Early Life Influences on Diabetes Among Older Americans

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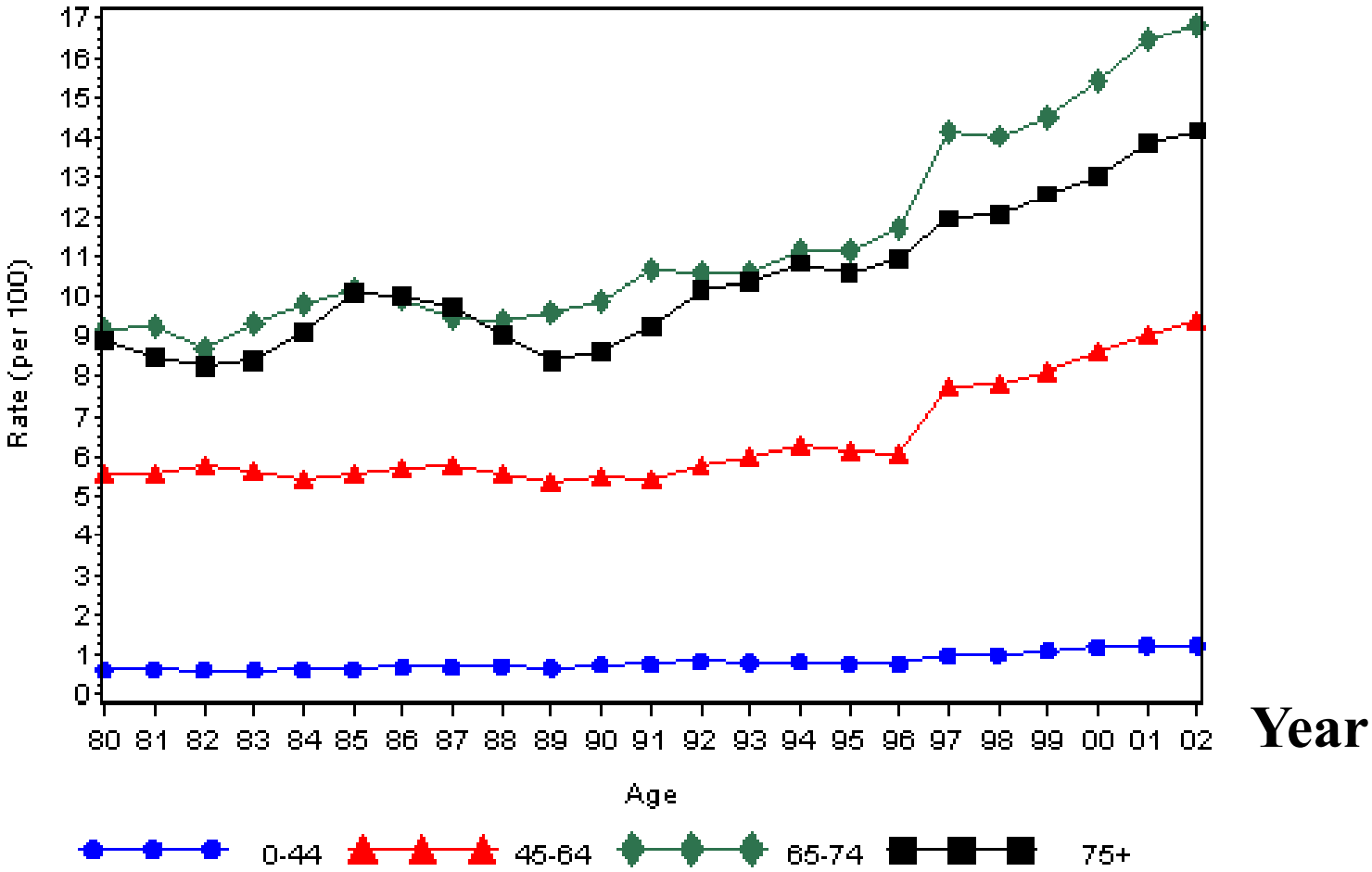
Diabetes-II Has Reached Epidemic Levels in the United States

- Type 2 diabetes may account for about 90% to 95% of all diagnosed cases of diabetes.
- Approximately 14.5 million adults currently have diagnosed diabetes in the United States
- Diabetes prevalence has increased 30% since 1980
- The rate of growth exceeds that for all other major chronic conditions.
- The consequences of diabetes are far-ranging and impact several biological systems
  - kidney-related conditions such as end-stage renal disease
  - diabetic retinopathy which is the leading cause vision problems of American adults aged 20-74 years
  - Elevated risk of CVD
  - Various ailments of the nervous system
- Diabetes is estimated to reduce average life expectancy about 15 years

