

Up the River, Without a Surveillance System:

The muddy, pot-holed road to surveillance in Haiti

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BEFORE & AFTER



Photo from <http://www.bostonherald.com/2010/01/republish-haiti-geography-caribbean.html>



After (1/15/2010)

Photo by [Gerald Downing for the United Nations](https://www.flickr.com/photos/gc_photography/3563542680/in/set-72157618695654699/) (https://www.flickr.com/photos/gc_photography/3563542680/in/set-72157618695654699/)

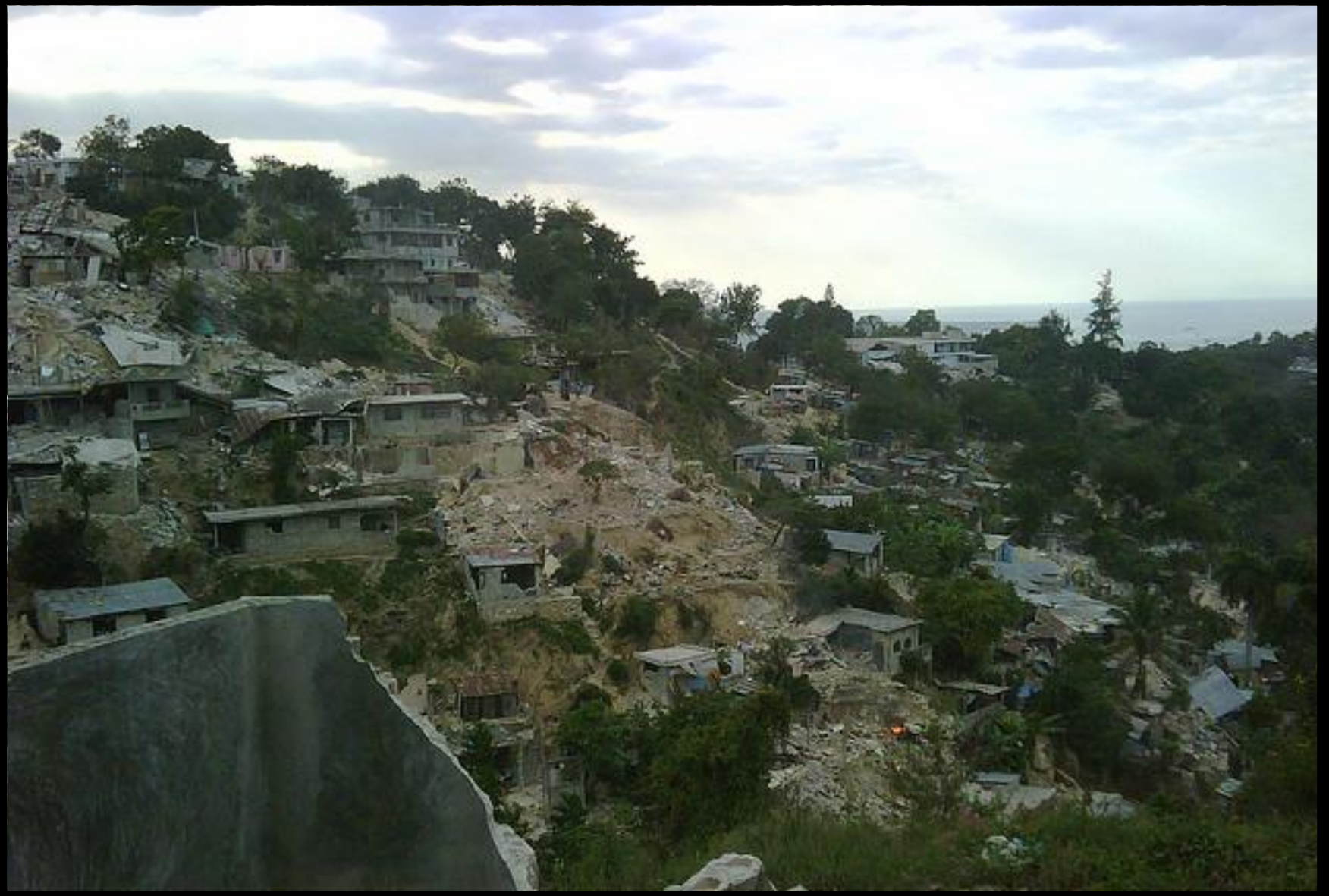


Photo by [elmag](http://www.flickr.com/photos/elmag/4230948352/) (<http://www.flickr.com/photos/elmag/4230948352/>)

Health Issues: Earthquake

- ❑ ~230,000 Dead
- ❑ ~2,000,000 Internally Displaced Persons (IDPs)
- ❑ Massive infrastructure destruction
 - Hospitals and clinics severely damaged
 - MSPP building destroyed
- ❑ Severe overcrowding
- ❑ Potential disease outbreaks
- ❑ Water and sanitation
- ❑ Lack of information
- ❑ Impending raining season



Photo from United Nations
(http://www.flickr.com/photos/un_photo/4293402594/)

Health Issues: Cholera

- ❑ Total Cases: 532,925
- ❑ Total Hospitalizations: 287,092
- ❑ Total Deaths: 7,095

Persistent issues:

- ❑ Water and sanitation
- ❑ Lack of information
- ❑ rainy season



Photo by Steve Gruby, MD

CDC RESPONSE

Emergency Response

- ❑ CDC activates Emergency Operations Center (EOC)
 - Deploy emergency response team
 - Engage CDC airplane and ship supplies
- ❑ WHO Health Cluster initiates coordinated response
 - Initial Rapid Assessment
 - Priorities identified: shelter, water, food, bed nets, access to health care and medicines
- ❑ Surveillance
 - National Sentinel Surveillance System (NSSS) implemented January 25, 2010
 - Notifiable diseases – immediate and daily



