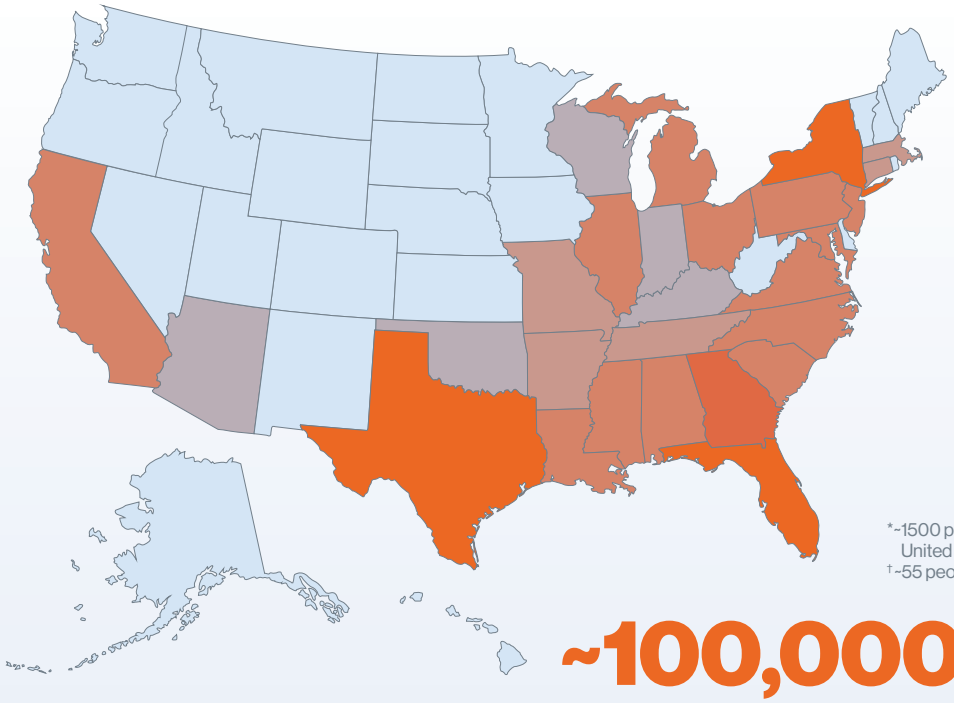
FACTS ABOUT SICKLE CELL DISEASE

~100,000 People Are Affected by Sickle Cell Disease in the United States[1]



Incidence of Sickle Cell Disease[1]

~1:365
African American Births*

~1:16,300
Hispanic American Births†

Incidence of Sickle Cell Trait[1]

~1:13 African American Births

*~1500 people with sickle cell disease (SCD) per year based on the birth rates in United States, 2017.[2]
†~55 people with SCD per year based on the birth rates in United States, 2017.[2]

~100,000 PEOPLE IN THE UNITED STATES HAVE SICKLE CELL DISEASE[1]

≥7000 | 5000-6999 | 2500-4999 | 1000-2499 | 500-999 | <500

Top 10 States With the Highest Prevalence of Sickle Cell Disease[3]

State[a]	Prevalence
Florida	8803
New York	8661
Texas	7132
Georgia	5797
Maryland	4860
California	4707
New Jersey	4256
North Carolina	3973
Louisiana	3936
Pennsylvania	3743
Total	**55,868**

>55%
OF PEOPLE WITH SCD RESIDE IN 10 STATES[3]

[a]**Prevalence for other states:** Alabama, 2851; Alaska, 45; Arizona, 635; Arkansas, 1266; Colorado, 371; Connecticut, 1252; Delaware, 561; District of Columbia, 1413; Hawaii, 82; Idaho, 36; Illinois, 3720; Indiana, 1162; Iowa, 254; Kansas, 417; Kentucky, 745; Maine, 75; Massachusetts, 1957; Michigan, 3322; Minnesota, 570; Mississippi, 3092; Missouri, 1903; Montana, 14; Nebraska, 148; Nevada, 539; New Hampshire, 33; New Mexico, 163; North Dakota, 14; Ohio, 3725; Oklahoma, 753; Oregon, 180; Rhode Island, 184; South Carolina, 3694; South Dakota, 19; Tennessee, 2077; Utah, 82; Vermont, 11; Virginia, 2961; Washington, 370; West Virginia, 200; Wisconsin, 1146; Wyoming, 16.

