Health, Gender and Mobility: Intergenerational Correlations in Longevity over Time

John Parman, College of William & Mary and NBER

April 6, 2016

Introduction

Measuring Modern and Historical Mobility

Health as a Measure of Mobility

Data

Longevity and Occupational Status

Intergenerational Correlations in Longevity

Moving forward

Motivation

- There is a steadily growing empirical literature on the links between socioeconomic status and both health inputs and outcomes
- Parental socioeconomic status influences early childhood health which in turn impacts adult health status and socioeconomic outcomes
- These links between socioeconomic status and health have been altered by a series of dramatic public health interventions, particularly in the first half of the twentieth century
- The goal of this paper is to examine how the intergenerational transmission of health status has evolved over time through the creation of a new historical dataset linking parent and child health outcomes

Motivation

- An additional motivation is to provide new evidence to complement the growing literature on historical intergenerational mobility rates
- Several studies have established historical mobility patterns in the United States based on occupation, income and educational attainment
- However, health mobility estimates can provide insight into slightly different dimensions of mobility
- In particular, estimates of the intergenerational transmission of health can illuminate two aspects of mobility traditionally difficult to estimate with historical data sources:
  - The intergenerational mobility patterns of females
  - The individual contributions of each parent to children's outcomes

Brief overview of paper

- I construct a new intergenerational dataset of linked death certificates that allows for estimating intergenerational correlations in longevity
- I find large intergenerational longevity elasticities for both males and females, with the strongest elasticities between children and parents of the same gender
- Over the sample period (deaths occurring between 1909 and 1975), these elasticities have grown
- Correlations in longevity are similar in strength when looking across spouses rather than across generations
- Modern data suggests that the correlations in longevity between spouses have remained strong but the correlations across generations have largely disappeared

Measures of modern income mobility

- One common approach is to measure intergenerational income elasticities using panel data like the PSID:

$$\ln y_s = \alpha + \rho \ln y_f + ...$$

- Elasticities are typically found to be in the 0.3-0.5 range (see Solon (1999) for a survey of estimates)
- Female mobility estimates compare household income of a daughter to household income of parents, ρ looks slightly smaller for females (see, for example, Solon and Chadwick (2002))
- Transitory fluctuations in income can have big effects (see Mazumder (2005))
- Historical estimates of income mobility are limited by data availability

Measures of historical income mobility

- Income is first reported in the federal census in 1940 (this is also the first year for educational attainment)
- The 1915 Iowa census provides a slightly earlier sample of incomes and educational attainments
- Linking fathers and sons across these sources provides early-twentieth century estimates of income mobility (see Feigenbaum (2015) and Parman (2011))
- More recent federal censuses are not public limiting the ability to extend the time span of these estimates

Measures of historical occupational mobility

- To assess mobility prior to 1940, studies have turned to occupations rather than income
- The basic approach is to construct occupational transition matrices and assess how far they are from a matrix representing complete mobility
- Results suggest that US exhibited high levels of occupational mobility in the 19th century that have fallen over time (Ferrie (2005), Ferrie and Long (2006, 2009), Olivetti and Paserman (2015))
- This is consistent with the little evidence available on historical income mobility (Parman (2011), Feigenbaum (2015))

Measures of historical and modern mobility

Historical and modern mobility estimates for the United States

Intergenerational mobility measure:	Estimates		Sources	
	1915 to 1940	Modern	Historical	Modern
Intergenerational income elasticity	0.249	0.35 to 0.54	Feigenbaum (2015)	Lee and Solon (2009)
Income rank-rank coefficient	0.210	0.307 to 0.317	Feigenbaum (2015)	Chetty et al. (2014)
Educational persistence	0.187	0.46	Feigenbaum (2015)	Hertz et al. (2007)
Altham-Ferrie Statistic	16.03	20.76	Feigenbaum (2015)	Ferrie (2005)

This is a modified version of Table 1 in Feigenbaum (2015).

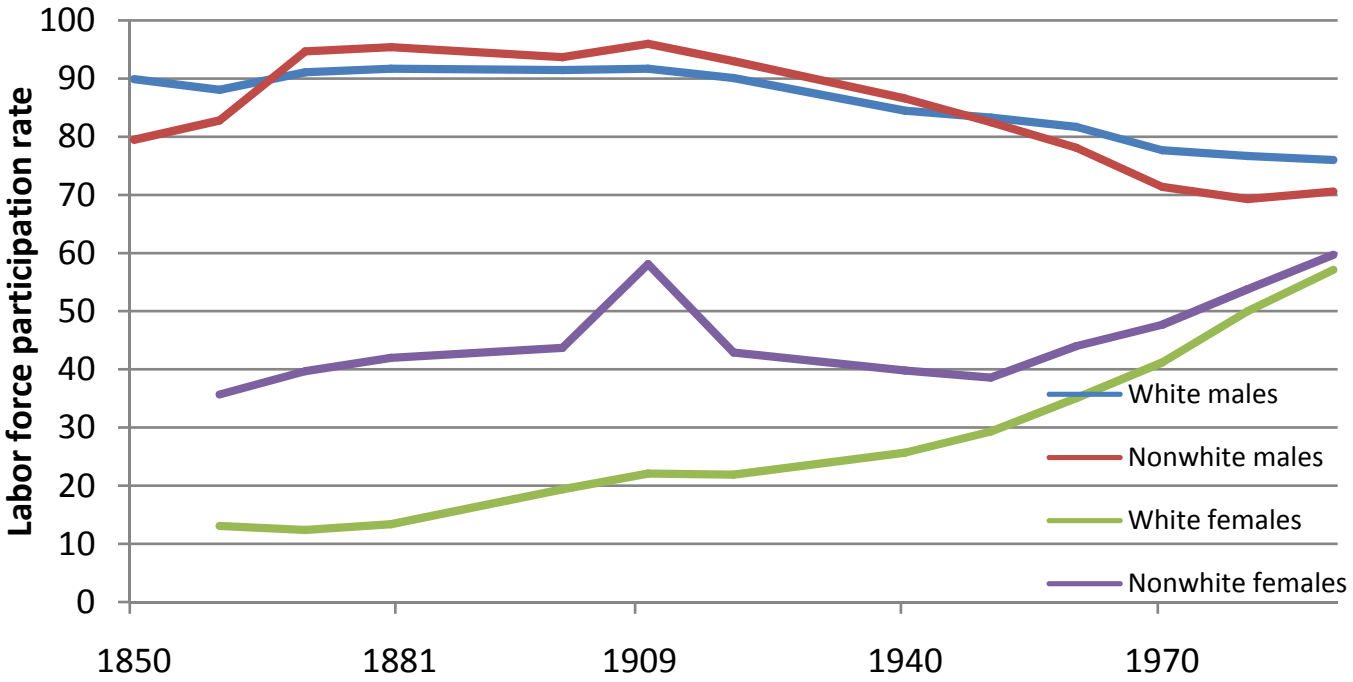
Motivating health as a measure of mobility

- This paper uses health rather than occupation or income to estimate intergenerational mobility
- There are a few reasons that a health-based measure provides a compelling complement to income and occupation measures:
  - Health is an important outcome in and of itself
  - Long-term health outcomes capture SES over the entire lifetime rather than a single snapshot
  - Health may be easier to compare across genders
  - Health offers an opportunity to look at parent-specific contributions to children's outcomes
  - Death certificates solve a big problem of how to apply linking techniques to females

Why might we expect different female mobility estimates?

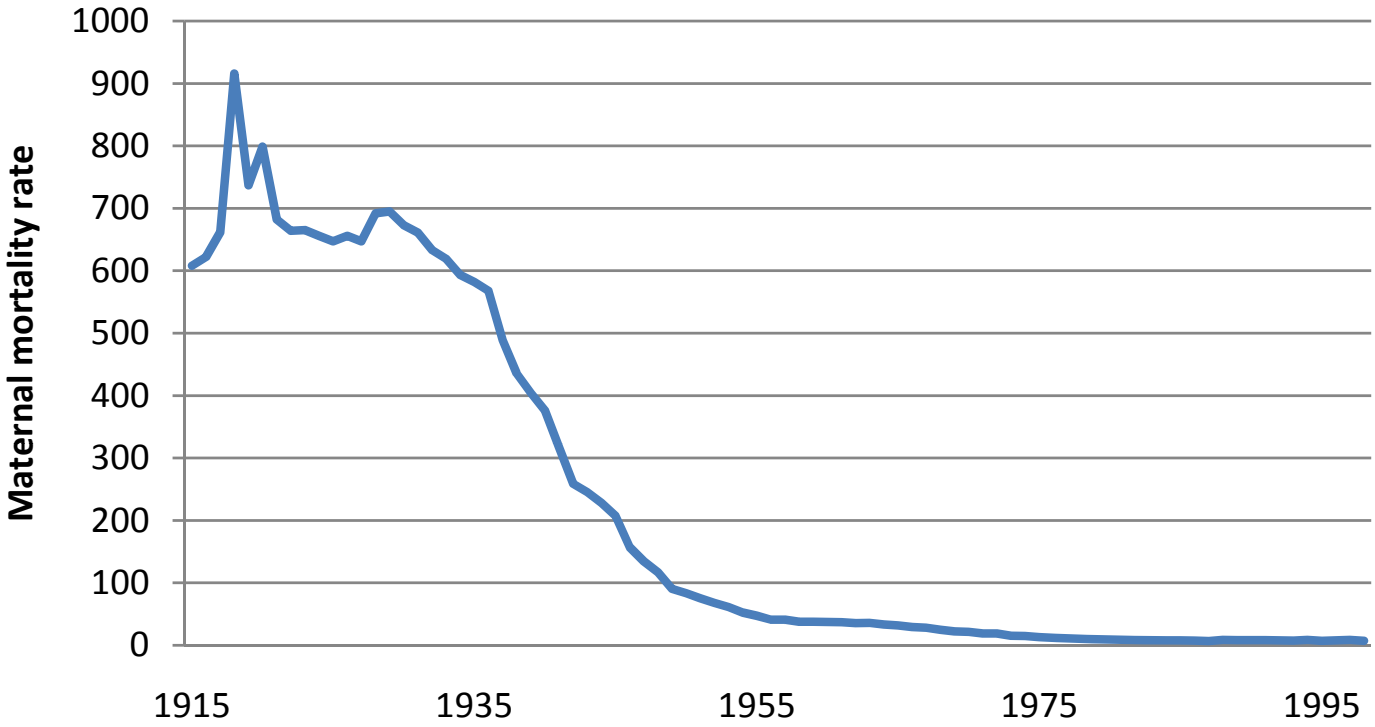
- There are a variety of reasons to believe that changes in female mobility over time have been quite different than changes in male mobility
- Consider the differences between the cohort in this study and in modern surveys (say the 1890 versus 1950 birth cohorts)
- In 1890, only Wyoming gives women the right to vote compared to universal suffrage in 1950 (at least for white females)
- The labor force participation rate of females doubled from 1890 to 1950
- The maternal mortality rate fell from over 608 deaths per 100,000 live births in 1915 to 83 in 1950

Why should we care about separate female mobility estimates?



