# Individual Consequences of Volunteer and Paid Work in Old Age: Health and Mortality*

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*The impacts of the productive social activities of volunteer and paid work on health have rarely been investigated among the oldest Americans despite a recent claim for their beneficial effect (Rowe and Kahn 1998). This paper used data from Waves 3 and 4 of the Asset and Health Dynamics among the Oldest Old (AHEAD) Study to (1) investigate the impact of these activities on health measured as self-reported health and activities of daily living (ADL) functioning limitations and to (2) explore possible causal mechanisms. Using multinomial logistic regression analysis, amounts of volunteer and paid work over a minimum of 100 annual hours self-reported at Wave 3 were related to poor health and death as competing risks measured at Wave 4, controlling for health measured at Wave 2 and for other predictors of poor health and death. Findings suggest that performing more than 100 annual hours of volunteer work and of paid work have independent and significant protective effects against subsequent poor health and death. Additional analyses suggest that the quantity of volunteer and paid work beyond 100 annual hours is not related to health outcomes and that physical exercise and mental health measured as cognitive functioning and depressive symptoms explain not entirely overlapping parts of the relationship between productive activities and health.*

## INTRODUCTION

### *Volunteer and Paid Work among Older Adults*

Volunteer work in formal organizations has enjoyed a fairly recent interest in gerontological research as a means of providing a fuller picture of contributions made by older adults to their communities during a time in history when concerns are rising about the productive potential of an aging society. A number of studies show that one third to one half of all older Americans participate in volunteer work (Caro and Bass 1995; Herzog et al. 1989; Kohli 1996) and that the relatively young, healthy, educated and partially retired among them are more likely to participate (Chambré 1987; Herzog and Morgan 1993; Warburton, Le Broque, and Rosenman 1998; Wilson and Musick 1997). This research also shows that 65 year old or older volunteers spend only an average of about 75 annual hours in volunteer service or less than 1 1/2 hours per week (Fischer and Schaffer 1993; Herzog and Morgan 1993; Herzog et al. 1989) but that up to one third of all older Americans might be willing to volunteer their services if asked, and many older volunteers might be willing to increase their volunteer time (Marriott Seniors Volunteerism Study 1991). Findings like these

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have helped to dispel the myth that older Americans are not productive after retirement but also highlight the limited extent of this productivity and indicate ways in which productive contributions might be facilitated.

Research on older Americans' paid work, the standard indicator of productivity, and retirement from paid work is somewhat more plentiful. This literature has documented a trend towards early retirement over the past decades (Woodbury 1999). Currently less than 70 percent of 60 year old men are in the labor force, and less than 40 percent of 65 year old men are; among women the figures are even lower. In light of increasing life expectancy, improving health status of older adults, and the government-mandated increase in the retirement age, many speculate that the trend towards early retirement is likely to slow or even reverse itself (Quadagno and Hardy 1996; Woodbury 1999). Major factors accounting for early retirement are health problems and economic sufficiency (Mutchler et al. 1999; Quinn and Burkhauser 1990). Consequently older adults who continue working after the age of 60, 65, or certainly 70 represent a rather select group. For example, they are more likely to be managers and professionals, and they are less likely to be farmers and laborers than older adults who are no longer working; they report higher educational attainment; and they are healthier (Hayward, Friedman, and Chen 1998; National Academy on an Aging Society 2000). Many of them have moved to a job other than their career job, and they often work part-time (Hayward et al. 1998; Quinn 1999; Rones, Ilg, and Gardner 1997; Tilly 1991).

Although paid work and volunteer work are undoubtedly different in some regards, both represent productive contributions to society in a formal context and display additional similarities when performed by older adults. First, wages are often less critical for both activities among older adults. Workers over 70 often receive less than full compensation (Quinn and Burkhauser 1993); volunteers receive no compensation except occasionally reimbursement for their expenses. In addition, as noted above both activities are likely to be performed part-time by older adults and to involve predominantly professional duties and responsibilities. Writing about volunteer work in the general adult population, Wilson and Musick (1997) address such similarities directly. These authors argue for a spill-over between paid and volunteer work by demonstrating that workers in occupations with relatively high control over their work and relatively high job satisfaction are more likely to be involved in volunteer work than workers in less advantageous occupational environments. They believe that skills and attitudes acquired in high-level jobs "spill over" by facilitating volunteer work among relevant workers or by making such workers more attractive volunteers to organizations. A similar spillover might be expected to operate in older age when volunteer work sometimes replaces paid work (Caro and Bass 1997).

### *Health Benefits of Volunteer and Paid Work for Older Adults*

The exhortation of the societal value of productive involvement among older Americans is usually accompanied by a statement about the beneficial effects of such activities for the older people themselves: Two longstanding gerontological themes of activity and adaptation address the link between activities and well-being. Activity theory (Lemon, Bengtson, and Peterson 1972; Kart and Longino 1980) maintains that remaining active in older age, and thereby socially involved, results in a positive identity and high well-being. In a similar vain, more recent theorizing about successful aging (Herzog and House 1991; Rowe and Kahn 1998) has highlighted the importance of productive activities in this process. Theories of activity and successful aging both would suggest that social activities including volunteer and paid work should yield benefits for health and well-being.

Theoretical work with respect to adaptation describes how, despite declining importance of major life roles, most older adults continue to be active and to contribute to the welfare of others and thereby maintain a certain level of well-being. Specifically, the literature (Baltes and Baltes 1990; Brim 1988) suggests a set of mechanisms that allows aging individuals to adapt to their changing environment and changing competencies by modifying the time lines for certain activities, altering the level of efforts expanded on activities, becoming more selective about activities, and ultimately by replacing activities, while maintaining their overall purpose and meaning. Working part-time may represent such an adaptation: By changing the time frame and intensity of paid

work older adults who find full-time work too taxing may be able to continue working. Taking up volunteer work may represent another adaptation: By switching to a productive activity with greater flexibility and less burden than paid work older adults may continue to be productive (Harlow and Cantor 1996). According to the related writing on continuity theory (Atchley 1989), activities of older adults remain in many ways the same as during middle-age and thereby they lend a sense of continuity and comfort to older adults' daily experiences. Older adults strive to maintain continuity, on the one hand, by continuing to pursue goals and perform activities which they know well and in which they feel competent and, on the other hand, by making slight adjustments and changes within this overall context of continuity. Adaptation and continuity theory would suggest that both paid work and volunteer work should play a beneficial role in older adults' adaptation to their aging by minimizing negative changes and facilitating adaptation to those changes that are unavoidable.

