

# Packaging & our Food System in the Future

Presented on 5/9/06 at the

## IFT Food Packaging Research Summit

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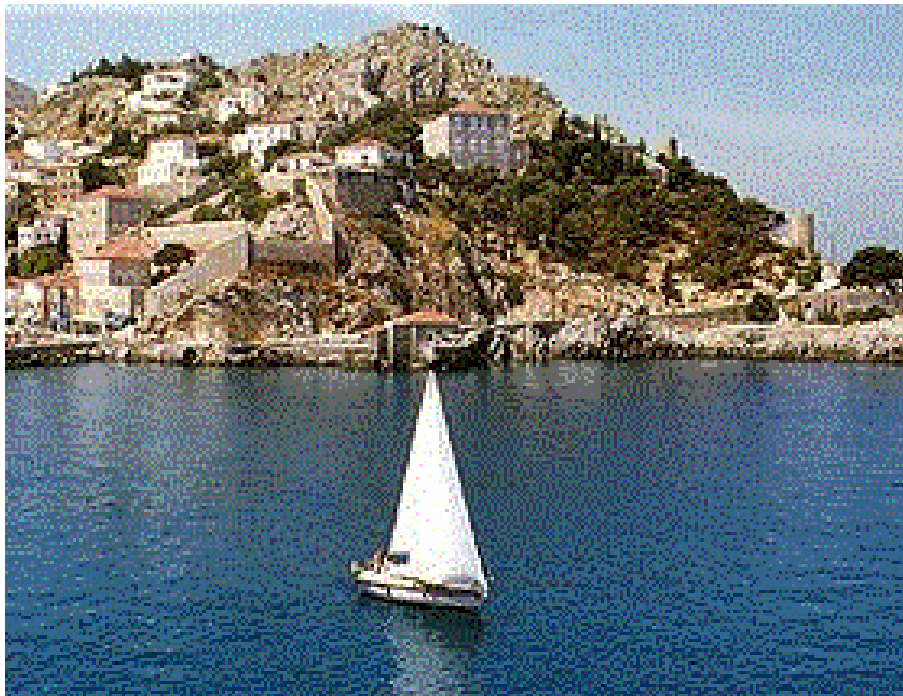
[www.foodscience.psu.edu](http://www.foodscience.psu.edu)



Welcome to Penn State



***“Beginning is the most important part of the work”***  
***Plato***



# Thanks to

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- **David Hughes**
- **Gil Leveille**
- **Jung Han**
- **Gilles Kouassi**

# Discussion Topics

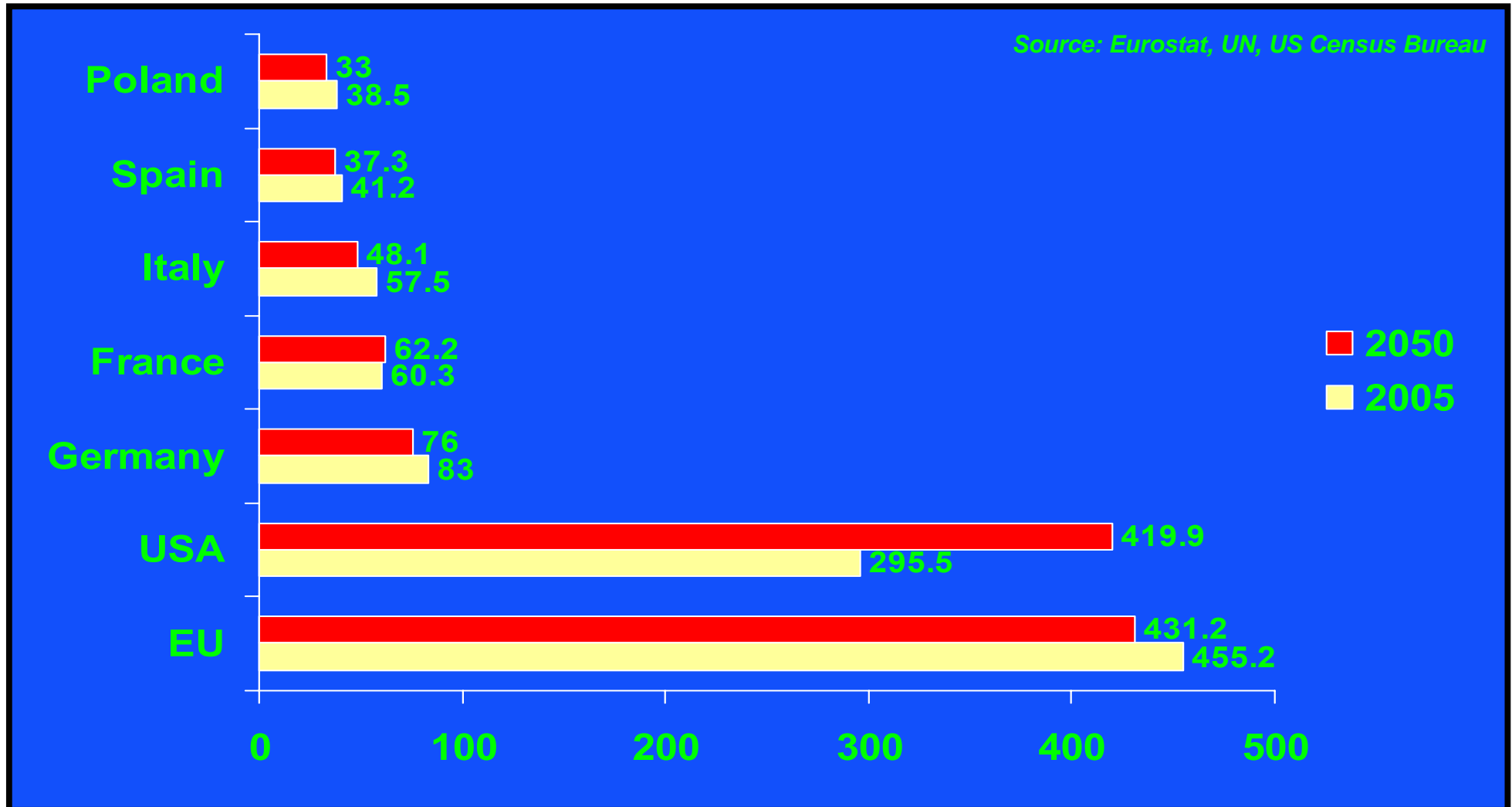
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- **Mega - Trends**
  - **Demographics**
  - **Consumer Trends & Concerns**
- **Food Industry Drivers**
- **Science and Technology**
- **Opportunities for the Future**

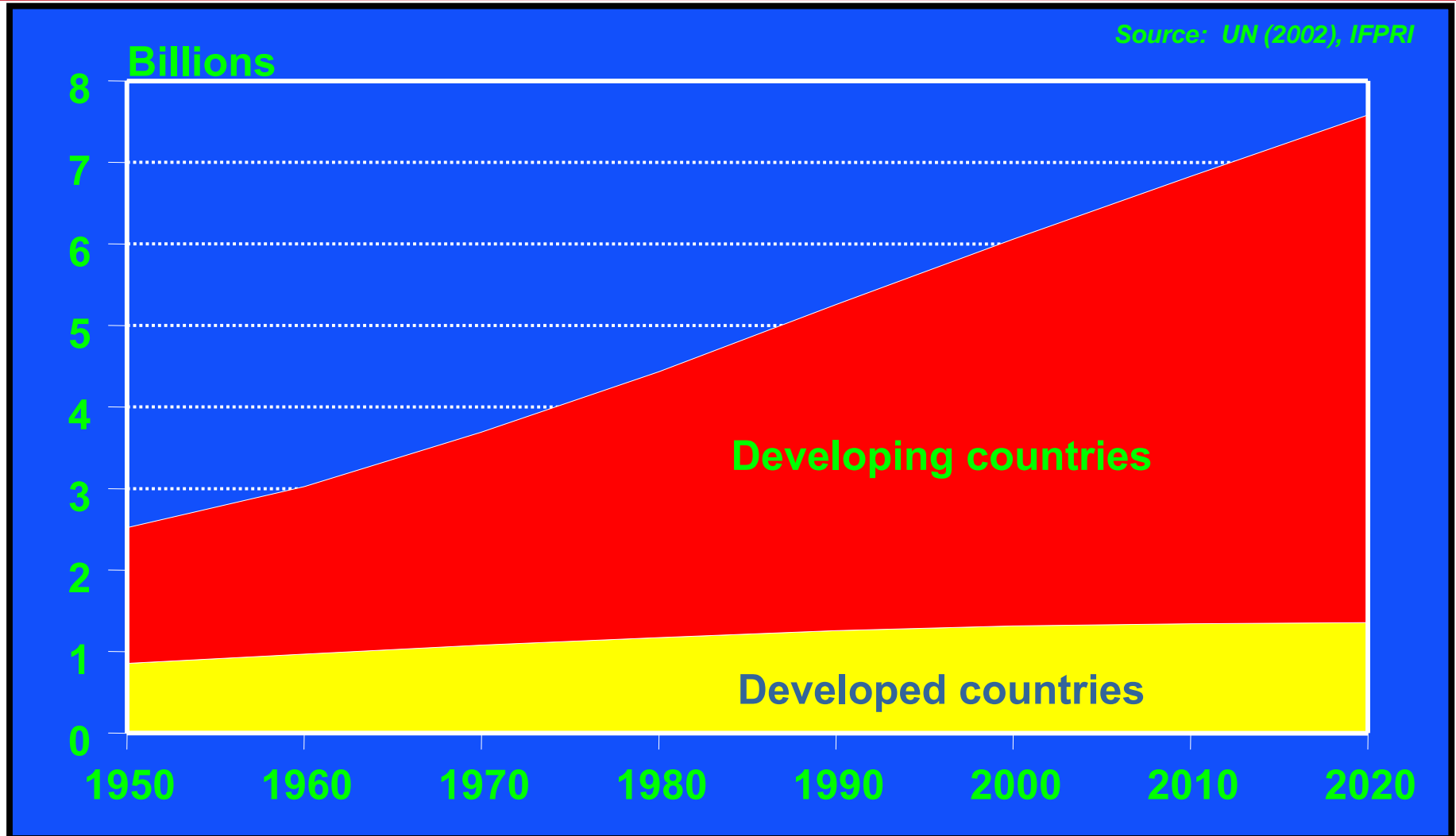
# Mega-Trends

- **Population size and growth rate**
- **Race and Ethnicity**
- **Age structure**
- **Household size and structure**
- **Education**
- **Employment structure**
- **Income level and distribution**
- **Obesity**

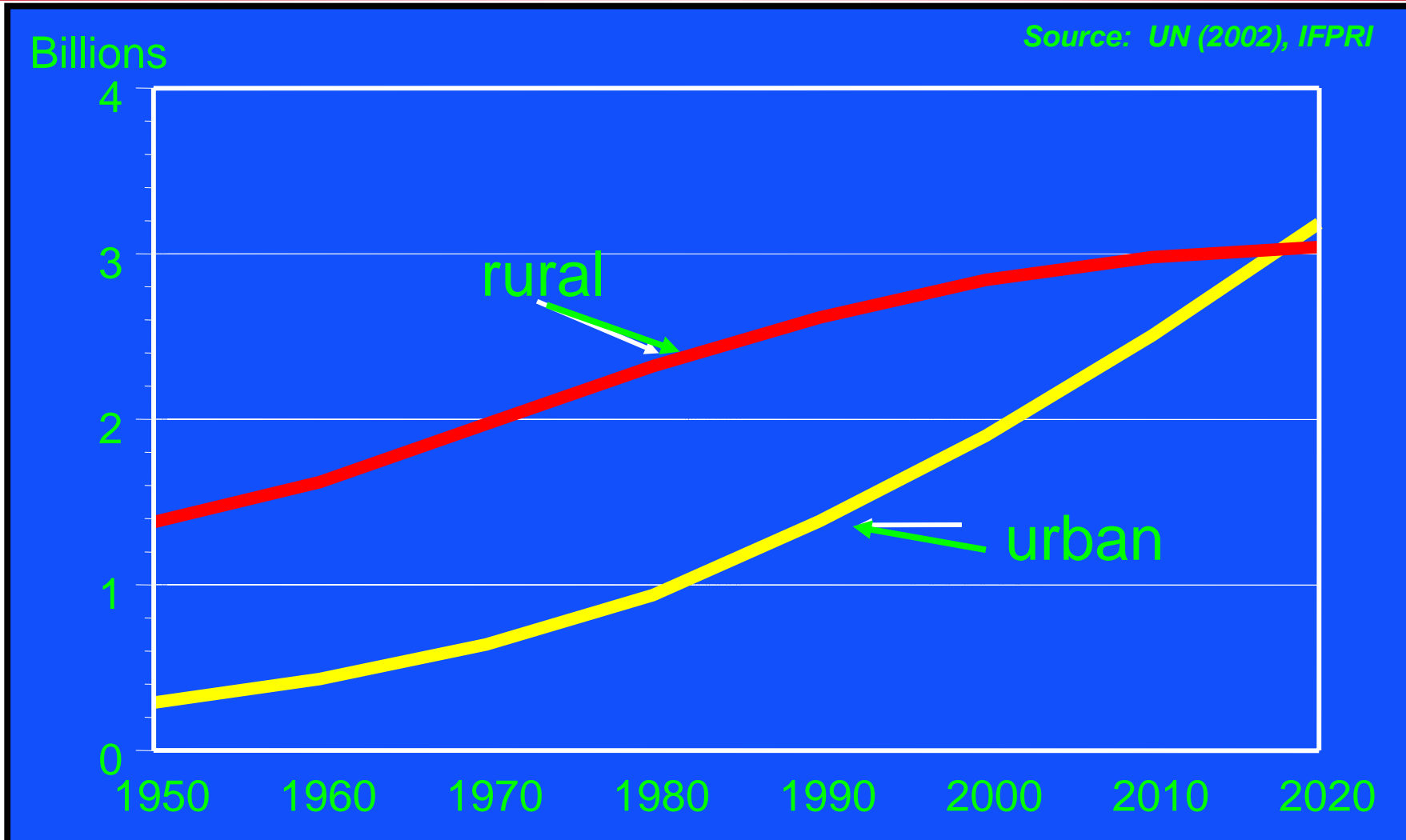
# Population (Million) in Selected Countries 2005 versus 2050



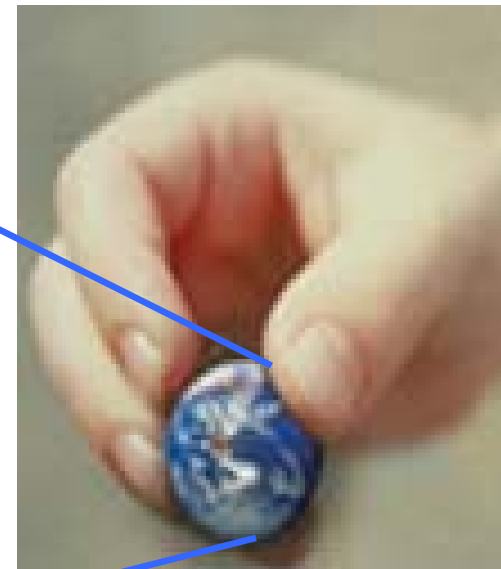
# World Population, 1950-2020



# Urban and Rural Population in Developing Countries, 1950-2020



# If the World was a Village of 100 People



# If the World was a Village of 100 People

- 57 Asians  
21 Europeans  
14 Western Hemisphere  
8 Africans
- 70 People of Color
- 70 Non-Christians
- 70 Unable to Read
- 50 Suffer from Malnutrition
- 80 Live in Substandard Housing
- 1 College Educated
- 6 own 50% of the World's wealth  
(all from the USA)



