The Georgia Centenarian Study
A Study of Longevity and Survival of the Oldest Old
1988 - 2007
The University of Georgia

In Collaboration with The University of Georgia, Boston University, Duke University, Emory University, Iowa State University, Louisiana State University, Rosalind Franklin University of Medicine and Science, University of Kentucky and University of Michigan.
Funded by the National Institute on Aging
Principal Investigator, Dr. Leonard W. Poon, with Mrs. Inez Wilson, a member of the Georgia Centenarian Study, on her 106th birthday. Mrs. Wilson survived to 108 years.

Cover Art: The collage of pictures on the cover depicts the diversity of the oldest old population from around the world.
Message from the Principal Investigator
Leonard W. Poon, Ph.D.

The purpose of this brochure is to share information about the Georgia Centenarian Study, a study that began in 1988 and is currently funded until 2007. The Study evolved from the 1988 National Institute of Mental Health funded study of “expert survivors” --- those individuals over 100 years who were community-dwelling and cognitively intact --- to our currently National Institute on Aging funded population-based program project of centenarians in northern Georgia. Since the inception of our research, the study has been multi-disciplinary and multi-institutional, collaborating with colleagues from different departments and institutions. The combined expertise of colleagues from a variety of research universities made this research exciting and possible. The following is a table of contents of information contained in this brochure.

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Left: The principal investigator visited with a village elder.
Right: The principal investigator enjoyed lunch with a 102-year old centenarian (middle) and Dr. Nobuyashi Hirosi (left) of the Tokyo Centenarian Study in Sunchang County, South Korea.
Why do we want to study centenarians?
An introduction to the Georgia Centenarian Study

Perhaps the most compelling reasons are found in the October 1999 draft of the National Institute on Aging (NIA) Draft Strategic Plan for Fiscal Years 2001-2005. This document pointed to the remarkable growth of the older population which poses both opportunities and challenges. One of these opportunities is that unprecedented numbers of elders in the coming decades will face the risks of disease, frailty, and dependence. The population at the highest risk is the oldest of the old who are increasing at the fastest rate among those who are 65 years and older (Jeune, 1995; Kannistof, Lauritsen, Thatcher, & Vaupel, 1994; Vaupel et al., 1998).

Centenarians by definition are survivors who have lived to at least 100, which is more than 20 years longer than the average life span. Contrary to the general picture of a frail individual at the end of life, we have found that 20 to 25% of centenarians are community-dwelling, cognitively intact, and generally vibrant and full of life (Poon, Clayton, Martin, Johnson, Courtenay, Sweaney, Merriam, Pless, & Thielman, 1992). On the other hand, at least 50% of the centenarians have some form of dementia. As expected, 60 to 70% have a disability and some are completely dependent (Franke, 1977, 1985, 1987) (Hagberg, Poon, & Homma, 2001). At the extreme longevity of the human species, centenarians represent the ultimate range of independence and dependence, frailty and strength. The challenge is that there is much to be learned from centenarians about survival, disease, frailty, and independence to promote health and independence for all who hope to maintain a successful quality of life in older adulthood.

A fundamental challenge is to understand how centenarians live longer and what specific biological, psychological, and sociological characteristics they possess that would allow them to survive longer (Lehr, 1991; Poon, Bramlett, Holtsberg, Johnson, & Martin, 1997). Another basic challenge is whether we could generalize the knowledge gained in our volumes of aging research to individuals of average life span which is in their 70s (e.g., the MacArthur Study) to individuals who live 20 to 30 years longer (Rowe & Kahn, 1998). While studies of centenarians and the oldest old remain a rarity within gerontological research, interest in this area has increased steadily over the past 20 years (Vaupel et al., 1998; Lehr, 1991; Poon et al., 1997). Recently completed studies conducted in the United States (e.g., Poon et al., 1992; Perls, 1997), Japan (e.g., Chan, Suzuki, & Yamamoto, 1997), Italy (e.g., Capurso et al., 1997), Hungary (e.g., Regius, Beregi, & Klinger, 1994), France (e.g., Allard et al., 1994), Sweden (e.g., Samuelsson et al., 1997), Finland and Denmark (e.g., Jeune, 1994b) have provided a foundation for further hypothesis testing. Centenarian studies have identified a number of characteristics associated with extreme longevity. For example, food preferences (Fischer, Johnson, Poon, & Martin, 1995), marital status (Samuelsson et al., 1997), personality and coping strategies (Martin et al., 1992), levels of family support (Capurso et al., 1997), and education (Poon et al., 1992; Ravaglia et al., 1997) have all been linked with successful late-life aging.

