Continuing Care Retirement Communities

An Empirical, Financial, and Legal Analysis

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Chapter Six

Population Projections for CCRCs

■ In order to make financial projections of a CCRC, it is necessary to forecast various characteristics of the community's population. For example, it is important to estimate the number of apartments that will be released each year, the temporary and permanent utilization of the health care facilities, the apartment density ratio (i.e., the ratio of apartment residents to total apartments, indicating the percentage of double occupancies), and other such population contingencies that will affect the community's revenues and expenses. Two characteristics that should be addressed by the methodology for projecting CCRC populations are the maturation process and the implications of random deviations due to the small population size.

CHARACTERISTICS OF IDEAL METHODOLOGY

Population Maturation

In the field of actuarial science, the concept of a mature population refers to a situation where the characteristics of a population (e.g., its age distribution, length of residency, distribution of double occupants, proportion of residents in the health care facility, and gender distribution) remain the same year after year. In practice, a perfectly mature population never occurs; however, the concept is important because eventually the population of most CCRCs will become reasonably stable from year to year after passing through a maturation period that may last anywhere from 10 to 15 or more years.

Generally, during the maturation period, apartment turnover rates increase, health care utilization increases, the apartment density ratio decreases, the percentage of females increases, average age and length of residency increase, and so forth. In addition to being in the immature or mature state, a CCRC's population can be overmature for a period of time. For example, if the ratio of health care center residents to apartment residents is 20 percent for a particular community in a mature state, this ratio could climb to 30 percent for a period of time due to a variety of factors. The population during this period would be considered overmature—at least with respect to the characteristic of health care.

Since the current and future maturity status of the community's population has an important impact on its revenues and expenses, it is essential that the population forecast methodology incorporate the maturing process. Moreover, since financial forecasts are designed to assess the long-term financial picture of the community under its current management policies *and* alternative policies, and since the adoption of alternative policies can affect the population's maturity status, the forecast methodology should be able to deal with this interaction as well.

Experience Deviations

CCRCs typically have fewer than 500 residents;[1] hence, there can be substantial deviations in the experience of CCRC populations relative to the expected experience suggested by a set of underlying mortality and morbidity rates. For example, if the apartment turnover rate for the upcoming year is expected to be 5 percent, it is important to be able to estimate the probability that the rate will be below 5 percent, because the financial implications of a lower rate are usually significant. Similarly, random deviations in health care utilization are crucial because of their financial importance, as are other experience deviations. Thus, the population forecast methodology should be able to estimate the likelihood of adverse experience of a population in order for management to conduct prudent financial planning.

With these two problem areas in mind, the analysis turns to two general types of forecast methodology: (1) approximation methods and (2) actuarial methods.

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[1] Of the CCRCs responding to the question on community size, 89 percent indicated that they had fewer than 450 residents.

APPROXIMATION METHODS

Over the years, a number of general guidelines, or approximations, for forecasting future CCRC populations have been developed, including the following:

Apartment releases: One percent of all apartments will be released during the first year of the community's operation, with this percentage increasing by one percentage point per year to an ultimate level of 8 percent.[2]

Health care utilization: Approximately 17 percent of all community members will reside in the health care center on a permanent basis once the community has matured.[3]

Density ratio: The ratio of total apartment residents to total apartments will be 1.25 during the life of the community.

Average age: The average age of the community will increase by one half of an age for each two years of the community's operation, to an ultimate average of age 80.

Replacements: The characteristics of new entrants to the community during the forecast period will be identical with the characteristics of those who vacate apartments due to death or permanent transfer to the health care center. Thus, the entry age distribution, gender distribution, double-occupancy distribution, and other population statistics are assumed to remain constant.

In addition to these rules of thumb, in some communities population forecasts are developed by assuming that the community's experience will follow precisely the experience of another community that has been in existence for 5 or 10 years. There are undoubtedly many other rules of thumb and/or approaches that logically fall under the approximation methodology, but the important point is that these do not capture the numerous variations in individual CCRCs that can invalidate such assumptions. This methodology makes assumptions about future population instead of making assumptions about the *determinants* of future populations (i.e., mortality rates, morbidity rates, entry age distributions, and so forth). Thus, it is risky, and possibly imprudent, to employ approximation methods as a basis for financial projections. Moreover, the approximation methodology does not address the prob-

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[2] For an example of this rule, see "One Example of Accommodation Fee Funding," *Continuing Care: Issues for Nonprofit Providers,* Chapter VIII (Washington, D.C.: American Association of Homes for the Aging), page 37.

[3] The authors know of no rules of thumb for this statistic during the maturation period; however, there are undoubtedly some in current use, since 17 percent is a long-run statistic.

lem of year-to-year experience deviations which can have a significant effect on population forecasts and, hence, financial forecasts of CCRCs.

ACTUARIAL METHODS

There are two types of actuarial methods for forecasting CCRC populations: (1) the deterministic method and (2) the stochastic method. The second type represents an extension of the first type, as described below. The distinguishing characteristics of the actuarial methods are that they involve fundamental assumptions regarding mortality and morbidity rates which are then applied to the initial year's population in deriving the population of successive years'. Such statistics as apartment turnover, health care utilization, and dual occupancy are determined by this process as opposed to being predetermined.

Deterministic Forecast Method

Under this approach, the year-to-year population forecast follows the underlying assumptions precisely. For example, if there were 100 females at age 80 living in apartments and the applicable mortality rate were 5 percent, then the deterministic model would forecast 5 deaths and 95 survivors. The age of the survivors would be increased and the process repeated for each year throughout the forecast period.

The advantage of the deterministic population forecast method is that it deals automatically with the maturation process described earlier. The initial population will mature according to the underlying assumptions, the length of the maturity period depending on the assumptions used. In addition, the consequences of any management policies that might affect the future maturity status can also be analyzed under this method. For example, the effects on turnover (and other statistics) of accepting a larger proportion of couples into the community can be compared with the effects of a policy favoring single occupancies, whereas under approximation methods such analyses would be difficult or impossible.

The primary disadvantage of the deterministic method is that it does not take into account the implications of year-to-year experience deviations. The only way this method can be used to estimate such variability is to repeat the population forecast using alternative assumptions or to introduce a "shock" into the assumptions from one year to the next. For example, one could assume that mortality rates increase or decrease sharply during a specific year of the forecast and analyze the resulting impact on turnover and other statistics; however, it may be difficult to formulate a reasonable experimental design. It is this limitation that the stochastic method is designed to overcome.

