
	OHU	112 (16)	112 (0)
	SNF	29 (4)	29 (0)
	Community Hospital	154 (21)	154 (0)
	Hospice	13 (2)	13 (0)
	General Population	n/a	171,211 (99.6)
Mental Health Code			
	CCCMS	183 (25)	27,614 (16)
	EOP	38 (5)	4,191 (2)
Life Sentence			
	Yes	185 (26)	25,406 (15)
Sex Offender Registrant			
	Yes	151 (21)	21,942 (13)
Strike Count			
	2	147 (20)	36,267 (21)
	3	54 (7)	8,863 (5)
Years until Projected Release			
	0 to 4	358 (50)	113,832 (66)
	5 to 9	56 (8)	14,146 (8)
	10 to 19	74 (10)	13,126 (8)
	20 to 29	21 (3)	4,672 (3)
	30 or more	215 (30)	26,173 (15)

Table 4. Top Ten Chronic Diseases Reported in Medical Bed Census

Rank	Description	Number (Pct)
1	Hypertension	283 (39)
2	Diabetes mellitus	134 (19)
3	Hepatitis C	119 (16)
4	Ischemic heart disease (CAD,h/o MI, h/o CABG)	113 (16)
5	Chronic obstructive pulmonary disease (COPD)	96 (13)
6	Major depression disorder (single episode or recurrent)	89 (12)
7	Cancer (active)	77 (11)
8	Epilepsy/seizure disorder	76 (10)
9	Low back pain	64 (9)
10	Anemia	63 (9)

N = 722 inmates; assessors could report up to 15 chronic diseases per inmate.

5.1.3 Medical Needs

In Section 3 of the assessment tool, chart review and proxy interview was used to collect information regarding inmates' current medical treatment needs. The assessment tool contained a list of 56 medical treatment needs ("nursing needs") that were expected to be frequently required by inmates in medical beds. The top ten reported nursing needs are listed in Table 5 (the full list is in Appendix 4, Table A4.2).

Table 5. Top Ten Nursing Needs Reported in Medical Bed Census

Rank	Nursing Needs	Number (Pct)
1	Vital signs Q [what is this?]shift or more often	373 (52)
2	Vital signs daily	265 (37)
3	Wheelchair	213 (29)
4	Chronic pain	125 (17)
5	Finger-sticks more than daily	103 (14)
6	Assistance with medication administration (e.g., cueing to swallow)	91 (13)
7	Continuous IV therapy	85 (12)
8	Surgical site, drain, and other wound requiring daily nursing care	85 (12)
9	Monitoring I/O	78 (11)
10	Altered diet (pureed, thickened liquids)	77 (11)

5.1.4 Functional Impairment

Functional impairment was measured using activities of daily living (ADL) and prison activities of daily living (PADL) scales. The results of the ADL section are shown in Tables 6a and 6b. The results of the PADL section are shown in Tables 7a and 7b. The distribution of ADL impairment across medical bed type and the correlation between temporary and permanent PADLs are shown in Appendix A4.1.3.

Activities of Daily Living

Of the inmates in the census, 337 individuals were not independent in at least one of the six ADLS. Proxy respondents were therefore asked more detailed questions about their need for assistance on

ADLs. Table 6a shows the number of inmates who needed supervision or assistance with each ADL. The percentages in parentheses are a measure of the prevalence of that ADL limitation among all inmates in medical beds (n=724). Limitations in ADLs are correlated with one another and inmates often have functional limitation in multiple activities. Table 6b shows the frequency with which inmates had limitations in multiple ADLs.

Table 6a. Number of Inmates Requiring Supervision or Assistance with Activities of Daily Living (ADLs)*

	1.	2.	3.	4.	5.	
ADL	Independent Number (Pct)	Supervision or Limited Assistance Number (Pct)	Extensive Assistance or Total Dependence Number (Pct)	Activity Did Not Occur Number (Pct)	Missing Number (Pct)	Columns 2 + 3 + 4 Number (Pct)
Walk	39 (5)	126 (17)	89 (12)	74 (10)	7 (1)	289 (39)
Eat	199 (27)	71 (10)	48 (7)	7 (1)	12 (2)	126 (18)
Dress	127 (18)	91 (13)	93 (13)	11 (2)	15 (2)	195 (28)
Hygiene	131 (18)	103 (14)	89 (12)	4 (1)	10 (1)	196 (27)
Bathe	94 (13)	125 (17)	104 (14)	7 (1)	7 (1)	236 (32)
Toilet Use	145 (20)	76 (10)	88 (12)	11 (2)	17 (2)	175 (24)

*The denominator for the percentages in parentheses is the number of inmates in medical beds (n=724).

Table 6b. Inmates Needing Supervision or Assistance with Multiple Activities of Daily Living (ADLs)

	Any Level of Limitation or Activity Did Not Occur	Extensive Assistance or Total Dependence or Activity Did Not Occur
Count of ADL limitations	Number (Pct)	Number (Pct)
0	399 (55)	539 (74)
>0	325 (45)	185 (26)
>1	246 (34)	127 (18)
1	79 (11)	58 (8)
2	40 (6)	26 (4)
3	31 (4)	10 (1)
4	21 (3)	16 (2)
5	43 (43)	29 (4)
6	111 (15)	46 (6)

*The denominator for the percentages in parentheses is the number of inmates in medical beds (n=724).

Prison Activities of Daily Living

Table 7a shows the number of inmates who were not able to perform each PADL. Table 7b shows the frequency with which inmates had limitations in multiple PADLs.

Table 7a. Limitations in Prison Activities of Daily Living (PADLs)*

PADL	1. Independent Number (Pct)	2. Temporary Limitation Number (Pct)	3. Permanent Limitation Number (Pct)	4. Missing Number (Pct)
Floor for Alarms	331 (46)	129 (18)	224 (31)	40 (6)
Hear Orders	655 (90)	17 (2)	35 (5)	17 (2)
Stand for Count	452 (62)	78 (11)	171 (24)	23 (3)
Dining Hall	392 (54)	143 (20)	161 (22)	28 (4)
Top Bunk	185 (26)	167 (23)	349 (48)	23 (3)
Climb Stairs	221 (31)	155 (21)	324 (45)	24 (3)

*The denominator for the percentages in parentheses is the number of inmates in medical beds (n=724). Source: medbed01_v2.dta

Table 7b. Occurrence of Limitation in Multiple Prison Activities of Daily Living (PADLs)*

Number of PADLs	Temporary Limitation Number (Pct)	Permanent Limitation Number (Pct)	Temporary and Permanent Limitation Number (Pct)
0	483 (67)	362 (50)	190 (26)
>0	241 (33)	362 (50)	534 (74)
1	60 (8)	38 (5)	38 (5)
2	52 (7)	81 (11)	97 (13)
3	49 (7)	55 (8)	105 (15)
4	33 (5)	73 (10)	109 (15)
5	36 (5)	83 (11)	140 (19)
6	11 (2)	32 (4)	45 (6)
Total	724 (100)	724 (100)	724 (100)

*The denominator for the percentages in parentheses is the number of inmates in medical beds (n=724).

5.1.5 Cognitive Impairment

Cognitive impairment was measured with questions regarding decision-making, memory, and making oneself understood. The results of the cognitive function assessment are shown in Table 8. Most medical bed inmates (77 percent) were completely independent in decision-making. About 13 percent of medical bed inmates were reported to have memory problems. About half of all those with any reported memory problem had problems with both short- and long-term memory. Only 7 percent of the census could only make themselves understood "sometimes" or "rarely."

Having any cognitive problem was positively correlated with having at least one permanent PADL (correlation coefficient = 0.35555, $p<0.0000$) and was negatively correlated with having a temporary PADL limitation (correlation coefficient = -0.0899, $p<.0156$).

Table 8. Cognitive Function

Question	Value	Number (Pct)
Decision-making		
	Independent	557 (77)
	Modified independence	70 (10)
	Moderately impaired	51 (7)
	Severely impaired	38 (5)
	Missing	8 (1)
Short term memory		
	OK	631 (87)
	Problem	91 (13)
	Missing	2 (0)
Long-term memory		
	OK	629 (87)
	Problem	91 (13)
	Missing	4 (0)
Can make self understood		
	Understood	581 (80)
	Usually	70 (10)
	Sometimes	30 (4)
	Rarely	20 (3)
	Missing	23 (3)

*The denominator for the percentages in parentheses is the number of inmates in medical beds (n=724).

5.1.6 Level of Care Assignment

The main purpose for conducting the census of medical beds was to assess the level of care needs of these inmates and the expected duration of those needs. Table 9 shows the assessors' recommendations for level of care. Of 724 inmates in medical beds, 637 (88 percent) were recommended for medical housing outside of GP (166 in high acuity, 219 in low acuity, 223 in specialized GP, and 29 in Hospice).

Among inmates in each current medical bed type, the assessors found individuals to recommend for all five levels of care (Table 9). The recommended shifts in placement were most commonly to lower levels of care. For example, only 16 (14 percent) of 112 inmates in GACH beds, currently the highest intensity medical bed type in the CDCR system, were recommended for a high-acuity medical bed. Seventeen percent of inmates in OHU beds and 9 percent of inmates in CTC beds were recommended for regular GP. Similarly, 29 (19 percent) of 154 inmates in community hospitals were recommended for specialized GP or regular GP. However, in the case of community hospitals, this finding most likely reflects the assessor's recommendation of the level of care the inmate will require upon returning to prison after discharge from the hospital. It was not within the scope of the project or the capability of the assessment process to determine whether hospital admissions were initially warranted.

Table 9. Recommended Level of Care by Current Bed Type

		Recommended Level of Care					Total
		High Acuity	Low Acuity	Special GP	General Population	Hospice	
		Num (Row%)	Num (Row%)	Num (Row%)	Num (Row%)	Num (Row%)	
Current Bed Type	GACH	16 (14.3)	47 (42.0)	36 (32.1)	11 (9.8)	2 (1.8)	112
	CTC	54 (30.2)	61 (34.1)	43 (24.0)	16 (8.9)	5 (2.8)	179
	OHU	13 (5.6)	56 (23.9)	121 (51.7)	40 (17.1)	4 (1.7)	234
	SNF	7 (24.1)	10 (34.5)	9 (31.0)	1 (3.4)	2 (6.9)	29
	C. Hosp	77 (49.4)	43 (28.6)	12 (7.8)	19 (11.0)	5 (3.2)	156
	Hospice	0 (0.0)	0 (0.0)	2 (15.4)	0 (0.0)	11 (84.6)	13
	Missing	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	0 (0.0)	1
	Total	167 (23)	218 (30.3)	223 (30.9)	87 (11.8)	29 (4)	724

Table 10 shows the assessors' expectations regarding the duration over which the inmate will require care. Of the 608 recommended for high-acuity, low-acuity or specialized GP, 329 (54 percent) were expected to require that level of care for more than three months. Level of care was missing for 37 inmates. These inmates were assumed to need care for more than three months. Thus, we estimated there are 366 inmates in medical beds at the time of the census who would particularly benefit from long-term care-specific housing and case management.

The clinician assessments suggested that many medical bed inmates could be shifted to a lower level of care designed for management of chronic conditions. In fact, 85 inmates (12 percent) currently in medical beds were apparently not in need of any significant long-term or short-term care, and were recommended for placement in regular GP. Two hundred twenty-three (223) inmates (31 percent) were recommended for specialized general population – a level of care that would cohort inmates within general population based on moderate ongoing medical need. This level of care does not currently exist within CDCR. Over 50 percent of the 223 inmates recommended for specialized general population are currently in more resource-intensive CTC or GACH beds.

Table 10. Assessor's Recommended Level of Care and Duration

		Recommended Level of Care					Total
		High-Acuity	Low-Acuity	Specialized GP	GP	Hospice	
Expected Duration at Level of Care	Less than 3 month	76	126	40			242 (33%)
	3 months or more	84	85	160			329 (46%)
	Not applicable				87	29	116 (16%)
	Missing	7	7	23			37 (5%)
	Total	167 (23%)	218 (30%)	223 (31%)	87 (12%)	29 (4%)	724 (100%)

We examined whether any variables in the PDS could predict long-term care need outside of regular GP among inmates housed in medical beds. To determine whether any variables in the PDS could predict long-term care (LTC) need outside of regular GP among inmates housed in medical bed, the data were analyzed with logistic regression (Table A4.6). The model performed moderately well at predicting inmates LTC need (R-squared = 0.33). As a result, PDS data was used to draw a stratified random sample of the general population for the primary data collection among general population based on inmates' predicted probability of needing LTC outside of general population. A full discussion of these findings may be found in Appendix A4.1.5.

5.2 General Population Assessments

5.2.1 Sampling Methods

The sample of general population inmates for assessment of LTC needs is clustered (in prison facilities) and stratified by risk groups and correctional officer nominations. Technical notes on the sampling methodology, including risk-stratification, and sample weighting are provided in Appendixes 5 and 6.

Prison Selection
The California state prison population is housed in 33 facilities across the state for the General Population Assessments. We selected California Medical Facility due to its unique medical mission and eight additional facilities. The facilities were selected in an attempt to achieve:

- representation of both male and female inmates,
- geographic distribution across the state,
- variation in facility size,
- variation in custody designation (security level), and
- variation in levels of historical medical utilization.

Risk Stratification
Using data on age, physical disability, and prior healthcare utilization, available for all inmates in the Project Data Set (PDS), we stratified the population into low-risk and high-risk groups.

Correctional Officer Nominations
In addition to stratifying the inmate population by risk, which would have yielded a sample with only a small number of inmates with medical, functional, or cognitive impairments, we also stratified the general population based on correctional officer referrals. We asked CDCR correctional officers (COs) in each housing unit at the nine sampled facilities to identify any inmate who they felt should be considered for housing outside general population, in some type of more supervised medical housing unit, because of medical, functional, or cognitive problems.

We were confident that COs would be able to provide these names based on experiences during a previous study where assessors interviewed COs about the health and functional status of a random sample of inmates and were often given the response, "That guy is fine, but come and see this guy, he's in bad shape."

Thus, the inmate population was divided into four strata: high-risk & nominated, low-risk & nominated, high-risk & not nominated, low-risk & not nominated. In the nine sampled prisons, 39,511 inmates were in the low-risk & not nominated stratum, 1,959 were in the high-risk & not nominated stratum, 349 were low-risk & nominated, and 262 were high-risk & nominated. The key advantage of stratifying our sample according to CO-nominations was that we were able to avoid "spending" a portion of our sample size on a large pool of inmates with an extremely low probability of needing LTC.

Sample Size

Our target sample size was 1,000 completed assessments for inmates distributed across the nine sampled prisons according to the prisons' stratified population sizes (Table 11). In all but one prison, we exceeded our target sample size. Overall, we exceeded our target sample size by about 19 percent, thereby improving the precision of our results.

Table 11. General Population Assessments Sample Size

Facility	Target	Actual
HD	100	107
CCWF	80	86
SVSP	120	103
CCI	60	97
ASP	160	213
SATF	170	187
CEN	60	60
CMF	170	214
SOL	80	125
Total	1000	**1192**

5.2.2 Findings from the General Population Assessments

From the population of the three stratum eligible for sampling (n= 3,338 inmates), 1,192 were assessed. However, 26 were found to be in medical beds, and although they were assessed, they were excluded from our estimates of LTC need in the general population since they were already included in the medical bed census analysis. Three hundred three (303) assessments were attempted, but not completed, for a variety reasons including unavailability of the medical record, inability to locate a proxy who could complete the assessment, and inmate movement to other facilities. Table 12 shows the comparison of demographic and custody characteristics between the 1,192 assessed inmates in the sample and the 303 inmates for whom an assessment was attempted but not completed.

Appendix A4.2.1 includes additional tables and a discussion of the basic demographic and custody characteristics of the sampled inmates compared to the total inmate population in the sampled facilities and in all CDCR facilities.

Chronic Diseases

Assessed general population inmates had an average of 4.9 disease diagnoses identified by medical record. The top ten diagnoses are listed in Table 13. Although these results can be scaled up to the general population of the nine sampled prisons, the prevalence of disease is likely to be an underestimate because of the sample design. The sample design did not draw from the large low-risk & not nominated strata. While we designed our method to allow for adjustments of our estimates of

long-term care need to account for the unsampled stratum, we did not have a corresponding approach for adjusting estimates of other characteristics such as chronic disease prevalence. Therefore we did not report generalized estimate of chronic disease prevalence's for the overall prison population.

Table 12: Demographic and Custody Characteristics of Inmates Eligible To Be Sampled, Inmates For Whom the Assessment Was Attempted But Not Completed, and Inmates Who Were Successfully Assessed

Category	Value	Sample Number (Pct)	Assessments Attempted, But Not Completed Number (Pct)	Assessments Completed Number (Pct)
Population		3,338 (100)	303 (100)	1,192 (100)
Gender				
	Female	213 (6)	10 (3)	86 (7)
	Male	3,125 (94)	293 (97)	1,106 (93)
Race/Ethnicity				
	Black	1,198 (36)	122 (40)	410 (34)
	Hispanic	282 (8)	30 (10)	91 (8)
	Mexican	395 (12)	25 (8)	167 (14)
	Other	170 (5)	17 (6)	67 (6)
	White	1,293 (39)	109 (36)	457 (38)
Age				
	17 to 34	262 (8)	23 (8)	99 (8)
	35 to 44	683 (20)	71 (23)	230 (19)
	45 to 54	1,063 (32)	93 (31)	373 (31)
	55 to 64	686 (21)	70 (23)	245 (21)
	65 to 74	471 (14)	34 (11)	187 (16)
	75+	173 (5)	12 (4)	58 (5)
Mental Health Code				
	Blank	2,006 (60)	175 (58)	767 (64)
	CCCMS	1,006 (30)	113 (37)	336 (28)
	EOP	326 (10)	15 (5)	89 (7)
Life Sentence				
	Yes	1,025 (31)	79 (26)	412 (35)
	blank	2,313 (69)	224 (74)	780 (65)
Sex Offender Registrant				
	Blank	2,343 (70)	224 (74)	871 (73)
	Yes	995 (30)	79 (26)	321 (27)
Strike Count				
	2	830 (25)	82 (27)	281 (24)
	3	357 (11)	53 (17)	116 (10)
	Missing	2,151 (64)	168 (55)	795 (67)
Years Until Projected Release				
	00 to 04	1,545 (46)	136 (45)	531 (45)
	05 to 09	385 (12)	25 (8)	145 (12)
	10 to 19	420 (13)	52 (17)	132 (11)
	20 to 29	138 (4)	16 (5)	48 (4)
	30 or more	850 (25)	74 (24)	336 (28)

Table 13. Top Ten Chronic Diseases Reported in General Population Assessments

Rank*	Rank among Medical Bed inmates	Description	Count (weighted percent of sample)**
1	1	Hypertension	599 (51)
2	68	Anxiety disorder	318 (27)
3	9	Low back pain	306 (26)
4	16	Hypercholesterolemia/Hyperlipidemia	311 (27)
5	32	Hx PPD+	311 (27)
6	27	Arthritis	287 (25)
7	3	Hepatitis C	243 (21)
8	13	GERD	239 (20)
9	2	Diabetes mellitus	215 (18)
10	4	Ischemic Heart Disease	206 (18)

*Based on weighted counts
**These estimates cannot be generalized beyond the sampled facilities due to sampling method. See text for explanation.

The number of diagnoses recorded for general population inmates was higher than for inmates in the medical bed census sample. This unexpected result may be due to variation in the assessors' examination of the medical records between the two data collection activities. The medical bed census utilized CDCR nurses and nurse consultants for data collection, whereas the general population sample data collection used external consultant nurses from Lumetra.

The rank of diseases among the medical bed census and the general population sample are notably different. In particular, the low rank of anxiety disorder among the medical bed census inmates is likely due to the explicit exclusion of mental health patients from the census, but the prevalence of anxiety disorder in the general population sample confirms the extent of significant mental health problems among inmates.

5.2.3 Medical Needs

In Section 3 of the assessment tool information regarding inmates' current medical treatment needs was obtained from the medical record. The top ten nursing needs reported are listed in Table 14. As with disease diagnoses, the medical bed census and the general population sample are quite different with respect to medical needs.

Table 14. Top Ten Nursing Needs Reported in General Population Assessments

Rank*	Rank among Medical Bed inmates	Description	Count of nursing needs in general population sample (weighted Percent of sample)**
1	30	Straight cane	263 (23)
2	4	Chronic pain	172 (15)
3	3	Wheelchair	173 (15)
4	36	Blind 2 eyes	134 (11)
5	33	Orthodic device	99 (8)
6	39	Hearing Impaired	69 (6)
7	40	Fingerstick daily	57 (5)
8	12	Sliding Scale Insulin	62 (5)
9	17	Routine Insulin	51 (4)
10	25	Nebulizer Treatment	50 (4)

*based on weighted counts

**These estimates cannot be generalized beyond the sampled facilities due to sampling method. See text for explanation.

5.2.4 Functional Impairment

Functional impairment was measured using an activities of daily living (ADL) scale and a prison activities of daily living (PADL) scale. The results of the ADL section are shown in Table 15a and 15b. The results of the PADL section are shown in Tables 16a and 16b.

Activities of Daily Living

Of the inmates in the general population assessment, 202 individuals were not independent in at least one of the following six ADLS: grooming, dressing, bathing, toileting, ambulation and eating, and 44 individuals needed extensive assistance or were totally depended in at least one ADL. Proxy respondents were therefore asked more detailed questions about their need for assistance with ADLs. Table 14a shows the number of inmates who needed supervision or assistance with each ADL. Table 14b shows the frequency with which inmates had limitations in multiple ADLs.

Table 15a. Inmates Requiring Supervision or Assistance with ADLs

Activity of Daily Living	1. Independent Number (Pct)	2. Supervision or Limited Assistance Number (Pct)	3. Extensive Assistance or Total Dependence Number (Pct)	4. Activity Did Not Occur Number (Pct)	5. Missing Number (Pct)	Column 2 + 3 + 4 Number (Pct)
Walk	990 (83)	125 (12)	35 (4)	16 (1)	0 (0)	176 (17)
Eat	1131 (96)	31 (3)	1 (0)	0 (0)	3 (0)	32 (3)
Dress	1130 (97)	27 (2)	7 (1)	0 (0)	2 (0)	34 (3)
Hygiene	1109 (95)	42 (4)	10 (1)	3 (0)	2 (0)	55 (5)
Bathe	1093 (93)	54 (5)	14 (1)	2 (0)	3 (0)	70 (7)
Toilet Use	1124 (96)	30 (3)	7 (1)	1 (0)	4 (0)	38 (4)

Table 15b. Inmates Needing Supervision or Assistance with Multiple ADLs

Count of ADLs per person	Extensive Assistance Required or Total Dependence: Number of Inmates in Sample (Weighted Percent)	At least limited assistance required: Number of Inmates in Sample (Weighted Percent)
0	1107 (94)	964 (81)
>0	59 (6)	202 (19)
>1	15 (2)	76 (7)
1	44 (4)	126 (12)
2	4 (0)	27 (3)
3	5 (1)	16 (2)
4	2 (0)	8 (1)
5	3 (0)	5 (0)
6	1 (0)	20 (2)

Prison Activities of Daily Living

Table 16a shows the number of inmates who were not able to perform each PADL. Table 16b shows the frequency with which inmates had limitations in multiple PADLs.

Table 16a. Limitations in PADLs

Prison Activity of Daily Living	1. Independent Number (Pct)	2. Temporary Number (Pct)	3. Permanent Number (Pct)	4. Missing Number (Pct)
Floor for Alarms	892 (76)	29 (2)	241 (21)	4 (0)
Hear Orders	1113 (95)	16 (1)	34 (3)	3 (0)
Stand for Count	1064 (91)	15 (1)	83 (8)	4 (0)
Dining Hall	1096 (93)	8 (1)	55 (6)	7 (1)
Top Bunk	525 (45)	47 (4)	592 (51)	2 (0)
Climb Stairs	714 (61)	39 (3)	412 (36)	1 (0)

Table 16b. Occurrence of Limitation in Multiple PADL

Number of PADLs	Temporary Limitation Number (Pct)	Permanent Limitation Number (Pct)	Temporary and Permanent Limitations Number (Pct)
0	1,070 (92)	549 (47)	503 (43)
1	57 (5)	182 (16)	183 (16)
2	25 (2)	204 (17)	219 (19)
3	13 (1)	130 (11)	142 (12)
4	2 (0)	80 (7)	86 (7)
5	0	15 (1)	24 (2)
6	0	7 (1)	10 (1)
Total	1,167 (100)	1167 (100)	1167 (100)

5.2.5 Cognitive Impairment

Cognitive impairment was measured with questions regarding decision-making, memory, and making oneself understood. The results of the cognitive function assessment are shown in Table 17. Most general population inmates (90 percent) were completely independent in decision-making. Only 5 percent of general population inmates were reported to have short- or long-term memory problems. Only 3 percent of the sampled inmates could only make themselves understood "sometimes" or "rarely."

