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**UNITED STATES DISTRICT COURT**
**FOR THE DISTRICT OF ARIZONA**
**TUCSON DIVISION**

Jane Doe, by her next friend and parents Helen Doe and James Doe; and Megan Roe, by her next friend and parents, Kate Roe and Robert Roe,

Plaintiffs,

v.

Thomas C. Horne in his official capacity as State Superintendent of Public Instruction; Laura Toenjes, in her official capacity as Superintendent of the Kyrene School District; Kyrene School District; The Gregory School; and Arizona Interscholastic Association Inc.,

Defendants.

Case No. 4:23-cv-00185-JGZ

**REBUTTAL DECLARATION OF DANIEL SHUMER, M.D., IN FURTHER SUPPORT OF MOTION FOR PRELIMINARY INJUNCTION**

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**Admitted pro hac vice.*

I, Daniel Shumer, declare as follows:

1. I submit this expert declaration based on my personal knowledge.

2. If called to testify, I would testify truthfully based on my expert opinion.

3. In preparing this declaration, I reviewed the expert declarations submitted by Dr. Gregory A. Brown, Ph.D., Dr. James M. Cantor, Ph.D., and Dr. Chad Thomas Carlson, M.D., in support of Proposed Intervenors' Opposition to Plaintiffs' Motion for Preliminary Injunction, as well as the expert declaration of Dr. Gregory A. Brown, Ph.D. in *Hecox v. Little*, 1:20-cv-00184 (D. Id. 2020), which is attached to Defendant Horne's Opposition to Plaintiffs' Motion for Preliminary Injunction. As with my prior expert declaration, I relied on my scientific education and training, my research experience, and my knowledge of the scientific literature in the pertinent fields. The materials I have relied on in preparing this declaration are the same types of materials that experts in my field of study regularly rely on when forming opinions on these subjects. I may wish to supplement these opinions or the bases for them as a result of new scientific research or publications or in response to statements and issues that may arise in my area of expertise.

## Dr. Brown's Declarations

### I. Testosterone levels are the biological driver of performance differences in sports between males and females.

4. Although Dr. Brown asserts that biological male physiology and anatomy is the basis for the performance advantage between males and females in athletic events (Brown Decl. at 5; Brown *Hecox* Decl. ¶ 11c),[1] the studies and findings discussed throughout Dr. Brown's declaration support the scientific consensus that the biological cause of average group differences in athletic performance between males and females is the rise in circulating levels of testosterone beginning in endogenous male puberty.

[1] The "Brown Declaration" refers to the declaration the Proposed Intervenors submitted in this case. (ECF No. 38-3.) The "Brown *Hecox* Declaration" refers to the declaration Defendant Horne submitted in this case. (ECF No. 40-1.)

5. Dr. Brown misrepresents the findings in several of the articles he cites to support his assertion that sex-based differences in sports are a result of male physiology and anatomy, without regard to the impact of the heightened level of testosterone associated with male puberty. Contrary to what Dr. Brown says, McManus and Armstrong (2011) acknowledge that differences between prepubertal boys and girls in various measurements are minimal or nonexistent. *See* Alison McManus & Neil Armstrong, *Physiology of elite young female* athletes, 56 Medicine & Science Sports & Exercise 23, 24 (2011) ("Prior to 11 years of age differences in average speed are minimal"); *id.* at 27 ("[S]mall sex difference in fat mass and percent body fat are evident from mid-childhood"); *id.* at 29 ("[B]one characteristics differ little between boys and girls prior to puberty"); *id.* at 32 ("There is little evidence that prior to puberty pulmonary structure or function limits oxygen uptake"); *id.* at 34 ("[N]o sex differences in arterial compliance have been noted in pre- and early- pubertal children").

6. Dr. Brown also misleadingly cites Staiano and Katzmarzyk (2012) for the proposition that 22 peer reviewed publications conclude that girls have more total body fat than boys throughout childhood and adolescence. (Brown Decl. ¶ 79.) Dr. Brown gives the false impression that all 22 of the peer-reviewed publications demonstrated differences on total body fat. Instead, Staiano and Katzmarzyk expressly note that "not all studies demonstrate sex differences in T[otal]B[ody]F[at] before puberty." AE Staiano & PT Katzmarzyk, *Ethnic and sex differences in body fat and visceral and subcutaneous adiposity in children and adolescents*, 36 Int. J. Obesity 1261, 1265 (2012). Nor do any of these studies connect these differences to athletic performance.

7. Dr. Brown further misrepresents Handelsman (2018)'s findings, notably omitting key portions from the study he cites. Dr. Brown writes, "[t]here is convincing evidence that the sex differences in muscle mass and strength are sufficient to account for the increased strength and aerobic performance of men compared with women and is in keeping with the differences in world records between the sexes." (Brown Decl. ¶ 59; Brown *Hecox* Decl. ¶ 88.) But Dr. Brown omits the following sentence from

Handelsman which explains that "[t]he basis for the sex difference in muscle mass and strength *is the sex difference in circulating testosterone*." David Handelsman, et al. *Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance*, 39 Endocrine Revs. 803, 816 (2018) (emphasis added).

