Introduction
Study Background
≥73-80% of firefighters considered overweight or obese
• Possible misclassification
• BMI: non-specific body composition metric
• Body fat percentage (BF%) can better classify muscular populations
• DXA is a safe, cost-effective, and simple technology to measure BF%
• Most clinicians believe (incorrectly) BMI is a good individual measure

Firefighter cardiorespiratory fitness (CRF) standards
• NFPA 1582 guidelines: VO\textsubscript{2max} ≥ 42 mL/kg/min
• Most fire departments do not use such standards!
• No studies correlating DXA measures and measured VO\textsubscript{2max}

Study Aims
1. Correlation of body composition measures
2. Correlation of VO\textsubscript{2max} with body composition measures
3. Evaluation of obesity by body composition methods
4. Development of an improved VO\textsubscript{2max} model
5. Evaluation of cost-effectiveness of VO\textsubscript{2max} (Phase 2)
6. Correlation of VO\textsubscript{2max} with CV risk measures (Phase 2)

Methods
1. Survey and Rowing Test
   • Survey of personal and employment demographics
   • Measurements: height, weight, resting heart rate
   • On-site 2000m Concept 2 (C2) rowing machine test
   • VO\textsubscript{2max} estimates: C2 highly/not highly-trained, TDPS

2. Treadmill VO\textsubscript{2max} Testing
   • Mask-based Bruce protocol

3. DXA Body Composition
   • Whole-body DXA scan
   • Hologic body comp.: NHANES vs. “classic” methods

Results
Demographics
• 52 subjects enrolled, 48 male, 4 female
• Mean age: 42.8 (SD: 8.1)

Body Comp. (M)

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>83.2</td>
<td>54.9</td>
</tr>
<tr>
<td>Height (in)</td>
<td>74.6</td>
<td>70.5</td>
</tr>
<tr>
<td>BM Index (kg/m\textsuperscript{2})</td>
<td>30.5</td>
<td>25.6</td>
</tr>
<tr>
<td>Overweight</td>
<td>4.4</td>
<td>5.5</td>
</tr>
<tr>
<td>FM Percentage</td>
<td>36.0</td>
<td>46.4</td>
</tr>
<tr>
<td>BMI, classic</td>
<td>26.0</td>
<td>28.6</td>
</tr>
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Body Comp. (F)

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Correlation of VO\textsubscript{2} & Body Composition

- Total and percent FM fit VO\textsubscript{2max} fairly well
- LM % fits well, but total LM does not
- BMI not as well-correlated as DXA measures
- FM% best-correlated with VO\textsubscript{2max} vs. other body comp. measures

Classification of Obesity

Only moderate agreement with “obese” BMI and “very poor” BF

Modeling VO\textsubscript{2max}

Body composition measures

Other measures

Preliminary VO\textsubscript{2max} model with R\textsuperscript{2} = 0.7

Including C2 VO\textsubscript{2max} estimate, FM%, bone mineral content (BMC), age, gender

Initial Conclusions

- FM% best body composition measure to estimate VO\textsubscript{2max}
- Classification of obesity is not consistent
- Body composition measures can improve a VO\textsubscript{2max} model
- Evaluation of firefighters may benefit from use of FM%