Labor force participation rates by gender and race, 1850-1990. Source: Sobek (2001).

Why should we care about separate female mobility estimates?



Maternal mortality rate per 100,000 live births, 1915-1998.
Source: US Public Health Service vital statistics.

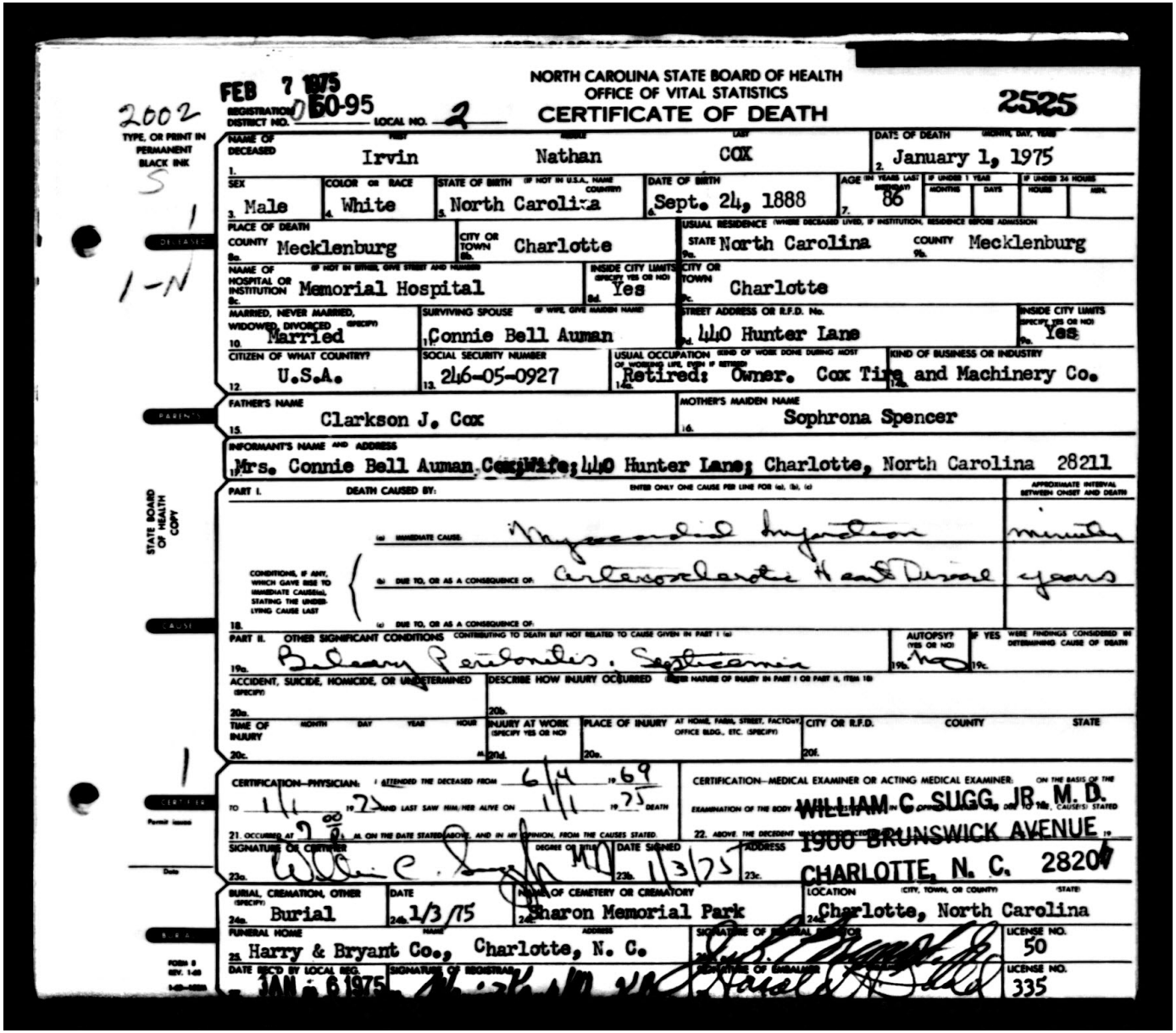
Death certificates as a data source

- The basic approach will be to link the death certificates of parents and children to assess correlations in long-term health outcomes
- Death certificates have several useful features:
  - Cover entire state populations
  - Extend back to the 19th century for several states
  - Contain excellent long-term health data and occupation information
  - More detailed information for linking than the census provides
- And a couple of drawbacks:
  - State-level rather than national
  - Filled out by someone other than the individual of interest

Death certificates as a data source

- Focus for this initial study will be the death certificates for North Carolina
- North Carolina has detailed death records available from 1909 to 1975
- Data collection took place in two waves
- A pilot study used a 10% sample of Mecklenburg County
- Mecklenburg is one of the more heterogeneous counties in terms of urban/rural locations, occupations, and race
- The second wave uses a 1% sample of the entire state, transcription is still in progress on the second wave

North Carolina death certificate, 1975



NORTH CAROLINA STATE BOARD OF HEALTH
OFFICE OF VITAL STATISTICS
CERTIFICATE OF DEATH

2525

2002 — FEB 7 1975 — 60-95 — LOCAL NO. 2

1. NAME OF DECEASED: Irvin Nathan COX
2. DATE OF DEATH: January 1, 1975
3. SEX: Male
4. COLOR OR RACE: White
5. STATE OF BIRTH: North Carolina
6. DATE OF BIRTH: Sept. 24, 1888
7. AGE: 86
8a. PLACE OF DEATH — COUNTY: Mecklenburg
8b. CITY OR TOWN: Charlotte
9a. USUAL RESIDENCE — STATE: North Carolina
9b. COUNTY: Mecklenburg
8c. NAME OF HOSPITAL OR INSTITUTION: Memorial Hospital
8d. INSIDE CITY LIMITS: Yes
9c. CITY OR TOWN: Charlotte
10. MARRIED, NEVER MARRIED, WIDOWED, DIVORCED: Married
11. SURVIVING SPOUSE: Connie Bell Auman
9d. STREET ADDRESS OR R.F.D. No.: 440 Hunter Lane
9e. INSIDE CITY LIMITS: Yes
12. CITIZEN OF WHAT COUNTRY?: U.S.A.
13. SOCIAL SECURITY NUMBER: 246-05-0927
14a. USUAL OCCUPATION: Retired: Owner. Cox Tire and Machinery Co.
14b. KIND OF BUSINESS OR INDUSTRY
15. FATHER'S NAME: Clarkson J. Cox
16. MOTHER'S MAIDEN NAME: Sophrona Spencer
17. INFORMANT'S NAME AND ADDRESS: Mrs. Connie Bell Auman, Wife; 440 Hunter Lane; Charlotte, North Carolina 28211

PART I. DEATH CAUSED BY: (ENTER ONLY ONE CAUSE PER LINE FOR (a), (b), (c))
18. (a) IMMEDIATE CAUSE: Myocardial Infarction — minutes
(b) DUE TO, OR AS A CONSEQUENCE OF: Arteriosclerotic Heart Disease — years
(c) DUE TO, OR AS A CONSEQUENCE OF:
CONDITIONS, IF ANY, WHICH GAVE RISE TO IMMEDIATE CAUSE(a), STATING THE UNDERLYING CAUSE LAST

PART II. OTHER SIGNIFICANT CONDITIONS CONTRIBUTING TO DEATH BUT NOT RELATED TO CAUSE GIVEN IN PART I (a): Bilateral Pneumonitis, Septicemia
19a. AUTOPSY? (YES OR NO): No
19b. IF YES, WERE FINDINGS CONSIDERED IN DETERMINING CAUSE OF DEATH?

20a. ACCIDENT, SUICIDE, HOMICIDE, OR UNDETERMINED (SPECIFY)
20b. DESCRIBE HOW INJURY OCCURRED
20c. TIME OF INJURY — MONTH DAY YEAR HOUR
20d. INJURY AT WORK (SPECIFY YES OR NO)
20e. PLACE OF INJURY (AT HOME, FARM, STREET, FACTORY, OFFICE BLDG., ETC. (SPECIFY))
20f. CITY OR R.F.D. COUNTY STATE

CERTIFICATION—PHYSICIAN: I ATTENDED THE DECEASED FROM 6/4 19 69 TO 1/11 19 75 AND LAST SAW HIM/HER ALIVE ON 1/11 19 75 DEATH
21. OCCURRED AT 7:00 P.M. ON THE DATE STATED ABOVE, AND IN MY OPINION, FROM THE CAUSES STATED.
23a. SIGNATURE OF CERTIFIER: William C. Sugg
DEGREE OR TITLE: MD
23b. DATE SIGNED: 1/13/75
23c. ADDRESS: 1900 BRUNSWICK AVENUE CHARLOTTE, N. C. 28207

CERTIFICATION—MEDICAL EXAMINER OR ACTING MEDICAL EXAMINER: ON THE BASIS OF THE EXAMINATION OF THE BODY I HOLD WILLIAM C. SUGG, JR. M.D.
22. ABOVE THE DECEDENT [illegible] CAUSE(S) STATED

24a. BURIAL, CREMATION, OTHER (SPECIFY): Burial
24b. DATE: 1/3/75
24c. NAME OF CEMETERY OR CREMATORY: Sharon Memorial Park
24d. LOCATION (CITY, TOWN, OR COUNTY) (STATE): Charlotte, North Carolina
25. FUNERAL HOME — NAME, ADDRESS: Harry & Bryant Co., Charlotte, N. C.
LICENSE NO.: 50
DATE REC'D BY LOCAL REG.: JAN 6 1975
SIGNATURE OF REGISTRAR
LICENSE NO.: 335

