

# Structural Shocks and Changing Dynamics Related to Emergent Risks, Evolving Health Trends, Demographic Shifts and Labor Markets CAS May 2011

**Risk Economics, Inc.**

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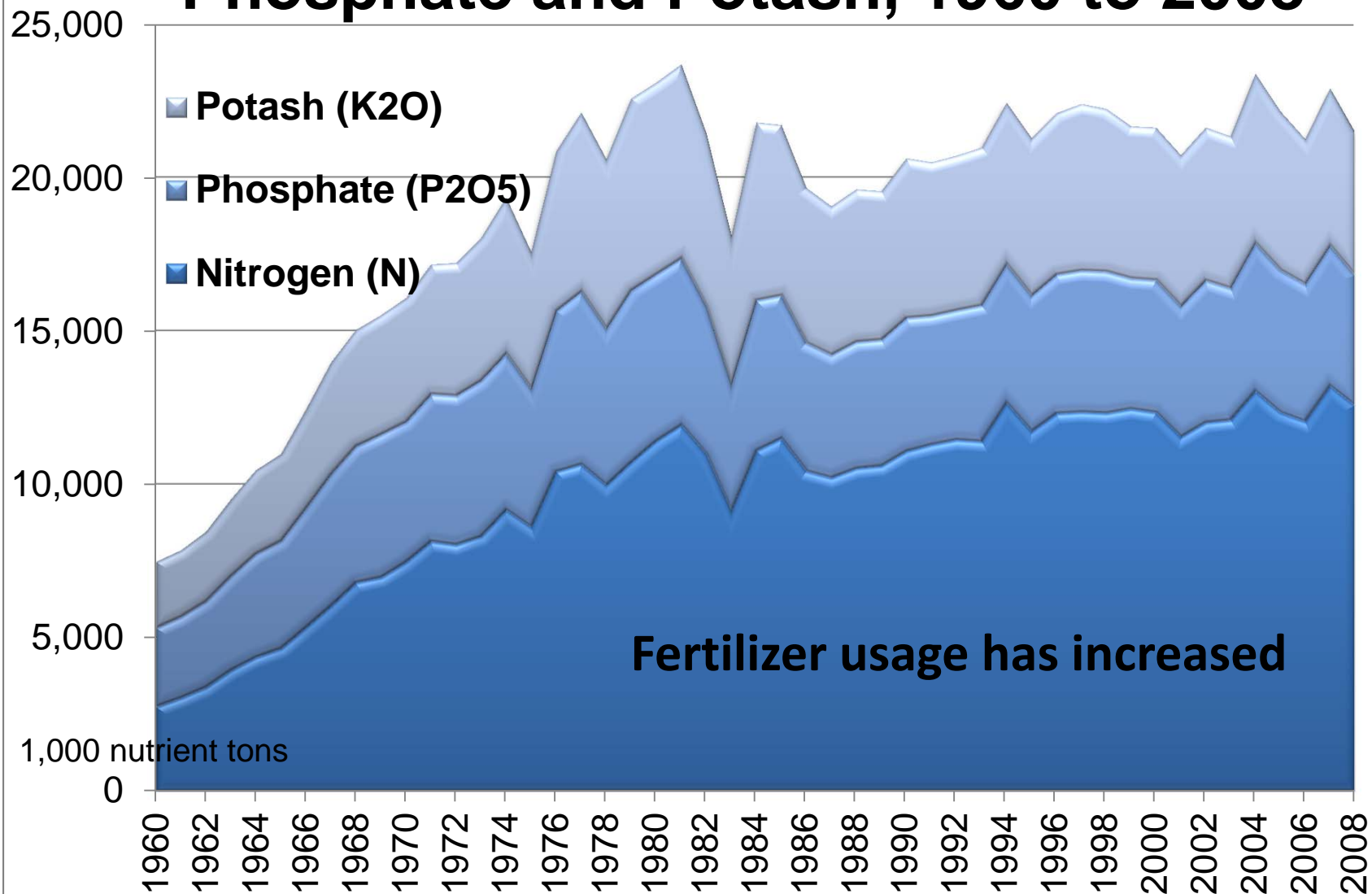
# Risk Economics, Inc.

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- Risk Economics, Inc. (RiskEcon) provides advisory services and testimonial expertise on complex issues related to financial instrument valuation models and frameworks, including market and industry standards and practices for the financing, risk management, and active trading, and hedging of OTC derivatives and structured products.
- RiskEcon provides consulting services by applying rigorous analytics to large-scale real world geopolitical and socio-economic issues relating to demographics and macroeconomics, including areas within labor, housing, consumption and consumer behavior, global population, immigration, environment, health and aging.
- RiskEcon's computational economics activities focus on the proprietary development and scalable implementation of robust modeling and data analytic frameworks, including the application of computational tools and methods derived from machine learning, data-mining, and text-mining to applied systemic real world issues.
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# **The Industrial Agricultural System**

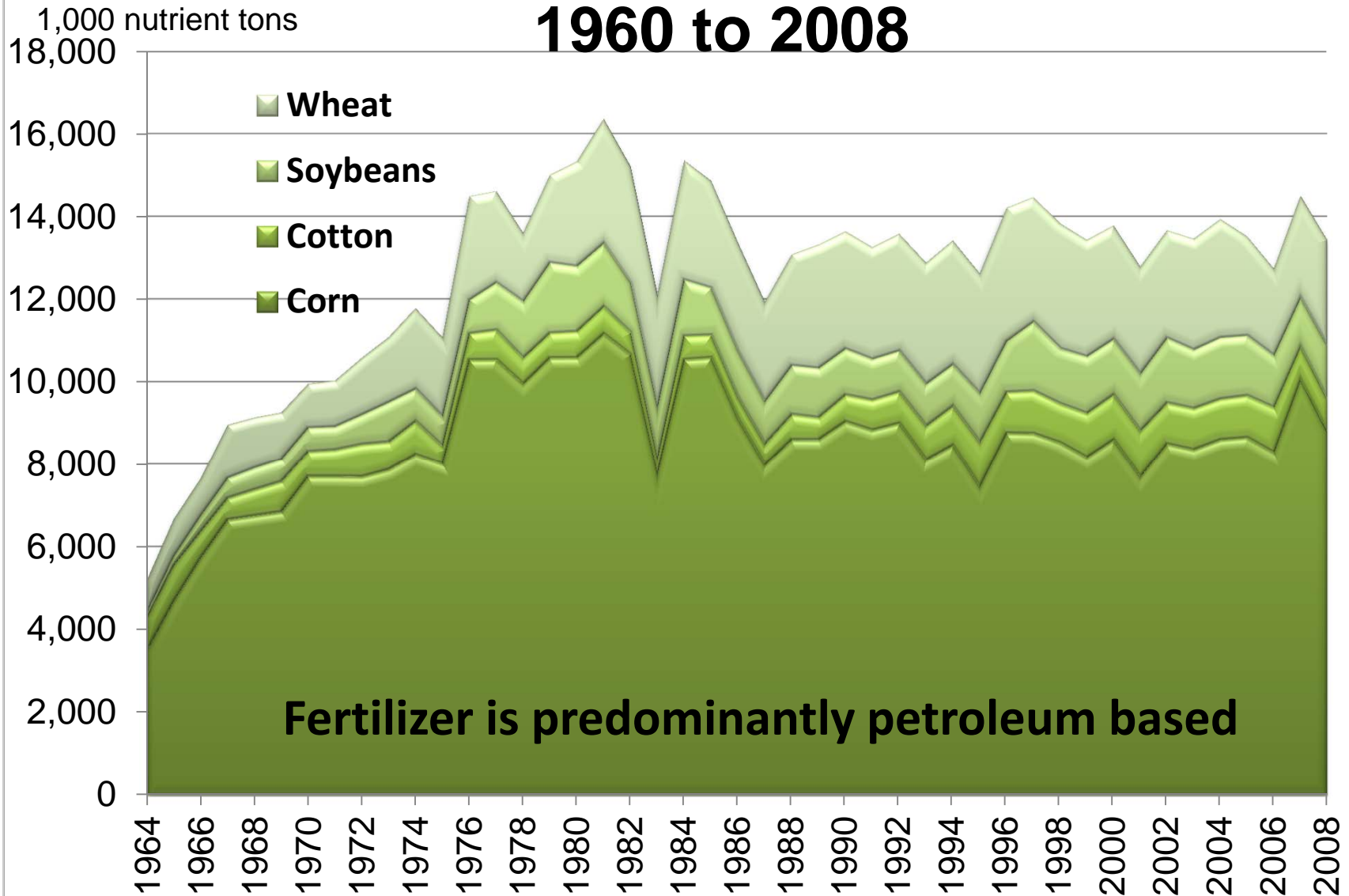
# U.S. Consumption of Fertilizer: Nitrogen, Phosphate and Potash, 1960 to 2008



