


# Blind sports' blind spot: The global epidemiology of visual impairment against participation trends in elite blind para sport

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Catherine S M Stratton<sup>1</sup> , Kristina Fagher<sup>2</sup>, Xiang Li<sup>3,4</sup>, Taylor D Ottesen<sup>5,6</sup> and Yetsa A Tuakli-Wosornu<sup>7,8</sup>

## Abstract

**Background:** It remains unknown whether access to elite blind sports opportunities is globally balanced or matches the prevalence of blindness/visual impairment (VI). The primary objective of this study was to determine the rate of elite blind sports participation in each world region registered in the International Blind Sports Federation's (IBSA) and to assess its association with the global and regional prevalence of blindness/VI. The secondary objective was to determine the association between other covariates, such as age, vision class, and sex, with the number of IBSA-registered athletes from each region.

**Methods:** A baseline estimate of blindness/VI data was established and used when comparing participation rates to blindness/VI rates. Descriptive statistics were used to describe sports participation and associated co-variables.

**Results:** Among 123 member countries registered in IBSA, 31 did not have any completed registrations in blind sports, of which 22 had a prevalence of blindness/VI higher than the global average. During the summer season 2019, 738 (29.52%) IBSA athletes were female and 1762 (70.48%) were male.

**Conclusions:** These results suggest elite blind/VI sport participation is limited independently from blindness/VI prevalence. Increasing blind-friendly sport resources, especially in low-and-middle-income countries (LMICs), would improve the rate of elite sport participation among athletes with blindness/VI.

## Keywords

Para athlete, blindness/visual impairment, global equity, geographic trends

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## Introduction

Physical activity plays a vital role in mitigating the risk of numerous medical conditions,<sup>1</sup> such as obesity, cardiovascular disease, diabetes mellitus, neurodegenerative diseases, depression, and cancer.<sup>2–5</sup> Thus, to improve global health the World Health Organization (WHO) recommends that adults engage in 150 min of moderate to vigorous physical activity per week.<sup>6</sup> However, WHO has recently warned of raising sedentariness globally across various demographics.<sup>6</sup> A concern is that physical inactivity is far more pervasive among individuals living with a disability due to challenges in

<sup>1</sup>Department of Chronic Disease Epidemiology, Yale School of Public Health, New Haven, CT, USA

<sup>2</sup>Rehabilitation Medicine Research Group, Department of Health Sciences, Lund University, Lund, Sweden

<sup>3</sup>Department of Biostatistics, Yale School of Public Health, New Haven, CT, USA

<sup>4</sup>Carey Law School, University of Pennsylvania, Philadelphia, PA, USA

<sup>5</sup>Yale School of Medicine, New Haven CT, USA

<sup>6</sup>Harvard Combined Orthopedic Residency Program, Boston, MA, USA

<sup>7</sup>Department of Social and Behavioral Sciences, Yale School of Public Health, New Haven, CT, USA

<sup>8</sup>Department of Physical Medicine and Rehabilitation, University of Pittsburgh, Pittsburgh, PA, USA

### Corresponding author:

Yetsa A Tuakli-Wosornu, Yale School of Public Health, 60 College Street  
New Haven, CT 06510, USA.

Email: [yetsa.tuakli-wosornu@yale.edu](mailto:yetsa.tuakli-wosornu@yale.edu)



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accessing physical activity and social exclusion.<sup>5-7</sup> As a consequence, the risk of developing chronic conditions is fourfold among those who live with impairment when compared with their able-bodied counterparts.<sup>8,9</sup>

Visual impairment (VI) in particular, is associated with an increased risk of mortality and morbidity in adulthood.<sup>5,10,11</sup> Mild VI refers to visual acuity worse than 6/12-6/18 and moderate to severe VI is used to describe visual acuity worse than 6/18-3/60.<sup>12</sup> Legal blindness is defined as visual acuity worse than 3/60.<sup>12</sup> Cardiometabolic disease, depression, and fractures are reported at higher rates partly due to reduced levels of physical activity and sport across the lifespan.<sup>5,10,11</sup> For example, it has been shown that adults over the age of 20 years without VI walked 9964 steps and completed 23.5 min of moderate to vigorous physical activity per day on average in contrast with the average 5992 steps and 9.3 min per day of exercise for those with VI.<sup>13</sup> Beyond the physical benefits physical activity and health risks associated with sedentariness, the cognitive, physiological, and social benefits of sport for persons with VI are well-documented.<sup>3,5</sup> For example, physical activity has shown to be both protective in the development of, and effective in lessening the effects of clinical depression and anxiety among persons with VI.<sup>3,5</sup> Further, sport improves confidence, self-concept, and cooperation.<sup>14</sup> Taken together, there are several health benefits that the 36 million individuals living with blindness and 217 million individuals living with VI globally could benefit from by increasing the levels of physical activity.<sup>12</sup>

To improve the health for persons with VI, The International Blind Sports Federation (IBSA) encourages sports participation for all persons with VI, regardless of geographic location or income.<sup>15</sup> However, a well-known concern among able-bodied athletes is that low-and-middle-income countries (LMICs) are under-represented at large sports events due to fewer athletes, poor training opportunities and lack of funds.<sup>16</sup> This calls into question whether there are similar patterns in Para sport, and whether access to elite blind sports opportunities is globally balanced in proportion with the regional rates of VI, and whether this reflects IBSA's egalitarian ideals.

