24 hours; therefore, the same trough targets cannot be extrapolated. With less-frequent administration of vancomycin, lower trough concentrations can be targeted and the same AUC_{24} achieved. Our results differ from a previous pharmacokinetic study of young infants who received the drug at 12- or 24-hour intervals. That study reported that with trough concentrations of 7 to 11 mg/L, an AUC_{24} greater than 400 mg.h/Lwould be achieved in more than 90% of infants.[6] This difference may be partially explained by the retrospective data set used in the previous model.

Study limitations include potential sampling or data errors; however, data were prospectively collected after appropriate staff training. Also, because our study population were young infants hospitalized in neonatal units, results can only be generalized to those settings.

The results of this study have important implications for the successful treatment of *S aureus* infections with vancomycin in young infants. The association between trough concentration and AUC_{24} for different dosage intervals (**Figure**) can be used to aid clinicians in the interpretation of trough concentrations in young infants with sepsis.

Amanda Gwee, PhD
Noel Cranswick, BMedSc
Brendan McMullan, BMed(Hons)
Srinivas Bolisetty, MD
Rodney W. Hunt, PhD
Nigel Curtis, PhD
Stephen B. Duffull, PhD

Author Affiliations: Department of Paediatrics, The University of Melbourne, Parkville, Victoria, Australia (Gwee, Hunt, Curtis); Department of General Medicine, The Royal Children's Hospital Melbourne, Parkville, Victoria, Australia (Gwee, Cranswick, Curtis); Murdoch Children's Research Institute, Parkville, Victoria, Australia (Gwee, Cranswick, Hunt, Curtis); Department of Pharmacology, The University of Melbourne, Parkville, Victoria, Australia (Cranswick); Department of Infectious Diseases, Sydney Children's Hospital, Randwick, New South Wales, Australia (McMullan); School of Women's and Children's Health, University of New South Wales, Sydney, New South Wales, Australia (McMullan, Bolisetty); Department of Newborn Care, Royal Hospital for Women, Randwick, New South Wales, Australia (Bolisetty); Department of Neonatal Medicine, The Royal Children's Hospital Melbourne, Parkville, Victoria, Australia (Hunt); School of Pharmacy, University of Otago, Dunedin, Otago, New Zealand (Duffull).

Accepted for Publication: February 25, 2019.

Published Online: June 10, 2019. doi:10.1001/jamapediatrics.2019.1488

Correction: This article was corrected on August 5, 2019, to correct vancomycin trough concentration values in the Results.

Corresponding Author: Amanda Gwee, PhD, Department of Paediatrics, The University of Melbourne, The Royal Children's Hospital Melbourne, 50 Flemington Rd, Parkville, Victoria 3052, Australia (amanda.gwee@rch.org.au).

Author Contributions: Dr Gwee had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Gwee, Cranswick, McMullan, Hunt, Curtis.
Acquisition, analysis, or interpretation of data: Gwee, Cranswick, McMullan, Bolisetty, Duffull.
Drafting of the manuscript: Gwee, Cranswick, Bolisetty.
Critical revision of the manuscript for important intellectual content: Gwee, Cranswick, McMullan, Hunt, Curtis, Duffull.
Statistical analysis: Gwee, Duffull.
Obtained funding: Gwee, Cranswick.
Administrative, technical, or material support: Gwee, Cranswick, McMullan, Bolisetty, Hunt.
Supervision: Cranswick, McMullan, Hunt, Curtis, Duffull.

Conflict of Interest Disclosures: None reported.

Funding/Support: Staff and materials for data collection for this work were funded by the Murdoch Children's Research Institute. Dr Gwee received stipend support from the Royal Australasian College of Physicians Basser Research Entry Scholarship as well as a National Health and Medical Research Council postgraduate scholarship GNT1150216.