8. Handelsman (2018), which Dr. Brown cites throughout his declaration, supports the scientific consensus that the biological cause of average differences in athletic performance between men and women is the rise in circulating levels of testosterone beginning in endogenous male puberty. (*See* Brown Decl. ¶¶ 127–30; Brown *Hecox* Decl. ¶¶ 20a, 25–28, 77–85.) As Handelsman states, "evidence makes it highly likely that the sex difference in circulating testosterone of adults explains most, if not all, of the sex differences in sporting performance." *See* Handelsman (2018) at 823 (summarizing evidence rejecting the hypothesis that physiological characteristics are driven by the Y chromosome).

## II. There is no evidence that prepubertal boys have a biological athletic advantage over prepubertal girls.

9. Contrary to Dr. Brown's Declarations, there is a well-established scientific consensus that, before puberty, there are no significant differences in athletic performance between boys and girls. *See, e.g.*, Marnee McKay & Joshua Burns, *When it Comes to Sport, Boys "Play Like a Girl,"* The Conversation (Aug. 3, 2017), https://theconversation.com/when-it-comes-to-sport-boys-play-like-a-girl-80328 (discussing results of research published in American Academy of Neurology Journal).

10. While some studies have found small differences between the performance of boys and girls with respect to some discrete activities, these studies did not control for other factors, particularly age, location, or socioeconomic factors. *Id.*

11. When research has controlled for those factors by using representative data, researchers have found that "[a]cross all measures of physical performance, there was one consistent finding. There was no statistical difference in the capabilities of girls and boys until high-school age (commonly age 12)." *Id.* These tests included long jump,

muscle strength, walking, jumping, and balancing. *Id*.

12. This finding has been replicated in many other studies, and there is a clear scientific consensus that athletic ability does not diverge significantly until puberty. *See, e.g.*, David Handelsman, *Sex Differences in Athletic Performance Emerge Coinciding with the Onset of Male Puberty*, 87 Clinical Endocrinology 68, 70–71 (2017) ("The gender divergence in athletic performance begins at the age of 12–13 years"); Jonathon W. Senefeld et al., *Sex Differences in Youth Elite Swimming*, 14 PLOS ONE 1, 1–2 (2019) (studying child and youth swimmers and concluding that the data suggests "girls are faster, or at least not slower, than boys prior to the performance-enhancing effects of puberty").

13. In support of his contention that boys have at least some biological advantages in athletic performance over girls before puberty, Dr. Brown relies primarily on demographic data from physical fitness tests or athletics in which there is a small difference in performance between prepubertal non-transgender boys and prepubertal non-transgender girls.[2] This data merely observes phenomena across a population sample in isolated areas and does not determine a cause for whatever is observed. There is no reliable basis for Dr. Brown to attribute those small differences to physiology or anatomy instead of other factors, such as greater societal encouragement of athleticism in boys, greater opportunities for boys to play sports, or different preferences of the boys and girls surveyed (Handelsman 2017).

## III. Transgender girls who receive puberty suppressing medication at the onset of puberty have no athletic advantage over other girls.

14. Dr. Brown incorrectly asserts that the administration of puberty suppressing medication (also sometimes referred to as puberty blocking medication) and hormone

[2] Two of the studies cited by Dr. Brown are also cited in paragraph 6 of the legislative findings of Arizona's statute. *See* S.B. 1165, 55th Leg., 2d Reg. Sess. (Ariz. 2022), § 6.

replacement therapy to transgender girls does not eliminate the athletic advantage that men and adolescent boys have over women and adolescent girls.

15. Puberty suppressing medication (gonadotropin-releasing hormone agonists, or GnRHa) may be prescribed to transgender girls at the onset of puberty, well before any observable increase in testosterone or muscle mass.

16. Because such girls do not undergo male puberty, they do not gain the increased muscle mass or strength that accounts for why post-pubertal boys as a group have an advantage over post-pubertal girls as a group.

17. For that reason, studies on transgender women who have undergone testosterone suppression as adults are almost meaningless when assessing the athletic abilities of transgender girls who have received pubertal suppression beginning at the onset of puberty. The women in those studies did not transition until well after puberty and experienced exposure to testosterone over an extended time, allowing their muscles to keep developing. In sharp contrast, transgender girls who receive GnRHa do not go through male puberty and are not exposed to the heightened level of testosterone associated with male puberty.

18. Even so, those studies of adult transgender women show that testosterone suppression resulted in significant mitigation of muscle mass and development in adult transgender women.