The primary objective of this study was to determine the rate of elite blind sports participation in each IBSA 123 member countries and the world regions registered in IBSA and to assess its association between global and regional prevalence of blindness/VI. The secondary objective was to determine the association between other covariates, such as age, vision class and sex, with number of athletes from each region registered in IBSA.

## Materials and methods

### Study design

This was an exploratory epidemiological study analyzing global trends in blind sport participation. A Yale librarian was

consulted on which search term to use in PubMed to yield literature results that identify the global and regional rates of blindness/VI, ([Supplemental Figure 1](#).) Bourne and colleagues published a systematic literature review and meta-analysis on global blindness/VI trends which included the crude prevalence and age-standardized prevalence of VI by sex, region, super-region in the year 2015.<sup>12</sup> This article was selected based on its recency, comprehensive approach to reach its conclusions and that it explored multiple causes of blindness/VI in lieu of specific conditions (e.g. glaucoma). This baseline data were then used in the statistical analysis of this study when comparing participation rates to blindness/VI rates. Data about the number of athletes in each world region and their characteristics were then obtained from the IBSA. In total, 2500 athletes from 123 countries were included in the analysis for blind/VI sport participation. The study follows the STROBE guidelines for epidemiological research and the World Medical Association's Declaration of Helsinki of Ethical principles for medical research involving human subjects. This study was exempt from full review by the Yale University Institutional Review Board (IRB) due to its study design with a large global data set without any possibility to identify an individual person.

### Data collection

Based on the previously published current rates of global prevalence of blindness/VI, the number of currently registered athletes and the overall license summary were extracted from the IBSA Sports Administration System (ISAS) with a timestamp of 26 April 2019. The athlete demographic data set included the gender, age, national federation, sport, blindness/VI class, and sports results. The license summary data included the number of completed registrations ("REG"), licensed sportsmen ("LIC"), and registered, but license canceled or temporarily denied ("INV") for each of the member countries ([Supplemental Table 1](#)). The dataset included the eight blind/VI sports at which IBSA athletes can compete: Chess, Football 5-a-side, Goalball, Judo, Ninepin Bowling, Powerlifting, Showdown, and Tenpin Bowling. Fifty-one athletes had a missing year of birth and were excluded from the age-related analysis; 58 athletes were not eligible for classification and were excluded from the classification-related analysis.

### Statistical analysis

An analysis was conducted to estimate the rate of elite sports participation among the blind/VI population within the 123 member countries of the IBSA. The analysis involved establishing the age-standardized blind/VI prevalence and the national population data in 2015 from the World Bank database<sup>17</sup> and comparing the statistics with the number of registered athletes in each of the 123 IBSA member

countries. This was done to estimate the rate of sports participation in the 123 member countries and world regions (Figure 1) and ascertain if the rate of participation is comparable to the local prevalence of blindness/VI. To aid the comparison, the categorical label of high-income countries (HICs) and LMICs was also introduced into the statistical analysis. The category of HICs and LMICs in the year of 2015 was obtained from the World Bank database (Supplemental Table 1).

