

# LIFE ON THE LINE

Young Doctors  
Come of Age  
in a Pandemic

**Emma Goldberg**



HARPER

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## A Note on Sources

Shortly after reporting for the *New York Times* on the medical schools that accelerated their graduations because of Covid-19, I began speaking with the group of six early graduates who appear in this book. I spent hundreds of hours interviewing the doctors as well as their family members, partners, classmates, and coworkers. I visited their hospitals and, in some cases, reviewed their photos, videos, and notes. I also spoke to dozens of other doctors who worked with Covid-19 patients, both in and outside New York City, and to researchers focused on health equity. I benefited from the generosity of academics and journalists focused on the history of medicine who shared insights from their decades of work.

I relied on reporting about the coronavirus pandemic that appeared in many publications but especially the *New York Times*, *STAT News*, the *New Yorker*, Reuters, NPR, and *ProPublica*. I used Covid-19 data from the Centers for Disease Control and Prevention. I also relied on the extensive historical research on American medical schools conducted by scholars such as Paul Starr, Kenneth Ludmerer, and David Oshinsky.

Here are the sources that were most useful for each chapter.

### Introduction

In writing the introduction, I relied primarily on interviews with Sam, along with his classmate Jessica, who was also present

on the early graduates' first day at Bellevue. I also made use of diversity statistics from the Association of American Medical Colleges, data on median weekly earnings from the US Bureau of Labor Statistics, reporting in *STAT News*, and data on Covid-19 from the Centers for Disease Control and Prevention and the Economic Policy Institute. The following published sources were especially useful:

Alsan, Marcella, Owen Garrick, and Grant C. Graziani. "Does Diversity Matter for Health? Experimental Evidence from Oakland." *NBER Working Paper No. 24787* (June 2018). <https://www.nber.org/papers/w24787>.

Starr, Paul. *The Social Transformation of American Medicine*. New York: Basic Books, 2017.

## Chapter One

In writing this chapter, I relied primarily on interviews with Sam; his partner, Jeremy; and Sam's parents, Laurie and Neil. I also interviewed Dr. Steven Abramson, the vice dean for education at NYU Medical School, and Alison Whelan, the chief medical education officer of the Association of American Medical Colleges. I made use of data from the Association of American Medical Colleges and reporting on Covid-19 in the *New York Times*, CNN, Reuters, the *New Yorker*, the *Guardian*, and the *Atlantic*. The following published sources were especially useful:

Herman, Benjamin, Rhonda J. Rosychuk, Tracey Bailey, Robert Lake, Olive Yonge, and Thomas J. Marrie. "Medical Students and Pandemic Influenza." *Emerg Infect Dis* 13, no. 11 (2007): 1781–83. <https://dx.doi.org/10.3201/eid1311.070279>.

Schwartz, Christine C., Aparna S. Ajjarapu, Chris D. Stamy, and Debra A. Schwinn. "Comprehensive History of 3-Year and Accelerated US Medical School Programs: A Century in Review." *Med Educ Online* 23, no. 1 (2018): 1530557. <https://doi.org/10.1080/10872981.2018.1530557>.

## Chapter Two

In writing this chapter, I relied primarily on interviews with Gabriela, her mother, and her partner, Jorge. I also interviewed Paul Starr, who has studied the history of American medical schools. I made use of data from the Association of American Medical Colleges and the Kaiser Family Foundation, the Carnegie Foundation's digital archive, and the annual reports of the president of Harvard University in 1869 and 1870. The following published sources were especially useful:

Campbell, Kendall M., Irma Corral, Jhojana L. Infante Linares, et al. "Projected Estimates of African American Medical Graduates of Closed Historically Black Medical Schools." *Journal of the American Medical Association* 3, no. 8 (2020): e2015220. <https://doi.org/10.1001/jamanetworkopen.2020.15220>.

Cooper, Richard. "Medical Schools and Their Applicants: An Analysis." *Health Affairs* 22, no. 4 (2003). <https://doi.org/10.1377/hlthaff.22.4.71>.

