

# To Vaccinate or Not to Vaccinate: Decreasing Incidence of Varicella in the US Army



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## Mission:

Provide health promotion and preventive medicine leadership and services to counter environmental, occupational, and disease threats to health, fitness, and readiness in support of the National Military

## Strategy.

14 Apr 99

Epidemiology of Varicella  
Hospitalizations in the US Army

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- TRADOC - Ronald Romero, Ronald Britt, Debbie Smith, Clifton Collins
- MEDCOM - James Jensen



# Introduction



- Highly contagious, spread by aerosol
  - 93% of 18 year olds are immune
  - Adults at higher risk for complications
  - Small outbreaks reported in US Army
- Varying rates of Varicella in the US Army and other services
- Varicella Vaccine licensed 1995



# Objectives

- Characterize varicella hospitalizations for
  - Active Duty Army
    - Total Active Duty Army Personnel = ~ 485,000
  - Initial Entry Trainees
    - Initial Entry Trainees = ~90,000/year
    - 8 week training
- Immunization Cost-Effective During Initial Entry Training?



# Methods: Data Sources for Epidemiology

- MEDCOM - Patient Administration Systems and Biostatistics Activity (PASBA) - Standard Inpatient Data Record (SIDR) - Cases (numerator)
- AMSA - DMED and Requests - Denominator data and additional data on cases
- TRADOC - Trainee denominator data
- Analysis
  - SPSS for Windows 8.0
  - Epi Info 6.02b - Chi Square

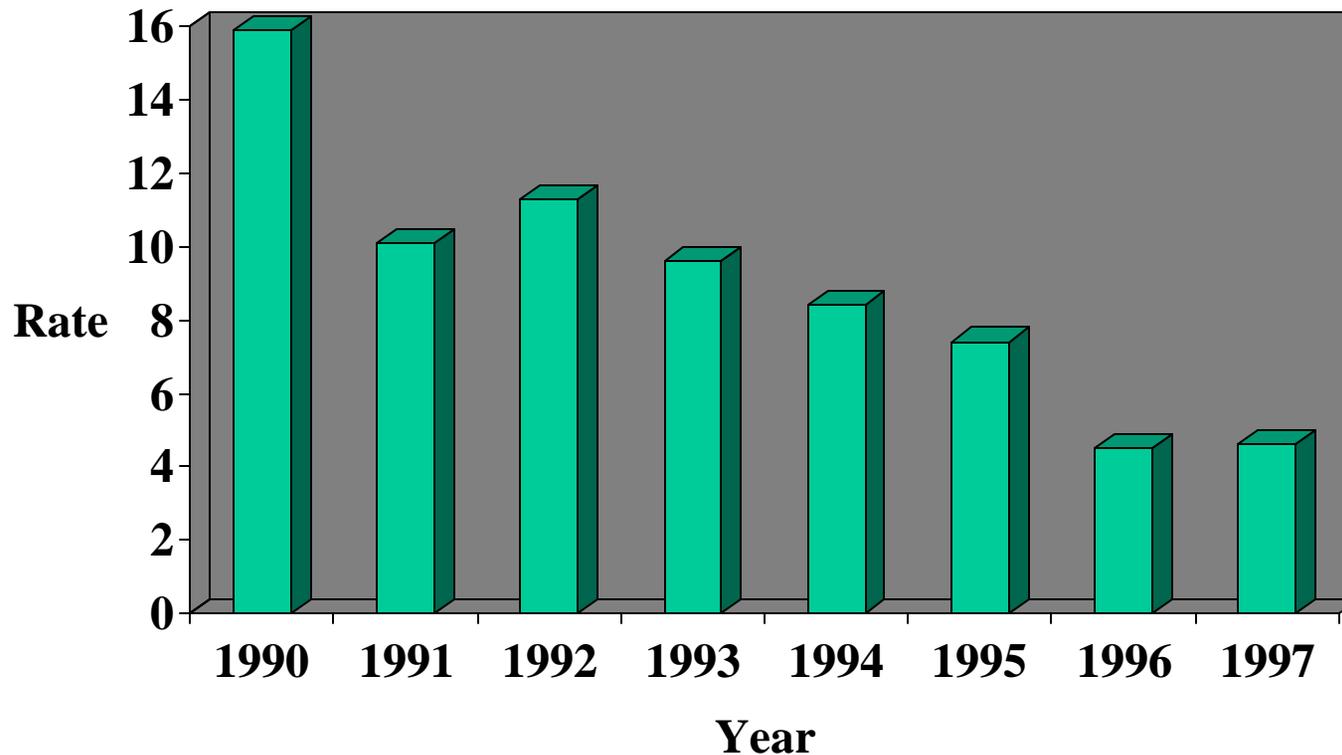


## Methods - Varicella Hospitalizations (Numerator Active Duty (AD) Army)

- Case Definition
  - Varicella Hospitalizations (1990-1997)
  - Varicella Diagnosis (ICD 9 = 052.0-052.9) in any diagnosis field
  - Active duty hospitalizations includes National Guard and Army Reserve while on active duty (eg. during IET)
- Variables:
  - From Hospital Record: Age, Sex, Race, Grade, Length of Service, Length of Hospital Stay
  - From AMSA: Occupation and Home of Record (State)



