Predictors of Nursing Home Placement Among Elderly Public Housing Residents

Betty Smith Black, PhD,1 Peter V. Rabins, MD, MPH,2,3 and Pearl S. German, ScD3

Elderly residents of public housing developments are at high risk for nursing home placement (Freedman, 1996; Weinberger et al., 1986). For example, Weinberger and colleagues (1986) found that 10% of the elderly residents at one public housing site were admitted to nursing homes during a 1-year period, a rate seven times higher than for similarly aged community residents. Data from the New Haven Established Populations for Epidemiologic Studies of the Elderly (EPESE) study showed that participants who lived in public housing were at significantly higher risk of nursing home placement than those living in the community at large, even when the data were controlled for other demographic, economic, and health characteristics (Freedman, 1996). The study reported here examines this phenomenon and identifies risk factors for nursing home admission among elderly residents of public housing.

Low-income elders represent one third of the 1.3 million households in U.S. public housing developments (Casey, 1992). They are a growing segment of the population whose care in nursing homes would inevitably be financed in large measure by government programs, primarily Medicaid. Given the high cost of nursing home care (S. B. Cohen, Carlson, & Potter, 1995; Spillman & Kemper, 1995), the identification of factors that predict placement of these residents in nursing homes is of considerable interest, particularly if any of these factors could be modified and thereby prevent or delay placement of some residents. Preventing or delaying admissions to nursing homes provides benefits beyond those that might be realized in dollars saved. The National Long Term Care Survey demonstrated that, even among disabled elders, the majority feel it is best to stay out of nursing homes for as long as possible (Rabiner, 1996).

Most older people wish to avoid nursing home placement, but only a minority of admissions to nursing homes may be avoidable. Spector, Reschovsky, and Cohen (1996) conservatively estimated that 15% of nursing home residents could be cared for in settings that provide lower levels of care. Prior studies of elders residing in public housing have found that many residents are socially isolated and cannot count on family for assistance. For example, Holshouser (1988) found that one of the major problems confronting public housing managers was obtaining cooperation from the elderly residents' family members when needed. Therefore, identifying potentially modifiable risk factors could be useful for delaying or avoiding placement of individuals who could continue living independently if those needs were met.

Andersen’s behavioral model (Andersen, 1968) was the conceptual framework used in this study to examine predictors of nursing home placement. This is a widely used model for the study of health services use in elderly persons (Wan, 1989; Wolinsky, 1990), including predictors of nursing home placement (Wolinsky, Callahan, Fitzgerald, & Johnson, 1992, 1993), and it has been used to understand the use of mental health services in this sample of elderly public housing.

Key Words: Mental morbidity, Congregate housing, Long-term care
residents (Black et al., 1997; Black, Rabins, German, Roca, McGuire, & Brant, 1998). Andersen's model proposes that three factors determine individuals' use of health services (Andersen & Newman, 1980). The predisposing factors identify characteristics of individuals that predispose to using health services. Examples include demographic characteristics (e.g., age, sex), ethnicity, social status, attitudes, and beliefs. The enabling factors make service use possible or make it easier for services to be obtained. They include personal and community resources such as income, health insurance, and physician density. Need factors represent the level of illness (or the probability of its occurrence) perceived by the individual or the person's family or evaluated by a health care provider. Although predisposing and enabling factors are necessary for service use to occur, level of illness represents the most immediate cause of service utilization.

Previous studies of elderly people have suggested factors that may place elderly public housing residents at high risk for placement. Among the predisposing factors, advancing age is one of the most consistent risk factors for admission to a nursing home (Branch & Jette, 1982; M. A. Cohen, Tell, & Wallack, 1986; Greene & Ondrich, 1990; Rabiner, 1996; Wolinsky et al., 1992). The majority of elderly public housing residents live alone (Casey, 1992), a known risk factor for nursing home placement (Branch & Jette, 1982; Greene & Ondrich, 1990; Wolinsky et al., 1992). Some have also found ethnicity to be associated with nursing home placement, with African Americans and Hispanics being less likely than Whites to have long stays in nursing homes (Belgrave & Bradsher, 1994; Greene & Ondrich, 1990). More than one third of public housing residents aged 65 and older are African Americans (Casey, 1992), but the sample examined in this study consisted predominantly of African Americans.

