# Interesting University EH&S Program Relationships and Predictors:

## An Introduction to CSHEMA's new Campus "Vital Statistics" Initiative

Robert Emery, DrPH, CHP, CIH, CBSP, CSP, CHMM, CPP, ARM
Vice President for Safety, Health, Environment & Risk Management
The University of Texas Health Science Center at Houston
Professor of Occupational Health
The University of Texas School of Public Health

# The Problem with Prevention

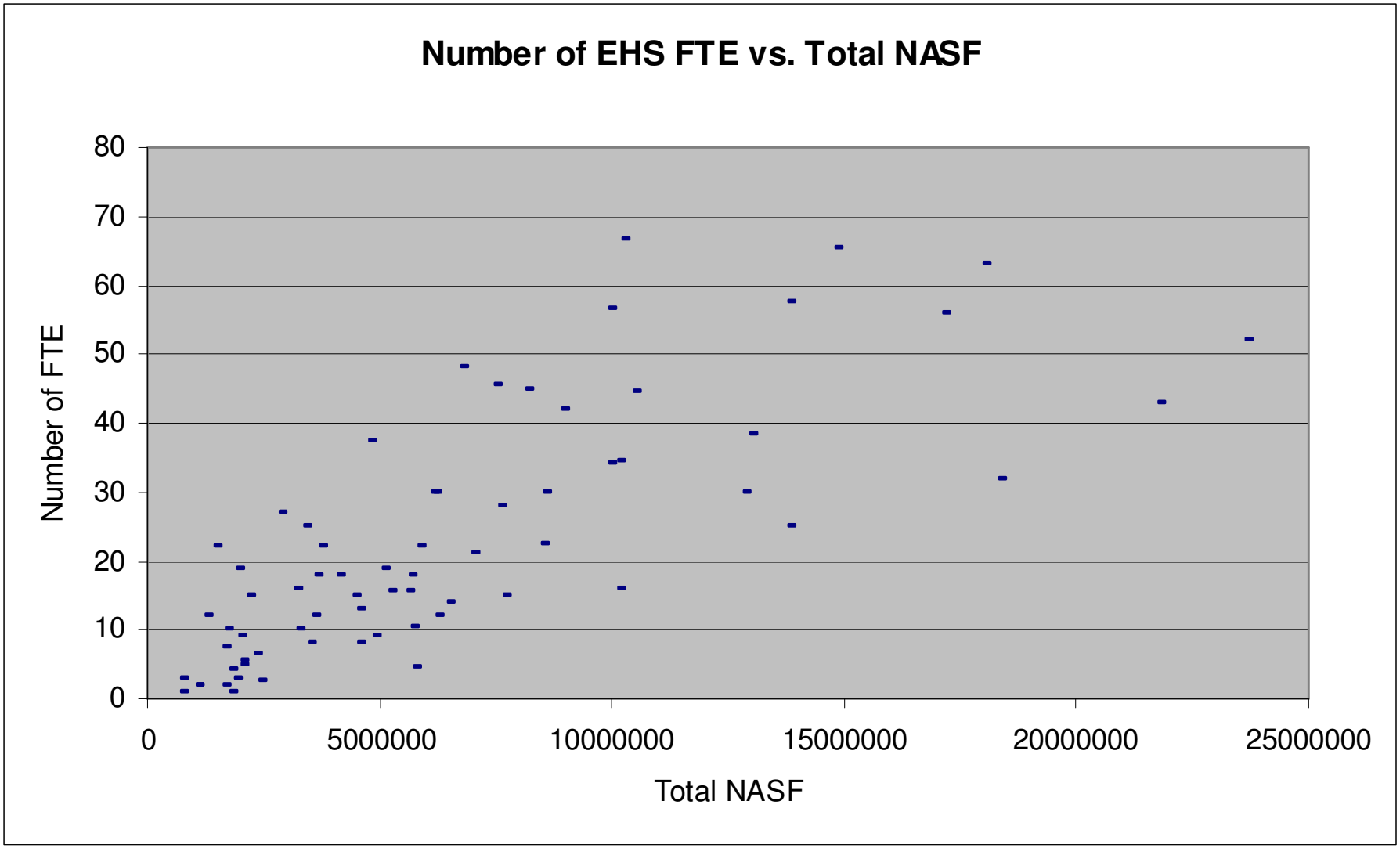
- University EH&S programs function largely in the realm of prevention
- On a good day “nothing happens”
- But demonstrating the value of prevention is very difficult
- One strategy is to develop statistically-valid benchmarks
  - What is the industry average amount of resourcing for EH&S programs for a campus of these characteristics?
- Although each campus is unique, certain commonalities do exist that can be leveraged upon

