

## **Introduction**

In the United States in 2012, the older adult population (age 65 years and over) made up ~15% of the population and was projected to increase to ~20% of the population by 2030. This represents an increase from 48 million to 70 million people (Ortman & Velkoff, 2014). In North Carolina, the older adult population age 65 years and over made up ~14% in 2013, with projections to increase to 20% of the population by 2033 (NCDHHS 2015) (See Appendix I for more N.C. statistics on aging). With this increase in the older adult population, it is reasonable to assume that there will be an increase in nursing home and care community populations. In 2013, ~85 percent of the nursing home population and ~93 percent of the residential care community population was made up of older adults age 65 and over (CDC, 2013). There were 15,700 nursing homes in the U.S. in 2013, with the total number of residents ~1.4 million people (CDC, February 2015).

There has been an increased research focus on quality of life and maintaining health and physical function of older adults in long-term care. Many of these studies focus on activities, either individual or group-based, that improve the quality of life and physical function of residents in long-term care. Some studies also focus on programs in long-term care and their ability to meet the Centers for Disease Control & Prevention's physical activity guidelines for older adults, yet there is no formal physical activity policy in place for long-term care facilities in North Carolina. A general format for such a policy could be modeled similar to the physical activity guidelines for the preschool population in childcare facilities in North Carolina.

This paper, in addition to addressing physical activity guidelines, will examine gardening as a form of physical activity for older adults and its potential to meet physical activity guidelines in long-term care settings. There is also research on gardening as an activity for the older adult population and its ability as an activity to meet physical activity guidelines. Gardening as an activity for older adults has been studied for over 30 years, yet gardening as an intervention in long-term care facilities remains rare.

This paper will propose implementation of physical activity guidelines for long-term care facilities in North Carolina. Gardening will be the primary focus area for physical activity interventions as well as examine studies involving the effects of gardening on older adult populations, with a specific focus on applying findings to long-term care facilities. To date, there are few studies that focus on gardening programs in long-term care facilities, and therefore, a missed opportunity to apply the benefits of gardening to older adults living in long-term care.

## **Characteristics of the Aging Population**

Older adults are at risk for developing chronic diseases as they age, which are the leading cause of death this population. The most common chronic conditions include diabetes, arthritis, congestive heart failure, and dementia (HealthyPeople2020, 2015). In North Carolina in 2013, the leading causes of death for the population age 65 and older was cancer, heart disease, and chronic lower respiratory disease (NCDHHS, 2015) (See Appendix I). Older adults are also at risk for developing disabilities or declines in physical function, which affect their ability to live at home as well as their ability to independently perform Activities of Daily Living (ADL). Approximately 40% of the population in long-

term care services needed assistance with at least one of the ADL's (out of 4 ADL's examined: toileting, eating, dressing, bathing) (CDC, 2013).

There are many changes that come with an older adult's transition from living independently in their own homes to living in a long-term care facility beyond what is immediately apparent. Residents often experience decreased socialization with their families and previous communities and a lack of stimulation. They also often experience decreased physical activity, loneliness, depression, and decreased feelings of self-worth (Brown et al, 2004). Many LTC facilities attempt to dampen these effects by providing opportunities for socialization and involvement of older adults.

### **Physical Activity Guidelines for Older Adults**

The Centers for Disease Control and Prevention provides physical activity guidelines for different age groups. For optimal health and disease prevention for older adults age 65 years and older, their recommendation is at least 2 hours and 30 minutes, or 150 minutes, per week of moderately intense aerobic exercise and muscle-strengthening activities that work major muscle groups on 2 or more days per week (CDC, June 2015).

These physical activity guidelines are basic guidelines for healthy, relatively active older adults and therefore may not be fully applicable to older adults in long-term care facilities and/or with physical disabilities. Therefore they should be taken as guidelines for physical activity and individual alterations to type and/or level of difficulty of physical activity may be warranted.

### **A Call to Action for Physical Activity Guidelines in Long-Term Care**

Little information exists regarding physical activity guidelines for long-term care facilities in North Carolina. While one of the major goals of North Carolina's Aging Services plan for 2015-2019 is to "empower older adults to have optimal health status and to have a healthy lifestyle", it does not specifically mention the promotion of physical activity within long-term care as a way to meet this objective. It instead focuses on the Senior Games, vaccinations, and expansion of the Seniors' Farmers Market Nutrition Program. (NCDHHS, 2015). While these objectives have merit in promoting health for older adults, a focus on physical activity may also aide in meeting this goal for the older adult population of N.C. The plan also states an objective to expand and promote access to evidence-based health promotion and disease prevention programs, but does not specifically say which population of older adults (independently living or living in long-term care) nor does it specifically list types of programs (NCDHHS, 2015).