# Total U.S. A.D. Army Varicella Hospitalization Rates per 10,000 1990-1997 (n=4536) Median=9.48





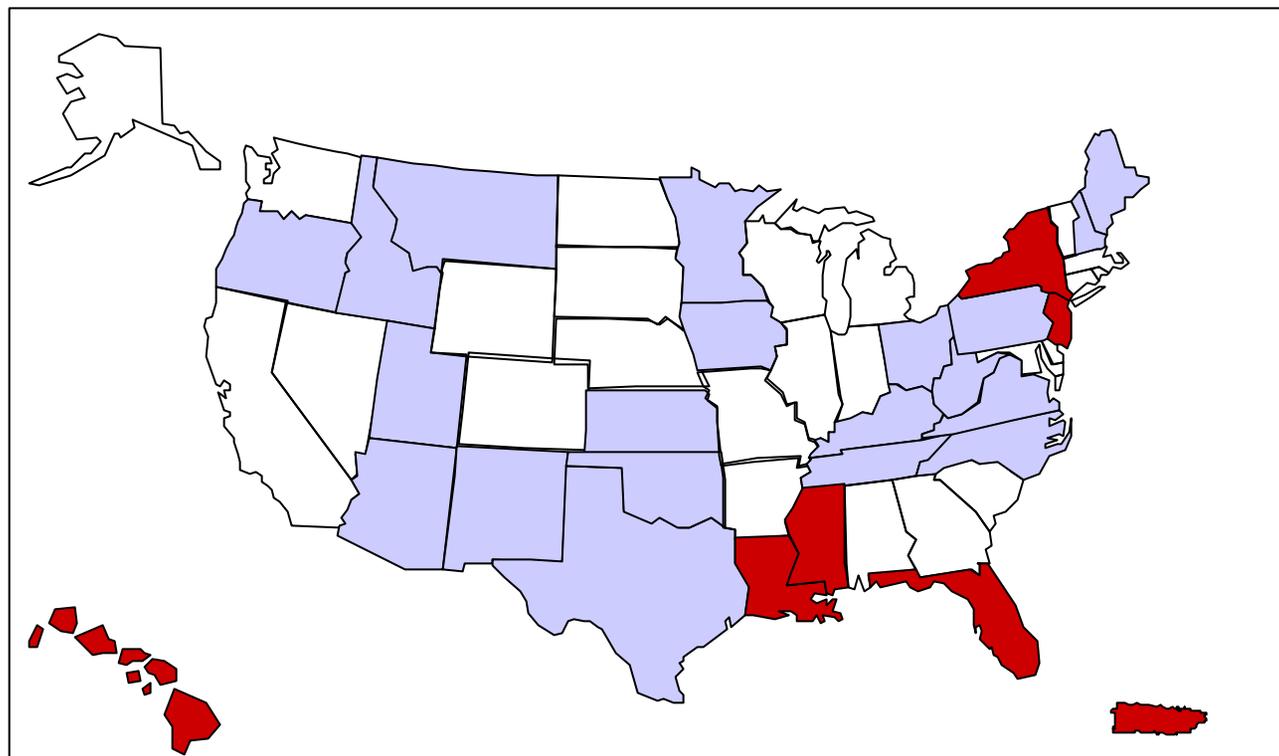
## Total U.S. A.D. Army Varicella Hospitalization Rates per 10,000 (n=4536) (1990-1997) : Relative Risks

	Rate per 10,000	Relative Risk	95% CI - Low	95% CI - High
Gender				
Male	9.24	1		
→ Female	11.13	1.21	1.11	1.31
Race				
White	7.90	1		
→ Black	13.37	1.69	1.59	1.8
Other	8.41	1.06	0.95	1.19
Age				
→ <20	38.64	5.36	5.03	5.71
>=20	7.21	1		
Grade				
→ E1-E4	17.71	5.78	5.29	6.32
E5-E9,O1-O9	3.06			
Occupation				
→ Medical	11.25	1.26	1.15	1.38
Non-Medical	8.95			