Among the enabling factors, both social and economic resources are predictors of admission to nursing homes. For example, Freedman, Berkman, Rapp, and Ostfeld (1994) found that elderly participants in the EPESE study who had regular contact with kin were at lower risk of institutionalization, and in a later study Freedman (1996) reported that having at least one daughter or sibling reduced the chances of an older person being admitted to a nursing home. Other enabling factors shown to be associated with nursing home placement include informal helpers and the use of paid helpers for disabled persons and sources of payment (e.g., welfare, insurance) for services received (Boaz & Muller, 1994; Branch & Jette, 1982; M. A. Cohen et al., 1986). These resources may be particularly important to low-income elders in public housing, where supportive services are available but informal help may be less available.

Indicators of need, reflecting both physical and mental health problems, may place these residents at greatest risk for nursing home placement. Seniors in public housing have high levels of impairment in mobility and instrumental and basic activities of daily living (Holshouser, 1988). These are two of the most consistent predictors of nursing home admissions in elderly people (Belgrave & Bradsher, 1994; Branch & Jette, 1982; M. A. Cohen et al., 1986; Freedman, 1996; Greene & Ondrich, 1990; Morris, Sherwood, & Gutkin, 1988; Rabiner, 1996; Wolinsky et al., 1992, 1993). Public housing residents' self-rated physical health is significantly worse than that of other older adults and is predictive of nursing home placement (Weinberger et al., 1986), as it is for elders in the community at large (M. A. Cohen et al., 1986; Freedman, 1996; Rabiner, 1996).

The mental status of older adults is another primary predictor of admission to nursing homes (Branch & Jette, 1982; Freedman, 1996; Greene & Ondrich, 1990; Wolinsky et al., 1993). Studies have demonstrated that elderly public housing residents have higher rates of psychiatric symptoms and mental disorders than elders living elsewhere in the community (Berkman et al., 1986; Bojrab et al., 1988; Rabins et al., 1996; Rabins, Fischer, German, & Shapiro, 1987). Although cognitive disorders are the most prevalent mental disorders in this population, rates of mood disorders, psychotic disorders, and substance use disorders far exceed those generally found among older adults (Rabins et al., 1996). Each of these prevalent psychiatric disorders can result in behavioral disturbances, which have also been linked to nursing home placement of elders living in the community (German, Rovner, Burton, Brant, & Clark, 1992; Morris, Rovner, & German, 1996; Steele, Rovner, Chase, & Folstein, 1990; Stern et al., 1997). The majority of those with mental disorders in this population go untreated (Black et al., 1997). Thus, symptoms of mental illness are likely to play a major role in the admission of elderly public housing residents to nursing homes.

Given the high prevalence of mental morbidity among elderly public housing residents, a psychogeriatric outreach program in Baltimore, Maryland, called Psychogeriatric Assessment and Treatment in City Housing (PATCH) was designed to identify and treat elderly residents with mental disorders (Roca, Storer, Robbins, Tlasek, & Rabins, 1990). This program is currently being evaluated to determine its effectiveness in reducing the level of mental morbidity in this setting. One aspect of the effectiveness study was to determine the incidence of nursing home placement in this population over a 28-month period.

In the present study, we used data collected during the evaluation of the PATCH program to determine predictors of nursing home placement among this sample of elderly public housing residents. The study design allowed us to examine in multivariate regression models the influence that baseline sample characteristics, including living arrangement, physical health, functional status, and mental morbidity, had on nursing home entry for these residents. In particular, we sought to identify psychiatric symptoms, which may be amenable to treatment, that place residents at greater risk of admission to nursing homes.