19. For example, the only study directly examining the effects of hormone therapy on the athletic performance of transgender female athletes is a small study of eight long-distance runners. The study showed that after undergoing medical interventions, which included lowering their testosterone levels, the athletes' performance had reduced so that relative to non-transgender women their performance was now proportionally the same as it had been relative to non-transgender men prior to any medical treatment. In other words, a transgender woman who performed at about 80% as well as the best performer among men of that age before transition would also perform at about 80% as well as the best performer among women of that age after

transition. *See* Joanna Harper, *Race Times for Transgender Athletes*, 6 J. Sporting Cultures & Identities 1 (2015).[3] Given that adolescent transgender girls who receive puberty suppressing medication do not go through male puberty, there is no medical basis to expect that transgender girls receiving such medications would have an athletic advantage.

20. Dr. Brown states that although he is not aware of any research directly addressing the implications of the use of pubertal suppression on athletic capability, "[i]t seems likely that males who have undergone puberty suppression will have physiological and performance advantages over females somewhere between those possessed by pre-pubertal boys, and those who have gone through full male puberty, with the degree of advantage in individual cases depending on that individual's development and timing of the start of puberty blockade." (Brown Decl. ¶ 116.) Dr. Brown admits that his speculation about puberty blockers is outside his area of expertise. (Brown Decl. ¶ 116). In fact, Dr. Brown's mere speculation has no basis in scientific evidence and seems to rest on a misunderstanding about the use of puberty suppressing medication to treat gender dysphoria.

21. Tanner staging (also called Sexual Maturity Rating) is used to document and track the development and sequence of secondary sex characteristics of children during puberty. Under current standards of care, transgender adolescents are eligible to receive puberty blockers when they reach Tanner Stage 2, at the first onset of puberty, and long before the development of increased muscle mass and strength associated with

[3] The legislative findings of the Arizona statute incorrectly state that for transgender women who go through male puberty (unlike the plaintiffs here), the benefit conferred by testosterone "is not diminished through the use of testosterone suppression." *See* S.B. 1165, 55th Leg., 2d Reg. Sess. (Ariz. 2022), § 13. While that statement conflicts with available evidence, which shows that hormone therapy significantly reduces muscle mass and strength, it is also irrelevant to the situation of the plaintiffs in this case who have not undergone male puberty and thus are not in the position of having to mitigate the increased muscle mass and strength caused by male puberty. Notably, the legislative findings do not state that transgender girls who receive puberty suppressing medication have any conceivable athletic advantage, nor do they cite any evidence that would support that claim.

later stages of male puberty. *See* Wylie C. Hembree et al., *Endocrine Treatment of Gender-Dysphoric/Gender-Incongruent Persons: An Endocrine Society Clinical Practice Guideline*, 102 J. Clinical Endocrinology & Metabolism 3869–3903 (2017).

22. Following the administration of puberty blockers, transgender girls will also receive hormone replacement therapy to allow them to go through puberty consistent with their female gender identity. As a result, these transgender girls will develop many of the same physiological and anatomical characteristics of non-transgender girls, including bone size (Brown Decl. ¶¶ 49-51), skeletal structure (*id*. at ¶ 49), and "distinctive aspects of the female pelvis geometry [that] cut against athletic performance" (*id.* at ¶ 54). Thus, a transgender girl who received puberty suppressing medication followed by hormone replacement therapy does not have the same physiology as a prepubertal non-transgender boy.

23. None of the studies Dr. Brown cites support his hypothesis that transgender girls who receive puberty suppressing medication and hormone therapy have an athletic advantage over other girls. For example, the primary finding of the Klaver (2018) study is that receiving GnRHa and hormone therapy brings the body composition of young transgender women much closer to their non-transgender female peers than their non-transgender male peers. (Brown Decl. ¶ 118.) Those results are more pronounced the earlier a transgender girl starts GnRHa treatment.

24. Dr. Brown also cites to Tack et al. (2018) for the proposition that transgender girls who receive medical treatments around 16 years of age purportedly maintain higher muscle mass, lower percent body fat, higher body mass, higher body height, and higher grip strength than comparable girls of the same age. (Brown Decl. ¶ 117.) However, the medication administered in this study is not used in the United States and does not have nearly the same impact as puberty blockers and hormone therapy for transgender girls. The medications administered to the study participants did not fully block puberty for the participants. Yet, even with this less effective medication, the study found that transgender girls "showed a significant increase in fat mass and decrease in

lean mass, resulting in an increased body fat percentage" and did not experience any increase in grip strength. Lloyd Tack et al., *Proandrogenic and Antiandrogenic Progestins in Transgender Youth: Differential Effects on Body Composition and Bone Metabolism*, J. Clinical Endocrinology & Metabolism 2147, 2153–54 (2018). If anything, this study shows that even with a less effective medication, the physiological impact of medically treating transgender girls in adolescence, rather than when they are adults, is profound.

25. The World Rugby Transgender Women's Guidelines 2020, which Brown cites throughout his declaration, allow transgender girls and women to participate in women's rugby if they did not experience endogenous puberty, stating: "Transgender women who transitioned pre-puberty and have not experienced the biological effects of testosterone during puberty and adolescence can play women's rugby."

