Is Family Care on the Decline? A Longitudinal Investigation of the Substitution of Formal Long-term Care Services for Informal Care

SHARON L. TENNSTEDT, SYBIL L. CRAWFORD, and JOHN B. McKINLAY

New England Research Institute, Watertown, Massachusetts

OVER 14 YEARS AGO, ETHEL SHANAS (1979) ARGUED that families were *not* abandoning their own—that family care of disabled elders was not diminishing. Her point has been echoed by many since then. However, in the 1990s, public policy makers contend that, in response to changing social circumstances, families might willingly withdraw from informal (no cost) care and relinquish their caregiving role to paid, largely public (costly) providers. This "service substitution" hypothesis, that formal services replace or substitute for informal care, is supported by frequently cited sociodemographic trends. These trends—smaller family size, increased geographic mobility of families, greater participation of women in the work force, growing rates of divorce and marital disruption—are predicted to have the potential to decrease both the availability and the willingness of informal caregivers to meet the needs of an increasing very old and disabled population (Doty 1986; U.S. General Accounting Office 1988; Stone and Kemper 1989; Hanley, Wiener, and Harris 1991).

Policy makers are most concerned that people's willingness to provide care is diminishing in response to the availability of publicly funded services. This type of volitional substitution of formal services is viewed as an unintended—and undesired—consequence of providing publicly funded services. On the other hand, the use of these services in the absence, or loss, of a family caregiver can also be viewed as service substitu-

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tion, but without the same negative connotation. In fact, this form of service substitution is an intended consequence of public policy initiatives to maintain disabled elders in the community and avoid unnecessary institutionalization.

In this article we investigate whether there is any evidence to support policy makers' concerns about the undesired type of service substitution (i.e., an unintended decline in family or informal care in response to the availability of publicly funded services). Data are reported from a longitudinal study of a representative sample of disabled older persons and their informal caregivers to investigate changes in the caregiving pattern over a seven-year period. The study was conducted in Massachusetts, a state with a publicly funded home care program that provides a comprehensive array of case-managed community services at no cost to low-income elders and on a sliding fee basis to others. Therefore, the location of the study in Massachusetts permits an investigation of changes in informal care due to the availability of publicly funded services.

To address specifically the issue of "service substitution," we examined data on the receipt of informal care in relation to the use of formal services. We hypothesized that there would be no persistent decrease in informal care related to an increase in formal service (i.e., no substitution of formal services for informal care over time). While investigating this hypothesis, we addressed the following research questions:

1. Is there any substitution of formal services for informal care, considering total amounts of care as well as amounts of specific types of care?
2. What factors—either elder or caregiver characteristics—predict any service substitution in terms of overall care as well as specific types of care?
3. Does substitution of formal services for informal care persist over time, or is it a transitory phenomenon?
4. Is substitution of community services for informal care associated with increased likelihood of subsequent institutionalization?

What Do We Know?

In response to the concern that changing social trends will decrease the availability or willingness of family members to provide care to a dis-

abled elder, no empirical evidence has been reported to support the concern that family care is on the decline (for reviews, see Horowitz [1985] and Tennstedt and McKinlay [1989]). Further, emerging longitudinal evidence documents considerable consistency and stability of care provided by the informal caregiving network over extended periods of time (Penning 1990; Miller, McFall, and Montgomery 1991; Jette, Tennstedt, and Branch 1992). As Jette, Tennstedt, and Branch (1992) have reported, even when one primary caregiver is no longer able to provide care, another person, typically someone from the same or next generation, steps into the role, thereby ensuring continuity of informal care.

Decreasing fertility rates mean that fewer adult children will be available to provide care for elderly parents. If recent projections materialize (Zedlewski and McBride 1992), the average number of children will decrease from 2.9 in 1990 to 1.9 in 2030. However, although this decline technically might decrease the probability of each person's having a caregiver, it does not necessarily mean that care will not be available. It has been reported consistently that most of the care received by an elder is provided by one person (Cantor 1980; Frankfather, Smith, and Caro 1981; Horowitz and Dobrof 1982; Stoller and Earl 1983; Johnson 1983; Tennstedt and McKinlay 1989; Tennstedt, McKinlay, and Sullivan 1989). Coupled with another consistently reported finding that most informal care is motivated by a sense of familial responsibility (Horowitz and Dobrof 1982; McKinlay and Tennstedt 1986), the empirical evidence suggests that having at least one child ensures an elder's receipt of informal care.

Studies of the trend of increased female labor force participation report inconsistent findings on the care provided by employed caregivers. Some studies have indicated that caregiver employment is associated with provision of less help (Nardone 1980; Soldo and Sharma 1980; Stoller 1983; Brody, Kleban, and Johnson 1984; Matthews, Werkner, and Delaney 1989). However, data from several other studies show no significant difference in the amount of care provided by employed, versus unemployed, caregivers (Cantor 1980; Horowitz and Dobrof 1982; Sherman, Horowitz, and Durmaskin 1982; Brody et al. 1983; Reece, Walz, and Hageboeck 1983; Soldo and Myllyluoma 1983).

