

# National Productivity Implications of Calorie and Sodium Reductions in the American Diet

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## ABSTRACT

- Objective:** We modeled the US adult population's potential productivity benefits — i.e., lower absenteeism, presenteeism, disability, and premature mortality — achieved by decreasing calorie and sodium intakes to reduce excess weight and hypertension.
- Methods:** We developed a simulation model, the Nutrition Impact Model, a system of calculations that combined findings from scientific literature, and analysis of national survey and health care use files.
- Results:** Productivity gains modeled from 100- and 500-calorie reductions among overweight and obese adults were \$45.7 billion and \$133.3 billion, respectively. Productivity gains from reducing the rate of uncontrolled hypertension by daily sodium intake reductions of 400 mg and 1,100 mg were \$2.5 billion and \$5.8 billion, respectively, for total productivity gains of \$48.2 to \$139.1 billion.
- Conclusions:** Combined with medical cost savings, the total economic impact of these dietary changes ranged from \$108.5 billion for moderate reductions to \$255.6 billion for aggressive reductions. Modest but sustained improvements in diet, specifically calorie reduction, can have profound implications for national productivity.

## BACKGROUND

- Obesity and hypertension are prevalent and pervasive health problems posing a severe burden on national productivity through work absenteeism, reduced productivity at work and at home, and disability that limits ability to work.
- Both obesity and hypertension are significant risk factors for early mortality that can cut short careers.
- The potential productivity gain nationwide from reducing calories and sodium is unclear.
- The relative magnitude of productivity benefits from reducing calorie or sodium intake is unknown

## PURPOSE

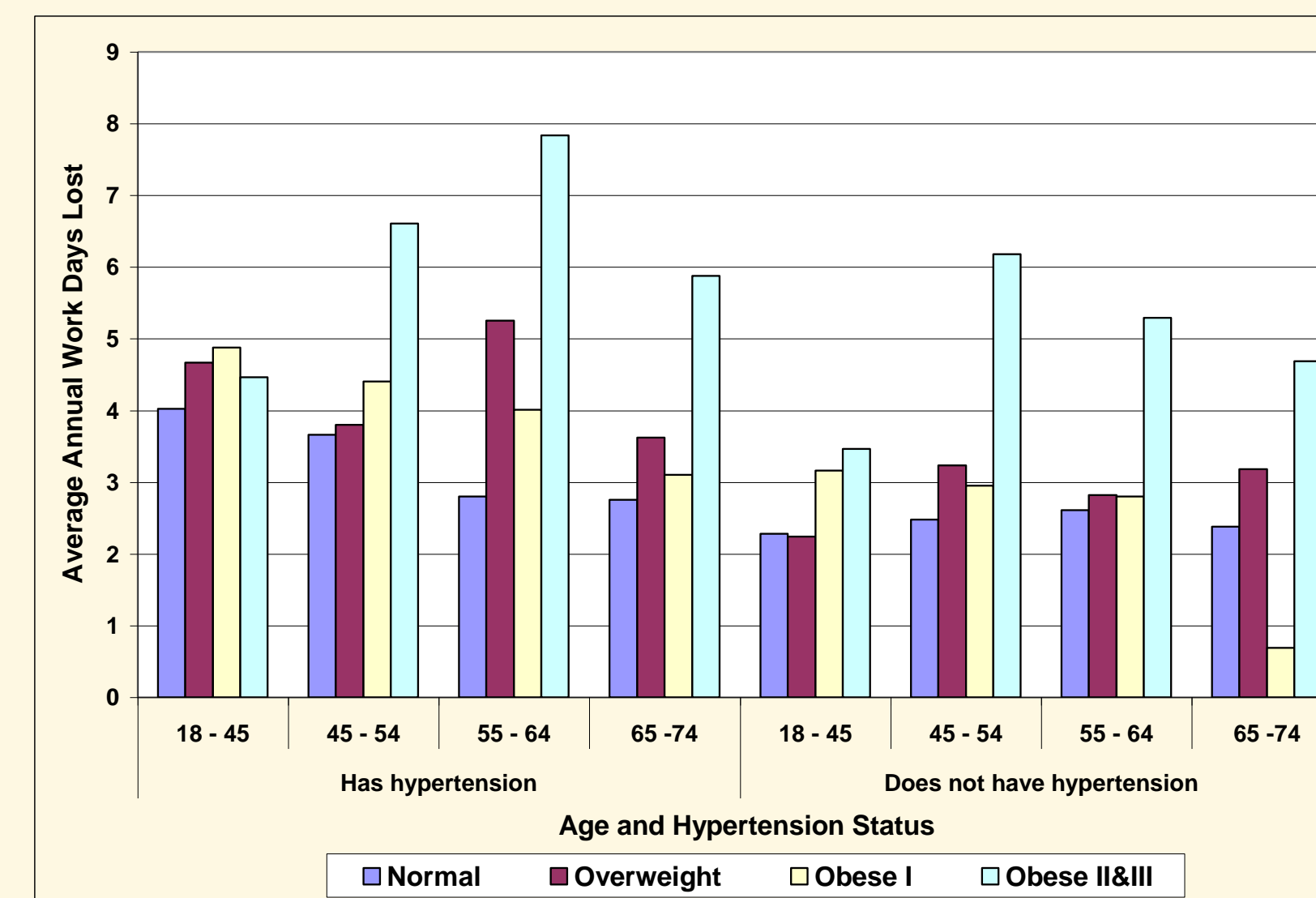
- To estimate total annual productivity loss from overweight, obesity and hypertension and then to model the potential productivity benefits of reducing prevalence of these conditions by decreasing caloric and sodium intakes.
- To quantify the relative magnitude of potential benefits from reducing calorie or sodium intakes