→ = significantly higher rate



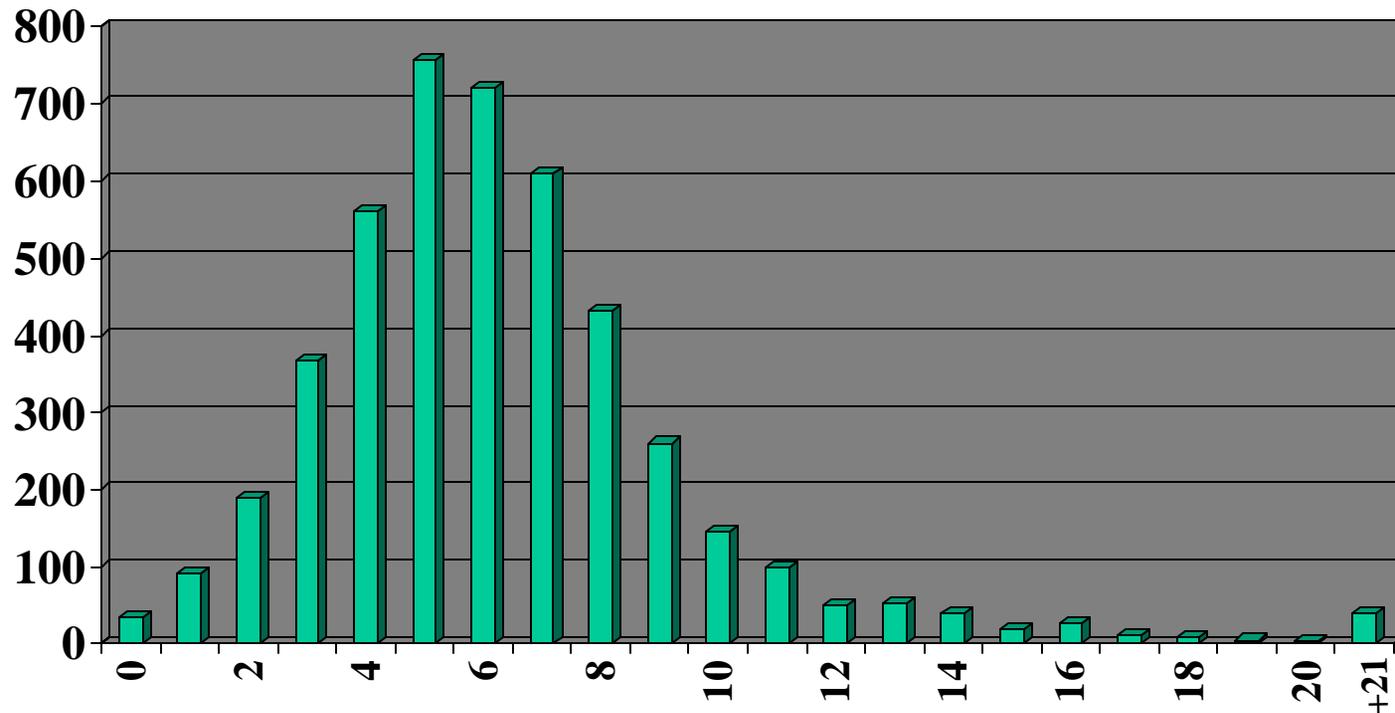
## Total U.S. A.D. Army Varicella Hospitalizations 1990-1997 (n=4536): High and Low Rates by Home of Record Location



- ■ Low Rates HOR;
- ■ High Rates HOR Other : Virgin Islands, Puerto Rico, Washington D.C., and Philippines

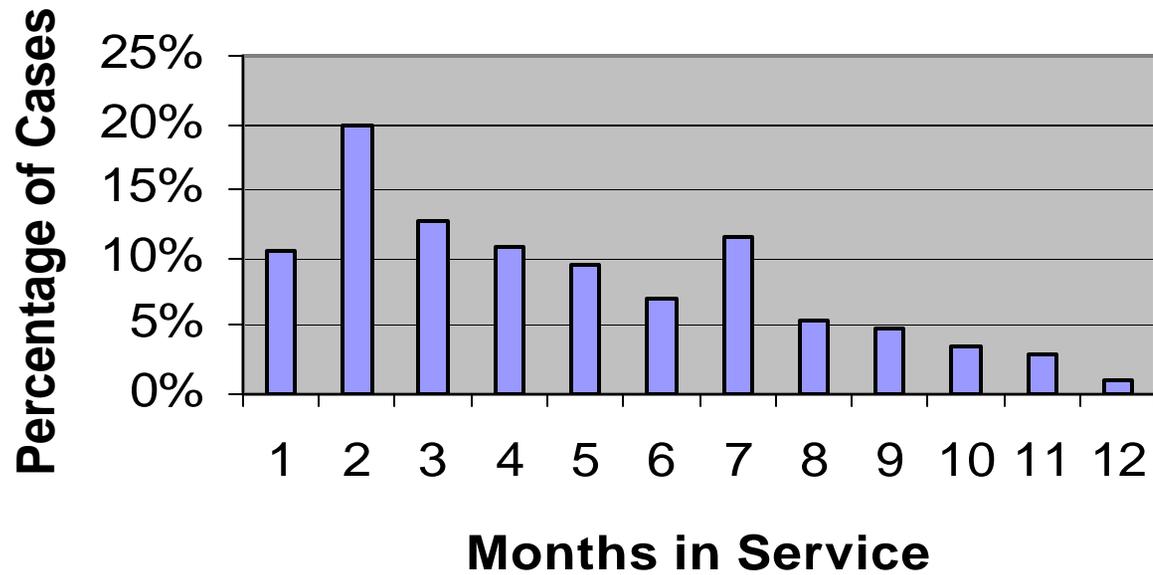


## Distribution of Total U.S. A.D. Army Varicella Hospitalizations 1990-1997 (n=4536) by Length of Hospital Stay (median=6 days)





