

COMPARING ATHLETIC PERFORMANCES THE BEST ELITE WOMEN TO BOYS AND MEN

[Doriane Lambelet Coleman](#) and [Wickliffe Shreve](#)

If you know sport, you know this beyond a reasonable doubt: there is an average 10-12% performance gap between elite males and elite females. The gap is smaller between elite females and non-elite males, but it's still insurmountable and that's ultimately what matters. Translating these statistics into real world results, we see, for example, that:

Just in the single year 2017, Olympic, World, and U.S. Champion Tori Bowie's 100 meters lifetime best of 10.78 was beaten 15,000 times by men and boys. (Yes, that's the right number of zeros.)

The same is true of Olympic, World, and U.S. Champion Allyson Felix's 400 meters lifetime best of 49.26. Just in the single year 2017, men and boys around the world outperformed her more than 15,000 times.

This differential isn't the result of boys and men having a male identity, more resources, better training, or superior discipline. It's because they have an androgenized body.

The results make clear that sex determines win share. Female athletes – here defined as athletes with ovaries instead of testes and testosterone (T) levels capable of being produced by the female, non-androgenized body – are not competitive for the win against males—here defined as athletes with testes and T levels in the male range. The lowest end of the male range is three times higher than the highest end of the female range. Consistent with females' far lower T levels, the female range is also very narrow, while the male range is broad.

These biological differences explain the male and female secondary sex characteristics which develop during puberty and have lifelong effects, including those most important for success in sport: categorically different strength, speed, and endurance. There is no other physical, cultural, or socioeconomic trait as important as testes for sports purposes.

The number of men and boys beating the world's best women in the 100 and 400 meters is far from the exception. It's the rule. To demonstrate this, we compared the top women's results to the boys' and men's results across multiple standard track and field events, just for the single year 2017. Our data are drawn from the International Association of Athletics Federations (IAAF) website which provides complete, worldwide results for individuals and events, including on an annual and an all-time basis.

We have limited the analysis to those events where a direct performance comparison could be made. For instance, we included the 100 meters because both males and females compete over exactly the same distance; but we excluded the shot put because males and females use a differently weighted shot.

TABLE 1 compares the number of boys – males under the age of 18 – whose results in each event in 2017 would rank them above the single very best elite “senior” woman that year. (In elite sport, “senior” simply means “adult.” The best “senior” athletes are the world’s best athletes.)

TABLE 1 – World’s Best Woman v. Under 18 Boys			
Event	Best Women’s Result	Best Boys’ Result	# of Boys Outperforming
100 Meters	10.71	10.15	124 ⁺
200 Meters	21.77	20.51	182
400 Meters	49.46	45.38	285
800 Meters	1:55.16 [*]	1:46.3	201+
1500 Meters	3:56.14	3:37.43	101+
3000 Meters	8:23.14	7:38.90	30
5000 Meters	14:18.37	12:55.58	15
High Jump	2.06 meters	2.25 meters	28
Pole Vault	4.91 meters	5.31 meters	10
Long Jump	7.13 meters	7.88 meters	74
Triple Jump	14.96 meters	17.30 meters	47

TABLE 2 compares the number of men – males over 18 – whose results in each event in 2017 would have ranked them above the very best elite woman that year. The differential increases significantly here, often by a factor of 20.

TABLE 2 – World’s Best Woman v. Number of Men Outperforming			
Event	Best Women’s Result	Best Men’s Result	# of Men Outperforming
100 Meters	10.71	9.69	2,474
200 Meters	21.77	19.77	2,920
400 Meters	49.46	43.62	4,341
800 Meters	1:55.16 [*]	1:43.10	3,992+
1500 Meters	3:56.14	3:28.80	3,216+
3000 Meters	8:23.14	7:28.73	1307+
5000 Meters	14:18.37	12:55.23	1,243
High Jump	2.06 meters	2.40 meters	777
Pole Vault	4.91 meters	6.00 meters	684
Long Jump	7.13 meters	8.65 meters	1,652
Triple Jump	14.96 meters	18.11 meters	969

⁺ Numbers marked with a “+” indicate events where the cutoff set by the IAAF for the men’s or boys’ list was faster than the top woman’s result for 2017; therefore, it is possible that more men or boys have outperformed the top woman’s result and were not included on the list.

^{*} The 2017 world best in the women’s category in the 800 meters was run by an athlete who is widely reported to have testes and T levels in the male range.

As surprising as those numbers may be to many people, the comparison is staggering when we count the number of *times* males outperformed the best female's result in each event in 2017. These results are provided in TABLE 3.

