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# Formal Home Care Utilization Patterns by Rural–Urban Community Residence

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***Background.*** We examined formal home care utilization among civilian adults across metro and nonmetro residential categories before and after adjustment for predisposing, enabling, and need variables.

***Methods.*** Two years of the Medical Expenditure Panel Survey (MEPS) were combined to produce a nationally representative sample of adults who resided in the community for a calendar year. We established 6 rural–urban categories based upon Urban Influence Codes and examined 2 dependent variables: (a) likelihood of using any formal home care and (b) number of provider days received by users. The Area Resource File provided county-level information. Logistic and negative binomial regression analyses were employed, with adjustments for the MEPS complex sampling design and the combined years.

***Results.*** Under controls for predisposing, enabling, and need variables, differences in likelihood of any formal home care use disappear, but differences in number of provider days received by users emerged, with fewer provider days in remote areas than in metro and several other nonmetro types.

***Conclusions.*** It is important to fully account for predisposing, enabling, and need factors when assessing rural and urban home care utilization patterns. The limited provider days in remote counties under controls suggest a possible access problem for adults in these areas.

***Key Words*:** Home health—Metropolitan—Nonmetropolitan—Long-term care.

## Adult Formal Home Care Utilization Patterns by Rural–Urban Community Residence

The goal of this paper is to assess similarities and differences in formal home care utilization patterns across metro and nonmetro counties in a nationally representative sample of the U.S. adult civilian noninstitutionalized population. We operationalize formal home care as financially reimbursed health-related services delivered to clients in the home. Paid home care may be funded by private or government sources, including Medicaid and Medicare (Spector, Cohen, & Pesis-Katz, 2004). The range of services includes acute, chronic, and terminal care, and formal home care may be provided through certified home health agencies, noncertified agencies, and independent providers (Kane, 1999). It should be noted that our representation of formal home care as paid care is only one approach to specifying types of home care and that in many cases paid and unpaid home care helpers share similar roles, goals, and responsibilities from the perspective of the recipient (Porter, Ganong, Drew, & Lanes, 2004).

Our examination of rural–urban differences in patterns of formal home care use draws heavily upon a modified version of the Andersen–Newman framework for individual use of medical care utilization (Andersen & Newman, 2005). Andersen and Newman proposed that an individual's utilization of medical care is due to three broad categories of factors: (a) societal factors, which encompass technology and norms and are generally inferred due to limitations of data and theory (Andersen and Newman, 2005, p. 6); (b) health system factors, encompassing resource and organizational issues, including the distribution of health care resources; and (c) individual determinants, consisting of predisposing, enabling, and illness level. Predisposing characteristics address the propensity to use health care and are measured in terms of personal and family characteristics, such as age, sex, marital status, education, race/ethnicity, and occupation. Enabling characteristics, which reflect the ability to access services, are measured in terms of income, insurance, type of and access to regular source of care, ratios of health personnel, and facilities to the population. Andersen and Newman also included rural–urban residence among the enabling characteristics. The final individual characteristic is illness, which is described by Andersen and Newman in terms of disability, diagnoses, and symptoms. Andersen and Newman emphasized the importance of these need-related factors as determinants of utilization. It should be noted that they did not include activities of daily living among the need variables. Their omission of activities of daily living may be a result of the fact that they did not directly address home care utilization in explicating their framework, focusing instead on hospital admissions, physician visits, and dentist visits. They stated, however,

that different health care types require different configurations of explanatory factors, and we have included activities of daily living as need measures, due to their frequent utilization as measures of home care need by providers and funding agencies and prior research suggesting significant associations of formal home care and activities of daily living (Johnson & Wolinsky, 1996).

Another revision of the Andersen–Newman framework for our purposes is to give emphasis and separate consideration to rural–urban residential types as proxies for within-U.S. societal and health system characteristics. Andersen and Newman (2005) emphasized country-level social system and the health services system characteristics as precursors to one's individual determinants of utilization. These macrolevel factors are likely to differ substantially from country to country but are not easily addressed within any country. We assert that rural–urban residence is a measure that incorporates multiple internal societal and health system differences within the U.S. health care system by capturing many of the internal normative, lifestyle (Congdon & Magilvy, 1998), technology, and health care distribution differences associated with formal home care. We describe these rural–urban differences in our justification for the focus on rural–urban residence subsequently.

Although there have been numerous studies suggesting that residents across rural and urban environments have different formal home care utilization patterns, the findings of these studies have been inconsistent and the factors explaining any identified differences have been limited (Coburn, 2002). Known predisposing, enabling, and need variations in the U.S. rural and urban population offer a rationale for an in-depth examination of rural–urban home care utilization. For example, rural residents are more likely to (a) have poverty-level incomes and low-wage positions (Gelfi & Parker, 1997; Reeder & Calhoun, 2002; Ziller, Coburn, Loux, Hoffman, & McBride, 2003); (b) be older (Reeder & Calhoun, 2002; Ziller et al., 2003); (c) have more chronic conditions such as arthritis, diabetes, hypertension, and heart disease (Nelson, 1994; Ziller et al., 2003); (d) report poorer health (Rogers, 2002), especially in the most rural areas (Medicare Payment Advisory Commission [MedPAC, 2001]); (e) report having a usual source of health care, though they experience fewer annual health provider visits (Larson & Fleishman, 2003); (f) make more use of informal assistance (Coward & Cutler, 1989); and (g) use Medicare and Medicaid for their acute and chronic care needs (Coburn; Reeder & Calhoun, 2002; Ziller et al., 2003). An analysis by McAuley, Spector, Shaffer, and Van Nostrand (2004) suggested that Medicaid coverage is an especially strong predictor of home care use in rural versus urban counties.

Hospitals might in some cases substitute for formal home care through the provision of outpatient or office-based acute and chronic services and in other cases generate formal home care utilization through discharges. For example, most home care visits to fee-for-service Medicare beneficiaries are preceded by a hospitalization (Welch, Wennberg, & Welch, 1996). Hospital beds are generally less available in rural counties (Dalton, Van Houtven, Slifkin, Poley, & Howard, 2002; Dansky, Brannon, Shea, Vasey, & Dirani, 1998; Dansky & Dirani, 1998; Kenney, 1993a, 1993b; Kenney & Dubay, 1992; Rogers, 2002). On the other hand, rural Medicare beneficiaries are more likely than urban beneficiaries to be admitted to a hospital at least once and to experience more hospital admissions per user (MedPAC, 2001). There are fewer physicians per 100,000 residents in nonmetro areas (Rogers, 2002). On the other hand, the per capita number of nursing home beds, a potential substitute service modality for formal home care, is higher in rural counties (Shaughnessy, 1994), although there is greater variation in beds and bed rates in nonmetro than metro counties because larger percentages of nonmetro counties have no facilities (McAuley, Pecchioni, & Grant, 2002). There are fewer home health agencies per county and per square mile in rural than in urban counties (Kenney & Dubay, 1992). The Balanced Budget Act of 1997 acted to further reduce the relative number of home care agencies and staff in most rural counties (McAuley, Spector, & Van Nostrand, 2008).

