



The Hennepin County Aging Initiative

Research highlights: Healthy behaviors and aging

Healthy. People are healthy, have access to quality health care and live in a clean environment. Healthy is a goal Hennepin County has for all its residents.

Top research findings

1. Growing evidence demonstrates that disease and disability can be prevented as individuals age and healthy behaviors such as physical activity and nutrition impact healthy aging.
2. Behaviors such as physical activity, not smoking, quality nutrition, and immunizations are among the most well-documented for preventing or mitigating disease and disability for individuals over the age of 65.
3. Emerging evidence demonstrates that empowering older adults to understand the importance of healthy behaviors through health promotion programs can maximize the quality of their health and reduce health care costs.
4. Researchers believe physical activity and nutrition are among the most important behaviors for preventing and managing disease.
5. Baby boomers are the largest alcohol and drug using cohort in history. The number of older adults with substance abuse problems is expected to double from its current rate of 2.7 million to 5.7 million in 2020.
6. Rates of syphilis and chlamydia are increasing among adults 55 and older. In addition, HIV (Human Immunodeficiency Virus) is growing faster among individuals 50 and older than individuals under 40.
7. Older adults are increasingly expected to participate in self-management of their care. Effective self-care disease management has been shown to be associated with increased independence, less need for health services, and decreased health care costs.

Prepared by:

Research, Planning & Development
Sherrie Simpson, Director

Principal contributors:

Constance Osterbaan, Research Manager
Ellen Wolter, Pr. Planning Analyst

August 2012

Prevention for Older Adults?

Growing evidence demonstrates that healthy behaviors can improve, maintain, or help manage an individual's health, even as they age. Individuals have greater control over their health status as they age than previously believed. The National Institutes of Health reports that genetics account for only 35 percent of an individual's lifespan. Studies suggest that environmental factors, rather than genetics, are primarily contributors to an individual's health and life expectancy.¹ Healthy behavior, for instance, is an environmental factor that can help to increase how long and also how well an individual ages.

Research demonstrates that healthy behaviors such as physical activity, nutrition, substance abuse, and sexual health are associated with how well individuals age. Studies have found that lifestyle factors can explain age-associated declines in physical and cognitive functioning. Not smoking, a normal body mass index, and being physically active are among the most well-documented healthy behaviors for preventing and managing diseases among middle and older aged adults. Healthy behaviors associated with aging well include obtain-

ing preventative screenings, physical activity, not smoking, quality nutrition, and immunizations.^{2,3,4,5,6,7,8,9,10,11,12,13,14}

Health promotion advocates and researchers argue that empowering elders to know their own risk factors and to understand the importance of screening, immunization, lifestyle, and medication can maximize the quality of older adults' health as well as reduce health care costs.^{15,16} However, primary prevention in the geriatrics field is relatively new.¹⁷ Although there is no comprehensive account of geriatric prevention literature, there is increasing evidence that health promotion, even among frail elderly, may improve or help manage health and disability.^{17,18} Numerous researchers report evidence that health promotion efforts related to physical activity, nutrition, and self-care can improve the health and longevity of the elderly.

Researchers suggest the challenge will be to support healthy behaviors among the current population approaching late life. Public health professionals will need to identify, plan, and evaluate effective health promotion programs for the aging population.

Aging Well and Physical Activity

Benefits of physical activity for older adults

Physical activity has been firmly established as an effective behavior for preventing and managing chronic disease and enhancing psychological well-being among older adults. A significant number of studies demonstrate an association between physical activity and aging well.^{2,3,4,5,6,7,8,9,10,11,12,13,14}

The National Institute on Aging (NIA) reports that physical activity "may be the most important thing an older person can do to stay healthy and self-reliant." The NIA suggests that physical exercise can prevent decline in disability and physical functioning. By delaying the onset of disability, fewer individuals will be disabled thereby requiring fewer lifestyle based intervention services and health care costs.¹⁹

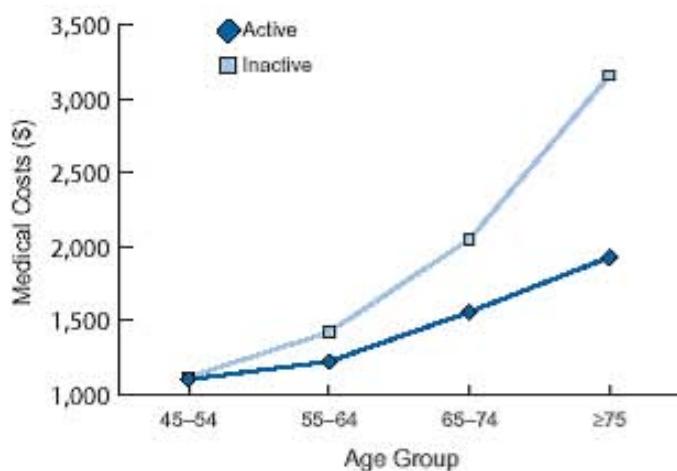
Specifically, physical activity affects fats in the blood, blood sugar, and ultimately, obesity.

