

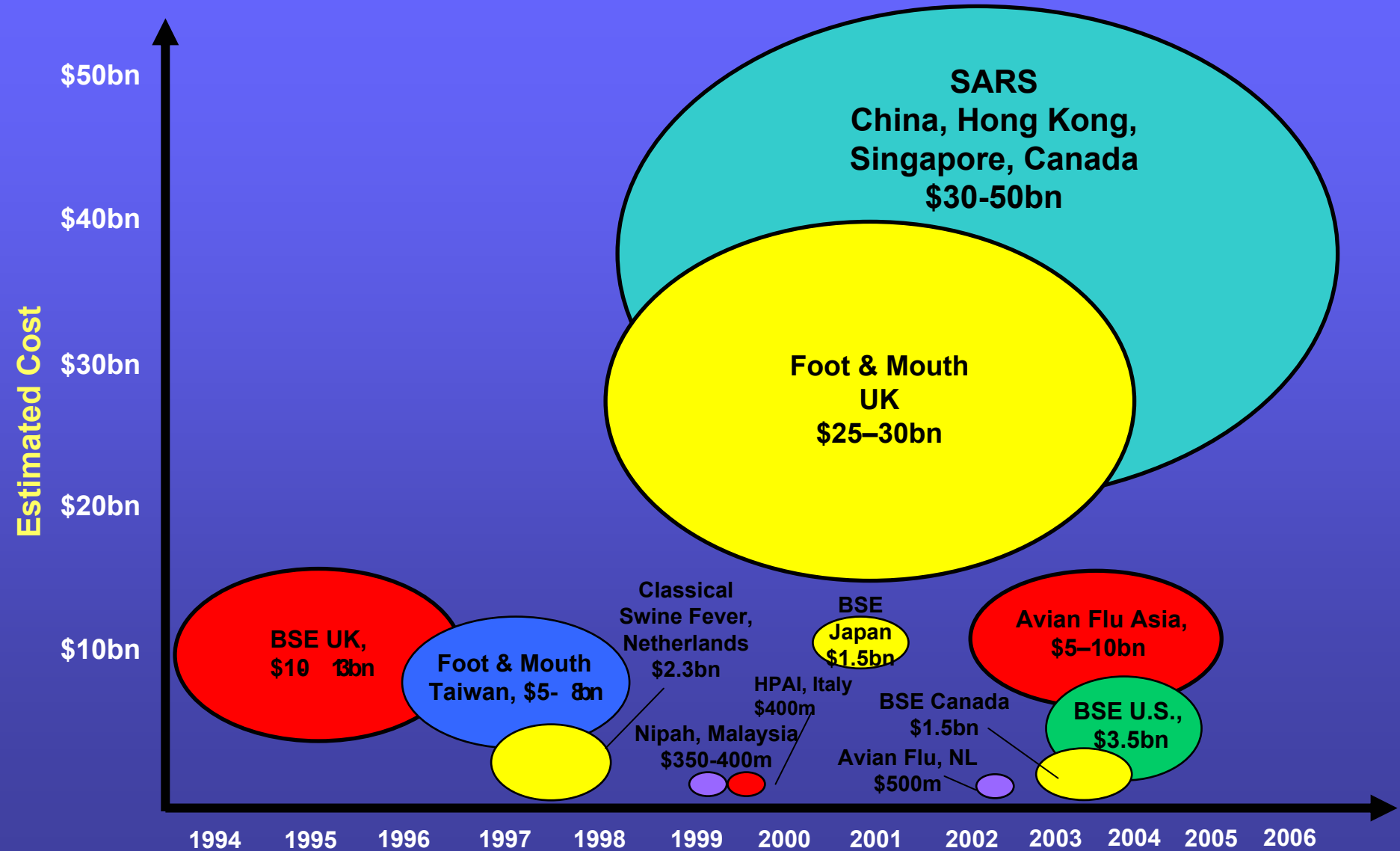
One World–One Health: An Economic Perspective

Beyond Zoonoses: The Threat of Emerging Diseases to Human Security and Conservation, and the Implications for Public Policy

James Newcomb
Bio Economic Research Associates (bio era)

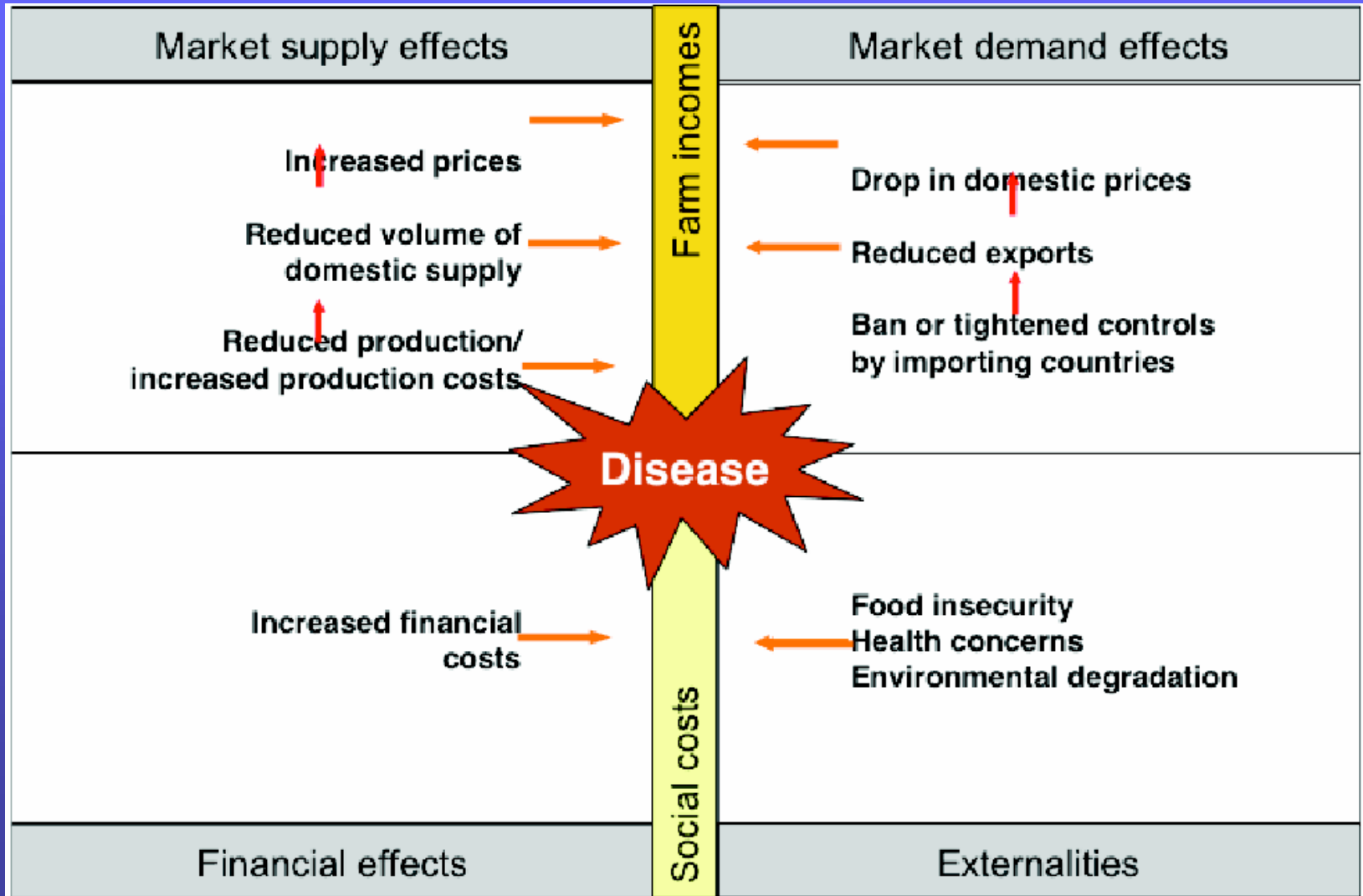
November 15, 2004
Bangkok, Thailand

Economic Impact of Selected Infectious Diseases



Figures are estimates and are presented as relative size.

