

**MEASURING PANDEMIC PREPAREDNESS,
CONTAINMENT,
&
EFFECTIVENESS IN COMMUNITIES,
STATES, & ACROSS the NATION**

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OBJECTIVES

- *Discuss the strategies of containment & how they coordinate with those of mitigation*
- *“...I love your plans but they don’t tell me how they are operationalized”*
- *Identify & discuss some operational level “showstoppers”*
- *Define universal measures of effectiveness (MOEs)*

REALITIES OF A PANDEMIC

“Health care is local,...and therefore it can’t be done on a national level....” Bartlett, JHU

“Important to be humbled about our expectations...”

- *Not expected to stop a pandemic in its tracks*
- *State & community efforts designed to “slow” the spread*
- *Buying time for:*
 - > vaccine development*
 - > health preparedness*
 - > reducing transmission and death rates*

RETHINKING “RESPONSE”

- *Initial emphasis on hospital- and vaccine-centric responses*
- *Won't take much to overwhelm the hospital system & the limitations of “surge capacity”*
- *WHO and national authorities have **gained new confidence** through progressive successes with H5N1 outbreaks in countries worldwide*

WORLD HEALTH ORGANIZATION: PROGRESS

- *International Health Regulations (IHR) resulted in prompt reporting of H5N1 human cases*
- *Emphasis is on stopping gene-swapping*
- *Respond to cluster of cases...anywhere*
- *Supplied international teams*

WHO-OUTBREAK CONTROL

- *Quick laboratory work*
- *Effective efforts to communicate the risk to the public*
- *Kill all local poultry*
- *Anti-viral (Tamiflu) Blanket Therapy: Dose ALL humans with antiviral medication*
- **Result: Contained threats to humans**



Every virus has an Achilles heel...

- *If transmission can be prevented the epidemic will die out*
- *Success is measured by the number of secondary infections produced*

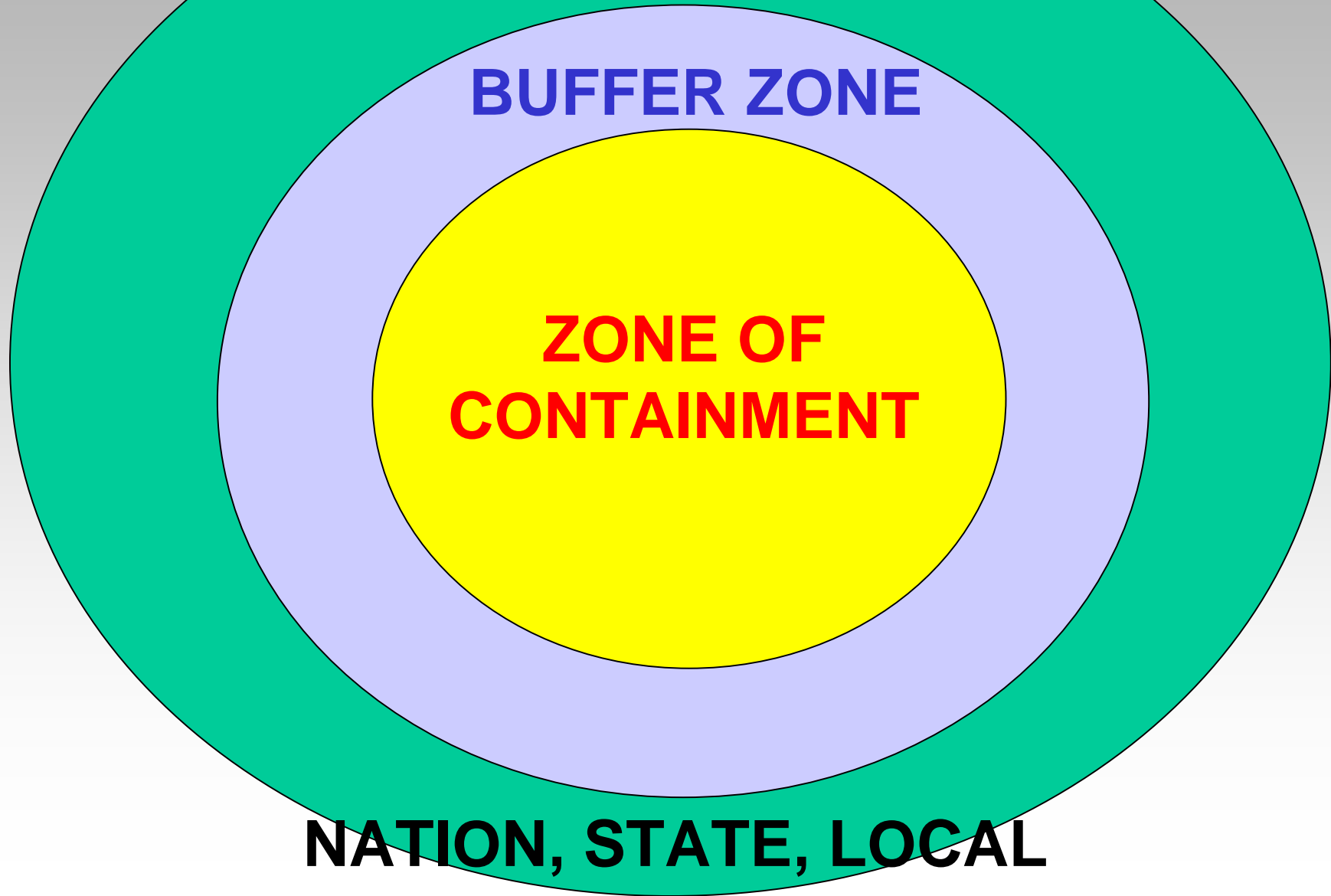
OPERATIONAL REALITIES

- *Rapid containment strategies and authority are **unique** & come from WHO and their international partners (ie., CDC)*
- *Immediate **goal** of WHO is to stop and contain the development of a pandemic through mobilization of large and complicated public health operations*
- *This goal is mimicked at the national, state & community level!*

STRATEGY OF RAPID CONTAINMENT

- *Potential for widespread harm & social disruption is considerable*
- *Mobilization of large & complicated public health operations is possible*
- *Control is possible if initial outbreak is localized ...within the first 3 weeks*

GEOGRAPHICALLY BASED APPROACH



BUFFER ZONE

**ZONE OF
CONTAINMENT**

NATION, STATE, LOCAL

Geographic Containment Strategy: Approach

- Containment Zone is the largest possible area that can be created to surround all known persons infected
- A second well defined Buffer Zone is where active and complete surveillance is preformed to detect any possible “breakthrough” cases