However, the robustness of these findings awaits further research owing to variations from different centenarian studies in samples, subject selection and research methods. For example, the first two phases of the Georgia Centenarian Study (1988 – 1998) examined community-dwelling and cognitively intact centenarians whom are estimated to be about 20 to 30% of the centenarian population. The findings await generalization to the other 70% of centenarians and research on predictors that could differentiate functional differences among centenarians. This is one of the goals of our current phase III program project (2001 – 2007).
The Three Phases of the Georgia Centenarian Study

We have been most fortunate to have funded three different phases of our research.

**Phase 1** (1988-1992) was a cross-sectional study examining unique adaptational characteristics of community-dwelling and cognitively-intact centenarians, octogenarians, and sexagenarians in Georgia. This was a collaboration among The University of Georgia, Medical College of Georgia, and Iowa State University and funded by the National Institute of Mental Health (NIMH). Leonard W. Poon, Peter Martin, and Mary Ann Johnson were in co-principal investigators with collaborations with many colleagues, students, and staff across the three universities. In this study, we compared “expert survivors” (who are cognitively intact and community dwelling centenarians) with “master survivors” (who are octogenarians with similar cognitive and community dwelling characteristics) and sexagenarians.

Figure 1. The Georgia Centenarian Study General Conceptual Model shows the conceptual model of the study. Briefly, we tested hypotheses of the direct and indirect effects of family longevity, environmental support, individual characteristics, adaptational abilities, nutrition, mental and physical health on perceived morale and quality of life of the three age groups.

**Phase 2** (1992-1998) was a study to evaluate stability and changes of the three groups over time. This study was also funded by NIMH.

**Phase 3** (2001-2007) is a program project designed to identify and isolate longevity genes, neuropathology, functional capacity, and adaptational characteristics of a population-based sample of centenarians and controls in 44 counties in Northern Georgia. This program project is a collaboration among The University of Georgia, Boston University, Duke University, Emory University, Iowa State University, Louisiana State University, Rosalind Franklin University of Medicine and Science, University of Kentucky and University of Michigan and is funded by the NIA.
Selected Findings of the Georgia Centenarian Study

The following are selected key findings generated from 1988 to the present based on the data collected in Phases I and II of our study:

(1) **Health and Health Habits:** Consistent with the findings from the Alameda County Study (Breslow & Breslow, 1993) and the Harvard College Alumni Study (Paffenbarger et al., 1994), the Georgia centenarians tended to practice health habits that were found to prolong life (Nickols-Richardson, Johnson, Poon, & Martin, 1996a; Johnson, Houston, Fischer, Poon, & Martin, 1995). That is, few smoked, were obese, or consumed excessive alcohol. They remained active throughout life and ate breakfast on a regular basis. Compared to cohorts in their 60s and 80s, centenarians tended to escape contracting chronic diseases during their lifetime.

(2) **Dietary Habits:** The intake of most nutrients were similar among 60-, 80-, and 100-year old community-dwelling groups with few exceptions (Fischer et al., 1995; Williams, Johnson, Poon, & Martin, 1995; Johnson, Brown, Poon, Martin, & Clayton, 1992). Centenarians consumed about 20 – 30% more carotenoids and vitamin A from foods. They also consumed breakfast more regularly and avoided weight loss diets and large fluctuations in body weight. Lastly, centenarians tended to consume more whole milk, less 2% milk and yogurt, and were less likely to avoid dietary cholesterol.

(3) **Cognition and Intelligence:** Comparing cognitively-intact centenarians with younger cohorts, centenarians showed poorer performances in most cognitive functions except for everyday problem-solving tasks (Holtsberg, Poon, Noble, & Martin, 1995; Poon et al., 1992). The magnitudes of age differences were smaller in crystallized intelligence than in fluid intelligence. Education was shown to have a profound positive effect that mitigated the level of performance differences between subjects, especially centenarians. It is interesting to note that the performances of centenarians who used their everyday experiences in problem-solving were found to be similar to the younger cohorts (Poon, et al., 1992). Cognition accounted for about 20% of the variance in IADL for all subjects. When functional and mental health, as well as social and economic resources, were included in the regression equation, the amount of IADL variance that could be predicted increased to 37%. These findings show that cognition, health, and resources are all important predictors of everyday functions.