STATE BOARD OF HEALTH COPY

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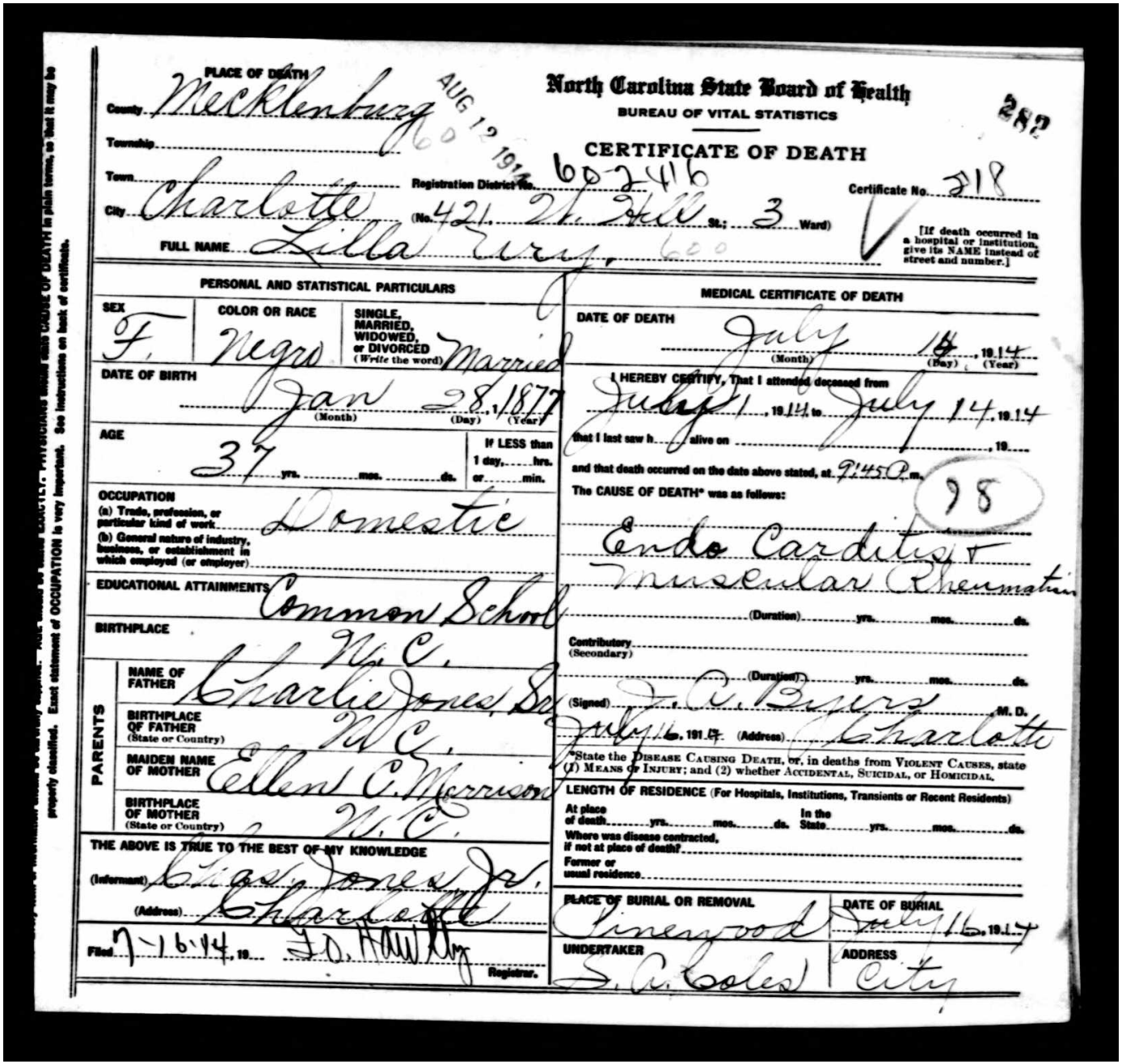
North Carolina death certificate, 1914



North Carolina State Board of Health
BUREAU OF VITAL STATISTICS
CERTIFICATE OF DEATH

PLACE OF DEATH
County Mecklenburg
Township
Town
City Charlotte
Registration District No. 60-2416
Certificate No. 218
(No. 421 W. 2nd St.; 3 Ward)
FULL NAME Lilla Perry

PERSONAL AND STATISTICAL PARTICULARS

SEX	COLOR OR RACE	SINGLE, MARRIED, WIDOWED, or DIVORCED (Write the word)
F.	Negro	Married

DATE OF BIRTH: Jan 28, 1877 (Month) (Day) (Year)
AGE: 37 yrs. mos. ds. If LESS than 1 day, hrs. or min.
OCCUPATION (a) Trade, profession, or particular kind of work: Domestic
(b) General nature of industry, business, or establishment in which employed (or employer):
EDUCATIONAL ATTAINMENTS: Common School
BIRTHPLACE: N. C.

PARENTS
NAME OF FATHER: Charlie Jones, Sr.
BIRTHPLACE OF FATHER (State or Country): N. C.
MAIDEN NAME OF MOTHER: Ellen C. Morrison
BIRTHPLACE OF MOTHER (State or Country): N. C.

THE ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE
(Informant) Chas. Jones, Jr.
(Address) Charlotte
Filed 7-16-14, 19... T. D. Hall Reg. Registrar.

MEDICAL CERTIFICATE OF DEATH

DATE OF DEATH: July 14 (Month) (Day) 19.14 (Year)
I HEREBY CERTIFY, That I attended deceased from July 1, 19.14 to July 14, 19.14
that I last saw h... alive on ..., 19...
and that death occurred on the date above stated, at 9:45 P. m.
The CAUSE OF DEATH* was as follows: 98
Endo Carditis
Muscular Rheumatism
(Duration) yrs. mos. ds.
Contributory (Secondary)
(Duration) yrs. mos. ds.
(Signed) J. C. Byers M. D.
July 16, 191 4. (Address) Charlotte
*State the DISEASE CAUSING DEATH, or, in deaths from VIOLENT CAUSES, state (1) MEANS OF INJURY; and (2) whether ACCIDENTAL, SUICIDAL, or HOMICIDAL.

LENGTH OF RESIDENCE (For Hospitals, Institutions, Transients or Recent Residents)
At place of death... yrs. mos. ds. In the State... yrs. mos. ds.
Where was disease contracted, if not at place of death?
Former or usual residence

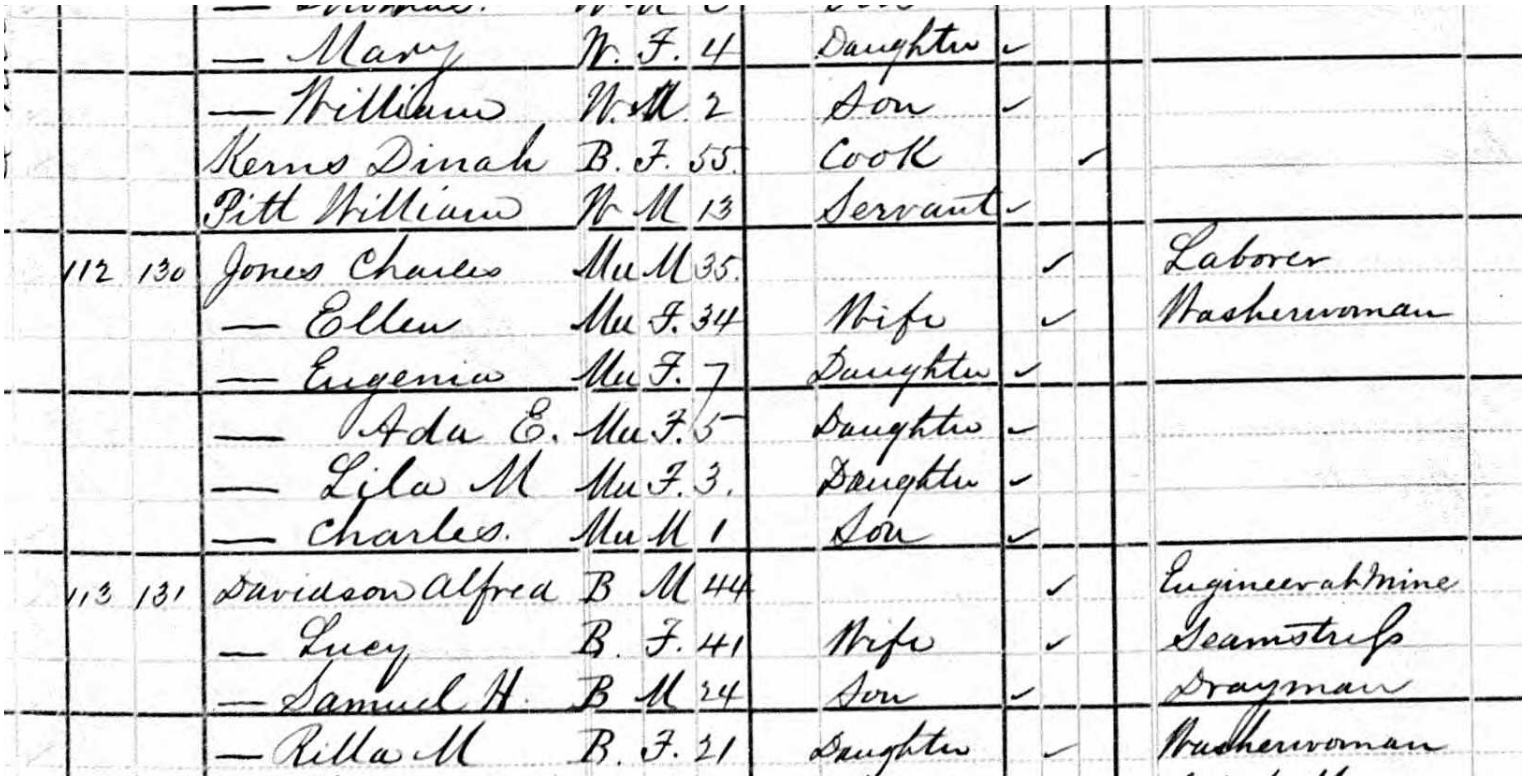
PLACE OF BURIAL OR REMOVAL: Pinewood
DATE OF BURIAL: July 16, 19.14
UNDERTAKER: D. A. Coles
ADDRESS: City

Constructing an intergenerational dataset

The basic linking procedure is the following:

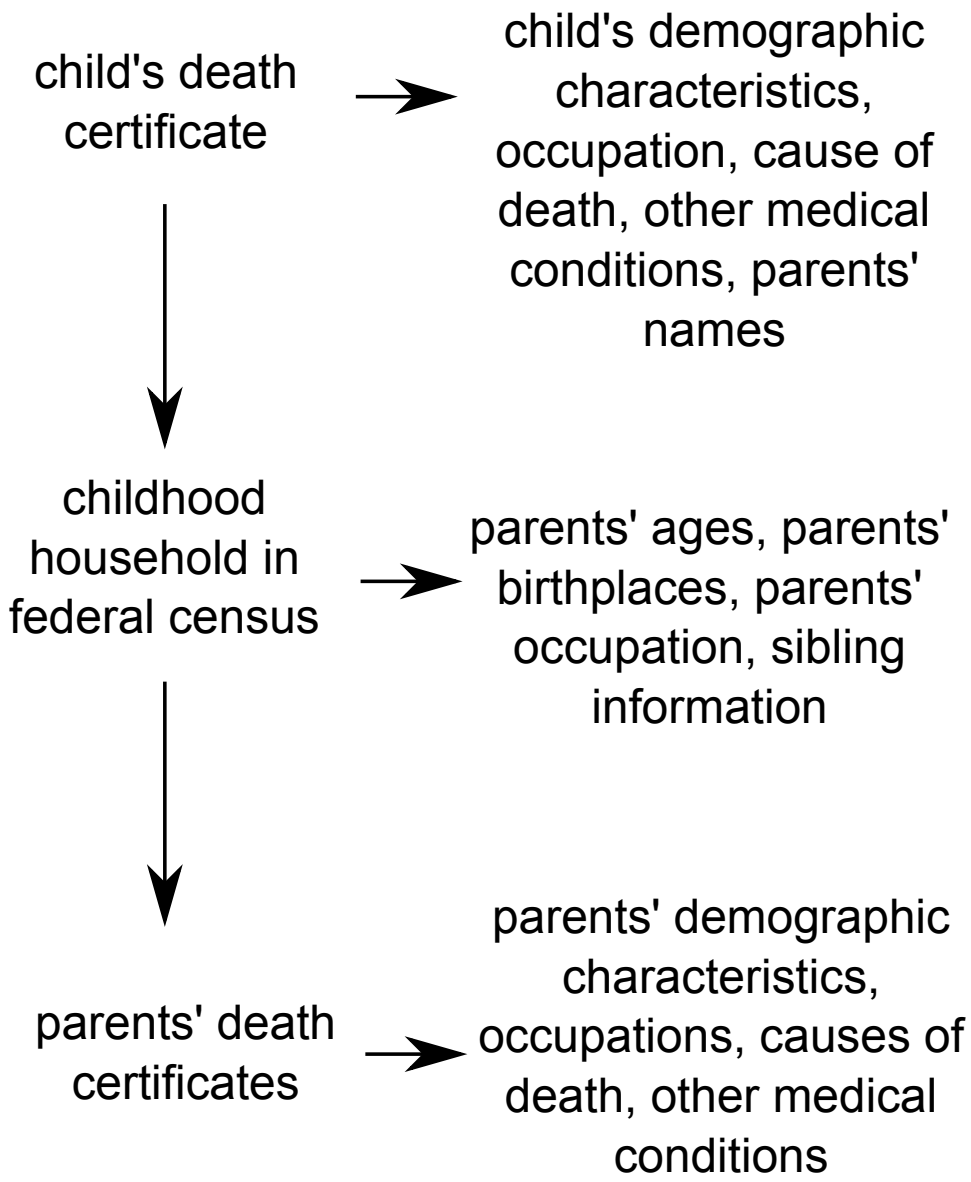
1. Draw a random sample of death certificates and extract name, birth date, death date, birth place and parents' names using a computer script
2. Search for each individual as a child in the federal census on the basis of name, birth state, birth year and parents' names
3. Extract parents' birth years and birth states from census record
4. Search for each parent in the death certificates on the basis of name, birth year, birth state and spouse's name
5. Transcribe death certificate and census info for all successfully matched individuals