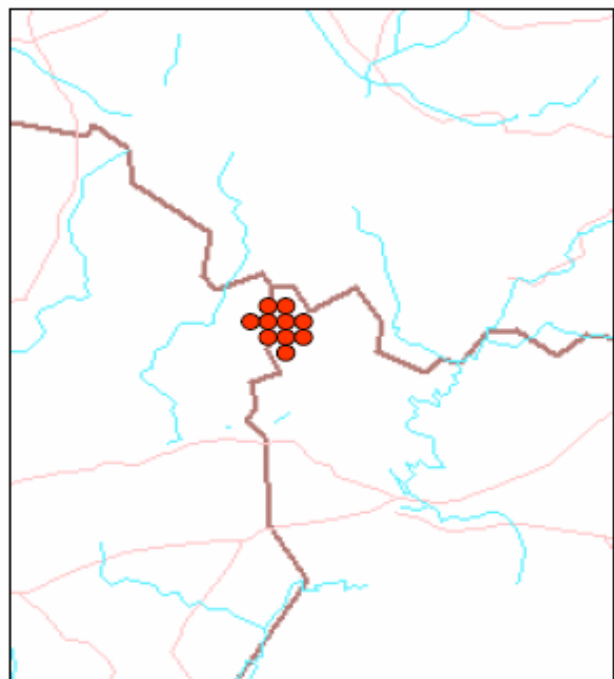
Geographic Containment Strategy:

Zones must include:

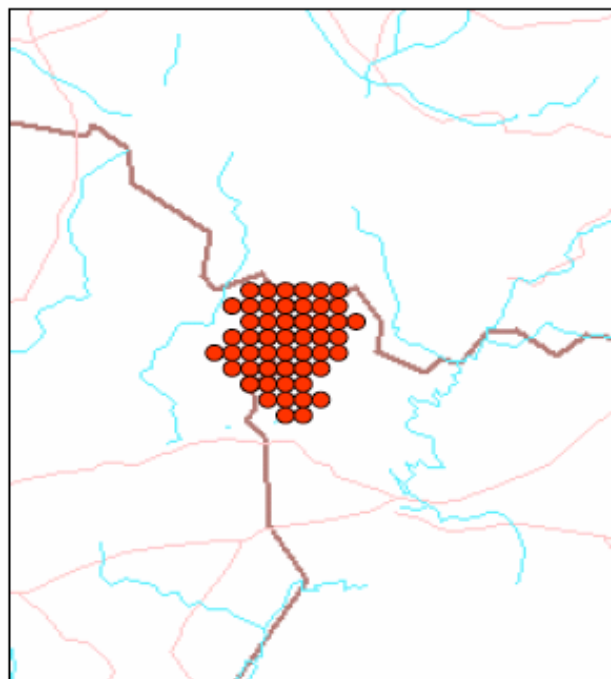
- *Cases & contacts:* *known movements and geographic distribution*
- *Administrative & natural boundaries:* *Important local or national boundaries that may limit movement of people*
- *Infrastructure and essential services:* *that substantially affect the safety & health of the people*

Containment Feasible?