(4) **Personality and Coping Styles:** Centenarians were more dominant, suspicious, practical, and relaxed than those in their 60s and 80s (Martin et al., 1992). Centenarians were less likely to use active behavioral coping but were more likely to use cognitive coping behaviors when compared to octogenarians (Martin et al., 1992). Centenarians were more likely to acknowledge problems than those in other age groups, and they were less likely to seek social support as a coping strategy for their problems (Martin, Poon, & Johnson, 1995).

(5) **Support Systems:** Community-dwelling centenarians reported having fewer potential visitors. They were less likely to talk on the telephone or have a spouse as a primary caregiver, but more likely to have their children as caregivers and to receive help with food and meal preparation from family and friends (Martin, Poon, Kim, & Johnson, 1996). However, they were just as likely as those in their 60s and 80s to have a confidante, to have daily visitors and to have someone help them if they were sick or disabled.
(6) **Mental Health**: Compared to younger community-dwelling cohorts, centenarians tended to report more somatic but not emotional symptoms. Although centenarians were found to have a higher level of depression, measured by the Geriatric Depression Scale (Yesavage, Brink, Rose, & et al., 1983), compared to younger cohorts, no clinical depression was found among the sample of community-dwelling centenarians. A comment on our findings on race difference is offered here. African-American centenarians had significantly higher levels of depression and poorer self-perceived health than their Caucasian counterparts. However, when education and income were taken into account, differences in self-perceived health were eliminated and differences in mental health decreased but remained significant (Kim, Bramlett, Wright, & Poon, 1998). This was found for all three age groups. This finding shows that concomitant measures such as education, socio-economic background, and mental health are very important and could influence survivorship and quality of life of the oldest old.

(7) **Survival Analyses**: These analyses were performed to ascertain which variables, if any, could predict length of survival after an individual attained the age of 100 (Poon et al, 2000). While regression and modeling analyses are currently being performed, our preliminary analyses have shown that five clusters of variables show promise. They are: gender, family longevity, income and social support, anthropometrics, and cognition.

(A) Women, on average, survived 1020 days after attaining 100 years. Men, on the other hand, survived an average of 781 days. The gender difference in survival in the first two years are not significantly different. However, the difference is significant after three years. The gender superiority for women is quite glaring among centenarians.

(B) Father’s age of death was found to exert a positive effect on the number of days of survival of centenarians. No effect was found for mother’s age of death.

(C) Three variables in social support seem to relate to length of survival among centenarians. They are: talking on the phone, having someone to help, and having a caregiver for the centenarians. These findings show that the availability of a support system is important to centenarians’ survival.

(D) Three anthropometric measures were found to correlate positively to survival. They are: triceps skinfold (an index of body fat), body mass index, and waist to hip ratio. These findings suggest that once a person attains centenarian status, it is important to have sufficient nourishment to survive longer.

(E) Higher level of cognition after age 100 is positively related to longer length of survival. This was found in the positive correlation with problem solving, learning and memory, and the WAIS performance measures of picture arrangement and block design.

Please visit http://www.geron.uga.edu for additional or related information.
Phase 3
The Georgia Centenarian Study
(2001 – 2007)

Phases I and II of our study focused primarily on behavioral and social science factors associated with longevity and survival of cognitively-intact and community-dwelling centenarians, octogenarians, and sexagenarians. Phase III expands our research to both community-dwelling and institutionalized centenarians in our population. We strive to study a population-based sample of centenarians. Further, we expand our study to provide a balance of biomedical and psychosocial predictors of longevity and survival. As this project is currently underway, we do not have results to share. However, we do want to share the design and methods in the execution of this phase of our study.

The impetus of our current project came from the NIA Strategic Plan which articulated four major goals that NIA will pursue in the years to come. The four projects being conducted in our current NIA-funded Program Project (2001 -2007) can contribute to the eventual realization of these goals:

**Project 1** will test the viability of four homologues of yeast longevity genes. Findings from Project 1 can contribute to the following NIA goals of (a) understanding healthy aging processes, (b) unlocking the secrets of aging, health, and longevity, and (c) identifying genes associated with aging, longevity, age-related diseases, and behavior.