Ludmerer, Kenneth. *Let Me Heal*. New York: Oxford University Press, 2015.

Simmenroth-Nayda, Anne, and Yvonne Görlich, "Medical School Admission Test: Advantages for Students Whose Parents Are Medical Doctors?" *BMC Medical Education* 15, no. 81 (2015). <https://doi.org/10.1186/s12909-015-0354-x>.

Starr, Paul. *The Social Transformation of American Medicine*. New York: Basic Books, 2017.

Stone, James. "The Relations of the Massachusetts Medical Society to the Public." *Boston Medical Surgery Journal* 190 (1924): 1005–12. <https://doi.org/10.1056/NEJM192406121902401>.

## Chapter Three

In writing this chapter, I relied primarily on interviews with Iris and her partner, Benjamin. I also interviewed Dr. Rana Awdish and Dr. Uché Blackstock. I made use of reporting in the *New York Times*, particularly by Aaron Carroll and Austin Frakt, and

the digital archives of the US Holocaust Museum. The following published sources were especially useful:

Awdish, Rana. *In Shock*. New York: St. Martin's Press, 2017.

Emanuel, Ezekiel, and Linda Emanuel. "Four Models of the Physician-Patient Relationship." *Journal of the American Medical Association* 267, no. 16 (1992): 2221–26. <https://doi.org/10.1001/jama.1992.03480160079038>.

Gawande, Atul. "Whose Body Is It Anyway?" *New Yorker*, October 4, 1999. <https://www.newyorker.com/magazine/1999/10/04/whose-body-is-it-anyway>.

Kaba, R., and P. Sooriakumaran. "The Evolution of the Doctor-Patient Relationship." *International Journal of Surgery* 5, no. 1 (2007): 57–65. <https://doi.org/10.1016/j.ijsu.2006.01.005>.

Katz, Jay. *The Silent World of Doctor and Patient*. New York: Free Press, 1984.

Lown, Bernard. *The Lost Art of Healing: Practicing Compassion in Medicine*. New York: Random House, 1996.

Metcalf, D. "Whose Data Are They Anyway?" *British Medical Journal* (Clinical Research Ed.) 292 (1986): 577–78. <https://doi.org/10.1177/0038038504039366>.

Moreno, Jonathan D., Ulf Schmidt, and Steve Joffe. "The Nuremberg Code 70 Years Later." *Journal of the American Medical Association* 318, no. 9 (2017). <https://doi.org/10.1001/jama.2017.10265>.

Roeland, Eric, Julia Cain, Chris Onderdonk, Kim Kerr, William Mitchell, and Kathryn Thornberry. "When Open-Ended Questions Don't Work." *Journal of Palliative Medicine* 17, no. 4 (2014): 415–20. <https://doi.org/10.1089/jpm.2013.0408>.

Rosenthal, Elisabeth. *An American Sickness: How Healthcare Became Big Business and How You Can Take It Back*. New York: Penguin, 2017.

Schneider, Carl. *The Practice of Autonomy*. New York: Oxford University Press, 1998.

Tingley, Kim. "Trying to Put a Value on the Doctor-Patient Relationship." *New York Times Magazine*, May 16, 2018. <https://www.nytimes.com/interactive/2018/05/16/magazine/health-issue-reinvention-of-primary-care-delivery.html>.

Vollmann, J., and R. Winau. "Informed Consent in Human Experimentation before the Nuremberg Code." *British Medical Journal* 313, no. 7070 (1996): 1445–49. <https://doi.org/10.1136/bmj.313.7070.1445>.

Weissman, Joel, and Joseph Betancourt. “Resident Physicians’ Preparedness to Provide Cross-Cultural Care.” *Journal of the American Medical Association* 294, no. 9 (2005): 1058–67. <https://doi.org/10.1001/jama.294.9.1058>.

Wells, Lindsay, and Arjun Gowda. “A Legacy of Mistrust.” *Proceedings of UCLA Health* 24 (2020).