Constructing an intergenerational dataset



			— Mary	W. F. 4	Daughter	✓			
			— William	W. M. 2	Son	✓			
			Kerns Dinah	B. F. 55	Cook		✓		
			Pitt William	W. M. 13	Servant	✓			
	112	130	Jones Charles	Mu M 35			✓		Laborer
			— Ellen	Mu F. 34	Wife		✓		Washerwoman
			— Eugenia	Mu F. 7	Daughter	✓			
			— Ada E.	Mu F. 5	Daughter	✓			
			— Lila M	Mu F. 3	Daughter	✓			
			— Charles	Mu M 1	Son	✓			
	113	131	Davidson Alfred	B M 44			✓		Engineer at Mine
			— Lucy	B. F. 41	Wife		✓		Seamstress
			— Samuel H.	B M 24	Son	✓			Drayman
			— Rilla M	B. F. 21	Daughter		✓		Washerwoman

Linking children to their parents



Linking success rates

Linkage success rates in the first stage by gender

	All individuals	Males	Females
Number of individuals in initial sample	12,317	6,849	5,468
Number of individuals born before 1930	10,104	5,489	4,615
Linking child to federal census			
% of individuals born before 1930 not found in census	61.3%	60.8%	63.0%
% found but not living with parents	0.2	0.1	0.2
% found living with mother but not father	0.6	0.5	0.2
% found living with father but not mother	0.3	--	0.1
% found living with both parents	37.6	38.5	36.5

Linking success rates

Linkage success rates in the second stage by gender

	All individuals	Males	Females
Linking parents to death certificates			
% of individuals found in census linked to father's death certificate only	18.6%	20%	17.2%
% linked to mother's death certificate only	17.9	18.7	17.4
% linked to both parents' death certificates	20.1	20.2	17.6
Number of individuals matched to at least one parent's death certificate	1521	872	649

Characteristics by linking outcome

Characteristics by linkage success and gender

	Sons		Daughters	
	Not matched to either parent	Matched to at least one parent	Not matched to either parent	Matched to at least one parent
Mean life span	58.6	60.9	61.9	64.7
Standard deviation of life span	(20.0)	(15.8)	(21.5)	(17.3)
% born in North Carolina	56%	83%	56%	80%
% born in South Carolina	23	8	23	12
% in farming	15	17	2	0.4
% in skilled/semi-skilled occupations	23	26	26	30
% in textiles	14	15	8	11
% in unskilled occupations	21	8	52	33
% in white collar occupations	28	35	13	26

Measures of health from death certificates

The standard information on the death certificates offers several ways to measure health:

- Date of death and date of birth allow for direct calculation of age at death
- Interval between onset and death for medical conditions allows for calculating years in poor health
- Cause of death and other significant conditions allow for disease-specific measures:
  - Disease incidence
  - Age at incidence
  - Duration of disease
- All of these can be measured for both children and their parents

Estimating mobility with longevity

- The basic idea is to estimate an intergenerational longevity elasticity:

$$\ln L_{i,c} = \alpha + \rho \ln L_{i,p} + X_i\beta + \varepsilon_i$$

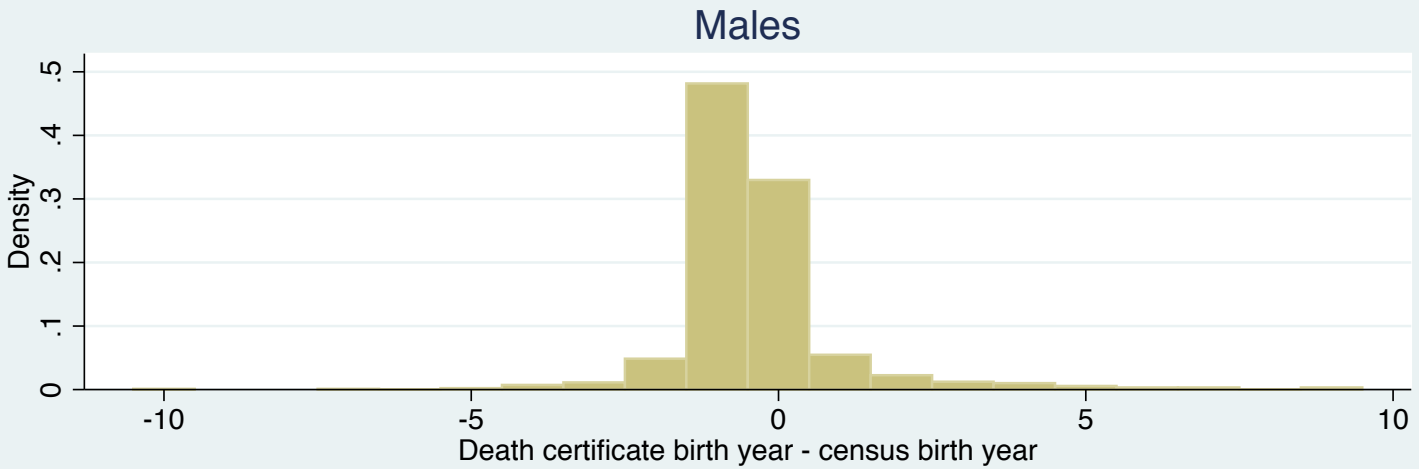
- $L_{i,c}$ and $L_{i,p}$ are the life spans of the child and parent for observation i, respectively
- X_i includes a quadratic in the child's birth year and a quadratic in parent's birth year
- Including an interaction between $L_{i,p}$ and child's birth year allows for time trends in mobility
- Sons and daughters are treated as separate samples

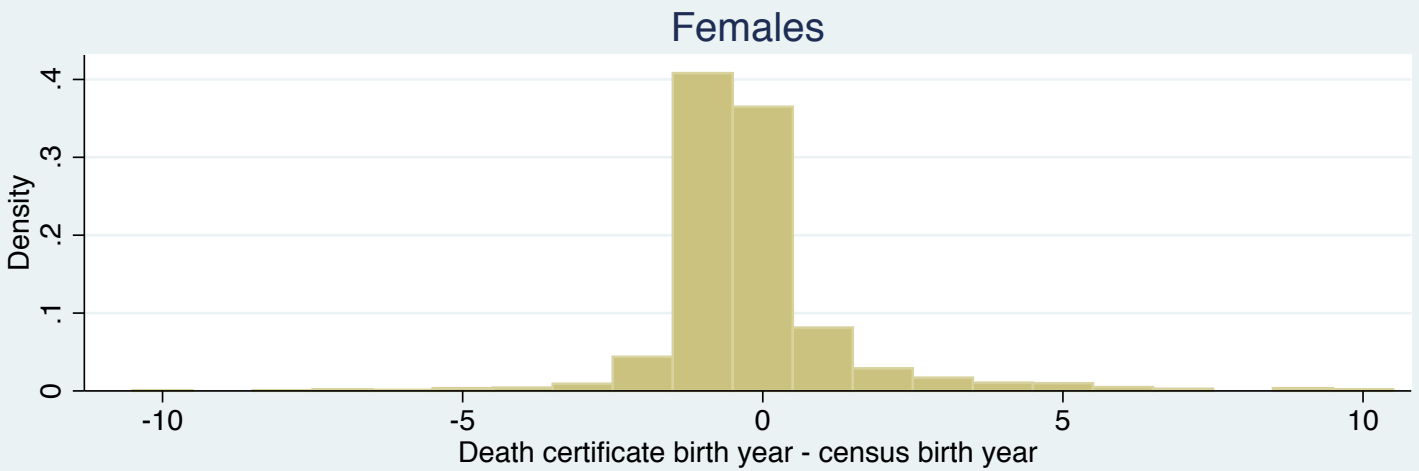
Measures of health from death certificates

Longevity does have a few complicating factors:

- One glaring issue: how to treat infant mortality and child deaths
- A second problem is measurement error in reported age
- There are two different ways to calculate longevity: using the date of birth given on the death certificate or using the age given on the federal census
- In a perfect world, these would give the same result but in practice they are often different
- This produces two distinct problems: a bias resulting from measurement error and a bias resulting from sample selection

