

## A Decade of Skeletal Surveys: What have we learned?

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# A Decade of Skeletal Surveys: *What have we learned?*

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## Introduction & Objectives

### Introduction

- A skeletal survey (SS) is a series of radiographs of the entire body that is vital in revealing indications of occult\* abusive fractures (healing or acute) in young children<sup>4</sup>
- Lehigh Valley Hospital mandates children 3 & under admitted to the trauma or burn services to undergo a SS

### What the literature says;

- The prevalence of positive SSs\* in children with burn injuries is estimated to be between 6% and 20%<sup>1</sup>
- Intentional burns are becoming increasingly more common, occurring in about 40% of children with burn injuries<sup>1</sup>
- Burn patients are more likely to be older and non-white compared to those with non-burn injuries<sup>2</sup>

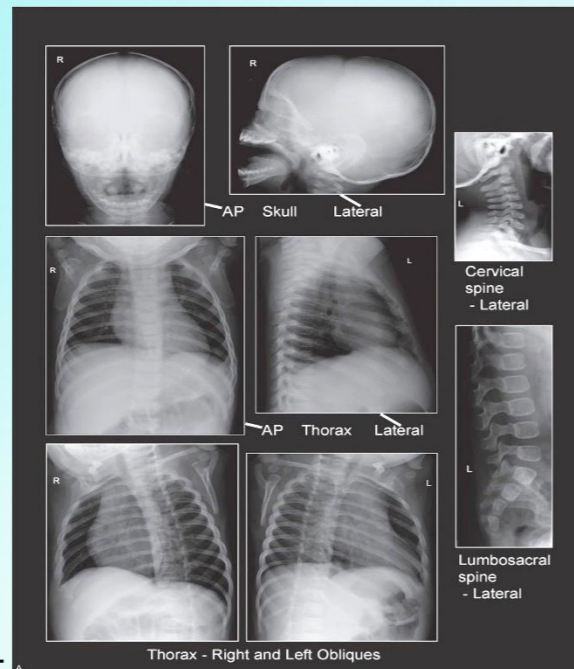
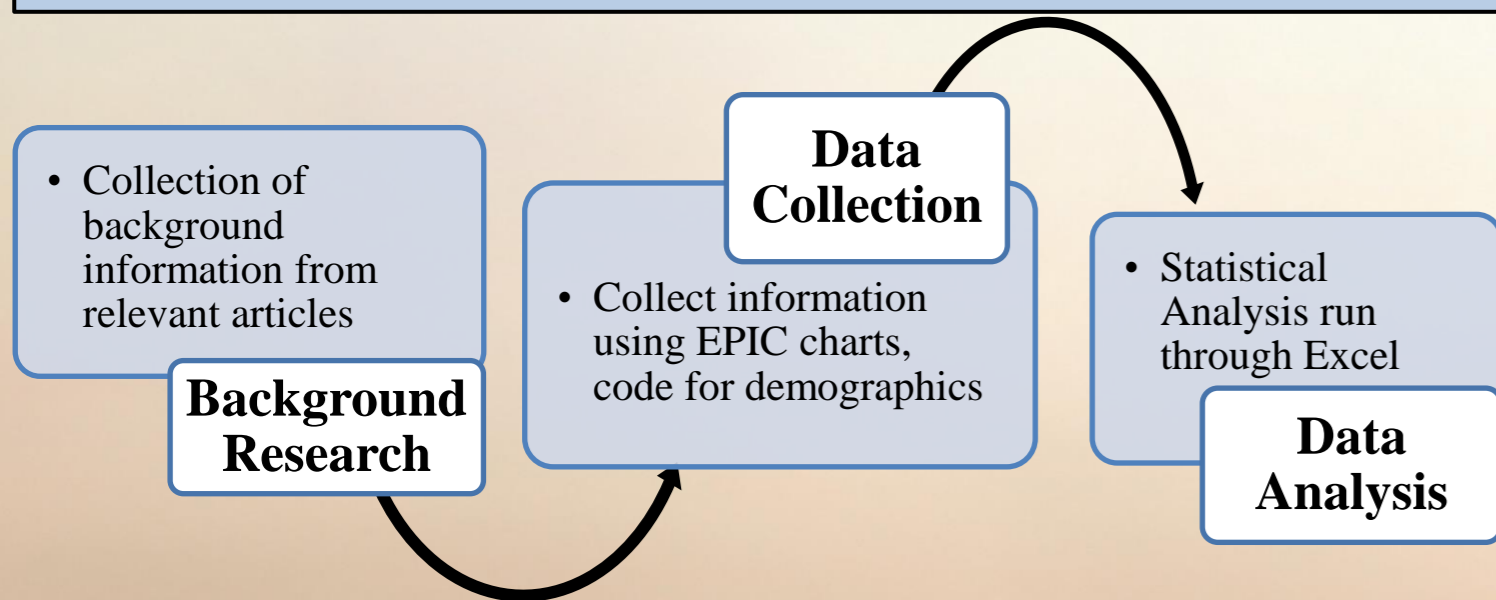


