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# Age and Utilization of Preventive Health Services among the Elderly in Five Texas Sites

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## Abstract

**Objectives**: This paper explores the relationship between age and the receipt of selected preventive health services (PHS) among the elderly and determines whether the implementation of the "Put Prevention into Practice" office-based system would increase the delivery rates of PHS among the elderly. **Method**: The population consisted of a representative sample of elderly aged 65 years and older who had presented at three specific time points at two community health centers and three family practice residency programs in Texas. **Results**: Overall, significant age-related inverse relationships among the elderly were shown in 9 of the 30 time/PHS pairs examined. The delivery rates of pneumococcal immunization and assessment of tobacco/smoking, physical activity, and nutrition significantly increased from

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time 1 to time 2 for the elderly. Tetanus-Diphtheria immunization was the only service to significantly increase from time 2 to time 3. Discussion: We found that PHS were not universally delivered to all older adults. For those PHS that are recommended for routine use among older adults, the clinician is required to deliver individualized PHS based on the patient's risk status. Other services, however, should be systematically provided for high-risk patients.

Key words: aged, preventive health services, longitudinal study

# Introduction

Increased age is associated with a rise in the incidence and mortality of chronic diseases; 79% persons over 70 reported at least one of seven chronic conditions (National Center for Health Statistics, 1999). Reducing the morbidity experienced by older persons by increasing the average age of onset of disability and the age of death will greatly increase quality of life and reduce health care costs (Fries, 1993). This Compression of Morbidity paradigm has been well supported through randomized trials of primary prevention (Fries, 1993). Although this paradigm provides a theoretical foundation for delivering preventive health services (PHS) to the elderly, many health professionals may not think of the elderly as appropriate targets for health promotion efforts (Lavizzo-Mourey, Day, Diserens & Grisso, 1989; Walker, Volkan, Sechrist & Pender, 1988). Studies indicate that the delivery rates of PHS show a trend toward an inverse relationship with age after controlling for demographic and health-related variables among people aged 60 and over (Ives, Lave, Traven, Schulz & Kuller, 1996; Mayer et al., 1992). This may indicate that health professionals do not assess the status of recommended PHS for their elderly clients, especially for the oldest old (aged 85 and over).

The Texas Department of Health (TDH) initiated a demonstration project in 1993 to test the effectiveness of the national Put Prevention into Practice (PPIP) office system change program. The PPIP program utilizes a set of office tools that targets providers (and staff), patients, and the office system to increase the provision of PHS in primary care practices (Goodson, Gottlieb & Smith, 1999; Gottlieb, Huang, Blozis, Guo & Smith, 2001). The purposes of this report are to explore whether there are inverse relationships between age and the receipt of selected PHS among the elderly and to examine PPIP intervention effects for the elderly in the receipt of selected PHS.

# Methods

## Pre and Post-Intervention Design

The details of methods for the intervention and its evaluation have been published elsewhere (Goodson et al., 1999; Gottlieb et al., 2001). In 1994, the Texas Department of

Health (TDH) used federal preventive health block grant monies to fund, through a competitive process, three community health centers (CHCs) and four family practice residency (FPR) programs to conduct PPIP implementation. For three years, each site received $42,000-$49,000 per year, free materials and offer of technical assistance from the TDH. Two of the sites did not show progress in implementation and withdrew from the program at the end of the second year. The data reported here are from the five sites that completed the three years of non-competitive continuation funding. All these sites reported use of the flowsheet, the health risk profile (a Texas-designed risk appraisal form to be administered by allied health staff), and the Personal Health Guide, with one site modifying the health risk profile and another modifying the Personal Health Guide.

Table 1 displays the characteristics of the five sites that completed the three years of funding and the two sites that did not. The family practice residency program clinics were over three times as large as the community health centers and were more often located in large urban areas. The CHCs were much less complex organizations than the FPRs.