**Fertilizer usage has increased**

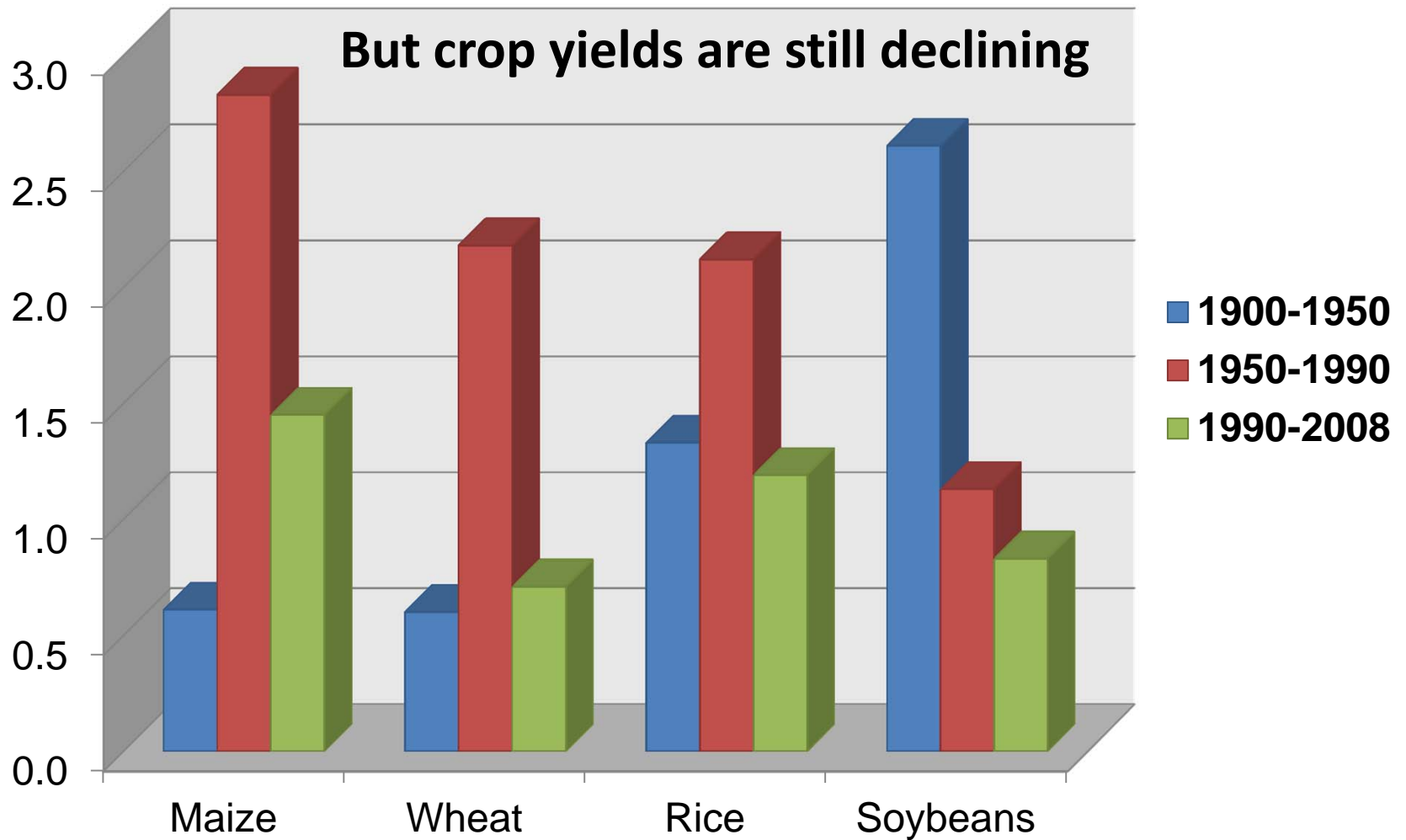
Source: USDA

# U.S. Fertilizer Use by Selected Crop 1960 to 2008



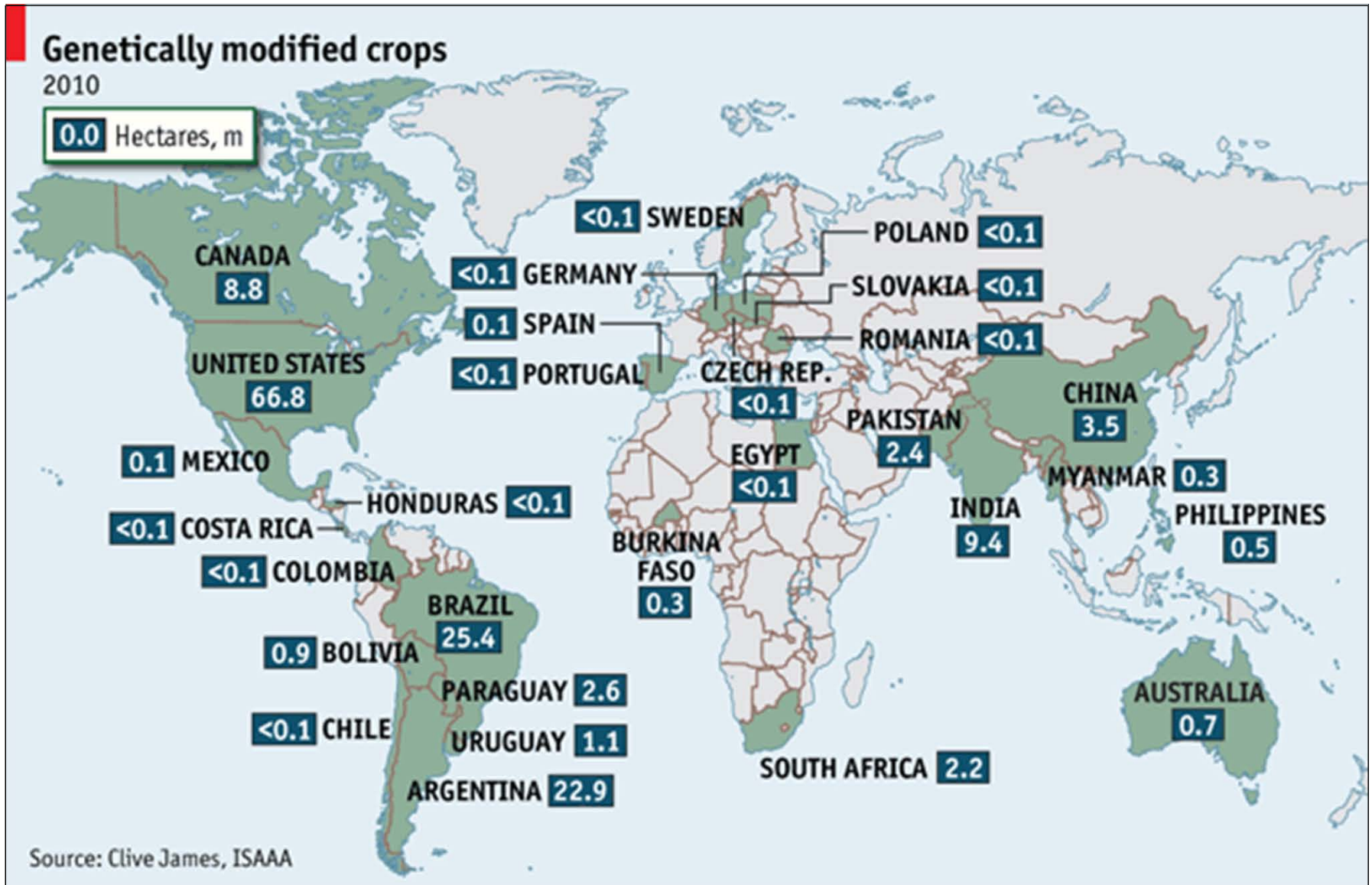
Source: USDA

# Global Yield Growth of Selected Crops annual averages (%), 1900 to 2008



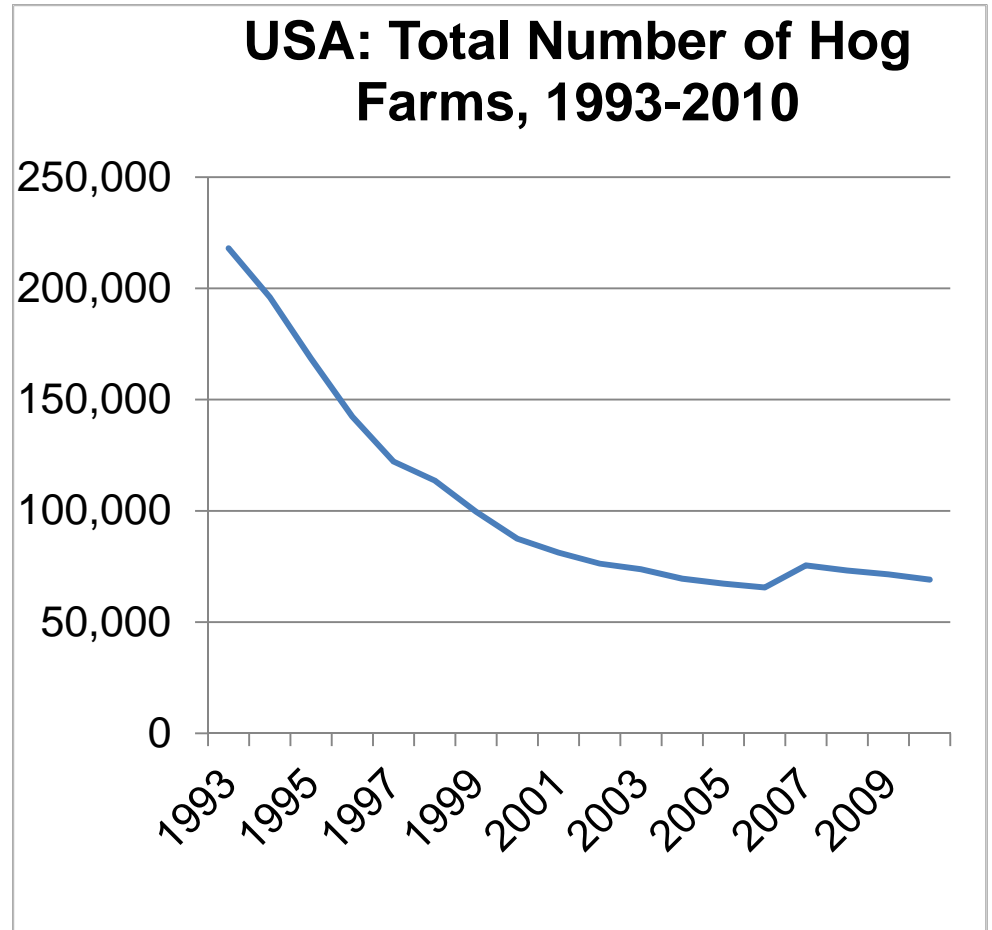
Source: Alston, Beddow and Pardey

# Global Distribution of Genetically Modified Crops



Source: Economist EIU

# Hog Farming: Fewer Farms Now

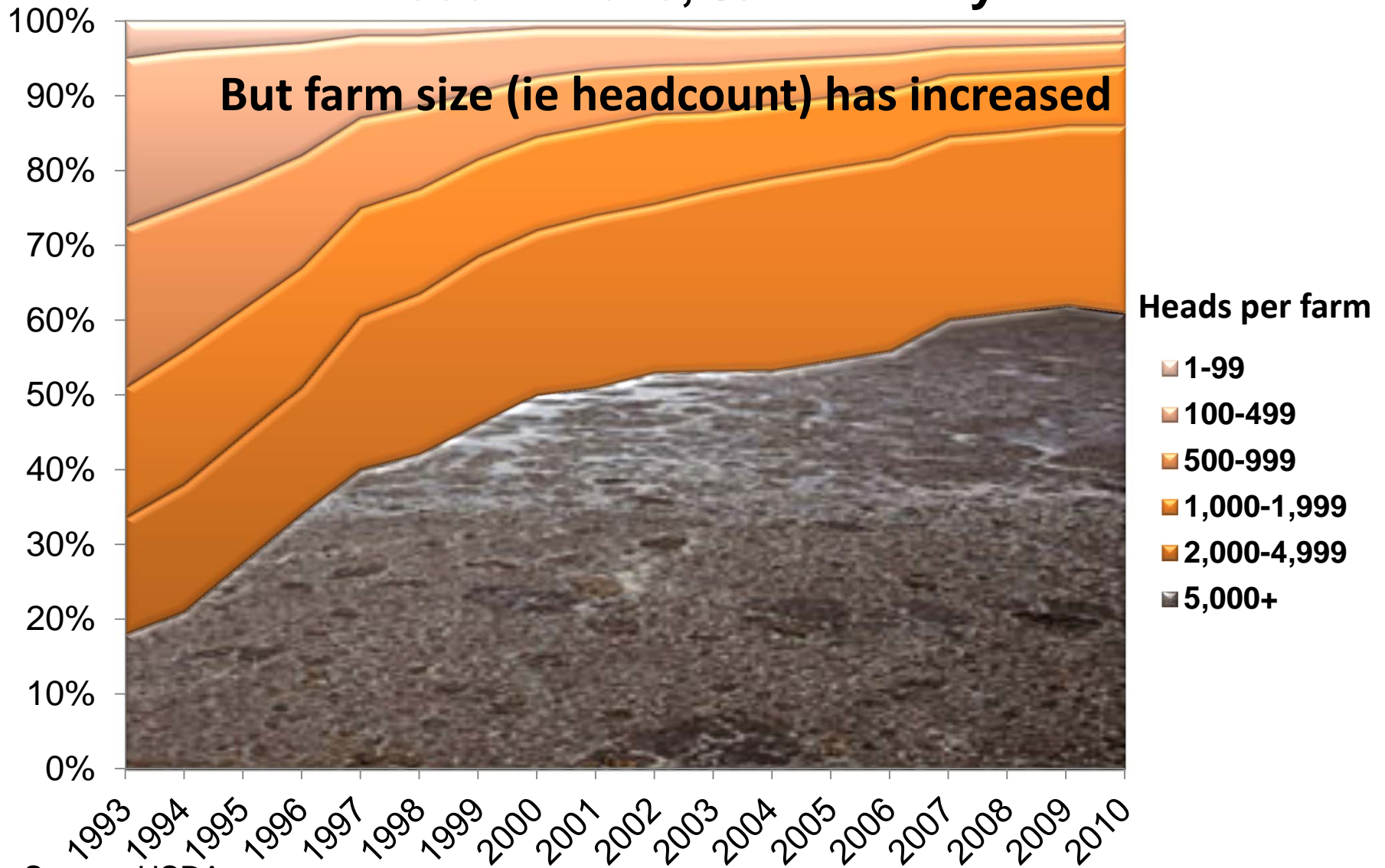


**The number of farms have fallen**



# Hog Farms: Heads per Farm Increase 1993 to 2010, % Inventory

**But farm size (ie headcount) has increased**



Source: USDA

# Industrial Chicken Farming



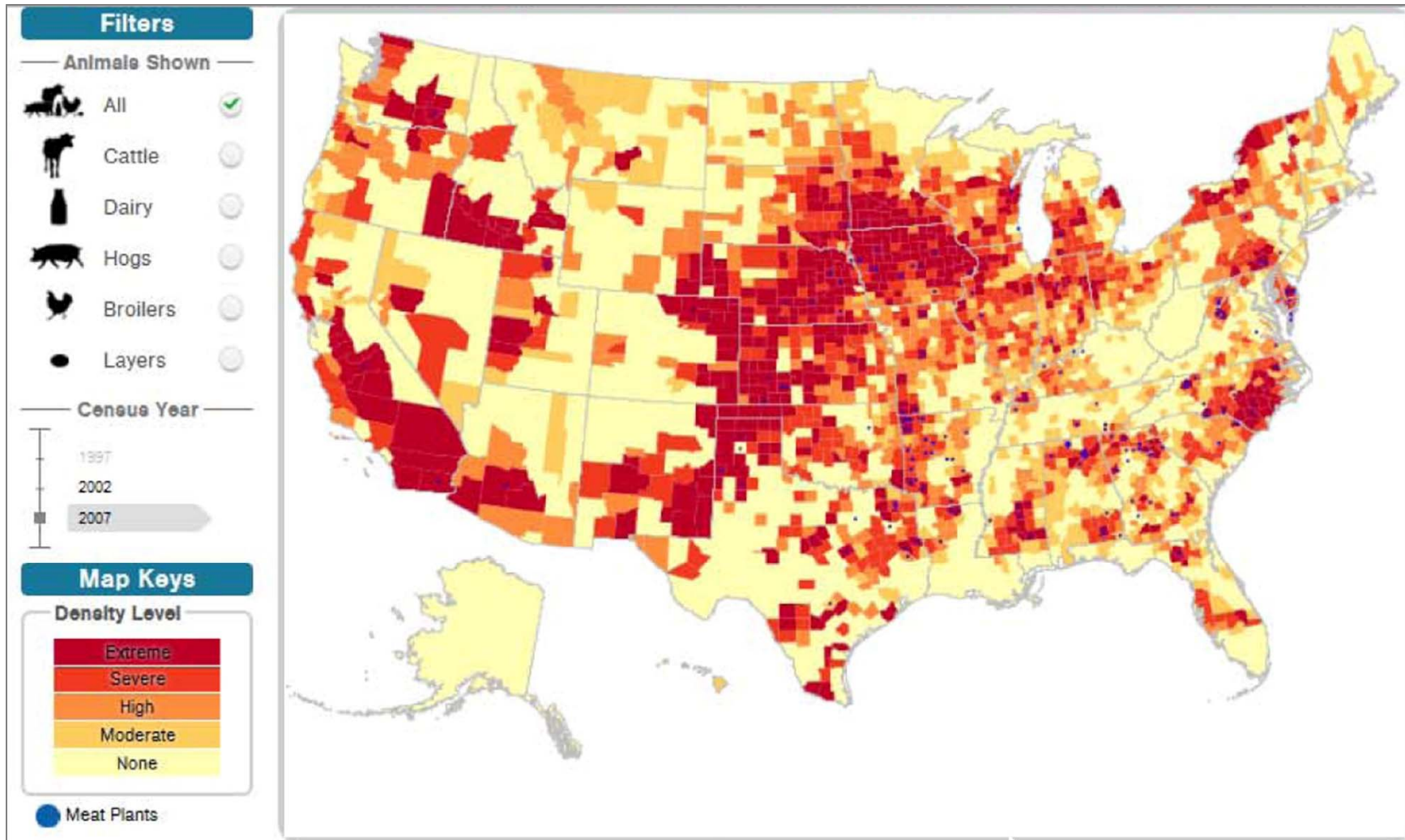
**Industrial chickens take 48 days to reach market weight. If a human grew as fast , he/she would weigh 349 pounds at age two.**



