



Food Security, Agriculture & Nutrition
Cross cutting theme Plant, livestock and human health (Zoonotic diseases)
“Health Perspective vis a vis Zoonosis, Sanitation & Hygiene & Nutrition-Stunting Emergency”



Habib Bokhari
Department of Biosciences
COMSATS University Islamabad

CHALLENGES/IMPETUS/Economic and social impact : Impact on public policy

The following predictions underscore the broad dimensions of dramatic changes by 2030 using 2013 as a baseline.

- The global population-  from 7.1 to 8 billion people: Urbanization growing by almost 60 %
- Demand for food & energy will  35% and 50% respectively



By 2050 we'll need to feed two billion more people. How can we do that without overwhelming the planet?

FOOD SECURITY & Nutrition (IMPETUS)

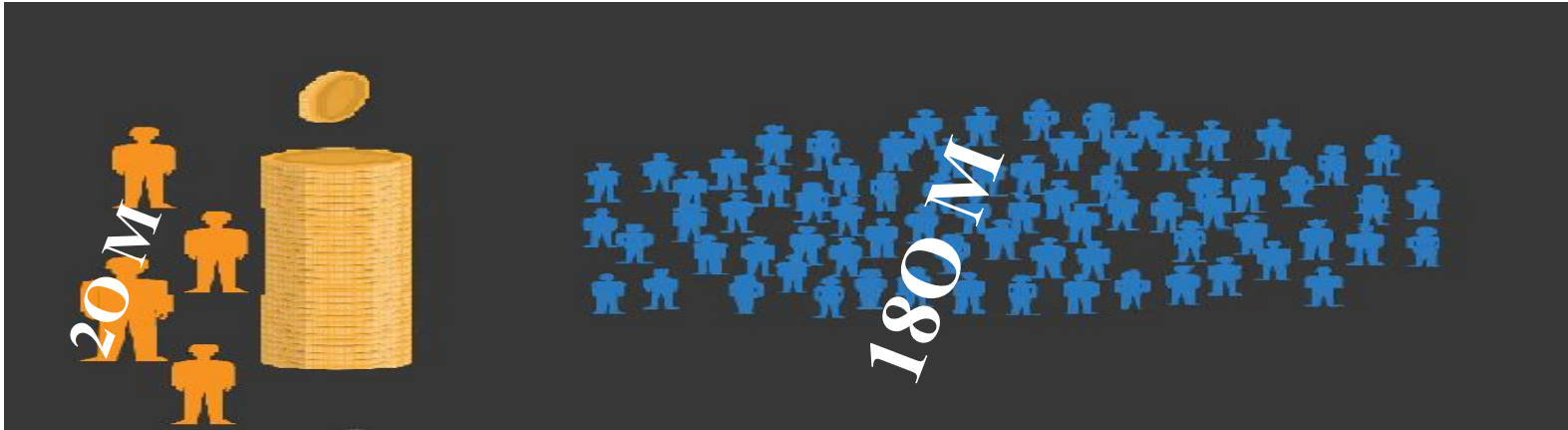
LIVESTOCK (Head of livestock)	Cattle & Buffaloes	Sheep & Goats	& Camels, Horses & Others	STATISTICS	
	Millions	Millions	Millions	Halal Meat Sector	Pakistan's Contribution
~200 million	>80	>100	~4.4	\$600 billion	\$115 million

- **Pakistan: Among top 20 countries-Meat Production i.e. >1000 million tons/year**
- **MULTI-BILLION \$ INDUSTRY (Pakistan: >8 Million Families: >1500 Billion Rs. GDP: ~12%: Growth Rate ~3.7% compared to Agriculture ~1.3%)**
- **Vaccination Coverage in Pakistan: Livestock varies from 15-80% (disease based)**

➤ Knowledge Based Economy- Polarized Society

➤ Knowledge Based Economy

❖ **Vibrant Youth: Statistics (~30% Age Group-15-29; 64% Age Group of Age 30)**



~ 44% Out of School Children 5-16-UNICEF

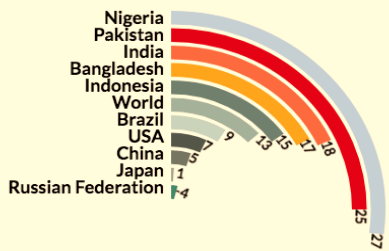
~8 Million Children with Stunted Growth (Impaired Physical & Cognitive Development)

Intellectual Disaster

Stunting?