The trends of smaller family size and increasing geographic mobility, greater participation of women in the work force, and rising rates of marital disruption are real. However, existing empirical evidence from investigations of caregiving does not unequivocally support the projected

impact of these trends on a family's willingness to provide continued care, nor do data from investigations into the increased availability of community services indicate that it would result in substitution for, or replacement of, informal care. Wiener and Hanley (1992) have noted that most research suggests that more paid help does not mean less unpaid care. Results from the federally sponsored Channeling demonstration (Christianson 1986), and studies of home care programs in Chicago (Edelman and Hughes 1990) and Minnesota (Moscovice, Davidson, and McCaffrey 1988), indicated that any substitution effect was small or statistically insignificant. In a study of a nationally representative sample of disabled elders (Hanley, Wiener, and Harris 1991), the amount of informal care received was not affected by the amount of formal services used. The majority of work to date, like the studies we have cited above, has been cross-sectional or has reported on nonrepresentative populations of service users. Although the findings for family care of disabled elders over the years have been steadfastly consistent, the longitudinal data and more discriminating measures of this study can test more definitively the hypothesized "service substitution" effect.

Methods

Sample

The Massachusetts Elder Health Project is a longitudinal study of a representative sample of older people to investigate their needs for assistance with daily living activities and the sources (both formal and informal) and patterns of this help. Data have been collected at four points in time (1984–85, 1988–89, 1990–91, 1991) from both functionally disabled elders and their primary informal caregivers. A geographically stratified random sample of 5,855 older adults age 70+ was drawn in two stages, using towns/cities of eastern Massachusetts as the primary sampling unit (PSU) and then randomly selecting individuals within these PSUs. Stratification by population size of the designated towns and cities was required before sampling, and towns/cities were sampled with probability proportional to the size of the 65+ population, based on 1980 census data. A constant proportion of elders was then selected in each sample town/city to provide a random sample (N = 5,855).

Twice as many women as men were selected to represent the gender ratio of the 70+ population in Massachusetts as of 1980 (University of Massachusetts 1983). The samples used in these analyses consisted of elders who were disabled and residing in the community for at least two sequential points of contact: baseline (BL) and follow-up 1 (FU1); follow-up 1 (FU1) and follow-up 2 (FU2); or follow-up 2 (FU2) and follow-up 3 (FU3).

Data Collection

Baseline data were collected in 1984–85 (McKinlay and Tennstedt 1986) on the initial sample of eligible individuals (Response Rate = 87.7 percent), from which we identified 790 (18.9 percent) functionally disabled elders and 3,388 elders who were not disabled. Disability was determined by using the Hebrew Rehabilitation Center for the Aged (HRCA) Vulnerability Index (Morris, Sherwood, and Mor 1984), a ten-item index that examines individual mobility, personal and instrumental activities of daily living, orientation, and activity level. Using this index, a person was considered disabled if one of the following situations was reported:

1. difficulty performing at least two instrumental activities of daily living (IADL) tasks
2. difficulty with one IADL task *and either* regular use of a walker, four-pronged cane, or wheelchair *or* incorrect reporting of year
3. any one area above *and either* difficulty with dressing, health limitation of normal activity, or restricted mobility outside the home

When compared with actual clinical judgement, the index had high predictive validity ($r = .85$) and has been tested for validity with several groups of noninstitutionalized elders (Morris, Sherwood, and Mor 1984). The proportion of disabled elders (18.9 percent) was similar to that reported by other small area and national studies (Nagi 1976; National Center for Health Statistics 1983; Branch et al. 1984).

Extensive interviews were conducted with 634 of the disabled respondents (Response Rate = 80.3 percent) about their functional limitations, need for assistance in activities of daily living (ADLs), and sources of this assistance. Data were collected primarily by telephone with in-person in-

terviews when necessary (e.g., no telephone, hearing impairment). Of the respondents, 503 also provided the name and address of the person who "provided most of the help with daily living activities." Interviews were subsequently conducted with 429 of these primary informal caregivers (Response Rate = 85.3 percent). At baseline, no further data were collected from the nondisabled elders.

At each of three follow-up interviews, conducted at 15-month intervals starting in 1988, all surviving elder respondents (i.e., both disabled and nondisabled) were again screened with the HRCA Vulnerability Index for disability status. All respondents were screened to detect change in disability status, particularly to identify elders with new disability. As at baseline, extensive interviews were conducted with the sample of disabled elders regarding their needs for ADL assistance and the sources of this assistance. The respondents were again asked to identify their primary informal caregiver, with whom interviews were also conducted. Proxy data regarding elders who had died or had been institutionalized since the last contact were collected at each follow-up from the primary caregiver prior to death or institutionalization, the next of kin, or a legal guardian. Dispositions and response rates for each point of contact are displayed in table 1.

