



Develop America's Airmen Today ... for Tomorrow

GOAL: Develop BMT Medical Surveillance Today ... for Tomorrow



Adenovirus at Lackland AFB in the Trainee Population

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U.S. AIR FORCE

Integrity - Service - Excellence



Overview



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- **Background**
- **Surveillance**
- **The Outbreak**
- **Response**
- **Current Status**



Background



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- Adenovirus; a frequent cause of mild to mod respiratory disease in basic military trainees (BMTs)
- Severe disease is rare in adults with normal immune systems
- 49 distinct strains of adenovirus with types 4 and 7 causing the majority of prior outbreaks seen in military recruits.
- Routine vaccination with oral adenovirus against serotypes 4 and 7 began at US training camps in 1971; production was stopped in 1996 and stores of vaccine were depleted by 1999.
- The most significant adenoviral respiratory disease at Lackland AFB occurred from Nov 1999 to Nov 2000 with over 2400 hospitalizations at a cost of \$3M.
- 1999 to 2004, adenovirus caused illness in an average of 3000 recruits/yr at Lackland (rate of 1.35/100); majority caused by type 4 and no cases of life threatening pneumonia

1. "Adenoviruses" CDC, National Center for Infectious Disease, Respiratory and Enteric Viruses Branch

2. Russell KL et al, "Vaccine preventable adenoviral respiratory illness in US military recruits, 1999 – 2004." *Vaccine* 24 (2006) 2835-2842.

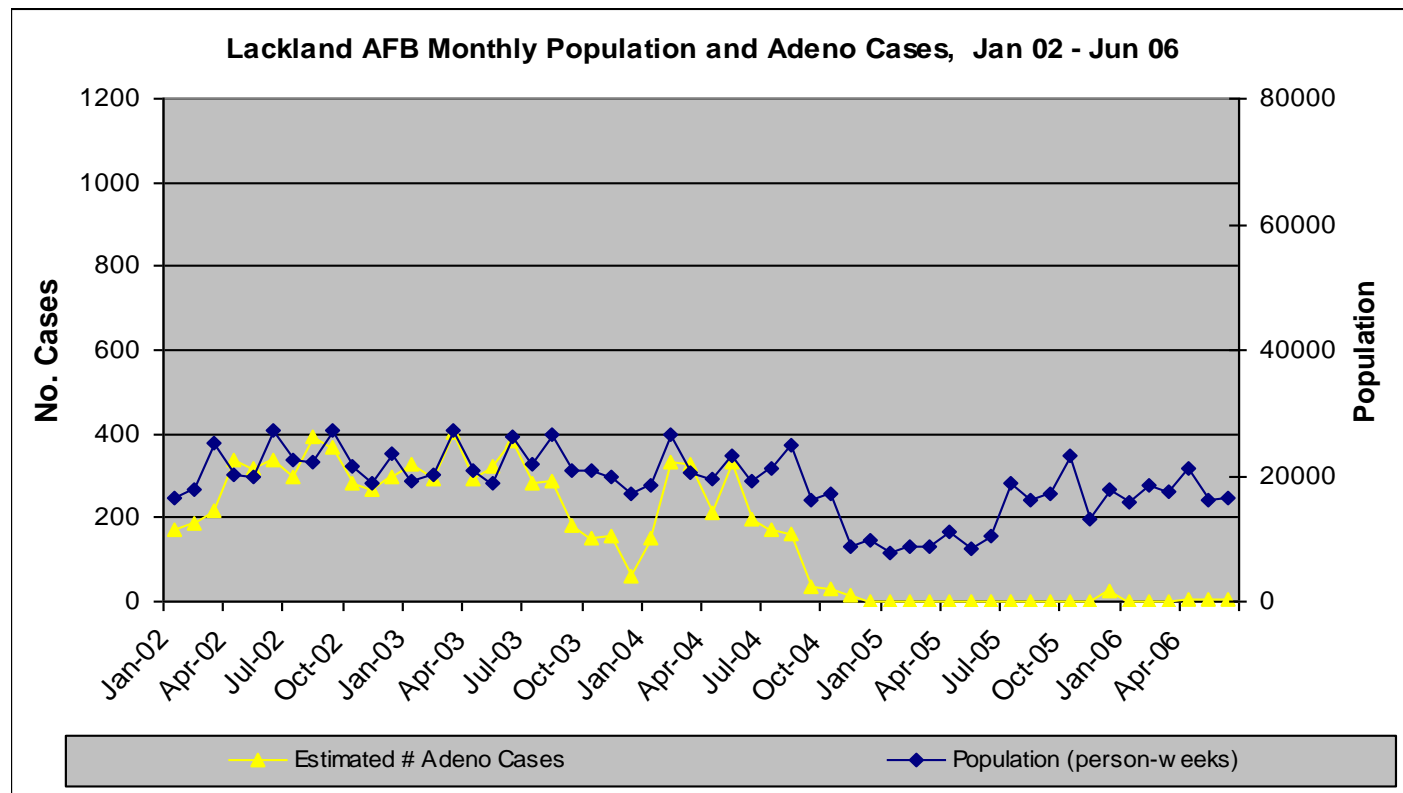


Lackland Adenovirus Activity



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No significant adenovirus activity at Lackland in 2005 and 2006





Surveillance



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- Active:
 - Febrile Respiratory Illness Study
 - Epidemic Outbreak Surveillance (EOS)
- Passive:
 - Disease Non-Battle Injury (DNBI) Data



FRI Study



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- **"Triservice Population-Based Surveillance for Viral Respiratory Pathogens Among High-Risk U.S. Military Personnel"**
- **Study Started in 1998-2009, PI is NHRC**
- **Subjects are military trainees from the following eight training centers:**
 - **Navy: Naval Recruit Training Center, Great Lakes, IL**
 - **Marine Corps Recruit Depot, San Diego, CA**
 - **Marine Corps Recruit Depot, Parris Island, SC,**
 - **Army: Fort Jackson, Columbia, SC**
 - **Fort Leonard Wood, Waynesville, MO**
 - **Fort Benning, Columbus, GA**
 - **Air Force: Lackland Air Force Base, San Antonio, TX**
 - **Coast Guard: US Coast Guard Training Center, Cape May, NJ**



FRI Surveillance Objectives



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- Determine the attack rate of febrile respiratory illness (FRI) among military populations at risk.
- Serve as an early warning system for respiratory disease outbreaks.
- Determine the etiology of respiratory pathogens causing clinical disease among military training populations.
- Determine the proportional distribution of influenza A and adenovirus serotypes causing clinical disease among military training populations.
- Measure the sensitivity and specificity of PCR testing of ambient temperature specimens for the detection of adenovirus and influenza, using viral culture as the gold standard.