Although there is empirical support for the hypothesized health benefits of social activities, the evidence is neither plentiful nor entirely conclusive (Berkman and Syme 1979; Cerhan and Wallace 1997; Glass et al. 1999; House, Robbins, and Metzner 1982; Liu et al. 1995; Steinbach 1992; Strawbridge et al. 1996). As noted recently by Young and Glasgow (1998) the strongest and most consistent evidence for a beneficial effect of social activities seems to emerge from the dimension of formal organizational activities and voluntary participation. Similarly, Carlson and colleagues (2000) argue that the beneficial effect of social activities may lie in the opportunity to be serving others. A few studies that have investigated volunteer work have reported supportive findings for the health and well-being of older adults (e.g., Krause, Herzog, and Baker 1992; Sabin 1993; Ward 1979; Wheeler, Gorey, and Greenblatt 1998; Young and Glasgow 1998), but typically these studies have been cross-sectional and focused primarily on well-being and mental health as outcome. One recent well-controlled prospective study of volunteer work (Musick, Herzog, and House 1999) was able to document a beneficial effect on seven-year mortality among older Americans. This study further suggested that the amount of volunteer work is not linearly related to mortality: mortality was lowest among those respondents who performed some but relatively little (i.e., less than 40 hours annually) volunteer work. A study that investigated the volunteer role only also documented lower five-year mortality rates among volunteers than non-volunteers (Oman, Thoresen, and McMahon 1999). Another recent longitudinal study (Van Willigen 2000) suggested a positive effect of volunteer work on self-rated health and also documented a lack of a linear relationship with volunteer hours.

Research on the health impact of paid work has focused mostly on unemployment among younger workers and on work cessation during standard retirement ages and has tended to show a negative effect of unemployment on health, and an inconsistent or possibly even positive effect of retirement from paid work (Ekerdt 1987; Herzog, House, and Morgan 1991; Mirowsky and Ross 1996; Warr 1998). Very little is known about the potential beneficial effects of paid work beyond retirement age.

In summary, there is suggestive but sparse evidence that older adults reap health benefits from volunteering or working for pay. Moreover, the evidence suggests that a modest amount of these activities is sufficient for a health benefit and that additional hours will not necessarily increase the benefit. The present paper investigates the health benefit of paid and volunteer work, as well as the amount of volunteer or paid work that can produce that effect, using a nationally representative longitudinal study of older Americans.

### *Potential Causal Mechanisms*

Our hypothesis of beneficial effects of volunteer or paid work on health might further be strengthened if we were able to identify plausible pathways for such effects. The mechanism that is often implied in the writings and theories is the social contacts afforded during the performance of paid or volunteer work or more general social activities. As noted before, social contacts and supports have a demonstrated effect on health and survival (for review of this literature see House, Landis, and Umberson 1988), and volunteer work and paid work often provide access to such social contacts, either because work duties include serving or assisting others or because work duties

are carried out in collaboration with others. Again, older workers are disproportionately working in jobs that rate high on social contacts (Hayward et al. 1998).

Another possible mechanism is the mere physical activity resulting from activities (Carlson, Seeman, and Fried 2000; Chambré 1987). Participation in volunteer and paid work requires at least minimal physical activity related to commuting to the site and moving about while performing the job. The positive effects of physical activity of even a moderate nature for health of older adults have been amply documented (LaCroix et al. 1993; Strawbridge et al. 1998).

A third set of mechanisms refers to both volunteer and paid work as supporting core psychological dispositions and beliefs about the self which, in turn, are related to good health. Such core dispositions include the need to contribute to the welfare of others, variably described as altruism (Midlarsky and Kahana 1994; Penner and Finkelstein 1998), religiosity (Chambré 1987; Wilson and Musick 1997), generativity (Carlson, Seeman, and Fried 2000; Erikson 1959; Erikson, Erikson, and Kivnick 1986), and need to feel useful (Warburton et al. 2001). A growing body of research demonstrates the health-promoting effects of religiosity (Idler and Kasl 1997; Levin and Chatters 1998; Strawbridge et al. 1997; for review of the literature see Levin and Schiller 1987) and of altruistic orientation (Midlarsky and Kahana 1994). Another core disposition is a sense of agency and control: Older persons who still work for pay or who engage in volunteer work are likely to have a higher sense of control and mastery (Hayward et al. 1998; Herzog et al. 1998; Krause, Herzog, and Baker 1992; Thoits and Hewitt 2001), and a large body of research demonstrates a positive relationship between a sense of control—also called self-efficacy, mastery, self-directedness, or agency—and health (for review of this literature see Ross and Wu 1996).

Finally, mental health and well-being might provide the causal link between volunteer or paid work and health. Volunteer work may impact on well-being (Thoits and Hewitt 2001; Ofstedal, Wheeler, and Herzog 2000; Fonda and Herzog 2001). Well-being in turn may impact physical health through the well-documented link between physical and mental health. Such a link has been demonstrated between depressive symptoms and clinical depression and disability (Ormel et al. 1993; Penninx et al. 1998) and premature death (Blazer, Hybels, and Pieper 2001) and between cognitive impairment and dementia and decline in functioning and mortality (Kelman et al. 1994; Korten et al. 1999).

In summary, a number of causal mechanisms can possibly explain the link between activities and health. To the extent possible, these mechanisms will also be investigated in the present paper.

### *The Present Study*

The present study is designed to address three research aims. First, we investigate in a prospective manner the impact of volunteer and paid work on a broad range of health and survival outcomes in older age while controlling on potential confounding factors that could lead to a spurious relationship between activities and health. Second, we describe the form of the relationship between the amount of volunteer and paid work and these health outcomes. Third, we examine several potential mechanisms that might explain the relationship between health and volunteer and paid work.

## METHOD

### *Data*

The data used in this study are from the Asset and Health Dynamics among the Oldest Old (often shortened to AHEAD) study. The study was designed to investigate the interface between health and economic resources and therefore tracks health status, economic status, and relevant behaviors such as paid work, volunteer work, and use of informal and formal health care services. It is a longitudinal survey of a nationally representative cohort of persons who were born in 1923 or before and were living in the community other than nursing homes at the time of the baseline interview in 1993. African Americans and Hispanic Americans were over-sampled. Interviews were conducted in 1993 with sampled respondents and their spouses (of any age), yielding a total sample size of 8,222 (of whom 7,447 were born in 1923 or before) for a baseline

response rate of 80 percent. When the selected respondent was unable to be interviewed himself or herself, a slightly modified interview was conducted with a proxy respondent. Surviving respondents were re-interviewed in additional survey waves conducted in 1995, 1998, and 2000 with respective interview rates of 93.8, 94.7, and 94.7 percent. In this paper we refer to them as Waves 1 through 4. Weights were used to adjust for unequal sampling probabilities and original non-response and subsequent attrition.