Methods

We selected six public housing developments for elderly persons in Baltimore, Maryland, as sites for evaluating the effectiveness of the PATCH outreach
program. These sites were chosen because no psychiatric services were being provided on site before initiating the study. The PATCH program was modeled after characteristics of both the Gatekeeper (Raschko, 1990) and Assertive Community Treatment (Stein & Test, 1980) models for identifying and providing care to individuals in need of psychiatric treatment. The PATCH model uses indigenous housing workers as casefinders and psychiatric nurses as primary providers of care, with geriatric psychiatrists serving as supervisors and consultants (Roca et al., 1990). The PATCH program has three components: (a) educating housing staff members to understand and recognize residents who may need mental health care, (b) conducting in-home psychiatric evaluations of residents referred by housing staff members, and (c) providing on-site treatment and case management services to those in need who agree to participate in the PATCH program.

Data Collection

Figure 1 shows the design of the evaluation study that was conducted from 1992 to 1996. The study had three phases: (a) a baseline epidemiologic survey to determine prevalence of mental morbidity, (b) the intervention and monitoring phase, and (c) a final epidemiologic survey to evaluate the intervention.

At baseline, we conducted a two-stage epidemiologic survey to determine the prevalence of psychiatric disorders at the six study sites and to identify residents needing mental health care. This survey is described elsewhere in detail (Rabins et al., 1996). At Stage 1, all residents of the six study sites were asked to participate in a brief screening interview, which included the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979), the Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975), and the CAGE Questionnaire (see Appendix, Note 1; Ewing, 1984). These measures were used to screen for emotional distress, cognitive disorder, and alcohol use disorder, respectively. The Stage 1 interview also obtained information on participants’ demographic characteristics and availability of emotional support (i.e., a confidant) and instrumental social support.

Of the 1,177 residents, 945 (80.3%) gave informed consent and participated at Stage 1. Participants and nonparticipants were not significantly different (p > .05) in age, sex, years in residence, and ethnicity (when non-English-speaking residents [n = 14] who could not be interviewed were excluded from the analyses). Participants were more likely than nonparticipants to be widowed, $\chi^2(2, N = 1,147) = 20.99$, $p < .001$, and to have telephones, $\chi^2(1, N = 1,177) = 19.42$, $p < .001$. The majority of Stage 1 participants were female (75%), African American (93%), and lived alone

![Figure 1. Overview of study methodology. PATCH = Psychogeriatric Assessment and Treatment in City Housing.](attachment:figure1.png)
of daily living (Lawton & Brody, 1969), and (c) mobil-
gastrointestinal disorders, glaucoma, epilepsy, gout,
dicators: (a) an activities of daily living (ADL) index 
orders [e.g., Paget’s disease].
daily living (Katz, Ford, Moskowitz, Jackson, & Jaffee, 
were estimated on the basis of participants’ prescribed 
ease, chronic obstructive pulmonary disease, diabetes-
ment categories were identified (cardiovascular dis-
microvascular, and behavioral disorder, and the 10-item Montgom-
er, Williams, Gibbon, & First, 1988) and a 
Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 
X2(1, N = 360) = 4.22.
We assessed mental health using several methods. 
the Structured Clinical Interview for DSM–III–R (Splt-
er, Williams, Gibbon, & First, 1988) and a DSM–III– 
algorithm (developed for this study) for diagnosing cognitive disorders were used to identify 
Stage 2 participants with psychiatric disorders (see Appendix, Note 2). Stage 2 participants were also 
for psychiatric symptoms by using the 16-item Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 
which is a measure of overall psychopathology and behavioral disorder, and the 10-item Montgom-
ery-Asberg Depression Rating Scale (MADRS; MONTGOMERY & ASBERG, 1979), which is used to assess mood 
in persons with depression. Participants’ self-rated mental health was determined by a single item rated 
as excellent, good, fair, poor, or very bad.
We used two indicators to determine participants’ 
physical health status. Self-rated physical health was 
based on a single item rated as excellent, good, fair, 
or poor. Number of current major medical illnesses 
were estimated on the basis of participants’ prescribed 
medications. Information on all medications shown to 
be prescribed, 298 (82.8%) agreed to participate at Stage 2. There were no significant differences (p > .05) be-
tween Stage 2 participants and nonparticipants based on sex, χ2(1, N = 360) = .07; age, t(87) = -7.5; 
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summarize the baseline Stage 2 sample characteristics and the participants' use of health services. Chi-square and Cox proportional hazard regression analyses were used to determine the relationship between the intervention and nursing home placement. In addition to using indicators for the predisposing, enabling, and need factors of Andersen's behavioral model (Andersen, 1968), baseline measures of health services use (i.e., medical visits, mental health care, and formal home care) were included in the analyses to determine whether the use of health services influenced nursing home placement (Wolinsky et al., 1992, 1993).