## DATA & METHODS

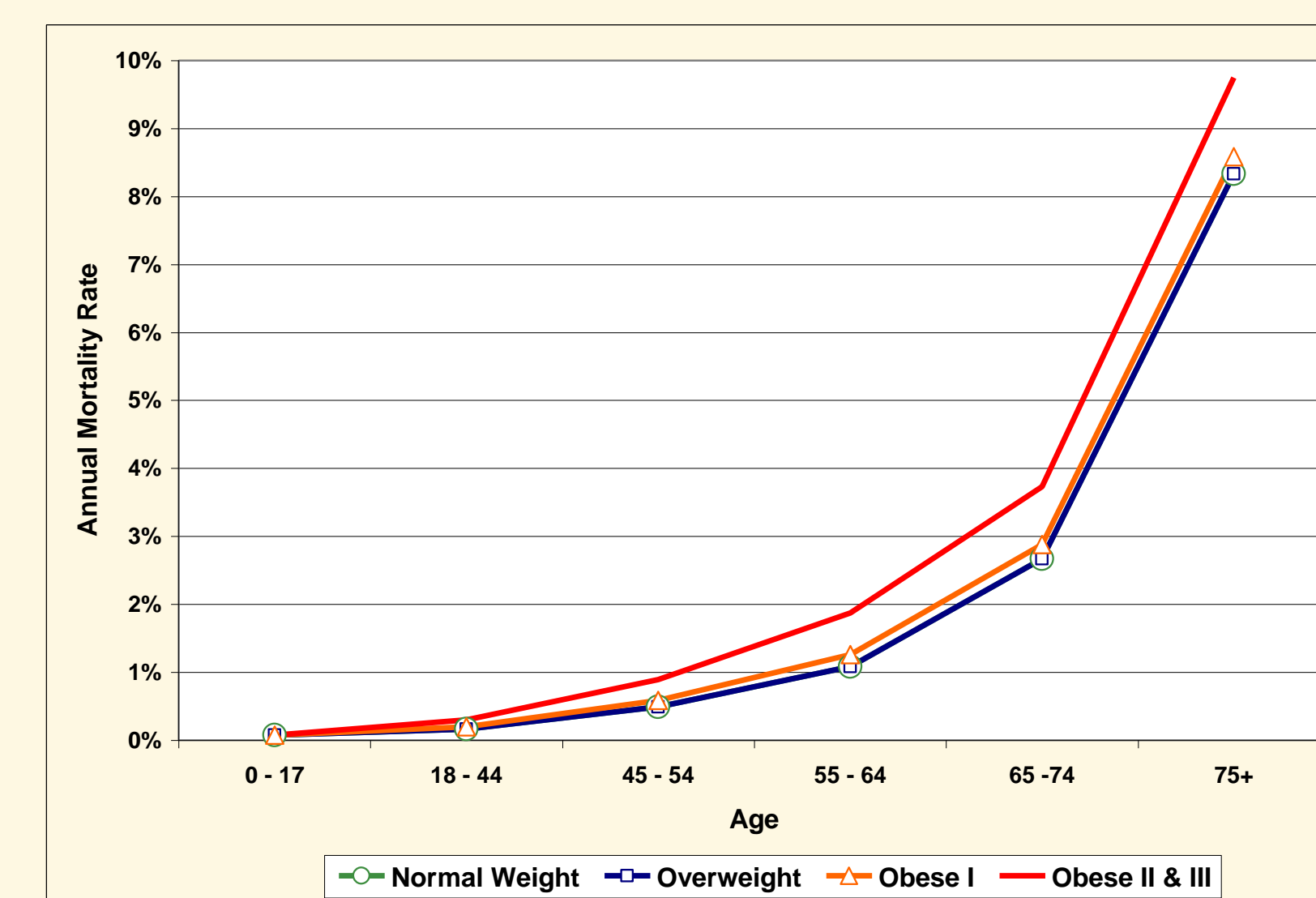
- Study population is U.S. adults who are overweight/obese or who have uncontrolled hypertension
- National Health Interview Survey (NHIS, 2006) analysis was used to calculate average work days lost per year by weight category, hypertension status and demographic.
- Presenteeism, defined as reduced productivity while at work, can result from various factors including concentration loss, slower work pace, job repetition, and fatigue. Reduced work performance associated with overweight averaged about 2% decline and with hypertension, a 3.1% productivity decline (Romero-Corral, 2006; Goetzl, 2004; Pelletier 2004; Boles 2004; Burton 2005)
- Disability was defined as receiving Social Security Supplemental Insurance payments due to disability. We used multivariate logistic regression to capture the relationships among overweight; obese I, II and III; HTN, age, gender, education attainment, marital status, healthy insurance coverage, race and ethnicity.
- We calculated a mortality rate by weight category and demographic and calculated productivity lost due to early mortality by computing the net present value of future productivity by age for both men and women.

