Women's Sports Policy Working Group

FREQUENTLY ASKED QUESTIONS – ABOUT SCIENCE AND SEX

WomensSportsPolicy.org

Q1. What is "biological sex"?

A1. Biological sex is the designation of an individual as male or female based on reproductive organs and associated primary and secondary sex characteristics. Biologically, they are either female with ovaries/eggs and an estrogenic endocrine system, or they are male with testes/sperm and an androgenic endocrine system.

Q2. What are sex differences?

A2. Sex differences are anatomical and physiological differences that are determined by or related to biological sex. Males on the one hand and females on the other have distinct genetic and chromosomal, gonadal, endocrinological, and phenotypic (external secondary) characteristics. The field of sex differences in biomedical research specifically studies these distinctions, which have implications not only for reproduction and sport, but also for immunology and cardiovascular health, among other things. As the Institute of Medicine has explained, "basic biochemical differences" exist between males and females even "at the cellular and molecular levels."

Q3. Why do we have separate sex sport?

A3. We have separate sex sport and eligibility criteria based on biological sex because this is the only way we can assure that female athletes have the same opportunities as male athletes not only to participate but also to win in competitive sport. We also separate males and females in contact sports for reasons related to on-the-field playing-safety. From the onset of male puberty, male bodies develop such that they are as a group faster, stronger, and more powerful than female bodies as a group. The performance gap between male and female athletes that emerges from that point typically ranges from 8-20%, but up to 50% depending on the sport and event. If we did not separate athletes on the basis of biological sex - if we used any other physical criteria - we would never see females in finals and on podiums.

Q4. Couldn't we have eligibility criteria for the two divisions (male and female) based on some different (other than sex) physical criteria?

A4. No. There are no other physical criteria that could be used to determine eligibility that would similarly assure sex equality in competitive sport. Based on those different criteria, e.g., matching leg length, wing span, height, weight, etc., males as a group would always outperform females as a group because their biological sex differences, primarily testosterone levels in the

male range from the onset of puberty and throughout the athletic career. Team USA stars Missy Franklin and Ryan Lochte illustrate this point well. They are both multiple Olympic and world champions in swimming. Both had first class training, coaching, and support. Both are 6'2" with reported 6'4" wingspans. Both held the world record in the 200 meters backstroke. But had they raced each other on their best days, Lochte would have finished about a half lap ahead of Franklin. In 2012, the year Franklin set her world record, her time of 2:04.06 would have placed her in a tie for 50th in the U.S. men's Olympic Trials.

Q5. If a boy and a girl are the same height, weight, and body build, aren't they likely to be essentially the same athletically?

A5. No. Testosterone-driven sex differentiation at puberty results in males developing larger hearts and higher capacity for oxygen transport and carbohydrate processing, as well as different skeletal and muscular composition. All of these characteristics provide males with superior strength, speed, power, and endurance.

Q6. What do scientific experts estimate is the sports performance advantage of post pubescent males?

A6. Experts estimate the male advantage is normally between 8 and 20% depending on the sport and event, and up to 50% in sports and events featuring explosive power. For example: Team USA's best female high jumper is Vashti Cunningham, NFL star Randall Cunningham's daughter. She is regularly ranked among the top ten best female high jumpers in the world. Her best jump as a professional (6' 6 ½") is regularly surpassed by dozens of U.S. high school boys.

As the chart immediately below – comparing California high school performances – shows, this isn't a phenomenon exclusive to professionals. Because the performance gap emerges at the onset of male puberty, as a group, high school girls have no chance against high school boys as a group.

2019 CALIFORNIA REGIONAL HIGH JUMP RESULTS[1]

[1] This chart is based on data from Athletics.net, California High Jump Results, accessed on September 25, 2019.