Learn more at: www.RethinkSCD.com

References: 1. Centers for Disease Control and Prevention. Data and Statistics: Sickle Cell Disease. https://www.cdc.gov/ncbddd/sicklecell/data.html. Accessed March 11, 2019. **2.** Martin JA, Hamilton BE, Osterman MJK, Driscoll AK, Drake P. Births: Final data for 2017. National Vital Health Statistics Reports; 67:8. Hyattsville, MD: National Center for Health Statistics. 2018. **3.** Hassell KL. Population estimates of sickle cell disease in the U.S. *Am J Prev Med.* 2010;38(4 Suppl):S512-S521.

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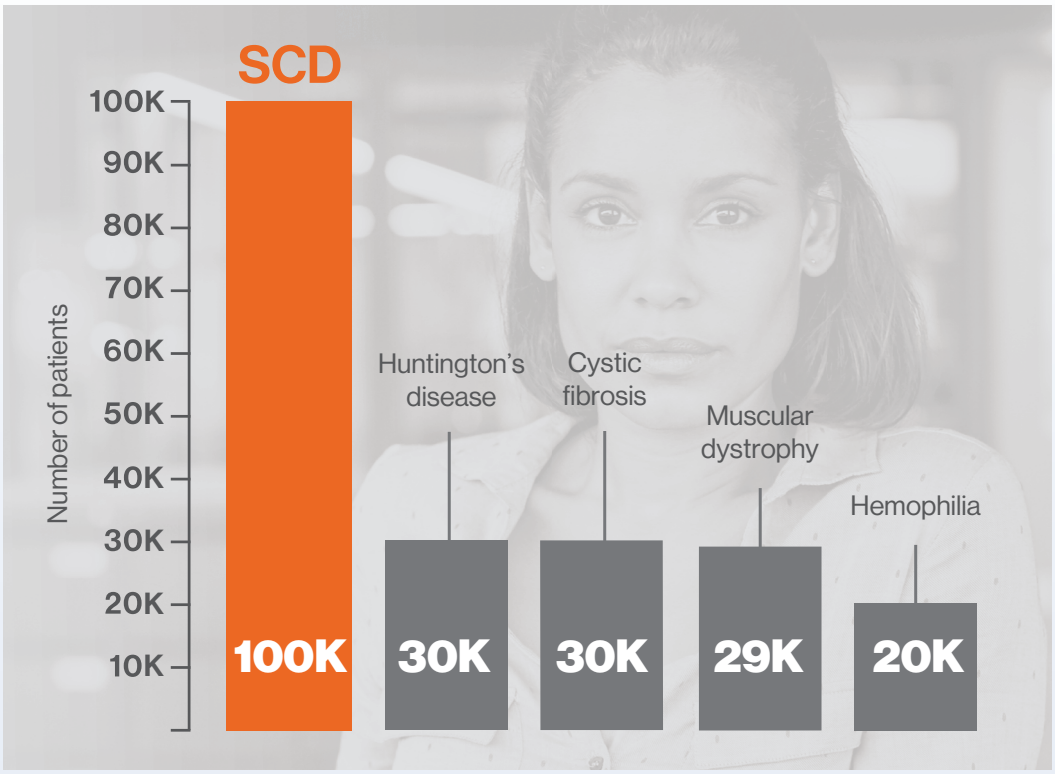
FACTS ABOUT SICKLE CELL DISEASE

Sickle Cell Disease Is the Most Common Genetic Blood Disorder in the United States[1,2]

Prevalence of Some Inherited Disorders in the United States[2-6]



SICKLE CELL DISEASE IS >3 TIMES MORE PREVALENT THAN OTHER RARE INHERITED DISORDERS

Funding for Cystic Fibrosis Is Greater Than That for Sickle Cell Disease[7]

Per affected individual, funding for cystic fibrosis is **11 times greater** than that for sickle cell disease(SCD)

Based on the National Institutes of Health; Sickle Cell Disease Association of America, Inc, Cystic Fibrosis Foundation©, and Cystic Fibrosis Foundation Therapeutics Inc. in 2011.