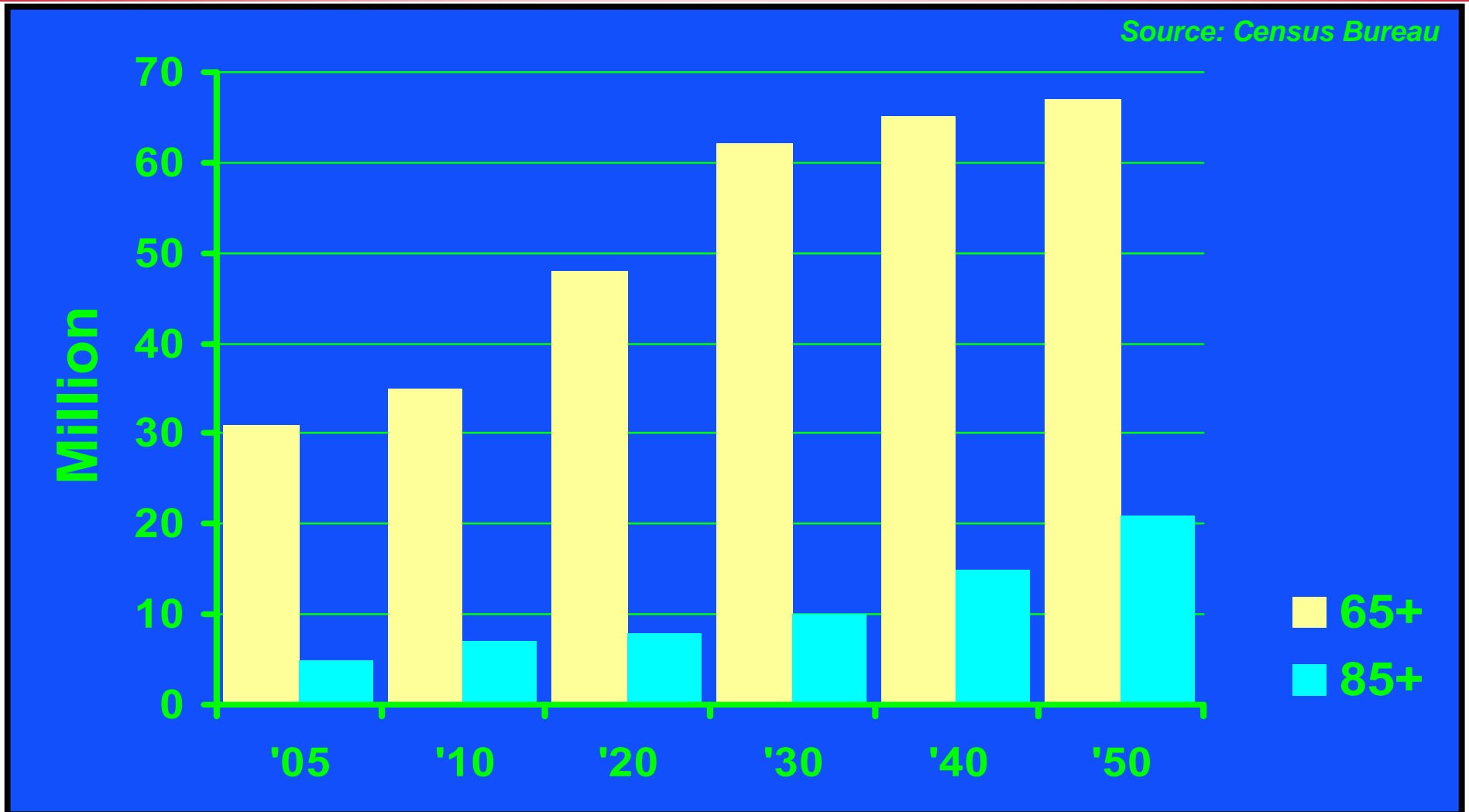
# The Graying of America

## We are aging



# America is getting older:

The number of Americans 65 and older will double by 2040



# The Browning of America

## We are more diverse

### ● 1990

- White - 75.6%
- Black -11.7%
- Hispanic - 9.0%
- Others -3.6%

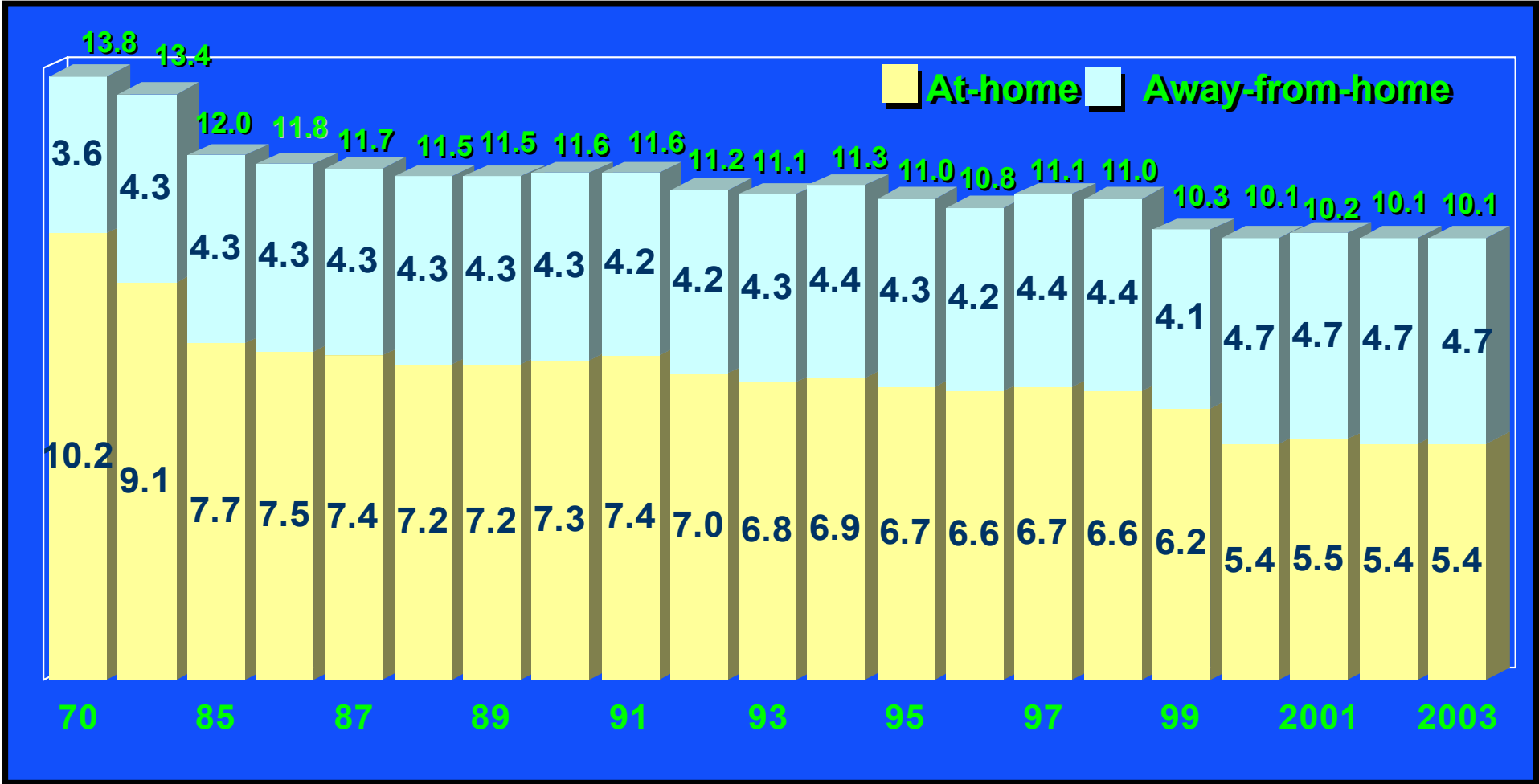
### ● 2000

- White - 69.1%
- Black -12.1%
- Hispanic -12.5%
- Others - 4.6%

# Key Groups

- ***Matures* - 60 years and older - more women (57%), fewer minorities (13%)**
- ***Boomers* - age 41-59 - have most disposable income**
- ***Gen X* - age 29-40 - parents**
- ***Gen Y* - age 11-28 - 25% non-white**

# U.S. Food Expenditures as a Share of Disposable Personal Income, 1970-2003



Source: ERS/USDA

# The Obesity Epidemic

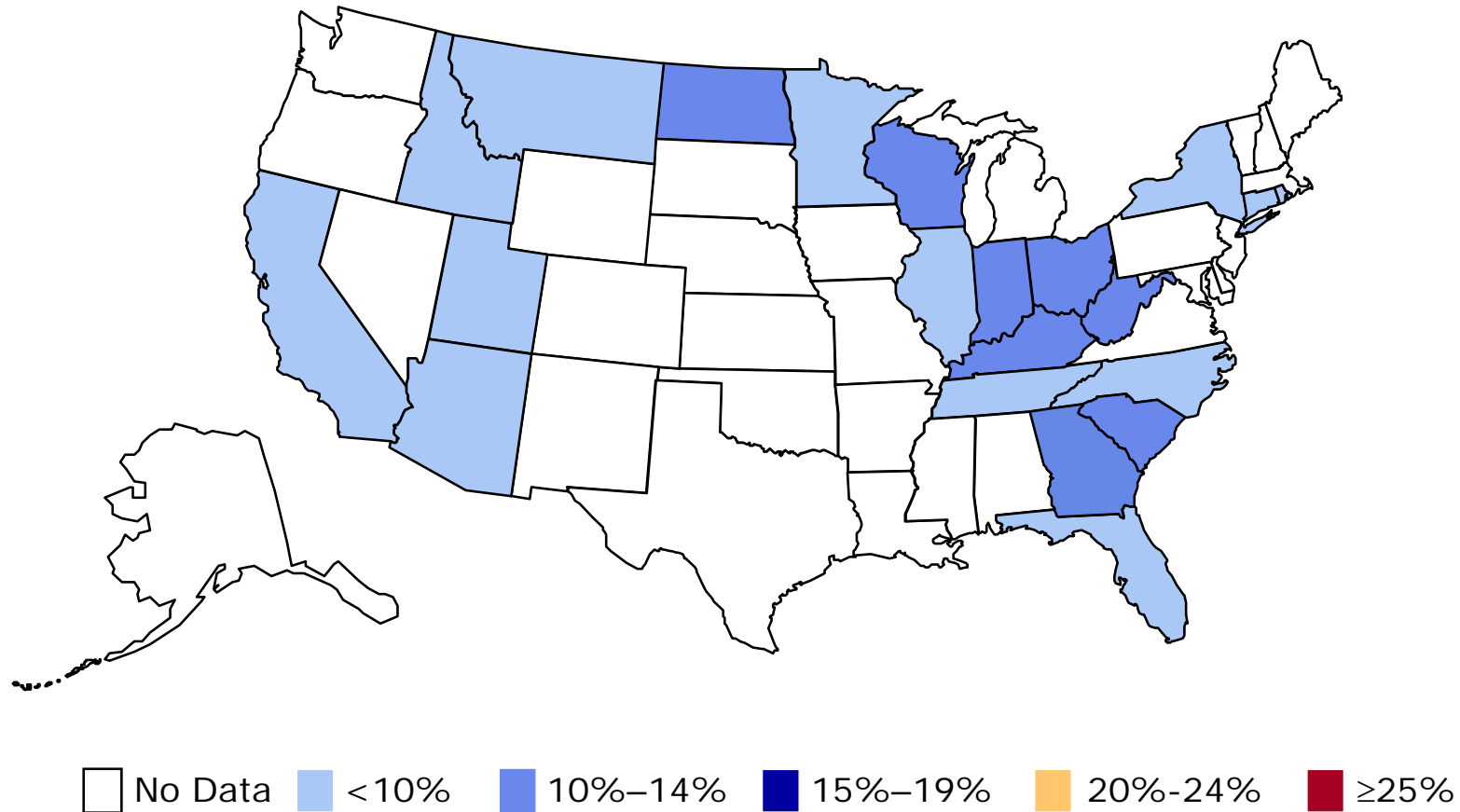


In 2001:  
**66%** of US  
Adults were  
Obese or  
Overweight

# Obesity Trends\* Among U.S. Adults

## BRFSS, 1985

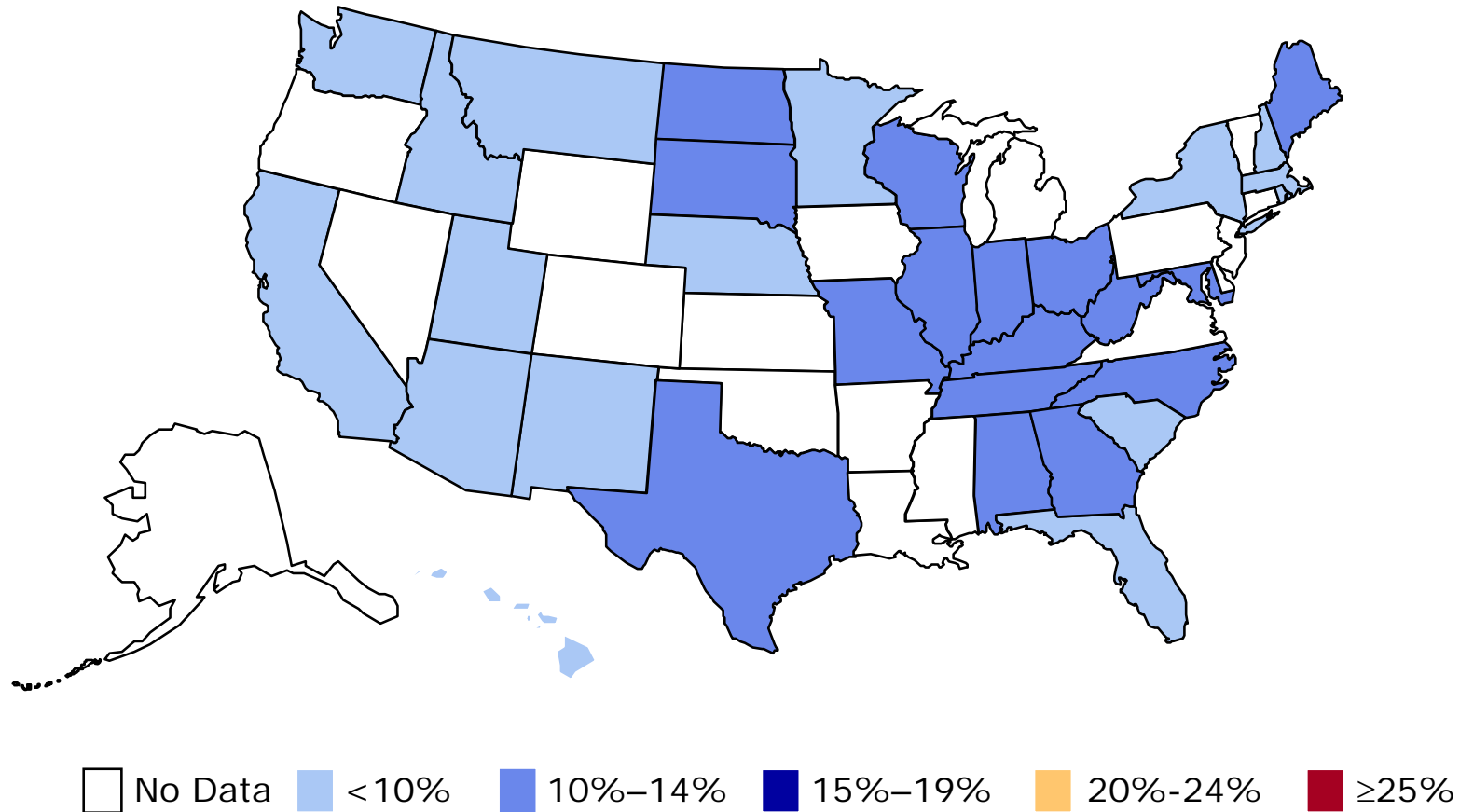
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1987