In the North Carolina state policy for activities programs in long-term care facilities, there is only one mention of physical activity. It requires that facilities provide a "minimum of 14 hours of a variety of planned group activities per week that include activities that promote socialization, **physical interaction**, group accomplishment, creative expression, increased knowledge and learning of new skills" (NCAC 2005). While physical activity is briefly mentioned in the list for types of activities in this policy, there is no direct requirement or recommendation for that amount of physical activity or types of physical activity that may be implemented in long-term care. This section of the state policy in long-term care facilities was last amended in 2005 (NCAC, 2005).

When interviewing activities directors or activities coordinators of North Carolina long-term care facilities, none were able to speak specifically about physical activity guidelines. Some were unsure of the existence of physical activity policies for N.C. but stated that their facility itself does not have physical activity policies. However, each activities director interviewed did state that there were opportunities for physical activity at their facilities through walking clubs, group exercise programs, physical therapy and occupational therapy services, or other types of activities. Only one facility interviewed had gardening offered as a program, and this facility was an assisted living community with relatively mobile residents versus a skilled nursing facility.

Each facility interviewed stated that there were opportunities to engage in physical activity at their facility, which may lead one to believe that a formal policy for physical activity is not necessary for North Carolina. However, having a formal policy required for facilities may lead to increased funding for existing programs, new grant opportunities, promote innovation for new programs that provide physical activity, and a new emphasis on physical activity within long-term care that may not be present in each LTC facility in North Carolina.

It is clear that North Carolina needs a task force, similar to the task force for physical activity guidelines for child care in N.C., to address the implementation of a physical activity policy for long-term care facilities. This task force may include representatives from policy, research, physical therapy, the medical field, long-term care facility administrators, and the Division of Aging and Adult Services from the North Carolina Department of Health and Human Services. Items on the agenda may include requirements for time allotted to offering physical activity programs, identification of appropriate instructors, strategies to monitor and evaluate implementation, and suggestions for types of programs. One such physical activity program for older adults in LTC may be gardening.

### **Gardening: A Form of Physical Activity?**

Gardening remains a popular leisure activity and form of exercise in the older adult population, particularly outside long-term care facilities. Gardening encompasses an array of different types of activities that may help older adults meet the CDC's guidelines for physical activity and prevent a sedentary lifestyle. One study using questionnaires sent to 298 older adults age 50 and up showed that gardeners, versus non-gardeners, had significant positive on four quality of life statements and on perceptions of their personal health and physical activity (Sommerfield et al, 2010b).

There are a few studies that describe specific gardening tasks and one found that measures the metabolic equivalents (METs) of each task. In a study by Park et al (2008) of independently-living older adults, described gardening tasks as low versus moderate intensity by describing the type of movement used to perform the tasks. Tasks using just the upper body in a standing or squatting position were considered low intensity: mixing soil, planting, and hand-weeding. Tasks using both the upper and lower body were considered moderate intensity: turning compost, digging, raking, mulching, etc. In a later study by Park et al (2011), the researchers used indirect calorimetry to measure 15 gardening tasks in a population of 20 Korean older adults age 65 and over. The same findings were found as the previous study for group low versus moderate intensity of gardening activities. Identifying specific gardening tasks as either low or moderate

intensity gives an opportunity to precisely tailor interventions to the older adult population, as well as to determine the appropriate tasks for various levels of physical ability. Neither of the studies found on this subject specifically examined the effectiveness or feasibility of tailoring interventions according to MET equivalents, or low versus moderate levels of activity.

In addition to the traditional outdoor activities, older adults may also be involved in indoor gardening activities. One study on the effects of indoor gardening activities on overall well-being and physical function involved the following types of indoor gardening activities: decorating pots and planting bulbs, choosing and transplanting flowering plants, discussing of proper plant care, planting hanging baskets, and arranging fresh-cut flowers. All of these activities may be performed sitting down (Brown et al, 2004), creating an opportunity for including older adults with physical disabilities in a gardening intervention, as well as including gardening as an option for facilities without adequate outdoor spaces. These topics will be further explored below.

