DIETARY SUPPLEMENT USE IN TRANSMASCULINE SPECTRUM POPULATIONS

by

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A Thesis
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of
Master of Science
Nutrition

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DEDICATION

This is dedicated to Ezra, my impediment and inspiration.

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I would like to thank my family for their unending support—without them this work would still be an idea. Thank you also to my professors and advisors, who stood behind me when I faltered and illuminated a path forward.

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GLOSSARY OF TERMS ASSOCIATED WITH THE TRANSGENDER AND NONBINARY COMMUNITY

(adapted from materials obtained from the Human Right Campaign[1])

Androgynous | Identifying and/or presenting as neither distinguishably masculine nor feminine.

Cisgender | A term used to describe a person whose gender identity aligns with those typically associated with the sex assigned to them at birth.

Gay | A person who is emotionally, romantically or sexually attracted to members of the same gender.

Gender dysphoria | Clinically significant distress caused when a person's assigned birth gender is not the same as the one with which they identify. According to the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM), the term - which replaces Gender Identity Disorder - "is intended to better characterize the experiences of affected children, adolescents, and adults."

Gender-expansive | Conveys a wider, more flexible range of gender identity and/or expression than typically associated with the binary gender system.

Gender expression | External appearance of one's gender identity, usually expressed through behavior, clothing, haircut or voice, and which may or may not conform to socially defined behaviors and characteristics typically associated with being either masculine or feminine.

Gender-fluid | According to the Oxford English Dictionary, a person who does not identify with a single fixed gender; of or relating to a person having or expressing a fluid or unfixed gender identity.

Gender identity | One's innermost concept of self as male, female, a blend of both or neither – how individuals perceive themselves and what they call themselves. One's gender identity can be the same or different from their sex assigned at birth.

Gender non-conforming | A broad term referring to people who do not behave in a way that conforms to the traditional expectations of their gender, or whose gender expression does not fit neatly into a category.

Genderqueer | Genderqueer people typically reject notions of static categories of gender and embrace a fluidity of gender identity and often, though not always, sexual orientation. People who identify as "genderqueer" may see themselves as being both male and female, neither male nor female or as falling completely outside these categories.

Gender transition | The process by which some people strive to more closely align their internal knowledge of gender with its outward appearance. Some people socially transition, whereby they might begin dressing, using names and pronouns and/or be socially recognized as another gender. Others undergo physical transitions in which they modify their bodies through medical interventions.

Intersex | An umbrella term used to describe a wide range of natural bodily variations. In some cases, these traits are visible at birth, and in others, they are not apparent until puberty. Some chromosomal variations of this type may not be physically apparent at all.

LGBTQIA+ | An acronym for “lesbian, gay, bisexual, transgender, queer, intersex and asexual +.”

Non-binary | An adjective describing a person who does not identify exclusively as a man or a woman. Non-binary people may identify as being both a man and a woman, somewhere in between, or as falling completely outside these categories. While many also identify as transgender, not all non-binary people do.

Queer | A term people often use to express fluid identities and orientations. Often used interchangeably with "LGBTQ."

Sex assigned at birth | The sex (male or female) given to a child at birth, most often based on the child's external anatomy. This is also referred to as "assigned sex at birth."

Sexual orientation | An inherent or immutable enduring emotional, romantic or sexual attraction to other people.

Trans/Transgender | An umbrella term for people whose gender identity and/or expression is different from cultural expectations based on the sex they were assigned at birth. Being transgender does not imply any specific sexual orientation. Therefore, transgender people may identify as straight, gay, lesbian, bisexual, etc.

Transphobia | The fear and hatred of, or discomfort with, transgender people.

LIST OF ABBREVIATIONS

Assigned Female At Birth.....AFAB
Cisgender .....CS
Cross-sex Hormone Therapy .....CHT
Diagnostic And Statistical Manual .....DSM
Dietary Supplement ..... DS
Female-to-Male.....FtM
Gender Dysphoria .....GD
Male-to-Female.....MtF
Transgender..... TG
Transmasculine Spectrum..... TMS

ABSTRACT

DIETARY SUPPLEMENT USE IN TRANSMASCULINE SPECTRUM POPULATIONS

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George Mason University, 2021

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Introduction: There are currently no dietary guidelines for the transgender community, and very little is known about the specific nutritional needs of this population. Previous studies suggest that transmasculine spectrum individuals may use dietary supplements in a way different from the general population due to cross-sex hormone therapy, struggles with gender dysphoria, and other elements of transitioning.

Objective: To learn how the transmasculine spectrum population differs in its use of dietary supplements by comparing survey reports to the NHANES, 2007-2010 dataset.

Methods: Forty-eight participants completed an online survey detailing their dietary supplement use and demographic information so that general trends could be determined.

Findings: The rates of supplement use in the sample were significantly higher than the general population and although the participants reported good access to healthcare, the supplements were relied on heavily for overall wellness, specific complaints, and

especially mental health. Medical transition status did not mitigate supplement use. There was no relationship between dietary supplement use and BMI or dietary supplement use and income.

Conclusion: The transmasculine spectrum population uses dietary supplements in unique ways from the general U.S. population, and further research must be conducted to better understand how to provide proper nutritional guidance to transmasculine spectrum individuals.

A NOTE ON NOMENCLATURE

The vocabulary associated with and used to identify LGBTQIA+ people is constantly evolving as understanding of this population deepens. As a result, certain terms currently in common use may become problematic in the future. During this research, the search terms used to identify relevant studies have in certain instances become outdated and offensive. Nevertheless, use of these terms was necessary to complete the research. Care was taken to use currently accepted nomenclature in the writing of the thesis, but it is inevitable that terminology progresses with society. For this research, we adopted and utilized terms and guidance from the National Center for Transgender Equality (www.transequality.com).

CHAPTER 1: LITERATURE REVIEW AND INTRODUCTION

Transgender people, that is those who do not identify their gender with their birth sex, account for about 0.6% of the American population, which amounts to approximately 1.4 million individuals.[2] This study is focused on the subpopulation of transmasculine spectrum identified people: those who were assigned female at birth (AFAB) but who associate more strongly with masculine rather than feminine identities. It is estimated that although the rate of transgender people overall is 1 in 30,000, the rate of trans men in particular (assigned female at birth, and identifying as men) is closer to 1 in 100,000. [3] Another estimate suggests that the rate for Male-to-Female (MtF)[a] is 6.8 in 100,000 while the rate for Female-to-Male (FtM) is 2.6 in 100,000. [4]

It is notoriously difficult to determine the size of the transmasculine spectrum population: the changes in societal stigma, as well as the shifting terminology mean that collecting accurate data is a complex problem. The authors of a meta-regression of population-based probability samples postulated that socially favorable conditions for self-identification were primarily responsible for the change, and noted that because of the different language across surveys ('non-binary', ''genderqueer', etc.) it has been nearly impossible to accurately track the changes in this subpopulation over time. [5]

The transgender community is more racially and ethnically diverse than the adult general population in the US. Approximately 55% of transgender people identify as white and non-Hispanic (66% in the general population), 16% as African-American or Black

[a] While 'FtM' and 'MtF' are not affirming terminology, they are useful here as search terms as well as to clearly convey the population segment in question

non-Hispanic (12% in the general population), 21% as Hispanic or Latinx (15% in the general population), and 8% as Other (also 8% in the general population).[6]

College attendance rates are lower for transgender people than for their cisgender (CG) counterparts (TG=35.6%, CG=56.6%), although there is not a marked difference in employment rates (TG=54.3%, CG=57.7%).[7] Notably, markedly more transgender people live below the poverty line than cisgender people (TG=26.0% TG, CG= 15.5%).[7]

Geographically, transgender people are unevenly represented from state to state, with the lowest concentration in North Dakota (.3%) and the highest in Hawaii (.8%).[2] Washington, DC has the highest percentage of trans-identifying residents per capita at 2.8%.[2] The likelihood of living in a rural area is not statistically significantly different for trans and cisgender people (TG= 28.7%, CG=22.6%).[7]

Gender Dysphoria

People on the transmasculine spectrum (TMS) may describe themselves in a variety of ways (for example: trans, transgender, third gender, non-binary, gender queer, gender fluid, androgynous, trans man, man, etc.), and may or may not desire to transition medically or socially.[8] Some use cross-sex hormone therapy (CHT) or plan or have undergone surgery to align their bodies more closely to their gender identities.