Weighted Stage 2 data were used in logistic regression analyses to determine the predictors of nursing home placement. Bivariate logistic regression analyses were first used to determine which sample characteristics were associated with nursing home placement, based on \( p \) values of less than .10. A stepwise logistic regression procedure was then used to determine which of those factors independently predicted nursing home placement in this sample. Proportional hazard analysis is an alternative approach for determining predictors of nursing home placement that takes into account time to placement; however, weighted data cannot be used for that procedure. We chose to use logistic regression analyses with weighted data as our primary statistical method in order to make inferences about the total sample as the follow-up periods at the six study sites were similar. Cox proportional hazard models were also calculated by using unweighted Stage 2 data to determine whether the findings from these two methods (i.e., logistic regression and proportional hazard) would be similar. The proportional hazard analyses were conducted following the same general approach as that used in the logistic regression analyses: Bivariate analyses were conducted first to identify which characteristics were associated \( (p < .10) \) with nursing home placement, followed by a stepwise model to determine which of those sample characteristics independently predicted placement.

### Results

Characteristics of the Stage 2 sample and their use of health services are listed in Table 1. As was the case for the Stage 1 sample, the majority of these residents were female (84%) and African American (95%), with few (5%) who did not live alone. On average, they were aged 74 (SD = 7.3) and had 8 (SD = 3.5) years of education. Most participants (73%) said they had someone to count on for help with daily activities (instrumental social support) or said no help was needed.
needed, and 43% reported actually receiving home care from informal sources. The indicators of need showed that almost half (47%) of the participants rated their physical health as fair or poor, but fewer than 7% perceived their mental health to be poor or very bad. Ten percent of this sample had poor mobility, and more individuals had impairments in IADLs than in ADLs. The most prevalent psychiatric disorders in this sample were cognitive disorders (10%) and mood disorders (8%). One third of these residents reported receiving mental health care in the previous 6 months from either their primary medical provider or a mental health specialist. Nineteen percent had used formal home care services in the previous 6 months.

Over the 28-month period of monitoring the six study sites, 10% of the total Stage 1 sample died and 6% moved to nursing homes. On the basis of weighted data, 4% of the Stage 2 sample were placed in nursing homes during that period. There were no significant differences between the intervention and comparison sites in their rates of nursing home placement, based on data from either the Stage 1 sample, \( \chi^2(1, N = 945) = 1.33, p = .249 \), or the weighted Stage 2 sample, \( \chi^2(1, N = 880) = 0.22, p = .640 \). A Cox proportional hazard model showed that the intervention had no significant effect on nursing home placement (risk ratio = 1.01, \( p = .98 \), confidence interval = \( .45-2.27 \)). Thus, Stage 2 data from both the intervention and comparison sites were examined as a single group in order to analyze factors leading to nursing home placement.

Table 2 shows the odds ratios (ORs), \( p \) values, and 95% confidence intervals (CIs) for the bivariate relationships between baseline characteristics of the Stage 2 sample and nursing home placement. Age was the only predisposing factor associated with nursing home placement, and receiving informal home care was the only significant enabling factor. Most of the need characteristics were associated with an increased likelihood of nursing home placement, including seven of the nine mental status indicators (poor/very bad self-rated mental health, GHQ positive, cognitive disorder, psychotic disorder, anxiety disorder, MADRS scores, and BPRS scores). Residents with a cognitive disorder (OR = 12.39) and those with poor mobility (OR = 10.51) were at highest risk of moving to a nursing home. Using formal home care services and receiving any mental health care in the 6 months before being interviewed at baseline were also significantly related to entering a nursing home during the 28-month follow-up period.

