

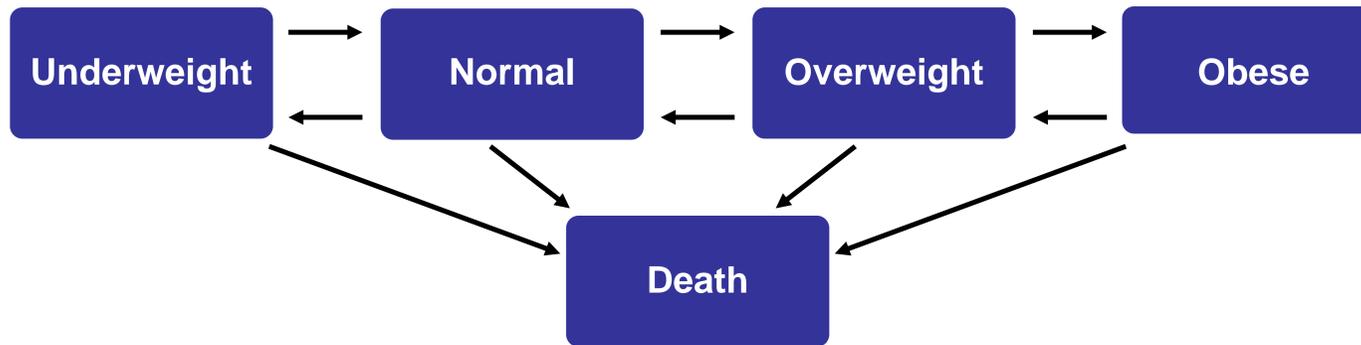
# Modeling Transitions Among BMI States

Carmen Ng

University of Pennsylvania, Graduate Group in Demography

## Introduction

- A living person can be put into 1 of 4 states – underweight, normal, overweight, or obese, determined by BMI
- Looking at transitions in a population could shed light on how a typical person moves among BMI states as he/she ages
- China is an ideal country for this analysis since both underweight and overweight exist to a noticeable extent and both are public health issues



## Sensitivity Analyses

- Increase each of the underweight, overweight, and obese states → normal state transition probabilities by 10%, 1 age interval at a time
- Decrease other transition probabilities from these states, proportionate to original probabilities

Expected Future Lifetime from Age 20 – 24 to Age 80 – 84 in each BMI State (pre-change)

BMI State	Underweight	Normal	Overweight	Obese	Death	Total
Expected Future Lifetime	3.43	27.94	20.62	5.65	2.36	60
<b>10% Increase Occurs in 35 – 39 → 40 – 44</b>	3.38	28.53	20.21	5.57	2.31	60
<b>10% Increase Occurs in 65 – 69 → 70 – 74</b>	3.38	28.32	20.38	5.63	2.30	60

- Consistently more time in normal state
- Increases in time spent in normal state greatest when change happens at younger ages
- Increases in proportion of time spent in normal state highest at older ages

## Research Question

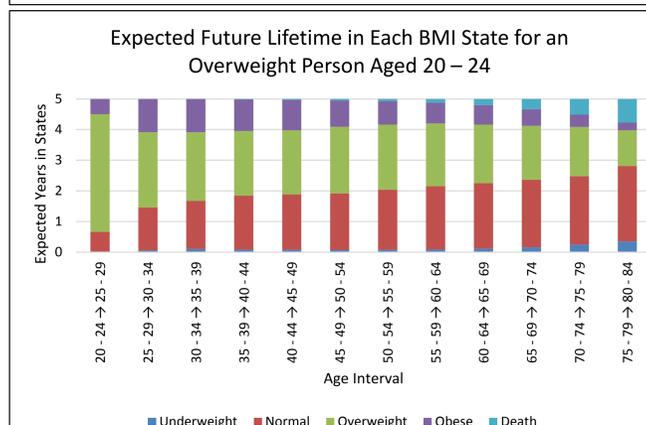
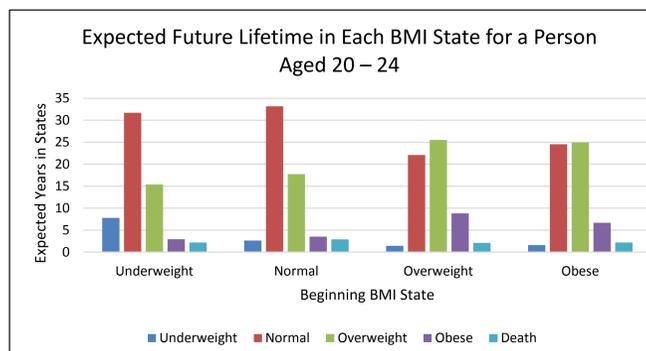
- Investigate such transitions among BMI states, specifically ...
  1. Compare BMI transition probabilities in 2 different time periods
  2. Investigate length of time in BMI states
  3. Sensitivity analyses

## Comparisons

- Compare 1989 – 1991 and 2009 – 2011
- Ages 20 – 49 at beginning of each period
- Empirically calculate, for quinquennial age intervals, age-specific transition probabilities among BMI states and each BMI state → death
- Decreased transition probabilities of different state → normal state
- Increased transition probabilities of different state → overweight or obese states
- Increased transition probabilities of normal state → different state

## Time in States

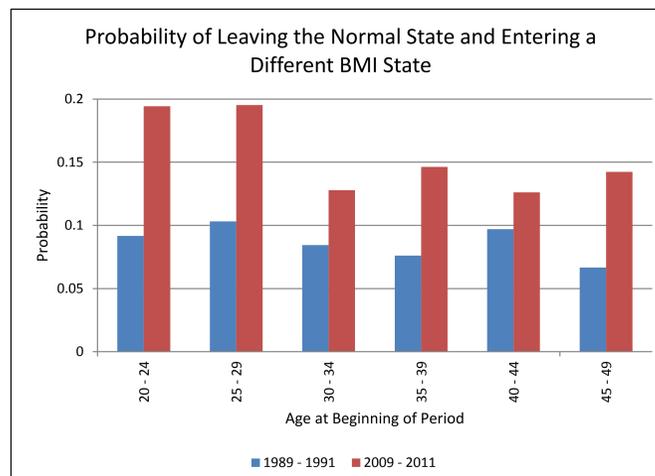
- 2006 – 2011
- Ages 20 – 79 at beginning of period
- Empirically calculate 5-year age-specific transition probabilities
- Projected future life time in each state
- Generally, regardless of the BMI state someone starts in, most time spent in the normal state



## Data

- China Health and Nutrition Survey (CHNS)
- By WHO standards:

BMI	BMI Category
< 18.5 kg/m <sup>2</sup>	Underweight
18.5 – 25 kg/m <sup>2</sup>	Normal
25 – 30 kg/m <sup>2</sup>	Overweight
> 30 kg/m <sup>2</sup>	Obese



## Conclusion

- More transitions into overweight and obese states and fewer into normal state over 2 decades
- Most of life spent in normal state, regardless of starting BMI state – promising from a policy standpoint
- Economically, policies to reduce underweight and overweight prevalence should be directed toward the young demographic who have more future productive years

Contact: [ngcarmen@sas.upenn.edu](mailto:ngcarmen@sas.upenn.edu)