## Distribution by Length of Service for those less than 1 Year of Service (n=1834)





# Initial Entry Training



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# Initial Entry Training



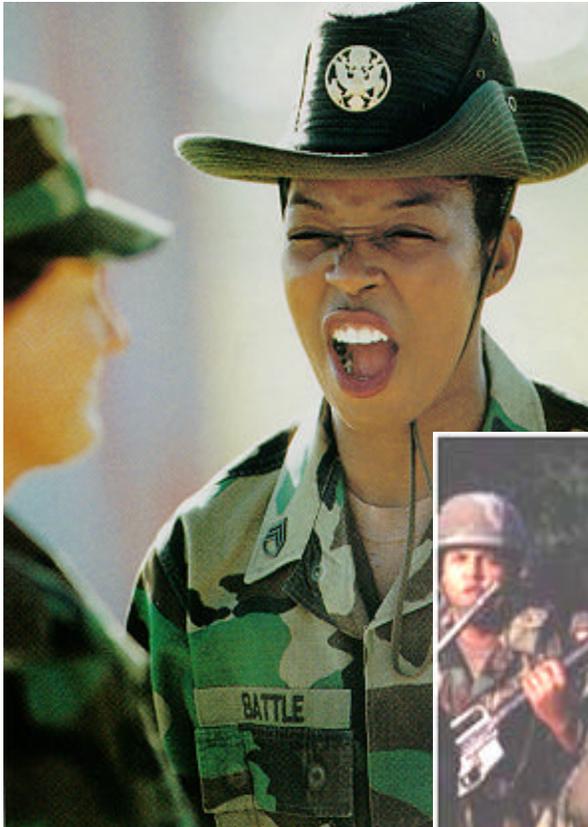
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# Initial Entry Training



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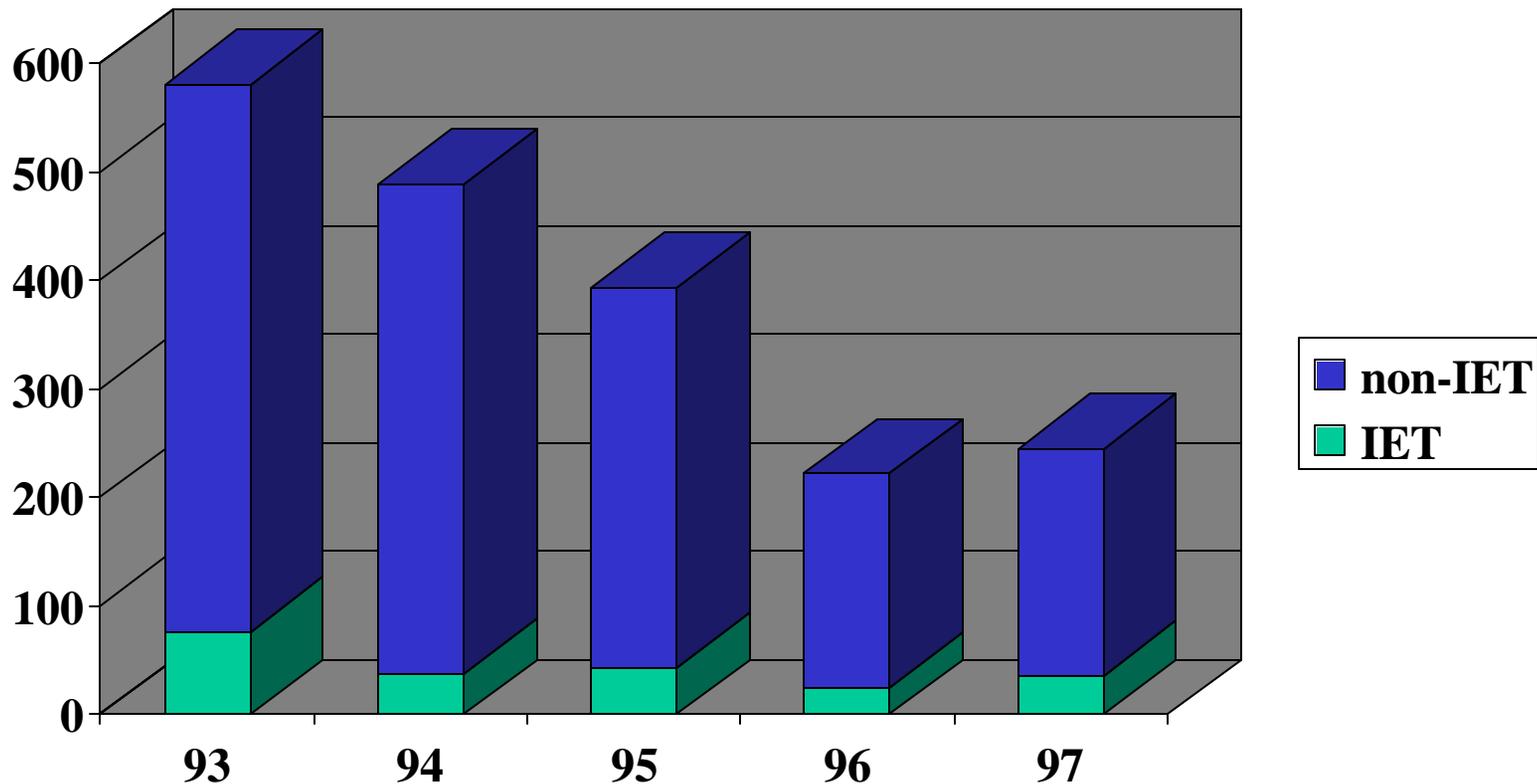


# Initial Entry Trainees

- Case Definition:
  - less than or equal to 2 months of service at time of admission (self reported)
  - E1-E4
  - At IET site during IET Training
    - Ft. Benning, Ft Knox, Ft. Leonard Wood, Ft. McClellan, Ft. Sill, Ft. Jackson
- Denominator - Computed from TRADOC
  - Estimated Person Time for First 8 Weeks of IET