## RESULTS

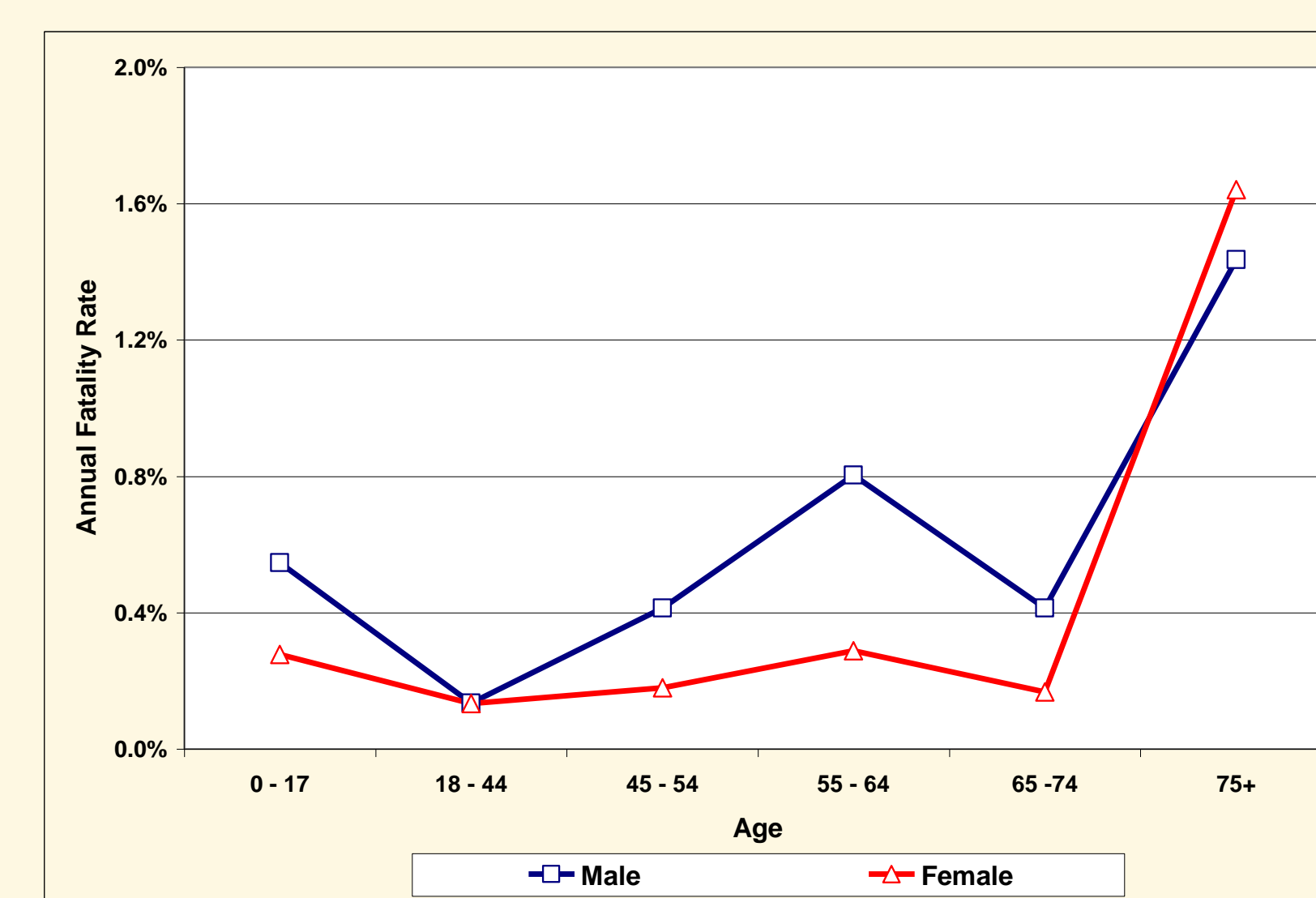
### 2006 National Health Interview Survey Analysis