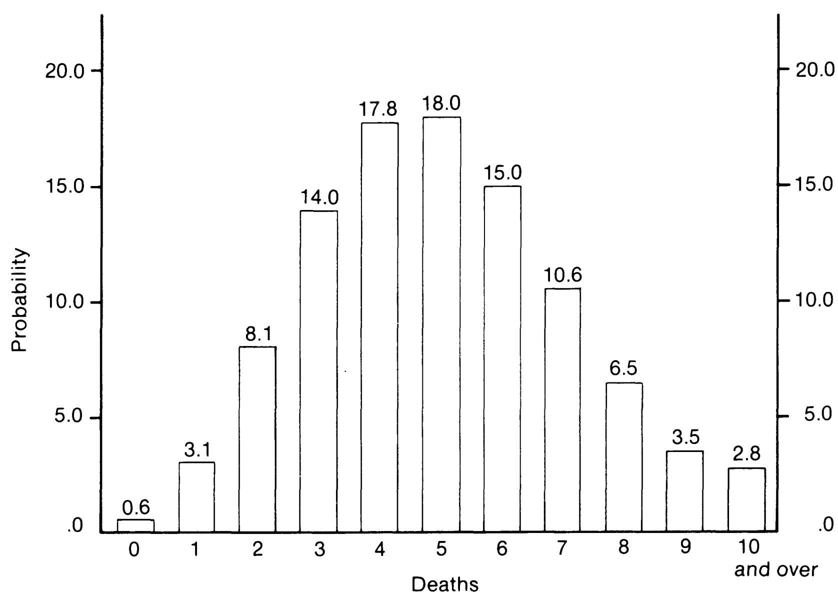
Stochastic Forecast Method

This method represents an extension of the deterministic method. It, too, begins by applying underlying mortality and morbidity rates to the initial population; however, the application is somewhat different. Continuing with the above example involving 100 females at age 80, the stochastic model examines each individual separately and determines whether or not the individual survives the year. In each case, a random number from 1 to 100 would be generated and the individual would be assumed to die if the number was 5 or less (since the mortality rate was assumed to be 5 percent in the example) and assumed to live if the number exceeded 5. If this process were successively applied to all 100 individuals, the result would not be predetermined or ascertainable in advance. Although five are expected to die, the process might conclude with three deaths. The difference between the five expected deaths and the three actual deaths represents the random deviation for the year.

Moreover, if a new sequence of random numbers were generated and again applied to the 100 individuals, one might find that 7 died during the second iteration (or trial), and so forth for successive iterations. Therefore, the stochastic methodology involves multiple population forecasts, each one representing an "iteration" using a different set of random numbers.

Figure 6–1 illustrates the distribution of deaths that would occur if an infinite number of iterations were performed. This figure shows that

FIGURE 6–1
Distribution of Deaths among 100 Individuals *(death rate = 5 percent)*



the expected number of deaths, five, has the highest probability of occurring. As the number of deaths increases or decreases, the probability of occurrence decreases somewhat symmetrically. In applying this approach, it is, of course, not feasible to generate an infinite number of iterations. Thus, a smaller number, such as 50, is generally used, and the resulting distribution, though not as smooth as the exact distribution, would tend to follow the pattern presented in Figure 6–1.

This example, of course, is an oversimplification of the stochastic process. However, it does serve to illustrate how this methodology incorporates random deviations into the population forecast, an element that should not be overlooked when dealing with small groups of individuals.

NUMERICAL ILLUSTRATIONS—HYPOTHETICAL COMMUNITY

The purpose of this section is twofold: (1) to illustrate the stochastic population forecast methodology and (2) to explore the population dynamics of CCRCs. A hypothetical community is used for illustrative purposes. The underlying actuarial assumptions and the physical configuration of the community for the baseline population forecast are given in Appendixes B and C, respectively.[4] Later in this section, changes in some of these parameters will be introduced to analyze the corresponding impact on the population forecasts.

Baseline Population Projection

Summary statistics for the baseline population forecast are given in Tables 6–1 through 6–4. Table 6–1 shows the number of residents in the apartment complex during each year throughout the 30-year forecast. Since the forecast methodology involves numerous iterations, the numbers shown in the table represent the *average* of the various iterations.[5] In addition to showing the number of residents by apartment type, the table also shows percentage of double occupancy.

A notable trend in Table 6–1 is that the total number of apartment residents decreases over the forecast period, beginning with 325 (a 1.44 density ratio) and scaling down by nearly 15 percent to 283 (a 1.26

[4] The actuarial assumptions were derived from the results of the case site experience studies and the authors' previous experience. It is not appropriate to apply these assumptions to existing or developing CCRCs.

[5] For illustrative purposes, the results in this section are based on 50 iterations of 30 years each. Additional iterations would be recommended in studying a specific community in order to develop somewhat tighter distributions than the ones underlying the data in these tables.

TABLE 6–1
Baseline Apartment Population Forecast *(average values based on 50 iterations)*

	Studios (75)	One bedroom (100)		Two bedrooms (50)		All apartments (225)	
Year	**Number of residents**	**Number of residents**	**Density ratio**	**Number of residents**	**Density ratio**	**Number of residents**	**Density ratio**
1983	75	150	1.50	100	2.00	325	1.44
1984	75	149	1.49	99	1.98	323	1.43
1985	75	147	1.47	96	1.92	319	1.41
1986	75	145	1.45	93	1.86	312	1.38
1987	75	141	1.41	88	1.76	305	1.35
1988	75	138	1.38	85	1.70	298	1.32
1989	75	136	1.36	82	1.64	293	1.29
1990	75	134	1.34	80	1.60	288	1.28
1991	75	132	1.32	79	1.58	286	1.27
1992	75	131	1.31	78	1.56	284	1.26
1993	75	130	1.30	78	1.56	283	1.26
1994	75	131	1.31	78	1.56	283	1.26
1995	75	129	1.29	78	1.56	282	1.25
1996	75	129	1.29	78	1.56	282	1.25
1997	75	129	1.29	78	1.56	282	1.25
1998	75	130	1.30	79	1.58	284	1.26
1999	75	131	1.31	79	1.58	284	1.26
2000	75	130	1.30	79	1.58	284	1.26
2001	75	130	1.30	78	1.56	283	1.26
2002	75	131	1.31	78	1.56	284	1.26
2003	75	131	1.31	78	1.56	284	1.26
2004	75	131	1.31	78	1.56	284	1.26
2005	75	131	1.31	78	1.56	285	1.27
2006	75	132	1.32	79	1.58	286	1.27
2007	75	132	1.32	79	1.58	286	1.27
2008	75	132	1.32	79	1.58	286	1.27
2009	75	132	1.32	79	1.58	286	1.27
2010	75	132	1.32	79	1.58	286	1.27
2011	75	133	1.33	78	1.56	286	1.27
2012	75	133	1.33	78	1.56	286	1.27

density ratio) after 10 years and remaining at approximately that level thereafter. This trend is due to survivors maintaining their apartments after the death or permanent transfer of their spouse (or roommate). As indicated by the two-bedroom double-occupancy percentage, the ultimate proportion of double occupants is only about one half of the initial proportion. During the 10-year maturation period, revenues from monthly fees would also decrease—an important point to recognize in designing the pricing structure of a CCRC, and particularly the fees for double occupants. This trend would differ, of course, if the initial population had a greater or lesser number of couples, as dictated by the physical configuration of the community or by management policies. Thus, the authors reiterate an important principle: the community in question, with all of its nuances, must be simulated as opposed to using approximation methods that may or not be applicable.

Table 6–2 shows some additional statistics on the population of residents occupying apartments. The minimum, expected, and maximum turnovers experienced for the 50 iterations are shown. These data illustrate that the turnover rate will differ by apartment type and that there can be significant year-to-year variations in this statistic. Since turnover rates have an impact on the community's revenues, it would be risky to base a pricing structure on the aggregate expected apartment turnover rate alone. The financial impact of this problem and pricing methodologies designed to deal with the possibility of sustained adverse (i.e., low) turnover experience are examined in Chapters 6 and 7.

Table 6–3 provides statistics on health care utilization during the 30-year forecast period. It can be seen that the maturation period for the health care center is somewhat longer than that for the apartment complex, approximately 15 years in this case. At a mature state, about 18 percent of all residents are found to be living permanently in the health care center (i.e., there are 63 health care residents to 346 *total* residents). The variability in health care center residents is significant, ranging from about 50 to 80 residents in a mature state and having higher variability prior to this time. These data indicate that a 90-bed health care facility may be adequate, although when temporary transfers are considered, it may be somewhat small. Temporary transfers use approximately 3,200 bed-days per year in a mature state, or an *average* of about 9 bed-days per apartment resident per year.