Much prior research on formal home care has been based upon Medicare Beneficiary Files (Dansky et al., 1998; General Accounting Office, 2000, 2002; Kenney, 1993a, 1993b; Kenney & Dubay, 1992; McCall, Komisar, Petersons, & Moore, 2001) or information from Medicare-certified home health agencies (MedPAC, 2006; Sutton, 2006). These data sources limit findings to subsets of Medicare beneficiaries and to Medicare reimbursed services, in spite of known differences (Shaughnessy, Schenkler, & Hittle, 1994).

Given our interest in understanding rural–urban differences in formal home care utilization, we examined whether there were such differences in (a) any expenditure for health-related formal home care and (b) number of provider days among users, prior to and after adjustment for predisposing, enabling, and need variables and after adjustments for these variables, in order. Because we have a relatively robust set of variables based upon the Andersen–Newman conceptual framework, we hypothesized that predisposing, enabling, and need factors would eliminate any unadjusted differences in likelihood of use (H1a) between metro residence and the nonmetro residence block, (H1b) between each nonmetro residence type and metro residence, and (H1c) between nonmetro residences. We further hypothesized that more limited access to home health agencies and a more limited range of home care professional categories in the most remote nonmetro areas (McAuley et al., 2008) would, among formal home care users, lead to fewer provider days between (H2a) remote and metro residence and (H2b) remote counties in comparison with other nonmetro categories.

Table 1. Operationalization of Rural–Urban Categories

| Urban Influence Codes | Rural–Urban Analytical Categories | | | | | |
|---|---|---|---|---|---|---|
| | Metro (comparison category) | Micro | Adjacent to metro | Adjacent to micro | Not adjacent/own town | Remote |
| (1) Large metro area of 1+ million | X | | | | | |
| (2) Small metro area of <1 million | X | | | | | |
| (3) Micropolitan area (urban cluster of >10,000) adjacent to large metro | | X | | | | |
| (4) Noncore adjacent to large metro | | | X | | | |
| (5) Micropolitan adjacent to small metro | | X | | | | |
| (6) Noncore adjacent to small metro, contains town of at least 2,500 | | | X | | | |
| (7) Noncore adjacent to small metro area with no town of 2,500 | | | X | | | |
| (8) Micropolitan area not adjacent to a metro area | | X | | | | |
| (9) Noncore adjacent to metro area, contains town of at least 2,500 | | | | X | | |
| (10) Noncore adjacent to micro area and no town of 2,500 | | | | X | | |
| (11) Noncore not adjacent to metro or micro area, contains town >2,500 | | | | | X | |
| (12) Noncore not adjacent to metro or micro area and no town of 2,500 | | | | | | X |

## Methods

This investigation is based upon the consolidated annual files of the Medical Expenditure Panel Survey (MEPS) for 2002 and 2003. The MEPS is a national survey of households examining health status, health care coverage, health care utilization, and costs. The sampling frame is derived from the National Health Interview Survey and uses a complex multistage sampling design (AHRQ, 2004). African Americans and Hispanics are oversampled, and weighting procedures address the oversampling. The overall combined response rates for 2002 and 2003 were 64.7% and 64.5%, respectively (AHRQ, 2004, 2005). With the application of appropriate weights, taking into account the merger of 2 years of data and the complex sample, the MEPS is a nationally representative sample of the noninstitutionalized civilian population during 2002–2003. The merger of 2 years, adjusted by appropriate weights and sample design features, improves the standard errors of estimates while providing unbiased estimates (Sommers, 2006; Williams, 2000).

As has been noted previously, the dependent variables employed in this analysis were (a) whether each person received formal home care during the year and (b) among users, the number of home care provider days received during the year. Determination of formal home care use in the MEPS was based upon a series of questions from multiple interviews over time and follow-up efforts, including contacting home health agencies and independent paid providers and reviews of billing and payment records to establish whether each sample member actually received the service, and if so, the number of provider days and costs. The formal home care utilization data were collected by MEPS on a per-month basis (AHRQ, 2005). In the MEPS data, formal home care consists of paid health-related care provided at home through all governmental sources as well as private sources, including fee-for-service and managed care organizations. For persons receiving any paid home care, total provider days was calculated by summing the number of days that home care was received from each provider. Thus, if an individual was visited by the same provider twice in a single day, the two visits were counted as one home care provider day, but if the individual received visits from two different providers in the same day (whether or not they were the same type of provider), each was counted as a separate home care provider day in calculating the total home care provider days received during the year. Although the formal home care data were carefully collected and audited, including provider follow-ups, the provider day calculations were made prior to entry into the available analytical file. Therefore, it was not possible for us to separate the number of days home health care was received from the number of different providers who visited a recipient in a day.

Information from the Area Resource File (Bureau of Health Professions, 2005) was used to establish rural and urban residential categories. We employed the Urban Influence Codes (UICs) in the analyses because they reflect the allocation of various levels of health care systems across geographical areas (Baer, Johnson-Webb, & Gesler, 1997; Gelfi & Parker, 1997; Ricketts, Johnson-Webb, & Taylor, 1998). The 2003 UIC coding system includes 12 categories ranging from large metro counties to counties that are not adjacent to metro counties and whose largest town or urban cluster population is less than 2,500. Even with the relatively large number of cases obtained by combining 2002 and 2003 MEPS samples, splitting the sample into 12 UIC categories would lead to complexities with analysis and interpretation and a large number of categories with few cases. Therefore, we combined the original 12 UIC categories into six groups. See Table 1 for a depiction of our approach for combining the UIC categories.

