

Presenter



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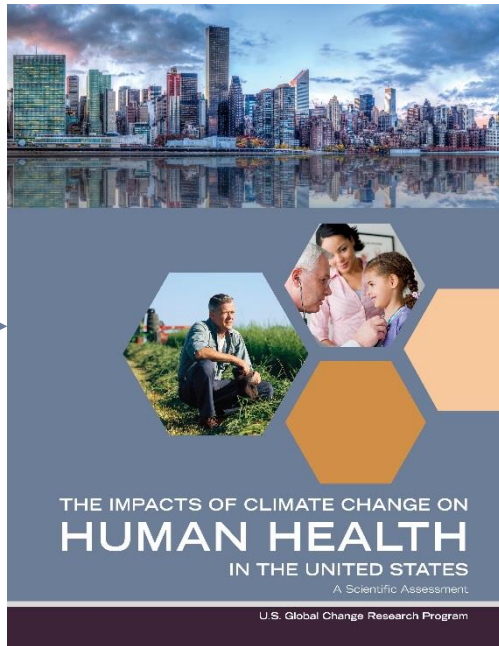
Climate change impacts of food safety, nutrition, and distribution

Chapter 7 of
THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH
IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT

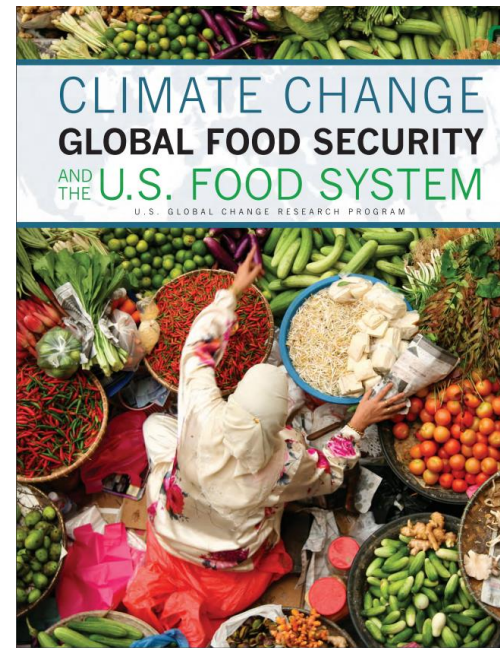
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Food security, in a public health context, can be summarized as permanent access to a sufficient, safe, and nutritious food supply needed to maintain an active and healthy lifestyle.