Image 1. Skeletal survey radiographs<sup>1</sup>

### Objectives

- Demonstrate the prevalence of positive SSs, and more specifically, what percentage of positive surveys come from the trauma service versus the burn service
- Demonstrate that 6%-20% is a high number of positive surveys in burn patients, and that the real prevalence is less
- Determine associated factors for probability of a positive survey or intentional burn, including race and insurance status
- Verify the usefulness of skeletal surveys in burn patients

## Methods



## Lehigh Valley Health Network, Allentown, Pennsylvania

## Results

### Overall Positive Skeletal Survey Results

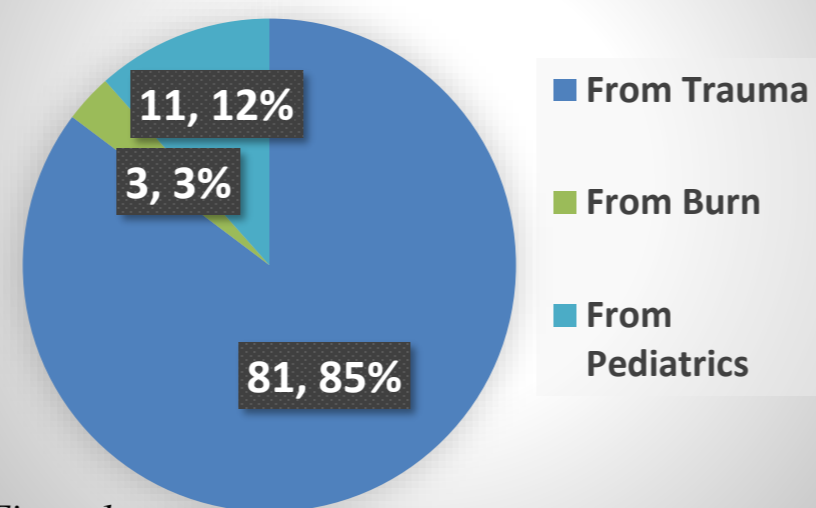


Figure 1.

Positive SS Demographics	Figure 2. Participants
<b>MALE</b>	<b>50, 53%</b>
Female	45, 47%
Hispanic or Latino	36, 38%
<b>CAUCASIAN/WHITE</b>	<b>43, 45%</b>
Black/African American	12, 13%
Asian	0
Unknown Ethnicity	4, 4%
No Insurance	13, 14%
Private Insurance	0
Medicare	15, 16%
<b>MEDICAID</b>	<b>61, 64%</b>
Medicare & Medicaid	6, 6%

### Burn Skeletal Survey Results

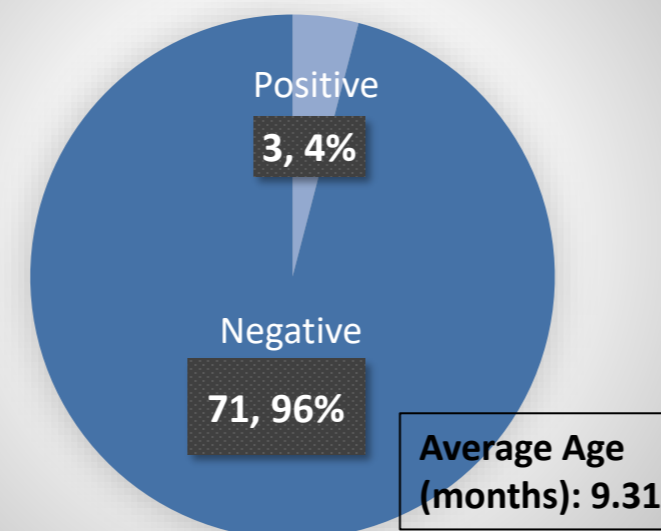


Figure 3.

### Trauma Skeletal Survey Results

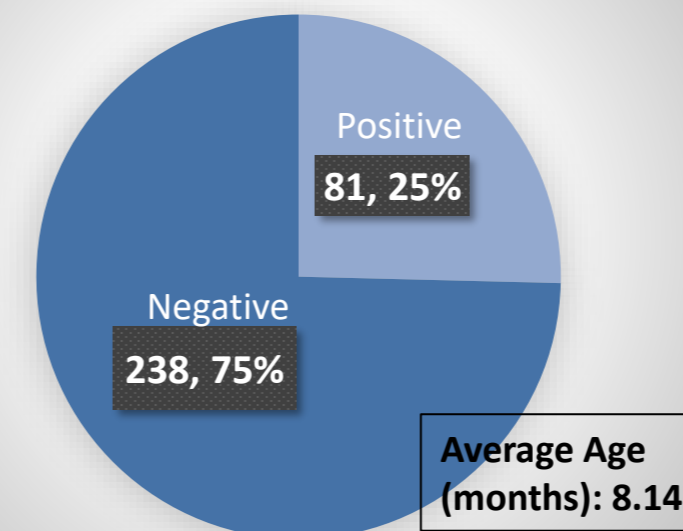


Figure 4.