## **Chapter Four**

In writing this chapter, I relied primarily on interviews with Gabriela; her partner, Jorge; and her mother; as well as their photos. I made use of reporting in the *New York Times*, by Sheri Fink, J. David Goodman, William K. Rashbaum, Jeffrey C. Mays, and Joseph Goldstein; in *ProPublica*, by Charles Ornstein, Joe Sexton, and Joaquin Sapien; in *Vox*, by Cameron Peters; and in the *Atlantic*, by Ed Yong. I also drew on Covid-19 data from the Centers for Disease Control and Prevention.

## **Chapter Five**

In writing this chapter, I relied primarily on interviews with Jay and her mother, along with Jay’s emails and photographs.

Rosenthal, Elisabeth. *An American Sickness: How Healthcare Became Big Business and How You Can Take It Back*. New York: Penguin, 2017.

## **Chapter Six**

In writing this chapter, I relied primarily on interviews with Elana, Ben, and Ben’s sister Jenny, along with their photos.

## **Chapter Seven**

In writing this chapter, I relied primarily on interviews with Sam, as well as visits to Bellevue. I interviewed Dr. Douglas Bails, Bellevue’s chief of medicine, AIDS expert Dr. Fred Valentine, historian Sandra Opdyke, and David Oshinsky, author of *Bellevue*. I made use of the *New York Times*’ reporting during the AIDS crisis, particularly the work of Bruce Lambert, Ronald

Sullivan, and Lawrence K. Altman, and the digital archives of the American Medical Association. The following published sources were especially useful:

Defoe, Daniel. *A Journal of the Plague Year*. New York: Penguin Classics, 2003.

Ofri, Danielle. “Imagine a World Without AIDS.” *New York Times*, July 27, 2012. <https://www.nytimes.com/2012/07/28/opinion/imagine-a-world-without-aids.html>.

———. “Pas de Deux,” in Lee Gutkind, ed., *Becoming a Doctor: From Students to Specialists, Doctor-Writers Share Their Experiences*. New York: W.W. Norton, 2010.

Oshinsky, David. *Bellevue*. New York: Penguin Random House, 2016.

Rockmore Angoff, Nancy. “Do Physicians Have an Ethical Obligation to Care for Patients with AIDS?” *Yale Journal of Biology and Medicine* 64, no. 3 (1991): 207–46. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2589324/>.

Yin, Sophia. “Physicians’ Duty to Treat in a Pandemic: A Code of Ethics Approach.” *Harvard Medical Student Review*, June 21, 2020. <https://www.hmsreview.org/covid/physicians-duty-to-treat>.

## Chapter Eight

In writing this chapter, I relied primarily on interviews with Iris, Benjamin, and Elana. I interviewed historian Kenneth Ludmerer and medical student Melissa Hill. I also made use of reporting in the *New York Times*, particularly by Mariel Padilla and Sanya Dosani, and in *STAT News*, by Lauren Joseph. The following published sources were especially useful:

Heschel, Abraham Joshua. *The Sabbath*. New York: Farrar, Straus and Giroux, 2005.

Hughes, Emily. “July Effect? Maybe Not.” *Canadian Medical Association Journal* 189, no. 32 (2017). <https://doi.org/10.1503/cmaj.1095466>.

Ludmerer, Kenneth. *Let Me Heal*. New York: Oxford University Press, 2015.



## Chapter Nine

In writing this chapter, I relied primarily on interviews with Jay and her coworkers, along with Jay's notes and photos and a visit to her hospital. I interviewed other Covid-19 doctors, including Dr. Manish Garg, Dr. Joshua Davis, Dr. Megan Ranney, Dr. Hashem Zikry, Dr. Luis Seija, Dr. Lakshman Swamy, Dr. Mizuho Morrison, and Dr. Richina Bicette; AIDS expert Dr. Fred Valentine; health equity researchers Dr. Marcella Alsan, Dr. Louis Penner, Dr. Uché Blackstock, Dr. Susan Persky, Dr. Nao Hagiwara, Cecile Yancu; and freelance journalist Patrice Peck. I made use of reporting in NBC, Reuters, the *New York Times*, NPR, *STAT News*, ABC News, and PBS as well as Covid-19 data from the Centers for Disease Control and Prevention. The following published sources were especially useful:

Alpert, Alison B., Eileen E. Cichoskikelly, and Aaron D. Fox. "What Lesbian, Gay, Bisexual, Transgender, Queer and Intersex Patients Say Doctors Should Know and Do: A Qualitative Study." *Journal of Homosexuality* 64, no. 10 (2017): 1368–89. <https://doi.org/10.1080/00918369.2017.1321376>.