Table 17. Cognitive Function

Category	Value	Number (Pct)
Decision-making		
	Independent	1,053 (90)
	Modified independence	40 (3)
	Moderately impaired	60 (5)
	Severely impaired	12 (1)
	Missing	1 (0)
Short term memory		
	OK	1,105 (95)
	Problem	58 (5)
	Missing	3 (0)
Long-term memory		
	OK	1,109 (95)
	Problem	53 (5)
	Missing	4 (0)
Can make self understood		
	Understood	1,077 (92)
	Usually	46 (4)
	Sometimes	25 (2)
	Rarely	16 (1)
	Missing	2 (0)

5.2.6 Level of Care

Unlike the medical bed census, no proxy or assessor recommendations regarding LTC placement were obtained in the general population sample. Instead, the expected LOC was calculated using a statistical model described in the next section of this report. However, correctional officers (COs) who served as proxy respondents were asked to assess whether they felt that the inmate should not be housed in the general population because of disease or due to a functional or cognitive reason. CO proxies felt that housing in the general population was not appropriate for 9 percent of assessed inmates as shown in Table 18.

Table 18: CO Proxy Assessment of Inmate's Current Level of Care Assignment

Value	Number (Pct)
Inmate Considered Physically or Medically Unsafe In GP	101 (9)
Inmate Not Considered Physically or Medically Unsafe In GP	1057 (91)
Missing	8 (0)

5.2.7 Overlap of Mental Health and Long-term Care Need

Although we did not incorporate the MHTS into the PDS, there was some mental health classification data available in the PDS from DDPS and utilization data. Having a mental health classification of EOP or CCCMS in the DDPS data indicated a history of being in an EOP or CCCMS bed. Inmates with a mental health classification of EOP or CCCMS were more likely to need LTC. These beds were included in our general population sample because they had not been accounted for in the medical bed census. However, the inmates with a mental health classification code of EOP or CCCMS were not necessarily in such beds at the time of the general population survey. After adjusting for sampling probability, inmates in the nine sampled prisons with a history of being in EOP or CCCMS were 5.6 and 1.8 times as likely to need LTC as inmates who had no mental health classification (and presumably no history of occupying EOP or CCCMS beds) Table 19.

Table 19. Relative Risk of LTC Need among Patients with History of Occupying Mental Health Bed

MHCODE	Expected Number with LTC need*	Population**	Fraction with LTC need	Relative Risk
none	603	35,617	1.69%	n/a
CCCMS	279	8957	3.12%	1.8
EOP	89	943	9.44%	5.6

*Adjusted for sampling probabilities (i.e. the value reflects the expected number for all nine sampled facilities
**General population of nine sampled facilities

6.0 Estimates of Long-term Care Need in the Prison Population

This section of the report describes the methods used to estimate the number of long-term care (LTC) beds that the California Prison Health Care Receivership Corporation can expect to need in the future to house California prisoners and provides those estimates and projections.

As described earlier in the report, two groups of inmates were assessed to provide data for projecting long-term bed needs: a census of patients in medical beds and a sample drawn from general population housing units at nine facilities. Primary differences between the two data collection processes were that 1) CDCR nursing staff from the medical units served as proxy data sources in the Medical Bed Census Assessment Tool while CDCR COs served as proxies for the General Population Assessments; and 2) proxies and assessors made a LOC determination for each assessed inmate in the Medical Bed Census, but no assignment was made in the General Population Assessments. This LOC determination (LOC) was not made as part of the General Population Assessment. As a result, it was necessary to develop an algorithm to estimate a sampled inmate's need for LTC and the level of that care directly from the assessment data.

6.1 Development of an Algorithm to Estimate the Probability of Current Long-term Care Need for General Population Inmates

As described in Section 4.1.2 of this report, a new definition of CDCR's levels of care, or need for long-term housing and care, were conceptualized by CPR staff that reflects a vision for the future that houses inmates into five major levels:

- high acuity medical beds;
- low acuity medical beds;
- specialized/sheltered housing,
- regular general population, and
- hospice.[2]

CDCR assessors, in addition to assigning a LOC to each assessed inmate in the medical bed census sample, were asked to estimate whether the inmate required the assigned LOC for more or less than the next three months.

The LOC determinations from the medical bed census contributed greatly to our analysis and interpretation of general population assessment data. After several iterations of initial data analysis, we decided to hold these determinations as the "standard" to which various statistical and clinical algorithms and other efforts to group or categorize inmates would be compared.

The LOC assignment algorithm was developed with input from three clinicians participating in the project. Alternative specifications of the algorithm were tested among the medical bed patients for

[2] Though these levels of care may be redefined over time in terms of the type of care and supports they will provide, the project team relied heavily on the conceptualized levels in these analyses.

whom a LOC recommendation had been made by the clinician assessors. We were able to use the medical bed census assessment data to develop and test alternative specifications of the LOC placement algorithm (as again, this sample was associated with a LOC recommendation). Variations of the algorithm were then applied to the inmates in the general population sample in order to assign the main outcome variable (Level of Long-term Care: 1. general population, 2. specialized general population, 3. low acuity long-term care, and 4. high acuity long term care). The algorithm is structured sequentially so that the need for LTC outside the general population is first established based on functional and/or cognitive impairment (inmates must have at least one major ADL or permanent PADL or cognitive problem to be considered for LTC). Then the *probability* of needing LTC and the *level* of that care are estimated for these individuals using statistical models based on observed diagnoses and nursing needs.

To develop the statistical models, we used the medical bed census data. Disease diagnoses and nursing needs from the assessment tool were tested both for correlation with the need for LTC and for correlation with the LOC among inmates identified as needing LTC. Any diseases or nursing needs that were significantly correlated with needing LTC were retained as variables in the logistic model used to predict LTC needs among general population inmates who met the clinical criteria of having functional and/or cognitive limitation. Similarly, any diseases or nursing needs that were significantly correlated with at least one of the levels of care were retained as variables in the multinomial logistic model used to predict level of care. These correlations are shown in Appendix 7 [TABLES A7.1-4].

Our approach to estimating the long-term housing and support needs of general population inmates involved two steps:

- First we modeled placement determinations from the medical bed census and tried to differentiate those inmate characteristics that CDCR assessors seemed to rely on to "drive" their LOC determinations.
- Then (when that approach resulted in some somewhat spurious findings) we worked with clinical CPR staff to develop a clinical model (or algorithm) to attempt to group or categorize inmates in our sample.

In the end, we used a "hybrid" approach to estimating California inmates' long-term housing and supports needs, by "screening" our sample first to identify current inmates in the general population units that have a probability of requiring long-term care, and then applying a statistical model to group inmates by need according to their probability of any given set of conditions and treatment needs. As described below, inmates' physical functioning was the primary driver of the screening step.

6.1.1 Estimating the Need for Long-term Care

The team agreed that functional and cognitive impairment are key drivers of an inmate's need for LTC and supports, and the literature is robust with examples of models that estimate need for care, services, and nurse staffing levels, using activities of daily living, cognitive status, and other health characteristics (Finch, Kane, and Philip, 1995; Lazaridis, Rudberg, Furner, and Cassel, 1994; Fries, 1990).

Based upon the literature and the clinical input of the team, six sets of alternative criteria were considered for identifying inmates needing care outside of general population. Listed in order of increasing inclusiveness, they are:

I. Any person requiring extensive assistance or totally dependent in at least two ADLs or with permanent limitation in at least two PADLs
II. Any person requiring extensive assistance or totally dependent in at least one ADL.
III. Any person requiring at least limited assistance in at least one ADL.
IV. Any person with permanent limitation in at least one PADL
V. Any person requiring extensive assistance or totally dependent in at least one ADL or with permanent limitation in at least one PADL
VI. Any person requiring extensive assistance or totally dependent in at least one ADL or with permanent limitation in at least one PADL or with any cognitive problem (in decision-making, short term or long term memory, or making themselves understood)

The performance of these criteria as screening tests for LTC need among inmates in medical beds is summarized in Table 20. None of the threshold criteria for LTC constructed using functional and/or cognitive limitations captures every medical bed patient assessed to be in need of LTC, suggesting that some factors other than the observed functional and/or cognitive limitations are associated with a need for LTC. Moreover, there is a tradeoff between the accuracy with which patients are properly identified as needing LTC (sensitivity) and the accuracy with which patients are properly identified as not needing LTC (specificity). For example, one of the more stringent criteria tested (I) requires that a patient must have a major limitation in at least one ADL. Using these criteria, only 35 percent of inmates in medical beds that were assessed to need LTC are identified as such. However, only 16 percent of inmates in medical beds that were assessed as not needing LTC would be misidentified as needing LTC. If the criteria are relaxed so that any major limitation in an ADL or any permanent limitation in a PADL or any cognitive problem is taken as an indicator of LTC need, the fraction of inmates in medical beds correctly identified as needing LTC increases to 81 percent. But, the fraction of inmates in medical beds that are incorrectly identified as needing LTC also increases (from 16 percent to 36 percent).

Table 20. Test Characteristics for Identifying LTC with Measures of Functional Limitation Among Medical Bed Occupants

	I. At least 1 Major Limitation in ADLs* (Percent)	II. At least 1 Limitation in ADLs** (Percent)	III. At least 2 Major ADL Limitations or 2 Permanent PADL Limitations (Percent)	IV. At least 1 Permanent PADL Limitations (Percent)	V. At least 1 Major ADL Limitation or Permanent PADL Limitation (Percent)	VI. At least 1 Major ADL or Permanent PADL or Cognitive Problem*** (Percent)
Sensitivity (Fraction of LTC patients identified correctly)	35%	58%	66%	71%	74%	81%
Specificity (Fraction of non-LTC patients identified correctly)	84%	69%	72%	72%	67%	64%

*Extensive assistance or total dependence in at least one ADL.
**Limited assistance, supervision, extensive assistance or total dependence in at least one ADL.
***Cognitive Problem is defined as any short or long term memory problem, or limitation in decision-making, or limitation in making oneself understood.

It is interesting to note that LTC need was more effectively identified using PADLs than ADLs. Using ADLs alone (I or II) identifies only 35 percent (when criteria is "extensive assistance in at least one ADL") or 58 percent (when criteria is "at least limited assistance in at least one ADL") of LTC inmates in medical beds. However, using a criterion of at least one permanent PADL limitation (IV) identifies 71 percent of LTC inmates in medical beds. Because of the correlation between ADLs and PADLs, adding major ADL limitations to the criteria (i.e., V) only results in an increase from 71 percent to 74 percent of LTC inmates identified. Adding cognitive problems to the criteria, increases the fraction of LTC inmates identified to 81 percent. Set of criteria VI—the most inclusive—was used in our final analyses.

The purpose of the algorithm was not to guide individual clinical care decisions, but rather to estimate an overall need for long-term-care in the total CDCR population. Therefore, instead of using decision rule to classify an inmate into a discrete category (e.g., LTC needed or LTC not needed), it was possible to assign a *probability* of LTC need to each inmate based on the health-related data collected using the assessment tool. We tested alternative specifications of a regression model for predicting the probabilities of LTC need among medical bed census patients. The model included age, indicator variables for functional limitation in ADLs and PADLs and cognitive problems, as well as constructed variables representing sets of disease diagnoses and nursing needs drawn from the 105 diseases and 56 nursing needs listed on the assessment tool. Diseases or nursing needs were selected for inclusion in these constructed variables based on their significant ($p<0.05$) positive or negative correlation with the LTC recommendation of the clinician-assessors. Four such constructed variables were considered for the model (Table 21).

Table 21. Constructed Variables for LTC and LOC Prediction Models

Constructed Variable	Included diseases or nursing needs
Count of diseases predicting long term care	Hypertension, Ischemic Heart Disease, Congestive Heart Failure, Atrial Fibrilation, COPD, Chronic constipation, Chronic renal insufficiency, Dementia, History of stroke with residual, Hemiplegia, Quadriplegia, Paraplegia, Hearing loss, Diabetes mellitus
Count of diseases predicting short term care	MRSA, Cellulitis, Herpes zoster, GI bleed, Nausea and vomit, jaw fracture, pre-procedure care, post-hospital care
Count of nursing needs predicting long term care	Vital signs daily, Nebulizer, Trach care, Fingersticks less than daily, Oral anticoagulants, Medication administration, Urinary incontinence, Diapers/briefs, Condom catheter, Gastro PEG tube, Fecal incontinence, Walker, Wheelchair, Mechanical Lift, Blind in 2 eyes, Hearing impaired, History of recent falls, History of falls past >90days, PT and/or OT
Count of nursing needs predicting short term care	Vital signs Qshift, Intermittent IV, Continuous IV, Central Line/PICC, SQ anticoagulant, Surgical site/drain care daily, Surgical site/drain care < daily

The results of the final logistic model are shown in Table A.7.5. Consistent with the observation that PADLs are more useful than ADLs for identifying LTC need among inmates in medical beds, the variables measuring limitations in ADLs were not significant when limitation in PADLs were included in the model. Similarly, although age is strongly correlated with LTC need, age was not a significant predictor when other factors were included in the model, and, therefore, was dropped from the specification.

6.1.1.1 Correction Factor

Because the coefficients of the predictive model were estimated using data for patients in the medical bed census, a methodological issue arises when we attempt to apply the model to the general population. The model does not capture all the factors that affect a patient's probability of needing LTC. Unobserved factors that are associated with a need for LTC are likely to be concentrated in the subpopulation of inmates in medical beds. As a result, applying the predictive model to the general population will overestimate the LTC need in that population. To illustrate, consider an inmate in a medical bed with no functional limitation in ADLs or PADLs, and no cognitive problems. According to the model, this inmate still has a 27 percent chance of currently needing LTC. It is unlikely that a randomly selected inmate living in the general population, also with no functional limitations in ADLs or PADLs and no cognitive problems, faces a 27 percent chance of currently needing LTC. Clearly, other factors (observable to the clinician-assessor, but not related to functional status) must explain the high likelihood of LTC need for the inmate currently in a medical bed.

One solution to this methodological problem would be to mirror the protocol used in the medical bed census and obtain a level-of-long-term care recommendations from clinician-assessors drawing on data collected with the assessment tool. In this way, the relationship between assessment tool variables and the need for LTC for general population inmates could be directly established.

An alternative solution, hereafter referred to as algorithm VII, implements a correction factor to the model's predicted probabilities. If one is willing to assume that the probability of LTC need among inmates with observed functional or cognitive limitations is similar for inmates in the general population and inmates in medical beds (i.e. an observable impaired functional status outweighs

unobservable factors) then one could accept the model's prediction for inmates with some functional or cognitive limitation, but downweight the model's prediction for those who are *not* functionally or cognitively impaired. To downweight the model's predictions for these individuals, the predictions could be multiplied by a correction factor that represents the assumed relative risk of needing LTC for general population inmates versus medical bed inmates (with no observed functional or cognitive impairments). Since the probability that a general population inmate with no observable functional or cognitive limitations is likely to be very low, we assumed the correction factor to be zero. With this approach, inmates must have at least one major ADL or permanent PADL or cognitive problem to be considered for LTC. Among those who meet that criterion, their probability of needing LTC is calculated using the (uncorrected) predictive model. To the extent that LTC need is still influenced by unobservable factors that are correlated with bed type even among those with similar functional status, the estimates generated by this approach may still be overestimates. Any overestimation may be offset by the assumption that *no* individuals in general population who are free of limitation in observed ADLs, PADLs, or cognition require LTC.

6.1.2 Estimating Level of Care

Having established a decision rule for assigning probabilities of current LTC need to general population inmates, we then developed a method for estimating the level-of-care required by these LTC inmates. The disease diagnoses and nursing needs on the assessment tool were tested for significant correlation with level-of-care among inmates identified as needing LTC in the medical bed census. Diagnoses and nursing needs that were significantly correlated were then tested in a multinomial regression model for estimating the probabilities of needing one of three levels of care (i.e., specialized general population, low-acuity long-term care, high-acuity long-term care). Any variables that were significant predictors for at least one of the levels of care were retained in the model (Table A7.6). This multinomial model was then used to estimate a probability that an inmate needing LTC would need each of the three types of LTC beds. The probabilities for the three beds summed to one. For example, an inmate with particular characteristics might be found to have a 65% chance of needing LTC and given that LTC is needed, they may have a 10% chance of needing hi-acuity care, 15% chance of low-acuity care, and 75% chance of needing a specialized general population bed.

6.2 Adjusting for Low Sensitivity of Correctional Officer Nominations

When calculating the estimates of LTC bed need as described above, we assumed that no inmates in the 4th stratum (low-risk and not nominated) needed long-term care. In other words, we assumed that the nomination procedure would identify all inmates needing long-term care. However, an analysis of the CO nominations among the inmates in our sample indicates that the nomination exercise was not very sensitive (Table A4-1). From our sample, we estimated 329 inmates need long-term care and 80 (24%) of them had been nominated by COs.

In order to get an estimate of the number inmates with long-term care needs among the inmates in the unsampled stratum of non-nominated low-risk inmates, we used the proportion of inmates from the medical bed census who were in the low-risk group in the 9 sampled prisons (33/164 = 20%). Assuming that the distribution of inmates with LTC need across the low and high risk groups is the same for the inmates in general population as it was for the inmates in medical beds, then, had there

been no nominations, the number of inmates from general population needing LTC that we calculated above, $\hat{C}$, would be an underestimate that can be corrected by multiplying by the adjustment factor, R = 164/(164-33) = 1.25. Because the sensitivity of the nominations in our project was 24%, the adjustment factor can be reduced to 164/(164-(33*0.79)) = 1.19. This is the adjustment factor we used in reporting our main results. The confidence interval around our estimate of current LTC bed need was adjusted by multiplying the $Var(\hat{C})$ by R^2.

6.3 Population-level estimates of current long-term care needs

To calculate the total number of inmates needing LTC at each LOC, we first applied, to our sample, the clinical criteria requiring that an inmate has some functional or cognitive limitation in order to be considered for LTC. For the inmates with such limitations, we then estimated their probability of needing LTC using the logistic model described above. (It was assumed that inmates without functional limitations or cognitive limitations did not currently need LTC). Then for inmates expected to need LTC, we applied the multinomial logistic model to estimate the probability these inmates would need each of the three types of LTC bed (levels of care). The results for each sampled inmate were weighted by the inverse of their sampling probabilities to generate an estimate of LTC need for the nine sampled prisons. The estimates for the sampled facilities, excluding CMF, were then generalized to the general populations of the 24 unsampled facilities, using weighting of inmates by risk strata. Estimate for CMF's general population were treated separately from the other prisons because of the prison's unique medical mission and the concentration of inmates with medical needs within its population. We then applied the adjustment factor (discussed in section 6.2) to the results for general population in order to account for LTC need in the unsampled stratum. Adding together the general population estimates of all the prisons and the estimated number of inmates needing LTC from the statewide medical bed census produced a total estimate for LTC bed needs across the CDCR system. These estimates are reported in the Table 22.

Table 22: Estimates of Current Need for Long-Term Care Beds in the California State Prison System*

Sub-population	Level of Long-term Care			
	Specialized GP (number of inmates)	Low Acuity (number of inmates)	High Acuity (number of inmates)	TOTAL (number of inmates)**
Medical Beds - all prisons	183	92	91	366
CMF	173	43	18	233
8 other sampled facilities	567	125	46	738
24 unsampled facilities	934	208	77	1,219
TOTAL- All prisons , unadjusted**	1,856	469	232	2,557
Adjustment Factor for Unsampled Strata				1.19
TOTAL – All prisons, adjusted for LTC need within unsampled stratum	2174	541	259	2974
95 percent confidence Interval (Lower Bound, Upper Bound)				(2713, 3233)

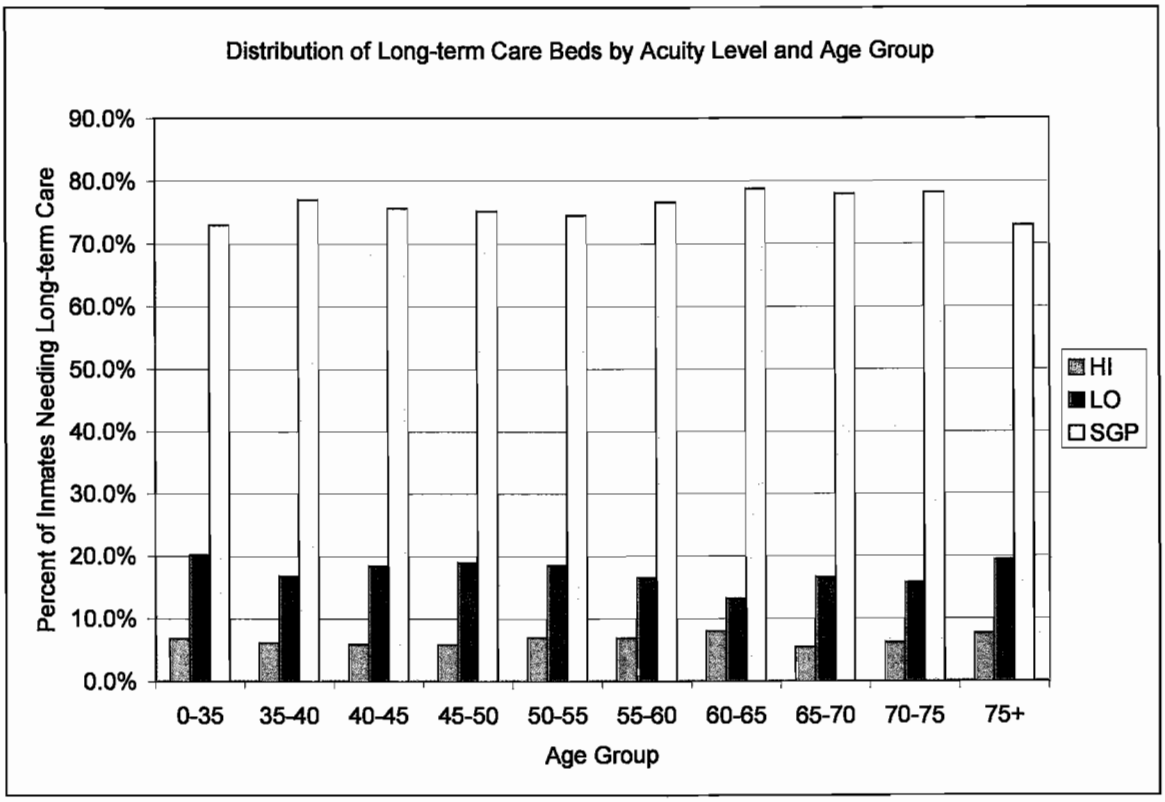
*Based on a population of 135,863 that does not include ~28,000 inmates in reception centers or ~7500 in community corrections.
*95% CI = E(X) +/- 1.96 * SQRT (Var(X)) where X is the number of beds needed

The 95 percent confidence interval around the total estimate of 2,974 beds is (2713, 3233). The inmates in need of LTC based on our estimates represent almost 2 percent of the CDCR inmate population. However, this estimate does not include the roughly 28,000 inmates in reception centers or about 7,500 in community corrections.

Our confidence interval estimates do not account for uncertainty in the value of the adjustment factor we calculated. This adjustment factor is calculated based on relatively small numbers of inmates in medical beds, and its true value may be significantly different than we observed. To account for this we tested the impact of different values of the adjustment factor on our estimates. In this sensitivity analysis, we found that even if the adjustment factor were as high as 1.5, which implies a 1 percent prevalence of LTC need in the "unsampled and not nominated" stratum--a reasonable upper bound--the total number of LTC beds currently needed would be 3,836 (95 percent CI: 3349, 4322)

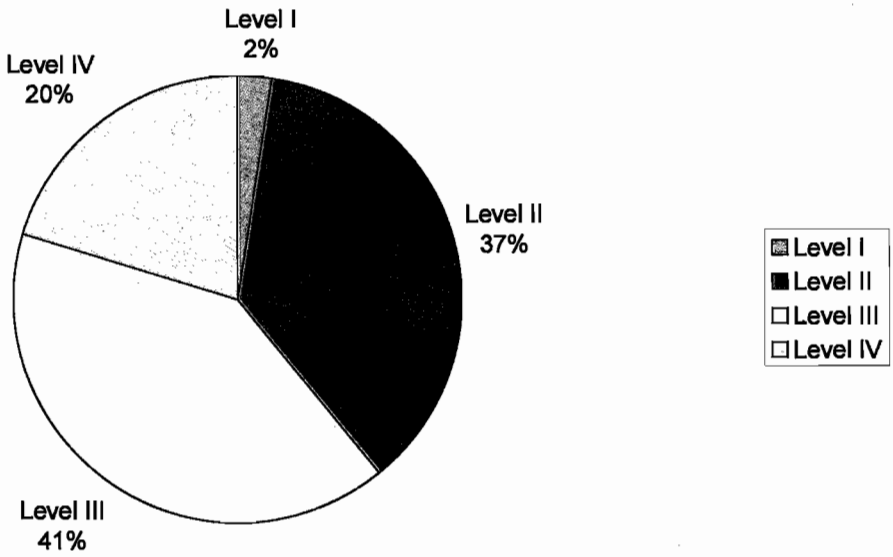
Approximately 73 percent of the LTC beds are required at the level of specialized general population, 18 percent of the required beds are low-acuity, and 9 percent of the required beds are high-acuity. Among those needing long-term care, we expected to observe higher acuity needs for older inmates. However, no such trend was observed (Figure 6.1). For all age groups, between 73 percent and 79 percent of inmates needing long-term care were estimated to need care at the specialized GP level. Similarly the approximately 2:1 ratio between low-acuity and high-acuity beds was constant across age groups.

