Alzheimer's Disease and Loss of Cognitive Function in Later Life among Black Americans and White Americans

Is the incidence of Alzheimer's disease greater among black Americans than among white Americans?

Is the incidence of Alzheimer's disease or dementia greater for black Americans than white Americans?
Existing Population-Based Studies

STUDY	FINDING	SIGNIFICANCE
WHICAP[1] (1079)	RR for incident AD black:white = 4.4 among APOE ε4 neg.	95% CI = 2.3-8.6
Duke EPESE[2] (471)	3-yr incidence of dementia black = 0.058 white = 0.062	NS
CHS[3] (3359)	Incidence of AD without VaD black = 34.7 white = 19.2	P = 0.06

Is the incidence of Alzheimer's disease or dementia greater for black Americans than white Americans? Existing Population-Based Studies (continued)

STUDY	FINDING	SIGNIFICANCE
CHAP[4] (842)	Adj. OR black vs. white = 1.84	95% CI = 0.73 – 4.66
CURRENT CHAP (1813) (unpublished)	Adj. OR black vs. white = 1.81	95% CI = 0.89 – 3.71

1. Tang, et al. JAMA 1998;279:751-755.
2. Fillenbaum et al. J Clin Epidemiol 1998;51:587-595.
3. Fitzpatrick et al. J Am Geriatr Soc 2004;52:195-204.
4. Evans et al. Arch Neurol 2003;60:185-189.

Studying each person's change in cognitive function in late life may be a useful complement to studying incidence of Alzheimer's disease.

- Cognitive function test results are influenced by many factors other than cognition itself, especially education, culture, and familiarity with test procedures.
- Cognitive test performance is not specific for a condition.
- Individual change in cognitive test performance intuitively corresponds to what is being studied--cognitive decline for that person--and is much less prone to distortions.

Measuring Cognition with Cognitive Function Testing

- Examining individual change in cognitive function testing removes much of the distortion in studying cognitive function at a single point in time.
- To the extent factors distorting measurement at each time point are the same at points a few years apart in time, individual change between these time points will not be distorted.

CHAP
THE CHICAGO HEALTH AND AGING PROJECT

A longitudinal study of common health problems of older persons, especially Alzheimer's disease.

Participants are residents, 65 years-of-age and older, of a geographically defined, urban, biracial (59% black, 41% white) community of the City of Chicago.

79% of age-eligible residents participated at baseline; 80%-85% at each follow-up