This paper is based on 4,860 respondents born in 1923 or before who are alive and participating in Wave 3 conducted in 1998 and who are alive and participating or dead in Wave 4 conducted in 2000. Data collected in all waves were used for these respondents. Respondents who participated in Wave 3 differed somewhat from those in the original sample, but the potential bias from this attrition was adjusted by the use of sample weights for Wave 3.[1] Attrition due to nonresponse between Wave 3 and Wave 4 was small, and no significant differences on sociodemographic and health variables emerged between nonrespondents and continuing and dead respondents (data not shown).

The Asset and Health Dynamics among the Oldest Old (AHEAD) study uses a dual mode design, whereby respondents aged 70 to 79 years are generally interviewed by telephone and those aged 80 years and over are generally interviewed in person. Mode effects so far have been found to be negligible (Herzog and Rodgers 1999; Hill and Rodgers 1996).

### *Measures*

*Volunteer work.* The survey questions on volunteer work contained in Wave 3 asked each respondent whether he or she had spent any time in the past 12 months doing volunteer work for religious, education, health-related, or other charitable organizations. Respondents who answered affirmatively were then asked how many total hours in the past 12 months they had spent doing volunteer work for such organizations. For the bi-variate analyses, in order to observe the effects of different amounts of volunteer work, this variable was recoded into four dummy variables representing less than 100 hours of volunteer work, 100–199 hours, 200–499 hours, and 500 or more hours. In the multivariate analyses only the two dummy variables representing 100 hours or more of volunteer work and less than 100 hours were used.

The reliability of the answers to the question on volunteer work may be checked in Wave 1. In that wave the question was posed slightly differently, by asking whether the respondent had spent 100 or more hours in the past 12 months doing volunteer work for religious, education, health-related, or other charitable organizations. In addition to that main question, a similar question was asked of a random subset of 894 respondents who answered an experimental module after the conclusion of the Wave 1 interview. Although the two questions specified the range of hours in a slightly different way, a high level of agreement between answers to the two questions is evident (see Table 1). About 93 percent of the respondents reported their volunteer work consistently.

*Paid work.* The survey questions on paid work asked each respondent whether she or he was "doing any work for pay at the present time." Respondents who answered affirmatively were then asked how many hours a week they worked and how many weeks a year. Annual hours were obtained by multiplying the number of hours per average week by the number of weeks worked. For the multivariate analyses this variable was coded as two dummy variables representing 100 hours or more of paid work and less than 100 hours.

*Health.* Researchers have used various conceptualizations of global self-reports of health status. A medical conceptualization is represented in reports of disease diagnoses or symptoms; global measures are achieved by summarizing diseases and symptoms either in weighted or unweighted form. A social conceptualization is reflected in measures of functioning in work or everyday activities and roles. A psychological conceptualization is based on the individual's rating of his or her health and draws on individual interpretations and evaluations of objective characteristics. A population conceptualization of health is represented in the use of mortality information. The Asset and Health Dynamics of the Oldest Old study contains measures relevant to all of these conceptualizations. In this investigation we used the following measures as outcome variables: (1) self-rated overall health ("Would you say your health is excellent, very good,

**TABLE 1. Comparison of Answers to Volunteer Work Questions Asked in Main Questionnaire and in Experimental Module**

| | Main questionnaire | |
|---|---|---|
| Experimental module | Less than 100 hours | 100 or more hours |
| 0 hours | 607 (78.8%) | 4 (3.3%) |
| 1–80 hours | 136 (17.7%) | 25 (20.3%) |
| 80–160 hours | 14 (1.8%) | 34 (27.6%) |
| 160 or more hours | 13 (1.7%) | 60 (48.8%) |
| Total | 770 (85.55%) | 123 (14.45%) |

*Note:* Asset and Health Dynamics of the Oldest Old (AHEAD) study, Wave 1, N = 893, weighted percentages are in parentheses.

good, fair, or poor?") and (2) the report of any activities of daily living (ADL) limitations due to a physical, mental, emotional, or memory problem that lasted longer than three months, defined as any difficulty experienced or any help or equipment used with six activities of daily living: walking across a room; dressing, including putting on socks and shoes; bathing or showering; eating, such as cutting up food; getting in and out of bed; and using the toilet. For the outcome variables in the multivariate analyses, these variables were coded into two dummy variables each, representing the categories of "excellent," "very good," "good" (below referred to as good health) versus the categories of "fair," "poor" (below referred to as poor health) and the category of no daily living limitations versus the category of any daily living limitations, respectively. Additional health information—used in this investigation for control purposes only—includes life-time affliction with major chronic diseases (hypertension, diabetes, lung disease, heart attack, cancer, stroke, arthritis, and psychiatric problems).

*Mortality.* Death of a respondent was assessed during the attempt for a re-interview by the field interviewer. Although National Death Index information was not available for the later study waves, comparing field information from earlier waves with Index information showed good correspondence.

*Demographic and socioeconomic variables.* Demographic control variables include age (represented as a continuous variable), gender (coded 1 if male, 0 if female), marital status (coded 1 if currently married, 0 if not married), and race and ethnicity, for which non-Hispanic whites are contrasted separately to Hispanics and to non-Hispanic blacks. Three measures of socioeconomic status—education, family income during past calendar year, and current net worth—are included in these analyses. Years of completed education was recoded into four dummy variables: less than 12 years (less than completed high school); 12 years (high school completed); 12–15 years (some college); 16 or more years(college completed or more). Family income and net worth (in dollars) are continuous variables. Health variables used as controls are described above. Finally, current and former smoking as major risk factors for bad health and mortality were also included as controls.

*Mediating variables.* Vigorous physical exercise was measured by one question ("On average, over the last 12 months have you participated in vigorous physical activity or exercise three times a week or more?") which was answered with "yes" or "no." Religiosity was measured by one question ("How important would you say religion is in your life; is it very important, somewhat important, or not too important?") with three response categories as indicated in the question. Social contact was measured by three questions about whether the respondent had any relatives in his or her neighborhood, had any good friends in his or her neighborhood, and how often he or she got together with them "just to chat or for a social visit." A summative index ranging from 0 to 3 was formed by adding one point for an affirmative answer to each of the first two questions and to "at least weekly" get-togethers. Cognitive functioning was represented by a 35-point index formulated from the answers to a modified Telephone Interview of Cognitive Status (TICS) measure of 12 cognitive items

(for full documentation see Herzog and Wallace 1997; Ofstedal, McAuley, and Herzog 2001). The depressive symptoms were represented by an 8-item modified Center for Epidemiologic Studies-Depression (CES-D) scale (for full documentation see Steffick 2000).

*Design and Analytical Strategy*

Our first set of analyses addressed the first and second research questions about the effects of volunteer work and paid work on subsequent health decline. We took advantage of the longitudinal design of the Asset and Health Dynamics of the Oldest Old study to control for the possibility that healthy older adults are more likely to participate in volunteer or paid work than those with health problems, i.e., a selection effect. Specifically, the available waves of the Asset and Health Dynamics of the Oldest Old study helped us to establish the causal ordering by allowing us (1) to investigate volunteer and paid work status that precede health change in time and (2) to control for health status that precedes volunteer and paid work status. Although in observational studies the possibility always remains that some unmeasured and uncontrolled aspect of poor health may bias the effect of activities on health, the analytical strategy pursued in this paper represents a reasonable approach to deal with a difficult research question, and many studies have used a similar approach (e.g., Thoits and Hewitt 2001; Van Willigen 2000).