Measures

Because of the longitudinal nature of the data, two forms of notations are used to describe the points of contact and transition periods between contact. The specific points of contact are referred to as baseline, FU1, FU2, and FU3. In referring to any transition between points of contact, T_i refers to the earlier point of contact and $T_i + 1$ to the subsequent point of contact.

Outcome Measures. The ***substitution of formal services for informal care*** from any one period to the next (i.e., T_i to $T_i + 1$) was defined as occurring when the following two conditions were satisfied:

- hours of formal service at $T_i + 1$ > hours of formal service at T_i
- hours of informal care at $T_i + 1$ < hours of informal care at T_i

That is, from one period to the next, the amount of formal assistance increased while the amount of informal care decreased. Potential service substitution was investigated for each of six areas of need for ADL assis-

TABLE 1
Sample Dispositions by Contact Point

Dispositions	Contact point							
	BL 1984–85		FU1 1988–89		FU2 1990–91		FU3 1991	
	n	%	n	%	n	%	n	%
Sample elders screened	5,855	100.0	4,022	100.0	2,703	100.0	2,277	100.0
Eligible respondents	4,178	87.7	3,600	90.1	2,602	96.3	2,150	94.4
Disabled	790[a]		610[b]		461[b]		369	
Nondisabled	3,388[b]		2,082[b]		1,813[b]		1,536	
Nursing home	—		136		107		85	
Deceased	—		772		221		160	
Refusals	499	10.5	207	5.2	90	3.3	94	4.1
Lost-to-field	88	1.8	177	4.4	8	0.3	6	0.3
No contact	2	—	11[d]	0.3	3[d]	0.1	27	1.2
Ineligible	1,088[c]	—	27[c]	—	—	—	—	—
Sample caregivers identified	503	100.0	482	100.0	389	100.0	297	100.0
Respondents	429	85.3	446	92.9	357	91.8	275	92.9
Refusals	58	11.5	29	6.0	24	6.2	17	5.7
No contact/deceased	16	3.2	5	1.1	8	2.0	4	1.4
Ineligible	—	—	2[c]	—	—	—	1[c]	—
Elders with no caregiver	28	4.4	65	10.7	36	7.8	33	8.9

[a] 634 frail elders (Response Rate = 80.3 percent) completed full baseline protocol and were included in FU1.
[b] Included in next follow-up.
[c] Ineligibles excluded from response rate calculation; high number of ineligibles at baseline is due primarily to errors in census lists.
[d] Unable to obtain interview; included in next follow-up.
Abbreviations: BL, baseline; FU, follow-up.

tance (personal care, housekeeping, meals, transportation, managing finances, and arranging for services) as well as for the total amount of care.

In order to detect true substitution, the possibility that caregivers redistributed their time to other areas of ADL assistance was also investigated. This *specialization of informal care* was defined as substitution of formal services for informal care in one area of assistance accompanied by an increase of informal hours in one or more other areas of assistance. Looking at the total amounts of care, therefore, one would see an increase in amount of formal assistance accompanied by an increase or no change in the amount of informal care provided.

Data used to detect patterns of service substitution or specialization of informal care consisted of the types and amounts (average hours/week in the month prior to interview) of informal care provided by the primary caregiver and up to three secondary caregivers, as well as the types and amounts (average hours/week in the month prior to interview) of formal services utilized. Six common types of assistance were investigated, matching informal care with a formal service as follows:

Informal care	Formal service
Personal care	Home health aide or nurse
Housekeeping	Homemaker or chore
Meals	Home-delivered or congregate meals
Transportation	Transportation service, taxi, ambulance
Managing finances	Financial management, accountant, lawyer
Arranging services	Case management

Formal services could be arranged from public or private agencies or on a private-hire basis.

Data on hours of formal services and informal care were collected from the primary caregiver rather than from the elder out of concern for both respondent burden and potential recall problems. As a result, this information was missing for elders with no caregiver (whose informal hours, but not formal hours, were assumed to be zero) and for elders with a caregiver who was not identified by the elder or who refused to be interviewed. Elders with missing hours were more likely than other elders to report formal service use, to live alone, to have a low disability level, and to have a nonrelative primary caregiver; they were also less likely to report receipt of informal care.