Table 1. Characteristics of sites funded to conduct PPIP*

| Site | Type | Status | Setting | Staff |
|---|---|---|---|---|
| Site A | CHC | Completed | Small city; 2 freestanding clinics | 6 Ftand 1PT physicians;13nurses; 7 clerks |
| Site B | CHC | Completed | City; freestanding clinic | 4 FT and 2 PT physicians; 5 nurses; 20 clerks |
| Site C | CHC | Completed | Town; freestanding clinic | 1 FT and 1 PT physician; 1 physician assistant; 5-6 nurses; 4-5 clerks |
| Site D | FPR | Completed | City; freestanding clinic linked to hospital | 19 resident, 4 FT and 3 PT faculty physicians |
| Site E | FPR | Completed | City; in medical center | 29 residents; 9 faculty physicians |
| Site F | FPR | Dropped-out | City; medical center with 5 freestanding clinics | 72 residents; 17 faculty and 117 teaching staff |
| Site G | FPR | Dropped-out | Small city; in hospital with 3 outlying clinics | 12 (24 in 7/94) residents and 5 (8) faculty physicians |

*PPIP: Put Prevention into Practice, CHC: community health center; FPR, family practice residency; FT: full-time; PT, part-time

All patient subjects were adults aged 19 years and older. Data were collected using an explicit protocol based on the Battelle Adult Chart Review Form by a single registered nurse (Hersey, 1995). Charts were selected from actual appointment logs (available for two community health centers and 1 residency program) or computer printouts of appointments for the equivalent periods. The appointment logs were sampled by taking the patients with appointments at 8 am, 10 am, 2 pm and 4 pm. For sites at which patient ages were unavailable, charts were over-sampled in order to eliminate children's charts from the selected pool later. The computerized printouts (one residency and one community health center) listed patients alphabetically by month and included provider names. In this case, the sampling list was created by choosing the first patient in each letter group per month. 372 charts were selected at baseline, and 376 charts were selected at 33-39 months following implementation of PPIP), with 61% from community health centers at baseline and 60% at follow-up. A small number (3.2%, n=12) of patients were present in both samples.

The present study involved chart review for a representative sample of elderly aged 65 years and older over a three-year period at two community health centers and three family practice residency programs in Texas. The baseline chart audit period was September 1993 through February 1994, Time 1. The official start date of the Texas PPIP Demonstration Project was April 1994. Time 2 and Time 3 were for patients with appointments during the periods December 1995 through May 1996 and December 1996 through May 1997 respectively in the chart audit processes.

The selected PHS included blood pressure, Papanicoloaou test, mammogram screening, smoking assessment and counseling, physical activity assessment and counseling, nutrition assessment and counseling, and tetanus-diphtheria (Td), pneumococcal and influenza immunization. Assessments referred to providers assessed the patients' smoking, physical activity and nutrition status. Counseling referred to that providers recommended medical suggestions to patients based on the information from the book entitled "Put Prevention into Practice: clinician's handbook of preventive services" (U.S. Department of Health & Human Services, 1994) (See Table 2).

Table 2. Standards for Screening Tests, Immunizations, and Risk Assessment for Elderly Patients

| Screening Test, Immunization, or Counseling | Guideline used for Analyses (Authority) | Operationalization for Analyses |
|---|---|---|
| Blood pressure monitoring | Adults every 2 years if < 130/85 (NHBPEP)[2] | Adults 67+ within previous 2 years |
| Papanicolaou's smear | Women annually at onset of sexual activity. If 3 or more satisfactory normal annual exams, may be performed every 1-3 years (USPSTF)[3] | Women age 68+ within previous 3 years |
| Smoking assessment and counseling | For patients who smoke, clinicians should provide smoking status assessment and cessation counseling (USPSTF)[3] | Assessment and counseling for tobacco risk within the previous 12 months |
| Physical activity assessment and counseling | Counseling to promote regular physical exercise is recommended for all adults (USPSTF)[3] | Assessment and counseling for physical activity status within the previous 12 months |
| Nutrition assessment and counseling | Limit fat and cholesterol; maintain caloric balance, emphasize grains, fruit, vegetables (USPSTF)[3] | Assessment and counseling for nutrition risk within the previous 12 months |
| Tetanus-Diphtheria | All adults every 10 years (ACP)[1] | Adults age 66+, within previous 10 years |
| Pneumovax | All adults age 65+one time (USPSTF)[3] | Recorded ever for patients age 66+ |
| Influenza | All adults age 65+ once/year (USPSTF)[3] | Adults age 66+, within previous year |