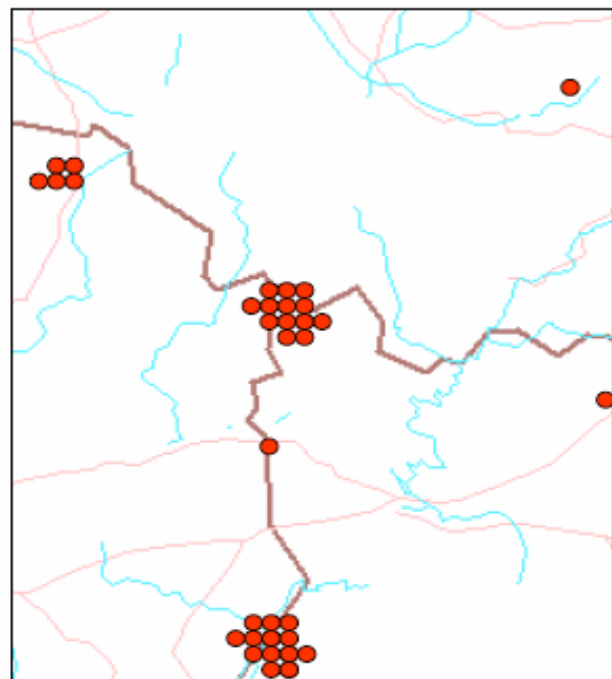
Location and Number of Cases



- One location
- Limited number of cases

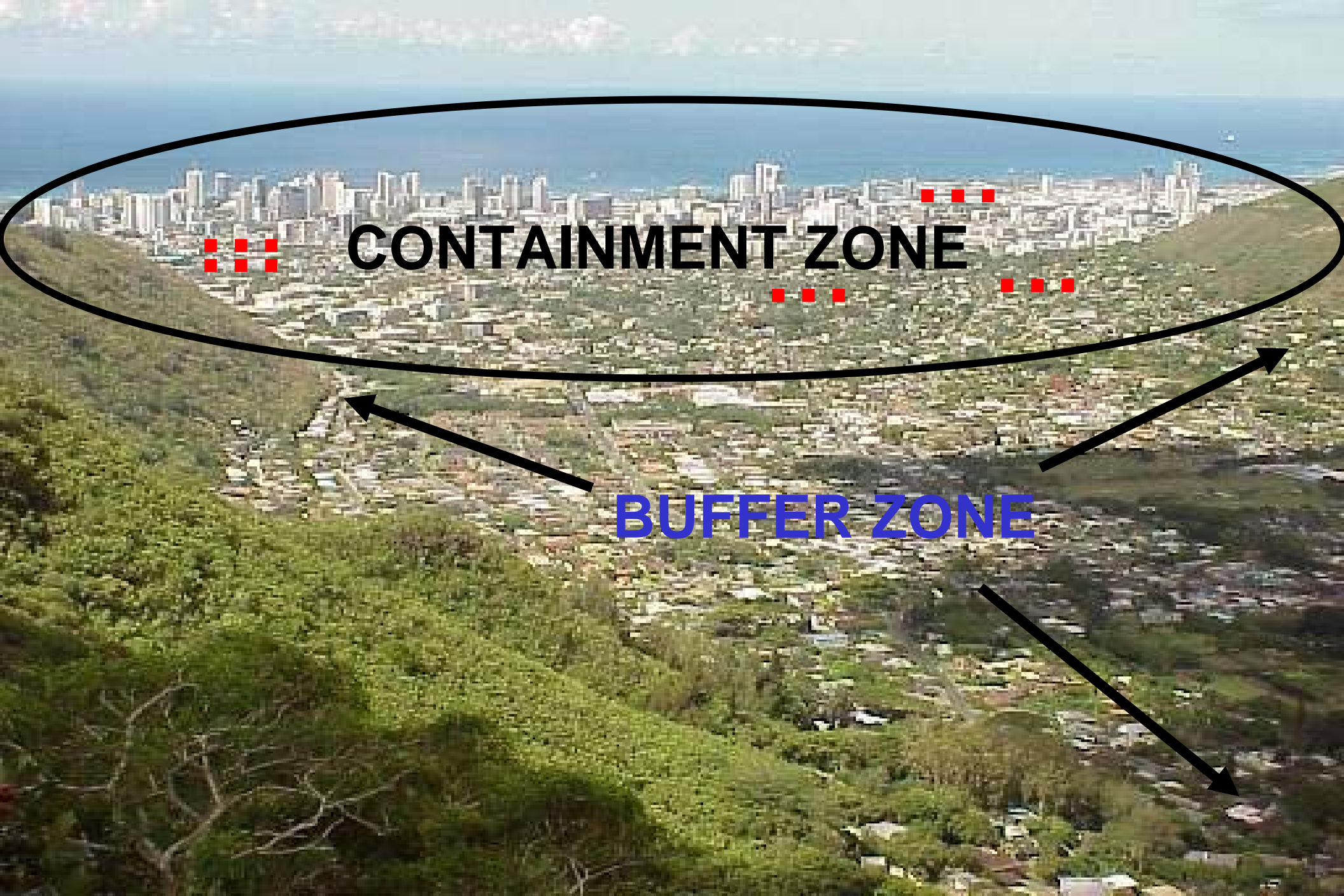


- One location
- Large number of cases



- Multiple locations
- Large number of cases



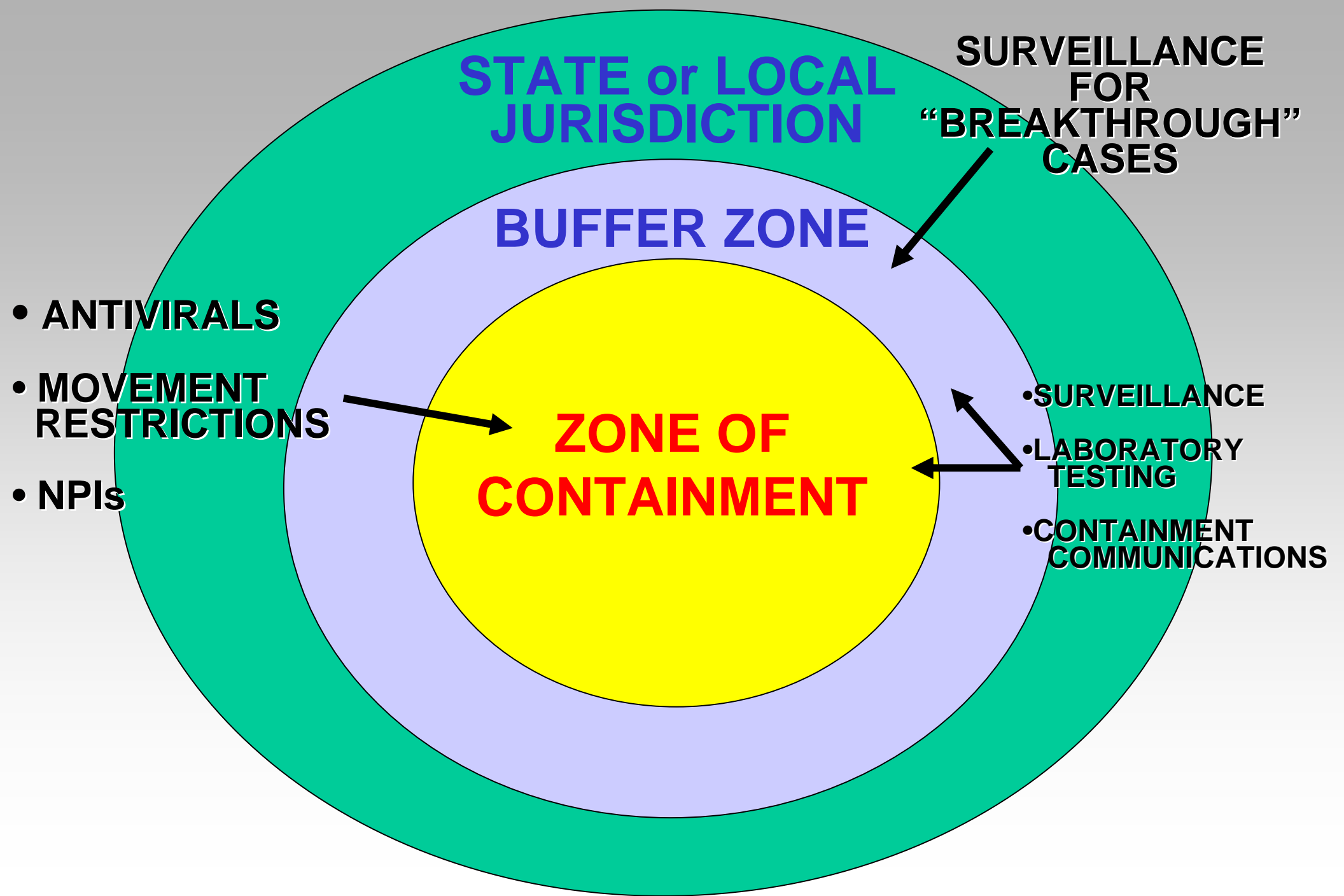


CONTAINMENT ZONE

BUFFER ZONE

ACTIVITIES IN THE “CONTAINMENT ZONE”

- *Extensive antiviral prophylaxis & treatment*
- *Movement restrictions & perimeter control in and out of the containment zone*
- *Multiple layered non-pharmaceutical interventions*
- *Surveillance & laboratory testing*
- *Virus assessment*