**Prior to the current farming techniques, chickens took 70+ days to reach market weight**

Source: National Geographic, (University of Arkansas Division of Agriculture, Cooperative Extension Service)

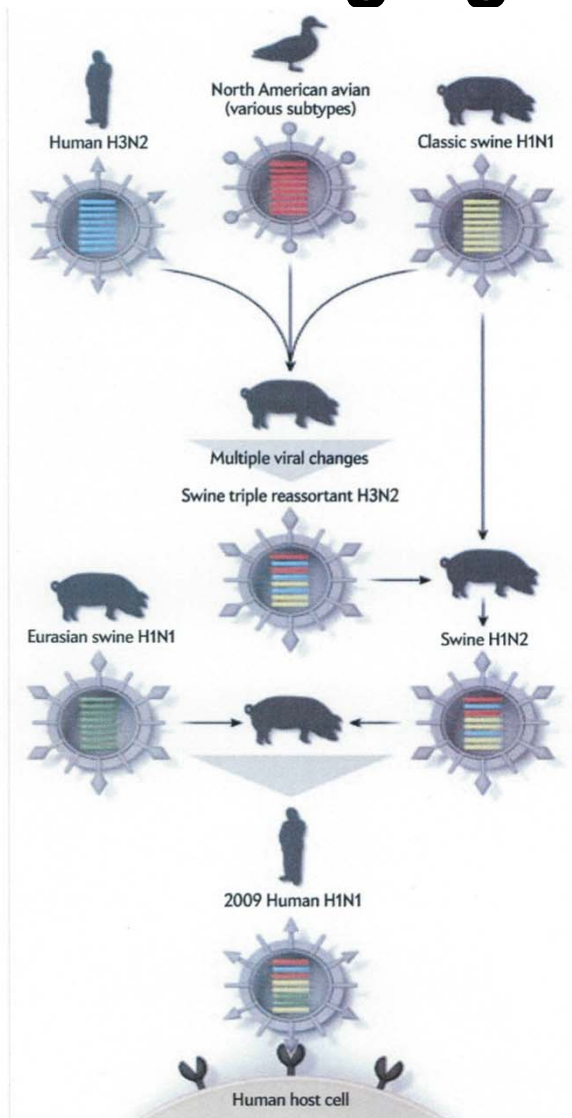
# Factory Farm Map, USA 2007



Source: [www.factoryfarmmap.org](http://www.factoryfarmmap.org), 2007 Census

# Emergent Risks

# Emerging Infectious Diseases



- During the past 20 years, at least 30 new diseases have emerged, for many of which there is no treatment, cure or vaccine, or the possibility of effective prevention or control.
- In addition, the uncontrolled and inappropriate use of antibiotics has resulted in increased antimicrobial resistance and is seriously threatening drug control strategies against such common diseases as tuberculosis, malaria, cholera, dysentery and pneumonia.

# Food Contamination



## E.coli Risk:

- A hamburger created from ground beef from the industrial food system contains meat originating from approx. 1,000 cows
- Feb 2011 USDA report: FSIS estimates the national prevalence of E. coli O157:H7 in beef trim for use in the manufacture of raw ground beef was 0.39 percent, with a 95 percent confidence interval from 0.05 to 0.73 percent.

# Environmental Hazard from Factory Farms

According to USDA estimates:

- Animal production in the U.S. is valued at over \$100 billion annually.
- The amount of manure generated in the U.S. at CAFOs and AFOs is estimated to exceed 335 million tons of dry matter per year.



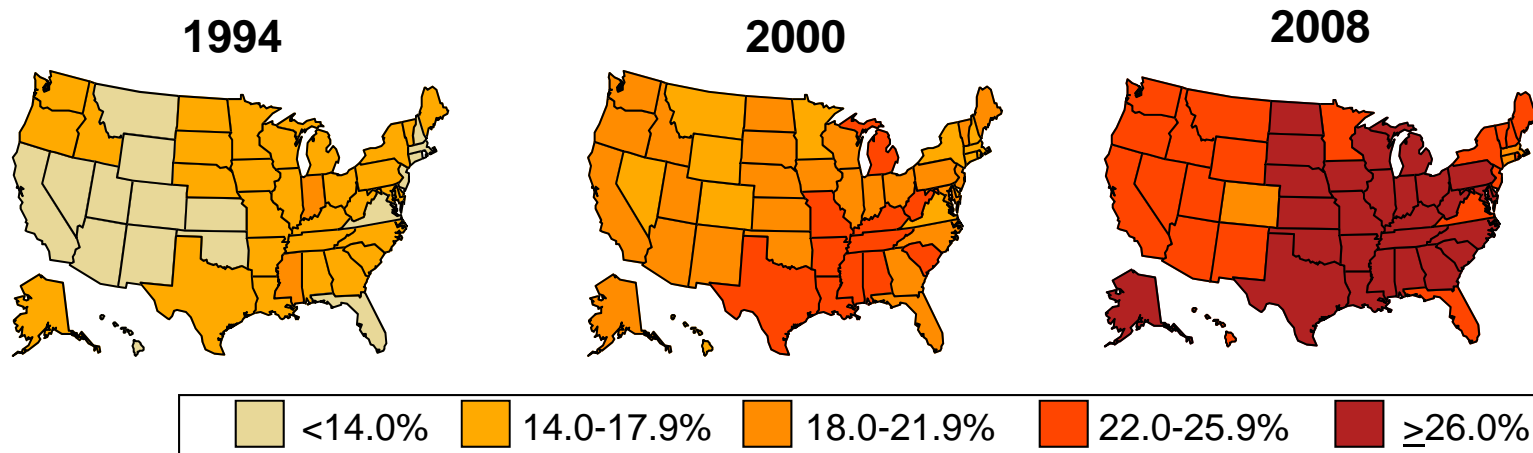
Pathogens and pharmaceutically active compounds in manure, bio-solids, and other byproducts can be transmitted to animals and humans through food supplies, water, and possibly air. Animals on farms can also be re-infected not only via water and air, but also from other vectors such as birds, rodents, and insects that can directly infect the animal or contaminate animal feeds or water.

# **Evolving Health Trends**

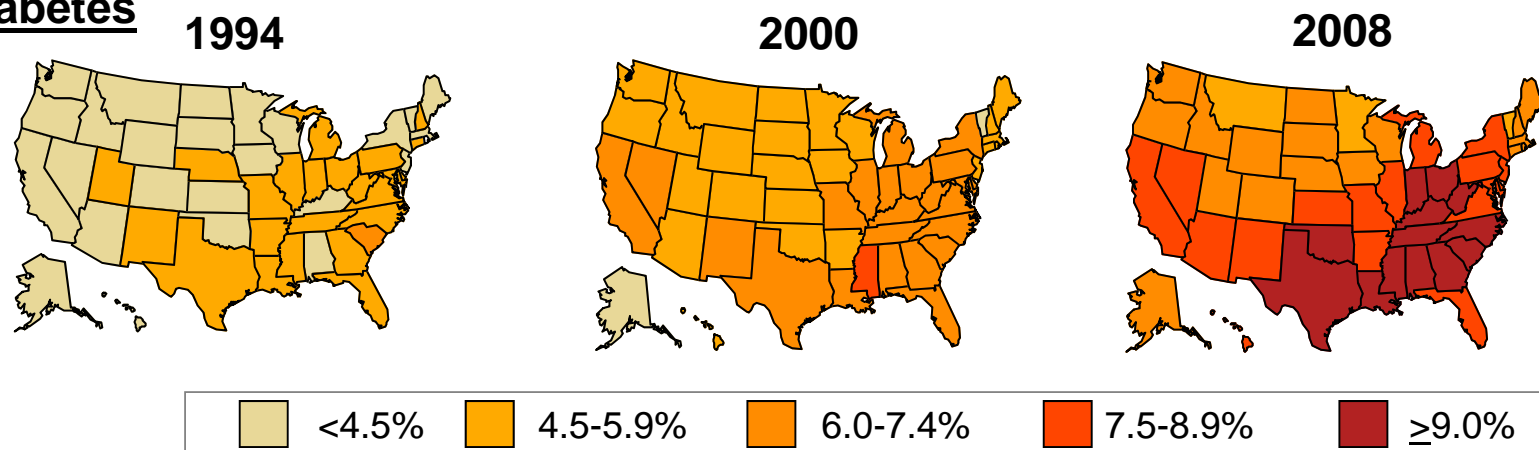


# Age-adjusted percentage of U.S. Adults who are obese or who have been diagnosed with diabetes

## Obesity (BMI $\geq 30$ kg/m<sup>2</sup>)



## Diabetes



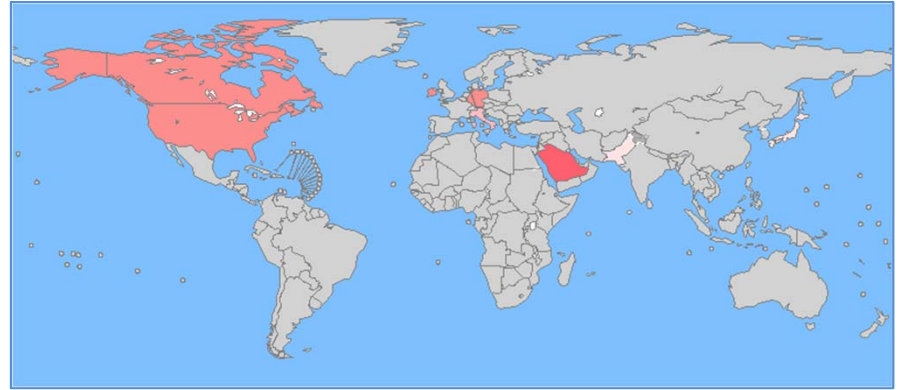
Source: CDC's Division of Diabetes Translation. National Diabetes Surveillance System

# Global BMI Snapshots: 1960 to 2009

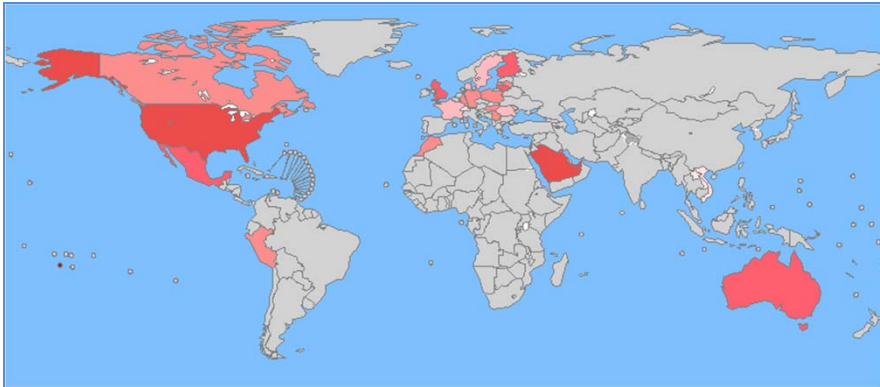
1960



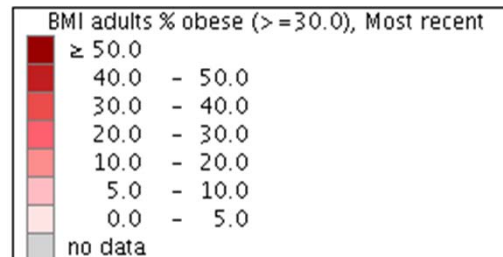
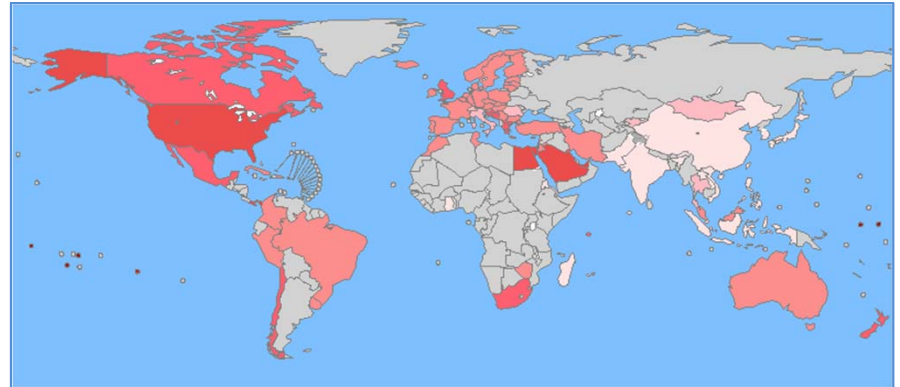
1990