REGION	BEST HIGH SCHOOL BOY	BEST HIGH SCHOOL GIRL	% DIFFERENCE
Central	6'10"	5'10"	14.63%
Central Coast	6'6"	5'6"	15.38%
Los Angeles	6'2"	5'2"	16.22%
North Coast	6'10"	5'5"	20.73%
Northern	6'5"	5'6"	14.29%
Oakland	5'11"	4'10"	18.31%
Sac-Joaquin	6'8"	5'8 1/4"	14.69%
San Diego	6'8"	5'10 1/2"	11.88%
San Francisco	6'0"	4'10"	19.44%
Southern	7'0"	5'8 1/2"	18.45%

Q7. Are advocacy groups correct when they say that it's a myth and an outdated stereotype that females can't compete with males?

A7. No. It is a fact - not myth or outdated stereotype - that starting from the onset of male puberty, i.e., starting in middle school, there is an average 8-20% performance gap between males and females, which reaches to 50% in some sports and events. The proposition that better resources and support for female athletes can change biological imperatives and competitive results is false. Some individual females can and will outperform some individual males. But even the very best female athletes are routinely surpassed not only by the very best male athletes but also by second tier or mediocre male athletes. For example, the world records in the men's and women's shot put are nearly identical – 74'4" for the men and 74'2$^{3/4}$" for the women. But the women's shot is 8.8 lbs. while the men's is almost twice as heavy at 16 lbs. The same pattern holds for the women's world records in all of the races on the track from 100 meters to 10,000 meters. Indeed, not only are those records surpassed by many men each year, they are also surpassed by many high school boys. The pattern also holds for high school athletes who aren't yet superstars. With rare exceptions, from the onset of male puberty, even the best high school girls have no chance against high school boys.

Q8. What does testosterone have to do with separate sex sport—why are we always hearing about testosterone in this context?

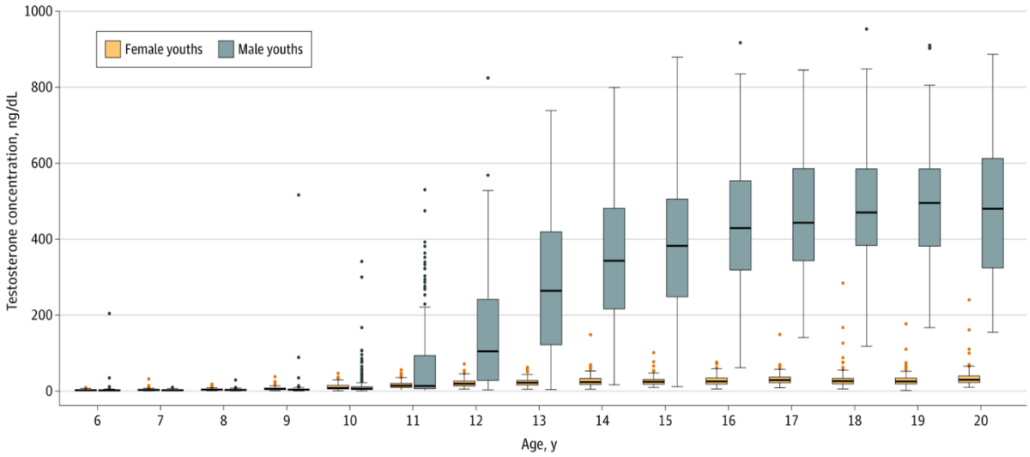
A8. Testosterone is an anabolic-androgenic steroid. *Anabolic* steroids build body tissue, including but not limited to bone and muscle tissue and red blood cells. *Androgenic* steroids are responsible for male sex differentiation, i.e., for the development of male primary sex characteristics (in utero), and male secondary sex characteristics (in puberty). Because of its body building and sex differentiation effects, testosterone produced *endogenously* (naturally within the human body) is the primary driver of the sex differences in athletic performance, i.e., of the

performance gap between male and female athletes. Beginning at puberty, at approximately age 11, the male testes begin producing significantly more testosterone than they did earlier in childhood, and also significantly more than is ever produced by female ovaries. This increased production triggers the onset of male puberty, and thereafter builds and sustains the male body in the respects that matter for sports performance: speed, strength, power, and endurance. The *exogenous* use of testosterone (doping) is banned by all national and international sports organizations because of these anabolic effects.

