

The Enigmatic Pursuit of Puberty in Girls

AUTHOR: Marcia E. Herman-Giddens, PA, MPH, DrPH

Department of Maternal and Child Health, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

KEY WORDS

puberty, thelarche, menarche, endocrine disruptors

ABBREVIATIONS

BCERC—Breast Cancer and the Environment Research Centers
NHANES—National Health and Nutrition Examination Survey
PROS—Pediatric Research in Office Settings

Opinions expressed in these commentaries are those of the author and not necessarily those of the American Academy of Pediatrics or its Committees.

www.pediatrics.org/cgi/doi/10.1542/peds.2013-3058

doi:10.1542/peds.2013-3058

Accepted for publication Sep 24, 2013

Address correspondence to Marcia E. Herman-Giddens, PA, DrPH, 1450 Russell Chapel Rd, Pittsboro, NC 27312. E-mail: mherman-giddens@unc.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2013 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The author has indicated she has no financial relationships relevant to this article to disclose.

FUNDING: No external funding

POTENTIAL CONFLICT OF INTEREST: The author has indicated she has no potential conflicts of interest to disclose.

COMPANION PAPER: A companion to this article can be found on page 1019, and online at www.pediatrics.org/cgi/doi/10.1542/peds.2012-3773.



Nuances of puberty, the actual trigger, influencing factors, secular and tempo changes, continue to plague us. Uncertainty, as in quantum physics, may continue. Niels Bohr concluded decades ago that what you see depends on how you look. In the robust Breast Cancer and the Environment Research Centers (BCERC) study in this issue of *Pediatrics* by Biro et al, onset of Tanner 2 breast development is the main end point.¹ This article adds to studies providing the unsettling findings that the age of onset of breast development, in synch with, though not entirely explained by, the “obesity epidemic,” has continued to drop. It will inspire continued investigations of causes and implications for psychosocial public health. Remedies will follow.

The 1997 cross-sectional Pediatric Research in Office Settings (PROS) study on 17 000 US girls, followed by nationally representative data from the National Health and Nutrition Examination Survey III (NHANES), reported earlier onset of secondary sexual characteristics in girls over the previous several decades.² The considerable controversy and angst generated by these findings led to lay and scientific essays and studies here and abroad. Now there is considerable agreement that puberty is occurring earlier.³ Adding further complexity are recent data finding male puberty is also occurring earlier.⁴

This BCERC study seeks to learn more about the role of genetic and environmental influences on breast cancer, acting through the risk factor of early maturation. Its methodology has benefited from lessons learned from recent pubertal studies. Although the 1200 girls are not nationally representative, their diversity provides data requiring our attention. Onset of breast stage 2 occurred at 8.8 years of age for African American girls, 9.3 for Hispanic girls, and 9.7 for white non-Hispanic and Asian girls. White girls experienced breast development 4 months earlier than PROS subjects 15 years prior, a change not entirely explained by current obesity prevalence. Although overall age of breast development onset for BCERC black girls was not different from PROS girls, their proportion of African American first-graders at Tanner 2 tripled in the 15 years between the studies. In the BCERC population, 18% of first-grade black girls are Tanner 2, rising to 38% in the third grade; for white girls it is 4% rising to 21%. BMI did not explain the entire change.¹

Whether this early breast development represents true centrally mediated puberty has been questioned. In 2005, NHANES data 10 years apart found slight menarcheal age declines in white girls from 12.57 to 12.52 and in black girls from 12.09 to 12.06.⁵ NHANES data from the 2003–2008 cohort found further declines to 12.1 years of age for white girls and 11.5 for black girls, incidentally with an inverse relationship between levels of environmental phenols and age of menarche.⁶ These data support the suggestion by Biro et al that the age span for the entire spectrum of puberty has declined, although age of thelarche and menarche appear less linked than before.