Role of the Funder/Sponsor: The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

1. Moise-Broder PA, Forrest A, Birmingham MC, Schentag JJ. Pharmacodynamics of vancomycin and other antimicrobials in patients with *Staphylococcus aureus* lower respiratory tract infections. *Clin Pharmacokinet*. 2004;43(13):925-942. doi:10.2165/00003088-200443130-00005

2. Holmes NE, Turnidge JD, Munckhof WJ, et al. Vancomycin AUC/MIC ratio and 30-day mortality in patients with *Staphylococcus aureus* bacteremia. *Antimicrob Agents Chemother*. 2013;57(4):1654-1663. doi:10.1128/AAC.01485-12

3. Anderson BJ, Holford NH. Understanding dosing: children are small adults, neonates are immature children. *Arch Dis Child*. 2013;98(9):737-744. doi:10.1136/archdischild-2013-303720

4. Gwee A, Cranswick N, McMullan B, et al. Continuous versus intermittent vancomycin infusions in infants: a randomized controlled trial. *Pediatrics*. 2019;143(2):e20182179. doi:10.1542/peds.2018-2179

5. Liu C, Bayer A, Cosgrove SE, et al. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children: executive summary. *Clin Infect Dis*. 2011;52(3):285-292. doi:10.1093/cid/cir034

6. Frymoyer A, Hersh AL, El-Komy MH, et al. Association between vancomycin trough concentration and area under the concentration-time curve in neonates. *Antimicrob Agents Chemother*. 2014;58(11):6454-6461. doi:10.1128/AAC.03620-14

Accuracy of Parent-Measured and Parent-Estimated Heights and Weights in Determining Child Weight Status

Accurate measurements of height and weight are necessary for assessing weight status of children in population-based studies. Professionally measured heights and weights represent the criterion standard for calculating body mass index (BMI), the most feasible and frequently used measure of body weight status. However, collecting professionally measured data on sufficient samples of children in population studies is extremely resource intensive.[1] As a result, these studies often rely on child- or parent-estimated heights and weights. Although these estimated values are easy to collect, they are prone to misreporting, with systematic differences across sociodemographic characteristics.[2]

A viable alternative, explored in only a few studies so far,[3,4] is parent measurement of height and weight—a method that is less expensive than professionally measured data and arguably more accurate than parent estimates. However, the accuracy of parent measurements has not been empirically tested in the United States. In this cohort study, using a subsample of children derived from the New Jersey Child Health Study, we evaluated whether parent-measured heights and weights were more accurate than parent-estimated heights and weights for classifying children's weight status. We compared each method with the criterion standard, professionally measured heights and weights.

Methods | The New Jersey Child Health Study was a longitudinal study that followed up on 2 panels of children between 2009 and 2017 to examine the association of changes in food and physical activity environments with changes in body

Table. Demographic Description of the Analytical Sample

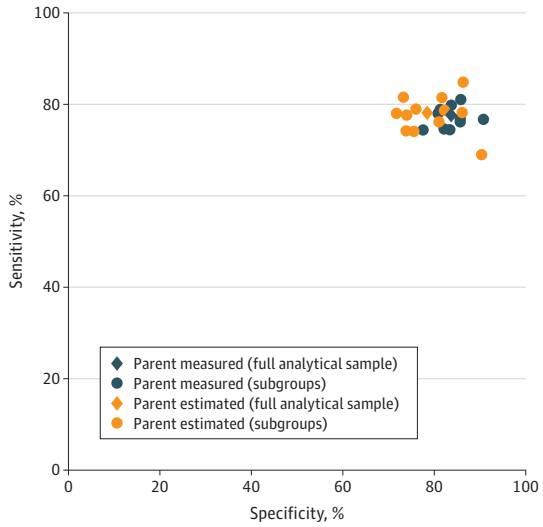
Characteristic	Participants, No. (%) (n = 226)
Sex	
Male	103 (45.6)
Female	123 (54.4)
Age, y	
3-11	118 (52.2)
12-18	108 (47.8)
Race/ethnicity	
Non-Hispanic white	9 (4.0)
Non-Hispanic black	144 (63.7)
Hispanic	62 (27.4)
Other	11 (4.9)
Mother's educational level	
Less than high school	29 (12.9)
High school	99 (44.2)
College or higher	96 (42.9)
Parent's BMI[a]	
Not obese	120 (53.1)
Obese	106 (46.9)
Household poverty level, FPL[b]	
<200%	163 (72.1)
≥200%	63 (27.9)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); FPL, federal poverty level.

[a] Parent's BMI: not obese was defined as a BMI less than 25; obese was defined as a BMI of 25 or greater.

[b] Household income is presented as a percentage of the FPL in the year in which the parent was interviewed.