One feature prevalent in the population is gender dysphoria (GD), a psychological condition in which a person experiences distress or discomfort because their biological sex characteristics do not match their gender identity.[9] GD is caused by the incongruence between experienced gender and assigned (sometimes called ‘natal’) sex.[10]

The terminology used to describe GD varies by location and time. The symptoms were first considered psychopathological when they were included under the label of Transsexualism and Gender Identity Disorder in the 1980 DSM-III, and were termed a disorder until the DSM-5 (2013) started to use the Gender Dysphoria language in an attempt to classify the distress as the clinical problem, rather than the identity itself.[11]

GD can be defined by the DSM-5 criteria as well as other measuring instruments, including the Utrecht Gender Dysphoria Scale and the Gender Identity/Dysphoria Questionnaire For Adolescents and Adults, both of which have been found to be effective tools for identifying transgender people with GD.[12] A 2016 analysis of the then-new Gender Preoccupation And Stability Questionnaire determined that this measurement tool for GD diagnosis was valid and effective, with the added benefit of not relying on the gender binary paradigm, allowing it to also be used by non-binary individuals.[13]

It is important to have standardized definitions of the clinical terms across institutions, as significant transgender health care studies are conducted by researchers that may not use the DSM. The European Network For The Investigation Of Gender Incongruence is a multinational multicenter prospective study that uses DSM as well as non-DSM inclusion criteria.[14] This partnership of clinics in Germany, Belgium, Netherlands, and Norway is conducting the world's largest study of transgender health issues.[15]

People who suffer from GD display a number of unwanted symptoms, including nonsuicidal self-injury, anxiety, disordered eating, depression and suicide.[16] A 2018 observational study of an ethnically diverse sample of GD patients (n=332, in-person

interview) found that 53.3% participants reported self-injurious behavior during their lifetime,[17] while the cisgender general population rate is 15-18%.[18] Incidence of nonsuicidal self-injury was found to correlate with body dissatisfaction, which is a known problem in TMS people.[17] A 2015 study (n=600) found that trans men have 'nearly identical' body dissatisfaction scores to cis-gender men with eating disorders.[4,19] Additionally, FtM individuals were much more likely to report nonsuicidal self-injury than MtF (60.5% to 39.5%, respectively).[17] In keeping with that finding, a study of 12-22 year-old subjects (n=96) published in 2017 calculated the rates of suicide attempts and self-harm to be much higher in trans men than trans women: while 14% of transwomen attempted suicide, 43% of trans men did, and while 34% of trans women reported instances of self-harm, 56% of trans men did.[18] A 2018 study in Spain noted that non-binary 14-25 year old subjects (n=856) were the less likely than either cisgender or transgender peers to receive social and/or familial support, a finding mirrored in another recent study from Australia.[16] Noted variances in behavior and social environment suggest that it is important to differentiate subpopulations within the larger transgender community for study to develop a nuanced understanding of risk factors in individuals.

Another study from 2016 found that while overall 30.3% of the observed transgender youth had a history of a suicide attempt, this percentage increased for those individuals concerned with weight change (gain or loss) from 20% to 41%.[18] A 2015 study found that 45.8% GD individuals reported an incidence of a lifetime depressive episode, and 21.2% reported a suicide attempt.[20] An ex post facto study of suicide ideation and attempts in Spain (n=151) found that 48.3% of patients with GD symptoms

at a gender identity treatment unit reported the presence of ideation (general population rate: 3.67%) and 23.8% reported a suicide attempt (general population rate: 1.6%).[21] Data from a 2014 study suggests that suicide attempts by transgender people are as high as 44%, while ideation may vary from 37-74% in this subgroup.[21]

A 2015 study of 118 individuals with GD found that 29.6% met the diagnostic criteria for dissociative disorders, a percentage significantly higher than the general population (p=.001).[20] Because of the pronounced increased incidence of these disorders in this subgroup, the authors theorize that dissociation is a feature of GD rather than a separate co-morbidity.[20] This idea is notable as qualitative interviews centered on body image in transgender youth found that altering diet and exercise may be done as a way of reconnecting to a sense of self lost to disassociation.[10]

Notably, as compared to trans women, TMS people have been found to experience higher levels of gender dysphoria on both the Utrecht Gender Dysphoria Scale and Gender Identity/Dysphoria Questionnaire For Adolescents and Adults, perhaps because trans men are more likely to be classified as Early Onset Gender Identity Disorder, which presents first in childhood, (in contrast to Late Onset for a higher percentage of trans women) and therefore have had a longer time span of gender incongruity.[12]

Body Dissatisfaction

Body dissatisfaction was experienced by 71.4% of TMS in a 2016 qualitative study conducted in the US, Canada and Ireland (n=90).[10] Another review of 97 charts found that 95% of patients reported body dissatisfaction.[19] The interviews determined

that TMS people experienced higher preoccupation with food and thinness than control populations matched by sex (cisgender women) and gender (cisgender men).[10] A 2017 retrospective chart review found a 19 fold increase in restrictive eating disorders in FtM.[19]

The most significant concerns regarding body image reported by this cohort were 1. gender dissociation, 2. dissatisfaction with body size, and 3. the intersection of gender dissociation with body size.[10] A 2016 study of 722 Gender Identity Disorder (DSM-4 used) found that trans men reported disproportionally high body insecurity, body checking behavior, and decreased body satisfaction.[22] This network analysis used a Body Image Scale for Transsexuals (developed in 1975) to determine which of 30 body characteristics contributed the most to the feeling of dysphoria in trans men and found that muscularity and posture were the most significant.[22]

It is unclear whether the use of CHT is preventative for disordered eating, although emerging research suggests that it is not.[23] It is notable that disordered eating may begin as a response to GD but may continue after any gender confirming surgeries or CHT if left untreated, even if the eating disorder symptoms temporarily abate during GD treatment.[24]

Disordered Eating And Eating Disorders

To alleviate the suffering caused by this incongruence, some TMS may engage in behaviors to reshape or modify their bodies. The incidence of eating disorders have been found to be significantly higher in transgender people across all age groups compared to their cisgender counterparts.[25] The prevalence of Anorexia Nervosa is .37% in young cis

women, and about 1% present with Bulimia Nervosa ; .3% of young cis men have Anorexia Nervosa and another .5% have Bulimia Nervosa- as compared to an eating disorder diagnosis in 7% of transgender men.[19]

The relationship between eating disorder pathology and body dissatisfaction is mediated by complex factors, including anxiety, depression, low self-esteem, perfectionism and interpersonal problems,[23] a concern for a community that is prone to exactly these factors as they are common in GD. Eating disorder pathology includes alterations in eating patterns as well as the use of supplements that induce vomiting, that have a laxative effect, or that trigger weight loss.[23] It has been estimated that among women with eating disorders, as many as 34% used diuretics, 28% used emetics, 75% used laxatives, and 52% used diet pills.[26] In a 2003 study of Bulimia Nervosa patients, 64% used diet pills.[27]

Some TMS people may resort to calorie restriction or purging in an effort to halt menses, minimize breast tissue growth, and prevent feminine-pattern fat deposits that lead to a feminine physique.[24] Nutritional restriction was the most common eating disorder symptom among individuals reporting disordered eating.[19] The prevalence of disordered eating is complicated by the attempts at delaying puberty and the associated emergence of assigned sex characteristics.[28] A small retrospective chart review (n=5) pointed to an intensely focused criticism of the patients' appearance as it related to their experienced gender,[28] highlighting the role of intersectionality in the area of disordered eating in those with GD.