Age misreporting by gender and race





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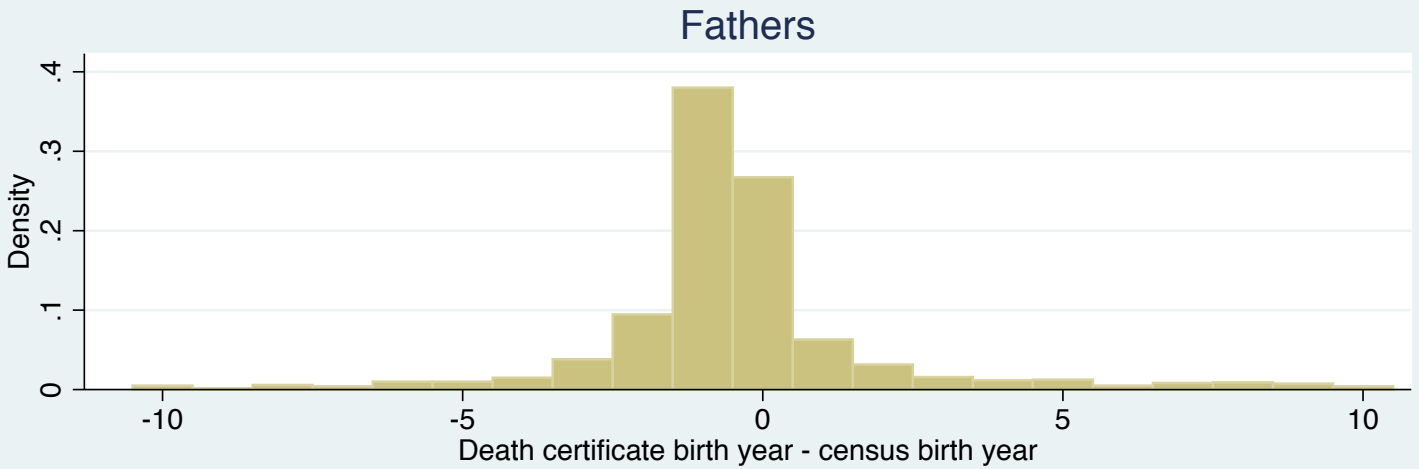
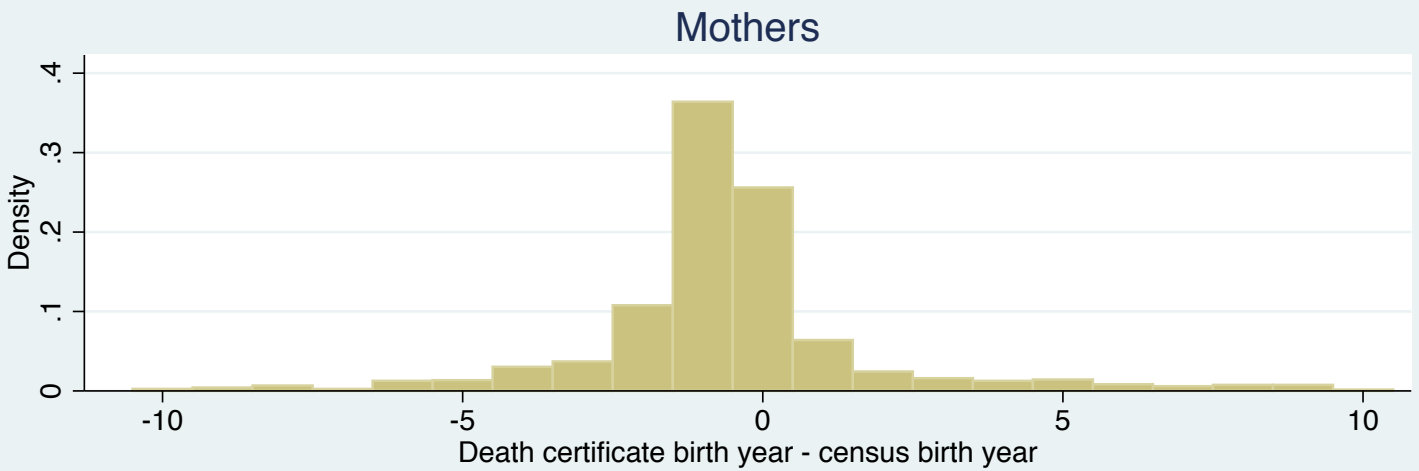
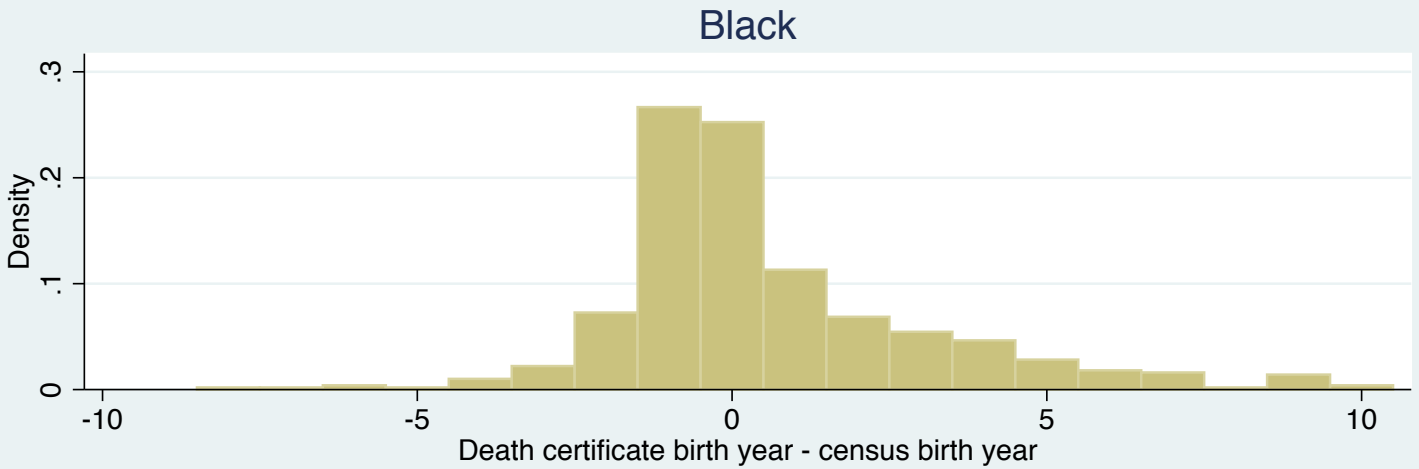
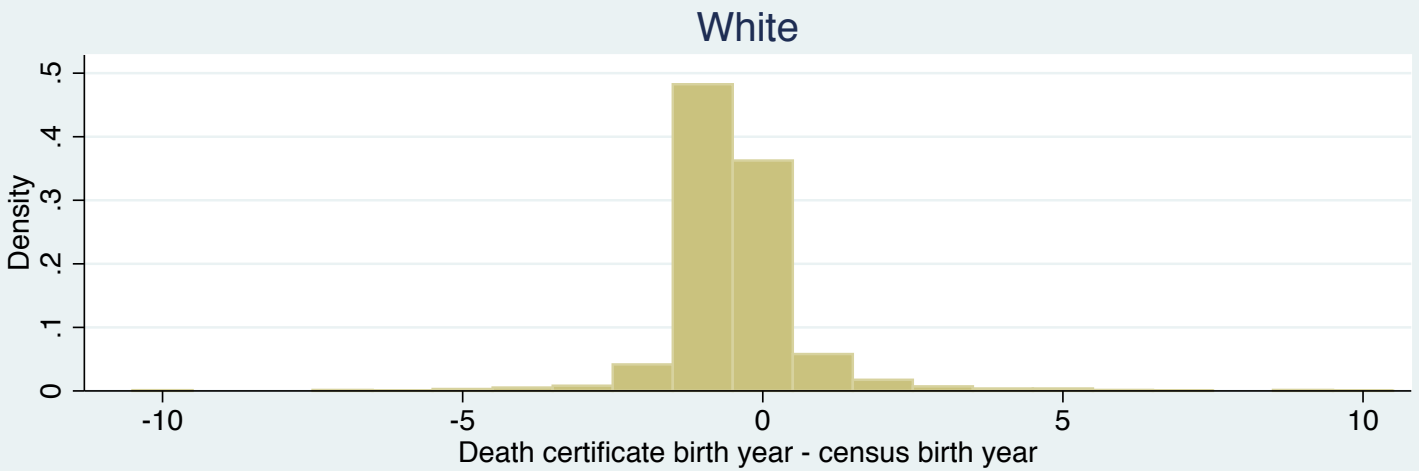