Prevalence of Diagnosed Diabetes by Age and Year



Diabetes-II is a chronic condition that must be examined from a life course perspective

The Hypothetical Life Course of Diabetes-II		
AGE	**Stage**	**Projected Condition**
20s	Start	Presence of risk factors (e.g., obesity)
30s	Discernable	Traces of abnormal glucose tolerance
40s	Sub-clinical	Elevation of fasting glucose
50s	Threshold	Sugar in urine
60s	Severe	Drug regimens to control (hypoglycemic)
70s	End	Occurrence of disabling conditions

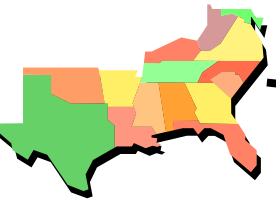
The Role of Early Life Conditions in Influencing Adult Diabetes Experience

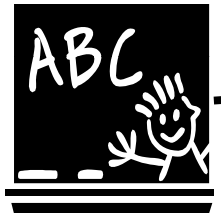
- LBW increases risk of Impaired Glucose Tolerance (IGT), insulin resistance, & consequently diabetes-II
- Under nourishment impairs glucose-insulin metabolism & inability to meet challenge of rapid growth in body mass which leads to higher incidence of insulin resistance
- Rapid increases in body mass, esp. among LBWs, increases diabetes risk
- Evidence from Great Britain suggests that childhood SES has long-term and direct effects on insulin resistance. Lower SES increases the risk of insulin resistance in adulthood
  - **Possible biological mechanisms include being a proxy for LBW & under-nourishment as well as increased risk of inflammation and physiologic response to stress (e.g., IGT)**
- Social chains of risk -- social factors in early life may foster adult lifestyle (e.g., obesity) or socioeconomic achievement processes, which may further increase risk of diabetes
  - **Consequences of childhood are contingent on the pathways and experiences negotiated or constrained in adulthood**
  - **Earlier in the 20th century, diabetes prevalence was highest among high SES groups – the reverse of current patterns. Hence, the importance of behavioral factors connecting SES with diabetes**

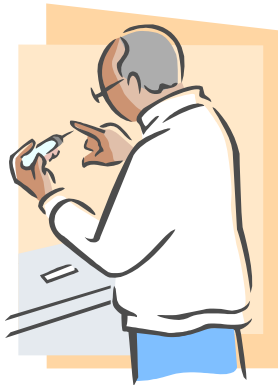
This study builds on prior research in a number of ways

- We assess whether associations detected in community- or hospital-based samples are evident in a nationally representative (and highly heterogeneous) sample of older Americans aged 51 years of age and older.
- We evaluate the influence of a number of theoretically important aspects of childhood (place of birth, SES, significant health problems and education) to identify the major facets of childhood associated with adult diabetes.
- We investigate core mediating mechanisms potentially linking childhood conditions with diabetes – biological and adult achievement processes, and adult lifestyle factors such as obesity.

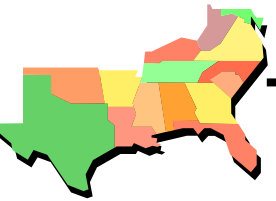
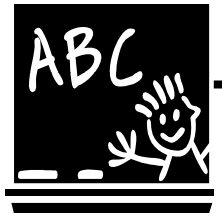
Possible mechanisms we consider that link early life conditions with diabetes-II







Possible mechanisms we consider that link early life & adult conditions with diabetes-II



Data and Measures

- Health and Retirement Study, 1998 wave
  - Ages 51 and older
  - 10,075 women and 7,534 men
  - Includes respondents from HRS (1931-1941), AHEAD (pre 1924), CODA (1924-1930), and War Babies (1942-1947)
  - Includes battery of retrospective items on childhood experiences from birth to 16 years of age
  - Also provides extensive collection of responses on adult socioeconomic achievement processes and health behaviors

Measurement & Modeling Approaches

- Diabetes prevalence measured in terms of *severity* on a 3-category variable:
  - no reported diabetes (based on self-report of physician diagnosis)
  - Diabetes without any major functional limitations
  - Diabetes with major functional limitations
  - Alternative definitions involving co-morbidity with CVD and diabetes symptoms have also been examined
- Limitations measured as self-reported ADL difficulties in bathing, dressing, eating, getting in and out of bed, or walking across a room
- Nested multinomial logistic regression models are estimated
  - Model 1: assesses the associations b/w childhood conditions and the odds of diabetes, controlling for age, race/ethnicity, and marital status
  - Model 2: introduces lifestyle factors (e.g. weight & drinking)
  - Model 3: full model, evaluating the above with the addition of family income & wealth