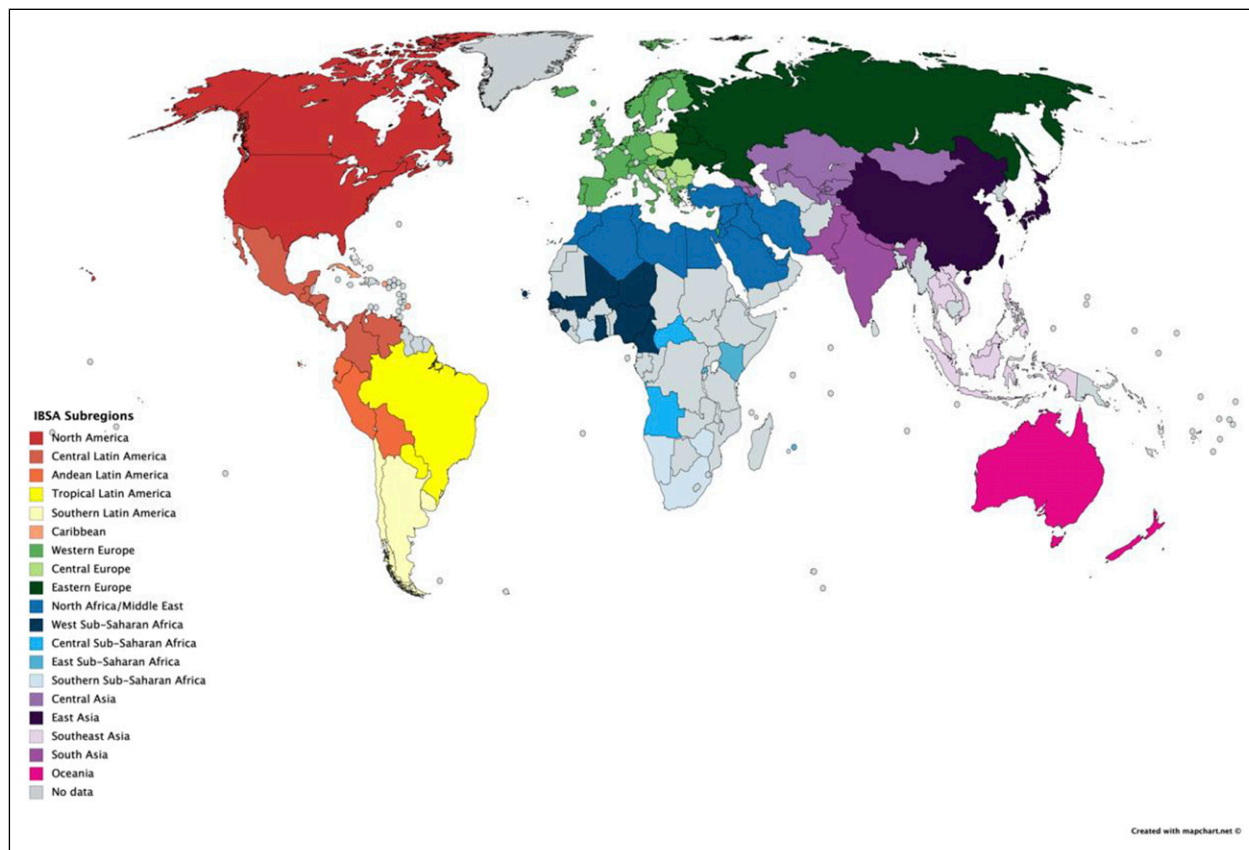
ANOVA, Welch's t-test, and regression models were then built to estimate the correlation between elite blind sports participation rates and various factors on both national and regional levels based on the data results that were collected. Different models were built between the independent variable of elite blind sports participation rates and the prevalence of the blindness/VI, the size of blind/VI population, sex differences in participation at IBSA, HIC or LMICs, and subregions the country belongs to. Further analysis was also conducted to examine divergence with a focus on the countries and regions where blind sports participation is not aligned with prevalence estimates of blindness and VI. All statistical analyses were performed using R version 3.5.2 (2018-12-20) – "Eggshell Igloo" (Copyright (C) 2018 The R Foundation for Statistical Computing).

## Results

### Overall trends

In 2019, there were 2500 registered athletes. Western Europe had the highest number of complete registration of any IBSA region with 539 athletes (21.56%). Europe has a whole contributed 1045 athletes (41.80%), followed by the Americas contributed 551 athletes (22.04%). Asia had 492 athletes (19.68%) and Africa had 390 athletes (15.60%). Oceania has the fewest athletes with 22 (0.88%) registered in the IBSA ISAS.

Among the 123 member countries that were registered in the IBSA ISAS, 31 did not have any completed registrations in blind sports, of which 22 had a prevalence of blindness/VI higher than the global average. Among these 31, 17 were located in Sub-Saharan Africa, North Africa, or the Middle East, (Table 1). According to the IBSA ISAS registration data, 40 countries had an increased number of registrations in 2019, and 21 countries had a decreased number of registrations. Morocco has the largest increase in registration number and Mauritius had the largest decrease.



**Figure 1.** The IBSA member nations organized by the IBSA Global Visual data system. This system uses unique super-region categories.

**Table 1.** The summary by subregions of athletes with blindness/VI that were registered in the IBSA Sports Administration System for summer season 2019, as of 26 April 2019 by sex, age, and IBSA classification (B1, B2, B3, CNC, and NE).

	Sex			Age (years)					Classification				
	Female	Male	Sex ratio	<20	20–30	30–40	41–50	>50	B1	B2	B3	CNC	NE
Caribbean	1	12	12.00	0	4	6	1	1	2	5	5	0	1
Central Asia	34	98	2.88	12	78	37	3	1	24	38	53	6	11
East Asia	82	160	1.95	34	90	46	43	23	97	85	58	0	2
Europe, Central	78	226	2.90	22	72	53	48	108	111	68	118	0	7
Europe, eastern	61	141	2.31	12	83	67	22	9	51	84	52	0	15
Europe, western	159	380	2.39	72	204	140	68	45	198	203	130	2	6
Latin America, Andean	13	32	2.46	10	14	14	5	2	24	13	8	0	0
Latin America, Central	57	168	2.95	43	97	54	23	5	150	34	35	1	5
Latin America, Southern	15	68	4.53	17	32	22	9	2	53	19	11	0	0
Latin America, Tropical	40	67	1.68	36	41	25	5	0	58	30	18	0	1
North Africa/Middle East	87	222	2.55	36	163	79	19	1	116	116	71	1	5
North America	34	44	1.29	15	31	21	9	2	17	21	38	0	2
Oceania	14	8	0.57	5	10	5	0	1	5	4	13	0	0
South Asia	4	18	4.50	1	17	2	1	0	14	2	6	0	0
Southeast Asia	28	68	2.43	10	40	26	8	6	55	19	21	0	1
Sub-Saharan Africa, Central	0	0	NA	0	0	0	0	0	0	0	0	0	0
Sub-Saharan Africa, East	11	15	1.36	0	18	8	0	0	18	3	4	0	1
Sub-Saharan Africa, Southern	5	9	1.80	1	9	4	0	0	6	5	2	0	1
Sub-Saharan Africa, West	15	26	1.73	3	27	8	2	1	33	8	0	0	0
Total	738	1762	2.39	329	1030	617	266	207	1032	757	643	10	58