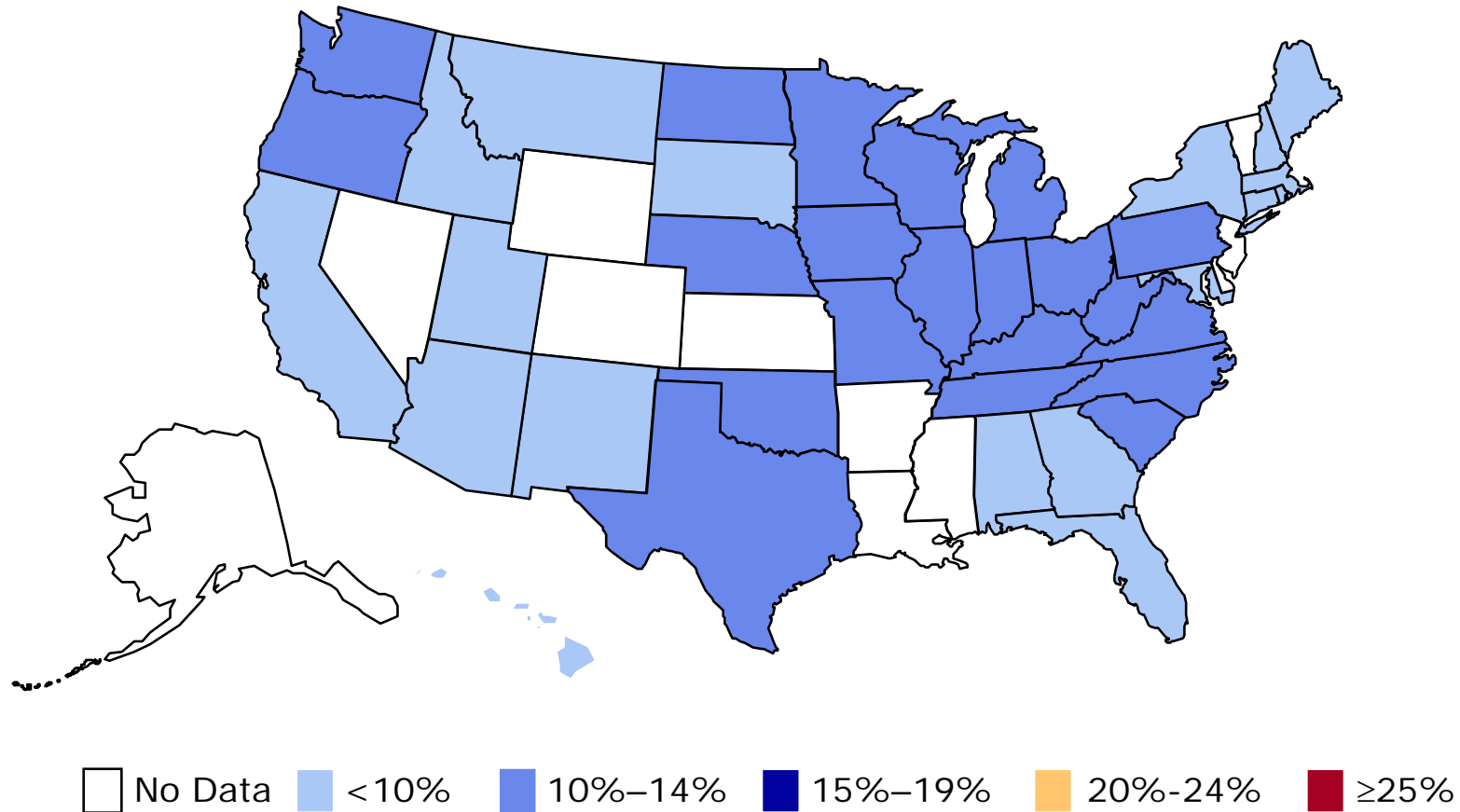
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1989

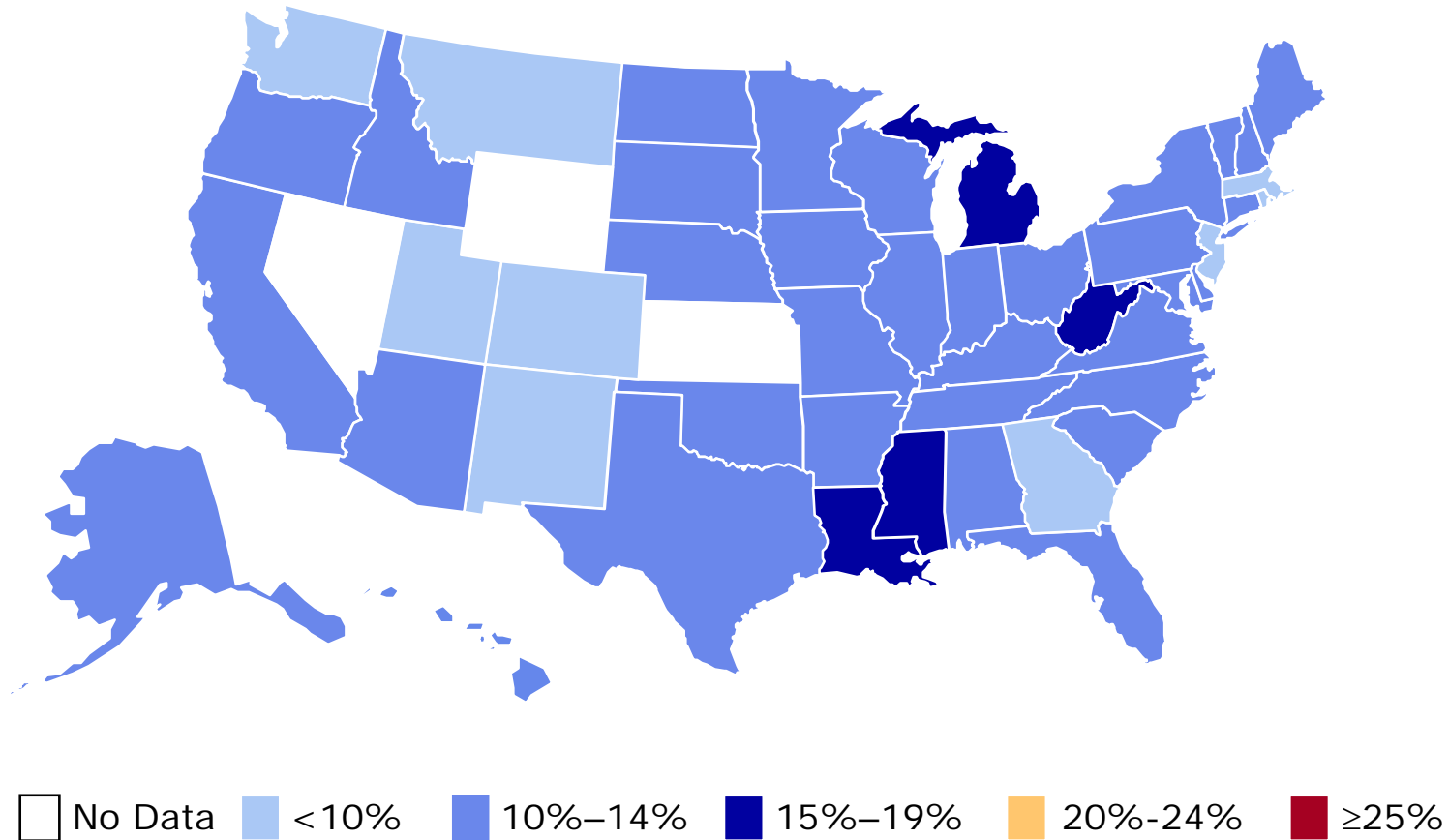
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1991

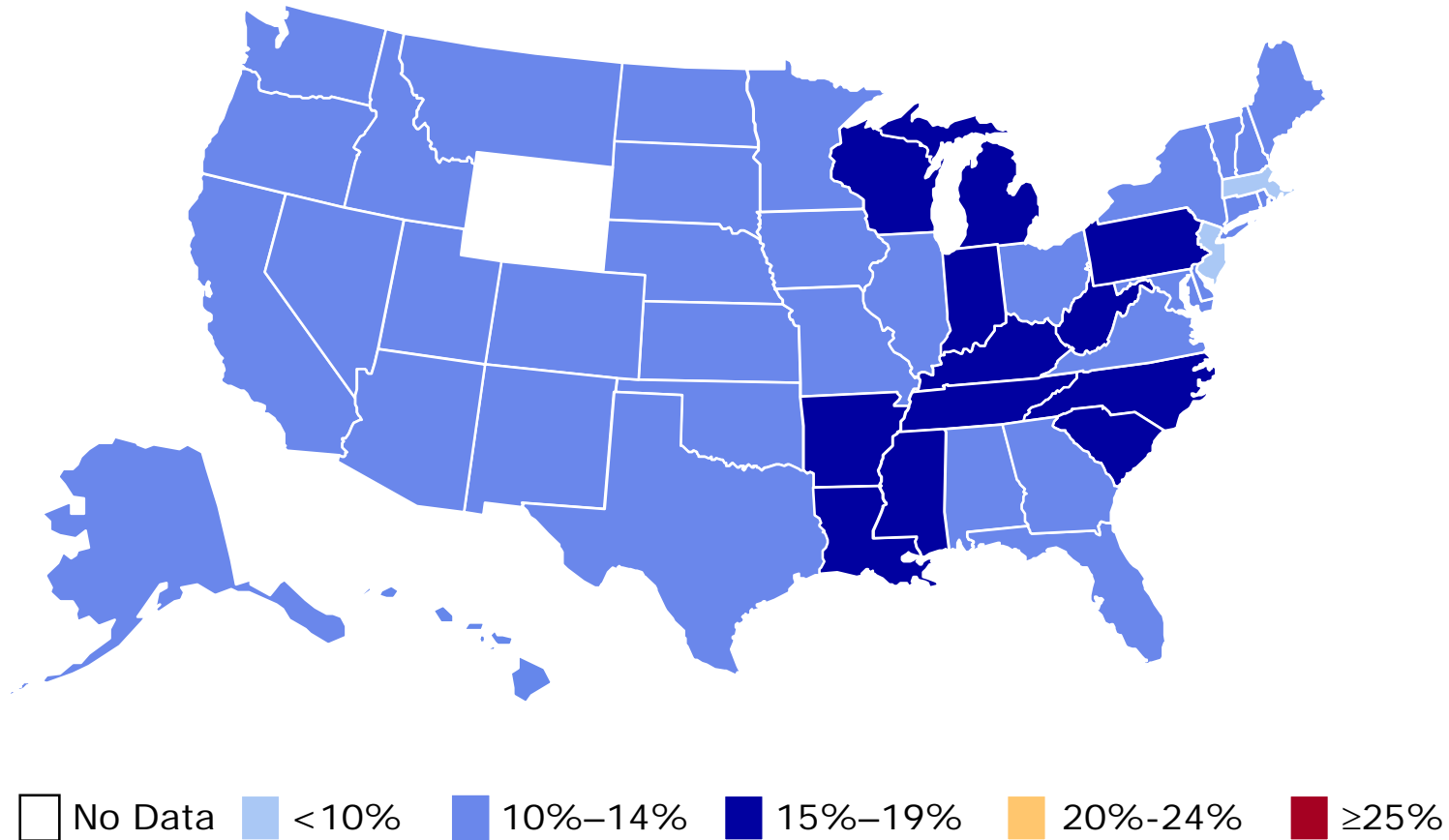
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1993

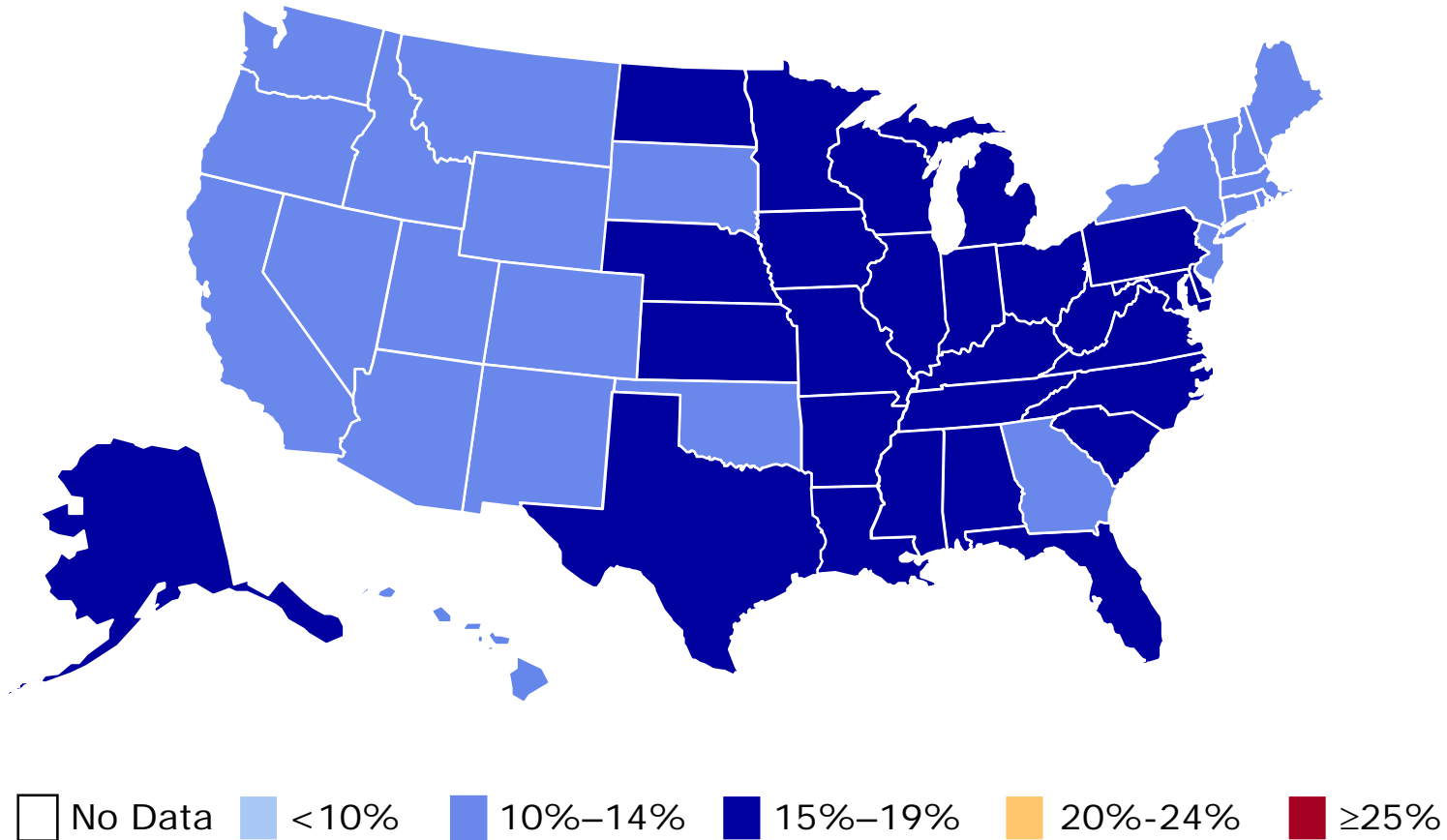
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1995

