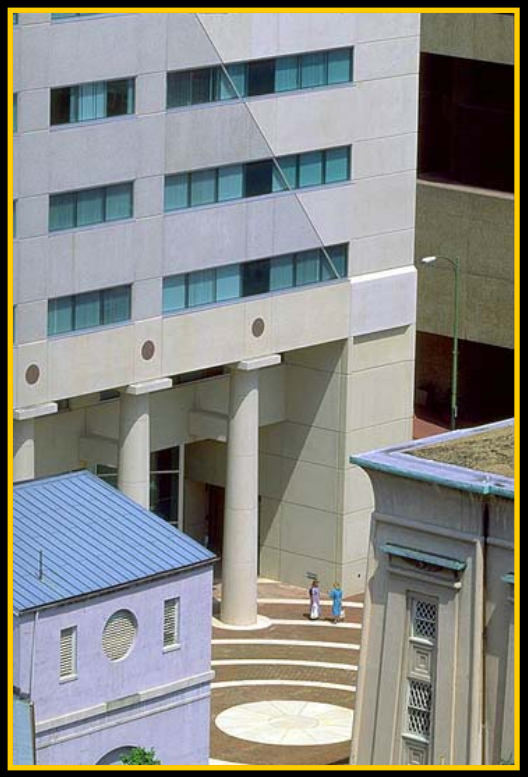
Surveillance



Gonzalo Bearman MD, MPH

Associate Professor of Medicine,

Epidemiology and Community Medicine

Division of Infectious Diseases

Associate Hospital Epidemiologist

Virginia Commonwealth University

VCU Medical Center

Virginia Commonwealth University

METHODS

- Volunteer Providers - the epidemic of Guillain-Barre syndrome and Swine influenza vaccination between 1978-1979

- Registries (Cancer, birth defects etc.) Virginia has a Cancer Registry – path labs report all diagnoses of cancer to the state

METHODS

- Surveys (national annual surveys to monitor the prevalence of most chronic illnesses and health behaviors. Example: National Health Interview Surveys, National Health and Nutrition Examination Surveys). This method is mostly used for chronic disease surveillance

- Animal populations: Animal morbidity and mortality caused by diseases that affect humans e.g. Rabies, West Nile Virus.

METHODS

- Environmental data: To detect contamination of public water, milk, and food supplies. Environmental monitoring for mosquito breeding site. Radiation, chemicals, biological and physical agents in work places.

- Drug/biologic utilization: State health departments and CDC are the only sources for a number of biologic agents and drugs (e.g. botulism antitoxin, diphtheria antitoxin)

Active surveillance on the National Level

NHANES

National Center for Health Statistics

- “The mission of the National Center for Health Statistics (NCHS) is to provide statistical information that will guide actions and policies to improve the health of the American people. As the Nation's principal health statistics agency, NCHS leads the way with accurate, relevant, and timely data.”

http://www.cdc.gov/nchs/about/mission/mission.htm

National Center for Health Statistics

- The NCHS Health Statistics:
  - document the health status of the population and of important subgroups
  - identify disparities in health status and use of health care by race/ethnicity, socio-economic status, region, and other population characteristics
  - monitor trends in health status and health care delivery
  - identify health problems
  - support biomedical and health services research
  - provide information for making changes in public policies and programs
  - evaluate the impact of health policies and programs

http://www.cdc.gov/nchs/about/mission/mission.htm

National Health and Nutrition Examination Survey

nchs National Center for Health Statistics ...Monitoring the Nation's Health

http://www.cdc.gov/nchs/about/mission/mission.htm

NHANES

- **Who are participants?**
  - The information gathered by NHANES provides a random, representative snapshot of the health and nutrition of the U.S. population.
  - Because of this, persons in this survey are from a broad range of age groups and racial/ethnic backgrounds.
  - Each participant represents approximately 50,000 other U.S. residents.

http://www.cdc.gov/nchs/about/mission/mission.htm

NHANES

- Private Health Interview
  - Health status - ages 12 and older
  - Questions about drug and alcohol use - ages 12 years and older (No drug testing will be done)
  - Nutrition - all ages
  - Reproductive health - females ages 12 years and older
  - Questions about sexual experience - ages 14-69 years
  - Tobacco use - ages 12 years and older