Q9. What do people mean when they say that there is a "male range" and a "female range" for testosterone?

A9. Both males and females produce testosterone naturally in their bodies, males primarily in the testes and females primarily in the ovaries. Starting from the onset of male puberty, generally about age 11, testes begin to produce much more testosterone than ovaries. From that point forward, the normal female range is between 0.06 and 1.68 nanomoles per liter (nmol/L), and the normal male range is between 7.7 and 29.4 nmol/L. The gap between top of the female range and the bottom of the male range is 6.02 nmol/L. Converted to ng/dL – the metric typically used in medicine in the U.S. – the normal female range is from 1.73 to 48.45 ng/dL, the normal male range is from 222 to 848 ng/dL, and the gap between the top of the female range and the bottom of the male range is 173 ng/dL.

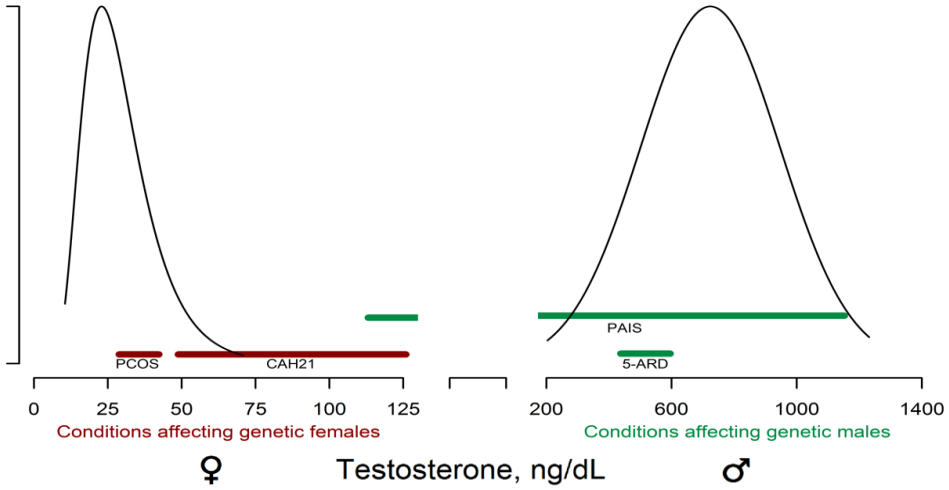
The figure below was published this year in the Journal of the American Medical Association (JAMA). It represents data from the U.S. National Health and Nutrition Examination Survey (NHANES). It shows the increase in testosterone concentration in male youth starting from age 11 onward, as well as the gap that emerges as a result between male and female testosterone levels.



(from J. Senefeld et al., JAMA Research Letter (2020))

Q10. Don't some healthy females produce testosterone in the "male" range?

A10. No. Although females do produce testosterone, mainly in their ovaries, healthy post-pubertal females never produce testosterone levels as high as post-pubertal males. Throughout childhood, up until the onset of male puberty, male and female testosterone levels are about the same; but from the onset of male puberty, male testes produce significantly more testosterone than female ovaries. From that point forward, normal female testosterone levels fall in a narrow range between 0.06 and 1.68 nanomoles per liter (nmol/L), and male levels fall in a broader range between 7.7 and 29.4 nmol/L. The gap between the normal male range and the normal female range is wide. As the following figure indicates, there is no overlap. Some biological females have higher than normal female testosterone levels, for example if they have polycystic ovaries, but again, no healthy female has a testosterone level even close to the normal male range.



This figure shows the normal female testosterone range on the left and the normal male range on the right. It also shows the abnormal testosterone ranges that can be produced by people with certain differences of sex development (DSDs). Some people with DSD prefer to describe themselves as intersex. The conditions marked in red are among those that affect genetic (biological) females. Those marked in green are two that affect (genetic) biological males. Those conditions are described further in the answer to Question 27 below.