It was important to retain these two groups in the analyses for two reasons: (1) they could have differed significantly from elders with caregiver data with respect to rates of substitution (and hence their omission would bias the estimation of the proportion of elders with service substitution); and (2) they comprised roughly 30 percent of the disabled elders at any given interview period. Therefore, separately at each interview we imputed missing hours of care using regression models, estimated from elders with caregiver data, that predicted hours of care as a function of elder-reported characteristics (which *were* observed for elders with no caregiver interview). Predictors included T_i variables (listed in table 2) plus elder reports of formal service use and receipt of informal care. Characteristics that distinguished missing-data elders from complete-data elders were included as predictors in order to account for response bias (David et al. 1983). For elders with no caregiver, relationship to the elder was set to "nonrelative" for purposes of imputation because nonrelative caregivers provided the least informal care. Service substitution for each area of care then was calculated as a function of imputed and/or observed hours of care using the above definition.

Predictor Variables. Potential predictors of service substitution included both elder and caregiver factors. These variables were selected primarily because of previously reported associations with provision of informal care or utilization of formal services (Horowitz 1985; Tennstedt and McKinlay 1989; Tennstedt et al. 1990). Among the *elder factors* were

1. two measures of the elder's disability status, the *level of disability at* T_i (5-point scale ranging from minimal to very extreme) and *change in level of disability at* $T_i + 1$ (less disabled, no change, more disabled)
2. *cognitive impairment at* T_i (coded "yes" either if the elder reported frequent confusion or if a proxy interview was required because of cognitive impairment; coded "no" otherwise), and *change in cognitive impairment status at* $T_i + 1$
3. *elder gender*
4. *living arrangement*, including any change from one period to the next (lives alone, moves from living with a caregiver to living alone, moves from living alone to living with a caregiver)
5. *elder annual income at* T_i

TABLE 2
Sample Characteristics at Each Transition ($T_i \rightarrow T_i + 1$): Percentage of Disabled Elders at Both Contacts[a]

	BL and FU1 (n = 236)	FU1 and FU2 (n = 300)	FU2 and FU3 (n = 232)
T_i disability level:			
Minimal	30.1	32.3	12.5
Moderate	8.1	20.3	26.3
Severe	33.9	26.6	29.7
Extreme	19.9	13.0	16.8
Very extreme	8.1	8.0	14.7
Cognitive impairment at T_i	7.6	20.5	21.5
Gender: male	14.0	16.6	19.7
Annual income at T_i			
<$5,000	28.8	12.6	13.3
$5,000–$10,000	63.1	75.5	60.1
>$10,000	8.1	11.9	26.6
Coresidence with PCG at T_i	42.4	44.2	47.8
Relationship to T_i PCG			
Spouse	22.9	17.3	20.3
Offspring	42.4	47.0	49.1
Other relative	17.8	21.0	19.0
Nonrelative	11.9	4.7	3.4
No T_i PCG	5.1	10.0	8.2
Change in disability			
Less	31.8	17.7	14.2
Same	35.6	36.7	41.8
More	32.6	45.7	44.0
Change in cognitive impairment			
No → Yes	17.4	11.6	13.3
Yes → No	2.1	6.3	7.7
No change	80.5	82.1	79.0
Number of CGs at T_i			
0	5.1	10.0	8.2
1	16.9	37.5	30.2
≥2	78.0	52.5	61.6
Change in number of CGs at $T_i + 1$			
Fewer	48.7	22.7	20.3
Same	39.8	43.7	38.5
More	11.4	33.7	41.1

continued

TABLE 2 continued

	BL and FU1 (n = 236)	FU1 and FU2 (n = 300)	FU2 and FU3 (n = 232)
Change in PCG			
No PCG → no PCG	3.0	5.6	4.7
Different PCG	19.9	20.9	15.0
No PCG → PCG	2.1	4.3	3.4
PCG → no PCG	11.4	2.6	2.6
Same PCG	63.6	66.5	74.2
Change in residence			
Alone → alone	50.8	46.4	49.4
Alone → with PCG	6.8	8.9	2.6
With PCG → alone	8.9	5.3	5.2
With PCG → with PCG	33.5	39.4	42.9

[a] Percentages may not add to 100 because of rounding.
Abbreviations: BL, baseline; FU, follow-up; CG, caregiver; PCG, primary caregiver; T_i, earlier point of contact; $T_i + 1$, subsequent point of contact.

Caregiver factors included an interaction term of *caregiver relationship at* T_i and their *coresidence status* with the elder (coresiding offspring, non-coresiding offspring, coresiding other relative, non-coresiding other relative, non-coresiding nonrelative; spouses were the referrant group). Other caregiver factors included a *change in primary caregiver* from T_i to $T_i + 1$ (lose caregiver, different caregiver) and any *change in the number of caregivers* from T_i to $T_i + 1$ (fewer, no change, more).

