The Prevalence of Immunosuppression Among Adults: United States, 2013

Rafael Harpaz, MD, MPH; Rebecca M Dahl, MPH; Kathleen L. Dooling, MD, MPH
Centers for Disease Control and Prevention, Atlanta, GA

Contact Information:
Rafael Harpaz
RHarpaz@cdc.gov

ABSTRACT

Background: The number of immunosuppressed adults in the US is likely increasing due to new indications for immunosuppressive treatments and to improvements in medical management and life-expectancy of these adults. Such increases can have major implications due to risks from exposure to acute infections and reactivation of chronic infections. Yet comprehensive data on prevalence of all-cause immunosuppression have never been published. We report data on prevalence of self-reported immunosuppression among adults in the US.

Methods: We conducted a cross-sectional analysis of US adults aged 18 years and older using the 2013 National Health Interview Survey (NHIS). Respondents were asked if they had ever been told by a health professional that their immune system was weakened and if that status still pertained. Follow-up questions were used to better assure the validity of the self-reported results; in sensitivity analyses we varied criteria for IC. We generated national estimates of prevalence of immunosuppression, taking into account the complex NHIS sampling design.

Results: Of 34,426 respondents, 4.2% (1,442) had been told at some time by a health professional that they were immunosuppressed. Of these, 2.8% (n=951) reported they were currently immunosuppressed, translating to a prevalence of 2.7 (2.4, 2.9). Rates varied by gender, race/ethnicity, and age. In sensitivity analyses, prevalence ranged from 1.8% (95% CI: 1.6, 2.0) to 3.1% (95% CI: 2.9, 3.3).

Conclusion: The number of immunosuppressed adults in the US may be increasing, with important implications. The prevalence of this phenomenon has not previously been assessed. Our data are self-reported but our questions designed to increase validity. These data can be important for planning purposes and to provide a baseline with which to assess trends.

BACKGROUND

❖ The number of immunosuppressed adults in the US is almost certainly increasing:
  ▪ New indications for immunosuppressive treatments
  ▪ Improvements in medical management which have increased life-expectancy of immunosuppressed adults
❖ Prevalence of all-cause immunosuppression has major implications for public health and for medical practice
  ▪ Risk and severity of acute infections, e.g., listeria, legionella, aspergilla, babesia, and cryptosporidium
  ▪ Risk and severity of reactivation of latent infections, e.g., tuberculosis, herpes zoster, toxoplasmosis, cytomegalovirus, and hepatitis B
  ▪ Impacts on public health programs relating to food & water safety, tuberculosis, infection control, outbreak preparedness, travel medicine, disease prophylaxis
  ▪ Impacts on vaccine preventable disease risk, vaccine effectiveness, vaccine safety
❖ Comprehensive data on the prevalence of all-cause immunosuppression have never been reported

STUDY OBJECTIVE

❖ To determine the prevalence of self-reported immunosuppressed adults in the US

METHODS

❖ **Data Source:**
  ▪ 2013 National Health Interview Survey (NHIS), an annual household health survey conducted since 1957
  ▪ Designed by the CDC (National Center for Health Statistics) and administered by the US Census Bureau
  ▪ Multistage probability design; sample weights provided so national prevalence estimates can be inferred
❖ **Study Population:**
  ▪ Non-military, non-institutionalized population of the US
❖ **Survey Questions:**
  ▪ Respondents asked if they had ever been told by a health professional that their immune system was weakened and if that status still pertained (see Table)
  ▪ Follow-up questions were used to better assure the validity of the self-reported results (see Table)
    o In sensitivity analyses we varied criteria for validity immunosuppression
❖ **Analysis**
  ▪ We generated national estimates of prevalence of immunosuppression, taking into account the complex NHIS sampling design
  ▪ Analyses were performed using SAS version 9.3 (SAS Institute Inc., Cary, NC).