# Daily Life Indexes or Predictors

- We make many important daily decision based on indexes or predictive models:
  - Weather
  - Flood zones
  - Dow Jones Industrial Average
  - Gross Domestic Product
  - Worker's Compensation Experience Modifier
  - Body Mass Index (BMI)
  - Life Expectancy

# Key Question

- What is the statistically significant driver for university EH&S resourcing?
  - Number of students?
  - Number of employees?
  - Number of faculty?
  - Total number of people on campus?
  - Number of buildings?
  - Total campus acreage?
  - Total campus square footage?

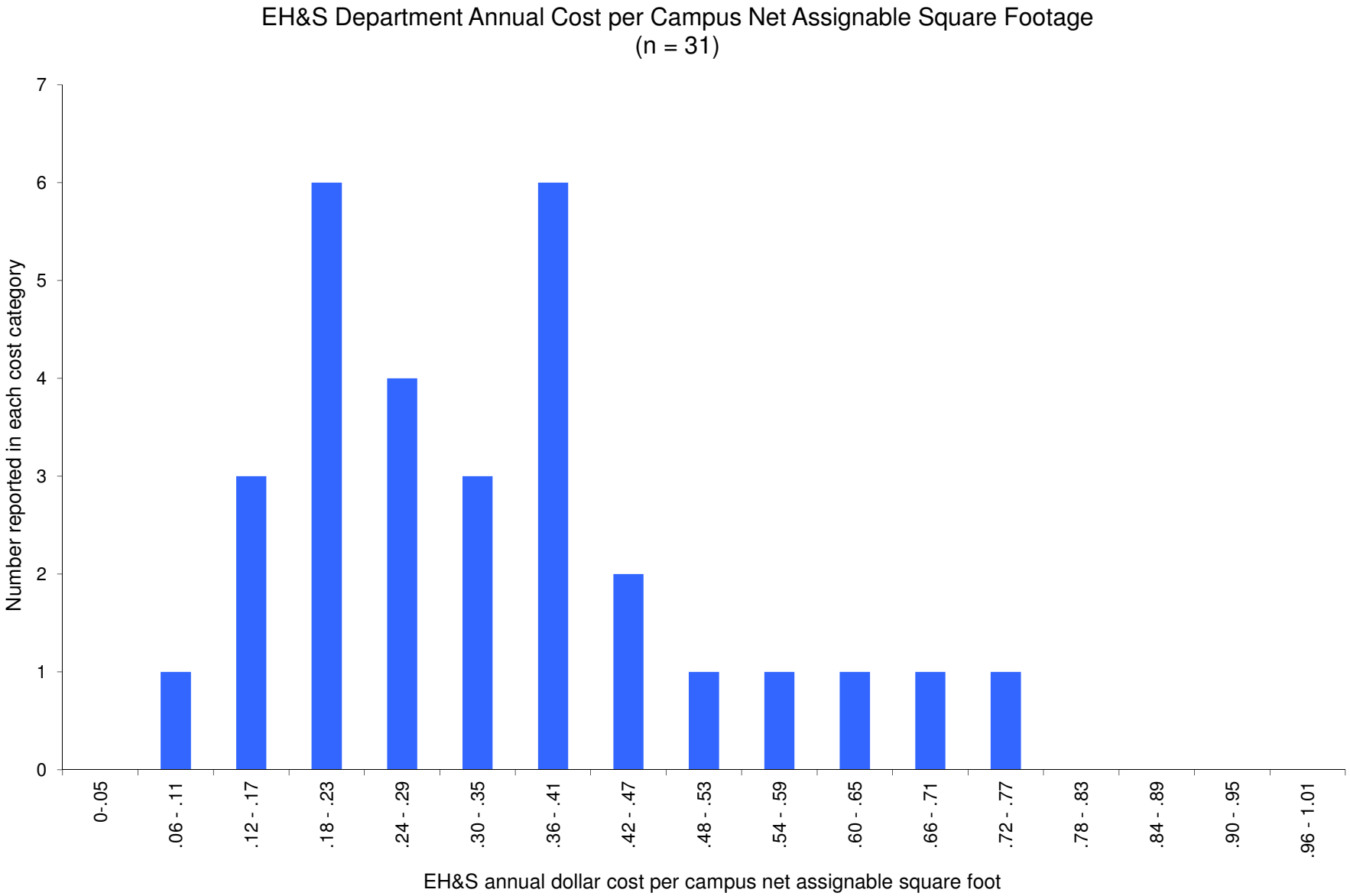

Number of EHS FTE vs. Total NASF
Number of FTE
80
70
60
50
40
30
20
10
0
0
5000000
10000000
15000000
20000000
25000000
Total NASF

# Predictability of Various Models

| Total campus sq ft | Lab + non-lab sq ft | ln (total campus sq ft) | ln (lab sq ft) + ln (non lab sq ft) | Med /Vet School | General "other" category | BSL3 or BSL4 | R Squared Value |
|---|---|---|---|---|---|---|---|
| X | | | | | | | 47.7 |
| | X | | | | | | 50.5 |
| | | X | | | | | 64.9 |
| | | | X | | | | 71.1 |
| | | | X | X | | | 78.2 |
| | | | X | X | X | | 78.4 |
| | | | X | X | | X | 80.0 |

Multiple regression model equation:

EH&S FTE = $e^{[(0.516 \times \text{Med/Vet School?}) + (0.357 \times (\ln \text{Lab sq ft})) + (0.398 \times (\ln \text{Non lab sq ft})) + (0.371 \times \text{BSL3?}) - 8.618]}$