2000



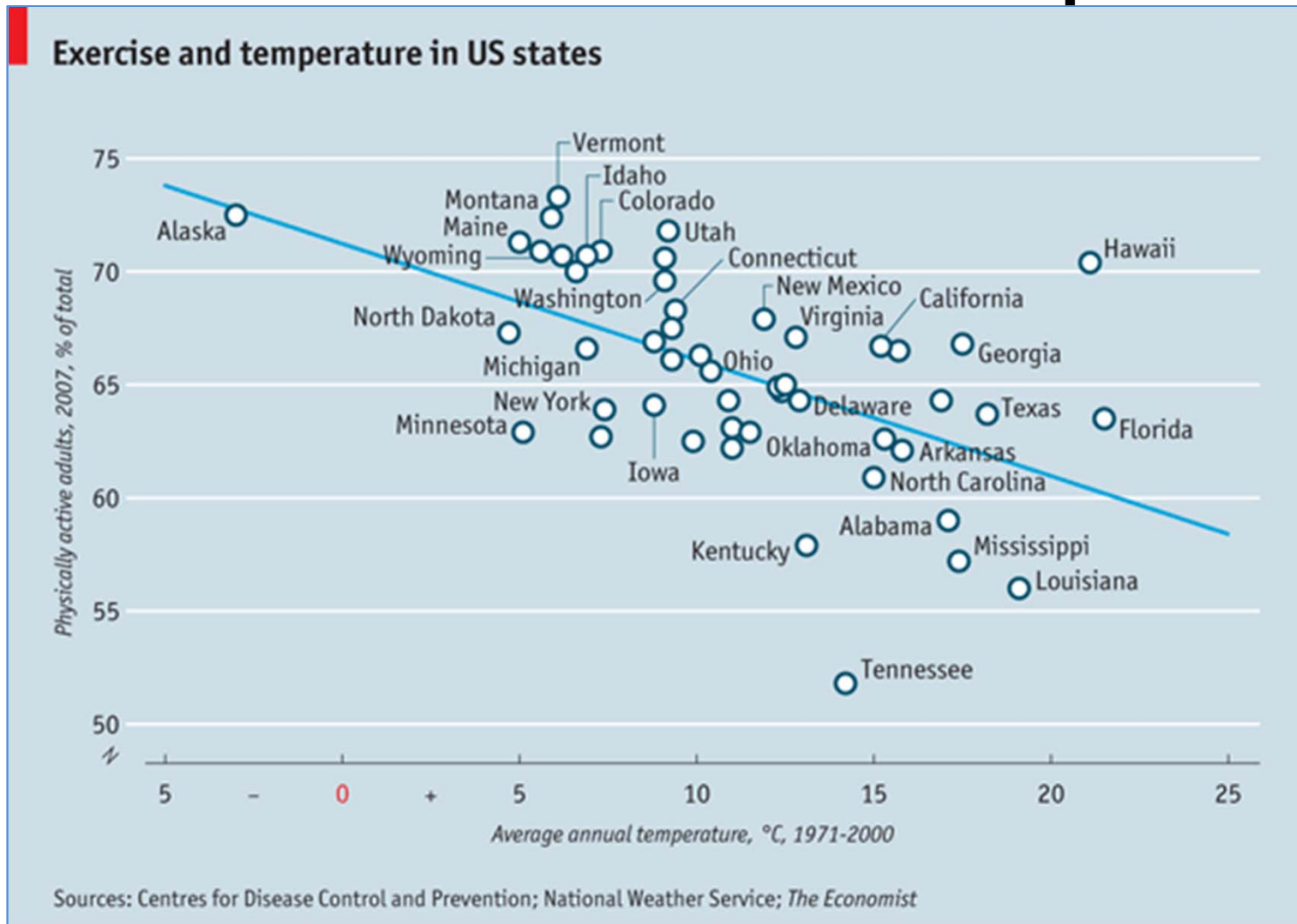
2009



Source: WHO Global Database on BMI

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# Exercise and correlation with temperature?



Source: Economist EIU

# Medical Cost Escalation

# Medical Spending and Weight

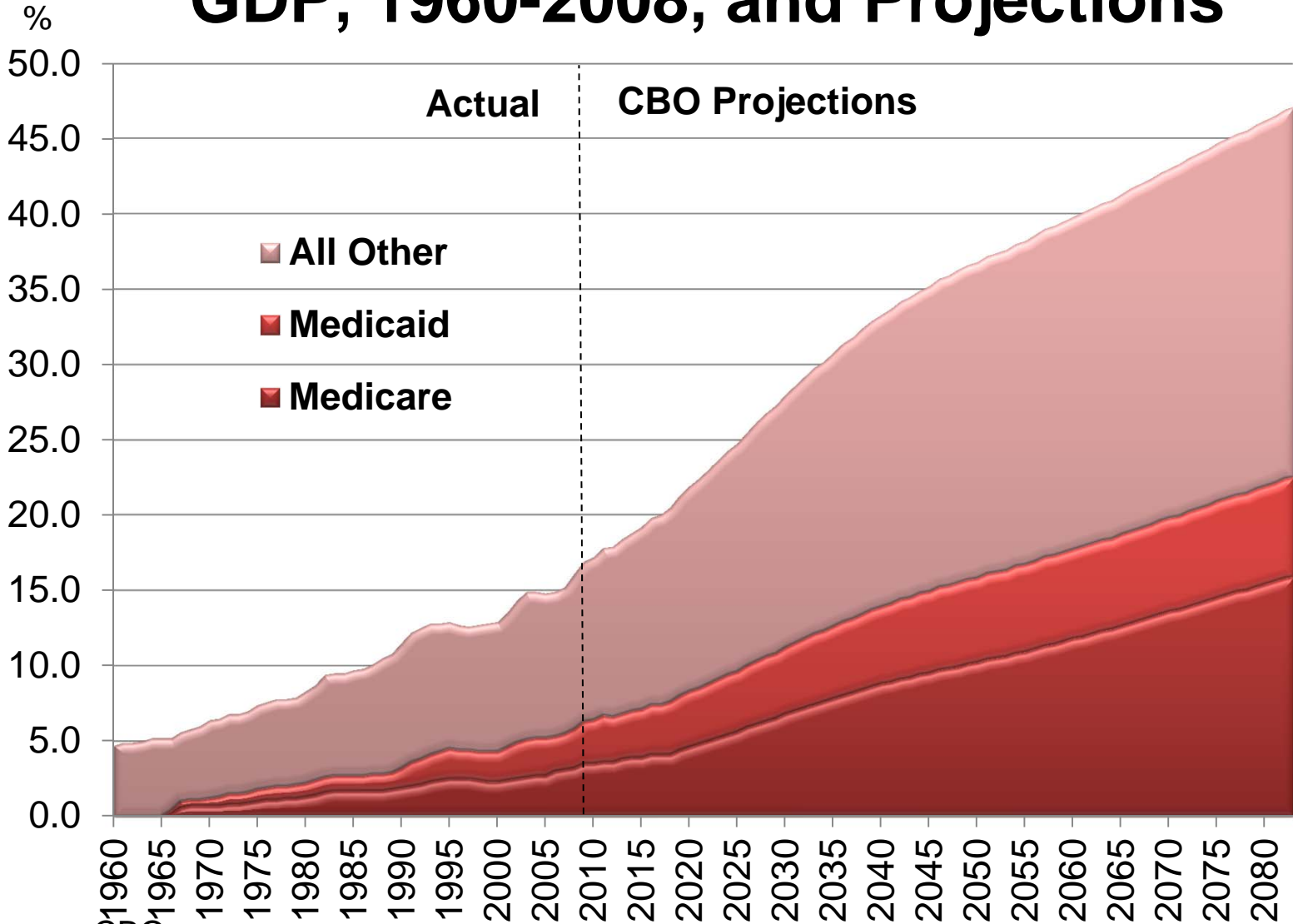
## Distribution of Adults and Health Care Spending, by Body Weight 1987 and 2007

Weight Category	Share of the Adult Population (%)		Spending per Adult (2009 dollars)		Percentage Changes 1987-2007	
	1987	2007	1987	2007	Share Adult Population	Spending per Adult
Underweight	4%	2%	\$3,230	\$4,970	-50%	54%
Normal	52%	35%	\$2,440	\$4,030	-33%	65%
Overweight	31%	35%	\$2,650	\$4,260	13%	61%
Obese	13%	28%	\$2,630	\$5,560	115%	111%
- Obese but not morbidly obese	12%	24%	\$2,640	\$5,330	100%	102%
- Morbidly Obese	1%	4%	\$2,530	\$7,010	300%	177%
All Categories	100%	100%	\$2,560	\$4,550	n.a	78%

Source: Congressional Budget Office based on the 1987 National Medical Expenditure Survey and the 2007 Medical Expenditure Panel Survey.

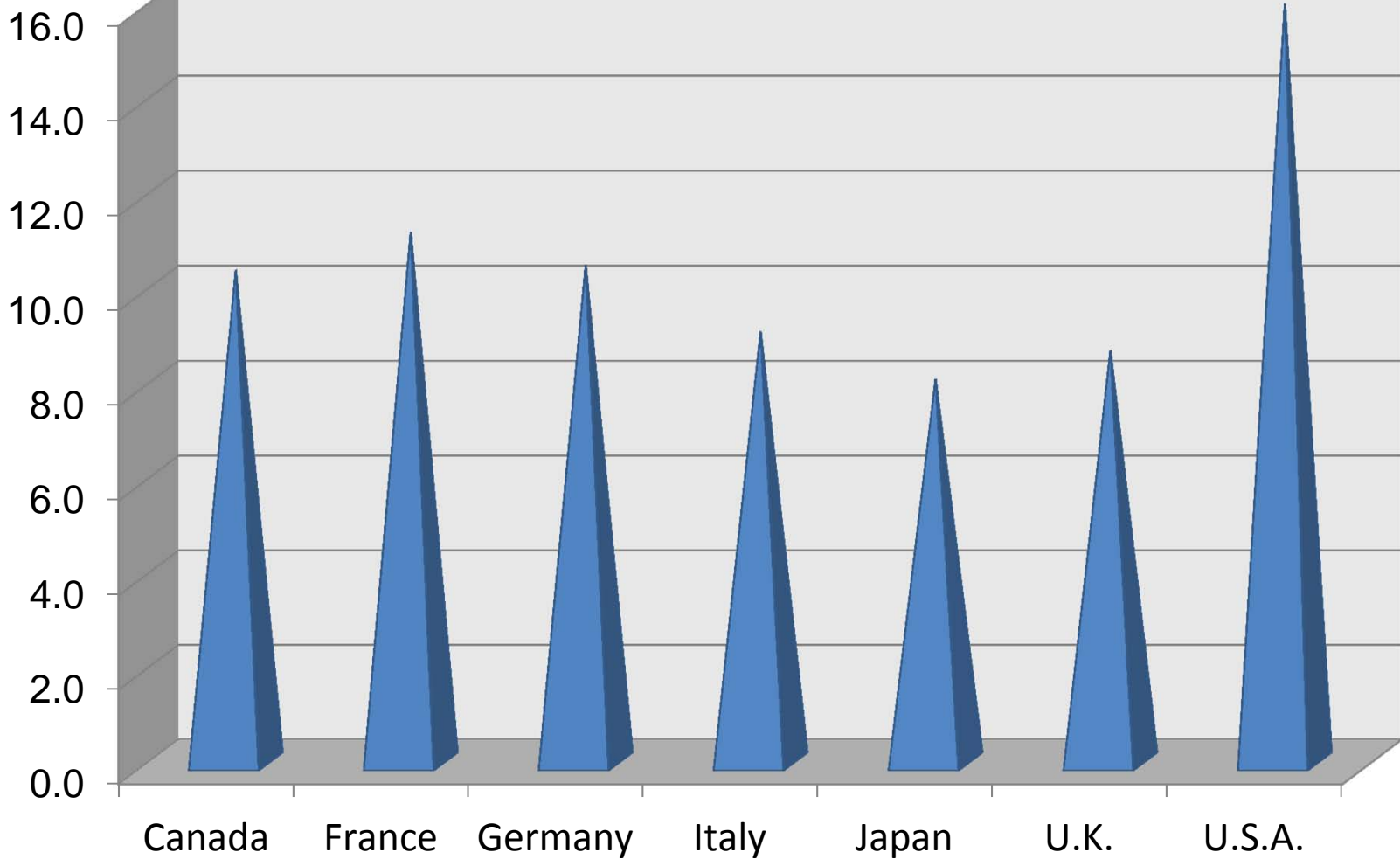
Weight categories are defined using the body-mass index (BMI)—a measure of weight standardized for height that applies to adult men and women—as follows: underweight (BMI is less than 18.5); normal (greater than or equal to 18.5 and less than 25); overweight (greater than or equal to 25 and less than 30); obese but not morbidly obese (greater than or equal to 30 and less than 40); and morbidly obese (greater than or equal to 40).