Decadal Change (In %)

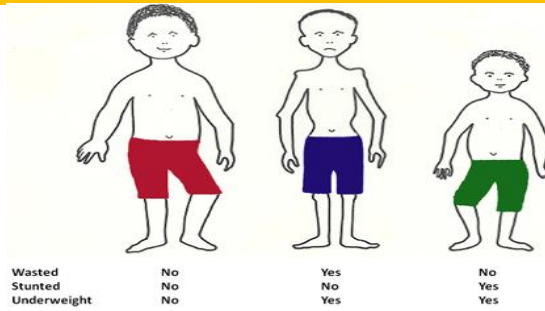


Protein: 17 grams to 27 grams



Enteropathogens

Vicious Cycles of Stunting: Poverty and Zoonosis hotspot



FOR NORMAL GROWTH & DEVELOPMENT "3" CONDITIONS MUST BE MET

Campylobacter, EPEC, ETEC, EAEC, Shigella, Norovirus etc.

Environmental Enteropathy

NO excess of symptomatic common infections such as Diarrhea, Respiratory tract infections, Malaria etc.

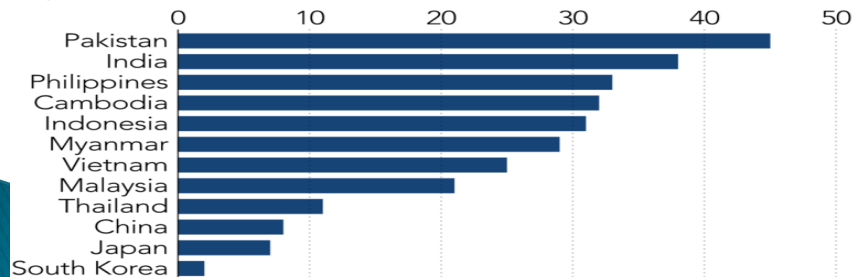
GOOD Growth Development



GOOD GUT HEALTH

DIET Provides Micro & Macro Nutrients in Bioavailable Form

Children under age 5 suffering from stunted growth (in percent)



Source: World Bank, Indonesian government

**PROVINCIAL
~30-48%**

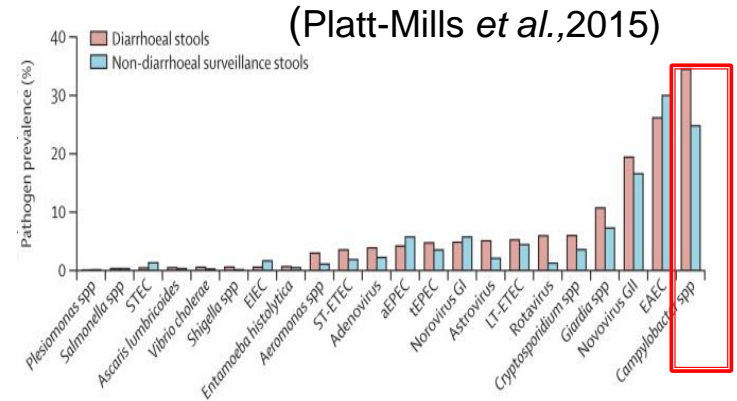
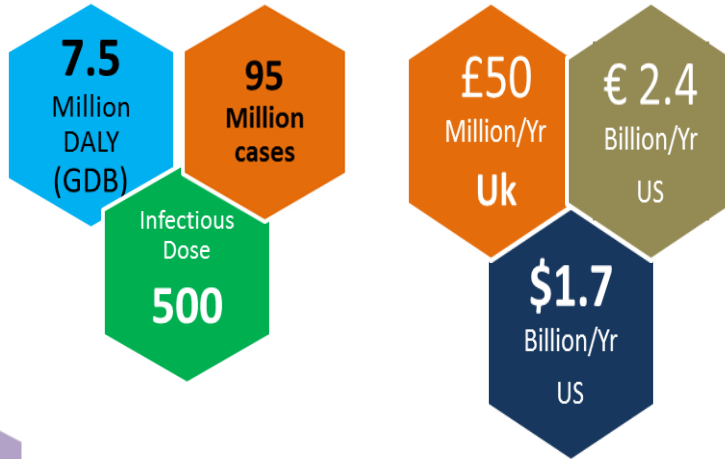
Campylobacteriosis