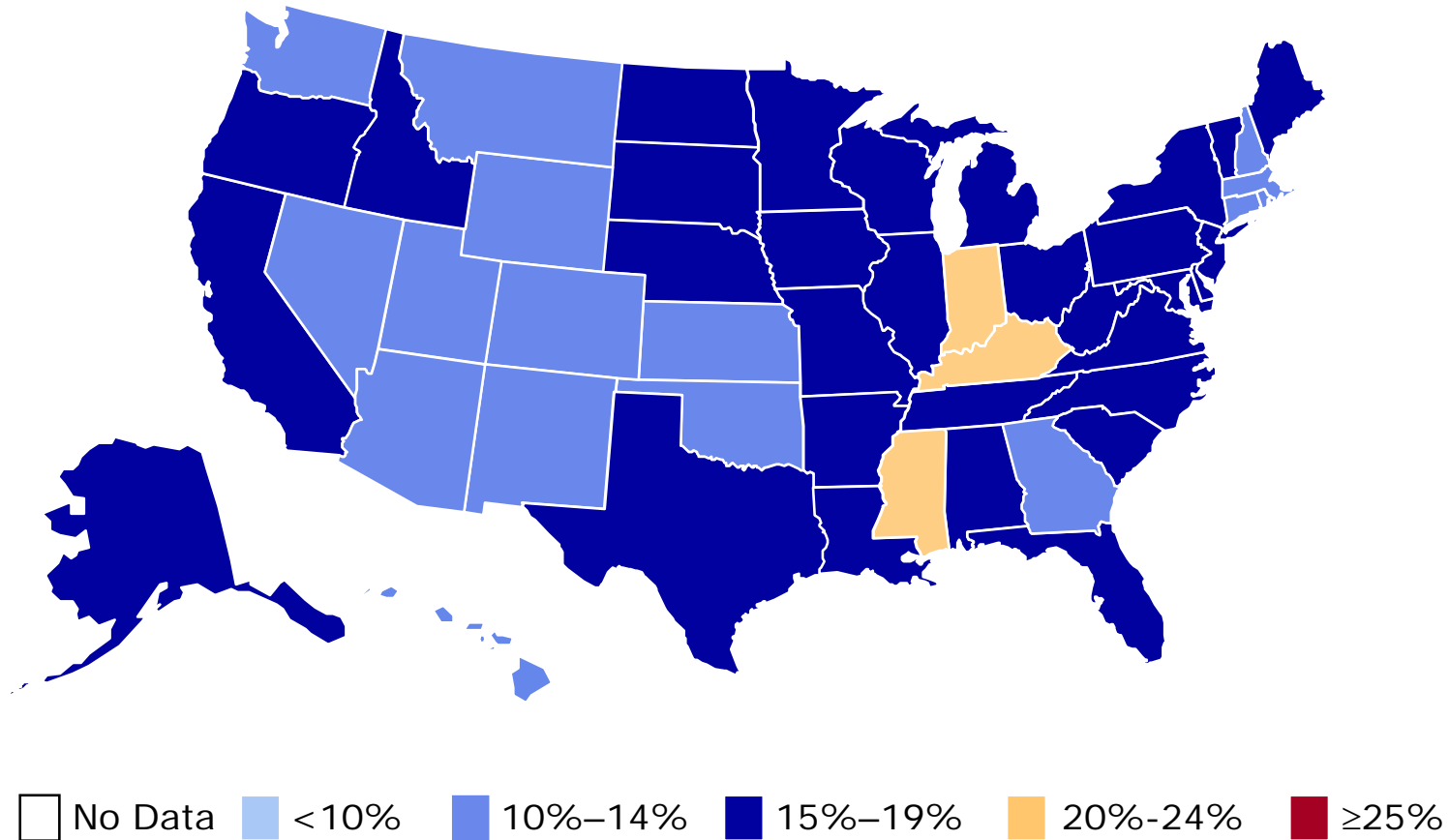
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 1997

(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)

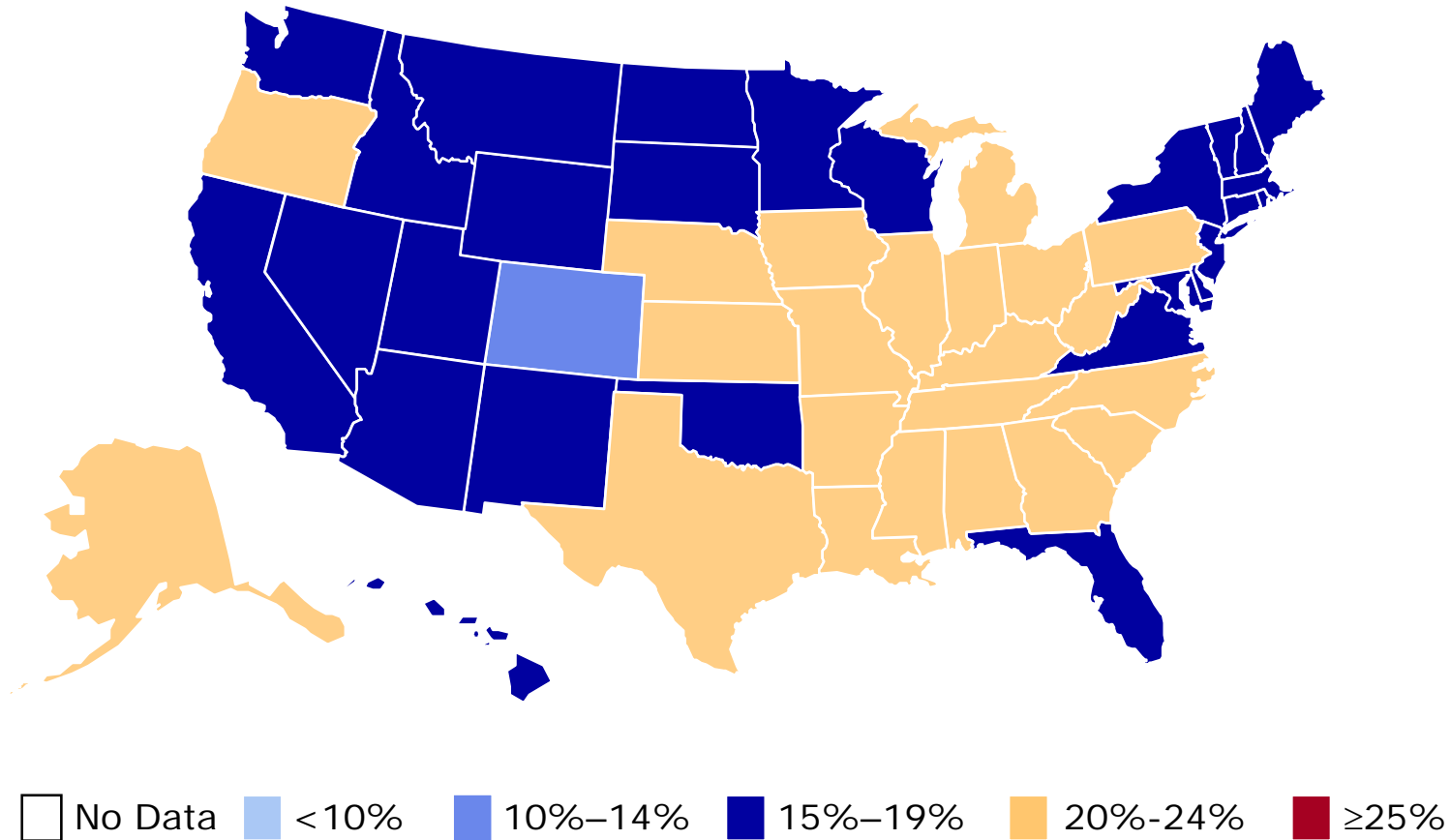




# Obesity Trends\* Among U.S. Adults

## BRFSS, 2000

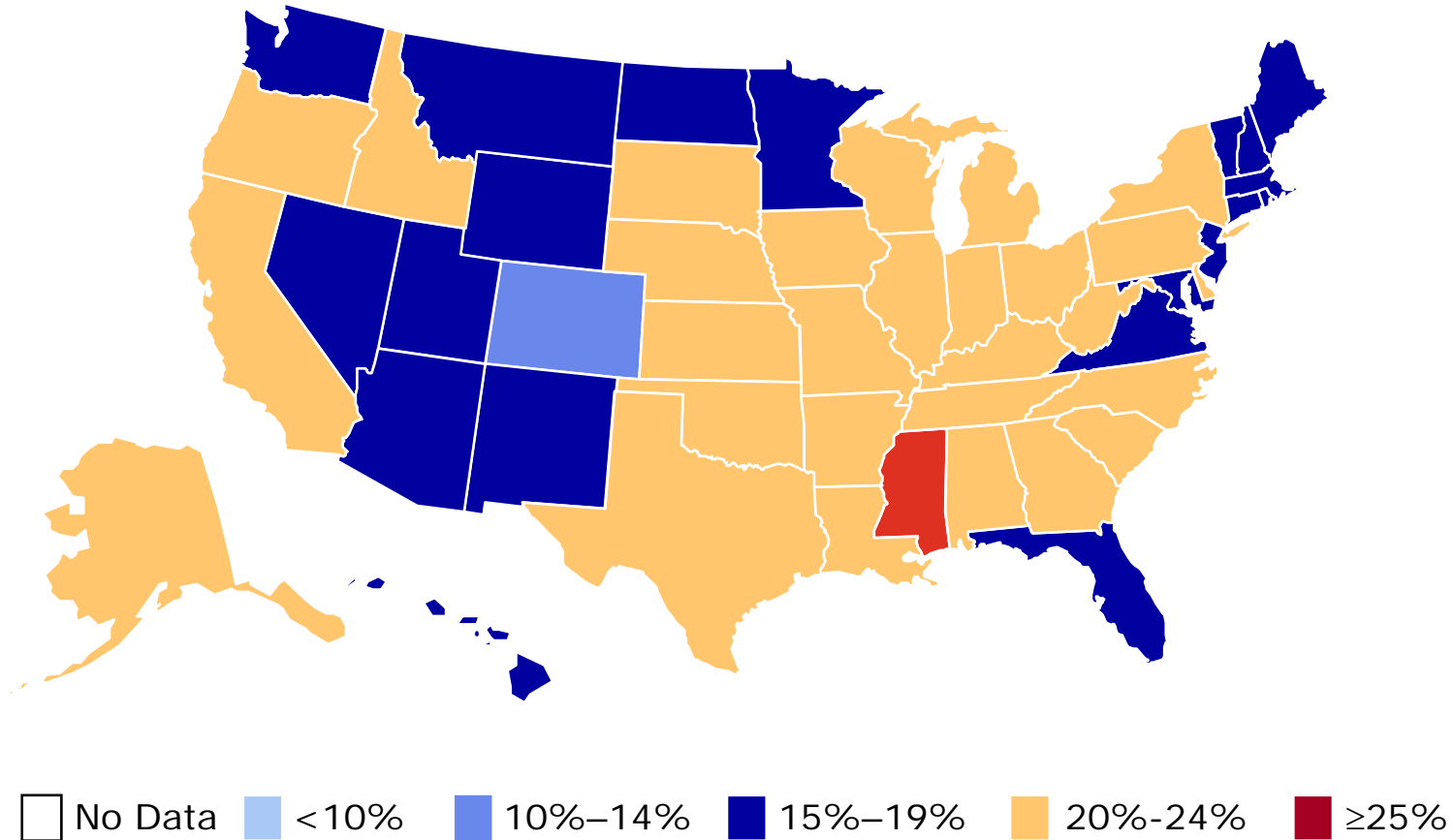
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 2001