http://www.cdc.gov/nchs/about/major/nhanes/testcomp.htm

NHANES

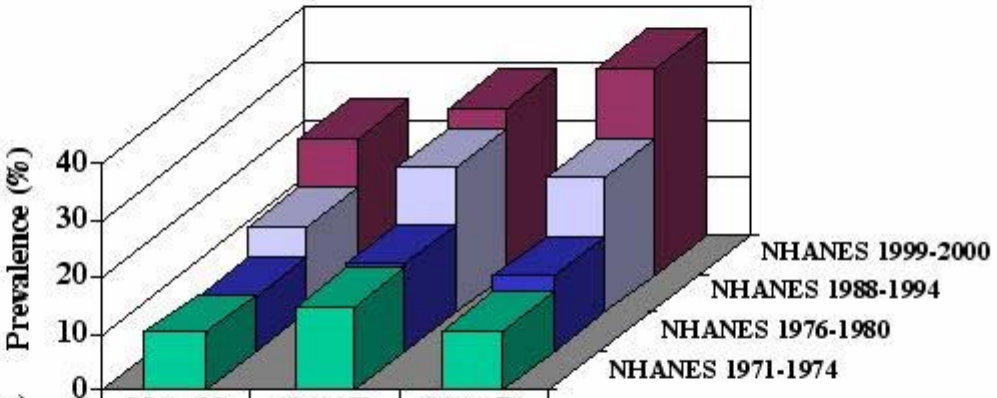
- **Health Measurements by Participant Age and Gender**
  - Physician's exam - all ages
  - Blood pressure - ages 8 years and older
  - Bone density - ages 8 years and older
  - Condition of teeth - ages 5 years and older
  - Vision test - ages 12 years and older
  - Hearing test - ages 12-19 years and 70 years and older
  - Height, weight, and other body measures - all ages
  - Ophthalmology exam for eye diseases - ages 40 and older
  - Breathing tests - ages 6-79 years

http://www.cdc.gov/nchs/about/major/nhanes/testcomp.htm

NHANES

- **Lab Tests on Blood: (1 year and older)**
- Anemia - all ages
- Total Cholesterol and HDL - ages 6 years and older
- Glucose measures - ages 12 years and older
- Infectious diseases - ages 2 years and older
- Kidney function tests - ages 12 years and older
- Lead - 1 year and older
- Cadmium - 1 year and older
- Mercury - ages 1 and older
- Liver function tests - ages 12 years and older
- Nutrition status - 1 year and older
- Thyroid function test - ages 12 years and older
- Prostate Specific Antigen (PSA)- males ages 40 and older
- Sexually transmitted diseases (STD)
- Genital Herpes - ages 14-49 years
- Human immunodeficiency virus (HIV) - ages 18-49 years
- Human papillomavirus (HPV) antibody - ages 14-59 years

Obesity Prevalence Trend for U.S. Men (1971 to 2000)



Age (Years)	20 to 39	40 to 59	60 to 74
NHANES 1971-1974	10.2	14.7	10.5
NHANES 1976-1980	9.8	15.4	13.5
NHANES 1988-1994	14.9	25.4	23.8
NHANES 1999-2000	23.7	28.8	35.8

Source: Flegal KM et. al. JAMA. 2002;288:1723-1727.