### Figure 5. Cause of Injury in Burn Patients

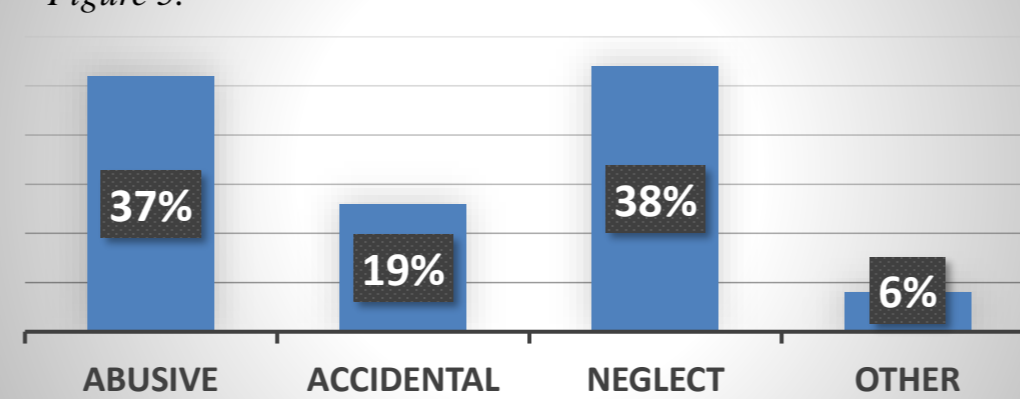


Figure 5.

Abusive Burn Demographics	Figure 6. Participants
Average Age	9.58
White	9, 35%
<b>NON-WHITE</b>	<b>10, 38%</b>
No Insurance	5, 19%
Private Insurance	1, 4%
Medicare	2, 8%
<b>MEDICAID</b>	<b>18, 69%</b>



Scan for References and Acknowledgments

## Discussion

In this retrospective study of 635 patients (351 male, 284 female, 297 white, 271 non-white, average age 8.6 months) who have undergone a SS in the last decade, we discovered;

- There were 95 positive and 540 negative surveys (15% positive)
- Of the positive surveys, 85% were admitted from trauma, 12% from pediatrics, and 3% from burns (Figure 1.)
- The prevalence of positive SSs in burn patients was 4%, which supports our hypothesis that 6%-20% is a high number (Figure 3.)
- -The 3 burn patients with positive surveys were all female, had Medicaid or no coverage, and were on average 11 months old
- 88% (97/110) of children with injuries from physical abuse had Medicaid or no insurance (Figures 2. and 6.)
- 37% of all burns were caused from abuse, and 38% from neglect (Fig.5.)
- Overall, burn patients were older (9.31 months vs 8.14 in trauma) but not more likely to be non-white (28 white/28 non-white for burns, 146 white/143 non-white for trauma)
- Skeletal surveys are necessary in detecting abuse in trauma patients (1/4) but not necessarily burn patients (1/25) (Figures 3. and 4.)

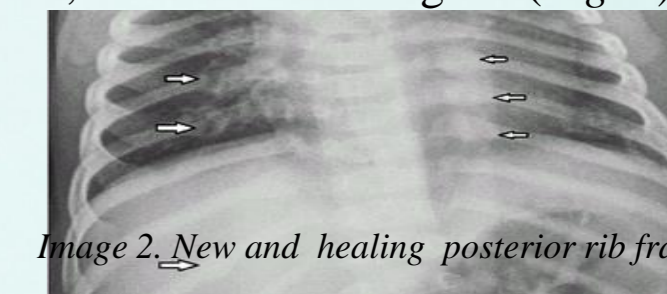


Image 2. New and healing posterior rib fractures<sup>2</sup>

## Future Directions

- Propose a change in policy for screening children with a burn injury as their primary diagnosis
  - If a patient is admitted for a burn injury, their pretest probability of a positive SS is almost negligible
  - Clinical suspicion should be extremely high to warrant subjecting the child to whole body radiation
- Further understand why patients from disadvantaged socio-economic backgrounds are prone to potential neglect and/or abuse
  - Eventually investigate ways to decrease this correlation (Figures 2. and 6.)
- Gather more data from Black/African American children (only 65, or 10% in this study) as well as from older children
- Develop a streamlined system to determine if burns are abusive, negligent, or accidental, and investigate why abusive burns are so prevalent (37% in this study, Figure 5.)
- Investigate ways to ensure follow ups with children found to have sentinel\* injuries (66 cases in this study)

### Glossary\*

- I. Occult<sup>3</sup>; hard to detect, non-naturally occurring (abusive) fractures
- II. Petechial Bruising<sup>3</sup>; pattern of bruising highly specific for physical abuse
- III. Positive Skeletal Survey<sup>3</sup>; containing one or more abusive fractures
- IV. Sentinel Injury<sup>3</sup>; physical abuse that is not a fracture, such as petechial bruising\* or oral injury