FRI Case Definition



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- A trainee will be considered a FRI case if he/she seeks medical care and meets both of the following criteria:
 - a. Fever of $\geq 100.5^{\circ}\text{F}$ (38°C) or equivalent,
 - b. Cough or sore throat
- Also, any trainee having clinical or radiographic evidence of pneumonia will be a FRI case.
- Any trainee meeting the above will be consented and a throat swab for viral culture obtained and sent to NHRC (3 yrs ago began swab to AFIOH)



EOS



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- Provide real-time public health service for influenza like illness; real-time sample analysis
- Lackland AFB is a real world test bed
- EOS nurses obtain clinical samples from patients with FRI symptoms
- Samples delivered to Advanced Diagnostic Laboratory (ADL); culture based testing; direct immunofluorescence and PCR
- Test advanced molecular diagnostic technologies



DNBI



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- Population Health Support Division at Brooks City Base sends weekly DNBI report
- Unique identifier for AF trainees
- Disease and Injury Surveillance



The Outbreak



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- The occurrence of any disease at a frequency that is unusual (compared with baseline) or unexpected
- Fri rates in 2005-6 about .2-.4 cases per 100
- In 2006 per FRI study 3 adenovirus positive cultures all year



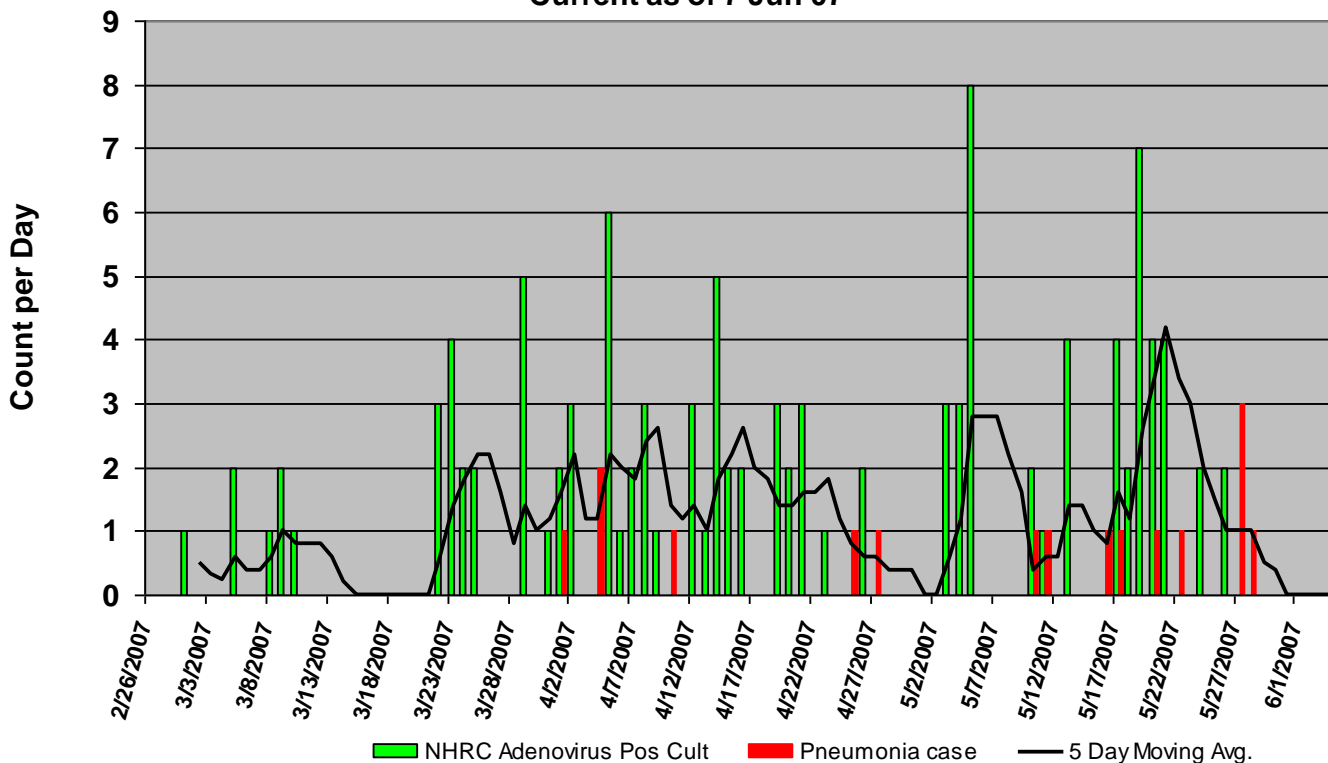
Adenovirus Cultures 2007



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RESPIRATORY VIRAL CULTURE POSITIVE COUNTS(NHRC) - THROAT SWAB

CONFIRMED PNEUMONIA
37 AMDS/ Public Health
Current as of 7 Jun 07



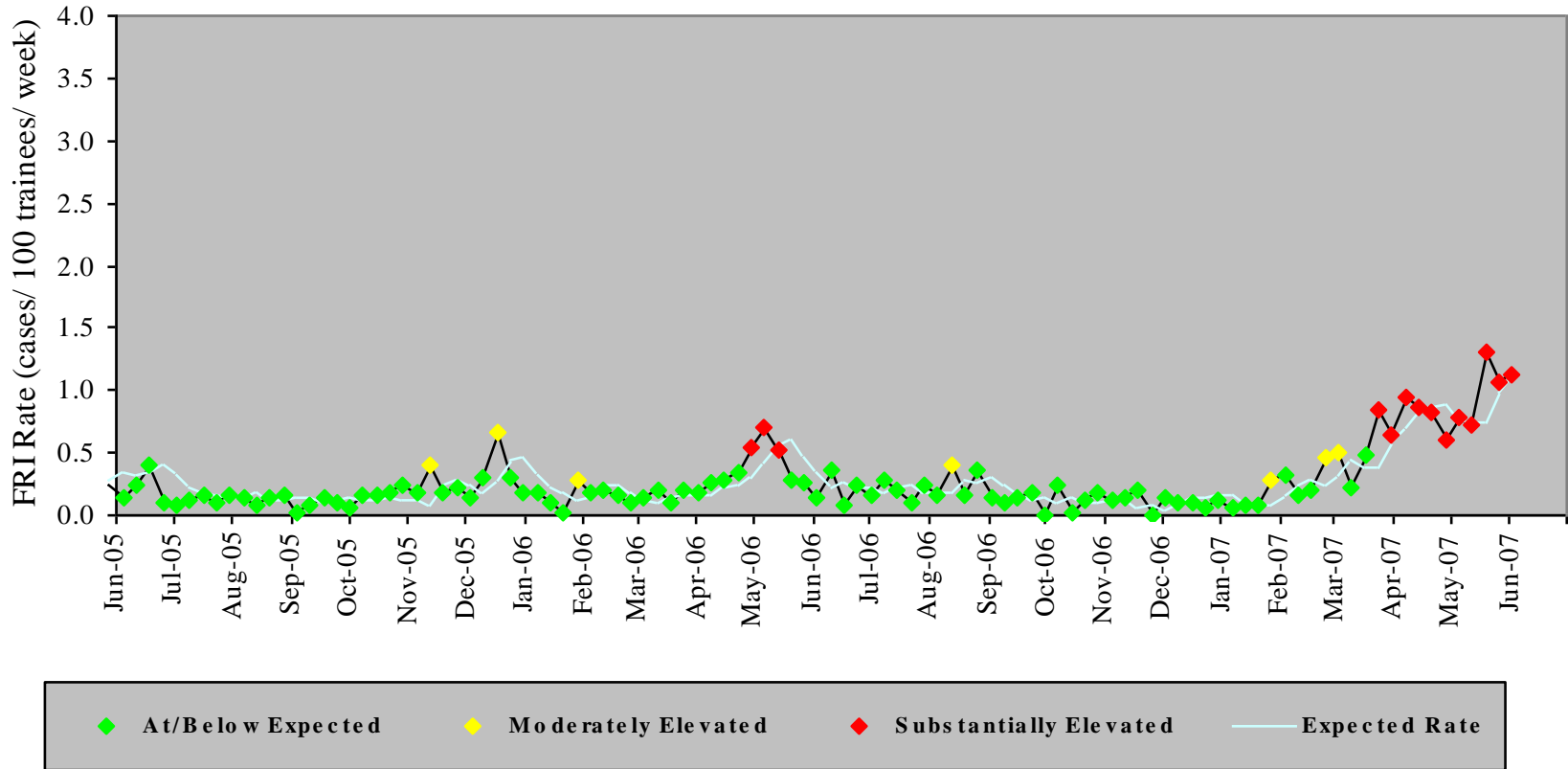


FRI Rates



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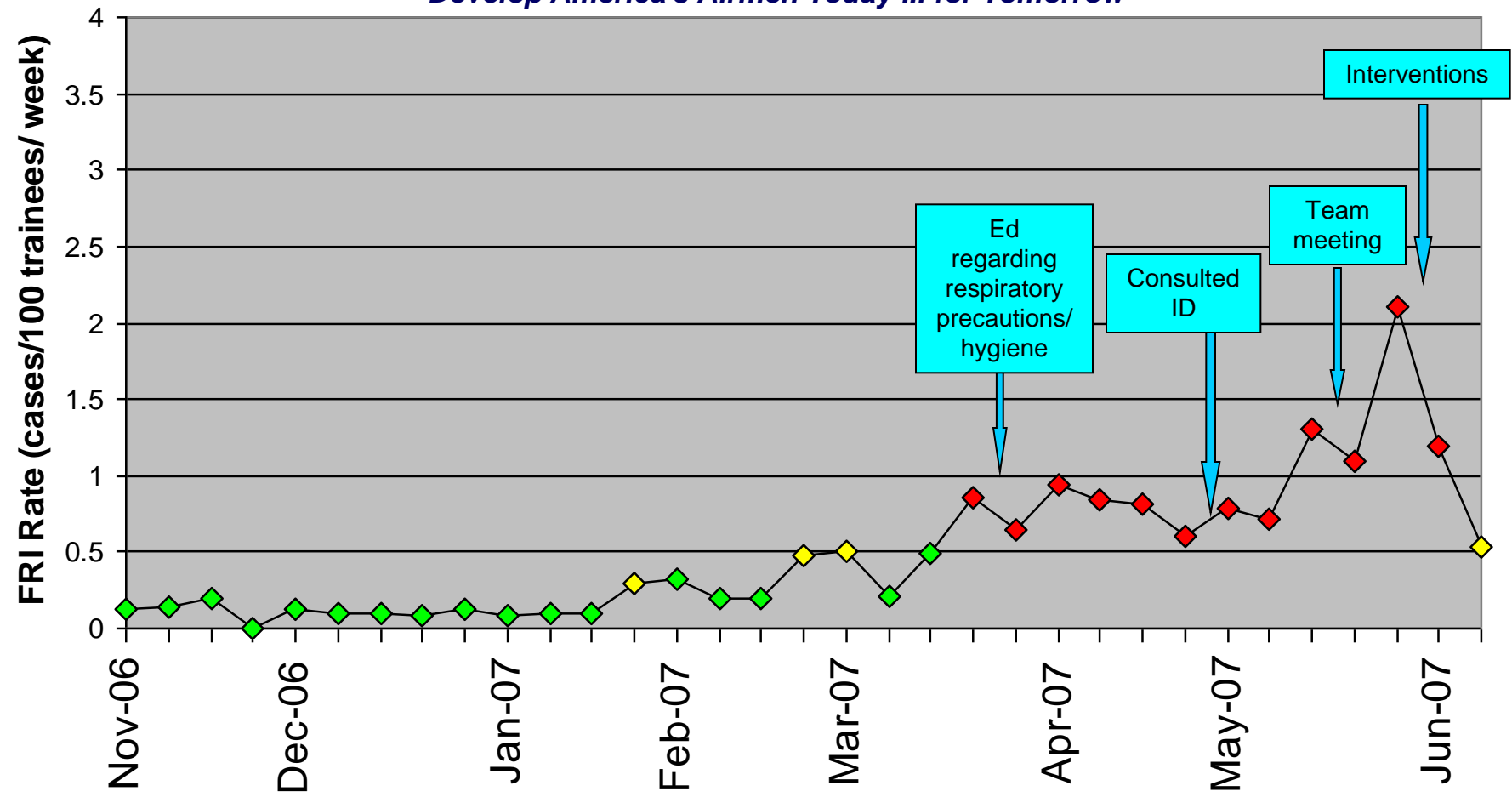
Lackland AFB FRI Rate Status