The combined 2002–2003 MEPS data set includes person-level information on 70,199 individuals who were eligible for the entire year. Because the MEPS interview instrument gathers different types of health-related information for adults versus those younger than age 18, we limited the analysis to the 48,587 sample members age 18 and older at the beginning of the year and who were identified as alive and in the sample for the entirety of the year. The sample was further reduced somewhat, due to missing

information on certain variables, with the largest numbers missing for education ($n$ = 254), functional limitation ($n$ = 75), and having a usual source of care ($n$ = 200). The final analytical file included 48,135 cases. The total number of cases receiving home care for the sample was 1,216. With listwise deletion, this number was reduced to 1,033.

The final set of variables used in the full analytical sample and the formal home care user sample are displayed in Table 2. The percentages, means, and standard errors presented in this table are weighted and adjusted for the MEPS complex sample design. It should be noted that all diagnosed illnesses available in the MEPS consolidated annual files for adult household members were included in the diagnoses. Furthermore, in some cases, the questions that determined the diagnoses and some other personal characteristics (e.g., poverty status) were asked relatively late in the year, whereas the use of formal home care covers the entire year. Therefore, it is likely that in some cases diagnoses were captured during or after a spell of home care use.

An initial review of correlation coefficients among the potential independent variables led to the exclusion of one potential independent variable, median home value, which was highly correlated (0.44) with median household income. Assessments of correlations between all other independent variables were well below 0.4. Following the correlation analyses, we conducted a series of variance inflation factor (VIF) analyses by performing linear regressions, with each potential independent variable iteratively included as the dependent variable and using the appropriate weights and complex sample adjustments. These VIF analyses were conducted for the full research sample and for the subsample of formal home care users. In no case did the VIF exceed 6.5, which is well below the criterion for concern of 10, suggesting that there were no potential multicollinearity problems. Therefore, no other variables were removed.

Logistic regression was employed to examine the factors predicting use versus nonuse of formal home care, focusing on the odds ratios associated with each model variable and the significance of the added variable blocks at each stage. Because the number of person days of home care received is an overdispersed count variable, we employed negative binomial regression to examine these models. We focused on the incidence rate ratios (IRRs), which can be interpreted as the relative incidence rate of home care person days per unit change in each model variable, holding other variables constant. In each of these regression analyses, we considered four variable blocks: the effect of the rural–urban residence variables alone, followed by the addition of predisposing variables, enabling variables, and illness variables, respectively. In each case, we determined the significance level of the added variable block and the significance of the nonmetro block (in order to determine whether nonmetro counties as a group differed from metro counties). Furthermore, model-adjusted Wald postestimation tests of differences across all nonmetro residence types were conducted to permit us to draw comparisons and test their significance. Due to the complex sample design employed by the MEPS and the combination of 2 years of data, the survey suite of the Stata statistical package, version 10 (StataCorp, 2007), was used in all analyses.

## Results

Table 3 presents the results of logistic regression analyses examining the likelihood of receiving formal home care during the year. Because metro residence is omitted, the odds of use in each nonmetro residential category is in comparison with utilization odds among persons residing in metro counties. Considering the results based solely upon residential category (Block 1 of Table 3), adults residing in micro counties were slightly less than twice as likely as those in metro counties to use home care at some point during the year. Adult remote residents had an approximately three times greater likelihood of using home care than did metro residents. Furthermore, the model-adjusted Wald postestimation tests suggest that adults residing in remote counties were significantly more likely to use home care than were adult residents of micro counties and residents of counties adjacent to metro areas.

Block 2 of Table 3 adds predisposing variables to the model. The predisposing variables, as a set, were significant, controlling for residence. The odds of using home care increased with increasing age and were also higher for White non-Hispanics, persons covered by Medicaid, and nonsenior adults covered by Medicare. Married persons residing with a spouse were less likely to receive formal home care. Under adjustments for the predisposing characteristics, no nonmetro category was significantly different than metro residents in the likelihood of using formal home care. Furthermore, the nonmetro variable set (Block 1) was not statistically significant under controls for the predisposing variable set. The model-adjusted Wald postestimation significance tests yielded one significant comparison: Remote residents were more likely than individuals residing in counties adjacent to metro areas to receive formal home care during the year.

Results of incorporating enabling variables into the model are presented in the Block 3 column of Table 3. The enabling variable set was statistically significant under controls for predisposing and residence variables. Having more population-adjusted home health agencies and having an emergency/trauma center in the county was associated with greater odds of home care use, whereas having more general nursing home beds per 1,000 elders was associated with slightly lower odds of home care use. Under adjustments for all of the variables in the Block 3 model, there were no significant differences in odds of use for any of the nonmetro residents in comparison with adult metro residents. Furthermore, the model-adjusted Wald postestimation tests suggest