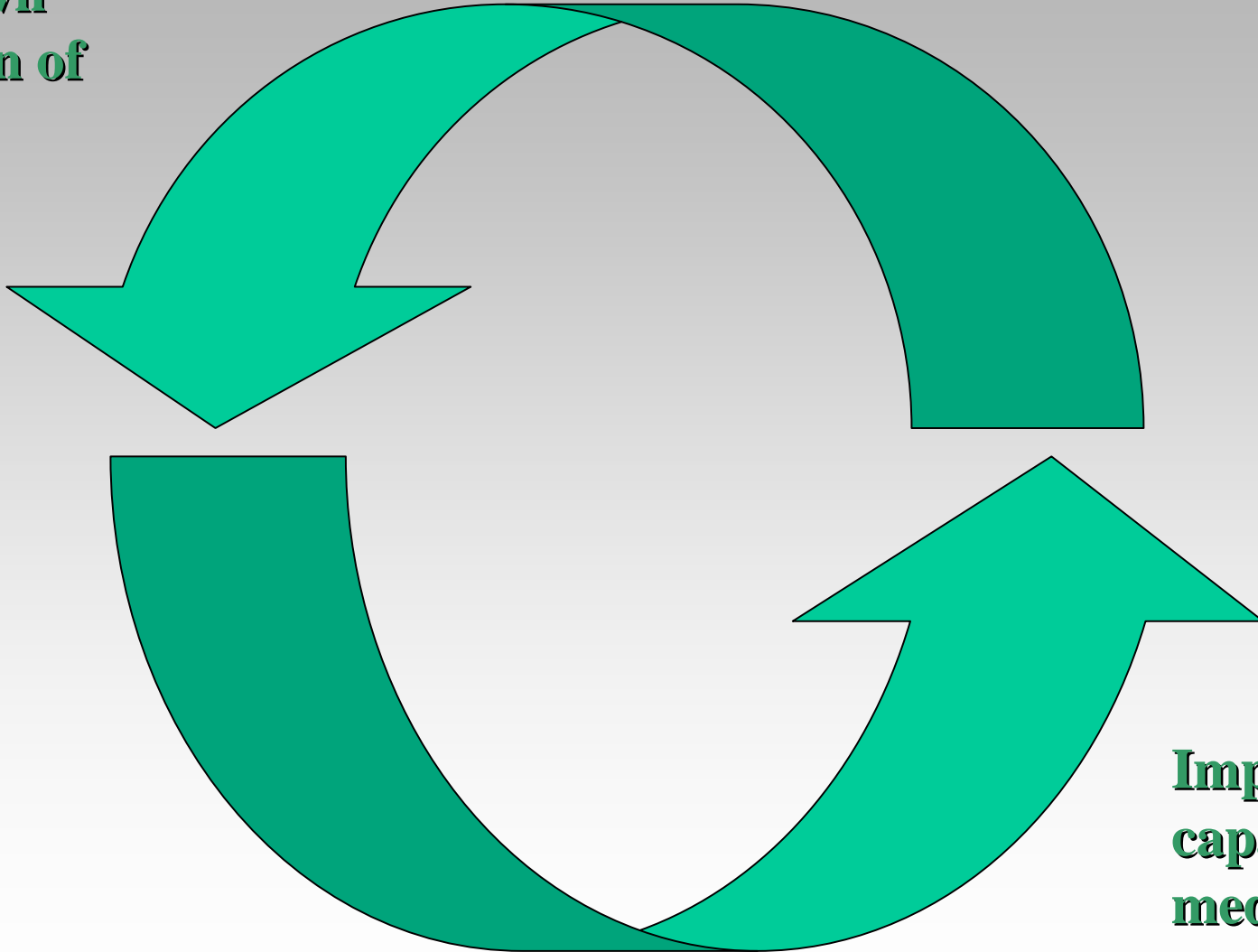
ACTIVITIES IN THE “BUFFER ZONE”

- *Active & complete surveillance with laboratory testing of all suspect cases*
- *Isolation & treatment of suspect cases*
- *Antiviral prophylaxis & quarantine of contacts of suspect cases*

MITIGATION STRATEGIES

USE OF NON-PHARMACEUTICALS

Driving down
transmission of
disease



Layering
Community
Mitigation
Measures

Improving
capacity of
medical care
systems

“Layered Solutions”

Vaccine & Antivirals



- **Community-wide hand & respiratory hygiene**
- **Isolating sick**
- **PPEs**

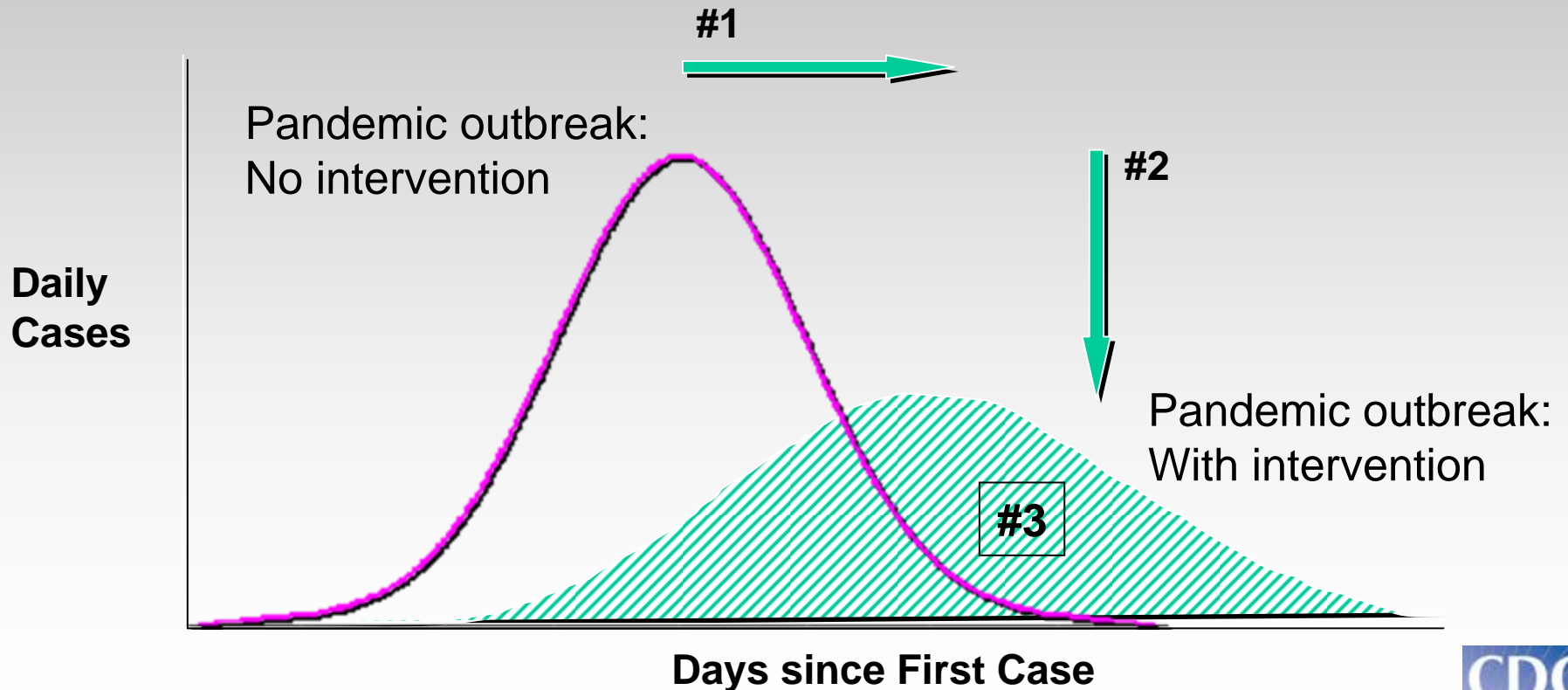
- **Voluntary quarantine of exposed**
- **Social distancing**
- **Minimizing person density**