Physical activity has been connected to the prevention and modification of osteoporosis, diabetes type 2, cognitive decline, falls, heart disease, stroke, depression, cardiovascular disease, onset of disability, hypertension, weight reduction, arthritis, and obesity.^{20,21,22,23}

Longitudinal studies have found that long-term physical activity has been shown to postpone disability and promote independent living in the oldest populations.²⁴ Recent studies have found that 30 minutes of physical activity a day resulted in lower mortality risks compared with no physical activity among older adults.²⁵

Studies have also found that individuals who become physically active after engaging in no physical activity reap the greatest health rewards.²¹ Improvements in physical functioning may be possible even in patients who did not begin regular exercise until age 75.^{19,21,22}

Annual medical costs of active and inactive women (Aged 45 and older) without physical limitations



Source: Centers for Disease Control and Prevention. Promoting Active Lifestyles Among Older Adults. National Center for Chronic Disease Prevention and Health Promotion. Nutrition and Physical Activity <http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/olderadults.htm>

Two recent studies have also linked moderate or high physical activity with reduced incidence of cognitive impairment among elderly populations including better preservation of cognitive function in older women with vascular disease.^{26,27,28} However, the Centers for Disease Control's Health Aging Program recently conducted a systematic literature review on community-based physical activity interventions designed to promote cognitive health. An interdisciplinary panel found insufficient evidence for determining whether physical activity and exercise interventions improve cognition in older adults.²⁹

Physical activity among older adults

Despite the well-documented benefits of physical activity, only 30 percent of older adults aged 65-74 are physically active five days a week. Physical activity declines with advancing age; 12 percent of individuals aged 75 and older engage in physical activity at least five days a week.³⁰ In Hennepin County, 32 percent of residents over the age of 65 reported engaging in moderate physical activity for more than 30 minutes five days a week. Thirty-eight percent of young boomers ages 45-54 and older boomers, ages 55-64, engage in five days of moderate physical activity a week.³¹

Documented barriers to physical activity among older adults include self-efficacy, discomfort, disability, poor balance, fear of injury, habit, fixed income, environmental factors (inclement weather), depression, cognitive decline, and fatigue.^{21,32,33} The American College of Sports Medicine recommends strength training, balance, and flexibility exercises for adults 65 and older. Recommendations also include 30 minutes of moderate-intensity exercise five days a week. Physical activity recommendations may need to be adapted to an individual's physical functioning and disability status.³³

Few studies have examined physical activity disparities among older adults. Some studies have found that persons of color engage in less physical activity in late life; these differences are less robust when controlled for education and income.^{34,35} Despite living longer, women are less physically active than men.³⁶

Physical activity health promotion

Health promotion interventions to increase physical activity among older adults are relatively new. Few physical activity intervention studies existed for older adults until recently. Research supports physical activity health promotion

interventions that include behavioral or cognitive-behavioral strategies such as goal-setting, self-monitoring, feedback, support, and relapse-prevention training as opposed to health education or instruction alone.³⁷ Other researchers have found short-term success with peer, home-based, and group-based physical activity interventions, such as a neighborhood based walking program.^{11,38,39,40,41} Long-term effects, however, have not been demonstrated.

The Centers for Disease Control recommends providing community-based physical activity programs, ensuring facilities accommodate older adults, and encouraging malls and other indoor locations to provide safe places for walking during the winter.⁴²

For information about specific programs please refer to the National Council on Aging's Center for Healthy Aging which promotes the use of evidence-based health promotion programming for older adults:

<http://www.ncoa.org/improve-health/center-for-healthy-aging/physical-activity/>

<http://depts.washington.edu/hprc/docs/activity-info-sheet.pdf>

Nutrition & Aging

Nutrition can assist in preventing disease and disease related-disability among older adults. Additionally, nutrition serves as a disease management strategy for chronic diseases by reducing disease symptoms and promoting high mental and physical function.⁴³ An older individual's nutritional status also supports their ability to recover and rehabilitate from illness, injury, and surgery.⁴⁴

Food is connected to an individual's social, cultural, and psychological quality of life. An older person's food habits are also determined by cultural and social factors such as lifetime preferences, physiological changes, living arrangements, caregiver resources, finances, transportation, and disability.⁴³ Researchers have suggested that meals can provide feelings of security, independence, control and a sense of mastery for older adults.⁴⁵ The social environment of meal time can also contribute to greater food intake and positive social interaction.⁴⁶ For example, research has found that women will eat more when men are present and men and women will eat more when dining with family or friends.

Malnutrition

Food intake, nutrients and energy substantially decline with age and put older adults at risk for malnutrition. Malnutrition is associated with increased mortality, functional decline, frailty, decreased quality of life, and increased health care utilization costs. Malnutrition also impacts physical and mental health such as failure to thrive.⁴⁷ In Hennepin County, 6 percent of residents over the age of 65 reported being worried "sometimes" or "often" that food would run out before they

had money to buy more.³¹ Health conditions, such as impaired mobility, poor oral health, reduced muscle mass and inability to feed oneself can alter an older adult's ability to maintain adequate nutrition. In addition, older adults often have altered sensations of thirst and hunger as well as changes in taste and flavor sensations.⁴⁸ The American Dietetic Association recommends providing flavor-enhanced foods to older adults. They will consume more food.⁴³

Appropriate intake of protein, vitamins, and minerals are most important nutrients to focus on among independently living elderly.⁴⁸ However, the knowledge of elderly dietary patterns is limited.⁴⁸ Forty-two percent of men and 38 percent of women do not meet the recommended intake of vegetables.⁴³ In Hennepin County, 39 percent of adults older than 65 had five or more servings of fruits and vegetables.³¹ Home-bound elders, in particular, have a low intake of fruits and vegetables due to limited access.⁴⁹ Among the current elderly population, men under eat more frequently than women because they were not socialized to prepare meals for themselves.⁴⁷ To help older adults sort through their specific nutritional needs, Tufts University created a food plate for adults 70 and older: <http://www.nutrition.tufts.edu/research/myplate-older-adults>