### Sex and age differences

Among the 2500 athletes registered in the IBSA ISAS in 2019, 738 (29.52%) were female and 1762 (70.48%) were male. This trend was shown in most subregions (Supplemental Table 1). The gender ratio of male to female was larger than 2:1 in 13 subregions, with the highest gender ratios occurring in South Latin America and Caribbean (68:15 and 12:1, respectively). The only subregion with a male to female gender ratio <1 is Oceania (4:7). The number of registered athletes whose age was between 20 and 40 was significantly higher than the other age groups ( $p$ -value = 0.041) (Figure 2). This is also the case in most subregions, with the only exception being Central Europe, in which the number of athletes aged over 50 years old was higher than all the other age groups.

### Country wealth and blind sport participation by region

According to the World Bank's classification, the 123 member countries were divided into LMICs and HICs. Statistical significance was observed in the difference in the mean prevalence of blindness/VI rates between HICs (1.35%) and LMICs (3.61%) ( $p$ -value <0.001). Beyond the lower rate of blindness and VI, Welch t-test showed the mean difference of sports participation rate in HICs (1.29%)

is higher than that in LMICs (0.79%) by 0.6%, but the difference is not statistically significant.

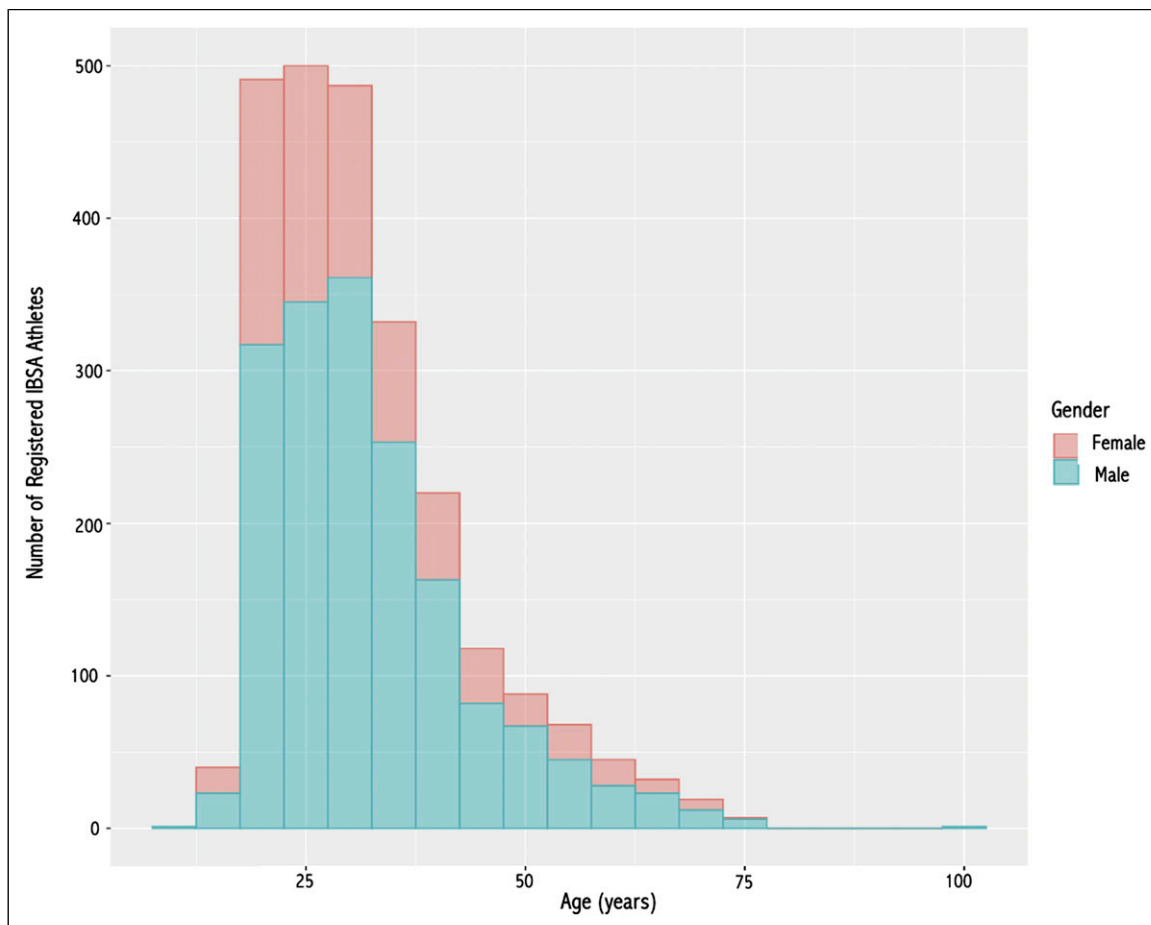
Despite the high prevalence of VI and blindness, the number of registered athletes in South Asia only accounted for 0.88% of all registered athletes (Table 1). Similar patterns were seen in Africa where there are discrepancies in sub-regional representation. Of 390 athletes from Africa, 309 (79.2%) are from North Africa/Middle East sub-region and there were no registrants from Central Sub-Saharan Africa (Table 1).