Support needed to reduce Social & Economic impacts

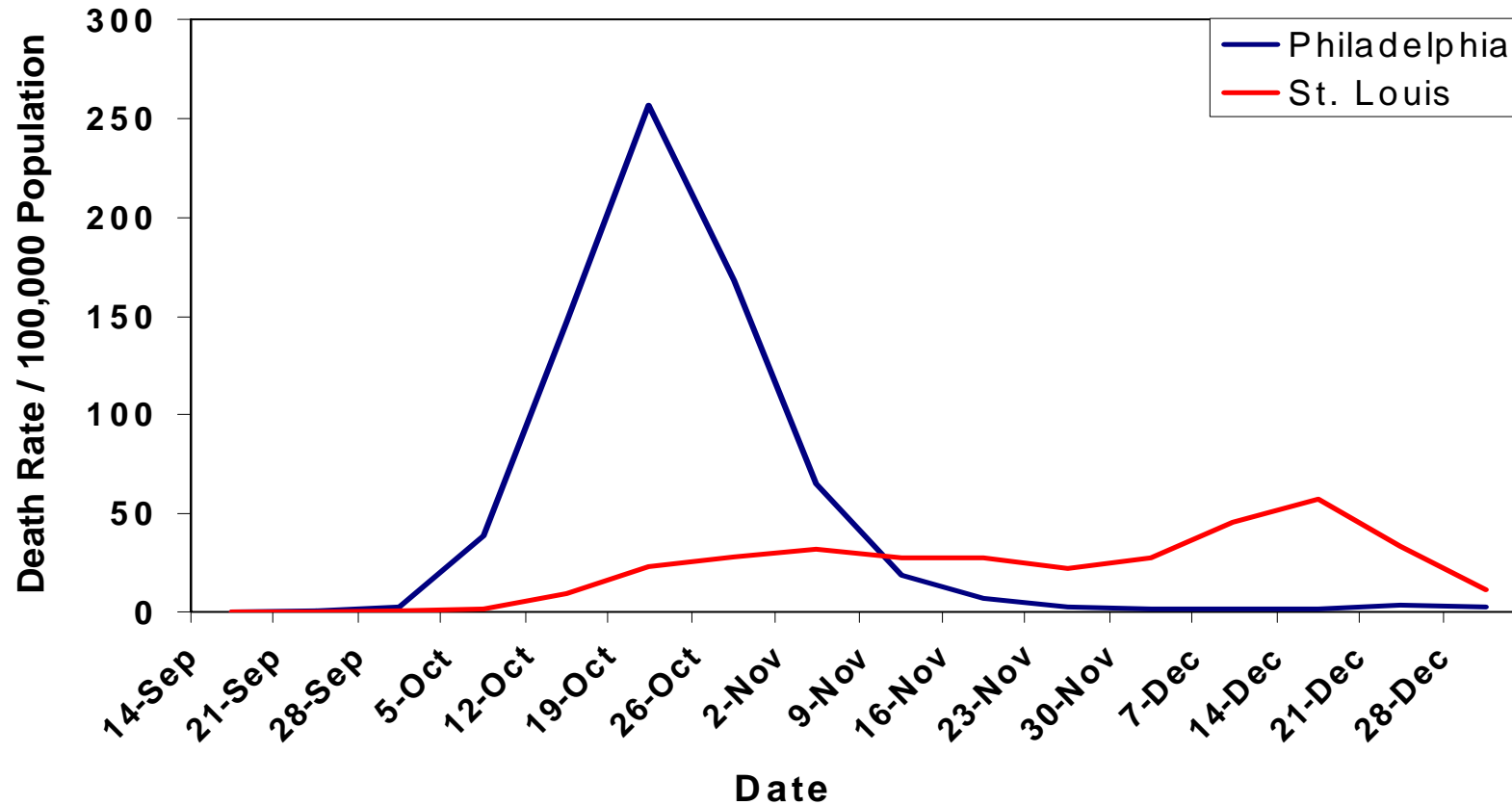


Goals of Community Mitigation

1. Delay disease transmission and outbreak peak
2. Decompress peak burden on infrastructure
3. Diminish overall cases and health impacts



Excess mortality over 1913-1917 baseline in Philadelphia and St. Louis



Source: Hatchett, Mecher, & Lipsitch. Public health interventions and epidemic intensity during the 1918 influenza pandemic. PNAS Early Edition. April 6, 2007

The Effect of PH Measures

- *Interventions have reduced transmission rates by up to 30-50%*
- *Must be done early & not lifted too soon*
- *Reduction correlated with high levels of mortality*



- *Containment is “just one element of a multi-pronged preparedness strategy”...delays but does not prevent **
- *Barring Vaccine, no other measure has the impact of layered Community Mitigation Strategies*

*MIDAS Modeling, 2006

OPERATIONAL



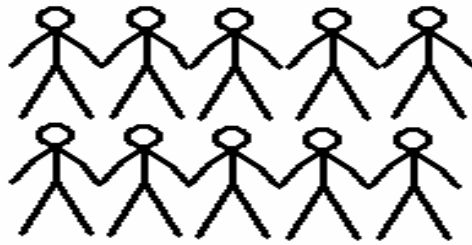
**MOVING FROM
INDIVIDUAL-BASED CARE
TO
POPULATION-BASED
CARE**

ALL INDIVIDUALS WITHIN A POPULATION SHARE THE FOLLOWING:

- *Everyone in the population have the same condition or are susceptible to it*
- *All require shared healthcare needs*
- *All require some intervention*

EVERYONE IN THE POPULATION ARE EITHER...

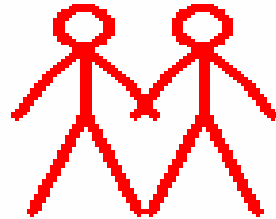
- **Susceptible**: *not exposed, but susceptible*
- **Exposed**: *infected but incubating the disease and are not symptomatic or contagious*
- **Infectious**: *contagious*



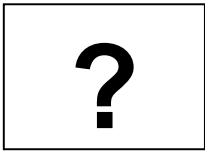
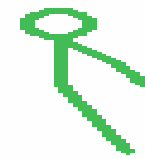
TOTAL POPULATION:
[stick figure icon] = 10% POPULATION

**PHASE-ONE
TRIAGE
MANAGEMENT**

SUSCEPTIBLE **EXPOSED** **INFECTIOUS** **REMOVED** **VACCINATED**



(20-40%)*



**0.24 - 1.5%
MORTALITY
RATE**

**PHASE-TWO
TRIAGE
MANAGEMENT**



**10X^s NORMAL
HOTLINE CALLS**

**HIGH
PROBABILITY
OF SURVIVAL**

**SAVABLE
WITH ICU
CARE**

**LOW
PROBABILITY OF
SURVIVAL**

SELF CARE

**REQUIRED ASSISTED CARE +/-
HOSPITALIZATION (40%)**

IMPLICATIONS OF POPULATION-BASED CARE

- *This approach does not minimize the importance of individual clinical tasks and daily routine tasks*
- *Adds the dimension of intervention informed by public health and surge capacity guidelines*
- *Encompasses new public health tools and techniques to improve health access and availability of resources to the **ENTIRE COMMUNITY...***

REMINDER

GOAL OF EVERY DECISION...no matter how small, is to prevent transmission of the virus!!

- *The fewer people and resources needed to get tasks done...the better !!*
- *When a creative idea pops up or a suggestion is made....ask if & how it will prevent transmission!*

**THE CURSE
OF THE
“SUSCEPTIBLE”
POPULATION**

LESSONS LEARNED

- *We know from the Ontario SARS epidemic data that the first few thousand callers over the first 10-14 days are extremely **unlikely** to be infected...*
- *The large majority will be experiencing various degrees of fear...which should be managed well with effective communication*

Stress Related, not Psychiatric Illness !