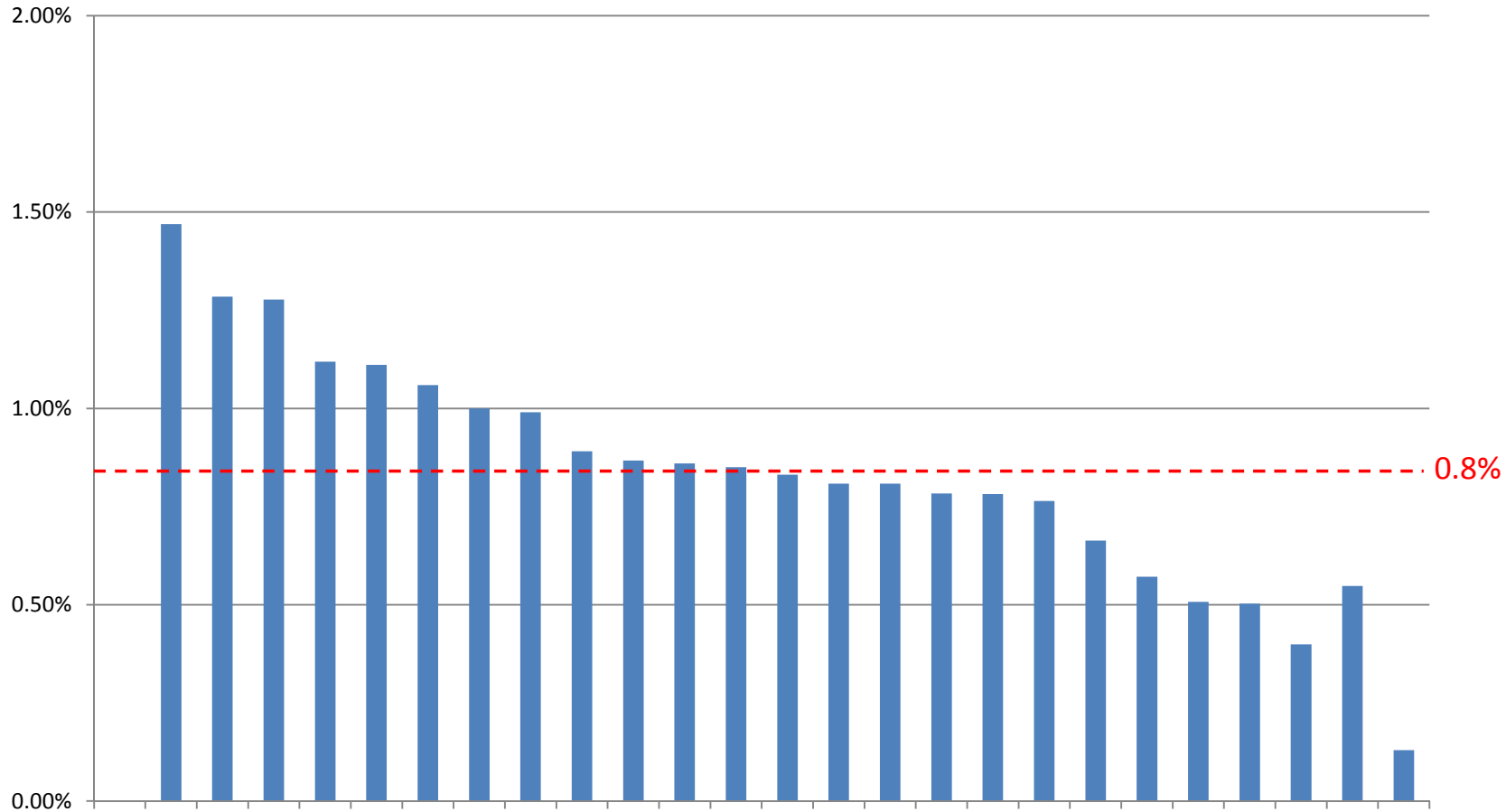

EH&S Department Annual Cost per Campus Net Assignable Square Footage
(n = 31)
Number reported in each cost category
0
1
2
3
4
5
6
7
0-.05
.06 - .11
.12 - .17
.18 - .23
.24 - .29
.30 - .35
.36 - .41
.42 - .47
.48 - .53
.54 - .59
.60 - .65
.66 - .71
.72 - .77
.78 - .83
.84 - .89
.90 - .95
.96 - 1.01
EH&S annual dollar cost per campus net assignable square foot

# Estimated Annual UTHSC-H Institutional Services Cost per Square Foot

(FY 10 estimates based on UTHSC-H square footage of 3,164,000 state [a] + 1,836,000 auxiliary = 5,000,000 ft$^2$ [b] )

| | |
|---|---|
| • Utilities (electricity, gas, steam)[a] | $5.38 |
| • Facilities Services (salaries, maint & ops)[a] | $2.98 |
| • Police[a] | $1.00 |
| • Information Technology Support[a] | $1.00 |
| • Contract Services (housekeeping, trash)[a] | $0.58 |
| • Insurance Premiums (property, worker's comp)[b] | $0.50 |
| • Environmental Health & Safety[b] | $0.45 |

