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The Impact of Obesity on Active Life Expectancy in Older American Males and Females

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ABSTRACT

Purpose: The purpose of this article is to whether the effects of obesity on Active Life Expectancy (ALE) vary between older African Americans and older whites in the United States (US).

Design and Methods: Using data from the first three waves of the Asset and Health Dynamics Among the Oldest Old (AHEAD) survey, this article develops estimates of total, active, and disabled life expectancy for obese and non-obese older African American and White males and females. The Interpolation of Markov Chains (IMaCh) method is used to estimate the average number of years obese and non-obese older persons can expect to live with and without ADL disability.

Results: Findings confirm that, for both African Americans and White, obesity has little effect on life expectancy in adults 70 and older. While there are clearly racial differentials in both death rates and disability rates, the impact of obesity is largely the same for both races. Regression results imply any observable differences in the impact of obesity are attenuated by education and lifestyle choices.

Implications: Given the observed differences in prevalence of obesity in African Americans, compared to Whites, one might expect a greater impact of obesity at least on disability in old age. At the same time, published data suggest that racial differences in disability occur primarily for those who have three or more ADL difficulties. One implication is that this research could benefit from defining disability in terms of severity, rather than simple presence. In addition, the lack of any findings in regard to race and obesity suggests that differences in obesity and disability may not be a function of race, but rather social class, to the extent that there are socioeconomic status differences in ALE. Further research is needed to examine other, perhaps, better indicators of disparity and disability within the older population.

KEYWORDS: race, ADL disability, obesity, multistate life table estimates

In the past two decades, much has been written about the problem of increasing levels of obesity in the United States (Flegal, Carroll, Kuczmarski, & Johnson, 1998; Mokdad, Serdula, Dietz, Bowman, Marks, & Koplan, 1999), including the effects of obesity on health which have been shown to persist well into later life (Himes, 2000). Indeed, the literature on obesity, disease, and disability suggests that obese older adults have higher rates of disability (Freedman & Martin, 1999; Jenkins, 2004).

Previous research on the impact of obesity on Active Life Expectancy (ALE) indicates that obese older adults who have already survived to the age of 70 or older are no more likely to die but substantially more likely to become disabled than their non-obese counterparts (Reynolds, Saito, & Crimmins, 2005). The aim of this paper is to extend our knowledge of health disparities along social economic status indicators, in this case, race. Examination of active life expectancy, defined as life free of difficulty in performing six activities of daily living (ADL), provides insight into the question of how health change in old age among those who are obese and not-obese translates into years lived with life of different quality. This paper extends that insight by examining race differences in ALE by obesity status.

BACKGROUND (A WORK IN PROGRESS)

Race Differences in Mortality

LE at birth, and 65 – Blacks higher mort than whites – xover at 85+
DATAWAREHOUSE

Race Differences in Disability

Disability – MCBS -- @data warehouse – little difference until we get into 3-6 ADLS, in which both males and females show higher for blacks.

Race Differences in Obesity

NCHS – three sources, NHIS, NHANES, and BRFSS – only in BRFSS is there evidence of higher rates of obesity, only in BFemales obese and severely obese.

Active Life Expectancy

Active life expectancy is often operationalized as the amount, or percent, of remaining life the average person of a given age can expect to live without disability. Studies have regularly estimated active life expectancy for the old population based on ability to perform basic personal care (ADL) and independent living (IADL) functioning (Crimmins, Hayward, & Saito, 1994; Manton & Land, 2000). Such studies have demonstrated the value of this summarizing approach to understanding complicated differentials in mortality and disability by race and gender (Crimmins, Hayward, & Saito, 1996).

Few have examined concurrently the complex links between obesity and the health processes determining active life expectancy in the older population. To date, only two articles examine obesity, total and disabled life expectancy (Peeters, Bonneux, Nusselder, De Laet, & Barendregt, 2004; Reynolds, Saito, & Crimmins, 2005). Using the Original and Offspring Framingham Heart Study participants, the Peeters and colleagues found that obesity implied higher mortality rates, shorter length of life lived free of disability, and no difference in the length of life lived with disability. However, the sample was not representative of the general population and their approach examined the onset of disability over two points, spanning a 46 year period from midlife to old age. In Reynolds et al. (2005), the authors concluded that obesity had little impact on total life

expectancy in a population that had already survived to the age of 70. However, they also found that obesity had a significant negative effect on active life expectancy, increasing significantly the probability of becoming disabled.

Our review of the literature would lead us to expect that obesity may have a larger effect on disability than mortality among the older population, and that due to higher disability, obesity, and death rates, older African Americans would be even more impaired by being obese, compared to older whites.. Because mortality, disability, and the prevalence of obesity are known to differ by gender (Crimmins, Saito, & Reynolds, 1997; Elo & Preston, 1996; Flegal, Carroll, Ogden, & Johnson, 2002), it is important to estimate active life expectancy by gender. Therefore, this paper addresses two questions: How does obesity affect the average length of life for white and African American males and females 70 and older, and how does obesity affect the length of non-disabled life among older African American males and females in the U.S.

RESEARCH DESIGN

The Data

The first three waves of Asset and Health Dynamics Among the Oldest Old (AHEAD) are the data utilized for this analysis. The data were run separately by gender, due to differences in both obesity and disability between the sexes. The first wave began in 1993-4, followed by the second wave in 1995-6; the third wave followed in 1998, resulting in an average interval of 2 years between the first and second waves and 2.25 years between the second and third waves. The 1993-4 baseline sample began with interviews of 8,222 individuals who were a representative sample of community-dwelling adults age 70 and older. Although their spouses/partners are included in the sample, 779

age-ineligible spouses/partners are excluded from this analysis (n=7,443). After eliminating respondents for whom dates of birth (n=57), dates of death (n=4) and initial functioning status (n=1) could not be determined, the sample consists of 7,381 persons in 1993. This sample was followed through the third wave, by which time 1,894 had died. Deaths and the date of death were determined through the National Death Index (NDI), as well as reports of survivors. The date of death provided by the NDI was used when available; when no date was available from NDI, the survivor-provided date of death was used. In addition, there were 151 cases with no information on explanatory variables, and we eliminated 359 Hispanics and other races, leaving a final sample of 6,871 (males, 2,676; females, 4,195).

All results are weighted to reflect the 70+ population. Details on the AHEAD survey design and procedures are readily available and are not repeated here (University of Michigan, 2004).

Measures

Active versus Disabled Life

Active life in this analysis is defined as having no difficulty performing any functions necessary for day-to-day personal care (Activities of Daily Living-ADLs); disabled life is having difficulty in one or more of 6 ADLs. These activities include walking across a room, bathing or showering, eating, dressing, toileting, or transferring in or out of bed. In addition, while the original sample consists solely of community-dwelling older adults, respondents may be in nursing homes in subsequent waves. Anyone residing in a nursing home at either Wave 2 or Wave 3 is defined as disabled.

Obesity

Obesity is based on calculations of body-mass index determined by self-reports of height and weight at the first wave. It is defined as a BMI of 30 or over, consistent with current WHO standards (WHO Expert Consultation, 2004).