Nutritional supplements have become popular among older adults; 42 percent of men and 55 percent of women 80 and older have reported using supplements. Researchers feel supplements may help to support the maintenance of physical and cognitive function in old age, if used properly.⁴⁸

Nutrition supportive services

Hunger and food insecurity are crucial issues for older adults. Approximately 6 percent of older adults experience food insecurity due to lack of resources.⁴³ Food insecurity is highest among households where older adults live alone. In addition, Latino and African-American older adults are more likely to be food insecure than whites.⁴³

The Older Americans Act Title III Nutrition Services Program provides food and nutrition services to older adults who are ambulatory as well as those who are frail and homebound. Title III Nutrition programs include the Congregate Nutrition Program, Home Delivered Nutrition Program, and the National Family Caregiver Support Program.⁵⁰ The purpose of these programs is to promote health, functional independence, and chronic disease management.^{43,50} These programs deliver nutritious meals that meet recommended dietary allowances and cultural preferences. Additional nutritional services may be provided such as screening, assessment, education, and counseling. All planning is determined by local communities. The United States Department of Agriculture (USDA) also operates programs that support senior nutrition including the Food Stamp program, Senior Farmers Market Nutrition program, and the Emergency Food Assistance program. Food stamp usage however decreases with age and many poor older adults do not receive food stamps.⁵¹

Nutrition health promotion interventions

Researchers have found that nutritional interventions need to include adequate caloric and protein intake, ensure adequate access to food, a pleasant dining experience with adequate assistance to eat, offering favorite foods, individualizing the least restrictive diet appropriate, using enhanced flavoring and fortified foods, and providing oral nutritional supplements. Other programmatic considerations include ensuring social interaction during meal time, including virtual interaction with family, home delivery of fruits and vegetables, and taking into account gender and cultural differences.^{46,47,51,52}

Additional programs have recognized the importance of combining nutrition and physical activity programs.⁵³ Nutrition and exercise together have synergistic effects that help to combat malnutrition, and failure to thrive as well as increase strength and improve quality of life.⁴⁴ Few studies, however, have examined the connection between dietary measures, physical activity variables, and quality of life indexes in older adults.

For information about specific programs please refer to the National Council on Aging's Center for Healthy Aging which promotes the use of evidence-based health promotion programming for older adults. <http://www.ncoa.org/improve-health/center-for-healthy-aging/healthy-eating-for-successful.html>

Additional Resources:
United States Department of Agriculture, Nutrition & Aging: <http://fnic.nal.usda.gov/lifecycle-nutrition/aging>

Older Adults General Nutrition Resource List, Food and Nutrition Information Center, 2010. <http://www.nal.usda.gov/fnic/pubs/olderadults.pdf>

Alcohol, Tobacco, and Illicit Drug Use

Approximately 3 million adults 50 and older are estimated to have an alcohol or illicit drug abuse disorder in the United States.⁵⁴ In 2009, 10 percent of adults older than 65 reported tobacco smoking and 40 percent admitted to being former smokers.⁵¹ Substance abuse is often overlooked and under-diagnosed due to limited research, ageism, and symptoms that are mistaken for other conditions such as dementia, diabetes, or depression. Substance abusers have a higher risk of falls, illness, and socioeconomic decline. Generally, substance abuse decreases with age, however researchers have suggested these reductions could be due to high mortality among substance abusers.⁵⁵

The available research on alcohol, tobacco, and illicit drug use among older adults is summarized below.

Alcohol

Fifty-three percent of men and 37 percent of women older than 60 report being current alcohol drinkers.⁵⁵ Although drinking has been shown to decrease with age, 27 percent of women and 49 percent of men ages 75-85 exceeded the recommended guidelines of alcohol consumption (more than seven drinks per week).⁵⁶ Alcohol use among middle-aged and older individuals has also been shown to be increasing.⁵⁷ In Hennepin County, 19 percent of adults older than 65 and 24 percent of adults 45-64 reported either binge or heavy drinking.³¹ High education and income, smoking, and being white and single are associated with unhealthy, heavy, episodic drinking.⁵⁴

Researchers express particular concern regarding older women

who drink heavily. Although likely underestimated, 12 percent of older women have reported drinking in excess of recommended guidelines. Older women have specific risk factors such as social isolation, impaired health, and poverty due to their long life expectancy. These risk factors often make them more vulnerable to alcohol abuse. Older women are also more sensitive to alcohol's effects such as medication interactions and alcohol related illness.

Alcohol consumption is also associated with higher levels of cognitive impairment. Men who have been heavy drinkers for five years or more are more likely to have a psychiatric disorder which is most often depression or dementia.⁵⁵

Elders who drink are more likely to exacerbate other mental and physical health problems; depression is of particular concern for substance abusers.⁵⁸ Social isolation, depression, cognitive impairment, and chronic medical illness put older adults with mental disorders at risk for substance abuse.⁵⁵

Smoking

Among individuals 65 and older, smoking is a risk factor for half of the primary causes of death, including Alzheimer's disease, stroke, heart disease, respiratory diseases, cancer, and chronic obstructive pulmonary diseases. Smoking also continues to be the leading preventable cause of death in the United States.