Table 2. Variables Used in the Analysis: Persons Age 18 and Older

| Variable | Description | Total Sample Percent[a], Mean (*SE*) | Users' Percent[a], Mean (*SE*) |
|---|---|---|---|
| Dependent variables | | | |
| Home care (HC) use | Had an HC expense (0/1) | 1.98 (0.27) | NA |
| HC provider days | Number of HC provider days for those with an HC expense | NA | 75.99 (4.31) |
| Rural–urban variables | Metro county (0/1) (comparison group) | 86.72 (1.79) | 78.92 (1.88) |
| Metro | | | |
| Nonmetro | All nonmetro counties (0/1) | 13.28 (1.79) | 21.08 (1.88) |
| Micro | County with an urban cluster of 10,000 or more and outlying counties meeting employment/commuting criteria (0/1) | 9.08 (1.41) | 14.82 (1.63) |
| Adjacent to metro | Nonmetro/nonmicro and adjacent to a metro county (0/1) | 2.36 (0.44) | 2.67 (0.57) |
| Adjacent to micro | Nonmetro/nonmicro and adjacent to a micro county (0/1) | 0.98 (0.22) | 1.74 (0.61) |
| Not adjacent/own town | Nonmetro/nonmicro and not adjacent to an urban cluster of at least 2,500 population (0/1) | 0.57 (0.20) | 1.07 (0.53) |
| Remote | Nonmetro/nonmicro and not adjacent, with no urban cluster of 2,500 (0/1) | 0.30 (0.13) | 0.78 (0.44) |
| Predisposing variables | | | |
| Married with spouse | Married with spouse present (0/1) | 58.82 (5.14) | 40.06 (2.35) |
| Men | Men (0/1) | 46.32 (3.52) | 38.11 (1.99) |
| Age | 18–39 (0/1) (comparison group) | 42.33 (3.00) | 7.95 (1.22) |
| | 40–64 (0/1) | 45.93 (2.75) | 28.86 (1.78) |
| | 65–74 (0/1) | 6.40 (0.77) | 23.04 (1.73) |
| | 75 or older (0/1) | 5.35 (0.64) | 40.15 (2.08) |
| Race/ethnicity | White non-Hispanic (0/1) | 72.51 (3.89) | 76.87 (1.86) |
| | African American non-Hispanic (0/1) | 11.24 (2.45) | 13.53 (1.44) |
| | Hispanic (0/1) | 11.65 (2.13) | 6.44 (1.07) |
| | All other ethnic groups (0/1) (comparison group) | 4.61 (0.59) | 3.17 (0.69) |
| Education | Completed 0–8 years of education (0/1) (comparison group) | 9.73 (2.28) | 20.01 (1.65) |
| | Completed 9–11 years of education (0/1) | 9.22 (1.09) | 15.26 (1.37) |
| | Completed high school (0/1) | 30.20 (3.91) | 31.18 (1.84) |
| | Completed some education beyond high school (0/1) | 50.85 (3.90) | 33.55 (2.03) |
| Medicaid | Medicaid covered (0/1) | 7.57 (1.88) | 28.45 (2.08) |
| Young with Medicare | Younger than 65 and Medicare coverage (to capture nonelderly disabled beneficiaries) (0/1) | 1.66 (0.21) | 10.83 (1.20) |
| Private insurance | Has any private health insurance (0/1) | 64.75 (4.99) | 45.57 (2.31) |
| Below poverty | Income is below poverty (0/1) | 9.57 (1.60) | 20.19 (1.54) |
| Professional | Working in a professional occupation (all others, including non-workers, set to 0) (0/1) | 25.31 (3.42) | 7.84 (1.47) |
| Seat belt | Whether uses seat belt in automobile (0/1) | 79.95 (1.76) | 77.84 (1.60) |
| Smoking | Whether currently smokes (0/1) | 19.60 (2.12) | 16.13 (1.49) |
| Enabling variables | | | |
| Median household income | County mean household income (thousands) | 45.34 (0.55) | 42.39 (0.53) |
| Percent below poverty | Percent of county population with income below poverty | 10.44 (0.43) | 11.70 (0.25) |
| RNs | Number of registered nurses per 1,000 | 6.55 (0.26) | 6.11 (0.20) |
| LPNs/VNs | Number of licensed practical nurses/visiting nurses per 1,000 | 1.73 (0.23) | 1.46 (0.06) |
| Aides | Number of nursing aides per 1,000 | 5.03 (0.27) | 4.97 (0.19) |
| MDs/DOs | Number of physicians or doctors of osteopathy per 1,000 | 2.73 (0.11) | 2.79 (0.10) |
| Hospital beds | Number of hospital beds per 1,000 | 3.38 (0.18) | 3.83 (0.18) |
| ER/trauma | Has at least one ER or trauma center (0/1) | 94.29 (1.16) | 94.62 (0.88) |
| Skilled NH beds | Number skilled NH beds in county per 1,000 age 65+ | 0.41 (0.01) | 0.42 (0.01) |
| General NH beds | Number of general NH beds per 1,000 age 65+ | 3.16 (0.40) | 2.93 (0.32) |
| Home health agencies | Number of home health agencies per 10,000 age 65+ | 0.18 (0.01) | 0.22 (0.01) |
| Usual source | Has usual source of health care, same provider (0/1) | 29.7 (3.65) | 30.01 (1.85) |
| Illness variables | | | |
| ADL deficit | At least one ADL impairment (0/1) | 1.20 (0.16) | 30.59 (1.73) |
| IADL deficit | At least one IADL impairment and no ADL impairment (0/1) | 1.55 (0.20) | 18.95 (1.42) |
| Functional limitation | Difficulty walking, standing, bending and no ADL or IADL limitation (0/1) | 11.53 (3.61) | 25.12 (1.67) |
| Diagnosis | Has arthritis diagnosis (0/1) | 16.17 (1.91) | 59.12 (1.89) |
| | Has asthma diagnosis (0/1) | 9.42 (1.52) | 16.14 (1.39) |
| | Has diabetes diagnosis (0/1) | 5.06 (0.62) | 28.11 (1.71) |
| | Has emphysema diagnosis (0/1) | 1.21 (0.16) | 8.21 (1.21) |
| | Has heart disease, angina, heart attack diagnosis (0/1) | 7.73 (0.94) | 39.73 (2.04) |
| | Has high blood pressure diagnosis (0/1) | 21.88 (3.15) | 58.76 (2.19) |
| | Has stroke diagnosis (0/1) | 2.08 (0.27) | 18.92 (1.58) |
| Perceived health | Overall perceived health is good or excellent (0/1) | 58.24 (3.60) | 22.96 (1.63) |

*Notes*: [a]Adjusted for the MEPS complex sample design. Population weights are applied to produce national estimates. Estimates are for persons age 18 or older, $N = 48{,}135$, no. of users = 1,033. LPN/VNs = licensed practical nurse/visiting nurse; NH = nursing home; ADL = activities of daily living; IADL = instrumental activities of daily living.

Table 3. Logistic Regression Results for Whether Used Formal Home Care Within the Calendar Year ($N$ = 48,135)[a]