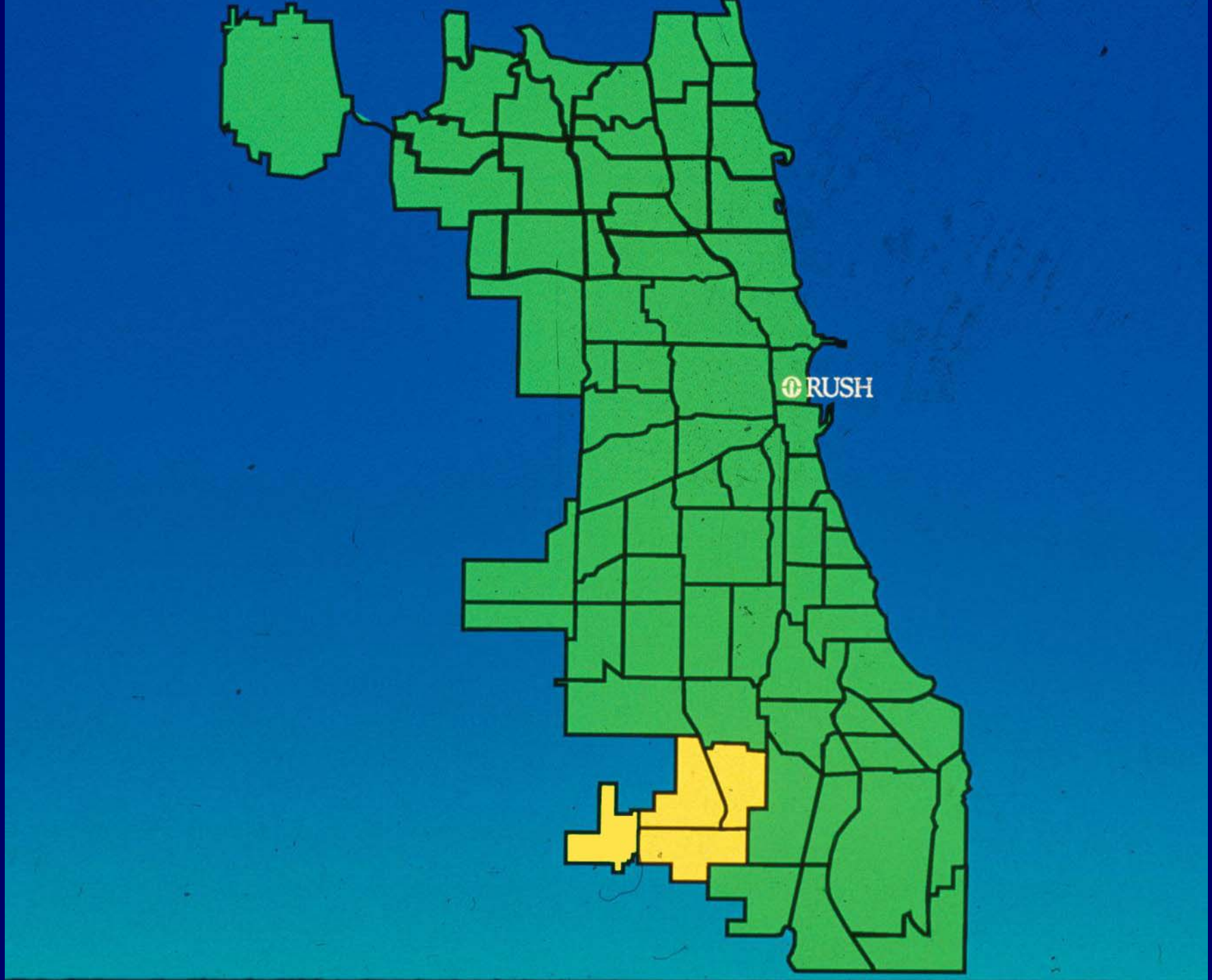
CHAP DESIGN

- Data are collected in cycles of three years duration.
- The interval between data collection points is approximately three years for each person.
- The first three-year data collection cycle began in late 1993 and the fifth cycle began in January 2006.
- Two forms of data collection in each cycle:
  - In-home interviews for all participants.
  - Clinical evaluation for Alzheimer's disease and other conditions of a stratified random sample of those interviewed.

CHAP STUDY COMMUNITY

The study community consists of four adjacent neighborhoods of the south side of Chicago.