**Project 2** will test hypotheses on relationships between senile plaque/neurofibrillary tangle counts, brain infarcts, functional abilities, cognitive measures, the presence of dementia and markers of neurocognitive reserves in centenarians. Findings from this Project can contribute to the NIA goal of characterizing normal cognitive and brain function of the oldest-old.

**Project 3** will test hypotheses on predictors of functional capacity, which has been shown to be an important determinant of utilization of health care resources, mortality, and institutionalization in the elderly. This Project has the potential to contribute to a number of NIA goals, including the definition of biological and environmental factors that maximize cognitive, sensory, and physical functions. This Project also aims to take advantage of the core physical health information collected on sensory, musculoskeletal, blood chemistry, mental health, and diseases of centenarians and their impact on functional capacity in comparison to control subjects in their 60s and 80s. This information can contribute to the dissociation of changes of normal or usual aging from those of diseases and disorders.

**Project 4** will test hypotheses of predictors that differentiate centenarians who are independent, healthy, and experience a sense of well-being from those who are dependent, unhealthy (frail), and do not experience a sense of well-being. This Project can contribute to the NIA goal of identifying social, psychological, and lifestyle factors that promote health, well-being, and longevity.
What This Phase 3 Program Project Will Accomplish:

This Program Project is a multi-disciplinary population-based study of centenarians in North Georgia. Our long-term goal is to elucidate the roles of biological, psychological, and social factors that are pertinent to the survival and functioning of this population. We propose to develop and employ probability sampling frames to select representative samples of centenarians and of younger control populations residing in a set of designated counties in Georgia.

Projects 1 and 2 will focus on biomedical aging mechanisms among centenarians and Projects 3 and 4 will concentrate on psychosocial mechanisms. The specific aims are to:

- Assess the underlying genetic structure of our population and test initially the viability of four homologues of yeast longevity genes (LAG1Hs, PHB1Hs, c-H-ras1, and GRP78) to human longevity. (Project 1)
- Test hypotheses on the relationship between advanced aging and cognitive impairment by evaluating relationships among plaque/tangle counts, brain infarcts, functional ability, and cognitive measures on those participants who are willing to donate their brains. (Project 2)
- Test hypotheses on neuropsychological, sensory, neuromuscular, blood chemistry, mental health, and disease correlates of functional capacity among centenarians. (Project 3)
- Test hypotheses on the impact of distal (life events, past achievements) and proximal (individual, social, and economic resources) influences on behavioral skills and developmental outcomes (levels of adaptation) among centenarians. (Project 4)

How We Are Accomplishing the Goals:

The Program Project contains four projects that will focus on the same population of centenarians so that hypothesis testing on the inter-relationships among biomedical and psychosocial factors could be maximized. Five cores are employed to support the four projects.

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<th>Projects</th>
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Support Services Provided by the Cores: The cores are designed to sample, ascertain, recruit, collect and analyze data for all four projects. In so doing, we maximize the efficiency and economy in the conducting of the Program Project.

Core A is the Administrative Core. It is the command and control center for the Program Project. Core B provides the sampling frame and ascertains subjects for all four projects. Core C recruits and tests all subjects for the projects. Core D (Cell, Blood, & DNA Bank) processes and distributes the blood for analysis in Projects 1, 2 and 3. Core E is responsible for the input of data, archive, and analysis for all four projects.

Basic Data Elements Shared Across Projects: Core elements will be collected by Core C across two or more projects. These variables are employed to provide basic participant characteristics. Depending on the project, more detailed information will be obtained beyond the basic profile; the information will be used as covariates, classifying variables, or as predictor or outcome variables.

These descriptive variables are:

Demographics

- Age, gender, race, education, marital status, county and place of residence, previous occupations (used by all projects).

Family longevity and history profile

- Age of death of mother, father, grandparents; number of siblings, age of death of siblings, causes of death; locations of homes over their lifetime; military service (used by Projects 1, 4)
Cognitive profile  | MMSE, Severe Impairment Battery, Global Deterioration Scale (used by all projects)
---|---
Physical health profile | Medical history; medications; physical exam of cardiovascular, respiratory, neurological and musculoskeletal systems; blood assay for status on liver, kidney, glucose control, and endocrine status (used by all projects)
Mental health profile | Geriatric Depression Scale, Cornell Scale for Depression in Dementia (used by Projects 3,4)
Level of dependency profile | Physical and instrumental activities of daily living (used by Projects 3,4)

Synergy Across Projects: Besides the sharing of basic data elements, the projects are designed to contribute in assisting each other to better understand and account for the variability of mechanisms under investigation.