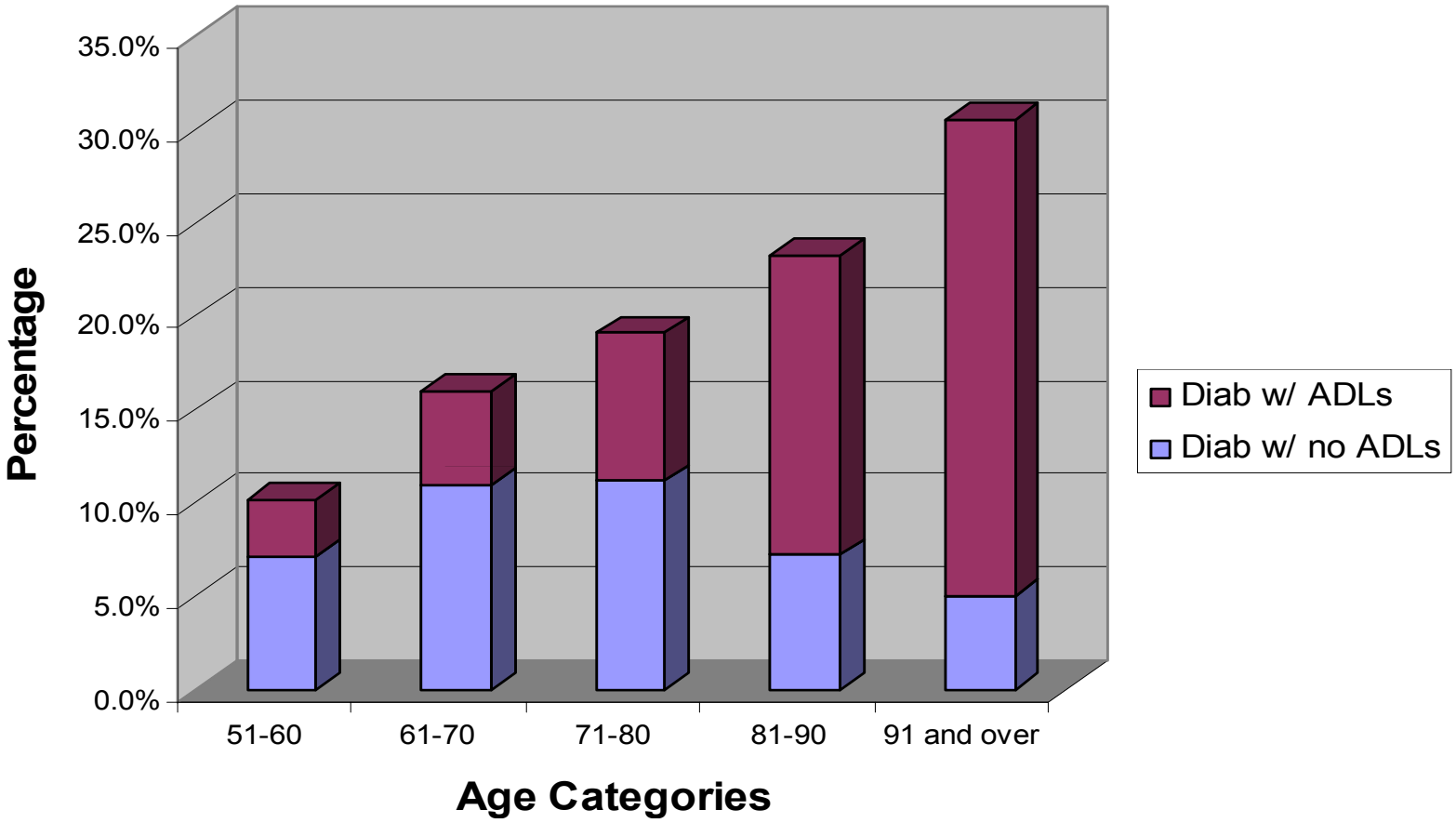
HRS Measures of Early Life Conditions

- Self rating of childhood health from birth to age 16 (5-point scale, from poor to excellent)
- Self rating of family's SES from birth to age 16 (5-point scale)
- Born in the South
- Completed years of Education