| Variable | Block 1 | Block 2 | Block 3 | Block 4 |
|---|---|---|---|---|
| | Residence Variables Odds Ratio (OR) (95% Confidence Interval [CI]) | Residence + Predisposing Variables OR (95% CI) | Residence + Predisposing + Enabling Variables OR (95% CI) | Residence + Predisposing + Enabling + Illness Variables (full model) OR (95% CI) |
| Nonmetro categories | | | | |
| Micro | 1.82** (1.24, 2.68) | 1.03 (0.75, 1.43) | 0.96 (0.70, 1.30) | 0.88 (0.63, 1.21) |
| Adjacent to metro | 1.25 (0.76, 2.07) | 0.74 (0.46, 1.18) | 0.64 (0.37, 1.09) | 0.62 (0.34, 1.13) |
| Adjacent to micro | 2.00 (0.95, 4.20) | 0.96 (0.50, 1.83) | 0.99 (0.48, 2.03) | 0.93 (0.42, 2.07) |
| Not adjacent/own town | 2.10 (0.76, 5.79) | 1.36 (0.45, 4.07) | 1.17 (0.43, 3.20) | 0.68 (0.16, 2.94) |
| Remote | 2.98*** (1.81, 4.90) | 1.62 (0.89, 2.97) | 0.98 (0.36, 2.67) | 1.05 (0.31, 3.60) |
| Predisposing variables | | | | |
| Married with spouse | | 0.70** (0.55, 0.89) | 0.70** (0.56, 0.88) | 0.75* (0.59, 0.96) |
| Men | | 0.88 (0.70, 1.11) | 0.86 (0.69, 1.07) | 1.08 (0.86, 1.35) |
| Age 18–39 | | 1 | 1 | 1 |
| Age 40–64 | | 2.89*** (1.89, 4.41) | 2.91*** (1.96, 4.34) | 2.01** (1.29, 3.15) |
| Age 65–74 | | 24.23*** (15.33, 38.28) | 22.58*** (15.00, 33.99) | 9.26*** (5.75, 14.91) |
| Age 75+ | | 49.58*** (32.05, 76.69) | 47.26*** (31.67, 70.53) | 11.87*** (7.35, 19.18) |
| White non-Hispanic | | 1.65* (1.00, 2.72) | 1.65 (1.00, 2.74) | 1.54 (0.91, 2.60) |
| Black non-Hispanic | | 1.78 (1.00, 3.16) | 1.65 (0.92, 2.97) | 1.29 (0.72, 2.33) |
| Hispanic | | 0.96 (0.52, 1.79) | 0.88 (0.47, 1.63) | 1.03 (0.55, 1.93) |
| Other ethnicity | | 1 | 1 | 1 |
| Education 0–8 | | 1 | 1 | 1 |
| Education 9–11 | | 0.84 (0.62, 1.14) | 0.81 (0.60, 1.10) | 0.98 (0.72, 1.35) |
| High school | | 0.78 (0.56, 1.10) | 0.78 (0.57, 1.08) | 1.16 (0.83, 1.64) |
| Some college | | 0.94 (0.68, 1.80) | 0.94 (0.68, 1.29) | 1.41 (1.00, 1.98) |
| Medicaid | | 4.60*** (3.46, 6.11) | 4.69*** (3.58, 6.13) | 2.93*** (2.20, 3.89) |
| Young with Medicare | | 10.25*** (6.50, 16.16) | 9.46*** (6.27, 14.25) | 2.68*** (1.84, 3.91) |
| Private insurance | | 1.10 (0.87, 1.40) | 1.12 (0.89, 1.43) | 1.31* (1.03, 1.67) |
| Below poverty | | 1.07 (0.80, 1.42) | 1.09 (0.84, 1.42) | 1.10 (0.83, 1.45) |
| Professional | | 0.88 (0.58, 1.33) | 0.86 (0.57, 1.31) | 1.29 (0.85, 1.97) |
| Seat belt | | 0.81 (0.64, 1.02) | 0.81 (0.64, 1.01) | 0.87 (0.69, 1.10) |
| Smoking | | 0.92 (0.68, 1.26) | 0.90 (0.67, 1.22) | 0.96 (0.70, 1.28) |
| Enabling variables | | | | |
| Median household income | | | 0.98 (0.96, 1.00) | 0.98 (0.95, 1.01) |
| Percent below poverty | | | 0.98 (0.94, 1.03) | 0.97 (0.93, 1.02) |
| RNs | | | 1.03 (0.97, 1.10) | 1.02 (0.96, 1.09) |
| LPNs/VNs | | | 0.79* (0.65, 0.97) | 0.79* (0.65, 0.97) |
| Aides | | | 1.03 (0.99, 1.07) | 1.03 (0.99, 1.08) |
| Number of physicians or doctors of osteopathy | | | 0.99 (0.93, 1.04) | 1.00 (0.95, 1.05) |
| Hospital beds | | | 1.00 (0.98, 1.03) | 1.01 (0.98, 1.04) |
| ER/trauma | | | 1.86* (1.15, 3.00) | 1.71* (1.03, 2.85) |
| Skilled NH beds | | | 1.04 (0.65, 1.66) | 0.98 (0.62, 1.56) |
| General NH beds | | | 0.99* (0.98, 0.99) | 0.99* (0.98, 1.00) |
| Home health agencies | | | 1.83** (1.21, 2.77) | 1.70* (1.07, 2.73) |
| Usual source | | | 1.01 (0.83, 1.23) | 1.02 (0.82, 1.26) |
| Illness variables | | | | |
| ADL deficit | | | | 38.36*** (27.71, 53.10) |
| IADL deficit | | | | 10.67*** (7.70, 15.17) |
| Functional limitation | | | | 3.16*** (2.27, 4.40) |
| Arthritis | | | | 1.32* (1.07, 1.64) |
| Asthma | | | | 1.28 (0.92, 1.79) |
| Diabetes | | | | 1.66*** (1.30, 2.12) |
| Emphysema | | | | 1.03 (0.66, 1.60) |
| Heart disease | | | | 1.46** (1.16, 1.84) |
| High blood pressure | | | | 1.02 (0.79, 1.31) |
| Stroke | | | | 1.23 (0.88, 1.71) |
| Perceived health | | | | 0.71** (0.55, 0.91) |
| Model F and significance | (5, 232) 4.34*** | (23, 214) 32.08*** | (35, 206) 26.94*** | (46, 191) 41.97*** |
| F and significance of added block | NA | (18, 236) 41.18*** | (12, 236) 2.97*** | (11, 236) 79.10*** |
| Significant Wald post-estimation tests | d*, g** | g* | — | — |
| Block 1 F and significance after adding other variables in each model | NA | (5, 236) 0.93, $p$ = .46 | (5, 236) 0.65, $p$ = .66 | (5, 236) 0.61, $p$ = .69 |

*Notes*: [a]Adjusted for the MEPS complex sample design. Population weights are applied to produce national estimates for noninstitutionalized persons age 18 and older. Significance levels: * = .05, ** = .01, *** = .001. No interaction terms were statistically significant. Model-adjusted Wald postestimation tests of differences: a = micro versus adjacent to metro, b = micro versus adjacent to micro, c = micro versus not adjacent to own town, d = micro versus remote, e = adjacent to metro versus adjacent to micro, f = adjacent to metro versus not adjacent to own town, g = adjacent to metro versus remote, h = adjacent to micro versus not adjacent to own town, i = adjacent to micro versus remote, and j = not adjacent to own town versus remote.

that there were no significant differences in likelihood of home care use among the nonmetro county types.