Testing Centenarians: From our experience in recruiting and testing centenarians as well as experience reported by other centenarian studies (Franke, 1977; Franke, 1985), we expect about 20 to 30 percent of the centenarians to be cognitively intact. Fifty percent will probably have dementia in varying levels of severity, and 20 to 30% will most likely be bedridden and severely demented. This variability in levels of cognitive abilities has a direct impact on all projects, as all centenarians in our population-based sample will be tested. Therefore, performance or observational measures will be used whenever possible. To address this issue, the relationships among performance, self and informant report measures are addressed in Study 1 of Project 3. Further, the relationship between informant and self reports is addressed in Project 4. Functional capacity is measured by a performance test (Lowenstein et al., 1989) in which a zero (denoting not able to perform) is a meaningful measure in Project 3. We have piloted the procedures in Project 3 with either blind, bed-ridden, or demented elders and have adjusted the procedures accordingly. We realize these measurement issues have not been adequately investigated for centenarians in the literature, and clarification of these issues is an important contribution of this Program Project.

Research Material Obtained

Depending upon a participant’s level of involvement in the program project, information will be obtained in each of 6 clusters of information: (1) Demographics; Family and Longevity History; (2) Cognition, Neuropsychology, and Neuropathology; (3) Physical and General Health; (4) Mental Health, Personality, Resources and Adaptation; (5) Functional Capacity and Independence; (6) Genetics, Blood Chemistry and Nutrient Biomarkers.

A condition to enrollment in the program project for both the younger and centenarian cohorts is willingness to donate a small blood specimen (20 ml) and consent to its use in genetic and other blood assays. Centenarians who do not actually provide the blood specimens for the required purposes will not progress in the data collection process beyond their initial enrollment and limited demographic and
cognitive screening. No additional compensation is provided for the blood specimen. All centenarian blood
draws will be conducted by a physician or nurse practitioner trained in geriatric venipuncture. Younger
control subject blood draws will be performed by licensed phlebotomists or nurse-practitioners.

Project 2 of the Program Project requires brain tissue donations from a subset of centenarian par-
ticipants willing to prospectively consent to the donation of such tissue after their deaths. Willingness to
consent to donation of brain tissue and consent to participation in Project 2 is not a condition to participa-
tion in any of the other projects. No additional compensation is offered to centenarians for the brain tissue
donation. Brain tissue is not requested from the younger control subjects.

All data obtained from participants, including blood and tissue specimens, will be recorded by cod-
ed ID only; participants’ names and ID numbers will be protected, according to the guidelines established
by the Institutional Review Board.

Participant Recruitment and Informed Consent Plans

Recruitment will be performed by Core C, using the methodology and procedures therein described.
Although preliminary contact with centenarians will be attempted by telephone and mail, actual recruitment
will occur only in face-to-face sessions between the interviewers and the centenarian plus their caregivers/
immediate family members. All informed consent procedures will comply with the guidelines, procedures,
and scripts approved by the Institutional Review Board for each Project. This process includes detailed
discussion of the purposes of the study, procedures to be used, confidentiality of data, and videotaping of
test sessions.

For centenarian participants, joint consent procedures will be followed. Informed consents will be
read and executed by the participant as well as the caregiver legally authorized to provide such consent
under Georgia law. This is a sensitive area, legally and ethically. On the one hand there is the need to safe-
guard the presumption of autonomy and self-determination. On the other hand, there is the need to insure
that the consent is truly informed, and provided by an individual possessing legal capacity. Given the frail
nature of centenarians, and the prevalence of both sensorial impairments as well as cognitive impairments
in this population, we believe that the optimal resolution of this dilemma is through joint consent processes.
If EITHER a centenarian or their legally authorized caregiver objects to participation, at any stage of the
process, the wishes of the objecting party will be strictly honored. All procedures, instruments, and docu-
ments requiring execution have been approved by the University of Georgia Institutional Review Board as
well as the Institutional Review Board of each academic institution involved in a given project or core.