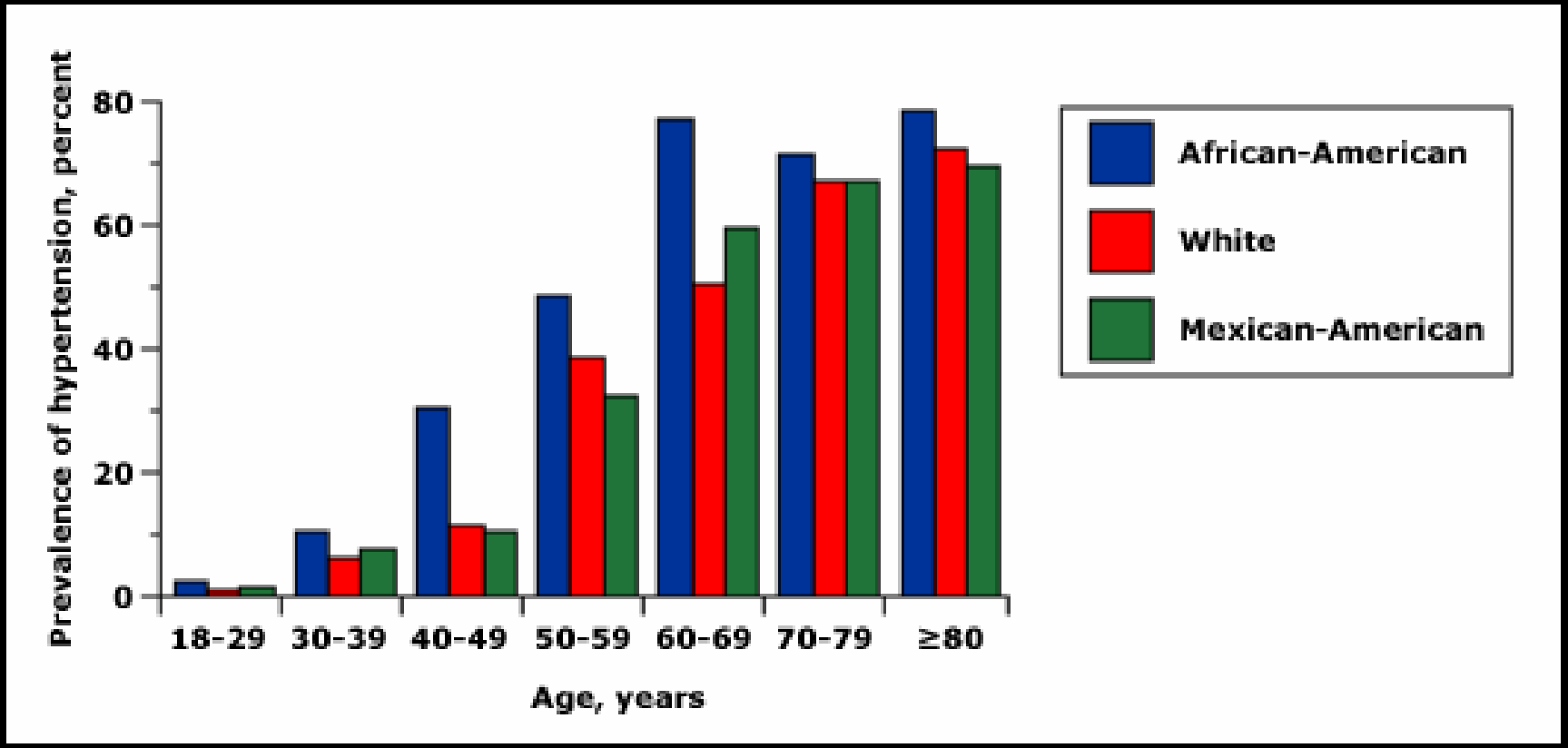
AMERICAN OBESITY ASSOCIATION

http://obesity1.tempdomainname.com/subs/fastfacts/Men_NHANES_Prev.jpg

NHANES III Age-Adjusted Prevalence of High Blood Cholesterol* According To Body Mass Index

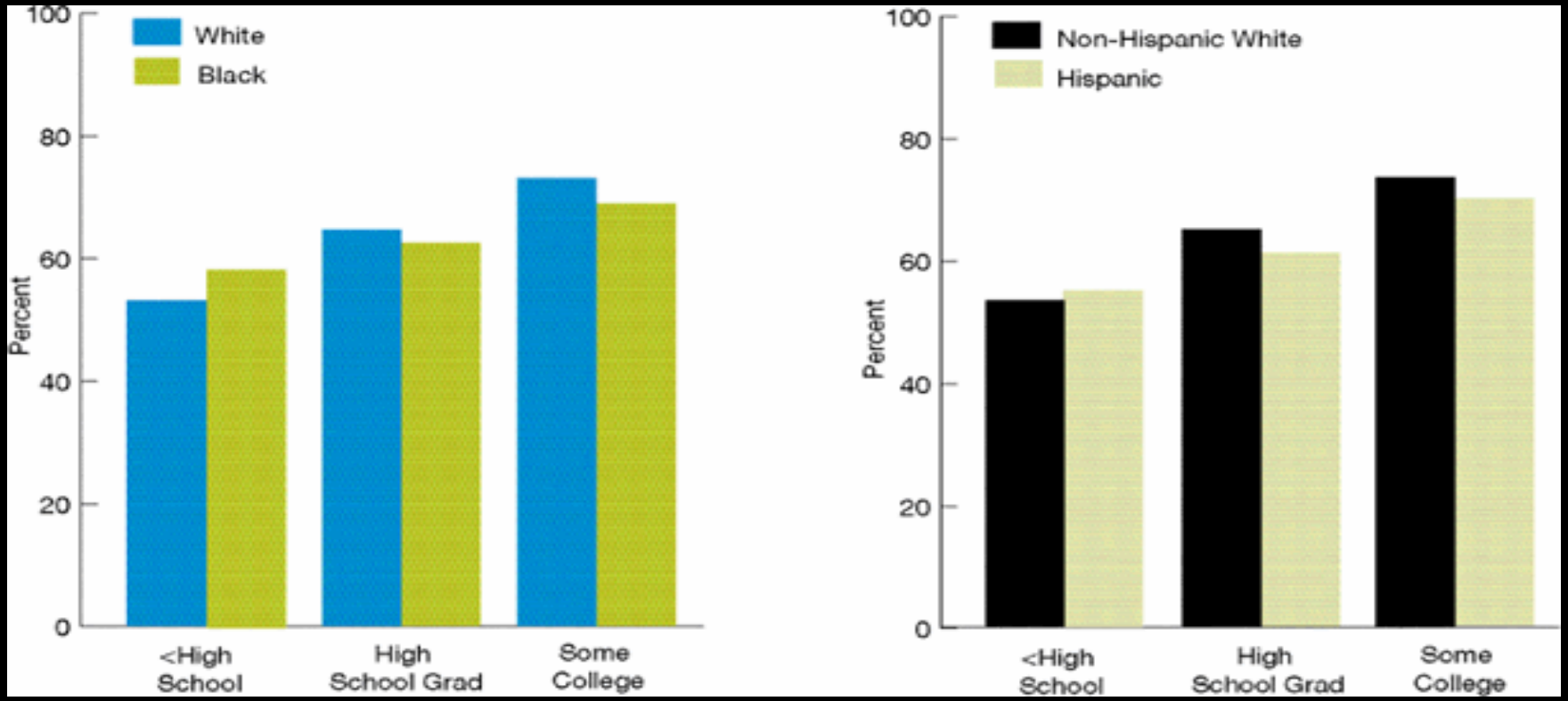
http://www.nhlbi.nih.gov/guidelines/obesity/e_txtbk/ratnl/2212.htm

Prevalence of hypertension in women according to age and race/ethnicity in the United States from the NHANES-III survey