Table 6–4 shows additional statistics on both apartment and health care center residents. A statistic of interest is the average years in the health care center for permanent residents, an average that eventually reaches four years. Based on an average daily cost of $50, this length of stay amounts to $73,000, excluding any inflationary increases in the cost of health care. It is therefore important that the morbidity rates as well as the mortality rates of health care center residents be developed carefully when making population and financial forecasts of CCRCs.

Effect of Aging Entry Age Distribution

Some communities experience an increase in the age of new entrants subsequent to the initial opening. This is undoubtedly caused by at least two factors. First, if the community develops a waiting list of prospective entrants, individuals on the waiting list become older as time passes. Second, as the initial population matures to an older average age, older individuals may be more attracted to enter the community and/or younger individuals may be less attracted. In any event, the aging of new entrants can affect the community's population and the

TABLE 6–2

Baseline Apartment Turnover Projection *(based on 50 iterations)*

	Studios (75)			One bedroom (100)			Two bedrooms (50)			All apartments (225)		
Year	Minimum	Expected	Maximum	Minimum	Expected	Maximum	Minimum	Expected	Maximum	Minimum	Expected	Maximum
1983	0	1	3	0	1	3	0	0	0	0	2	6
1984	0	2	4	0	2	4	0	0	2	1	3	7
1985	0	2	6	0	2	4	0	0	2	1	4	9
1986	1	4	10	0	3	7	0	1	2	2	8	16
1987	1	5	11	1	4	12	0	2	5	4	11	19
1988	0	5	10	1	5	12	0	2	6	7	12	23
1989	1	5	10	2	5	10	0	3	8	5	13	22
1990	2	6	10	2	6	11	0	3	8	7	15	20
1991	1	6	13	2	7	12	0	3	9	9	15	28
1992	0	5	9	1	7	13	0	3	7	7	15	25
1993	2	6	12	3	8	14	0	3	7	13	17	22
1994	2	6	10	2	7	12	0	3	9	8	15	23
1995	1	6	11	1	7	12	0	4	7	9	17	22
1996	2	6	12	2	8	15	0	3	7	11	17	22
1997	2	6	12	1	8	18	0	4	9	13	18	27
1998	2	6	12	2	8	13	1	4	7	9	18	26
1999	1	7	13	1	6	12	0	3	9	11	16	24
2000	2	6	12	2	8	18	0	3	6	11	17	25
2001	2	7	12	2	9	14	0	3	9	14	18	26
2002	1	7	13	4	8	18	0	3	9	10	17	29
2003	1	6	11	2	7	15	0	3	8	10	16	21
2004	2	6	11	3	8	12	1	4	8	11	17	27
2005	1	6	13	4	8	15	0	3	6	11	17	23
2006	2	6	13	4	8	15	0	3	8	7	17	28
2007	2	6	12	2	8	14	0	3	8	10	17	29
2008	1	5	12	2	8	14	0	3	7	10	17	21
2009	1	6	12	1	7	13	0	4	6	10	17	23
2010	1	7	12	3	8	16	0	3	9	9	17	24
2011	0	6	11	4	7	14	1	4	8	12	18	26
2012	0	7	12	2	7	11	0	4	8	11	18	23

TABLE 6–3
Baseline Health Care Center Population Forecast *(based on 50 iterations)*

	Number of residents			Annual transfers			
Year	Minimum	Expected	Maximum	Minimum	Expected	Maximum	Average number of temporary days
1983	0	0	0	0	3	7	766
1984	0	3	7	3	5	10	1,545
1985	3	7	12	1	7	14	2,306
1986	6	14	20	4	11	19	3,023
1987	12	22	34	7	14	21	3,666
1988	22	31	45	4	15	21	3,529
1989	28	39	55	8	15	23	3,413
1990	27	46	61	7	14	23	3,325
1991	36	51	71	8	15	22	3,263
1992	36	54	78	7	14	22	3,227
1993	45	57	72	8	15	23	3,199
1994	46	59	72	6	15	27	3,168
1995	48	60	73	6	15	22	3,160
1996	47	60	77	8	16	22	3,161
1997	51	62	81	11	16	21	3,146
1998	52	63	75	10	16	25	3,132
1999	49	63	78	6	14	23	3,127
2000	46	61	78	8	16	26	3,148
2001	43	62	78	10	16	23	3,154
2002	45	63	83	3	16	26	3,153
2003	50	63	82	9	15	23	3,144
2004	49	63	85	8	16	24	3,145
2005	46	63	83	5	16	24	3,155
2006	49	63	84	7	15	28	3,159
2007	45	63	84	6	15	27	3,164
2008	44	63	82	6	15	23	3,170
2009	44	63	80	8	15	27	3,186
2010	47	65	82	6	16	24	3,198
2011	52	66	89	10	16	23	3,187
2012	48	67	85	9	16	26	3,178

TABLE 6–4

Summary Statistics on Baseline Population Forecast *(average values based on 50 iterations)*

Year	Apartment center: Number of residents	Average age	Years in community	Percentage female	Health care center: Number of residents	Average age	Years in HCC	Percentage female
1983	325	75.7	.0	66.5%	0	.0	.0	.0%
1984	323	76.6	1.0	66.7	3	73.6	.0	45.7
1985	319	77.5	2.0	67.0	7	80.6	.3	56.7
1986	312	78.3	2.9	67.4	14	81.7	.6	63.3
1987	305	78.9	3.8	68.1	22	82.8	.8	62.4
1988	298	79.4	4.5	68.7	31	83.2	1.0	65.9
1989	293	79.8	5.2	69.1	39	83.7	1.3	68.9
1990	288	80.2	5.7	69.4	46	84.1	1.6	72.6
1991	286	80.4	6.2	69.7	51	84.6	1.9	74.8
1992	284	80.6	6.6	70.1	54	85.1	2.1	76.2
1993	283	80.8	6.9	70.2	57	85.5	2.4	78.1
1994	283	80.8	7.0	70.1	59	85.8	2.6	79.8
1995	282	80.9	7.2	70.4	60	86.2	2.7	80.2
1996	282	81.0	7.4	70.6	60	86.5	2.8	80.3
1997	282	81.0	7.4	70.6	62	86.9	2.9	80.1
1998	284	80.9	7.4	70.7	63	87.1	3.0	80.0
1999	284	80.9	7.4	70.5	63	87.2	3.0	80.6
2000	284	80.9	7.4	70.6	61	87.4	3.2	80.8
2001	283	80.9	7.5	71.1	62	87.5	3.2	80.1
2002	284	80.8	7.4	71.3	63	87.7	3.2	79.8
2003	284	80.8	7.4	71.3	63	87.7	3.3	80.2
2004	284	80.7	7.3	71.4	63	87.7	3.3	79.7
2005	285	80.7	7.3	71.4	63	87.8	3.4	79.2
2006	286	80.6	7.2	71.4	63	87.9	3.4	80.0
2007	286	80.6	7.2	71.5	63	87.9	3.5	79.6
2008	286	80.6	7.2	71.5	63	87.8	3.6	80.0
2009	286	80.7	7.2	71.4	63	87.8	3.6	80.7
2010	286	80.7	7.2	71.6	65	87.9	3.6	79.7
2011	286	80.7	7.2	71.4	66	87.9	3.7	79.6
2012	286	80.7	7.2	71.0	67	87.8	3.7	80.6

corresponding financial forecast. Thus, management should be aware of this phenomenon and adopt policies appropriate to the situation.

