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WORLDWIDE VARIATIONS IN SPERM COUNTS

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ABSTRACT

Objectives. Based on the premise that various human disease processes manifest differently depending on geography, we set out to determine whether sperm counts vary from different nations and different regions within the United States.

Methods. We reviewed the literature of all significant population-based studies that evaluated sperm counts from fertile or presumably fertile men from 1930 to the present.

Results. We found that sperm counts did, in fact, vary greatly. Throughout the United States, average sperm counts ranged from a low of 48 million/cc in Iowa to a high of 134 million/cc in New York, with multiple values in-between from Texas, Minnesota, Washington State, and California. Internationally, average sperm counts ranged from a low of 52.9 million/cc in Thailand to a high of 102.9 million/cc in France.

Conclusions. We conclude that sperm counts are subject to a wide range of variation among geographic locations. *Copyright 1996 by Elsevier Science Inc.* UROLOGY **48:** 909–911, 1996.

There has recently been a heightened awareness of possible worldwide changes in sperm counts over the past 50 years.[1–3] Nevertheless, no current report fully describes whether sperm counts vary from region to region. Because geographic variations are seen in many disease entities, we analyzed data on sperm counts throughout the world to determine if sperm counts are also subject to this phenomenon.

MATERIAL AND METHODS

A literature review was performed, as previously described,[1] of all population-based publications evaluating sperm counts from fertile or presumably fertile men from 1930 to the present. Publications involving men with a history of infertility were not included in this review. Our review focused on the geographic variations in sperm counts as seen in different parts of the world. To minimize the influence of small-cohort publications, only those studies with at least 100 men were included. Data from population-based studies that evaluated sperm counts over this period were included, and the mean sperm counts were recorded.

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RESULTS

Our review of the literature revealed 63 publications concerning fertile or presumably fertile men. Sixty-one of these publications had been included in the meta-analysis by Carlsen *et al.*[1] Only 22 publications fit the criteria of at least 100 men per study; these comprise a total of 16,174 men, with an average cohort size of 735.2 men per study.

Of the 41 publications not included in our review, there were a total of only 1407 men, with an average cohort size of 34.3 men per study. Of the 22 publications included in our analysis, 9 were from the United States and 13 represented locations worldwide. One study from the United States included three locations.

In the United States (Table I), the only location studied more than once was New York, where sperm counts ranged from 79 to 134 million/cc, with a mean of 112.1 million/cc. Throughout the United States, average sperm counts varied between 48 million/cc in Iowa to the highest values of 134 million/cc in New York, with multiple values in-between from Texas, Minnesota, Washington State, and California. Worldwide (Table II), France was represented by three publications, whereas other locations were represented once. Internationally, average sperm counts ranged from a low of 52.9 million/cc in Thailand to a high of 102.9 million/cc in France.

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TABLE I. *Geographic location and mean sperm counts in the United States*

Location	Mean Sperm Count (10^6/cc)	Number of Men	Year of Publication	Author
New York	134.0	100	1945	MacLeod[11]
New York	131.5	400	1996	Fisch[3]
New York	120.6	200	1938	Hotchkiss[12]
Washington State	110.0	100	1963	Rutherford[13]
New York	107.0	1000	1951	MacLeod[14]
Minnesota	100.8	662	1996	Fisch[3]
New York	100.7	100	1950	Falk[15]
New York	79.0	1300	1975	Naghma-E-Rehan[16]
California	72.7	221	1996	Fisch[3]
Texas	66.0	4435	1982	Tjoa[17]
Iowa	48.0	386	1974	Nelson[18]

TABLE II. *Geographic location and mean sperm counts worldwide*

Location	Mean Sperm Count (10^6/cc)	Number of Men	Year of Publication	Author
France	102.9	809	1983	Schwartz[19]
France	98.8	1351	1995	Auger[2]
United Kingdom	91.3	104	1989	Badenoeh[20]
Australia	83.9	119	1984	Handelsman[21]
Hong Kong	83.0	1239	1985	Wang[22]
France	77.7	1222	1989	Pol[23]
Germany	74.4	100	1971	Starde[24]
Greece	72.0	114	1984	Panidis[25]
Brazil	67.6	185	1979	Bahamondes[26]
Tanzania	66.9	120	1987	Kirei[27]
Libya	65.0	1500	1983	Sheriff[28]
Nigeria	54.7	100	1986	Osegbe[29]
Thailand	52.9	307	1986	Aribarg[30]

COMMENT

Although we were surprised to find marked geographic variations of sperm counts throughout the United States and worldwide, our results are consistent with the public health literature pertaining to many other diseases. Marked geographic and racial differences in the incidence, morbidity, and mortality of human illness is ubiquitous. For example, geographic differences have been noted in diseases such as cancers of the esophagus, colon, stomach, and cervix.[4–7] Breast cancer has been found to have a worldwide variation in incidence of 10-fold.[8] It would, therefore, seem reasonable that variations in sperm counts might also exist as a function of geographic location.

This report describes widespread variation in sperm counts worldwide. Within the United States, states with the highest sperm counts include New York, Minnesota, and Washington. The lowest sperm counts were reported in Iowa and Texas. In the worldwide literature, sperm counts were similar in the European countries of France, United Kingdom, and Germany. Interestingly, sperm counts from relatively underdeveloped countries were consistently low.

Theories behind the geographic variations in sperm counts are currently only speculative. Reasons given for variations in other diseases, such as environmental, socioeconomic, and racial differences, could also be applied to sperm counts. To date, no studies have addressed the issue of sperm count variation relating to race. However, racial differences in disease is clear; for example, benign prostatic hyperplasia and prostate cancer have been shown to be influenced by race.[9,10]

In summary, our review of the literature indicates large variations in sperm counts from region to region. This phenomenon is important and should be considered when evaluating and comparing results of population-based studies. Certainly, more studies are encouraged, which we hope will allow a better understanding of the magnitude and significance of these findings.

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