Approximately 22 percent of adults smoke and 9.5 percent of adults 65 and older smoke.⁵⁹ Forty percent of adults older than 65 admit to being former smokers.⁵⁹ In Hennepin County,

5 percent of residents over the age 65 and 10 percent of adults ages 55-64 are currently smoking.³¹ Research has demonstrated that even adults who smoked throughout their lives and who continue to smoke can improve their health outcomes if they quit smoking. A 2003 study found that those who quit smoking in mid-life had improved lung function compared with those who did not quit smoking.⁶⁰ Other studies have reported a reduced risk of heart attacks and improved quality of life.^{61,62,63}

The Affordable Care Act recently expanded its coverage of tobacco-cessation counseling for individuals who smoke but who have not been diagnosed with a tobacco-related disease. Public health professionals believe this will provide clinicians with an opportunity to better help older adults quit smoking.⁶⁴

Research on smoking cessation among older adults is limited. Researchers propose that the aging process may adversely impact an individual's ability to quit smoking. For instance, increases in body fat and changes in liver size could affect medication metabolism. In addition, smoking cessation counseling may require adaptations to meet specific concerns of an older population. Additional research is needed to determine effective smoking cessation treatments.⁶⁴

Public health professionals expect, given the large numbers of baby boomers, that the absolute numbers of smokers will increase as the baby boomers age. However, a projection study has not been completed.⁶³

Prescription drug abuse

Non-medical use of prescription drugs among older adults has been increasing.⁵⁶ A recent study found that adults 50 and older were more likely to misuse prescription drug medication than younger generations.⁶⁵ Although data is limited, the National Survey on Drug Use and Health estimates that nonmedical use of prescription drugs among adults 50 and older will increase to 2.7 million in 2020.

Ninety percent of older adults use prescription medications or over the counter medications and these medications often interact adversely with alcohol or illicit drugs.⁵⁵ Therefore, older adults who use, and in particular those who abuse, prescription drugs are at risk for complications. Recent studies found that adults older than 50 were more likely to misuse prescription drug medication than younger generations. Women have been demonstrated to misuse prescription drugs more often than men. Some researchers feel older adults may not feel they are inappropriately using prescription medications because they obtained medications through a doctor.⁶⁵

Marijuana

Marijuana users, who are older than 50, have increased from 1.9 percent in 2002 to 2.9 percent in 2008. Among 55 to 59 year olds, marijuana use has increased from 1.6 percent in 2002 to 5.1 percent in 2008.⁶⁶ Marijuana users are more likely to be engaged in risk behaviors such as smoking cigarettes, alcohol and illicit drug abuse.

Users are more likely to be unmarried, black, and experiencing high levels of stress.

Attitudes toward marijuana use, have been changing. A 2004 AARP survey showed that 72 percent of adults older than 45, feel marijuana should be allowed for medical purposes with a doctor's prescription.⁶⁷ Researchers are also exploring the positive aspects of marijuana which older adults increasingly use to manage pain and conditions associated with chronic disease. Marijuana drug users are expected to be among the largest groups of drug users in the coming years.⁶⁶

Heroin/Opioids

Although the overall prevalence of heroin use is low among older adults (.08 percent among adults 50-64), researchers expect the number of older adults who abuse heroin to grow in the next 20 years.^{57,68} Approximately, 30 percent of heroin users continue using into old age. Many researchers and public health professionals believe heroin use is a chronic condition. Heroin users have poor physical and mental health including hepatitis C, heart disease, and alcohol related conditions. Heroin users are more likely to be male and single.⁵⁷

Future challenges

Baby boomers are the largest drug using cohort in history. Substance abuse is highest among people born between 1953 and 1964.⁶⁹ The number of older adults with substance abuse problems is expected to double from its current rate of 2.7 million to 5.7 million in 2020.^{54,57} Researchers believe the current social service and health care systems are not prepared to support the number of older adults who will need treatment in the next 30 years.^{70,71}

Treatment programs can help to improve older adults' health and quality of life. However, only seven percent of substance

abuse treatment facilities report having a program for adults older than 65.⁵⁴ Treatment in older populations may also be complicated by dementia and other cognitive impairment. Older adults are also less likely to participate in treatment than younger adults.⁵⁵

Public health professionals recommend tailoring treatment programs to whether an older adult is an early or late onset user as well as whether they are dealing with dementia or cognitive impairment.

Recommendations also include assisting isolated and poor alcohol dependent women by providing programs that are nonthreatening.^{72,73}

Sexual Health and Older Adults

Limited research exists on sexuality and aging in the United States including how sexual activities change with aging and illness.⁷⁵ Available research demonstrates that aging is associated with decreasing sexual activity. Seventy-three percent of older adults ages 57 to 64 years of age are sexually active, 53 percent of older adults ages 65-74 are sexually active, and 26 percent of older adults who are 75 and older are sexually active.

Older men are more likely to be sexually active than women, particularly those who are 75 and older. Thirty-nine percent of men ages 75-85 years of age are sexually active compared with 17 percent of women the same age. Multiple studies support these findings.^{74,75} Researchers suggest that awareness and access to medications for erectile dysfunction in the last 10 years may have increased interest in sex among older men.⁷⁴ In addition, older women, between the ages of 54-85, are less likely than men to be in a marital or other intimate relationship.⁷⁵

Researchers believe older adults' decrease in sexual activity is not necessarily due to lack of interest. Despite decreasing sexual activity among older adults, 59 percent of 75-84 year olds still attributed importance to sex. Sexual activity

decreases among older adults can be attributed to declines in overall physical health, psychological causes such as depression, medication side effects, and sexual dysfunction.⁷⁶ Men and women with good health are more likely to be sexually active.