On a country level, the prevalence of blindness/VI does not significantly correlate with the number of registration of blind/VI athletes, (Figure 3). ANOVA showed the prevalence of blind sports participation, and the prevalence of blindness and VI accounted for 15.84% of the variability in blind sport participation. Regression analysis showed that the correlation between the prevalence of VI/blindness and the rate of blind sports participation amongst the blind/VI subpopulation of a country was not significant.

In summary, participation in blind/VI sport is markedly higher in regions with lower prevalence of blind/VI and vice versa.

### Visual impairment classification

Among the 2500 registered athletes, 1032 (41.28%) were B1 (no or very poor vision), 757 (30.28%) were B2 (poor



**Figure 2.** Age and Sex distribution of IBSA registered blind/VI athletes in summer season 2019.

to partially sighted), and 643 (25.72%) were B3 (partially sighted) (Table 1 and Supplemental Table 2). Ten registered athletes (0.40%) had a classification not completed (CNC), and 58 athletes (2.32%) were not eligible for classification and were excluded from the classification-related analysis (NE) (Table 1). In most regions, the number of B1 athletes was higher than B2 and B3, but in Central Asia, Central Europe, and North America, the highest number of athletes belonged to the B3 class (Figure 4). Another exception is Western Europe, where the number of B2 class athletes is higher than B1 class athletes.

## Discussion

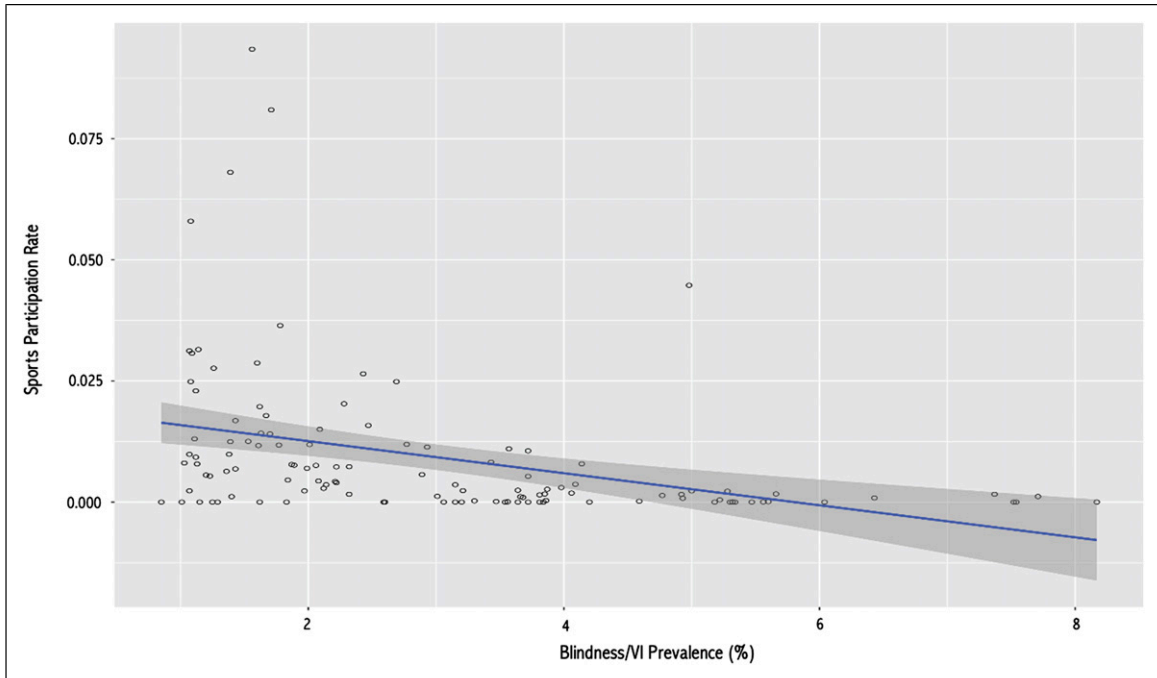
Overall findings from this study are that; i) elite athletes with blindness/VI in Europe are more active in sports compared to individuals with blindness/VI in other world regions; ii) a majority of the registered athletes in IBSA are from Europe; iii) more males than females are active in blind sports and; iii) there are more athletes from HICs that are engaged in elite sports compared to LMICs.