26. In sum, there is no evidence that transgender girls on puberty suppression medication or hormone therapy have an athletic advantage over other girls. There are no studies that have documented any such advantage, and there is no medical reason to posit that any such advantage would exist.

27. In my clinical practice, I have provided medical care to more than 300 adolescent transgender girls. None of the transgender girls I have treated with the above medical interventions appeared to have any athletic advantage over other girls.

## IV. There is no evidence linking in-utero development or minipuberty to athletic performance and no credible medical reason to posit any such connection.

28. There is no scientific basis for the claim that boys gain an athletic advantage over girls based on exposure to testosterone in utero or during minipuberty.

29. In a male fetus, testosterone production peaks around 11–14 weeks of gestation (in the first trimester of pregnancy), then declines until it is completely suppressed at birth. Testosterone is necessary during this time for normal development of the genitals. *See, e.g.*, Marianne Becker & Volker Hesse, *Minipuberty: Why Does it Happen?*, 93 Hormone Research Paediatrics 76 (2020). Male babies also experience an

elevation of testosterone after birth, with levels peaking between one to two months old, and returning to prepubertal levels before six months of age. As with the in-utero elevation of testosterone, a rise in testosterone during minipuberty correlates positively with growth of the male genitals. *Id.* at 78–79.

30. Minipuberty does not result in clinically visible physical changes, other than a possible transient increase in testicular volume.

31. No research has linked this brief exposure to elevated testosterone during minipuberty to any lasting physiological impact, much less to an increase in athletic ability. Nor is there any credible medical basis even to hypothesize such an impact.

**Dr. Carlson's Declaration**

32. Dr. Carlson asserts that permitting transgender girls to play on girls' teams jeopardizes the safety of other girls, but none of the evidence he cites has any relevance to transgender girls—like the plaintiffs in this case—who are either prepubertal or have received puberty blocking medication at the onset of puberty and therefore have not undergone male puberty.

33. For example, Dr. Carlson states "it is [his] opinion that World Rugby's assessment of the evidence is scientifically sound." (Carlson Decl. at 2.) But as noted above, the World Rugby Transgender Women's Guidelines 2020 allow transgender girls and women to participate in women's rugby if they did not experience endogenous puberty, stating: "Transgender women who transitioned pre-puberty and have not experienced the biological effects of testosterone during puberty and adolescence can play women's rugby."

34. Dr. Carlson also cites the UK Sports Councils' Equality Group guidance for transgender inclusion in organized sports, which is not a scientific report and did not consider the situation of transgender girls who receive puberty suppression at the onset of puberty. (Carlson Decl. at 2.) Notably, however, the guidance stated that "[c]urrent scientific evidence indicates that the difference between the strength, stamina, and physique between the sexes is largely due to the higher testosterone levels of males

during their lifetime"—a consideration that has no relevance to transgender girls who do not undergo male puberty. United Kingdom Sports Councils, *Guidance for transgender inclusion in domestic sport* (2021), https://equalityinsport.org/docs/300921/Guidance for Transgender Inclusion in Domestic Sport 2021 - Summary of Background Documents.pdf (last accessed May 29, 2023).

35. Throughout his declaration, Dr. Carlson bases his opinion that transgender girls pose a safety risk to other girls on the fact that "[m]ales exhibit large average advantages in size, weight, and physical capacity over females—often falling far outside female ranges." (Carlson Decl. ¶ 11c.) But that fact has no relevance to transgender girls who receive puberty suppressing medications at the onset of puberty and thus do not develop the size, weight, and physical capacity of individuals who go through male puberty.

36. In particular, transgender girls who receive puberty suppressing medication at the onset of puberty do not differ from other girls with respect to the factors that Dr. Carlson discusses at paragraphs 42 to 56 of his declaration. They do not have greater bone density or connective tissue strength. They do not have greater speed, strength, weight, or power. And they do not have greater throwing or kicking speed.

37. Dr. Carlson notes that girls are more prone to concussions than boys (Carlson Decl. ¶¶ 58–65) and cites research indicating this may be because, on average, adolescent girls have weaker neck muscles than post-pubertal adolescent boys. (Carlson Decl. ¶ 66.) If that accounts for girls' higher rates of concussions, transgender girls on puberty suppression would be at the same or similar risk for such injury as non-transgender girls. There is no evidence, and no medical reason to believe, that their participation on girls' teams would pose any increased threat of such injuries to other girls.

38. Dr. Carlson similarly claims that permitting transgender girls to play on girls' teams increases the risk of ACL injuries because "[w]hen males are permitted to enter into the pool of female athletes based on gender identity rather than biological sex,

there is an increased possibility that a statistical outlier in terms of size, weight, speed, and strength—and potentially an extreme outlier—is now entering the female pool. Although injury is not guaranteed, risks to female participants will increase." (Carlson Decl. ¶ 78.) That rationale for exclusion has no relevance to transgender girls who receive puberty suppressing medications at the onset of puberty and who therefore do not have any advantage over other girls with respect to size, weight, speed, or strength.