Diarrhea – second leading cause of death in children

Globally, 1.7 billion cases every year

Mortality rate – 7.6 million per year (children under five)

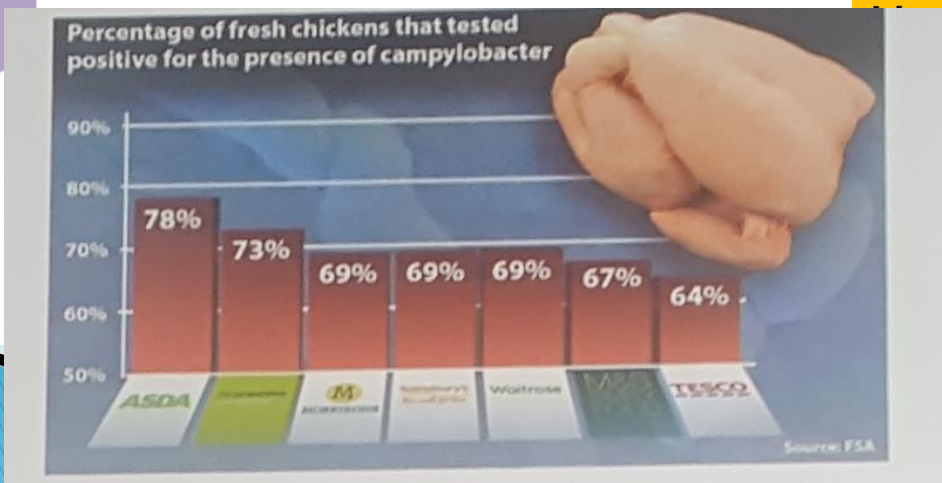
Annual incidence of 4.4-9.3/1000 population in developed countries



100 Million hospitalizations and >50,000 deaths per year due to naturally occurring food-borne illness in Pakistan

Therefore, developing robust methodologies for attributing outbreaks to the proper sources is essential for security and biosafety

Pakistan ?



CASE STUDY OF FOODBORNE PATHOGEN- *Campylobacter jejuni*- Source Tracking & Associated Antibiotic Resistance



WHO- High Priority Pathogen

Enterococcus faecium

Staphylococcus aureus

Helicobacter pylori

Campylobacter spp.

Macrolides-resistant

Fluoroquinolone-resistant

Salmonellae

Neisseria gonorrhoeae

Environment/Sanitation/Hygiene → Health



Watery & Bloody Diarrhea??

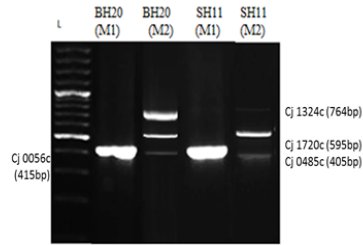


GBS is emerging threat among AFP cases in South-east Asia?
Pakistan??

The combination of an increase in multidrug-resistant pathogens, shrinking therapeutic pipelines, and enhanced access to health care has the potential to produce a health crisis.