Despite its higher prevalence, SCD awareness and funding are lower than that of other genetic diseases.[8]

Learn more at: www.RethinkSCD.com

References: 1. Brousseau DC, Panepinto JA, Nimmer M, Hoffmann RG. The number of people with sickle-cell disease in the United States: national and state estimates. *Am J Hematol*. 2010;85(1):77-78. **2.** Centers for Disease Control and Prevention. Data and Statistics: Sickle Cell Disease. https://www.cdc.gov/ncbddd/sicklecell/data.html. Accessed March 11, 2019. **3.** NORD (National Organization for Rare Disorders). Huntington's Disease. https://rarediseases. org/rare-diseases/huntingtons-disease/. Accessed March 11, 2019. **4.** Cystic Fibrosis Foundation. Patient Registry 2017 Annual Data Report. https://www.cff.org/Research/Researcher-Resources/Patient-Registry/2017-Patient-Registry-Annual-Data-Report.pdf. **5.** Orphanet. Becker muscular dystrophy. https://www.orpha.net/consor/cgi-bin/OC_Exp.php?lng=en&Expert=98895. Accessed March 11, 2019. **6.** Centers for Disease Control and Prevention. Hemophilia: Data & Statistics. https://www.cdc.gov/ncbddd/hemophilia/data.html. Accessed March 11, 2019. **7.** Strouse JJ, Lobner K, Lanzkron S, Haywood C. NIH and National Foundation expenditures for sickle cell disease and cystic fibrosis are associated with PubMed publications and FDA approvals. *Blood*. 2013;122:1739. **8.** Adams-Graves P, Bronte-Jordan L. Recent treatment guidelines for managing adult patients with sickle cell disease: challenges in access to care, social issues, and adherence. *Expert Rev Hematol*. 2016;9(6):541-542.

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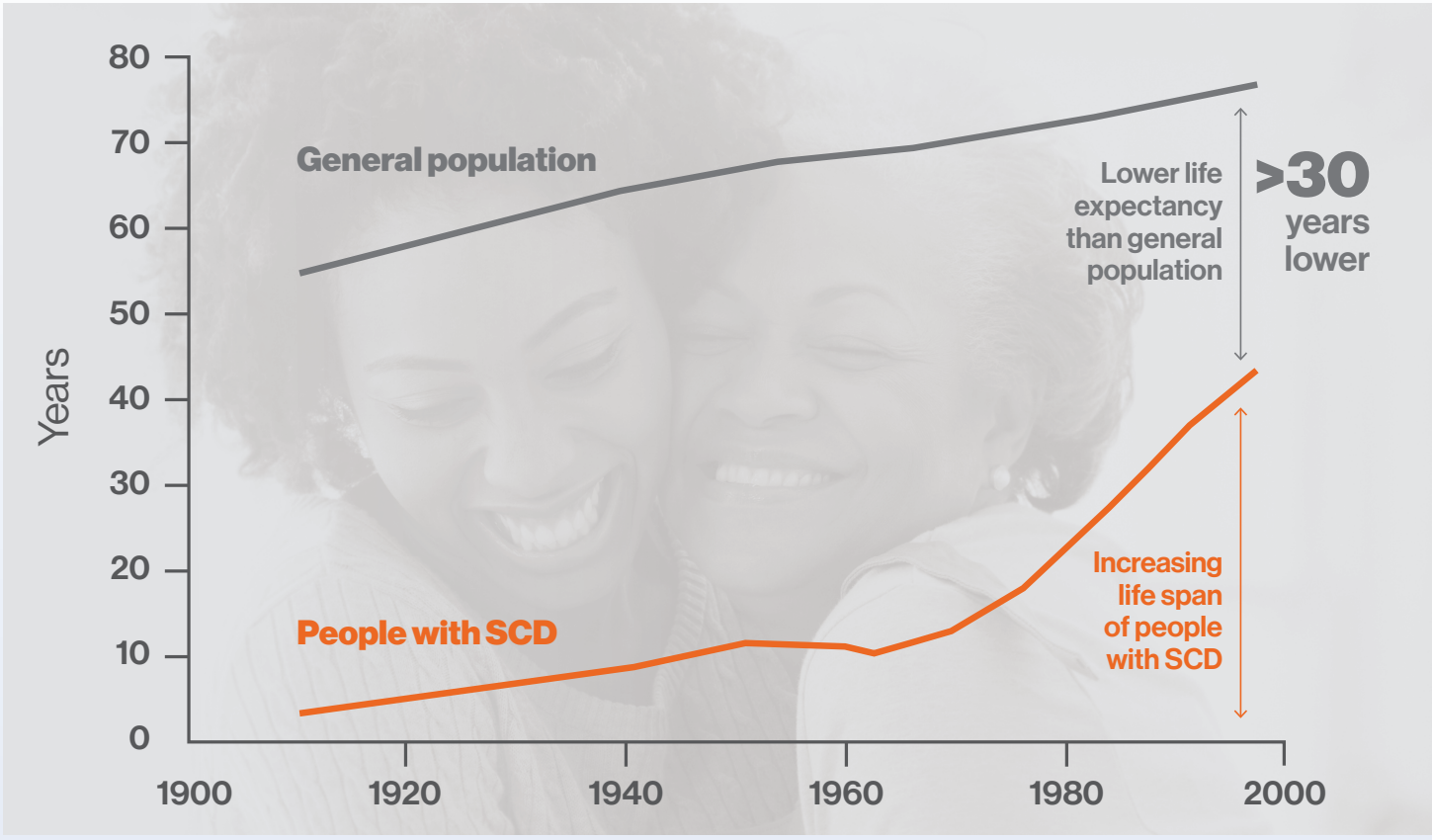
FACTS ABOUT SICKLE CELL DISEASE