- Morgan Park
- Beverly
- Washington Heights
- Mount Greenwood


RUSH


9812

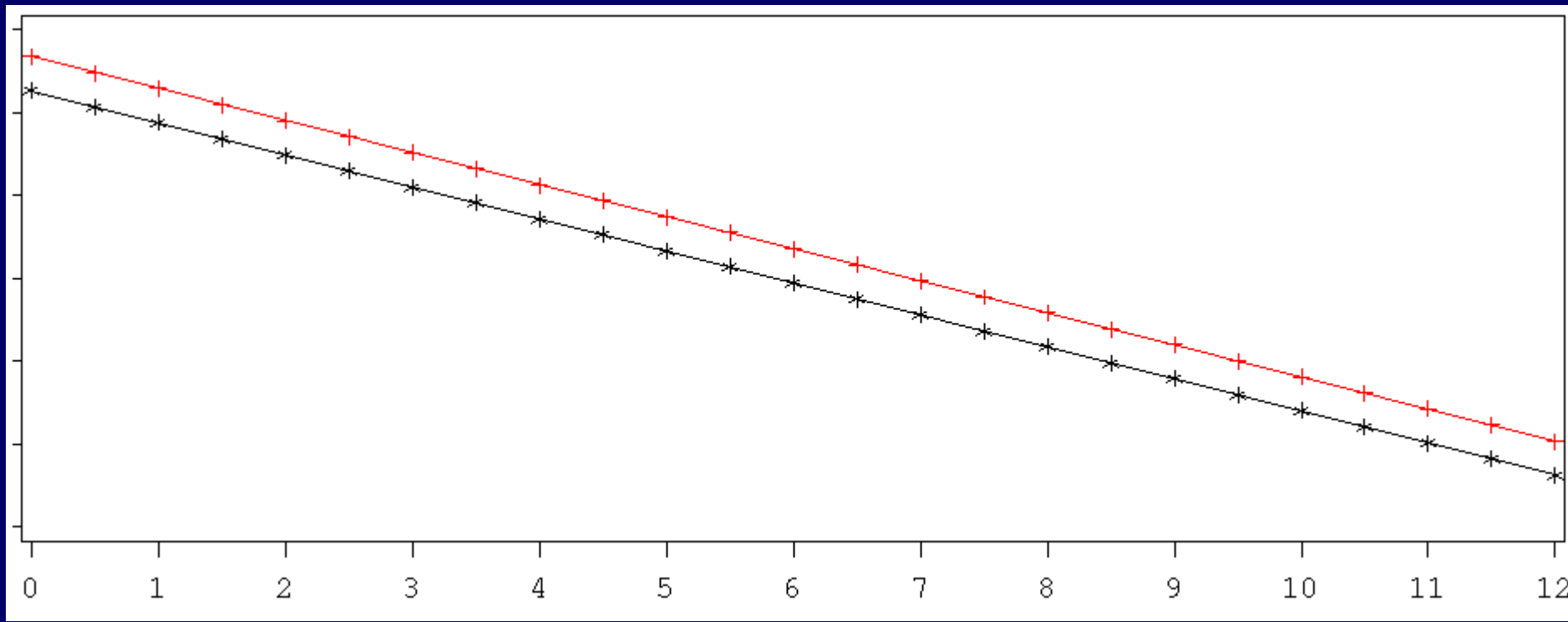
CHAP
Global Cognitive Test Performance

4432 subjects followed up to 12 yrs with 4 data collection cycles (13,908 observations)

	Cross-sectional level of Global Cognitive Test Performance	Change in Global Cognitive Test Performance (avg. decline: -.061 sdu/yr, $p < 0.00001$)
Black race-ethnicity	-0.410 sdu $p < 0.00001$	0.000 sdu $P = 0.94$

Mixed model adjusted for time on study (lag), age, lag*age, gender, lag*gender, education, lag*education, education^2.
sdu = standard deviation unit

CHAP
Global Cognitive Test Performance
For Black and for White Subjects
4432 subjects followed up to 12 yrs
with 4 data collection cycles (13,908 observations)