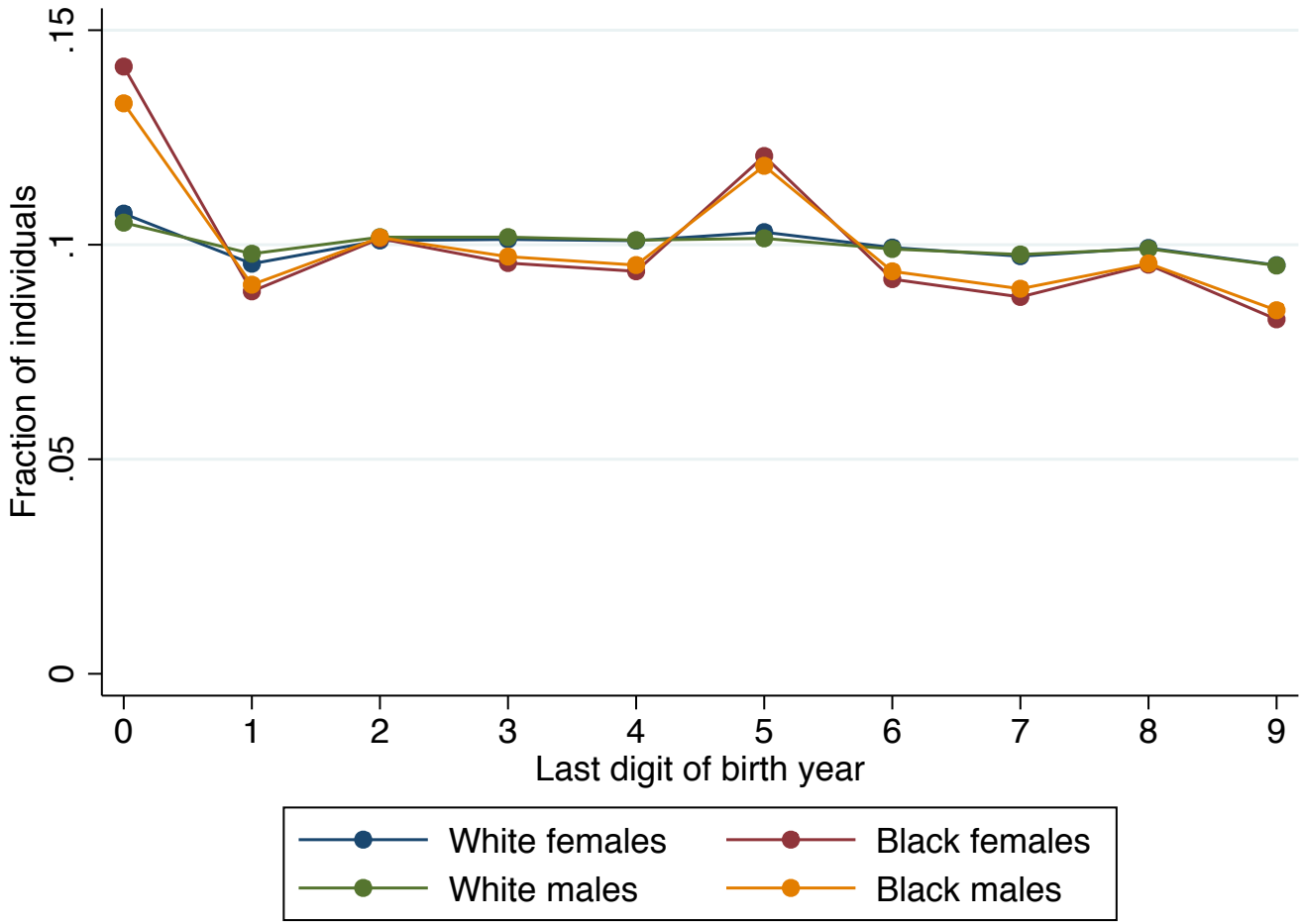


Age misreporting by gender and race



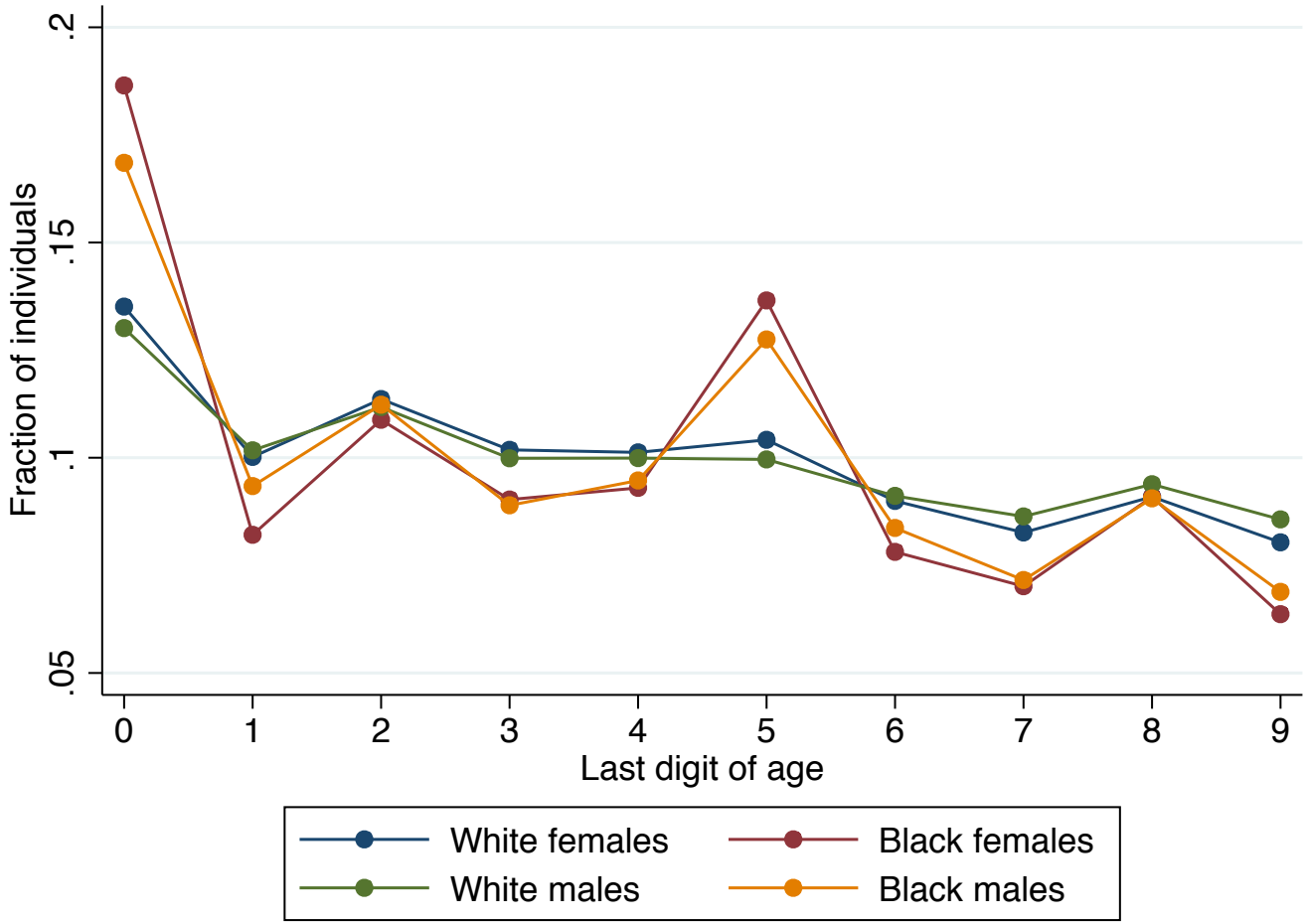


Age heaping by gender and race



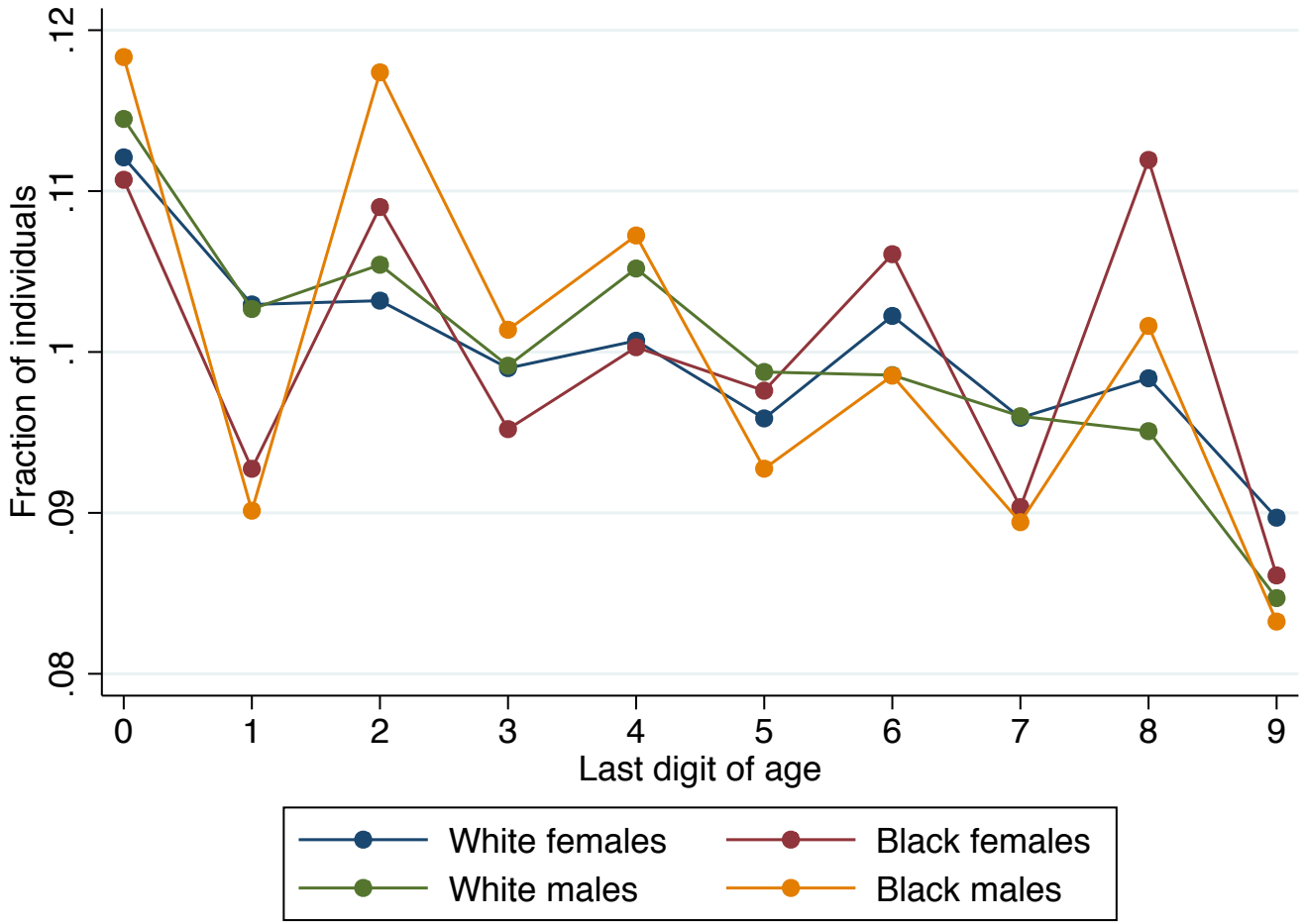
Distribution of last digit of birth year in NC death certificates records for individuals dying over the age of 19

Age heaping by gender and race



Distribution of last digit of age in 1880-1930 federal census records for NC residents over the age of 19

Age heaping by gender and race



Distribution of last digit of age in 1880-1930 federal census records for NC residents between the ages of 10 and 19

Age heaping and bias

OLS estimates of age heaping correlates using IPUMS 1% federal census samples, age ending in zero or five as dependent variable (=1 for zero or five, =0 otherwise)

Age range:	20 to 59 years old	
Black (1=yes)	0.0549***	0.0659**
	(0.0067)	(0.0200)
Male (1=yes)	-0.0115**	-0.0053
	(0.0040)	(0.0031)
Male x Black		-0.0218***
		(0.0037)
Lives on a farm (1=yes)	-0.0126*	-0.0072***
	(0.0051)	(0.0014)
Lives on farm x Black		-0.0088
		(0.0115)
Household head's log income	-0.0115***	-0.0054
	(0.0021)	(0.0034)
Household head's log income x Black		-0.0169***
		(0.0015)
Own literacy (1=literate)	-0.0439***	-0.0254**
	(0.0062)	(0.0089)
Own literacy x Black		-0.0336***
		(0.0063)
Age	-0.0020***	-0.0027***
	(0.0002)	(0.0001)
Age x Black		0.0024***
		(0.0002)
Observations	119,412	119,412

Robust standard errors clustered by census year are included in parentheses. Regression sample includes all North Carolina residents in the 1% IPUMS samples of the 1870, 1880, 1900, 1910, 1920 and 1930 federal censuses. The omitted category for the census year indicators is 1870. * significant at 10%, ** significant at 5%, *** significant at 1%

Longevity as a product of socioeconomic status

- Before turning to estimating intergenerational elasticities, it is useful to confirm that longevity is related to SES in a way that could lead to intergenerational correlations
- There is a literature on the heritability of longevity going back to the early 1900s with a renewed focus in recent years
- If longevity is entirely genetic, then its meaning as a measure of intergenerational mobility is quite different than if it is determined by SES
- The occupation data offer a way to confirm how correlated SES is with longevity in the sample

Longevity and occupational status

Mean age at death by occupational category

Occupational category	Son's age at death by son's occupation	Son's age at death by father's occupation	Daughter's age at death by father's occupation
Farmer	68.2	64.7	67.6
	(15.0)	(13.9)	(16.6)
Skilled, semi-skilled	62.0	56.8	64.1
	(13.5)	(16.9)	(19.2)
Unskilled	51.7	53.2	55.4
	(17.8)	(18.1)	(17.5)
White collar	60.4	58.4	61.5
	(12.2)	(15.3)	(16.4)
Number of observations	360	414	316

Notes: Standard deviations are given in parentheses. Age at death is calculated using the year of death from the death certificate and the year of birth implied by the age given on the federal census.