Table 6–5 shows the impact on the baseline population forecast of this phenomenon. For this experiment, it is assumed that the distribution of new entrants (which spans the ages from 65 to 85 and averages age 75 for the initial group of entrants) gradually increases for subsequent entrants by approximately one half of an age for each year after the community first opens, eventually stabilizing at age 80. The apartment density ratio is hardly affected by this change in assumption; however, the turnover statistics are increased, as would be expected. Although not shown in Table 6–5, the average age of apartment residents in a mature state increases from 81 in the base case to 83 in this experiment. Finally, the number of residents in the health care center increases for this forecast.

This experiment illustrates that a CCRC's population can change in response to a shift in entry ages and that making the population projection according to the actuarial methodology set forth previously can accommodate this possibility and others.

Effect of Alternative Policies Regarding Couples

The number of couples that enter the community is partially a function of management policy regarding new entrants. Some managements are indifferent to the dual-occupancy mix; others wish to discourage couples because they tend to lower turnover rates and corresponding entry fee revenues; and still others encourage couples to enter the community—sometimes for social reasons and sometimes for the short-run additional entry and/or monthly fee income.

Table 6–6 shows the results of a twofold management policy, namely, (1) increasing the number of coupled entrants (from 50 percent in one-bedroom apartments to 100 percent) and (2) requiring that the survivor of a couple move to a studio apartment after the death or permanent transfer of his or her spouse (or roommate), provided a studio apartment is available. The apartment density ratio increases significantly under this experiment, with the ultimate size climbing to nearly 1.51 (339 residents) as opposed to 1.27 (286 residents) under the baseline experiment, or a 20 percent increase in the ratio.

The other statistics of the community do not change significantly, there being only a modest increase in the number (and a decrease in the proportion) of health care center residents. Although most communities do not have strict policies requiring transfers, this may be an area that management should consider addressing, through either economic incentives or contract provisions, because of its potential for increasing revenues without a commensurate increase in costs. The financial

TABLE 6–5
Effect of an Increasing Entry Age Distribution

	Apartment center						Health care center					
			Turnover percentage						Number of residents			
	Density ratio		Average value		Minimum value		Health care ratio		Average value		Maximum value	
Year	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment
1983	1.44	1.44	0.9%	0.9%	0.0%	0.0%	0.0%	0.0%	0	0	0	0
1984	1.43	1.43	1.3	1.3	0.0	0.0	0.8	0.8	3	3	7	7
1985	1.41	1.41	1.8	1.8	0.4	0.4	2.2	2.2	7	7	12	12
1986	1.38	1.38	3.6	3.6	0.9	0.9	4.1	4.1	14	14	20	20
1987	1.35	1.35	4.9	4.9	1.8	1.8	6.8	6.8	22	22	34	34
1988	1.32	1.32	5.3	5.3	2.7	2.7	9.5	9.5	31	31	45	45
1989	1.29	1.29	5.8	5.8	2.2	2.2	11.9	11.9	39	40	55	55
1990	1.28	1.28	6.7	6.7	3.1	3.1	13.6	13.7	46	46	61	61
1991	1.27	1.27	6.7	6.7	3.6	3.6	15.1	15.2	51	51	71	71
1992	1.26	1.26	6.7	7.6	3.1	4.4	16.1	16.3	54	55	78	79
1993	1.26	1.25	7.6	8.0	4.4	5.3	16.6	17.0	57	58	72	74
1994	1.26	1.25	6.7	8.0	3.6	4.0	17.3	17.8	59	61	72	75
1995	1.25	1.25	7.6	8.4	4.0	4.9	17.5	18.2	60	63	73	73
1996	1.25	1.25	7.6	8.9	4.9	5.3	17.6	18.3	60	63	77	82
1997	1.25	1.25	8.0	8.9	5.8	5.8	17.9	18.8	62	65	81	85
1998	1.26	1.25	8.0	8.9	3.6	5.3	18.1	18.9	63	66	75	77
1999	1.26	1.26	7.1	8.4	2.2	3.6	18.1	19.0	63	66	78	81
2000	1.26	1.25	7.6	9.3	4.4	4.0	17.7	18.8	61	65	78	84
2001	1.26	1.25	8.0	9.3	5.3	6.2	18.0	19.2	62	67	78	83
2002	1.26	1.25	7.6	9.3	4.4	4.0	18.2	19.2	63	67	83	81
2003	1.26	1.25	7.1	9.3	4.4	5.8	18.2	19.2	63	67	82	80
2004	1.26	1.26	7.6	9.3	4.9	5.8	18.2	19.3	63	67	85	93
2005	1.27	1.26	7.6	9.8	3.6	6.2	18.0	19.0	63	67	83	84
2006	1.27	1.27	7.6	9.3	3.1	5.8	18.1	19.0	63	67	84	87
2007	1.27	1.27	7.6	9.3	4.4	4.9	18.0	19.1	63	67	84	85
2008	1.27	1.26	7.6	8.9	3.6	4.9	18.0	19.2	63	68	82	89
2009	1.27	1.27	7.6	8.4	4.0	5.8	18.1	19.3	63	68	80	87
2010	1.27	1.26	7.6	9.3	4.0	5.3	18.5	19.7	65	70	82	86
2011	1.27	1.27	8.0	8.9	4.9	6.2	18.8	19.6	66	70	89	85
2012	1.27	1.27	8.0	9.8	4.9	5.3	18.9	19.6	67	70	85	88

TABLE 6–6
Effect of Survivor Transfer to Single Units

	Apartment center						Health care center					
			Turnover percentage						Number of residents			
	Density ratio		Average value		Minimum value		Health care ratio		Average value		Maximum value	
Year	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment
1983	1.44	1.44	0.9%	0.9%	0.0%	0.0%	0.0%	0.0%	0	0	0	0
1984	1.43	1.43	1.3	1.3	0.0	0.0	0.8	0.8	3	3	7	7
1985	1.41	1.43	1.8	1.8	0.4	0.4	2.2	2.2	7	7	12	12
1986	1.38	1.41	3.6	3.1	0.9	0.9	4.1	4.1	14	14	20	20
1987	1.35	1.40	4.9	4.9	1.8	1.8	6.8	6.6	22	22	34	34
1988	1.32	1.39	5.3	5.3	2.7	2.7	9.5	9.2	31	32	45	45
1989	1.29	1.39	5.8	5.8	2.2	2.2	11.9	11.3	39	40	55	55
1990	1.28	1.40	6.7	6.2	3.1	2.7	13.6	12.8	46	46	61	63
1991	1.27	1.40	6.7	6.2	3.6	3.6	15.1	14.2	51	52	71	71
1992	1.26	1.41	6.7	6.7	3.1	3.6	16.1	15.0	54	56	78	80
1993	1.26	1.42	7.6	7.1	4.4	3.6	16.6	15.6	57	59	72	81
1994	1.26	1.44	6.7	6.7	3.6	2.7	17.3	16.2	59	63	72	78
1995	1.25	1.44	7.6	7.1	4.0	3.6	17.5	16.3	60	63	73	79
1996	1.25	1.45	7.6	7.1	4.9	4.0	17.6	16.4	60	64	77	82
1997	1.25	1.46	8.0	7.5	5.8	3.1	17.9	16.9	62	67	81	81
1998	1.26	1.47	8.0	7.5	3.6	4.0	18.1	17.3	63	69	75	86
1999	1.26	1.48	7.1	6.7	2.2	2.7	18.1	17.3	63	70	78	87
2000	1.26	1.48	7.6	6.7	4.4	3.6	17.7	16.9	61	68	78	87
2001	1.26	1.48	8.0	6.7	5.3	4.4	18.0	17.1	62	69	78	86
2002	1.26	1.48	7.6	7.1	4.4	4.0	18.2	17.3	63	70	83	88
2003	1.26	1.49	7.1	7.1	4.4	2.7	18.2	17.4	63	71	82	90
2004	1.26	1.49	7.6	7.1	4.9	4.0	18.2	17.6	63	72	85	87
2005	1.27	1.50	7.6	7.1	3.6	3.6	18.0	17.5	63	72	83	90
2006	1.27	1.50	7.6	7.1	3.1	4.0	18.1	17.7	63	73	84	100
2007	1.27	1.51	7.6	7.5	4.4	3.6	18.0	17.7	63	73	84	94
2008	1.27	1.51	7.6	6.7	3.6	3.6	18.0	17.8	63	74	82	102
2009	1.27	1.51	7.6	7.1	4.0	3.6	18.1	17.8	63	73	80	96
2010	1.27	1.51	7.6	6.7	4.0	2.7	18.5	18.1	65	75	82	106
2011	1.27	1.51	8.0	7.1	4.9	3.6	18.8	17.8	66	73	89	97
2012	1.27	1.51	8.0	7.1	4.9	4.9	18.9	18.0	67	74	85	93