Ziska et al., 2016



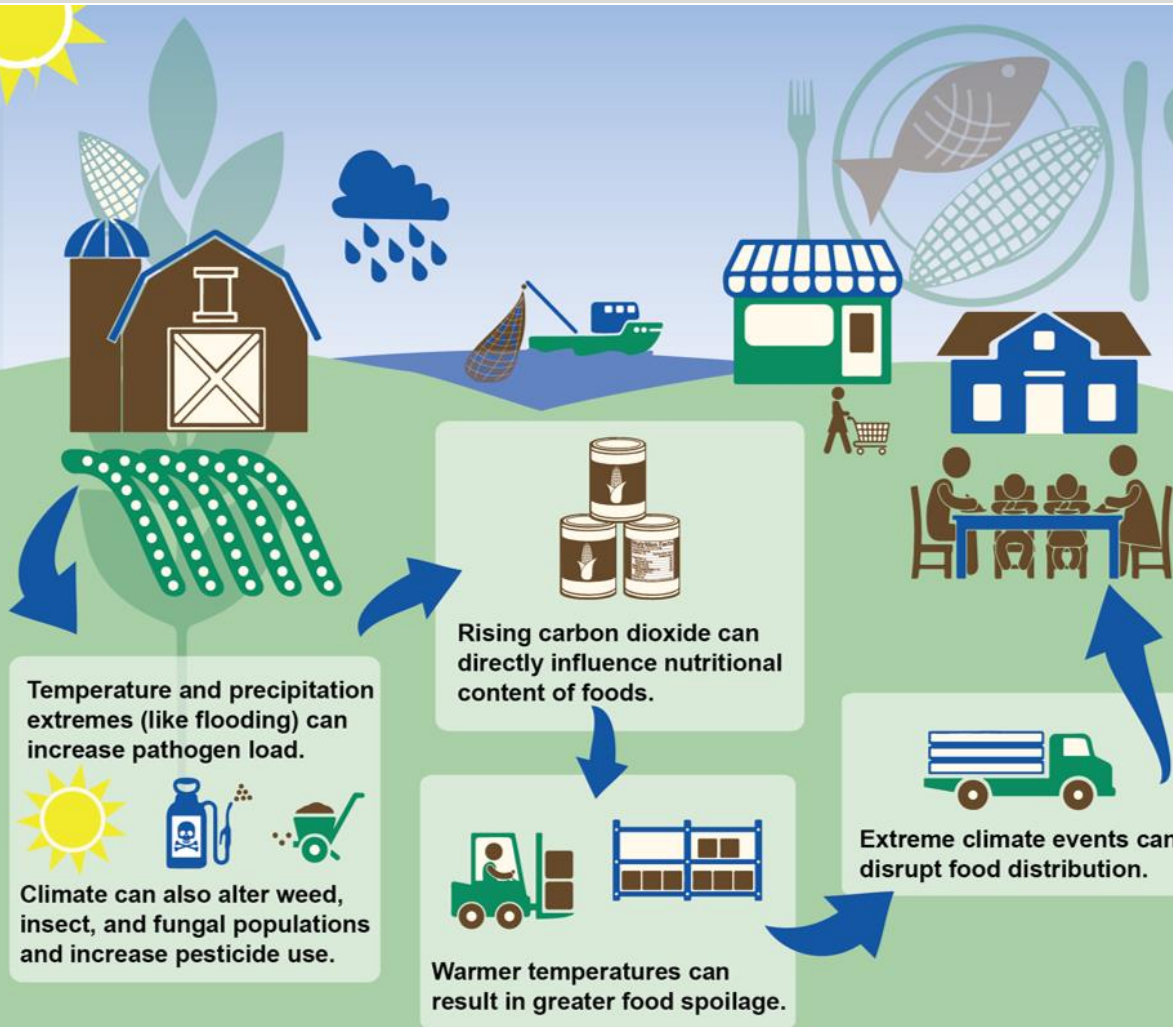
Brown et al., 2015



Impacts of \uparrow CO₂ and climate change

Rising global temperatures and changes in weather patterns

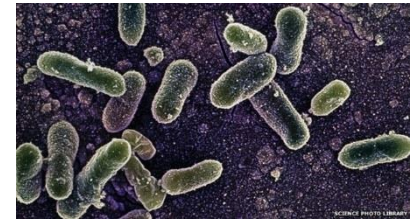
Rising CO₂ concentration or “fertilization”



Risks to Food Safety

Changes in air and water temperatures, weather-related changes, and extreme events can shift the seasonal and geographic occurrence of bacteria, viruses, pests, parasites, fungi, and other chemical contaminants.

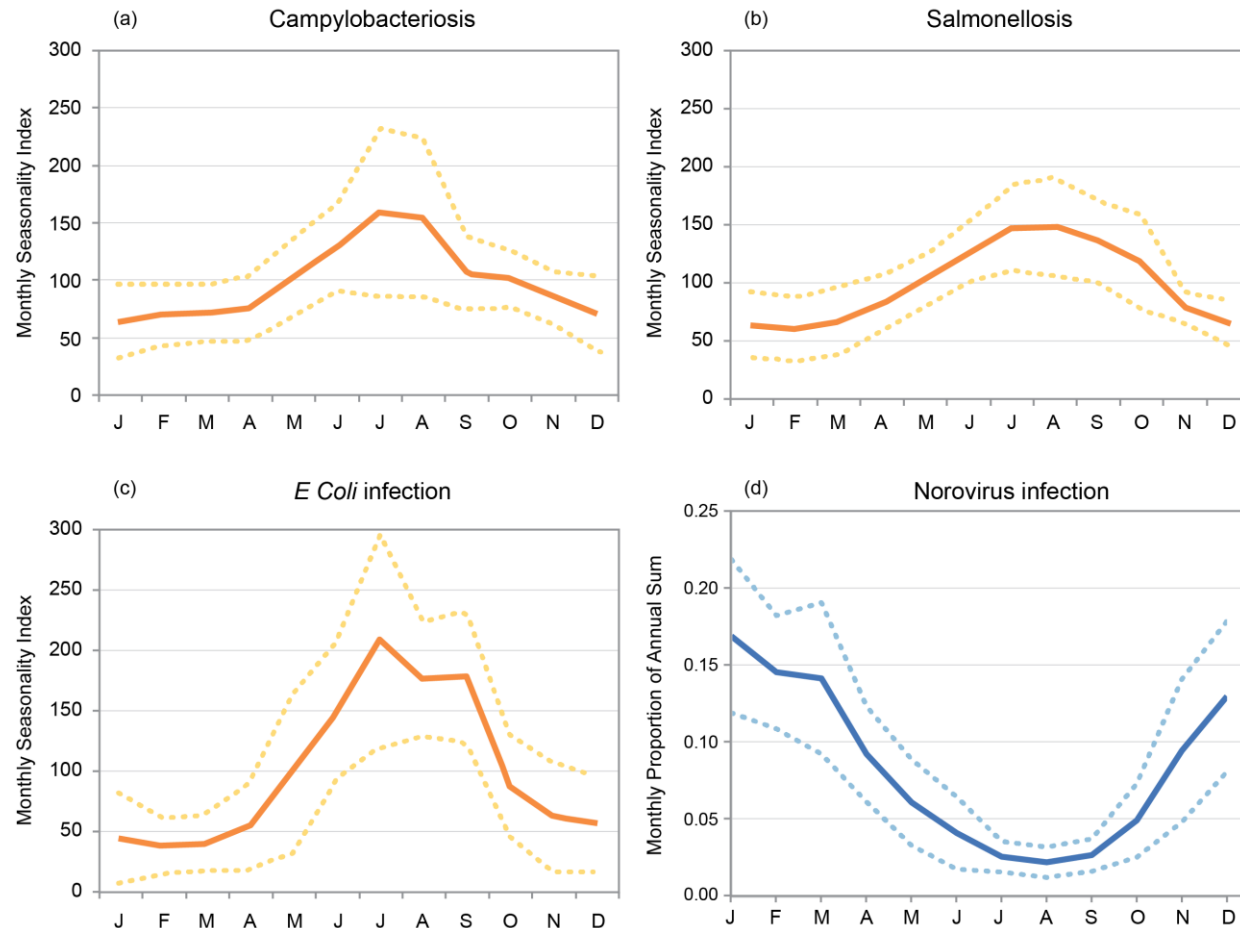
- **Higher temperatures** can increase pathogens and bacteria on produce and seafood, before and during food storage
- **Precipitation** can contaminate irrigation water and produce
- **Rising sea surface temperatures** lead to seafood pathogens
- **Extreme weather events** like dust storms or flooding can introduce toxins and heavy metals in the food supply



