RISK FACTORS FOR NURSING HOME PLACEMENT AMONG OAA SERVICE RECIPIENTS: ANALYSIS OF DATA FROM THE GEORGIA DIVISION OF AGING SERVICES

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Introduction

As part of the Administration on Aging's Performance Outcomes Measurement Project (POMP), this study examined the effect of the receipt of Older Americans Act (OAA) services on the delay in nursing home placement among OAA service clients age 60 and older in Georgia. We conducted time-to-event analyses (time to nursing home placement) using proportional hazards regression models applied to client data from the Georgia Department of Aging Services. Predictors in the models included demographics (e.g., age, gender, ethnicity, living arrangements, presence of a caregiver); measures of physical functioning from the revised Determination of Needs (DON-R) impairment and unmet needs scores; and receipt of OAA home-and-community-based services. The services included the following:

- o   Home Delivered Meals
- o   Homemaker Services
- o   Home Repair
- o   Personal Care
- o   Respite Care

Service variables included not only "yes/no" indicators of the receipt of a particular service, but also measures of units of service used (average number of meals per month for HDM, and average hours per month for the other services). In addition, costs for each service were included in the data sets. Finally, a variable was created to indicate a count of the total number of services received by each client. The outcomes were: (1) remaining in the community, (2) permanent nursing home placement, (3) mortality, (4) loss to follow-up, and (5) the end of the study period. All outcomes except for nursing home placement were considered censoring events. Thus, "survival" was defined as any outcome other than permanent nursing home placement.

The Data Sets

The data sets consisted of four Excel files of administrative records covering the time period **July 1, 1999 through September 30, 2005**. The first two Excel files contained data on service clients from selected Area Agencies on Aging (AAAs) in Georgia. One file contained records for clients whose outcomes were nursing home placements, and the other contained data for clients who had other outcomes (remained active in the community, died, or were lost to follow-up for any reason). The third and fourth Excel files contained records for persons on the waiting list for services in Georgia (one file for persons with nursing home outcomes and one file for persons with all other outcomes). At the beginning of the study the hope was that the waiting list files could be used as a potential comparison group for the study. Results of the evaluation of the waiting list files will be presented below.

Creation of an analytic file suitable for use with the SAS software for conducting the proportional hazard modeling (SAS PROC PHREG) required several processing steps. First, the data were converted from Excel to SAS format. Next, because the administrative files contained multiple records per client (because of multiple services provided to many clients), it was necessary to merge the multiple records per person into a single record and de-duplicate the redundant information (such as demographics, functional status measures, and so on). Similar de-duplication was applied to the waiting list files. In addition, it was necessary to merge the two client files together so that all possible client outcomes were available on the same file. Similarly, the two waiting list files were merged so that all possible outcomes were available on one file. Additional editing of data involved cleaning the dates of entry into and exit from the service system (or the waiting list) to insure that no inconsistencies in the dates remained in the data set. Finally,

the data were checked to make sure that variable values lay within expected ranges, and that coding was logical and valid.

Demographic data available for each client included age, gender, ethnicity, living arrangement, marital status, income and presence or absence of a caregiver. Functional status measures in the data file included impairment scores and unmet needs scores from the revised Determination of Needs (DON-R) scale. This scale is based on 15 items similar in nature to standard ADL and IADL items with possible score values ranging from 0 – 3 for each item. Thus, the range for the total score is from 0 – 45, both for level of impairment and for amount of unmet needs. Further details of the construction and evaluation of this scale are available from the Georgia Department of Aging Services (2003). Service indicator variables (that is, 'yes/no' indicators) were limited to home delivered meals, homemaker services, home repair, personal care, and respite care. Finally, the number of units and costs of service for each of those types of service were available for each client on the data set.

