Body Surface Area

In medicine, calculation of body surface area can be very important. Severe burns are usually described as covering a percentage of the body surface area. Some chemotherapy drug dosages are based on body surface area.

1. How might body surface area be measured?

2. What factors influence the accuracy of the estimates?

3. Develop a method to estimate the total surface area of a given body.

4. Use your method to estimate the actual surface area of one member of your group.

5. Think about the variables involved and develop a mathematical model to measure surface area. Be sure to consider and specify where errors might occur.
Standard Measurements for Body Surface Area

6. One standard medical practice of approximating surface area is to use the following formula:

$$\sqrt{\frac{\text{height} \times \text{weight}}{3600}}$$

How does this formula compare to your approximation? (Note that height is measured in centimeters and weight is measured in kilograms.)

Reference Table: Five formulas for calculating Body Surface Area

<table>
<thead>
<tr>
<th>Author</th>
<th>BSA formula</th>
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</thead>
<tbody>
<tr>
<td>Boyd(^a)</td>
<td>$\text{BSA (m}^2) = \text{Wt(kg)}^{0.4838} \times \text{Ht(cm)}^{0.3} \times 0.017827$</td>
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<tr>
<td>Gehan and George(^b)</td>
<td>$\text{BSA (m}^2) = \text{Wt(kg)}^{0.51456} \times \text{Ht(cm)}^{0.42246} \times 0.02350$</td>
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<tr>
<td>Mosteller(^c)</td>
<td>$\text{BSA (m}^2) = \left[ \frac{\text{Ht(cm)} \times \text{Wt(kg)}}{3600} \right]^{\frac{1}{2}}$ or $\text{BSA (m}^2) = \left[ \frac{\text{Ht(in)} \times \text{Wt(lbs)}}{3131} \right]^{\frac{1}{2}}$</td>
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<tr>
<td>Haycock(^d)</td>
<td>$\text{BSA (m}^2) = \text{Wt(kg)}^{0.5378} \times \text{Ht(cm)}^{0.3964} \times 0.024265$</td>
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<tr>
<td>Du Bois and Du Bois(^e)</td>
<td>$\text{BSA (m}^2) = \text{Wt(kg)}^{0.425} \times \text{Ht(cm)}^{0.725} \times 0.007184$</td>
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</tbody>
</table>

\(^a\) This formula is based on 197 observations.
\(^b\) This formula is based on direct measurements of 401 individuals.
\(^c\) This formula is a simple modification of the equation by Gehan and George.
\(^d\) This formula is based on measurements of 81 individuals ranging from premature infants to adults.
\(^e\) This formula is based on measurements of 9 individuals, one of whom was a child.

http://www.halls.md/bsa/bsaVu5.htm