Livestock Disease Economics



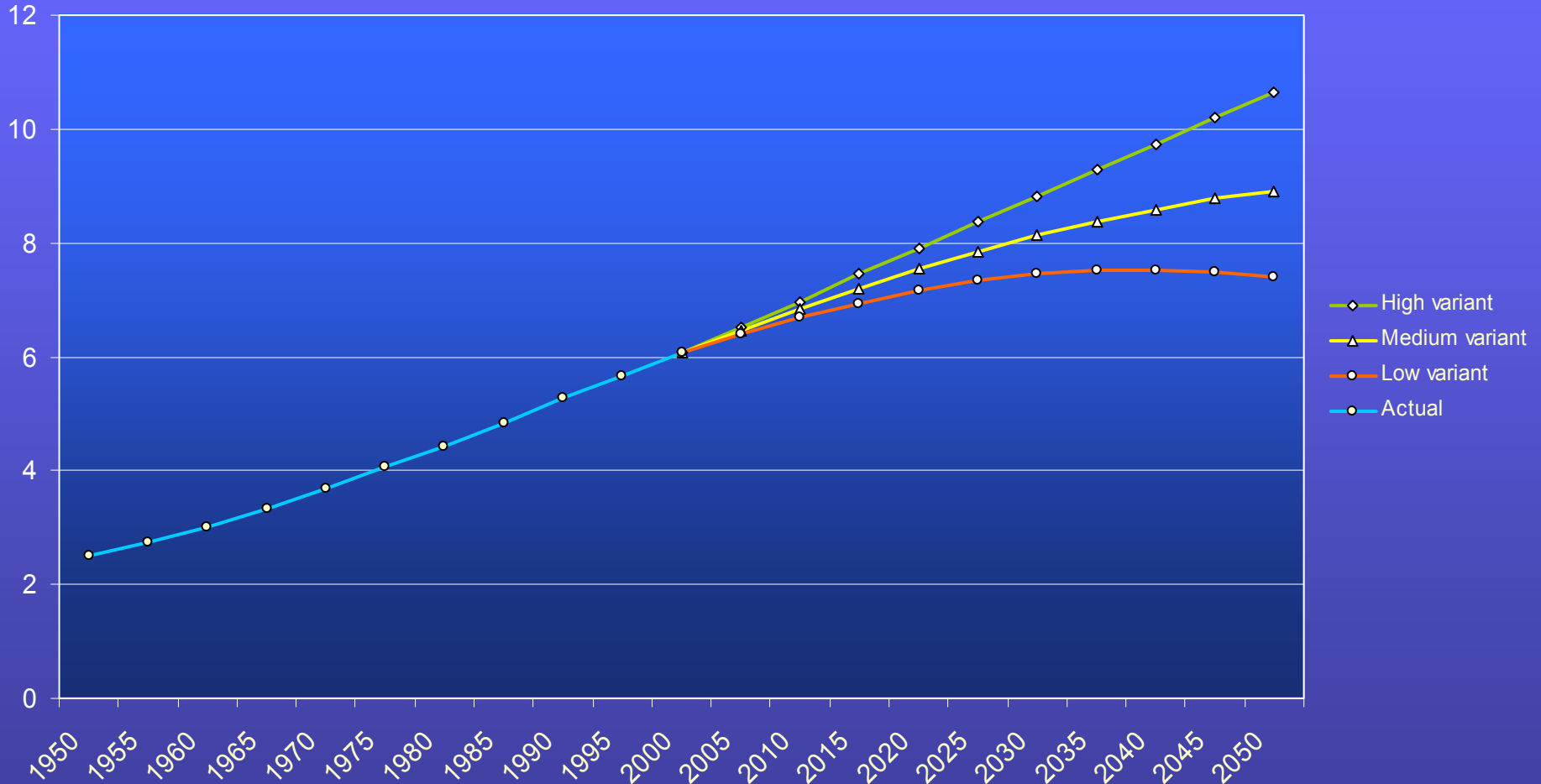
Livestock Disease Risks: Widening Concerns

- Recent animal disease outbreaks have affected one-third of global meat exports (UN/FAO)
- Economic impacts of major livestock disease outbreaks in the past 10 years exceed \$80 billion
- Concerns about human health risks of emerging infectious diseases are increasing (SARS, avian flu, Nipah virus)
- Rapid growth of Asia's livestock industries poses new challenges
- Global trade and travel increase the interconnectedness of livestock producers worldwide
- Pathogen exchanges with wildlife populations could be significant
- Bioterrorism aimed at agricultural targets is possible

One World–One Health: An Economic Perspective

1. **Inevitable Collisions: Projected Increases in Livestock Populations Will Create New Ecosystem Stresses**
2. **Network Dynamics: Highly Interconnected Systems Are Vulnerable to Epidemics**
3. **Policy Responses Must Take the Long View**

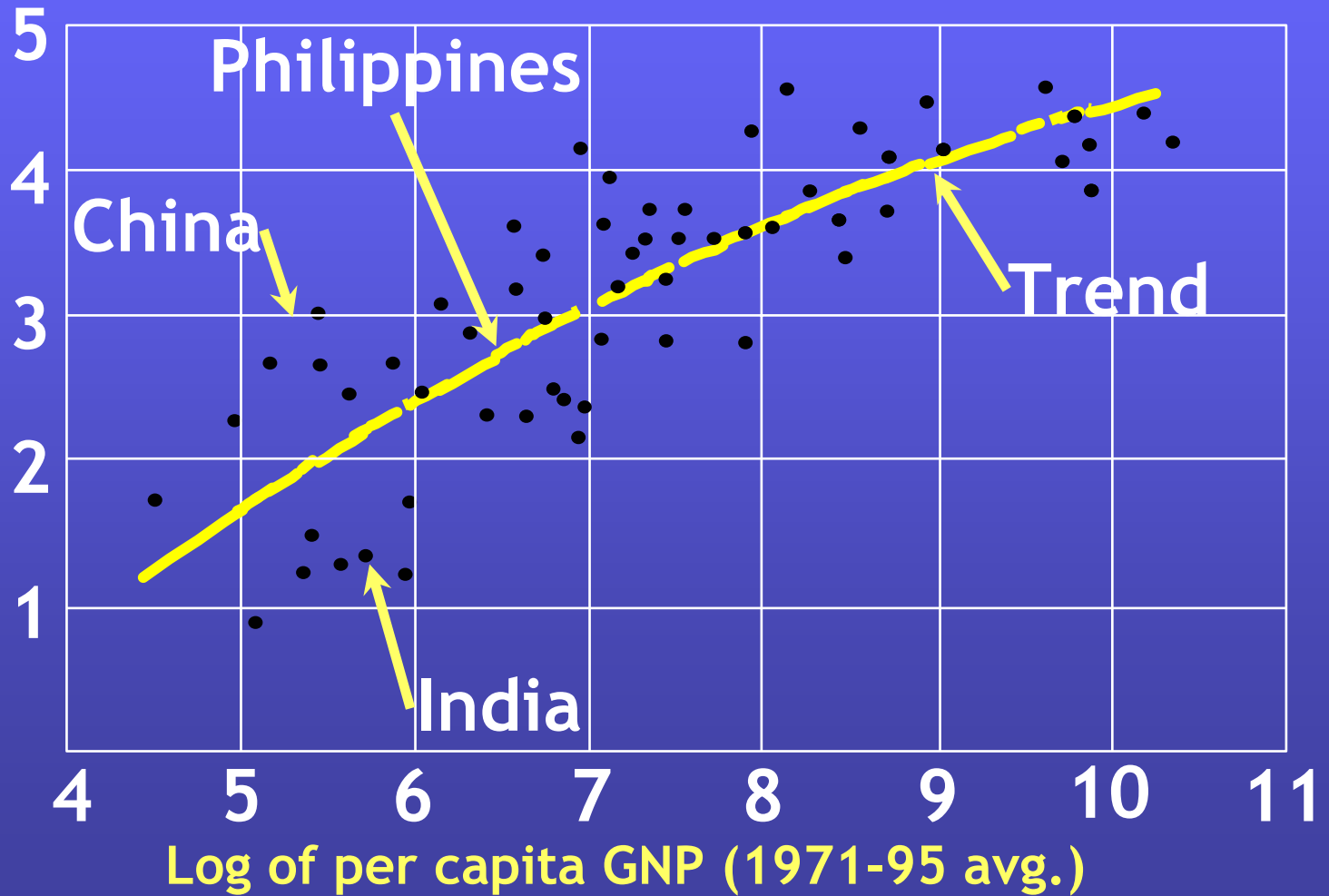
UN Population Projections (Bn)