Schedule of Participant Testing

Data collection will begin in month 6 of the Program Project and run through month 48. This is the
amount of time required to recruit and test the number of centenarians and control subjects involved in the
projects. Each centenarian will be tested by appointment in their own residence. Five two-hour sessions
will be required to interview a centenarian completely. All five sessions will be completed within a 30 day
interval. In addition, centenarians who have provided consent for brain tissue donation, will be followed
longitudinally every 6 months until death with brief neurological exams performed at each follow-up ap-
pointment. Younger controls in the 80-89 age range will require approximately 3.5 hours of testing time,
which will be scheduled in 2 two-hour sessions. They will also be tested in their own residence by appoint-
ment. In addition, 400 controls from 20 to 59 years of age will be tested for Project 1.
Literature Cited


Project 1
Genetic Contributions to Longevity
Abstract

Life maintenance in extreme old age is the problem we address by initiating a genetic analysis of human aging using a novel approach. Associative genetics constitutes the first tool applied, but the candidate genes that will be analyzed have already passed the muster of causal connection to the aging process in genetic model organisms. The association of specific alleles of these genes with human longevity will provide probes for the verification of longevity gene function at the molecular level and clues to the molecular mechanisms of aging. Our focus will initially be the genes LAG1Hs and c-H-ras-1, which have been validated in yeast longevity studies, and the APOE locus. We will test the hypothesis, for each of these genes, that certain alleles of a gene are more frequent in centenarians than in younger controls.

The research will be carried out in several steps. First, we will assess the underlying genetic structure of our population by searching for polymorphisms in these genes. Second, we will determine the level of variation in the centenarian population compared to the control, in our candidate longevity selected (i.e. replication in other longevous cohorts). We will also supply a panel of ethnic affiliation markers to control for the confounding effects of population admixture. This analysis, in conjunction with the tests in other populations, may suggest the existence of longevous haplotypes in the population, a possibility which will be explored further. Finally, we will examine the functional significance of any allelic variants detected at higher frequency in centenarians, using the yeast genetic model system. This will involve the determination of the effect on yeast longevity of corresponding mutations in the yeast gene. The embodiment of this genetic study with its emphasis on metabolic control and stress responses and its accent on nervous system function in the context of this Program Project with its nutrition, neuropathology, and neuropsychology components will facilitate identification of genetic correlates, and the elucidation of features important for maintenance of functional health in old age. Thus, these studies should help to improve the quality of life in old age.

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Many questions about the relationship between late-life aging and cognitive impairment are unanswered. It is not known which cognitive changes occur with age alone, and which are due to the presence of undiagnosed brain diseases, such as Alzheimer’s disease (AD) and cerebral infarcts (CVAs). Among persons with the same degrees of neuropathological burden, what factors will influence the clinical expression of dementia? This project will explore these questions by gathering clinical, cognitive and neuropathological data from a sample of centenarians (individuals 100 years old or older).

The overall Program Project will identify and characterize a population-based, stratified sample of 242 centenarians from 44 northern Georgia counties. These subjects and their families will be asked to agree to brain donation after death. If they agree, they will be recruited into this project and will undergo standardized physical and cognitive examinations every 6 months thereafter until death. Then, following death, brain tissue will be removed and examined. Procedures for clinical, cognitive, and neuropathological evaluations will conform to those currently being used in NIH funded research on other aging populations: the Nun Study and the Honolulu Asian Aging Study, adding to the diversity of subjects being studied with these methods. In particular, based upon the racial and ethnic characteristics of the north Georgia centenarian population, the Program Project (and consequently this project) is expected to enroll a high proportion of African-American subjects. Successful recruitment of African-Americans into this clinicopathological project would be especially valuable, as this ethnic group has been underrepresented in previous clinicopathological studies.

The overall aim of this project is to explore relationships between the senile plaque/neurofibrillary tangle counts, brain infarcts, functional abilities, cognitive measures, the presence of dementia and markers of neurocognitive reserves in a racially and educationally diverse sample of centenarians. Clinicopathological data will permit refinements of NIA-Reagan neuropathological criteria for AD in very elderly individuals.

**Project 2 Investigators**

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Two studies are proposed in Project 3 to measure, evaluate, and predict patterns of functional capacity in the oldest old. Study 1 is designed to examine profiles of age differences in functional capacity as well as to test hypotheses regarding the convergent validity of the functional capacity measures. Study 1 will provide information on profiles of centenarians’ functional capacity, including those who are visually and hearing impaired and demented, as well as measurement issues (and problems) relating to functional capacity. This information will be used in Study 2A on neuropsychological correlates of functional capacity. While global cognitive status (typically using the MMSE) has been investigated in several studies of centenarians, little is known about the relationship between specific cognitive mechanisms and functional capacity in centenarians. First, we aim to characterize BADL and IADL capacity in centenarians to identify functional areas that could be targeted for intervention. Second, we aim to examine the relationships of specific neuropsychological mechanisms, especially motor-dependent and motor-independent executive functioning, visuospatial abilities, and memory functioning with everyday functional capacities. If central executive functions, visuospatial skills, and/or memory functioning could account for meaningful amounts of variance in functional capacity, then this finding could have significance in dealing with remediation and compensation strategies.