Lackland AFB FRI Rate Status

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◆ At/Below Expected ◆ Moderately Elevated ◆ Substantially Elevated



Lab Testing



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- **Capability**

- May 2007: Viral culture from AFIOH, Viral culture/Serotyping from NHRC and Rapid adeno test from EOS (50% sensitivity)
- June 2007: EOS able to perform PCR for adeno 14; AFIOH serum neutralization
- July 2007: AFIOH PCR for adeno 14

- **Results**

- May 2007; Rapid adeno pos from EOS; May 18 NHRC reports **Adeno 14**
- June 2007; 3 adenovirus positives in 2006; 1 type **3**; 1 type **14/21**; 1 type **21** and March/April 2006 type **14** simultaneously emerged mostly as co-infections at 5 training bases: Lackland; Ft Benning/Ft. Leonard Wood; Navy, Great Lakes and MCRD, San Diego (**weren't aware of this until June 2007**); NHRC Results indicated: April 1- June 1 out of 106 adenopositive cultures 90% were **ADENO 14!!**



Laboratory Case Definition



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- Detection of adenovirus antigen using the rapid Adenovirus detection assay from a clinical specimen with subsequent confirmation using real time PCR for adenovirus and follow-on identification of the Adeno 14 strain OR
- Isolation in cell culture of adenovirus from a clinical specimen with subsequent confirmation of Adeno 14 in a reference lab OR
- Detection of adenovirus by PCR assay from a clinical specimen with subsequent confirmation of Adeno 14 in a reference lab



Clinical Presentation of Adenovirus



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- Clinical Case Definition
 - **Mild** (Outpatient) Febrile Respiratory Illness
 - Temp >100.4 AND cough, sore throat or nasal congestion
 - **Moderate** (Outpatient or Inpatient)
 - Temp > 100.4 AND x-ray evidence of pneumonia
 - Temp >100.4 AND one or more clinical findings of lower respiratory illness or systemic inflammatory response (tachycardia, leukopenia, tachypnea)
 - **Severe** (Inpatient)
 - Moderate Illness and acute respiratory distress or sepsis
- 1 April to 24 June 06: 14 pneumonias (3 admitted) Rate of .4% (4 per 1000)
- 1 April to 24 June 07: 51 pneumonias (27 admitted) Rate of 1.4% (14 per 1000)
- *** Pneumonias confirmed by chest x-ray

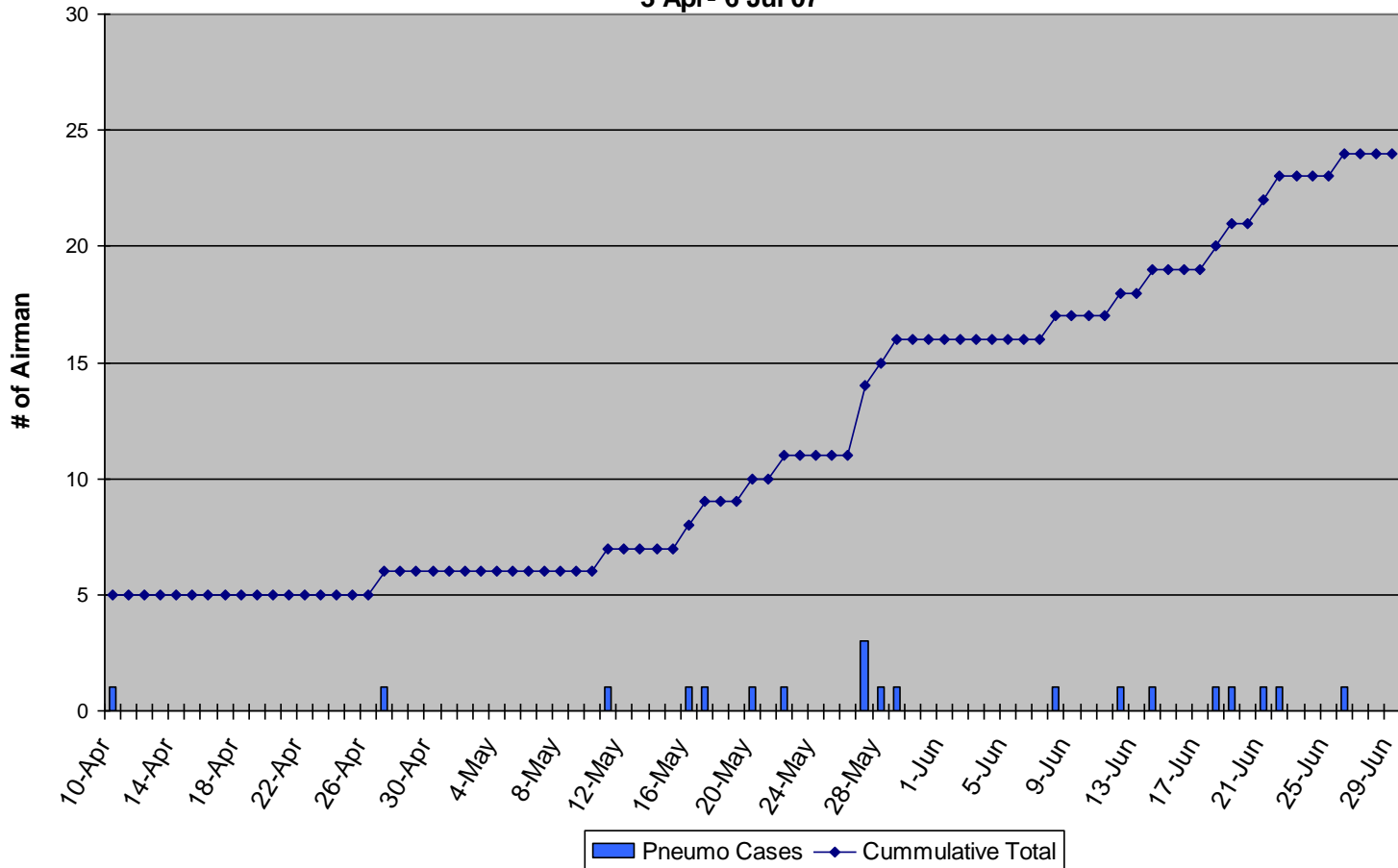


Inpatient Pneumonias



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BMT WHMC Pneumonia Cases Hospitalized
37 AMDS/ Public Health
3 Apr- 6 Jul 07





Inpatient Pneumonias



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- Inpatient Pneumonias, 1 Apr-24 Jun 07 n= 27
- BMT, 24 (89%); tech trainee, 3 (11%) ;
- Male: 26 (96%), Female: 1 (4%);
- Comorbid conditions: monospot pos(1),rhabdo(2)
- Median LOS:3 days; ICU, 5 (19%); intubated, 3 (11%); deaths, 1 (not until 7 August);
- WBC < 4.5: 15 (55%), Plts < 150: 9 (33%)
- 20 out of the 27 patients had adenovirus throat swab; 19 were positive. Subtyping on 13 of those adeno positive patients; all 13 (100%) adeno 14 PCR positive by EOS or NHRC.