Some advocates for trans and intersex athletes claim that there is an overlap in the normal ranges. This claim is not supported by the data or the current peer-reviewed literature. Their argument depends on the existence of a small number of outlier (abnormal) readings, i.e., on a small number of higher-than-normal female T readings and a small number of lower-than-normal male T readings. These abnormal readings are used by advocates to construct a "spectrum" that *appears* to negate the normal bimodal distribution by "filling in" the gap between the two ranges.[2] The figure above shows one way this optical effect can be achieved. It requires ignoring that more than 99%

[2] Advocates may refer to this older paper to support their claim: Healy ML, et al., Endocrine profiles in 693 elite athletes in the postcompetition setting. Clin Endocr. 2014; 81(2): 294-305. PMID: 24593684.

of the population has readings in the normal ranges, and then "filling in" the gap between those ranges with readings from the less than 1% of the population that has an intersex condition.

As the leading experts in the field have established, however, the overlap argument is not supported by the data points themselves, which do not distinguish between (1) doped and non-doped females; (2) females and males with differences of sex development; and (3) male readings taken at rest and following strenuous exercise—the latter has been established temporarily to lower normal levels. Additionally, they measure testosterone by immunoassay – which is inaccurate at lower testosterone concentrations in women – rather than by state-of-the-art methodology, i.e., by mass spectrometry.[3] Once those errors are corrected, the overlap disappears.

Q11. Don't elite female athletes have high testosterone levels—isn't this what makes them good athletes?

A11. No. Elite female athletes generally have testosterone levels within the normal female range, i.e., below 1.68 nmol/L. If they have the condition known as polycystic ovary syndrome (PCOS), they may have testosterone levels up to 3 nmol/L, or, in rare instances, up to 4.8 nmol/L. This is why some sports organizations, wishing to be inclusive of all possible healthy biological females, set their maximum testosterone level at 5 nmol/L.

Q12. Why have many sports organizations adopted a testosterone test for their eligibility standard for inclusion in women's sport?

A12. Testosterone is an excellent proxy for biological sex and a valid basis for an eligibility rule for the women's category for the following reasons:

- Testosterone is the primary driver of the sex differences in athletic performance;
- Sport already tests for and monitors testosterone levels as part of the normal anti-doping process; and
- Different sex testing protocols are more intrusive and, in some cases, less accurate.

No other single criterion so comprehensively addresses sport's and society's concerns about the testing protocol.

Q13. Why have some sports organizations adopted the testosterone level of 5 nmol/L as the upper limit for inclusion in the female category?

A13. Some sports organizations have adopted the level of 5 nmol/L as the upper limit for inclusion in the female category because it represents the outermost bounds that a healthy biological female – regardless of her legal or gender identity – can reach naturally. Almost all females, including elite athletes, have testosterone levels well below 5 nmol/L. The normal female range is between 0.06 and 1.68 nmol/L. Even females with the condition known as polycystic ovary syndrome (PCOS) – which can dramatically raise testosterone levels – only very

[3] Handelsman DJ, Hirschberg AL, Bermon S. Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance. Endocr Rev. 2018;39(5):803-29. Epub 2018/07/17. Clark RV, Wald JA, Swerdloff RS, Wang C, Wu FCW, Bowers LD, Matsumoto AM 2019 Large divergence in testosterone concentrations between men and women: Frame of reference for elite athletes in sex-specific competition in sports, a narrative review. Clin Endocrinol (Oxf) 90:15-22.

occasionally reach 3 nmol/L, with rare readings up to 4.8 nmol/L. Setting the level at 5 nmol/L assures that no otherwise healthy biological female could be excluded by the standard. Given that 5 nmol/L is already high, however, some international federations are considering the lower limit of 3 nmol/L.

Q14. Why is only the female category policed for testosterone levels—why doesn't sport also set an upper limit for the male category?