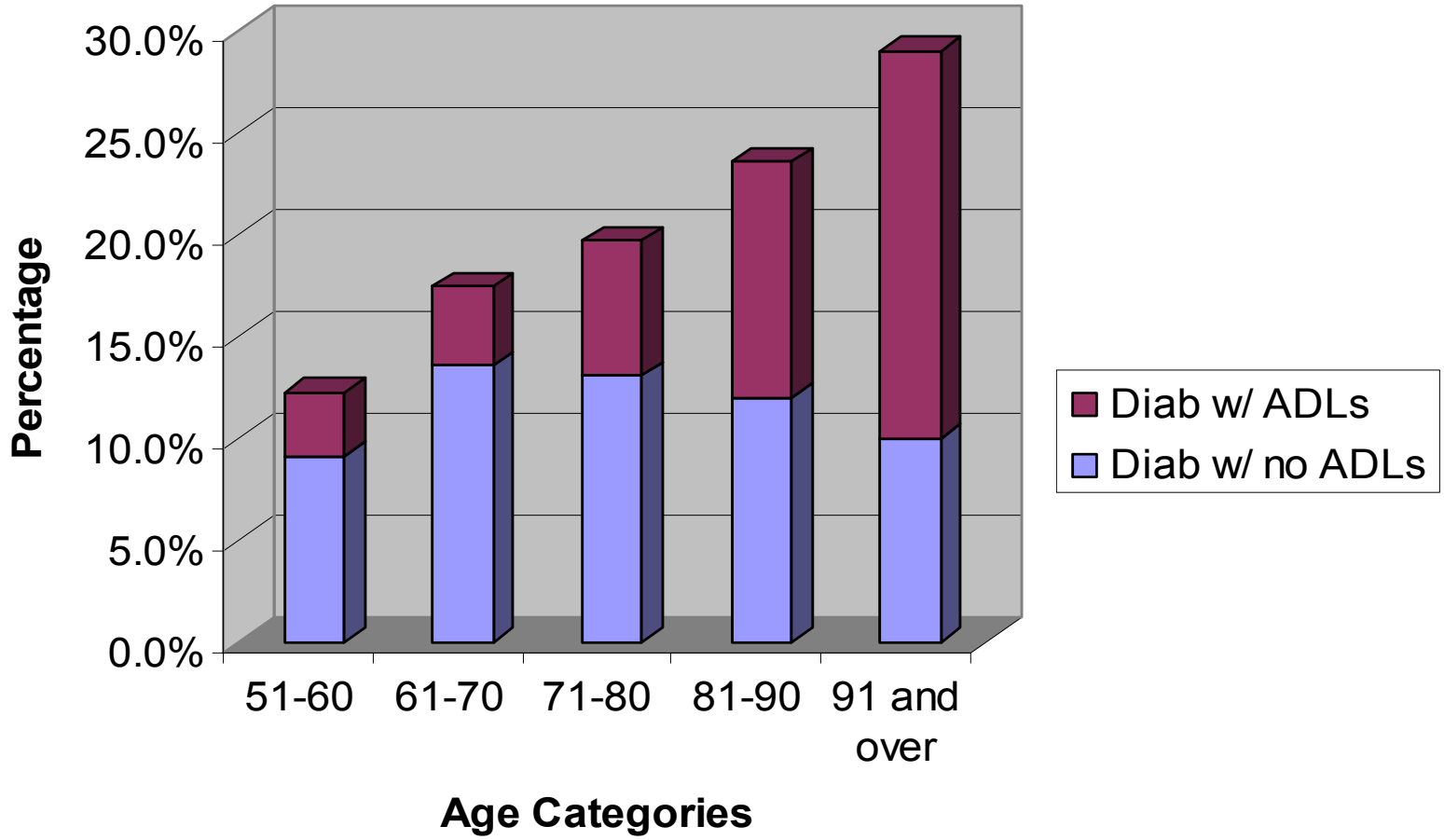
Table 1. Percentages of Childhood Conditions by Diabetes Prevalence and Gender

	Females			Males		
	No Diabetes (N=8253)	Diabetes w/no ADL (N=970)	Diabetes w/ ADL (N=843)	No Diabetes (N=6142)	Diabetes w/no ADL (N=935)	Diabetes w/ ADL (N=457)
Negative Child Health	6.0	7.4	10.4	5.1	5.8	9.5
Poor SES	27.0	32.8	43.3	31.8	31.6	39.7