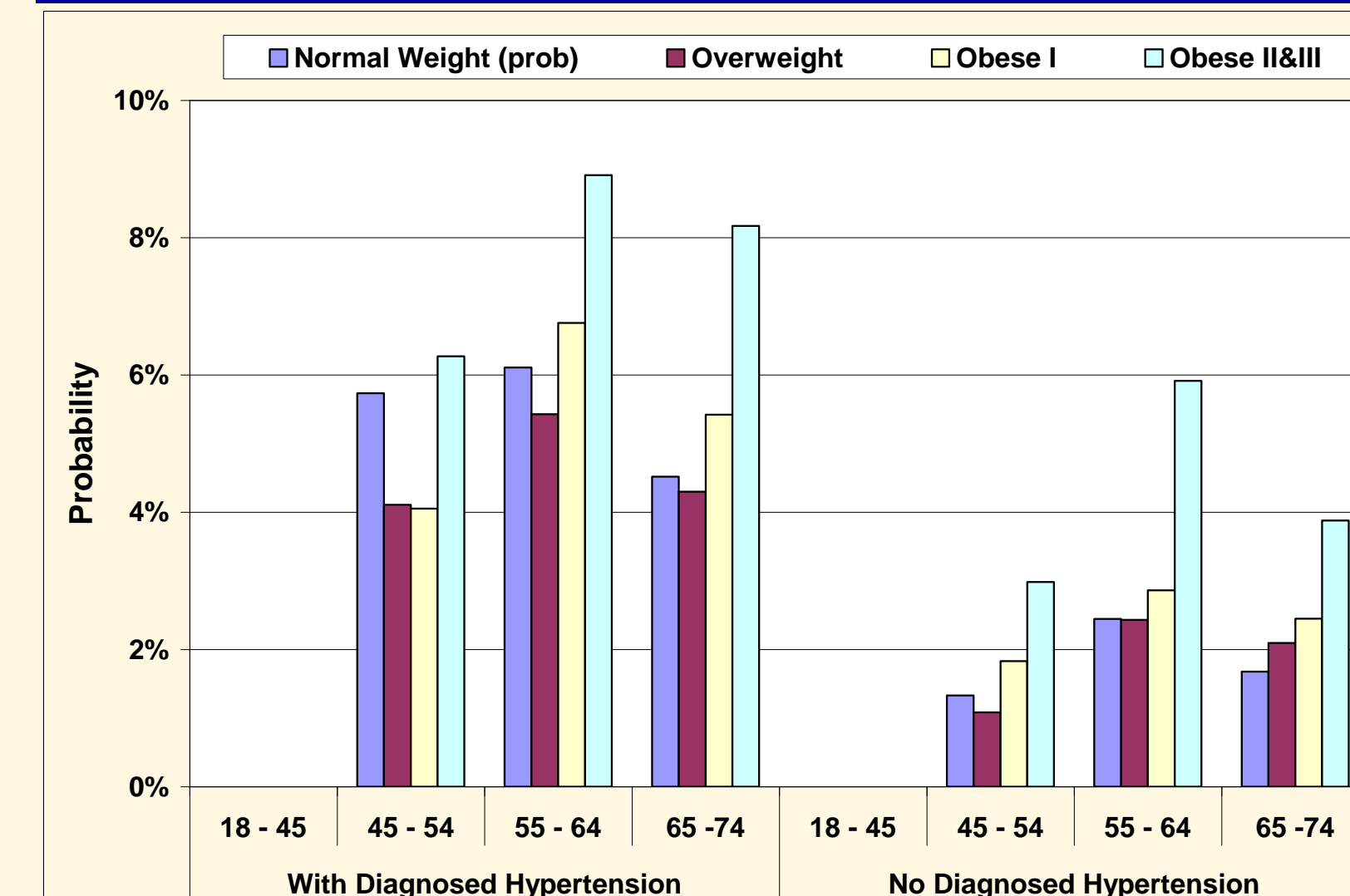
### Mortality Associated with Obesity



### Mortality Associated with Hypertension



### Probability for Receiving Social Security