Consequently, this suggests that blind sports participation is heavily affected by factors other than how prevalent blindness/VI is in a region.

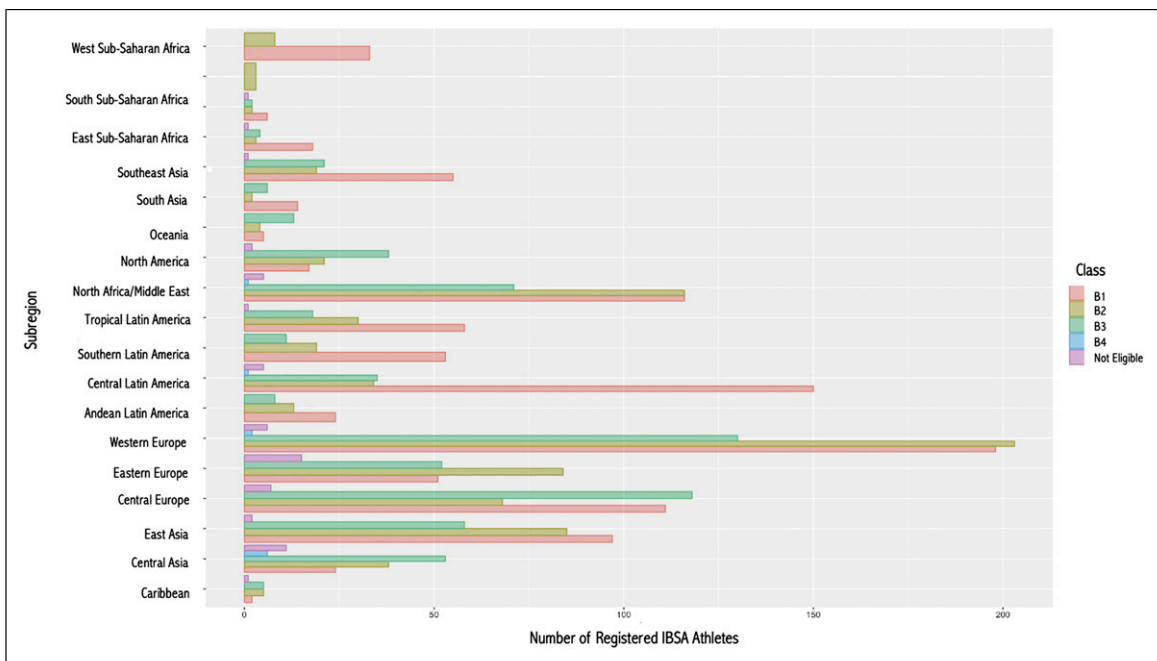
### Barriers to physical activity

While proponents of the medical model of disability sometimes claim that barriers to participating in physical activity are due to the physical nature of one's impairment, there is no evidence to suggest that persons with VI are physically unable to participate in physical activity.<sup>9</sup> According to the social model of disability, however, environmental and social factors that inhibit physical activity can be linked to financial restrictions, lack of local resources and accessibility, and severity of eye disease.<sup>9</sup>

The results from this study indicate that this is a phenomenon that is more prevalent in LMICs. This is also supported by the literature, in which a study from Nigeria found the financial barrier to be the most consequential to low level of physical activity among persons with VI.<sup>18</sup> In addition to the direct costs of engaging in certain sports, the



**Figure 3.** Regression analysis of country-level prevalence of blindness/VI against blind sports participation rate. The darker grey area surrounding the solid blue line indicates 95% confidence interval. The Sports Participation Rate for a country is determined by the number of registered IBSA VI/blind athletes divided by the size of VI/blind populations. Blindness/VI Prevalence refers to the VI/blind population divided by the total population of a country, expressed as a percentage. Here, the size of the blind/VI population could only interpret 0.98% of the variance in the prevalence of blind sports participation, and the prevalence of blindness/VI accounted for 15.84% of the variability in blind sports participation.



**Figure 4.** Distribution of visual classifications by subregion.

participants expressed general financial hardship due to lower employment rates and indirect costs, such as accessible transportation.<sup>18</sup>

Concerning resources and accessibility, there are challenges especially within emerging market countries that might perpetuate the ignoring of disability rights as well as adequate health and education for persons with a disability.<sup>19</sup> Other concerns are environmental factors such as difficulties in funding a guide that can support the person in transportation to the training for example. Also, barriers related to poor equipment, lack of appropriate facilities/spaces for the practice of physical activity and lack of political support from public entities for the practice of physical activity in relation to people with disabilities have been demonstrated in the literature.<sup>11</sup>

Another major barrier is that the sports organization are established in large cities in many countries, which excludes persons living in rural settings. Kelly et al. found that many persons with VI felt there were no appropriate recreational centers in their environment.<sup>18</sup> More local programs and resources could probably foster future blind athletes.<sup>11,20</sup>

Another concern is the lack of trained personnel and coaches in adapted sports.<sup>11</sup> Columna et al. showed that persons with VI have difficulties in finding information about available sports programs.<sup>20</sup> Based on the results from this study it could be recommended that both sports bodies, sports federations as well as governmental authorities need to reduce the different barriers to sports among persons with VI.