A 2018 study conducted in the United Kingdom (n=563) determined that out of those individuals who presented with eating disorder symptoms at a transgender health service assessment, 13.5% used diet pills and 15.6% used laxatives.[23] The 2013 Massachusetts Youth Health Survey (n=2473) calculated the adjusted odds ratio of transgender use of selected supplements to cisgender male use as 8.9 for diet pills, 7.2 for laxatives, and 26.6 for non-prescription steroid use.[29] This survey did not specify the gender of the transgender students.

Supplements As Non-CHT Transitioning Mechanism

A 2016 post-mastectomy survey of 33 trans men found that this procedure not only improves the dysphoric feelings associated with the chest, but contributes to overall body satisfaction and the feeling of passing (i.e., being read as the experienced gender by society), which contribute to perceived higher quality of life and self-esteem.[30] While trans women tend to focus on the appearance of their genitalia in the context of GD, trans men universally mentioned the need for chest surgery as a way to ameliorate their dysphoria.[30] While post-mastectomy trans men still indicate lower scores on body satisfaction surveys than cisgender population controls, they do report improvements in their perception of body areas unrelated to breasts from baseline, moving from 'neutral' to 'satisfied' in overall body satisfaction, social and hair growth metrics, and hip region.[30] Similarly, a 2018 Turkish study that used American testing methods and the DSM-5 classifications described improvement in the quality of life (p=.004) in 20 post-operative trans men as compared to a pre-operative sample of 50.[31]

While these positive results of gender affirming care are well-known in the TMS community, access to these medical services is tightly controlled. The Standards of Care set forth by the World Professional Association For Transgender Care with clinical guidelines provided by the Endocrine Society regulate who may use medical services and when.[32] It is standard practice that youth presenting with persistent GD may be eligible for pubertal suspension drugs and must then wait for CHT and then wait again for surgery, and that the pertinent milestones are increasingly reached based on cognitive and emotional maturity as opposed to previously common age standards.[32] Each step is overseen by medical and mental health professionals and requires recommendation letters and other obstacles to access, which ensures no potentially permanent decisions are reached rashly, however, this but can be frustrating for individuals who are waiting for care or have no hope of access due to financial hardships, lack of familial support, and/or other reasons.

Many medical providers who work with trans people require Real-Life Experience in the individual's perceived gender before they approve puberty blockers or cross-sex hormone therapy,[33] in effect asking people to socially transition without medical support. This may add pressure on the patient to align their gender presentation to their experienced gender through other means, which may include diet and exercise.

Anecdotal evidence from pediatric endocrine treatment centers suggests that the demand for services has risen dramatically over time,[33] indicating that the number of individuals who are seeking a medical intervention but who have not yet received it is also growing.

It is known that in the absence of CHT, TMS patients may turn to Non-Medical Body Modification practices, such as changes to diet and exercise.[34] The 2003 Canadian Trans PULSE Project, found that 43% of the respondents used CHT, of which a quarter obtained it without a prescription.[35] Herbal supplements accounted for 3.2% of the nonprescription CHT use.[35]

Dietary Supplements Introduction

By law, a dietary supplement is a substance that "is intended to supplement the diet; contains one or more dietary ingredients (including vitamins; minerals; herbs or other botanicals; amino acids; and other substances) or their constituents; is intended to be taken by mouth as a pill, capsule, tablet, or liquid; and is labeled on the front panel as being a dietary supplement".[36] The most common supplements that are included in the 30 billion dollar a year industry[37] are vitamins/minerals, botanicals, weight-loss supplements and sports performance enhancing substances.[36] A small minority of users (23%) choose dietary supplements at a doctor's recommendation, and most report taking them to improve (45%) or maintain (33%) overall health.[38]

While over half of Americans use dietary supplements,[39] little is known about the incidence of dietary supplement use in the TMS community. Dietary supplements that encourage calorie loss, diuretics and laxatives are often used in this group.[40] Exercise for the purpose of building muscle is a common strategy, and some TMS people have been reported to use supplementation as a means of facilitating muscle growth.[29] While we know that 5% of the general population uses dietary supplements for weight loss,[38] it is unknown whether this holds true for the TMS population.

Dietary Supplement Use Rates

A 2011 analysis of surveys commissioned by the dietary supplement trade associations calculated that 67% of respondents used a vitamin/mineral supplement. 35% used a specialty supplement, 23% used a botanical, and another 17% used a sports supplement in their lifetime.[41] These statistics are somewhat higher than what has been reported in the National Health And Nutrition Examination Survey (NHANES) because they include seasonal and occasional users in additional to regular users. The most common supplements reported by the general U.S. population are summarized in **Table 1** below.[41] These percentages are substantially higher than the numbers captured by the NHANES Dietary Supplement Questionnaire, which only asks participants about use within the past-30 day use survey.[42]

A 2004 Canadian study of high school students (n=333) found that males were more likely to use creatine and diuretics while females were more likely to use herbal weight-loss supplements.[43] The authors reported protein supplement use rates of 13.5%, but purposefully did not measure the use of steroids and illegal supplements.[43] The study used convenience sampling and did not ask about transgender status. An analysis of the American College Health Association (ACHA) National College Health Assessment (NCHA) II (n=289,024) calculated that trans students had an odds ratio of 2.05 (95% CI, 1.48-2.83) for the past-month use of diet pills as compared to cisgender heterosexual women, and an odds ratio of 2.46 (95% CI, 1.83-3.30) for the use of laxatives and/or vomiting with the same comparison group.[25] Although this study separated cisgender students into six categories by sex (male, female) and sexual orientation (heterosexual,

sexual minority, or unsure), it did not make any distinctions for the transgender community, making it impossible to determine how the use of diet pills or laxatives is affected by the gender or sexual orientation of transgender students. The 2014 Canadian Trans Youth Survey (n=923) found that in the 14-18 year old age group 7% used diet pills and 5% used laxatives, while another 4% used diet pills and 3% used laxatives among 19-25 year olds.[40] The survey also found that those who identified as non-binary were more likely to use purging as a coping behavior as compared to trans boys/men.[40] These statistics point to a need to allow more specific categories within the non-cisgender spectrum to tease out the trends and health issues among specific smaller subpopulations.

Table 1. The 15 Most Common Reported Previous 30 Day Used Dietary Supplements.

Dietary supplement	**% Reporting use**
Multivitamins	71
Omega-3/fish oil	33
Calcium	32
Vitamin D	32
Vitamin B/B-complex	32
Vitamin E	25
Magnesium	19
Glucosamine and/or chondroitin	12
Fiber	12
Green tea	12
Protein bars	11
Iron	11
Flaxseed oil	10
Energy drinks/gels	10

The ACHA-NCHA II from 2012 found the rate of lifetime consumption of energy drinks to be 68.4% with 30.2% in the past 30 days.[44] The consumption of energy drinks was associated with weight loss attempts, poor body image, and unhealthy weight loss behaviors.[44] Increased caffeine use, a common ingredient in energy drinks, has been found in young girls presenting with Anorexia Nervosa.[45]

Risk Factors

An analysis of single-supplement-related adverse events collected over 11 years by the US Department of Agriculture and published in 2019 noted 977 events, of which 40% were classified as severe, which entailed hospitalization and/or death.[39] Muscle-building, energy and weight loss supplements showed a 3 fold risk increase over vitamin supplements (which are not free from adverse events) in the 18-25 year old age group.[39] A 2000 survey found that 57% of non-military gym goers used creatine, a much larger percentage than non-gym-goers.[46]

This is especially troubling because while protein supplement use may be potentially dangerous for any person due to unlisted harmful ingredients, toxicity and potential negative side effects, these problems may be more likely to occur in people whose liver and kidneys are already under the load of exogenous testosterone.[47] It is also known that adverse effects of supplementation use are more pronounced in youth and adolesecents,[39] which is a group less likely to have access to gender confirmation medical services and may therefore may be more likely to rely on supplements to lessen gender dysphoria symptoms.[29]

CHAPTER 2: THE STUDY

Methods

The Institutional Review Board (IRB) Office at George Mason University determined this research to be exempt from IRB review (1489875-1).