Figure 6.1



In planning for the construction of new LTC beds, non-medical custody factors must be considered. In particular the security level at which inmates are housed may constrain the housing placement decision. Among the entire prison population (in our December 2006 cohort) 75%, 5%, and 20% of females were housed at level I, II, and III. Likewise, 14%, 29%, 35%, and 22% of males were houses at level I, II, and III. However, our sample of female inmates only included inmates at security level I and the distribution of inmates in the eight male institutions we sampled was 6%, 36%, 32%, and 26% for the four security levels, I, II, III, and IV, respectively. Among inmates at these prisons estimated to need LTC, 2%, 37%, 41%, and 20% of were at security level I, II, III, and IV, respectively (Figure 6.2). Thus, inmates needing LTC were somewhat more frequently found at security level III and less frequently found at levels I and IV than the non-LTC population of their prisons.

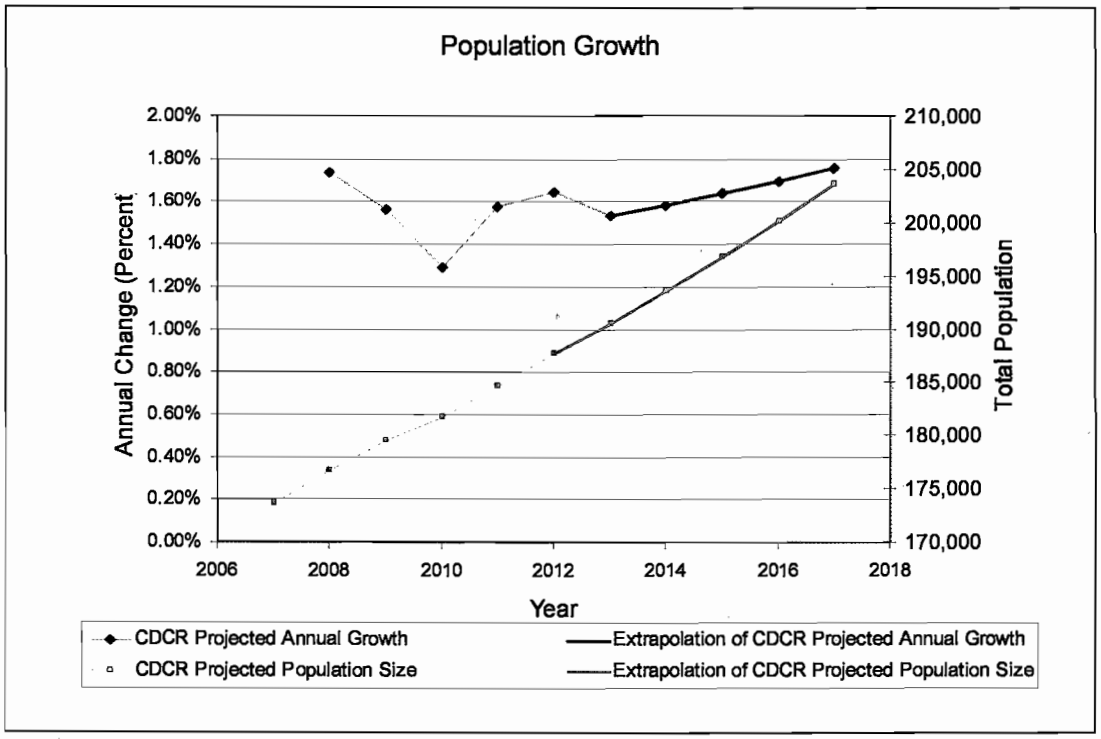
Security Level of Male Inmates Needing Long-term Care



7.0 Projected Growth in Long-term Care Needs for CDCR Inmates

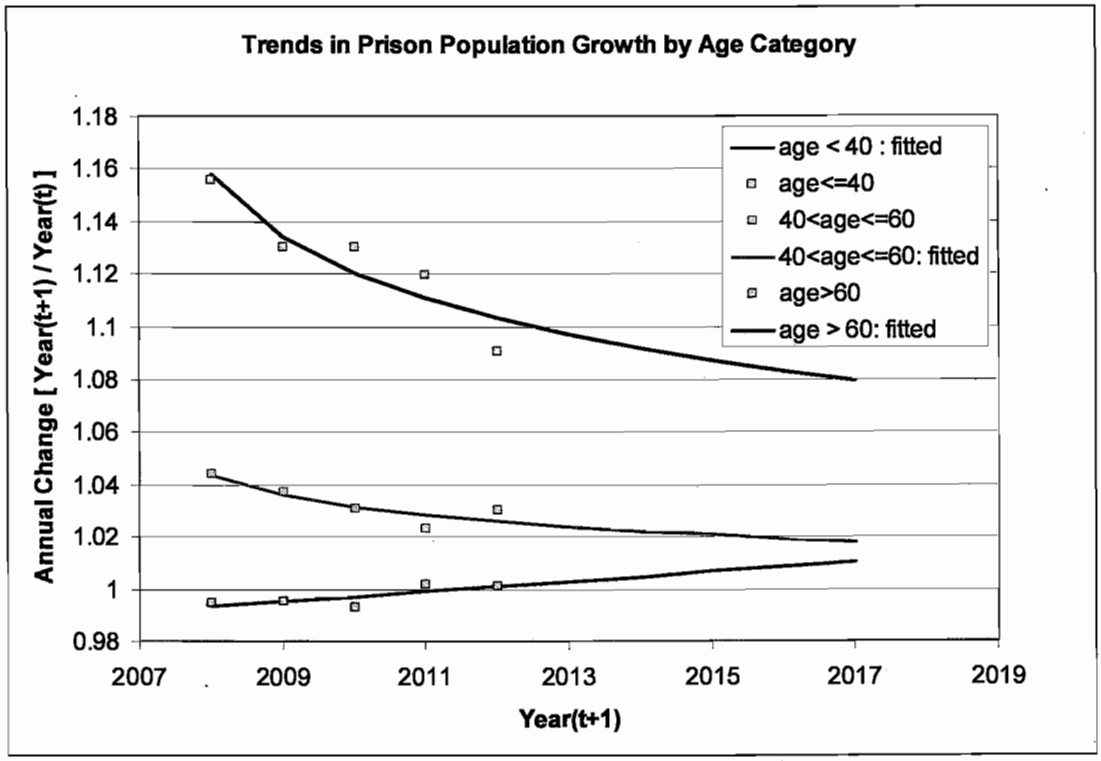
The California prison population is ageing. According to CDCR projections, the total CDCR inmate population is expected to increase by 8 percent through 2012, but the over-60 age group will increase by 80 percent[3] (Figure 7.1). We extrapolated the CDCR's official projections for an additional five years (through 2017) by fitting trendlines to the growth rates within age strata and projecting the change in population within these age groups (Figure 7.2).

Figure 7.1



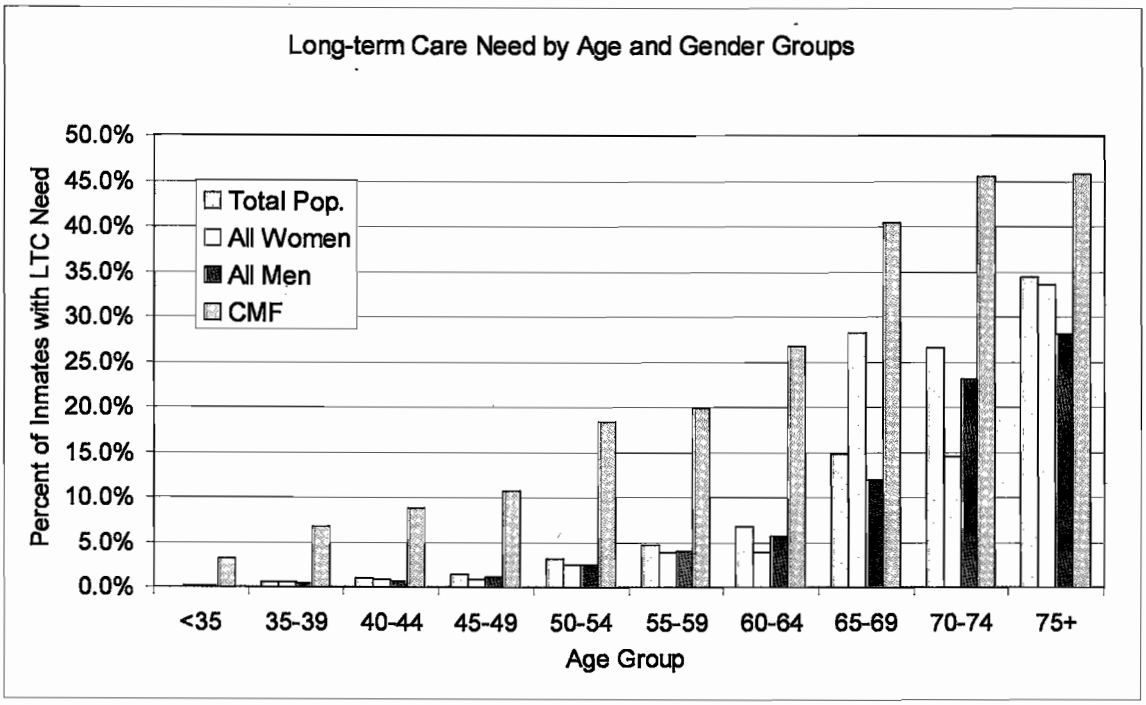
3 California Department of Corrections. 2007. "Adult Population Projections 2007-2012" http://www.cdcr.ca.gov/reportsresearch/OffenderInfoServices/Projections/S07Pub.pdf

Figure 7.2



The rapid increase in the number of older inmates will drive demand for LTC within the California prison health care system. Our project found that the probability of needing LTC increases exponentially with age. The fraction of inmates under 50 needing LTC was under 1 percent. The probability of needing LTC reaches 6.8 percent for those aged 60-64, 15 percent for those aged 65-69, 27 percent for those aged 70-75, and 34 percent in inmates over 75 (Figure 7.3).

Figure 7.3



To generate projections of LTC bed need over the next five years, we partitioned the estimated 2557 LTCs that are currently needed in to 10 age categories. We calculated the proportion of population that currently needs LTC within each age category. Then we applied that estimate of the age-specific prevalence of LTC need to the CDCR's age-structured population projections. For example, we found the prevalence of LTC need among the 55-59 age group was 4.65 percent. From 2007 to 2008, that age group is projected to increase by 671 from 5889 to 6560, so that absolute number of individuals needing LTC in that age group would increase from 274 (5889 x 0.0465 = 274) to 305 (6560 x 0.0465 = 305). We then applied the adjustment factor for LTC need in the unsampled stratum. By 2012, we estimate that between 3,835 and 4,570 beds will be needed. The resulting projected number of LTC beds needed over the next ten years are shown in Table 23.

Table 23. Projected Number of Long-term Care Beds Needed Over the Next Ten Years*

Year	Expected LTC Need	Lower Bound Estimate†	Upper Bound Estimate†
2007	2974	2713	3233
2008	3224	2941	3504
2009	3474	3170	3777
2010	3697	3373	4019
2011	3939	3593	4282
2012	4204	3835	4570
2013	4411	4144	4797
2014	4624	4344	5029
2015	4842	4548	5265
2016	5064	4757	5507
2017	5292	4971	5755

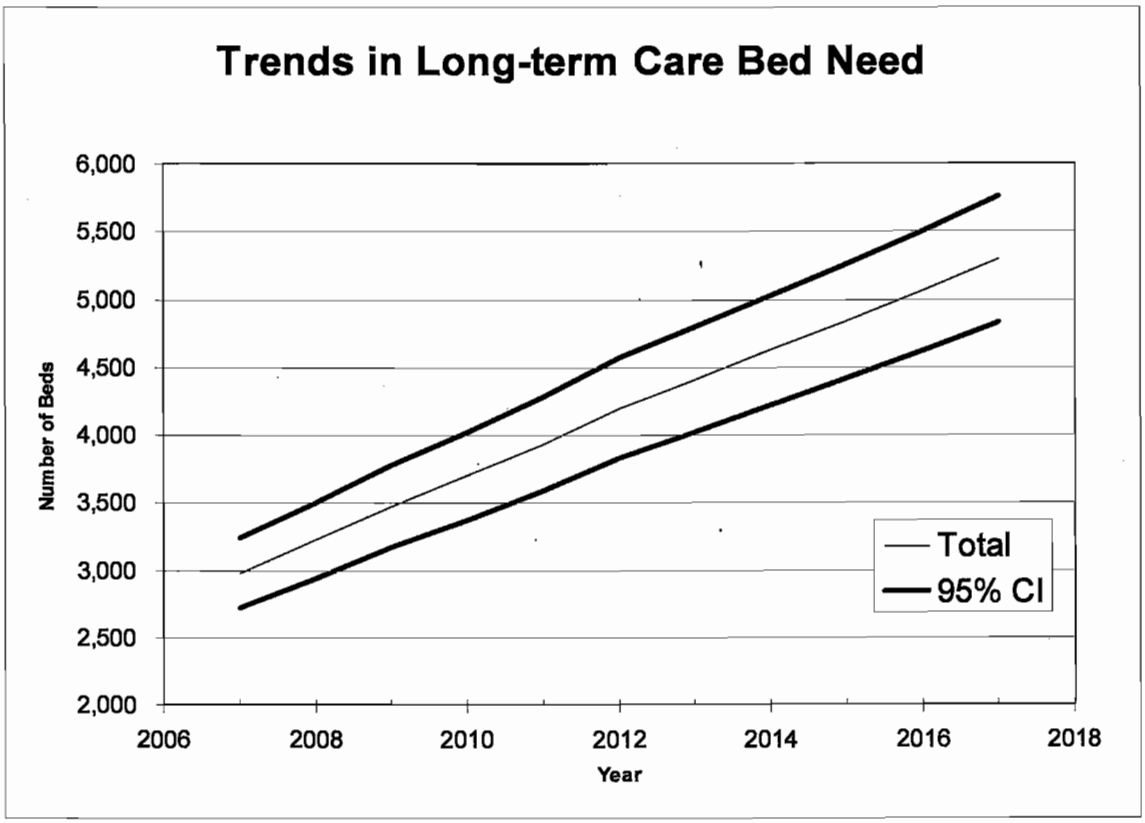
*The estimates for the first 5 years are based directly on the age- and sex- structured population projections developed by CDCR as described in the text. The second five years (2013-2017) are based on extrapolations of the CDCR population projections obtained by fitting parametric trendlines to the age-stratified population growth projections as described in the text.

†The lower bound estimate represents projections based on the lower threshold value in the 95% confidence intervals of the base estimate of current LTC bed need and the upper bound estimate represents projections based on the upper threshold value in the 95% confidence intervals of the base estimate of current LTC bed need adjusted for LTC need in the unsampled strata. The projected trends do not incorporate a measure of increasing uncertainty over time.

By extrapolating the CDCR prison population projections and additional five years (to 2017), we found that the trends in inmate ageing would continue, and LTC bed need would continue to rise approximately 230 beds per year (Figure 7.4). Assuming the projected population growth and age-group trends persist for an additional five years to 2017, the continued aging of the population will require between 4,970 and 5,760 beds for inmates with long term care needs.

These results do not account for the possibility that chronic disease progresses more slowly among incarcerated individuals than among free persons. In other words, if inmates who are 50 in 2017 will have spent more of the preceding years incarcerated than inmates who reached 50 in 2007, then older inmate in the future may have lower rates or less severe chronic disease than current older inmates. This may reduce the need for LTC beds somewhat.

Figure 7.4*



*The projected trends do not incorporate a measure of increasing uncertainty over time.

8.0 Discussion

The results of the medical bed census suggest a fairly high overall concurrence between placement in some type of medical bed and assessed needs for care beyond that available in regular GP. However, the results of the census also reveal substantial discordance between current placement in *specific* types of medical beds and assessed level of care needs. In most cases of discordance, it was found that the inmate could be better served at a lower level of care, suggesting that health care infrastructure and services could be reorganized to accommodate inmates in specialized general population units where their moderate care needs could be more efficiently met.

The survey of general population found considerable unmet need for long-term care services. We estimate that over 2500 inmates currently in regular general population could benefit from a transfer to LTC medical beds. However, nearly three-quarters of these inmates were estimated to need a low level of LTC that could be provided in specialized general population housing designed specifically to support the delivery of long term care programming. The construction or reallocation of new beds to this level of care would increase the real capacity of the infirmary beds (GACH, CTC and OHU) to treat short-term patients with acute medical needs. The potential to create greater capacity in the infirmary beds for acute care is substantial. Of the inmates in the census, no more than 215 (30 percent) would remain in the current infirmary beds if adequate LTC housing was available. We expect a new care configuration that supported LTC and liberated infirmary beds for short-term beds would likely reduce CDCR's reliance on relatively expensive community hospital beds and reclaim current CTC and OHU beds for acute infirmary care.

The establishment of housing and programming for inmates with LTC needs will surely increase the overall number of inmates in medical beds. The transfer of inmates from regular GP to LTC beds is a move to a higher level of care, but the implication for resource utilization is uncertain. A case management program for inmates in LTC beds may improve health outcomes and reduce the utilization of community hospital beds, which may, in turn, offset some of the costs associated with delivering long-term care.

The results of the full analysis including the medical bed census and the general population sample indicate that 2974 (95% CI: 2710, 3230) LTC beds are currently needed. The projected aging of the prison population is expected to drive growth in the demand for LTC beds and programming. The need for these beds will increase by roughly 230 beds per year over the next decade. By 2017, between 4,970 and 5,760 LTC beds will be needed.

One surprising finding of the study was the lack of association between age and level-of care *among inmates needing LTC*. We expect that as inmates age they may progress from specialized GP to higher levels of care. Our study is not longitudinal and could not follow the clinical progress of inmates over time. Nevertheless, we expected that LTC need among older inmates would be more likely to be at higher levels of care than LTC need among younger inmates. Because we did not observe this association between inmate age and level of care among inmates estimated to need long-term care, we reported bed need projections for all levels of long-term care combined. The aging of the prison population over the next decade will drive a steady increase in demand for long-term care beds, but our findings suggest that the distribution of long-term care bed demand by level of care will remain relatively constant with about three-quarters of LTC beds at the specialized GP level. Of the remaining LTC beds, about two-thirds are expected to be low-acuity and one-third high-acuity.

Our findings indicate that LTC need may be disproportionately higher among security level III inmates and lower among security level I and IV inmates, but these differences were modest. In general, we found that beds will be needs at all four security levels roughly in the same proportions found in the overall prison population.

Our study has several limitations. Our statistical models for projecting LTC need and for projecting level of care among general population inmates with LTC need relied on generalizing the relationship between LTC need and variables in our assessments for inmates currently in medical beds to inmates in the general population. To the extent that there were unobserved drivers of LTC need for the inmates in medical beds which we could not account for with our methods, we may have overestimated LTC need in the general population. The size of this overestimation would only be measurable if some clinical evaluations were conducted on a portion of the sampled general population inmates. Limited resources for data collection necessitated an approach in which the population was stratified and sampling occurred only in the higher-risk strata. Although we designed a reasonable method for estimating the amount of LTC need in the unsampled stratum, our method relies on a relatively small sub-sample of medical bed inmates and thus is subject to some significant uncertainty. Fortunately, we were able to set a reasonable upper bound on this uncertainty in sensitivity analysis. Our analysis did not calculate the uncertainty around the distribution of LTC patients into the three levels of care. And, as with the estimates of overall LTC need, the estimates of level-of –care needed also rely on generalizing from medical bed inmates to the general population. Finally, our analysis did not account for uncertainty in the CDCR population projections or trends in medical care over the next decade. Our LTC need projections do not account for uncertainty in the CDCR population projections on which they are based. Since the spring of 2000, the 5-year population projections of the CDCR have been quite accurate, with about a 4% underestimation error of inmate population 5 years into the future. This suggests that our confidence intervals for LTC need projection could be widened modestly to account for population projection uncertainty.

The Receiver has proposed the construction of 5,000 new health care beds. Earlier this year, Governor Arnold Schwarzenegger signed into law the Public Safety and Offender Rehabilitation Services Act of 2007, which provides for the immediate construction of 6,000 health care beds plus an additional 2,000 beds conditional on CDCR meeting rehabilitation, management, and construction benchmarks. Our results suggest that over half of these beds should be allocated to LTC in order to meet the growing need as California's prison population ages. Despite the limitations of our analysis and the corresponding uncertainty that remains in our estimate of current and future LTC need, we expect that 5000 beds will be adequate for meeting the LTC need of the California prison population over the 10-year time horizon we considered.

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Appendix 1: Project Data Set: Supporting Material and Tables

A1.1 Utility of PDS for the Data Warehouse Initiative

Much of the data collected in the PDS could also be valuable for medical case management. The PDS offers a snapshot of inmates who were in prison on December 31, 2006; yet, it serves as a prototype for a clinical data warehouse that would integrate this information in real-time for use in ongoing care management by medical and custody CDCR staff. All of the data sources from which the PDS was constructed could dynamically feed into a clinical data warehouse.

Although the value of a clinical data warehouse as a tool for high-quality, cost-effective care management is clear, several obstacles identified during construction of the PDS will need to be addressed before a "live" clinical data warehouse can be developed. The health-related data systems throughout CDCR suffer from (1) a lack of standards, policies, and procedures for data management, (2) a lack of infrastructure for integration and interoperability among facilities across the state, and (3) an over-reliance on ad hoc, labor-intensive efforts to extract information and reconcile discordant information across multiple legacy data systems, all of which results in poor data quality, overworked staff, and a missed opportunity to provide quality health care.

In the case of the Armstrong-Clark Tracking System (ACTS), the Mental Health Tracking System (MHTS), and the Pharmacy Tracking System (PTTS) data is spread across facilities in separate Microsoft Access databases. For example, Abt obtained 33 standardized stand-alone ACTS database files from CDCR, one for each prison.

A1.2 Disability Data

The PDS includes inmate disability data from facility-level ACTS. These facility-level ACTS databases are used to track inmates with special care needs as a result of having developmental or physical disabilities. Information from these databases is synchronized manually with the central DDPS/OBIS system as rarely as once per year. A DPP classification code is used to indicate physical disabilities. DPP classification codes were not found consistently in the ACTS data extracts that CDCR provided Abt. Therefore, we used the DPP codes from DDPS. An inmate can have up to 10 DPP codes recorded in DDPS resulting from multiple disabilities and multiple assessments during the course of an inmate's incarceration. A DDP classification code of "DDx" (where x represents an integer between 1 and 3) indicates that an inmate has developmental disabilities requiring special care and monitoring.

Comparing the classification of inmates according to the Clark assessment code for developmental disability program (DDP) placement found in ACTS databases at individual facilities to the corresponding classification information found in the central DDPS/OBIS system we found significant discordance as shown in Table A1.1. Of 171,959 inmates in the prison population on March 14, 2007, 1065 unique individuals were found to be classified as "DDx" in either the facility-level ACTS database or the central DDPS system. However, only 470 (44 percent) of these inmates were identified with a matching "DDx" code in both data sources. If the facility-level ACTS

databases are taken as the "gold-standard" (as was recommended by several members of the CDCR information technology staff) then the sensitivity of the central DDPS system is 55 percent (470/851).

Table A1.1. Concurrence Between Facility Data and Central Data Regarding Inmates' Developmental Disability Classification

		Central DDPS/OBIS		
		"DDx"	Not "DDx"	Row Total
Facility ACTS	"DDx"	470	381	851
	Not "DDx"	214	170,884	171,098
	Col. Total	684	171,265	171,959

Since the Armstrong-Clark data in the central DDPS are obtained through periodic updates from facilities, such substantial discordance suggests that synchronization of the two databases does not occur with sufficient frequency. The difficulty of obtaining accurate state-wide information hinders efforts to measure and manage performance and ensure CDCR is meeting the goals set for in its mission.

A1.3 Health Care Utilization Data

The PDS includes health care utilization data from two sources, PTTS and HCCUP. We consistently used a master list of major chronic diseases, corresponding to major International Classification of Diseases (ICD9) categories and American Hospital Formulary Service (AHFS) medication classifications, to identify health care utilization that is likely to be related to long-term care needs. These are shown in Table A1.2, Tables A1.3 and A1.4 provide further description of the mapping of disease categories to ICD9 and AHFS classification systems.