Although there are many positive health outcomes related to sexual activity, public health professionals believe sexually transmitted infections (STIs) could become a significant concern among older adults. A recent study found that rates of chlamydia, gonorrhea, and syphilis have doubled among older adults in the United Kingdom.⁷⁷ In the United States, the Centers for Disease control reports that cases of syphilis and chlamydia increased 43 percent among adults 55 and older between 2005 and 2009.

Additionally, HIV (Human Immunodeficiency Virus) is growing faster among individuals 50 and older than individuals under 40.^{78,79,80} Older women, in particular, are at risk of acquiring HIV due to physiological changes that allow more vaginal body fluid exposure. Older racial and ethnic minorities are also at risk for HIV infection. Throughout midlife and old age, African-Americans and Latinos are the most vulnerable groups for HIV infection.⁷⁸

The number of older adults living with HIV/AIDS will increase in the next 30 years. Thirty-four percent of adults living with HIV/AIDS are 50 and older.⁸¹ Older adults with HIV will experience specific health challenges and are more likely to be treated for comorbidities. Public health professionals have called for guidelines for primary care providers on how to address the needs of older adults infected with HIV.⁷⁸

Public health professionals believe that older adults lack general knowledge about preventing STIs and HIV. Individuals 50 years or older are less likely to use condoms or to have been tested for HIV than individuals in their 20s.⁸² In 2006, the CDC recommended routine STI and HIV screening tests for adults older than 64. However, sexual health screening and issues are not often discussed with physicians, possibly due to the common misconception that older adults are not sexually active; 38 percent of men and 22 percent of women have discussed sex with a physician since age 50.⁷⁵ Many older adults are diagnosed with late stages of AIDS because they were not routinely screened for HIV.⁸³ Typically, older adults are not targeted by sexual health public education campaigns.

Self-Care Management

The rise of chronic conditions, including multiple chronic conditions, has required that older adults participate more actively in managing their care. For instance, individuals with diabetes are expected to check their blood sugar. Older adults are also expected to get regular health care for diabetes screenings, bone measurement, and flu vaccines.¹⁷ However, screening rates for adults older than 65 are not particularly high—only cardiovascular screenings exceeds 50 percent nationally. All other preventative screenings have lower rates of use.¹⁷

Older adults experience many barriers to managing their health care. Typical barriers to engaging in self-care disease management include low-income, cultural differences, and loss of a spouse.⁸⁴

Little research exists about self-care and how well patients with one or more multiple

chronic conditions care for themselves.¹⁷ Self-care disease management has been shown to be associated with increased independence, lower health care costs, functional improvement, better clinical outcomes.^{17,84}

Effective self-care disease management skills have been demonstrated to be more effective than patient education alone in improving clinical outcomes.⁸⁵ Other intervention strategies have focused on health promotion strategies which steer away from focusing on one-disease or one-intervention focus. Researchers believe it will be crucial “to empower elders to know their own risk factors and to understand the importance of screening, immunization, lifestyle, and medication to maximize the quality of their health.”^{11,17}