Race Differences

In this case, we examine differences between non-hispanic Whites and non-Hispanic African Americans. Hispanics and other races have been excluded.

Statistical Analysis

We use a multistate life table method to estimate total and active life expectancy appropriate for use with longitudinal data. The method takes into consideration the fact that persons experience both declines and improvements in disability; it also allows different mortality profiles by disability state (Crimmins, Hayward, & Saito, 1994). For the estimation of active life expectancy, we designate two live states, 1) active, no difficulties with any of the six ADLs listed above, and 2) disabled, difficulty with at least one of the six ADLs, and one absorbing state, dead (Figure 1). Estimates of active and disabled life expectancy are derived from age-specific transition rates for the four types of health events that can occur: deaths from each of the live states, and movemalest into and out of disability.

[FIGURE 1 ABOUT HERE]

We use the Interpolation of Markov Chains (IMaCh) approach to estimation of transition schedules and life expectancy (Lièvre, Brouard, & Heathcote, 2003). IMaCh is

designed to incorporate multiple waves of data and different interval lengths between survey waves. It also can incorporate cases with missing data. IMaCh also produces confidence intervals for the age specific transition schedules and life expectancy estimates. IMaCh uses a multinomial logistic regression approach to estimating annual age-specific health transitions. These transition rates are used to estimate total life expectancy, active life expectancy, and the health structure of the life table population implied by the rates (Crimmins, Hayward and Saito, 1994). In this analysis, race and obesity are included as covariates.

For simplicity's sake, the estimated transition rates for males and females of both races, with and without obesity are shown without 95% confidence intervals; text will indicate where the confidence intervals suggested significant relationships. Estimates of average total and active life expectancy for obese and non-obese older adults, for males and females, and both races are presented in tabular form, with 95% confidence levels.

RESULTS

Health Transitions of Obese and Non-obese White and African American Males and Females

I first present descriptive data detailing initial and ending states for obese and non-obese older white and African American males and females during the study period, 1993 to 1998 (Table 1). While information from the 1995 wave is included in estimating transition rates, for ease of presentation it is not in this descriptive table. In terms of death rates from either initial state (active or disabled), obesity results in 8 percentage points lower death rates for both obese white and African American males, compared to their non-obese counterparts. For white females, obesity does not affect the death rates

for those who were initially active, but decreases the death rates for those were initially disabled by 12 percentage points. In African American females, the obese of both initial states have lower death rates by 7 (active) to 18 (disabled) percentage points).

[TABLE 1 ABOUT HERE]

When we examine those who remain active in both periods, obesity makes no difference for white males, however, obese African American males are 18 percentage points less likely to remain active, compared to non-obese African American males. For the females, obese whites are 4 percentage points less likely to remain active; obesity made no difference for African American females.

In terms of becoming disabled, obesity increased the prospect by 7 percentage points in white males, and 23 percentage points in African American males. In contrast, obesity increased the prospects of becoming disability similarly for both white (5%) and African American females (8%).

The estimated age-specific transition rates that form the basis for calculating total, active, and disabled life expectancy for obese and non-obese older adults are presented for males and females (Figures 2 and 3). The likelihood of recovering from disability is not significantly different for any of the groups and is not shown to simplify display of the results.

Figure 2a and 2b chart the 2-year probability of dying in white (2a) and African American (2b) males by obesity status. Although generally African American males have a slightly higher probability of dying than white males (except at the highest ages),

obesity does not significant affect the prospects of dying in either white or African American males. African American females (2d) also have a slightly higher probability of death than white females (2c), regardless of age, but as with males, obesity does not significantly affect the prospects of dying in this population.

[FIGURES 2 AND 3 ABOUT HERE]

Figure 3 shows the 2-year probability of becoming disabled for the same groups. For the white males (3a), obesity significantly increases the probability of becoming disabled, up to the age of approximately 92. For African American males (3b), however, there is no effect of obesity on becoming disabled. The picture is slightly more complex for the females, with obese white females (3c) having a significantly higher probability of becoming disabled than non-obese white females, but only between the ages of 74 and 88. There is no effect of obesity on the probability African American females becoming disabled.

Total, Active, and Disabled Life Expectancy

Rather than detailing the specifics of total, active, or disabled life expectancy, in this case the focus is on differences in the impact of obesity on these concepts. For that reason, Table 2 shows not only the years of total, active and disabled life for obese and non-obese white and African American males and females, but also columns delineating the percent differences in total and disabled life due to the impact of obesity. For males, for example, we can see that in whites, obesity increases total life expectancy by approximately 5, 8, and 14% for ages 70, 80, and 90 respectively. In contrast, the impact

of obesity on total life for African American males implies 14, 25, and 34% longer life for the same ages. While this may seem a large differential, it is important to remember that the transition rates were not significant for obesity status. In contrast, obesity in white males increases the years lived in disability by 87, 85, and 80%, while for African American males, the increases are lower—57, 39, and 37% respectively; these differences were significant, at least up to age 92.

For females, being obese results in approximately 1% lower life expectancy than for non-obese females at age 70; results are similar for African American females. At ages 80 and 90, however, obesity suggests a 3 to 9% longer life expectancy for white females; results for African American females at the same ages are 6 and 4% respectively. These results were not significant, according to the transition rates. In terms of disabled years, white and African American women have generally similar results, with obesity increasing disabled years by 46, 35, and 29% for ages 70, 80, and 90. For African American females, obesity increases disabled years by 48, 29, and 38% respectively.

DISCUSSION

In summary, we find little evidence to suggest that obesity affects older African Americans much differently than older whites, regardless of gender. The sole exception is that of disability rates in obese white men; this finding must include a caveat that significant differences between obese and non-obese white and African American men are certainly likely to be biased due to the small number of older obese African American men in the sample.

In order to examine some potential reasons for the lack of race differences in the impact of obesity on ALE, we ran hierarchical logistic regression models on the probability of dying between 1993 and 1998 (Table 3). Model 1 included only age, race (coded 1=non-Hispanic African American; 0=non-Hispanic white), and obesity status. Model 2 included adjustments for urban residence and education; model 3 added healthy behaviors (smoking and drinking), and the last model included baseline health. A subsequent model including changes in health added nothing to the analysis and is not shown. Similar models were run on the probability of becoming disabled, but health changes were also included in a 5th model (Table 4). In addition, an interaction term was constructed between race and obesity, but it was never significant.

[TABLES 3 AND 4 ABOUT HERE]

As Table 3 suggests, regardless of the model run, neither race nor obesity was a significant predictor of the probability of dying, for both males and females. Factors that were significant predictors in the final model included age, smoking, ADL impairments at baseline, and presence of diabetes, cancer, lung disease, heart conditions, and stroke in males. In females, significant factors included age, lower education, smoking, and all of the chronic conditions except for psychiatric problems and arthritis.

In Table 4, we find slightly different results, with obesity being a significant predictor of the onset of disability, but only for males. For both genders, race is never a significant predictor of disability in 1998. Significant predictors of 1998 disability for males included age, obesity, the presence of cancer and arthritis, and the onset of any of

the other chronic conditions between 1993 and 1998. Factors significant in the onset of disability for females included age, rural status, presence of hypertension and arthritis, and onset of other chronic conditions between 1993 and 1998.