Table A1.2. Chronic Disease and Functional Impairment Categories

Category Number	Category Description
1	Cancer, Solid Tumors
2	Lymphomas
3	Chronic Pulmonary Disease
4	Coronary Artery Disease
5	Congestive Heart Failure
6	Peripheral Vascular Disease
7	Severe Chronic Liver Disease
8	Diabetes with End Organ Damage
9	Chronic Renal Failure
10	Nutritional Deficiencies
11	Dementia
12	Functional Impairment
13	Psychiatric diseases (incl. substance abuse)

Table A1.3. Chronic Disease and Functional Impairment Categories Used to Categorize Hospital and Physician Utilization

Category Number	Category Description	ICD9
1	Cancer, Solid Tumors	140-199
2	Lymphomas	200-208
3	Chronic Pulmonary Disease	491-494,496,501,506,515
4	Coronary Artery Disease	411-414
5	Congestive Heart Failure	398,402,404,428
6	Peripheral Vascular Disease	440,441,443
7	Severe Chronic Liver Disease	571,572
8	Diabetes with End Organ Damage	250,357,362,366
9	Chronic Renal Failure	403,585,v45,v56
10	Nutritional Deficiencies	260-263,783,799
11	Dementia	290,294,331,797
12	Functional Impairment	342,344,438,799,v44,v46,v53,887,896,897
13	Psychiatric diseases (incl. substance abuse)	290-316

(Adapted from Iezzoni, http://www.dartmouthatlas.org/faq/Chronic_Disease_ICD9_codes.pdf)

Table A1.4. Crosswalk from ICD9 to AHFS and Chronic Disease Categories Used to Categorize Medication Utilization

ICD 9	Disease/Medical Problems	AHFS CLASSIFICATION	Cat#
Endocrine/metabolic			
250	Diabetes mellitus	68:20:00	8
240-246	Thyroid disorder	68:36:00	
585	Renal failure on dialysis	40:00 & 20:00 (20:16 & 20:04)	8
Heart/Circulation			
410	Myocardial Infarction	24:00:00	
411	Ischemic Heart Disease		4
413	Angina Pectoris		4
427	Arrhythmia	24:04 / 24:08	
428	Congestive heart failure	24:04 / 24:08 / 24:12 / 40:28	5
401	Hypertension	24:08:00	
	Other heart problems of any type	Hyperlipidemia 24:06	
Peripheral Vascular Disease			
396	Heart valve damage	24:00:00	
Infections			
42	HIV/AIDS	08:18.1	
70.3	Hepatitis B	10:00 Interferons fall under misc. antineoplastics	
70.7	Hepatitis C		
11	Pulmonary Tuberculosis, present or prior	8:16	
	Under treatment currently for an infection of any type		
281	Anemia	20:04	
140-239	Cancer	10:00	1,2
Musculoskeletal			
714	Arthritis	28:08.0	
Neurological			
345	Seizure disorder/Epilepsy	28:12:00	
430-435	Cerebrovascular accident (stroke)	20:12.04 / 24:00	
331	Dementia, including Alzheimer's		11
342	Traumatic brain injury with residual Paraplegia, Quadriplegia, or Hemiplegia		12
332	Parkinson's disease	12:08.04 / 28:92	
315	Developmental disability (includes dyslexia, attention deficit & learning disorder)	28:20:00	
Pulmonary			
496	COPD	12:12 / 86:16 / 12:08.8 / 68:04	3
493	Asthma	12:12 / 86:16 / 12:08.8 / 68:04	3
Mental Health Issues			
300	Anxiety disorder	28:24 / 28:16.04	13
296.2	Major Depression disorder (single episode)	28:16.0	13
296.3	Major Depression disorder (recurrent episode)		13
296	Bipolar disorder	28:16:00	13
295	Schizophrenia	28:16:00	13
303-304	H/O Addiction to prescription, non-Rx or illicit drugs	Narcotics: 28:08.8	13

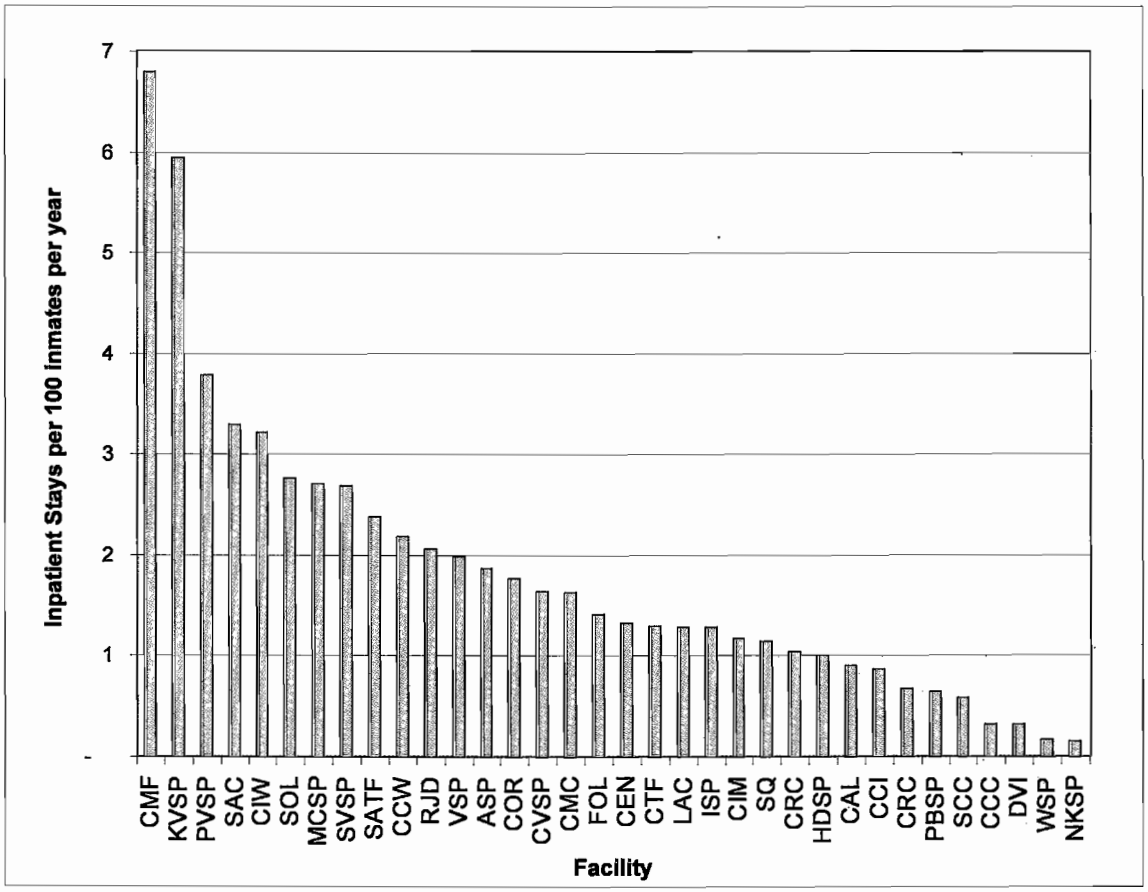
Pharmacy records from all facilities' PTTS for the month of December 2006 were included in the Project Data Set. Only utilization of medications likely to be prescribed for chronic diseases were included (i.e. AHFS categories listed in Table A1.4). The data was cleaned and aggregated by Maxor Pharmacy. Approximately 25 percent of CDCR inmates received at least one prescription medication in December 2006. The average number of prescriptions per inmate was 3.9. Table A1.5 shows, in rank order, the most prescribed medications classes. With the exception of non-steroidal anti-inflammatory agents (e.g. ibuprofen), medications for psychiatric problems were most frequently prescribed.

Table A1.5. Most Prescribed Medications

AHFS Code	AHFS Description	Script Count	Pct of Scripts
52:08.20	Nonsteroidal Anti-Inflammatory Agents	34720	22.73 percent
28:16.04	Antidepressants	23197	15.19 percent
28:16.08	Antipsychotic agents	21402	14.01 percent
28:12	Anticonvulsants, miscellaneous	9839	6.44 percent
24:32.04	Angiotensin-converting enzyme inhibitors	9379	6.14 percent
24:24	Beta-adrenergic blocking agents	7191	4.71 percent
12:12.08	Beta-adrenergic agonists	6172	4.04 percent
24:06.08	HMG-COA reductase inhibitors	6147	4.02 percent
24:28.08	Dihydropyridines	4076	2.67 percent
28.12.12	Hydantoins	3279	2.15 percent
28:24.92	Anxiolytics, sedatives & hypnotics, misc.	3140	2.06 percent
68:20.04	Biguanides	3117	2.04 percent
68:04	Adrenals	2766	1.81 percent
92:00	Antiparkinsonian agents	2543	1.67 percent
	Sulfonylureas	2046	1.34 percent
24:12	Nitrates and nitrites	1565	1.02 percent
24:20	Alpha-adrenergic blocking agents	1497	0.98 percent
8:16	Antituberculosis agents	1475	0.97 percent
24:08	Central alpha-agonists	1224	0.80 percent
	Thyroid agents	1205	0.79 percent
20:04.04	Iron preparations	1019	0.67 percent
12:12.08	Antimuscarinics/antispasmodics	815	0.53 percent
20:12.04	Anticoagulants	717	0.47 percent
8:18.08	Antiretrovirals	569	0.37 percent
24:32.20	Mineralocorticoid (aldosterone) antagnts	540	0.35 percent
24:28	Calcium-channel blocking agents, misc.	471	0.31 percent
28:24.04	Barbiturates (anxiolytic, sedative/hyp)	417	0.27 percent
28:24.08	Benzodiazepines (anxiolytic,sedativ/hyp)	345	0.23 percent
68.20.08	Insulins	330	0.22 percent
24:04.08	Cardiotonic agents	272	0.18 percent
12:12	Alpha- and beta-adrenergic agonists	229	0.15 percent
28:12.04	Barbiturates (anticonvulsants)	218	0.14 percent
28:92	Central nervous system agents, misc.	160	0.10 percent
24:08.20	Direct vasodilators	159	0.10 percent
86:16	Respiratory smooth muscle relaxants	143	0.09 percent
28:12.08	Benzodiazepines (anticonvulsants)	94	0.06 percent
10:00	Antineoplastic agents	84	0.05 percent
24:04.04	Antiarrhythmic agents	70	0.05 percent
24:06.04	Bile acid sequestrants	49	0.03 percent
24:06.05	Cholesterol absorption inhibitors	16	0.01 percent
28:20.04	Amphetamines	11	0.01 percent
24:32.08	Angiotensin ii receptor antagonists	11	0.01 percent
	Vasodilating agents, miscellaneous	7	0.00 percent
24:06.06	Fibric acid derivatives	6	0.00 percent
		152732	

For this project, we integrated Microsoft Access–based data systems used by the Health Care Cost and Utilization Program (HCCUP). These data included outpatient medical care and inpatient medical care in community hospitals for an 18-month period (July 2005 to December2006) with diagnoses matching the ICD9 codes for chronic disease and functional impairment discussed above, as well as all in-house medical care utilization (i.e. "inpatient" stays in prison medical beds). Figure A1.1 below shows the variation in rates of inpatient medical care in community hospitals across prisons.

Figure A1.1. Inpatient Hospitalization Rates



The reason for hospitalization was determined by examining the ICD9 code for the primary diagnosis (determined at discharge). A full rank-ordered list is presented in Table A1.6. Heart and back problems were most common.

Table A1.6. Top Diagnoses for Inpatient Stays

ICD9	Frequency	Percentage	Description
786	305	8.06	Symptoms involving respiratory system and other chest symptoms
414	206	5.44	Other forms of chronic ischemic heart disease
722	182	4.81	Intervertebral disc disorders
996	131	3.46	Complications peculiar to certain specified procedures
410	99	2.62	Acute myocardial infarction
682	99	2.62	Other cellulitis and abscess
V58	87	2.3	Encounter for other and unspecified procedures and aftercare
427	83	2.19	Cardiac dysrhythmias
780	79	2.09	General symptoms
571	75	1.98	Chronic liver disease and cirrhosis
250	66	1.74	Diabetes mellitus
114	65	1.72	Coccidioidomycosis
428	62	1.64	Heart failure
572	56	1.48	Liver abscess and sequelae of chronic liver disease
411	41	1.08	Other acute and subacute forms of ischemic heart disease
574	41	1.08	Cholelithiasis
998	36	0.95	Other complications of procedures, NEC
493	35	0.92	Asthma
276	34	0.9	Disorders of fluid, electrolyte, and acid-base balance
401	34	0.9	Essential hypertension
434	34	0.9	Occlusion of cerebral arteries
584	34	0.9	Acute renal failure
721	33	0.87	Spondylosis and allied disorders
486	32	0.85	Pneumonia, organism unspecified
715	32	0.85	Osteoarthrosis and allied disorders
802	32	0.85	Fracture of face bones
733	31	0.82	Other disorders of bone and cartilage
592	29	0.77	Calculus of kidney and ureter
38	28	0.74	Septicemia
578	25	0.66	Gastrointestinal hemorrhage
435	24	0.63	Transient cerebral ischemia
717	24	0.63	Internal derangement of knee
518	23	0.61	Other diseases of lung
560	23	0.61	Intestinal obstruction without mention of hernia
569	23	0.61	Other disorders of intestine
577	22	0.58	Diseases of pancreas
730	22	0.58	Osteomyelitis, periostitis, and other infections involving bone
738	21	0.55	Other acquired deformity
282	20	0.53	Hereditary hemolytic anemias
535	20	0.53	Gastritis and duodenitis

Comparing the utilization of in-house medical beds to the utilization of community hospitals (Table A1.7) reveals that psychiatric conditions are much more likely to be treated in-house. In fact, psychiatric diseases were given as the primary diagnosis for 44 percent of the inmates in medical beds within the prison. Of inmates who received care in community hospitals, only 3 percent were primarily treated for psychiatric problems. In contrast, coronary artery disease, peripheral vascular disease, and chronic renal failure were far more likely to be treated in community hospitals.

Table A1.7. Comparison of Diagnosis Categories by Delivery Setting

Category Number	Category Description	Unique inmates with at least one stay ICD9 matching category	
		Community Hospital	In-house Medical Beds
1	Cancer, Solid Tumors	152 (6)	59 (0.5)
2	Lymphomas	33 (1)	22 (0.2)
3	Chronic Pulmonary Disease	125 (5)	113 (0.9)
4	Coronary Artery Disease	389 (16)	52 (0.4)
5	Congestive Heart Failure	127 (5)	38 (0.3)
6	Peripheral Vascular Disease	57 (2)	13 (0.1)
7	Severe Chronic Liver Disease	109 (4)	59 (0.5)
8	Diabetes with End Organ Damage	123 (5)	188 (1.5)
9	Chronic Renal Failure	128 (5)	16 (0.1)
10	Nutritional Deficiencies	23 (1)	10 (0.1)
11	Dementia	25 (1)	31 (0.3)
12	Functional Impairment	47 (2)	64 (0.5)
13	Psychiatric diseases (incl. substance abuse)	81 (3)	5355 (43.8)
	Total "chronic" inpatient stays (Category 1 through 12)	1419 (57)	6020 (49.2)
	Total inpatient stays	2476 (100)	12231 (100)

Appendix 2a: Medical Bed Census Assessment Tool

CDCR Care Management Screening and Assessment
Medical Bed Sweep

1-6/

7-9/

1. Assessor name (last, first): _____

10-39/ 40-59/

CHART

Section 1: Demographics

2. Inmate name (last, first): _____

60-89/ 90-109/

3. CDCR#: | | | | | | | 110-115/

4. Date of birth (mm/dd/yyyy): ___/___/_____ 116-123/

5. Facility (check 1):

☐1	ASP	☐6	CMF	☐11	COR	☐16	CCWF	☐21	HDSP	☐26	PBSP	☐31	SCC
☐2	CCC	☐7	CMC	☐12	LAC	☐17	CVSP	☐22	ISP	☐27	PVSP	☐32	VSPW
☐3	CCI	☐8	CRC	☐13	SAC	☐16	CTF	☐23	KVSP	☐28	RJD	☐33	WSP
☐4	CIM	☐9	CAL	☐14	SOL	☐19	DVI	☐24	MCSP	☐29	SVSP		
☐5	CIW	☐10	CEN	☐15	SATF	☐20	FSP	☐25	NKSP	☐30	SQ		124-125/

6. Bed type (check 1): 126-127/

☐01 OHU
☐02 CTC
☐03 GACH
☐04 SNF (CCWF only)
☐05 Outside Community Hospital
☐06 Hospice (CMF only)

7. Current admission date to this unit (mm/dd/yyyy): __ __ / __ __ / __ __ __ __ 128-135/

8. Gender (check 1): ☐1 Male ☐2 Female 136/

Section 2: Disease Burden

CHART AND PROXY

9a. Primary diagnosis triggering this admission to medical bed: _____ 137-186/

9b. Check all active or chronic conditions, unless historical conditions are specified.

CARDIOVASCULAR

- ☐1 Hypertension
- ☐2 Ischemic heart disease (CAD, h/o MI, h/o CABG)
- ☐3 Congestive heart failure (CHF)
- ☐4 Arrhythmia
- ☐5 Atrial fibrillation
- ☐6 Long-term anticoagulants, e.g. coumadin
- ☐7 Cardiac pacemaker
- ☐8 Valvular heart disease
- ☐9 s/p heart valve replacement
- ☐10 Aortic aneurysm (thoracic or AAA)
- ☐11 Peripheral vascular disease
- ☐12 Venous insufficiency (peripheral edema)

RESPIRATORY

- ☐13 Allergic rhinitis
- ☐14 Asthma
- ☐15 Chronic obstructive pulmonary disease (COPD)
- ☐16 Supplemental oxygen (long term)
- ☐17 Obstructive sleep apnea
- ☐18 Tracheostomy (current)

GASTROINTESTINAL

- ☐19 Gastroesophageal reflux (GERD)
- ☐20 Peptic ulcer disease or gastritis
- ☐21 Cholelithiasis (gallstones)
- ☐22 Irritable bowel disease
- ☐23 Inflammatory bowel disease (Crohn's, ulcerative colitis)
- ☐24 Cirrhosis
- ☐25 End stage liver disease (ESLD), hepatic encephalopathy
- ☐26 Chronic constipation
- ☐27 Hernia, inguinal or abdominal

RENAL AND URINARY

- ☐28 Chronic renal insufficiency
- ☐29 End stage renal disease (ESRD) (on dialysis)
- ☐30 Renal stones
- ☐31 Benign prostatic hypertrophy (BPH)
- ☐32 Neurogenic bladder

NEUROLOGICAL/SENSORY

- ☐33 Epilepsy/seizure disorder
- ☐34 Developmental disability (mental retardation)
- ☐35 Dementia, e.g. Alzheimer's and vascular dementia
- ☐36 Traumatic brain injury with cognitive impairment
- ☐37 h/o stroke (CVA) with any residual impairment
- ☐38 Hemiplegia/hemiparesis
- ☐39 Quadriplegia
- ☐40 Paraplegia
- ☐41 Cerebral palsy
- ☐42 Multiple sclerosis
- ☐43 Parkinson's disease
- ☐44 Peripheral neuropathy
- ☐45 Hearing loss
- ☐46 Visual loss both eyes (mod-severe or blind)
- ☐47 Glaucoma
- ☐48 Cataracts

PSYCHIATRIC

- ☐49 Anxiety disorder
- ☐50 Major depression disorder (single episode or recurrent)
- ☐51 Bipolar disorder
- ☐52 Schizophrenia
- ☐53 Delusional or paranoid disorder
- ☐54 Personality disorder (borderline, antisocial, etc)

ENDOCRINE / METABOLIC

- ☐55 Diabetes mellitus
- ☐56 Hypothyroidism
- ☐57 Other thyroid disorder 187-189/
- ☐58 Hypercholesterolemia, hyperlipidemia 190-192/
- ☐59 Transgender 193-195/

BLOOD

- ☐60 Anemia (iron-deficiency and other) 196-198/
- ☐61 Sickle cell disease 199-201/

MUSCULOSKELETAL / RHEUMATOLOGIC

- ☐62 Arthritis (osteoarthritis, DJD) 202-204/
- ☐63 Rheumatoid arthritis 205-207/
- ☐64 Systemic lupus erythematosis (SLE) 208-210/
- ☐65 Osteoporosis 211-213/
- ☐66 Low back pain 214-216/
- ☐67 h/o hip repair or replacement 217-219/
- ☐68 h/o lower limb amputation 220-222/

CANCER

- ☐69 Cancer (active): _____ 232-256/
- ☐70 h/o cancer: _____ 257-281/
- ☐71 Lymphoma, Hodgkin's, or leukemia
- ☐72 Chemotherapy (active)
- ☐73 Radiation therapy (active)

INFECTIONS

- ☐74 Hepatitis B 223-225/
- ☐75 Hepatitis C 226-228/
- ☐76 HIV/AIDS 229-231/
- ☐77 Pneumonia (current)
- ☐78 Pulmonary tuberculosis (currently getting multidrug Rx)
- ☐79 h/o positive PPD
- ☐80 Coccidioidomycosis (currently getting treatment)
- ☐81 Endocarditis (current)
- ☐82 Urinary tract infection (UTI) (current)
- ☐83 Pelvic inflammatory disease (current)
- ☐84 Osteomyelitis (currently getting antibiotics)
- ☐85 Cellulitis (current)
- ☐86 Herpes zoster (current)
- ☐87 MRSA (colonization)
- ☐88 Other current infection: _____ 282-317/

OTHER CONDITIONS

- ☐89 Alcohol/substance abuse
- ☐90 Abnormal weight loss, failure to thrive, malnutrition
- ☐91 Morbid obesity
- ☐92 Volume depletion (dehydration) (current)
- ☐93 Orthostatic hypotension
- ☐94 GI bleed, current
- ☐95 Nausea and vomiting
- ☐96 Diarrhea
- ☐97 Pancreatitis
- ☐98 Altered mental status
- ☐99 Abnormal vaginal bleeding
- ☐100 Pregnancy
- ☐101 Possibly terminal condition (death probable within 1 year)
- ☐102 Jaw fracture
- ☐103 Other current fracture: _____ 318-362/

PROCEDURE RELATED CONDITIONS

- ☐104 Pre-procedure care for: _____ 363-407/
- ☐105 Post-hospital care for: _____ 408-452/

OTHER DIAGNOSES

- ☐106 Other diagnosis: _____ 453-502/
- ☐107 Other diagnosis: _____ 503-552/
- ☐108 Other diagnosis: _____ 553-602/
- ☐109 Other diagnosis: _____ 603-652/

Section 3: Medical-Nursing Needs/Treatments

CHART OR PROXY

10. Current medical and nursing needs and treatments required by the inmate (Check all that apply)

VITALS
- ☐1 Vital signs daily
- ☐2 Vital signs Q shift or more often
- ☐3 Daily weights

RESPIRATORY
- ☐4 Intermittent oxygen
- ☐5 Continuous oxygen
- ☐6 Nebulizer therapy (bronchodilators)
- ☐7 Continuous positive airway pressure (CPAP)
- ☐8 Tracheostomy care

GI
- ☐9 Altered diet (pureed, thickened liquids)
- ☐10 NG or PEG tube feeding
- ☐11 Parental (IV) feeding

DIABETES CARE
- ☐12 Fingersticks less than daily
- ☐13 Fingersticks daily
- ☐14 Fingersticks more than daily
- ☐15 Routine insulin
- ☐16 Sliding scale insulin

IV
- ☐17 Intermittent IV therapy
- ☐18 Continuous IV therapy
- ☐19 Central line / PICC line
- ☐20 Blood transfusions

ANTICOAGULATION
- ☐21 IV anticoagulation (heparin)
- ☐22 Oral anticoagulation (coumadin)
- ☐23 SQ anticoagulation (e.g. Lovenox)

WOUNDS
- ☐24 Pressure sore or leg ulcer requiring daily nursing care
- ☐25 Pressure sore or leg ulcer requiring less than daily nursing care
- ☐26 Surgical site, drain, and other wound requiring daily nursing care
- ☐27 Surgical site, drain, and other wound requiring less than daily nursing care

MEDICATION ADMINISTRATIONS
- ☐28 Assistance with medication administration (e.g., cueing to swallow)
- ☐29 IM injections: _____ 673-712/

BOWEL AND BLADDER
- ☐30 Urinary incontinence 653-654/
- ☐31 Diapers or briefs 655-656/
- ☐32 Condom catheter 657-658/
- ☐33 Foley catheter 659-660/
- ☐34 Urinary retention 661-662/
- ☐35 Suprapubic catheter 663-664/
- ☐36 Intermittent catheterization 665-666/
- ☐37 Gastrostomy (PEG) tube 667-668/
- ☐38 Colostomy or ileostomy care 669-670/
- ☐39 Routine or frequent disimpaction or enemas
- ☐40 Fecal incontinence 671-672/

MOBILITY
- ☐41 Straight cane
- ☐42 Quad cane
- ☐43 Walker
- ☐44 Wheelchair
- ☐45 Mechanical lift
- ☐46 Orthotic device (brace, splint, prosthesis)

VISION/HEARING
- ☐47 Blind both eyes (unable to correct vision to >20/200)
- ☐46 Hearing impaired but functional with hearing aid
- ☐49 Deaf (both ears)

OTHER
- ☐50 History of recent falls (past 90 days)
- ☐51 History of remote falls
- ☐52 Cast care
- ☐53 Isolation for: _____ 713-752/
- ☐54 Chronic pain
- ☐55 Monitoring I/O
- ☐56 PT and/or OT

PROXY

Section 4: Activities of Daily Living / Mobility

Ability to perform Activities of Daily Living (ADLs)

11. Is the inmate completely independent in grooming, dressing, bathing, toileting, transferring, ambulation and eating?

☐1 Yes *(Skip to Section 5)* ☐2 No

753/

ADL support provided over the last 7 days:

What level of support did the inmate require over the last week in the following activities?