References

- 1 National Institutes of Health. (2011). *Disability in older adults. NIH Research Portfolio Online Reporting Tools (RePORT)*. Retrieved March 16th, 2011 from <http://report.nih.gov/nihfactsheets/ViewFactSheet.aspx?csid=37>.
- 2 Ford J., Spallek, M., & Dobson, A. (2008). Self-rated health and a healthy lifestyle are the most important predictors of survival in elderly women. *Age Ageing* 37(2): 194-200.
- 3 Swindell W., Ensrud K., Cawthon P., Cauley J., Cummings S., & Miller R. (2010). *Indicators of 'Healthy Aging' in older women (65-69 years of age). A data-mining approach based on prediction of long-term survival*. BMC Geriatrics, 10(55): 1-24.
- 4 Pruchno R., Wilson-Genderson M., Rose M., & Cartwright F. (2010). Successful aging: Early influences and contemporary characteristics. *The Gerontologist*, 50(6): 821-833.
- 5 Weir P., Meisner B., & Baker J. (2010). Successful aging across the years: does one model fit everyone? *J Health Psychol* 15: 680-687.
- 6 Britton A., Shipley M., Singh-Manoux A., & Marmot M. (2008). Successful aging: the contribution of early-life and midlife risk factors. *JAGS* 56: 1098-1105.
- 7 Franklin, N. & Tate, C. (2009). Lifestyle and successful aging: an overview. *Am J Lifestyle Medicine*, 3: 6-11.
- 8 The National Institute on Aging. (2011). Biology of aging. Retrieved April 19th, 2011 from <http://www.nia.nih.gov/health/publication/biology-aging/aging-under-microscope>
- 9 Seeman, T. & Chen, X. Risk and protective factors for physical functioning in older adults with and without chronic conditions: MacArthur Studies of Successful Aging. *J Gerontol B Psychol Sci Soc Sci*, 57: S135-S144.
- 10 Reed, D.M., Foley D.J., & White, L.R. (1998). Predictors of healthy aging in men with high life expectancies. *Am J Public Health*, 88: 1463-1468.
- 11 Newman, A., Bayles, C., Milas, C., McTigue, K., Williams, K., Robare, J., Taylor, C., Albert, S., & Kuller, L. (2010). The 10 keys to healthy aging: findings from an innovative prevention program in the community. *J Aging Health* 22: 547.
- 12 Depp, C. & Jeste, D. (2006). Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. *American Journal of Geriatric Psychiatry*, 14: 6-20.
- 13 Hartman-Stein, P. & Potkanowicz, E. (2003). Behavioral determinants of healthy aging: good news for the Baby Boomer generation. *Online Journal of Issues in Nursing*, 8:2.
- 14 Peel, N., McClure, R., & Bartlett, H. (2005). Behavioral determinants of healthy aging. *Am J Prev Med*, 28(3): 298-304.
- 15 Russell, L.B. (2009). Preventing chronic disease: an important investment, but don't count on cost savings. *Health Affairs (Project Hope)*, 28(1): 42-45.
- 16 Cohen, J.T., Neumann, P.J. & Weinstein, M.C. (2008). Does preventative care save money? Health economics and the presidential candidates. *New England Journal of Medicine*, 358(7): 661-663.
- 17 Albert S.M. & Freedman V. (2010). *Public health and aging: Maximizing function and well-being*. New York: Springer Publishing.
- 18 Matsuda, P.N., Shumway-Cook, A., & Cioli, M.A. (2010). The effects of a home-based exercise program on physical function in frail older adults. *J Geriatr Phys Ther*, 33(2): 78-84.
- 19 National Institutes on Aging. 2010. Aging under the microscope: a biological quest. Retrieved March 11, 2011 from www.nia.nih.gov/HealthInformation/Publications/AgingUndertheMicroscope
- 20 Satariano, W. (2005). *Epidemiology of aging: An ecological approach*. Sudbury, MA: Jones & Bartlett Learning.
- 21 Nied, R. & Franklin, B. (2002). Promoting and prescribing exercise for the elderly. *American Family Physician*, 65(3): 419-426.
- 22 Haskell, W.L., Lee, I.M., Pate, R.P., Powell, K.E., Blair, S.N., Franklin, B.A., Macera, C.A., Heath, G.W., Thompson, P.D., & Bauman, A. (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116: 1-13.
- 23 Stewart, K. (2005). Physical activity and aging. *Ann. N.Y. Acad. Sci.*, 1055: 193-206.
- 24 Kahana, E., Lawrence, R.H., Kahana, B., Kercher, K., Wisnieweski, A., Stoller, E., Tobin, J., & Stange, K. (2002). Long-term impact of preventative proactivity on quality of life of the old-old. *Psychosom Med*, 64: 382-394.