Photo by David Snyder for CDC



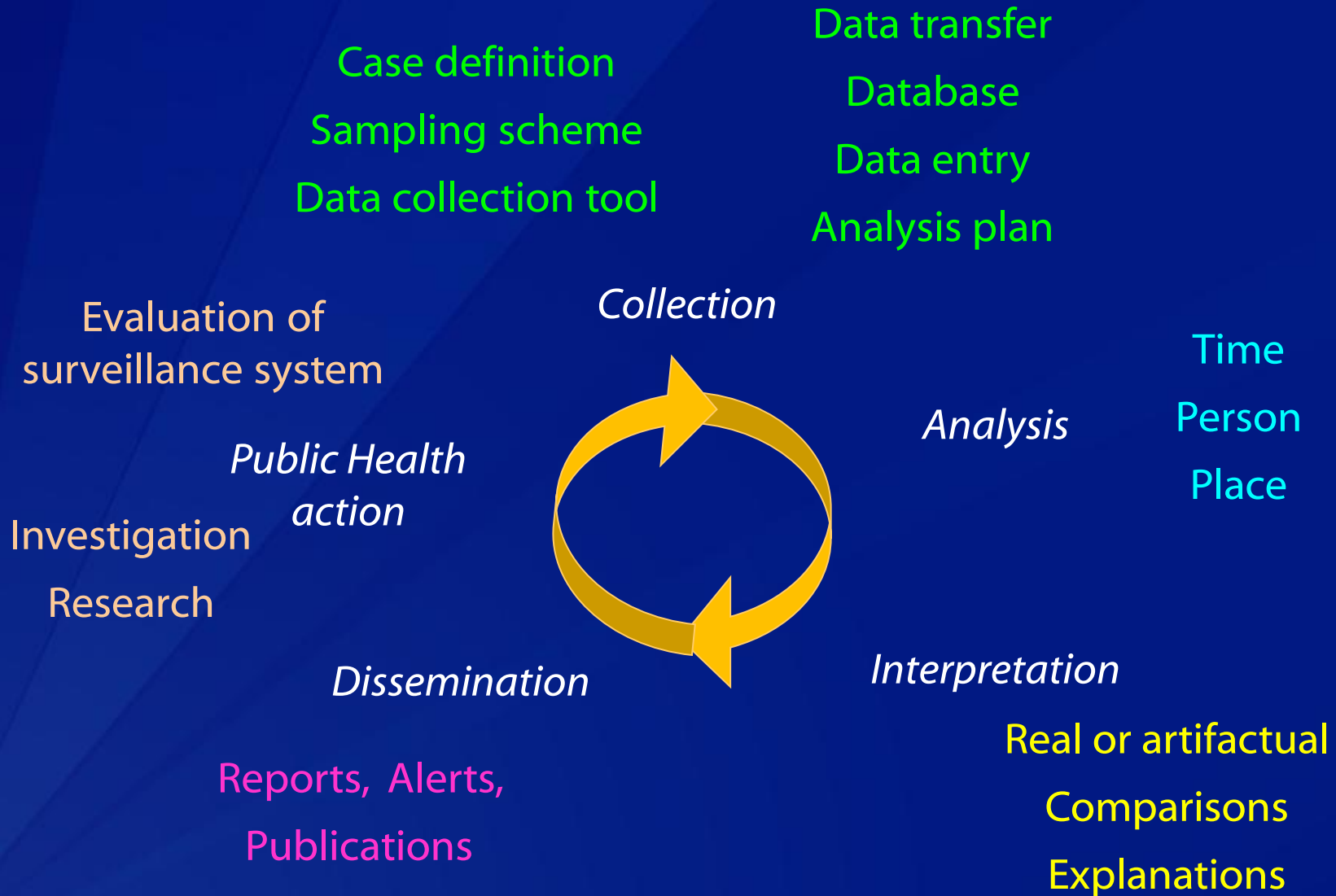
*Photo by US Air Force
(<http://www.flickr.com/photos/usairforce/4296235679/>)*

Definition of Surveillance

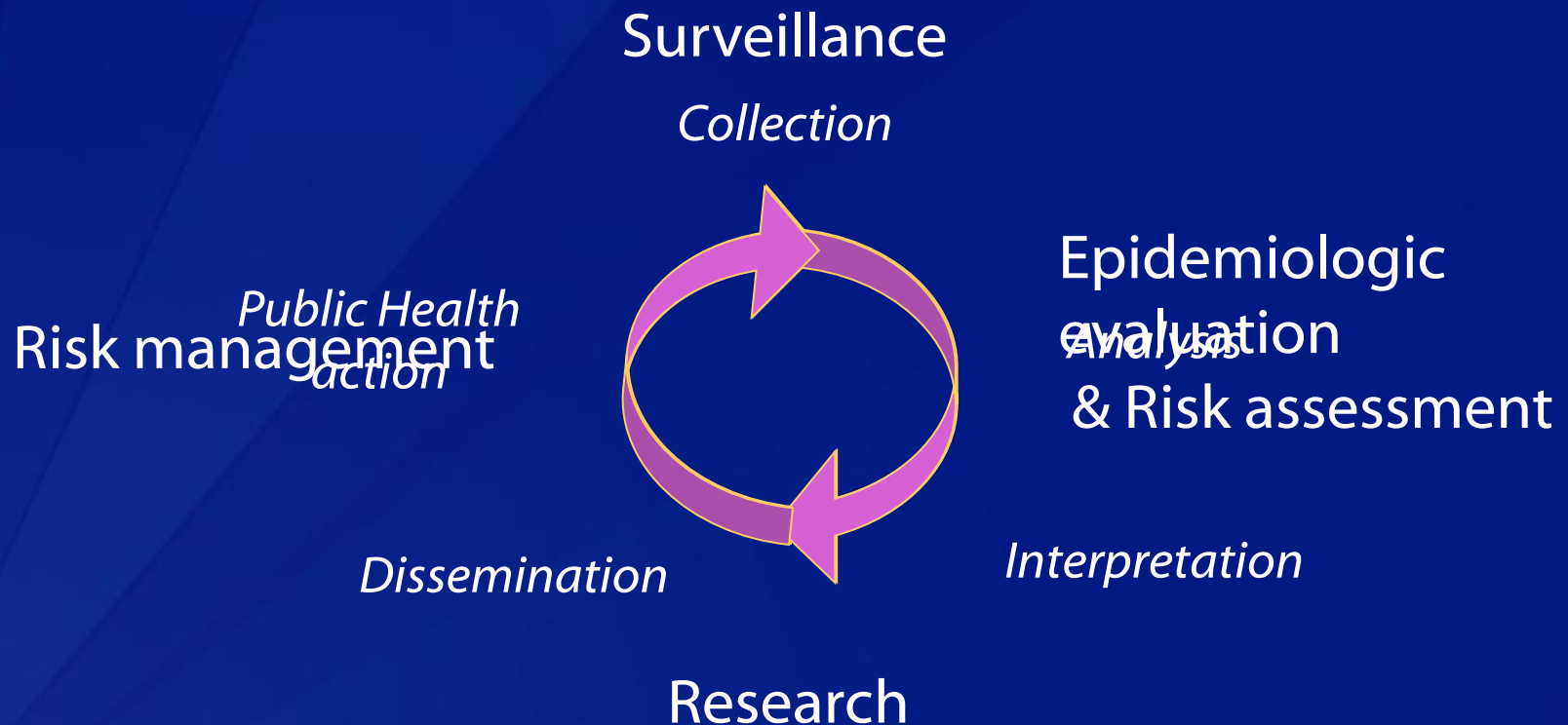
The systematic, ongoing collection, analysis, interpretation and dissemination of data for public health action