A considerable literature supports the obesity epidemic as an important factor in the decline. This article found BMI accounted for 14.2% of the variance of all covariates in their model. Although obesity is implicated as a “prime driver,” factors involved in these secular changes are far more complex. Extensive interacting variables are known to be associated with earlier development in addition to weight and genetics: certain intrauterine conditions and exposures, preschool high-meat diets, dairy products, low fiber intake, isoflavones, high-stress families, absent fathers, certain endocrine disruptors, the microbiome as it influences weight, epigenetics, light exposure, hormone-laced hair products, insulin resistance, activity level, geographical location, and others.³ Animal husbandry has known for decades

that growth and/or the age of puberty can be manipulated by altering nutrition, light exposure, exogenous hormones, and activity.⁷

Each individual girl is exposed to multiple factors in today’s environment, many not present decades ago, that may potentially influence her pubertal onset. Given that the exact trigger for pubertal initiation is still unknown, we hardly can fully understand the interactions of factors known to affect puberty, even with current sophisticated statistical modeling. We may have to live with uncertainty for a long time. Furthermore, because early puberty and menarche are associated with many detrimental health and psychosocial issues, we must not accept this premature development as the “new normal.” Data may appropriately alter

clinical decisions; for example, when invasive procedures are required for evaluating a particular early developer, but they should not alter forward movement on creating a healthier environment for our children.

Companies now market “smaller than regular (menstrual) pads” with sparkling designs for elementary school girls and a genre of deodorants for children aged 8 to 10 with “younger, sensitive skin.”^{8,9} With each new study in the past 2 decades, we hope the age of “early puberty” has bottomed out. When each “new study” has been published, however, we find the trend toward early puberty has continued. Fortunately, we have moved beyond controversy about the data and are responding to the wake-up call.

REFERENCES

1. Biro FM, Greenspan LC, Galvez MP, et al. Onset of breast development in a longitudinal cohort. *Pediatrics*. 2013;132(6):1019–1027
2. Euling SY, Herman-Giddens ME, Lee PA, et al. Examination of US puberty-timing data from 1940 to 1994 for secular trends: panel findings. *Pediatrics*. 2008;121(suppl 3):S172–S191
3. Biro FM, Greenspan LC, Galvez MP. Puberty in girls of the 21st century. *J Pediatr Adolesc Gynecol*. 2012;25(5):289–294
4. Herman-Giddens ME, Steffes J, Harris D, et al. Secondary sexual characteristics in boys: data from the Pediatric Research in Office Settings Network. *Pediatrics*. 2012;130(5). Available at: www.pediatrics.org/cgi/content/full/1305/e1058
5. Anderson SE, Must A. Interpreting the continued decline in the average age at menarche: results from two nationally representative surveys of US girls studied 10 years apart. *J Pediatr*. 2005;147(6):753–760
6. Buttke DE, Sircar K, Martin C. Exposures to endocrine-disrupting chemicals and age of menarche in adolescent girls in NHANES (2003-2008). *Environ Health Perspect*. 2012;120(11):1613–1618
7. Robertson GL, Casida LE, Grummer RH, Chapman AB. Some feeding and management factors affecting age at puberty and related phenomena in Chester White and Poland China gilts. *J Anim Sci*. 1951;10:841–866
8. U by Kotex Tween. Available at: www.ubykotex.com/products/tween-pads/1223. Accessed September 19, 2013
9. Boots. Keep It Kind Fresh Kidz Deodorant. Available at: www.boots.com/en/Keep-It-Kind-Fresh-Kidz-Deodorant-Roll-on-50ml_1305069/. Accessed September 19, 2013

The Enigmatic Pursuit of Puberty in Girls

Marcia. E. Herman-Giddens

Pediatrics 2013;132;1125

DOI: 10.1542/peds.2013-3058 originally published online November 4, 2013;

Updated Information & Services

including high resolution figures, can be found at:
<http://pediatrics.aappublications.org/content/132/6/1125>

References

This article cites 7 articles, 3 of which you can access for free at:
<http://pediatrics.aappublications.org/content/132/6/1125#BIBL>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):
Endocrinology
http://www.aappublications.org/cgi/collection/endocrinology_sub
Puberty
http://www.aappublications.org/cgi/collection/puberty_sub

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
<http://www.aappublications.org/site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:
<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

The Enigmatic Pursuit of Puberty in Girls

Marcia. E. Herman-Giddens

Pediatrics 2013;132;1125

DOI: 10.1542/peds.2013-3058 originally published online November 4, 2013;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/132/6/1125>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2013 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