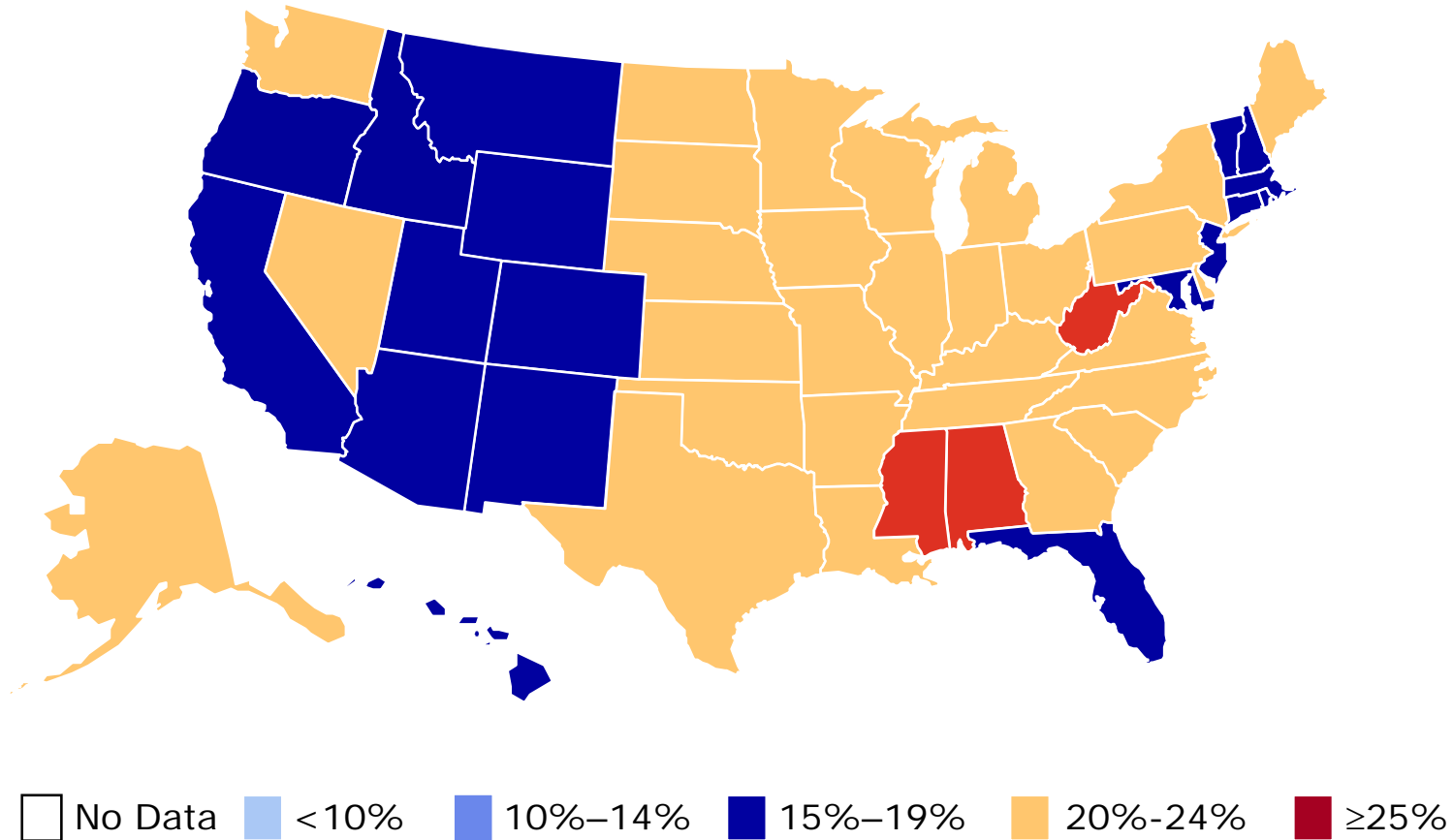
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5' 4" woman)



# Obesity Trends\* Among U.S. Adults

## BRFSS, 2002

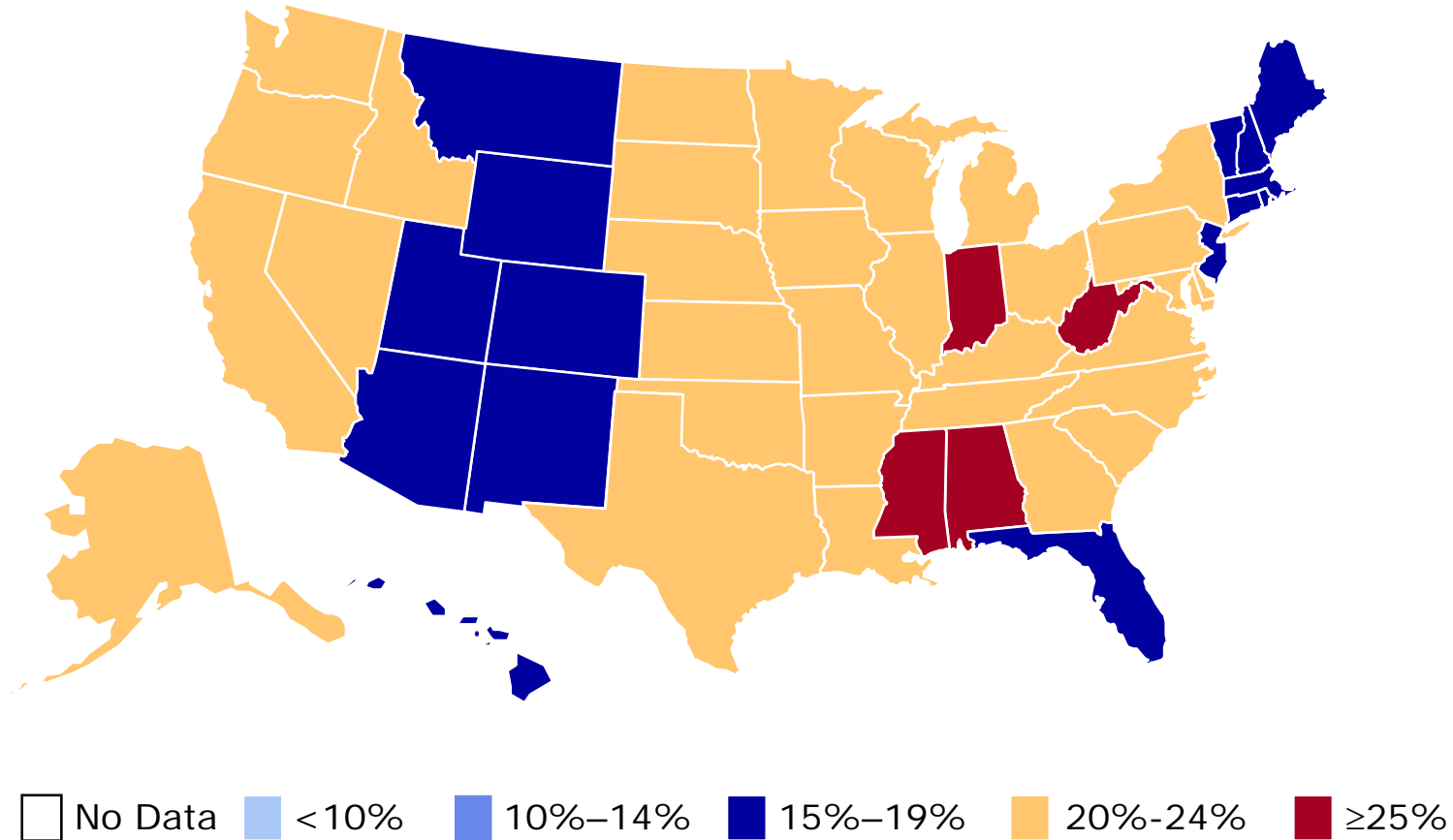
(\*BMI  $\geq 30$ , or  $\sim 30$  lbs overweight for 5'4" person)



# Obesity Trends\* Among U.S. Adults

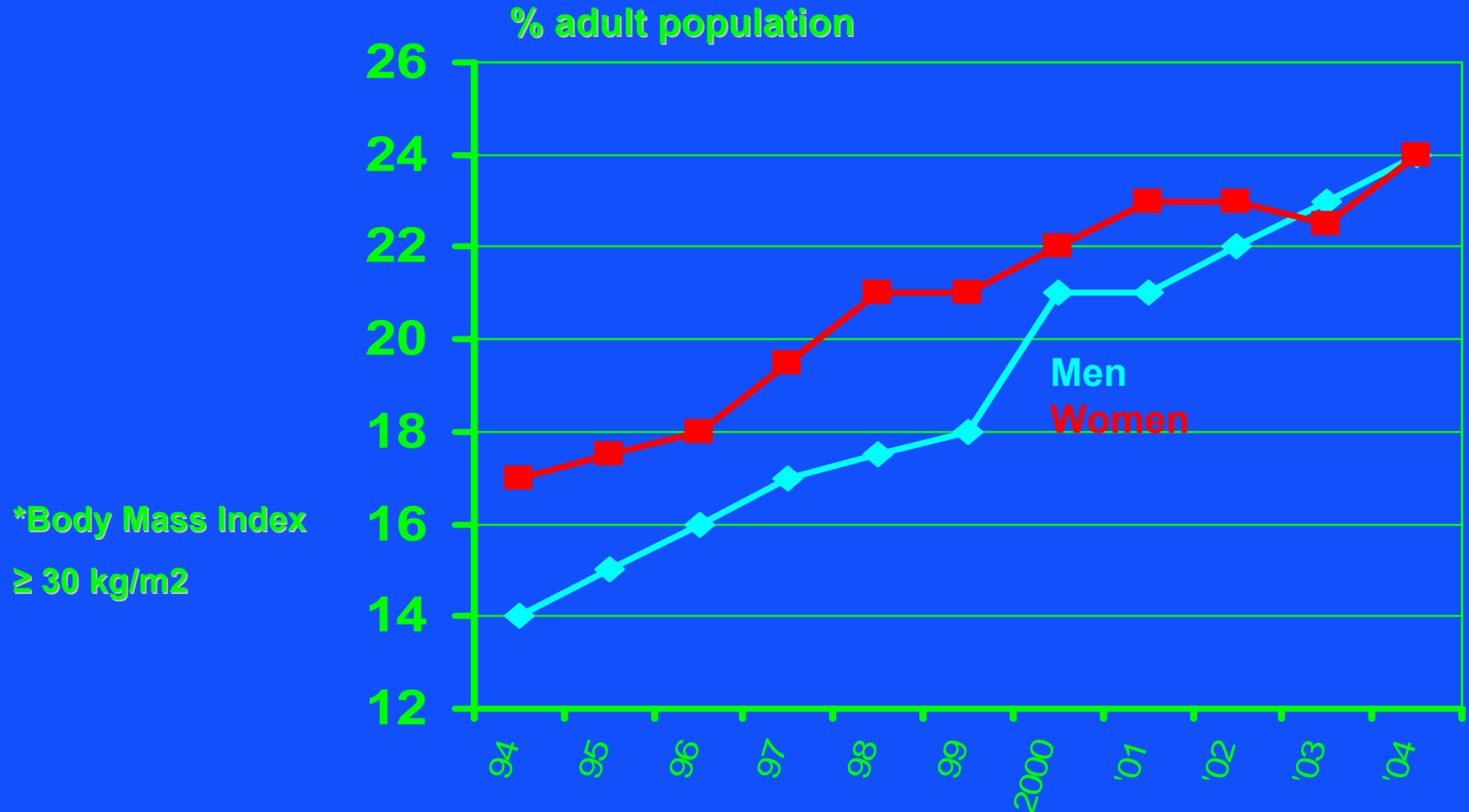
## BRFSS, 2003

(\*BMI  $\geq 30$ , or about 30 lbs overweight for 5'4" person)





# Obesity Trends\* in England, 1994-2004



Source: Department of Health

# Mega-Trends

- **Population size and growth rate**
- **Race and Ethnicity**
- **Age structure**
- **Household size and structure**
- **Education**
- **Employment structure**
- **Income level and distribution**
- **Obesity**

# What do consumers want?

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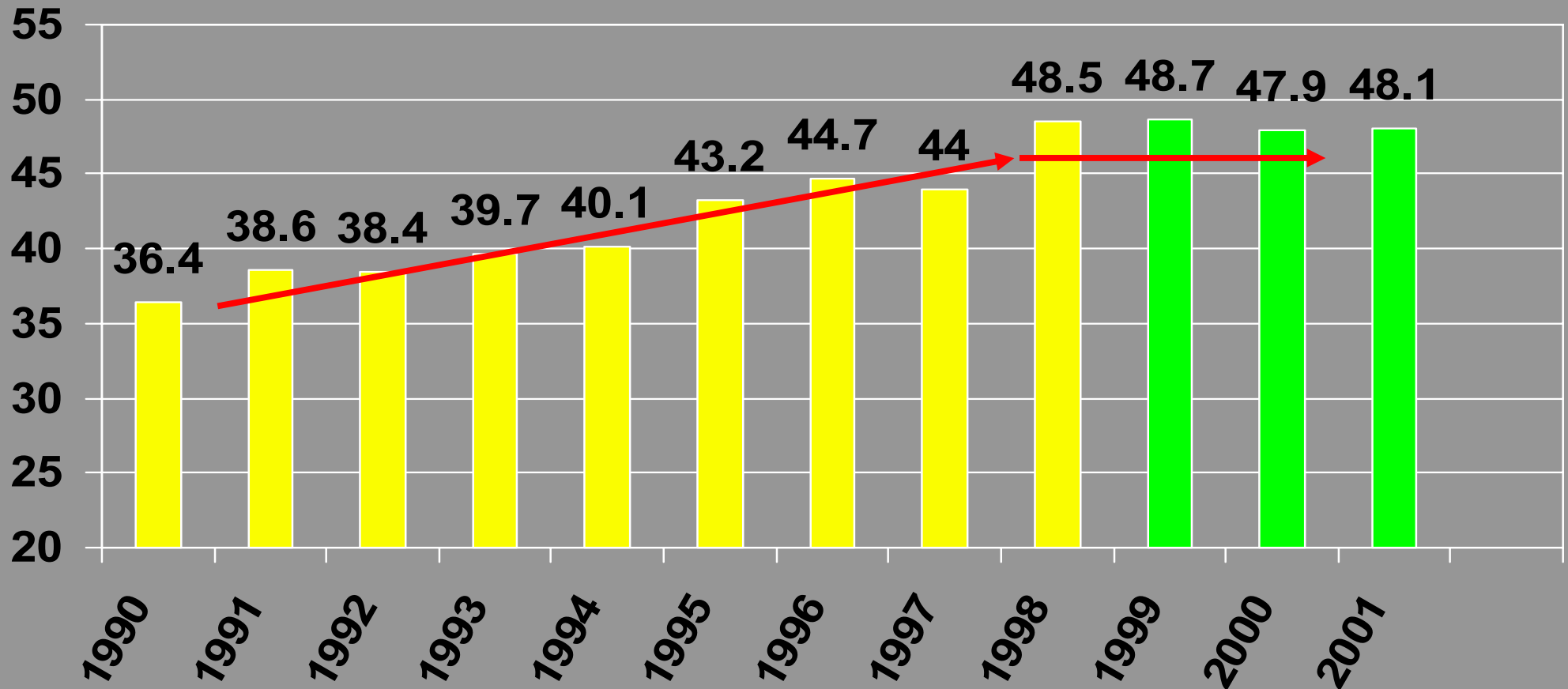
# Drivers of Consumer Purchase Decisions

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- **TASTE**

# “Food taste is more important than how nutritious it is”

Percent that agree with statement (all levels of agreement)