Steps in Surveillance



Cycle of Surveillance & Public Health Protection



Spectrum of Disease Surveillance

*Improving
communication,
capacity and
infrastructure*

*Changing
epidemiology*

Integrated
disease
surveillance



Lab-based
surveillance



Syndromic
surveillance



No formal
surveillance



Outbreak
detection
can occur at
all levels

No Formal Surveillance

Setting

- Politically unstable country, recent war, extreme poverty
- Public health is very low priority
- External assistance often present

Capacity

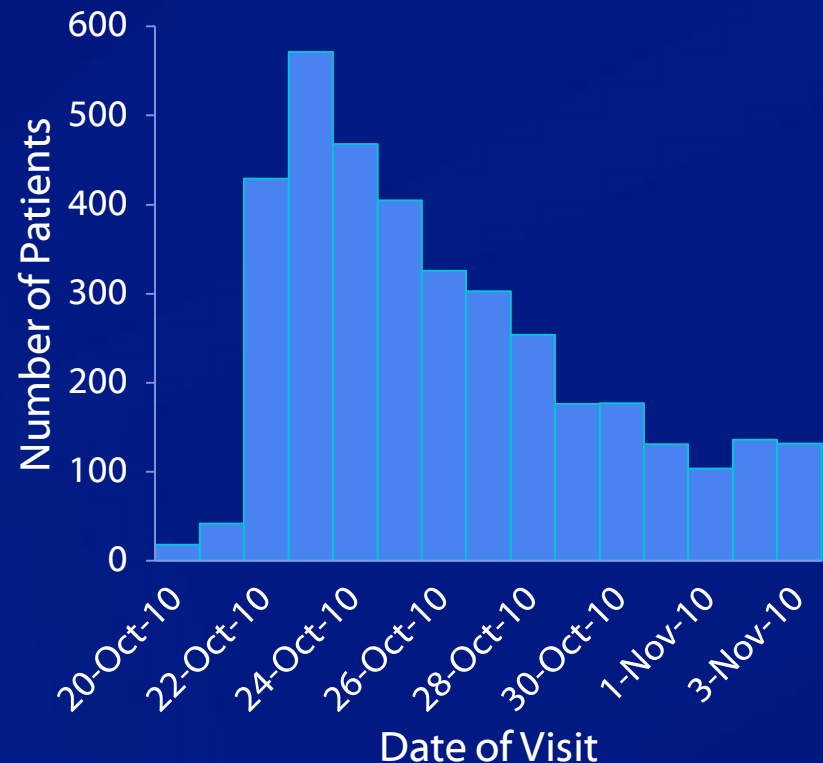
- Large or unusual outbreaks can be detected

No Formal Surveillance

Example: Cholera

- Haiti has historically experienced prolonged civil instability
- The 2010 earthquake destroyed the already damaged health infrastructure leaving Haiti dependant on humanitarian assistance.
- **October 2010:** MSPP was notified of an increase in people with watery diarrhea presenting to hospitals
- A few isolates were lab-tested at LNSP and confirmed cholera.
- By November, 18,000 cases of cholera were reported

Numbers of Patients with Diarrhea by
Visit Date, Hospital A, Haiti
October 20 – November 3, 2010



Improving no formal surveillance

- Improve capacity to detect, investigate and control outbreaks
 - ✓ Improve network between health care providers, labs and epidemiologists/public health officers so that increases in cases are communicated
 - ✓ Have joint investigative teams
 - ✓ Train and practice epi and investigation skills

Improving no formal surveillance



Reallocate resources

- Use labs for investigation of outbreaks rather than solely for monitoring



Disseminate findings and success stories to government and other stakeholders

- Focus on high-impact issues
 - Water, sanitation and hygiene
 - Public health infrastructure and capacity

Syndromic Surveillance

- Syndrome:
 - group of signs and symptoms indicative of a common diagnosis
 - acute flaccid paralysis (polio)
 - watery diarrhea (cholera, rotavirus)
 - bloody diarrhea (*Shigella*, Shiga-toxin producing *E. Coli*)
- Useful in detection of outbreaks
- Not very useful in specific disease surveillance
 - many pathogens present with same symptoms
 - acute watery diarrhea: cholera or rotavirus?