SARS related stress:

- *Uncertainty, high levels of fear, anxiety & stress*
- *Argumentative, irritable, anger (90th %)*
- *About 5% experience “hyper-vigilant fear” which requires additional attention and referral*
- *Are manageable at the citizen & primary care level*

Canadian SARS Telehealth Experience

- *“Telehealth” (Government 1-800 phone number): Staffed by RNs; protocol driven information*
- *2,000 calls per day*
- *20,000 calls per day during SARS*
- *Utilized both recorded and live assessment & advice as well as PH personnel*

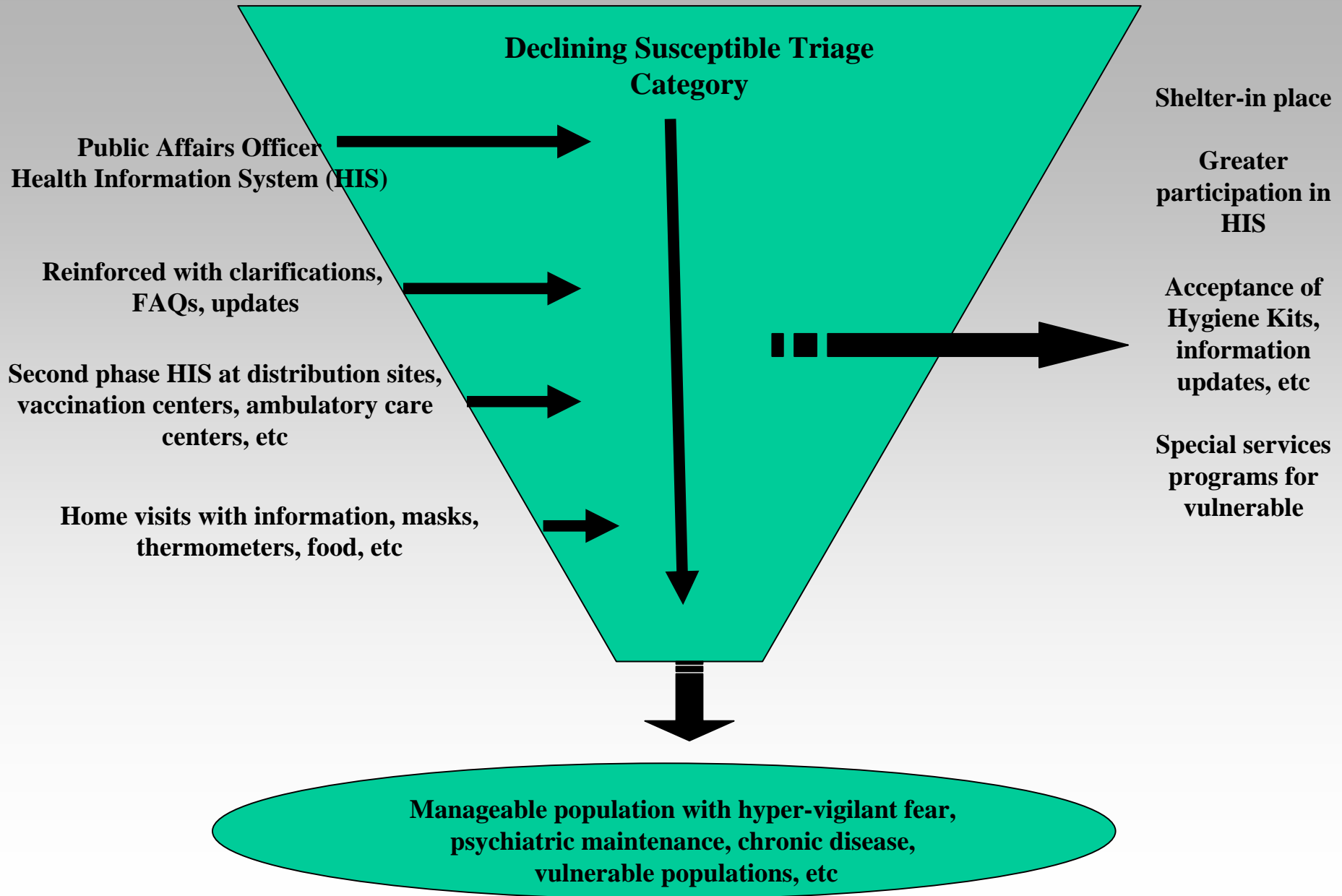
The “Susceptible” Category:

- *Make up 2/3 to 3/4 of “victims”*
- *Ratio of susceptible : exposed & infectious:*
500 : 1 (*happens quickly*)
- *Toronto SARS: health system “inundated”*
- *The population category where the Red Cross, VOAD and other volunteer agencies have greatest role and expertise*

APPROACH

- *Fear is essential...recognition of what is dangerous...must address fundamental issues of safety*
- *Fear is mediated by cognition (information)...crucial role of effective information*
- *“...bits of information can certainly change the situation quickly.”*
- *GOAL: Create a safe environment...in their home (Shelter-in-place)*

POPULATION



BIOEVENT FEAR & RESILIENCE (FR) CHECKLIST

Bracha & Burkle, 2006 f

Face-to-face ___	Phone ___	Start with part 1 below Circle Yes's checkmark No's	PART 4: A one-minute checklist for screened persons <u>unlikely</u> to be infected				
PART 1: Do you believe you have been exposed or infected? Yes(1) No If so, how did this occur?		Are you <u>fearful</u> that ...	Circle and add YES scores:	YES	?	NO	Total sub-scores:
			...you are infected with ...? (the bird flu, SARS, etc.?)	4			Max: 34
			...you will die from the ...?	12			
			...a close family member will die from...?	6			
		...your children will die from...?	12				
PART 2: Do you have a fever? Yes(1) No Did you check your temperature with a thermometer? Yes(1) No Do you know how high the fever is? ____ Yes(1) No Are you experiencing persistent cough? Yes(1) No Are you experiencing a sore throat? Ye (1) No Are you experiencing difficulty breathing? Yes(1) No Are you experiencing diarrhea? Yes(1) No		Right now, do you <u>feel</u>fearful?	1			Max: 3
			...helpless?	1			
			...horrified?	1			
		Right now, are you <u>experiencing</u> ...	<u>S</u> weaty palms or cold sweat?	2			Max: 10
			<u>T</u> rembling, shaking, or buckling knees?	2			
			<u>R</u> acing or pounding heart?	4			
			<u>S</u> hortness of breath?	2			
PART 3: Is anyone in your immediate family or contacts experiencing these symptoms? Yes(1) No Have they received Medical evaluation or care? No(1) Yes		Are you fearful that you will run out of money if you cannot work for the next 2-3 months?		3			Low Resilience
		How many (different) prescription medications are you on?					
If <u>any</u> questions in <u>PART 2</u> are answered in the positive please provide the caller with the immediate-referral options listed separately on referral Forms ___		Are you the kind of person that tends to bounce back after an illness?		- 5			High Resilience
		Do you have any nearby blood relatives who may be willing to help you?		- 5			
If not answered in the positive please continue to PART 4 ⇨		Finally, do you have any friends you can call on the phone so that you don't feel alone?		- 5			
PARTS 1+2+3 Total Score ->		M/F: ____ Age: ____ Date: ____/____/____	Name: _____ Phone: ____-____ Phone 2: ____-____		PART 4 score range is from <u>minus</u> 15 to 50 (+ number of medications)		PART 4 only: Total Score ->