impact of a change in policy could be analyzed by generating the cash flows associated with population projections for each policy.

Effect of Alternative Policies Regarding Permanent Transfers

In some instances, judgment is required as to whether an individual should be permanently transferred to the health care center. Some community administrators encourage such transfers in order to gain the entry fee revenue from apartment resales, a policy pursued even though having individuals live in the health care center is considerably more expensive. Other managers discourage such transfers until they are absolutely necessary.

Table 6–7 illustrates a management policy of encouraging transfers on a more rapid basis than the baseline case. Permanent transfer rates are assumed to increase by 25 percent; however, the overall life expectancy of residents remains unchanged.[6] This policy is seen to have little impact on the total number of apartment residents and the corresponding turnover statistics. However, the proportion of residents in the health care center increases dramatically. In a mature state, the number of such residents increases from the baseline value of approximately 63 to over 90.

NUMERICAL ILLUSTRATIONS— CASE STUDIES

The actuarial methodology for projecting future populations is applied to six existing communities in this section. The results of the mortality and morbidity experience studies given in the preceding chapter are used to estimate future apartment turnover and health care utilization, starting with the current resident census for each case study. Since the size and age of the community affect these projections, Table 6–8 describes each community by these criteria as well as by the community's location and health care guarantee.

The age characteristic refers to the year in which continuing care contracts were first offered. The community is considered *new* if it is 3 years or younger, *maturing* if it is 3 to 12 years old, and *mature* if it is over 12 years old. Size is categorized as *medium* for communities with 200 to 499 total residents and *large* for communities with 500 or more residents. The location description is based on the U.S. Census Bu-

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[6] In order to simulate this policy, the mortality rates among apartment residents and health care residents were decreased in a way that maintained the same aggregate mortality for all residents combined.

TABLE 6–7

Effect of More Rapid Transfers to the Health Care Facility

	Apartment center						Health care center					
			Turnover percentage						Number of residents			
	Density ratio		Average value		Minimum value		Health care ratio		Average value		Maximum value	
Year	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment	Baseline	Experiment
1983	1.44	1.44	0.9%	0.9%	0.0%	0.0%	0.0%	0.0%	0	0	0	0
1984	1.43	1.43	1.3	1.8	0.0	0.0	0.8	1.0	3	3	7	8
1985	1.41	1.41	1.8	2.2	0.4	0.4	2.2	2.8	7	9	12	14
1986	1.38	1.38	3.6	3.6	0.9	1.3	4.1	5.1	14	17	20	27
1987	1.35	1.35	4.9	5.8	1.8	2.7	6.8	8.6	22	28	34	38
1988	1.32	1.31	5.3	6.7	2.7	4.0	9.5	12.1	31	41	45	54
1989	1.29	1.29	5.8	6.2	2.2	2.2	11.9	15.2	39	52	55	74
1990	1.28	1.28	6.7	7.1	3.1	3.1	13.6	17.6	46	61	61	76
1991	1.27	1.27	6.7	7.1	3.6	3.6	15.1	19.4	51	68	71	86
1992	1.26	1.26	6.7	7.5	3.1	3.6	16.1	20.7	54	74	78	95
1993	1.26	1.25	7.6	8.4	4.4	5.3	16.6	21.6	57	78	72	94
1994	1.26	1.26	6.7	8.0	3.6	4.4	17.3	22.5	59	82	72	97
1995	1.25	1.25	7.6	8.0	4.0	4.4	17.5	23.0	60	84	73	99
1996	1.25	1.25	7.6	8.4	4.9	5.3	17.6	23.1	60	85	77	100
1997	1.25	1.26	8.0	8.9	5.8	4.4	17.9	23.4	62	87	81	100
1998	1.26	1.26	8.0	8.4	3.6	4.4	18.1	23.8	63	89	75	102
1999	1.26	1.27	7.1	7.1	2.2	3.6	18.1	23.9	63	89	78	110
2000	1.26	1.26	7.6	8.0	4.4	4.4	17.7	23.6	61	88	78	103
2001	1.26	1.26	8.0	8.9	5.3	5.3	18.0	23.9	62	89	78	104
2002	1.26	1.26	7.6	8.4	4.4	4.4	18.2	23.9	63	89	83	107
2003	1.26	1.26	7.1	8.4	4.4	4.4	18.2	24.1	63	90	82	106
2004	1.26	1.26	7.6	8.0	4.9	4.4	18.2	24.5	63	92	85	108
2005	1.27	1.26	7.6	8.4	3.6	4.4	18.0	24.3	63	91	83	105
2006	1.27	1.27	7.6	8.0	3.1	4.4	18.1	24.3	63	92	84	115
2007	1.27	1.27	7.6	8.0	4.4	4.0	18.0	24.2	63	91	84	111
2008	1.27	1.27	7.6	8.0	3.6	4.0	18.0	24.3	63	92	82	115
2009	1.27	1.27	7.6	8.4	4.0	5.3	18.1	24.4	63	92	80	114
2010	1.27	1.27	7.6	8.0	4.0	4.4	18.5	24.8	65	94	82	113
2011	1.27	1.27	8.0	8.0	4.9	4.9	18.8	25.1	66	96	89	115
2012	1.27	1.27	8.0	8.4	4.9	4.9	18.9	25.2	67	96	85	112

TABLE 6–8
General Characteristics of Case Study CCRCs

Characteristics	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Age	Maturing	Maturing	Mature	New	Maturing	Mature
Size	Medium	Large	Large	Large	Medium	Large
Location	Northeast	South	North Central	South	North Central	West
Health care guarantee	Extensive	Extensive	Both	Extensive	Extensive	Extensive

reau's categories for Northeast, South, North Central, and West. All the CCRCs offer extensive health care guarantees (one offers both extensive and limited guarantees), meaning that the resident pays the same monthly fee in the health care center which he or she paid prior to permanent transfer.[7]

Apartment Turnover Percentage

The expected rate of apartment turnover typically increases as the community ages and eventually stabilizes as the community reaches maturity. As noted previously, this statistic is needed for estimating future entry fee revenues. Table 6–9 contains the average apartment

TABLE 6–9
Apartment Turnover % and Cause of Apartment Turnover for Case Study CCRCs

Statistic	Fiscal years	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Average expected apartment turnover	1982 through 1986	8.5%	8.1%	15.9%	6.2%	6.1%	7.3%
	1987 through 1991	9.0	9.0	15.5	8.1	7.0	7.9
Apartment turnover caused by death	1982 through 1986	44%	42%	5%	50%	69%	52%
	1987 through 1991	43	43	7	51	71	50

turnover percentages for five-year intervals, from 1982 through 1986 and from 1987 through 1991. This table shows a slight increase in the second five-year interval for all cases except Case 3. The range in expected turnover percentages is 6 percent to 9 percent, excluding Case 3, which is an outlier showing 15 percent.[8]

[7] The exact definition for health care guarantee used in this study is given in Chapter 2.