39. Dr. Carlson spends a large part of his declaration disputing whether testosterone suppression and hormone therapy can mitigate athletic advantage for transgender women who transition as adults and who have therefore undergone male puberty. (Carlson Decl. ¶¶ 79–96.) I disagree with his analysis of the evidence on this issue; however, it is irrelevant to this case, which concerns transgender girls who have not yet undergone male puberty or have received puberty suppressing medication at the onset of puberty. Dr. Carlson does not cite to any evidence, nor does any exist, that such girls have an athletic advantage over other girls.

40. Dr. Carlson states in passing that there are differences in athletic ability between prepubertal boys and girls, but he does not cite any evidence to support that opinion. For the reasons stated in paragraphs 9 through 13 above, there is no evidence to support that claim.

41. In sum, transgender girls who have not yet undergone male puberty or have received puberty suppressing medication at the onset of puberty do not present any unique safety risks to other girls. Their physical characteristics in terms of height, weight, and strength overlap with those of other girls.

**Dr. Cantor's Declaration**

42. As discussed above, this case concerns a legal challenge to Arizona's law prohibiting girls who are transgender from participating on girls' sports teams. Dr. Cantor's expert declaration does not offer a single expert opinion that directly relates to Arizona's law or to the participation of transgender athletes in sports. Instead, Dr. Cantor launches a broadside attack against the prevailing model of medical care for transgender

youth that has been endorsed by the American Academy of Child and Adolescent Psychiatry, the American Academy of Pediatrics, the American Psychological Association, the American Psychiatric Association, and the American Medical Association, among many other mainstream medical organizations.

43. Many of Dr. Cantor's criticisms are largely irrelevant to the group targeted by Arizona's law, instead relating to children who no longer identify as transgender once they reach puberty and transgender boys. But Arizona's law affects only transgender girls.

44. Dr. Cantor appears to have no experience in child or adolescent psychology and no relevant experience with respect to gender dysphoria in childhood and adolescence. His academic career has focused on pedophilia and sexual paraphilias in adults.

45. In terms of substance, Dr. Cantor's declaration demonstrates a basic lack of understanding of the nature, evaluation, and treatment of gender dysphoria, the serious consequences of the condition if left untreated, and the strength of the evidence in support of medical management of gender dysphoria, including the efficacy and safety of these treatments. His opinions are not consistent with current evidence-based standards of care or the general medical consensus–they run counter to recommendations made by leading and well-respected medical bodies.

## I. Medical care for transgender adolescents is safe and effective.

46. Dr. Cantor devotes much of his declaration to criticizing medical care for transgender adolescents. Dr. Cantor does not explain how any of his criticisms are relevant to the issue of whether transgender girls should be able to participate on female sports teams. In any event, his criticisms are not well-founded.

47. Studies have repeatedly documented that pubertal suppression and hormone therapy are safe and effective treatments for transgender adolescents with gender dysphoria.[4] These articles represent a small percentage of the full body of literature that

[4] *See, e.g.*, Diana M. Tordoff et al., *Mental Health Outcomes in Transgender and Nonbinary Youths Receiving Gender-Affirming Care*, 5 Jama Network Open at 1

was utilized to create evidence-based clinical practice guidelines for the treatment of gender dysphoria in children, adolescents, and adults. These treatments alleviate the increased distress and dysphoria caused by the physical changes accompanying puberty. Hormone therapy also brings a transgender person's body into greater alignment with their identity and reduces the number of surgeries a transgender person may need as an adult.[5]

48. The guidelines were published by long-standing and well-respected bodies, including the World Professional Association for Transgender Health (WPATH) and the

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(2022) (finding that receipt of medical care, including puberty blockers and gender-affirming hormones, was associated with 60% lower odds of moderate or severe depression and 73% lower odds of suicidality over a 12-month follow-up); Amy E. Green et al., *Association of Gender-Affirming Hormone Therapy with Depression, Thoughts of Suicide, and Attempted Suicide Among Transgender and Nonbinary Youth*, 70 J. Adolescent Health [ePublication ahead of print] at 1 (2021) (finding that access to hormone therapy during adolescence was associated with lower odds of recent depression and having attempted suicide in the past year); Jack L. Turban et al., *Pubertal Suppression for Transgender Youth and Risk of Suicidal Ideation*, 145 Pediatrics at 1 (2020) (finding that access to puberty blockers during adolescence is associated with a decreased lifetime incidence of suicidal ideation among adults); Christal Achille et al., *Longitudinal impact of gender-affirming endocrine intervention on the mental health and well-being of transgender youths: Preliminary results*, Int'l J. Pediatric Endocrinology at 1 (2020) (finding that endocrine intervention was associated with decreased depression and suicidal ideation and improved quality of life for transgender youth); Laura E. Kuper et al., *Body Dissatisfaction and Mental Health Outcomes of Youth on Gender-Affirming Hormone Therapy*, 145 Pediatrics at 1 (2020) (showing hormone therapy in youth is associated with reducing body dissatisfaction and modest improvements in mental health); Anna I.R. van der Miesen et al., *Psychological Functioning in Transgender Adolescents Before and After Gender-Affirmative Care Compared with Cisgender General Population Peers*, 66 J. Adolescent Health 699–704 (2020) (showing fewer emotional and behavioral problems after puberty suppression and similar or fewer problems compared to same-age non-transgender peers); Rosalia Costa et al., *Psychological Support, Puberty Suppression, and Psychosocial Functioning in Adolescents with Gender Dysphoria*, 12 J. Sexual Medicine at 2206 (2015) (finding increased psychological function after six months of puberty suppression); Annelou L.C. de Vries et al., *Young Adult Psychological Outcome After Puberty Suppression and Gender Reassignment*, 134 Pediatrics 696–704 (2014) (following a cohort of transgender young people in the Netherlands from puberty suppression through surgical treatment and finding that the cohort had global functioning equivalent to the Dutch population).