## **Literature Review: Gardening As a Form of Physical Activity for Older Adults and Other Health Benefits of Gardening**

In reviewing the literature on the benefits of gardening for older adults, several themes emerged. The studies discussed here focus on four major themes: physical activity and physical function, mental and psychosocial health, nutrition, and gardening for older adults with physical disabilities. The latter two themes of nutrition and older adults with disabilities contain limited research and are often a peripheral focus of studies. In addition, many studies on gardening in older adults focus on the aesthetic benefits of access to nature which will not be discussed here. The major findings according to each theme are discussed below.

### *Physical Activity and Functionality*

Improving and preserving the physical function of older adults has become an increasingly popular area of study. Two areas within this theme are prevalent: gardening as a way to meet the physical activity recommendations for older adults and gardening as a way to preserve and improve the physical function of older adults. Gardening is thought to encourage physical activity due to the variation in types of gardening tasks and variations according to the seasons (Park et al, 2008).

Physical activity recommendations for older adults are at least 150 minutes of moderate intensity physical activity per week. An observational study using a small sample of gardeners who lived at home with an average age of 72 years old showed that on average, gardeners reached or exceeded the physical activity recommendations (Park et al, 2008). While gardening may not be a physically vigorous activity, it helps prevent a sedentary lifestyle and meet the physical activity requirements for older adults.

Gardening has also been associated with physiological effects. Park et al (2009) described decreased total cholesterol, blood pressure, and mortality among older adults who gardened. Physical function is also improved among gardeners. Park et al (2009) described an increase in physical function, decrease in pain, improved grip strength after 6 months, and increased hand flexibility. In this study, hand flexibility included an improved

grasping and releasing function and improved flexing of the thumb and forefinger, movements that are an integral part of several Activities of Daily Living. Improvements specifically in physical function as it relates to ADL's are described in a study by Brown et al (2004). This study focused on the effects of a 5-week indoor gardening intervention in a nursing home. After 5 weeks, gardening program participants showed a significant effect on three activities of daily living: transfer, eating, and toileting. Gardening has also been associated with decreased incidence of falls in older adults due to better balance and fewer functional limitations (Chen & Janke, 2012).

Overall, there may be insufficient, or at least inconsistent, evidence for the effects of gardening on physical function. This is mostly due to the lack of use of standardized methods for this area of research (Nicklett, 2014) and its emergence as a topic to be studied. Many studies are population-based and based on information from life-long gardeners versus non-gardeners and not necessarily the effects of gardening interventions implemented late in life. A few population-based studies focus on gardeners versus non-gardeners and results may be biased due to the sampling population. For instance, in the study on the association of falls with older adult gardeners and non-gardeners by Chen & Janke (2012), the survey used did not obtain information on how long the participants had been gardening. The positive association between gardening and the incidence of falls could instead be due to characteristics of people who choose to garden versus a true effect of gardening on the incidence of falls.

### *Mental & Psychosocial Health*

Physical activity has long been known to positively affect mental health and the management of stress. The majority of research on the health benefits of gardening on older adults discusses the mental health and psychosocial effects. This may be tied to the physical nature of gardening as an activity, but since this was not specifically researched or discussed in the studies below, it cannot be concluded here.

Every study found within this theme resulted in positive effects for older adults, both statistically and non-statistically significant. Among the benefits found were decreased stress, feelings of accomplishment, improved attention span, positive cognitive effects for older adults with dementia (Detweiler et al, 2012), improved mental health status and lessened depression after 3 months (Park et al, 2009), and relaxed emotional states (Brown et al, 2004). Studies also resulted in improved socialization among older adults, including social integration, an increase in social support, and a decrease in feelings of loneliness (Park et al, 2009; Brown et al, 2009; Milligan, Gatrell, & Bingley, 2004). A study by Brown et al (2009) involved 66 older adults from two nursing homes. The nursing home that served as the experimental group participated in an hour-long indoor gardening program once a week for 5 consecutive weeks while the nursing home that served as the control group received a 20-minute visit once a week. The differences in the pre- and post-test results of the experimental versus the control group were significant, with the gardeners reporting a significant increase in self-worth and overall improved quality of life compared to the control group. These results were with indoor gardening activities similar to those described above, in which most of the activities involved sitting down, making this gardening intervention accessible to populations who may not have otherwise been able to participate.