TABLE 3 – World's Best Woman v. Instances of Men Outperforming			
Event	Best Women's Result	Best Men's Result	Instances of Men Outperforming
100 Meters	10.71	9.69	10,009
200 Meters	21.77	19.77	8,993
400 Meters	49.46	43.62	13,898
800 Meters	1:55.16*	1:43.10	12,285+
1500 Meters	3:56.14	3:28.80	8,251+
3000 Meters	8:23.14	7:28.73	1,784+
5000 Meters	14:18.37	12:55.23	2,140
High Jump	2.06 meters	2.40 meters	2,741
Pole Vault	4.91 meters	6.00 meters	2,981
Long Jump	7.13 meters	8.65 meters	4,801
Triple Jump	14.96 meters	18.11 meters	3,440

Not only did hundreds and thousands of males outperform the best results of the elite females, they did so thousands and *tens* of thousands of times. (Yes, again, that's the right number of zeros.)

Here's a combined version of the three tables:

TABLE 4						
Event	Best Women's Result	Best Boys' Result	Best Men's Result	# of Boys Outperforming	# of Men Outperforming	Instances of Men Outperforming
100 Meters	10.71	10.15	9.69	124+	2,474	10,009
200 Meters	21.77	20.51	19.77	182	2,920	8,993
400 Meters	49.46	45.38	43.62	285	4,341	13,898
800 Meters	1:55.16*	1:46.3	1:43.10	201+	3,992+	12,285+
1500 Meters	3:56.14	3:37.43	3:28.80	101+	3,216+	8,251+
3000 Meters	8:23.14	7:38.90	7:28.73	30	1307+	1,784+
5000 Meters	14:18.37	12:55.58	12:55.23	15	1,243	2,140
High Jump	2.06 meters	2.25 meters	2.40 meters	28	777	2,741
Pole Vault	4.91 meters	5.31 meters	6.00 meters	10	684	2,981
Long Jump	7.13 meters	7.88 meters	8.65 meters	74	1,652	4,801
Triple Jump	14.96 meters	17.30 meters	18.11 meters	47	969	3,440

QUESTIONS ABOUT SEX IN SPORT AND SPORTS POLICIES

These data and comparisons explain why competitive sport has traditionally separated biological males (people with male bodies) from biological females (people with female bodies), and also why legal measures like Title IX in the United States require institutions to set aside and protect separate and equal funding, facilities, and opportunities for women and girls.

Still, society is being pushed in this period to reconsider both importance of separate sport compared to other values, and the way the girls' and women's category is protected. As a result, the conversation includes four general categories of policy options:

1. Keeping girls' and/or women's sport only for females.
2. Keeping the two categories but allowing males to compete in girls' and women's events (a) where they identify as girls and women, and/or (b) because they want the opportunity for some other reason, e.g., they are swimmers and their high school has a girls' but not a boys' swim team.
3. Keeping the two categories but allowing males to compete in girls' and women's events only if they identify as such and they transition their testosterone levels to within the female – ovarian – range.
4. Erasing the categories – no divisions by “male” and “female” however these are defined – and featuring only “open” sports and events where everyone competes together, or else in sports and events based on different classifications like height or weight.

Our goal in developing and presenting the data and comparisons in TABLES 1- 4 is to provide some of the facts necessary to evaluate these options and to help answer the overarching question: what would happen if we stopped classifying athletes on the basis of sex or else allowed exceptions to that rule? More specifically, we hope that the data and comparisons are useful as people think about the following questions:

*How important is sport, its particular events, and goals?

*Should societies and sports governing authorities continue to be committed to equal sports events and opportunities for boys and girls, men and women?

*Are there good reasons to ensure that biological females (people with female bodies) are included and visible in competitive sport, and if so, does it matter how they are visible? For example, is it enough that they are given an opportunity to participate at some point in development sport, or is it important that they are competitive for the win so that we see them in championships and on the podium?

*In general, the goals of the identity movement are to ensure that people who are trans and intersex are fully and equally included in society's important institutions on the basis of their identity, not

their (reproductive) biology. In cases of conflict between the goals of the identity movement and sports' traditional goals for girls' and women's sport, what should our priority be: equal opportunity in sport for girls and women or the ability of each individual to participate in sports on their own terms?

*Should our priorities depend on the sporting context, for example, is or should the priority be different in elementary school, junior high school, high school, college, and professional sport?

*If we want to have it all – to respect everyone's gender identity and still to support girls' and women's sport by making a place for athletes with female bodies in competition – what's the best way forward? What's the best compromise position? Ultimately, this is the most important question for sports policymakers in this period.