We started with bivariate analyses of hours of volunteer and of paid work measured in Wave 3 on health and mortality measured in Wave 4, addressing the second research question. We then used multivariate analysis techniques to predict health status measured in Wave 4 from volunteer and paid work measured in Wave 3, while controlling for health status measured in Wave 2. Such an analysis produces arithmetically equivalent coefficients (except the coefficient of Wave 2 health status) to an analysis investigating change in health status between Waves 2 and 4 (Allison 1990; Bereitner 1963). Other well-established factors associated with onset of poor health and death were also controlled in these analyses in order to assess the effect of volunteer and paid work net of these possibly confounding factors. These factors include the sociodemographic characteristics of age, gender, race, and ethnicity measured in Wave 1, and marital status, measured at Wave 3; the socioeconomic characteristics of education, family income, and wealth were also measured in Wave 1; the health characteristics of life-time chronic disease conditions and smoking, both measured in Wave 1 and updated in Wave 2.

In order to capture the entire effect of volunteer and paid work we predicted the alternative outcomes of poor health and death, contrasting each with good health and controlling on the alternative outcome. By Wave 4, respondents may have developed poor health or they may have died. If they had not died, those now deceased may well have reported poor health. In other words, estimating the effect of volunteer and paid work only on the health of those who survived will not capture the entire effect of volunteer and paid work.

Our second set of analyses addresses the third research question about potential mechanisms involved in the link between volunteer and paid work and health outcomes. We started with the fully controlled model from our previous analyses and controlled for potentially mediating variables measured in Wave 3, one at a time. Note that the sample is smaller due to missing data on mediating variables.

Using multinomial logistic regression, we estimated two sets of models: one for self-rated health and one for daily living limitations. We show odds ratios and associated t-values for assessing the significance of individual predictors, and we present log likelihood and pseudo $R^2$ (Judge et al. 1985) for estimating the degree of fit. For estimation we used the STATA statistical package (Stata Corp. 1999) and adjusted for the complex sample design of the Asset and Health Dynamics of the Oldest Old study in the STATA program. Before presenting the core results, we show univariate statistics for volunteer and paid work, for health and mortality outcomes, and for all the covariates.

## RESULT

*Univariate Information*

Table 2 presents descriptive information (i.e., means and standard deviations for the variables of interest) on 4,860 study respondents. In Wave 1, study respondents were on

**TABLE 2. Means and Standard Deviations of All Study Variables**

| | Mean | Standard deviation |
|---|---|---|
| Died by Wave 4 (v.s. Alive) | 0.15 | 0.36 |
| *Volunteer and Work Status at Wave 3* | | |
| Volunteer work >= 100 hours (v.s. < 100 hours) | 0.12 | 0.32 |
| Paid work >= 100 hours (v.s. < 100 hours) | 0.07 | 0.25 |
| *Self-rated Health at Wave 4* | | |
| Excellent | 0.08 | 0.27 |
| Very good | 0.22 | 0.42 |
| Good | 0.32 | 0.47 |
| Fair | 0.25 | 0.43 |
| Poor | 0.14 | 0.34 |
| *Self-rated Health at Wave 2* | | |
| Excellent | 0.11 | 0.32 |
| Very good | 0.26 | 0.44 |
| Good | 0.32 | 0.47 |
| Fair | 0.21 | 0.41 |
| Poor | 0.09 | 0.29 |
| *Sociodemographic Characteristics at Wave 1* | | |
| Age (years) | 76.4 | 5.26 |
| Male (v.s. female) | 0.37 | 0.48 |
| Education | | |
| Years of schooling | 11.3 | 3.50 |
| Less than high school | 0.38 | 0.49 |
| High school | 0.33 | 0.47 |
| Some college | 0.16 | 0.37 |
| College graduate | 0.13 | 0.34 |
| Black (v.s. white) | 0.07 | 0.26 |
| Hispanic (v.s. white) | 0.04 | 0.20 |
| Married (v.s. not married) at Wave 3 | 0.42 | 0.49 |
| Socioeconomic characteristics | | |
| Household income ($10,000) | 2.62 | 3.00 |
| Net worth ($10,000) | 20.0 | 35.7 |
| *Activities of Daily Living at Wave 4* | | |
| Any limitations (v.s. no limitations) | 0.39 | 0.49 |
| Limitations with walking (v.s. no limitations) | 0.29 | 0.46 |
| Limitations with dressing (v.s. no limitations) | 0.18 | 0.39 |
| Limitations with eating (v.s. no limitations) | 0.09 | 0.28 |
| Limitations with bathing (v.s. no limitations) | 0.19 | 0.39 |
| Limitations with getting in and out of bed (v.s. no limitations) | 0.16 | 0.37 |
| Limitations with toileting (v.s. no limitations) | 0.12 | 0.32 |
| *Activities of Daily Living at Wave 2* | | |
| Limitations with walking (v.s. no limitations) | 0.19 | 0.39 |
| Limitations with dressing (v.s. no limitations) | 0.12 | 0.33 |
| Limitations with eating (v.s. no limitations) | 0.04 | 0.20 |
| Limitations with bathing (v.s. no limitations) | 0.10 | 0.30 |
| Limitations with getting in and out of bed (v.s. no limitations) | 0.11 | 0.31 |
| Limitations with toileting (v.s. no limitations) | 0.07 | 0.26 |
| *Major Chronic Conditions by Wave 2* | | |
| Stroke (v.s. no stroke) | 0.08 | 0.28 |
| Heart attack (v.s. no heart attack) | 0.08 | 0.27 |
| Diabetes (v.s. no diabetes) | 0.13 | 0.33 |
| Hypertension (v.s. no hypertension) | 0.53 | 0.50 |
| Arthritis (v.s. no arthritis) | 0.51 | 0.50 |
| Psych problems (v.s. no psych problems) | 0.13 | 0.34 |
| Cancer (v.s. no cancer) | 0.15 | 0.35 |
| *Smoking Status at Wave 2* | | |
| Current smoker at Wave 2 (v.s. non-smoker) | 0.08 | 0.27 |
| Former smoker at Wave 2 (v.s. non-smoker) | 0.44 | 0.50 |

*Note*: Asset and Health of the Oldest Old (AHEAD) study, Waves 1–4, unweighted N = 4,860. All figures are weighted and adjusted for complex sample design.

average 76.4 years old, 37 percent of them were men, 7 percent were African American, and 4 percent were Hispanic. At that point, the respondents reported an average of 11 years of education, an annual household income of about 26,000 dollars, and an average household net worth of about 200,000 dollars. Forty-two percent of respondents were married at Wave 3. The proportion of respondents with chronic conditions at Wave 2, range from 8 percent for prior heart attacks to more than 50 percent for both hypertension and arthritis. The proportions with daily living functional limitations at Wave 2 range from 4 percent who had difficulty or needed help with eating to 19 percent who had difficulty, needed help, or used equipment with walking across the room. The proportion who reported themselves in fair or poor health is 30 percent.