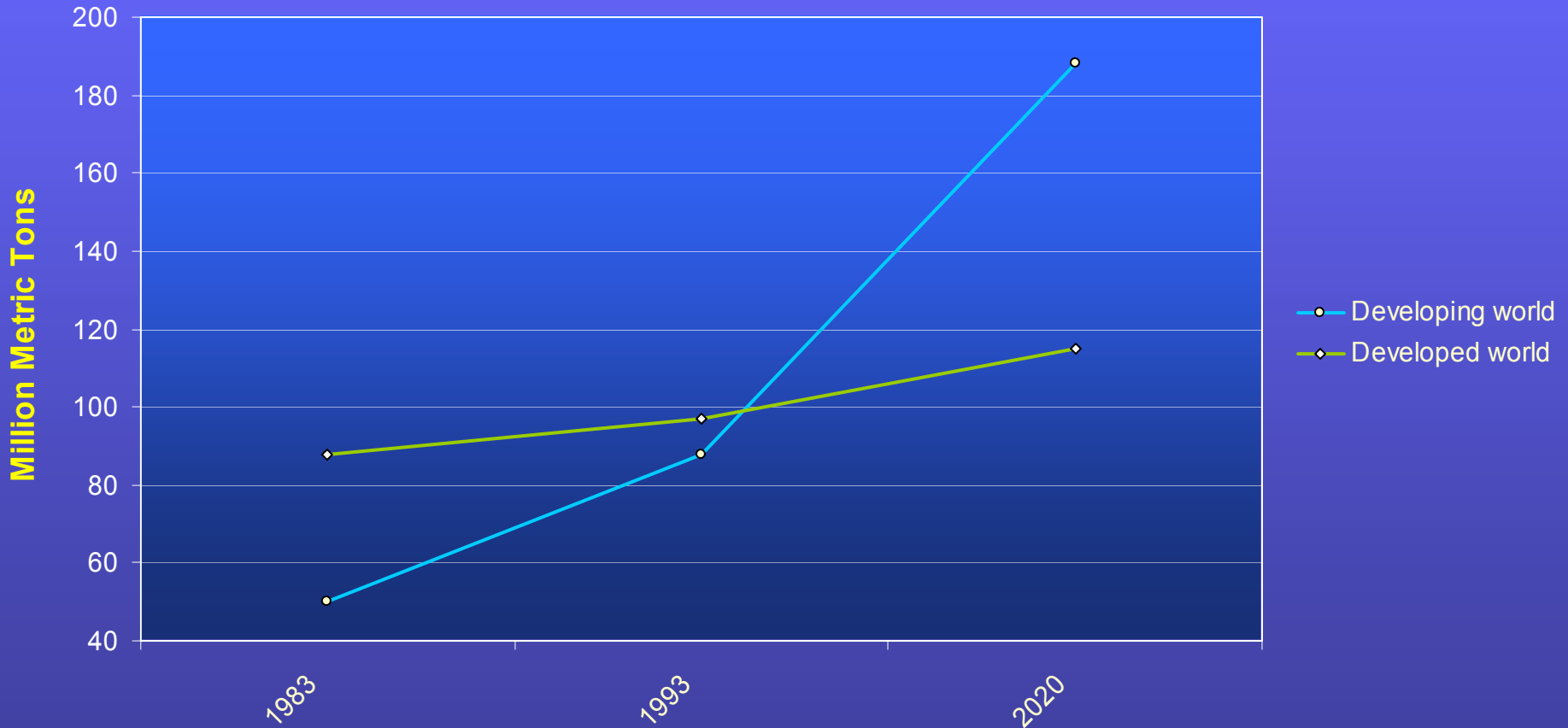
Source: United Nations Secretariat, "World Population Prospects: 2002 Revision"

Meat Consumption and Income Trends

Log of per capita Consumption of Meat (1971-1995 avg.)



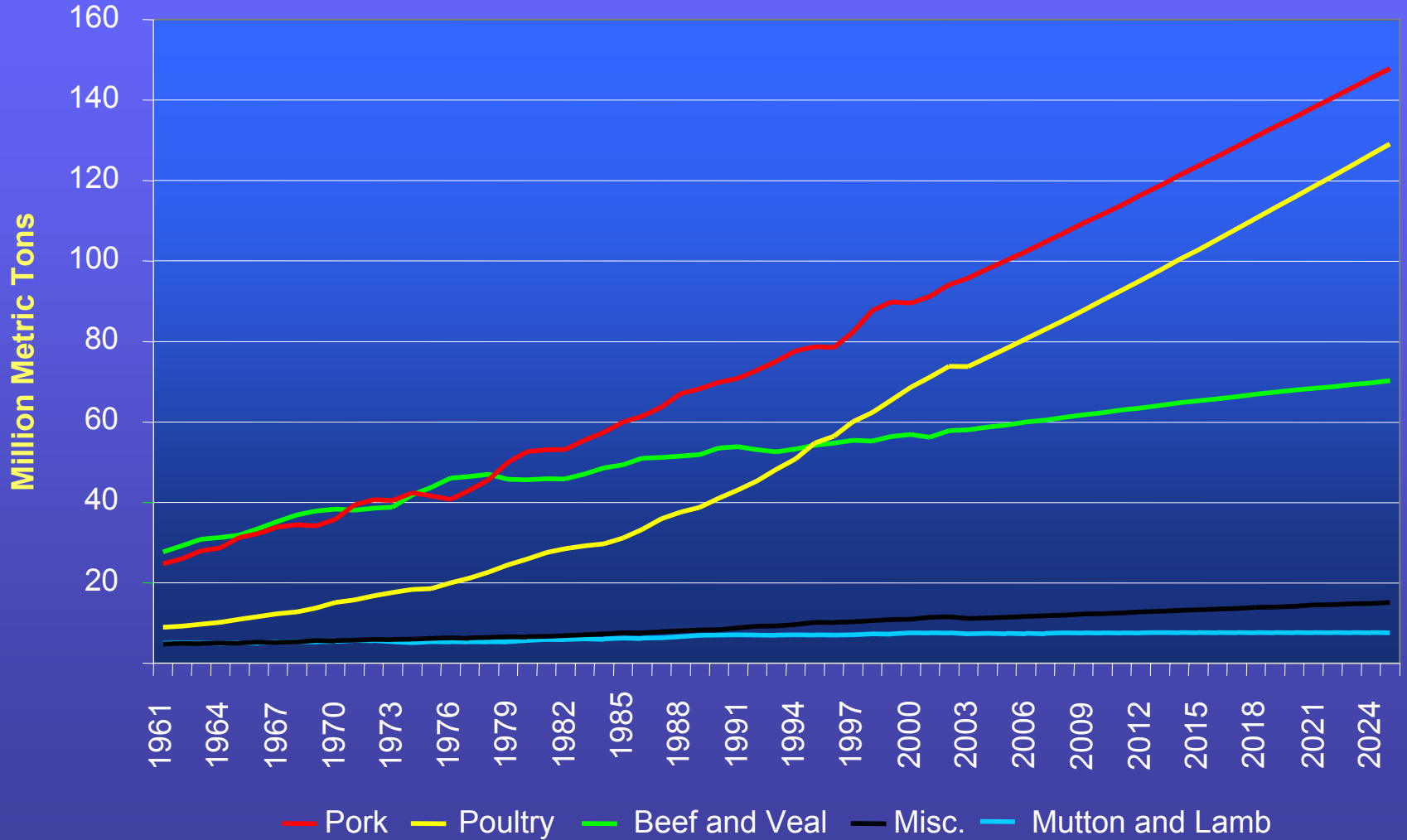
World Meat Consumption: 1983-2020



Source: IFPRI, "Livestock to 2020: The Next Food Revolution"