Study 2B will seek to determine whether and to what extent there are age-specific impacts of physical functioning, sensory impairment, depression, and specific cognitive abilities on levels of adaptive functioning. We will rely upon common data, in addition to data collected as part of other projects in our analysis. These include the sections from the physical examination on visual and hearing acuity, tactile acuity, neuro-musculoskeletal functions, general cognitive functioning, depression and demographic information. For our exploratory hypothesis testing, specific blood chemistry parameters, medication, and health history will be employed. These common data will be combined with the data collected for this project. Results will be analyzed using descriptive analyses and hierarchical multiple regression and structural equation modeling.

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Project 4
Resources and Adaptation in Centenarians
Abstract

The primary objective of this research is to assess predictors that differentiate centenarians who are independent, healthy, and experience a sense of wellbeing from those who are dependent, unhealthy (frail), and do not experience a sense of wellbeing. The study will advance a model of centenarian adaptation that builds upon and extends traditional stress-and-coping paradigms, emphasizing proximal resources (e.g., personality traits, social support, economic assets), as well as distal experiences (e.g., early life events and past achievements). These proximal resources and distal experiences are hypothesized to influence five differing levels of adaptation in centenarians: functional capacity, cognitive impairment, mental health, economic dependency and psychological well-being.

Centenarians and their primary caregivers (“proxies”) will be recruited for this research. They will participate in structured interviews that will assess the functional capacity and basic physical health, level of cognitive impairment, mental health, economic costs and burden, psychological well-being, individual, social, and economic resources, distal and proximal life events and individual achievements, and the behavioral coping skills of each participant.

The overall design includes three separate but interrelated levels. First, a configural frequency design and subsequent analyses are conceptualized to test for specific types and anti-types of adaptation in centenarians. Second, ANOVA and logistic regression designs are conceived to test for group differences in high and low functioning centenarian groups and to assess differences between centenarians and their proxies. Finally, the direct and indirect effects of proximal and distal resources on the five adaptational outcomes will be tested with LISREL analyses.

Project 4 Investigators

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Core A
Administrative Core
Abstract

The purpose of the Administrative Core is to ensure the smooth functioning of the Program Project and to enhance collaboration among the Cores and Projects. This Core has five specific aims: (1) to provide overall scientific leadership; (2) to facilitate and coordinate communication and activities across Cores and Projects; (3) to provide fiscal management (4) to coordinate the activities of the External Advisory Board; and (5) to interface with other centenarian studies for research development. The Core Leader of the Administrative Core and the Principal Investigator of the Program Project is Leonard W. Poon. Joyce S. Tenover, M.D., Ph.D. serves as Biomedical Director and Dr. Poon serves as the Psychosocial Director within the Administrative Core. An Executive Committee (Core and Project Leaders) participates in all administrative and scientific decisions. An External Advisory Board evaluates the extant work and assists in solutions to design, testing, and analysis issues during the project.

Core A Investigators

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Core B
Sampling Core
Abstract

The purpose of this core is to develop and direct sampling strategies for the Program Project. The target population for this project is defined as consisting of all individuals who reach their 100th birthday by the end of the year 2003 and, who at the time they are first contacted, reside within a geographic area defined by 44 counties of Georgia. The Sampling and Subject Ascertainment Core is responsible for sampling individuals from both community-dwelling and institutional settings according to census estimates. Four distinct samples, of sufficient total size to provide 242 centenarians who complete the full complement of five data collection sessions, will be selected from that population and passed on to the Recruitment and Data Acquisition Core. In addition, control samples will be developed of individuals in each of six age groups ranging from 20 to 59 years for Project 1. Samples of those age 65-69 and 80-89 will be obtained for Projects 3 and 4. A list of telephone numbers will be developed, using random digit dialing procedures, in sufficient numbers to provide control samples of 100 respondents living within the same geographic area and in each of the age ranges 20-29, 30-39, 40-49, and 50-59.