Study designs and methods for these overall similar results varied; randomized control trials, focus groups, semi-structured interviews, surveys, and observational methods were all used. There were also variations in research setting; studies included both older adults living independently in their homes and older adults in long-term care facilities, with similar results. One significant disadvantage to all of these studies is the lack of comparison of gardening-specific interventions to other types of programming interventions, such as music therapy, craft programs, or organized group exercise. In this way, it is difficult to determine if the results of these studies are from the socialization and cognitive aspect of the interventions or if the results are specific to gardening rather than other types of activities in LTC facilities. It would also be interesting to see if other physical activity interventions have the same mental and psychosocial benefits.

### *Nutrition: Limited Research*

Physical activity is only one half of the equation for health promotion and chronic disease prevention in the older adult population. Nutrition is the other half of the equation; however, there is a distinct lack of studies in this area and a lack of focus on the older adult population living in long-term care facilities. However, a few studies were found that viewed the relationship between older adults who garden and nutrition status.

Only one study was found that specifically evaluated the relationship between gardening and fruit and vegetable consumption in the older adult population. One study discussed fruits and vegetables as a peripheral focus. In Philadelphia, Pennsylvania low-income older adults living in senior facilities considered quality fresh fruits and vegetables as a perceived benefit of community gardening (Wang & Glicksman, 2013). Another study by Sommerfield et al (2010a) utilized questionnaires for older adults who live at home age 50 and up to compare the fruit and vegetable consumption of gardeners versus non-gardeners. They found that gardeners had higher levels of vegetable consumption with no differences in fruit consumption among gardeners versus non-gardeners. Gardeners were also asked questions regarding how long they have been involved with gardening. Surprisingly, the researchers found no difference between long-term gardeners versus those who started gardening later in life. This may suggest that there is an opportunity for gardening interventions late in life to improve health behaviors of older adults.

One study was found that examined the relationship between types of indoor and outdoor activities and vitamin D levels among older adults. They found higher vitamin D levels (and thus, lower risk of vitamin D deficiency) in older adults who frequently engaged in outdoor activities. Gardening and cycling had the highest vitamin D levels, above other outdoor activities such as brisk walking and fishing (De Rui et al, 2014).

### *Potential for Older Adults with Physical Disabilities or Limitations*

While gardening interventions may be considered suitable only for the physically active older adult, gardening interventions can also be made suitable for older adults with physical disabilities or limitations. While physical activity may only be considered for the mobile older adult, providing opportunities for physical activity to older adults with physical limitations may help improve their quality of life and/or their physical function.

Few studies focused solely on garden intervention design for these older adults, but included aspects that tailored to these populations. For instance, one of the first studies on indoor gardening interventions in long-term care facilities by Powell et al (1978) showed that participants of limited physical ability may still participate with positive results on their well-being. Of the 32 participants in this study, 9 were partially or completely blind and ~90% were wheelchair-bound. Another study involving community gardening in low-income senior housing used garden beds raised to wheelchair height to allow wheelchair-bound residents to participate (Wang & Glicksman, 2013). Littman et al (2014) researched participation in physical activity of older veterans living at home with partial foot, below-knee, and above-knee amputations and found that ~30% participated in gardening. The top barriers reported that prevented physical activity was pain and access to resources.

### **Potential for Implementing Physical Activity Programs in Long-Term Care**

In a qualitative study of nine LTC including interviews with administrators, the barriers to implementing physical activity programs in LTC settings was examined. Each of the administrators interviewed demonstrated an understanding of benefits of physical activity for older adults, but each had common barriers to implementation. Barriers mentioned included lack of staff or low staff to resident ratio, funding constraints, safety concerns due to lack of staff for one-on-one attention, and the changing demographics of the facilities (i.e. increased average age of residents). Administrators also reported and increased portion of residents with high acuity and therefore, less independently mobile. Several administrators reported the lack of staff to be a problem during times when a large number of residents need to be transported, as in mealtimes or prior to programming. One administrator reported beginning to transport patients 45 minutes before programming due to the low staff to resident ratio and the high amount of residents needing assistance. No research was found on the potential differences in spending decisions and funding priorities among for-profit versus nonprofit LTC settings (Benjamin et al, 2009).