A14. The female category was carved out from open (mixed or co-ed) sport as a protected space where females could compete only against each other and not also against males. It was designed specifically to exclude males, i.e., people with male sex-linked performance advantages. Testosterone is the primary driver of these sex-linked advantages. The male category is not policed because it does not need protection from itself; it was not designed to exclude or regulate males with natural male testosterone levels. Elite sport does, however, monitor testosterone levels in all athletes, male and female, for exogenous use of (i.e., doping with) androgens, including testosterone.

Q15. Are advocacy groups correct when they say that there is no evidence that trans girls/women have an advantage over females in sport?

A15. No. They are wrong. Trans girls/women are biologically male. Consequently, unless they go on puberty blockers and then on gender affirming hormones before the onset of male puberty, they benefit from normal male sex development and differentiation. There is overwhelming evidence that individuals who are biologically male – however they identify – have an athletic advantage over individuals who are biologically female—however they identify. Gender identity has nothing to do with athletic ability. Additionally, there is convincing evidence[4] that, depending on the task, skill, sport, or event, trans women maintain male sex-linked (legacy) advantages even after a year on standard gender-affirming hormone treatment.

Q16. Are advocacy groups correct when they say that any remaining advantages males have over females in sport are the result of cultural stereotypes and lesser opportunities for development, training, and competition?

A16. No. They are wrong. Although stereotypes and opportunities can affect the degree of the performance gap between the best females and the best males, especially in third world countries, for almost all sports and events we know that the gap itself is biologically-based and immutable.

---

[4] (1) Roberts TA, Smalley J, Ahrendt D. Effect of gender affirming hormones on athletic performance in transwomen and transmen: implications for sporting organisations and legislators. Br J Sports Med. 2020. Epub 2020/12/09. (2) Hilton EN, Lundberg TR. Transgender Women in The Female Category of Sport: Perspectives on testosterone suppression and performance advantage. Sports Medicine. 2021;51:(in press) (PMID 33289906 and doi: 10.1007/s40279-020-01389-3). (3) Handelsman DJ, Hirschberg AL, Bermon S. Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance. Endocr Rev. 2018;39(5):803-29. Epub 2018/07/17. See also (4) Gooren LJ, Bunck MC. Transsexuals and competitive sports. Eur J Endocrinol. 2004;151(4):425-9. (5) Wiik A, Lundberg TR, Rullman E, et al. Muscle Strength, Size, and Composition Following 12 Months of Gender-affirming Treatment in Transgender Individuals. J Clin Endocrinol Metab. 2020;105(3). Epub 2019/12/04.

Q17. What does it mean physically or biologically to say that someone is "transgender"?

A17. A transgender person is currently defined as someone whose identifies as other than their biological sex. For example, a trans girl/woman is someone who identifies as a girl/woman even though they are biologically male. A person does not need to take gender affirming hormones or have surgery to be considered transgender. Some transgender people are not on hormones and have not had surgery. Some transgender people take hormones but do not have surgery. And some transgender people do both. Whether a transgender person takes hormones, the level at which they choose to set their hormones, and whether they have surgery, are all matters of personal choice, medical advice, and/or opportunity.

Q18. Do all trans girls/women have a testosterone advantage?

A18. No. Those trans girls/women who *never* experience the onset of male puberty do not develop the secondary sex characteristics that are responsible for the performance gap between male and female athletes. Preventing male puberty involves taking puberty blockers before its onset, and thereafter transitioning to gender affirming hormones that keep testosterone levels consistently within the female range. In contrast, trans girls/women who go on blockers and/or gender affirming hormones and/or have a gonadectomy only *after* they experience some or all of male puberty retain a "legacy advantage" as a result of this experience. The degree of their legacy advantage depends on a combination of factors including: the extent to which they have experienced puberty; whether they had a gonadectomy (surgical removal of their testes); the levels at which they maintain their circulating testosterone; and the particular sport and event in which they compete.

Q19. What is meant by "legacy advantages" in the discussion of trans girls/women in girls/women's sport?