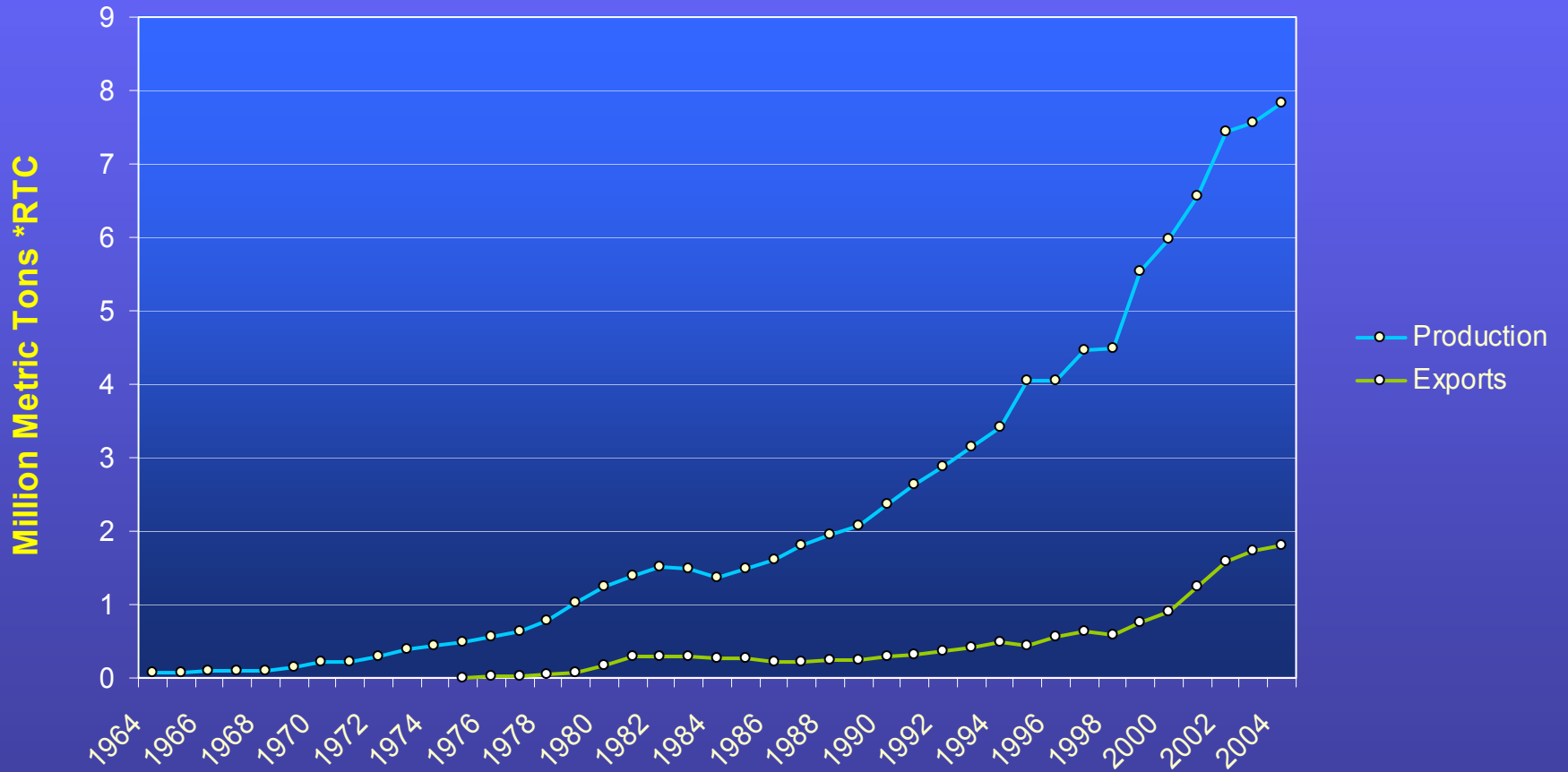
FAO Annual Data. Total meat consumption for 1983 and 1993 are three-year moving averages. 2020 projections come from IFPRI's global model, IMPACT