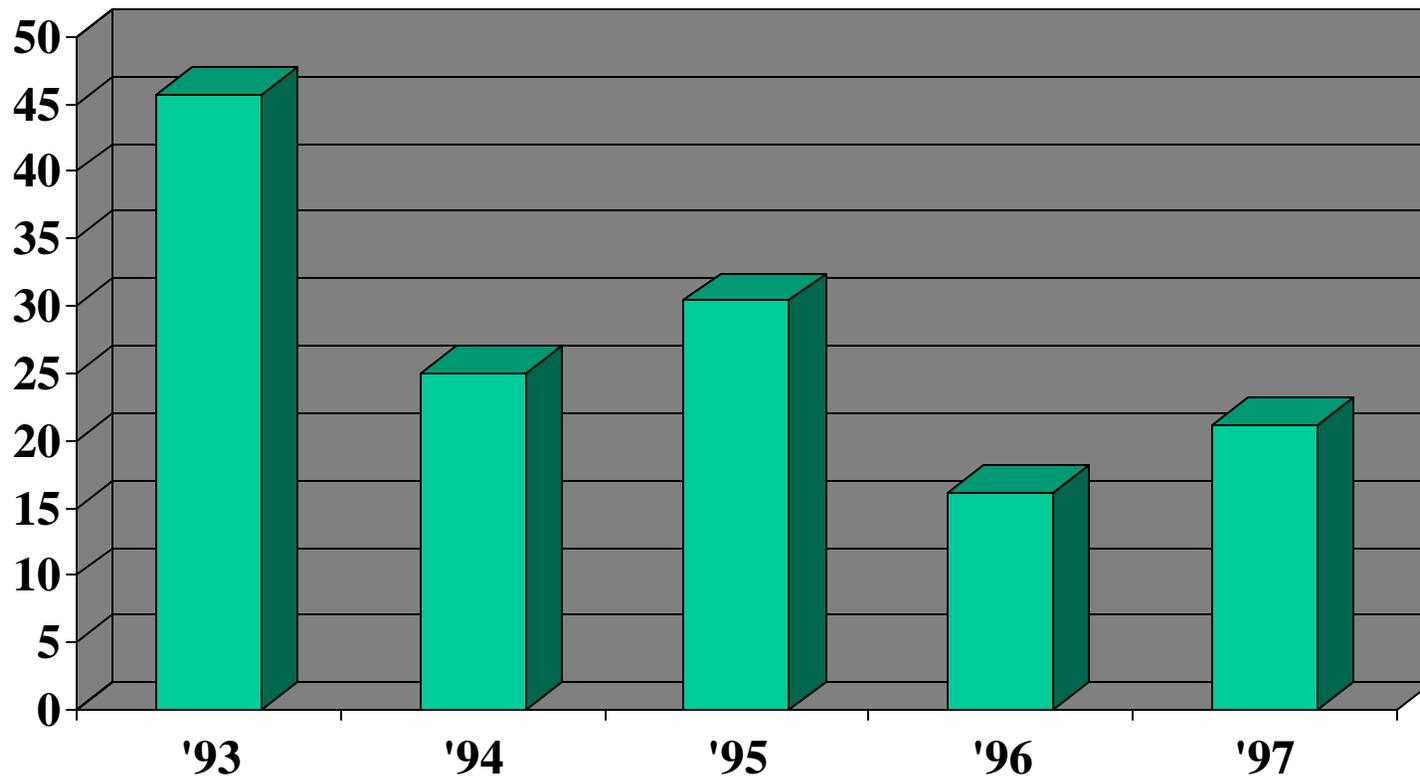


# FY 1993 - 1997 U.S. A.D. Army Varicella Hospitalizations: IET and non-IET Cases (n=1931) (avg IET%=11.3)





## Varicella Hospitalization Rate per 10,000 per Year for IET FY 1993-97 (n=219)





# FY 1993 - 1997 US Army IET Varicella Hospitalization Rate per 10,000 per year (n=219) : Relative Risks

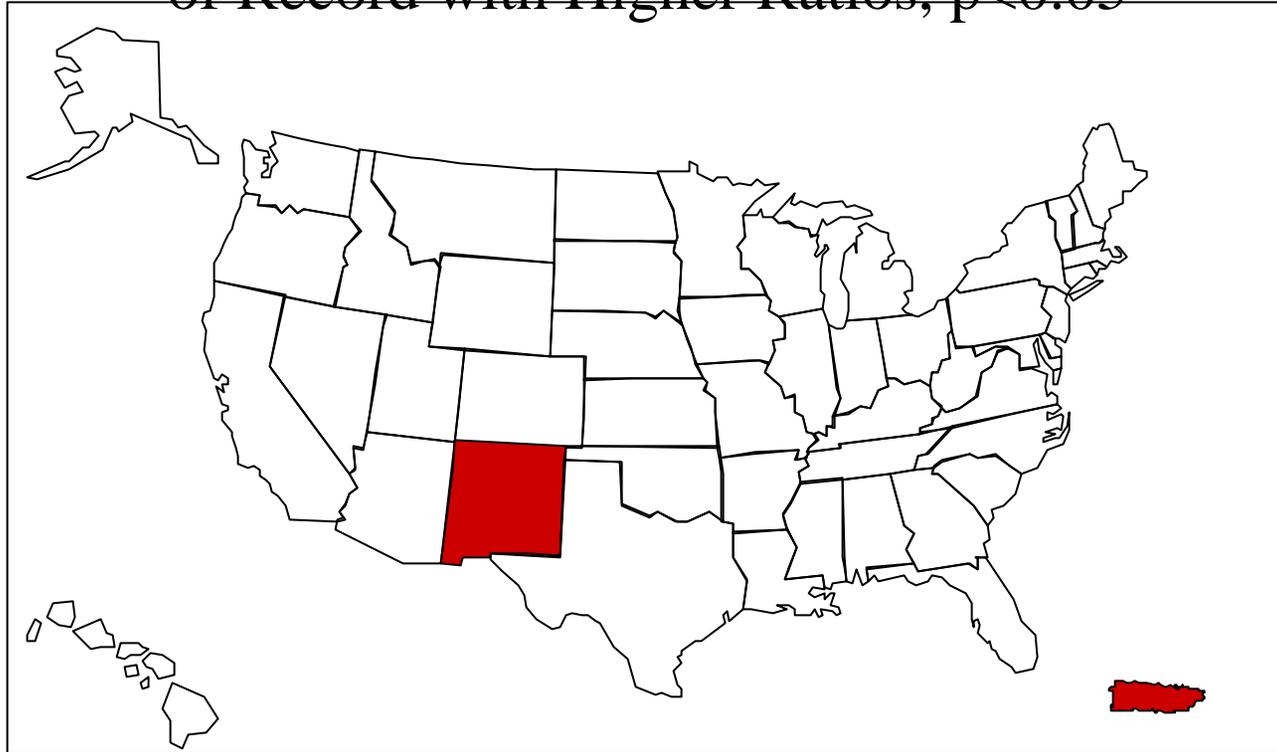
	Rate per 10,000	Relative Risk	95% CI - Low	95% CI - High
* Gender				
Male	28.26	1.07	0.75	1.52
Female	27.12	1		
Race				
White	26.34	1		
→ Black	36.48	1.41	1.04	1.89
Other	22.08	0.85	0.53	1.36
* Age				
<20	23.04	0.67	0.51	0.87
→ ≥20	35.00	1		
Post (vs all others)				
Benning	22.86	0.8	0.53	1.19
→ Knox	42.00	1.6	1.11	2.32
Leonard Wood	32.82	1.25	0.92	1.68
McClellan	25.49	0.91	0.54	1.54

\* result differs from Rel. Risk of Active Duty

→ = significantly higher rate



FY 1993 - 1997 US Army IET Varicella  
Hospitalization Rate per 10,000 (n=219) by Home  
of Record with Higher Ratios,  $p < 0.05$



**Other High Rate HOR: Virgin Islands, America Samoa,**



# Summary

- There has been a decreasing trend in Varicella hospitalizations
- A large percentage (40%) of total hospitalizations are those with less than 1 year.
- Hospitalizations during IET comprise a small percentage (11%) of total hospitalizations
- Higher Rates are seen for Females (AD only), Blacks, Younger Age ? (AD only), Soldiers from Island Locations



# Conclusions

- Varicella does not seem to be a large problem for the US Army at this time