Participants

This study was an analysis of anonymous questionnaire data collected from a nonprobability volunteer sample of participants between March, 2019 and November, 2020. Eighty-five (85) participants were recruited using purposive and snowball sampling methods. Recruitment of potential participants included two main strategies: word of mouth and social media. Initial respondents were encouraged to share the survey with their peers and social groups. Additionally, flyers were posted on Facebook groups of interest to the target population. To be included in the study, potential participants had to identify as trans-masculine. An electronic consent form provided detailed information about the purpose, inclusion criteria, and research procedures. Those who signed the electronic consent form were automatically directed to a separate screen where the study questionnaire was available. Of the 85 participants, 48 met inclusion criteria. The final sample consisted entirely of individuals assigned female at birth whose current gender identity is not explicitly female/woman.

Materials

The online survey tool used to create and administer the questionnaire was Qualtrics (Qualtrics, Provo, Utah USA). The survey was available as both a computer and

mobile application. Participants completed the online survey consisting of 29 items which collected data on demographics, medical transition status, and dietary supplement use. Although participants were given instructions that the survey may take 45 minutes to complete, most were finished within 12 minutes.

The data collection was anonymous, and no incentives were provided to participants.

The list of supplements in the survey was adapted by using the NHANES Dietary Supplement Questionnaire [b], and by looking at the most common supplements used in the general population as well as by people concerned with muscle development and weight loss (data from the National Institutes of Health Office of Dietary Supplements- NIH ODS[48]). Online men's health forums,[49(p11),50,51(p10)] bodybuilding advice sites,[52–54] and transitioning advice forums[55,56] were searched for supplement recommendations, which were then included in the survey.

The efficacy of testosterone boosters is contested in the literature, and the included list (**Table 9** in the Appendix) is comprised of recommendations offered on FtM, transitioning, bodybuilding and related forums as opposed to government-sanctioned guidance. The mechanisms of action are not proposed due to lack of sufficient evidence.

Although most protein bars, liquids, and gels are considered food rather than DS, they were included in the survey because this product category is particularly salient in

[b] items repeated due to varied dosage reduced to single entry/items repeated due to varied delivery method reduced to single entry

the TMS population. Supplements banned by the FDA were also included due to their potential use across the population. The reasons for supplement use are reproduced from the NHANES Dietary Supplement Questionnaire.

Transgender status was determined using a two-part question technique recommended by The Gender Identity in U.S. Surveillance group, which is associated with the Williams Institute, a UCLA Law think tank specializing in research in sexual orientation and gender identity as they relate to policy and law.[57] The group is a working partnership of 'scientists, scholars, and transgender leaders dedicated to increasing knowledge about gender-related measurement and promoting the inclusion of these measures on population-based surveys, with particular consideration for publicly-funded data collection efforts'.[58] A non-binary variant of the two-step approach was used in this research, which is shown in **Table 12** in the Appendix.

Procedure

At the completion of the survey open period data was exported from Qualtrics. Qualitative answers were converted to numerical data for ease of analysis: for example, if a participant indicated that they use a multivitamin, the selection was coded as a number that corresponded to multivitamins. The results were then compared to previously reported data from the NHANES, 2007-2010 datasets using percentages obtained from descriptive statistical analysis of the data.

Results

A total of 85 individuals were recruited to the study, of which, 83 provided informed consent. Twenty-two participants were excluded due to not meeting the

inclusion criteria, either because they indicated they were assigned male at birth (n=12) or currently identified their gender as female/woman (n=10). Also excluded were 13 participants who did not complete any questions past the race/ethnicity demographics collection. In total there were 48 survey respondents; not every survey was entirely complete (**Figure 1**).

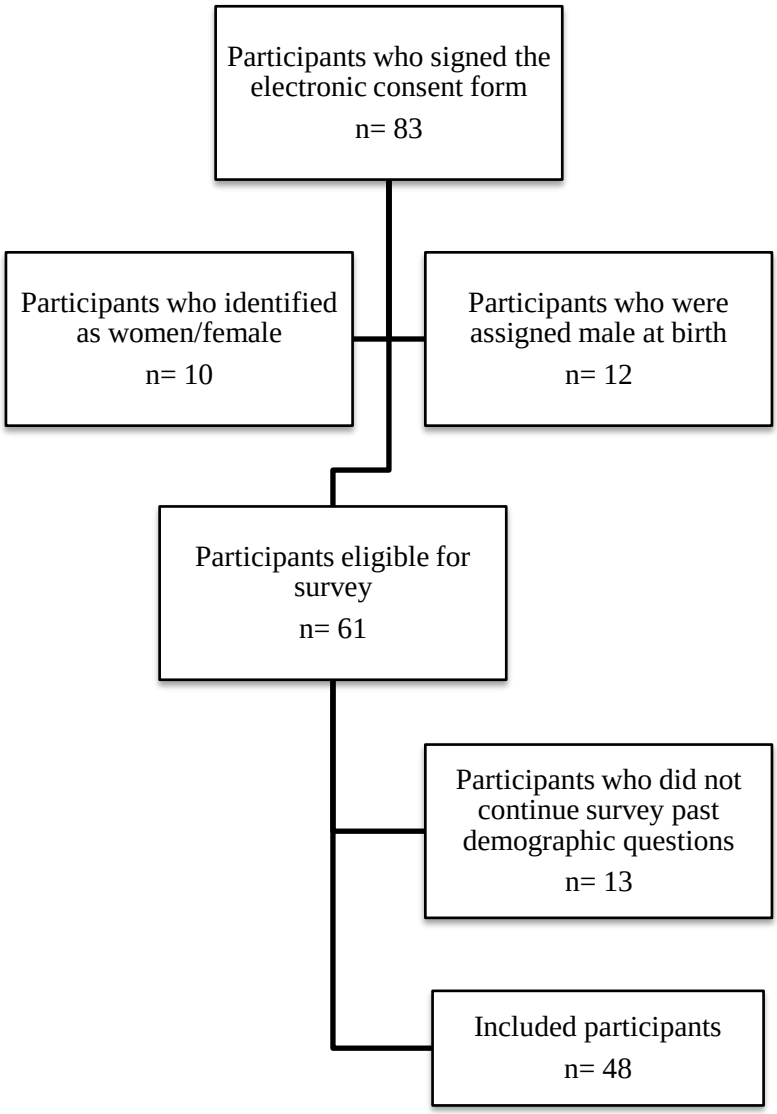

Figure 1. Inclusion Flowchart.

The mean age of participants was 29.0±6.4years. Not accounting for ethnicity, 87.2% of participants identified as white. **Table 2** contains the demographic and health characteristics of the respondents.

While most participants (95.8%) had access to health insurance and received cross-hormone therapy (77.1%), the incidence of surgical interventions was lower (37.5% for mastectomy, 0% for bottom surgery).

Table 2. Demographic Characteristics Of Our TMS Population.