Several other data quality issues and assumptions were dealt with during the data preparation phase prior to conducting the analyses. First, in cases where multiple records for a given individual provided different dates for nursing home placement (the primary outcome variable in these analyses) we made the assumption that the earliest placement date recorded applied to the case. Second, in cases where an individual had more than one assessment of functional status, the most recent impairment and unmet needs scores were used in the analysis. Third, the large amount of missing data for marital status and income precluded their use as control variables in the analytical models. Fourth, "survival time" was calculated for each individual client as the difference (in months) between the date of the event (nursing home placement) or censoring (by death, movement out of the study area, end of the study period, or other loss to follow-up) and the date the client entered the service system. In cases where the client entered the service system prior to the beginning of the study period, the starting date was truncated to the beginning of the study period (December 1998). Finally, a "total services" variable was created for each individual by counting up the total number of services received by that individual during the study period.

The **waiting list file** contains the same demographic, functional status and outcome data as the client file, but of course, no service data. The assumptions and editing rules applied to this data set were the same as those applied to the client file. To determine whether it would be appropriate for the waiting list file to be used as a comparison group for the client files, we conducted an evaluation of the waiting list file for data quality and to make sure that persons on the waiting list did not become service clients and enter the client file during the study period. Data preparation and editing of the file yielded 1,023 usable records on the waiting list file. However, upon matching the waiting list file to the client file, it was learned that 744 individuals on that file became clients during the study period and had records on the client file. Therefore the number of "pure" waiting list persons (that is, those who did not become clients) was sufficiently small that the waiting list was deemed not to be useful as a comparison group.

Statistical Methods

Modeling of time to event for nursing home placement was guided by a number of prior studies in the literature which suggested the use of the Cox proportional hazards model (Cox, 1972; SAS PROC PHREG, SAS Institute, 2007) as the most appropriate statistical approach (see, for example, McCann et al., 2005, Friedman et al., 2006). Selection of predictor variables also relied on prior literature (for example, Foley et al., 1992 and Miller and Weissert, 2000) as well as empirical evaluation of the model fits, plausibility of the selected variables and analytical judgment.

Summary of Results

Descriptive statistics for the client data set are provided in **Table 1.** Note first that there are varying amounts of missing data, depending on which variable was tabulated. Age, ethnicity, living arrangement, and presence of a caregiver are complete for all clients, but other variables are incomplete as indicated by smaller totals in the table. The most frequent age range in this population is between 80 and 89 (38%). A majority of the clients are female (71%) and White, not Hispanic (52%). Data on living arrangement showed that almost half (46%) of the clients live alone, but only about 2% reported having a caregiver. The overwhelming majority of clients received three or fewer services during the study period. The nursing home placement rate was 7.3% over the entire study period, and the mean "survival time" in the community was 25.4 months (out of a total study period of 75 months), although the variability in survival time was large (standard deviation 20.6 months). All of the above data suggest a client population with demographic characteristics and a nursing home risk profile similar to other older populations.

To help sort out the effects of these different factors on the relative risk of nursing home placement during the study period, we fitted proportional hazards models using demographic characteristics, living arrangements, presence of a caregiver and functional status as control variables and examined the effects of the various measures of service use as the principal predictors of placement.

Results of the initial modeling summarized in **Table 2** showed that, controlling for demographics and functional status, there was statistically significant lowering of the relative risk of nursing home placement with the increased use of services among the Georgia clients. Since the Georgia data set included only service recipients, the reference group for the "total services" variable was the group receiving only one service. The interpretation of the finding for the "total services" variable is that the relative risk of nursing home placement was decreased for those clients receiving more than one service compared to the clients receiving only one service.

In addition, as shown in **Table 3**, there was a persistent increase in mean "survival times" (in months) in the community with increases in the total number of services used. It appears that the whole program of services, as measured by the total count, is important in delaying the time to nursing home placement in this service client population.

Recent additional work in this area has examined the effects of measures of intensity of the services received (average number of units of service received per unit of time over the study period) and costs of individual services as possible additional predictors of nursing home placement risk. Exploratory analyses revealed that when both costs and intensity measures were entered into the same model, costs were never significant predictors of the relative risk of nursing home placement. These and other considerations led to the development of a 'final' model for this data set as shown in **Table 4**. Results here indicate that, again controlling for demographics and functional status, the average number of home-delivered meals per month, average hours of homemaker service received per month and average hours of respite care received per month are also statistically significant predictors of lowered relative risk of placement. For these characteristics the comparison groups are clients receiving no units of service, because not all clients received all services in this study population. In addition, the total service count remains significant in this model, even in the presence of the individual intensity measures.