Other than the barriers mentioned, additional aspects should be considered before implementing physical activity programs in a LTC facility. Recreation standards for different levels of function (Benjamin et al, 2009) as well as preferred staff to resident ratio during programming may need to be established by the facility to provide continuity of care and maintain safety. The overall goals of the intervention should be determined prior to implementation as they may have an effect on study design. Potential goals may include improved muscle strength and flexibility, improved physical function, increased bone mineral density (Park et al, 2011), improved vitamin D levels, or psychosocial benefits.

From discussions with activities directors in North Carolina and reviewing the activities program policy for the state, it seems that physical activity for older adults in long-term care is not an area of focus for N.C. or within LTC facilities. It may be assumed that residents have plenty of opportunities for physical activity, either through activities that already exist or through physical and occupational therapy. However, this assumption may mean that facilities are not reaching their full potential for providing physical activity and there may be residents who would benefit from a focus on physical activity in long-term care.

## Discussion

Although the CDC developed physical activity recommendations for the older adult population and while physical activity exists in long-term care in the form of existing exercise programs, physical therapy services, and occupational therapy services, there is not a formal state policy in North Carolina regarding physical activity for older adults. Since there is not a state policy on the subject, there is no method of knowing if older adults in long-term care are meeting the CDC's recommendations for physical activity. Since there has been implementation of physical activity guidelines for North Carolina's preschool population in childcare services, it may be argued that similar guidelines should be in place for the older adult population in long-term care. There are both benefits and drawbacks to implementation of physical activity guidelines in long-term care.

Benefits to implementing physical activity guidelines are improvements to the physical and mental health of a growing older adult population. Appropriate physical activity may improve overall health and the management of chronic disease. It may also lead to a more engaged LTC population and improve the mental health of residents. Providing formal guidelines or policy may result in positive benefits for residents that were previously overlooked for physical activity, especially those with physical disabilities or limitations. Monitoring and evaluation of such a policy will show the effects of the policy on the population and allow more robust research to be conducted on physical activity in long-term care. It may also lead to innovation in physical activity for this population.

Implementing a formal policy will also place a new challenge on an already challenged field. It may lead to further budget constraints for LTC facilities. The low staff to resident ratio may affect the types of physical activity programs that could be offered, the safety of these programs, and the ability of the facility to tailor physical activity to each resident's needs. However, it is important to note that the barriers to implementation may also serve as reasons to implement physical activity guidelines. Residents with high acuity, physical disabilities, and decreased physical function may present challenges but may also benefit most from a formal policy. The research discussed in this paper showed that implementing physical activity in the form of gardening increased the participant's performance in Activities of Daily Living. This may lead to increased self-worth, increased independence in daily activities, and reduced costs for their care, addressing several barriers simultaneously. While operational barriers in long-term care such as funding constraints and low staff to resident ratio may seem insurmountable, they should not deter innovation in improving physical function for older adults residents.

Gardening may be one such program in long-term care to meet the physical activity guidelines for older adults. The benefits of gardening in long-term care include physical activity and function, mental and psychosocial health, its potential as an activity for older adults with physical disabilities, and its potential for nutritional benefits. For many older adults, gardening may be something they engaged in prior to living in long-term care and may be a more attractive option for physical activity than a formal exercise program. Since gardening may be indoor or outdoor and include a variety of tasks, it may be easily tailored to the facility's property and a variety of physical ability. Gardening is also an example of an activity that can be resident-led, providing independence and opportunities for leadership and creativity for residents. However, gardening may also be an expensive program to implement in long-term care. Facilities may not have the outdoor or indoor space to

provide gardening opportunities or may not have an instructor with expertise on the subject. There may also be seasonal restrictions or weather restrictions for outdoor gardens which may affect participation. There also may be little interest in gardening from residents.

More research is needed in this area that specifically focuses on gardening in long-term care. Study design involving physical activity would benefit from the use of standardized measurements and more information on differing intensities and/or durations of gardening tasks with specific physical function outcomes. Activities of Daily Living are immediately applicable to older adults in long-term care facilities and may have a significant effect on the implementation of gardening interventions. Many studies also focus on mental health and physical function characteristics of life-long gardeners. A focus on the effects of gardening programs that are initiated late-in-life may be more applicable to LTC communities. There is little research on the accessibility of gardening programs for older adults with physical disabilities, which would be immediately applicable to the LTC setting. Research on the type of gardens, gardening tasks, and design of garden spaces would provide invaluable information for successful implementation in this population. There is also little research on the ability of gardening interventions to address fruit and vegetable consumption in older adults, and many of the garden program designs did not include growing fruits and vegetables. Gardening programs may be made simple or complex according to the desires of residents and LTC facilities. Little research has been conducted on the costs and benefits of gardening programs and there is no research on implementation at different levels of complexity in program design.