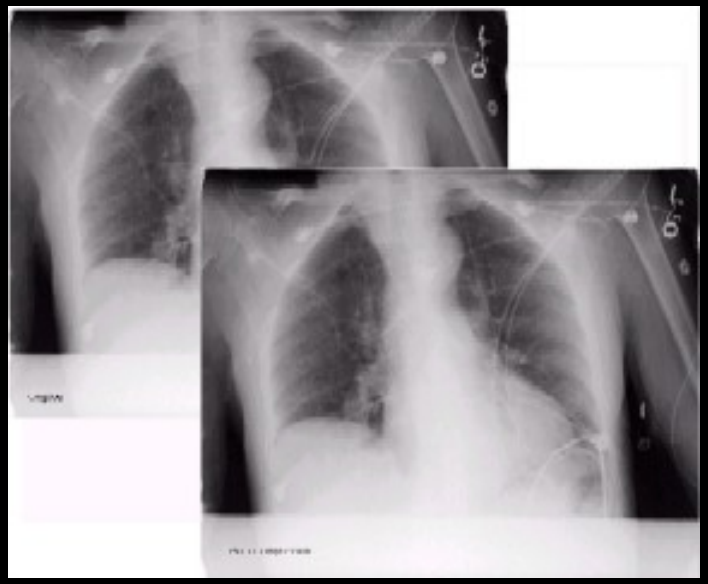
http://www.uptodate.com/patients/content/images/htn_pix/Prevalence_of_HTN_in_women.gif

Women age 40+ and undergoing mammography



Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey, 2005

http://www.ahrq.gov/qual/nhdr07/Ch2fig3.gif



Surveillance in a Hospital

VCU Medical Center
Virginia Commonwealth University

Epidemiology and Infection Control

Staff | Functions | Policies | Presentations | Links | Contact us | Info on Infectious Diseases

Mission

- To prevent transmission of pathogenic microorganisms to patients, visitors, and hospital personnel via an evidence-based approach
- To serve as a resource for patient management via 24-hour coverage by nurse- and physician-epidemiologists
- To establish endemic rates of nosocomial infections
- To quickly detect and terminate outbreaks of nosocomial infections
- To educate healthcare & other workers on the prevention of infection
- To create new knowledge in infection control
- To be viewed as a national leader in infection control

Contact information:
Epidemiology and Infection Control Unit
1201 East Marshall Street
A.D. Williams Clinic, 6th Floor, Room 6-602
PO Box 980019
Richmond, Virginia 23298

VCU Hospital Epidemiology and Infection Control

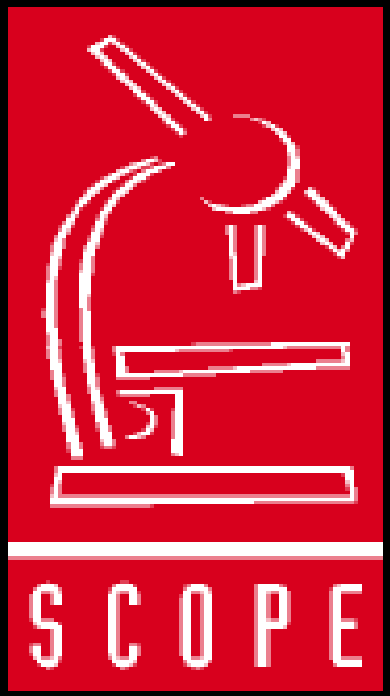
- Real time surveillance of hospital acquired infections
- Utilize CDC standard definitions for catheter associated BSIs, ventilator associated pneumonias, urinary tract infections and surgical site infections
- Active surveillance methodology employing daily analysis of laboratory data, radiology reports, and patient chart and bedside review
- Specific interdisciplinary team of infection control nurses, laboratory technicians and infectious diseases physicians/epidemiologists

Nosocomial Infection Surveillance

- Incidence of Infections per 1000 device days
  - Catheter associated UTI
  - Catheter associated BSI
  - Ventilator associated pneumonia
- Incidence of SSI per 100 procedures
  - Stratified by risk index
- Surveillance of risk reduction practices
  - Hand hygiene
  - Head of bed elevation
  - Invasive device days