KF1: Increased Risk of Foodborne Illness

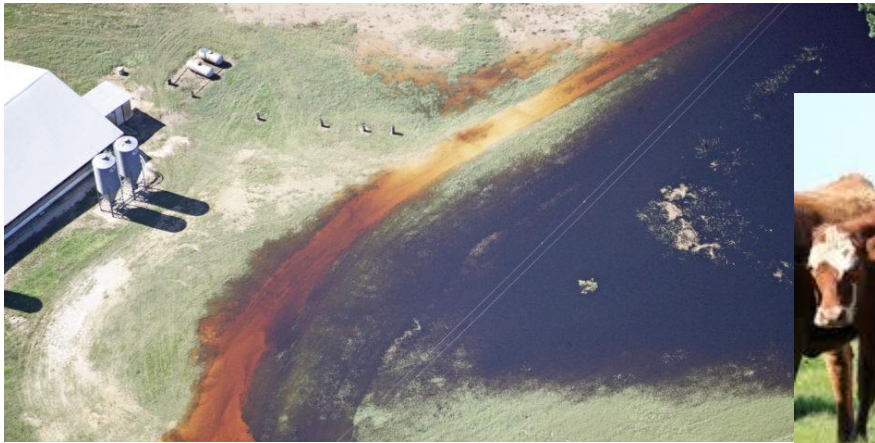
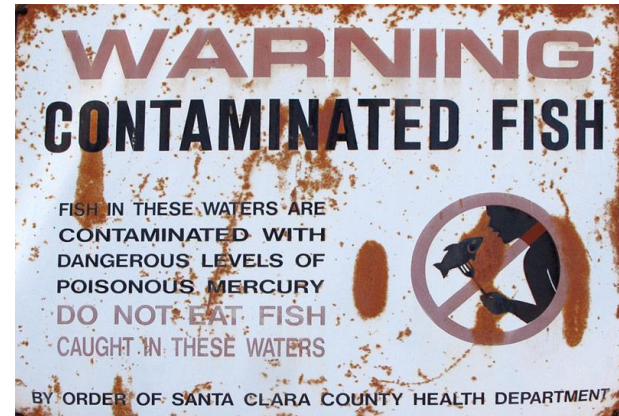
- Climate change will influence the fate, transport, transmission, viability, and multiplication rate of pathogens in the food chain.
- This increases the *risk* of negative health impacts but actual *incidence* of foodborne illness will depend on efficacy of food safety practices.