A19. Legacy advantages are the male sex-linked advantages that remain even after a trans girl/woman has gone on gender affirming hormones and/or gender affirming surgery. They are the benefits for sport of having gone through all or part of puberty as a male.

Q20. Does transgender inclusion have anything to do with doping or performance enhancing drugs (PEDs), and if so, what's the connection?

A20. Doping is the exogenous use – the taking – of prohibited performance enhancing drugs (PEDs), including testosterone and other body building androgens. These are among the substances that propelled the East German women to victory in the Olympic Games and World Championships in the 1970s and 1980s, costing clean American women and Team USA to lose out on medals they would otherwise have won. Some American athletes have also doped with androgens, but not in the systematic and state-sponsored way as the East Germans, and more recently the Russians. Trans girls/women who want to be included in girls'/women's events are not doping; that is, they aren't taking PEDs to compete. But their natural testosterone levels build

strength, speed, and power in the same way that doping does; and because their natural levels are much higher than even those of doped female athletes, the effect on competition is the same or more overwhelming for the clean females in the field.

Q21. Do we have any data on the impact of trans girls with no medical intervention in girls' high school sports?

A21. Yes. The data that exist about trans girls with no medical intervention are consistent with the fact that they are biologically male. For example, based on its interpretation of the State of Connecticut's Equality Act, the Connecticut Interscholastic Athletics Conference (CIAC) permits trans girls to compete in girls' events even if they have not yet gone on puberty blockers or gender affirming hormones. (The CIAC places no physical or physiological conditions on their inclusion in girls' events). Two trans girls who used to compete on their schools' boys' teams moved to the girls' teams when they came out as trans. They immediately dominated their events at their conference, state, and regional competitions, even though their performances would have been insufficient to qualify them for post-season play had they competed in the boys' divisions. And although they started competing in girls' events before they began taking gender-affirming hormones, they continued to be among the best girls in their events even after they publicly stated they had started on puberty blockers and hormones.

T MILLER – SPRINTS
55 meters indoors and 100 meters outdoors

GRADE	Hormone Status*	Event	Connecticut Boys' State Rankings	Connecticut Girls' State Rankings
9th	not on gender affirming hormones	Indoor-55m	662nd	32nd
		Outdoor-100m	326th	2nd
10th	not on gender affirming hormones	Indoor-55m	377th	5th
		Outdoor-100m	181st	1st
11th	not on gender affirming hormones	Indoor-55m	118th	1st
		Outdoor-100m	165th	1st
12th	on gender affirming hormones	Indoor-55m	335th	3rd
		Outdoor-100m	- / -	- / -

Miller competed on the boys' track team her freshman year and through the winter of her sophomore year. She came out publicly as transgender in the middle of 10th grade, and then switched to the girls' team for her remaining two-and-a-half years of eligibility.

Her hormone status for each season is derived from publicly-available information. Because that information indicates she went on hormones for the first time only at the end of the 2019 outdoor season, i.e., sometime in May, and because her best time that year was run before then, she is listed here as "not on hormones" for the year.

The table shows rankings for the 55 meters indoors first, followed by the 100 meters outdoors. The rankings in blue font show the division she actually competed in, and the point at which she switched from the boys' to the girls' division. Simply by walking off of the track in the boys' events and walking onto the track in the girls' events, she went from barely being in the top 400 in the state to being #1 in the state.

The girls' rankings for her 9th grade year are those she would have achieved based on her times as run in boys' events. The boys' rankings for her sophomore, junior, and senior years are those she would have achieved based on her times as run in girls' events. There were no rankings for the 100 meters outdoors her 12th grade year (2020) because the season was cancelled due to COVID.