Local Response



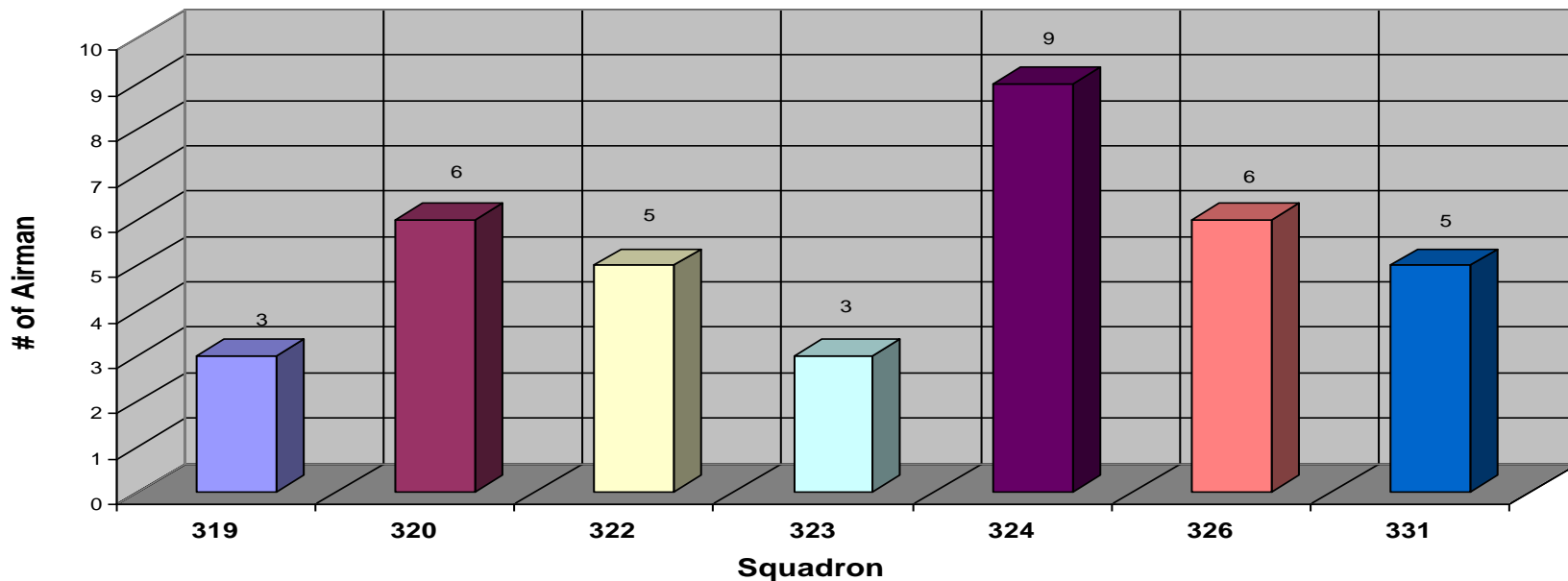
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- Met as a team: Preventive med, public health, ID, clinicians and squadron leadership
- Recommended segregation of trainees into a fever (bed rest) flight in the 319th Squadron; Return to training when afebrile for 24 hours and decreased respiratory symptoms
- Public Health measures
 - Hand washing utilizing soap and water for 20 seconds duration as much as practical. Use Purell hand sanitizer when soap and water is unavailable.
 - Proper coughing/sneezing techniques.
 - Dormitory sleeping configuration should remain head-to-toe with 3 foot minimal gap between beds.
 - Common use phones should be sanitized between each use utilizing sanitizing wipes.
 - Clean all floor surfaces daily with antiviral agents (trade name to follow).
 - Clean/disinfect all contact surfaces daily to include all hand rails
 - Daily PH/IDMT dorm hygiene inspection.



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**Number of Pneumonia Cases (by BMT Squadron)
37 AMDS/Public Health
1 Apr - 3 Sep 07**