As the analysis also showed that there was a clear connection between regional economic status and blind sports participation, rather than the prevalence of blindness, it is important that the Paralympic movement especially support LMICs in both resources and education. Environmental factors may include public policy, climate, accessibility to proper equipment or resources, and cultural attitudes towards disability. One study that examined the barriers to physical activity among individuals with blindness or VI in Brazil found that environmental factors were more consequential in physical activity participation than personal ones (such as motivation to exercise or athleticism).<sup>11</sup> When reviewing a list of environmental and personal barriers to physical activity among individuals with blindness, there were eight of the 19 environmental factors with which over half of the respondents identified.<sup>11</sup> By contrast, more than half of the respondents identified with only two of the personal factors. Secondary to “problems with pavements (e.g., slopes, potholes, obstacles)” (66.00%), the most common barriers were a “lack of appropriate facilities/spaces” (65.00%) and, a “lack of supportive policies from public entities” (63.00%).<sup>11</sup>

### *Regional prevalence of blindness/visual impairment and elite sports participation*

Regionally, the largest number of persons with VI/blindness resided in South Asia with 72.90 million individuals with VI/blindness, which accounts for 28.86% of the global blind/VI population.<sup>12</sup> The prevalence of blindness in older adults was approximately 8–10 times higher in western sub-Saharan Africa and eastern sub-Saharan Africa than in all the regions categorized as “high-income”.<sup>12</sup> By contrast, Western Europe accounted only for approximately 3.9% of the global blind/VI population, making it a region with one of the lowest prevalence rates globally.<sup>12</sup>

Interestingly, the results from this study show that the prevalence of VI/blindness plays little to no role in predicting elite blind sport participation, with Europe being the region with the most registered athletes and one of lowest prevalence of blindness/VI. Several countries in parts of Africa, such as Djibouti, did not have any registered athletes even though blindness/VI is among the top causes of disability for the nation.<sup>21,22</sup> In 2015, there were only two ophthalmologists for the entire nation’s population, which leads to unnecessary suffering and few treatment options for persons with VI/blind and probably no possibilities for VI classification with the aim to get a license from IBSA.<sup>23</sup> These findings are also mirrored across the broader Paralympic Movement, which is densely populated by individuals from high-income settings.<sup>24</sup> Historically many LMICs will bring only one to two delegates to the Olympics, highlighting the extensive costs of training, qualifying, and traveling for the Olympics.<sup>25</sup> These statistics are only further exacerbated in the Paralympic Games showing the gaps in opportunity for participating in elite sport for athletes with disabilities, including, but not limited to, blindness/VI.<sup>25</sup> Based on these results it could be hypothesized that the disproportionate rates of elite sports participation are determined by other factors such as a region’s wealth and priorities, possibilities and access to training, social support and the opportunities of participating in inclusive adapted sport organizations.

Based on these results, investigators suggest that stakeholders such as the IBSA, International Paralympic Committee, WHO and national governments speed up their work and resources towards a more equal and global sports participation. This could probably lead to both better physical and mental health for persons with VI/blindness, reduce health care costs for the society as well as increase disability rights in LMICs.

### *Gender and age discrepancies in blind sport*

One of the most glaring results of this study was the gender discrepancy between male and female athletes. Despite that 54.00–56.00% of persons with blindness/VI are female,<sup>12</sup>

less than 30.00% of IBSA's athletes are females (Table 1). Historically, there has always been a gender discrepancy in many sport competitions.<sup>26</sup> However, the Paralympic Games are coming closer to an overall 40% female representation.<sup>25</sup> Based on these results, it can, therefore, be suggested that the Paralympic Movement and IBSA must work towards inclusion of especially women with VI in sports, and especially in LMICs.

Regarding age as a covariate, while there was a statistically significant difference in the representation of athletes aged 20–40 years compared with other age groups, this appears to be the case with athletes belonging to other elite sports organizations. For example, the average age of Olympians has slowly grown from 25 to 27 for males and 24 to 26 for females over the past three decades.<sup>27</sup> This suggests that despite a slight increase in age, elite athletes tend to be in their twenties, regardless of their disability status.

### *Sport participation and VI classification*

Another important factor that seems to affect regional blind sports participation is the VI classes. Study results demonstrated that regions with the highest number of athlete registrations, such as Europe, had more athletes with a B2 or B3 classification and fewer B1 athletes with a severe VI impairment. By contrast, the regions with the lowest number of registered athletes, such as South Asia and Africa, had more B1 athletes than B2 or B3 athletes. Consequently, the results show that the athlete-rich regions from HICs with a low prevalence of total VI/blindness were represented by athletes with less severe visual impairment and LMICs with a high prevalence of total VI/blindness but few athletes had a higher frequency of athletes with the most severe VI. Unfortunately, this pattern may mean that athletes with the most severe form of VI, and especially those from lower socio-economic backgrounds, never will have a possibility to qualify for the large blind sport competitions as previous research has shown that visual impairment severity affects both sports performance as well as medal chances.<sup>26</sup> Subsequently, stakeholders need to work on also allowing athletes with the most severe impairment to qualify for global blind sports participation by reviewing classification systems and medal events. The classifications themselves, as well as the costs associated with having a classification review by an official classifier, act as a significant deterrent for athletes in lower-income settings who may have to travel great distances to acquire these services.<sup>24</sup>