[5] *See* de Vries, *supra* n.4.

Endocrine Society (Coleman et al. 2022; Coleman et al. 2012; Hembree et al. 2017; Hembree et al. 2009). Other leading medical bodies such as the American Association of Pediatrics ("AAP"), the American Medical Association ("AMA"), the American Psychological Association, the American Psychiatric Association, and the American Academy of Family Physicians ("AAFP") all support the tenants of these guidelines due to the rigorous nature of their review of scientific evidence in the field (Rafferty et al. 2018 (AAP); AMA 2019; American Psychological Association 2015; Drescher et al. 2018 (American Psychiatric Association); Klein et al. 2018 (AAFP)).

49. Dr. Cantor's criticisms of the process used to develop the WPATH Standards of Care and the Endocrine Society Guidelines are unfounded. Both were created based on rigorous reviews of the best available science and expert professional consensus in transgender health. For WPATH, international professionals were selected to serve on the SOC 8 writing committee. Recommendation statements were developed based on data derived from independent systemic literature reviews. Grading of evidence was performed by an Evidence Review Team which determined the strength of evidence presented in each individual study relied upon in the document (Coleman et al. 2022). Similarly, the Endocrine Society Guidelines were developed through rigorous scientific processes that "followed the approach recommended by the Grading of Recommendations, Assessment, Development, and Evaluation group, an international group with expertise in the development and implementation of evidence-based guidelines." The Endocrine Society published its clinical practice guidelines in collaboration with the Pediatric Endocrine Society, the European Societies for Endocrinology and Pediatric Endocrinology, and WPATH, among others (Hembree et al. 2017).

50. Dr. Cantor also spends more than 10 pages of his declaration discussing the "Pyramid of Standards of Evidence" to support his claim that the evidence supporting puberty suppression and hormone therapy is not based on randomized controlled trials and is therefore not reliable. (Cantor Decl. ¶¶ 38–66.) While I agree with Dr. Cantor that

randomized control trials are an excellent study design in many contexts, such trials are not ethically permissible for treatments that are already known to provide a benefit to patients, which includes the use of GnRHa and hormone therapy to treat gender dysphoria in adolescents. For this reason, no such study of these treatments would be approved, no patients and families would participate, and no ethical researcher would undertake such a study. As is true for most other pediatric treatments, researchers in this field must rely on other types of study design. These types of studies can include longitudinal cohort studies, which examine any changes in symptoms over the course of treatment, or cross-sectional studies, which compare persons who are treated with those who are untreated.

51. Dr. Cantor also misstates the risks and benefits associated with GnRHa and hormone therapy. (Cantor Decl. ¶¶ 125–37.)

52. Dr. Cantor's concerns about bone density in patients prescribed GnRHa are well-known, generally short-lived (as he himself admits), and are specifically managed during patient care. In practice, risk of lower bone mineral density is mitigated by screening for, and treating, vitamin D deficiency when present, and by limiting the number of years of treatment based on a patient's clinical course (Rosenthal 2014). It is accurate to state that pubertal hormones (either testosterone or estrogen) contribute to bone density accrual. A person who was never exposed to any sex hormones for their entire life would be at high risk of osteoporosis. GnRHa, however, is administered only for a relatively short period of time. Once a decision is made to either administer gender-affirming hormones or to resume puberty consistent with a patient's birth-assigned sex, bone density accrual rises with exposure to those sex hormones.

53. Dr. Cantor also raises a hypothetical concern regarding the impact of puberty blockers on brain development. (Cantor Decl. ¶ 128.) While it is common for researchers and clinicians to consider any possible adverse impacts of medications, there is no evidence that puberty blockers have any adverse impact on brain development. For example, when considering children with naturally occurring delayed puberty, I find no

published evidence of negative consequences to brain development compared with children with normally timed puberty. Likewise, Dr. Cantor can point to no published evidence in support of this concern in transgender adolescents prescribed GnRHa, instead citing various articles that simply raise the issue. There are also studies related to children who are prescribed GnRHa for precocious puberty that found that "GnRHa treated girls do not differ in their cognitive functioning … from the same age peers." (Wojniusz et al. 2016). The authors of this article came to this conclusion because there was not a statistically significant difference in IQ, memory, mental rotation, cognitive executive function, processing speed, attention, or executive function in participants treated with GnRHa for precocious puberty.