Because primary caregivers providing large amounts of informal care might feel burdened and therefore be likely to substitute formal services for some of their care, the *log informal hours at* T_i for each of the six types of care, as well as *total amount of care*, were included as potential predictors. The log of hours was used instead of simply hours of care in order to reduce the influence of outlying values, as well as to satisfy the requirement of linearity in the statistical models. Finally, because of the difference in length of time between contacts (i.e., four years between baseline and first follow-up compared with approximately 15 months between subsequent follow-up contacts), we also included indicators (1 = yes, 0 = no) for each transition (baseline to FU1, FU1 to FU2, and FU2 to FU3). This provided a better fit to the data than did including the elapsed time between T_i and $T_i + 1$.

Analysis

Extent of Service Substitution. Using the definition stated above, the rates of substitution in each of the six types of care, and substitution in total amount of care, were computed. Substitution from T_i to $T_i + 1$ in a particular type of care was examined only for elders receiving informal care in that area at T_i; by definition, elders receiving no informal care in that area cannot have a decrease in the amount of informal care and hence cannot substitute formal for informal assistance at $T_i + 1$. Thus, the sample sizes used in the analyses of rates differed by type of care.

Predictors of Substitution. Elder and caregiver characteristics associated with substitution were identified by estimating a multiple logistic regression model for the probability of substitution, taking each area of need separately. Stepwise procedures were used to eliminate irrelevant or redundant predictor variables, in order to better estimate the effects of the remaining variables. Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit statistic (Hosmer and Lemeshow 1989). The sample for each model consisted of elders who received the relevant type of informal care at baseline, FU1, or FU2, and who remained disabled and residing in the community at the subsequent interview. Some elders contributed more than one observation to these analyses because elders were interviewed up to four times. To account for the dependence between repeated measurements on the same subject, the standard errors of the parameter estimates were adjusted, using a procedure that involved the correlation of multiple residuals from the same subject similar to calculation of design effects in cluster sampling (see Liang and Zeger [1986] and Lipsitz and Harrington [1990]). Exploratory analyses indicated that the relationship between substitution status and predictors was stable over time, so that combining the three datasets (baseline → FU1, FU1 → FU2, FU2 → FU3) into a single model was appropriate.

Specialization versus Consistent Changes in Care Patterns. Specialization of care was defined as substitution of formal services for informal care in one area of need accompanied by an increase of informal hours in one or more other areas of need. Rates of specialization were computed separately by each area of care in which substitution was detected. A logistic regression model for the rate of overall substitution then was estimated for the subset of elders with no specialization (i.e., for the group

of elders who were not principally redistributing their total informal care hours).

Persistence of Service Substitution and Other Patterns over Time. Additional issues involved changes in elders' care patterns following service substitution. Questions of particular interest included persistence of service substitution, that is, whether elders with overall substitution from T_i to $T_i + 1$ had higher rates of subsequent substitution than did other elders; and whether elders with overall substitution had higher rates of institutionalization ("ultimate" substitution) by the following interview. These patterns were examined by comparing rates of service substitution and institutionalization at FU2 for three groups of elders who potentially could have substituted at FU2:

1. those with overall service substitution from BL to FU1 (past substitution)
2. those who initiated receipt of informal care at FU1 ("newly able" to substitute)
3. those who received informal care at BL, FU1, and FU2, but had no overall service substitution from BL to FU1 (past nonsubstitution)

A similar comparison was made at FU3, based on FU1 to FU2 substitution. Elders with specialization of informal care again were omitted from the analyses.

Results

Sample Characteristics

Characteristics of the elder samples at each of the three transitions are summarized in table 2. The size and characteristics of the transition samples vary because each sample consists of surviving respondents who were disabled at both waves comprising each transition period. In general, the elders became more disabled over time, as one might expect. The first transition sample differed from the other two transition samples in the distribution of change in disability level, as a higher proportion became less disabled and a lower proportion showed increased disability (perhaps reflecting a "survivorship" effect due to the longer period between

baseline and FU1). Other, possibly related, differences between the first transition sample and the remaining transition samples included a greater average number of caregivers, a higher proportion of elders with fewer caregivers, a higher proportion of elders who lost a primary caregiver, and a lower proportion with the same primary caregiver. In addition, there was a trend toward an increasing proportion of men and higher incomes among the disabled elders. The distribution of other elder and caregiver characteristics remained fairly stable over time.

Is There Any Substitution of Formal Services for Informal Care?