Syndromic Surveillance

Requirements

- Collection, analysis and interpretation of syndromic data (e.g. diarrhea, food poisoning, fever)
- Use of a standard case definition
- There may be lab capacity, but no formal lab-based surveillance

Capacity

- Can differentiate between watery diarrhea and dysentery
- Can follow trends over time
- Can identify high risk populations
- Can detect outbreaks

Moving Towards Syndromic Surveillance



Identify priority diseases

- 25 condition selected
 - 6 requiring immediate notification
 - 19 additional conditions prioritized for surveillance



Develop system

- Develop a case definition or use a preexisting one
- Develop a reporting form
- Determine flow of data from patient to district to national level
- Disseminate case definition and process



Collect, analyze, interpret, disseminate, investigate, control

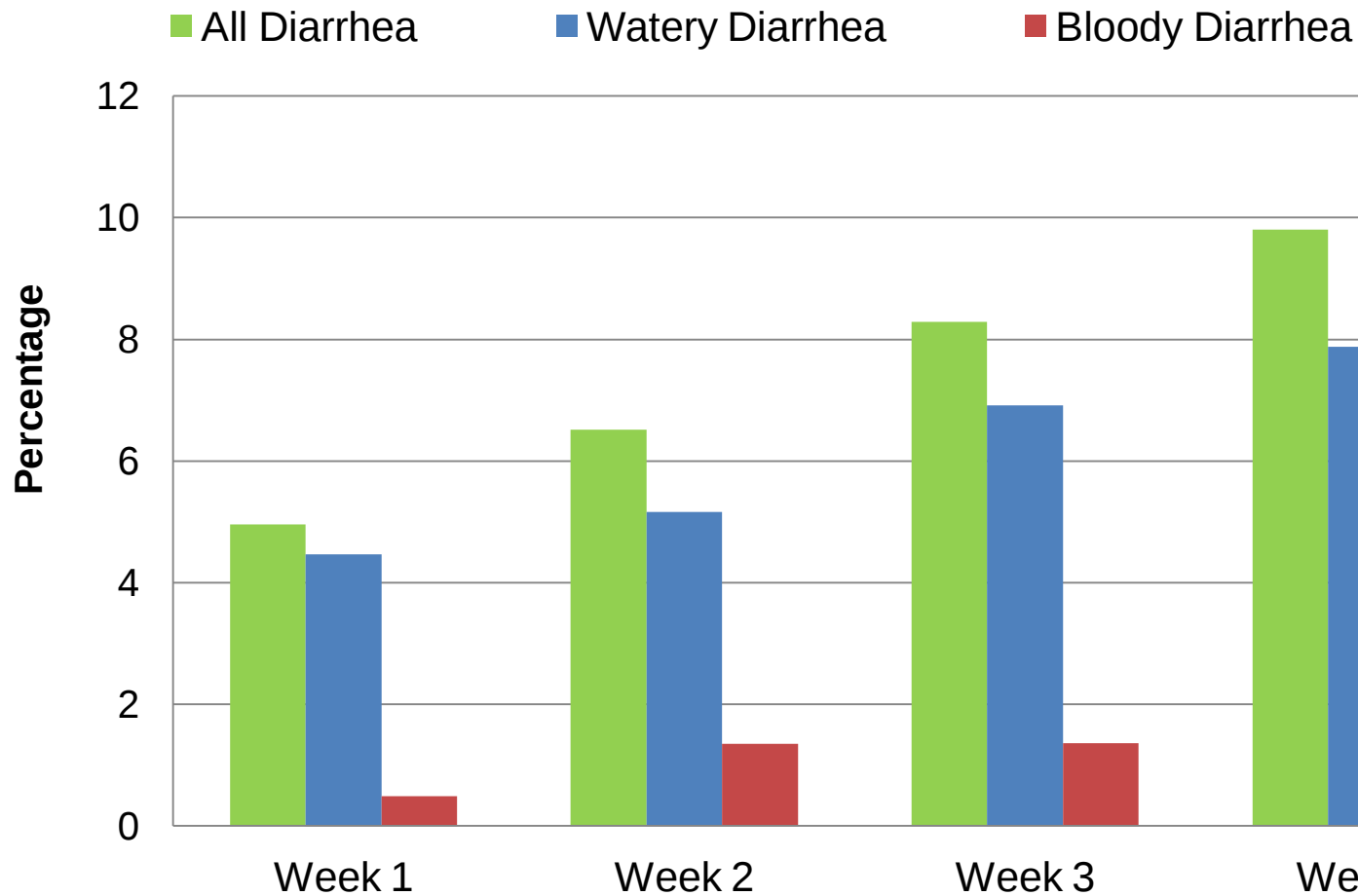
DISEASES / SYNDROMES	AGE			
	No of cases (morbidity)		No of death (mortality)	
	< 5 years	>= 5 years	< 5 years	>= 5 years
Acute hemorrhagic fever syndrome				
Suspected case of meningococcal meningitis				
Suspected case of diphtheria				
Suspected case of acute flaccid paralysis				
Suspected case of measles				
Bite by animal suspected of having rabies				
Fever of unknown origin				
Acute febrile illness with jaundice				
Acute respiratory infection				
Acute non-bloody diarrhea				
Acute bloody diarrhea				
Suspected case of typhoid				
Suspected case of whooping cough				
Suspected case of tetanus				
Suspected case of neonatal tetanus				
Suspected case of malaria				
Suspected case of dengue				
Suspected case of cutaneous anthrax				
Tuberculosis (TB) patient with interrupted TB treatment				
HIV/AIDS patient with interrupted ART				
Third trimester pregnancy or pregnancy complications				

Syndromic Surveillance

Example: National Sentinel Site Surveillance (NSSS)

- Developed by MSSP, PAHO, & CDC and launched 12 days after the earthquake
- Includes 51 Government and private health facilities across Haiti
- All had pre-existing PEPFAR-supported Disease Reporting Officers
- Surveillance form adapted from one used after 2008 hurricanes
- Included information on age group (<5 , ≥ 5 years old), sex, and mortality for 25 conditions, using standardized case definitions