Surgical Site Infections

Nosocomial Bloodstream Infections, 1995-2002

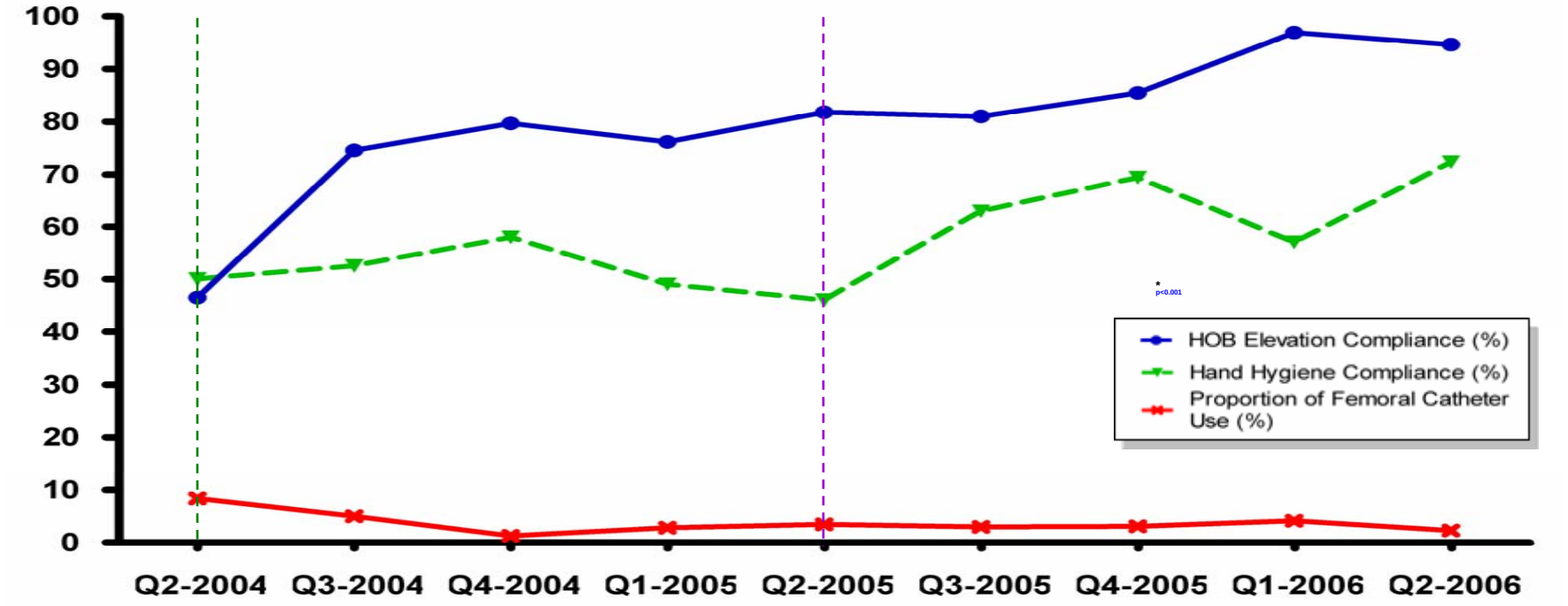


Rank	Pathogen	Percent
1	Coagulase-negative Staph	31.3%
2	*S. aureus*	20.2%
3	Enterococci	9.4%
4	*Candida* spp	9.0%
5	*E. coli*	5.6%
6	*Klebsiella* spp	4.8%
7	*Pseudomonas aeruginosa*	4.3%
8	*Enterobacter* spp	3.9%
9	*Serratia* spp	1.7%
10	*Acinetobacter* spp	1.3%

Impact of Two Different Levels of Performance Feedback on Compliance with Infection Control Process Measures in Two Intensive Care Units

Susan Assanasen, MD, Michael Edmond, MD, MPH, MPA, Gonzalo Bearman, MD, MPH
Virginia Commonwealth University Medical Center, Richmond, VA, USA

Trends of IC Process Measures in STICU



Baseline

Feedback to unit management

Feedback to unit management and to staff directly via IC posters

Presented at SHEA conference 2007, Baltimore, MD

Surveillance in the Commonwealth of Virginia

VIRGINIA EPIDEMIOLOGY BULLETIN

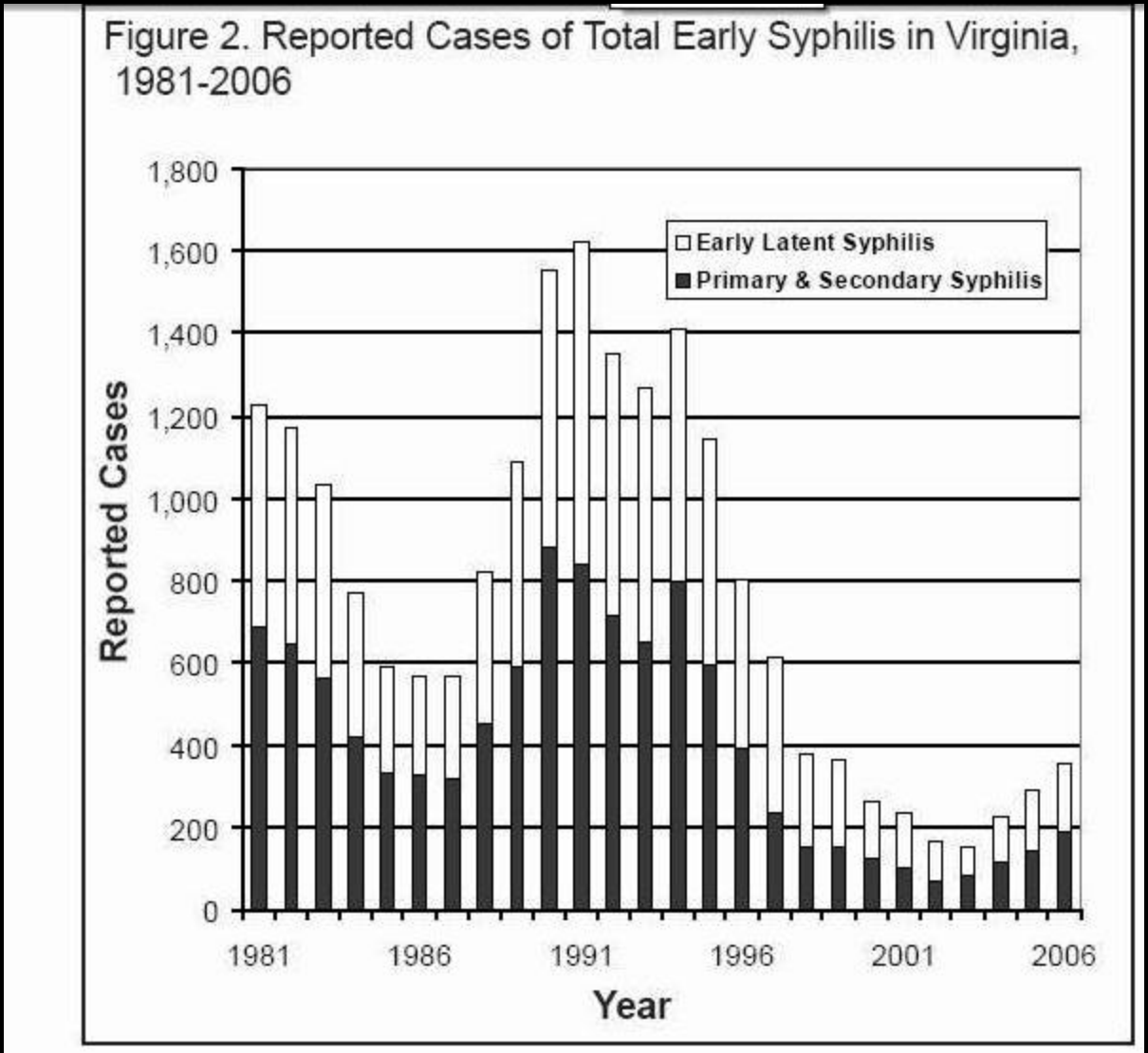
Robert B. Stroube, M.D., M.P.H., Health Commissioner
Carl W. Armstrong, M.D., State Epidemiologist