Projected Species Production



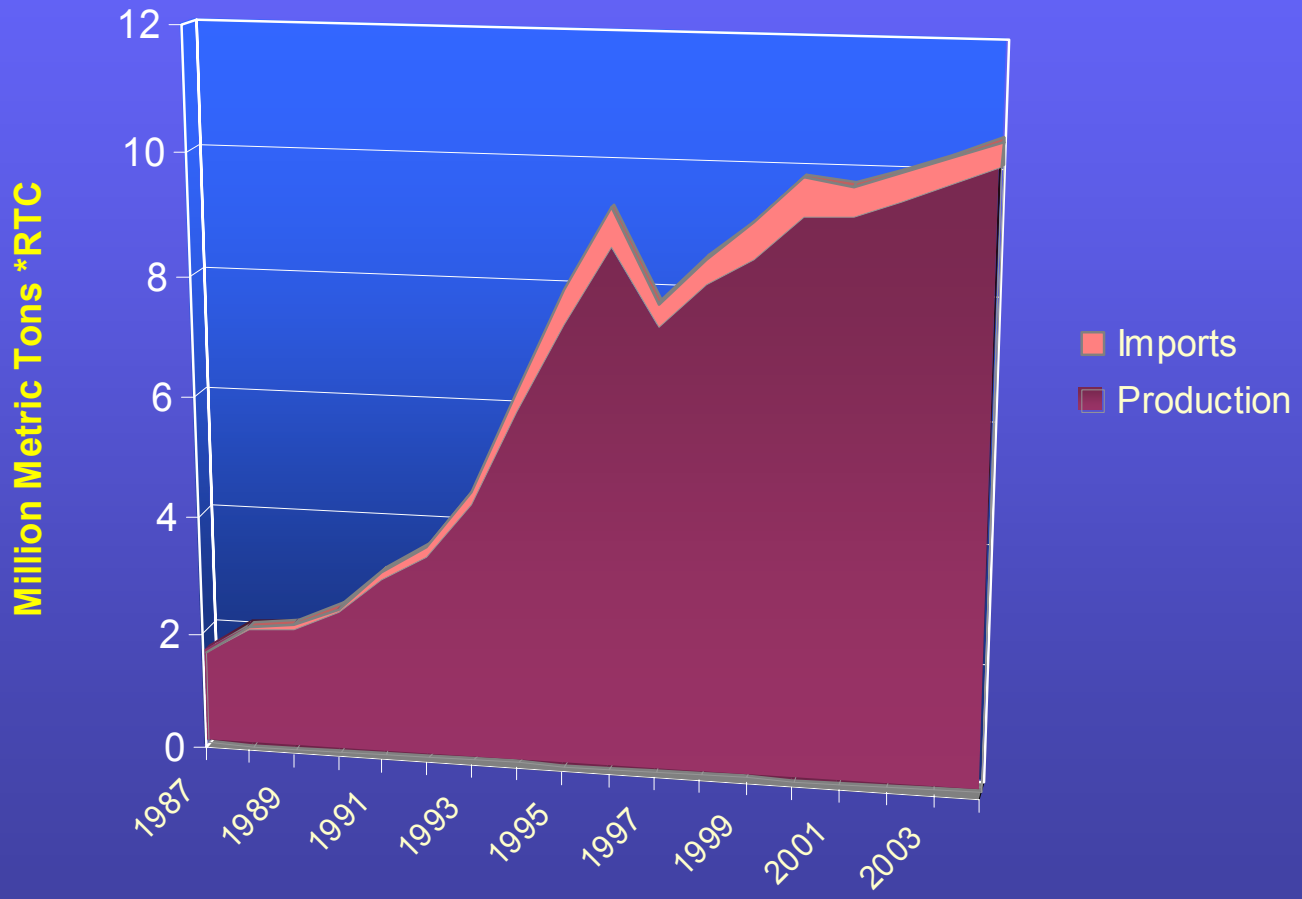
Source: Center for Global Food Issues

Brazil Chicken Meat Production and Exports: 1964-2004



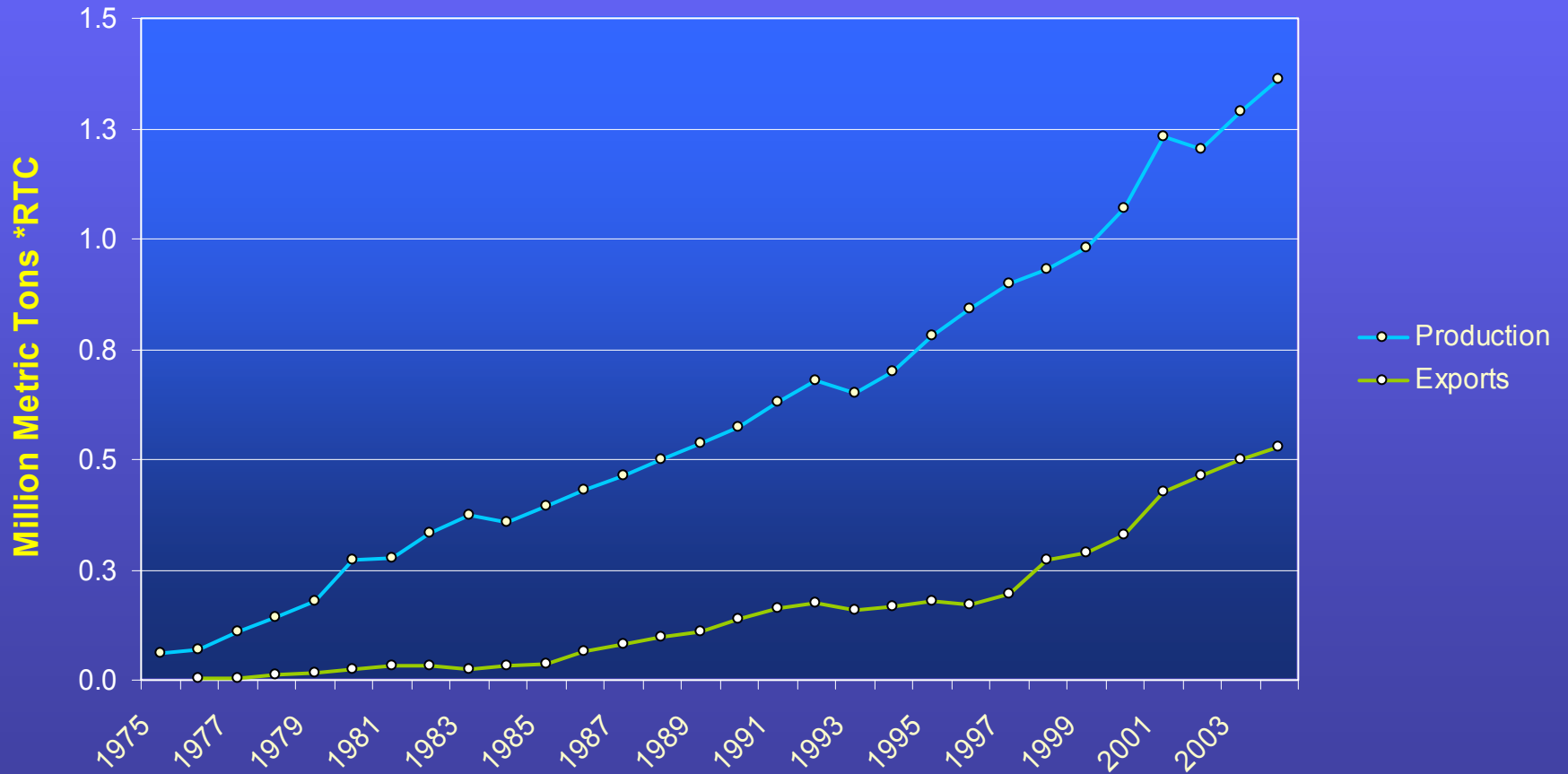
Source: FAOSTAT

China Chicken Meat Production and Imports: 1987-2004



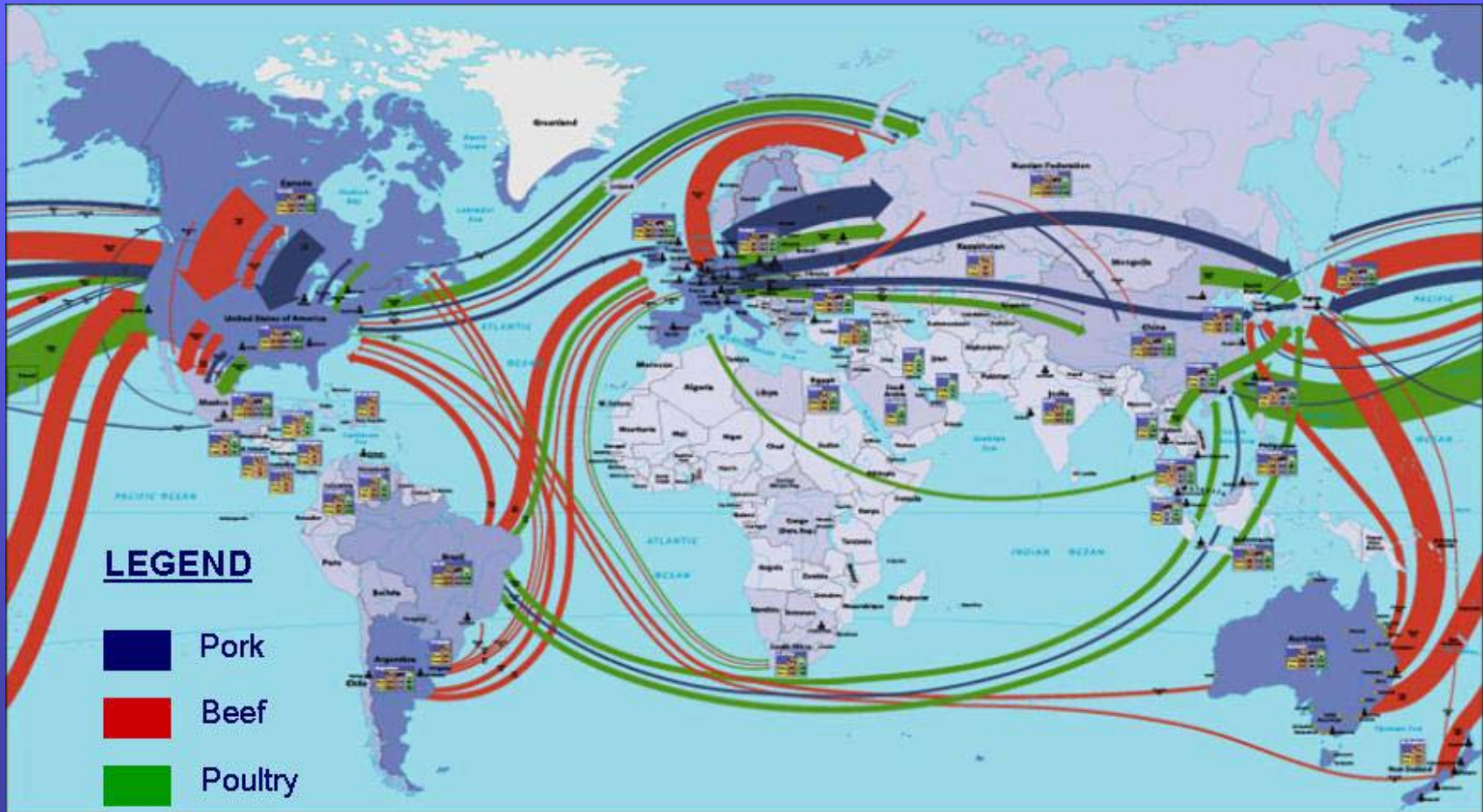
Source: FAOSTAT

Thailand Chicken Meat Production and Exports: 1964-2004



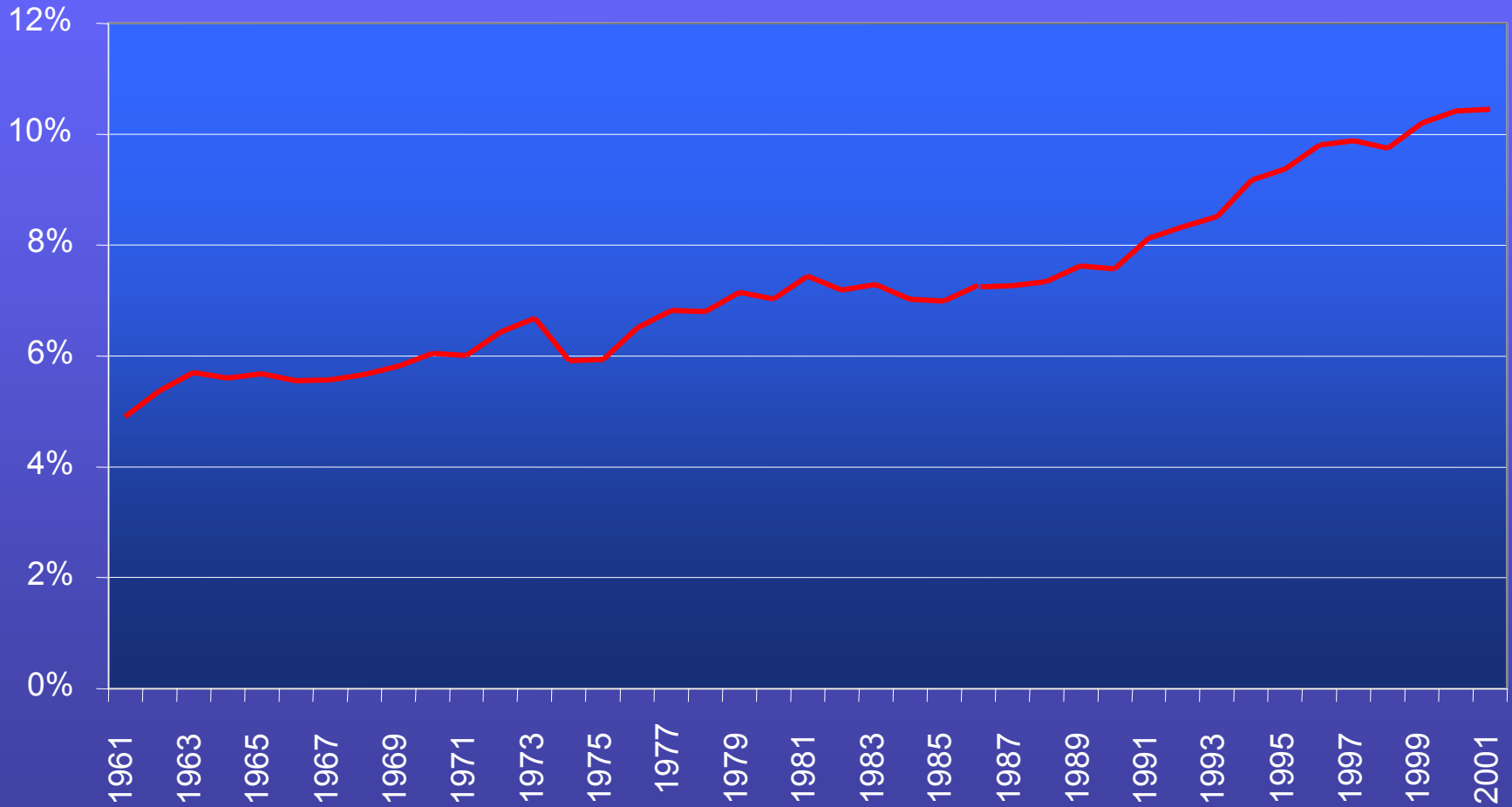
Source: FAOSTAT

The Global Meat Trade is Highly Concentrated



Source: Center for Global Food Issues

Percent of Global Meat Production Exported