Average Life Expectancy for People With Sickle Cell Disease in the United States Is 40-45 Years of Age[1*]

Life Expectancy of People With Sickle Cell Disease in the United States[2]



LIFE EXPECTANCY FOR PEOPLE WITH SICKLE CELL DISEASE REMAINS >30 YEARS LOWER THAN THE GENERAL POPULATION[2]

Major advances in sickle cell disease (SCD) screening and interventions over the past 4 decades have increased life expectancy; however, life expectancy is still more than 30 years lower than that of the general population.[1,2]

The majority of people with SCD in the United States are adults and of African ancestry. Patients of Hispanic, South Asian, South European, and Middle Eastern descent are also affected.[2-4]

Learn more at: www.RethinkSCD.com

*Based on the United States Census Bureau data from 1979-2005.

References: 1. Lanzkron S, Carrol CP, Haywood C. Mortality rates and age at death from sickle cell disease: US, 1979-2005. *Public Health Rep.* 2013;128(2):110-116. **2.** Thein MS, Igbineweka NE, Thein SL. Sickle cell disease in the older adult. *Pathology.* 2017;49(1):1-9. **3.** Hassell KL. Population estimates of sickle cell disease in the U.S. *Am J Prev Med.* 2010;38(4 Suppl):S512-S521. **4.** Ashley-Koch A, Yang Q, Olney RS. Sickle hemoglobin (HbS) allele and sickle cell disease: a HuGE review. *Am J Epidemiol.* 2000;151(9):839-845.

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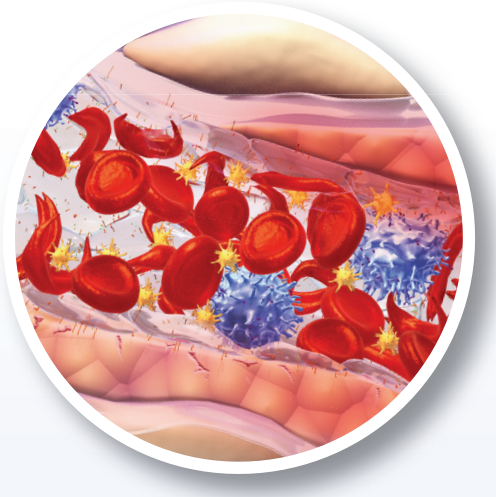

Sickle Cell Disease Goes Beyond Red Blood Cells and, Early on, Progresses to a Chronic Vascular Disease[1]