We calculated a stepwise logistic regression analysis to determine which of the factors associated (\( p < .10 \) with nursing home placement listed in Table 2 were the strongest predictors in this sample. Table 3 shows each significant variable in the order that it entered the model, and the final model, with ORs and 95% CIs, is shown on the right. The 5 variables (out of 14 used in the analysis) that entered the model were IADL impairments (OR = 1.22), cognitive disorder (OR = 10.23), positive GHQ score (OR = 7.27), psychotic disorder (OR = 4.46), and anxiety disorder (OR = 4.73). Although anxiety disorder remained in the model, its confidence interval included 1, and the \( p \) value was greater than .05 (\( p = .053 \)). With these factors in the model, no other sample characteristic had a significant independent relationship to nursing home placement.

Cox proportional hazard analyses performed with unweighted Stage 2 data revealed findings partially consistent with the logistic regression analyses (data not shown in tabular form). The bivariate proportional hazard analyses identified fewer sample characteristics associated with nursing home placement than were identified in the bivariate logistic regression analyses using weighted data. In the proportional hazard models, self-rated mental health, psychotic disorder, and

<p>| Table 2. Nursing Home Placement of Stage 2 Participants by Baseline Characteristics |
|---------------------------------|--------|-----------------|------------------|</p>
<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>Odds Ratio</th>
<th>( p ) Values*</th>
<th>95% Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predisposing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (female)</td>
<td>0.68</td>
<td>ns</td>
<td>0.29-1.57</td>
</tr>
<tr>
<td>Age</td>
<td>1.12</td>
<td>&lt;.001</td>
<td>1.07-1.18</td>
</tr>
<tr>
<td>Race (African American)</td>
<td>0.44</td>
<td>ns</td>
<td>0.14-1.38</td>
</tr>
<tr>
<td>Living with someone</td>
<td>2.46</td>
<td>ns</td>
<td>0.79-7.63</td>
</tr>
<tr>
<td>Education</td>
<td>0.93</td>
<td>ns</td>
<td>0.84-1.03</td>
</tr>
<tr>
<td><strong>Enabling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has confidant</td>
<td>0.71</td>
<td>ns</td>
<td>0.23-2.15</td>
</tr>
<tr>
<td>Instrumental social support</td>
<td>1.28</td>
<td>ns</td>
<td>0.55-2.95</td>
</tr>
<tr>
<td>Medicare insurance</td>
<td>0.98</td>
<td>ns</td>
<td>0.32-2.99</td>
</tr>
<tr>
<td>Medicaid insurance</td>
<td>1.51</td>
<td>ns</td>
<td>0.70-3.28</td>
</tr>
<tr>
<td>Regular medical provider</td>
<td>0.70</td>
<td>ns</td>
<td>0.33-1.48</td>
</tr>
<tr>
<td>Informal home care</td>
<td>8.22</td>
<td>&lt;.001</td>
<td>3.11-21.73</td>
</tr>
<tr>
<td><strong>Need</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated physical health</td>
<td>1.86</td>
<td>ns</td>
<td>0.87-3.99</td>
</tr>
<tr>
<td>health (fair/good)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major medical illnesses</td>
<td>0.95</td>
<td>ns</td>
<td>0.70-1.29</td>
</tr>
<tr>
<td>IADL index score</td>
<td>1.37</td>
<td>&lt;.001</td>
<td>1.26-1.49</td>
</tr>
<tr>
<td>ADL index score</td>
<td>1.52</td>
<td>&lt;.001</td>
<td>1.30-1.77</td>
</tr>
<tr>
<td>Poor mobility</td>
<td>10.51</td>
<td>&lt;.001</td>
<td>5.03-21.95</td>
</tr>
<tr>
<td>Self-rated mental health</td>
<td>3.48</td>
<td>.008</td>
<td>1.38-8.76</td>
</tr>
<tr>
<td>(poor/very bad)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHQ positive</td>
<td>7.62</td>
<td>&lt;.001</td>
<td>3.68-15.80</td>
</tr>
<tr>
<td>Cognitive disorder</td>
<td>12.39</td>
<td>&lt;.001</td>
<td>5.99-25.65</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>0.93</td>
<td>ns</td>
<td>0.25-3.52</td>
</tr>
<tr>
<td>Psychotic disorder</td>
<td>2.81</td>
<td>.075</td>
<td>0.90-8.76</td>
</tr>
<tr>
<td>Substance use disorder</td>
<td>1.82</td>
<td>ns</td>
<td>0.47-7.00</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>4.56</td>
<td>.034</td>
<td>1.12-18.57</td>
</tr>
<tr>
<td>MADRS score</td>
<td>1.09</td>
<td>&lt;.001</td>
<td>1.04-1.13</td>
</tr>
<tr>
<td>BPRS score</td>
<td>1.06</td>
<td>&lt;.001</td>
<td>1.03-1.09</td>
</tr>
<tr>
<td><strong>Health Services Use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical visits</td>
<td>0.81</td>
<td>ns</td>
<td>0.48-1.37</td>
</tr>
<tr>
<td>Mental health care</td>
<td>2.67</td>
<td>.006</td>
<td>1.32-5.39</td>
</tr>
<tr>
<td>Formal home care</td>
<td>7.57</td>
<td>&lt;.001</td>
<td>3.51-16.34</td>
</tr>
</tbody>
</table>