- A. Is it acceptable to include everyone but still to classify on the basis of sex, like we do already on the basis of weight in wrestling and boxing? For example, could the Olympic Committee have required Bruce Jenner – before he became Caitlyn and transitioned physically – to compete as a man in the men's decathlon?
- B. Would it have been more or less acceptable to have required Jenner to compete in the men's decathlon, but not to prescribe how she expresses her identity as a woman?
- C. If Jenner before her physical transition had wanted to compete in the women's heptathlon, would it have been acceptable for the Olympic Committee to have required her first to transition physically, at least her testosterone levels, so that – although she would still be competing with a lot of developed male traits useful for athletics – all competitors would compete on equal footing in terms of steroid levels?
- D. If none of these options strikes the right balance between the two important competing interests, is there another option that does?

SOURCES OF INFORMATION AND FURTHER READING

For the IAAF's results databases, sortable by multiple categories, see:

<https://www.iaaf.org/records/toplists/sprints/100-metres/outdoor/men/senior/2018>.

For an example of the different competition requirements for men/women and boys/girls for events requiring specific equipment – for example, for the hurdles, shot put, etc. – see:

<http://www.usatf.org/groups/officials/files/resources/track-events/Hurdle-Placement-Heights-Feb2011.pdf>

For more information on the goals of Title IX and girls' and women's sport we recommend:

Women's Sports Foundation, [Issues Related to Girls and Boys Competing With and Against Each Other in Sports and Physical Activity Settings](https://www.womenssportsfoundation.org/wp-content/uploads/2016/11/issues-related-to-girls-and-boys-competing-with-and-against-each-other-in-sports-and-physical-activity-settings-the-foundation-position.pdf) (2016), available at <https://www.womenssportsfoundation.org/wp-content/uploads/2016/11/issues-related-to-girls-and-boys-competing-with-and-against-each-other-in-sports-and-physical-activity-settings-the-foundation-position.pdf>

For more information on the role of testosterone in sex differentiation, the male and female testosterone ranges, the role of testosterone in athletic performance, the goals of sport, and sex testing in sport, see:

Doriane Lambelet Coleman, [Sex in Sport](https://scholarship.law.duke.edu/lcp/vol80/iss4/5), 80 *Law & Contemporary Problems* 63 (2017), available at <https://scholarship.law.duke.edu/lcp/vol80/iss4/5>.

Joanna Harper, [Race Times for Transgender Athletes](http://jrci.cgpublisher.com/product/pub.301/prod.4), 6 *Journal of Sporting Cultures and Identities* 1 (2015), available at <http://jrci.cgpublisher.com/product/pub.301/prod.4>

Gina Kolata, [Men, Women and Speed. 2 words: Got Testosterone?](https://www.nytimes.com/2008/08/22/news/22iht-22testosterone.15533354.html), N.Y. Times, Aug. 22, 2008, <https://www.nytimes.com/2008/08/22/news/22iht-22testosterone.15533354.html>

There's been a lot written about the inclusion of intersex and trans athletes in sport which doesn't acknowledge (or flatly rejects) the facts of biological and competitive sex differences. If you'd like to read more from others who accept these facts, we recommend:

Richard J. Auchus, [Endocrinology and Women's Sports: The Diagnosis Matters](https://scholarship.law.duke.edu/lcp/vol80/iss4/6/), 80 *Law & Contemporary Problems* 130 (2017) (explaining the biology of intersex athletes as it's relevant to sport), available at <https://scholarship.law.duke.edu/lcp/vol80/iss4/6/>

Erin E. Buzuvis, [Challenging Gender in Single-Sex Spaces: Lessons from a Feminist Softball League](https://scholarship.law.duke.edu/lcp/vol80/iss4/8/), 80 *Law and Contemporary Problems* 155 (2017), available at <https://scholarship.law.duke.edu/lcp/vol80/iss4/8/>

Erin E. Buzuvis, ["On the Basis of Sex": Using Title IX to Protect Transgender Students from Discrimination in Education](https://hosted.law.wisc.edu/wordpress/wjlg/files/2014/07/Buzuvis-Article.pdf), 31 *Wisconsin Journal of Law, Gender and Society* 29 (2016), available at <https://hosted.law.wisc.edu/wordpress/wjlg/files/2014/07/Buzuvis-Article.pdf>

Shasta Darlington, [Transgender Volleyball Star in Brazil Eyes Olympics and Stirs Debate](https://www.nytimes.com/2018/03/17/world/americas/brazil-transgender-volleyball-tiffany-abreu.html), N.Y. Times, March 17, 2018, <https://www.nytimes.com/2018/03/17/world/americas/brazil-transgender-volleyball-tiffany-abreu.html>