1.ACP = American College of Physicians
2.NHBPEP = National High Blood Pressure Education Program of the National Heart, Lung, and Blood Institute
3.USPSTF = U.S. Preventive Services Task Force

## Data Analyses

Hierarchical linear analyses (multi-level modeling) were used to take into account the nested nature of the data (charts within clinics) and the potential for autocorrelation, that is, the effect of multiple charts coming from the same clinic. The GENMOD function of SAS version 8.0/PC (SAS Institute Inc., 1999) was appropriate to examine the relationships between advancing age and delivery rates of selected PHS for the elderly at the three time points and to evaluate the intervention effects of PPIP. First, age was used as a continuous variable in logit regression models. Linear relationships were anticipated between advancing age and the reception of timely PHS among elderly adults. The general equation between advancing age and the receipt of timely PHS among elderly adults is:

$\log\{p / (1-p)\} = \alpha_i + \beta_1(\text{age})$ (elderly adults only) for time 1, time 2 and time 3 (Allison, 1999)

Exponentiating the coefficients of βs in the logit regression models yielded odds ratios for the PHS variables. For each PHS, odds ratios were also calculated for time 2 vs. time 1 and time 3 vs. time 2 after adjusting for the nested structure.

Covariates including patients' gender, reasons for visit (acute condition or check-up or treatment of a chronic condition), number of clinic visit in the past 12 month and medical and risk factor history form use) were controlled at the equation mentioned above in order to examine the effects of PPIP intervention and age.

# Results

## Relationship Between Age and the Delivery Rates of Selected PHS

As shown in Table 3, there were significant inverse relationships between age and the selected PHS among the elderly on delivery rates for 9 of the 30 time/PHS pairs examined.

Screening Tests. Because blood pressure (BP) screening was universally delivered to the elderly subjects, there is no variance to be analyzed. When the elderly patients were older, they were less likely to receive cholesterol screening at time 1 (odds ratio = 0.84) and time 3 (odds ratio = 0.92) (Table 3). That is, the increase of one year of age among elderly adults was associated with a 16% (1-0.84 = 0.16) decrease in the probability of receiving cholesterol screening at time 1. Similarly, a one year increase in age was associated with a 8% (1-0.92 = 0.08) decrease in the possibility of receiving this service among elderly patients at time 3. However, the age-related inverse relationship between advancing age and receipt of cholesterol screening was not significant at time 2. The association between advancing age and receipt of the Papanicolaou test was only significant at time 2 (odds ratio = 0.79). The older the elderly women were, the less likely they were to receive a Papanicolaou test at time 2 (Table 3). The associations between advancing age and receipt of a yearly mammogram were not significant at any of the three time points.

Life Style Assessments and Counseling. As age increased, elderly adults were less likely to receive smoking assessment at time 3 (odds ratio = 0.89) but there were no significant associations between age and receipt of smoking assessment at times 1 and 2 (Table 3). Also, elderly adults of increasing age were less likely to receive smoking counseling at time 1 (odds ratio = 0.78); there were no significant associations between age and reception of

smoking counseling at times 2 and 3. As age increased, elderly adults were less likely to receive physical activity assessment at all three time points (Table 3). There was a negative association between age and physical activity counseling at time 1 (odds ratio = 0.71), but there were no significant associations between age and reception of physical activity counseling at times 2 and 3. The older elderly were less likely to receive nutrition assessment (odds ratio = 0.94) at time 3 but there were no significant associations between age and receipt of nutrition assessment at times 1 and 2 (Table 3). No differences were found between age and nutrition counseling at the three time points.

Immunizations. The negative association between advancing age and reception of Td immunization at time 2 was the only Age/Td relationship that reached a significant level (odds ratio = 0.83) (Table 3). No age-related inverse relationship existed for the delivery of pueumococal and influenza immunizations.