Table 3 presents the rates of substitution of formal services for informal care at each transition for the six specific types of care. Rates of service substitution from baseline to FU1 tended to be somewhat higher than at subsequent periods, particularly for help with arranging services. This higher rate of service substitution is most likely related to the longer time period between baseline and FU1. Financial management had somewhat lower rates of service substitution (4 to 18 percent) than did the other types of help (9 to 40 percent for meals, housekeeping, personal care, and arranging services). After omitting elders with specializa-

TABLE 3
Rates of Substitution of Formal Services for Informal Care at Each Transition

	Percent (no.) substituting		
Area of care	BL → FU1	FU1 → FU2	FU2 → FU3
Personal care	23.2 (29)	16.9 (29)	12.8 (17)
Housekeeping	17.7 (39)	15.1 (39)	14.8 (30)
Meal preparation	21.6 (37)	12.6 (24)	10.2 (13)
Arranging services	40.4 (65)	14.4 (13)	22.5 (20)
Financial management	17.8 (32)	4.1 (8)	11.0 (17)
Transportation	23.9 (48)	17.2 (32)	8.9 (15)
Overall assistance[a]	19.7 (30)	13.8 (27)	14.9 (23)

[a] Elders with any specialization of care are omitted.
Abbreviations: see table 2.

tion of informal care, the rates of overall service substitution ranged from 14 to 20 percent.

Service substitution in one of the six areas of care generally was not associated with increases in informal help (i.e., informal care specialization) in other areas of care. The rate of informal care specialization in any single area was relatively small (4 to 15 percent). The proportion of elders with specialization in one or more of the six areas ranged from 24 percent at the FU1 to FU2 transition period to 30 percent at the baseline to FU1 transition period. In addition, correlations between substitution status in one area and substitution status in another area (not shown) were close to one for all six areas of assistance. These findings suggest that service substitution in one type of care did not tend to be accompanied by increases in informal care in other areas (i.e., care specialization), but rather by substitution in other types of care as well.

What Factors Predict Service Substitution?

The results of the logistic regression models (table 4) indicate that the most consistent predictor of service substitution was loss of the primary caregiver. Depending on the type of care, elders who lost a primary caregiver were between 9 and 35 times as likely to substitute formal services for informal assistance. To a lesser degree, elders with a different primary caregiver at T_i also had higher rates of substitution. Other important predictors of service substitution included living alone at $T_i + 1$, particularly a change from coresidence at T_i to living alone at $T_i + 1$. Elders who lived alone and had an other-relative primary caregiver at T_i also had a higher rate of service substitution for arranging services. Higher disability level at T_i was positively related to substitution of formal case management services, but negatively related to service substitution in financial management. An increase in disability was linked to overall service substitution. Elders who had a decrease in number of caregivers (but still had at least one caregiver) were less likely to substitute case management services for help with arranging services. Greater amounts of informal care at T_i were positively associated with service substitution in personal care, housekeeping, meals, and overall assistance. After controlling for elder and caregiver characteristics, rates of service substitution for transportation were significantly higher in the

TABLE 4
Predictors of Substitution for Types of Care and Overall Care: Odds Ratios[a]

Predictor	Area of care		
	Personal care	Housekeeping	Meals
Disability level			
Decrease			
Increase			
T_i level			
Relationship to T_i PCG			
Nonresident other relative			
Living situation			
Live alone → live alone	3.49 (1.67, 7.30)	2.09 (1.23, 3.56)	
Coreside → live alone	3.96 (1.60, 9.93)		2.62 (1.20, 5.72)
Change in PCG			
Different PCG		2.56 (1.50, 4.38)	
Loss of PCG	11.29 (4.68, 27.27)	9.17 (4.34, 19.38)	19.68 (8.21, 47.17)
Change in number of CGs			
Fewer			
T_i informal hours[b]			
Log personal care	1.71 (1.08, 2.69)		
Log housekeeping hours		2.55 (1.81, 3.60)	
Log meal hours			1.95 (1.18, 3.22)
Log total hours			
Transition			
BL → FU1			
FU1 → FU2			
Number	430	681	489

[a] Numbers in parentheses represent the 95 percent confidence intervals.
[b] Evaluated at increase from 25th percentile to 75th percentile.
[c] Elders with specialization of care were omitted from this model.
Abbreviations: see table 2.

baseline to FU1 and FU1–FU2 periods and for arranging services in the baseline to FU1 period. The fit of the models was satisfactory.

Is Service Substitution Persistent or Transitory? Is It Associated with Subsequent Institutionalization?

As displayed in figure 1, among elders who potentially could have substituted services from FU1 to FU2, the rates of overall service substitution were relatively low (7.5 to 14.6 percent) and differed little for elders with past substitution, those without past substitution, and those beginning informal care at FU2, indicating that service substitution did not persist over time. The pattern among those who could have substituted