Joanna Harper, [Athletic Gender](https://scholarship.law.duke.edu/lcp/vol80/iss4/7/), 80 *Law and Contemporary Problems* 139 (2017), available at <https://scholarship.law.duke.edu/lcp/vol80/iss4/7/>

There's also been a lot written recently about male-to-female trans kids who are competing and winning in girls' high school sport in the United States. For discussions and stories on this issue, see:

Karma Allen, *[Trangender Teens Outrun Track and Field Competitors but Critics Close Behind](https://abcnews.go.com/US/transgender-teens-outrun-track-field-competitors-critics-close/story?id=55856294)*, ABCNews.com, June 13, 2018, <https://abcnews.go.com/US/transgender-teens-outrun-track-field-competitors-critics-close/story?id=55856294>

Katie Barnes, *[They Are the Champions](http://www.espn.com/espnw/feature/23592317/how-two-transgender-athletes-fighting-compete-sports-love)*, ESPN.com, May 29, 2018, <http://www.espn.com/espnw/feature/23592317/how-two-transgender-athletes-fighting-compete-sports-love>

Jeff Jacobs, *[No Easy Answers When it Comes to Transgender Athletes](https://www.ctpost.com/highschool/article/Jeff-Jacobs-No-easy-answers-when-it-comes-to-12967306.php)*, C.T. Post, June 4, 2018, <https://www.ctpost.com/highschool/article/Jeff-Jacobs-No-easy-answers-when-it-comes-to-12967306.php>

Cyd Zeigler, *[As Trans High School Athletes Win State Titles, Parent Petition to Ban Them](https://www.outsports.com/2018/6/14/17458696/trans-athlete-connecticut-high-school-ban-petition)*, Outsports Blog (June 14, 2018, 7:48 AM), <https://www.outsports.com/2018/6/14/17458696/trans-athlete-connecticut-high-school-ban-petition>

Here are some links to stories about (cis) boys who are competing on girls' teams and in girls' events for different reasons:

Caroline Crosson Gilpin, *[Should Girls and Boys Sports Teams Compete in the Same League?](https://www.nytimes.com/2017/05/12/learning/should-girls-and-boys-sports-teams-compete-in-the-same-league.html)*, N.Y. Times, May 12, 2017, <https://www.nytimes.com/2017/05/12/learning/should-girls-and-boys-sports-teams-compete-in-the-same-league.html>

Nancy Haggerty, *[The Politics of Boys Playing a 'Girls' Sport](http://usatodayhss.com/2015/the-politics-of-boys-playing-a-girls-sport)*, USA Today, Sept. 3, 2015, <http://usatodayhss.com/2015/the-politics-of-boys-playing-a-girls-sport>

Karen Crouse, *[Girl Defeats Boys to Win Girls Swim Title](https://www.nytimes.com/2011/11/20/sports/broderick-wins-massachusetts-girls-swim-title-against-field-including-boys.html)*, N.Y. Times, Nov. 19, 2011, <https://www.nytimes.com/2011/11/20/sports/broderick-wins-massachusetts-girls-swim-title-against-field-including-boys.html>

Karen Crouse, *[Boys Swimming on Girls Teams Find Success, Then Draw Jeers](https://www.nytimes.com/2011/11/19/sports/boys-swimming-on-girls-teams-find-success-then-draw-ire.html)*, N.Y. Times, Nov. 18, 2011, <https://www.nytimes.com/2011/11/19/sports/boys-swimming-on-girls-teams-find-success-then-draw-ire.html>

If you'd like to read more about how puberty affects boys and girls differently in terms of their athletic capacities, and whether sex segregation is necessary before puberty, see:

Matthew Futterman, *[America's Next Great Running Hope, and One of the Cruellest Twists in Youth Sports](https://www.nytimes.com/2018/06/08/sports/katelyn-tuohey.html)*, N.Y. Times, June 8, 2018, <https://www.nytimes.com/2018/06/08/sports/katelyn-tuohey.html>

Marnee McKay & Joshua Burns, *When it Comes To Sport, Boys 'Play Like a Girl'*, The Conversation, Aug. 3, 2017, <http://theconversation.com/when-it-comes-to-sport-boys-play-like-a-girl-80328>

Joel M. Stager and Andrew C. Cornett, *Sex Differences in Childhood Athletic Performance* (2012), available at <https://secure.edweek.org/media/sexdifferences-blog.pdf>

Espen Tønnessen et al., *Performance Development in Adolescent Track and Field Athletes According to Age, Sex and Sport Discipline*, PLoS ONE (June 4, 2015), <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0129014>