[8] This community appears to have an aggressive permanent transfer policy of moving residents to its personal and nursing care facilities.

The bottom portion of Table 6–9 shows the percentage of apartment turnovers caused by the death of a resident. This percentage is consistently over 40 percent for all cases except Case 3, where it is less than 10 percent. The variation in these percentages is explained somewhat by differences in the morbidity assumptions which are affected by management policies on permanent transfers.

FIGURE 6–2A
Apartment Turnover Projection for Case 1

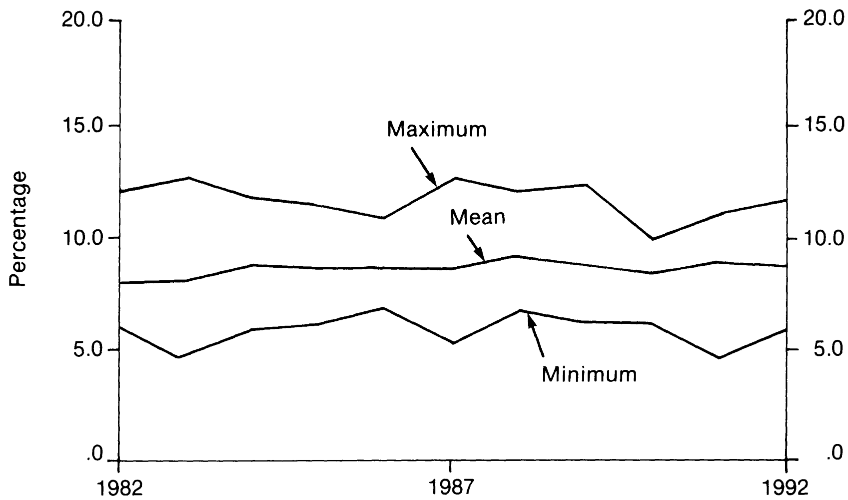
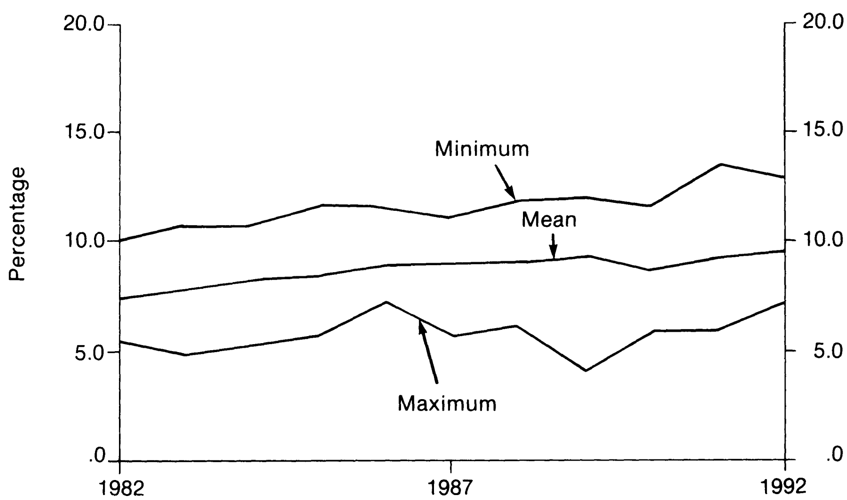


FIGURE 6–2B
Apartment Turnover Projection for Case 2



As noted earlier, the stochastic methodology allows one to analyze the risks associated with random deviations that might take place in the population forecast. An example is presented in Figures 6–2A through 6–2F, where the mean, minimum, and maximum apartment turnover percentages for the 6 case studies are shown. The minimum and maxi-