Table 3. The association between advancing age and delivery rates of selected preventive health services among elderly patients at time 1, time 2 and time 3

| | Time 1 | | | Time 2 | | | Time 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | n | Odds Ratio[1] (95% C.I.) | p | n | Odds Ratio (95% C.I.) | p | n | Odds Ratio (95% C.I.) | p |
| **Screening Tests** | | | | | | | | | |
| Papanicolaou test (women only) | 37 | 0.99(0.95, 1.03) | 0.66 | 29 | 0.79 (0.63,0.98) | 0.03 | 29 | 0.93 (0.8, 1.03) | 0.16 |
| **Life Style Assessment and Counseling** | | | | | | | | | |
| Tobacco/ Smoking cessation assessment | 68 | 0.97 (0.90, 1.05) | 0.57 | 71 | 0.98 (0.92, 1.04) | 0.46 | 65 | 0.89 (0.84, 0.94) | <.001 |
| Tobacco/ Smoking counseling | 68 | 0.78 (0.73, 0.83) | <.001 | 71 | 0.99 (0.90, 1.09) | 0.88 | 65 | 0.97 (0.8, 1.09) | 0.14 |
| Physical activity assessment | 68 | 0.95 (0.92, 0.98) | <.01 | 71 | 0.92 (0.91, 0.94) | <.001 | 65 | 0.94 (0.91, 0.98) | <.001 |
| Physical activity counseling | 68 | 0.71 (0.51, 0.99) | 0.04 | 71 | 0.90 (0.80, 1.02) | 0.09 | 65 | 0.94 (0.87, 1.02) | 0.11 |
| Nutrition assessment | 68 | 0.97 (0.90, 1.05) | 0.36 | 71 | 0.95 (0.88, 1.03) | 0.29 | 65 | 0.94 (0.91, 0.98) | <.01 |
| Nutrition counseling | 68 | 0.97 (0.92, 1.03) | 0.31 | 71 | 0.98 (0.94, 1.02) | 0.45 | 65 | 0.90 (0.80, 1.01) | 0.08 |
| **Immunizations** | | | | | | | | | |
| Tetanus-Diphtheria immunization | 27 | 1.01 (0.99, 1.03) | 0.91 | 23 | 0.83 (0.71, 0.97) | 0.02 | 21 | 0.90 (0.80, 1.02) | 0.10 |
| Pneumococcal immunization | 68 | 0.97 (0.94, 1.00) | 0.07 | 71 | 0.99 (0.92, 1.07) | 0.80 | 65 | 0.97 (0.92, 1.03) | 0.29 |
| Influenza immunization | 68 | 0.95 (0.90, 1.01) | 0.10 | 71 | 0.99 (0.93, 1.05) | 0.74 | 65 | 0.96 (0.91, 1.02) | 0.12 |

Odds ratios are adjusted for clinics. This table indicates that a one-age increase in the older adults is associated with the decrease with certain percentage in the receipt of selected PHS

# PPIP Intervention Effects

As shown in Table 4, after adjusting for the nested nature of data, at time 2 in comparison to time 1, elderly adults were more likely to receive yearly mammography (odds ratio = 2.45, 95% C.I. for odds = 1.25-4.80), assessment for tobacco/smoking (odds ratio = 2.66, 95% C.I. for odds = 1.18-6.02), physical activity assessment (odds ratio = 6.34, 95% C.I. for odds = 2.54-15.78), nutrition assessment (odds ratio = 17.96, 95% C.I. for odds = 4.89-66.03) and pneumococcal immunization (odds ratio = 2.21, 95% C.I. for odds = 1.02-4.79). The delivery rate of tetanus-diphtheria (Td) immunization for elderly adults was significantly increased from time 2 to time 3 (odds ratio = 3.23, 95% C.I. for odds = 1.35-7.71), while the documentation of the other PHS did not significantly change. Blood pressure (BP) screening was universal: 100% at baseline and time 2. There was only one elderly subject not documented to receive timely BP screening at time 3 (98.2%, n =51).

Table 4. Delivery rates and comparative odds ratios of selected preventive health services among elderly patients at and between three time points[1]