# Total Healthcare Spending as a Percentage of GDP, 1960-2008, and Projections



Source: CBO

# Total Healthcare Expenditure as a Percentage of GDP for G7 Countries, 2009

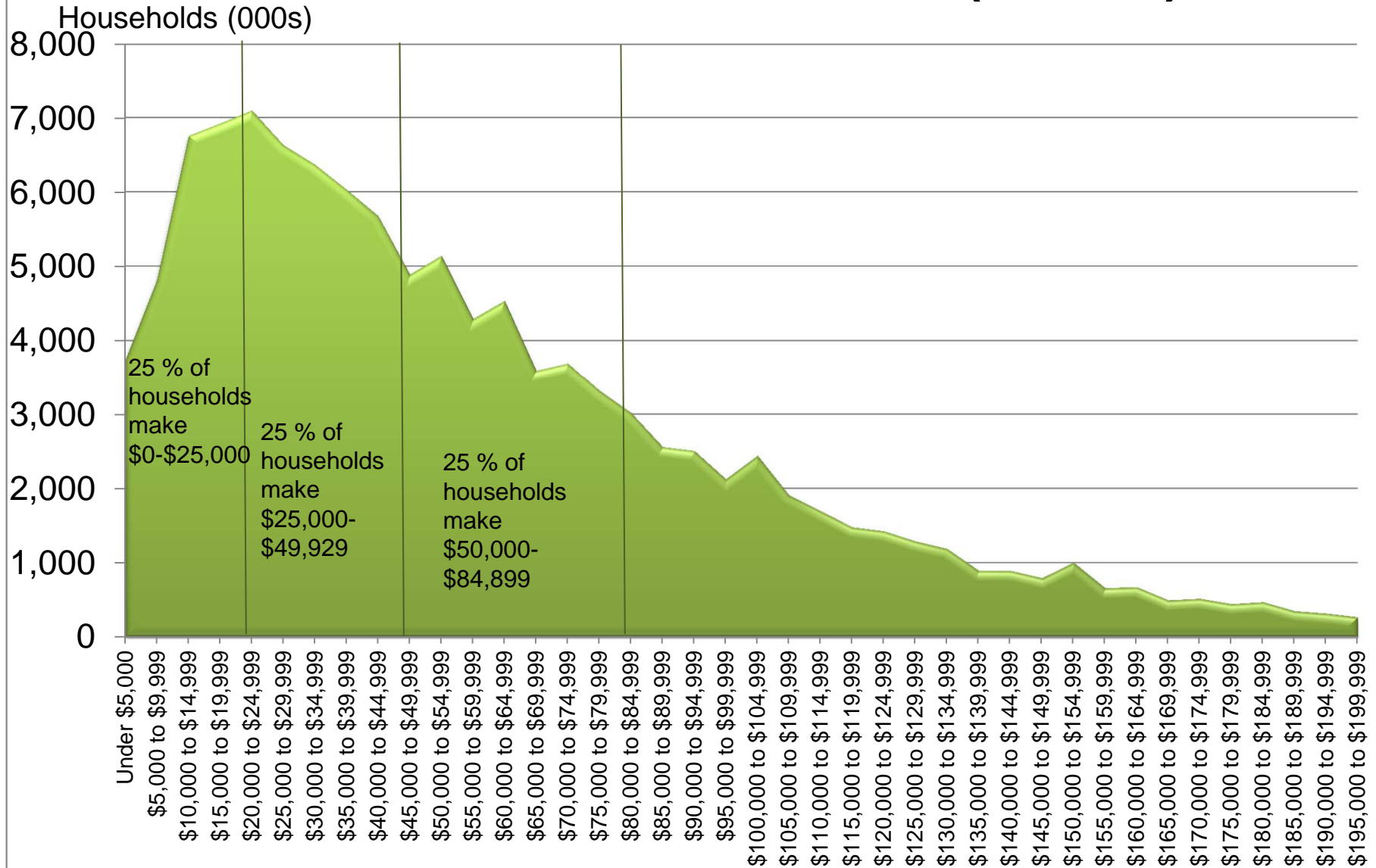


Source: OECD

# Wealth and Income Distribution

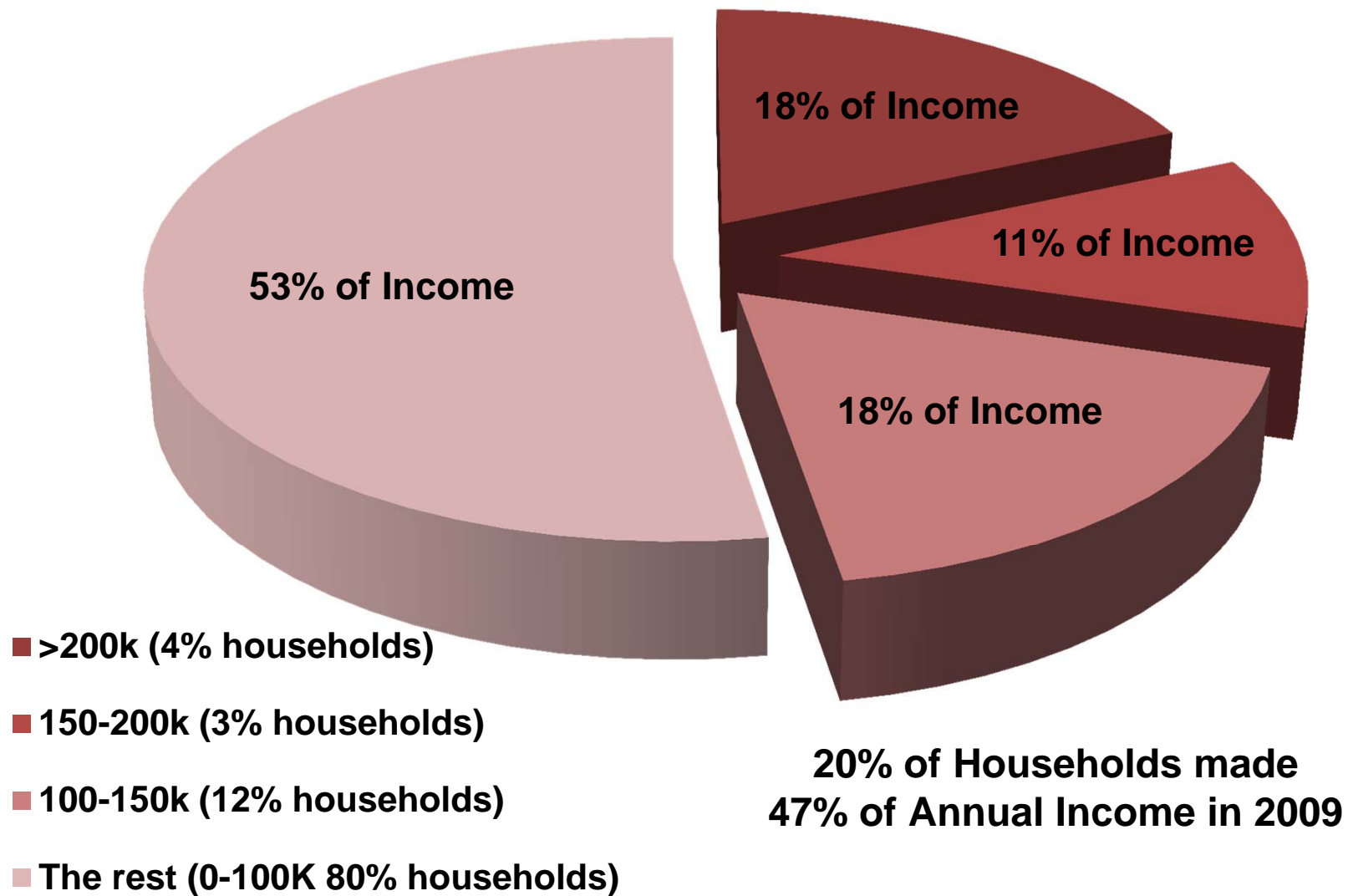


# Income distribution of bottom 96% (<\$200k), 2009



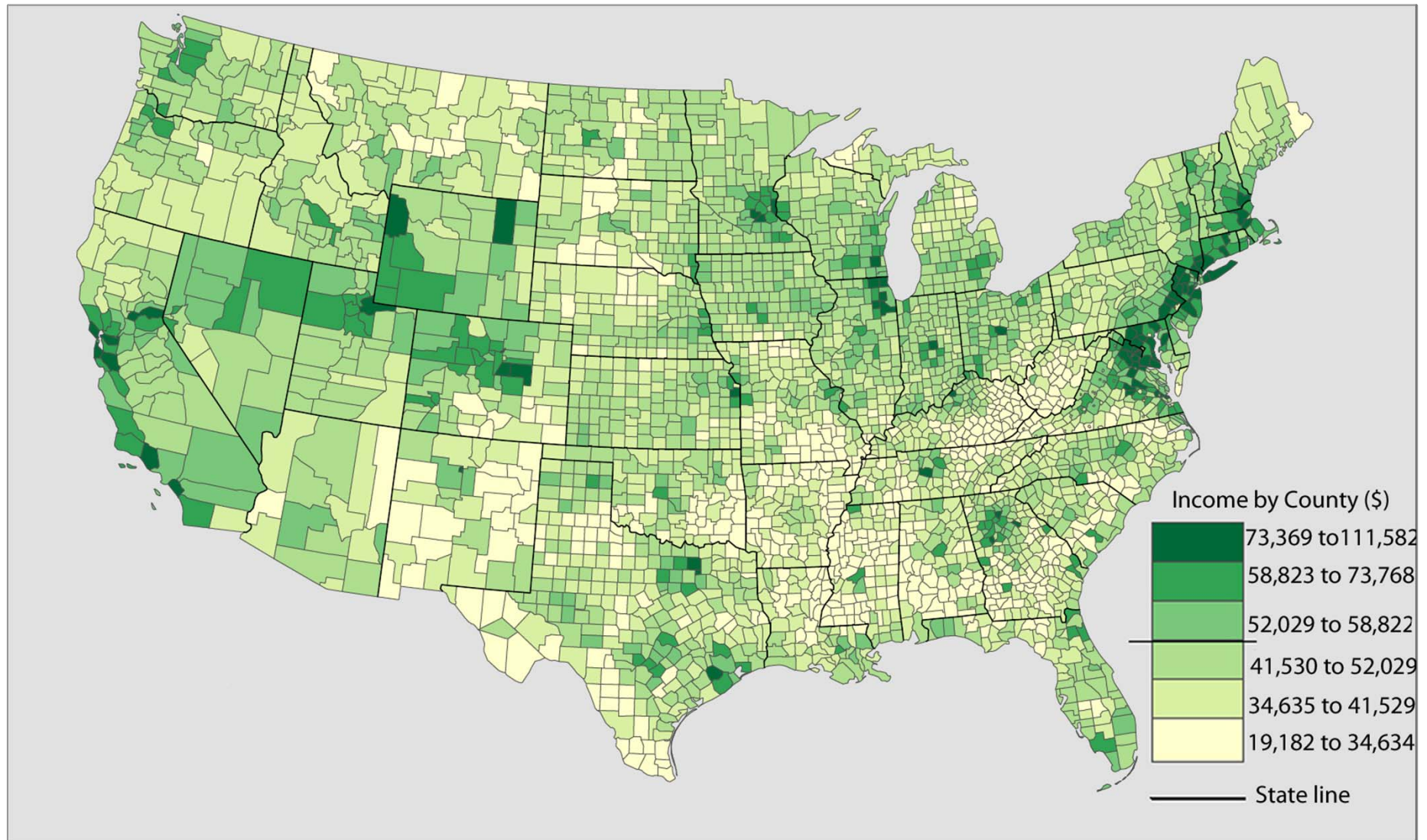
Source: CPS: BLS and Census Bureau, Risk Economics Calculations