Illness measures were added to the model in Block 4 of Table 3. The illness variable set was significant under controls for residence, predisposing, and enabling variables. Adults with activities of daily living (ADL) deficits, instrumental activities of daily living (IADL) deficits, and physical limitations experienced significantly higher odds of formal home care use, as did persons with arthritis, diabetes, and heart disease. Persons with better perceived level of health were less likely to use formal home care. As with Block 3, no nonmetro county types were significantly different from metro residents, and there were no significant model-adjusted Wald postestimation differences across nonmetro residential categories.

Table 4 presents the results of negative binomial regression analyses for number of provider days among the adults who were formal home care users, following the same hierarchical approach for entering blocks of variables into the models as was employed in Table 3. The alphas, a measure of dispersion, in all are well above zero, suggesting that dispersion is a problem and that negative binomial regression is an appropriate analytical approach. Block 1 of Table 4, which includes only residential type, suggests that there were no significant differences in provider day IRRs between metro counties and any of the nonmetro county types. The model-adjusted Wald postestimation tests of differences for this model yielded two significant comparisons among the nonmetro counties: Formal home care users who were in counties adjacent to micro counties used more provider days than both those in nonmetro counties adjacent to metro counties and those in remote counties.

The addition of predisposing measures (Block 2 of Table 4) suggests that married formal home care users living with their spouses tended to receive relatively fewer provider days. Persons receiving Medicaid and persons below age of 65 years who were Medicare recipients tended to receive relatively more provider days. Professional/managerial workers who received formal home care received relatively fewer days. The predisposing variable block was statistically significant, and the residence type block was not significant at this point. The model-adjusted Wald postestimation tests suggest that there were no significant differences in provider days across the nonmetro residential categories.

The enabling variables block (Block 3 of Table 4) was significant under controls for residence and predisposing variables. Formal home care users in counties with higher percentages below poverty tended to have more provider days. The residence set, as a block, was not statistically significant, and no Wald postestimation tests of differences across nonmetro residences were significant.

Incorporating the illness measures into the negative binomial regression model for number of provider days (Block 4 of Table 4) leads to several important changes in the results. Home care recipients with ADL limitations and those with IADL limitations received significantly more formal home care provider days, while specific diagnoses were not significantly associated with number of provider days. The illness block was statistically significant under controls for the other characteristics. Although the full residence block was not significant, suggesting that metro and nonmetro users did not differ with regard to provider days, those in remote counties received fewer provider days than metro residents. Furthermore, the model-adjusted Wald postestimation tests of differences identified three significant differences: Formal home care recipients residing in remote counties received relatively fewer provider days than those in micro counties, counties adjacent to micro counties, and nonadjacent counties with a town having a population of at least 2,500.

## Discussion

In support of hypotheses H1a and H1b, the findings of this study indicate that unadjusted differences in the likelihood of using formal home care between metro residence and the nonmetro block, as well as between each nonmetro residence type and metro residence, were not significant under controls for the independent variables. Furthermore, in support of hypothesis H1c, there were no significant differences in the likelihood of use across the five nonmetro residential categories in the full model. In actuality, once predisposing and enabling variables were controlled, the initial significant differences in likelihood of use across residential types no longer held. These results suggest that relatively comprehensive measures of predisposing and enabling characteristics may be sufficient in explaining existing rural–urban patterns in the likelihood of formal home care use among adults—a finding not previously identified.

Our examination of number of provider days received by formal home care users supported hypothesis H2a and provided partial support for hypothesis H2b. Under controls for other factors in the model, remote adult formal home care users received significantly fewer provider days than metro users. Remote formal home care users also received significantly fewer provider days than micro users, users who are adjacent to micro counties, and those who resided in nonmetro/nonmicro counties with a town or urbanized area of at least 2,500 people. However, there were no significant differences between remote users and the other nonmetro residential categories. Because the significant differences between remote residence and the metro and three other nonmetro types arose after the illness variables were included in the model, it is possible that illness factors across rural–urban residence may serve to mask meaningful differences in provider days.

Andersen and Newman (2005) indicated that illness variables are the most important predictors of service use. In both sets of analysis, illness measures were significantly associated with the dependent variables and, as noted, they may mask unadjusted differences in formal home care

Table 4. Negative Binomial Regression Results for Number of Home Care Provider Days Received by Persons Who Used Formal Home Care ($N$ = 1,033, IRR = Incidence Rate Ratio)[a]