*Notes: Weighted \( n = 881 \). For each baseline participant characteristic, a logistic regression model was computed to determine its relationship to nursing home placement within the following 28 months. ADL = activities of daily living; IADL = instrumental ADL; GHQ = General Health Questionnaire; MADRS = Montgomery-Asberg Depression Rating Scale; BPRS = Brief Psychiatric Rating Scale.

\* \( p \) values greater than .10 are listed as not significant.
anxiety disorder were not significant (p < .10) predictors of nursing home placement and, therefore, were not used in the subsequent multivariate analysis. The stepwise proportional hazard analysis, which included all the significant variables from the bivariate analyses, showed (in order of entry) that IADL impairments (RR = 1.23, p < .001, CI = 1.12–1.34) and cognitive disorder (RR = 3.98, p < .01, CI = 1.63–9.72) were significantly associated with nursing home placement. Although these findings are similar to those of the final logistic regression analysis (using weighted data), GHQ positive (p = .07) failed to reach the level of statistical significance required for entry into the proportional hazard model (using unweighted data).

### Discussion

This study demonstrates that nursing home placement of elderly public housing residents is predicted primarily by functional status and mental status. The IADL index score, which entered the logistic regression model first, was the only measure of functional status in the final model, indicating that the likelihood of nursing home placement was greater as the need for assistance with activities such as shopping, using the telephone, and handling finances increased. Although IADL impairments have been found to predict placement in previous studies of older adults (Belgrave & Bradsher, 1994; Branch & Jette, 1982; Morris et al., 1988; Rabiner, 1996), neither ADL impairments nor poor mobility were independently associated with nursing home entry in this sample, as has been found for elders in general (Freedman, 1996; Osterweil, Martin, & Syndulko, 1995; Wolinsky et al., 1993). The most likely explanation is that almost all elderly residents of public housing (95%) live alone and so become unable to live independently before ADLs or gait become impaired.

The other four risk factors for nursing home placement in the final model were indicators of mental health. Cognitive disorder was the second variable to enter the model as an independent predictor of nursing home placement in this sample, a finding consistent with other studies (Abraham, Currie, Neese, Yi, & Thompson-Heisterman, 1994; Branch & Jette, 1982; Freedman, 1996; Greene & Ondrich, 1990; Osterweil et al., 1995; Wolinsky et al., 1993). Although cognitive impairment was not a significant predictor of placement on the basis of data from the National Long-Term Care Survey when other predisposing, enabling, and need factors were included in the model, it was associated with the belief that it is best to stay out of nursing homes as long as possible (Rabiner, 1996). The importance that cognitive disorder has on admission of public housing residents to nursing homes is not surprising, given the prevalence of dementia in this population (10%; Rabins et al., 1996) and the adverse impact of cognitive impairment on functional status and the ability to live independently. Having a GHQ score of 5 or more was the third variable to enter the final logistic regression model. Residents with moderate or severe symptoms of emotional distress, as measured by the GHQ, were seven times more likely to enter nursing homes than those with fewer symptoms. Although this finding was not replicated in the proportional hazard model, it suggests the need to examine this indicator in further studies. If a high GHQ score proves to be predictive of nursing home entry in other samples, it could be an important screening tool for identifying older adults at high risk of nursing home placement whose symptoms might be amenable to intervention.