The lack of differences in mortality by obesity status is less surprising than the lack of differences in disability. If we assume that African Americans have relatively high rates of death, disability, and obesity, a natural assumption would be that deleterious effects of obesity would have hit them harder than whites. This appears not to be the case; in the only instance where there is any significant role in obesity—the higher rate of disability in obese white males compared to obese African American males—the results are suspect due to the small sample size of obese African American males.

If the impact of obesity on Active Life Expectancy does not differ by race, then there are three potential implications. First, obesity may be an "equal opportunity" disabler. If this is the case, then public health efforts to slow or halt the obesity epidemic may be most effective in addressing the general population. Second, there is some evidence that differentials in ADL disability between whites and African Americans becomes evident when examining more severe definitions of disability—for example, in the 3 to 6 ADL difficulty category. If this is so, the further research is warranted on the role of obesity in the severity of ADL difficulty. Finally, obesity may have a significant role in health disparities, but through mechanisms other than race. For example, if socioeconomic status (SES) is driving health disparities, perhaps other measures of SES may be better used to examine these disparities in the context of ALE. Further research should be done on differentials in income, education, and occupation.

This study has some limitations, including the reliance on self-reported obesity. Another limitation is the small number of obese persons, particularly in African American males; it is possible that analysis of the males in this study was hampered by lack of statistical power. Future research should be done to clarify the role of other measures of both disability and social class.

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Table 1. Transitions between 1993 and 1998 for Obese and Non-Obese Older African Americans and Whites: AHEAD, age 70+

NON-OBESE MALES

	Whites				African Americans		
	1998				1998		
1993	Active	Disabled	Dead	1993	Active	Disabled	Dead
Active	63.1	11.2	25.7	Active	55.5	12.7	31.8
Disabled	16.9	24.7	58.4	Disabled	22.1	25.0	52.9

OBESE MALES

	Whites				African Americans [a]		
	1998				1998		
1993	Active	Disabled	Dead	1993	Active	Disabled	Dead
Active	64.4	18.1	17.5	Active	41.2	35.3	23.5
Disabled	15.7	43.1	41.2	Disabled	72.7	18.2	9.1

NON-OBESE FEMALES

	Whites				African Americans		
	1998				1998		
1993	Active	Disabled	Dead	1993	Active	Disabled	Dead
Active	63.6	18.2	18.2	Active	56.3	21.6	22.1
Disabled	21.6	39.1	39.3	Disabled	22.7	32.0	45.3

OBESE FEMALES

	Whites				African Americans		
	1998				1998		
1993	Active	Disabled	Dead	1993	Active	Disabled	Dead
Active	59.7	23.1	17.2	Active	55.5	29.1	15.4
Disabled	25.2	48.1	26.7	Disabled	20.3	53.1	26.6

[a] Number too small to produce reliable results

Table 2. Total, Active and Disabled Life Expectancy, plus % Remaining Life Disabled; Percent +/- Life or Disabled Life Due to Obesity: AHEAD 1993-1998.

MALES

	OBESE WHITES						**OBESE AFRICAN AMERICANS**					
		% Due to			**% Due to**			**% Due to**			**% Due to**	
	Total	**Obesity**	Active	Disabled	**Obesity**	% Disabled	Total	**Obesity**	Active	Disabled	**Obesity**	% Disabled
70	13.5	**4.7**	9.2	4.3	**86.9**	31.9	13.1	**13.9**	8.4	4.7	**56.7**	36.1
80	7.8	**8.3**	4.1	.07	**85.0**	47.4	8.1	**24.6**	4.5	3.6	**38.5**	44.4
90	4.7	**14.6**	2.0	2.7	**80.0**	56.9	5.1	**34.2**	2.5	2.6	**36.8**	50.7

	NON-OBESE WHITES				**NON-OBESE AFRICAN AMERICANS**			
	Total	Active	Disabled	% Disabled	Total	Active	Disabled	% Disabled
70	12.9	10.5	2.3	18.0	11.5	8.5	3.0	26.5
80	7.2	5.2	2.0	27.9	6.5	3.9	2.6	39.3
90	4.1	2.6	1.5	37.1	3.8	2.0	1.9	48.5

FEMALES

	OBESE WHITES						**OBESE AFRICAN AMERICANS**					
		% Due to			**% Due to**			**% Due to**			**% Due to**	

	Total	**Obesity**	Active	Disabled	**Obesity**	% Disabled	Total	**Obesity**	Active	Disabled	**Obesity**	% Disabled
70	16.1	**-0.6**	9.4	6.7	**45.7**	45.7	15.1	**-1.3**	8.3	6.8	**47.8**	44.9
80	10.0	**3.1**	4.6	5.4	**35.0**	35.0	9.4	**5.6**	4.0	5.3	**29.3**	57.0
90	6.1	**8.9**	2.1	4.0	**29.0**	29.0	5.3	**3.9**	0.9	4.4	**37.5**	82.5

	NON-OBESE WHITES				**NON-OBESE AFRICAN AMERICANS**			
	Total	Active	Disabled	% Disabled	Total	Active	Disabled	% Disabled
70	16.2	11.6	4.6	28.5	15.3	10.7	4.6	30.2
80	9.7	5.7	4.0	41.2	8.9	4.7	4.1	46.6
90	5.6	2.4	3.1	56.5	5.1	2.0	3.2	61.5

Table 3. Odds-Ratios (Confidence Intervals) from Logistic Regression on the Probability of Dying: AHEAD, 1993-1998 By Gender

MALES		Age		Black		Obese		R-Square	Hosmer-Lemeshow X-Square Test
N= 3,015	Model 1[a]	1.118***	(1.100-1.136)	1.303	(0.976-1.738)	0.955	(0.704-1.295)	0.1019	0.9035
	Model 2[b]	1.115***	(1.096-1.133)	1.177	(0.868-1.595)	0.938	(0.690-1.273)	0.1047	0.8425
	Model 3[c]	1.119***	(1.100-1.138)	1.117	(0.822-1.517)	0.958	(0.705-1.302)	0.1095	0.7500
	Model 4[d]	1.129***	(1.109-1.150)	1.142	(0.827-1.576)	0.844	(0.609-1.170)	0.1997	0.1570
FEMALES		Age		Black		Obese			
N=5,207	Model 1[a]	1.115***	(1.102-1.128)	1.235	(0.981-1.556)	0.981	(0.785-1.125)	0.1179	0.1236
	Model 2[b]	1.111***	(1.097-1.124)	1.106	(0.872-1.403)	0.944	(0.755-1.181)	0.1226	0.4284
	Model 3[c]	1.115***	(1.102-1.129)	1.103	(0.868-1.401)	0.968	(0.773-1.212)	0.1275	0.4819
	Model 4[d]	1.119***	(1.104-1.134)	1.12	(0.876-1.433)	0.894	(0.708-1.129)	0.1691	0.7034

[a] Unadjusted Model

[b] Adjusted for Urban Residence and # Years of Education

[c] Model 2 plus adjustment for Smoking and Heavy Drinking

[d] Model 3 plus adjustment for Baseline ADL impairments and self-reports of Hypertension, Diabetes, Cancer, Lung Disease, Heart Conditions, Psychiatric Problems, Arthritis, or Stroke.