| Variable | Block 1 | Block 2 | Block 3 | Block 4 |
|---|---|---|---|---|
| | Residence Variables IRR (95% confidence interval [CI]) | Residence + Predisposing Variables IRR (95% CI) | Residence + Predisposing + Enabling Variables IRR (95% CI) | Residence + Predisposing + Enabling + Illness Variables (full model) IRR (95% CI) |
| Nonmetro categories | | | | |
| Micro | 1.09 (0.79, 1.50) | 0.96 (0.70, 1.32) | 1.09 (0.77, 1.54) | 0.99 (0.72, 1.38) |
| Adjacent to metro | 0.63 (0.37, 1.06) | 0.72 (0.41, 1.24) | 0.75 (0.41, 1.37) | 0.83 (0.44, 1.56) |
| Adjacent to micro | 1.45 (0.94, 2.25) | 1.40 (0.87, 2.25) | 1.46 (0.72, 2.97) | 1.31 (0.67, 2.54) |
| Not adjacent to own town | 0.83 (0.39, 1.75) | 1.29 (0.69, 2.44) | 1.46 (0.69, 3.10) | 1.05 (0.50, 2.22) |
| Remote | 0.48, (0.20, 1.18) | 0.79 (0.38, 1.65) | 0.69 (0.24, 1.94) | 0.39** (0.20, 0.78) |
| Predisposing variables | | | | |
| Married with spouse | | 0.66** (0.50, 0.87) | 0.66** (0.51, 0.85) | 0.71** (0.57, 0.88) |
| Men | | 0.91 (0.72, 1.16) | 0.86 (0.68, 1.09) | 0.94 (0.77, 1.16) |
| Age 18–39 | | 1 | 1 | 1 |
| Age 40–64 | | 0.69 (0.39, 1.22) | 0.69 (0.40, 1.20) | 0.89 (0.58, 1.35) |
| Age 65–74 | | 1.21 (0.61, 2.38) | 1.22 (0.63, 2.38) | 1.55 (0.93, 2.58) |
| Age 75+ | | 1.48 (0.78, 2.83) | 1.56 (0.83, 2.92) | 1.66* (1.05, 2.61) |
| White non-Hispanic | | 0.59 (0.33, 1.06) | 0.66 (0.38, 1.17) | 0.67 (0.41, 1.11) |
| Black non-Hispanic | | 0.78 (0.43, 1.42) | 0.86 (0.48, 1.53) | 0.84 (0.50, 1.42) |
| Hispanic | | 0.99 (0.54, 1.82) | 0.90 (0.49, 1.68) | 1.10 (0.64, 1.89) |
| Other ethnicity | | 1 | 1 | 1 |
| Education 0–8 | | 1 | 1 | 1 |
| Education 9–11 | | 0.85 (0.65, 1.11) | 0.87 (0.67, 1.14) | 0.89 (0.68, 1.16) |
| High school | | 0.91 (0.65, 1.29) | 0.93 (0.68, 1.27) | 0.83 (0.63, 1.10) |
| Some college | | 0.90 (0.65, 1.23) | 0.91 (0.68, 1.20) | 0.86 (0.64, 1.16) |
| Medicaid | | 1.99*** (1.47, 2.69) | 1.92*** (1.43, 2.57) | 1.66*** (1.26, 2.19) |
| Young with Medicare | | 1.72* (1.01, 2.93) | 1.80* (1.14, 2.85) | 1.32 (0.91, 1.93) |
| Private insurance | | 0.96 (0.70, 1.31) | 0.94 (0.69, 1.29) | 1.08 (0.83, 1.41) |
| Below poverty | | 0.84 (0.68, 1.05) | 0.87 (0.69, 1.09) | 0.85 (0.70, 1.04) |
| Professional | | 0.46* (0.25, 0.84) | 0.45* (0.24, 0.82) | 0.65 (0.39, 1.09) |
| Seat belt | | 1.03 (0.81, 1.31) | 0.98 (0.79, 1.22) | 1.07 (0.86, 1.34) |
| Smoking | | 1.12 (0.79, 1.60) | 1.15 (0.83, 1.60) | 1.17 (0.90, 1.52) |
| Enabling variables | | | | |
| Median household income | | | 1.02 (0.99, 1.05) | 1.00 (0.98, 1.02) |
| Percent below poverty | | | 1.07** (1.02. 1.12) | 1.02 (0.99, 1.06) |
| RNs | | | 1.06 (0.99, 1.14) | 1.04 (0.99, 1.10) |
| LPNs/VNs | | | 0.88 (0.69, 1.11) | 0.84 (0.69, 1.03) |
| Aides | | | 0.98 (0.93, 1.04) | 0.99 (0.95, 1.03) |
| Number of physicians or doctors of osteopathy | | | 0.97 (0.91, 1.04) | 0.96* (0.92, 0.99) |
| Hospital beds | | | 0.99 (0.97, 1.01) | 0.98* (0.97, 0.99) |
| ER/trauma | | | 1.22 (0.72, 2.08) | 1.18 (0.73, 1.90) |
| Skilled NH beds | | | 1.23 (0.78, 1.95) | 1.39 (0.91, 2.14) |
| General NH beds | | | 1.00 (0.99, 1.00) | 1.00 (0.99, 1.00) |
| Home health agencies | | | 0.72 (0.46, 1.10) | 0.73 (0.48, 1.12) |
| Usual source | | | 1.05 (0.82, 1.34) | 1.06 (0.87, 1.29) |
| Illness variables | | | | |
| ADL deficit | | | | 5.02*** (3.73, 6.76) |
| IADL deficit | | | | 3.33*** (2.44, 4.54) |
| Functional limitation | | | | 1.20 (0.91, 1.60) |
| Arthritis | | | | 0.86 (0.67, 1.10) |
| Asthma | | | | 1.21 (0.90, 1.65) |
| Diabetes | | | | 1.12 (0.88, 1.43) |
| Emphysema | | | | 0.90 (0.63, 1.28) |
| Heart disease | | | | 0.89 (0.74, 1.08) |
| High blood pressure | | | | 0.97 (0.80, 1.18) |
| Stroke | | | | 1.01 (0.80, 1.28) |
| Perceived health | | | | 0.83 (0.63, 1.10) |
| Alpha | 1.83 | 1.55 | 1.20 | 1.20 |
| Model F and significance | (5, 224) 1.85 | (23, 206) 7.29*** | (35, 194) 8.63*** | (46, 183) 16.37*** |

(*Table 4 Continues*)

Table 4. Negative Binomial Regression Results for Number of Home Care Provider Days Received by Persons Who Used Formal Home Care ($N$ = 1,033, IRR = Incidence Rate Ratio)[a] (*Continued*)

| Variable | Block 1 | Block 2 | Block 3 | Block 4 |
|---|---|---|---|---|
| | Residence Variables IRR (95% confidence interval [CI]) | Residence + Predisposing Variables IRR (95% CI) | Residence + Predisposing + Enabling Variables IRR (95% CI) | Residence + Predisposing + Enabling + Illness Variables (full model) IRR (95% CI) |
| F and significance of added block | NA | (16, 228) 7.42*** | (12, 228) 1.84* | (11, 228) 20.41*** |
| Significant Wald Solid tests | e*, i* | — | — | d**, i***, j* |
| Block 1 F and significance after adding other variables in each model | NA | (5, 228) 0.84, $p$ = .52 | (5, 228) 0.99, $p$ = .42 | (5, 228) 2.08, $p$ = .07 |

*Notes*: [a]Adjusted for the MEPS complex sample design. Population weights are applied to produce national estimates. Estimates are for persons age 18 and older. Significance, * = .05, ** = .01, *** = .001. Model adjusted Wald Solid tests of differences: a = micro versus adjacent to metro, b = micro versus adjacent to micro, c = micro versus not adjacent to own town, d = micro versus remote, e = adjacent to metro versus adjacent to micro, f = adjacent to metro versus not adjacent to own town, g = adjacent to metro versus remote, h = adjacent to micro versus not adjacent to own town, i = adjacent to micro versus remote, and j = not adjacent to own town versus remote.

provider days. It is interesting that limitations in performing ADLs and IADLs were consistently significant predictors, whereas certain diagnoses and perceived health were significant predictors only of likelihood of formal home care use. As Andersen and Newman have noted, the factors associated with the initial receipt of health care may differ from those that explain amount of the service received.