- 25 Paganini-Hill A, Kawas C, and Corrada M. (2011). Activities and mortality in the elderly: the leisure world cohort study. *J of Gerontol A Biol Sci Med Sci*, 66A(5): 559-567.
- 26 Middleton, L., Manini, T., Simonsick, E., Harris, T., Barnes, D., Tylavsky, F., Brach, J., Everhart, J., & Yaffe, K. (2011). Activity energy expenditure and incident cognitive impairment in older adults. *Arch Intern Med.*, 171(14): 1251-1257.
- 27 Etgen, T., Sander, D., Huntgeburth, U., Poppert, H., Forst, H., & Bickel, H. (2010). Physical activity and incident cognitive impairment in elderly persons. *JAMA*, 170(20): 186-193.
- 28 Vercambre, M.N., Grodstein, F., Manson, J., Stampfer, M., & Kang, J. (2011). Physical activity and cognition in women with vascular conditions. *Arch Intern Med.*, 171(14): 1244-1250.
- 29 Centers for Disease Control (2011). *The CDC Health Brain Initiative: Progress 2006-2011*. National Center for Chronic Disease Prevention and Health Promotion. Retrieved October 9th, 2011 from: http://www.cdc.gov/aging/pdf/HBIBook_508.pdf
- 30 AHRQ. (2002). *Physical activity and older Americans: Benefits and strategies*. Retrieved May 11, 2011 from <http://www.ahrq.gov/ppip/activity.htm>.
- 31 Hennepin County Human Services and Public Health Department. SHAPE 2010, Survey of the Health of All the Population and the Environment, Minneapolis, Minnesota.
- 32 Schutzer, K. & Graves, B.S. (2004). Barriers and motivations to exercise in older adults. *Preventive Medicine*, 39(5): 1056-1061.
- 33 Nelson, M., Rejeski, W., Blair, S., Duncan, P., Judge, J., King, A., Macera, C., & Castaneda-Sceppa, C. (2007). Physical activity and public health in older adults: recommendations from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116: 1094-1105.
- 34 Kim J.S., Bramlett, M.H., Wright L.K., & Poon L.W. (1998). Racial differences in health status and health behaviors of older adults. *Nurs Res Jul-Aug* 47(4): 243-250.
- 35 August, K. & Sorkin, D. (2011). Racial/ethnic disparities in exercise and dietary behaviors of middle-aged and older adults. *J Gen Intern Med.*, 26(3): 245-250.
- 36 Shaw, B.A., Liang, J., Krause, N., Gallant, M., & McGeever, K. (2010). Age differences and social stratification in the long-term trajectories of leisure-time physical activity. *The Journals of Gerontology*, 65B(6): 756-766.
- 37 King, A., Rejeski, J., & Buchner, D. (1998). Physical activity interventions targeting older adults: a critical review and recommendations. *American Journal of Preventive Medicine*, 15(4): 316-330.
- 38 Van der Blij, A.K., Laurant, M., & Wensing, M. (2002). Effectiveness of physical activity interventions for older adults: a review. *American Journal of Preventive Medicine*, 22(2): 120-133.
- 39 Jancey, J.M., Clarke, A., Howat, P.A., Lee, A.H., Shilton, T., & Fischer, J.. (2008). A physical activity program to mobilize older people: A practical and sustainable approach. *The Gerontologist*, 48(2): 251-257.
- 40 Wellman, N., Kamp, B., Kirk-Sanchez, N., & Johnson, P. (2007). Eat better & move more: a community-based program designed to improve dlients and increase physical activity among older Americans. *American Journal of Public Health*. 97(4): 710-717.
- 41 Tan, E., Xue, Q.L., Carlson, M., & Fried, L. (2006). Volunteering: a physical activity intervention for older adults—the Experience Corps program in Baltimore. *J Urban Health*, 83(5): 954-969.
- 42 Centers for Disease Control. (1999). *Physical activity and health: older adults*. Retrieved May 12, 2011 from <http://www.cdc.gov/nccdphp/sgr/olderad.htm>.
- 43 American Dietetic Association (2005). Position paper of the American dietetic association: nutrition across the spectrum of aging. *Journal of the American Dietetic Association*, 105: 616-633.
- 44 Dorner, B. (2010). Creative nutrition: solutions for failure-to-thrive patients. *Aging Well*, 3(4): 8-11.
- 45 Amarantos, E., Martinez, A., & Dwyer, J. (2001). Nutrition and quality of life in older adults. *J Gerontol Biol Sci Med Sci*, 56A: 54-64.
- 46 Paquet, C., St-Arnaud-McKenzie, D., Ma, Z., Kergoat, M.J., Ferland, G. & Dube, L. (2008). More than just not being alone: The number, nature, and complementarily of meal-time social interactions influence food intake in hospitalized elderly patients. *The Gerontologist*, 48(5): 603-611.
- 47 Locher, J.L., Ritchie, C.S., Robinson, C.O., Roth, D.L., West, D.S., & Burgio, K.L. (2008). A multi-dimensional approach to understanding the under-eating in homebound older adults: The importance of social factors. *The Gerontologist*, 48(2): 223-234.
- 48 Drenowski,A. & Evans, W. (2001). Nutrition, Physical Activity, and Quality of Life in Older Adults: Summary. *J of Gerontology: Series A*, 56A: 89-94.

- 49 Johnson, D.B., Beaudoin, S., Smith, L.T., Beresford, S.A.A., & LoGerfo, J.P. (2004). Increasing fruit and vegetables intake in homebound elders: The Seattle Senior Farmers' Market Nutrition Pilot Program. *Preventing Chronic Disease Public Health Research, Practice, and Policy*, 1(1): 1-9.
- 50 Colello, K. (2011). *Older Americans Act: Title III Nutrition Services Program*. Congressional Research Service. Retrieved April 11, 2011 from <http://aging.senate.gov/crs/nutrition1.pdf>
- 51 Fuller-Thomson, E. & Redmond, M. (2008). Falling through the social safety net: Food stamp use and nonuse among older impoverished Americans. *The Gerontologist*, 48(2): 235-244.
- 52 Quandt, S.A., Chen, H., Bell, R.A., Savoca, M.R., Anderson, A.M., Leng, X., Kohrman, T., Gilbert, G.H., & Arcury, T.A. (2010). Food avoidance and food modification practices of older rural adults: Association with oral health status and implication for service provision. *The Gerontologist*, 50(1): 100-111.
- 53 Wellman, N., Kamp, B., Kirk-Sanchez, N., & Johnson, P. (2007). Eat better & move more: a community-based program designed to improve diets and increase physical activity among older Americans. *American Journal of Public Health*, 97(4): 710-717.
- 54 Han, B., Gfroerer, J., Colliver, J., & Penne, M. (2009). Substance abuse disorder among older adults in the United States in 2020. *Addiction*, 104(1): 88.
- 55 Breslow, R.A. & Smothers, B. (2004). Drinking patterns of older Americans: National Health Interview Surveys, 1997-2001. *J Stud Alcohol*, 65(2): 232-240.
- 56 Moos R.H., Schutte K.K., Brennan, P.L., & Moos, B.S. (2009). Older adults' alcohol consumption and late-life drinking problems: a 20 year perspective. *Addiction*, 104: 1293-1302.
- 57 Blazer, D. & Wu, L. (2009). The epidemiology of at-risk and binge drinking among middle-aged and elderly community adults: national survey on drug use and health. *Am J Psychiatry*, 166(10): 1162-1169.
- 58 Balsa, A.I., Homer, J.F., Fleming, M.F., & French, M.T. (2008). Alcohol consumption and health among elders. *Gerontologist*, 48(5): 622-636.
- 59 Centers for Disease Control and Prevention. (2009). National Center for Health Statistics. National Health Interview Survey.
- 60 Connett J.E., Murry R.P., Buist AS, Wise R.A., Bailey W.C., Lindgren P.G., & Owens G.R. (2003). Changes in smoking status affect women more than men: results of the lung health study. *American Journal of Epidemiology*, 157: 973-979.
- 61 U.S. Department of Health and Human Services, National Center for Chronic Disease Prevention and Health Promotion, & Office on Smoking and Health (2004). The health consequences of smoking: A report of the Surgeon General. Retrieved from http://www.cdc.gov/tobacco/data_statistics/sgr/sgr_2004/chapters.htm
- 62 Ossip-Klein, D.J., Pearson, T.A., McIntosh, S., & Orleans, C.T. (1999). Smoking is a geriatric health issue. *Nicotine Tob Res*, 1(4): 299-300.
- 63 Almeida, O.P., Garrido, G.J., Alfonso, H. et al. (2011). 24 month effect of smoking cessation on cognitive function and brain structure later in life. *Neuroimage*, 55(4): 1480-1489.
- 64 Kleyamp, B. & Heishman, S. (2011). The older smoker. *JAMA*, 306(8): 876-877.
- 65 Moore A.A., Kurn M.P., Grella C.E., Lin J.C., Liao D.H., and Hu P. (2009). Alcohol, tobacco, and non-medical drug use in US adults aged 65 years and older: Data from the 2001-2002 NESARC.
- 66 Dinitto DM and Choi NG. (2010). Marijuana use among older adults in the USA: user characteristics, patterns of use, and implications for intervention. *Int Psychogeriatr*. Nov 25: 1-10.
- 67 Kalata, J. (2004). *Medical uses of marijuana: Opinions of US residents 45+*. AARP.
- 68 Colliver, J.D., Compton, W.M., Gfroerer, J.C., & Condon, T. (2006). Projecting drug use among aging baby boomers in 2020. *Annals of Epidemiology*, 16(4): 257-265.
- 69 Grella C. (2009). *Older adults and co-occurring disorders*. UCLA Integrated Substance Abuse Programs, David Geffen School of Medicine, University of California Los Angeles. Accessed on March 12, 2011 at http://www.aodpolicy.org/Docs/Older_Adults_COD.pdf
- 70 Gfroerer J., Penne, M., Pemberton, M., & Folsom, R. (2003). Substance abuse treatment need among older adults in 2020: the impact of the aging baby-boom cohort. *Drug and Alcohol Dependence*, 69(2): 127-135.
- 71 Patterson TL and Jeste DV. (1999). The potential impact of the baby boom generation on substance abuse among elderly persons. *Psychiatric Services*, 50(9): 1184-1188.