Table 4. Odds-Ratios (Confidence Intervals) from Logistic Regression on the Probability of Becoming ADL Disabled: AHEAD, 1993-1998 By Gender

MALES		Age		Black		Obese		R-Square	Hosmer-Lemeshow X-Square Test
N= 3,015	Model 1[a]	1.044***	(1.025-1.063)	1.277	(0.826-1.760)	1.766***	(1.310-2.380)	0.0198	0.0964
	Model 2[b]	1.040***	(1.021-1.059)	1.138	(0.810-1.598)	1.737*	(1.287-2.343)	0.0241	0.0372
	Model 3[c]	1.041***	(1.022-1.060)	1.129	(0.802-1.589)	1.745***	(1.293-2.355)	0.0246	0.0029
	Model 4[d]	1.045***	(1.025-1.064)	1.090	(0.769-1.544)	1.681***	(1.240-2.279)	0.0365	0.0019
	Model 5[e]	1.054***	(1.034-1.075)	1.125	(0.790-1.602)	1.603**	(1.177-2.182)	0.0670	0.6465
FEMALES		Age		Black		Obese			
N=5,207	Model 1[a]	1.043***	(1.032-1.055)	1.150	(0.923-1.432)	1.108	(0.906-1.354)	0.0195	0.0094
	Model 2[b]	1.044***	(1.033-1.056)	1.178	(0.939-1.478)	1.114	(0.911-1.363)	0.0228	0.0222
	Model 3[c]	1.046***	(1.034-1.058)	1.194	(0.951-1.499)	1.130	(0.923-1.384)	0.0248	0.0014
	Model 4[d]	1.049***	(1.037-1.061)	1.153	(0.915-1.454)	1.062	(0.864-1.306)	0.0345	0.0001
	Model 5[e]	1.060***	(1.047-1.073)	1.156	(0.912-1.465	1.011	(0.819-1.248)	0.0890	0.3042

[a] Unadjusted Model

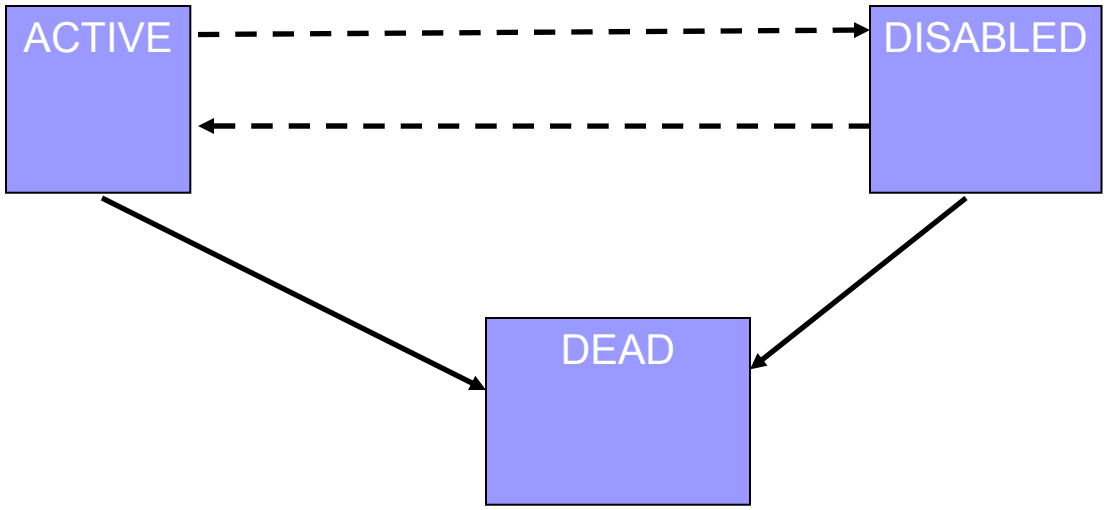
[b] Adjusted for Urban Residence and # Years of Education

[c] Model 2 plus adjustment for Smoking and Heavy Drinking

[d] Model 3 plus adjustment for Baseline ADL impairments and self-reports of Hypertension, Diabetes, Cancer, Lung Disease, Heart Conditions, Psychiatric Problems, Arthritis, or Stroke.

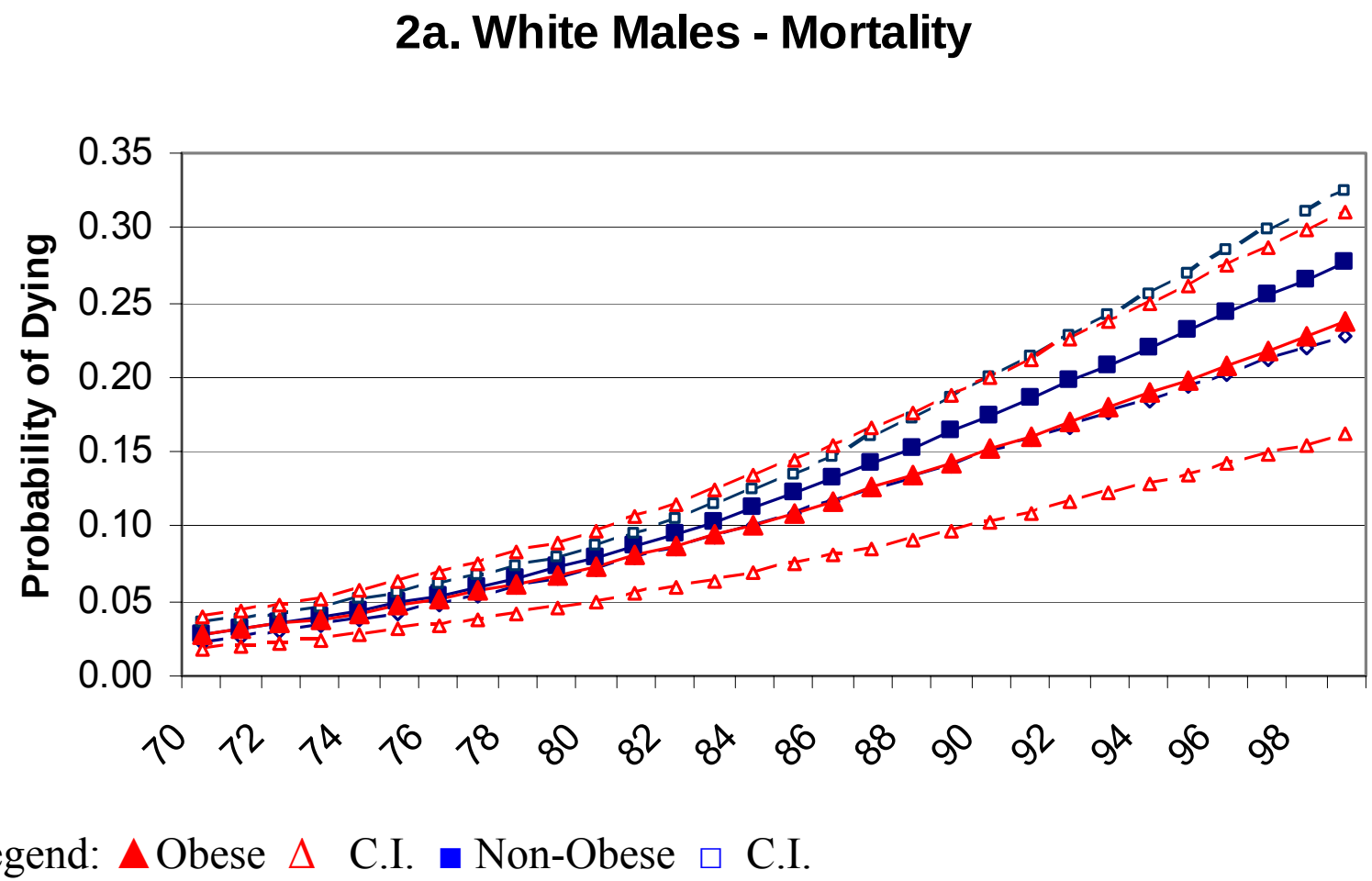
[e] Model 4 plus adjustment for onset of chronic conditions between 1993 and 1998