Source Attribution & Antibiotic Resistance Profiling: Estimation of relative contributions of different sources to burden of MDR human illness

	CDs	Function
M1	Cj0056c	hypothetical protein
	Cj1139c	beta-1,3 galactosyltransferase
	Cj1422c	putative sugar transferase
M2	Cj0485c	putative oxidoreductase
	Cj1324c	hypothetical protein
	Cj1720c	hypothetical protein
	Cj1720c	hypothetical protein



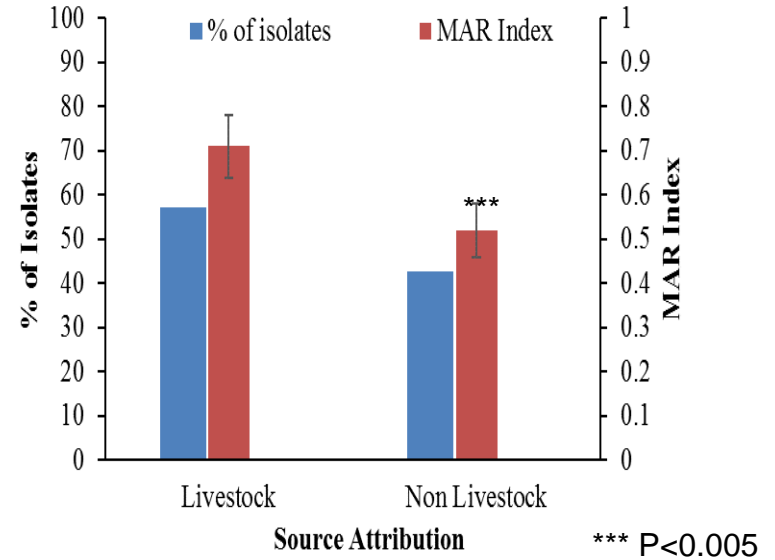
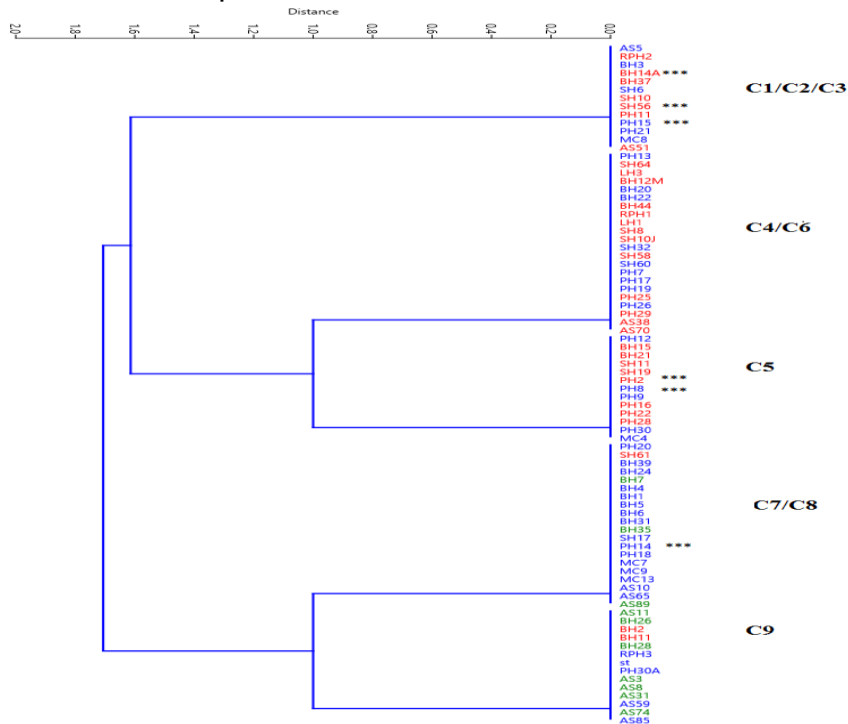
Cj0056c	Cj0485c	Cj1139c	Cj1324c	Cj1422c	Cj1720c	Clonal Group
0	1	1	1	1	1	C1/C2/C3
1	1	0	1	0	1	C4/C6
1	1	1	1	0	1	C5
0	1	0	0	0	1	C7/C8
0	0	0	0	0	1	C9