- 72 Boeri, M.W., Sterk, C.E., & Elifson, K.W. (2008). Reconceptualizing early and late onset: A life course analysis of older heroin users. *Gerontologist, 48*: 637-645.
- 73 Patterson, T.L. & Jeste, D.V. (1999). The potential impact of the baby boom generation on substance abuse among elderly persons. *Psychiatric Services, 50*: 1184-1187.
- 74 Lindau, S.T. & Gavrilova, N. (2010). Sex, health, and years of sexually active life gained due to good health: evidence from two US population based cross sectional surveys of ageing. *BMJ, 340*: 1-11.
- 75 Lindau, S.T., Schumm, L.P., Laumann, E., Levinson, W., O'Muircheartaigh, C., & Waite, L. (2007). A study of sexuality and health among older adults in the United States. *N Engl J Med, 357*: 762-764.
- 76 Taylor, A. & Gosney, M.A. (2011). Sexuality in older age: essential considerations for healthcare professionals. *Age and Ageing, 40*: 538-543.
- 77 von Simson, R. & Kulasegaram, R. (2012). Sexual health and the older adult. *Student BMJ, 20*: e688.
- 78 Slinkard, M. & Kazer, M.C. (2011). Older adults and HIV and STI screening: the patient perspective. *Geriatri Nurs, Article In Press*.
- 79 Karlvosky, M., Lebed, B., & Mydlo, J.H. (2004). Increasing incidence and importance of HIV/AIDS and gonorrhea among men aged > 50 years in the US in the era of erectile dysfunction therapy. *Scand J Urol Nephrol, 38*: 247-252.
- 80 Patel, D., Gillespie, B., & Foxman, B. (2003). Sexual behavior of older women: results of a random digit-dialing survey of 2000 women in the United States. *Sex Transm Dis, 216*-220.
- 81 Population Reference Bureau. (December 2009). HIV/AIDS and Older Adults in the United States. *Today's Research on Aging, No. 18*.
- 82 Levy, B.R., Ding, L., Lakra, D., et al. (2007). Older persons' exclusion from sexually transmitted disease risk-reduction clinical trials. *Sex Transm Dis, 34*: 541-544.
- 83 Skiest, D.J. & Keiser, P. (1997). Human immunodeficiency virus infection in patients older than 50 years: a survey of primary care physicians' beliefs, practices, and knowledge. *Arch Fam Med, 6*: 289-294.
- 84 Bowen, M.E. & Gonzalez, H.M. (2008). Racial/ethnic differences in the relationship between the use of health care services and functional disability: the health and retirement study (1992-2004). *Gerontologist, 48*(5): 659-667.
- 85 Meng, H., Wamsley, B., Liebel, D., Dixon, D., Eggert, G., & Van Nostrand, J. (2009). Urban-rural differences in the effect of a Medicare health promotion and disease self-management program on physical function and health care expenditures. *The Gerontologist, 49*: 407-417.