In terms of the independent variables of interest, 11.9 percent of the Wave 3 respondents had performed 100 hours or more of volunteer work during the year preceding Wave 3: 4.7 percent performed between 100 and 199 hours, 5.6 percent performed 200 to 499 hours, and 1.6 percent performed 500 or more hours (Table 3). Only 6.6 percent had performed 100 hours or more of paid work during the same time period; about 1.3 percent performed 100 to 499 hours, 2.8 percent performed 500 to 1,199 hours, and 2.5 percent performed 1,200 or more hours (Table 4). These figures are somewhat lower than those reported in other studies. The lower figures can at least in part be attributed to the definition of volunteer and paid work of over 100 annual hours; many other studies probed any volunteer or paid work.

In terms of outcome variables, 15 percent of the respondents alive in Wave 3 had died by Wave 4. Among the survivors who remained in the study 39 percent rated their health as fair or poor in Wave 4, and 39 percent reported any daily living functional limitations.

### *Bivariate Relationships*

Self-reported health and mortality at Wave 4 by volunteer and employment status and by hours spent volunteering and working at Wave 3 are shown in Tables 3 and 4. Respondents who reported having volunteered 100 hours or more in the year preceding Wave 3 were less likely to have died by Wave 4 than those who had not volunteered or had volunteered less time (5.6% versus 16.8%). The difference is statistically significant ($p < .01$). Those who had volunteered 100 hours or more were also less likely to report poor health and daily living limitations, both statistically significant differences ($p < .01$). Among those having volunteered 100 hours or more, the number of hours spent in volunteer work was not related to outcomes.

Likewise, respondents who reported having worked for pay 100 hours or more annually by Wave 3 were less likely to have died (3.4% versus 16.3%), less likely to report poor health, and less likely to report daily living limitations in Wave 4. Among those having worked 100 hours or more, the actual number of hours was not related to health outcomes. Because the number of hours worked above 100 was not related to health outcomes, the following multivariate analyses distinguish only between 100 annual hours or more of volunteer and paid work and less than 100 hours. The latter category includes those who volunteered or worked less than 100 hours and those who did

**TABLE 3. Mortality, Self-rated Health and Daily Functioning Limitations at Wave 4 by Hours of Volunteer Work at Wave 3**

| Hours of volunteer work at Wave 3 | % | Death at Wave 4 (%) | | Fair or poor health at Wave 4 (%) | | Daily functioning limitations at Wave 4 (%) | |
|---|---|---|---|---|---|---|---|
| Less than 100 hours | 88.08 | 16.82 | | 34.45 | | 41.40 | |
| 100 or more hours | 11.92 | 5.61 | | 18.86 | | 22.29 | |
| 100–199 hours | 4.72 | | 5.82 | | 19.13 | | 21.49 |
| 200–499 hours | 5.60 | | 3.67 | | 18.09 | | 20.92 |
| 500+ hours | 1.62 | | 8.72 | | 20.74 | | 29.69 |
| chi-square | | 35.0 | 3.258 | 56.4 | 0.284 | 72.4 | 2.520 |
| d.f. | | 1 | 2 | 1 | 2 | 1 | 2 |
| p-value | | 0.000 | 0.242 | 0.000 | 0.865 | 0.000 | 0.247 |

*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 3 and 4, unweighted N = 4,860. All figures are weighted and adjusted for complex sample design.

**TABLE 4. Mortality, Self-rated Health and Daily Functioning Limitations at Wave 4 by Hours of Paid Work at Wave 3**

| Hours of paid work at Wave 3 | % | Death at Wave 4 (%) | | Fair or poor health at Wave 4 (%) | | Daily functioning limitations at Wave 4 (%) | |
|---|---|---|---|---|---|---|---|
| Less than 100 hours | 93.40 | 16.29 | | 33.69 | | 40.61 | |
| 100 or more hours | 6.60 | 3.36 | | 17.01 | | 17.18 | |
| 100–499 hours | 1.33 | | 4.41 | | 12.39 | | 23.57 |
| 500–1199 hours | 2.82 | | 3.35 | | 22.33 | | 14.39 |
| 1200+ hours | 2.45 | | 2.80 | | 13.40 | | 16.97 |
| chi-square | | 41.7 | 0.307 | 38.4 | 4.428 | 80.6 | 2.289 |
| d.f. | | 1 | 2 | 1 | 2 | 1 | 2 |
| p-value | | 0.000 | 0.780 | 0.000 | 0.124 | 0.000 | 0.432 |

*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 3 and 4, unweighted N = 4,860. All figures are weighted and adjusted for complex sample design.

not volunteer or work at all. The findings answer our second research question: The relationship between activities and health was not linear but reflected a threshold between no or little activity and a substantial amount.

### *Multivariate Analyses*

Our first research question refers to the causal effect of volunteer and paid work on health decline and death and therefore must control for possible confounding factors that could lead to a spurious relationship between activities and health. Table 5 presents the multivariate models for the self-rated health and mortality outcomes; Table 6 presents identical models for the outcomes of any daily living limitations and mortality. Focusing first on self-rated health and mortality outcomes, we observed that having spent 100 annual hours or more in volunteer work by Wave 3 significantly lowered the odds of reporting poor health and of dying compared to reporting good health (model 1 in Table 5). This finding is consistent with the major contrast shown in Table 3. The effect remained significant even after controlling for self-rated health reported at Wave 2, although its strength was somewhat reduced (model 2 in Table 5). Likewise, having worked 100 annual hours or more for pay significantly lowered the odds of reporting poor health and of dying versus reporting good health, effects which were reduced when pre-existing self-rated health was controlled (models 1 and 2 in Table 5). The effects of volunteer work and paid work were further reduced in strength when the remaining potentially confounding characteristics were included as controls (model 3 in Table 5), but both effects remained statistically significant. Those who volunteered were only two thirds as likely to report bad health and one third as likely to die than were those who did not volunteer. Likewise, those working for pay were only half as likely to report bad health and one quarter as likely to die. The predicted probabilities of poor health among volunteers is 26 percent and 7 percent of dying compared to 34 percent and 14 percent, respectively, among non-volunteers (data not shown). In summary, despite fairly rigorous controls on pre-existing health status and on sociodemographic and socioeconomic characteristics that may have selected older persons into or out of volunteer and paid work in the first place, volunteer and paid work are negatively related to subsequent decline in physical health and to death.