- Sickle cell disease (SCD) is a genetic blood disorder arising from mutations in the hemoglobin gene[1,2]
- Multicellular adhesion among endothelium and blood cells is a major driver of vaso-occlusion and vaso-occlusive crises (VOCs)[1]
- The upregulation and expression of specific adhesion mediators, including selectins, drive multicellular adhesion clusters[1,3]
- VOCs are the clinical hallmark of SCD and originate from ongoing, silent, vaso-occlusion[4,5]

Vaso-Occlusive Crises May Account for a Majority of the Burden of Sickle Cell Disease[1]

VOCs may be only the tip of the ongoing vaso-occlusion iceberg[4,5]

VOCs are unpredictable, extremely painful events that last, on average, 10 days[5,6]

79% of VOCs are treated at home; many patients do not seek the medical attention they need[7]*

VOCs are associated with decreased quality of life and increased risk of organ damage, multiorgan failure, and death[1,6,8]

The Burden of VOCs on Both Patients and Their Caregivers

VOCs are the **primary reason for emergency room** visits and **hospital admissions** in patient with SCD[9,10]

VOCs are associated with **frequent hospital admissions** that can lead to **increased health care costs**[7,10,11]

VOCs can affect **social relationships, employment, and education**[12,13]

Learn more at: **www.RethinkSCD.com**

*According to PiSCES (Pain in Sickle Cell Epidemiology Study), in which 232 adults with sickle cell disease completed daily pain diary logs, home management of pain episodes constituted about 13% of the total days; whereas, use of health care facilities constituted less than 4% of the total days.[7]

References: 1. Conran N, Franco-Penteado CF, Costa FF. Newer aspects of the pathophysiology of sickle cell disease vaso-occlusion. *Hemoglobin*. 2009;33(1):1-16. **2.** Steinberg MH. Sickle cell disease and associated hemoglobinopathies. In: Goldman L, Ausiello D, eds, *Cecil Medicine*, 23rd ed. Philadelphia, PA; Saunders Elsevier; 1991:Chap 167. **3.** Zhang D, Xu C, Manwani D, Frenette PS. Sickle cell disease: challenges and progress. Neutrophils, platelets, and inflammatory pathways at the nexus of sickle cell disease pathophysiology. *Blood*. 2016;127(7):801-809. **4.** Puri L, Nottage KA, Hankins JS, Anghelescu DL. State of the art management of acute vaso-occlusive pain in sickle cell disease. *Paediatr Drugs*. 2018;20(1):29-42. **5.** Ballas SK, Gupta K, Adams-Graves P. Sickle cell pain: a critical reappraisal. *Blood*. 2012;120(18):3647-3656. **6.** Piel FB, Steinberg MH, Rees DC. Sickle cell disease. *N Engl J Med*. 2017;376(16):1561-1573. **7.** Smith WR, Pemberthy LT, Bovbjerg VE, et al. Daily assessment of pain in adults with sickle cell disease. *Ann Intern Med*. 2008;148(2):94-101. **8.** American Society of Hematology. State of Sickle Cell Disease: 2016 Report. Washington, DC: 2016. http://www.scdcoalition.org/report.html. **9.** Lentz MB, Kautz DD. Acute vaso-occlusive crisis in patients with sickle cell disease. *Nursing2018*. 2017;41(1):67-68. **10.** Ballas SK, Lusardi M. Hospital readmission for adult acute sickle cell painful episodes: frequency, etiology, and prognostic significance. *Am J Hematol*. 2005;79(1):17-25. **11.** Adams-Graves P, Bronte-Jordan L. Recent treatment guidelines for managing adult patients with sickle cell disease: challenges in access to care, social issues, and adherence. *Expert Rev Hematol*. 2016;9(6):541-542. **12.** Swanson ME, Grosse SD, Kulkarni R. Disability among individuals with sickle cell disease. *Am J Prev Med*. 2011;41(6S4):S390-S397. **13.** Brandow AM, Brousseau DC, Panepinto JA. Post-discharge pain, functional limitations, and impact on caregivers of children with sickle cell disease treated for painful events. *Br J Haematol*. 2009;144(5):782-788.

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