FIGURE 6–2C
Apartment Turnover Projection for Case 3

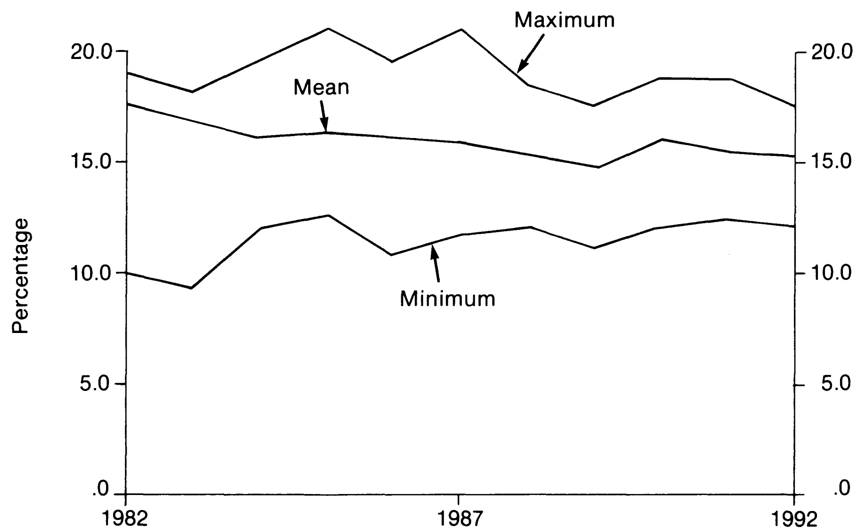


FIGURE 6–2D
Apartment Turnover Projection for Case 4

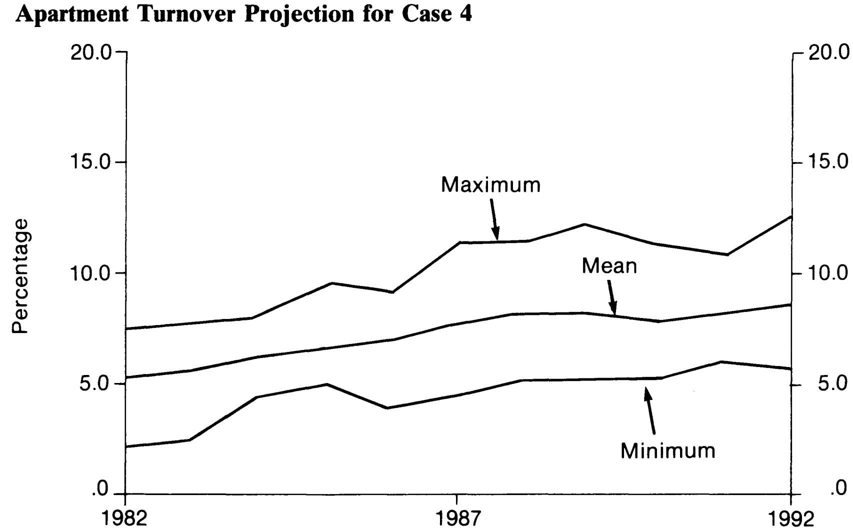


FIGURE 6–2E
Apartment Turnover Projection for Case 5

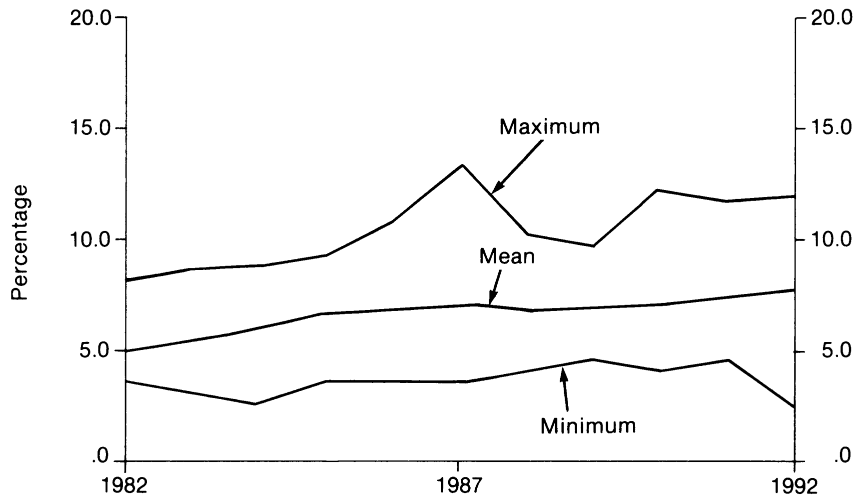
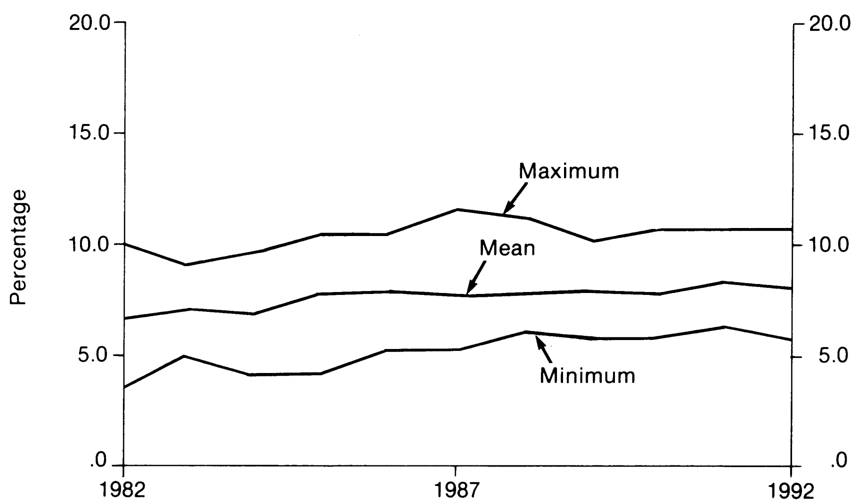


FIGURE 6–2F
Apartment Turnover Projection for Case 6



mum variation in these examples ranges from positive 5 to negative 5 percentage points from the expected (mean) values.

Health Care Utilization

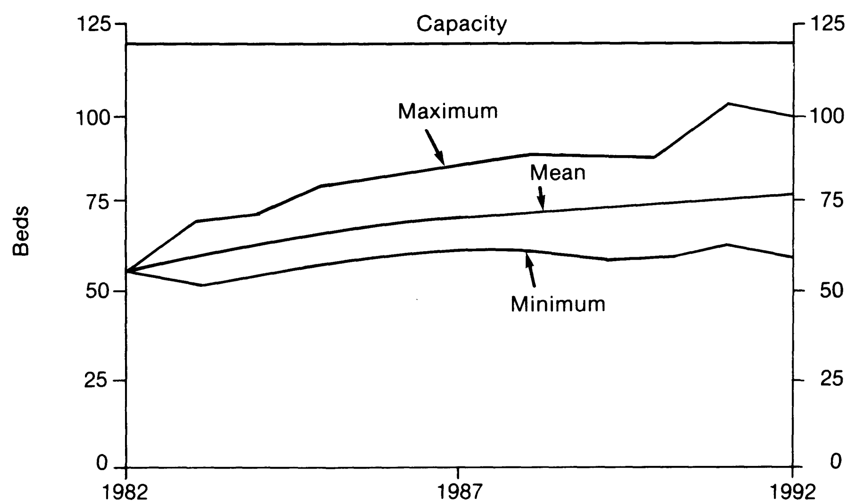
Health care utilization is another key statistic generated by a population projection. This statistic is used both for financial projections and

TABLE 6–10
Projected Health Care Ratios for Case Study CCRCs

Fiscal year	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
1982	11.1%	13.5%	25.5%	2.5%	4.0%	12.7%
1983	12.0	14.6	28.1	4.7	4.6	11.2
1984	12.5	15.4	26.8	6.7	5.1	10.9
1985	13.4	16.0	28.8	8.2	5.1	10.5
1986	13.8	16.6	30.0	9.6	6.0	10.4
1987	14.0	17.2	30.9	10.2	6.7	10.5
1988	14.1	17.6	31.8	11.0	6.7	10.5
1989	14.4	17.8	32.4	11.7	6.6	10.5
1990	14.6	18.2	32.8	12.2	6.5	10.5
1991	14.8	18.5	33.3	12.6	6.9	10.9

for estimating the ultimate size of the health care center. Table 6–10 contains a statistic summarizing the permanent health care usage by continuing care contractholders. This statistic is the health care ratio, which equals the number of permanent health care residents divided by the total number of continuing care contractholders. The results of our survey showed that the average ratio was 13.1 percent for CCRCs that had nursing care only and offered contracts with *extensive* health care guarantees; the average for CCRCs that had personal care and nursing care was 15.6 percent. The average health care ratio during the 10th year of the projection for the six CCRCs studied here is 16 percent, ranging from a low of 6.9 percent to a high of 33.3 percent. This variation is caused by differences in the communities' initial population maturity and the underlying assumptions. Variation of this magnitude

FIGURE 6–3A
Projection of Total Health Care Requirements for Case 1



also point to the weakness of using rules of thumb for estimating health care utilization.

In order to estimate whether the current health care capacity of each community was adequate, the stochastic model was used to estimate the distribution of total health care utilization, including the health care beds required by permanent residents and apartment residents using