Figure 1. The Multistate Model

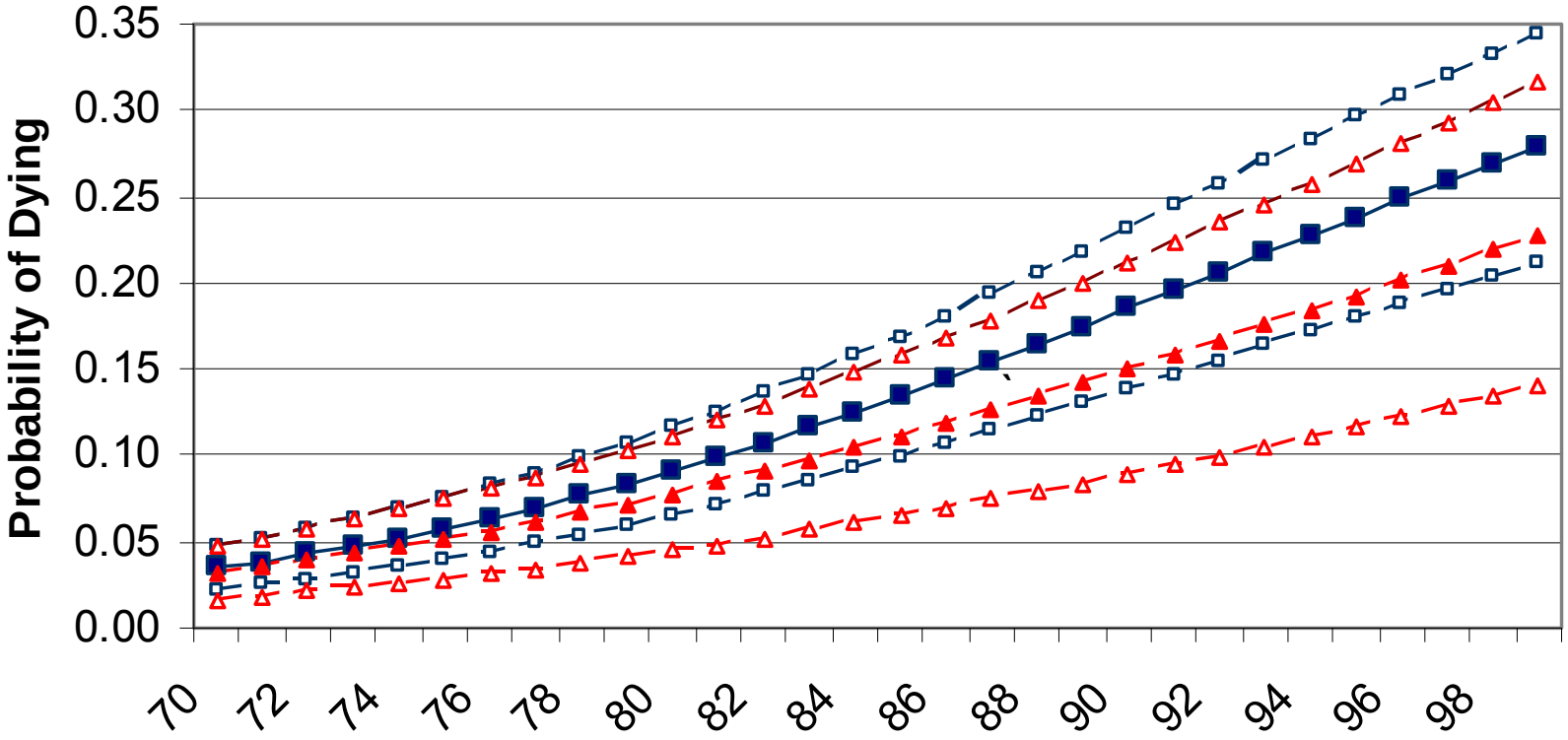


Disabled: Difficulty performing any of 6 Activities of Daily Living: bathing, eating, dressing, toileting, walking, transfer in/out of bed.

Figure 2. Estimated Annual Probability of Dying (Confidence Intervals) for Obese and Non-Obese White and African American Males and Females70 and Older: 1993-1998 AHEAD