When we turn to limitations with daily living functions and death as outcomes by Wave 4 and contrast them with no limitations with daily living functions by Wave 4 (Table 6), the results are similar. Performance of more than 100 annual hours of volunteer work and of paid work reported by Wave 3 significantly lowered the odds of subsequently reporting any daily living limitations or of mortality compared to reporting no limitations (model 1). These effects were somewhat reduced in strength but remained statistically significant when pre-existing daily living limitations were controlled (model 2). With socioeconomic and health controls (model 3) the effect of paid work and of volunteer work on daily living limitations and on survival were further reduced, but all remained statistically significant.

It is also interesting to consider the effects of the control variables on subsequent health and mortality (see Tables 5 and 6). Among the socio-demographic variables, older age was strongly related to poor health and functional

**TABLE 5. Effect of Wave 3 Volunteer and Paid Work on Wave 4 Self-rated Health and Mortality**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| Independent Variable | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s excellent-good health odds ratio | Death v.s. excellent-good healh odds ratio |
| Volunteer work >= 100 hours | 0.35*** | 0.19*** | 0.51*** | 0.25*** | 0.59*** | 0.38** |
| | (–9.50) | (–5.75) | (–5.02) | (–4.51) | (–3.95) | (–2.92) |
| Paid work >= 100 hours | 0.32*** | 0.13*** | 0.50*** | 0.19*** | 0.53*** | 0.26*** |
| | (–6.95) | (–6.18) | (–4.04) | (–4.87) | (–3.56) | (–3.56) |
| Health at Wave 2, excellent | | | 0.19*** | 0.44*** | 0.24*** | 0.44*** |
| | | | (–12.0) | (–3.92) | (–9.58) | (–3.91) |
| Health at Wave 2, very good | | | 0.40*** | 0.66** | 0.45*** | 0.68** |
| | | | (–9.40) | (–2.81) | (–7.89) | (–2.54) |
| Health at Wave 2, good (omitted) | | | | | | |
| Health at Wave 2, fair | | | 3.23*** | 3.03*** | 2.90*** | 2.69*** |
| | | | (10.0) | (9.22) | (8.44) | (7.39) |
| Health at Wave 2, poor | | | 7.72*** | 9.53*** | 6.35*** | 8.24*** |
| | | | (10.6) | (10.1) | (8.72) | (8.43) |
| Age | | | | | 1.03*** | 1.15*** |
| | | | | | (3.85) | (12.9) |
| Male | | | | | 1.12 | 1.64*** |
| | | | | | (1.18) | (3.28) |
| Education | | | | | | |
| Less than high school (omitted) | | | | | | |
| High school | | | | | 0.95 | 0.94 |
| | | | | | (–0.62) | (–0.43) |
| Some college | | | | | 0.69** | 0.90 |
| | | | | | (–2.93) | (–0.63) |
| College graduate | | | | | 0.56*** | 0.67* |
| | | | | | (–4.65) | (–2.00) |
| Black | | | | | 1.26 | 1.17 |
| | | | | | (1.58) | (1.03) |
| Hispanic | | | | | 1.59 | 0.74 |
| | | | | | (1.64) | (–0.82) |
| Married | | | | | 1.10 | 0.94 |
| | | | | | (0.92) | (–0.54) |
| Household income | | | | | 1.02 | 1.02 |
| | | | | | (0.95) | (1.06) |
| Net worth | | | | | 1.00* | 0.99** |
| | | | | | (–1.79) | (–2.79) |
| Stroke by Wave 2 | | | | | 1.27* | 1.41** |
| | | | | | (1.90) | (2.99) |
| Heart attack by Wave 2 | | | | | 1.32* | 1.86*** |
| | | | | | (2.08) | (3.34) |
| Diabetes by Wave 2 | | | | | 1.17 | 1.81*** |
| | | | | | (1.20) | (3.87) |
| Hypertension by Wave 2 | | | | | 1.20* | 1.04 |
| | | | | | (2.29) | (0.42) |
| Arthritis by Wave 2 | | | | | 1.38*** | 0.74*** |
| | | | | | (3.69) | (–3.16) |
| Psych problems by Wave 2 | | | | | 1.29** | 1.12 |
| | | | | | (2.13) | (0.77) |
| Cancer by Wave 2 | | | | | 1.22* | 1.48*** |
| | | | | | (1.89) | (3.20) |
| Current smoker at Wave 2 | | | | | 2.31*** | 3.37*** |
| | | | | | (4.75) | (5.67) |
| Former smoker at Wave 2 | | | | | 1.16 | 1.39** |
| | | | | | (1.31) | (2.62) |
| Log-likelihood | –4684.9 | | –4211.7 | | –3941.8 | |
| Pseudo R-squared | 0.0295 | | 0.1276 | | 0.1835 | |

* $p < .05$: ** $p < .01$; *** $p < .001$, one-tailed test, t-statistics in parentheses.

*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 1–4, N = 4,860, All figures are weighted and adjusted for complex sample.