Canadian SARS Telehealth Experience:

- Able to separate callers into:
Probably Infected/Exposed VS. Probably not
- Options:
 1. *Clinic & out-patient facilities*
 2. *Designated Flu hospital*
 3. *Home with self- or assisted-care*
- **Minimized mixing patients especially at all clinical levels**
- **2007 : 1st line of triage-management in Canada**

**RELATIONSHIP BETWEEN
PUBLIC HEALTH
&
HEALTH CARE**

MAJOR PROBLEM

Operational relationship between Health Care
Community & Public Health Community is a
TACIT one only

- *Developing this relationship at the time of a pandemic is too late*
- *Experience suggests that this relationship will be vertical, not lateral*
- *Public health leadership needs to bridge this gap !*



Walt Whitman

*"And it was so typically brilliant of you
to have invited an epidemiologist."*

Conflicts Between Professional Duties & Fear of Influenza Transmission

- *Reality that some essential healthcare providers will abandon their workplace*
- *“OK to abandon workplace”*:*
Physicians: 35%; Nurses: 46%; Administrators: 68%
- *Studies confirm that by increasing the knowledge-base of the disease...will also improve willingness to perform*
- *Untapped resource: **Citizens***

*Ehrenstein BP, et al,
BMC Public Health,
2006

**CITIZEN INFORMED
&
READY VOLUNTEERS**

COMMUNITY MISTAKES*

Fail to recognize:

- *Citizens are capable, non-expert, caregivers who care for large numbers of non-critical victims*
- *Community networks in which people belong (ethnic, religious, businesses, & institutions) provide critical information & meaning in a crisis*
- *Incorporate constructive cooperation of citizens into emergency plans rather than excluding them (don't assume lack of expertise)*

* Lancet, 2005

RESILIENCE

- *Individual resilience is the foundation that leads to family, neighborhood, and community resilience*
- *Resilience is a major surge capacity resource*
- *Every community has some capacity to bring citizens together...but varies greatly from community to community*
- *Resilience can be measured and serve as criteria for volunteerism*

HEALTH-RELATED EMERGENCY OPERATIONS CENTER

MASS ILLNESS MANAGEMENT

- **Incident Command System (ICS)**
- **Hospital Emergency Incident Command System (HEICS)**
-The ICS at the hospital level
- **Unified Command System (UCS)**
-Multi-agency command especially in mass casualty/illness events
- **Emergency Operations Center (EOC):** Not normally exercised

HEALTH-RELATED EMERGENCY OPERATIONS CENTER (HEOC)**

Tactical Operations and Training Coordination Center

- *Maintain Situational Awareness*
- *Establish Triage Protocols & Execute as Needed*
- *Enforce Health Information Communication & Compliance*
- *Mobilization & Just-in-Time Training*
- *Maintain Health & Recovery Systems*
- *Facilitate and Integrate Resources*
- *Health Measures of Effectiveness*

***...SEVERAL DIFFERENT HEOC MODELS
EXIST...both State & Regional***

****Burkle, et al: J DM & PHP, 2007**

*** D. Barbisch The Practice of Community Emergency Public Health
Concept of**

Ontario Health System Adult ICU Task Force

- *Recognizes **Emergency Operations Center's (EOC)**...“absolute command & control over critical care resources to ensure accountability.”*
- *Emphasizes ethical and moral standards*
- *Population recognizes need for “health rationing” and triage:...demands it be performed with honesty & transparency*

“Preparedness” Planning

- *Examples I use:*
 - > *Triage-management*
 - > *Emergency Medical Services Systems*
- **3000 local health departments & plans...What is executed locally is coordinated & governed by State authorities**
- *Whether plans translate operationally?...This process defines “PREPAREDNESS”*

EXERCISES

- *Predominately cost-inefficient*
- *Wasteful opportunity where process & outcomes are “fairy-dusted”*
- *Must address:*
 - > dilemma situations*
 - > hypothetical & paradoxical thinking*
 - > cause ‘angst’...better now than later !!*