# U.S. Income Distribution, 2009



# Median Household Income, 2008

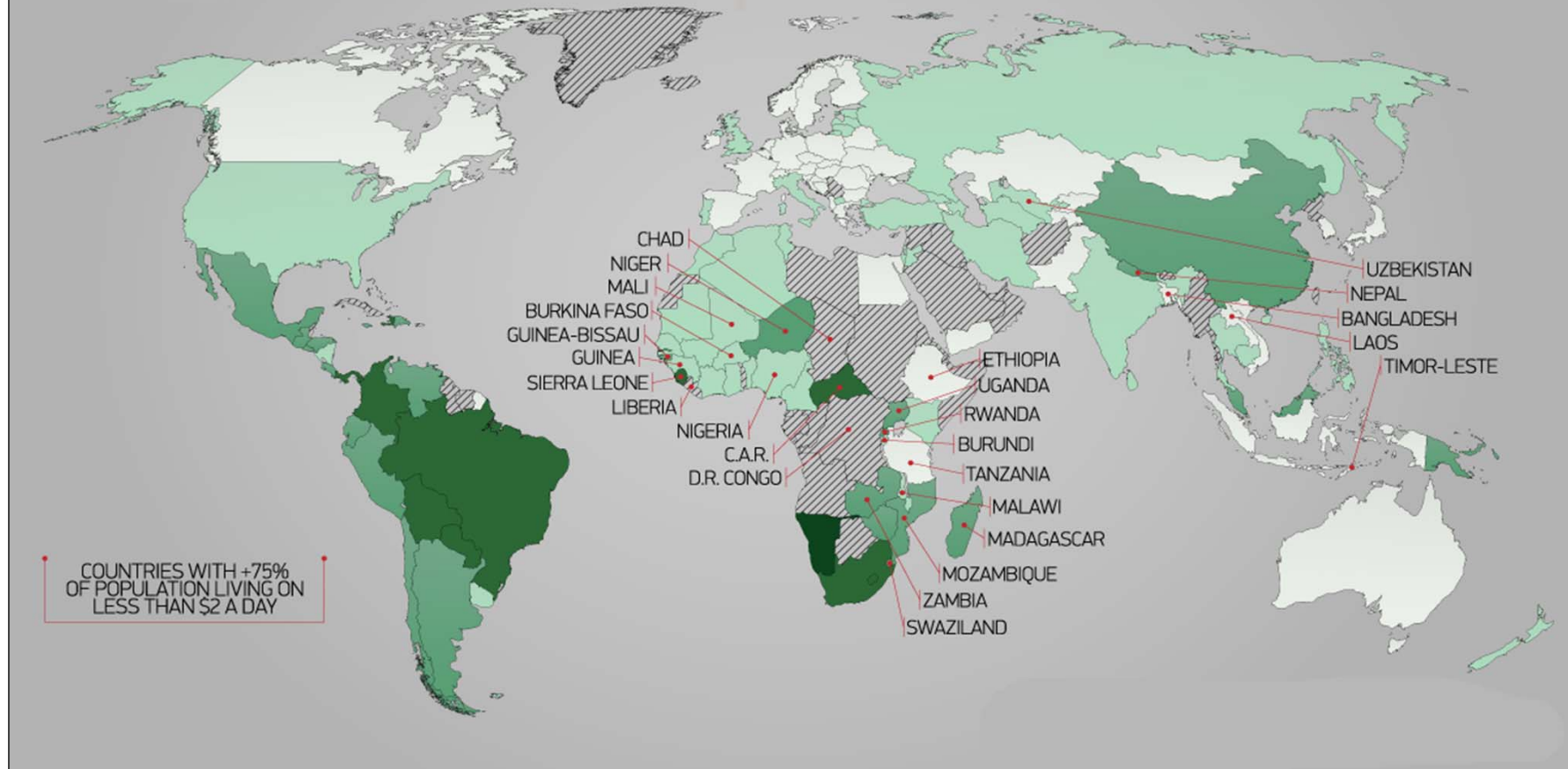
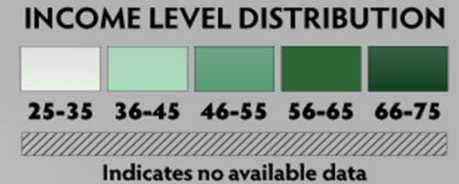
## US Median: \$52,029



Source: Department of Commerce Economic and Statistics Administration

# Global Income Distribution

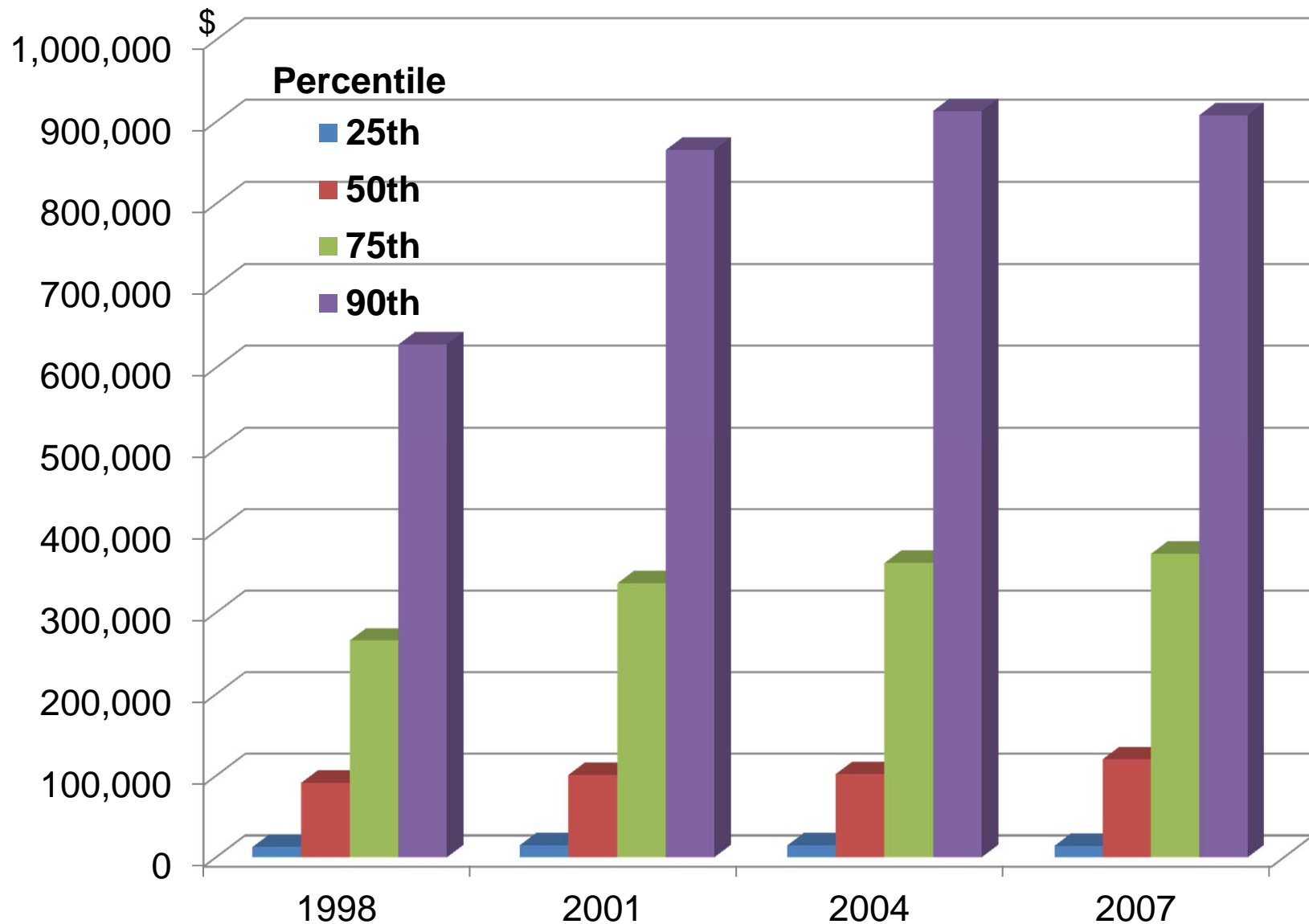
Values are Based on the Gini Coefficient, a measure of dispersion for each country. It is a calculation that represents the relative mean difference of personal income between citizens. A value of 1 represents absolute equality and 100 represents absolute inequality.



