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## **SIXTEEN YEAR LONGITUDINAL STUDY OF U.S. SPERM DONORS CONTINUES TO DEMONSTRATE DECLINING SPERM COUNT AND MOTILITY**

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### **OBJECTIVE:**

It has been suggested that geographic variations in environmental toxins may impact sperm quality. Previously, we published findings that demonstrated a decline in sperm quality over an eleven year period across six regions of the United States (US).<sup>1</sup> The current study investigates whether there was a decrease in sperm quality from a diverse set of US sperm donors across six regions in the US over a sixteen year period. Additionally, this study sought to evaluate changes between semen analysis (SA) parameters in an era of sperm collection during the COVID-19 pandemic.

### **MATERIALS AND METHODS:**

Semen analyses (SA) from sperm donors aged 19-38, with 2-5 days abstinence, from 9 different geographic regions from January 2005-April 2021 were examined. The sperm donors originated from one of the following regions: Palo Alto, Los Angeles, Westwood, International Nordic Cryo Bank Denmark, Indianapolis, Cambridge, New York, Houston, and Spokane, WA. Donation date, BMI, and geographic region were recorded. Data was analyzed as a whole as well as by individual region. Primary outcomes were ejaculate volume (mL), average concentration (M/mL), motility (%), and total motile count (M). Data was analyzed using a general estimate equation (GEE) model with an exchangeable working correlation structure to account for repeated measures.

### **RESULTS:**

A total of 176,706 SA specimens (from 3,532 unique donors) were analyzed. Controlling for BMI, there was a significant decline in average concentration (M/mL) ( $\beta=-1.89$ ,  $p<0.0001$ ), sperm motility (%) ( $\beta=-0.2892$ ,  $p<0.0001$ ) and total motile sperm (M) ( $\beta=-4.53$ ,  $p<0.0001$ ) over the 16-year study period. There were significant decreases in SA parameters within all geographic regions (Spokane only had two unique donors and could not be examined). Indianapolis showed a significant decrease in sperm concentration and total motile sperm, but also displayed an increase in sperm motility over the study period.

### **CONCLUSIONS:**

Time related decline in sperm quality continues to be evident at a national level in young, healthy sperm donors. There was a decline across all geographic regions in all parameters except for ejaculate volume. How this decline in sperm counts impacts fertility has yet to be determined. Our modern environment involves increased exposures to endocrine disruptors and changes to lifestyle (including smoking, diet, and stress) that are postulated to impair male fertility by interfering with spermatogenesis. While a causative link to these risk factors remains to be elucidated further studies are necessary to evaluate whether this temporal decline in sperm count correlates with decreased fecundity.



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**IMPACT STATEMENT:**

Sperm concentration, motility, and total motile sperm continue to decline across young, healthy sperm donors across the continental United States.

**REFERENCES:**

1. Chang, S. Nazem, T. G., Goukko, D., Lee, J., Bar-Chama, N., Shamonki, J. M., Antonelli, C., & Coppeerman, A.B. (2018) Eleven year longitudinal study of U.S. sperm donors demonstrates declining sperm count and motility. *Fertility and Sterility*, 110 (4), e54-e55.  
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