**TABLE 6. Effect of Wave 3 Volunteer and Paid Work on Wave 4 Daily Functioning Limitations and Mortality**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| Independent Variable | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio |
| Volunteer work > 100 hours | 0.41*** | 0.21*** | 0.55*** | 0.30*** | 0.62*** | 0.41** |
| | (–8.14) | (–5.86) | (–5.22) | (–4.33) | (–4.37) | (–2.99) |
| Paid work > 100 hours | 0.31*** | 0.13*** | 0.44*** | 0.20*** | 0.59** | 0.28*** |
| | (–6.74) | (–6.24) | (–4.63) | (–4.85) | (–2.86) | (–3.51) |
| Limitations at Wave 2, walk | | | 8.41*** | 8.33*** | 5.84*** | 6.01*** |
| | | | (14.4) | (13.9) | (11.2) | (11.4) |
| Limitations at Wave 2, dress | | | 2.37** | 2.04*** | 2.31*** | 2.16*** |
| | | | (5.55) | (4.52) | (5.12) | (4.80) |
| Limitations at Wave 2, eat | | | 3.07** | 4.21*** | 3.02** | 3.74*** |
| | | | (2.92) | (3.80) | (2.93) | (3.47) |
| Limitations at Wave 2, bathe | | | 2.60*** | 3.86*** | 2.24** | 2.91*** |
| | | | (3.60) | (5.22) | (3.03) | (4.16) |
| Limitations at Wave 2, bed | | | 2.32*** | 2.40*** | 1.89** | 2.22*** |
| | | | (3.52) | (4.25) | (2.76) | (4.08) |
| Limitations at Wave 2, toilet | | | 2.85** | 2.19** | 2.46** | 2.09** |
| | | | (3.44) | (2.89) | (2.85) | (2.56) |
| Age | | | | | 1.11*** | 1.19*** |
| | | | | | (12.1) | (13.2) |
| Male | | | | | 0.89 | 1.51** |
| | | | | | (–1.00) | (2.95) |
| Education | | | | | | |
| Less than high school (omitted) | | | | | | |
| High school | | | | | 0.87 | 0.92 |
| | | | | | (–1.52) | (–0.70) |
| Some college | | | | | 0.94 | 1.03 |
| | | | | | (–0.50) | (0.15) |
| College graduate | | | | | 1.03 | 0.80 |
| | | | | | (0.24) | (–1.07) |
| Black | | | | | 1.42** | 1.34 |
| | | | | | (2.24) | (1.61) |
| Hispanic | | | | | 1.16 | 0.65 |
| | | | | | (1.11) | (–1.36) |
| Married | | | | | 0.99 | 0.99 |
| | | | | | (–0.13) | (–0.11) |
| Household income | | | | | 0.98 | 1.01 |
| | | | | | (–0.96) | (0.44) |
| Net worth | | | | | 1.00 | 1.00* |
| | | | | | (–0.29) | (–1.99) |
| Stroke by Wave 2 | | | | | 1.32* | 1.25 |
| | | | | | (1.92) | (1.43) |
| Heart attack by Wave 2 | | | | | 1.10 | 1.60*** |
| | | | | | (0.80) | (3.56) |
| Diabetes by Wave 2 | | | | | 1.49** | 2.09*** |
| | | | | | (2.90) | (5.06) |
| Hypertension by Wave 2 | | | | | 1.30** | 1.13 |
| | | | | | (2.99) | (1.13) |
| Arthritis by Wave 2 | | | | | 1.65*** | 0.75** |
| | | | | | (6.51) | (–2.87) |
| Psych problems by Wave 2 | | | | | 1.38*** | 1.13 |
| | | | | | (3.32) | (0.70) |
| Cancer by Wave 2 | | | | | 1.42*** | 1.65*** |
| | | | | | (4.22) | (4.41) |
| Current smoker at Wave 2 | | | | | 1.75*** | 3.18*** |
| | | | | | (4.03) | (5.74) |
| Former smoker at Wave 2 | | | | | 0.91 | 1.23* |
| | | | | | (–1.00) | (1.83) |
| Log-likelihood | –4705.1 | | –4135.9 | | –3811.0 | |
| Pseudo R-squared | 0.0271 | | 0.1448 | | 0.2120 | |

* $p < .05$: ** $p < .01$; *** $p < .001$, one-tailed test, t-statistics in parentheses.
*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 1–4, N = 4,860, All figures are weighted and adjusted for complex sample.

limitations, whereas gender was not. Among socioeconomic variables, educational attainment was related negatively only to poor health but not to functioning. None of the other variables were related to health. Among health variables, arthritis and current smoking were related to poor health, and arthritis, psychological problems, cancer, diabetes, hypertension, and present smoking were related to functional limitations. Age, male gender, net worth, all pre-existing health conditions except hypertension, arthritis, and psychological problems, and current smoking were clearly linked to mortality. These effects are generally consistent with those reported in the literature and provide a sense of construct validity to the Health and Retirement Study (HRS) outcome measures.

Our third research question refers to potential mechanisms through which volunteer and paid work might affect health and functioning. Models controlling for cognitive functioning, depressive symptoms, physical exercise, and social contacts are shown in Table 7 for self-rated health and Table 8 for daily living functioning. We estimated an identical model with the religiosity measure, but the measure did not relate to health and functioning and had no effect on the relationship between volunteer and paid work and health and functioning. Therefore, we do not include the latter model in the tables.

Starting with self-rated health (Table 7), cognitive functioning, depressive symptoms, and vigorous exercise measured at Wave 3 showed strong and statistically significant effects on health and mortality measured at Wave 4. The social contacts term was only related to mortality but not health. Compared to the fully controlled effects of Model 3 in the previous table (which are recalculated in this table for the smaller sample that was available for these analyses), the effects for volunteer and paid work on health were slightly reduced when cognitive functioning, depressive symptoms, and vigorous exercise were included in the multivariate model. This finding suggests that the tested mediating factors may in fact explain part of the effects of volunteer and paid work on subsequent health. The explanatory effects are partly independent of each other, as further reduction in the paid and volunteer effects were obtained when all mediating variables were controlled together (data not shown).

The findings are quite similar for daily living functioning (see Table 8). Cognitive functioning, depressive symptoms, and physical exercise were strongly related to daily living functioning, social contacts less so. When these factors were controlled in the multivariate model, small reductions of the paid and volunteer work effects were observed.

## DISCUSSION

In the context of older Americans' productive contributions to their society, the present paper asks whether older adults draw individual health benefits from performing the productive activities of volunteer and paid work. Data from several waves of the nationally representative Asset and Health Dynamics among the Oldest Old study were used to deal with the causal ordering between productive activities and health. Results indicate that volunteer and paid work performed for at least 100 annual hours by Wave 3 were related to subsequent good health and survival by Wave 4, even after preexisting health status measured at Wave 2 and other potential confounding factors were controlled.

The findings provide support for the hypothesis implied in the first research question raised in this paper about a beneficial effect of volunteer and paid work on subsequent health among older Americans, as predicted by activity and adaptation theories in gerontology. The findings further extend previous sparse findings in several ways. First, the salubrious effect of volunteer and paid work has been demonstrated here on several health outcomes ranging from the rather subjective measure of self-reported health, over the more objective measure of daily living functioning, to the hard measure of death and survival. Moreover, by casting health decline and mortality as alternative outcomes, this study avoids the biased samples of surviving panel members. Second, previous research had little to say about the effect of paid work beyond the typical retirement age. This investigation suggests that both paid and volunteer work among those adults who are considerably beyond standard retirement age has a beneficial effect on health.