| | Time 1 | Time 2 | Time 3 | Time 2 vs. Time1 | Time 3 vs. Time 2 |
|---|---|---|---|---|---|
| | % (n[2]) | % (n) | % (n) | Odds Ratio (95% C.I.) | Odds Ratio (95% C.I.) |
| Screening Tests | | | | | |
| Blood pressure screening | 100 (61) | 100 (65) | 98.2 (51) | NA[3] | NA |
| Papanicolaou test (women only) | 48.7 (37) | 55.2 (29) | 72.4 (29) | 1.09 (0.22, 5.36) | 2.44 (0.58, 10.18) |
| Assessments and Counseling Activities | | | | | |
| Tobacco/Smoking cessation assessment | 45.6 (68) | 69.0 (71) | 69.2 (65) | 2.66 (1.18, 6.02) | 1.02 (0.47, 2.23) |
| Tobacco/Smoking cessation counseling | 1.5 (68) | 7.0 (71) | 10.8 (65) | 4.85 (0.47, 49.92) | 1.74 (0.45, 6.74) |
| Physical activity assessment | 17.6 (68) | 59.2 (71) | 53.9 (65) | 6.34 (2.54,15.78) | 0.81 (0.48, 1.37) |
| Physical activity counseling | 10.3 (68) | 18.3 (71) | 24.6 (65) | 3.76 (0.47, 30.39) | 1.45 (0.32, 3.37) |
| Nutrition assessment | 8.8 (68) | 56.3 (71) | 56.9 (65) | 17.96 (4.89, 66.03) | 1.06 (0.60, 1.88) |
| Nutrition counseling | 13.2 (68) | 32.4 (71) | 23.1 (65) | 3.67 (0.72, 18.70) | 0.71 (0.30, 1.69) |
| Immunization | | | | | |
| Tetanus-Diphtheria | 18.5 (27) | 17.4 (23) | 47.6 (21) | 1.01 (0.30, 3.39) | 3.23 (1.35, 7.71) |
| Pneumococcus | 23.5 (68) | 36.6 (71) | 43.1 (65) | 2.21 (1.02, 4.79) | 1.40 (0.92, 2.11) |
| Influenza | 45.6 (68) | 46.5 (71) | 46.2 (65) | 0.94 (0.39, 2.27) | 1.17 (0.65, 2.12) |

1. Odds ratios are adjusted for clinics.
2. n = total number of subjects
3. NA: not applicable

## Discussion

Systems-level interventions to increase the delivery of preventive services improve the quality of care of the elderly, as measured by delivery of PHS, as well as the general adult population (Goodson et al., 1999; Gottlieb et al., 2001). Such interventions, which are rarely used in Medicare managed care populations, have potential to increase preventive care to this overlooked population (Herman, Speroff & Cebul, 1994; Herman, Speroff & Cebul, 1995). Just as with other populations the increases occurred primarily during the first year of the program and did not increase significantly thereafter (Dickey & Petitti, 1992; Dietrich, Sox, Tosteson & Woodruff, 1994; Melnikow, Kohatsu & Chan, 2000).

Examination of the pattern of differences in the delivery of PHS by age at all time points showed that there were no cases of an increase in delivery of a PHS with age among elderly patients, although blood pressure was universally measured. Decreases with age were most prevalent in the assessment and counseling for lifestyle behavior, and least in the delivery of immunizations.

With respect to screening tests, the decreases in cholesterol and Papanicolaou screening are consistent with the recommendations of the US Preventive Services Task Force, in which the elderly are not recommended to receive these services as they are unlikely to be of continued benefit. Although other studies have found decreases in mammography rates with aging among the elderly (Potosky, Breen, Graubard & Parsons, 1998; The NCI Breast Cancer Screening Consortium, 1990), we found no difference. The USPSTF guidelines do not recommend screening after age 70. The rates of mammography among women over 70, however, were low, consistent with quality care. The universally measured blood pressure provides an example of what can be accomplished with a functioning system for a recommended PHS, although it is delivered more frequently than recommended by USPSTF (U.S. Preventive Services Task Force, 1996).

Although the rates for immunizations never reached 50%, this set of PHS showed the fewest inverse relationships between age and delivery of the service. Both pneumococcal and influenza immunizations are recommended specifically for the elderly, and providers were not influenced by the patient's age in their delivery in this study. The rates for tetanus-diphtheria immunization were (except for time 3) low (under 20%), but only at time 2 was there a difference with age, suggesting that this immunization which is required for all

age groups, is being given to older patients without regard to age. However, recent US data show the delivery rates of pneumococcal and influenza immunizations to be highest for the older old (National Center for Health Statistics, 1999).