54. Dr. Cantor asserts that I have not provided sources showing that gender identity "has a strong biological basis." (Cantor Decl. ¶ 145.) Scientific research and medical literature across disciplines demonstrates that gender identity, like other components of sex, has a strong biological foundation. For example, there are numerous studies detailing the similarities in the brain structures of transgender and non-transgender people with the same gender identity (Luders et al. 2009; Rametti et al. 2011; Berglund et al. 2008). In one such study, the volume of the bed nucleus of the *stria terminalis* (a collection of cells in the central brain) in transgender women was equivalent to the volume found in non-transgender women (Chung et al. 2002).

55. There are also studies highlighting the genetic components of gender identity. Twin studies are a helpful way to understand genetic influences on human diversity. Identical twins share the same DNA, while fraternal twins share roughly 50% of the same DNA; however, both types of twins share the same environment. Therefore, studies comparing differences between identical and fraternal twin pairs can help isolate the genetic contribution of human characteristics. Twin studies have shown that if an identical twin is transgender, the other twin is much more likely to be transgender compared to fraternal twins, a finding which points to genetic underpinnings to gender identity development (Heylens et al., 2012).

56. There is also ongoing research on how differences in fetal exposures to hormones may influence gender identity. This influence can be examined by studying a medical condition called congenital adrenal hyperplasia. Female fetuses affected by congenital adrenal hyperplasia produce much higher levels of testosterone compared to fetuses without the condition. While most females with congenital adrenal hyperplasia have a female gender identity in adulthood, the percentage of those with gender dysphoria is higher than that of the general population. This suggests that fetal hormone exposures contribute to the later development of gender identity (Dessens et al. 2005).

57. There has also been research examining specific genetic differences that appear associated with gender identity formation (Rosenthal 2014). For example, one study examining differences in the estrogen receptor gene among transgender women and non-transgender male controls found that the transgender individuals were more likely to have a genetic difference in this gene (Henningsson et al. 2005).

58. The above studies are representative examples of scientific research demonstrating biological influences on gender identity. Gender identity, like other complex human characteristics, is rooted in biology with important contributions from neuroanatomic, genetic, and hormonal variation (Roselli 2018).

59. Dr. Cantor discounts gender identity on the basis that there is "no means of either falsifying or verifying people's declarations of their gender identities." (Cantor Decl. ¶ 105.) He also claims "[i]n science, it is the objective factors—and only the objective factors—that matter to a valid definition." (Cantor Decl. ¶ 105.) But just because gender identity is a human characteristic ascertained through observation and conversations rather than a lab test makes it no less valid or "scientific." Gender identity is a real human characteristic, and it is rooted in biology.

60. Dr. Cantor also takes issue with my statement in my original declaration that a "person's gender identity is innate and cannot be changed by medical or psychological intervention." (Shumer Decl. at 7.) Dr. Cantor notes that a youth may be "mistaken about their gender identity" or may "misinterpret their experiences to indicate

they are transgender." (Cantor Decl. ¶ 146.) It is true that some youth go through a period of exploration and identity development before they understand their gender identity, while others consistently identify as a particular gender from an early age into adulthood. This is true for both transgender and non-transgender youth and does not show that therapy or any other intervention can change a young person's gender identity. To the contrary, substantial evidence shows that attempts to change a young person's gender identity or gender expression are both ineffective and extremely harmful.[6]

61. Dr. Cantor also appears to dispute that supportive treatments for gender dysphoria reduce suicidality in transgender adolescents. In fact, there are multiple studies demonstrating this positive impact, which is also consistent with my own clinical practice.[7]

62. Finally, Dr. Cantor claims, without citation, that I somehow violated "medical ethics" in my original declaration by asserting specific conclusions about the medical status of "people not under my care." Dr. Cantor is presumably referring to the plaintiffs in this case and to my statements about those plaintiffs at the end of my declaration. There is nothing unethical about those statements, all of which I stand behind.

## II. Other countries provide medical care to transgender adolescents.

63. Dr. Cantor's declaration references documents from several other countries on the treatment of gender dysphoria, predominantly from Finland, Sweden, and the United Kingdom ("UK"), although they also mention documents from France and Norway.

64. Before addressing the substance of his claims related to these documents,

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[6] Douglas C. Haldeman (Ed.), *The Case Against Conversion "Therapy": Evidence, Ethics, and Alternatives* (2022).

[7] *See* Diana M. Tordoff et al., *Mental Health Outcomes in Transgender and Nonbinary Youths Receiving Gender-Affirming Care*, 5 JAMA Network Open (2022); Amy E. Green et al., *Association of Gender-Affirming Hormone Therapy With Depression, Thoughts of Suicide, and Attempted Suicide Among Transgender and Nonbinary Youth*, 7 J. Adolescent Health 643–649 (2022).

several preliminary points should be made. Dr. Cantor does not provide a comprehensive review of international practices; rather, he selectively cites documents that he believes support his position.