  - low number of cases (1996: 220, 1997: 222)
  - decline in rates
  - 93% of 18 year olds have protective Antibodies



# Cost-Effectiveness Question



# Policy Development: Cost-Effectiveness of Varicella Vaccination in U.S. Army Recruits



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# Cost-Effectiveness Question

- Four prevention strategies for IET.
  - Screening at the MEPS and vaccination at IET
  - Screening and vaccination at IET
  - Universal vaccination at IET
  - No intervention strategy

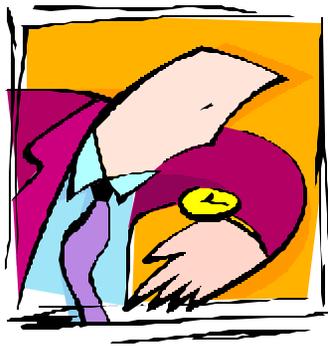


# Cost-Effectiveness Methodology

- **Model** (SMLTREE 2.9: a computer, decision analytic, probability model):
  - expected vaccination costs
  - direct and indirect medical and military training costs
  - expected cases of varicella hospitalizations prevented
  - associated number of varicella complications prevented
  - vaccine adverse events: fever, rash, etc., and costs of required treatment
  - 100,000 recruits considered from a 1 yr analytic horizon for 8 weeks of basic training per individual
  - costs and ranges were calculated in 1996 dollars
    - 5% discount rate



# Event Probability, Morbidity, and Cost Estimates



Timing for Screening

MEPS

OR

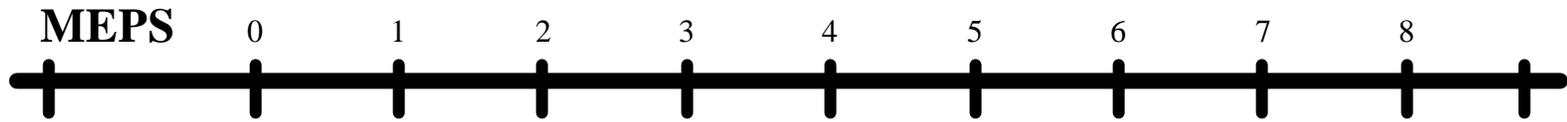
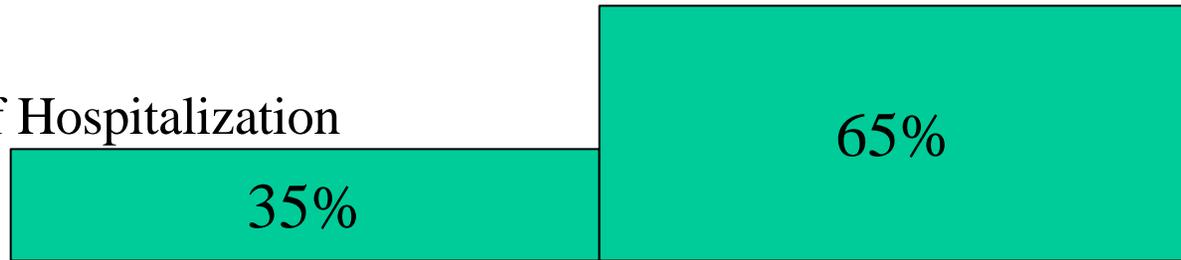
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Affects Timeline for  
Ab Protection & Admin  
Costs for 2nd Dose