		Independent	Supervision or Limited Assistance	Extensive Assistance or Total Dependence	Activity Did Not Occur	Don't Know	
12.	Walking	☐1	☐2	☐3	☐4	☐8	754/
13.	Dressing	☐1	☐2	☐3	☐4	☐8	755/
14.	Eating	☐1	☐2	☐3	☐4	☐8	756/
15.	Toilet use	☐1	☐2	☐3	☐4	☐8	757/
16.	Personal hygiene	☐1	☐2	☐3	☐4	☐8	758/
17.	Bathing/Showering	☐1	☐2	☐3	☐4	☐8	759/

Section 5: Prison Activities of Daily Living

Could the inmate complete the following activities?

	Activity	YES	NO (TEMPORARY)	NO (PERMANENTLY)	
18.	Get on the floor for alarms	☐1	☐2	☐3	760/
19.	Hear orders from staff	☐1	☐2	☐3	761/
20.	Stand for head count	☐1	☐2	☐3	762/
21.	Go to the dining hall	☐1	☐2	☐3	763/
22.	Get on the top bunk	☐1	☐2	☐3	764/
23.	Climb one flight of stairs	☐1	☐2	☐3	765/

Section 6: Cognitive Status

Cognitive Performance

24. Cognitive skills for daily decision-making (making decisions regarding tasks of daily life) **How well does inmate do daily decision-making** (e.g., knowing when and how to go to meals, activities, program; seeking information appropriately [not repetitively] regarding daily routines; asking for help when needed; being able to make safe decisions so as to avoid accidents and incidents.)

766/

- ☐0 Independent - daily decisions are consistent, reasonable, and organized.
- ☐1 Modified independence - has difficulty in decision-making when faced with new tasks or situations.
- ☐2 Moderately impaired - decisions are poor; needs reminders, cues, and supervision for daily routines.
- ☐3 Severely impaired - decision-making is severely impaired.

Memory / Recall Ability

Code for recall of what was learned or known

	Memory OK	Memory Problem	
25. Short-term memory OK-seems/appears to recall after 5 minutes	☐1	☐2	767/
26. Long-term memory OK-seems/appears to recall long past	☐1	☐2	768/

PROXY

27. Making self understood (expressing information content – however able)

- ☐0 Understood - expresses ideas clearly 769/
- ☐1 Usually understood - has difficulty finding words or finishing thoughts, requires some prompting
- ☐2 Sometimes understood - ability is limited to making concrete requests, e.g., food, drink, toilet.
- ☐3 Rarely or never understood

Section 7: Level-of-care assignment

28. Could inmate function at a lower level of care? ☐1 Yes ☐2 No ☐8 Unknown 770/

29. What services or resources would the inmate need to function at a lower level of care?

a. _____ 771-820/

b. _____ 821-870/

c. _____ 871-920/

d. _____ 921-970/

e. _____ 971-1020/

f. _____ 1021-1070/

30. ASK THE PROXY to (1) choose the appropriate level-of-care for the inmate, (2) record the services required by the inmate at that level-of-care, and (3) indicate whether the inmate will need to be at that level-of-care for less than 3 months or 3 months or more. 1071/

PROXY

PROXY ASSIGNMENT

☐1 **1. HIGH ACUITY Medical Bed**

Inmates require:

☐1 RN availability 24 hours/day for assessment, monitoring and/or complex management 1072/
☐2 IV hydration for more than 3 days 1073/
☐3 Complex or high-risk medication regimen or blood transfusion 1074/
☐4 Complex wound care regimen 1075/
☐5 Extensive assistance with ADLs (or totally dependent) 1076/
☐6 Other _____ 1078-1152/ 1077/

Inmate will need this level of care for

☐1 **< 3 months** 1153/
☐2 **> 3 months**

☐2 **2. LOW ACUITY Medical Bed**

Inmates are unable to be at lower level of care because they require:

☐1 RN availability 8-16 hours/day for assessment, monitoring and/or management 1154/
☐2 IV hydration for less than 3 days 1155/
☐3 Straightforward IV antibiotics, e.g. for osteomyelitis 1156/
☐4 Straightforward wound care regimen 1157/
☐5 Supervision or limited assistance with ADLs 1158/
☐6 Other _____ 1160-1234/ 1159/

Pre-procedure care and routine post-hospital care can usually be done in low-acuity medical bed.

Inmate will need this level of care for

☐1 **< 3 months** 1235/
☐2 **> 3 months**

☐3 **3. Specialized GP Housing / Sheltered Housing**

Inmates do not require continuous nursing care/medical bed, but

- would benefit from cohorted housing and services and/or
- cannot be in regular GP due to:

☐1 Vision, hearing, or mobility impairment preventing residence in regular GP 1236/
☐2 AIDS 1237/
☐3 Pregnancy 1238/
☐4 Frailty due to age or medical condition 1239/
☐5 Other_____ 1241-1315/ 1240/

If need for supervision or limited assistance is inmate's only reason for not being in regular GP, then that inmate can be in sheltered housing with ADLs provided by cell mate, buddy system, or inmate helper program.

Inmate will need this level of care for

☐1 **< 3 months** 1316/
☐2 **> 3 months**

☐4 **4. Regular GP**

Inmates requiring only oxygen, CPAP, or dialysis or who can do their own catheter/colostomy care can be in regular GP.

☐5 **5. Hospice**

Inmate has life expectancy of less than 6 months <u>and</u> has nursing needs requiring medical bed (high or low acuity).

31. (1) choose the appropriate level-of-care for the inmate, (2) record the services required by the inmate at that level-of-care, and (3) indicate whether the inmate will need to be at that level-of-care for less than 3 months or 3 months or more. 1317/

ASSESSOR

ASSESSOR ASSIGNMENT

☐1 **1. HIGH ACUITY Medical Bed**

Inmates require:

- ☐1 RN availability 24 hours/day for assessment, monitoring and/or complex management 1318/
- ☐2 IV hydration for more than 3 days 1319/
- ☐3 Complex or high-risk medication regimen or blood transfusion 1320/
- ☐4 Complex wound care regimen 1321/
- ☐5 Extensive assistance with ADLs (or totally dependent) 1322/
- ☐6 Other _____ 1324-1398/ 1323/

Inmate will need this level of care for

☐1 **< 3 months** 1399/

☐2 **> 3 months**

☐2 **2. LOW ACUITY Medical Bed**

Inmates are unable to be at lower level of care because they require:

- ☐1 RN availability 8-16 hours/day for assessment, monitoring and/or management 1400/
- ☐2 IV hydration for less than 3 days 1401/
- ☐3 Straightforward IV antibiotics, e.g. for osteomyelitis 1402/
- ☐4 Straightforward wound care regimen 1403/
- ☐5 Supervision or limited assistance with ADLs 1404/
- ☐6 Other _____ 1406-1480/ 1405/

Pre-procedure care and routine post-hospital care can usually be done in low-acuity medical bed.

Inmate will need this level of care for

☐1 **< 3 months** 1481/

☐2 **> 3 months**

☐3 **3. Specialized GP Housing / Sheltered Housing**

Inmates do not require continuous nursing care/medical bed, but

- would benefit from cohorted housing and services and/or
- cannot be in regular GP due to:

- ☐1 Vision, hearing, or mobility impairment preventing residence in regular GP 1482/
- ☐2 AIDS 1483/
- ☐3 Pregnancy 1484/
- ☐4 Frailty due to age or medical condition 1485/
- ☐5 Other_____ 1487-1561/ 1486/

If need for supervision or limited assistance is inmate's only reason for not being in regular GP, then that inmate can be in sheltered housing with ADLs provided by cell mate, buddy system, or inmate helper program.

Inmate will need this level of care for

☐1 **< 3 months** 1562/

☐2 **> 3 months**

☐4 **4. Regular GP**

Inmates requiring only oxygen, CPAP, or dialysis or who can do their own catheter/colostomy care can be in regular GP.

☐5 **5. Hospice**

Inmate has life expectancy of less than 6 months <u>and</u> has nursing needs requiring medical bed (high or low acuity).

Appendix 2b: General Population Assessment Tool

STRATA
withinfac_picorder

«ABTID»*

«ABTID»

1-6/
7-9/

CDCR Care Management Screening and Assessment

10/

General Population Assessment

SAMPLE

Section 1: Demographics

1 Inmate name (last, first):

_____ 11-40/ 41-60/

Assessor name (last, first):

_____ 61-90/ 91-110/

2. CDCR #:

111-116/

Assessment date (mm/dd/yyyy):

____/____/____ 117-124/

3. Bed number: _____ 125-142/

4. Date of birth (mm/dd/yyyy): ____/____/____ 143-150/

5. Facility (check 1):

☐1 ASP ☐3 CCI ☐6 CMF ☐10 CEN ☐14 SOL 151-152/
☐15 SATF ☐16 CCWF ☐21 HDSP ☐29 SVSP

PROXY

6. Bed type (check 1): 153-154/

☐02 CTC
☐03 GACH
☐04 SNF (CCWF only)
☐06 Hospice (CMF only)
☐07 General Population (including Ad Seg, PSU, PHU, SHU)
☐08 HIV Unit (GP)
☐09 DPW Unit (GP)
☐10 Other specialized GP unit: _____ 155-204/
☐11 Enhanced Outpatient Treatment (EOP)

ASK PROXY:
I'm here to ask you about a few inmates. The inmates I'm asking you about have been selected at random and are not known to have any medical, mental health or behavior problem. I will be asking your opinion about how well this inmate can get around the prison and take care of themselves (things like if they can: walk, get dressed, shower, get on the floor for alarms, get on the top bunk); how well they can make decisions; if they have any memory problems; and if they can make themselves understood.

7. Do you think you know this inmate well enough to answer these questions? 205/

☐1 Yes ☐2 No *[DO NOT USE THIS PROXY]*

ASSESSOR

DISPOSITION	☐ Chart not available
Inmate not assessed because:	☐ Proxy cannot answer questions
☐ Inmate no longer at facility	☐ Reached sample quota
☐ Inmate at an outside community hospital	☐ Other reason _____

Section 2: Disease Burden

ABTID

8. Check all active or chronic conditions, unless historical conditions are specified.

CHART

CARDIOVASCULAR

- ☐1 Hypertension
- ☐2 Ischemic heart disease (CAD, h/o MI, h/o CABG)
- ☐3 Congestive heart failure (CHF)
- ☐4 Arrhythmia
- ☐5 Atrial fibrillation
- ☐6 Long-term anticoagulants, (e.g. coumadin)
- ☐7 Cardiac pacemaker
- ☐8 Valvular heart disease
- ☐9 s/p heart valve replacement
- ☐10 Aortic aneurysm (thoracic or AAA)
- ☐11 Peripheral vascular disease
- ☐12 Venous insufficiency (peripheral edema)

RESPIRATORY

- ☐13 Allergic rhinitis
- ☐14 Asthma
- ☐15 Chronic obstructive pulmonary disease (COPD)
- ☐16 Supplemental oxygen (long term)
- ☐17 Obstructive sleep apnea
- ☐18 Tracheostomy (current)

GASTROINTESTINAL

- ☐19 Gastroesophageal reflux (GERD)
- ☐20 Peptic ulcer disease or gastritis
- ☐21 Cholelithiasis (gallstones)
- ☐22 Irritable bowel disease
- ☐23 Inflammatory bowel disease (Crohn's, ulcerative colitis)
- ☐24 Cirrhosis
- ☐25 End stage liver disease (ESLD), hepatic encephalopathy
- ☐26 Chronic constipation
- ☐27 Hernia, inguinal or abdominal
- ☐110 Gastrostomy (PEG) tube

RENAL AND URINARY

- ☐28 Chronic renal insufficiency
- ☐29 End stage renal disease (ESRD) (on dialysis)
- ☐30 Renal stones
- ☐31 Benign prostatic hypertrophy (BPH)
- ☐32 Neurogenic bladder

NEUROLOGICAL/SENSORY

- ☐33 Epilepsy/seizure disorder
- ☐34 Developmental disability (mental retardation)
- ☐35 Dementia, (e.g. Alzheimer's and vascular dementia)
- ☐36 Traumatic brain injury with cognitive impairment
- ☐37 h/o stroke (CVA) with any residual impairment
- ☐38 Hemiplegia/hemiparesis
- ☐39 Quadriplegia
- ☐40 Paraplegia
- ☐41 Cerebral palsy
- ☐42 Multiple sclerosis
- ☐43 Parkinson's disease
- ☐44 Peripheral neuropathy
- ☐45 Hearing loss
- ☐46 Visual loss both eyes (mod-severe or blind)
- ☐47 Glaucoma
- ☐48 Cataracts

PSYCHIATRIC

- ☐49 Anxiety disorder
- ☐50 Major depression disorder (single episode or recurrent)
- ☐51 Bipolar disorder
- ☐52 Schizophrenia
- ☐53 Delusional or paranoid disorder
- ☐54 Personality disorder (borderline, antisocial, etc)

ENDOCRINE / METABOLIC

- ☐55 Diabetes mellitus
- ☐56 Hypothyroidism
- ☐57 Other thyroid disorder 206-208/
- ☐58 Hypercholesterolemia, hyperlipidemia 209-211/
- ☐59 Transgender 212-214/

BLOOD

- ☐60 Anemia (iron-deficiency and other) 215-217/
- ☐61 Sickle cell disease 218-220/

MUSCULOSKELETAL / RHEUMATOLOGIC

- ☐62 Arthritis (osteoarthritis, DJD) 221-223/
- ☐63 Rheumatoid arthritis 224-226/
- ☐64 Systemic lupus erythematosis (SLE) 227-229/
- ☐65 Osteoporosis 230-232/
- ☐66 Low back pain 233-235/
- ☐67 h/o hip repair or replacement 236-238/
- ☐68 h/o lower limb amputation 239-241/

CANCER

- ☐69 Cancer (active): _____ 251-275/
- ☐70 h/o cancer: _____ 276-300/
- ☐71 Lymphoma, Hodgkin's, or leukemia
- ☐72 Chemotherapy (active)
- ☐73 Radiation therapy (active)

INFECTIONS

- ☐74 Hepatitis B 242-244/
- ☐75 Hepatitis C 245-247/
- ☐76 HIV/AIDS 248-250/
- ☐77 Pneumonia (current)
- ☐78 Pulmonary tuberculosis (currently getting multidrug Rx)
- ☐79 h/o positive PPD
- ☐80 Coccidioidomycosis (currently getting treatment)
- ☐81 Endocarditis (current)
- ☐82 Urinary tract infection (UTI) (current)
- ☐83 Pelvic inflammatory disease (current)
- ☐84 Osteomyelitis (currently getting antibiotics)
- ☐85 Cellulitis (current)
- ☐86 Herpes zoster (current)
- ☐87 MRSA (colonization)
- ☐88 Other current infection: _____ 301-336/

OTHER CONDITIONS

- ☐89 Alcohol/substance abuse
- ☐90 Abnormal weight loss, failure to thrive, malnutrition
- ☐91 Morbid obesity
- ☐92 Volume depletion (dehydration) (current)
- ☐93 Orthostatic hypotension
- ☐94 GI bleed, current
- ☐95 Nausea and vomiting
- ☐96 Diarrhea
- ☐97 Pancreatitis
- ☐98 Altered mental status
- ☐99 Abnormal vaginal bleeding
- ☐100 Pregnancy
- ☐101 Possibly terminal condition (death probable within 1 year)
- ☐102 Jaw fracture
- ☐103 Other current fracture: _____ 337-381/

PROCEDURE RELATED CONDITIONS

- ☐104 Pre-procedure care for: _____ 382-426/
- ☐105 Post-hospital care for: _____ 427-471/

OTHER DIAGNOSES

- ☐106 Other diagnosis: _____ 472-521/
- ☐107 Other diagnosis: _____ 522-571/
- ☐108 Other diagnosis: _____ 572-621/
- ☐109 Other diagnosis: _____ 622-671/

Section 3: Medical-Nursing Needs/Treatments

CHART AND PROXY

9. Current medical and nursing needs and treatments required by the inmate (Check all that apply).

VITALS
- ☐1 Vital signs daily
- ☐2 Vital signs Q shift or more often
- ☐3 Daily weights

RESPIRATORY
- ☐4 Intermittent oxygen
- ☐5 Continuous oxygen
- ☐6 Nebulizer therapy (bronchodilators)
- ☐7 Continuous positive airway pressure (CPAP)
- ☐8 Tracheostomy care

GI
- ☐9 Altered diet (pureed, thickened liquids)
- ☐10 NG or PEG tube feeding
- ☐11 Parental (IV) feeding

DIABETES CARE
- ☐12 Fingersticks less than daily
- ☐13 Fingersticks daily
- ☐14 Fingersticks more than daily
- ☐15 Routine insulin
- ☐16 Sliding scale insulin

IV
- ☐17 Intermittent IV therapy
- ☐18 Continuous IV therapy
- ☐19 Central line / PICC line
- ☐20 Blood transfusions

ANTICOAGULATION
- ☐21 IV anticoagulation (heparin)
- ☐22 Oral anticoagulation (coumadin)
- ☐23 SQ anticoagulation (e.g. Lovenox)

WOUNDS
- ☐24 Pressure sore or leg ulcer requiring daily nursing care
- ☐25 Pressure sore or leg ulcer requiring less than daily nursing care
- ☐26 Surgical site, drain, and other wound requiring daily nursing care
- ☐27 Surgical site, drain, and other wound requiring less than daily nursing care

MEDICATION ADMINISTRATIONS
- ☐28 Assistance with medication administration (e.g., cueing to swallow)
- ☐29 IM injections: _____ 692-731/

BOWEL AND BLADDER
- ☐30 Urinary incontinence 672-673/
- ☐31 Diapers or briefs 674-675/
- ☐32 Condom catheter 676-677/
- ☐33 Foley catheter 678-679/
- ☐34 Urinary retention 680-681/
- ☐35 Suprapubic catheter 682-683/
- ☐36 Intermittent catheterization 684-685/
- ☐38 Colostomy or ileostomy care 686-687/
- ☐39 Routine or frequent disimpaction or enemas 688-689/ 690-691/
- ☐40 Fecal incontinence

MOBILITY
- ☐41 Straight cane
- ☐42 Quad cane
- ☐43 Walker
- ☐44 Wheelchair
- ☐45 Mechanical lift
- ☐46 Orthotic device (brace, splint, prosthesis)

VISION/HEARING
- ☐47 Blind both eyes (unable to correct vision to >20/200)
- ☐48 Hearing impaired but functional with hearing aid
- ☐49 Deaf (both ears)

OTHER
- ☐50 History of recent falls (past 90 days)
- ☐51 History of remote falls
- ☐52 Cast care
- ☐53 Isolation for: _____ 732-771/
- ☐54 Chronic pain
- ☐55 Monitoring I/O
- ☐56 PT and/or OT

PROXY

Section 4: Activities of Daily Living / Mobility

Ability to perform Activities of Daily Living (ADLs)

10. Is the inmate completely independent in grooming, dressing, bathing, toileting, transferring, ambulation and eating?

☐1 Yes *(Skip to Question 17)* ☐2 No

772/

ADL support provided over the last 7 days:

What level of support did the inmate require over the last week in the following activities?

		Independent	Supervision or Limited Assistance	Extensive Assistance or Total Dependence	Activity Did Not Occur	
11.	Walking	☐1	☐2	☐3	☐4	773/
12.	Dressing	☐1	☐2	☐3	☐4	774/
13.	Eating	☐1	☐2	☐3	☐4	775/
14.	Toilet use	☐1	☐2	☐3	☐4	776/
15.	Personal hygiene	☐1	☐2	☐3	☐4	777/
16.	Bathing/Showering	☐1	☐2	☐3	☐4	778/

Section 5: Prison Activities of Daily Living

17. Can the inmate get on the floor, hear orders, stand for count, go to the dining hall, get on the top bunk and climb one flight of stairs?

☐1 Yes *(Skip to Question 24)* ☐2 No

779/

Can the inmate perform the following activities?

	Activity	YES	NO (TEMPORARY)	NO (PERMANENTLY)	
18.	Get on the floor for alarms	☐1	☐2	☐3	780/
19.	Hear orders from staff	☐1	☐2	☐3	781/
20.	Stand for head count	☐1	☐2	☐3	782/
21.	Go to the dining hall	☐1	☐2	☐3	783/
22.	Get on the top bunk	☐1	☐2	☐3	784/
23.	Climb one flight of stairs	☐1	☐2	☐3	785/

Section 6: Cognitive Status

Cognitive Performance

Cognitive skills for daily decision-making (making decisions regarding tasks of daily life).

24. How well does inmate do daily decision-making (e.g., knowing when and how to go to meals, activities, program; seeking information appropriately [not repetitively] regarding daily routines; asking for help when needed; being able to make safe decisions so as to avoid accidents and incidents).

786/

- ☐0 Independent - daily decisions are consistent, reasonable, and organized.
- ☐1 Modified independence - has difficulty in decision-making when faced with new tasks or situations.
- ☐2 Moderately impaired - decisions are poor; needs reminders, cues, and supervision for daily routines.
- ☐3 Severely impaired - decision-making is severely impaired.

Memory / Recall Ability

Code for recall of what was learned or known

	Memory OK	Memory Problem	
25. Short-term memory OK-seems/appears to recall after 5 minutes	☐1	☐2	787/
26. Long-term memory OK-seems/appears to recall long past	☐1	☐2	788/

PROXY

27. Making self understood (expressing information content – however able)

- ☐0 Understood - expresses ideas clearly 789/
- ☐1 Usually understood - has difficulty finding words or finishing thoughts, requires some prompting
- ☐2 Sometimes understood - ability is limited to making concrete requests (e.g., food, drink, toilet).
- ☐3 Rarely or never understood

Section 7: Level-Of-Care Assignment

		Yes	No	Unknown	
28.	Do you feel that the inmate is physically or medically unsafe in his/her current location due to a health condition?	☐1	☐2	☐8	790/

Appendix 3: Development of the Assessment Tools and Data Collection Protocol: Supporting Material and Tables

A3.1 Assessment Tool Domains

Section 1: Demographics

The Demographics domain of the assessment tool included inmate information (name, CDCR number, date of birth), custodial information (facility, bed type), and assessor information (name, date). These items reflect those fields that contain demographic data of interest, and in cases where the data are available in the Project Data Set (PDS), the items are in the format from which the data are submitted to that database.

A few items in this domain differ between the Medical Bed Census and the General Population Assessment Tools. The Medical Bed Census Assessment Tool included an item for "current admission date to the medical bed" and for gender, in recognition that assessors would complete the assessment entirely from information in the medical records and from nurses on the unit. The General Population Assessment Tool included additional items relevant to the sampling and data collection processes (sample strata, bed number, proxy's knowledge of the inmate, assessor disposition of why inmate not assessed). This tool also was pre-printed with values for select items (name, CDCR number, date of birth, facility, bed number, sample strata) taken directly from the PDS. These items were confirmed during on-site data collection by the assessor via medical record review.

Section 2: Disease Burden

The Disease Burden domain included 105 chronic conditions, grouped by type of condition (e.g., cardiovascular, respiratory, gastrointestinal). Assessors also had the option to write-in four other diagnoses not already captured in the list of conditions. This list was developed based on the previous Lumetra study and discussion among the project team and CDCR staff about conditions most likely to trigger long-term care needs. The assessor reviewed the medical record and recorded any active or chronic conditions affecting the inmate on a check-off list. In addition to the check-off list, the Medical Bed Census Assessment Tool also included a place for the assessor to enter the diagnosis or event that triggered admission to the medical bed. This was reviewed with the nurse proxy to confirm all entries and identify any missing conditions. Custody proxies were not asked to review this section in the general population assessments.