Longevity and occupational status

Marginal effects of occupation on age at death, log of child's age at death as dependent variable

	Sons	Sons	Sons	Daughters
Son's occupation dummies				
Skilled/semi-skilled	0.11***	--	0.11***	--
	(0.03)	--	(0.03)	--
White collar	0.07***	--	0.08***	--
	(0.02)	--	(0.03)	--
Farmer	0.08**	--	0.07*	--
	(0.03)	--	(0.03)	--
Father's occupation dummies				
Skilled/semi-skilled	--	0.01	0.01	-0.06
	--	(0.04)	(0.04)	(0.06)
White collar	--	0.03	0.01	-0.001
	--	(0.04)	(0.04)	(0.040)
Farmer	--	0.07***	0.07***	0.001
	--	(0.03)	(0.02)	(0.035)
Child's birth year	0.84***	0.96***	0.76***	1.07***
	(0.20)	(0.27)	(0.22)	(0.38)
(Child's birth year)^2	-0.0002***	-0.0003***	-0.0002***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	-783.64***	-897.16	-710.24***	-955.08***
	(191.58)	(253.97)	(206.25)	(357.91)
Observations	578	562	545	411
R-squared	0.36	0.36	0.37	0.39

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Ommitted occupational dummy is unskilled for both son's and father's occupation. Child's life span is calculated as the death year given on the death certificate minus the birth year given on the death certificate.

Longevity and occupational status

- So longevity seems to be related to SES (both child's and parent's) in the sample, offering hope that longevity can pick up something beyond genetics
- This is reinforced by looking at simple correlations in longevity between parents and children:

Correlations in birth year adjusted ages at death

	White males		
	Child's age at death	Father's age at death	Mother's age at death
Child's age at death	1.000		
Father's age at death	0.116	1.000	
Mother's age at death	0.036	0.151	1.000
	White females		
	Child's age at death	Father's age at death	Mother's age at death
Child's age at death	1.000		
Father's age at death	0.016	1.000	
Mother's age at death	0.139	0.208	1.000

Birth year adjusted ages are the residual from a regression of age at death on a quartic in birth year.

Intergenerational longevity elasticities for males

Estimates of intergenerational longevity elasticities for white males, natural log of son's age at death as dependent variable

	(1)	(2)	(3)	(4)
ln(Father's age at death)	0.475***	0.241***	0.248***	0.211***
	(0.100)	(0.087)	(0.087)	(0.081)
ln(Father's age at death) x (Son's birth year)/10				0.093
				(0.090)
Son's birth year controls	No	Yes	Yes	Yes
Father's birth year controls	No	No	Yes	Yes
Observations	727	727	727	727
R-squared	0.056	0.319	0.319	0.322

Robust standard errors given in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Intergenerational longevity elasticities for females

Estimates of intergenerational longevity elasticities for white females, natural log of daughter's age at death as dependent variable

	(1)	(2)	(3)	(4)
ln(Mother's age at death)	0.446***	0.145	0.120	0.118
	(0.105)	(0.099)	(0.099)	(0.085)
ln(Mother's age at death) x (Daughter's birth year)/10				0.006
				(0.086)
Daughter's birth year controls	No	Yes	Yes	Yes
Mother's birth year controls	No	No	Yes	Yes
Observations	562	562	562	562
R-squared	0.054	0.352	0.360	0.360

Robust standard errors given in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Intergenerational longevity elasticities using both parents' life spans

Estimates of intergenerational longevity elasticities using both parents, natural log of child's age at death as dependent variable

	Sons		Daughters	
	(1)	(2)	(3)	(4)
ln(Father's age at death)	0.263**	0.105	0.055	0.053
	(0.114)	(0.095)	(0.118)	(0.106)
ln(Father's age at death) x		0.271**		0.056
(Child's birth year)/10		(0.135)		(0.137)
ln(Mother's age at death)	0.094	0.027	0.445***	0.249***
	(0.092)	(0.069)	(0.131)	(0.083)
ln(Mother's age at death) x		0.081		0.386***
(Child's birth year)/10		(0.101)		(0.092)
Observations	355	355	262	262
R-squared	0.360	0.387	0.493	0.541

Robust standard errors given in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. All regressions control for a quadratic in child's birth year.

Biased intergenerational elasticities

- Comparing these results to other estimates of intergenerational elasticities is tricky
- The age misreporting will lead to an attenuation bias but income and educational attainment misreporting may be equally problematic
- There is a second issue related to censoring of observations unique to the longevity estimates
- The sample starts with complete death cohorts
- However, these individuals only remain in the sample if (i) they were born before 1940 and (ii) their parents died between 1909 and 1975
- The effects of this censoring are ambiguous

Biased intergenerational elasticities

Child		Parent: Short life span	Parent: Long life span
Early death cohort	Short life span	censored	observed?
	Long life span	censored	censored
Recent death cohort	Short life span	observed	censored?
	Long life span	observed	observed

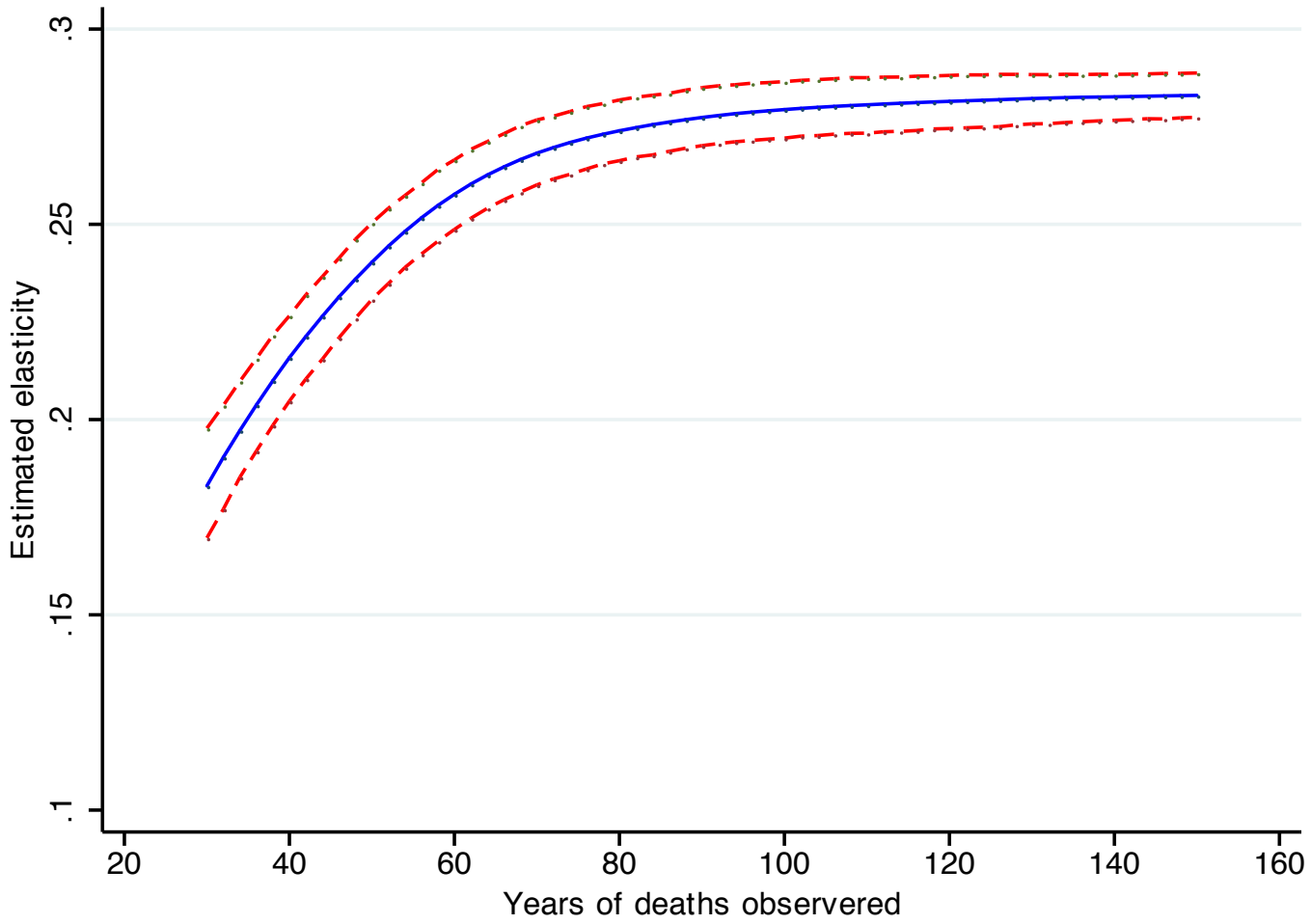
Biased intergenerational elasticities

	Child	Parent: Short life span	Parent: Long life span
Early death cohort	Short life span	censored	observed?
	Long life span	censored	censored
Recent death cohort	Short life span	observed	censored?
	Long life span	observed	observed

Low mobility

High mobility

Biased intergenerational elasticities



Simulated longevity elasticities with truncation when true elasticity is 0.28

A modern point of comparison

- Estimating an intergenerational longevity elasticity for more modern cohorts is difficult due to limited data
- One approach is to use the National Health Interview Survey (NHIS)
- In 1987, the NHIS asked about the age at death for the respondent's parents
- The National Center for Health Statistics linked survey participants to the National Death Index (NDI)
- For individuals who died by 2011 and whose parents died by 1987, we can calculate intergenerational correlations in longevity

A modern point of comparison

Modern intergenerational longevity estimates using the IHIS, natural log of child's age at death as dependent variable

	White males			White females		
ln(Father's age at death)	0.002		0.013	0.018*		0.018*
	(0.015)		(0.008)	(0.006)		(0.007)
ln(Mother's age at death)		0.007	0.007		0.015*	0.012
		(0.012)	(0.011)		(0.006)	(0.006)
Observations	1806	1577	1433	2561	2439	2209
R-squared	0.707	0.647	0.603	0.701	0.646	0.600

Robust standard errors clustered by region given in parentheses. All regressions control for a quadratic in child's birth year and include region fixed effects. * significant at 10%, ** significant at 5%, *** significant at 1%

A modern point of comparison

Correlations in longevity between spouses, natural log of husband's age at death as dependent variable

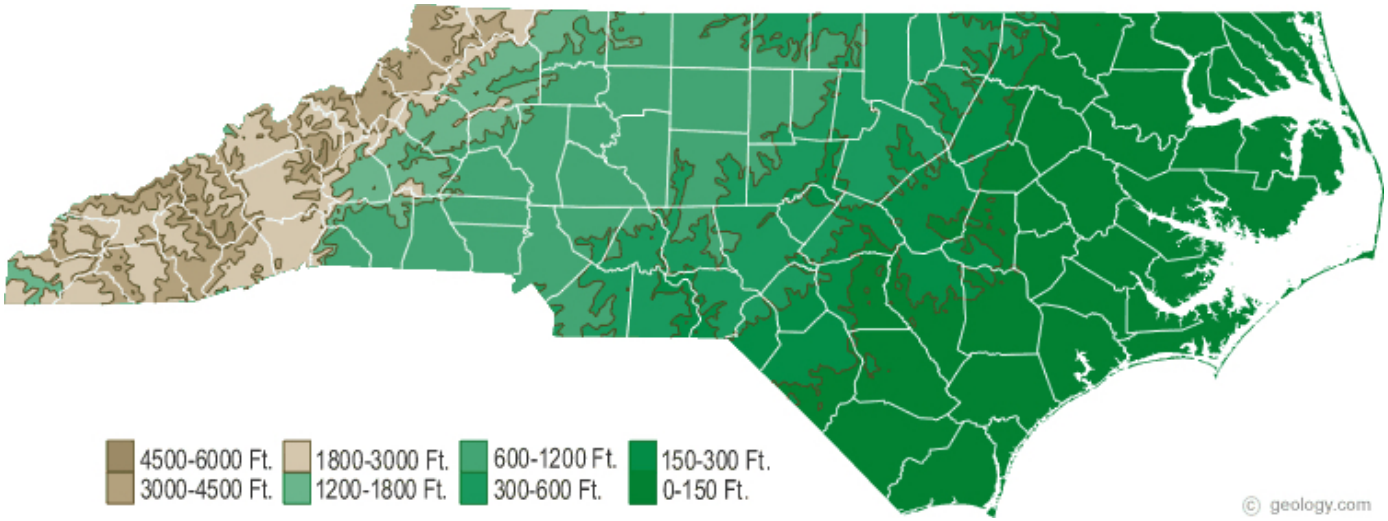
	North Carolina linked sample	IHIS sample, full sample	IHIS sample, restricted to respondents who died
ln(Wife's age at death)	0.162***	0.100***	0.082***
	(0.039)	(0.010)	(0.012)
Observations	619	5296	3642