Supplemental Insurance Payments Due to Disability



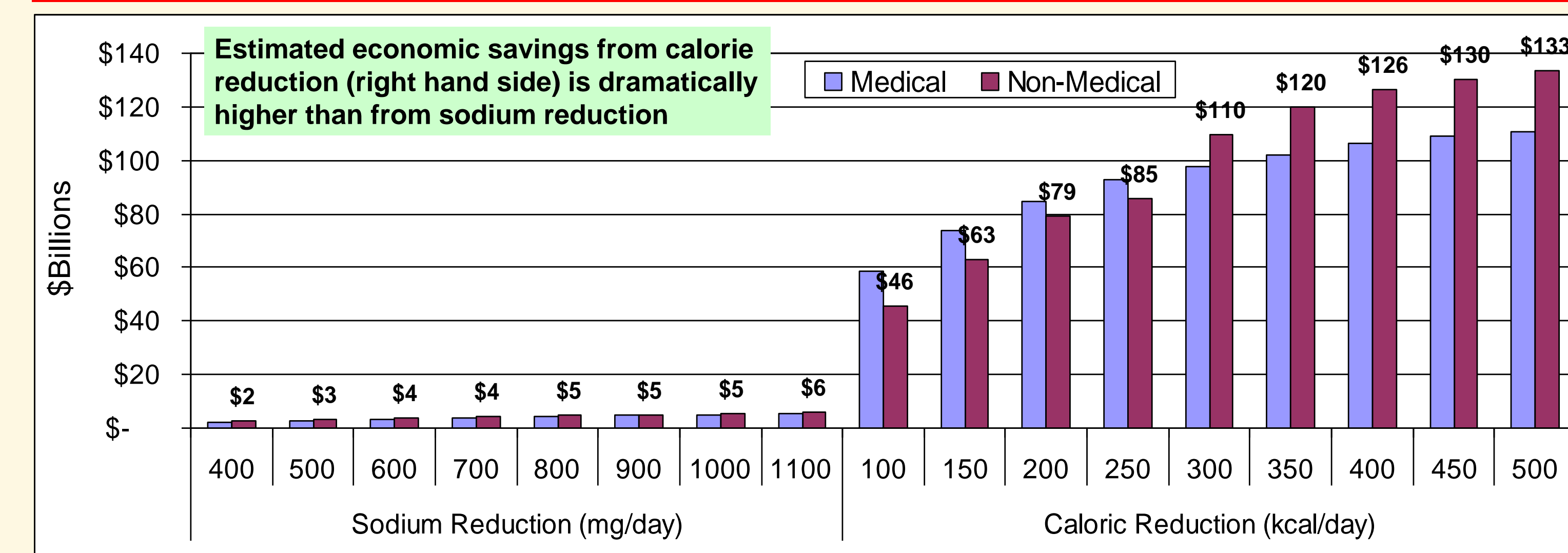
### Productivity Loss Associated with Overweight, Obesity, and Uncontrolled Hypertension