Tables 5 – 7 show the effects of the significant service predictors on the mean "survival times" in the community for the intensity measures. First, we created four categories each for the continuous variables average home-delivered meals per month, average hours of homemaker services per month and average hours of respite care per month. Note that for home-delivered meals and homemaker services, there was

an overall increase in mean "survival time" for increases in the intensity of use of these services. For respite care, however, the relationship between service intensity group and "survival time" was relatively flat, even though in the model the intensity measure for respite care significantly predicted decreased risk of nursing home placement. We speculate that this apparent contradiction may be due to the fact that respite care has only an indirect affect on the service clients themselves, since the care is provided to the caregivers and not to the clients directly. Also, a relatively small number of caregivers received respite care in this population.

Discussion

The analyses presented here are limited to OAA service recipients in the Georgia administrative data set and are not necessarily representative of other states, other service client populations, or other populations of older persons. Secondly, there is no formal comparison group represented in these analyses, although the group of clients receiving one service serves as an approximation to a comparison group. A third limitation is that the proportional hazards model as applied to these data automatically deletes from the analysis any observation with missing values for either the outcome variable, or any of the predictors. The amount of bias, if any, introduced by deletion of cases with incomplete data is unknown.

Despite the limitations cited above, Westat believes that the results of these analyses are important in demonstrating the effectiveness of home- and community-based service programs in allowing at-risk older persons to remain in the community for a longer period of time. The results here are consistent with results of analyses of similar data sets from other states. In the case of Georgia, the results suggest that identifying at-risk persons and moving them into the service system would have positive effects on the quality of life for these older persons.

TABLE 1 Descriptive Data

Age Category	Frequency	Percent
60-69	654	13.9%
70-79	1,361	28.9%
80-89	1,796	38.2%
90-99	826	17.6%
100+	66	1.4%
Total	4,703	100.0%

Gender	Frequency	Percent
Male	1,369	29.2%
Female	3,313	70.8%
Total	4,682	100.0%

Ethnicity	Frequency	Percent
White	2,489	52.9%
African American	2,034	43.3%
All Other	97	2.1%
Total	4,703	100.0%

Lives Alone	Frequency	Percent
Yes	2,183	46.4%
No	2,458	52.3%
Total	4,703	100.0%

Presence of a Caregiver	Frequency	Percent
Yes	104	2.2%
No	4,599	97.8%
Total	4,703	100.0%

Impairment and Unmet Needs Scores	N	Mean	Standard Deviation
First Impairment	3,851	8.7	6.5
Last Impairment	3,855	8.6	6.3
First Unmet Needs	3,851	19.2	9.3
Last Unmet Needs	3,855	18.9	9.2

Total Services	Frequency	Percent
1	4,282	91.1%
2	333	7.1%
3	64	1.3%
4	16	0.3%
5	7	0.2%
6	1	0.0%
Total	4,703	100.0%

TABLE 1 Descriptive Data, continued

Permanent Nursing Home Placement	Frequency	Percent
Yes	345	7.3%
No	4,358	92.7%
Total	4,703	100.0%

Survival Time	N	Mean	Standard Deviation
Months	4,703	25.4	20.6

TABLE 2 Georgia Modeling Results: All Clients Age 60+ -- Initial Model

Total Clients	Number Placed in Nursing home	Percent nursing home placement
3685	290	7.87%

Variable	Hazard Ratio*	Hazard ratio, 95% lower conf. limit	Hazard ratio, 95% upper conf. limit	(p-value)**
Age	*1.014*	*1.001*	*1.027*	*0.0300*
Sex	1.122	0.856	1.472	0.4041
Last Impairment Score ***	0.992	0.969	1.016	0.5190
Last Unmet Needs Score ***	*1.043*	*1.026*	*1.061*	*<.0001*
Lives Alone	1.020	0.800	1.299	0.8747
Ethnicity	*0.628*	*0.498*	*0.792*	*<.0001*
Caregiver	1.570	0.798	3.089	0.1913
Total Services	*0.374*	*0.244*	*0.574*	*<.0001*

* Hazard Ratios < 1 indicate a lowering of the relative risk of nursing home placement.