Section 3: Medical-Nursing Needs/Treatments

This domain included a list of 56 medical and nursing needs and treatments grouped into 12 areas (e.g., vital signs, respiratory, gastrointestinal). The final list of items was derived from discussions with CPR and CDCR staff, documents prepared by CPR staff (e.g., "Resources Used by Level of Care") and experiences and data from the previous Lumetra study. Items in this domain represent "resources" (i.e. nursing time, medical supplies) required by inmates and therefore are important contributors to estimating long-term care housing needs. This list was further revised to include relevant items from Chrono forms and Disability Placement Program Verification forms (i.e., cane,

wheelchair, hearing/vision impairment) that are generally documented in the medical record. The assessor reviewed the medical records and records which medical and nursing needs/treatments the inmate currently uses. For the Medical Bed Census, nurse proxies were also asked to identify treatments used by the inmate.

Section 4: Activities of Daily Living (ADLs) / Mobility

Assessments of long-term needs and functional abilities often include "late loss" activities of daily living (ADLs). In the Activity of Daily Living/Mobility domain, the proxy assessed the inmate's ability to perform six ADLs (i.e., walking, dressing, eating, toilet use, personal hygiene, bathing/showering) on a three-point scale that captures the level of support required in the previous week (independent, supervision or limited assistance, extensive assistance or total dependence).

The ADLs and scale for level of support required by the inmate were developed based on discussions among the project team and CDCR staff and review of ADL assessment items found in other tools and surveys. The final set of ADL items was adapted from the Nursing Home Minimum Data Set, has established reliability, and is relatively familiar to nurse assessors. Many other ADL assessments were examined and discussed throughout the iterative assessment tool development process.

- ASIS ADL items measure patient's current ability to perform activities and the tool is used by all certified home health agencies across the country; however the team determined this tool was too cumbersome to meet the needs of this project (e.g., too many assessment items considered extraneous to functioning in a prison).
- The Medicare Current Beneficiary Survey (MCBS) uses six ADLs (bathing, eating, dressing, toileting, getting in/out of chairs, and walking) measured as "difficulty performing" or "inability to perform" these activities.
- The National Long Term Care Survey (NLTCS) assesses ability to perform six ADLs (bathing, eating, dressing toileting, getting in/out of bed, getting around inside) based on the patient receiving help or supervision, using equipment to perform the activity, or not performing the activity at all.
- The National Nursing Home Survey (NNHS) assesses six ADLs (bathing, eating, dressing, toileting, transferring in/out of bed or chairs, and walking).
- The Health and Retirement Study examines difficulty and dependence for five ADLs (bathing, eating, dressing, toileting, and transferring).

Section 5: Prison Activities of Daily Living (PADLs)

Data collection in the "Prison Activities of Daily Living" domain captured six key functional abilities specific to life in a correctional facility that may drive placement of inmates: the ability to (1) get on the floor for alarms, (2) hear orders from staff, (3) stand for head count, (4) go to the dining hall, (5) get up on a top bunk, and (6) climb one flight of stairs. Dr. Brie Williams of the University of California at San Francisco developed these measures and has termed them "prison activities of daily living", or PADLs. The items included in the Medical Bed Census Assessment and the General Population Assessment Tools are a modified version of Dr. Williams' PADLs assessments and scale.

The proxy assesses the inmate's ability to perform each of the six PADLs on a three-point scale (can perform the activity, temporarily cannot do activity, permanently cannot do activity).

Section 6: Cognitive Status

Cognitive status may predict need for increases in an inmate's daily care and is important for modeling the long-term housing needs of inmates. In the Cognitive Status domain, the proxy assessed the inmate's cognitive skills through questions of the inmate's daily decision-making, memory and recall ability, and ability to make him/herself understood. Decision-making was evaluated on a four-point scale (independent, modified independence, moderately impaired, severely impaired). Memory/recall ability for short-term and long-term memory was evaluated on a two-point scale (no problem, problem). The inmate's ability to make him or herself understood was measured on a four-point scale (understood, usually understood, sometimes understood, rarely or never understood).

The need for proxy assessment of cognitive status (as opposed to face-to-face inmate assessment) introduced some complexity to development of the tool. As with other domains of the assessment, these items were developed based on discussions among the Abt/Lumetra project team and CDCR staff and a review of proxy measures of cognitive functioning in the literature. The final items were a modified version of the Nursing Home Minimum Data Set Cognitive Performance Scale (CPS) items. The CPS is used in all U.S. certified nursing homes and has been found to have adequate reliability. A literature review of Cognitive Screening by proxy revealed several possible assessments that could be administered, at least in part, via proxy, in addition to the Nursing Home MDS CPS.

- The General Practitioner Assessment of Cognition (GPCOG) is an instrument designed to assist general practitioners in detecting dementia through a blend of direct patient and assessment and informant interviews.
- The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) is a screening test for dementia with subjects unable to undergo direct cognitive testing, designed to be used with family members and relies on the proxy having a long history with the patient.
- The Modified Blessed Dementia Rating Scale (MBDRS) is a tool designed for proxy administration appropriate in cases where detection of moderate to severe cognitive impairment is sufficient.

Section 7: Level-of-care Assignment

The Level-of-care Assignment domain on the Medical Bed Census Assessment Tool had the proxy assess whether the inmate could function at a lower level-of-care than their current placement and, if so, what nursing resources they would need to function there. Next, the proxy and the assessor each made a three-step determination of the appropriate level of care for each inmate: (1) housing level, (2) specific resources needed, and (3) whether the inmate needs this level of care for greater or less than three months.

In the Level-of-care Assignment domain on the General Population Assessment Tool, the proxy assessed whether the inmate is physically or medically unsafe in his/her current location due to a health condition. In the general population sample, neither the proxy nor the assessor made an assignment recommendation; rather, an assignment recommendation was made using a computer algorithm after the assessment data were collected and analyzed.

A3.2 Comparison of the Medical Bed Census and General Population Assessment Tools

The draft Medical Bed Census Assessment Tool was pilot tested and revised based on a debriefing with staff involved in the pilot. The Medical Bed Census Assessment Tool (see Appendix 1) was revised based on the experience of the medical bed census and consideration of the specific needs of the general population assessment procedures (e.g., use of assessors who were not CDCR nurses, health status of general population inmates compared to inmates in medical beds) (see Appendix 2 for a copy of the General Population Assessment Tool).

The major differences between the assessment tools and implementation of the tools for the medical bed census and the general population assessments were:

- Proxies in the general population assessments were almost always correctional officers from the house unit where the inmate was placed; nurses served as proxies for inmates in medical beds. Proxies in the medical bed census were nurses in the medical unit.
- General population assessments did not collect the "Primary diagnosis triggering the admission to medical bed" of the inmates, while the medical bed census did collect this information.
- General population assessments did not include a level-of-care assignment by the assessor or the proxy. The medical bed census assessment asks the proxy and assessor to choose an appropriate level-of-care for each inmate. General population correctional officer proxies were asked whether the inmate is physically or medically unsafe in his/her current housing location due to a health condition.

Specific domains and assessment items were included on interim revisions of the assessment, but not included in the final assessment tool because either the items added little value to the medical bed census or general population assessments or the data could be retrieved from the Project Data Set following data collection. One example of this is that the Medical-Nursing Needs/Treatments domain of the final assessment tools include items that examine how well the inmate can make him or herself understood, and indicating blindness and deafness, but no other communication items are included (e.g., whether the inmate can communicate in English, the inmate's primary language), as these items may be obtained from the PDS. In addition, a Psychiatric Status domain was considered, but the team determined that these data could be added to the PDS through the Mental Health Tracking System if they were deemed necessary later in the project.

A3.3 Pilot Testing the Assessment Tool

The Abt/Lumetra Team conducted a pilot test of the draft assessment tool at the California Medical Facility (CMF) and California State Prison, Solano on February 27-29, 2007 with assistance from CPR and CDCR staff. The pilot test was conducted to determine: 1) the average time required to complete each form, 2) whether the data elements on the form could be obtained from the medical record and/or the correctional officer proxies, and 3) how well the assessment items performed in the field.

Lumetra conducted a training for CDCR and Abt staff on the purpose of the pilot test and the protocol for administering the assessment tool.

Fifty-six inmates were assessed during the pilot test; 29 at the California Medical Facility and 27 at the California State Prison, Solano. CMF has more medical beds; thus, more inmates were assessed at that facility (see Table A3.1).

Table A3.1. Number of Inmates Assessed in the Pilot Test

	California Medical Facility	California State Prison-Solano
Medical Bed	13	6
General Population	16	21
Total	29	27

Several changes were made to the data collection protocol and the assessment tool based on the pilot test.

- The most significant change was the confirmation that inmates would not be directly assessed to gather data for any sections of the assessment tool. A subset of inmates was directly assessed during the pilot test and the responses did not differ greatly from the responses obtained from the proxy interviews and the medical record.
- Another important change was the decision not to include any Armstrong or Clark (CDCR disability codes) in the assessment tool, either as questions or prepopulated items to be used to assign inmates to a level-of-care.
- Several question in the Demographics section were reworded (e.g., bedtype), reordered, added (e.g., assessor name, assessment date) or deleted (e.g., gender).
- A few items in the Disease Burden section were deleted (e.g., "Pressure sore, decubitus ulcer, leg ulcer") or moved to the Medical-Nursing Needs/Treatments section (e.g., Chronic pain syndrome); no items were added to the Disease Burden section.
- A few items in the Medical-Nursing Needs/Treatments section were added (e.g., a "wounds" subsection) or deleted (e.g., "Needs less than 24 hour nursing observation").
- The response scale for the PADLs section was revised.
- Several changes were made to the Level-of-Care Assignment section, including: having both the nurse proxy and the assessor assign the inmate to a level of care; making the assignment a two-stage process covering the level-of-care needed and the duration of that need.

A3.4 Data Collection Protocol

Table A3.2. Current Placement of Inmates Assessed in Medical Bed Census

Facility	OHU	CTC	GACH	SNF	Hospital	Hospice	Total Assessed
Avenal State Prison (ASP)	23				17		40
California Correctional Center (CCC)	17				2		19
California Correctional Institution (CCI)	10				0		10
California Institution for Men (CIM)			39		3		43
California Institution for Women (CIW)		2			6		8
California Medical Facility (CMF)	74	42	6		6	13	141
California Men's Colony (CMC)			29		3		32
California Rehabilitation Center (CRC)	5				2		7
California Rehabilitation Center (Women) (CRCW)							
Calipatra (CAL)	14				2		16
Centinela (CEN)		11			5		16
Corcoran (COR)	20		37		4		61
Los Angeles County (LAC)		10			5		15
Sacramento (SAC)	13	4			6		23
Solano (SOL)	3	4			8		15
Folsom State Prison (FSP)							
Substance Abuse Treatment Facility (SATF)		24			13		37
Central California Women's Facility (CCWF)				29	4		33
Chuckawalla Valley State Prison (CVSP)	9				2		11
Correctional Training Facility (CTF)	8				5		13
Deuel Vocational Institution (DVI)	14				8		22
High Desert State Prison (HDSP)		21			0		21
Ironwood State Prison (ISP)	4		1		6		11
Kern Valley State Prison (KVSP)		8			5		13
Mule Creek State Prison (MCSP)		4			0		4
North Kern State Prison (NKSP)		6			7		13
Pelican Bay State Prison (PBSP)		6			2		8
Pleasant Valley State Prison (PVSP)		4			10		14
R J Donovan (RJD)		12			4		16
Salinas Valley State Prison (SVSP)		12			3		15
San Quentin (SQ)	9				7		16
Sierra Conservation Center (SCC)	5				1		6
Valley State Prison for Women (VSPW)	5				4		9
Wasco State Prison (WSP)	1	9			6		16
Community Corrections (statewide)							
Reception Centers (statewide)							
Missing facility data							
Total	234	179	112	29	156		724

A3.5 Performance of the General Population Assessment Tool and Recommendations

Abt Associates conducted debriefing calls with Lumetra nurse assessors to gather feedback on what worked well and how the logistics of the facility visits, the medical record review, and the proxy interviews could be improved. Lumetra assessment teams reported that prison staff were very supportive of the assessment effort and helpful in the data collection process. Lessons learned included:

- Assessors found that the most efficient protocol for completing the assessment tool was to first review medical records (during the first 1-2 days of the site visit) and then interview CO proxies (during the second part of the site visit). This was because inmates are located throughout the prison and walking to units was time consuming.
- Organizing the medical records and printed assessment tools in the order necessary to meet sample strata requirements was also time consuming; the time spent organizing medical records was much lower in facilities that pulled medical records in the sample order.
- Medical record review was quicker in facilities where medical records had comprehensive problem lists because these lists made it easier to determine the inmate's disease burden. Assessors noted that having descriptions of each bed type written directly on the assessment tool or as an appendix would have been helpful.
- During the CO proxy interviews, assessors found that COs often did not recognize inmates by name, but did recognize the bed number. Some CO interviews were done via telephone instead of in-person if the CO was not able to leave their posts to speak with the Lumetra nurses.
- An assessment instruction manual could improve consistency of data collection across assessors and provide additional detail to assessors that could not be placed directly on the assessment tool.
- For non-CDCR assessors, like the Lumetra nurses, obtaining information about facility-specific requirements for gaining entrance into the facility and which colors to avoid wearing would be helpful and timesaving for visitors.

A3.6 Data Collection Limitations

Debriefings with the Lumetra assessment teams identified possible limitations to the reliability of the assessment data. In general, assessment nurses reported that they were comfortable with the medical record review assessment items; however, select sections of the assessment tool were noted as problematic. Assessment tool sections and their noted limitations are described below.

Section 2: Disease Burden

- *Psychiatric.* Some assessors found that the psychiatric documentation in the medical records was enormous and time consuming to review, did not include a specific psychiatric workup, and included unfamiliar ICD-9 codes. As a result, some assessors reported that they made their own clinical judgments regarding whether the inmate had the psychiatric conditions of

interest (e.g., major depression disorder). Assessors also found it difficult to determine whether depression could be categorized as "major" (vs. minor).

- *Renal and Urinary*. One assessor noted that inmates may have a diagnosis of End-stage renal disease (ESRD), but not be on dialysis. However, the item on the assessment form implies that the inmate must have both the diagnosis and the dialysis treatment to check off ESRD.
- *Neurological/Sensory*. One assessor noted that she used her own judgment, sometimes referring to an eyeglass prescription, regarding whether inmates had "visual loss both eyes", as this was not a diagnosis commonly seen in the medical record.
- Assessors noted that problem lists in medical records were more comprehensive at some facilities than others. In facilities where problem lists were comprehensive, assessors did not have difficulty identifying current conditions. In other facilities, some assessors recorded diagnoses based on medical notes and prescription drugs without written documentation of the diagnosis, but other assessors did not record any diagnoses unless they found the explicit documentation in the medical record.

Section 3: Medical-Nursing Needs/Treatments

- *Respiratory*. Two assessors noted they included "inhalers" (i.e. asthma inhalers) when they coded "Nebulizer therapy", whereas a third assessor did not code this section in cases with an inhaler.

Section 4: Activities of Daily Living/Mobility and Section 5: Prison Activities of Daily Living

- *Accuracy of information supplied by proxy*. Some assessors reported proxy respondents seemed knowledgeable about ADL and PADL functioning among their inmates. However, one assessment team in a high security unit noted that proxies might be more likely to say that inmates can perform ADLs or PADLs because the inmates do whatever they are told to do. Assessors reported that the culture of the units could affect proxy responses in these assessment sections.

Section 6: Cognitive Status

- In some cases, correctional officer proxies were unsure of the cognitive functioning of inmates. Specifically, they noted difficulty in reporting on inmates' Memory/Recall ability and long-term memory. Some proxies stated that they do not know this information through their normal interaction with the inmates.

Based on these findings, Abt recommended revisions to the assessment tool and the training materials for the general population sample.

Appendix 4: Primary Data Collection Findings: Supporting Material and Tables

A4.1 Findings from the Medical Bed Census

A4.1.1 Chronic Diseases

Table A4.1. Chronic Disease Burden Among Inmate-Patients Assessed in Medical Bed Census

Rank	Description	Count
1	Other diagnosis (any "write-in" diagnoses)	480
2	Hypertension	283
3	Diabetes mellitus	134
4	Hepatitis C	113
5	Ischemic heart disease (CAD,h/o MI, h/o CABG)	96
6	Chronic obstructive pulmonary disease (COPD)	89
7	Major depression disorder (single episode or recurrent)	77
8	Cancer (active)	76
9	Epilepsy/seizure disorder	64
10	Low back pain	63
11	Anemia (iron-deficiency and other)	62
12	Congestive heart failure (CHF)	60
13	Post hospital care for...	58
14	Gastroesophageal reflux (GERD)	57
15	h/o stroke (CVA) with any residual impairment	57
16	Asthma	49
17	Hypercholeserolemia, hyperlipidemia	48
18	Arthritis (osteoarthritis, DJD)	45
19	Dementia, e.g. Alzheimer's and vascular dementia	42
20	Chronic constipation	41
21	Hemiplegia/hemiparesis	41
22	Paraplegia	41
23	HIV/AIDS	41
24	Alcohol/substance abuse	40
25	Chronic renal insufficiency	35
26	Schizophrenia	33
27	h/o cancer	32
28	Other current infection	32
29	End stage liver disease (ESLD), hepatic encephalopathy	31
30	End stage renal disease (ESRD) (on dialysis)	31
31	Altered mental status	31
32	Pre-Procedure care for...	31
33	h/o positive PPD	30
34	Benign prostatic hypertrophy (BPH)	29
35	Cirrhosis	26
36	Personality disorder (borderline, antisocial, etc)	26
37	Abnormal weight loss, failure to thrive, malnutrition	24
38	Nausea and vomiting	24

Rank	Description	Count
39	Peptic ulcer disease or gastritis	22
40	Chemotherapy (active)	22
41	Venous insufficiency (peripheral edema)	21
42	Hearing loss	21
43	Morbid obesity	21
44	Peripheral neuropathy	20
45	Coccidioidomycosis (currently getting treatment)	20
46	MRSA (colonization)	20
47	Supplemental oxygen (long term)	19
48	Arrhythmia	18
49	Hypothyroidism	18
50	Atrial fibrillation	17
51	Peripheral vascular disease	16
52	Cellulitis (current)	15
53	Visual loss both eyes (mod-sever or blind)	14
54	Hepatitis B	14
55	Pneumonia (current)	14
56	Diarrhea	14
57	Parkinson's disease	13
58	bipolar disorder	13
59	h/o hip repair or replacement	13
60	GI bleed, current	13
61	Cardiac Pacemaker	12
62	Hernia, inguinal or abdominal	12
63	Traumatic brain injury with cognitive impairment	12
64	Cataracts	12
65	h/o lower limb amputation	12
66	Urinary tract infection (UTI) (current)	12
67	Jaw fracture	12
68	Long-term anticoagulants, e.g. coumadin	11
69	Anxiety disorder	11
70	Lymphoma, Hodgkin's, or leukemia	11
71	Possible terminal condition (death probable within 1 year)	11
72	Obstructive sleep apnea	10
73	Multiple sclerosis	10
74	Glaucoma	10
75	Osteomyelitis (currently getting antibiotics)	10
76	Tracheostomy (current)	9
77	Aortic aneurysm (thoracic or AAA)	8
78	Allergic rhinitis	7
79	Quadriplegia	7
80	Other thyroid disorder	7
81	Other current fracture	7
82	Radiation therapy (active)	6
83	Pulmonary tuberculosis (currently getting multidrug RX)	6
84	Pancreatitis	6
85	Valvular heart disease	5
86	s/p heart valve replacement	5
87	Cholelithiasis (gallstones)	5
88	Renal stones	5

Rank	Description	Count
89	Neurogenic bladder	5
90	Delusional or paranoid disorder	5
91	Rheumatoid arthritis	5
92	Osteoporosis	5
93	Herpes zoster (current)	5
94	Volume depletion (dehydration) (current)	5
95	Inflammatory bowel disease (Crohn's ulcerative colitis)	4
96	Cerebral palsy	4
97	Sickle cell disease	4
98	Developmental disability (Mental retardation)	3
99	Orthostatic hypotension	3
100	Pregnancy	3
101	Irritable bowel disease	2
102	Systemic lupus erythematosis (SLE)	2
103	Pelvic inflammatory disease (current)	1
104	Transgender	0
105	Endocarditis (current)	0
106	Abnormal vaginal bleeding	0

A4.1.2 Nursing Needs

Table A4.2. Nursing Needs

Rank	Nursing Needs	Count
1	Vital signs Q shift or more often	373
2	Vital signs daily	265
3	Wheelchair	213
4	Chronic pain	125
5	Fingersticks more than daily	103
6	Assistance with medication administration (e.g., cueing to swallow)	91
7	Continuous IV therapy	85
8	Surgical site, drain, and other wound requiring daily nursing care	85
9	Monitoring I/O	78
10	Altered diet (pureed, thickened liquids)	77
11	Walker	73
12	Sliding scale insulin	72
13	Continuous oxygen	67
14	PT and/or OT	64
15	Foley catheter	62
16	Intermittent IV therapy	53
17	Routine insulin	52
18	Central line / PICC line	52
19	Pressure sore or leg ulcer requiring daily nursing care	52
20	Urinary incontinence	51
21	Fecal incontinence	45
22	Daily weights	43
23	Diapers or briefs	41
24	History of recent falls (past 90 days)	41
25	Nebulizer therapy (bronchodilators)	39
26	Oral anticoagulation (coumadin)	35
27	Intermittent oxygen	34
28	SQ anticoagulation (e.g. Lovenox)	29
29	Mechanical lift	29
30	Straight cane	27
31	History of remote falls	27
32	NG or PEG tube feeding	25
33	Orthotic device (brace, splint, prosthesis)	21
34	Isolation for...	21
35	IM injections	19
36	Blind both eyes (unable to correct vision to >20/200)	18
37	Condom catheter	17
38	Colostomy or ileostomy care	17
39	Hearing impaired but functional with hearing aid	17
40	Fingersticks daily	16
41	Surgical site, drain, and other wound requiring less than daily nursing care	13
42	Fingersticks less than daily	12
43	Gastrostomy (PEG) tube	12
44	Tracheostomy care	9
45	Suprapubuic catheter	9
46	Routine or frequent disimpaction or enemas	9

Rank	Nursing Needs	Count
47	Pressure sore or leg ulcer requiring less than daily nursing care	7
48	Intermittent catheseterization	6
49	Quad cane	6
50	Continuous positive airway pressure (CPAP)	5
51	IV anticoagulation (heparin)	4
52	Urinary retention	4
53	Cast care	4
54	Parental (IV) feeding	3
55	Blood transfusions	3
56	Deaf (both ears)	0

Sample Size= 724. Up to 10 nursing needs were allowed per respondent.

A4.1.3 Functional Status

Activities of Daily Living

The current categorization of medical beds is based on an infirmary care model designed for addressing inmate's acute care needs. Figure A4.1 shows the level of ADL impairment among inmates in different types of medical beds. The observed pattern suggests that patients with functional limitations can be found in any type of medical bed. With the exception of the 29 hospice beds there is not a strong concentration of inmates with functional limitation in any one type of medical bed. In a prison health system with both infirmary beds and long-term care beds, one would expect to see patients with functional limitations (especially permanent limitations) concentrated in long-term care beds.

Figure A4.1 Percentage Of Bed Occupants With At Least One ADL Impairment

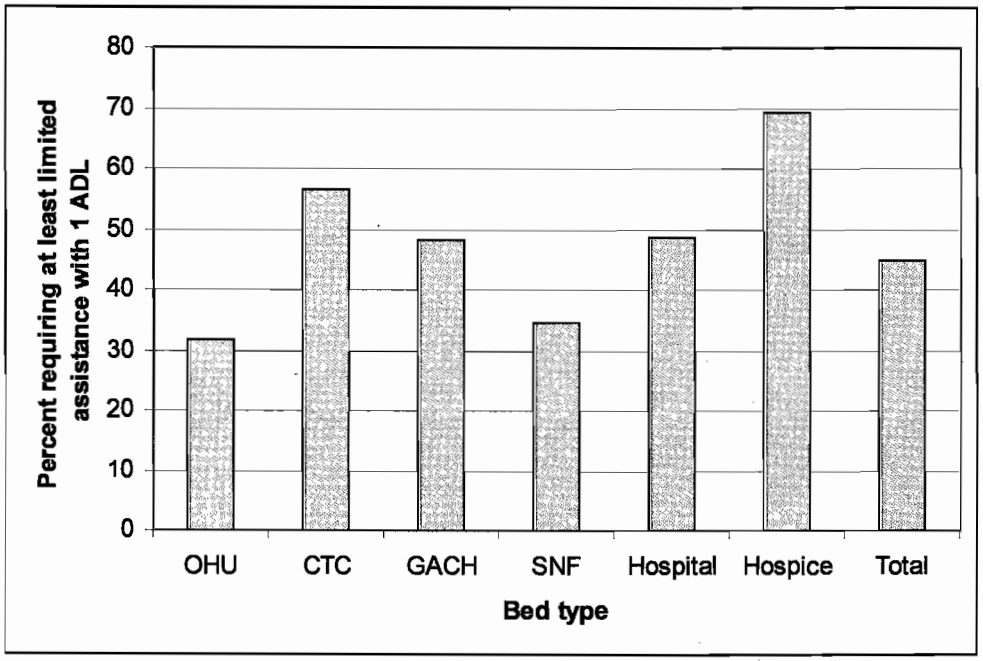


Table A4.3. Correlation Between ADL Scale Items

	Walk	Dress	Eat	Toilet	Personal Hygiene	Bathe
Walk	1.00					
Dress	0.44	1.00				
Eat	0.41	0.68	1.00			
Toilet	0.46	0.79	0.68	1.00		
Personal Hygiene	0.43	0.80	0.73	0.79	1.00	
Bathe	0.48	0.79	0.62	0.74	0.83	1.00

Prison Activities of Daily Living

Most inmates with temporary limitation in a PADL do not also have permanent limitation in another PADL (Table A4.4). Having a temporary PADL and no permanent PADL is negatively correlated with long-term care need among inmates in medical beds (correlation coefficient = -0.128, p<0.0006).