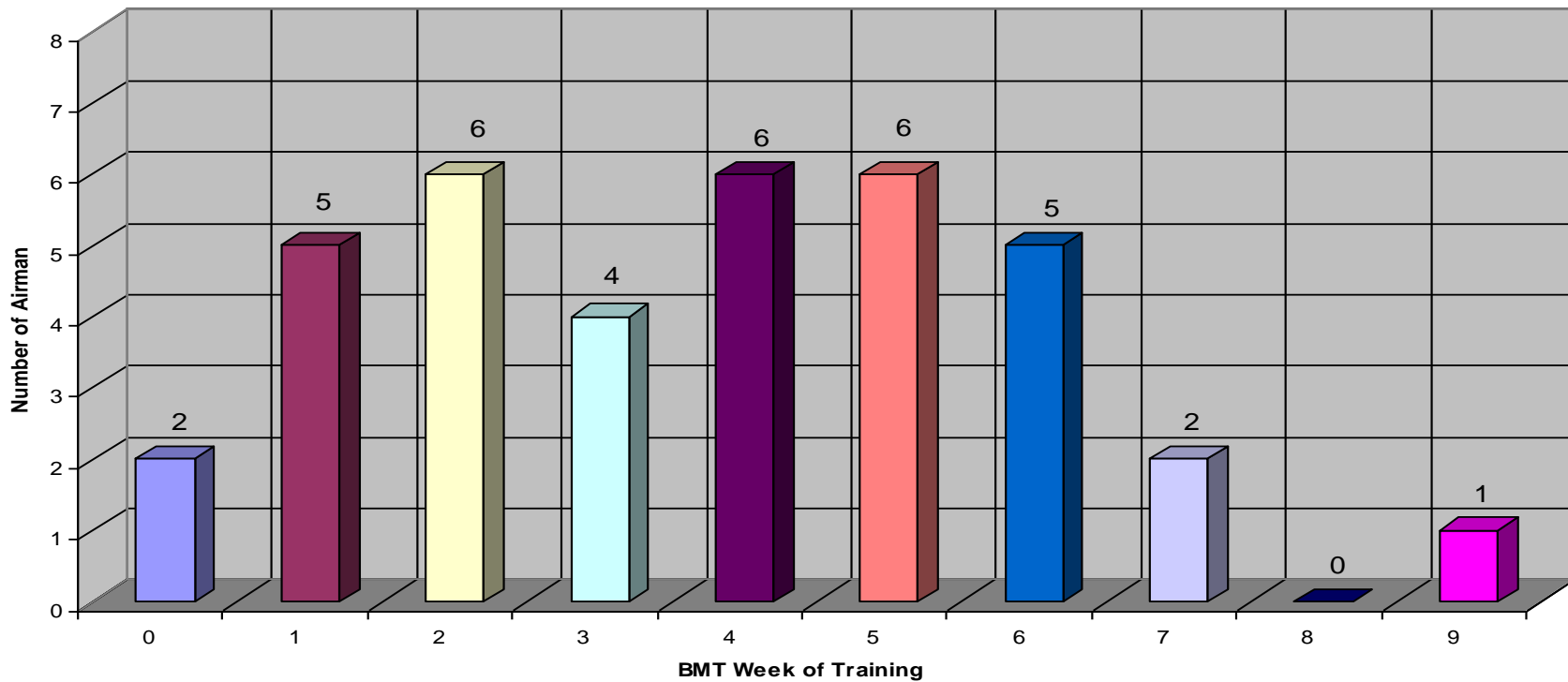
**Total hospitalized = 42 (37 BMTS shown + 3 Techs & 1 TI, 1 DS)
Currently hospitalized: 2 BMTs (326th) + 1 ADAF Dental Officer**

*** Please review notes for additional comments**



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Pneumonia Cases (BMT Week of Training)
37 AMDS/ Public Health
1 Apr- 3 Sep 07



*** Please review notes for additional comments**



Interaction with Outside Agencies



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- AF agencies; AFIOH and AETC (tech training bases)
- Army; CHPPM and staff from Phase 3 vaccine trials
- CDC
- Texas State Health Dept

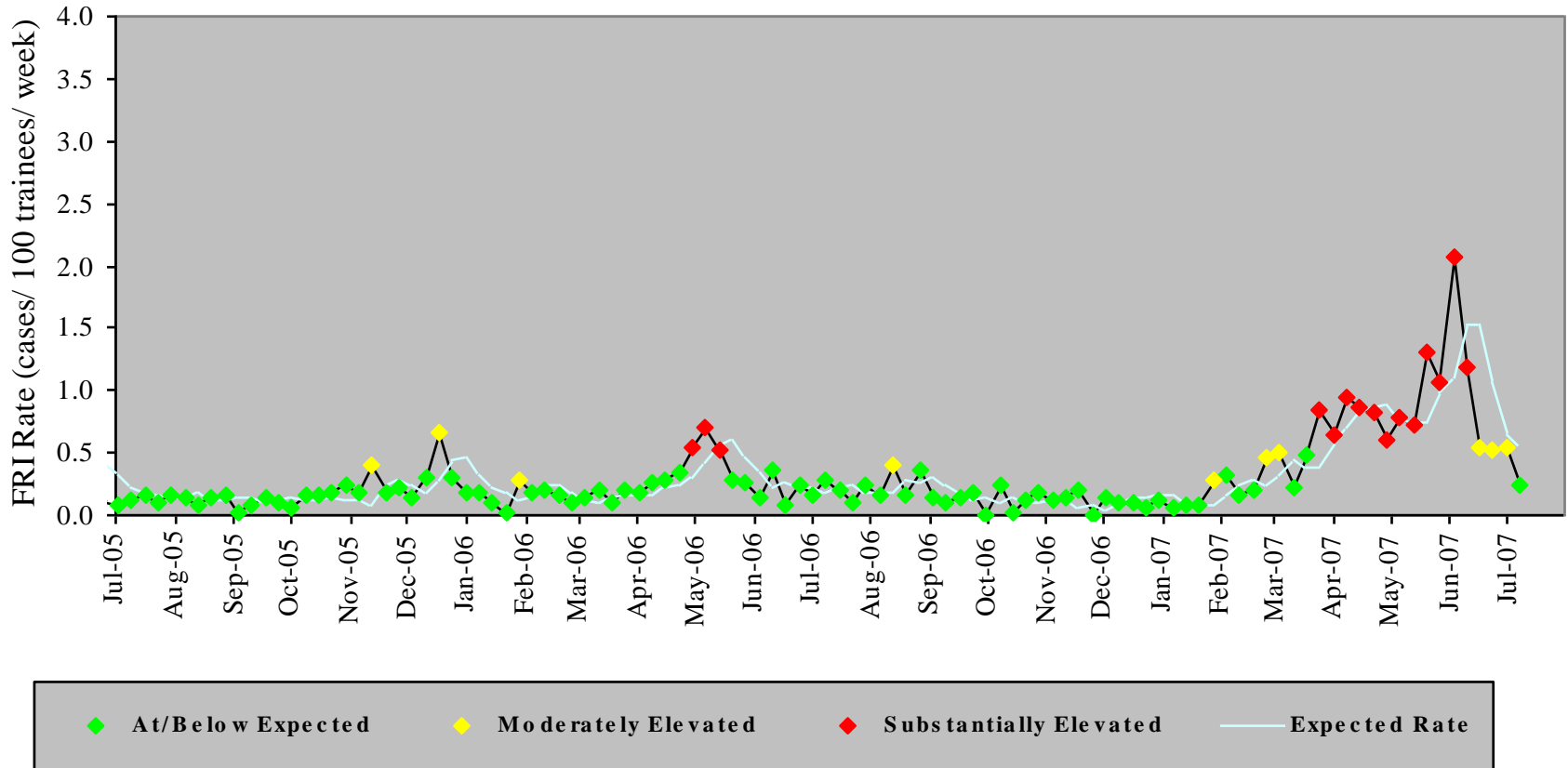


Initial Results From Response



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Lackland AFB FRI Rate Status