# Gap between Poor and Rich has increased because of the recession

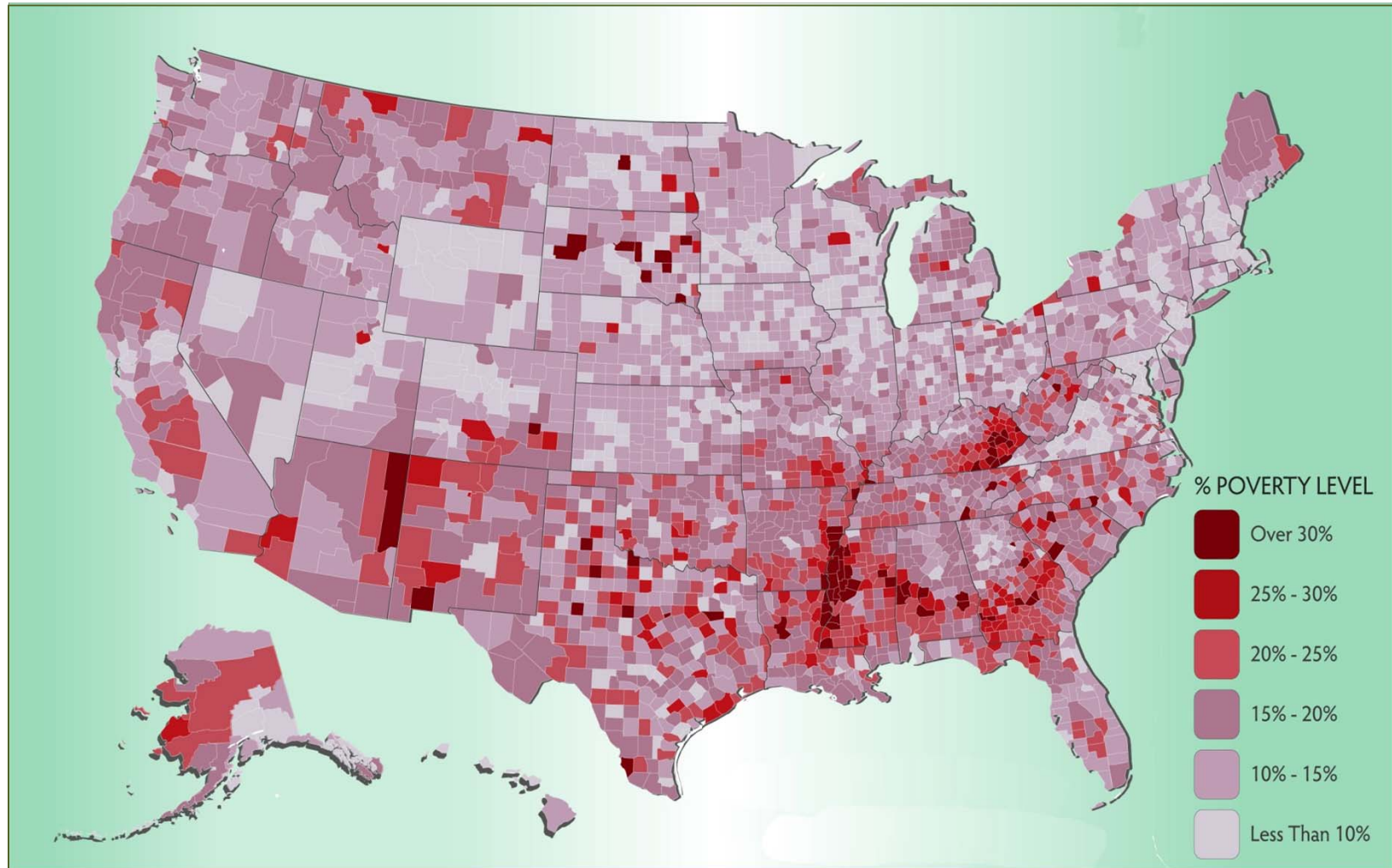


# U.S. Wealth Distribution: 1998 to 2007



Source: Federal Reserve

# America's Poor: A Regional Look at Poverty

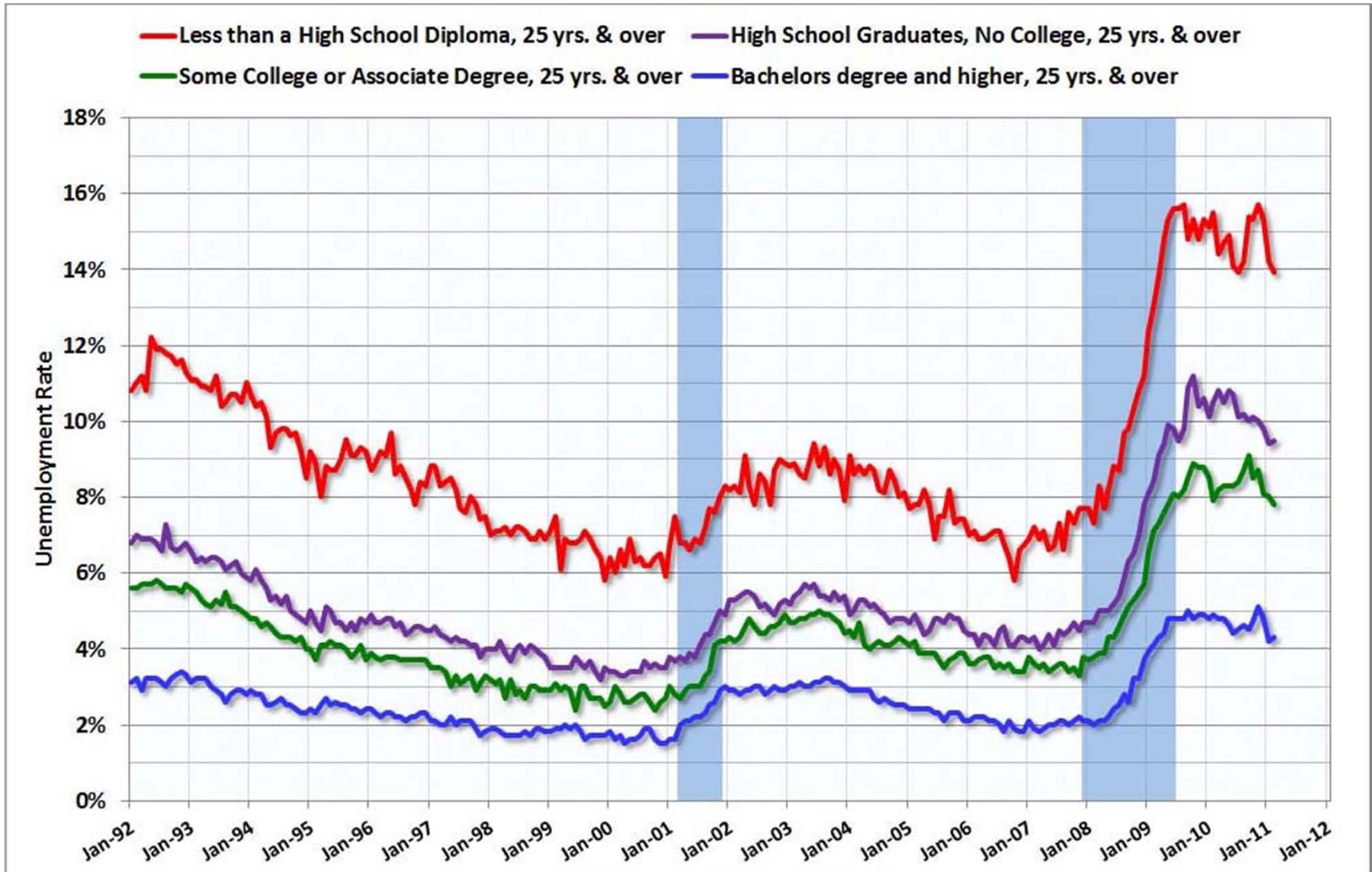


Source: CIA World Factbook, Mint.com

# **Effects on Labor Markets and the Dependency Ratio**

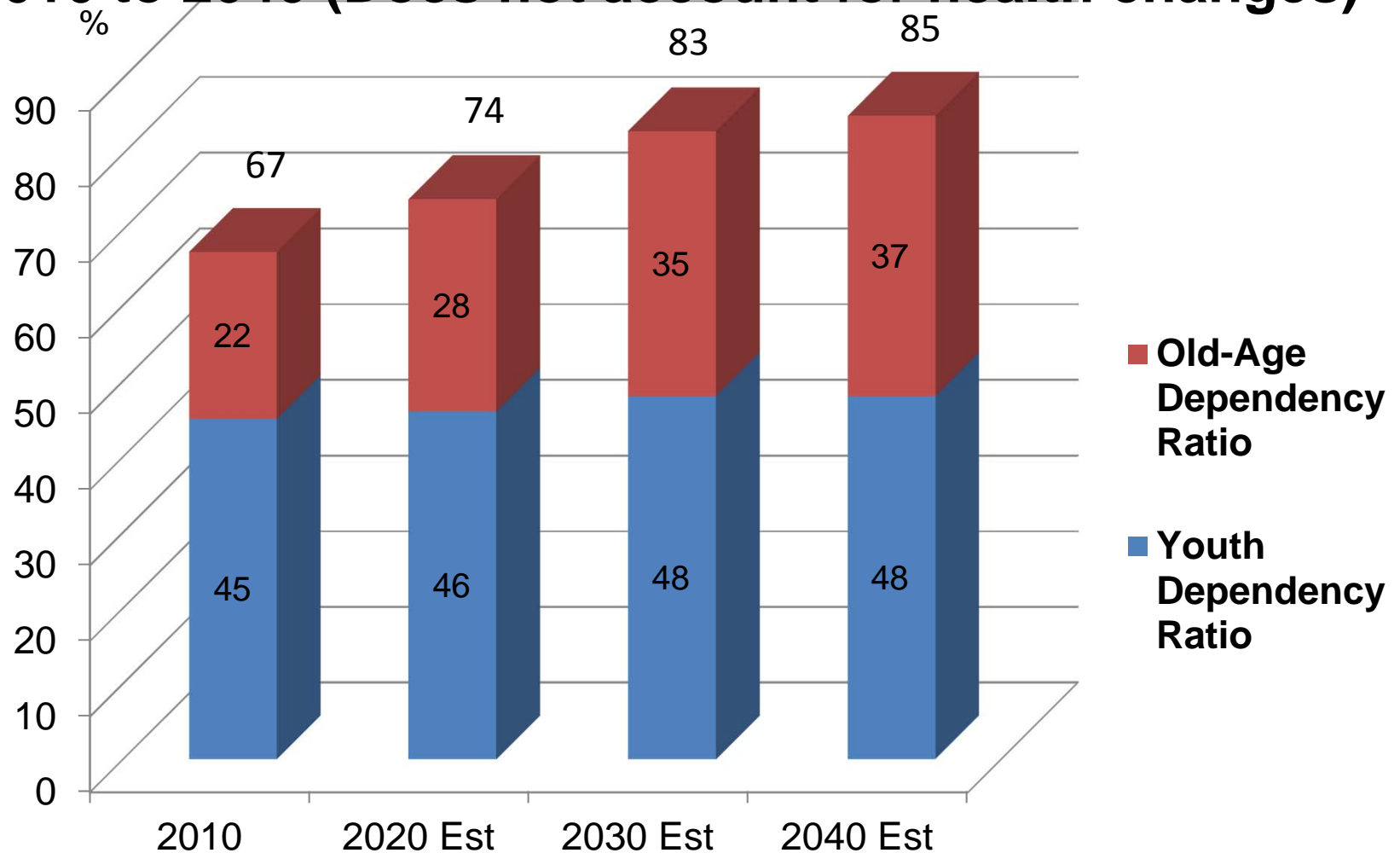


# Unemployment Rate by Level of Education



Source: <http://www.calculatedriskblog.com>

# Dependency Ratios for the United States 2010 to 2040 (Does not account for health changes)

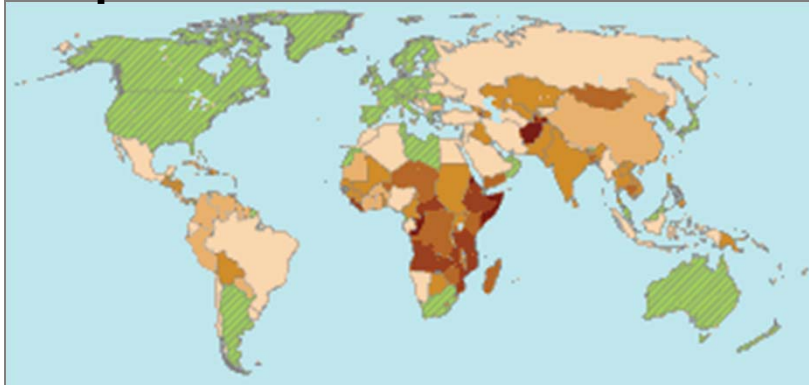


Source: US Department of Commerce

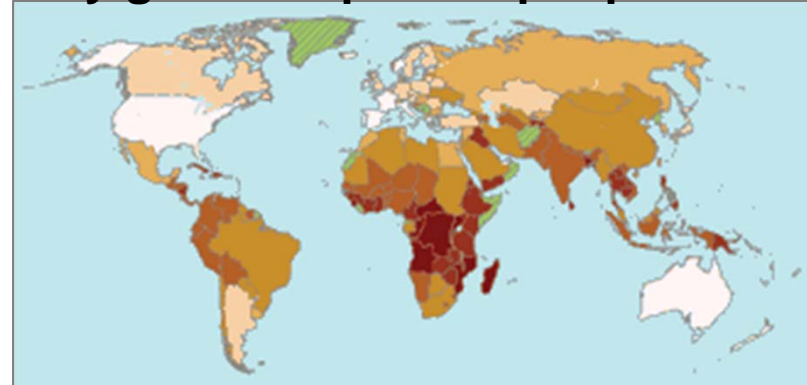
# **Accessibility of Food and Water**

# Food Distribution Maps

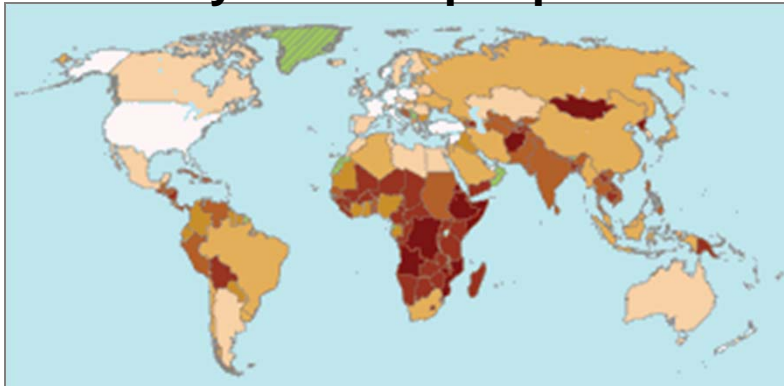
**% Population that is undernourished**



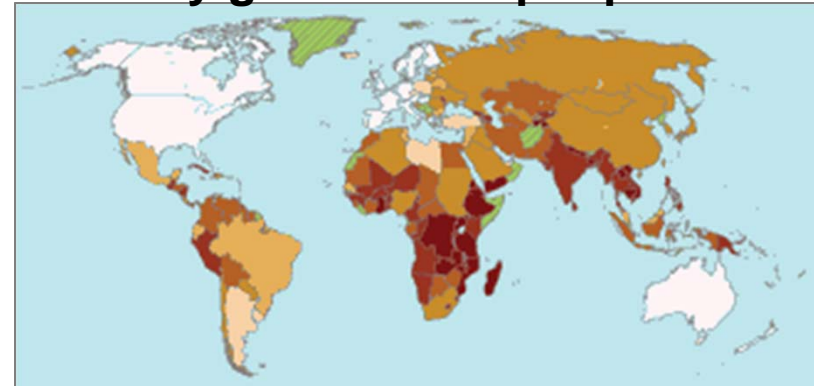
**Daily grams of protein per person**



**Daily calories per person**



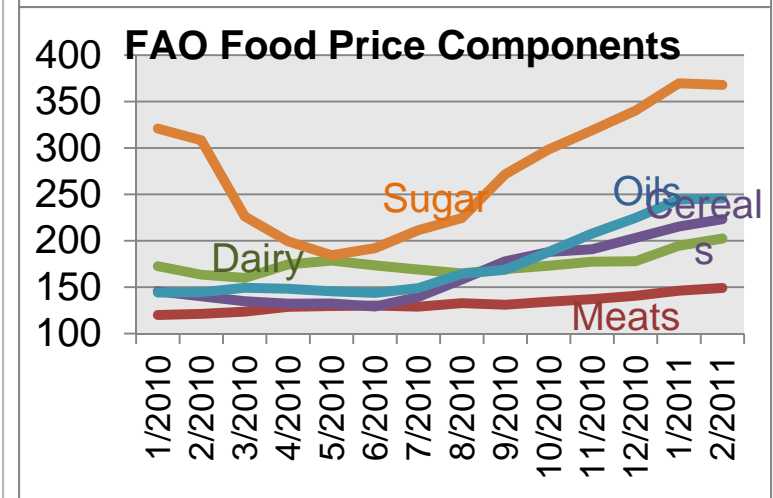
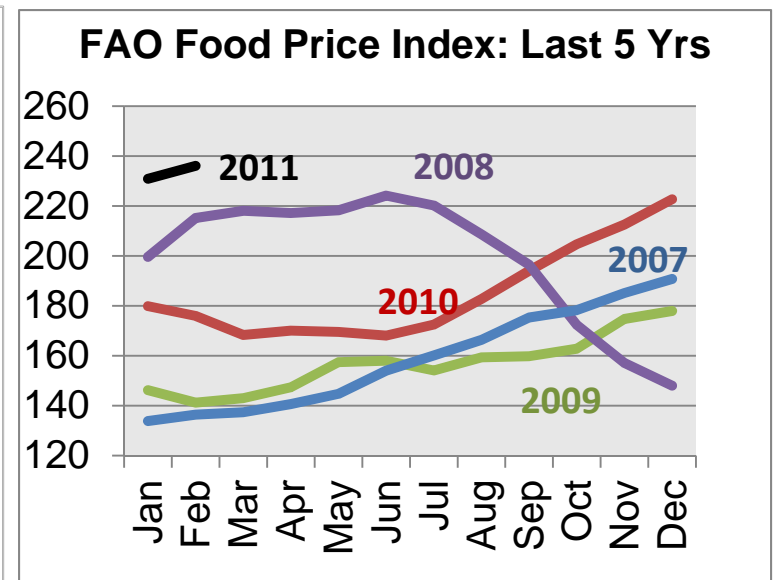
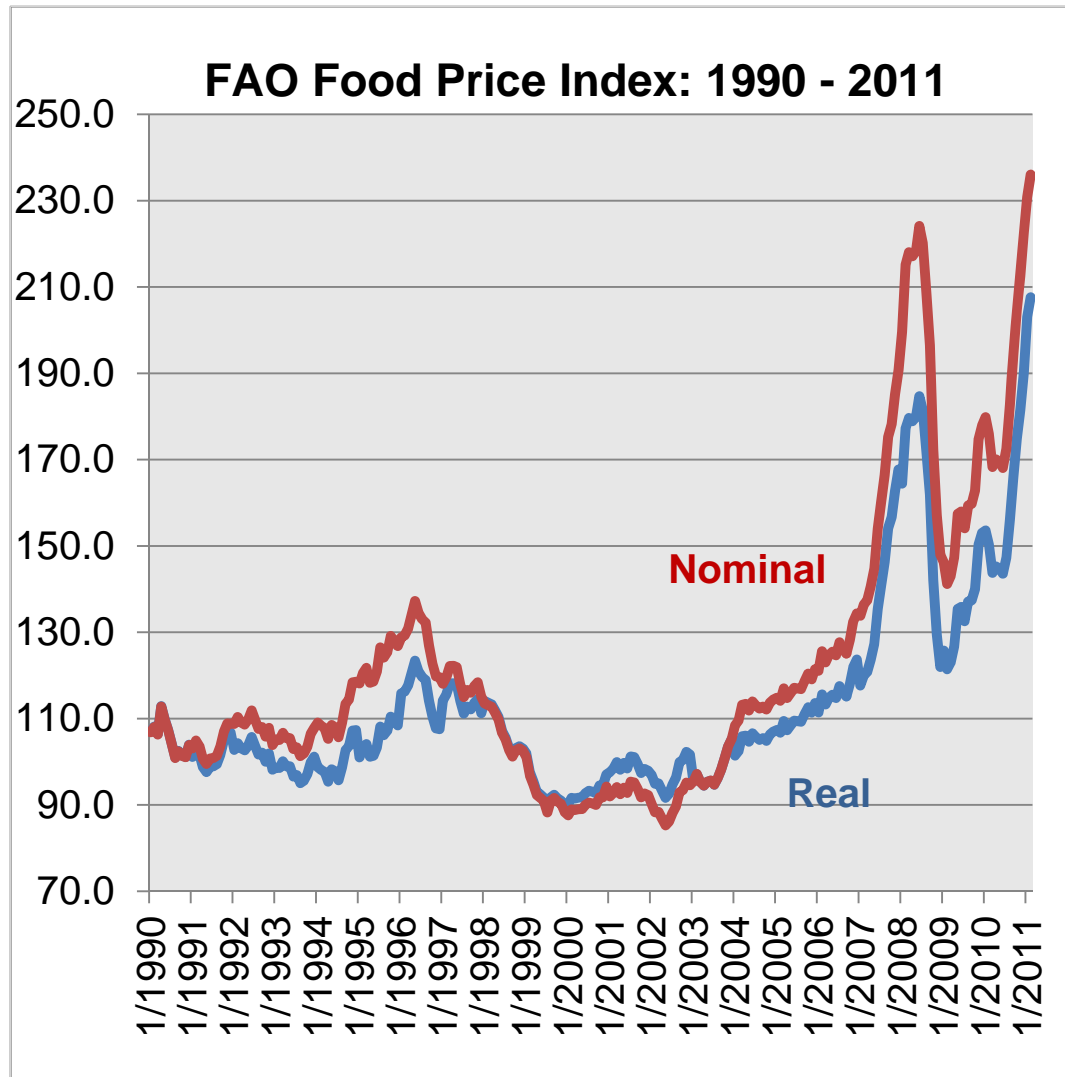
**Daily grams of fat per person**



	---	3-9%	10-18%	19-29%	30-41%	42-53%	54-75%	NO DATA
% OF POPULATION UNDERNOURISHED	---	3-9%	10-18%	19-29%	30-41%	42-53%	54-75%	NO DATA
DAILY CALORIES PER PERSON	3395-3699	3091-3394	2786-3090	2481-2785	2176-2480	1872-2175	1566-1871	NO DATA