Table A4.4. Correlation of Temporary and Permanent PADLs

Correlation of Permanent and Temporary PADLs*		Temporary		
		None	>0	Total
Permanent	None	190	172	362
	>0	293	69	362
	Total	483	241	724

*correlation coefficient = -.302, p<0.00000

Table A4.5. Pairwise Correlation (Phi-coefficient) Between Permanent PADLs

	Floor for Alarms	Hear Orders	Stand for Count	Dining Hall	Top Bunk	Climb Stairs
Floor for Alarms	1.00					
Hear Orders	0.32	1.00				
Stand for Count	0.76	0.37	1.00			
Dining Hall	0.63	0.40	0.63	1.00		
Top Bunk	0.65	0.23	0.56	0.55	1.00	
Climb Stairs	0.70	0.25	0.61	0.57	0.88	1.00

A4.1.5 Level of Care Assignment

Utility of PDS in Predicting Long Term Care Need

To determine whether any variables in the PDS could predict long-term care need outside of regular GP among inmates housed in medical bed, the data were analyzed with logistic regression (Table A4.6). Age, DDP, DPP, cumulative length of stay in inpatient community hospital, and several categories of chronic disease diagnosis were significant predictors in the model (significance level <.05). The significant disease categories were solid tumor cancer, chronic pulmonary disease, severe chronic liver disease, chronic renal failure, dementia, and functional impairment. The model performed moderately well at predicting inmates LTC need (R-squared = 0.33). As a result, PDS data

was used to draw a stratified random sample of the general population for the primary data collection among general population based on inmates' predicted probability of needing long-term care outside of general population.

Table A4.6. PDS Variables that Predict LTC Outside of Regular General Population

Variable	Coef	Std Error	Z	p>|z|	Lower CI Bound	Higher CI Bound
Age	0.080	0.005	16.44	0	0.070	0.090
Age_miss	4.096	0.836	4.9	0	2.457	5.737
Black	0.204	0.132	1.54	0.123	-0.055	0.463
Hispanic	0.140	0.212	0.66	0.507	-0.276	0.558
Male	-0.124	0.227	-0.55	0.586	-0.571	0.322
ddp_yes	1.026	0.462	2.22	0.027	0.119	1.933
ddp_miss	2.089	0.189	11.03	0	1.718	2.460
dpp_dpx	2.376	0.152	15.59	0	2.077	2.675
dpp_dnx	0.001	0.201	0	0.998	-0.394	0.395
Cancer, Tumors	1.807	0.362	4.99	0	1.097	2.517
Lymphomas	-0.297	0.961	-0.31	0.757	-2.180	1.585
Chronic Pulmonary	1.074	0.333	3.22	0.001	0.421	1.728
Coronary Artery Dis.	-0.274	0.349	-0.79	0.432	-0.960	0.410
Congest Heart Failure	0.455	0.428	1.06	0.288	-0.384	1.296
Peripheral Vasc Dis	0.429	0.586	0.73	0.465	-0.721	1.579
Severe Chr Liver Dis	2.649	0.351	7.54	0	1.961	3.338
Diabetes w/OD	0.466	0.389	1.2	0.231	-0.297	1.230
Chronic Renal Failure	1.870	0.341	5.47	0	1.200	2.540
Nutritional Def	1.290	0.785	1.64	0.1	-0.249	2.829
Dementia	2.138	0.481	4.44	0	1.195	3.083
Funct Impairment	1.587	0.344	4.61	0	0.912	2.262
Psych	0.165	0.246	0.67	0.503	-0.318	0.648
Cumm. LOS	0.007	0.001	12.82	0	0.006	0.009
_cons	-10.395	0.334	-31.12	0	-11.050	-9.741

Logistic regression Number of obs = 164468
LR chi2(23) = 1641.86
Prob > chi2 = 0.0000
Log likelihood = -1651.2981 Pseudo R2 = 0.3321

A4.2 General Population Assessments

A4.2.1 Demographic and Custody Factors of the General Population Sample

The total population of the nine sampled prisons does not appear to be substantively different from the total prison population (Table A4.7).

Table A4.7 Demographic and Custody Characteristics for Population of Sampled Prisons and for the Population of All CDCR Facilities

Category	Value	Full Population of the 9 Sampled Prisons**	Full Population of All Prisons**
		Number (Percent)	Number (Percent)
Population		45,517 (100)	135861 (100)
Gender			
	Female	3259 (7)	8954 (7)
	Male	42258 (93)	126907 (93)
Race/Ethnicity			
	Black	13547 (30)	40642 (30)
	Hispanic	7736 (17)	20133 (15)
	Mexican	9857 (22)	31089 (23)
	Other	2709 (6)	7776 (6)
	White	11668 (26)	36221 (27)
Age			
	17 to 34	19645 (43)	61089 (45)
	35 to 44	13441 (30)	40494 (30)
	45 to 54	8958 (20)	25677 (19)
	55 to 64	2699 (6)	6895 (5)
	65 to 74	601 (1)	1401 (1)
	75+	173 (0)	305 (0)
Mental Health Code			
	Blank	35617 (78)	109888 (81)
	CCCMS	8957 (20)	22345 (16)
	EOP	943 (2)	3628 (3)
Life Sentence			
	Yes	8694 (19)	25069 (18)
	blank	36823 (81)	110792 (82)
Sex Offender Registrant			
	Blank	37150 (82)	116531 (86)
	Yes	8367 (18)	19330 (14)
Strike Count			
	2	10628 (23)	32277 (24)
	3	2625 (6)	8752 (6)
	Missing	32264 (71)	94832 (70)
Years until Projected Release			
	00 to 04	28158 (62)	84350 (62)
	05 to 09	4987 (11)	13611 (10)
	10 to 19	4116 (9)	12740 (9)
	20 to 29	1447 (3)	4536 (3)
	30 or more	6809 (15)	20624 (15)

Because the total inmate population for the state prison system was extracted from DDPS on December 31, 2006 and the data collection activities did not commence until March 14 (Medical Bed Census) and May 16 (General Population Sample), there was a need to update the current location data for inmates before the general population data collection. For example, among the 7596 inmates at ASP in April, 6,656 (87.6 percent) had been there in December, but 570 (7.5 percent) had been in reception centers in December, and the rest were in other prisons. Likewise, of the 7332 inmates that were in ASP in December, 568 left the prison system, and 108 transferred to another facility (leaving the aforementioned 6656). When the inmate locations were refreshed in April, it was observed that 12.4 percent of the total December 2006 cohort was no longer in prison. There may also be new inmates that entered the CA state prison system since December 2006, but we do not update our cohort with these individuals.

Despite, the flow of patients out of our cohort over the study period, the demographic and custody characteristics of the portion of the cohort that was not in reception centers did not change substantially (Table A4.8). As would be expected, there is a slightly higher fraction of inmates with life sentences, since they do not exit the prison system, but this is not likely to have a meaningful impact our results.

Table A4.8: Comparison of Demographic and Custody Characteristics of the Prison Population in December 2006 and the Remaining Fraction of That Population Incarcerated in April 2007

Category	Value	Population of 9 Sampled Prisons (December, 2006)* Number (Pct)	Population of 9 Sampled Prisons (April, 2007)** Number (Pct)	Population of All Prisons (December, 2006) Number (Pct)	Population of All Prisons (April, 2007) Number (Pct)
Population		45,937 (100)	45,517 (100)	171,949 (100)	150,578 (100)
Gender					
				16 (0)	
	Female	3,100 (7)	3,259 (7)	11,768 (7)	9,559 (6)
	Male	42,837 (93)	42,258 (93)	160,165 (93)	141,019 (94)
Race/Ethnicity					
	Black	13,601 (30)	13,547 (30)	49,550 (29)	44,264 (29)
	Hispanic	8,086 (18)	7,736 (17)	27,296 (16)	23,317 (15)
	Mexican	9,771 (21)	9,857 (22)	38,545 (22)	34,022 (23)
	Other	2,653 (6)	2,709 (6)	9,370 (5)	8,406 (6)
	White	11,826 (26)	11,668 (26)	47,172 (27)	40,569 (27)
Age					
	17 to 34	20,021 (44)	19,645 (43)	80,554 (47)	69,149 (46)
	35 to 44	13,502 (29)	13,441 (30)	50,799 (30)	44,526 (30)
	45 to 54	8,976 (20)	8,958 (20)	30,866 (18)	27,797 (18)
	55 to 64	2,679 (6)	2,699 (6)	7,841 (5)	7,314 (5)
	65 to 74	590 (1)	601 (1)	1,542 (1)	1,475 (1)
	75+	169 (0)	173 (0)	347 (0)	317 (0)
Mental Health Code					
	Blank	36,143 (79)	35,617 (78)	140,144 (82)	121,207 (80)
	CCCMS	8,842 (19)	8,957 (20)	27,614 (16)	25,461 (17)
	EOP	952 (2)	943 (2)	4,191 (2)	3,910 (3)
Life Sentence					
	Yes	8,511 (19)	8,694 (19)	25,406 (15)	25,327 (17)
	Blank	37,426 (81)	36,823 (81)	146,543 (85)	125,251 (83)
Sex Offender Registrant					
	Blank	37,594 (82)	37,150 (82)	150,007 (87)	129,796 (86)
	Yes	8,343 (18)	8,367 (18)	21,942 (13)	20,782 (14)
Strike Count					
	2	10,656 (23)	10,628 (23)	36,267 (21)	33,974 (23)
	3	2,642 (6)	2,625 (6)	8,863 (5)	8,837 (6)
	Blank	32,639 (71)	32,264 (71)	126,819 (74)	107,767 (72)
Years until Projected Release					
	00 to 04	29,008 (63)	28,158 (62)	113,832 (66)	94,678 (63)
	05 to 09	4,803 (10)	4,987 (11)	14,146 (8)	14,027 (9)
	10 to 19	4,052 (9)	4,116 (9)	13,126 (8)	13,074 (9)
	20 to 29	1,454 (3)	1,447 (3)	4,672 (3)	4,652 (3)
	30 or more	6,620 (14)	6,809 (15)	26,173 (15)	24,147 (16)

*Population data extracted from DDPS represents population on December 31, 2006
**Population data extracted from DDPS represents population on April 17, 2000

Appendix 5: Methods for Stratifying the Population According to Long-term Care Risk

In order to gain efficiency estimating LTC need in the general population, we leveraged the results of the medical bed census and the data in the Project Data Set (PDS). The results of the medical bed census included the assessing clinician's recommendation for the placement of each inmate into medical beds and the clinician's estimation of the duration of care each inmate needed. For every inmate in the prison system, we had several data items that could serve as predictors of long-term care. Combining the two data sources, we were able to estimate a LTC risk score for each inmate.

We used a logistic regression model in order to stratify the inmates with respect to their propensity to require long term care. In this model we used three characteristics:

- Age
- Having a physical disability (PD)
- Total length of stay (LOS) in community hospital and in house medical beds (in days)

- We created six categories based on the total length of stay variable. These categories are:
  - Category 1: $LOS = 0$
  - Category 2: $LOS \in (0,30)$
  - Category 3: $LOS \in [30,90)$
  - Category 4: $LOS \in [90,180)$
  - Category 5: $LOS \in [180,365)$
  - Category 6: $LOS \in [365,548)$

- Interacting the six length of stay categories with the two physical disability categories (having a PD or not), we created 12 groups. In addition to age, we employed these 12 group dummies in the logistic regression. More formally, our model was:

$$P(C_i = 1) = \frac{1}{1+e^{-X_i}}$$

where X_i is defined as :

$$X_i = \sum_{c=1}^{12} \beta_c D_i^c + \beta_{13} Age_i$$

Here, i denotes inmates. C_i is a dummy variable which equals 1 if inmate i was in the medical bed survey and assessed to require long term care. D_i^c is a dummy indicator for the cth of the 12 groups created by interacting length of stay and physical disability categories for inmate i.[1] Age_i is the age of inmate i.

[1] In the actual estimation, we drop one of these dummy variables as the "reference category" in order to have a constant in our specification.

- We estimated this specification using the inmates from all 33 prisons in California. The results are shown in Table A5.1.

Table A5.1 Results for Risk Score Model

Variable	Coefficient	Std. Err.	z	P>z	Low 95 percent CI	High 95 percent CI	Odd Ratio
Category 1*No PD	-5.54905	0.402467	-13.79	0	-6.33787	-4.76023	0.003891
Category 1*PD	-3.04157	0.425455	-7.15	0	-3.87545	-2.20769	0.04776
Category 2*No PD	-4.26662	0.42417	-10.06	0	-5.09798	-3.43527	0.014029
Category 2*PD	-2.75166	0.463928	-5.93	0	-3.66094	-1.84237	0.063822
Category 3*No PD	-2.52374	0.440415	-5.73	0	-3.38694	-1.66054	0.080159
Category 3*PD	-1.21233	0.472509	-2.57	0.01	-2.13843	-0.28623	0.297503
Category 4*No PD	-1.96005	0.48004	-4.08	0	-2.90091	-1.01918	0.140852
Category 4*PD	-0.47827	0.522995	-0.91	0.36	-1.50332	0.546781	0.619855
Category 5*No PD	-1.63217	0.514282	-3.17	0.002	-2.64014	-0.62419	0.195506
Category 6*No PD	-0.84656	0.549973	-1.54	0.124	-1.92449	0.231366	0.428888
Category 6*PD	0.445749	0.483894	0.92	0.357	-0.50267	1.394163	1.561659
Age	0.078134	0.00462	16.91	0	0.069079	0.087189	1.081267
Constant	-4.92703	0.460391	-10.7	0	-5.82938	-4.02468	

- Then utilizing these estimated coefficients, we calculated every inmate's probability of residing in a medical bed and requiring long term care (the risk score). Using 0.005 as the threshold, we divided the inmate population into two categories: High risk (high probability of needing long term care) and low risk (low probability of needing long term care). These categories are the strata that we use in the sample selection process.

A5.1 Sample Selection

Our sampling design deals with the problem of being unable to form an efficient sample for inmates who have a very low probability of needing long-term care. In addition to the risk stratification described above, we solicited nomination of inmates likely to need long-term medical care from correctional officers at the nine prisons included in our sample. These nominations, combined with the high and low risk categories described in the preceding section allowed us to partition the inmate population into four strata. For simplicity, we discuss the estimators for a single prison.[2]

A5.2 Notation

S — There are S strata s=1…S. The strata are formed based on estimated probabilities of needing long-term care (and being in medical beds). Without loss of generality, let stratum S be the stratum with the lowest probability that the inmate needs long-term care.

C_s — This is the number of inmates needing long-term care in stratum s. This is what we would like to estimate.

M_s — This is the number of inmates needing long-term care in stratum s who are also in medical units. We know this number.

N_s — This is the number of nominated inmates in stratum s. These inmates do not necessarily need long-term care.

[2] In the analysis, we take into account that our sample comes from nine prisons.

n_s This is the number of nominated inmates in stratum s who need long-term care.
R_s This is the number of inmates in stratum s who were not nominated.
r_s This is the number of inmates in stratum s who need long-term care but are not nominated.

Q_{1s} This is a measure of the sensitivity of the nominations. It is the probability that a nominated inmate needs long-term care.

$$E[n_s] = Q_{1s} N_s$$

Q_{2s} This is a measure of specificity. It is the probability that an inmate in stratum s needs long-term care conditional on his or her not being nominated.

$$E[r_s] = Q_{2s} R_s$$

P_{1s} This is the sampling probability for persons nominated in stratum s. We will determine for sampling purposes.
P_{2s} This is the sampling probability for persons who were not nominated in stratums s. We get to set this, too.

A5.3 The Estimates

The number of inmates needing long-term care is:

$$[1] \qquad C = \sum_{s=1}^{S} C_s = \sum_{s=1}^{S} M_s + n_s + r_s$$

We estimate this with suitable estimates of n_s and r_s.

$$[2] \qquad \hat{C} = \sum_{s=1}^{S} M_s + N_s \hat{Q}_{1s} + R_s \hat{Q}_{2s}$$

We estimate Q and R from the sample. The sampling variance is of greatest interest to us because we need to set the sampling rates. Of course, we set the sampling rates to minimize the sampling variance. The term M_s does not enter into the sampling variance because we know it with certainty. However, we have to estimate the Q's, and that is where the uncertainty enters.

The sampling variance is[3]:

$$[3] \qquad VAR(\hat{C}) = \sum_{s=1}^{S} \left[\frac{N_s}{P_{1s}} (1 - P_{1s}) Q_{1s} (1 - Q_{1s}) + \frac{R_s}{P_{2s}} (1 - P_{2s}) Q_{2s} (1 - Q_{2s}) \right]$$

Minimizing [3] with respect to the constraint that:

[3] The terms $(1 - P_{1s})$ and $(1 - P_{2s})$ reflect the finite sample adjustment that we employed.

[4] $$sample\ size = \sum_{s=1}^{S} N_s P_{1s} + R_s P_{1s}$$

will provide the solution.

A5.4 Dealing with Rare Events

In designing the sample selection process, the main problem is that R_S is very large but we expect r_S to be comparatively low. Our solution is to set $P_{2S}=0$ and use a different estimator for r_S. (In other words, we do not sample from the non-nominated part of stratum S.) Recall that capital S denotes the last stratum – the one that has most of the inmate population. The way to get an estimate for r_S is to make some identifying assumption. There are three possibilities.

1. The ratio r_s/M_s is constant across the strata. Using $\hat{r}_s$ and M_s from the strata for which we have estimates (s=1..S-1):

[5] $$\hat{r}_S = M_S \left[\frac{\sum_{s=1}^{S-1} r_s}{\sum_{s=1}^{S-1} M_s} \right]$$

2. The ratio $r_s/(M_s+n_s)$ is constant across the strata. Then the estimate is:

[6] $$\hat{r}_S = (n_S + M_s) \left[\frac{\sum_{s=1}^{S-1} r_s}{\sum_{s=1}^{S-1} n_s + M_s} \right]$$

3. The ratio r_s/n_s is constant across the strata and the estimator is similar to the above.

A5.4.1 Calculating Optimal Sampling Probabilities:

We chose to employ the second possibility as shown in [6] to estimate r_S. Using [6] complicates the variance estimates because r_s and n_s are themselves estimated. More specifically, under this option as M_s is known with certainty, the variance term in [3] and the constraint [4] become:

[3'] $$VAR(\hat{C}) = \sum_{s=1}^{S} \frac{N_s}{P_{1s}} (1 - P_{1s}) Q_{1s} (1 - Q_{1s}) + \sum_{s=1}^{S-1} \frac{R_s}{P_{2s}} (1 - P_{2s}) Q_{2s} (1 - Q_{2s}) + Var(\hat{r}_S)$$

[4'] $$sample\ size = \sum_{s=1}^{S} N_s P_{1s} + \sum_{s=1}^{S-1} R_s P_{2s}$$

We can find the optimal sampling probabilities $\hat{P}_{11}, \hat{P}_{12}, ...\hat{P}_{1S}$ and $\hat{P}_{21}, \hat{P}_{22}, ...\hat{P}_{2S-1}$ by minimizing [3'] subject to [4']. In order to solve this optimization problem, we first need to derive $Var(\hat{r}_S)$. Let's introduce new notation to simplify things:

[7] $A \equiv n_S$

[8] $B \equiv \sum_{s=1}^{S-1} r_s$

[9] $C \equiv \sum_{s=1}^{S-1} n_s$

These are the stochastic terms in [6]. Note that M_s $(s = 1,2,...S)$ are constants. Let's further define:

[10] $D \equiv M_S$

[11] $E \equiv \sum_{s=1}^{S-1} M_s$

Using [7]-[11], we can rewrite $\hat{r}_S$ as:

[12] $\hat{r}_S = (A + D)\dfrac{B}{C + E}$

Using the delta method, we can approximate $Var(\hat{r}_S)$ as

[13] $VAR(\hat{r}_S) \approx \left(\dfrac{\partial \hat{r}_S}{\partial A}\right)^2 VAR(A) + \left(\dfrac{\partial \hat{r}_S}{\partial B}\right)^2 VAR(B) + \left(\dfrac{\partial \hat{r}_S}{\partial C}\right)^2 VAR(C)$

Variances of the terms A, B, and C can be estimated as:

[14] $VAR(A) = \dfrac{N_S}{P_{1S}}(1 - P_{1S})Q_{1S}(1 - Q_{1S})$

[15] $VAR(B) = \sum_{s=1}^{S-1} \dfrac{R_s}{P_{2s}}(1 - P_{2s})Q_{2s}(1 - Q_{2s})$

[16] $VAR(C) = \sum_{s=1}^{S-1} \dfrac{N_s}{P_{1s}}(1 - P_{1s})Q_{1s}(1 - Q_{1s})$

Using these, we can rewrite [13] as

$$[13'] \quad VAR(\hat{r}_S) \approx \left[\frac{B}{C+E}\right]^2 (1-P_{1S})\frac{N_S}{P_{1S}}Q_{1S}(1-Q_{1S}) + \left[\frac{A+D}{C+E}\right]^2 \sum_{s=1}^{S-1}(1-P_{2s})\frac{R_s}{P_{2s}}Q_{2s}(1-Q_{2s}) + \left[-\frac{(A+D)B}{(C+E)^2}\right]^2 \sum_{s=1}^{S-1}\frac{N_s}{P_{1s}}(1-P_{1s})Q_{1s}(1-Q_{1s})$$

Note that the optimization problem will take terms A, B, C, D, and E as given. Let's further define:

$$[17] \quad \alpha_1 = \left[\frac{B}{C+E}\right]^2$$

$$[18] \quad \alpha_2 = \left[\frac{A+D}{C+E}\right]^2$$

$$[19] \quad \alpha_3 = \left[-\frac{(A+D)B}{(C+E)^2}\right]^2$$

Using [17], [18], and [19] we can further simplify [13'] as:

$$[13''] \quad VAR(\hat{r}_S) \approx \alpha_1 \frac{N_S}{P_{1S}}(1-P_{1S})Q_{1S}(1-Q_{1S}) + \alpha_2 \sum_{s=1}^{S-1}\frac{R_s}{P_{2s}}(1-P_{2s})Q_{2s}(1-Q_{2s}) + \alpha_3 \sum_{s=1}^{S-1}\frac{N_s}{P_{1s}}(1-P_{1s})Q_{1s}(1-Q_{1s})$$

Using this, we can rewrite [3'] as:

$$[3''] \quad VAR(\hat{C}) = \sum_{s=1}^{S}\frac{N_s}{P_{1s}}(1-P_{1s})Q_{1s}(1-Q_{1s}) + \sum_{s=1}^{S-1}\frac{R_s}{P_{2s}}(1-P_{2s})Q_{2s}(1-Q_{2s}) + \alpha_1 \frac{N_S}{P_{1S}}(1-P_{1S})Q_{1S}(1-Q_{1S}) + \alpha_2 \sum_{s=1}^{S-1}\frac{R_s}{P_{2s}}(1-P_{2s})Q_{2s}(1-Q_{2s}) + \alpha_3 \sum_{s=1}^{S-1}\frac{N_s}{P_{1s}}(1-P_{1s})Q_{1s}(1-Q_{1s})$$

Then the optimization problem is:

$$[20] \quad \text{minimize}_{P_{11},P_{12},\ldots P_{1S} \text{ and } P_{21},P_{22},\ldots P_{2S-1}} VAR(\hat{C}) \text{ s.t. } \textit{sample size} = \sum_{s=1}^{S} N_s P_{1s} + \sum_{s=1}^{S-1} R_s P_{2s}$$

First order conditions for particular P_{1s} (s = 1,2,...S - 1), P_{2s} (s = 1,2,...S - 1), and P_{1S} are

$$[21] \quad \{P_{1s}\}: Q_{1s}(1-Q_{1s})(1+\alpha_3) = \lambda P_{1s}^{\ 2}, \text{ s} = 1,2,\ldots\text{S - 1}$$

$$[22] \quad \{P_{2s}\}: Q_{2s}(1-Q_{2s})(1+\alpha_2) = \lambda P_{2s}^{\ 2}, \text{ s} = 1,2,\ldots\text{S - 1}$$

[23] $\{P_{1S}\}: Q_{1S}(1-Q_{1S})(1+\alpha_1) = \lambda N_S$

Overall, we have 2S unknowns (P_{1s} (s = 1,2,...S), P_{2s} (s = 1,2,...S - 1), and λ) and 2S equations (2S-1 first order conditions and the constraint). By assigning priors to the sensitivity and specificity measures (Q_{1s} (s = 1,2,...S), Q_{2s} (s = 1,2,...S - 1)), we can solve these equation systems to yield the optimal sampling probabilities.