Livestock (domesticated animals)
C1/C2/C3
C4/C6
C5

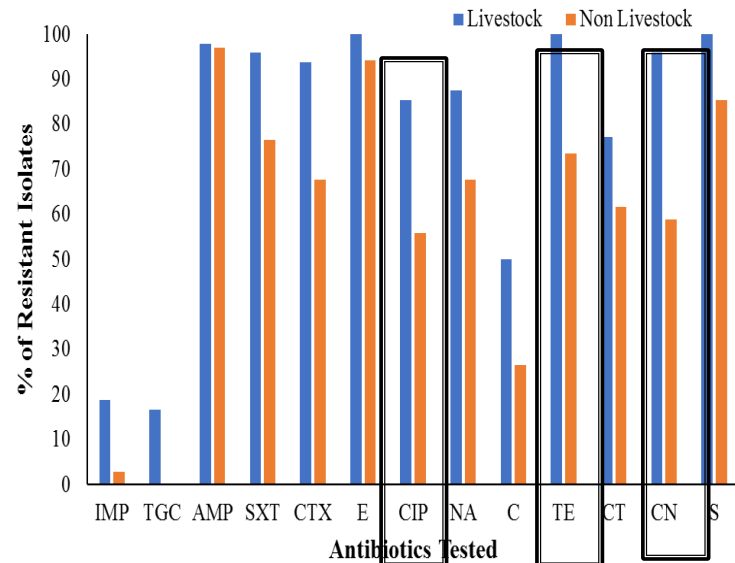
Non-Livestock (wild animals and water)
C7/C8
C9