## **Conclusion & Recommendations**

Physical activity is important to the health of older adults in long-term care. Raising awareness about the need for physical activity guidelines or recommendations for older adults in long-term care will bring a new challenge to long-term care. Regardless of whether a formal physical activity policy is implemented or simply recommendations placed for physical activity in long-term care, this population will benefit from a more structured and intentional approach to physical activity. A task force for the state of North Carolina would be beneficial in examining the feasibility and potential for implementation of physical activity guidelines in long-term care facilities. North Carolina needs to start the discussion about physical activity for older adults in long-term care. In addition, the current research in older adults and physical activity, including gardening, should be reframed in terms of examining the need and potential of physical activity guidelines in long-term care.

One such activity that may be useful in providing physical activity in long-term care is gardening. Gardening as an activity for older adults has been studied for over 30 years, yet gardening interventions in long-term care facilities remain rare. Gardening has been shown to meet the CDC's physical activity guidelines for older adults, improve physical function, provide mental and psychosocial benefits, and it may be tailored to a wheelchair-bound population. Although gardening in long-term care needs more research, it may be a beneficial start for implementing physical activity guidelines in long-term care.

## Appendix I – North Carolina Statistics on Aging

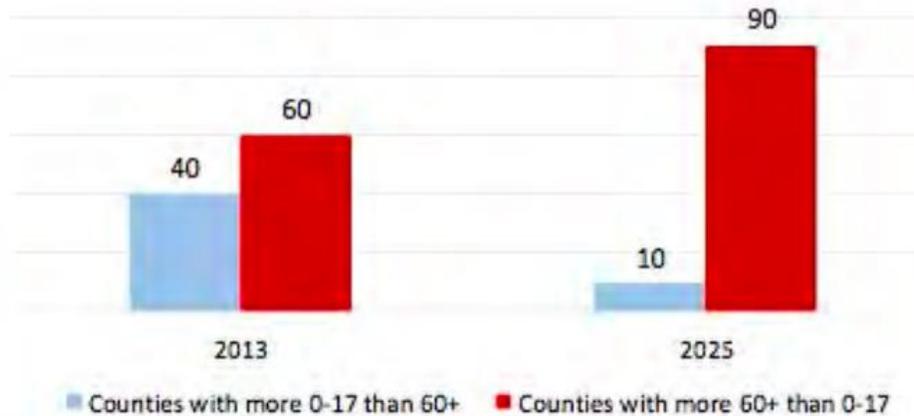
Tables below provided by NCDHHS, 2015.

### Population Change

Ages	2013		2033		Percent Change 2013-2033
	Number	Percent	Number	Percent	
Total	9,861,952		11,856,858		20.2%
60+	1,969,351	20.0%	3,117,795	26.3%	58.3%
65+	1,402,321	14.2%	2,411,960	20.3%	72.0%
85+	164,848	1.7%	309,807	2.6%	87.9%

Source: NC State Data Center; Population estimates and projections, October 2014

### Number of counties with more people 60+ than ages 0-17 will increase



Source: N.C. State Data Center; Population estimates and projections, October 2014

### Status of those 65 and Older (as a % of age group)

Charateristics	NC	US
Living alone	27%	27%
Veterans	22%	23%
Have a disability	38%	37%
Have less than a high school diploma	24%	22%
Median household income	\$34,117	\$37,000
Income below the poverty level	10%	9%
Income is between 100-199% of the poverty level	25%	22%
In labor force	16%	17%
Own their homes	82%	79%

Source: US Census, 2005-2009 ACS, \*2009 ACS

### Top Seven Leading Causes of Death Among People in N.C. Age 65 and Over in 2013

Rank	Cause
1	Cancer
2	Diseases of the heart
3	Chronic lower respiratory diseases
4	Cerebrovascular disease
5	Alzheimer's disease
6	Diabetes mellitus
7	Pneumonia & influenza

N.C. State Center for Health Statistics

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