Characteristic	N	%
Gender[1]		
Male	24	50.0
Trans man, trans male	33	68.8
Non-binary	5	10.4
Transmasculine	3	6.20
Genderfluid	1	2.10
Demiboy	1	2.10
Genderqueer, gender nonconforming	16	33.3
Void	1	2.10
Age (years)		
<20	3	7.10
20-29	22	52.4
30-39	15	35.7
≥40	2	4.80
Race/ethnicity		
White, non-Hispanic	32	68.1
White, Hispanic	4	8.50
White, other	5	10.6
Black, non-Hispanic	2	4.20

Demographic Characteristics Of Our TMS Population, Con't.		
Race/ethnicity	**N**	**%**
Asian, non-Hispanic	1	2.10
Other, non-Hispanic	3	6.40
Other, other	1	2.10
BMI		
<18.5	4	8.50
18.5 to <25.0	15	31.9
25.0 to <30.0	9	19.1
≥30.0	19	40.4
Income		
Low (<$25K)	18	37.5
Medium ($25 to <$75K)	21	43.8
High (>$75K)	9	18.8
Access to health insurance		
Yes	46	95.8
No	2	4.20
Cross sex hormone therapy		
Yes	37	77.1
No	11	22.9
Top surgery		
Yes	18	37.5
No	30	62.5

Demographic Characteristics Of Our TMS Population, Con't.		
Bottom surgery		
Yes	0	0.00
No	47	100
Hysterectomy		
Yes	8	16.7
No	40	83.3
Oophorectomy		
Yes	6	12.5
No	42	87.5
Other gender affirming surgery		
Yes	6	12.5
No	42	87.5

As compared to the general population, transmasculine spectrum respondents reported a higher incidence of using dietary supplements. While the general population's use of dietary supplements remained stable at 52% between 1990 and 2012,[42] 64% of TMS respondents in our survey reported dietary supplement use in the previous 30 days, and 90% reported use at some point during their lifetime. Of those TMS persons who reported using dietary supplements, the average respondent used 4.22 ±4.12 distinct DSs in the previous 30 days and an average of 9.11±7.5 distinct dietary supplements over their lifetime.

Age did not have a significant effect on the number of dietary supplements used, with participants under 30 using an average of 9.25±8.53 supplements in their lifetime, while participants 30 years and older reported an average of 9.42±6.09supplements (p= 0.94). Participants under the age of 30 years used an average of 4.81±5.05 dietary supplements over the previous 30 days, while those 30 and overused 3.86±2.90 in that time period (p= 0.53).

Of the 25 respondents under the age of 30 years, 96% had used at least one supplement in their lifetime, but only 64% did so within the previous 30 days. Supplement use was less pronounced in the 30 and over group (83% over lifetime, 74% previous 30 days).

Income and BMI were not predictors of dietary supplement use. There was no significant relationship between income level or the number of supplements used within the last 30 days (p=0.51) or over the lifetime (p=0.71). **Table 3** summarizes the effect of household income on supplement use.

Table 3. Household Income And Dietary Supplement Use**.**

Household income	**Average number of supplements used over the past 30 days**	**Average number of supplements used over the lifetime w/SD**
Low: less than $25,000	3.25(3.14) n=12	9.94(7.25) n=17
Medium: $25,000 to $74,999	5.58(5.52) n=12	9.22(8.48) n=18
High: $75,000 or more	4.14(2.27) n=7	8.25(6.02) n=8

There was no relationship between CHT and BMI or CHT and dietary supplement use.

The top reported reasons for using dietary supplements in the general population are to improve health (45.0%), maintain health (32.8%), and bone health (25.2%).[38] The TMS population in our study specified improving health (60.4%), maintaining health (54.2%) and mental health (39.6%) as the top three reasons for supplement use. While both surveys showed that supplementing an insufficient diet was a reason for use, 22.0% of the general population reported this reason compared to 41.7% in the TMS population. The largest disparity in reason for use between the groups was mental health: while 3.7% of the general population chose this reason, 39.6% of the TMS population did so.[38]

Table 4 below compares the data from respondents within the NHANES, 2007-2010 dataset. Motivations for use of dietary supplements in our survey were selected to correspond with these previously reported data by Bailey et al, 2013.[38]

There was no statistically significant relationship between the amount of dietary supplements used and mastectomy status, either within the past 30 days ($p=.95$) or over the lifetime ($p=.11$). **Table 5** reports the incidence of use of various dietary supplement categories, as reported by TMS respondents in our study. The full breakdown by name of each reported supplement is included in **Appendix 1**.

Table 4. Dietary Supplement Use Reasoning in Transmasculine Spectrum Individuals Compared To the General U.S. Population.

Motivation	TMS population %	U.S. population[1] %
Improve my overall health	60.4	45.0
Maintain health (to stay healthy)	54.2	32.8
Bone health, build strong bones, osteoporosis	18.8	25.2
Supplement my diet (because I don't get enough from food)	41.7	22.0
Prevent health problems	32.3	20.4
Heart health, cholesterol	25.0	15.1
Prevent colds, boost immune system	33.3	14.5
Healthy Joints, arthritis	18.8	12.4
Get more energy	26.3	10.8
Good bowel/colon health	20.8	4.8
Anemia, such as low iron	22.9	4.6
Eye health	0.0	4.3
Mental health	39.6	3.7
Weight loss	16.7	2.6
Muscle related issues	8.3	1.5
Build muscle	10.4	NR

Adapted from Bailey et al (2013)38

The most common category of dietary supplement used by our TMS population was vitamins and minerals, followed by miscellaneous, herbal, and sports nutrition. This incidence of use value indicates how many times a distinct supplement product from this

category was reported among the study participants. An individual supplement product may have been used by more than one participant, and each participant may have reported use of more than one supplement from any category.

Table 5. Categories Of Dietary Supplements And Incidence Of Use.

Type of dietary supplement	Incidence of use
Vitamins and minerals	151
Miscellaneous	100
Herbal	93
Sport nutrition	41

Table 6 compares dietary supplement use in our TMS population with that of respondents from the NHANES, 2007-2010 datasets.[38] Five of the top ten dietary supplements reported by the general U.S. population were also reported by our TMS study population: multivitamins, fish oil, Vitamin D, Vitamin B/B-complex, and green tea (**Figure 2**). Several commonly used supplements (>10% usage) that were reported amongst our TMS population were absent from respondents within the NHANES, 2007-2010 datasets. The TMS population reported similar rates of melatonin and multivitamin use in our study. Iron, biotin, and cranberry were also reported at rates of usage.

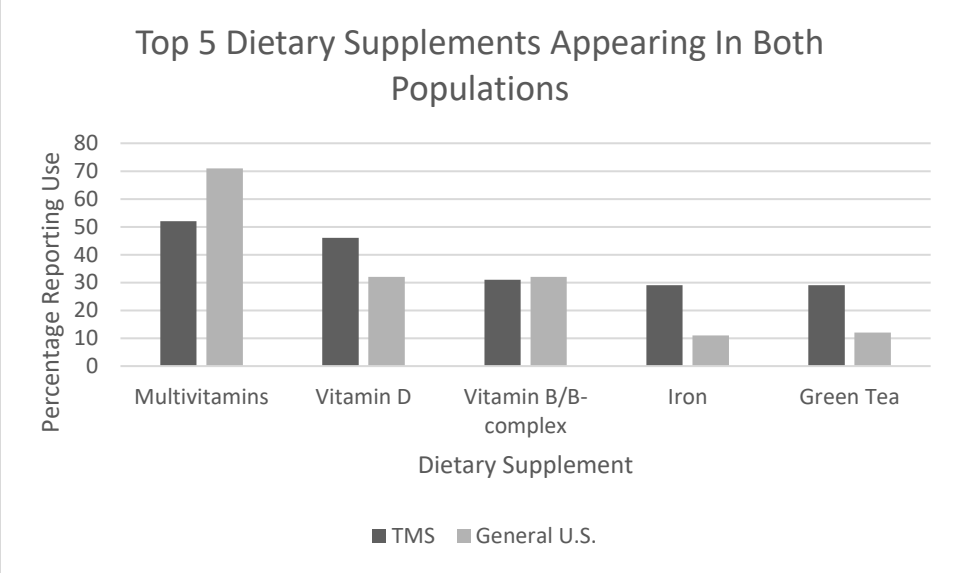

Figure 2. Top 5 Supplements Appearing in Both The TMS Population And the General U.S. Population.