Christopher Novak, M.D., M.P.H., Editor
Vickie L. O'Dell, Layout Editor

Volume 107, No.3

Syphilis in the United States and Virginia

http://www.vdh.virginia.gov/Epidemiology/Surveillance/Bulletin/pdf/vebmar07.pdf



http://www.vdh.virginia.gov/Epidemiology/Surveillance/Bulletin/pdf/vebmar07.pdf

Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, February 2007						Total Cases Reported Statewide, January - February		
		Regions							
	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	18	6	4	0	2	6	45	59	91
Campylobacteriosis	28	2	7	7	7	5	50	48	37
Chickenpox	5	2	0	3	0	0	8	43	45
E. coli, Shiga toxin-producing	4	0	1	1	2	0	11	4	2
Giardiasis	14	4	6	0	4	0	45	53	37
Gonorrhea	412	22	24	49	173	144	723	962	1,300
Group A Strep, Invasive	10	3	2	2	2	1	15	15	9
Hepatitis, Viral									
A	5	2	2	1	0	0	9	3	7
B, acute	9	0	3	5	1	0	15	4	16
C, acute	1	0	0	0	0	1	1	0	0
HIV Infection	69	1	12	1	11	44	98	134	112
Lead in Children†	39	3	2	7	9	18	53	76	60
Legionellosis	0	0	0	0	0	0	3	5	3
Lyme Disease	17	1	13	1	1	1	30	0	1
Measles	0	0	0	0	0	0	0	0	0
Meningococcal Infection	0	0	0	0	0	0	2	3	2
Pertussis	6	1	0	1	0	4	16	12	13
Rabies in Animals	50	17	9	8	7	9	80	71	65
Rocky Mountain Spotted Fever	1	0	0	1	0	0	2	0	0
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	40	0	11	8	10	11	96	57	69
Shigellosis	1	0	0	0	0	1	5	3	44
Syphilis, Early§	32	2	8	5	6	11	70	44	24
Tuberculosis	22	3	12	0	1	6	22	19	21