Figure. Sensitivity and Specificity of Parent-Measured and Parent-Estimated Values for Classifying Children's Weight Status



Professional measurements were used as true values for calculating sensitivity and specificity. Subgroup analyses were conducted using child age, sex, and race/ethnicity; parent body mass index and educational level; and household income.

weight status. In a subsample, 3 approaches were used in the following order to measure the height and weight of participants aged 3 to 18 years (n = 226): (1) parent estimates, obtained through a telephone interview; (2) parent measurements, whereby parents weighed and measured their children according to an established protocol[5] that included using instructions and a tape measure that were mailed to the child's home, recording the anthropometric data on a supplied worksheet, and mailing the worksheet back to the research team; and (3) professional measurements conducted by trained nurses in children's homes using the standard Centers for Disease Control and Prevention protocol[1] and standardized equipment. The institutional review board of Arizona State University approved this study. Oral consent was obtained from parents for collecting the estimated and measured heights and weights, and written consent (from parents and adolescents) and oral assent (from younger children) were obtained for collecting professionally measured data.

The 3 types of measurements were used to calculate age- and sex-specific BMI percentiles for participants based on US Centers for Disease Control and Prevention growth reference charts.[6] Professionally measured data were used to obtain the true weight status classification: overweight or obese (≥85th BMI percentile) vs not overweight or obese (<85th BMI percentile). The sensitivity and specificity of parent-estimated and parent-measured values for accurately classifying children's weight status relative to the criterion standard were also calculated. Analyses were run using Stata 14.0 (StataCorp).

Results | The analytical sample included 226 children from low-income families from 4 New Jersey cities: Camden, New Brunswick, Newark, and Trenton (**Table**). Among those in the sample, 123 children (54.4%) were female and 103 (45.6%) were male, 118 (52.5%) were aged 3 to 11 years and 108 (47.8%) aged 12 to 18 years, and 9 (4.0%) were non-Hispanic white, 144 (63.7%) non-Hispanic black, 62 (27.4%) Hispanic, and 11 (4.9%) another race/ethnicity. The parent-estimated, parent-measured, and professionally measured methods classified similar proportions of children as overweight or obese: 104 of 207 children (50.2%), 105 of 222 children (47.3%), and 114 of 226 children (50.4%), respectively. The sensitivity and specificity (**Figure**) of parent-measured values (77.7% and 83.6%, respectively) were similar to those of parent-estimated values (78.1% and 78.4%, respectively). The 95% CIs for the relative sensitivity and relative specificity of the 2 approaches suggested no statistically significant difference in the accuracy of children's weight status classification using the 2 methods. Subgroup analyses using child's age, sex, and race; parent educational level and BMI (obese vs not obese) calculated from self-reported heights and weights; and household annual income yielded similar results. Classifying children's weight status as obese vs nonobese also did not alter our findings.

Discussion | Collection of parent-measured heights and weights based on standardized instructions is feasible and less expensive than collection of professionally measured data. However, in our study parent measurements did not improve the accuracy of children's weight status classification over parent

estimates, the least expensive of the 3 methods. A possible explanation for this finding is that parent estimates yielded relatively high sensitivity and specificity, leaving limited room for improvement. A European study of preschool children reported lower sensitivity (47%) and similar specificity (93%) of parent estimates relative to our findings and reached the same conclusion: parent measurements did not improve overweight/obese status classification over parent estimates.[4]

Our study has some limitations. The children included in this sample were predominantly non-Hispanic black and Hispanic and were from low-income households, limiting the generalizability of our findings to other populations. In addition, the subsample from the New Jersey Child Health Study that we used depended on parents' willingness to participate in additional measurements. However, the demographic characteristics of the subsample were similar to those of the overall New Jersey Child Health Study.

Our study indicates that parent estimates and parent measurements of children's height and weight are both effective in classifying weight status. Therefore, when professionally measured data cannot be collected, parent estimates represent the most efficient alternative, as they are less resource intensive than parent measurements but without any trade-off in accuracy.

Punam Ohri-Vachaspati, PhD, RD
Francesco Acciai, PhD
Derek DeLia, PhD
Kristen Lloyd, MPH
Michael J. Yedidia, PhD

Author Affiliations: College of Health Solutions, Arizona State University, Phoenix (Ohri-Vachaspati, Acciai); MedStar Health Research Institute, Hyattsville, Maryland (DeLia); Department of Plastic and Reconstructive Surgery, Georgetown University School of Medicine, Washington, DC (DeLia); Rutgers Center for State Health Policy, Rutgers University, New Brunswick, New Jersey (Lloyd, Yedidia).