Table 6. Top 14 Used Dietary Supplements.

Dietary supplement use	
U.S. population (%)[1]	**TMS population (%)**
Multivitamins 71	Multivitamins 52
Omega-3/fish oil 33	Melatonin 52
Calcium 32	Vitamin D 46
Vitamin D 32	Vitamin C 35
Vitamin B/B-complex 32	Fish oil 33
Vitamin E 25	Vitamin B6/B-complex 31

Top 14 Used Dietary Supplements, Con't.	
U.S. population (%)[1]	**TMS population (%)**
Magnesium 19	Iron 29
Glucosamine and/or chondroitin 12	Green tea 29
Fiber 12	Biotin 25
Green tea 12	Cranberry 23
Protein bars 11	Zinc 23
Iron 11	Protein powder 23
Flaxseed oil 10	Probiotic 23
Energy drinks/gels 10	calcium 21

Discussion

Our surveyed TMS population was 68% White/non-Hispanic, 4% Black/non-Hispanic, and 8% Hispanic, while a previous study has found that this population is more diverse with 55% reporting that they are White/non-Hispanic, 16% Black/non-Hispanic, and 21% Hispanic.[6] The study did not capture the ethnic or racial diversity of the U.S. TMS population.

The percentages of transmasculine spectrum respondents signifying that they use dietary supplements for specific health and medical motivations are much higher than what has previously been reported by the general U.S. population, suggesting that this subgroup may use supplementation in a unique way. While 33.3% of TMS respondents reported using dietary supplements for immune system support, only 14.5% of the general U.S. population reported this motivation for use.[38] These differences can be seen in respondents wishing to improve overall health (45.0% for the general population, 60.4% for TMS respondents), maintaining health (32.8% for the general population, 54.2% for TMS respondents), and across many other categories.[38] Although the reasoning for these differences is not clear from the data present in our survey (note: the vast majority have access to health care and have trust in their health provider), the outcomes suggest that this subgroup places a higher reliance on dietary supplements to fulfill their wellness needs. To our knowledge, no previous studies present in the scientific literature have explored these differences amongst the TMS population. Interestingly, this study did not find a relationship between the number of supplements used and income. Dietary supplement use in the general U.S. population has been reported to be associated with higher income status.[30]

The percentage of the survey population reporting use of dietary supplements for mental health as compared to the general population is striking (39.6% vs. 3.7%, respectively).[38] This may point to a disparity in access or perceived access to mental health services, or simply reflect the higher prevalence of mental health complaints among the TMS population: a 2018 study of 913 transgender adolescents found a

fourfold increase in depressive symptoms,[59] and previous studies on self-harm, anxiety, and other mental-health concerns have consistently found that transgender individuals are at significantly higher risk.[17,20,25]

While there is overlap in the ten most popular supplements used by the general U.S. population and the TMS population (i.e., multivitamins, fish oil, Vitamin D, B/B-complex, and green tea), there are notable variations. The TMS group reports high use of melatonin (52%), which has been shown to be taken by less than 10% of the U.S. population.[38] Melatonin is used to support sleep (research in this field is emerging but inconclusive),[60] and to our knowledge, there are no previous studies reporting the greater prevalence of use among TMS individuals. Biotin and cranberry are also missing from the general population top 14 list (>10% usage), however, use was prevalent among our TMS population (25% and 23%, respectively). Both these supplements are commonly associated with use by people who are assigned female at birth, due to the popular belief that biotin supports hair and nail health and cranberry is protective against urinary tract infections,[61,62] which may contribute to the difference in prevalence.

Calcium use was reported by 32% of the general U.S. population and 21% of our TMS population. Glucosamine and/or chondroitin use in the NHANES, 2007-2010 dataset was 12% and less than 1% of the TMS survey sample. These differences may be due to age: while the average age in the surveyed TMS sample was 29.0, with the oldest participant at 35.4 years, the NHANES includes an older population that is associated with calcium and glucosamine/chondroitin supplementation for osteoarthritis, which is more prevalent in older populations.[63,64]

Prolonged exogenous testosterone use is associated with endometrial atrophy, a thinning of the uterine lining, a condition that may cause bleeding.[65] Surgical intervention in the form of hysterectomy may be necessary, and one study found that 21% of TSM people reported having had the procedure, with another 58% who wanted to in the future (n=2566).[66] The reasons reported for having had or wanting the procedure varied, with reports of ameliorating organ incongruence, encouraging masculinization, and avoiding future gynecological appointments, as well as medical necessity and/or prevention. Our TMS survey respondents reported a hysterectomy rate of 16.7%, a lower rate that may be explained by the age of the group. Testosterone exposure produces changes over time, and the side effects that impact the uterus will not manifest immediately.[67] The younger skew of our survey population may mean that participants have had less time using testosterone and have therefore not experienced these potential side effects yet.

The percentages of TMS respondents in our study that report use of dietary supplements is also significantly higher than in the U.S. population. This adds clarity to the idea that the TMS subpopulation has different motivations for use of dietary supplements, compared to the general population, and that these patterns of use should be studied more closely. The CDC reports that between 2017-2018, 58% of U.S. adults used dietary supplements in the last 30 days during the survey period.[68] In our study of TMS population, use of dietary supplements in the same timeframe was reported to be 64%, with 90% of respondents having used supplements at some point in their lifetime. No previous data has been found on the overall prevalence of dietary supplement use in the TMS population, so it's not possible to place this finding in context with prior data.

While we know that fewer transgender individuals have access to affirming health care and indicate more concerns with body image and disordered eating, and mental health than the general population, [4,17,20,25,40,59,59,69] we are not aware of previous studies that are able to help elucidate reasons between the various factors mentioned above and specific dietary supplement use.

An additional area of concern in nutritional guidance for TMS individuals is obesity. While this study did not find an increased incidence of obesity (40.4% respondents were obese as compared to the national average of 42.4 in adults[70]), the literature has been conflicting, with findings of an increased, decreased, and similar prevalence of obesity among TMS populations.[71,72] These conflicts may be due to the paucity of studies focusing on transgender people and further highlight the need for nationally representative data collection.

The finding that mastectomy status and rates of dietary supplement use were not significantly correlated is consistent with a previous study in which transgender respondents reported improvements in body satisfaction post-surgery, but that their body satisfaction scores were still lower than the cisgender group.[30]

While the types of dietary supplements used were consistent between the general population and the TMS individuals in our study, the rates and the numbers of respondents indicating their reliance on dietary supplements for health concerns were markedly higher, suggesting that although TMS people are using the similar dietary supplement products for many of the same reasons as the general U.S. population, distinct motivations exist.

The disparity between rates of supplement usage between the surveyed TMS population and the NHANES, 2007-2010 dataset respondents may be partially explained by the mistrust of the medical establishment. The 2015 U.S. Transgender Survey conducted across the United States, its territories, and military installations (n=27, 715) found that 33% of respondents reported being refused medical care or being harassed.[73] Of those who attempted to gain coverage for gender affirming surgery, 55% were denied, while 25% were denied coverage of hormone therapy.[73] Another 23% reported not seeing a doctor when needed due to fear of harassment.[73] The commonality of these experiences may lead to a community-wide hesitation to engage with the medical community.