** Statistically significant results are indicated by **bold italics**. In cases where the confidence intervals include the value 1.000, there is no statistical evidence concerning either an increased or decreased relative risk.

***Last impairment score and last unmet needs score are measures of functional limitation that incorporate elements of both ADL and IADL activities in the Determination of Needs-revised (DON_R) scale. Score ranges run from 0 to 45, with higher values indicating more impairment or need for care (Georgia DHR Division of Aging Services, 2003).

Data Source: GEORGIA DIVISION OF AGING SERVICES - ADMINISTRATIVE RECORDS OF SERVICE RECIPENT DATA FROM SELECTED Area Agencies on Aging.

TABLE 3 Georgia Mean Survival Times (In Months) By Number of Services Received (Age 60+) – Based on Initial Model Sample

Number of Services Received	N	Mean
1	3312	25.0
2	290	30.5
3	60	41.2
4	23	40.6

TABLE 4 Georgia Modeling Results: All Clients Age 60+ -- "Final" Model

Total Clients	Number Placed in Nursing home	Percent nursing home placement
3685	290	7.87%

Variable	Hazard Ratio*	Hazard ratio, 95% lower conf. limit	Hazard ratio, 95% upper conf. limit	(p-value)**
Age	*1.015*	*1.002*	*1.028*	*0.0224*
Sex	1.072	0.818	1.406	0.6142
Last Unmet Needs Score ***	*1.046*	*1.032*	*1.060*	*<0.0001*
Lives Alone	0.971	0.763	1.236	0.8138
Ethnicity	*0.603*	*0.477*	*0.763*	*<0.0001*
Caregiver	1.606	0.813	3.173	0.1726
Average home-delivered meals per month	*0.930*	*0.911*	*0.950*	*<0.0001*
Average hours per month homemaker	*0.862*	*0.788*	*0.943*	*0.0011*
Average hours per month respite	*0.878*	*0.831*	*0.927*	*<0.0001*
Total Services	*0.332*	*0.208*	*0.530*	*<0.0001*

* Hazard Ratios < 1 indicate a lowering of the relative risk of nursing home placement.

** Statistically significant results are indicated by ***bold italics***. In cases where the confidence intervals include the value 1.000, there is no statistical evidence concerning either an increased or decreased relative risk.

***Last unmet needs score is a measure of functional limitation that incorporates elements of both ADL and IADL activities in the Determination of Needs-revised (DON-R) scale. Score ranges run from 0 to 45, with higher values indicating more impairment or need for care (Georgia DHR Division of Aging Services, 2003).

Data Source: GEORGIA DIVISION OF AGING SERVICES - ADMINISTRATIVE RECORDS OF SERVICE RECIPENT DATA FROM SELECTED Area Agencies on Aging.

TABLE 5 Georgia Mean Survival Times (In Months) By Average Home-Delivered Meals Received Per Month (Age 60+) – Based on 'Final' Model Sample

Average Home-delivered Meals Received Per Month	N	Mean
0	412	17.3
>0-15	1035	16.6
16-18	1126	22.2
19-21	1205	32.9
>21	827	34.2

TABLE 6 Georgia Mean Survival Times (In Months) By Average Hours of Homemaker Service Received Per Month (Age 60+) – Based on 'Final' Model Sample

Average Hours of Homemaker Service Received Per Month	N	Mean
0	4381	25.1
>0-3	60	28.3
4-7	47	30.9
8-10	52	39.4
>10	65	33.9

TABLE 7 Georgia Mean Survival Times (In Months) By Average Hours of Respite Care Received Per Month (Age 60+) – Based on 'Final' Model Sample

Average Hours of Respite Care Received Per Month	N	Mean
0	4295	25.5
>0-7	71	27.9
8-18	80	19.8
19-28	76	27.1
>28	83	25.8

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