	Risk Group				Total*
	Over-weight*	Obese I*	Obese II & III*	With un-controlled hypertension*	
Adult population modeled (000,000)	74.7	37.8	26.7	42.1	224.7
Excess Cases Associated with Each Risk group (000)					
Absenteeism days	18,144	24,773	39,905	18,471	101,293
Presenteeism (FTE) days	257,441	140,392	98,378	100,375	596,586
Days unable to work due to disability	12,378	4,082	50,426	35,622	102,508
Premature mortality	0	16	60	363	440
Productivity Loss (\$000,000) Associated with Each Risk Group					
Absenteeism	\$3,518	\$3,930	\$6,791	\$3,295	\$17,534
Presenteeism	\$43,521	\$22,847	\$15,347	\$18,446	\$100,161
Days unable to work due to disability	\$2,543	\$673	\$9,714	\$7,573	\$20,502
Premature mortality	\$1,898	\$6,874	\$25,870	\$22,859	\$57,501
Total associated costs	\$51,480	\$34,323	\$57,721	\$52,174	\$195,698
Total cost per person at risk (\$)	\$689	\$908	\$2,244	\$1,270	\$871

### Adult Potential Productivity Loss Averted Through Calorie and Sodium Reduction

Comorbidity Group	Current Total Cases in the U.S. (000)	Reduction in Daily Intake*			
		Calories		Sodium	
		100 kcal	500 kcal	400 mg	1100 mg
Population covered	224,669				
Cases Averted (000)					
Overweight	74,700	36,870	74,700	-	-
Obese I	37,782	21,816	37,782	-	-
Obese II & III	26,724	12,532	26,664	-	-
Hypertension	42,080	6,030	11,248	1,596	3,466
Associated cases					
Absenteeism days		28,813	75,177	1,292	3,040
Presenteeism (FTE) days		125,132	434,884	6,349	13,923
Disability work days lost		28,570	72,771	1,778	4,208
Premature mortality		62	135	10	22
Productivity Gains (\$000,000)					
Absenteeism		\$4,937	\$12,730	\$234	\$569
Presenteeism		\$20,569	\$69,910	\$1,138	\$2,559
Disability work days lost		\$5,717	\$14,059	\$371	\$892
Premature mortality		\$14,575	\$36,564	\$752	\$1,795
Total associated costs		\$45,798	\$133,263	\$2,495	\$5,815

### Medical and Non Medical Savings Associated with Reducing Sodium and Calories



## CONCLUSIONS

- Sustained reductions in energy intake alone (e.g., 100 to 500 kcal/day below estimated energy expenditure) among adults who are overweight or obese could improve national productivity by \$45.7 to \$133.3 billion annually, or roughly \$2 to \$6 per overweight worker per day.
- Modest but sustained reductions in sodium intake alone (e.g., reduced by 400 to 1,100 mg/day) among those with uncontrolled hypertension may increase the nation's annual productivity by an estimated \$2.5 to \$5.8 billion, respectively.
- Combining the productivity cost savings to medical cost savings of \$60.3 to \$116.5 billion, the economic benefit from modest to aggressive reductions in calories and sodium ranges from \$108.5 to \$255.6 billion.

## PUBLIC HEALTH IMPACT

- Similar to the medical cost findings, estimated economic savings from calorie reduction is dramatically higher (~20 times) than from sodium reduction, making calorie reduction the top priority.
- Productivity loss associated with excess weight and hypertension is largely invisible at the individual level, but imposes a cost similar to that of direct medical costs. Both medical and non medical costs must be considered when assessing the total economic burden of excess weight and hypertension on individuals, employers, and society.
- A focus on calorie reduction for overweight and obese individuals, and to a much smaller degree, sodium reduction for those with uncontrolled hypertension, provides a high potential for boosting productivity through reduced absenteeism, presenteeism, disability, and premature death.

## SELECTED CITATIONS

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