65. Language differences also make it difficult to fully assess some of the material that the defendants' experts cite to as support for their claims. For example, the Swedish National Board of Health and Welfare's ("NBHW"'s) guideline for the care of children and adolescents with gender dysphoria is not available as an official English translation; only a 6-page summary is available.[8]

66. With respect to the content of these documents, none is a clinical practice guideline which rates the quality of the evidence and the strength of the recommendations. Some of the documents are systematic reviews of the literature that rate the quality of the evidence but do not make recommendations.[9] Direct inferences cannot be drawn from the quality of the evidence to the strength of recommendations; low quality evidence may be a sufficient basis for strong recommendations. The French document referenced is in fact only a press release.[10]

67. Dr. Cantor mischaracterizes the conclusions of these documents, stating for example that they "range from medical advisories to outright bans on the medical transition of minors." (Cantor Decl. ¶ 16). None of the documents to which Dr. Cantor refers recommends banning medical care for treating gender dysphoria in adolescents.

68. Finland, Sweden, and the UK are all moving to providing care through

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[8] The National Board of Health and Welfare, *Care of Children and Adolescents with Gender Dysphoria: Summary* (2022), https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/kunskapsstod/2022-3-7799.pdf (last accessed May 26, 2023).

[9] National Institute for Health and Care Excellence (NICE), *Evidence Review: Gonadotrophin releasing hormone analogues for children and adolescents with gender dysphoria* (2020), *available at* https://cass.independent-review.uk/nice-evidence-reviews/ (last accessed May 26, 2023).

[10] Académie Nationale de Médecine, *Medicine and gender transidentity in children and adolescents* (2022), *available at* https://www.academie-medecine.fr/la-medecine-face-a-la-transidentite-de-genre-chez-les-enfants-et-les-adolescents/?lang=en (last accessed May 26, 2023).

regional multidisciplinary clinics, the type of care commonly provided in the US.[11] In Finland, for example, medical care is provided by Helsinki University Central Hospital and Tampere University Hospital. Puberty suppression and hormone treatment are provided to minors with persistent gender dysphoria on a case-by-case basis.[12]

69. Sweden is restructuring care for gender dysphoria into three national specialized medical care units. While the Swedish recommendations state puberty suppression and gender-affirming hormone treatment "should be offered only in exceptional cases," they later state that "an early (childhood) onset of gender incongruence, persistence of gender incongruence until puberty and a marked psychological strain in response to pubertal development is among the recommended criteria."[13]

70. The UK is moving from a single specialist provider model to regional centers. The Cass Review encourages providers prescribing puberty blocker and hormone therapy to follow the Endocrine Society Guidelines and UK guidelines regarding informed consent.[14]

71. The documents all emphasize the importance of data collection. The Cass Review recommends, for example, "[e]xisting and future services should have standardised data collection in order to audit standards and inform understanding of the

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[11] Sam Hsieh & Jennifer Leininger, *Resource list: Clinical care programs for gender-nonconforming children and adolescents*, 43 Pediatric Annals 238–244 (2014).

[12] Council for Choices in Health Care in Finland, *Medical treatment methods for dysphoria associated with variations in gender identity in minors – recommendation* (2020), *available at* https://palveluvalikoima.fi/documents/1237350/22895008/Summary_minors_en+(1).pdf/fa2054c5-8c35-8492-59d6-b3de1c00de49/Summary_minors_en+(1).pdf?t=1631773838474 (last accessed May 26, 2023).

[13] The National Board of Health and Welfare, *Care of Children and Adolescents with Gender Dysphoria: Summary* (2022), *available at* https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/kunskapsstod/2022-3-7799.pdf (last accessed May 26, 2023).

[14] Hilary Cass, *The Cass Review: Independent Review of Gender Identity Services for Children and Young People Interim Report*, National Health Service (NHS), UK at 71–72 (2022).

epidemiology, assessment and treatment of this group of children and young people."[15]

72. The Swedish NBHW similarly states, "[t]o ensure that new knowledge is gathered, the NBHW further deems that treatment with GnRH-analogues and sex hormones for young people should be provided within a research context, which does not necessarily imply the use of randomized controlled trials (RCTs). As in other healthcare areas where it is difficult to conduct RCTs while retaining sufficient internal validity, it is also important that other prospective study designs are considered for ethical review and that register studies are made possible."[16]

I declare under criminal penalty under the laws of Arizona that the foregoing is true and correct.

Signed on the 31st day of May, 2023, in Ann Arbor, Michigan.

Daniel Shumer, M.D.

[15] *Id.*

[16] The National Board of Health and Welfare, Care of Children and Adolescents with Gender Dysphoria: Summary (2022), *available at* https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/kunskapsstod/2022-3-7799.pdf (last accessed May 26, 2023).