At the same time as the transgender community is experiencing bias and harassment from mainstream health care providers, the rise of social media has created an easily accessible resource for alternative sources of advice and information. A 2019 study analyzing 30 YouTube channels dedicated to the transgender experience (view count between 114 and 86, 477 for each video with an average of 11, 758) reported that these videos provided viewers with advice on the function of diet and exercise, diet and exercise philosophies, and the use of dietary supplements, in addition to other topics of interest to the transgender population.[74] In the absence of trust in the medical establishment, it is possible that members of the transgender community are turning to alternative sources of health and diet information, driving the differences in dietary supplement use between this community and the general population.

To assemble actionable information about the transgender community, the Federal government must start oversampling the transgender population in future cycles of the

NHANES. Without this important data it is impossible to derive evidence-based nutritional guidance to TMS individuals and the healthcare providers who work with them.

Limitations

Due to the small number of respondents, population-wide inferences cannot be made. Furthermore, the participants were not randomly selected, so the sample cannot be said to be representative of the U.S. TMS population. However, large trends can be seen in the data, suggesting that a unique set of motivations exist in the TMS population regarding the use of dietary supplements.

Future Research

The available literature on transgender populations is scarce, but this problem is compounded by the way data has often been gathered and reported. While cisgender groups are separated by ethnicity, sex, and sexual orientation, it has been common to sort the entire transgender segment into one group. Doing so makes it impossible to determine whether the participants were trans men or trans women, and any details about their demographic characteristics are lost. Although this may be due to the relatively small numbers of such participants in any given study, classifying individuals into one broad category does not add clarity to the unique characteristics of each subpopulation. Future studies must better define their participants by salient demographic categories so that a better understanding of these subpopulations may be gained.

Because of the small size of the overall transgender/non-binary population, it may be more useful to study one subpopulation at a time and maximize the number of

participants, rather than to study a broad group but lack descriptive power due to very few individuals in any particular demographic category. More specifically, the majority of studies we found that included the transgender population have skewed towards an overwhelmingly White sample, as has this one. Care should be taken to find Black, Indigenous and other people of color participants as this population has been historically underrepresented in the literature.

APPENDIX

NHANES

The NHANES is an annual cross-sectional survey of 5,000 participants selected to be representative of the US population[75]. It has been running continuously since 1999 and collects data on demographics, health issues, and nutrition, among other areas, as part of the Centers for Disease Control and Prevention[75]. Gender identity is not collected by the survey, so there is no way to differentiate data from cisgender and non-cisgender respondents. The nationally representative and comprehensive nature of this longitudinal study makes it a reliable source of comparison to the target population, allowing for the development of a meaningful understanding of the specific nutritional needs of transmasculine spectrum people.

Tables

Table 7. Surveyed Supplements Derived From NHANES.

Acai	Alfalfa	Amino Acid Capsules	B-Complex
Bacopa Monnieri	Barley Grass Powder Packs	Bee Pollen	Bee Propolis
Bilberry	Biotin	Blueberry	Calcium
Calcium & Magnesium	Calcium + Vitamin D	Calcium Citrate With Vitamins D3 & K	Calcium Magnesium & Zinc
Calcium, Vitamin D & Magnesium	Cascara Sagrada	Chlorella	Choline
Chondroitin	Chromium	Cinnamon	CLA
Coconut Oil	Cod Liver Oil	Coenzyme Q-10	Colloidal Silver
Copper	Cordyceps Mushroom	Corn Silk	Cranberry
Cranberry Plus Vitamin C	Creatine	DHEA	D-Mannose
Echinacea	Elderberry & Zinc	Elderberry Liquid	Enzymes
Evening Primrose Oil	Fat Burner	Fiber	Fish Oil
Flax Seed Oil	Flaxseed And Fish Oil	Fluoride Tabs	Folic Acid
Garcinia Cambogia	Garlic	Ginkgo Biloba	Ginseng
Glucosamine	Glucosamine Chondroitin	Glutamine Powder	Gotu Kola
Green Coffee Bean	Green Tea	Gymnema Sylvestre	Inositol

Surveyed Supplements Derived From NHANES, Con't.			
Iron	Krill Oil	Lactobacillus Acidophilus	L-Arginine
L-Carnitine	Lecithin	Licorice Root	Lutein
Lycopene	Lysine	Maca	Magnesium
Melatonin	Milk Thistle	Multimineral	Multivitamin
Multivitamin Multimineral Pack	Noni	Olive Leaf	Omega 3
Oregano	Papaya Enzyme	Passion Flower	Policosanol
Potassium	Pregnenolone	Probiotic	Protein Powder
Psyllium Fiber	Pycnogenol	Raspberry Ketone	Red Yeast Rice
Rhodiola Rosea	Salmon Oil	Sam-E	Saw Palmetto
Scullcap	Selenium	Sodium Fluoride Drops	Spirulina Powder
Trikatu	Turmeric	Vitamin A	Vitamin A & D
Vitamin B-1 (Thiamin)	Vitamin B-12 (Cobalamin)	Vitamin B-2 (Riboflavin)	Vitamin B-3 (Niacin)
Vitamin B-5 (Pantothenic Acid)	Vitamin B-6 (Pyridoxine)	Vitamin B-Complex	Vitamin C
Vitamin D	Vitamin E	Vitamin K	Whey Protein
Zinc	ZMA		

Table 8. Supplements Associated With Athletic Performance Enhancement And the Proposed Mechanism of Action.

Supplement	Proposed Mechanism of Action
Antioxidants (vitamin C, vitamin E, and coenzyme Q_{10})	Minimize free-radical damage to skeletal muscle, thereby reducing muscle fatigue, inflammation, and soreness
Arginine	Increases blood flow and delivery of oxygen and nutrients to skeletal muscle; serves as a substrate for creatine production; increases secretion of human growth hormone to stimulate muscle growth
Beetroot or beet juice	Dilates blood vessels in exercising muscle, reduces oxygen use, and improves energy production
Beta-alanine	Increases synthesis of carnosine, a dipeptide that buffers changes in muscle pH, thereby reducing muscle fatigue and loss of force production; considerable individual variation in associated muscle carnosine synthesis
Beta-hydroxy-beta-methylbutyrate (HMB)	Helps stressed and damaged skeletal muscle cells restore their structure and function
Betaine	Might increase creatine production, blood nitric-acid levels, or water retention in cells
Branched-chain amino acids (BCAA)	Can be metabolized by mitochondria in skeletal muscle to provide energy during exercise
Caffeine	Blocks activity of the neuromodulator adenosine; reduces perceived pain and exertion
Citrulline	Dilates blood vessels to increase delivery of oxygen and nutrients to skeletal muscle
Creatine	Helps supply muscles with energy for short-term, predominantly anaerobic activity
Deer antler velvet	Contains growth factors (such as insulin-like growth factor-1 [IGF-1]) that could promote muscle tissue growth
Dehydroepiandrosterone (DHEA)	Steroid hormone that can be converted into testosterone and estradiol

Supplements Associated With Athletic Performance Enhancement And the Proposed Mechanism of Action, Con't.	
Supplement	**Proposed Mechanism of Action**
Ginseng	Unknown mechanism of action; Panax ginseng used in traditional Chinese medicine as a tonic for stamina and vitality; Siberian ginseng used to reduce fatigue
Glutamine	Involved in metabolism and energy production; contributes nitrogen for many critical biochemical reactions
Iron	Increases oxygen uptake, reduces heart rate, and decreases lactate concentrations during exercise
Protein	Builds, maintains, and repairs muscle
Quercetin	Increases mitochondria in muscle, reduces oxidative stress, decreases inflammation, and improves blood flow
Ribose	Involved in production of adenosine triphosphate (ATP)
Sodium bicarbonate	Enhances disposal of hydrogen ions generated from intense muscle activity, thereby reducing metabolic acidosis and resulting fatigue
Tart or sour cherry	Phytochemicals in tart cherries may facilitate exercise recovery by reducing pain and inflammation
Tribulus terrestris	Increases serum testosterone and luteinizing hormone concentrations, thereby promoting skeletal muscle hypertrophy
Androstenedione *(banned by FDA)* Dimethylamylamine (DMAA) (banned by FDA) Ephedra *(banned by FDA)*	

Table 9. Supplements Popularly Associated With Testosterone Increase.