Corresponding Author: Punam Ohri-Vachaspati, PhD, RD, College of Health Solutions, Arizona State University, 500 N Third St, Phoenix, AZ 85004 (pohrivac@asu.edu).

Accepted for Publication: February 26, 2019.

Published Online: June 17, 2019. doi:10.1001/jamapediatrics.2019.1545

Author Contributions: Dr Ohri-Vachaspati and Ms Lloyd had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Ohri-Vachaspati, DeLia, Yedidia.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Ohri-Vachaspati, Acciai, DeLia.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Ohri-Vachaspati, Acciai, DeLia, Lloyd.
Obtained funding: Ohri-Vachaspati, DeLia.
Administrative, technical, or material support: Ohri-Vachaspati, Lloyd, Yedidia.
Supervision: Ohri-Vachaspati, DeLia, Yedidia.

Conflict of Interest Disclosures: Drs Ohri-Vachaspati, Acciai, DeLia, and Yedidia and Ms Lloyd reported receiving grants from the Eunice Kennedy Shriver National Institute of Child Health and Human Development during the conduct of the study. No other disclosures were reported.

Funding/Support: This study was funded by grant 1R03HD080859-01 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (Drs Ohri-Vachaspati, Acciai, and DeLia).

Role of the Funder/Sponsor: The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: Meg Bruening, PhD, RD, MPH (Arizona State University), contributed to procurement of the grant, development of training materials, and study design. For this work she was supported by grant 1R03HD080859 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

1. Centers for Disease Control and Prevention. Anthropometry procedures manual. https://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/manual_an.pdf. Published January 2007. Accessed October 4, 2018.

2. Weden MM, Brownell PB, Rendall MS, Lau C, Fernandes M, Nazarov Z. Parent-reported height and weight as sources of bias in survey estimates of childhood obesity. *Am J Epidemiol*. 2013;178(3):461-473. doi:10.1093/aje/kws477

3. Scholtens S, Brunekreef B, Visscher TLS, et al. Reported versus measured body weight and height of 4-year-old children and the prevalence of overweight. *Eur J Public Health*. 2007;17(4):369-374. doi:10.1093/eurpub/ckl253

4. Huybrechts I, Himes JH, Ottevaere C, et al. Validity of parent-reported weight and height of preschool children measured at home or estimated without home measurement: a validation study. *BMC Pediatr*. 2011;11(1):63. doi:10.1186/1471-2431-11-63

5. Measuring children's height and weight accurately at home. Centers for Disease Control and Prevention website. https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/measuring_children.html. Reviewed May 15, 2015. Accessed October 4, 2018.

6. A SAS program for the 2000 CDC Growth Charts (ages 0 to <20 years). Centers for Disease Control and Prevention website. https://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm. Reviewed February 26, 2019. Accessed October 4, 2018.

Assessment of Underage Sales Violations in Tobacco Stores and Vape Shops

In 2018, the US Centers for Disease Control and Prevention announced a 78% increase in vaping from 2017 to 2018 among high school students, an epidemic characterized by increased use of flavored tobacco products.[1] With a goal to reverse this trend, the US Food and Drug Administration (FDA) announced its intent to limit sales of flavored (excluding menthol) tobacco products to age-restricted (adult-only) locations, such as tobacco and vape shops.[2]

However, the 2017 California tobacco purchase survey[3] reported that tobacco and vape shops had the highest rate of underage sales compared with other types of tobacco retailers. We investigated whether disparate violations persisted in 2018 and whether the FDA's intention to limit the sale of flavored tobacco products to age-restricted locations is adequate.

Methods | This study used data from the 2018 sample (n = 1746) of the California Tobacco Control Program's Young Adult Tobacco Purchase Survey that was drawn from the statewide tobacco retail license list. The data were collected by the California State University, Sacramento. Their institutional review board did not consider this study to involve human subjects' research.

From March through June 2018, decoys (aged 18-19 years) were randomly assigned to purchase either cigarettes (n = 1123) or vape products (n = 498), such as e-liquids and e-cigarettes. The sample also included stores that were considered noncompletes (n = 98) and stores where decoys asked for other tobacco products (eg, little cigars or cigars) (n = 27). According to the standard protocol, decoys did not carry identification (ID) and told the truth about their age. A trained chaperone observed whether ID was requested from the decoy and whether a sale occurred. Tobacco and vape shops were