A YEARWOOD – SPRINTS
55 meters indoors and 100 meters outdoors

GRADE	Hormone Status*	Event	Connecticut Boys' State Rankings	Connecticut Girls' State Rankings
9th	not on gender affirming hormones	Indoor-55m	- / -	- / -
		Outdoor-100m	422nd	4th
10th	not on gender affirming hormones	Indoor-55m	392nd	5th
		Outdoor-100m	470th	3rd
11th	on gender affirming	Indoor-55m	194th	2nd
	hormones	Outdoor-100m	449th	5th
12th	on gender affirming hormones	Indoor-55m	170th	1st
		Outdoor-100m	- / -	- / -

Yearwood competed on the girls' team all four years in high school. She came out publicly as transgender in the 9th grade. Her hormone status for each season is derived from publicly-available information. The table shows rankings for the 55 meters indoors first, followed by the 100 meters outdoors. The boys' rankings listed on the table are those she would have achieved based on her times run in girls' events. There were no rankings for the 100 meters outdoors her 12th grade year (2020), because the season was cancelled due to COVID.

We don't have statistics on the number of trans girls who have competed in girls' events in high school sports. However, it appears that, at least in the past, most were already on gender-affirming hormones by the time they sought to participate on girls' teams; trans advocacy groups seems generally to assume that this is the case when they speak to the issue. However, we are at a juncture in history where trans girls who are not on hormones are just beginning to ask to be included in girls' competitions. In part this is because the standard of care in trans-medicine now recommends that trans-kids "come out" socially before they transition medically; and many physicians now require that kids wait until they are 16 to go on gender-affirming hormones. For a trans girl, going out for a girls' school sports team is one way to come out socially. We are thus increasingly likely to face situations like that in Connecticut where trans athletes seek to compete in girls'/women's sport while not on hormones.

Q22. Do we have any data on the impact of trans boys with or without medical intervention in high school sports?

A22. Yes. The medical community now recommends that trans kids "come out" socially before they transition medically. While some trans girls have opted to go out for a girls' school sports team as one way to come out socially, this option is not so easily available to trans boys who, because they are biologically female, are unlikely to be able to make a boys' team. As a result, some trans boys have chosen to come out socially while remaining on the girls' team. This has allowed them to continue to participate and to remain competitive in high school sport. Some trans girls have chosen this same path, coming out socially while remaining on the boys' team.

Q23. When post-pubescent trans girls take gender-affirming hormones, do their athletic performances decline? If so, does any performance or "legacy" advantage remain?

A23. Going on gender affirming hormones causes a decline in circulating levels of testosterone which, if consistently maintained over time, has some effect on athletic performance. This effect seems to be primarily on endurance, not on strength and power. The effect on speed seems to be dependent on the extent to which the event is endurance- as opposed to strength- and power-based. Thus, the nature and extent of the decline in male performance advantage, also known as the "legacy advantage", appears to depend on the sport and the event. It also depends on the extent to which the individual experienced male puberty before they began their physical transition, and on how high they choose to maintain their testosterone levels once they do go on gender affirming hormones. Regardless, as we explain in our answer to Question 15, the current state of the peer reviewed literature is that legacy advantages remain significant.

Q24. Why do some sports organizations and governing bodies – including the NCAA – require that trans girls/women reduce their testosterone levels for a year before they can compete in girls'/women's events?

A24. The NCAA, the IOC, and many international federations (IFs) and national governing bodies (NGBs), require trans girls/women to reduce their testosterone levels for at least a year before they can compete in girls'/women's events. This accommodation is a policy compromise, based in the tenuous hypothesis that if a trans girls/woman reduces her testosterone levels into the

female range and keeps her levels consistently within that range for at least a year, her male-linked advantages will decline to the point that it is fair to include her in girls'/women's competition. The hypothesis itself is based in the fact that trans girls/women are biologically male and that testosterone is the primary driver of the performance gap between male and female athletes. Just how much gender affirming hormones reduces her male sex-linked advantages and what "legacy advantages" remain is the subject of ongoing investigation.

Q25. Is there strong scientific evidence that trans girls/women have an unfair advantage over biological females even after a year of androgen-suppressing treatment?