TABLE

Self-reported immunosuppressed status: National health Interview Survey, 2013		
	Number (%)	**Prevalence per 100 US population (95% CI)**
Currently immunosuppressed*§ (N = 34,426)	951 (2.8)	2.7 (2.4, 2.9)
Sex (N = 951)		
Male	298 (31.3)	1.8 (1.5, 2.1)
Female	653 (**68.7**)	3.5 (3.1, 3.9)
Race/Ethnicity‡ (N = 951)		
White	641 (67.4)	3.0 (2.7, 3.4)
Black	122 (12.8)	2.3 (1.8, 2.8)
Hispanic	128 (13.5)	1.6 (1.2, 1.9)
Asian	29 (3.0)	1.7 (0.8, 2.7)
Other	31 (3.3)	3.9 (2.0, 5.9)
Age group in years (N = 951)		
18-39	182 (19.1)	1.6 (1.3, 1.9)
40-49	136 (14.3)	2.3 (1.8, 2.8)
50-59	281 (29.5)	4.4 (3.7, 5.1)
60-69	213 (22.4)	3.9 (3.2, 4.5)
70-79	101 (10.6)	3.1 (2.4, 3.8)
80+	38 (4.0)	2.5 (1.4, 3.5)

* Defined based on responses to questions below: YES to questions 1 AND 2 AND either 3 OR hematologic cancer within last 2 years (latter based on question 7 and date calculations from question 8). Other questions used to assess response validity and conduct sensitivity analyses (algorithms available from authors on request)
1. Have you ever been told by a doctor or other health professional that your immune system is weakened?
2. Based on what a doctor or other health professional told you, do you still have a weakened immune system?
3. During the past 6 months, have you taken prescription medication or had any medical treatments that a doctor or other health professional told you would weaken your immune system?
4. Do you currently have a health condition that a doctor or other health professional told you weakens the immune system, even without related medications or treatments?
5. Has a doctor or other health professional ever told you that your immune system is weakened because you have kidney disease, lung disease, liver disease, diabetes, poor nutrition, or general frailty?
6. Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?
7. What kind of cancer was it?
8. How old were you when your cancer was first diagnosed?
9. Earlier you said you had cancer. Did a doctor or other health professional EVER tell you that your immune system is weakened because of this cancer/these cancers?
10. Has a doctor or other health professional ever told you that your immune system is weakened because you seem to get many infections and colds or that you can't seem to get over them?

§ 2,148 responded yes question 1; we excluded 103 responding "Refuse" or "Don't know" to any questions

‡ Persons identified as black, white, Asian, or "other" are non-Hispanic; categories are mutually exclusive.

RESULTS

❖ Total household response rate 75.7% consisting of 41,355 eligible households having 34,426 eligible adult respondents
  ▪ 4.2% (n=1,442) had been told at some time by a health professional that they were immunosuppressed.
  ▪ 2.8% (n=951) reported they were currently immunosuppressed
❖ This translates to an estimated US prevalence of immunosuppression of 2.7% (95% Confidence Interval [CI]: 2.4, 2.9).
❖ In sensitivity analyses, prevalence of immunosuppression ranged from 1.8% (95% CI: 1.6, 2.0) to 3.1% (95% CI: 2.9, 3.3).
❖ Prevalence was highest in women, whites, and persons aged 50-59 years (see Table).

LIMITATIONS

❖ The data are self-reported:
  ▪ This could impact validity
    o However, we used a stringent definition for immunosuppression, excluding self-reported evidence limited to chronic diseases that are not frankly immunosuppressive (e.g., diabetes, renal failure without transplantation, lung disease), frailty, or subjective assessments (e.g., "frequent colds or infections")
  ▪ With a limited number of survey questions, our study was not designed to explore the attributable causes of immunosuppression
    o We assume prevalence is driven by frequency and chronicity (i.e., life-long conditions or treatments would contribute more than transient ones).

CONCLUSIONS

❖ The higher prevalence of immunosuppression in women may reflect their higher risk for autoimmune conditions.
❖ Increase in immunosuppression by age presumably reflects prevalence of conditions requiring immunosuppressive treatments; the peak at ages 50-59 years is unexpected
❖ There are 100s of clinical trials underway assessing immunosuppressive treatments to prevent or mitigate chronic diseases in large risk groups (with heart disease, diabetes, depression), if these treatments are effective, prevalence of immunosuppression is likely to increase
❖ These data can be important for planning purposes and to provide a baseline with which to assess trends

National Center for Immunization & Respiratory Diseases
Division of Viral Diseases

CDC