MAR < 0.4
MAR = 0.5-0.65
MAR > 0.7

*** MBL producers.

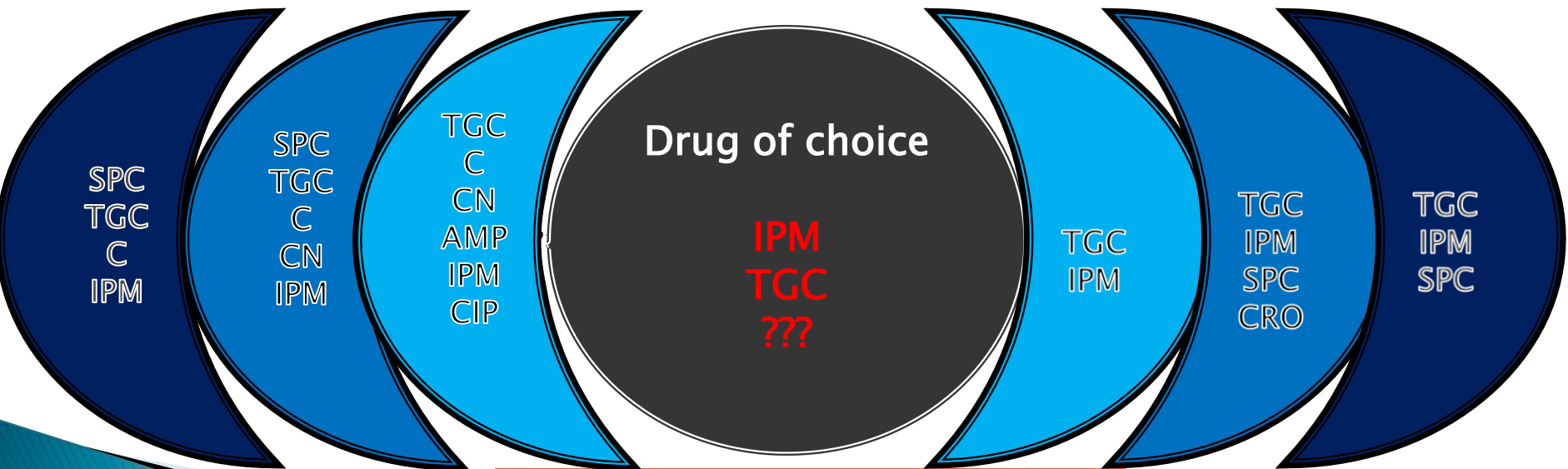
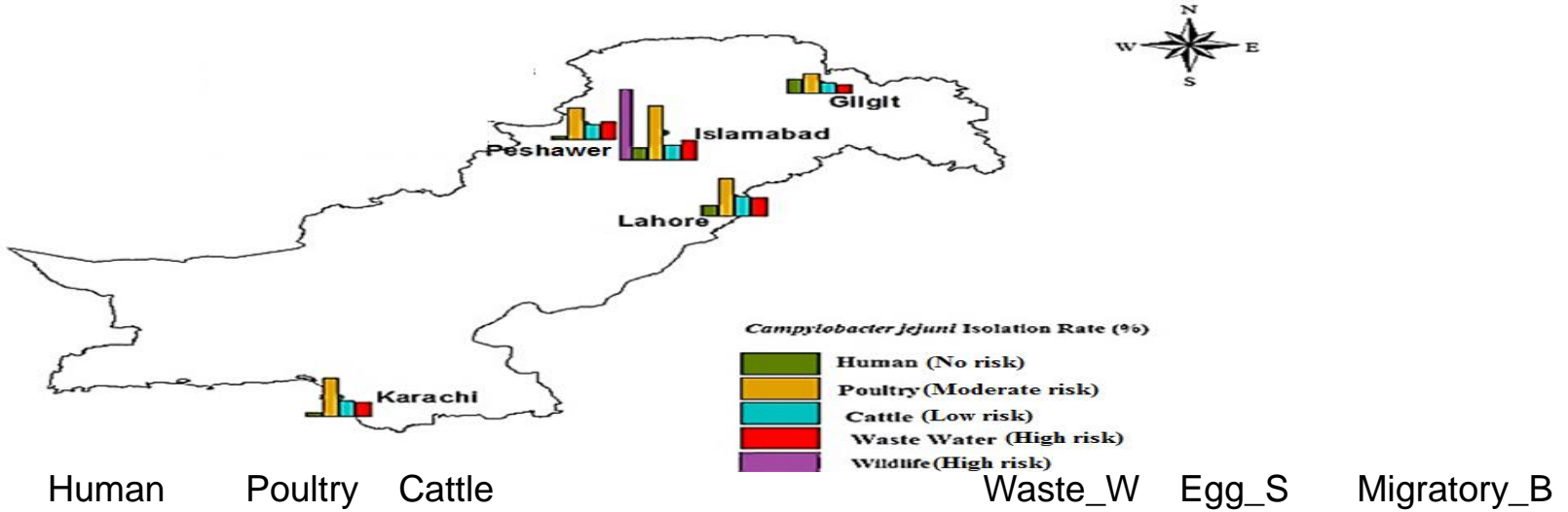