Psychotic disorder was the fourth variable to enter the model as a predictor of nursing home placement. That is, residents with symptoms such as delusions and hallucinations are almost four-and-a-half times more likely to be admitted to a nursing home. Previous studies that have found psychotic symptoms to be predictive of nursing home placement examined participants with dementia (Morris et al., 1996; Steele et al., 1990). The present study found psychotic symptoms to be predictive of placement independent of cognitive disorder. Although anxiety disorder also entered the final logistic regression model, this variable failed to reach statistical significance by a slim margin (p = .053), probably due to the lower prevalence of anxiety disorder (2%) in this sample than of cognitive disorder (10%) or psychotic disorder (5%). Further examination of the relationship between anxiety and nursing home placement is warranted.

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### Table 3. Logistic Regression Model for Nursing Home Placement

<table>
<thead>
<tr>
<th>Variables in Model</th>
<th>Forward Stepwise Model&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Final Model&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step</td>
<td>–2 log Likelihood</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>238.25</td>
</tr>
<tr>
<td>IADL score</td>
<td>1</td>
<td>191.65</td>
</tr>
<tr>
<td>Cognitive disorder</td>
<td>2</td>
<td>178.86</td>
</tr>
<tr>
<td>GHQ positive</td>
<td>3</td>
<td>160.45</td>
</tr>
<tr>
<td>Psychotic disorder</td>
<td>4</td>
<td>157.19</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>5</td>
<td>154.18</td>
</tr>
</tbody>
</table>

<sup>a</sup>Forward stepwise model, with entry based on p < .05 and removal based on p > .10, using the Wald statistic.

<sup>b</sup>Variables not entering the model: age, informal home care, Activities of Daily Living score, poor mobility, poor/very bad self-rated mental health, Brief Psychiatric Rating Scale score, Montgomery-Asberg Depression Rating Scale score, home health care, and mental health care.

* *p < .05; ***p < .001.

Notes: IADL = instrumental activities of daily living; GHQ = General Health Questionnaire.
Several factors that predicted nursing home placement in other studies—age (Branch & Jette, 1982; M. A. Cohen et al., 1986; Greene & Ondrich, 1990; Rabiner, 1996; Wolinsky et al., 1992), informal help with daily activities (Boaz & Muller, 1994), and use of formal home care services (Jette, Tennstedt, & Crawford, 1995)—did not enter the final regression model, although they were significant in bivariate analyses. It is likely that their failure to enter the model is due to strong correlations with the significant factors, particularly IADL impairments. Although previous studies have found self-rated health to be associated with nursing home placement (M. A. Cohen et al., 1986; Freedman, 1996; Rabiner, 1996; Weinberger et al., 1986), residents in this sample who perceived their physical health to be fair or poor were no more likely to enter nursing homes than those with ratings of excellent or good; whereas those with poor or very bad self-rated mental health were at significantly increased risk (OR = 3.5) of placement, based on bivariate analysis. The high prevalence of current mental disorders (28%) in this population (Rabins et al., 1996) may account for this significant relationship, but the failure of this factor to enter the final model is likely due to its correlation with the other status factors that were significant, such as being GHQ positive, which is also a self-reported measure of mental health.

In assessing the implications of these findings, the limitations of the study should be considered. This research was conducted in only one geographic area, a city in the mid-Atlantic region of the United States, in which African Americans represent a high proportion (87%) of the elderly persons living in public housing. Therefore, these results may not be extrapolated to elderly public housing residents in demographically different regions or from different ethnic backgrounds. This study relied on self-reported data. As most of these residents lived alone, the use of proxy informants was not possible. Furthermore, the reliability of some data provided by those with cognitive disorders is unknown. Data on residents' social network, frequency of contacts with family members, and informal caregiver characteristics, factors that have been linked to nursing home placement in other studies (Freedman, 1996; Freedman et al., 1994; Jette et al., 1995), were not gathered in this study.