Table 4, continued

Area of care			
Arranging services	Financial management	Transportation	Overall assistance[c]
			1.74 (1.02, 2.96)
1.22 (1.00, 1.48)	0.48 (0.29, 0.80)		
3.20 (1.57, 6.55)			
		2.36 (1.40, 3.98)	3.51 (1.62, 7.59)
			4.39 (1.79, 10.79)
	2.47 (1.21, 5.03)		2.30 (1.22, 4.36)
12.99 (4.91, 34.36)	35.21 (14.89, 83.26)	15.14 (6.67, 34.33)	10.18 (4.45, 23.29)
0.37 (0.18, 0.72)			
			3.51 (2.04, 6.01)
3.81 (2.23, 6.51)		2.71 (1.30, 5.66)	
	0.21 (0.08, 0.58)	2.41 (1.15, 5.06)	
340	529	555	501

from FU2 to FU3 was similar. At both FU2 and FU3, no elders who were newly able to substitute at the preceding interview were institutionalized, reflecting a lower level of disability than in the other two groups. Rates of institutionalization at FU2 and FU3 were similar for those with past substitution and past nonsubstitution, suggesting that service substitution did not tend to precede institutionalization, particularly after accounting for level of disability.

Discussion

A decade ago, the focus of long-term-care policy was on avoiding institutionalization of disabled elders. In response to the rising costs of nurs-

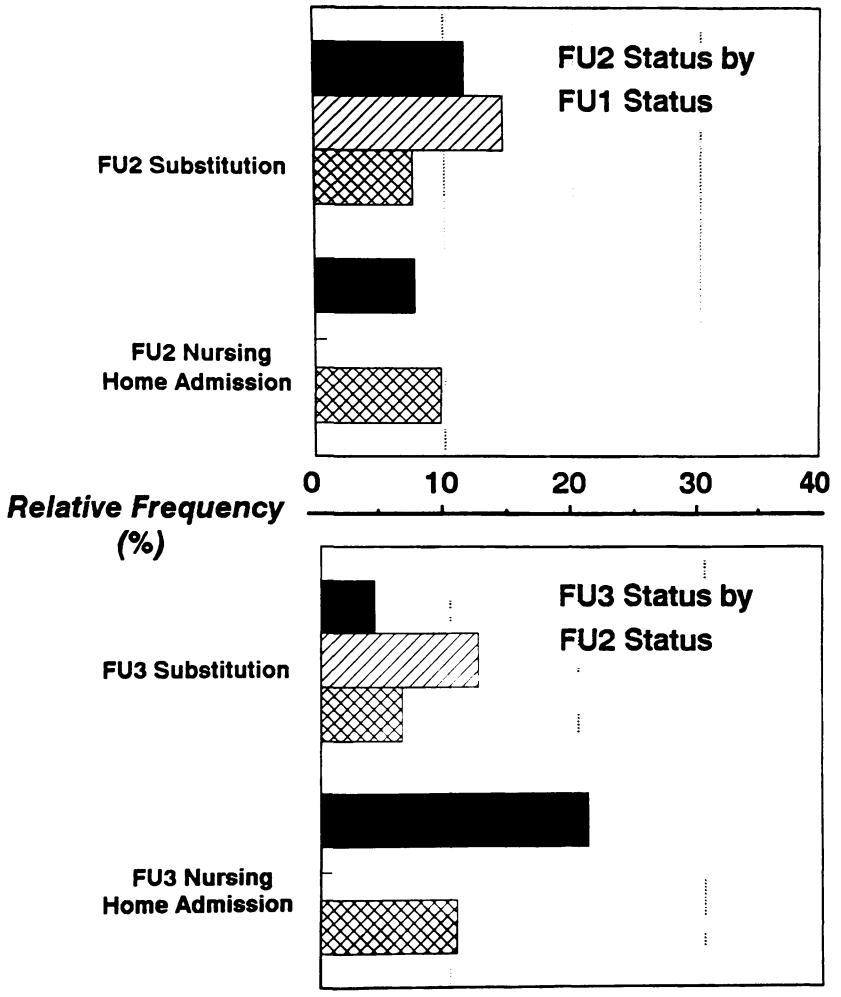

FIG. 1. Rates of substitution and nursing-home admission for FU2 and FU3 by past substitution status. Key for prior status: ■, past substitution; ☑, newly able to substitute; ☒, past nonsubstitution.

ing-home care and personal preference for community residence, a range of in-home and community long-term-care services has been developed as an alternative to institutional care. With alarming projections of a rapidly increasing population of older people, particularly the oldest old and disabled, policy concern with increased costs now encompasses the community long-term-care system as well. Of particular concern is the potential for substitution of these services for no-cost informal care. Findings from this study provide important information regarding the

extent and nature of this service substitution to suggest (1) that it is not a widespread phenomenon, but rather that it occurs under certain circumstances; and (2) that under these circumstances service substitution can be beneficial in ensuring continued community care for a disabled elder.