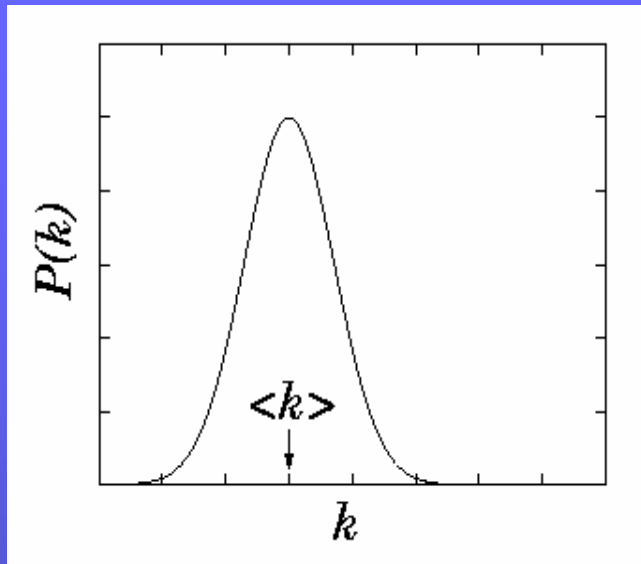


Source: Center for Global Food Issues

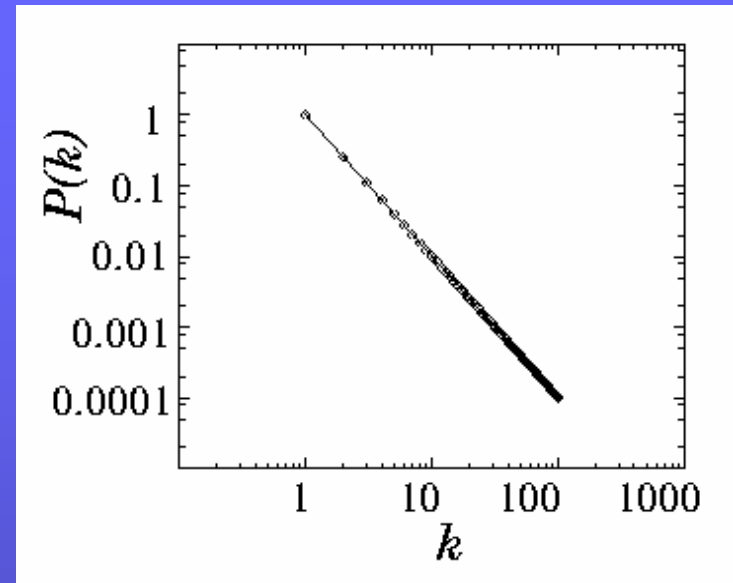
Network Theory Offers Important New Tools for Analyzing and Managing Disease Risks

- Network models (scale-free, small world, urban, etc.) give fundamental new insights into epidemiology
- Scale-free networks are especially vulnerable, but can be made more robust by focusing control measures at hubs
- Network theory has significant practical applications in understanding and managing livestock diseases through application of “contact tracking” to identify hubs