## Ratio of Reported Total EH&S Budget and Extramural Research Expenditures




25 responding institutions, names removed

# Ongoing Research on Possible Predictors of EH&S Resourcing

- Exploring three promising relationships – all imperfect, but each potentially useful with some degree of care
  - EH&S staffing based on model that includes
    - (1) non-lab square footage
    - (2) lab square footage
    - (3) presence of a medical or veterinary school (0 = no, 1 = yes)
    - (4) presence of BSL3 labs (0 = no, 1 = yes)
  - EH&S budget as related to campus square footage
    - About $0.20/total sq ft for low lab density (5-15%)
    - About $0.40/total sq ft for high lab density (20-35%)
  - Proportion of extramural research expenditures
    - About 0.8%

**Summary of Reported and Modeled Values for University of XXX Environmental Health & Safety Program**

| Reported University of XXX values for 2012 | | Modeled values | |
|---|---|---|---|
| Total institutional net assignable square footage (TNASF) | 10,372,818 | | |
| Research net assignable square footage (RNASF) | 1,213,577 (12% of total) | | |
| Total Institutional expenditures | $2,541,500,000 | | |
| Annual research expenditures | $290,100,000 | | |
| EH&S expenditures | | $2,593,204[(a)] | $2,320,800[(b)] |
| Number EH&S staff | | | 38 FTE[(c)] |

[(a)] Based on TNASF model: TNASF x $0.25/square feet (for lower density lab square footage peak on frequency histogram)
$0.25/sq ft x 10,372,818 sq ft = $2,593,204

[(b)] Based on Percent of Research Expenditures Model
0.008 x $290,100,000 = $2,320,800

[(c)] Based on Staffing Model relying on non-lab and lab NASF, presence of Med or Vet School, and presence of BSL3 labs
EH&S FTE = $e^{[(0.516 \times \text{Med/Vet School}) + (0.357 \times (\ln \text{Lab sq ft})) + (0.398 \times (\ln \text{Non lab sq ft})) + (0.371 \times \text{BSL}) - 8.618]}$ $e^{3.649} = 38$ FTE

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| Number EH&S staff | 30.25 FTE | | 38 FTE[(c)] |

[(a)] Based on TNASF model: TNASF x $0.25/square feet (for lower density lab square footage peak on frequency histogram)
$0.25/sq ft x 10,372,818 sq ft = $2,593,204 (8% difference)

[(b)] Based on Percent of Research Expenditures Model
0.008 x $290,100,000 = $2,320,800 (2% difference)

[(c)] Based on Staffing Model relying on non-lab and lab NASF, presence of Med or Vet School, and presence of BSL3 labs
EH&S FTE = $e^{[(0.516 \times \text{Med/Vet School}) + (0.357 \times (\ln \text{Lab sq ft})) + (0.398 \times (\ln \text{Non lab sq ft})) + (0.371 \times \text{BSL}) - 8.618]}$ $e^{3.649}$ = 38 FTE (20% difference)

# Acknowledged Shortcomings

- Each university possesses unique characteristics
- Trying to capture all characteristics in a model would be impossible
- And the models don't speak to outcomes – such as number of injuries/illnesses or non-compliance
- And we lack error bars – but that can be remedied with more data
- This does represent the only evidence-based means available fro us to articulate the cost of prevention

# Action Items for Each of You!

- Assemble and submit your institutional “vital statistics”:
  - 1. Total Institutional Net Assignable Square Feet (NASF)
  - 2. Research Net Assignable Square Feet (NASF)
  - 3. Research Expenditures
  - 4. Total Institutional Expenditures
  - 5. Total Number of Enrolled Students
  - 6. Total Full Time Equivalent (FTE) Employees
  - 7. EHS Full Time Equivalent (FTE) Staff
  - 8. EHS Expenditures

# Submitting Data/Questions

- Please submit data to
  - Robert.J.Emery@uth.tmc.edu
- For questions, comments, please e-mail
  - Bruce.J.Brown@uth.tmc.edu