*** P < 0.005



MONITORING IS ESSENTIAL

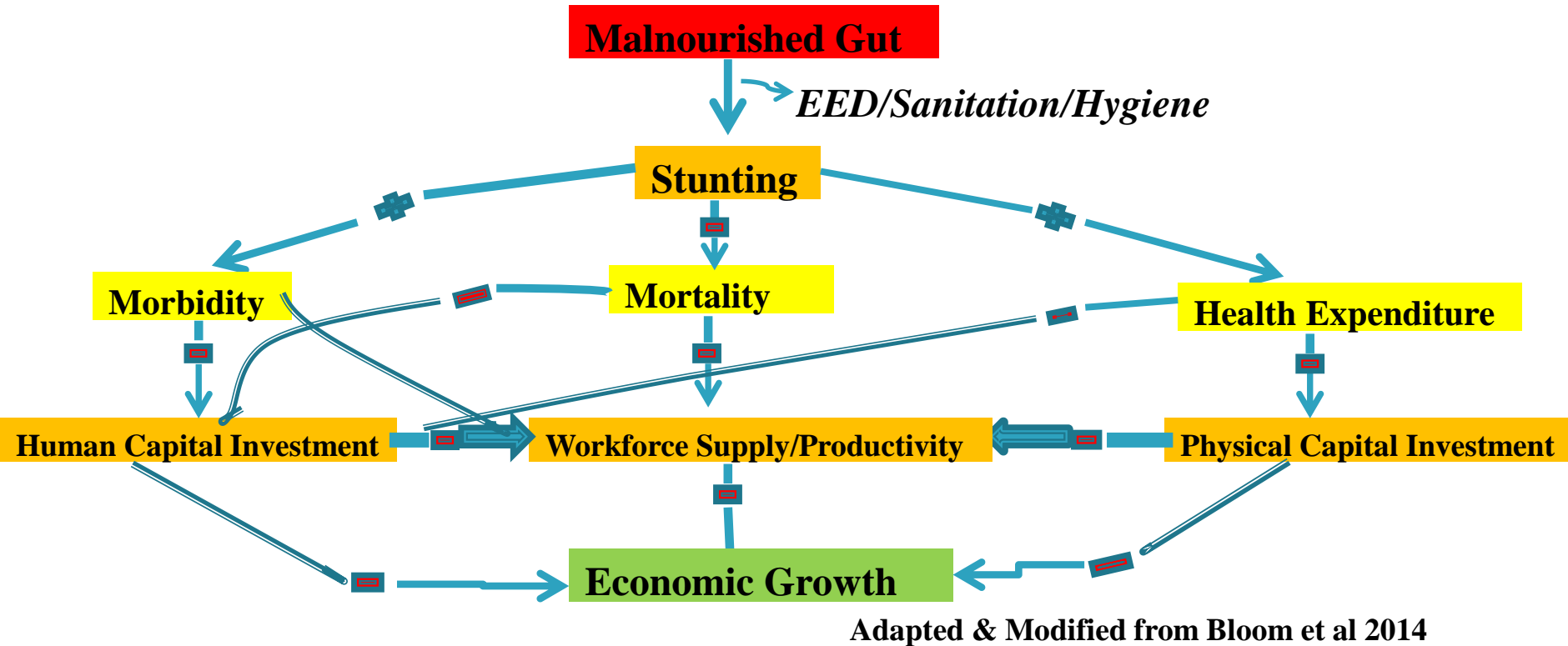
Map Showing Location of *C. jejuni* Isolates from Different Sources



PREVALENCE → Waste Water > Livestock > Egg Shells

Conclusions and Way Forward

Pathways Linking Stunted Growth to Economic Stunting



Fall in Child Stunting in Many African Countries Attributed to:

- Better Child-Maternity Care
- Improved Nutritional Status

Improved Gut Functions (Gut Microbiota-EDD/Sanitation/Hygiene)

Overall Improvement in these factors helped improving Economic Growth of Referred Countries

Farming Practices: Backyard Poultry- Survival and Persistence in Environment

PAKISTAN: PM Imran Khan's initiative for backyard poultry/small livestock holding inaugurated



Nutrients Deficiency + Environmental Pollution/Biosafety/Behavior



~20 Million Out of School Children (5-16)



Interventions

Feeding Practices/Micro- & Macronutrients

Maternal Nutrition

Improved Sanitation

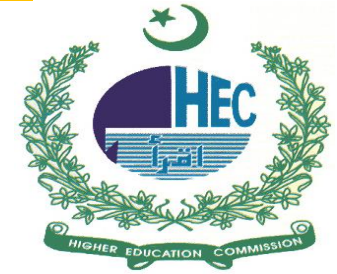
Improved Farming Practices-Occupational Hazards Poultry/Livestock

Improved GUT HEALTH



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