Robust standard errors given in parentheses. All regressions control for a quadratic in husband's birth year. IHIS regressions include region fixed effects. * significant at 10%, ** significant at 5%, *** significant at 1%

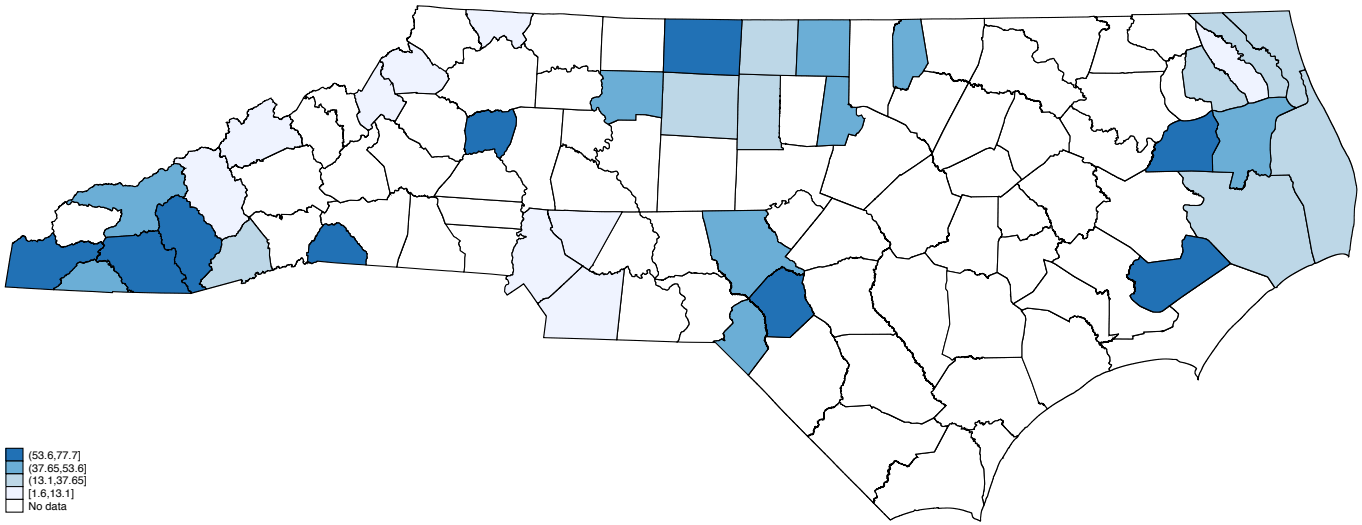
A modern point of comparison

- The modern estimates suggest that the intergenerational correlations in health have largely disappeared
- However, correlations between spouses remain almost as strong
- Moving forward, a main goal is to confirm these findings with other data sources and test whether they can be explained by advances in medical technology, particularly public health improvements in the early twentieth century
- The linked data cover an important period in the improvements of water quality and the control of communicable diseases
- These changes may have profoundly changed the intergenerational transmission of health

Moving forward

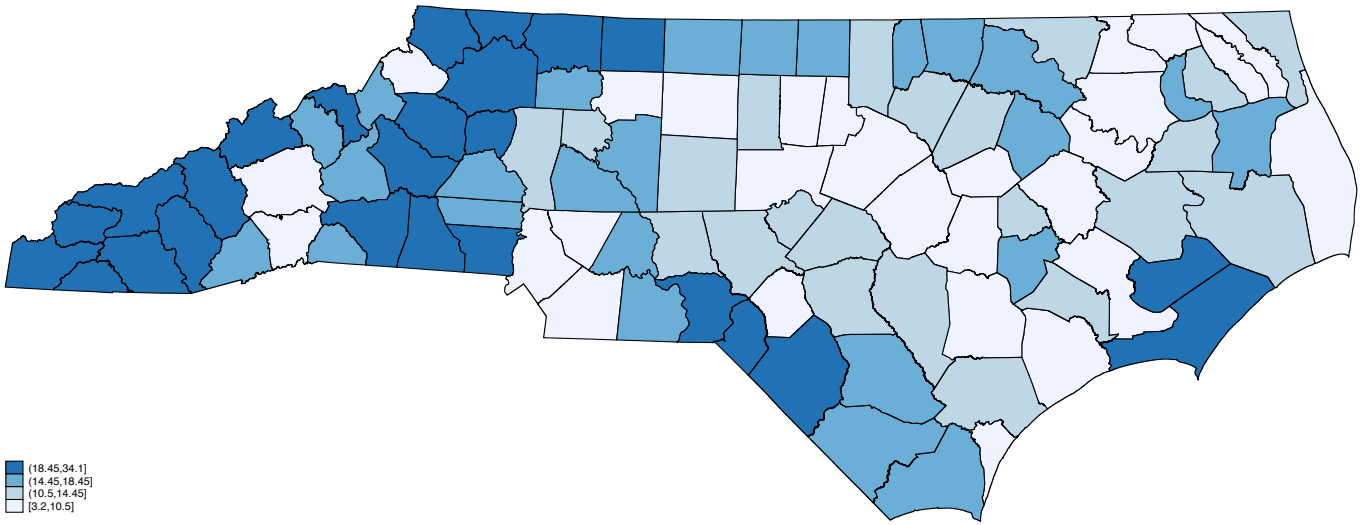


Moving forward



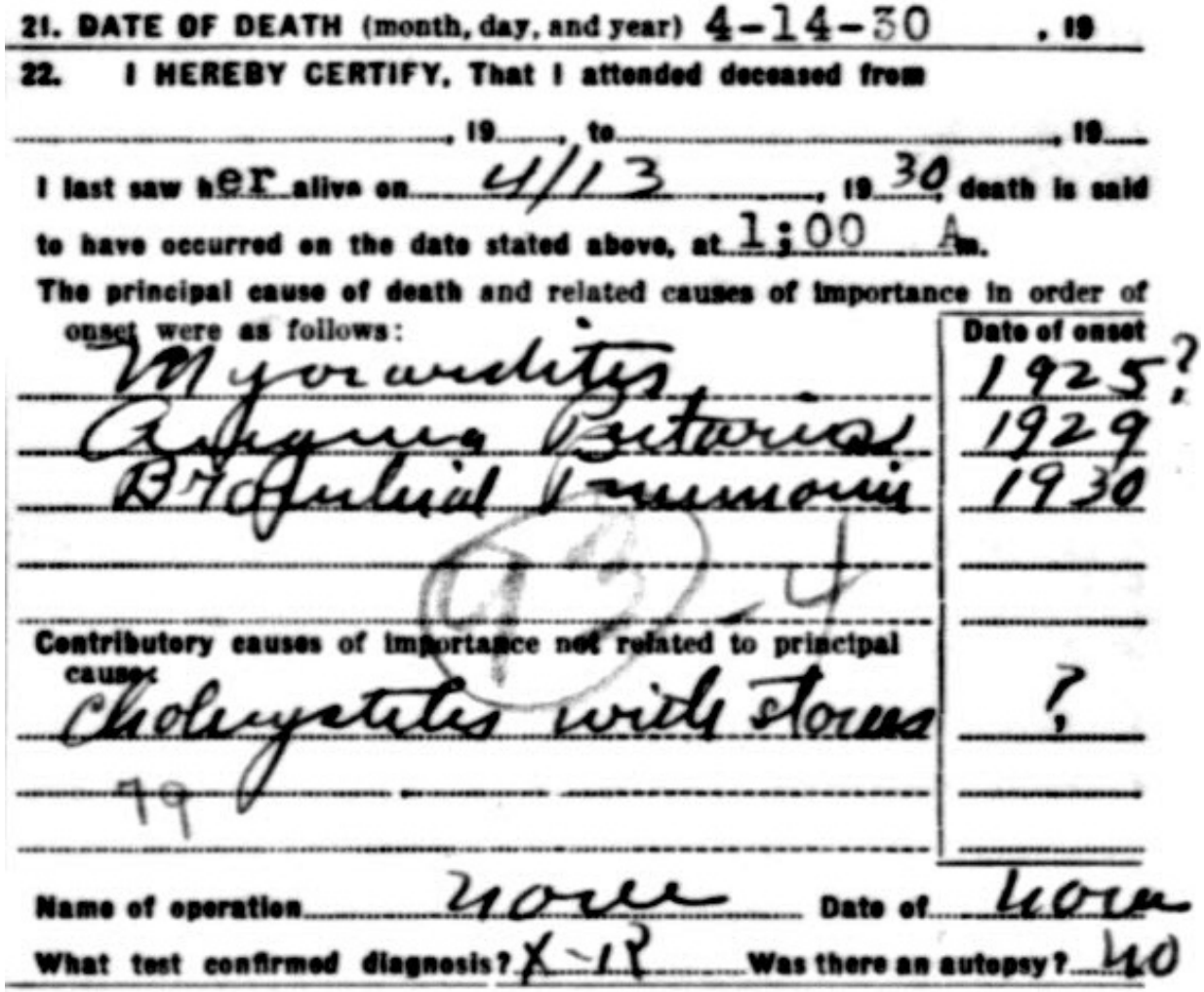
Hookworm infection rates among children by county, 1912

Moving forward



Percent of births where mother smoked during pregnancy by county, 2011-2014

Moving forward



21. DATE OF DEATH (month, day, and year) 4-14-30 , 19

22. I HEREBY CERTIFY, That I attended deceased from

, 19 , to , 19

I last saw her alive on 4/13 , 19 30 ; death is said to have occurred on the date stated above, at 1:00 A m.

The principal cause of death and related causes of importance in order of onset were as follows:

	Date of onset
Myocarditis	1925?
Arteriosclerosis	1929
Bronchial Pneumonia	1930

Contributory causes of importance not related to principal cause:

Cholecystitis with Stones	?

Name of operation None Date of None

What test confirmed diagnosis? X-Ray Was there an autopsy? No

Introduction

Measuring Modern and Historical Mobility

Health as a Measure of Mobility

Data

Longevity and Occupational Status

Intergenerational Correlations in Longevity

Moving forward