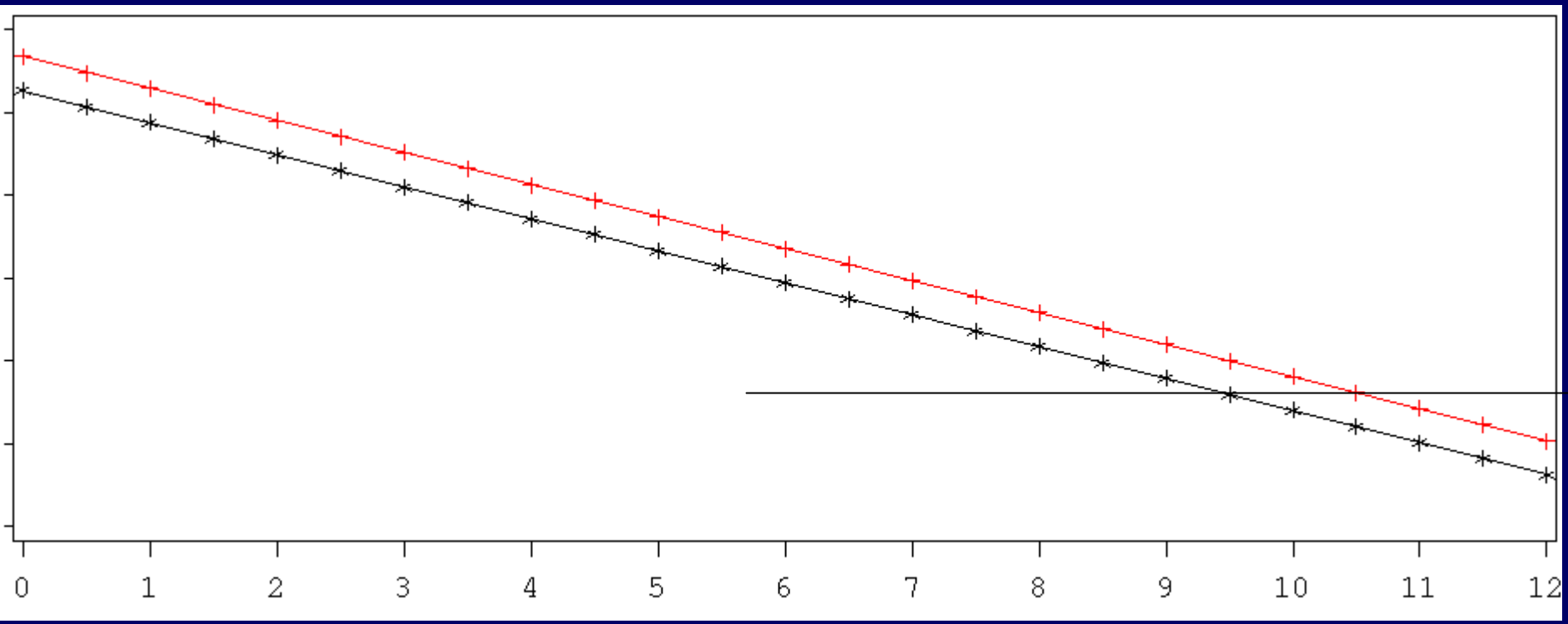


Inferences from Analyses of Cognitive Decline

- No evidence of any difference in black vs. white rates of cognitive decline
- If Alzheimer's disease is seen as a common condition that leads to progressive cognitive decline, these analyses do not support the idea of different risks of Alzheimer's disease among blacks and whites.

Inferences from Analyses of Cognitive Decline (continued)

- Strong evidence of a persistent cross-sectional difference in black vs. white average level of cognitive test performance
- The possibility that any apparent higher risk among blacks in analyses of incident Alzheimer's disease may be due to difficulties in diagnosing the disease uniformly across ethnic groups and cultures must be strongly considered.


0
1
2
3
4
5
6
7
8
9
10
11
12

Do blacks and whites differ, on average, in their responses to risk factors for Alzheimer's disease?

Does the APOE ε4 allele differ as a risk factor for Alzheimer's disease for blacks and whites?

STUDY	FINDING	SIGNIFICANCE
WHICAP[1]	RR AD: ε4 positive vs. ε3/ε3 blacks = 1.0; whites = 2.5	95% CIs: black = 0.6-1.6 white = 2.3-8.6
MIRAGE[2]	OR AD among blacks: ε3/ ε4 = 2.6 ε4/ ε4 = 10.5 OR decreased with increasing age	95% CIs: ε3/ ε4 = 1.8-3.7 ε4/ ε4 = 5.1-21.8
Indianapolis-Ibadan[3, 4]	Indianapolis-OR AD among blacks: ε3/ ε4 = 2.32 ε4/ ε4 = 7.19 Ibadan-OR AD among blacks: ε3/ ε4 = 1.22 ε4/ ε4 = 1.60	ε3/ ε4=1.41-3.82 ε4/ ε4=3.0-17.3 ε3/ ε4=0.85-2.25 ε4/ ε4=0.86-5.23