The differential effect of the enabling variables on the two dependent variables under full statistical control is quite interesting. With regard to likelihood of use, emergency room/trauma centers may generate home care cases, while population-adjusted general nursing homes may have a slight substitution effect and population-adjusted home health agency numbers may reflect access. Like Welch, Wennberg, and Welch (1996), we found no association between skilled nursing beds and home health use. The negative impact of population adjusted licensed practical nurse/visiting nurse on likelihood of formal home care use was unanticipated but may represent the availability of other care modalities, such as homes for adults, that were not measured. Only two enabling variables were associated with number of provider days among users, with more population adjusted doctors and hospital beds leading to significantly (but very slightly) fewer provider days. Again, these findings suggest the need for additional research, especially across rural and urban environments.

Our inclusion of all adults who remained in the sample throughout the year in the analysis of home care utilization substantiates prior findings regarding the net effect of older age on the likelihood of using home care (Freedman, Rogowski, Wickstrom, Adams, Marainen, & Escarce, 2004; Komisar, 2002). However, it also allowed for the identification of the fact that being below age 65 years and eligible for Medicare (young disabled) was a significant independent factor in accounting for likelihood of formal home care use. This novel finding demonstrates the wide-ranging importance of Medicare eligibility in home care utilization.

Medicaid eligibility was associated both with a greater likelihood of using home care and with receiving relatively more provider days. This finding corresponds with those of McAuley et al. (2004) and may be partly explained by the more liberal rules for receipt of home care and for the number of home care days that can be provided under Medicaid, in comparison with Medicare.

Being married and living with one's spouse was associated with both a lower likelihood of using formal home care and fewer provider days among users, suggesting the importance of access to informal care in formal home care use. As Porter et al. (2004) have shown, paid and unpaid helpers frequently share similar roles, goals, and responsibilities. Therefore, it would be important in future research to more fully examine the specifics of home care provided by helpers of different types across residential types.

The results demonstrate the relatively complex patterns of likelihood of formal home care use and of provider days received across rural–urban residential categories. Predisposing and enabling characteristics go far toward accounting for rural–urban differences in the receipt of any formal home care among adults. However, it would be incorrect to suggest that rural–urban differences in likelihood of use have been "explained away" by this analysis. Instead, our findings suggest that a multitude of factors may well be partly responsible for differences in the likelihood of use across metro–nonmetro areas and across nonmetro areas. More research is needed to fully assess the circumstances that lead to use or nonuse of formal home care of various types and from various sources and funding streams across the rural–urban continuum. Phenomenological research of home care users and providers across different residential types could elucidate the differing dynamics, expectations, relationships, benefits, problems, and perceptions of home care in differing environments (Porter, 2000; Porter et al., 2004). Prospective longitudinal analyses, especially those that consider persons with differing diagnoses, would help to determine starts and stops over time and to separate number of providers from number of days of use. Such research would also be beneficial in identifying the actual predictors of formal home care, rather than covariates of care, as is the

case with the current analysis. Research that focuses on the different types of visits and the number of hours received by type of home care provider would help to clarify the differences in patterns of visits that we identified in remote versus other areas. In addition, more research is needed on the role of agency behavior, including the incentives, disincentives, and capacities for offering more versus fewer days of home care of various types and through different provider professional categories across rural and urban settings.

Some limitations of this study should be noted. First, although relatively robust when compared with other analyses of home care, the available independent variables are somewhat limited and do not fully correspond with all of the variables recommended by Andersen and Newman (2005). For example, MEPS has no direct measures of how the family or other informal providers respond to or provide home care. Given the evidence that informal assistance is somewhat more common in rural areas (Coward & Cutler, 1989) and the recipient's perceived interoperability of formal and informal home care (Porter et al., 2004), the results may well differ if informal service availability were included in the model. Second, we focused on individuals who remained in the MEPS panel, and therefore in the community, for a full calendar year. However, formal home care often occurs prior to institutionalization or death, whose likelihood might differ across rural and urban residence. Analyses that incorporate these forms of attrition (though use of home care is generally exogenous to them) would further our understanding of rural–urban differences in patterns of use. On the other hand, this research benefits from the fact that we control for the time individuals were "at risk," and our measure of formal home care is far more inclusive of payers than that used in most past research. Therefore, the results are more likely to be nationally representative of utilization patterns of the full range of paid home care provided to civilian, noninstitutionalized adults who remained in the community during the target years. Third, the count of provider days that is available in the MEPS data, though carefully audited, combines days of care received and the type of provider. It would be more meaningful to have separate measures of these elements. Fourth, many alternative approaches might be used to differentiate rural and urban residence. Although we believe that our rural–urban categorization is logical, and it is definitely more detailed than prior examinations of home care patterns, it would be good to assess variations on the categories we employed. Fifth, although this was not a primary goal of the analysis, the Stata Survey software set for the analytical procedures we used precluded our ability to address variance explained by the models.

In spite of its limitations, our findings do show that the Andersen–Newman framework, with the addition of variables not included in its original configuration, enhance our understanding of rural–urban variations in patterns of formal home care use. We identified an important new variable (being a young adult with Medicare). We found that there were no metro–nonmetro differences or differences across the nonmetro residences in likelihood of using home care once predisposing and enabling variables were controlled. We also determined that under controls for the full set of variables, the receipt of formal care provider days was more limited in remote counties than in metro counties and three nonmetro county types. Furthermore, we found that elements of all three individual variable categories (predisposing, enabling, and illness) were significant predictors of both likelihood of using formal home care and provider days among users.

Although ADLs and IADLs were not explicitly included in the Andersen–Newman model, we provided a justification for their inclusion when formal home care is being addressed, and we found that they are highly significant predictors of both likelihood of use and number of provider days. We suggest that the Andersen–Newman framework is a useful starting point for the examination of formal home care, including rural–urban issues, but it should be modified with prudence, according to the type of health care being addressed. In particular, the more limited number of formal home care provider days for remote recipients identified under controls for other factors suggests that some remote adult formal home health users may experience problems with length of support and/or the types of formal home care providers available to them. Notwithstanding the measurement problems with this variable, this finding may reflect issues of personnel availability; travel expenses and other formal home care costs; variations in economies of scale; proximity of informal supports; differences in norms, expectations, and family/neighbor sense of responsibility; formal/informal home caregiver interactions; or unmeasured differences in type of need (e.g., long-term vs. acute home care need). Therefore, fully understanding the reasons for this finding will require carefully planned research employing different methods, both qualitative and quantitative, more precise measurement strategies, and further modifications/expansions/articulations of the Andersen–Newman framework.

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