Source: The NPD Group's National Eating Trends<sup>R</sup> Service

# Drivers of Consumer Purchase Decisions

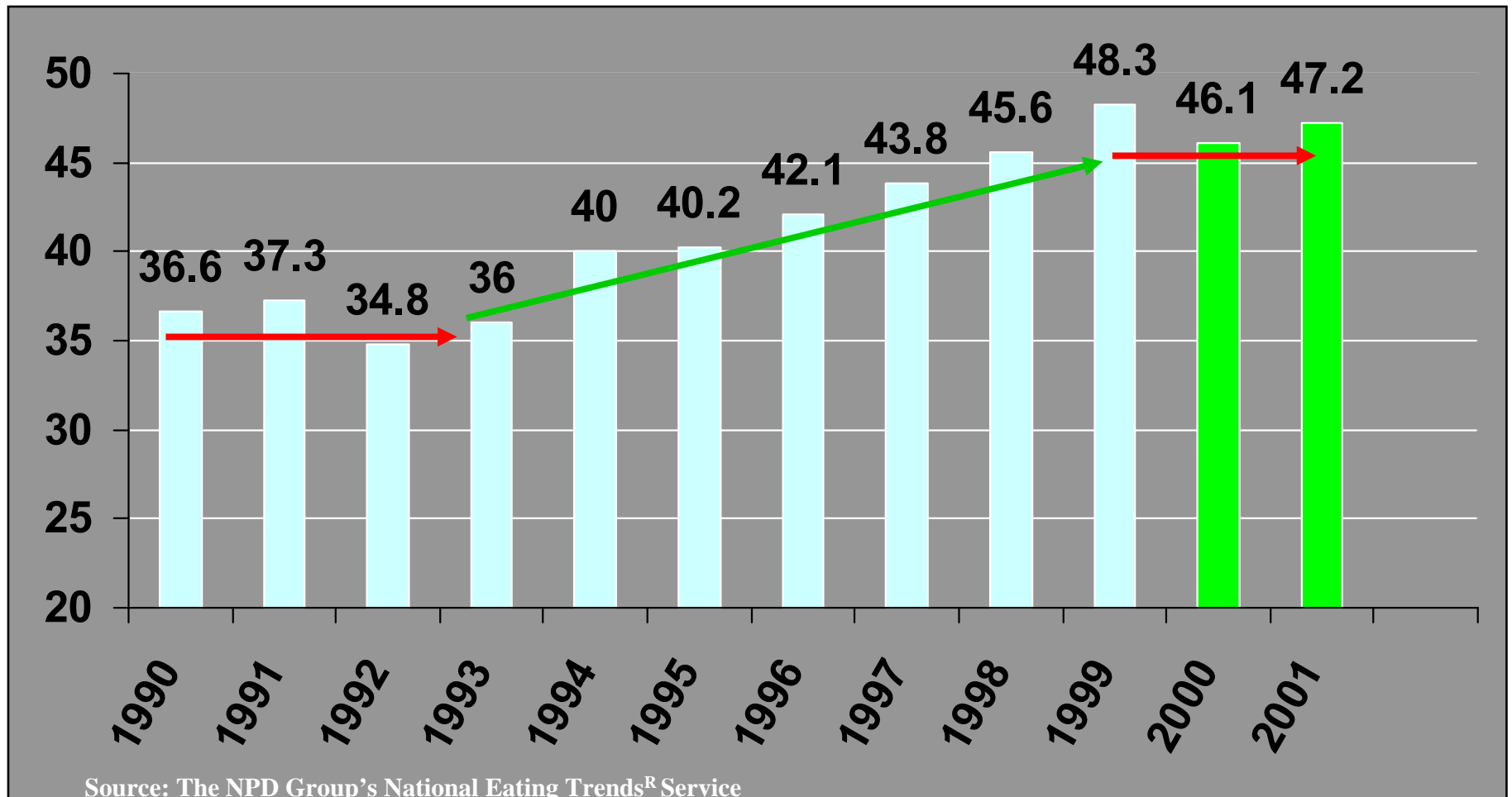
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- **TASTE**

- **CONVENIENCE**

# “Convenience is most important in the foods I eat”

Percent that agree with statement (all levels of agreement)



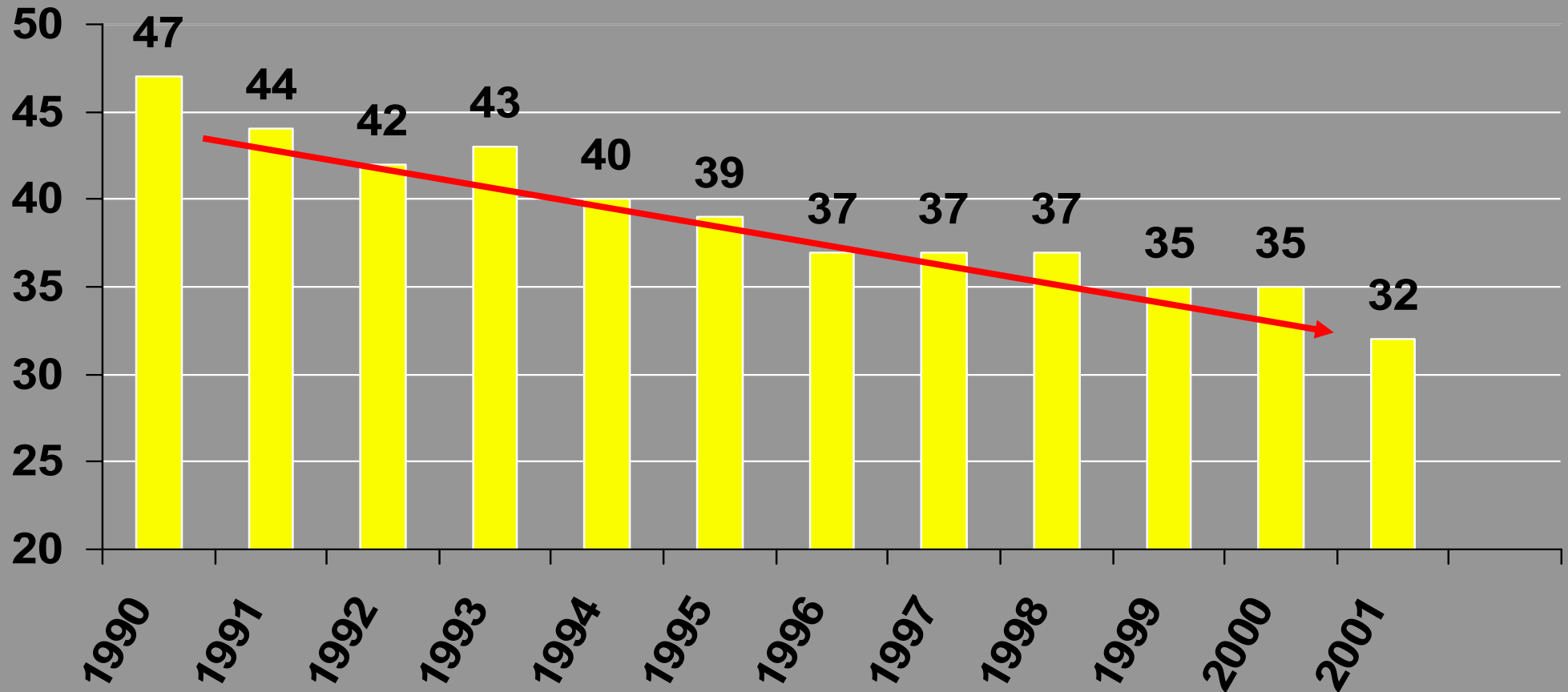
# Drivers of Consumer Purchase Decisions

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- **TASTE**
- **CONVENIENCE**
- **HEALTH**

# “I carefully plan my household meals to be sure they are nutritious”

Percent that completely agree with statement



Source: The NPD Group's National Eating Trends<sup>R</sup> Service

# FMI Trends 2004

## ● How concerned about nutritional content?

- Very concerned

- 2003 - 53% to 2004 - 45%

- Women work 20+ hrs/wk

- 57% to 44%

- Household with children

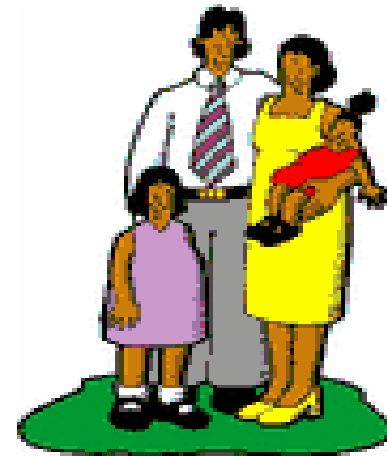
- 48% to 43%

- Ages

- 40-49 - 56% to 51%

- 50-64 - 63% to 48%

- 65 and older - 57% to 45%



# Health

- **Biggest *health* push -**
  - **Fruits,**
  - **salads,**
  - **fresh cut vegetables,**
  - **grains,**
  - **nuts**



# Nutraceuticals - Functional Foods

- Nutraceuticals
- Functional foods
- Dietary Supplements
- Bioactive Ingredients
- Prebiotics/Probiotics



# Drivers of Consumer Purchase Decisions

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- **TASTE**
- **CONVENIENCE**
- **HEALTH**
- **SAFETY**

# FMI Trends 2004

- **Confidence in the safety of food in your supermarket**
  - **82% completely or mostly confident**
  - **Men (85%) vs. women (81%)**
  - **Young (88%) vs. older (78%)**

# Issues Impacting Food Safety

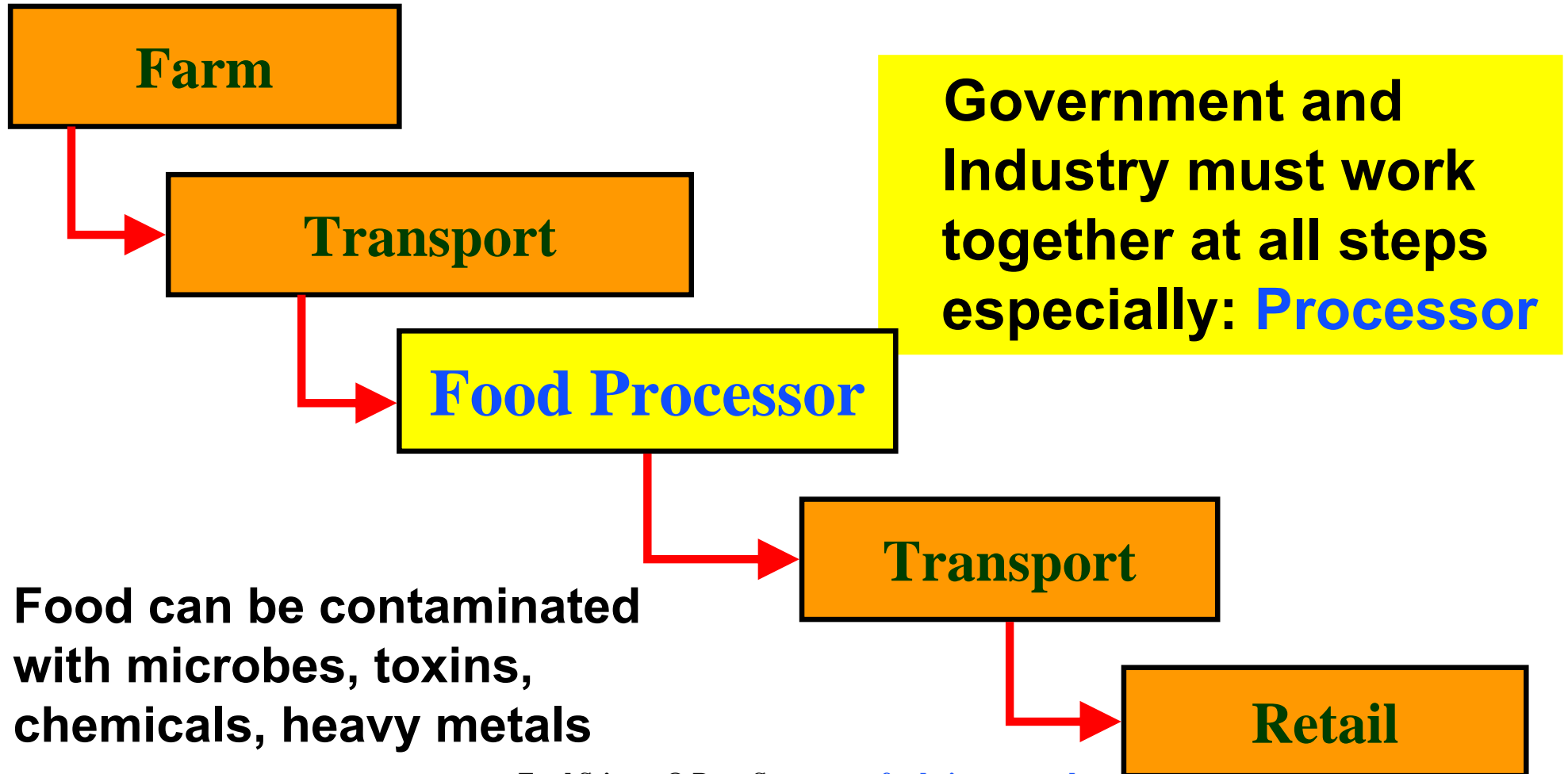
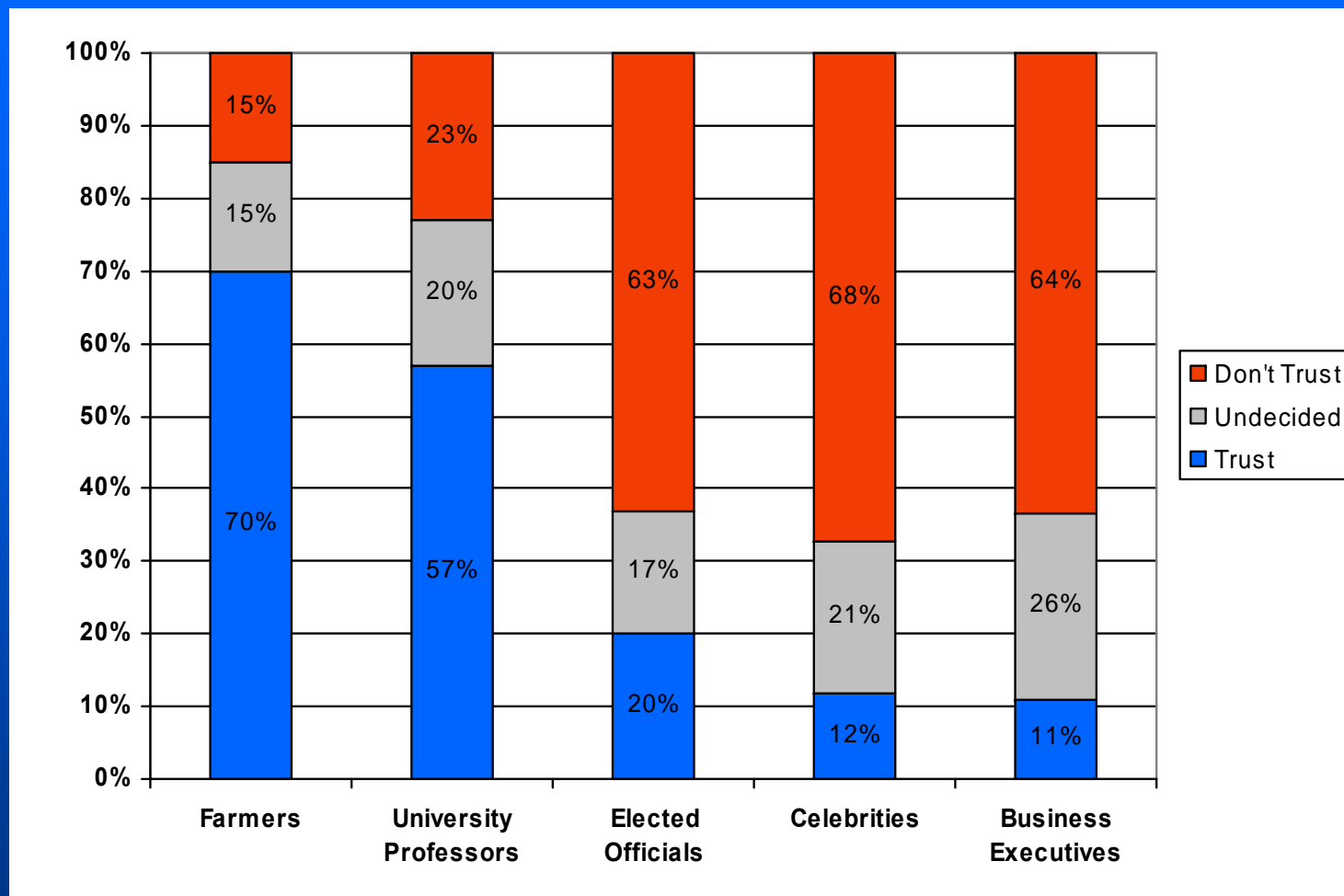
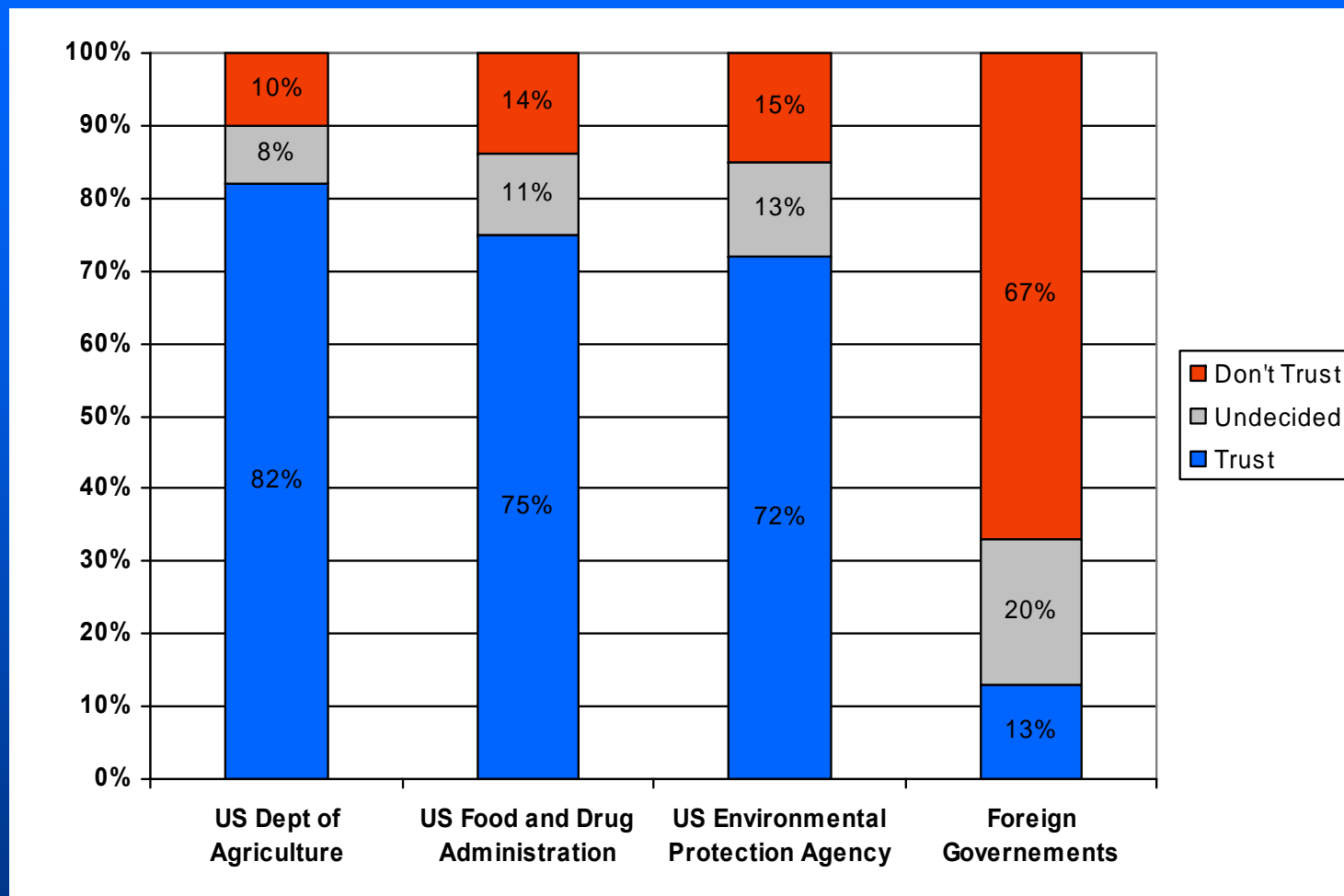