### *Implications of low physical activity among blind and VI individuals*

As discussed, the health benefits of physical activity, principally among them, primary prevention, are not fully

actualized by persons with blindness/VI in settings with low physical activity adoption. The health implications of poor physical activity access among blind and VI individuals are layered since lack of exercise may increase disease risk and ultimate disease development may hinder the pursuit of further physical activity. Sport is also known to provide tremendous psychological benefits as well.<sup>28</sup> The lack of accessible physical activity may contribute to worse mental health outcomes and isolation among blind and VI individuals. The mitigation of physical and mental health problems through exercise among persons living with blindness/VI is known to improve the quality of life substantially.<sup>28</sup>

Beyond the health implications of low physical activity participation, the lower number of registered blind/VI athletes in some regions than reflective of the prevalence is illustrative of how potential talent is being under-utilized across the globe, but especially in lower-resourced nations. This calls attention to the need to optimize sport engagement in these regions for future blind sport competition to be more reflective of blindness in the general population. Societal attitudes, funding, and priorities all contribute to possible discrepancies in blind sport participation.

### *Possible solutions*

It has become apparent through this study that blind sport participation is lacking in LMICs and that major contributing factors to this reality are largely due to access to participation and disability-informed policy. As such, more creative opportunities for implementing physical activity among the blind/VI community may be needed. This will be especially critical for non-elite participants who have no formal sports federation to support their physical activity.

One such opportunity is the 'First Steps' program, which was aimed at providing adolescent blind and VI children with access to physical activity.<sup>29</sup> The program was to be completed in the home setting. It was centered around the development of foundational exercise skills, such as motor skills, kicking, and underarm rolls.<sup>29</sup> Skills became more complex as the program continued and participants were also provided with an activity booklet to help guide their exercises. This form of physical activity provides great promise by addressing many barriers to physical activity. Firstly, by being accessible within the home, participants do not need to find a formal exercise setting (e.g. specialized gym) for physical activity. This might be particularly important for those who still face transportation or accessibility barriers. Secondly, the focus on foundational skills will provide individuals with blindness/VI with a platform on which to develop and build their physical fitness level. For most individuals who are not elite athletes, developing skills specific to a particular sport is inconsequential. Rather, they need a strong exercise plan for health



promotion. One limitation, however, is that by having a home-based exercise, policymakers might be less compelled to develop resources for persons with blindness, VI and other disabilities, only perpetuating their isolation from society. This is why ultimately sports inclusion will be born of policy change.

### Strengths and limitations

To the best of investigators' knowledge, this is the first study that has assessed the prevalence of blindness/VI and its association to blind sport participation. A limitation of the study is that it was restricted to analyzing data on elite sport participation among registered IBSA athletes. The reason for this methodological choice was that the IBSA data is verifiable and therefore, provides data for measuring blind sport participation. The implication of this choice, though is that it is difficult to speak to the broader issue of physical inactivity among persons with blindness and VI in non-elite settings. We hold the position though, that this data has allowed us to identify the significant gap in elite sport participation which is the result of broader, systemic barriers, some of which would be shared by non-elite individuals with blindness/VI. Now that this gap has been established, a future study should investigate the barriers to physical activity among individuals with blindness/VI in a non-elite study population. Further, to better understand and work towards inclusion of athletes from LMICs who were not part of the IBSA database, it is recommended that future research access barriers and facilitate physical activity in these regions.

### Conclusion

In summary, the results from this study show that athletes with VI/blindness in lower-resourced world regions are most underrepresented in blind sports despite having the highest prevalence of VI/blindness. Consequently, blind sports participation is heavily affected by factors other than regional prevalence of blindness and VI. Moreover, women and athletes with the most severe VI are underrepresented in elite blind sports. Taken together, elite blind sport excludes athletes from LMICs, women, and athletes with the most severe form of VI. In order to close this gap, it is recommended that sports stakeholders, as well as national federations, work towards a global equity of blind sports participation. Closing this gap would favor physical and mental health and allow better social inclusion for the most exposed individuals with VI.

### Author's note

This research was presented at the Association of Academic Physiatrists and The International Society of Physical and Rehabilitation Medicine combined annual meetings in 2020.

### Author contributions

Y-TW conceived, framed, and helped revise the paper. CS helped write the first draft, revise and format the paper. KF assisted in framing and revising the paper. XL conducted the statistical analyses. TO assisted with revising the paper. All authors reviewed the final draft and approved the final draft.

### Guarantor

Y-TW

### Declaration of conflicting interests

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### ORCID iD

Catherine S M Stratton  <https://orcid.org/0000-0002-1841-4565>

### Supplemental Material

Supplemental material for this article is available online.

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