The health care providers were more likely to assess than counsel their elderly patients on tobacco, physical activity, and nutrition, just as for the general population (McPhee, Bird, Fordham, Rodnick & Osborn, 1991; Milan, Marcus, Goldstein & Taylor, 1994). An age-related decrease in services was noted most evidently for physical activity assessment. Bergman-Evans and Walker reported decreases with age for smoking cessation and physical activity counseling using a nationally representative sample from 1991. Durham and colleagues indicated that the older adults with increasing age were less likely to participate in a study of utilization of preventive services that included health risk assessment, clinical screening and health promotion counseling (Durham et al., 1991). German and colleagues also reported that the oldest old are less likely to make preventive visits (German et al., 1995). The lower participation rate for the older and oldest old may decrease the opportunity to receive lifestyle counseling compared to the young old. Elderly adults represent the most sedentary segment of the adult population (King, Rejeski & Buchner, 1998), and it has been reported that the proportion of elderly adults who exercise declines with age (National Center for Health Statistics, 1994). Prior findings also reveal that activity limitations increase with age, and the oldest-old are more likely than the young old and older old to be unable to perform physical activities (National Center for Health Statistics, 1999). These phenomena may discourage providers from offering physical activity counseling.

For those PHS that are not recommended for routine use among older adults, the clinician is required to deliver individualized preventive care based on the patient's risk status (Goldberg & Chavin, 1997). Other services, however, should be systematically provided for all patients, and office systems, including preauditing of charts (Cardozo et al., 1998; Holmboe, Scranton, Sumption & Hawkins, 1998), physician prompts (Balas et al., 2000), flow sheets (Herman et al., 1994), and reminders (Chambers, Balaban, Carlson & Grasberger, 1991; Chang, Zimmerman & Beck, 1995), are needed to increase the proportion of older patients receiving these PHS.

The strengths of our study include chart audit measurement, the use of hierarchical models appropriate for nested data, and the use of five different clinics for data collection. A

weakness was that the study was not designed specifically to examine PHS delivery among the elderly, and the sample size, particularly for women's services, may have had insufficient power to detect small differences (Lipsey, 1990). The major limitation of this study is the lack of a randomized controlled design, which reduces the possibility to link the results to the PPIP intervention. Explicitly, a secular trend towards increasing preventive health services and changes in the case mix of patients, providers, insurance coverage, and management policies that could account for the findings may have occurred. Thus, our findings are generalizable only to those Texas health care sites sampled.

From the viewpoint of family practice, great potential exists for the improvement of health status for the elderly population, who are now living longer. Concern over the health care cost of this increased longevity will be a new challenge to family physician and public health workers. Preventive care can serve as a potential solution to cost issues (Fries, Bloch, Harrington, Richardson & Beck, 1993; Makela, Jokinen, Pyhala, Makela & Ruutu, 1990; Messonnier, Corso, Teutsch, Haddix & Harris, 1999) and should be intensively pursued to make increased longevity less costly and less characterized by dysfunction, frailty and low quality of life.

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# 年齡與預防保健服務利用之關係－以美國德州五醫院老年門診病患爲例

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## 摘　要

本研究推估美國德州「Put Prevention Into Practice」預防保健公共衛生計畫是否應加老人的預防保健服務量，並探討年齡與接受預防保健服務之關係。以查閱病人病歷爲資料來源，爲一爲期三年的縱貫性研究，於三所家庭醫學科和兩所社區衛生中心的老年病患爲研究對象。於第一年至第二年間，肺炎和流行性感冒疫苗和吸菸、運動和營養評估的服務量皆有顯著增加。於第二年和第三年間，破傷風－白喉混合疫苗的服務量則有顯著增加。所有病患幾乎皆接受定期血壓測量（每兩年至少一次）。此外，在三年間所研究的 10 項預防保健服務，其中的共有 9 次（9/30）顯示出老人的年齡與接受的服務量有顯著的負向關係。研究結果顯示老人仍未全面性的接受預防保健服務，雖然老人並未被建議必須例行性的接受部分預防保健服務，這些預防保健服務的提供必須因人而異。而老人被建議接受的預防服務項目，建議醫師應該於門診中例行提供，以促進老年人的身體健康。本研究經驗可供台灣未來推行預防保健服務之參考。

**關鍵詞**：老年人、預防保健服務、縱貫性研究