# Distribution of Hospitalizations

Distribution of Hospitalization



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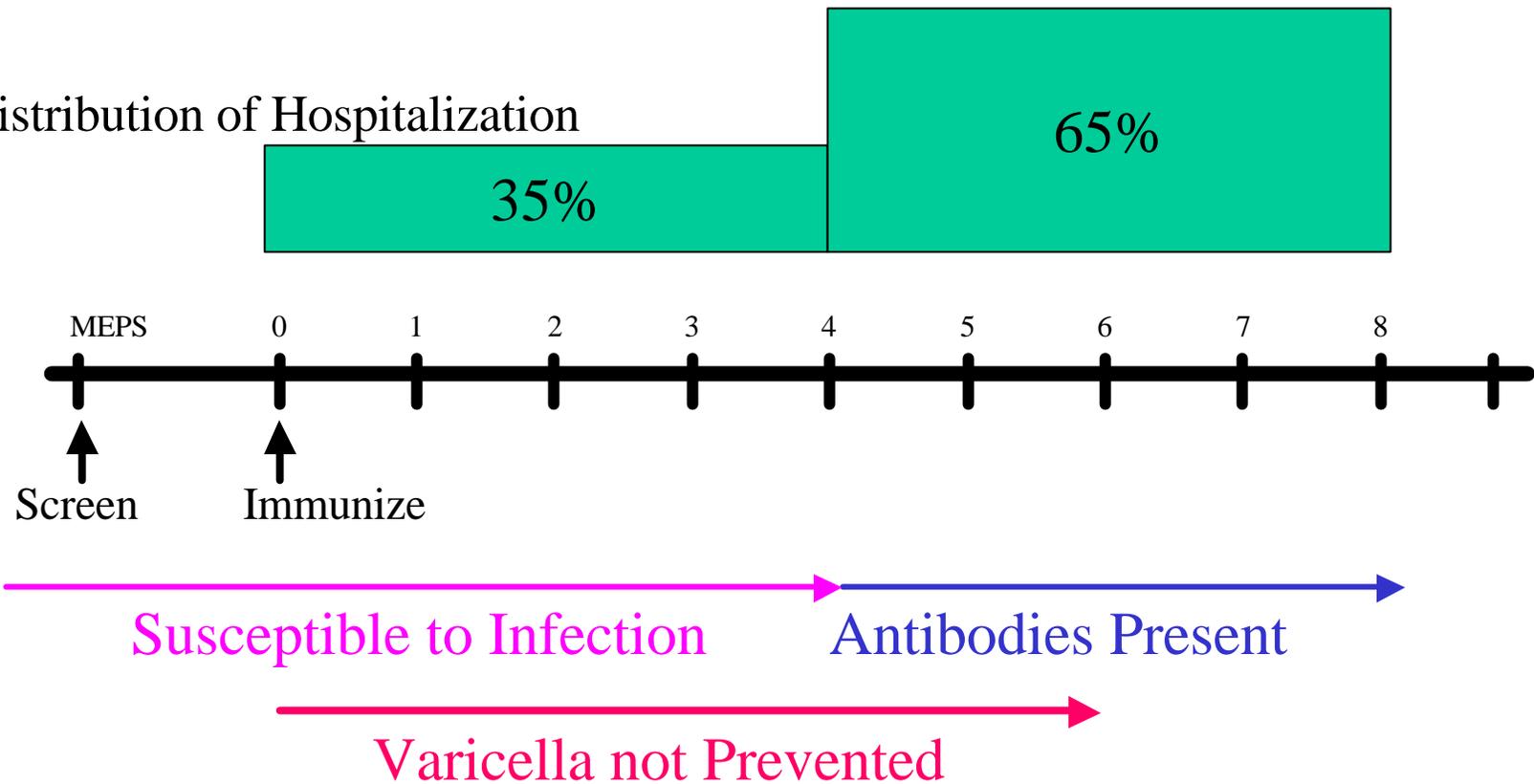
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When to Screen?