First, although substitution of formal services for informal care was detected in this representative sample of disabled elders, the evidence does not support a major or persistent trend of service substitution. When considering overall care, the extent of service substitution ranged from a high of 20 percent for the first period of follow-up to 14–15 percent for the two subsequent follow-up periods. The higher rate of service substitution at the first transition period, compared with the other periods, is most likely related to the longer length of this period (i.e., four years) compared with the 15–18 months of the other two transition periods. In addition, respondent difficulties with reporting hours of care were identified at the baseline interview and were apparently corrected by subsequent refinement of the survey instrument. Therefore, baseline values for amount of informal care might have been inflated in comparison with those from the first follow-up, resulting in an artificially high rate of service substitution for this transition period. The similarity in rates (13.8 percent and 14.9 percent) for the subsequent periods suggests that these rates more accurately reflect the prevalence of service substitution.

Service substitution was more likely for certain types of care than others and was consistently associated with factors related to availability of informal care. Substitution of case management or social work for informal help with arranging services was the area with the highest rate of service substitution over time. Given the recognized fragmentation of the health and long-term-care systems in the United States, a formal provider is more knowledgeable, and therefore better suited, than an informal caregiver for coordinating and arranging services for the elder. Substitution of this formal service, in turn, might explain the rates of service substitution for personal care and housekeeping, areas of care for which formal in-home services are well established and available through the state-funded home care program. That is, once a case manager was involved, he or she referred the elder for other formal services offered by the program. Therefore, substitution of formal services occurring in one area of care might lead to service substitution in other areas of care as well. This conclusion is supported by the lack of evidence to uphold the

specialization-of-care hypothesis. Since Greene (1983) reported data a decade ago in support of service substitution, it often has been speculated that substitution of formal services for certain areas of care might free caregivers' time to offer specialized assistance in areas for which they are better suited than service providers to help. Instead, these data indicate that, in most cases, service substitution occurs across the board.

Service substitution was more likely if there was a change in the caregiving arrangement, particularly loss or change of the primary caregiver. Data from this study reported elsewhere (Jette, Tennstedt, and Branch 1992) indicate that the majority of elders who experienced a change/loss in caregiver had a caregiver again by the next contact. Typically, the change or loss was due to death or illness (an involuntary situation) of the caregiver rather than to competing demands or interpersonal conflict that would suggest a voluntary withdrawal from the helping role. Consistent with this transition in caregiving arrangement, the data also indicate that substitution of formal services for informal care was temporary rather than permanent, and that informal care was again in place by the next contact. This suggests that, in these cases, service substitution was beneficial in that it met the elder's needs for care during a transition in informal care, thereby possibly avoiding nursing-home admission.

Specific elder characteristics associated with service substitution again suggest that it played a beneficial role. Those elders who initially had been more disabled or whose disabilities had increased were likely to substitute formal homemaker services for some of their informal care. Similarly, elders receiving greater amounts of informal help were also likely to replace some informal care with formal services. In these situations, it seems possible that the formal services provided respite for a caregiver who might otherwise not have been able to continue in a helping role.

Finally, service substitution was also related to an elder's living arrangement, as it was more likely for elders who lived alone or who started living alone after coresiding with a caregiver. The exact reasons for single living are not known, but the change in living arrangement could have been related to the death of a spousal caregiver or a necessary geographic move by the caregiver (e.g., related to a job change). Both of these situations, then, could represent a transition in informal care arrangement, as we discussed above. However, the association between service substitution and living alone suggests that formal services might

also facilitate independent residence of the elder when the elder and/or the caregiver do not want to coreside. In addition, there still exist financial disincentives (e.g., reduction in public benefits or ineligibility for certain types of public housing) that preclude coresidence of an elder and caregiver. In these cases, service substitution again might have a beneficial effect in ensuring that the needs of the elder are met in a community rather than an institutional setting. Significantly, substitution of community services was not found to be a precursor to institutionalization, which can be considered the ultimate substitution of formal services in the continuum of long-term care. Community care of the elder—by both informal and formal sources—continued following any period of service substitution.

In conclusion, evidence of substitution of formal services for informal care was detected in this representative sample of older people. It is important to restate that this study was conducted in a state with a well-established, publicly funded home care program, which would have made substitution of formal services for informal care easier. However, the fact that service substitution was temporary and related to availability of the primary caregiver suggests that public funding for home care does not result in widespread and undesired (i.e., costly) service substitution. There were no data to suggest that large numbers of families were voluntarily withdrawing their help in favor of formal service use. Rather, these publicly funded services appear to be doing what they are intended to do: supporting and sustaining the informal caregiving arrangement or providing care during the disruption (usually temporary) of this arrangement in order to keep the elder in the community. It cannot be denied that this substitution of formal services for previously provided informal care incurs costs that would not have been required had the informal care continued. However, the probable benefits of these services to both the care recipient who desires to remain living at home and to society in containing the number of institutionalizations justify the costs.

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Address correspondence to: Sharon Tennstedt, PhD, Director, Institute for Studies on Aging, New England Research Institute, 9 Galen Street, Watertown, MA 02172.