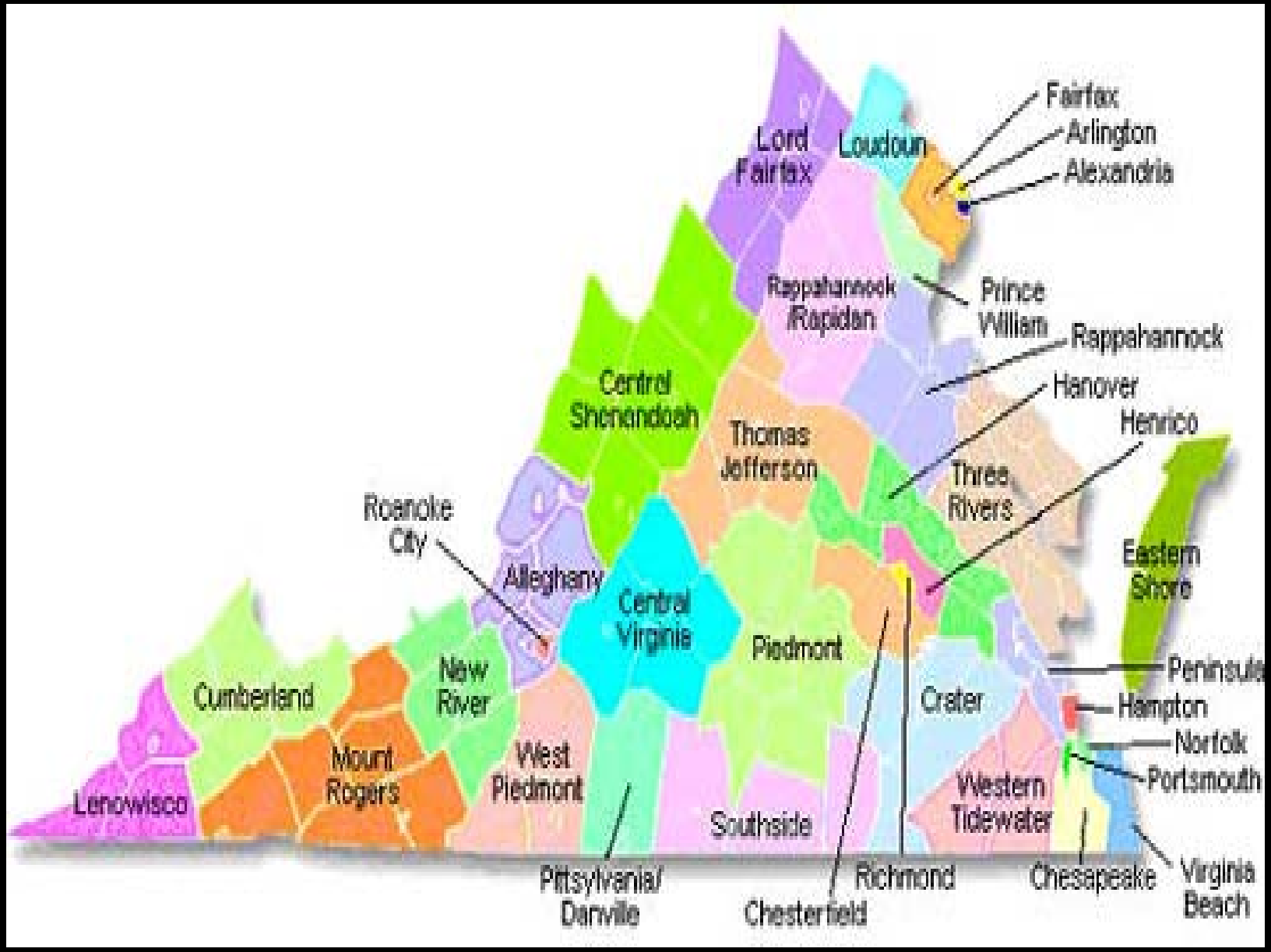
Localities Reporting Animal Rabies This Month: Accomack 2 raccoons; Albemarle 1 raccoon; Amelia 1 skunk; Augusta 2 raccoons; Bland 1 raccoon; Clarke 1 fox, 1 raccoon; Cumberland 1 skunk; Fairfax 1 cat, 2 foxes, 2 raccoons, 1 skunk; Fauquier 1 skunk; Floyd 1 raccoon, 1 skunk; Hampton 1 raccoon; Hanover 1 raccoon, 3 skunks; James City 1 fox, 1 skunk; King George 1 raccoon; Loudoun 1 cow, 2 raccoons; Mecklenburg 1 skunk; Montgomery 1 raccoon; Patrick 1 raccoon; Roanoke 1 cat; Rockbridge 1 cow; Rockingham 1 raccoon; Shenandoah 1 fox, 4 skunks; Spotsylvania 1 cow; Stafford 1 skunk; Tazewell 1 raccoon, 1 skunk; Virginia Beach 1 fox, 3 raccoons; Warren 1 raccoon.

http://www.vdh.virginia.gov/Epidemiology/Surveillance/Bulletin/pdf/vebmar07.pdf

HEALTH OF A COMMUNITY

- You are the new health director for the Eastern Shore Health District in Virginia
  - How healthy is your community? What is the ‘Burden of Disease’

- Look at surveillance data: (Census data, death data etc.)
  - Deaths due to specific diseases – cardiovascular disease, stroke, cancer
  - Incidence of infectious disease
  - Prevalence of chronic diseases – how many people have HIV/AIDS?
  - Infant mortality


Lord Fairfax
Loudoun
Fairfax
Arlington
Alexandria
Rappahannock /Rapidan
Prince William
Rappahannock
Central Shenandoah
Thomas Jefferson
Hanover
Henrico
Three Rivers
Roanoke City
Alleghany
Central Virginia
Piedmont
Eastern Shore
Peninsula
Crater
Hampton
Norfolk
Portsmouth
Cumberland
New River
Mount Rogers
West Piedmont
Lenowisco
Southside
Western Tidewater
Pittsylvania/ Danville
Chesterfield
Richmond
Chesapeake
Virginia Beach

HEALTH OF A COMMUNITY

1. Who **lives** on the Eastern Shore?
   - 52,661 people estimated in 2004
   - 26% are less than 20 years of age
   - 8% are 75 years of age or older
   - 33% of the residents are Black

HEALTH OF A COMMUNITY

How many people die on the Eastern Shore? What is the risk of death?