Current Status



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- Still seeing an increased FRI rate (.6-.9) and positive cultures for adenovirus and PCR for **adeno 14**
- Outpatient and inpatient pneumonia rates still elevated as compared to last year (about 3 x)
- Less confirmed adeno positive pneumonias (about 25-30%). Looking for other organisms as etiologies.
- Continuing segregation of the trainees

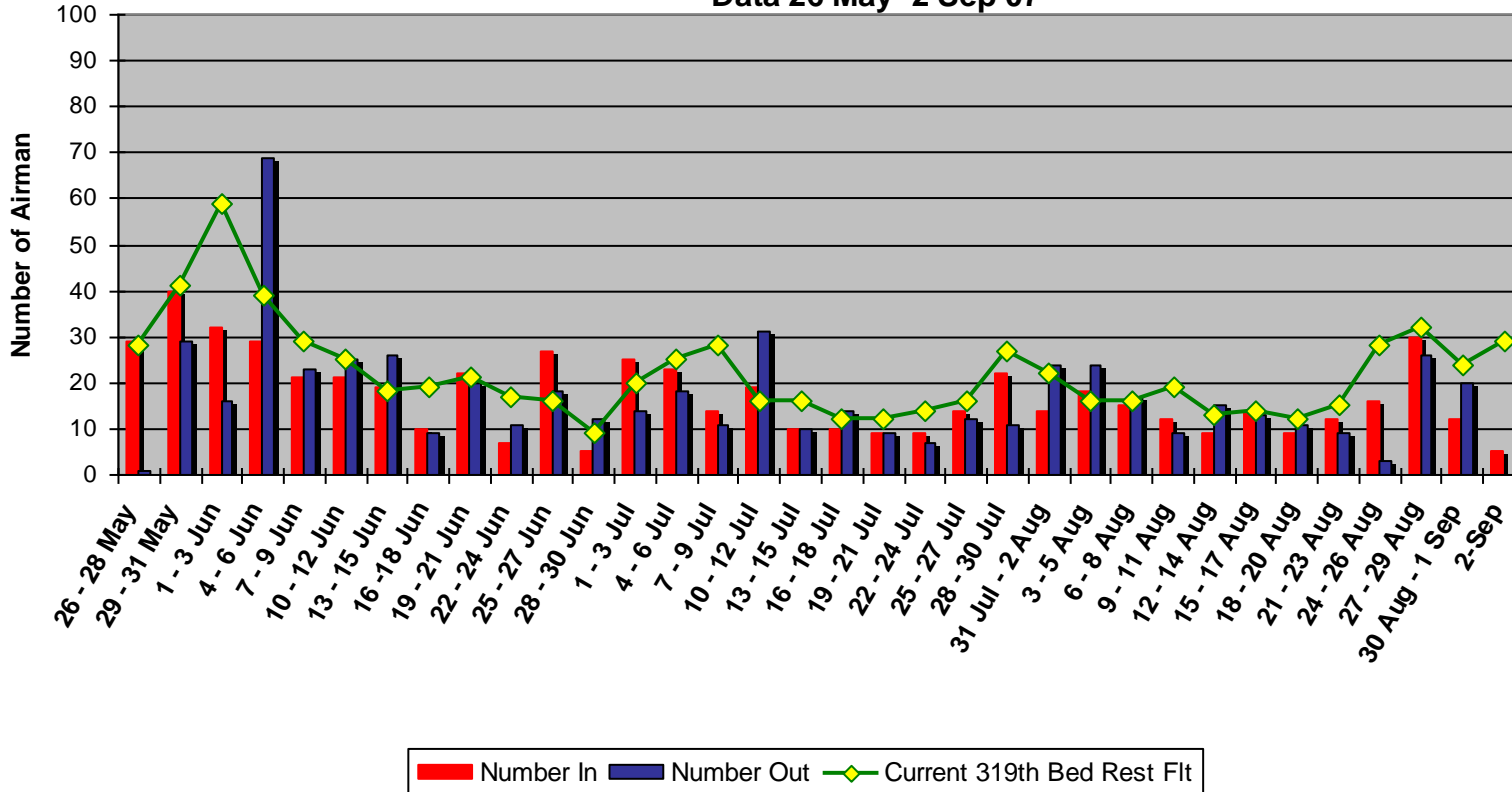


Bed rest (Fever) Flight



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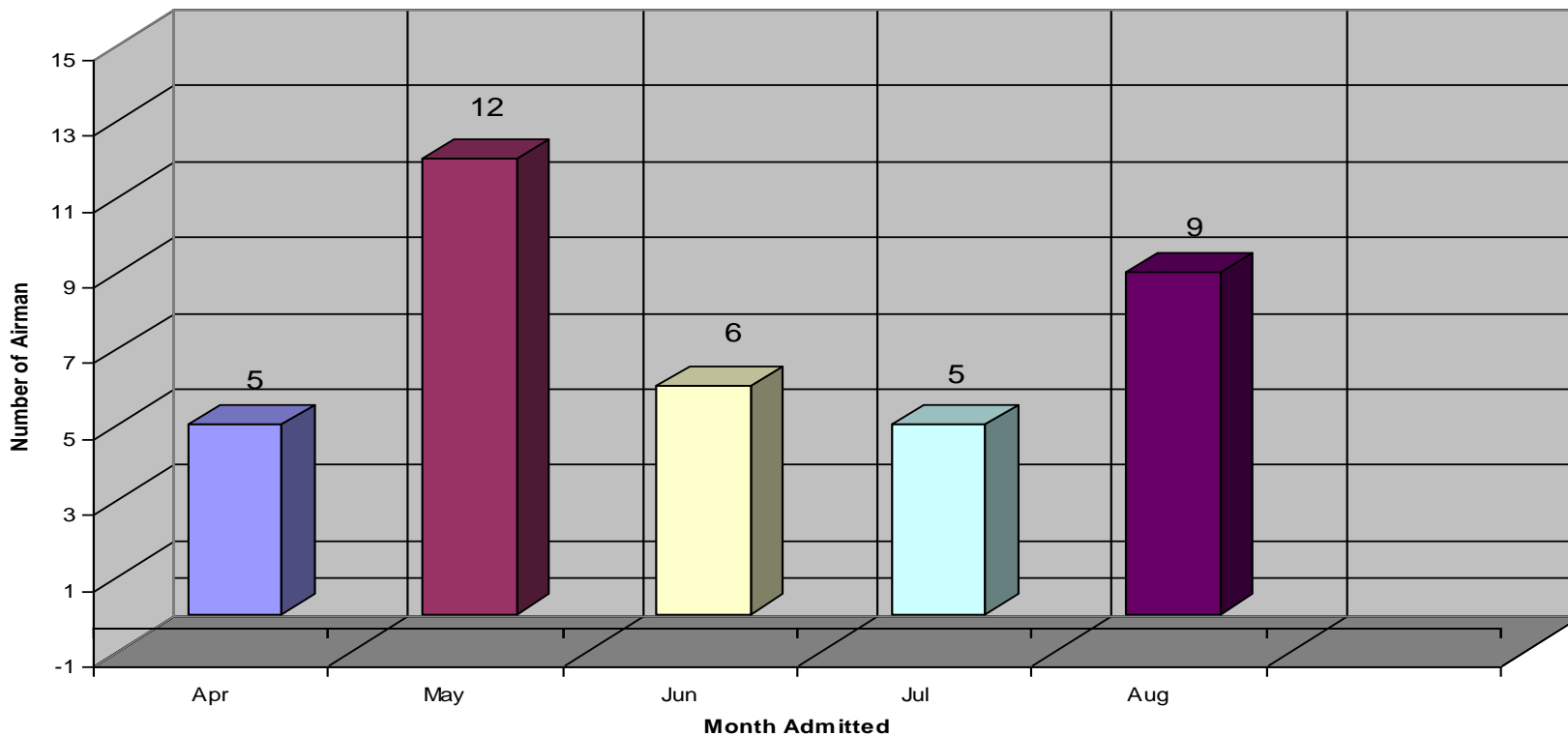
**Suspected Respiratory Cases in Medical Hold (319th)
37 AMDS/Public Health
Data 26 May- 2 Sep 07**