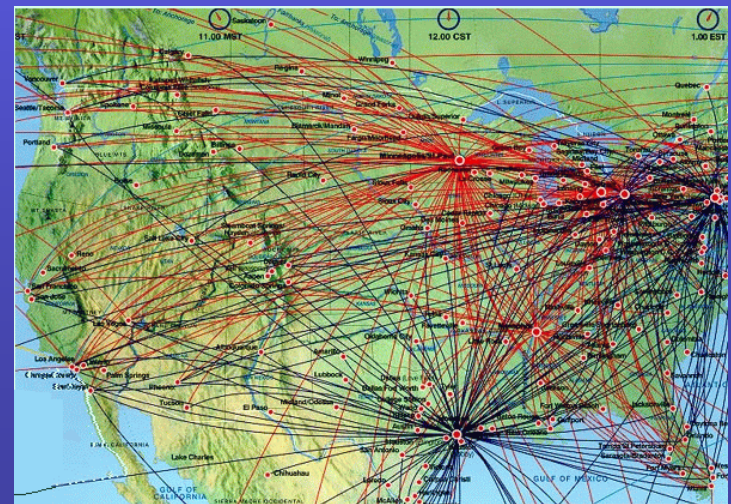
Poisson distribution



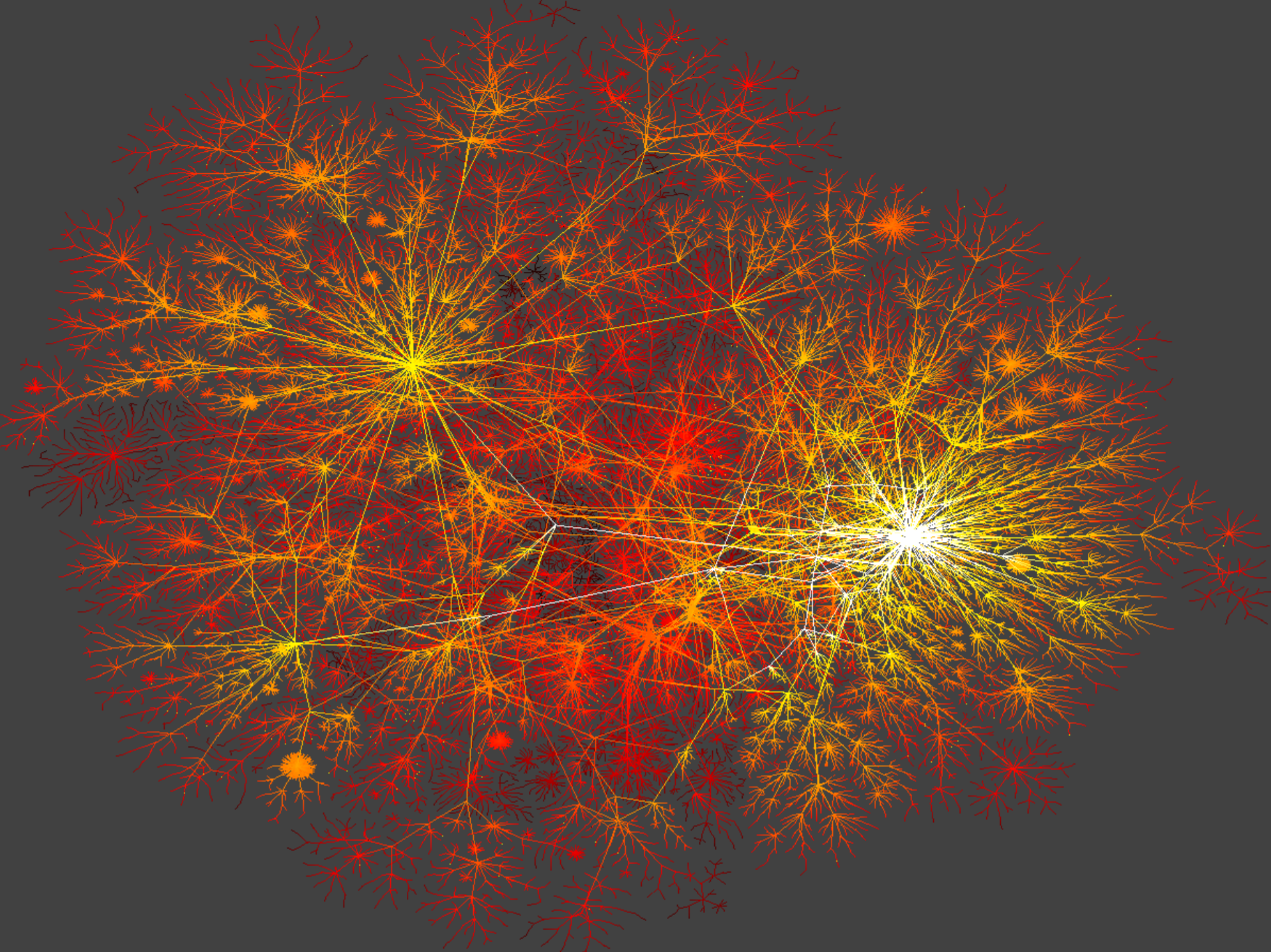
Power-law distribution



Exponential Network

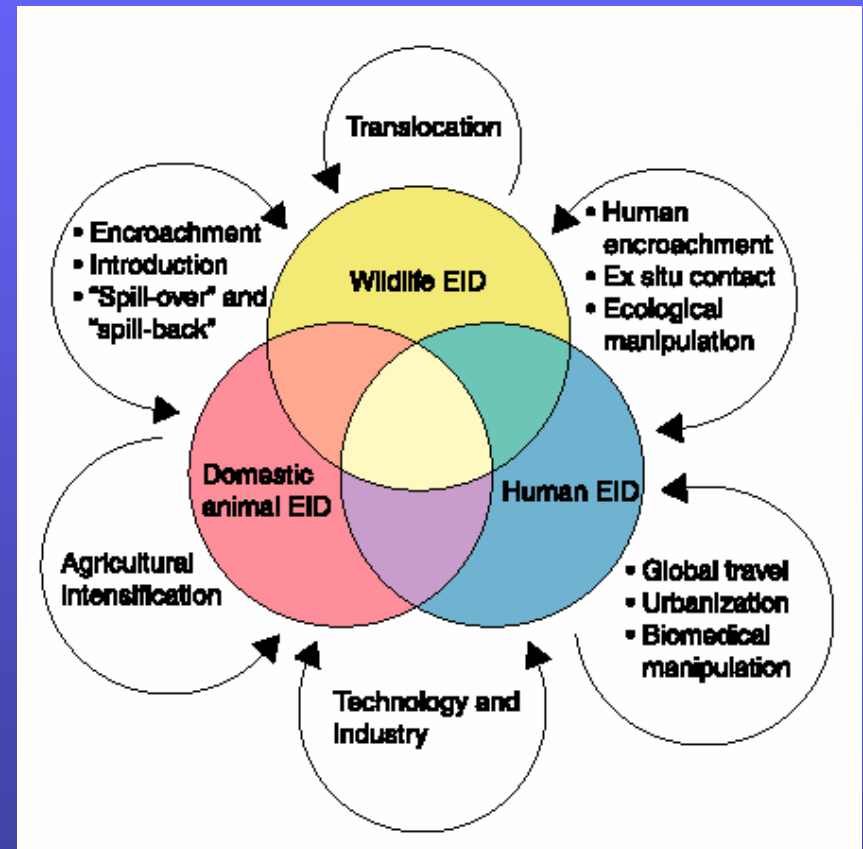


Scale-free Network

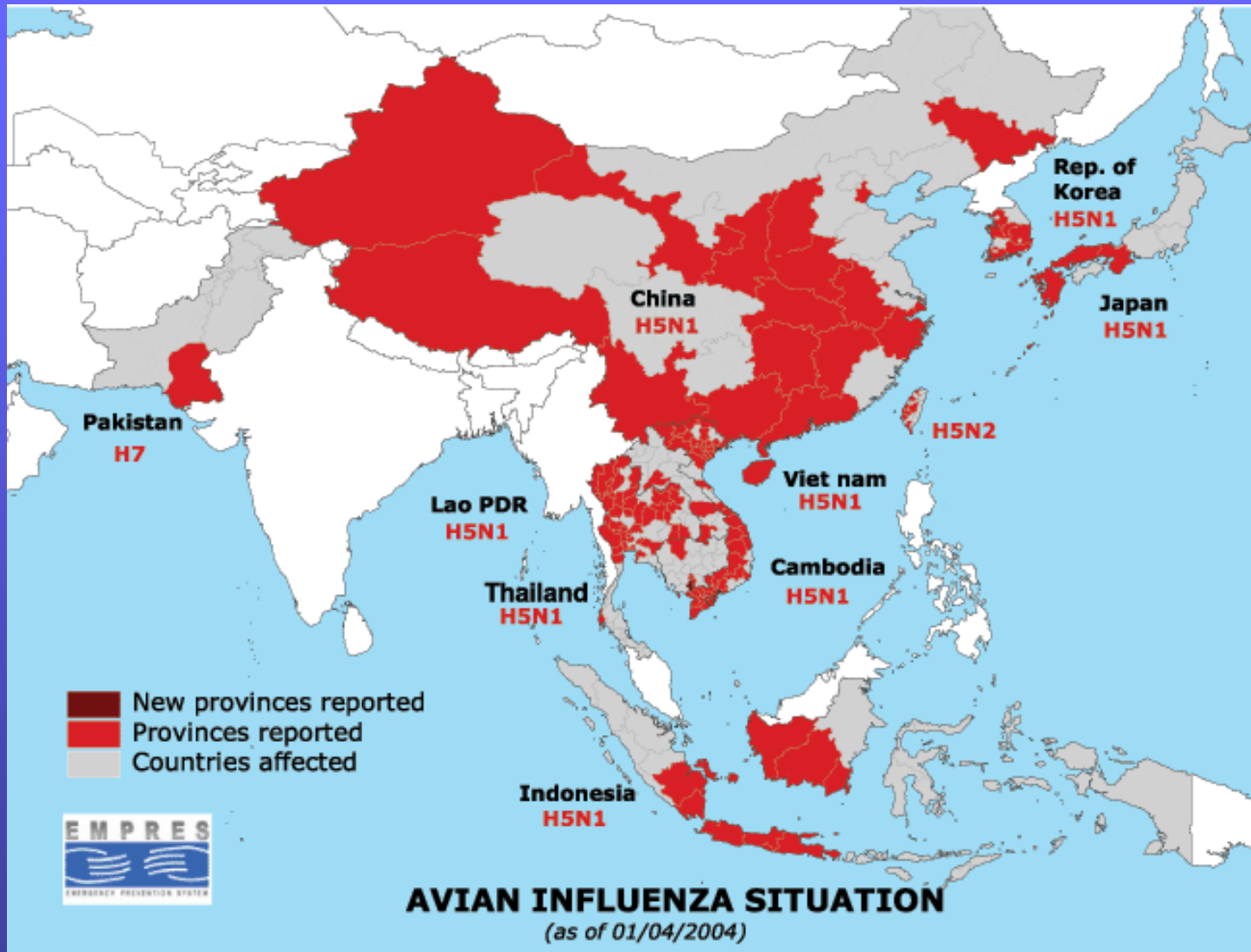


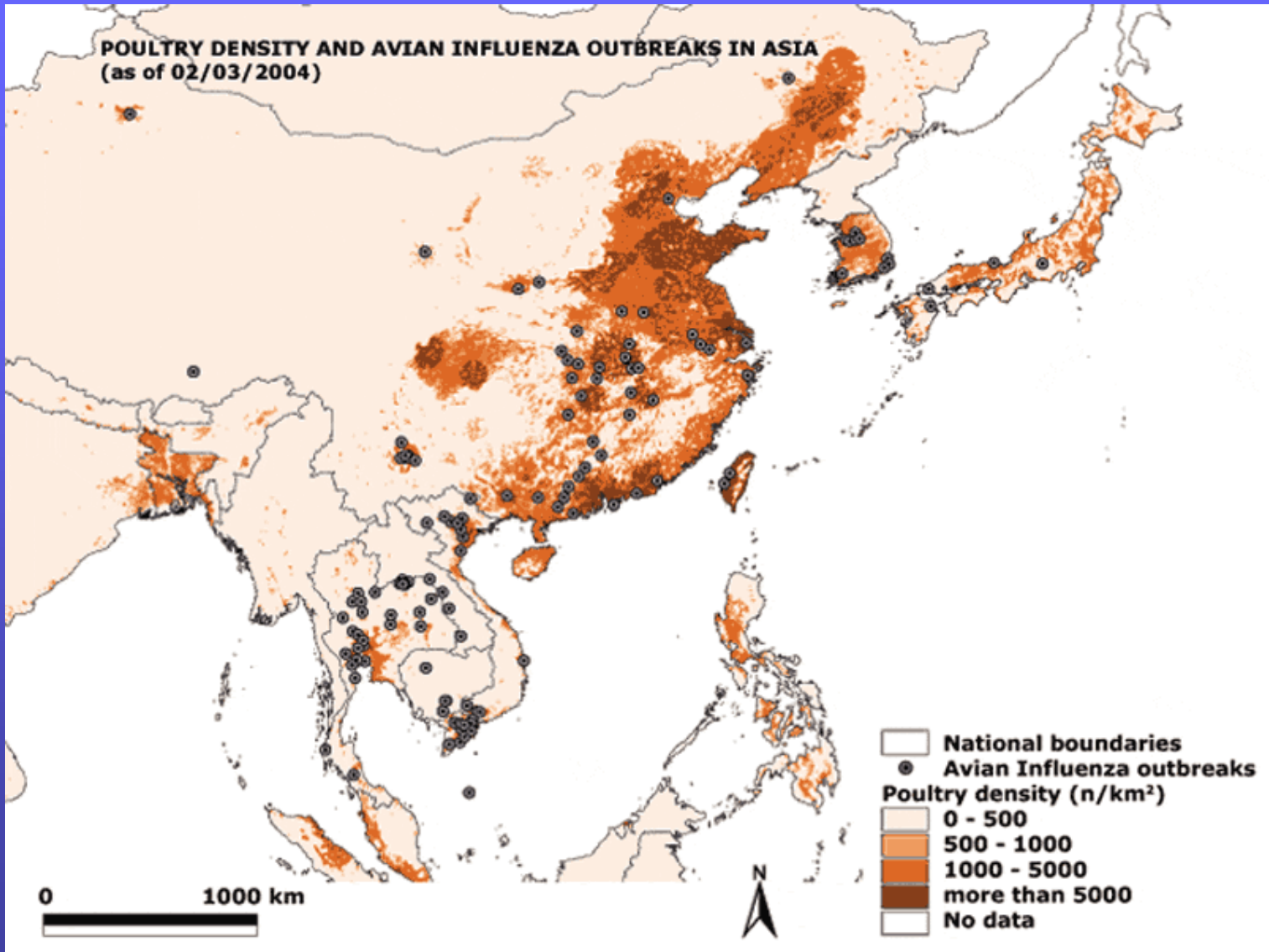
Emerging Infectious Diseases: What Are the Linkages Among Wildlife, Domestic Animals and Humans?

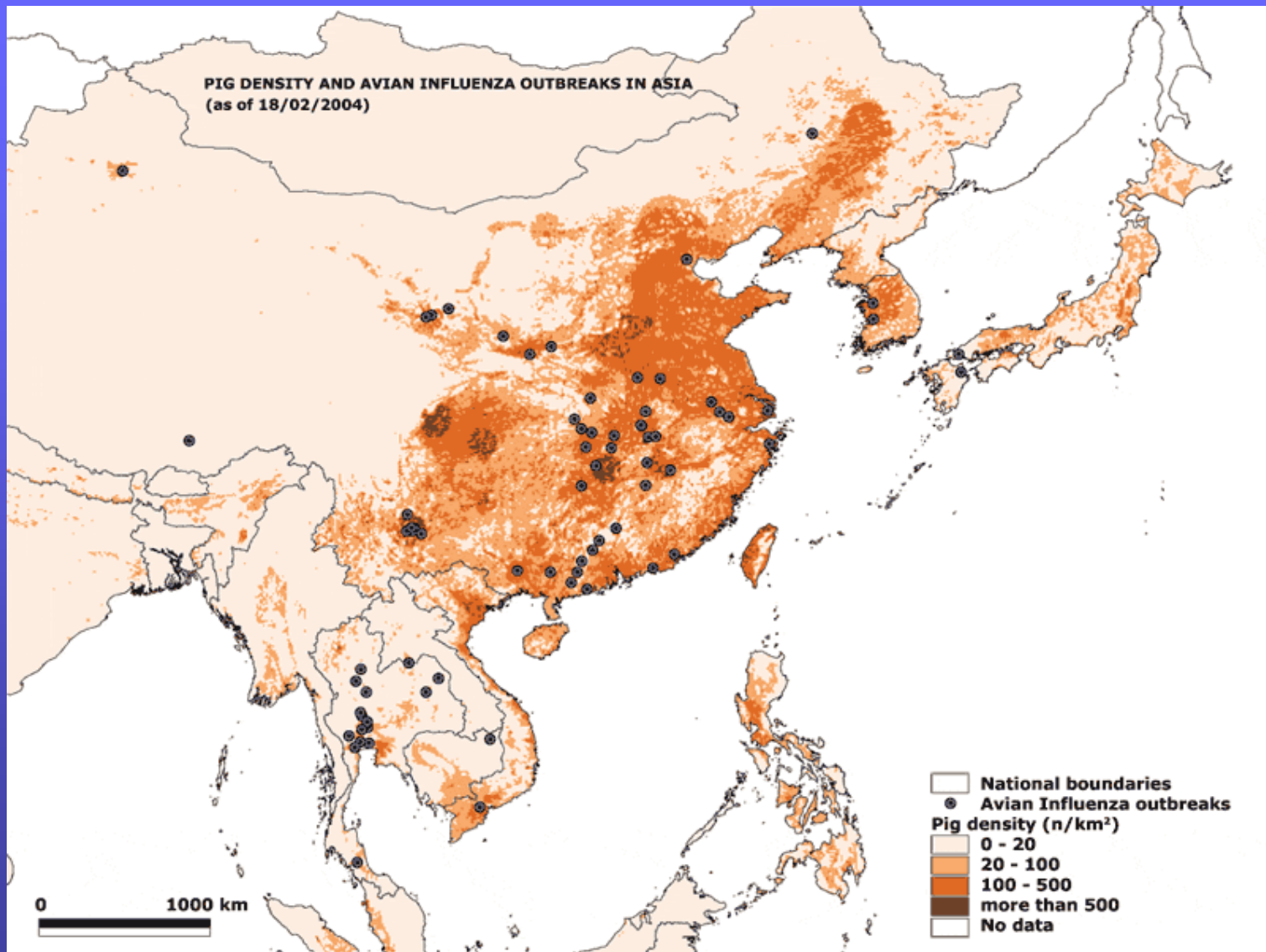
- Fundamental forces are driving new infection disease threats for livestock
- Avian influenza poses especially large potential risks
- Emerging diseases are causing significant economic disruptions



Source: Daszak, Cunningham, and Hyatt, *Science*, January 2000







Control and Mitigation Methods Are Evolving Quickly

- Mass culling has been effective, but at very high cost
- Trade embargoes are crude tools to control disease
- New monitoring and detection systems are being put in place
- Vaccination is now being used, but evolutionary implications are unknown
- Rapid testing technologies have been developed
- Changes in livestock practices are being explored



Institutional Responses to Avian Flu: Recommendations of OIE/CDC/WHO

- **Surveillance and separation systems to limit contact between wild birds and poultry**
- **Strategies to ensure the purity of drinking water supplies for poultry**
- **Tight control measures over livestock movement in affected areas**
- **Bird-proofing of poultry sheds to prevent contact between wild birds, especially migrating waterfowl, and poultry**
- **Protection for workers during culling operations including protective clothing and vaccinations**
- **Financial support for losses incurred by farmers culling their flocks**
- **Endorsement of vaccination strategies as complement to culling**

Sustainable Long-Term Solutions May Require Innovative Science and Policy

- Breed livestock for disease resistance
- Produce animal vaccines in feed grains
- Implement advanced monitoring and detection systems for livestock
- Develop global wildlife health surveillance network

One World–One Health