The use of weighted data is an issue for debate. Some would argue that this approach artificially inflates the sample size and therefore influences hypothesis testing. For example, in this study, the analysis using weighted data differed from the analysis using unweighted data by allowing GHQ positive status and psychotic disorder to enter the regression model as significant predictors of nursing home placement. However, weighting data to adjust for sampling and nonresponse has been used in large epidemiologic studies such as the Epidemiologic Catchment Area study (Holzer et al., 1985) and in outcome studies, such as those conducted by Ormel and colleagues (Ormel et al., 1990), because it allows investigators to make inferences about the total population from which the sample was obtained. This advantage is illustrated in the present study. Conducting a clinician-based assessment of all 945 Stage 1 participants would have been prohibitively expensive. By selecting all the Stage 1 participants who screened positive and a 10% random sample of those who screened negative, the study was able to fully assess Stage 2 participants with the risk factors of interest and a random sample of those with fewer risk factors. The two-stage approach maximizes the ability to study populations rather than convenience samples. When random sampling is used to control costs and enhance efficiency, weighting is an appropriate technique.

Several baseline characteristics of this sample (race, living arrangement, anxiety disorder) had little variability and could almost be regarded as constants. Nevertheless, we chose to examine these variables in bivariate analyses because previous studies have suggested that they may influence the use of health services and nursing home placement. For example, data from the Longitudinal Study on Aging showed that African Americans are less likely to be placed in nursing homes than Whites (Wolinsky et al., 1992, 1993). Our previous work has also shown that African Americans residing in public housing who need mental health care are less likely to receive it, but those who have an anxiety disorder are more likely to obtain care (Black et al., 1997). In this study, factors that were not associated (p < .10) with nursing home placement in bivariate analyses, such as race and living arrangement, were ultimately not included in the multivariate analyses.

Within the context of Andersen's behavioral model (Andersen, 1968), age and informal home care were the only predisposing and enabling factors associated in bivariate analyses with nursing home placement, but these factors did not enter the final stepwise logistic regression model. Indicators of need—impairments related to IADLs and mental morbidity—were the primary predictors of admission to nursing homes in this setting. Previous studies of health services utilization based on Andersen's model have consistently found that need factors have the greatest influence on service use among elderly persons (Coulton & Frost, 1982; Wan, 1989).

Public housing residents have a high rate of unmet need for mental health care (Black et al., 1997). This study demonstrates that psychiatric symptoms, as measured by the GHQ, BPRS, and MADRS, place residents at increased risk of entering a nursing home and emphasize the need to identify and treat those who are suffering from depression, anxiety, and other psychiatric symptoms such as delusions and hallucinations. Because these symptoms are also the most frequently cited reasons for asking congregate housing residents to leave or for refusing to renew a lease (Barker, Mitteness, & Wood, 1988; Bernstein, 1982), their treatment has the potential for delaying or preventing nursing home placement. However, for many public housing residents whose physical functioning or mental health prevents them from continuing to live independently, entering a nursing home may be the most appropriate placement and ultimately may not be preventable.
Appendix

Notes

1. The CAGE acronym refers to the four questions that comprise the instrument: (a) Have you ever felt you should Cut down on your drinking? (b) Have people Annoyed you by criticizing your drinking? (c) Have you ever felt bad or Guilty about your drinking? and (d) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (an Eye-opener)?

2. The Structured Clinical Interview for DSM-III-R is a semistructured questionnaire that enables the examiner to assess participants for 33 of the most frequently diagnosed psychiatric disorders for research purposes. The DSM-III-R-derived algorithm for diagnosing cognitive disorder (available on request) is used to assess cognitive functioning associated with long-term memory, abstraction, judgment, delirium, and intoxication.

Project manager wanted to coordinate activities of Laboratory studying Alzheimer's disease and related disorders in Cleveland, Kenya and Israel. Manager needed to oversee daily activities involved in international epidemiological studies of risk and protective factors, especially genes and lifestyle factors in the development of Alzheimer's disease. Supervision of several research assistants and coordination of field work, correspondence and data exchange and management involving investigators in Cleveland, Kenya, and Israel. Masters degree in epidemiology, social work, sociology, psychology, statistics or related discipline desired. Research experience also desirable.

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