## Timeline for Screening at MEPS

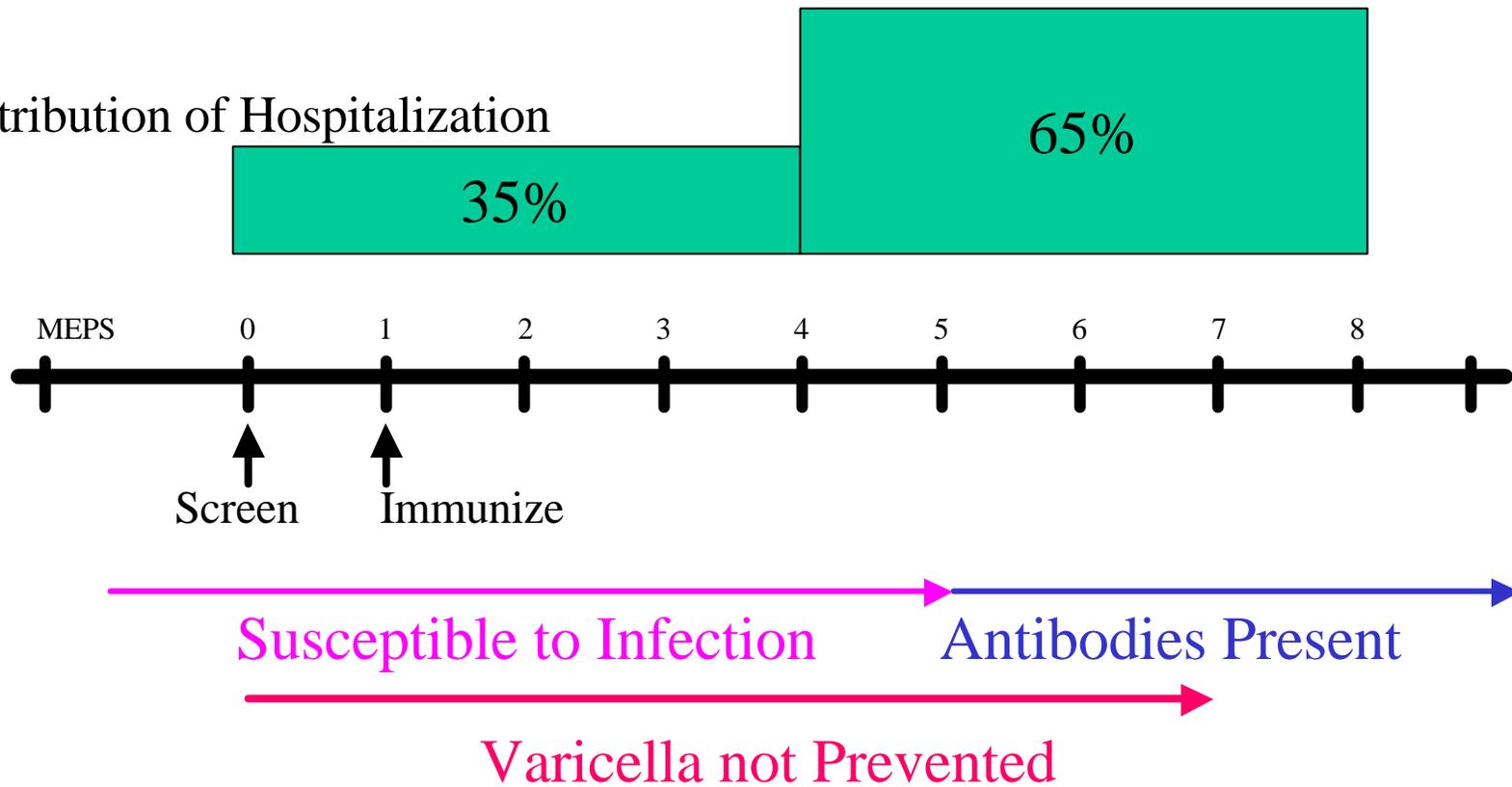
Distribution of Hospitalization





## Timeline for Screening at IET

Distribution of Hospitalization



# Results

	Cases in IET 	Cost 	Cost/Cases Prevented
No Intervention	36	\$ 181K	
Screen IET + Imm. IET	32	\$ 3,436 K	\$ 814 K
Screen MEPS + Imm. IET	29	\$ 2,915 K	\$ 390 K
Immunize All at IET	27	\$ 18,592 K	\$ 2,065 K



# Discussion

- The major overriding factors contributing to the results of the CE study were:
  - the costs of the screening,
  - the costs of vaccinations and vaccination adverse events, and
  - that the delay in immunologic protection could not prevent disease until late in the 8 week IET cycle.
- Previous CEA in the literature modeled much higher incidence rates in HCW and children.



# Sensitivity Analyses

- Univariate sensitivity analyses
  - Ranging the values of the variables do not result in significant changes in the cost-effectiveness strategies
- Multivariate sensitivity analyses: similar results.
  - Zero adverse events; \$0 admin costs; no delay in Ab.



# Discussion

- A rapid antibody screening test may decrease screening costs
- We assumed diligent medical treatment for adverse vaccine events for trainees.
- Adverse event rates were based on package insert, recent data from VAERS suggests lower rate of adverse events.
- We were conservative regarding the length of time for immunity induction (package insert), qualitative, but not quantitative, data suggests earlier induction of immunity.



# Discussion

- There may be additional benefits beyond the IET and 1 year analytic horizon, i.e., total A.D. Army.
- However, this may be negated by the continuing downtrend in incidence rates that we are seeing.
- Reports in the use of questionnaires to screen have been equivocal.
- Lastly, with the ACIP recommendations, the incidence rates in IET and in the Army may continue to decrease.



# Conclusions

- Given the review of the epidemiology of varicella in the U.S. Army and based on the results of our cost-effectiveness analysis for currently available screening and immunization strategies in IET, we conclude that an Army-wide policy for use of varicella vaccine in IET is not warranted.