DAILY GRAMS OF PROTEIN PER PERSON	104-115	91-103	80-90	69-79	57-68	47-56	28-46	NO DATA
DAILY GRAMS OF FAT PER PERSON	122-164	99-121	84-98	69-83	51-68	37-50	11-36	NO DATA

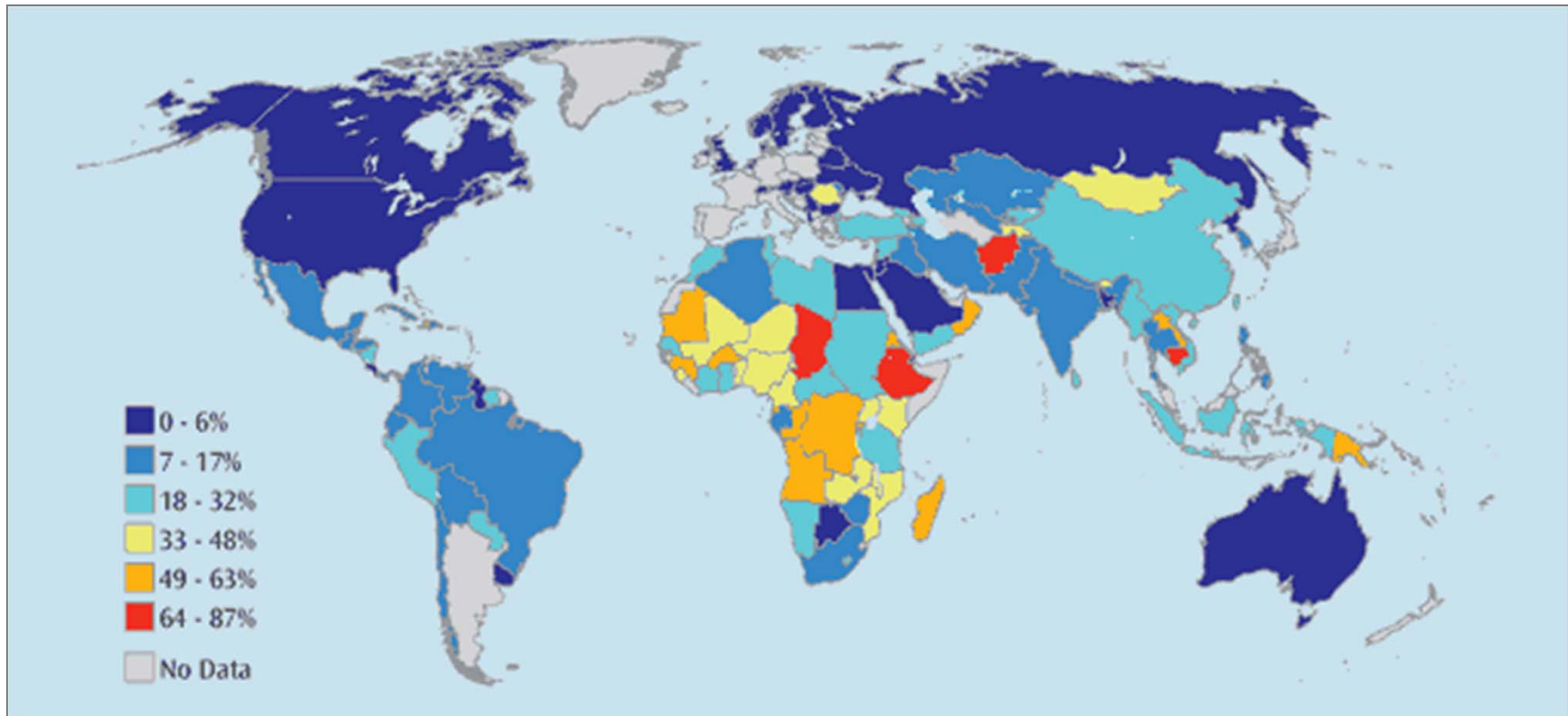
Source:  
UNDP

# Food Prices Continue to Rise



Source: FAO

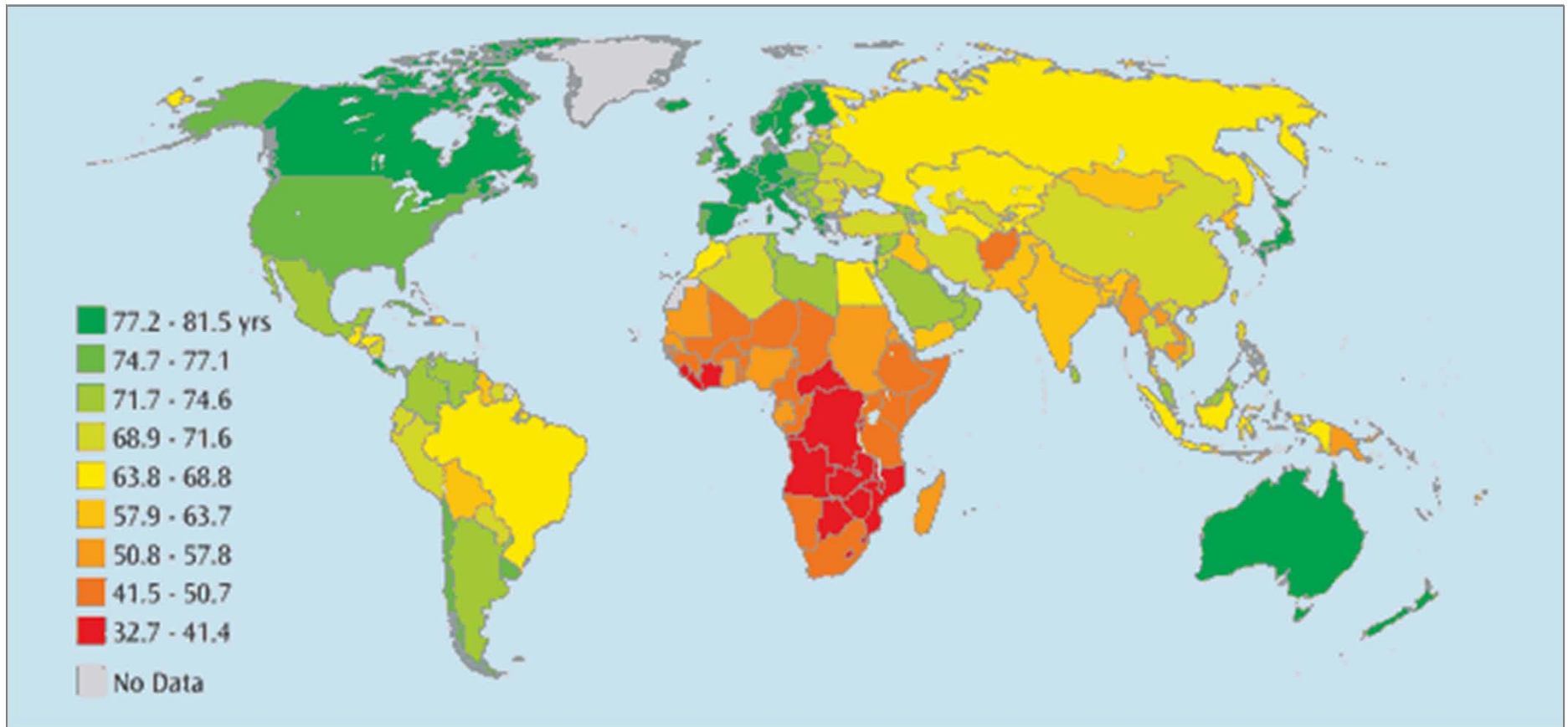
# Population Without Access to Safe Drinking Water (%)



# Civil Unrest: 20 Countries Susceptible to Food Price Inflation

Rank	Country	GDP per Capita	Food as a % of Total Consumption	Net exports of Food (as % of GDP)
1	Bangladesh	\$497	53.8%	-3.3%
2	Morocco	\$2,769	63.0%	-2.1%
3	Algeria	\$4,845	53.0%	-2.8%
4	Nigeria	\$1,370	73.0%	-0.9%
5	Lebanon	\$6,978	34.0%	-3.9%
6	Egypt	\$1,991	48.1%	-2.1%
7	Sri Lanka	\$2,013	39.6%	-2.7%
8	Sudan	\$1,353	52.9%	-1.3%
9	Hong Kong	\$30,863	25.8%	-4.4%
10	Azerbaijan	\$5,315	60.2%	-0.6%
11	Angola	\$4,714	46.1%	-1.4%
12	Romania	\$9,300	49.4%	-1.1%
13	Philippines	\$1,847	45.6%	-1.0%
14	Kenya	\$783	45.8%	-0.8%
15	Pakistan	\$991	47.6%	-0.4%
16	Libya	\$14,802	37.2%	-1.7%
17	Dominican Republic	\$4,576	38.3%	-1.1%
18	Tunisia	\$3,903	36.0%	-1.1%
19	Bulgaria	\$6,546	49.5%	-0.1%
20	Ukraine	\$3,899	61.0%	+0.9%
	United States	\$45,989	8%	

# World Life Expectancy in Years





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