Age Profile of Diabetes Prevalence among Females, 1998 HRS, Weighted Data



Age Profile of Diabetes Prevalence among Males, 1998 HRS, Weighted Data



Results

- For men
  - Odds of diabetes, esp. severe, are significantly increased by:
    - **Low education**
    - **Southern Birth**
    - **Poor childhood health**
  - **Education**'s effect is persistent even after controlling for adult SES achievement processes and lifestyle, although obesity, alcohol consumption & adult achievement processes are important conduits through which education influences the odds of diabetes
  - **Southern birth** effect primarily direct with some influence via obesity
  - **Childhood health problems** appear to increase underweight and alcohol abstinence which then increases the odds of diabetes
  - The odds of diabetes are also linked to adult SES and lifestyle factors
    - **Odds are elevated for persons of low income, low household wealth, who do not consume alcohol, and who do not engage in vigorous exercise**

Table 2. Nested MNL Regressions of Early Life Conditions on Diabetes, Males

	MODEL 1			MODEL 2			MODEL 3		
	Diabetes w/ No ADLs		Diabetes w/ ADLs	Diabetes w/ No ADLs		Diabetes w/ ADLs	Diabetes w/ No ADLs		Diabetes w/ ADLs
Education	**-0.021**	*	**-0.097** ***	-0.013		**-0.079** ***	-0.010		**-0.067** ***
Born in the South	0.037		**0.523** ***	-0.008		**0.436** ***	-0.017		**0.418** ***
Negative Child Health	0.086		**0.432** *	0.029		0.318	0.015		0.271
Poor family SES	-0.130		0.108	**-0.190** *		0.074	**-0.197** *		0.050

Note: † p<.10; * p<.05; **p<.01; ***p<.001 (two-tailed tests); Reference Category is individuals without diabetes

Results (continued)

- **For women**,
  - Odds of diabetes are significantly higher for persons who have:
    - **Low education**
    - **Southern Birth**
    - **Negative health problems**
    - **Poor family SES**
  - **Education's** effect operates primarily by lowering the chances of obesity and increasing the chances of moderate alcohol consumption.
  - **Southern birth** effect is primarily direct.
  - **Negative health problems** has a strong direct effect but it also decreases the chances of moderate drinking – a protective effect
  - **Poor family SES** primarily has a direct effect on the odds of diabetes with modest indirect effects via increases in obesity and decreases in moderate alcohol consumption
  - Women's odds of diabetes is also elevated by adult SES and lifestyle factors
    - **Obesity *and* underweight, non-drinkers, lack of physical activity, low income and wealth**

Table 2. Nested MNL Regressions of Early Life Conditions on Diabetes, Females

	MODEL 1			MODEL 2			MODEL 3		
	Diabetes w/ No ADLs		Diabetes w/ ADLs	Diabetes w/ No ADLs		Diabetes w/ ADLs	Diabetes w/ No ADLs		Diabetes w/ ADLs
Education	**-0.031**	**	**-0.031**	*	**-0.024**	*	-0.015	**-0.021**	*	-0.009
Born in the South	0.06		**0.452**	***	-0.014		**0.390**	***	-0.028		**0.366**
Negative Child Health	0.165		**0.460**	**	0.176		**0.395**	**	0.139		**0.328**
Poor family SES	0.117		**0.538**	***	0.042		**0.479**	***	0.018		**0.439**

Note: † p<.10; * p<.05; **p<.01; ***p<.001 (two-tailed tests); Reference Category is individuals without diabetes

Conclusions

- Substantial evidence that adult diabetes is tied to early life education, SES, health problems and Southern birth
- The effects are evident for a nationally representative population. Diabetes prevalence in today's older population is strongly tied to conditions experienced decades earlier in life
- Some evidence that links between early life conditions & adult diabetes are biological in nature (i.e., early life conditions have direct effects). Stress and inflammation are possible mechanisms.
- **Modest evidence suggesting that early life influences adult diabetes via an obesity pathway – but this is not the super "causal" highway that some researchers have suggested. Moderate alcohol consumption also plays a role**
- Substantial evidence that early and adult life SES both influence the odds of diabetes, combining additively over the life course
- The odds of diabetes is thus hinged to social conditions spanning many decades of life – not to any one particular part of the life course

Caveats and Thoughts on Future Research

- Measurement of childhood conditions
  - Underreporting of health problems
  - **Selection issues regarding who survives to age eligibility**
  - Lack of information on early life family structure and dynamics
- Alternative definitions of diabetes severity
  - Alternative approach is to identify people with diabetes who also have lower extremity and vision limitations
  - Incidence is essential to understand timing of disease experience and mortality selection processes
- **No direct observation of the "stress" biomedical pathway in most of the scientific literature**
- **In order to better evaluate the role of obesity as a conduit for effects of social conditions, information is needed on weight change over the life span**
- **Integration of disease incidence, mortality, and functional problems to understand how early life shapes healthy life expectancy**