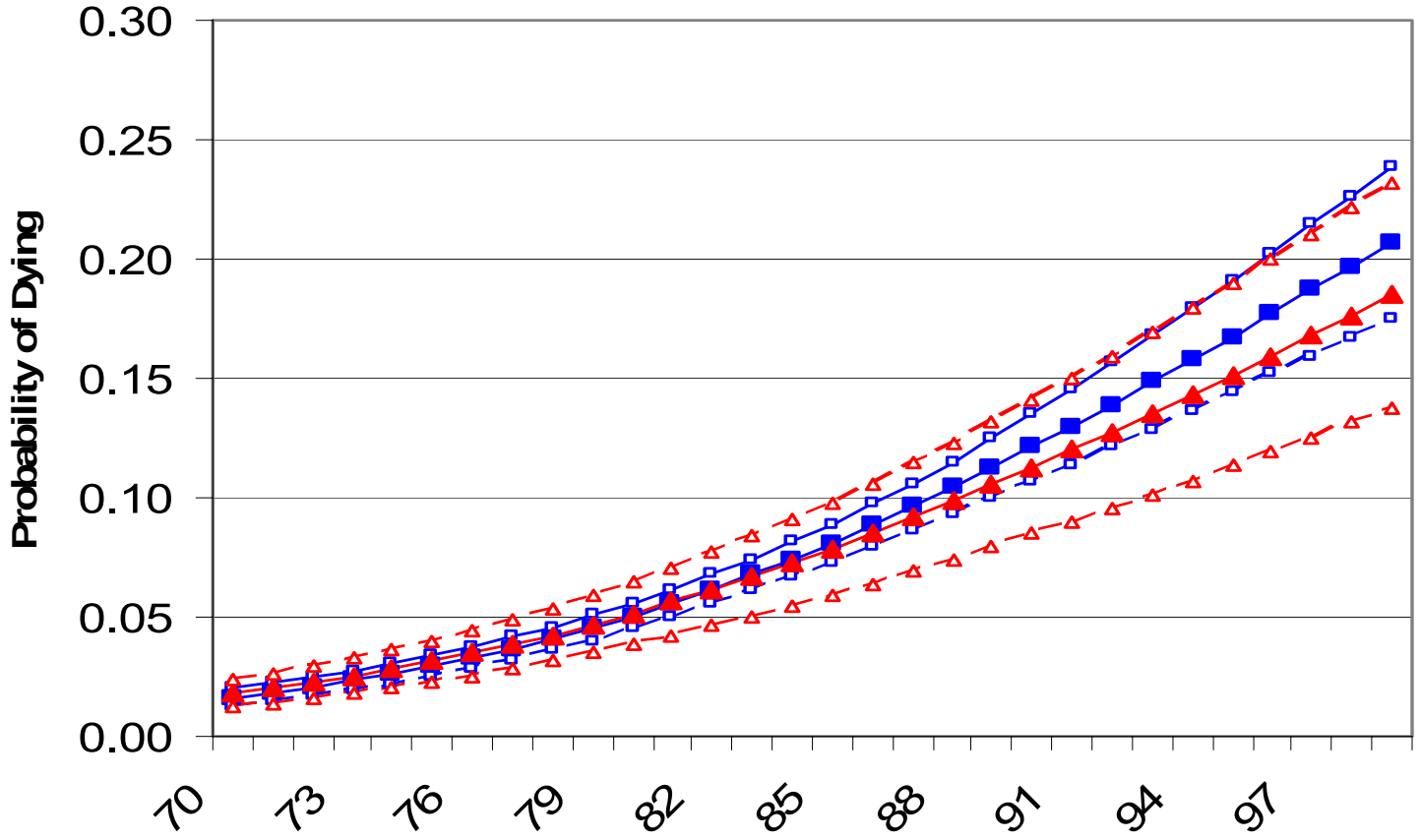


2b. African American Males - Mortality



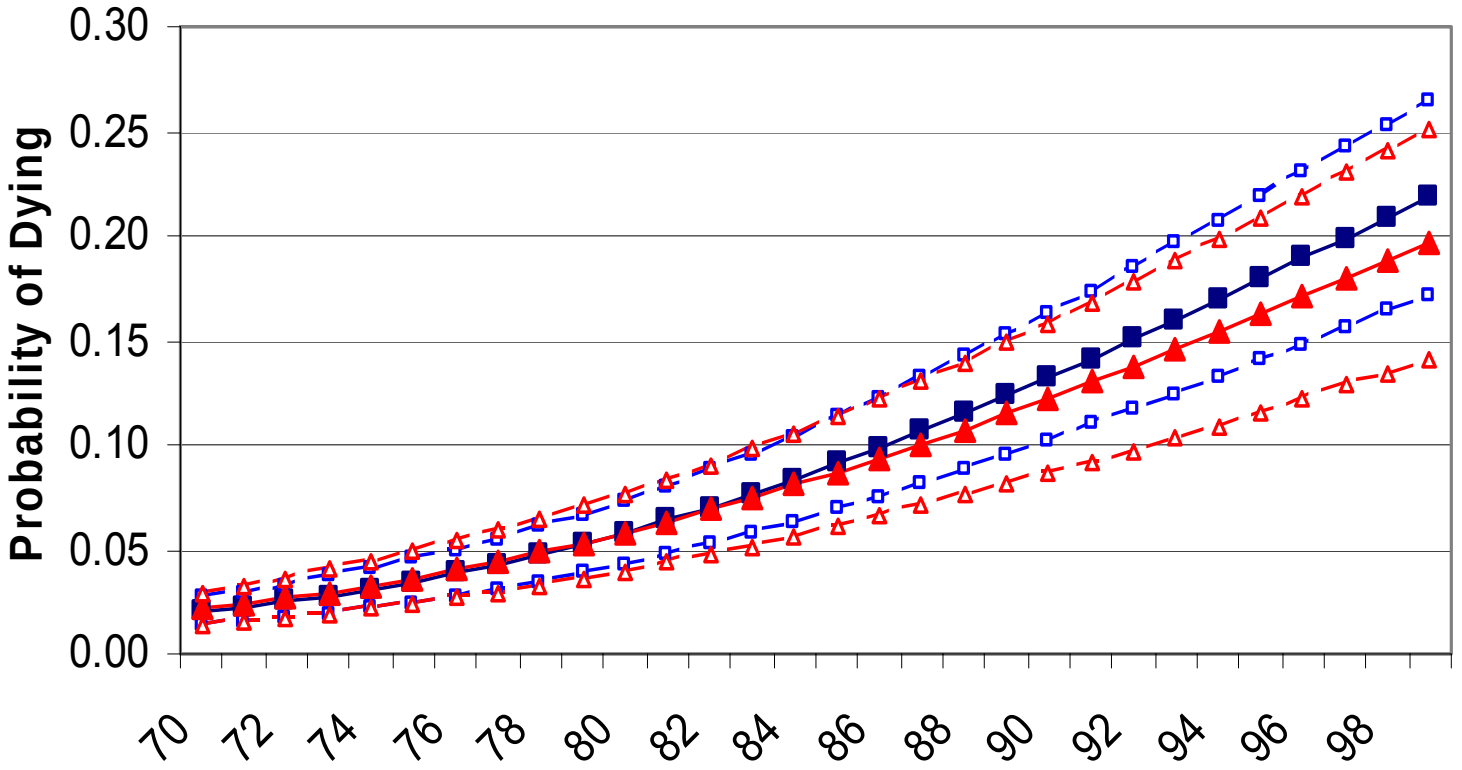
Legend: ▲ Obese Δ C.I. ■ Non-Obese □ C.I.