Core B Investigator

Willard L. Rodgers, Ph.D.
Core Leader
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Core C
Subject Recruitment & Data Acquisition

Abstract

The Subject Recruitment & Data Acquisition Core will recruit all subjects and acquire all data for the program project. To do so, Core C will provide: (1) subject recruiter and subject tester training, certification and quality control; (2) instrumentation assembly across the projects into one standardized testing battery; (3) subject recruitment for all individuals to be ascertained by Core B; (4) all stages of data collection for all subjects in procedural compliance with the standardized testing battery (including quality assurance procedures), from and including informed consents, data collection, debriefings, compensation, through mortality surveillance; (5) venipunctures and transfer of blood specimens to Core D (for processing and analysis); (6) videographic recordings of session conducted with centenarians and their caregivers, supplemented by still photographs/slides; and (7) longitudinal follow-up of and data collection from all centenarian subjects who by virtue of their enrollment in Project 2 have agreed to donate brain tissue after their deaths. Data will be collected from 242 centenarians, 80 80-year-old controls, and 400 control subjects who are 20-59 years.

Core C Investigators

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Libby Jackson, M.S.W.  
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Core D
Cell, Blood, & DNA
Abstract

The overall goal of the proposed project is to effectively manage the collection, processing, storage and distribution of biological materials collected and derived from centenarians and control subjects participating in the program project study. Centralization of blood sample processing, storage and distribution by this core laboratory will permit standardization of sample handling procedures, coordination of sample distribution and control of sample inventories. These activities will help maximize the scientific benefit obtained from the limited amounts of materials available from this unique study population.

Several projects may utilize different blood components from a single tube of blood if processed properly, e.g., leukocytes for genetics and plasma for blood chemistry. In addition, processing blood samples for specific project needs will generate by-products that can be preserved and used for additional future studies, e.g., red blood cells for isozyme and mitochondrial DNA analyses. This type of efficiency could not be easily achieved if blood samples were processed by individual project investigators. The laboratory will also establish lymphoblastoid cell lines (LCLs) from peripheral blood specimens; maintain, expand, and preserve cell lines; and harvest cells for DNA purification. LCLs will be cryopreserved in liquid N2 and recovered as needed to provide a renewable supply of DNA, RNA, and proteins. In most cases, the short life expectancy of the centenarian study population will preclude re-sampling of study members beyond one or two years after the first sample is collected. The renewable supply of DNA from LCLs can be used for follow-up studies of informative genotypes and for typing new candidate genes that may become of interest during the proposed studies or in future studies related to the present investigations. Since LCLs remain viable for many years if properly stored, these cells can also be used as living models for in vitro studies of cellular processes, a feature not available with tissue and blood samples no matter how large.

Core D Investigators

Dorothy Hausman, Ph.D.
Core Leader
University of Georgia

Mary Ann Johnson, Ph.D.
Co-Core Leader
University of Georgia
Core E
Data Management & Statistical Analysis
Abstract

The Data Management and Statistical Analysis Core will provide each component of the Program Project with expertise and comprehensive support in the areas of data management, study design, and statistical analysis. The proposed Program Project is composed of multiple interrelated studies, each collecting large quantities of information. This Core facility will supply the coordinated resources, services and consultation essential for effective collaborative research.

This unit will perform data entry and management activities, including maintenance of data quality, security, and confidentiality, as well as the linkages necessary for the integration of component contributions for collaborative research. It will assist with development of data collection instruments, institute data verification procedures and participate in instrument validation and assessment of inter-observer variability. The Data Management and Statistical Analysis Core will be responsible for creation and maintenance of all data files and timely generation of progress reports. Personnel of the Core will provide biostatistical consultation and support, including assistance with study design, study implementation, planned methods of analysis, and considerations of power and sample size. They will carry out statistical analyses of the data from the various components of the Program Project, including both preliminary and exploratory analyses and multivariate statistical modeling as required. Specific expertise residing within the Core which are particularly germane to centenarian studies include genetic, survival, multivariate and longitudinal analysis. Unit personnel will thus assist Program Project investigators at every stage of research from the initial conception through to the final analysis and presentation results.

Core E Investigators

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Publications of the Georgia Centenarian Study


Links to .pdf files of selected articles can be found at: http://www.geron.uga.edu/multimedia/onlinepublications.php