Figure 4. Who do you trust for knowledge about the safety of the foods you eat? (Professional Roles)



Source: Compiled by R.C. Wimberley from S-276 national survey data, items 8e through 8i, N = 819.

Figure 5. Who do you trust for knowledge about the safety of the foods you eat? (Agencies & Governments)



Source: Compiled by R.C. Wimberley from S-276 national survey data, items 8j through 8m, N = 819.

# Issues Impacting Food Safety

- **Microbiological**

- **Microbial pathogens and toxins**

- **Ecology**

- **Detection**

- **Prevention/Control in foods**

- **HACCP, GMP, Sanitation**

- **New/emerging pathogens**

- **Microbial resistance to antibiotics**

# Issues Impacting Food Safety

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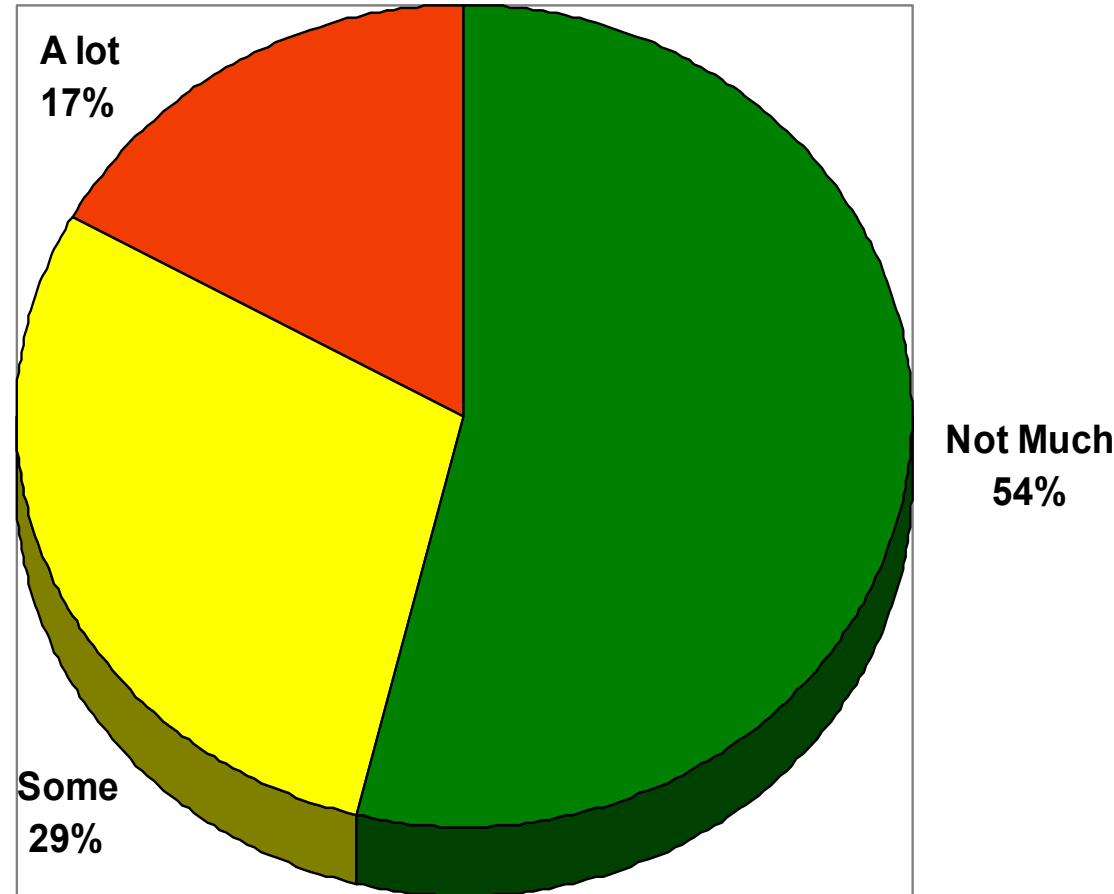
- **Biotechnology**
  - **Food safety**
  - **Environmental aspects**
  - **Developing/developed countries**
  - **Culture/ethics**
  - **Benefit to consumer**
  - **Labeling/Traceability**

# Issues Impacting Food Safety

- **Bioterrorism - Impacts**
  - **Economic destabilization**
  - **Loss of confidence**
  - **Social instability**
  - **Food Insecurity**

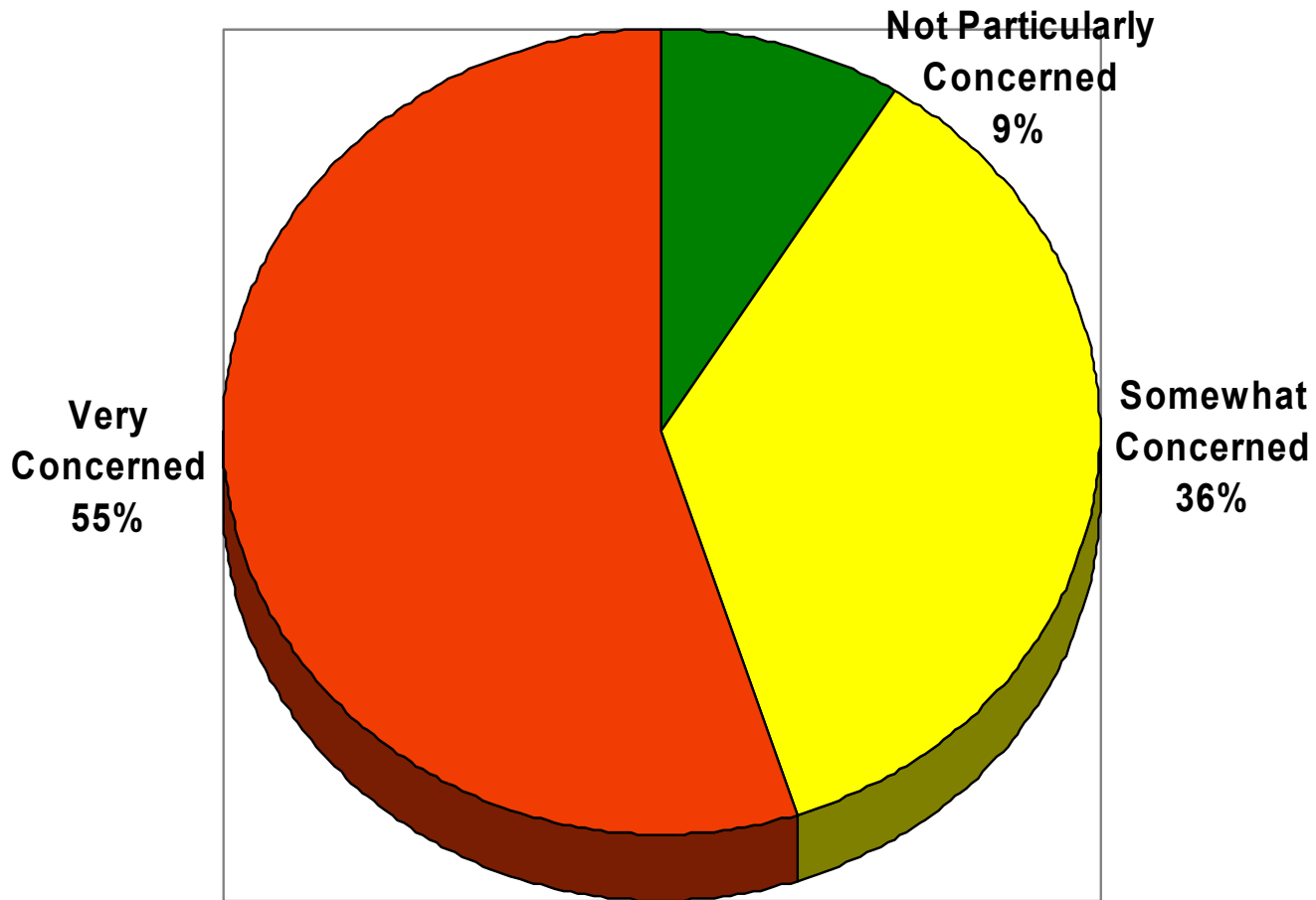
(Peter Chalk, World Food Prize Symposium, Des Moines, October, 2001)

Figure 6. Before the September 11 terrorist attack on the United States, had you thought about food security...



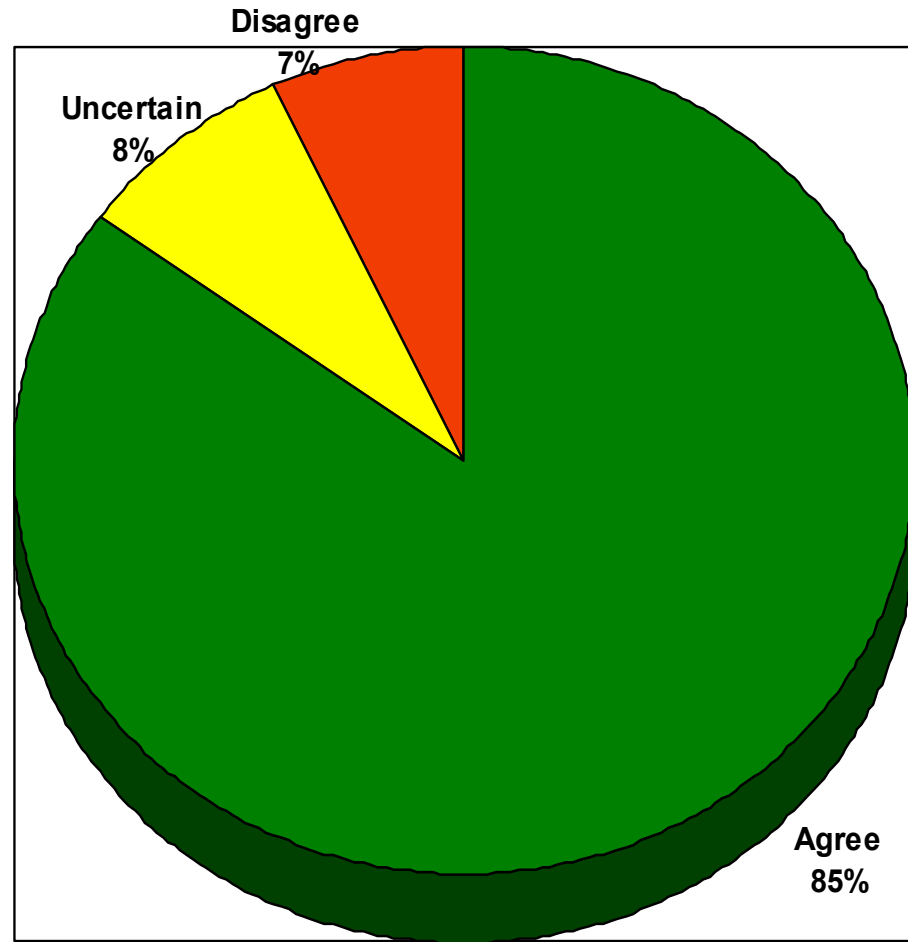
Source: Compiled by R.C. Wimberley from S-276 national 2001 survey data, item 11a, n = 196.