**Proportion of Patient Visits due to Diarrhea (by Type) per Week
among Persons >5 Years, from Jan 26 to Feb 22, 2010**

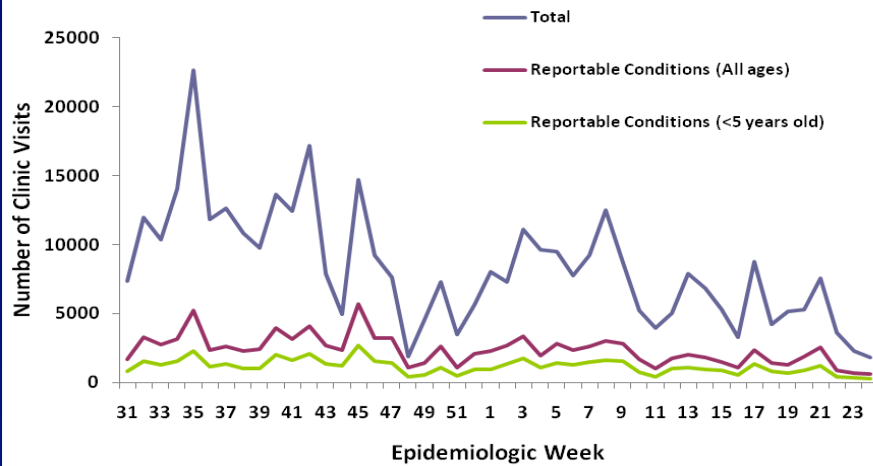


Syndromic Surveillance

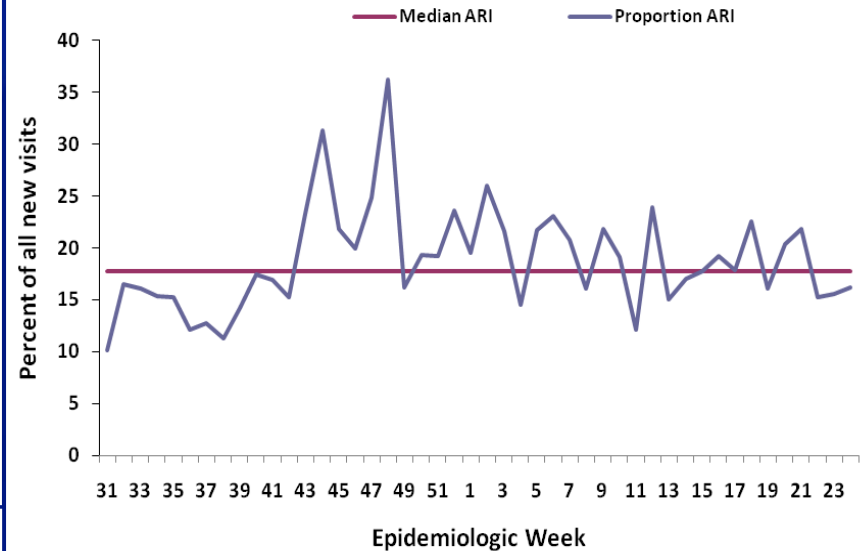
Example: IDP Surveillance System (IDPSS)

- Developed by MSSP, PAHO, & CDC and launched 37 days after the earthquake
- 60 NGOs report regularly, 213 have reported at least once
- Surveillance form adapted from the one used for NSSS
- Tracking 19 conditions, using standardized case definitions
- Includes information on age group ($</\geq 5$ years), *but not on sex, or mortality*

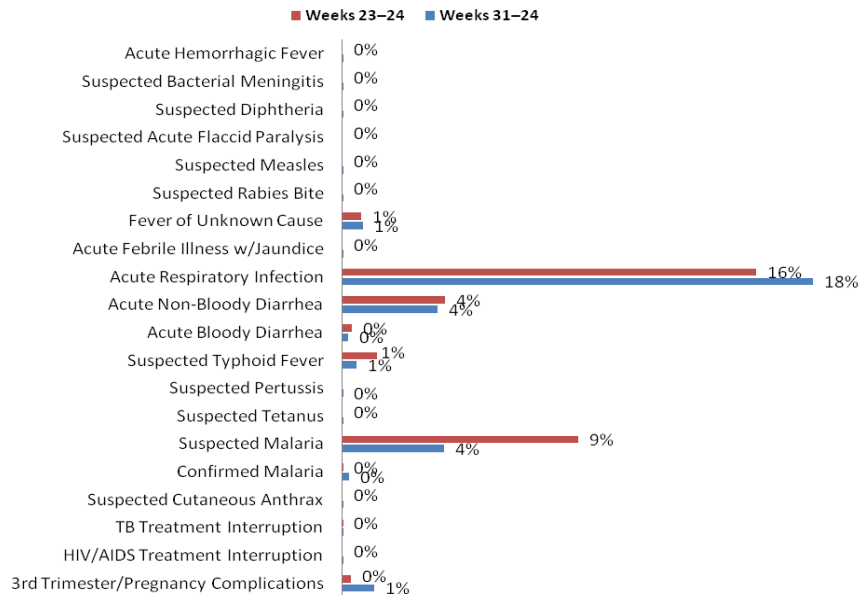
Number of Clinic Visits and Patients with Reportable Conditions