Magnesium
Fenugreek
Longjack
Zinc
D-Aspartic Acid

Supplements Popularly Associated With Testosterone Increase, Con't.
Ginseng
Boron
Tribulus Terrestris
Novedex XT
Animal M Stack
Anabolic Signal
Beast Sports Nutrition's Super Test
DAA Max By Vital Labs
Sergeant Steel By Assault Labs
Test1fy By Olympus Labs
Viron By Black Lion Research
Sustain Alpha By Iconic Formulations
Alphamax XT By Performax Labs
Forged Methyl EAA By Transform Supplements
Apex Male By Blackstone Labs

Table 10. Supplements Associated With Fat/Weight Loss And the Proposed Mechanism Of Action.

Supplement	Proposed Mechanism Of Action
African mango (Irvingia gabonensis)	Inhibits adipogenesis and reduces leptin levels
Beta-glucans	Increase satiety and gastrointestinal transit time, and slow glucose absorption
Bitter orange (Citrus aurantium L.)	Increases energy expenditure and lipolysis, acts as a mild appetite suppressant. Synephrine is the proposed active constituent.
Caffeine	Stimulates central nervous system, increases thermogenesis and fat oxidation
Calcium	Increases lipolysis and fat accumulation, decreases fat absorption

Supplements Associated With Fat/Weight Loss And the Proposed Mechanism Of Action, Con't.

Supplement	Proposed Mechanism Of Action
Capsaicin and other capsaicinoids	Increase energy expenditure and lipid oxidation, increase satiety, and reduce energy intake
Carnitine	Increases fatty acid oxidation
Chitosan	Binds dietary fat in the digestive tract
Chromium	Increases lean muscle mass; promotes fat loss; and reduces food intake, hunger levels, and fat cravings
Coleus forskohlii	Enhances lipolysis and reduces appetite. Forskolin is the proposed active constituent.
Conjugated linoleic acid (CLA)	Increases lipolysis, reduces lipogenesis, and promotes apoptosis in adipose tissue
Fucoxanthin	Increases energy expenditure and fatty acid oxidation, suppresses adipocyte differentiation and lipid accumulation
Garcinia cambogia (hydroxycitric acid)	Inhibits lipogenesis, suppresses food intake. Hydroxycitric acid is the proposed active
Glucomannan	Increases feelings of satiety and fullness, prolongs gastric emptying time
Green coffee bean extract	Inhibits fat accumulation, modulates glucose metabolism
Green tea/green tea extract	Increases energy expenditure and fat oxidation, reduces lipogenesis and fat absorption
Guar gum	Acts as bulking agent in gut, delays gastric emptying, increases feelings of satiety
Hoodia (Hoodia gordonii)	Suppresses appetite, reduces food intake
Probiotics	Alter gut microbiota, affecting nutrient and energy extraction from food and altering energy expenditure
Pyruvate	Increases lipolysis and energy expenditure
Raspberry ketone	Alters lipid metabolism
Vitamin D	None proposed; associations exist between low vitamin D status and obesity

Supplements Associated With Fat/Weight Loss And the Proposed Mechanism Of Action, Con't.	
Supplement	**Proposed Mechanism Of Action**
White kidney bean (Phaseolus vulgaris)	Interferes with breakdown and absorption of carbohydrates by acting as a "starch blocker"
Yohimbe (Pausinystalia yohimbe)	Has hyperadrenergic effects. Yohimbine is the proposed active constituent.

Table 11. Reasons for Using Dietary Supplements.

To:
Build muscle
Gain weight
Get more energy
Improve digestion
Improve my overall health
Maintain health (to stay healthy)
Maintain healthy blood sugar level, diabetes
Prevent colds, boost immune system
Prevent health problems
Supplement my diet (because I don't get enough from food)
For:
Anemia, such as low iron
Bone health, build strong bones, osteoporosis
Eye health
Good bowel/colon health
Healthy Joints, arthritis
Healthy skin, hair, and nails
Heart health, cholesterol
Kidney and bladder health, urinary tract health
Liver health, detoxification, cleanse system
Menopause, hot flashes
Mental health
Muscle related issues, muscle cramps
Pregnancy/breastfeeding
Prostate health
Relaxation, decrease stress, improve sleep

Teeth, prevent cavities
Weight loss

Table 12. Two-Step Approach To Measuring Gender Identity.

Assigned sex at birth

What sex were you assigned at birth, on your original birth certificate?

- Male
- Female

Current gender identity

What is your current gender identity? (Check all that apply)

- Male
- Female
- Trans male/Trans man
- Trans female/Trans woman
- Genderqueer/Gender non-conforming
- Different identity (please state): _____

Table 13. Complete List Of Dietary Supplements Used, With Incidence Of Use.

Type of dietary supplement	Incidence of use
Sports nutrition	
Amino Acid capsules	1
BCAA	1
Biotin	12
Creatine	4
L-Arginine	1
L-Carnitine	2
Lysine	2
Protein powder	11
Whey protein	6
ZMA	1
Vitamins and minerals	
B complex	13
Calcium	9
Calcium and Magneisum	1
Calcium and Vitamin D	10
Calcium, Vitamin D3 and Vitamin K	1
Calcium, Magnesium and Zinc	2
Calcium, Vitamin D, Magnesium	2
Iron	14

Complete List Of Dietary Supplements Used, With Incidence Of Use, Con't.	
Vitamins and minerals	
Magnesium	7
Multimineral	1
Multimineral/Multivitamin	2
Multivitamin	25
Potassium	4
Vitamin A	3
Vitamin A and Vitamin D	1
Vitamin B6	2
Vitamin C	17
Vitamin D	22
Vitamin E	3
Vitamin K	1
Zinc	11
Herbal	
Acai	5
Bilberry	1
Blueberry	6
Chlorella	1
Chlorophyll	2
Cinnamon	5
Cranberry	11
Cranberry and Vitamin C	5
Echinacea	5
Elderberry and Zinc	1
Evening primrose	1
Garcinia Cambogia	1
Garlic	8
Ginko Biloba	2
Ginseng	4
Gotu Kola	1
Green Coffee Bean	2
Green tea	14
Maca	1
Olive leaf	1
Oregano	2
Papaya enzyme	1
Passion flower	1
Red yeast rice	1
Spirulina powder	2
Turmeric	9
Miscellaneous	
Bee pollen	1

Complete List Of Dietary Supplements Used, With Incidence Of Use, Con't.	
Miscellaneous	
Bee propolis	1
CLA	1
Coconut Oil	6
Cod liver oil	4
Coenzyme Q10	1
Colloidal silver	1
DHEA	1
D-Mannose	1
Fat burner	1
Fiber	8
Fish oil	16
Flax seed oil	1
Folic acid	5
Glucosamine Chondroitin	2
Krill oil	1
Lactobaccilus	4
Lecithin	1
Melatonin	25
Omega 3	5
Probiotic	11
Psyllium fiber	2
Sam-E	1

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