Figure 2c. White Females - Mortality



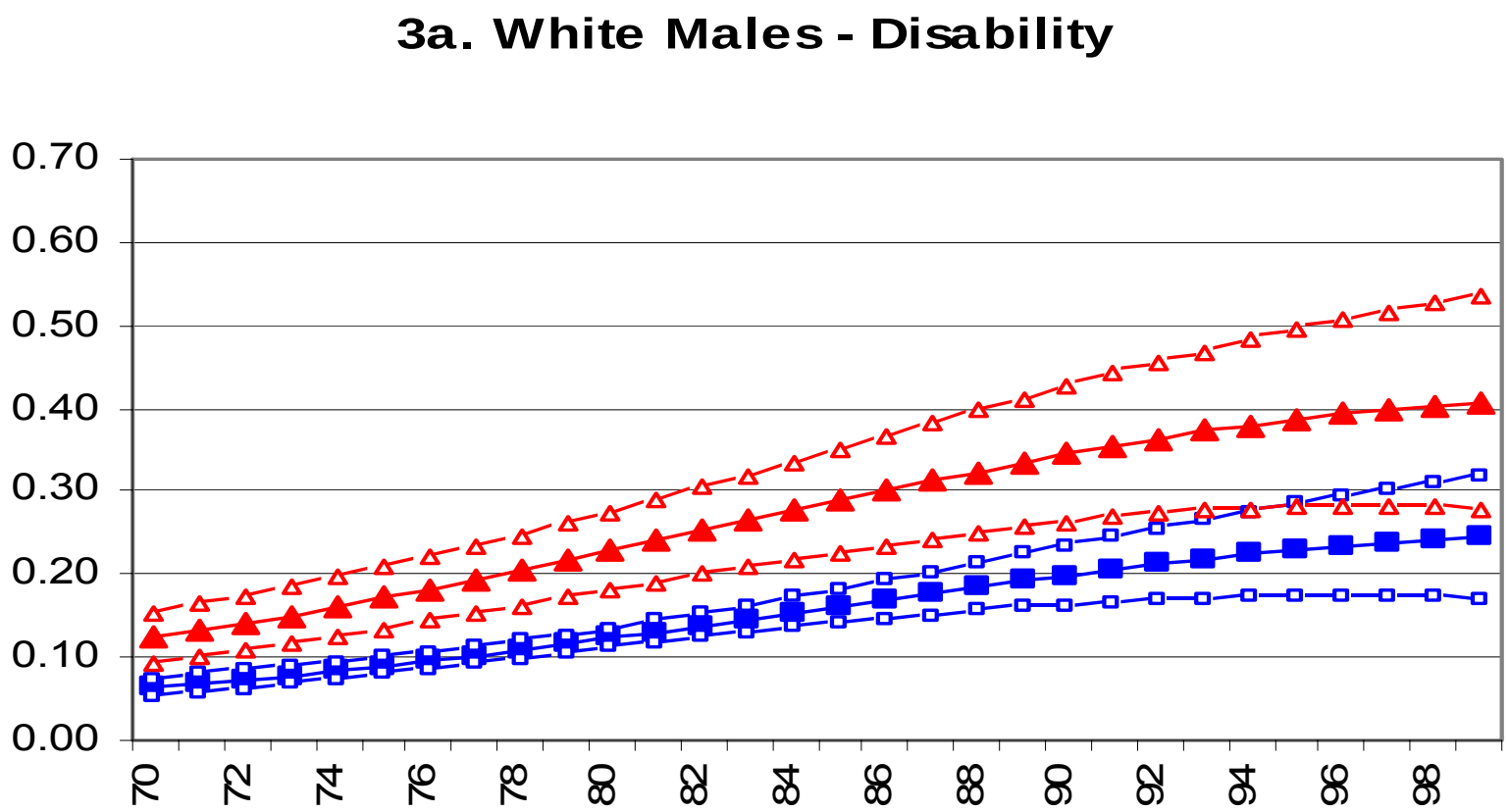
Legend: ▲ Obese Δ C.I. ■ Non-Obese □ C.I.

2d. African American Females - Mortality



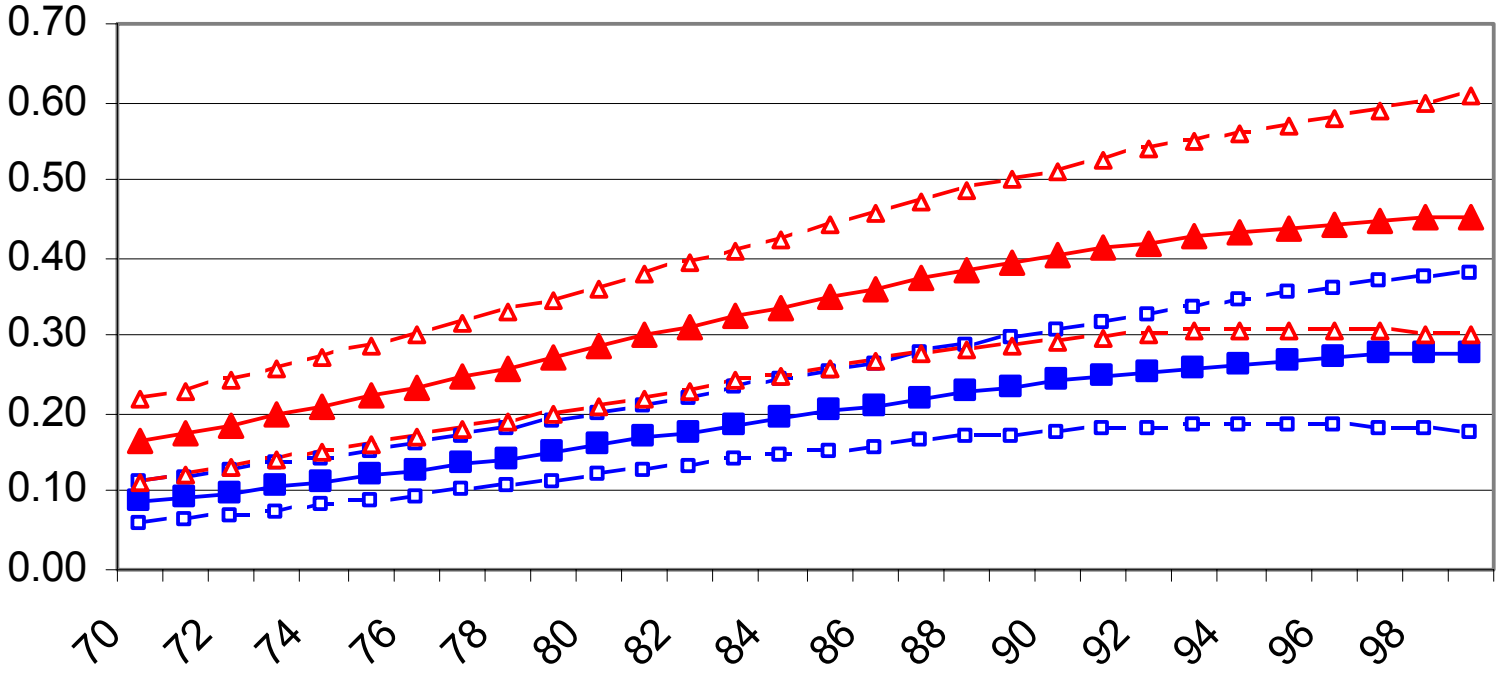
Legend: ▲Obese Δ C.I. ■ Non-Obese □ C.I.