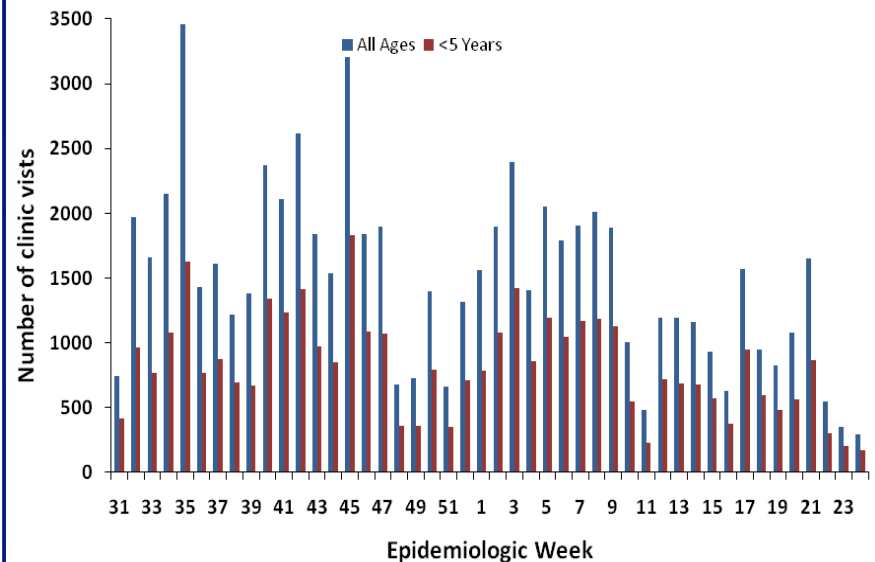
Acute Respiratory Infections



Reportable Conditions as a Proportion of All New Clinic Visits



Acute Respiratory Infections



Improving Syndromic Surveillance



Ask for key information with case reports (minimum dataset)

- Person: age, sex
- Place: location
- Time: onset date



Analyze existing syndromic case data regularly (at least weekly) to

- Know your baseline
- Follow trends
- Identify outbreaks

Improving Syndromic Surveillance

-  Review hospital data (deaths, discharges) and existing lab data (from hospitals and private labs) to
 - Identify common organisms, types
 - Identify trends
-  Consider using labs outside the area to conduct some testing, especially in outbreak situations

Laboratory-based Surveillance

- Diagnosis made on the basis of lab results
- Used routinely for:
 - *Salmonella*
 - *Campylobacter*
 - *E.coli*
- Very useful in surveillance of bacterial infectious diseases
 - since many pathogens present with similar signs and symptoms, lab helps differentiate causes

Laboratory-based Surveillance

Requirements

- Collection, analysis and interpretation of lab data
- Standard case definitions
- Standard lab methods
- Lab quality assurance
- Sharing of lab data with public health staff

Capacity

- Can identify and prioritize pathogens causing disease
- Can determine pathogen-specific trends over time and space
- Can detect outbreaks and identify source
- Can identify high risk populations and establish control measures

Laboratory-based Surveillance

Example: National Cholera Surveillance System (NCSS)

- ❑ Developed by MSSP, PAHO, & CDC and launched 9 days after the outbreak
- ❑ Utilized a standardized case definition and laboratory methods
- ❑ Vertical surveillance system – focusing solely on laboratory-confirmed cholera
 - Cases that met the case definition for cholera in a department where *vibrio cholerae* had previously been isolated were considered to be “lab-confirmed”
- ❑ Tracked by age group ($</\geq$ 5 years):
 - Number of cases seen, hospitalized
 - Number of institutional and community deaths
- ❑ Calculated:
 - Hospital case fatality ratio (CFR), Overall CFR



	Sans et +		Tout âge	
	Cumulatif jusqu'à la date sélectionnée	Journalier	Cumulatif jusqu'à la date sélectionnée	Journalier
Cas Vus	250934	342	283362	412
Cas Hospitalisés	138113	208	152816	232
Exécutés	135359	206	149820	230
Décès Institutionnels	2754	2	2996	2
Décès Communautaires	1789	4	1860	4
Décès Totaux	4543	6	4856	6
Létalité Hospitalière	2.0%	1.0%	2.0%	0.9%
Létalité Globale	1.8%	1.7%	1.7%	1.4%

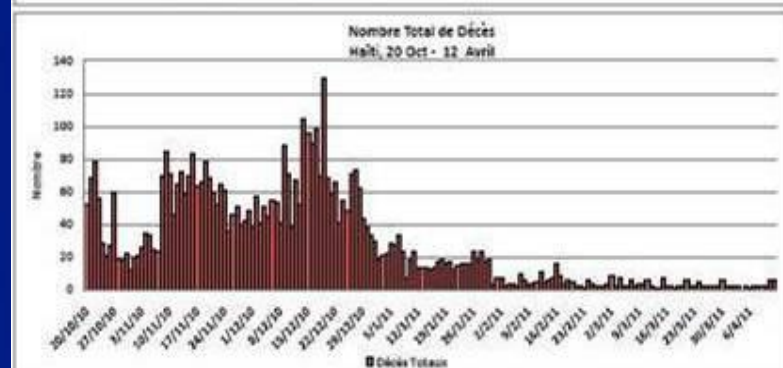
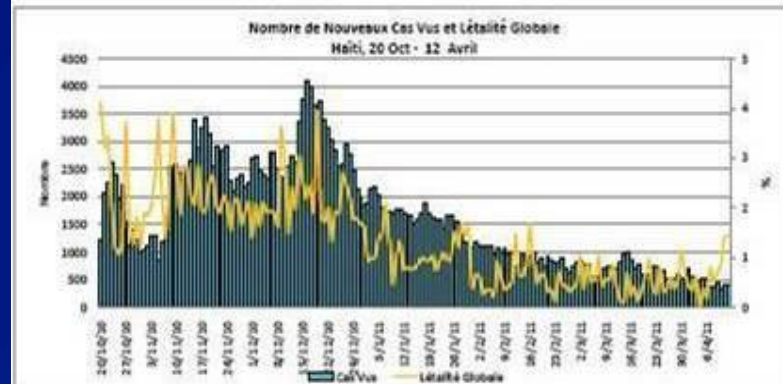
Département	Sans et +							
	Cumulatif jusqu'à la date sélectionnée (Journalier)							
	Cas Vus	Cas Hospitalisés	Exécutés	Décès Institutionnels	Décès Communautaires	Décès Totaux	Létalité Hospitalière	Létalité Globale
Artibonite	57058 (55)	21362 (25)	20852 (25)	510 (0)	318 (0)	828 (0)	2.4%	1.4%
Centre	22973 (69)	9708 (31)	9515 (31)	193 (0)	180 (0)	373 (0)	2.0%	1.6%
Grande Anse [*]	14287 (34)	10450 (21)	10130 (21)	320 (0)	476 (0)	796 (0)	3.1%	5.4%
Nippes	3404 (1)	2001 (1)	1942 (1)	59 (0)	93 (0)	152 (0)	2.9%	4.3%
Nord [*]	26425 (36)	26425 (31)	25847 (30)	578 (1)	44 (0)	622 (1)	2.2%	2.3%
Nord Ouest	14479 (21)	8543 (16)	8393 (15)	150 (1)	70 (0)	220 (1)	1.8%	1.5%
Nord Est	10378 (22)	7708 (22)	7601 (22)	107 (0)	137 (0)	244 (0)	1.4%	2.3%
Ouest [*]	24076 (4)	15985 (4)	15743 (4)	242 (0)	111 (0)	353 (0)	1.5%	1.5%
Port-au-Prince ^{**}	59163 (54)	25934 (24)	25571 (24)	363 (0)	138 (0)	502 (0)	1.4%	0.8%
Sud [*]	12911 (22)	7508 (15)	7343 (15)	165 (0)	47 (0)	212 (0)	2.2%	1.6%
Sud Est	2844 (24)	2489 (18)	2422 (18)	67 (0)	174 (4)	241 (4)	2.7%	8.0%