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**Pneumonia Cases in BMTs (Month Admitted)
37 AMDS/ Public Health
1 Apr- 3 Sep 07**



Aug – 7 BMTs (shown) + 2 SFS Tech School = 9 Total

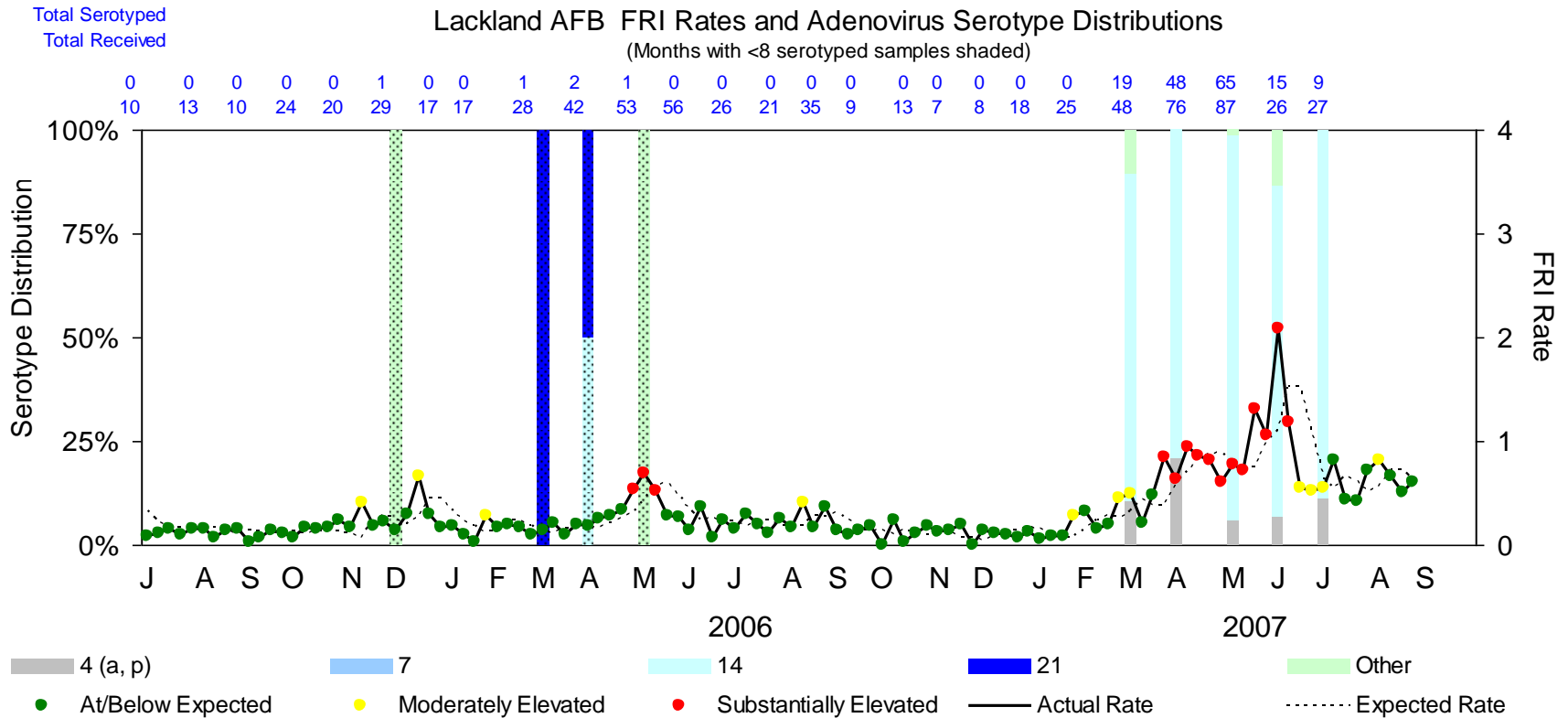
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Current FRI Rates



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Acknowledgments



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- 37 AMDS SQ/CC: Col Mike Bunning and Lt Col Shoor
- 37 AMDS PH: Lt Cols Cogburn & Blakeslee
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- Trainee Health Doc: Capt Ruth Brenner
- EOS: Lt Col Livingstone, Dr. Lisa Lott, Roger Bravo and Christina Gardner
- NHRC: John Gomez and Tony Hawksworth
- AFIOH: Major Natalie Johns, Dr. Macias and Dr. Jill Trei
- AETC: Lt Col Brian Ortman and Capt Larry Noel
- CDC: Dr. Tate and team
- TX State Health Dept: Dr. Vince Fonseca and Dr. John Su



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QUESTIONS??