Figure 3. Estimated Annual Probability of Becoming Disabled (Confidence Intervals) for Obese and Non-Obese White and African American Males and Females 70 and Older: 1993-1998 AHEAD



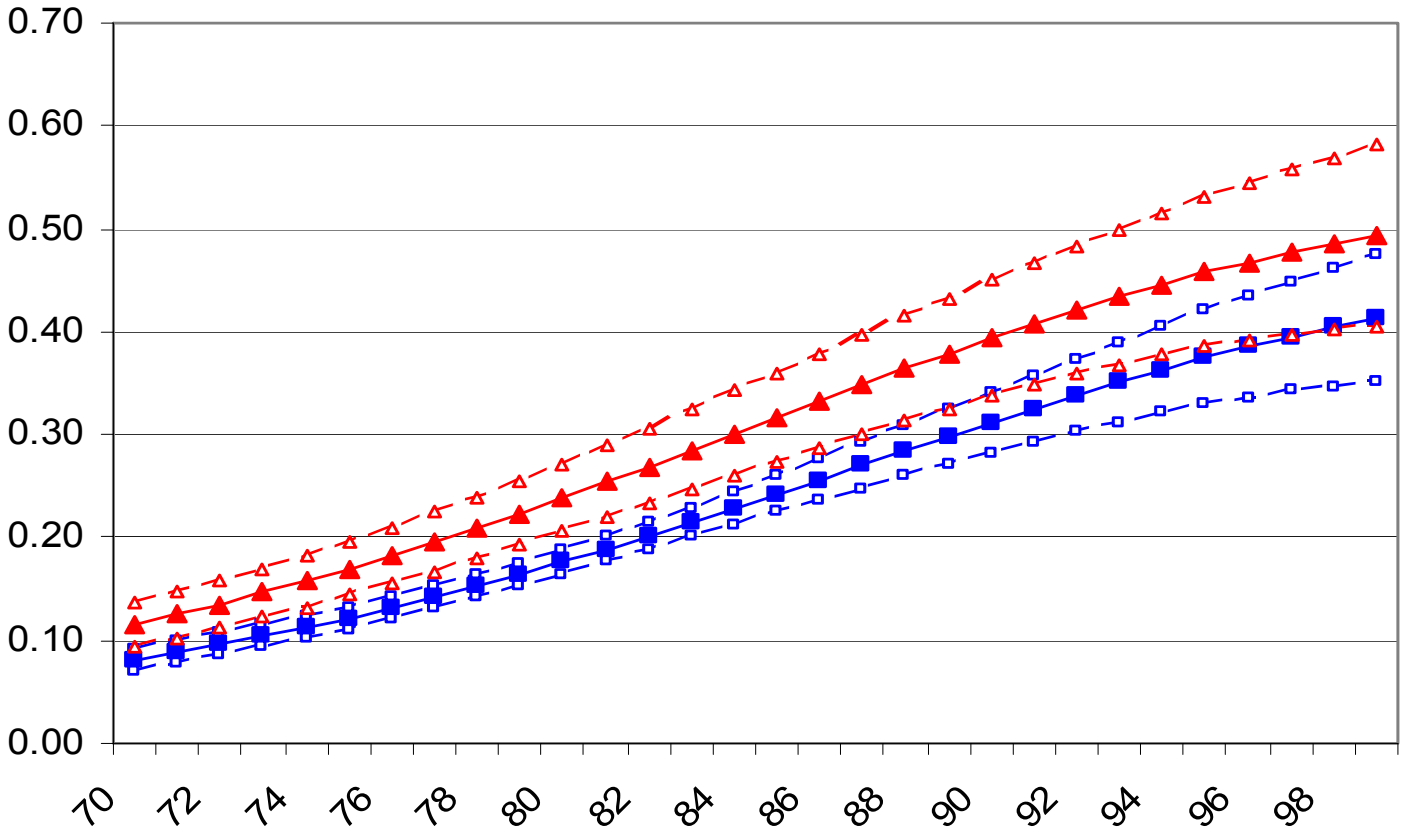
Legend: ▲Obese Δ C.I. ■ Non-Obese □ C.I.

3b. African American Males - Disability



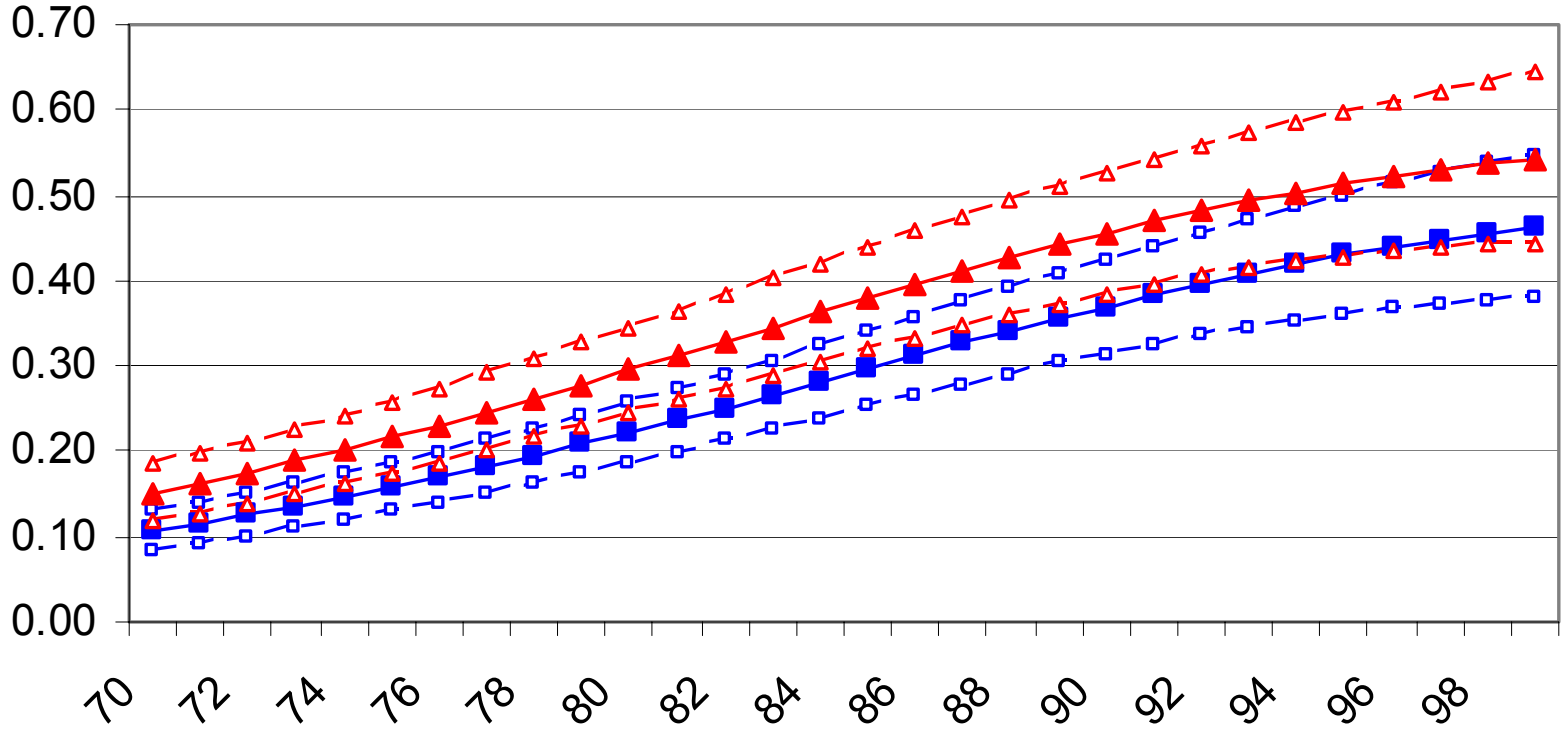
Legend: ▲Obese Δ C.I. ■ Non-Obese □ C.I.

3c. White Females - Disability



Legend: ▲Obese Δ C.I. ■ Non-Obese □ C.I.

3d. Black Females - Disability



Legend: ▲Obese Δ C.I. ■ Non-Obese □ C.I.