Département	Tout âge							
	Cumulatif jusqu'à la date sélectionnée (Journalier)							
	Cas Vus	Cas Hospitalisés	Exécutés	Décès Institutionnels	Décès Communautaires	Décès Totaux	Létalité Hospitalière	Létalité Globale
Artibonite	66555 (73)	25450 (27)	24882 (27)	568 (0)	322 (0)	890 (0)	2.2%	1.3%
Centre	25128 (86)	10758 (36)	10556 (36)	202 (0)	186 (0)	388 (0)	1.9%	1.5%
Grande Anse [*]	15463 (36)	11202 (22)	10858 (22)	344 (0)	497 (0)	841 (0)	3.1%	5.3%
Nippes	3632 (2)	2154 (2)	2092 (2)	62 (0)	93 (0)	155 (0)	2.9%	4.2%
Nord [*]	28063 (41)	28063 (36)	27471 (35)	592 (1)	45 (0)	637 (1)	2.1%	2.3%
Nord Ouest	16506 (21)	9821 (16)	9643 (15)	178 (1)	72 (0)	250 (1)	1.8%	1.5%
Nord Est	11915 (24)	8699 (24)	8582 (24)	117 (0)	150 (0)	267 (0)	1.3%	2.2%
Ouest [*]	25460 (6)	17289 (5)	17033 (5)	256 (0)	121 (0)	377 (0)	1.5%	1.4%
Port-au-Prince ^{**}	69190 (70)	28018 (27)	27599 (27)	419 (0)	141 (0)	560 (0)	1.5%	0.8%
Sud [*]	13892 (25)	8072 (15)	7891 (15)	181 (0)	55 (0)	236 (0)	2.2%	1.7%
Sud Est	3104 (28)	2726 (22)	2649 (22)	77 (0)	178 (4)	255 (4)	2.8%	7.8%