FIGURE 6–3B
Projection of Total Health Care Requirements for Case 2

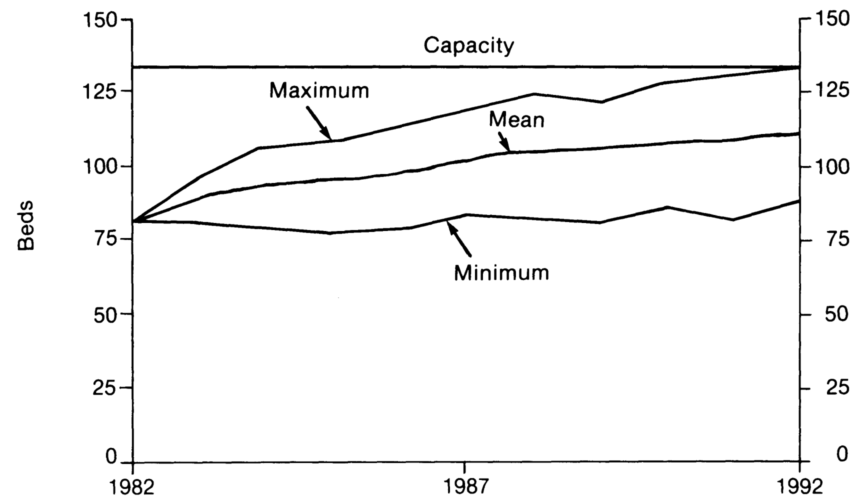


FIGURE 6–3C
Projection of Total Health Care Requirements for Case 3

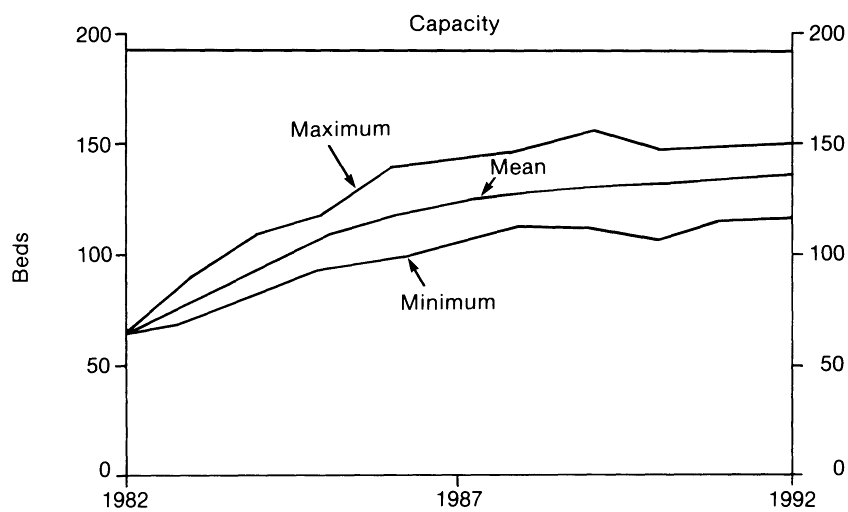


FIGURE 6–3D
Projection of Total Health Care Requirements for Case 4

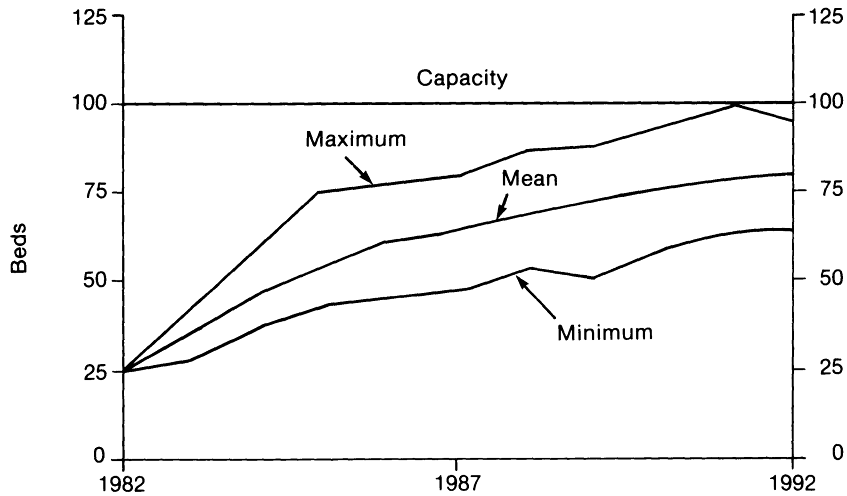
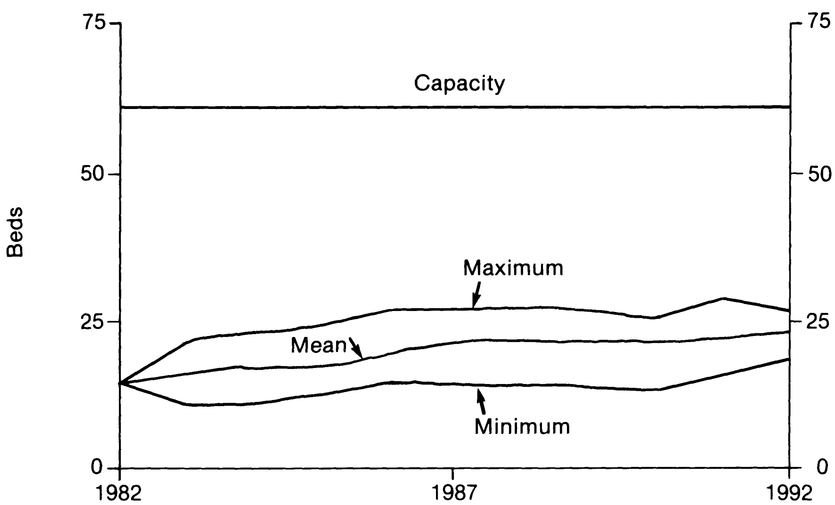


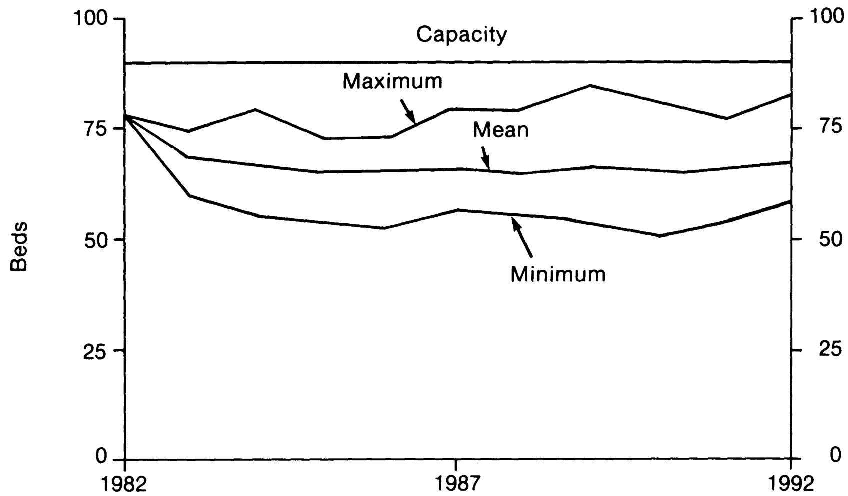
FIGURE 6–3E
Projection of Total Health Care Requirements for Case 5



the health care facility on a temporary basis.[9] Figures 6–3A through 6–3F show each community's current capacity and the minimum and maximum requirements based on 25 iterations. The maximum expected

[9] The health care utilization estimates do not reflect needs during an epidemic or due to seasonal variations. Hence, it is possible that requirements may exceed the maximum number indicated.

FIGURE 6–3F
Projection of Total Health Care Requirements for Case 6



requirements for Cases 2 and 4 approach their capacity. Combining this observation with the fact that the projections do not reflect seasonal variations, these communities may need to start planning for the future expansion of their facilities. Case 5 has projected requirements that are far below its capacity (its health care ratio was also the lowest of all cases). However, this community is relatively new and its actuarial data base is sparse. The cash flow projections associated with this population projection should be reviewed carefully, and perhaps alternative projections should be generated to reflect more typical health care usage.

Summary

The projection of future population flows is an important component in performing financial analyses of CCRCs. Current practice is to use rules of thumb, or approximation methods, to estimate statistics required for cash flow projections such as apartment turnover and health care utilization. However, this approach has several deficiencies. First, rules of thumb are based on the assumption that all communities have approximately the same mortality and morbidity rates, management policies, and demographic profiles. Second, this approach does not allow management to determine the impact of random deviations from the assumptions due to the small size of the population. Moreover, approximation methods do not allow management to explain the effects of different management policies.

Two actuarial methods, deterministic and stochastic, for projecting future population flows were described, and a numerical example was developed using the stochastic method to illustrate the impact of changes in assumptions regarding entry age distribution and changes in policies toward admission of couples. The actuarial projection model was applied to the six case studies in generating population projections using mortality and morbidity assumptions derived from their experience studies. These projections showed that the population flows for the communities will vary due to differences in underlying assumptions and the current resident profile. ■