Extending the results of the previous section to multiple prisons is straightforward. Presuming that the prisons have similar compositions, the sampling rates should be the same in each prison and the above solution with not change.

Table A5.2 Risk Score by Strata

Cell (Strata)	Summary of Risk Score		
	Mean	Std. Dev.	Freq.
1. High-Risk & Nominated (1_nh)	0.065065	0.115337	288
2. Low-Risk & Nominated (2_nl)	0.001479	0.001225	360
3. High-Risk & Not Nominated (3_nnh)	0.039464	0.08755	2,690
4. Low-Risk & Not Nominated (4_nnl)	0.000777	0.000791	42,185
Total	0.003476	0.025388	45,523

Table A5.3 Count of Inmates by Strata

Facility	Count of Inmates by Strata				Total
	1. High-Risk & Nominated	2. Low-Risk & Nominated	3. High-Risk & Not Nominated	4. Low-Risk & Not Nominated	
ASP	50	80	405	7,060	7,595
CCI	8	50	105	4,474	4,637
CCWF	25	56	132	3,046	3,259
CEN	2	4	65	4,827	4,898
CMF	26	11	731	2,244	3,012
HDSP	49	69	212	3,704	4,034
SATF	46	29	528	6,712	7,315
SOL	14	11	231	5,763	6,019
SVSP	68	50	281	4,355	4,754
Total	288	360	2,690	42,185	45,523

Appendix 6: Creating Sample Weights

We prepared an ordered list of inmates who were in the first three strata (1_nh. 2_nl, and 3_nnh) using the optimal probabilities, as described in [21], [22], and [23] to be used in the sampling. Overall, we have a total of 3338 inmates. Of these, 1495 were selected to be assessed. Surveys of 303 inmates, however, could not be completed, due to various reasons (Table A6.1).

Table A6.1 Survey Disposition

Survey Disposition	Freq.	Percent
Complete	1,192	79.73
Final Other	8	0.54
Inmate no longer at facility	26	1.74
Inmate an outside community hospital	7	0.47
Medical record not available	195	13.04
Proxy cannot answer questions	58	3.88
Reached Sample Quota	9	0.6
Total	1,495	100

We created weights for the 1192 inmates (more precisely 1166 inmates excluding those in medical beds) in our final analytic sample to account for 2 factors:

- As seen above, 303 inmates were attempted to be sampled, but could not. We searched for factors that could explain why these inmates were not surveyed but could not find enough evidence to suggest that these inmates were systematically left out. The main reason for not being sampled is "not having a medical record available" and we believe that this could occur at different rates across prisons. Once we account for prisons, it is plausible to assume these 303 inmates were missing from our final analytic sample at random.

- 1843 inmates could have been potentially selected for assessments but they were not surveyed as they were further down in the ordered lists and there were not enough resources to survey all 3338 "eligible" inmates. Since the only factor that we used in creating the ordered lists are the optimal sampling probabilities calculated for each stratum; once we control for these strata, we believe that these 1843 inmates could be assumed to be "missing at random".

As weights, we use the inverse of estimated probabilities of being assessed. Use of inverse probability weighting has been widely used as a solution for missing data problems, of which sampling provides an obvious illustration (Robins et al. (1995) and Rotnitzky and Robins (1995), Wooldridge (2002, 2003), Hirano et al. (2000).

We estimate the probabilities of being assessed using a logistic regression, which controls for prison and the stratum that an inmate was in. In particular, we interacted nine prison indicators with 3 strata indicators to yield 27 dummy variables and we employed them as covariates in the logistic regression. The logistic regression is specified as:

$$P(S_i = 1) = \frac{1}{1+e^{-X_i}} \qquad \text{where } X_i \text{ is defined as } \quad X_i = \beta_0 + \sum_{c=1}^{26} \beta_c D_i^c$$

In this specification, i denotes one of the 3338 inmates who could be potentially sampled and S_i is the sampling indicator (=1 if inmate i is sampled, =0 otherwise) of inmate i. D_i^c is the dummy variable that represents the cth category formed as a result of the interaction of the prison and strata indicators. It is equal to one if inmate i falls into that category and zero otherwise. One of the 27 category dummies is not included as the reference category in the specification as we have a constant. The estimated coefficients from the this model are shown in Table A6.2. Using these estimated coefficients, we predicted each assessed inmate's probability of being selected (also called propensity scores) and used inverses of these as weights.[4]

Table A6.2 Results for Sample Weights Regression

Variable	Coefficient	Std. Err.	z	P>z	Low 95 percent CI	High 95 percent CI	Odd Ratio
sfint_1_ASP	-1.25896	0.864397	-1.46	0.145	-2.953142	0.4352318	0.283951
sfint_2_ASP	-1.55645	0.848135	-1.84	0.066	-3.218759	0.1058686	0.210884
sfint_3_ASP	-1.53504	0.822813	-1.87	0.062	-3.147723	0.077644	0.215447
sfint_2_CCI	-1.17866	0.864173	-1.36	0.173	-2.872403	0.5150928	0.307692
sfint_3_CCI	-0.53151	0.841373	-0.63	0.528	-2.180566	1.117554	0.587719
sfint_1_CCWF	-1.50408	0.912871	-1.65	0.099	-3.293272	0.2851167	0.222222
sfint_2_CCWF	-1.98959	0.868797	-2.29	0.022	-3.692395	-0.286775	0.136752
sfint_3_CCWF	-1.38174	0.835791	-1.65	0.098	-3.019859	0.2563823	0.251142
sfint_2_CEN	-1.09861	1.290994	-0.85	0.395	-3.628915	1.43169	0.333333
sfint_3_CEN	0.616186	0.893184	0.69	0.49	-1.134422	2.366795	1.851852
sfint_1_CMF	-1.56862	0.910586	-1.72	0.085	-3.353331	0.2160996	0.208333
sfint_2_CMF	-3.4012	1.329158	-2.56	0.011	-6.0063	-0.7960952	0.033333
sfint_3_CMF	-2.08959	0.82077	-2.55	0.011	-3.698273	-0.4809152	0.123737
sfint_1_HDSP	-2.43361	0.890496	-2.73	0.006	-4.178953	-0.688274	0.087719
sfint_2_HDSP	-1.30221	0.851611	-1.53	0.126	-2.971337	0.3669148	0.27193
sfint_3_HDSP	-1.94591	0.830267	-2.34	0.019	-3.573203	-0.3186178	0.142857
sfint_1_SATF	-2.14007	0.882843	-2.42	0.015	-3.870407	-0.4097257	0.117647
sfint_2_SATF	-1.30625	0.897825	-1.45	0.146	-3.065956	0.453453	0.270833
sfint_3_SATF	-1.93865	0.822027	-2.36	0.018	-3.549793	-0.3275077	0.143898
sfint_1_SOL	-1.6864	0.988827	-1.71	0.088	-3.624463	0.2516653	0.185185
sfint_2_SOL	-0.539	1.029332	-0.52	0.601	-2.55645	1.478457	0.583333
sfint_3_SOL	-1.14191	0.827037	-1.38	0.167	-2.762873	0.4790544	0.319209
sfint_1_SVSP	-2.27727	0.8651	-2.63	0.008	-3.972831	-0.5817031	0.102564
sfint_2_SVSP	-2.25129	0.881088	-2.56	0.011	-3.978192	-0.5243914	0.105263
sfint_3_SVSP	-2.12242	0.827668	-2.56	0.01	-3.744623	-0.5002236	0.119741
_cons	1.098612	0.816497	1.35	0.178	-0.5016916	2.698916	

Note: Sample size=3310. 26 inmates in medical beds were excluded from the analysis. Sfint_1_CCI is the reference category. Being in the category "sfint_1_CEN" predicts being sampled perfectly so 2 inmates in this category were excluded from this analysis and assigned a weight of 1.

[4] We estimated another regression which uses the covariates that are used in the initial low risk-high risk stratification (length of stay and physical disability interactions, and age) but we did not gain much. The coefficients on these additional covariates were not statistically significant.

Appendix 7: Development of Algorithm to Determine Appropriate Level of Care: Supporting Material and Tables

Table A7.1 Need for Long Term Care Diseases with a Significant (p_value<.05), Positive Correlation with the Need for Long Term Care*

Disease	Number of Inmates with the Disease	Pearson Correlation Coefficient**	P Value Measure of Significance
035: Dementia	42	0.18634	<.0001
037: Hx Stroke (CVA) w/resid impair	57	0.17628	<.0001
038: Hemiplegia	41	0.15865	<.0001
040: Paraplegia	41	0.14670	<.0001
015: COPD	90	0.13818	0.0002
003: Congest Heart Failure	60	0.12695	0.0006
028: Chronic renal insuff	35	0.11987	0.0012
001: Hypertension	284	0.10428	0.0050
002: Ischemic Heart Disease	96	0.10158	0.0062
005: Atrial Fibrilation	17	0.09863	0.0079
039: Quadripeligia	7	0.09772	0.0085
055: Diabetes mellitus	134	0.09432	0.0111
042: Hypertension	10	0.09337	0.0120
043: Multiple sclerosis	13	0.09212	0.0131
068: Hx Lower Limb Amp	12	0.08512	0.0220
065: Osteoporosis	5	0.08247	0.0265
046: Hearing loss	14	0.07869	0.0343
006: Longterm AntiCoags	11	0.07767	0.0367
087: MRSA (colonization)	19	0.07595	0.0410
026: Chronic constipation	41	0.07498	0.0437

* In Descending Order by the Size of the Correlation Coefficient

Table A7.2. Need for Long Term Care Diseases with a Significant (p_value<.05), Negative Correlation with the Need for Long Term Care

Disease	Number of Inmates with the Disease	Pearson Correlation Coefficient*	P Value Measure of Significance
105: Post-hospital care	58	-0.17626	<.0001
094: GI bleed (current)	13	-0.11592	0.0018
095: Nausea and vomit	25	-0.11557	0.0018
102: Jaw fracture	12	-0.10963	0.0031
085: Cellulitis (current)	15	-0.10828	0.0035
104: Pre-procedure care	31	-0.09104	0.0143
086: Herpes zoster (current)	5	-0.08432	0.0233

* In Order by the Size of the Correlation Coefficient

Table A7.3 . Nursing Needs with a Significant (p_value<.05), Positive Correlation with the Need for Long Term Care*

Nursing Need	Number of Inmates with the Nursing Need	Pearson Correlation Coefficient*	P Value Measure of Significance
44: Wheelchair	213	0.30509	<.0001
31: Diapers/Briefs	41	0.19451	<.0001
30: Urinary Incont	51	0.16430	<.0001
28: MedAdmin	91	0.15832	<.0001
56: PT and/or OT	64	0.14254	0.0001
43: Walker	72	0.13480	0.0003
01: Vital signs Daily	265	0.12064	0.0011
45: Mechanical Lift	28	0.11240	0.0025
12: Fingerstick <daily	12	0.10676	0.0040
50: Hx Recent fall	40	0.10616	0.0042
40: Fecal incont	45	0.10586	0.0044
47: Blind 2 eyes	18	0.10469	0.0048
32: Condom Cath	17	0.09863	0.0079
48: Hearing Impaired	17	0.09863	0.0079
08: Trach care	9	0.08603	0.0206
22: Oral anticoag	35	0.08123	0.0289
51: Hx fall in past >90day	25	0.08113	0.0291
37: Gastro PEG tube	11	0.07767	0.0367
06: Nebulizer Tx	39	0.07690	0.0386

* In Descending Order by the Size of the Correlation Coefficient

Table A7.4. Need for Long Term Care Nursing Needs with a Significant (p_value<.05), Negative Correlation with the Need for Long Term Care

Nursing Need	Number of Inmates with the Nursing Need	Pearson Correlation Coefficient*	P Value Measure of Significance
18: Cont. IV	86	-0.25168	<.0001
26: SurgSite/Drain daily	86	-0.20899	<.0001
02: Vital signs Qshift	375	-0.12479	0.0008
27: SurgSite/Drain <daily	13	-0.11592	0.0018
17: Intermitt. IV	54	-0.09777	0.0085
23: SQ anticoag	31	-0.09104	0.0143

* In Order by the Size of the Correlation Coefficient

Table A7.5. Predicting the Probability Of Current LTC Need Among Inmates In Medical Beds.

RHS Variable	Coef	Std. Err	Z	P>z	[95 percent Conf. Interval]	
Any Permanent PADL	0.94	0.20	4.71	0.00	0.55	1.33
Nursing Needs associated with short-term care	-0.35	0.09	-3.68	0.00	-0.53	-0.16
Diagnoses associated with short-term care	-0.64	0.20	-3.27	0.00	-1.03	-0.26
Diagnoses associated with long-term care	0.25	0.07	3.51	0.00	0.11	0.39
Nursing Needs associated with long-term care	0.31	0.08	3.86	0.00	0.15	0.47
Any cognitive problem	0.56	0.22	2.59	0.01	0.14	0.99
Constant	-0.87	0.19	-4.61	0.00	-1.24	-0.50

Logistic regression: Number of obs = 724, Outcome Variable: LTC (1= yes, 0=no), LR chi2(5)=227.65, Prob > chi2 =0, Log likelihood = -387.9713, Pseudo R2 =0.2268

Table A7.6 Multinomial Logistic Model for Estimating Level Of Long-Term Care*

Nursing Need	Coef	Std Err	z	P>|z|	95 percent CI	
LEVEL = LOW-ACUITY						
Vitals Q shift	0.91	0.29	3.10	0.00	0.33	1.48
Continuous IV	1.11	1.20	0.92	0.36	-1.25	3.47
Surg. site/ drain daily care	1.35	0.74	1.82	0.07	-0.10	2.81
Medication administration	0.54	0.43	1.27	0.21	-0.30	1.38
Routine/frequent disimpaction/enemas	23.16	1.19	19.49	0.00	20.83	25.49
Fecal incontinence	1.58	0.86	1.84	0.07	-0.10	3.25
Mechanical Lift	22.12	.	.	.	.	.
Blind both eyes	-1.81	1.10	-1.64	0.10	-3.98	0.35
Monitoring I/O	1.14	0.49	2.34	0.02	0.19	2.10
COPD	-0.76	0.41	-1.84	0.07	-1.56	0.05
Lymphoma, Hodgkins or Leukemia	21.35	.	.	.	.	.
Herpes zoster	0.20	0.99	0.20	0.84	-1.75	2.14
Pre-procedure care	0.49	0.98	0.50	0.62	-1.42	2.40
_Constant	-1.30	0.22	-5.93	0.00	-1.73	-0.87
LEVEL = HIGH-ACUITY						
Vitals Q shift	1.42	0.36	3.90	0.00	0.71	2.13
Continuous IV	2.51	1.12	2.25	0.03	0.32	4.70
Surg. site/ drain daily care	1.66	0.78	2.13	0.03	0.13	3.18
Medication administration	1.57	0.44	3.60	0.00	0.72	2.43
Routine/frequent disimpaction/enemas	21.91	.	.	.	.	.
Fecal incontinence	2.28	0.84	2.71	0.01	0.63	3.94
Mechanical Lift	25.62	1.08	23.61	0.00	23.49	27.74
Blind both eyes	-1.16	1.13	-1.02	0.31	-3.39	1.06
Monitoring I/O	1.18	0.53	2.22	0.03	0.14	2.22
COPD	0.21	0.42	0.49	0.62	-0.61	1.03
Lymphoma, Hodgkins or Leukemia	22.46	0.94	23.85	0.00	20.62	24.31
Herpes zoster	1.52	0.89	1.71	0.09	-0.23	3.27
Pre-procedure care	1.89	0.88	2.16	0.03	0.17	3.61
_Constant	-2.64	0.34	-7.81	0.00	-3.30	-1.98

*Comparison level is SPECIAL GP

Appendix 8: Estimating the Number of Inmates with Current Long-term Care Need

In order to generalize the findings for the nine sampled prisons to the unsampled prisons and generate estimates of the total number of each level of long-term care bed needed, we follow the procedure described in this Appendix.

There are P prisons: p = 1,2…9. The first, CMF, has a medical mission. The next eight -- p=2… 9 appear in the sample. The rest, p = 10…33, comprise the unsampled prisons.

Inmates were partitioned into 4 strata based on whether or not they were nominated by correctional officers (COs) and whether they were in the high-risk or low-risk group according to the risk model discussed in Appendix 5.

There are 4 strata: h – 1,2,3, and 4.

- h=1 denotes nominated (by guards) and high risk group
- h=2 denotes not-nominated and high risk group
- h=3 denotes nominated and low risk group
- h=4 denotes not-nominated and low risk group

The index j denotes individual prisoners

n_{ph} number of prisoners sampled from stratum h in prison p. of course, n_{p4}=0.

N_{ph} number of prisoners in stratum h in prison p

Y_{phj} response variable = 1 if inmate has long-term care need (LTC) and = 0 otherwise for the jth offender in stratum h and prison p.

First, we will estimate the number of inmates needing LTC in strata 1 and 2. These are the high risk offenders.

[1] $$\hat{Q}_{p,h=1or2} = \frac{N_{p1}\hat{Q}_{p1} + N_{p2}\hat{Q}_{p2}}{N_{p1} + N_{p2}}$$

where $\hat{Q}_{ph} = \frac{\sum_{j=1}^{n_{ph}} y_{ph}}{n_{ph}}$ is the stratum mean where y_{ph}

[2] $$Var(\hat{Q}_{p,h=1or2}) = \left[\frac{N_{p1}}{N_{p1} + N_{p2}}\right]^2 Var(\hat{Q}_{p1}) + \left[\frac{N_{p2}}{N_{p1} + N_{p2}}\right]^2 Var(\hat{Q}_{p2})$$

where $Var(\hat{Q}_{ph}) = \frac{\hat{Q}_{ph}(1-\hat{Q}_{ph})}{n_{ph}}$

[3] $$\hat{\bar{Q}}_{p,h=1or2} = \frac{\sum_{\rho=2}^{9} \hat{Q}_{p,h=1or2}}{8}$$

[4] $$\left(\hat{\bar{Q}}_{p,h=1or2}\right) = \frac{1}{8^2} \sum_{\rho=2}^{9} Var\left(\hat{Q}_{p,h=1or2}\right)$$

[5] $$V = \frac{\sum_{\rho=2}^{9} (\hat{Q}_i - \hat{\bar{Q}}_{p,h=1or2})^2}{8}$$

For the sampled prisons, the best estimate for the number of inmates needing LTC in strata h=1 and h=2 is:

[6] $$\hat{C}_{s,h=1or2} = \sum_{\rho=1}^{9} \left(N_{p1} + N_{p2}\right) \hat{Q}_{p,h=1or2}$$

The variance term requires using a finite sample adjustment factor $f_{ph} = 1 - \frac{n_{ph}}{N_{ph}}$ so that

$$Var\left(\hat{Q}_{ph}\right) = f_{ph} \frac{\hat{Q}_{ph}\left(1 - \hat{Q}_{ph}\right)}{n_{ph}}$$

Substitute this variance into [2] gives a new expression for $Var(\hat{Q}_{p,h=1or2})$ <u>which applies only to the sample</u>. The resulting variance for inmates needing LTC in the sampled facilities is

[7] $$Var\left(\hat{C}_{s,h=1or2}\right) = \sum_{\rho=1}^{9} \left(N_{p1} + N_{p2}\right)^2 Var\left(\hat{Q}_{p,h=1or2}\right)$$

For the non-sampled facilities, the estimates are

[8] $$\hat{C}_{U,h=1or2} = \hat{\bar{Q}} N_U$$

Where N_u is the total number of offenders in strata 1 and 2 in the prisons that were not sampled.

The sampling variance is [4]

[9] $$Var\left(\hat{C}_{h=1or2}\right) = N_{U,h=1or2} \left[Var\left(\hat{\bar{Q}}_{h=1or2}\right) + \frac{V}{33-9} \right]$$

To get estimates from across all prisons for offenders in the first two strata, we added the estimates for the sampled prisons and the unsampled prisons.

To get the estimate for offenders in the last two strata (h = 3 and 4):

[A] Assume initially that there are no inmates with LTC need in stratum h=4. Equivalently, assume $\hat{Q}_{p4} = 0$ and $Var(\hat{Q}_{p4}) = 0$

[B] Repeat all the calculations [1] through [8] setting $n_{p4} = N_{p4}$, an innocuous assumption since $\hat{Q}_{p4} = 0$ by assumption. Add all the estimates together.

[10] $$\hat{C} = \hat{C}_{s,h=1or2} + \hat{C}_{U,h=1or2} + \hat{C}_{s,h=3or4} + \hat{C}_{U,h=3or4}$$

[11] $$Var(\hat{C}) = Var(\hat{C}_{h=1or2}) + Var(\hat{C}_{h=3or4})$$

The 95 percent confidence interval around $\hat{C}$ is [12].

[12] $$\hat{C} \pm 1.96\sqrt{Var(\hat{C})}$$

A8.1 Adjusting for Low Sensitivity of Nominations

In the estimates calculated above, we assumed that no inmates in the 4th stratum (low-risk and not nominated) needed long-term care. In other words, we assumed that the nomination procedure would identify all inmates needing long-term care. However, an analysis of the CO nominations among the inmates in our sample indicates that the nomination exercise was not very sensitive (Table A4-1). From our sample, we estimated 329 inmates need long-term care and 80 (24 percent) of them had been nominated by COs.

In order to get an estimate of the number inmates with long-term care needs among the inmates in the unsampled stratum of non-nominated low-risk inmates, we used the proportion of inmates from the medical bed census who were in the low-risk group in the nine sampled prisons (33/164 = 20 percent). Assuming that the distribution of inmates with LTC need across the low and high risk groups is the same for the inmates in general population as it was for the inmates in medical beds, then, had there been no nominations, the number of inmates needing LTC that we calculated above, $\hat{C}$, would be an underestimate that can be corrected by multiplying by the adjustment factor, R = 164/(164-33) = 1.25. The confidence interval can be corrected by multiplying the $Var(\hat{C})$ by R^2. This is the adjustment factor we used in reporting our main results. Because the sensitivity of the nominations in our project was 24 percent, the adjustment factor could be reduced to 164/(164-(33*0.8)) = 1.19. However, we expected that in the general population inmates LTC need may be somewhat less correlated with risk group than it is among inmates in medical beds, and therefore, we choose to use the adjustment factor of 1.25 to account for the extrapolation from medical bed inmates to the general population inherent in the application of the adjustment factor.

Table A8.1. Results of Correctional Officer Nominations

Prison Facility	ASP	CCI	CCWF	CEN	CMF	HDSP	SATF	SOL	SVSP
Number of Nominations	54	30	27	4	11	42	187	12	28
Number not Nominated but Sampled	159	67	59	56	203	65	162	113	75
Percent with Functional or Cognitive Limitations	78	67	67	50	91	40	92	75	64
Relative Risk	1.5	2.2	1.02	0.62	5.62	1.05	4.2	2.86	1.76
pLTC | Nominated	0.49	0.39	0.44	0.41	0.61	0.41	0.55	0.52	0.43
pLTC | Not nominated	0.42	0.36	0.43	0.39	0.45	0.38	0.47	0.43	0.43
Expected number with LTC among Nominated	26	12	12	2	7	17	103	6	12
Expected number with LTC among non-nominated	67	24	25	22	92	25	76	49	33
Percent of Nominated that needed LTC	49 percent	39 percent	44 percent	41 percent	61 percent	41 percent	55 percent	52 percent	43 percent
Percent of non Nominated that needed LTC	42 percent	36 percent	43 percent	39 percent	45 percent	38 percent	47 percent	43 percent	43 percent
RR of LTC for Nominated vs Non-nominated	1.16	1.10	1.03	1.04	1.35	1.07	1.17	1.19	0.99
Nominations in Low-risk strata	31	24	17	2	1	31	13	7	12
Percent of Nominated Low Risk that Needed LTC	47 percent	36 percent	41 percent	39 percent	35 percent	35 percent	45 percent	49 percent	36 percent
Number of High-risk group that were nominated	23	10	10	2	10	11	12	4	16
Percent of high-risk nominated that needed LTC	51 percent	49 percent	49 percent	43 percent	64 percent	58 percent	66 percent	56 percent	49 percent

Table A8.2.

Stratification of General Population Inmates		Statistical model	
		High-risk group	**Low-risk group**
Correctional officer nominations	Nominated 107	Sampled (n=95, N=288)	Sampled (n=138, N=360)
	Not Nominated 413	Sampled (n=959, N=2690)	Not Sampled (N=42,185)