Figure 7. Now, after the terrorist attack on September 11, how concerned are you with our food supply?



Source: Compiled by R.C. Wimberley from S-276 national 2001 survey data, item 11b, n = 196.

Figure 8. Of the possible ways that terrorists might attack people in the United States, our food supply is a major concern.



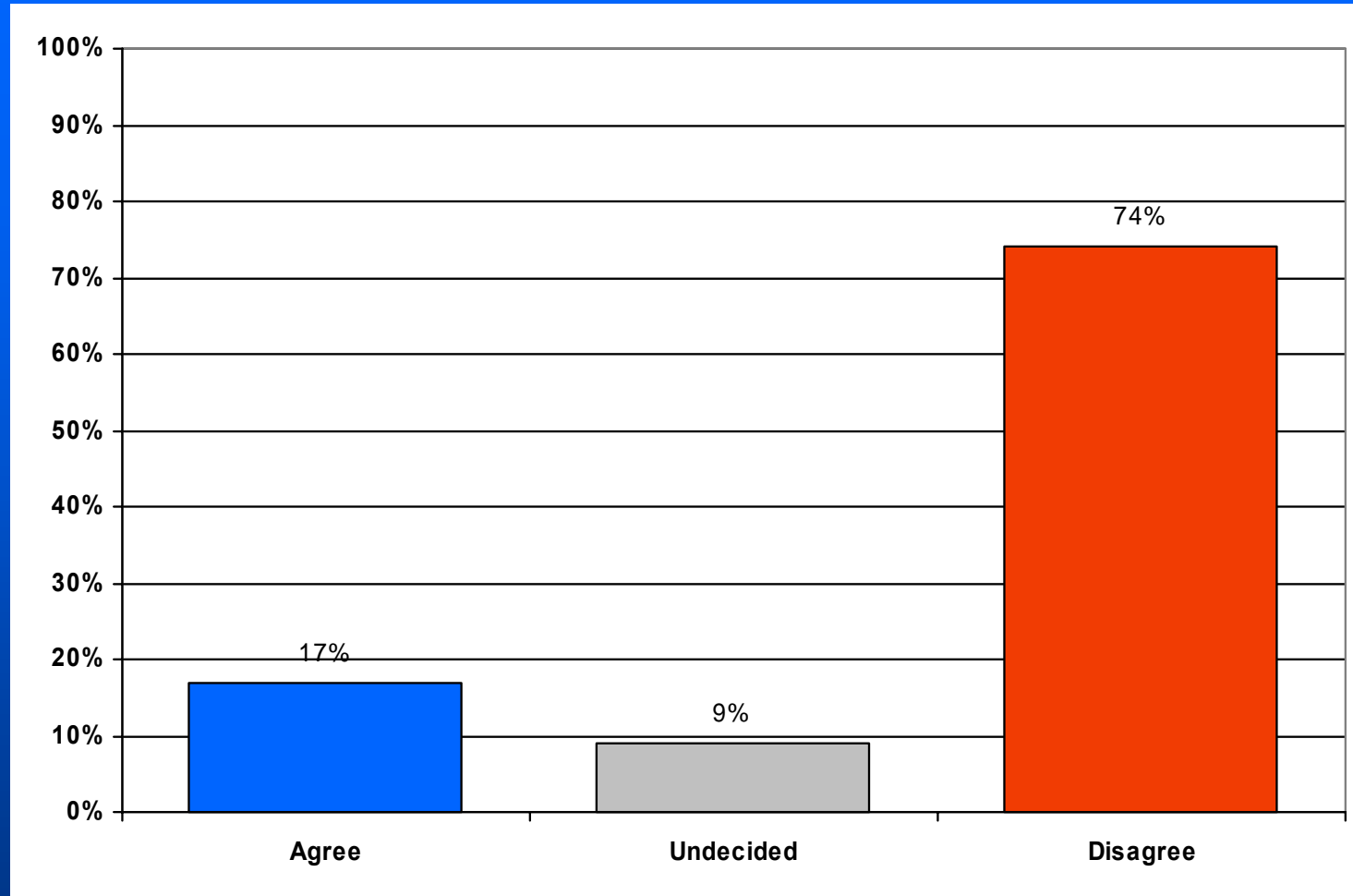
Source: Compiled by R.C. Wimberley from S-276 national 2001 survey data, item 11c, n = 196.

# Issues Impacting Food Safety

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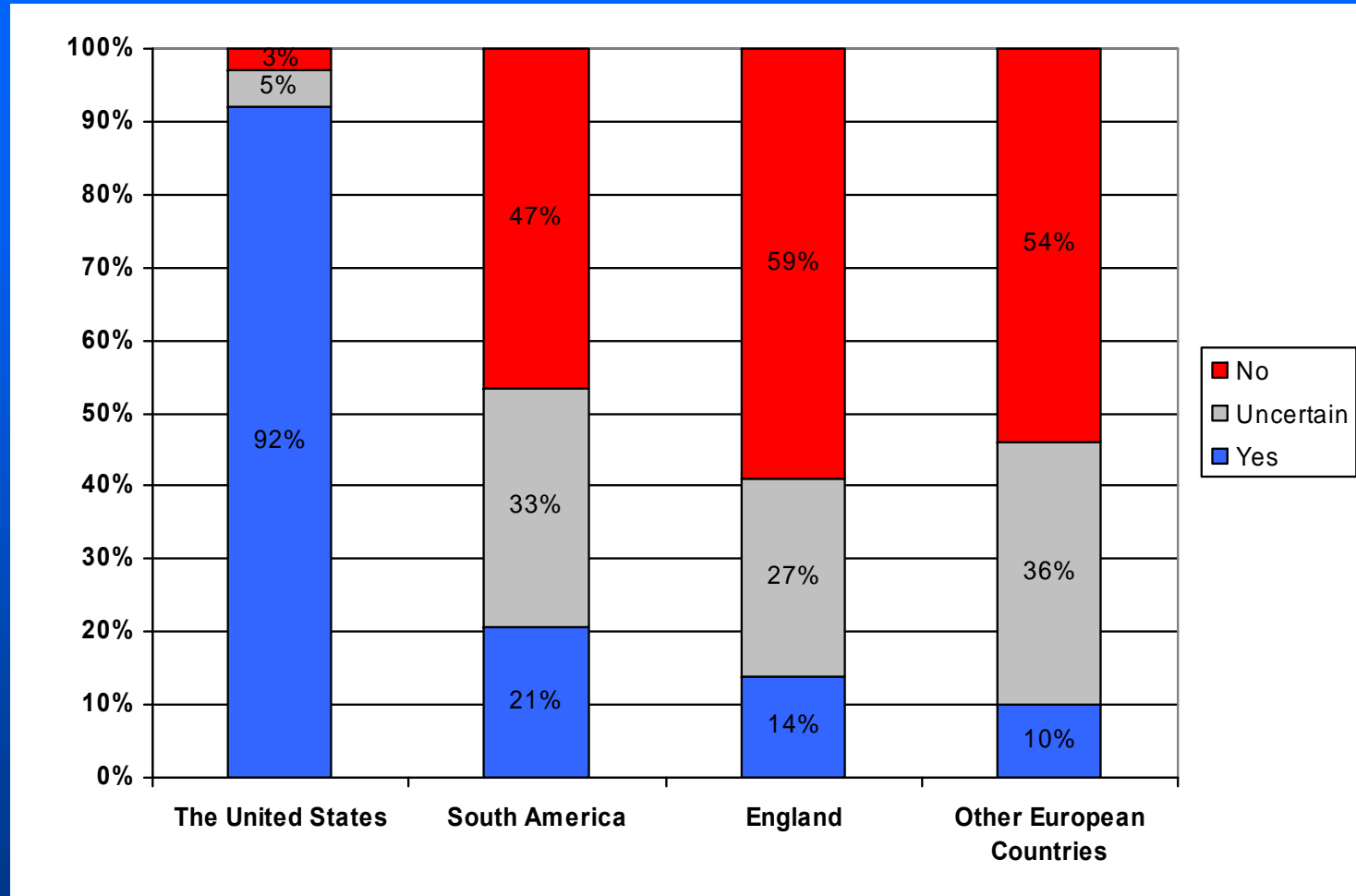
- **Globalization**
- **New processing technologies**
- **New packaging technologies**

Figure 1. If the U.S. could buy all its food from other countries cheaper than it can be produced and sold here, we should.



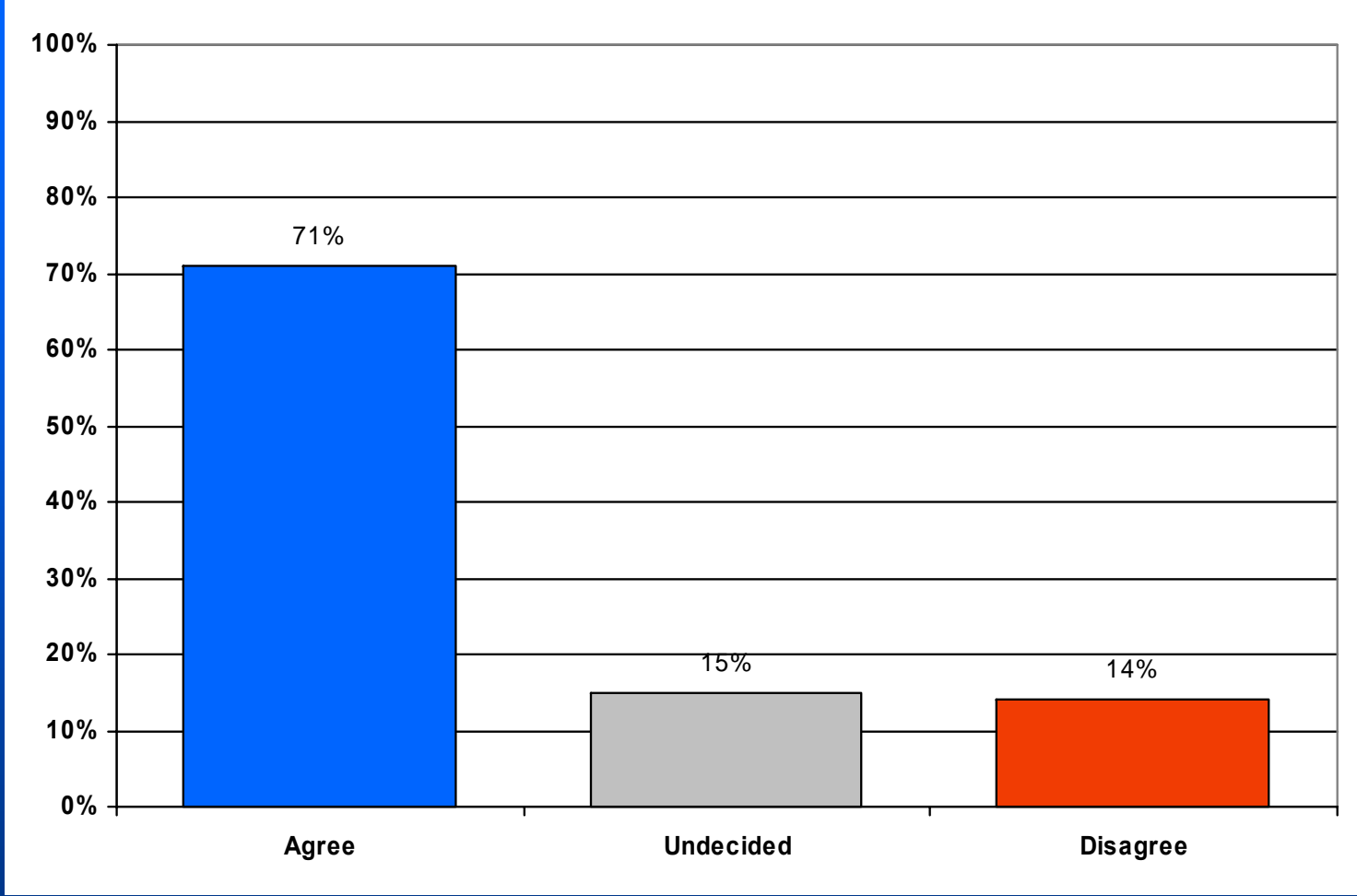
Source: Compiled by R.C. Wimberley from S-276 national 2001 survey data, item 3p, N = 819.

Figure 2. Would you eat meat from livestock grown in ...?



Source: Compiled by R.C. Wimberley from S-276 national survey data, items 8a through 8d, N = 819.

Figure 3. I would be willing to pay more for food that is...  
grown locally, near where I live, rather than far away.



Source: Compiled by R.C. Wimberley from S-276 national 2001 survey data, item 4q, N = 819.

# New Processing & Packaging Technologies

- **Aseptic P&P**
- **Microwave Heating**
- **Ohmic Heating**
- **Irradiation**
- **High pressure**
- **Pulsed electric fields**
- **Oscillating magnetic fields**
- **High intensity light**
- **Ultrasonication**
- **MAP**
- **Active Packaging**
- **Intelligent Packaging**
- **Edible coatings**
- **Surface Modification**
- **Sensors / Indicators**
- **Nano-composites**
- **O<sub>3</sub> / ClO<sub>2</sub>**
- **Bio-Based Materials**

# Drivers of Consumer Purchase Decisions

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- **TASTE**
- **CONVENIENCE**
- **HEALTH**
- **SAFETY**
- **OTHER**

# Other New Technologies

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- **Nutrigenomics**
- **Biotechnology**
- **Materials Science**
- **Nanotechnology**
- **Information Technologies**

# Other Trends & Concerns

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- **Environment and Natural Resources**
- **Water**
- **Land**
- **Energy**
- **Social Impact**
- **Religious Beliefs**
- **...**

# Sustainable and Organic

- Organic sales grew 18% in 2004 in the US
- Locally grown products continue to capture premium food and beverage markets worldwide.
- Ethnic foods



# The Consumer Value Proposition

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- **Value = Cost / Benefits**
- **Value = Cost / (Taste + Convenience + Health + Safety + Other)**

# Consumers of tomorrow

“Mass Customization”

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**“We may have vending machines that allow you to program in your health profile and then obtain a pill with the optimal nutrients that you need”**

**Manfred Kroger**

# Bipolarism: Migration to the Poles



**Global**  
**High Tech**  
**New and Improved**  
**Ready-to-Eat**  
**Low Price**  
**Good For You**  
**All Year**  
**Large-Scale**  
**Commodity Market**  
**Open Supply Chain**

**Local**  
**High Touch**  
**Traditional**  
**Natural/Unprocessed**  
**Premium Price**  
**Naughty but Nice**  
**Seasonal**  
**Craft-scale**  
**Speciality Market**  
**Closed Supply Chain**

# In Conclusion ...

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## Bipolarism: Migration to the Poles



**Packaging will be different for each pole  
and must cover the continuum in between**

# Thank you



*“Great is the art of beginning, but greater is the art of ending”  
H.W. Longfellow*