Does the APOE ε4 allele differ as a risk factor for Alzheimer's disease for blacks and whites? (continued)

STUDY	FINDING	SIGNIFICANCE
CHAP[5]	OR AD: ε4 positive vs. ε4 negative blacks = 1.02; whites = 2.73	95% CIs: black = 0.4-2.7 white = 1.4-5.3
CHAP (unpublished)	OR AD: ε4 positive vs. ε4 negative blacks = 1.04; whites = 2.85	95% CIs: blacks = 0.5-2.0 whites = 1.5-5.4

1. Tang, et al. JAMA 1998;279:751-755.
2. Graff-Radford, et al. Arch Neurol 2002;59:594-600.
3. Murrell et al. Arch Neurol 2006;63:431-434.
4. Gureje et al. Ann Neurol 2005;59:182-185.
5. Evans et al. Arch Neurol 2003;60:185-189.

Does Cognitive Activity Differ as a Risk Factor for Alzheimer's Disease or for Cognitive Decline among Blacks and Whites?

STUDY	FINDING
CHAP-AD[1]	OR AD: blacks: 0.35 (0.17-0.74) whites: 0.35 (0.14-0.90)
CHAP-Cog. Function[2]	Level of cog func: coeff = 0.294, p < 0.001 No interaction with race/ethnicity Change in cog func: coeff = 0.012, p < 0.001 No interaction with race-ethnicity
CHAP-Cog. Function (unpublished)	Level of cog func: black-coeff = 0.330, p< 0.0001; white-coeff = 0.247, p< 0.0001 Change in cog func:black-coeff = 0.082, p = 0.005; white-coeff = 0.012, p = 0.01

1. Wilson, et al. Neurology 2002;59:1910.
2. Wilson, et al. Neurology 2003;61:812.

Other Risk Factors Examined in CHAP		
Risk Factor	Condition	Different action in blacks/whites?
Stress proneness (neuroticism)	AD	Less for blacks[1]
Depressive Sx.	Cog Decl.	Same[2]
Social Networks	Cog Decl.	Same[3]
Soc Engagement	Cog Decl.	Less for blacks[3]
Smoking	AD	Same[4]
Diet: Vitamin E	AD	Same[5]
Antioxidants	AD	Same[6]

Other Risk Factors Examined in CHAP (continued)		
Risk Factor	Condition	Different action in blacks/whites?
Diet: Saturated Fats	AD	Greater for blacks[7]
Fish	AD	Same[8]

1. Wilson, et al. Neurology 2005;64:380–382.
2. Wilson, et al. J Neurol Neurosurg Psychiat 2004;75:126–129.
3. Barnes, et al. Neurology 2004;63:2322–2326.
4. Aggarwal, et al. Neuroepidemiol 2006;26:140–146.
5. Morris, et al. Arch Neurol 2002;59:1125-1132.
6. Morris, et al. JAMA 2002;287:3230-3237.
7. Morris, et al. Arch Neurol;2003:60:194-200.
8. Morris, et al. Arch Neurol;60:940-946.

Conclusions

- Rigorous investigation of racial/ethnic differences in Alzheimer's disease and cognitive decline is challenging.
- The occurrence of Alzheimer's disease and cognitive decline is probably similar among Americans blacks and American whites.
- Many risk factors for Alzheimer's disease and for cognitive decline appear to operate similarly among blacks and whites, but the actions of numerous other risk factors appear to vary across race/ethnicity.

COLLABORATORS

- David A. Bennett
- Neelum T. Aggarwal
- Robert S. Wilson
- Julia L. Bienias
- Carlos F. Mendes de Leon
- Lisa L. Barnes

- Jennifer Tarpey
- Flavio Lamorticella
- Li Peng