Third, the findings also suggest that both volunteer work and paid work appear to have independent beneficial effects for health. This

**TABLE 7. Effect of Potential Mediating Variables on Self-rated Health and Mortality**

| | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio | Fair-poor health v.s. excellent-good health odds ratio | Death v.s. excellent-good health odds ratio |
| Volunteer work >= 100 hours | 0.61*** | 0.42* | 0.66** | 0.49* | 0.64** | 0.44* | 0.63** | 0.44* | 0.61** | 0.44* |
| | (–3.17) | (–2.12) | (–2.53) | (–1.73) | (–2.91) | (–2.04) | (–3.01) | (–2.02) | (–3.20) | (–1.99) |
| Paid work >= 100 hours | 0.50** | 0.35** | 0.52** | 0.38* | 0.52** | 0.36** | 0.54** | 0.38* | 0.50** | 0.35** |
| | (–2.96) | (–2.39) | (–2.85) | (–2.23) | (–2.92) | (–2.34) | (–2.63) | (–2.22) | (–2.98) | (–2.36) |
| Total cognition score at Wave 3 | | | 0.95*** | 0.92*** | | | | | | |
| | | | (–5.11) | (–6.76) | | | | | | |
| Depressive symptoms at Wave 3 | | | | | 1.17*** | 1.16*** | | | | |
| | | | | | (6.44) | (5.63) | | | | |
| Vigorous exercise at Wave 3 | | | | | | | 0.65*** | 0.50*** | | |
| | | | | | | | (–3.44) | (–4.35) | | |
| Social contacts (0–3) at Wave 3 | | | | | | | | | 1.03 | 0.75*** |
| | | | | | | | | | (0.62) | (–4.58) |
| Log-likelihood | –2524.7 | | –2496.5 | | –2502.1 | | –2509.6 | | –2514.3 | |
| Pseudo R-squared | 0.1825 | | 0.1916 | | 0.1898 | | 0.1874 | | 0.1858 | |

* $p < .05$: ** $p < .01$; *** $p < .001$, one-tailed test, t-statistics in parentheses.

*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 1–4. N = 3,277. Covariates shown in Table 5 are controlled. All figures are weighted and adjusted for complex sample design

**TABLE 8. Effect of Potential Mediating Variables on Daily Functioning Limitations and Mortality**

| | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent Variable | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio | Any limitations v.s. no limitations odds ratio | Death v.s. no limitations odds ratio |
| Volunteer work >= 100 hours | 0.64*** | 0.46* | 0.69** | 0.53* | 0.67*** | 0.48* | 0.66*** | 0.49* | 0.64*** | 0.48* |
| | (–3.45) | (–2.17) | (–2.74) | (–1.74) | (–3.08) | (–2.08) | (–3.15) | (–2.03) | (–3.51) | (–2.04) |
| Paid work >= 100 hours | 0.46** | 0.36** | 0.48** | 0.38* | 0.48** | 0.37** | 0.51** | 0.39* | 0.46** | 0.35** |
| | (–2.89) | (–2.42) | (–2.70) | (–2.30) | (–2.74) | (–2.36) | (–2.41) | (–2.20) | (–2.88) | (–2.39) |
| Total cognition score at Wave 3 | | | 0.95*** | 0.92*** | | | | | | |
| | | | (–4.98) | (–7.24) | | | | | | |
| Depressive symptoms at Wave 3 | | | | | 1.17*** | 1.15*** | | | | |
| | | | | | (6.21) | (5.71) | | | | |
| Vigorous exercise at Wave 3 | | | | | | | 0.50*** | 0.48*** | | |
| | | | | | | | (–7.81) | (–4.44) | | |
| Social contacts (0–3) at Wave 3 | | | | | | | | | 1.04 | 0.76*** |
| | | | | | | | | | (0.75) | (–4.23) |
| Log-likelihood | –2472.1 | | –2446.9 | | –2451.2 | | –2445.4 | | –2462.1 | |
| Pseudo R-squared | 0.2046 | | 0.2127 | | 0.2113 | | 0.2132 | | 0.2078 | |

* $p < .05$: ** $p < .01$; *** $p < .001$, one-tailed test, t-statistics in parentheses.

*Note*: Asset and Health Dynamics of the Oldest Old (AHEAD) study, Waves 1–4. N = 3,277. Covariates shown in Table 6 are controlled. All figures are weighted and adjusted for complex sample design

suggests that regular paid work and unpaid formal volunteer work potentially represent alternative avenues for maintaining health. Whereas adaptation theory suggests that volunteer work may function as compensation for paid work, we were not able to explicitly test this particular prediction with statistical interaction terms because of the relatively small number who both volunteer and work for pay. Our findings are therefore limited to the demonstration of additive effects of volunteer and paid work in old age.

Fourth, the study confirms and extends the recent results by Musick and his colleagues (1999) in that it shows the effect of volunteer and paid work to reside in the difference between performing the amount of 100 or more annual hours versus performing less or no volunteer and paid work, not in working additional volunteer and work hours beyond 100. Musick and his colleagues had found that volunteering for only one organization for 40 annual hours or less was most beneficial. These various findings look like threshold effects rather than linear effects. They are consistent with adaptation theory and its postulated reduction and modification of activity patterns: It is possible that the incorporation into one's identity of the mere knowledge about donating one's time for a good cause and about remaining active and competent is sufficient for the beneficial effect, but that the analogy to a muscle for which more exercise provides a stronger effect may be misguided.

Fifth, this study explored a number of possible mechanisms through which paid and volunteer work affect health. Although the entire effect could not be explained, cognitive impairment, depression, and physical activity appear to explain parts of the effect. However, future research should continue to explore the suggested and additional mechanisms and use more targeted and comprehensive measures than were available in this study.

Several limitations of this study also must be mentioned. First, although the results are based on observational data, the longitudinal nature of the data and the controls on pre-existing health problems and on other well-established predictors lend credence to the causal effect of volunteer and paid work. Though perfect control is never possible in observational studies, and thus we must acknowledge the possibility that some of the effects of volunteer and paid work may still be influenced by pre-existing uncontrolled health differences, it is worth pointing out that experimental approaches to these kinds of research questions have serious limitations of their own and that progress can best be made by using a multitude of less-than-perfect methodologies.

We performed an additional check on the selection effect of health by estimating the effect of self-reported health at Wave 2 on volunteer work and on paid work at Wave 3, controlling on volunteer and paid work at Wave 2, respectively (data not shown). These analyses suggested effects of health on volunteer work and on paid work in addition to stability in volunteer and paid work. Therefore, the causation between health and volunteer and paid work is most likely bi-directional, as is recently suggested by Thoits and Hewitt (2001) for volunteer work and well-being. Future investigations should address directly the hypothesis of bi-directionality.

Second, we cannot exclude the possibility that the lack of an ever-increasing beneficial effect associated with higher levels of activities reflects unreliability of measurement rather than a substantive finding. It is well known that the quantity and frequency of behaviors—particularly irregular behaviors such as volunteer work or paid work during retirement age—are not easy to measure accurately with global survey questions (Menon 1994).

Third, the variables available to test causal mechanisms linking activities and health are limited in the AHEAD data set, particularly measures of identity.

In conclusion, future work needs to (1) replicate the effect of paid work and volunteer work on health and survival among older individuals, (2) further probe the importance of the quantity of volunteer and paid work, and (3) explicate the mechanisms involved in the effect. In the meantime, the results reported in this paper represent preliminary support for the significance of an active life style that has captured the imagination of gerontologists for a long time and for the importance of a health-promoting factor that may be amendable to modification well into old age.

## NOTE

1. Estimates using sample weights adjusted for attrition differed only in very minor ways from estimates using the original sample weights.

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