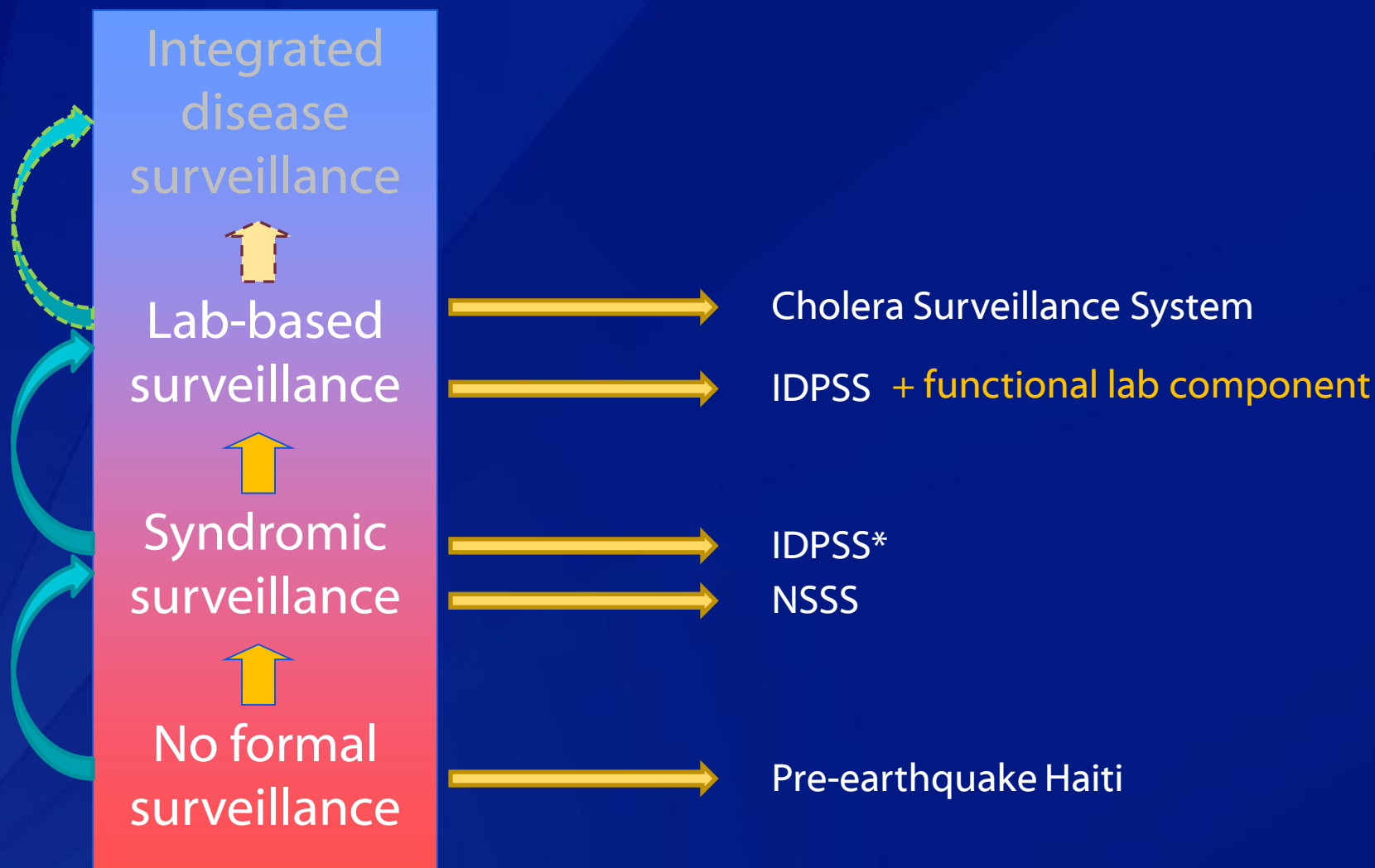
^{*} Données Incomplètes

^{**} Sans Port-au-Prince

^{**} Port-au-Prince: Carrefour, Cité Soleil, Delmas, Kenscoff, Pétion Ville, Port-au-Prince, et Tabarre



Spectrum of Disease Surveillance



Surveillance and the Public Health Response

Surveillance data was used to:

- Effectively track the course of the outbreak
- Target public health interventions:
 - Cholera Treatment Centers and Units
 - Physician and community health worker trainings
 - Public health messaging
 - Prepositioning of medical commodities
- Seek additional funding
- Guide epidemiological studies to assess risk factors
- Build specialized epidemiological models for:
 - Projecting the future course of the outbreak
 - Forecasting the effects of different interventions

Lessons Learned

- ❑ National surveillance in Haiti can be carried out effectively
- ❑ During an acute event, it is possible to strengthen official structures without replacing them
- ❑ Use simple, low technology solutions in situations of scarcity
- ❑ Build upon pre-existing relationships and structures
 - Incorporation of previously learned lessons leads to success!

Lessons Learned - Applications

- ❑ Lessons learned must be put into application:
 - Experience with NSSS allowed for the improvement of IDPSS through the simplification of the reporting form
 - IDPSS Report form does not include mortality or sex
 - Incorporation of departmental and communal MSPP staff in NCSS (unlike in NSSS and IDPSS) allowed for local engagement in surveillance activities

Lessons Learned – Two Years Later

- ❑ Two years' worth of work on NSSS, IDPSS and NCSS:
 - Imparted a real grasp of the technical and human resources at MSPP's disposal
 - Preempted the simplification of data management and analysis tools for IDPSS
 - Allowed for the development and implementation of data management/analysis tools for NCSS that MSPP was able to take ownership of
 - MSPP has taken full ownership of IDPSS and NCSS as of July 2011

Successes and Struggles

❑ Successes

- Provide timely, useful information that directed the public health response
- MSPP recognized as the sole source for official statistics
- Integration of MSPP actors from the central, departmental and communal levels
- Integration of LNSP
- Model for epidemiological surveillance in Haiti

❑ Struggles

- Drop off in timeliness of reports once the epidemic began tailing off
- Difficulties in assessing day-to-day completeness of reporting
- Commune-level data not disseminated to a wide audience

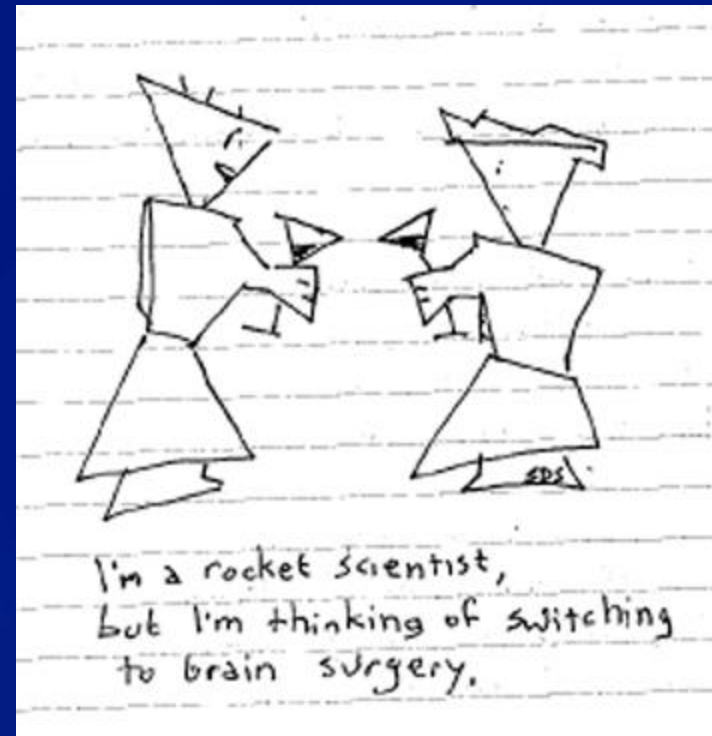
Unforeseen Challenges

- ❑ Scarcity of technical and human resources at MSPP's disposal
 - Worse or better since earthquake?
- ❑ Sheer number of actors involved
- ❑ Compounding developments:
 - Hurricane Tomás
 - Post-election violence
 - Resurgence during rainy season?



My Pearl of Wisdom

- Surveillance *is not* rocket science
- Implementing surveillance, *is*



Acknowledgments

- ❑ Haiti Ministry of Public Health and Population
- ❑ PAHO,
- ❑ Countless NGOs
- ❑ CDC Haiti Office
- ❑ CDC Headquarters
 - EIS and PHPS fellows,
 - EOC staff
 - All of our TDYers
 - International Emergency Health & Refugee Branch
 - Health Systems Reconstruction Office



Thank you for your attention