**MEASURING
PREPAREDNESS
&
EFFECTIVENESS**

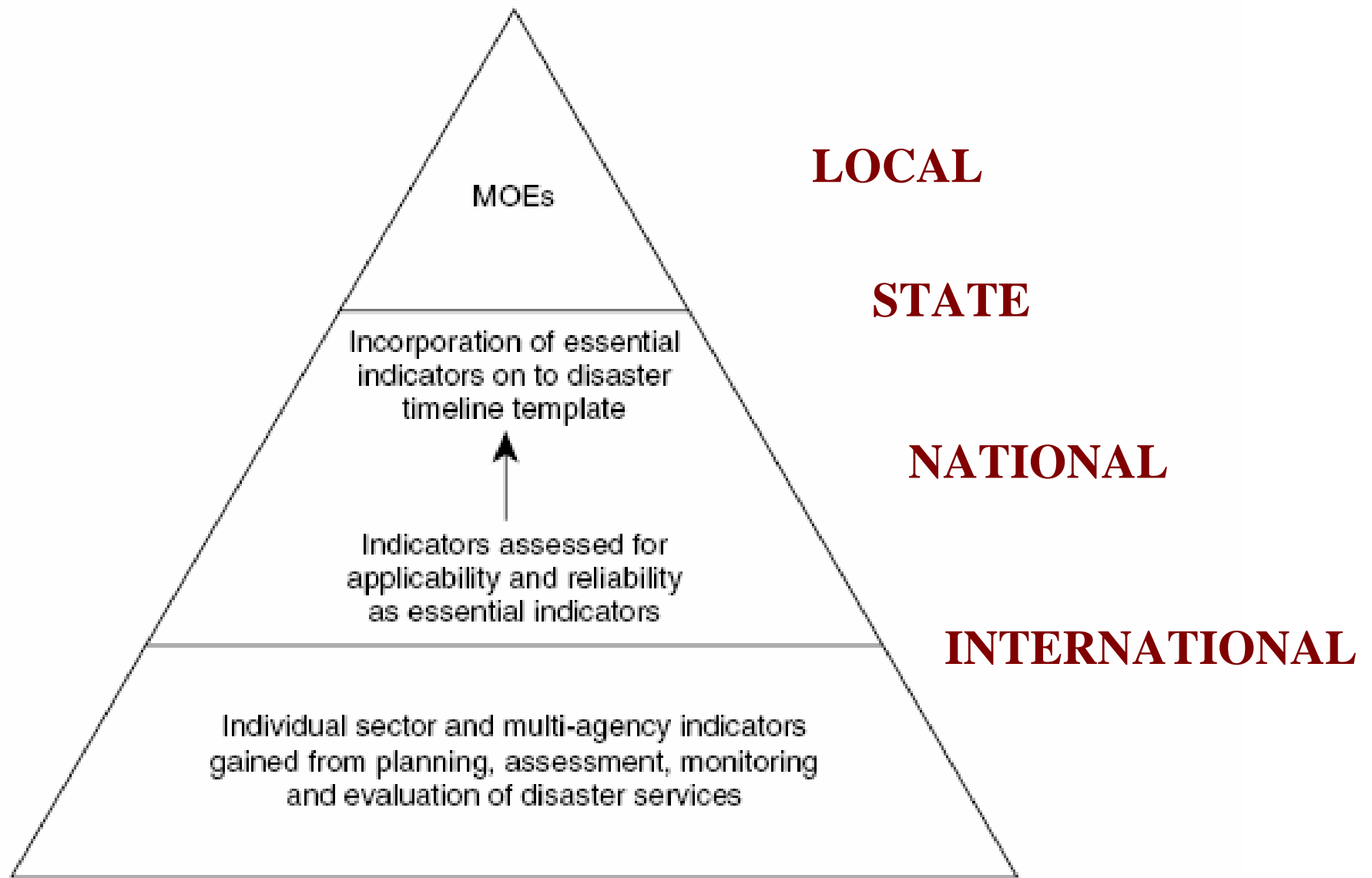


FIGURE 52-1 Measures of effectiveness are based on essential indicators.

Measures of Effectiveness

- *A major indicator of success is a **declining** ‘SUSCEPTIBLE’ population category*
- *How rapidly a Health Information System (HIS) can be mobilized...with accurate information:*
- **SARS/WHO:** “Must move fast and decisively to communicate to the public incredibly well”

Measures of Effectiveness

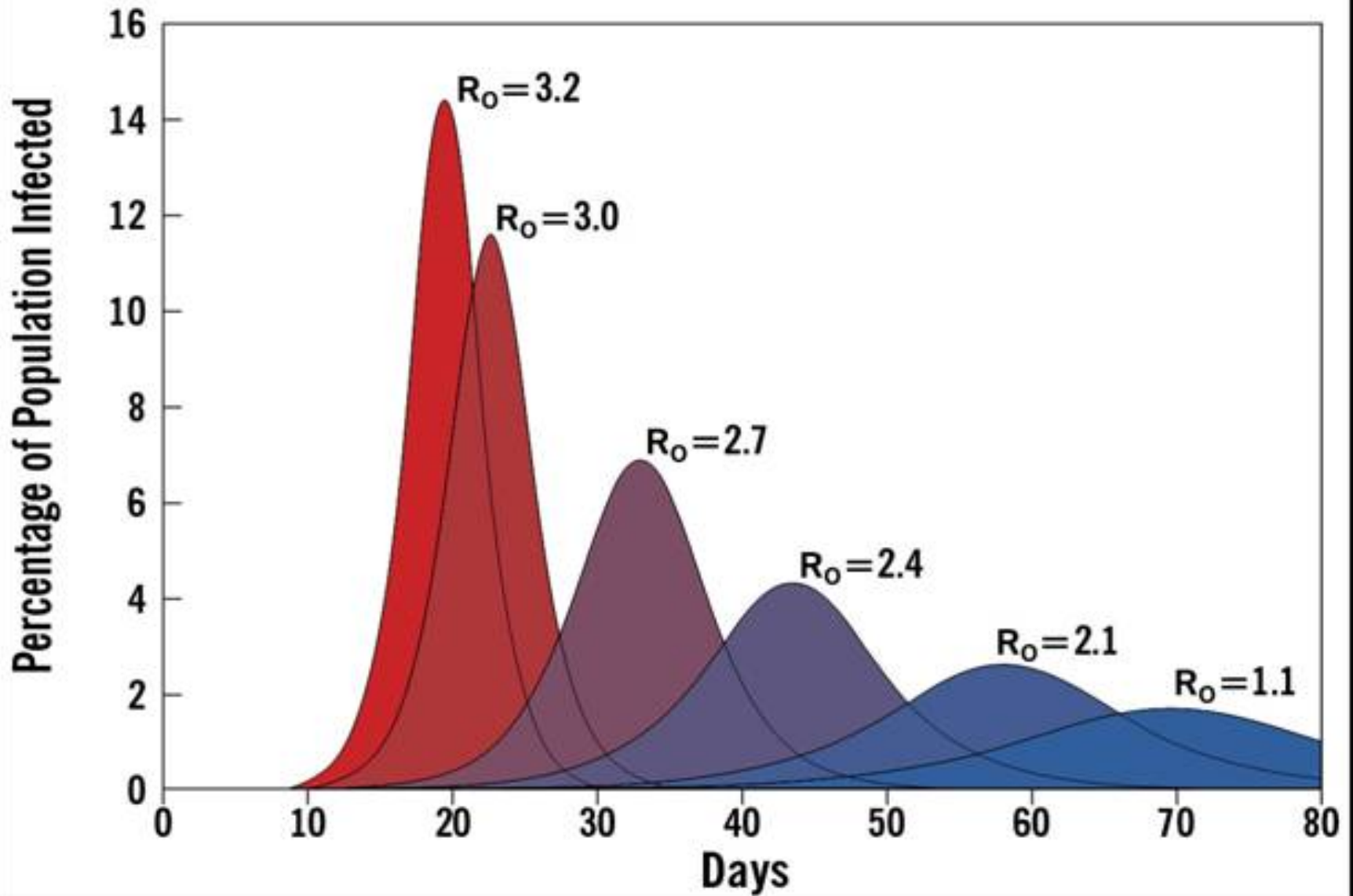
- *Decline mortality & morbidity*
- *Appropriate resource distribution across entire population cohort*
- *Control transmission rate (R_0): Ratio of secondary to primary cases*

TRANSMISSION RATE: R_0

R_0 is the number of secondary infections from 1 infectious case...Determines Community Mitigation Control Measures

- $R_0 > 1 =$ *there will be an epidemic*
- $R_0 = 1 =$ *the disease will become endemic*
- $R_0 < 1 =$ *the disease will eventually disappear*

If people become immune or are protected the R_0 will fall below 1 and the epidemic will eventually die out...!!



Detection...Containment...Mitigation

- *“Hold the ground”...containment*
- *“Preserve life & diminish cases”...mitigation strategies*
- *Containment is just one more layer in the “layering” of critical mitigation strategies*
- *“Surge capacity” as we know it has reached its max*
- **Preparedness** = *Capacity to “Operationalize” plans and exercises...& measures of effectiveness will tell the story*