In 2004, 639 residents of the Eastern Shore died, 436 white and 203 black

Crude Mortality rates

= No. of deaths in a population in a year X 100,000

Size of population mid-year

639/ 52,661 = 12.13 out of every 1,000 residents on the Shore died last year

Increased risk for death indicates a shorter average life span.

This indicates poorer health among the group with the higher risk.

HEALTH OF A COMMUNITY

- **Is one race more at risk for death than another?**
- **Race-specific Rates** = A rate limited to a particular racial group.

White	*Numerator*	*Denominator*	*Quotient X 100,000*
	# Deaths	**White Population**	**Rate / 1000**
Whites	436	34,870	12.5

Black	*Numerator*	*Denominat*	*Quotient X 1000*
	# Deaths	**Black Pop**	**Rate / 1000 Blacks**
Blacks	203	17,383	11.7

HEALTH OF A COMMUNITY

- **What is the incidence of infectious diseases – HIV/AIDS?**
- You need to know what type of services you should offer
  - What is the **incidence** of HIV and AIDS on the Eastern Shore
  - **Incidence = new cases**
  - 2003, 6 reports of HIV, meaning 6 people were newly diagnosed with HIV during 2003
  - 11 people were reported with AIDS
  - Calculate the incidence rates for HIV and AIDS

HEALTH OF A COMMUNITY

		# New Reports in 2003	2003 Est. Population	Rate / 100,000
	HIV	6	52,310	11.47
	AIDS	11	52,310	21.03

HEALTH OF A COMMUNITY

- **What is the prevalence of HIV/AIDS?**
  - Guide the type of services should be offered
  - You need to know how many of your residents **currently have** HIV or AIDS, i.e.

$$PR = \frac{\text{No. of EXISTING cases of disease}}{\text{Total population}} \times 1000$$

	# Persons Living with HIV/AIDS as of Dec 2005	Est. Population 2004 (latest)	Rate / 1,000
Both	146	52,661	2.77
Female	52	27,078	1.92
Males	94	25,583	3.67

Males are more likely to be living with HIV/AIDS on the Eastern Shore than females

HEALTH OF A COMMUNITY

Other types of disease measures

- **Infant Mortality Rate (IMR)** = A measure of the frequency of occurrence of death among all infants born in a geographic area in one year

$$= \frac{\text{No. of infants who die before their 1st birthday}}{\text{Live birth}} \times 1{,}000$$

HEALTH OF A COMMUNITY

- **Case-fatality Rate** =
  - The proportion of all cases of disease that result in death.
  - An indication of the severity of illness
  - Measure of disease virulence

Case Fatality Ratio

Avian influenza – situation in Indonesia – update 14

- ***16 August 2007***
- *The Ministry of Health of Indonesia has announced a new case of human infection of H5N1 avian influenza. A 17-year-old female from Tangerang District, in Banten Province developed symptoms on 9 August , was hospitalized on 13 August and died in hospital on 14 August . Her source of exposure is currently under investigation.*
- *Of the 104 cases confirmed to date in Indonesia, 83 have been fatal*

Case Fatality Ratio= Number of deaths/Number ill from a given disease x 100

Avian Flu in Indonesia -75.5% case fatality rate

http://www.who.int/csr/don/2007_08_16/en/index.html

HEALTH OF A COMMUNITY

Other types of disease measures

- **Infant Mortality Rate (IMR)** = A measure of the frequency of occurrence of death among all infants born in a geographic area in one year.

$$= \frac{\text{No. of infants who die before their 1st birthday}}{\text{Live birth}} \times 1{,}000$$

Mirror, Mirror on the Wall: An International Update on the Comparative Performance of American Health Care

K. Davis, C. Schoen, S. C. Schoenbaum, M. M. Doty, A. L. Holmgren, J. L. Kriss, and K. K. Shea.

The Commonwealth Fund, May 2007

http://www.commonwealthfund.org/publications/publications_show.htm?doc_id=482678

Figure ES-1. Overall Ranking

Country Rankings	
	1.00–2.66
	2.67–4.33
	4.34–6.00

	Australia	Canada	Germany	New Zealand	United Kingdom	United States
Overall Ranking (2007)	3.5	5	2	3.5	1	6
Quality Care	4	6	2.5	2.5	1	5
Right Care	5	6	3	4	2	1
Safe Care	4	5	1	3	2	6
Coordinated Care	3	6	4	2	1	5
Patient-Centered Care	3	6	2	1	4	5
Access	3	5	1	2	4	6
Efficiency	4	5	3	2	1	6
Equity	2	5	4	3	1	6
Healthy Lives →	1	3	2	4.5	4.5	6
Health Expenditures per Capita, 2004	$2,876*	$3,165	$3,005*	$2,083	$2,546	$6,102

* 2003 data

Source: Calculated by The Commonwealth Fund based on the Commonwealth Fund 2004 International Health Policy Survey, the Commonwealth Fund 2005 International Health Policy Survey of Sicker Adults, the 2006 Commonwealth Fund International Health Policy Survey of Primary Care Physicians, and the Commonwealth Fund Commission on a High Performance Health System National Scorecard.

Healthy Lives: outcome indicators such as preventable deaths, infant mortality, and healthy life expectancy

http://www.commonwealthfund.org/publications/publications_show.htm?doc_id=482678

Surveillance