Seasonality of Human Illnesses Associated With Foodborne Pathogens



KF2: Chemical Contaminants in the Food Chain

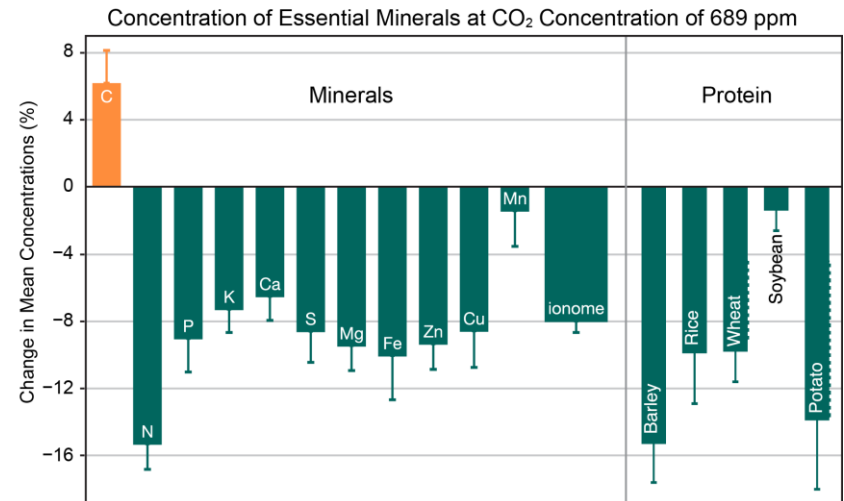
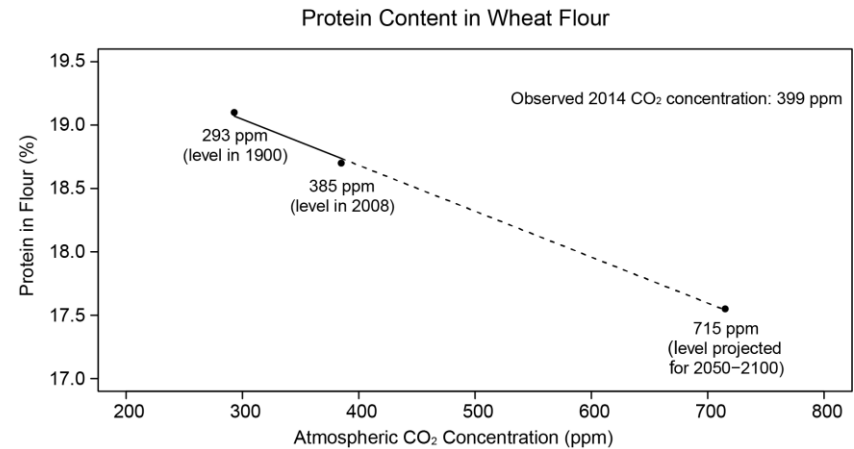
- Climate change will affect human exposure to
 - Metals
 - Pesticides
 - Pesticide residues
- However, resulting incidence of illness will depend on the genetic predisposition of the person exposed, type of contaminant, and extent of exposure over time.



KF3: Rising Carbon Dioxide Lowers Nutritional Value of Food

- Protein:** When grown at the CO₂ levels projected for 2100 (540–958 ppm), major food crops, such as barley, wheat, rice, and potato, exhibit 6% to 15% lower protein concentrations relative to ambient levels (315–400 ppm).
- Ratio of major macronutrients (carbohydrates to protein).** It is very likely that rising CO₂ will alter the relative proportions of major macronutrients in many crops by increasing carbohydrate content while at the same time decreasing protein content.
- Micronutrients:** Rising CO₂ levels are very likely to lower the concentrations of essential micro- and macroelements in most plants (including major cereals and staple crops).

Effects of Carbon Dioxide on Protein and Minerals



Risks to Distribution

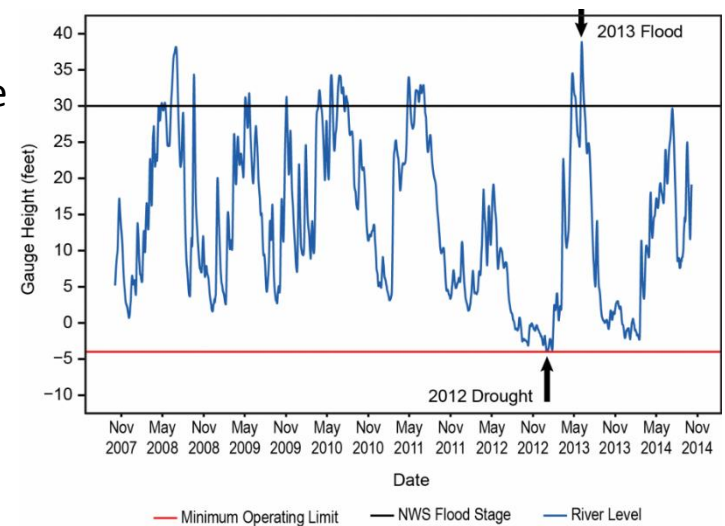
Key Finding 4:

Extreme Weather Limits Access to Safe Foods

- Increased disruptions of food distribution by damaging existing infrastructure or slowing food shipments.
- Increased risk for food damage, spoilage, or contamination, which will limit availability of and access to safe and nutritious food.
- The risk for food spoilage and contamination in storage facilities, supermarkets, and homes is likely to increase due to the impacts of extreme weather events, particularly those that result in power outages.



Mississippi River Level at St. Louis, Missouri



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USGCRP resources: health2016.globalchange.gov