A25. Yes. As our answer to Question 15 details, several peer-reviewed studies, including one based in data from the U.S. military, have confirmed that trans women retain their male sex-linked advantages even after a year on gender affirming hormones. This is especially the case for sports and events that are not endurance-based. Because of these retained advantages, USA Powerlifting and World Rugby have recently concluded that it isn't possible fairly and safely to include trans women in women's competition; and. other international sports federations including World Athletics – the international federation that governs the sport of track and field – have rejected the International Olympic Committee's 2015 guidance suggesting that trans women be included in women's competition so long as they reduce their testosterone levels to the bottom of the male range (under 10 nmol/L). These federations (e.g., those responsible for the sports of track and field, tennis, cycling, and rowing) have reduced the required testosterone level to within the female range.

Q26. Is the NCAA's testosterone rule for trans women athletes sufficient to ensure fairness to and the safety of the biological females in the field?

A26. No, not as currently administered. The NCAA rule is superficially similar to that of the IOC and other sports governing bodies in that it focuses on testosterone levels; however, as administered it currently lacks their rigor and detail. It provides only that trans women athletes need to be on gender affirming hormones for at least a year. It does not specify that they need to bring their testosterone levels into the female range; it does not require them to keep their levels consistently within that range; and it does not monitor their compliance. The hypothesis that reducing testosterone levels winds down the male performance advantage sufficient to ensure fairness to and safety for the female athletes in the field depends not only on getting those levels into the female range, but also maintaining them consistently within that range throughout the operative period. The NCAA rule has been properly criticized, including by trans women athletes and their coaches, for its lack of monitoring and guidance in these respects.

Q27. What if any is the relationship between intersex and trans athletes?

A27. Intersex conditions result from differences in biological sex development. They are also known as differences of sex development or DSDs. There are many different intersex conditions, but those that are relevant for sport all involve biological males – individuals with an XY karyotype, testes, and testosterone levels in the male range – whose sex development was atypical in some respect. For example, their external genitalia might not be fully formed or their androgen

receptors may be less than typically sensitive. Athletes with such intersex conditions may be raised as male or female. People who are transgender do not generally consider themselves to be intersex. The two are related in sport to the extent that they may both involve biological males with full or partial male advantage who seek eligibility to compete in girls'/women's sport.

The following table is illustrative. It is from an exhibit in the case brought by South African runner Caster Semenya against her international federation (the IAAF now World Athletics) at the Court of Arbitration for Sport (CAS) in Switzerland. In 2019, CAS upheld the federation's eligibility rules for the women's category. Those rules require affected athletes to verifiably reduce their testosterone levels to within the normal female range for a 12-month period before they can compete in that category. Switzerland's Supreme Court affirmed the CAS decision in 2020.

COMPARING BIOLOGICAL SEX TRAITS
FOR PURPOSES OF GIRLS' AND WOMEN'S SPORT
(from IAAF Exhibit in Semenya and ASA v. IAAF)

	Typical Male	Person with 5-ARD (not on hormones)	Person who is Transgender MTF (not on hormones	Typical Female
Chromosomes	46 XY	46 XY	46 XY	46 XX
Gonads and Gametes	Testes & Sperm	Testes & Sperm	Testes & Sperm	Ovaries & Eggs
Endocrine system	Androgenic	Androgenic	Androgenic	Estrogenic
Sex hormones	Testosterone levels in male range	Testosterone levels in male range	Testosterone levels in male range	Testosterone levels in female range
Primary sex characteristics (develop in utero)	Testes, epididymis & vas deferens, prostate	Testes, epididymis & vas deferens, vestigial prostate	Testes, epididymis & vas deferens, prostate	Ovaries, fallopian tubes, uterus, vagina
Virilisation on puberty	Yes	Yes	Yes	No
Secondary sex characteristics (develop at puberty)	Male	Male	Male	Female
External genitalia	Penis, scrotum	Varies	Penis, scrotum	Clitoris, labia
Legal sex	Male	Varies	Varies	Female
Gender Identity	Male	Varies	Female	Female