Alsan, Marcella, Owen Garrick, and Grant C. Graziani. "Does Diversity Matter for Health? Experimental Evidence from Oakland." *National Bureau of Economic Research*. Working Paper 24787, June 2018. <https://doi.org/10.3386/w24787>.

Alsan, Marcella, and Marianne Wanamaker. "Tuskegee and the Health of Black Men." *Quarterly Journal of Economics* 133, no. 1 (2018). <https://doi.org/10.3386/w22323>.

Bower, Julie K., Pamela J. Schreiner, Barbara Sternfeld, Core E. Lewis. "Black-White Differences in Hysterectomy Prevalence." *American Journal of Public Health* 99, no. 2 (2009): 300. <https://doi.org/10.2105/AJPH.2008.133702>.

Calabrese, Sarah K., Valerie A. Earnshaw, Kristen Underhill, Douglas S. Krakower, Manya Magnus, Nathan B. Hansen, Kenneth H. Mayer, Joseph R. Betancourt, Trace S. Kershaw, and John F. Dovidio. "Prevention Paradox: Medical Students Are Less Inclined to Prescribe HIV Pre-Exposure Prophylaxis for Patients in Highest Need." *Journal of the International AIDS Society* 21, no. 6 (2018): e25147. <https://doi.org/10.1002/jia2.25147>.

Chapman, Elizabeth N., Anna Kaatz, and Molly Carnes. “Physicians and Implicit Bias: How Doctors May Unwittingly Perpetuate Health Care Disparities.” *Journal of General Internal Medicine* 28, no. 11 (2013): 1504–10. <https://doi.org/10.1007/s11606-013-2441-1>.

Corbie-Smith, G. “The Continuing Legacy of the Tuskegee Syphilis Study: Considerations for Clinical Investigation.” *American Journal of the Medical Sciences* 317, no. 1 (1999): 5–8. <https://doi.org/10.1097/00000441-199901000-00002>.

Esnaola, Nestor F., and Marvella E. Ford. “Racial Differences and Disparities in Cancer Care and Outcomes: Where’s the Rub?” *Surgical Oncology Clinics of North America* 21, no. 3 (2012): 417–37. <https://doi.org/10.1016/j.soc.2012.03.012>.

Feinglass, Joe, Cheryl Rucker-Whitaker, Lee Lindquist, Walter J. McCarthy, and William H. Pearce. “Racial Differences in Primary and Repeat Lower Extremity Amputation: Results from a Multihospital Study.” *Journal of Vascular Surgery* 41, no. 5 (2005): 823–29. <https://doi.org/10.1016/j.jvs.2005.01.040>.

Frazer, Somjen M. “LGBT Health and Human Services Needs in New York State.” *Empire State Pride Agenda Foundation*, 2009.

Greenwood, Brad N., Seth Carnahan, and Laura Huang. “Patient-Physician Gender Concordance and Increased Mortality among Female Heart Attack Patients.” *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 34 (2018): 8569–74. <https://doi.org/10.1073/pnas.1800097115>.

Greenwood, Brad N., Rachel R. Hardeman, Laura Huang, and Aaron Sojourner. “Physician-Patient Racial Concordance and Disparities in Birthing Mortality for Newborns.” *Proceedings of the National Academy of Sciences of the United States of America* 117, no. 35 (2020): 21194–200. <https://doi.org/10.1073/pnas.1913405117>.

Hoberman, John. *Black and Blue: The Origins and Consequences of Medical Racism*. Los Angeles: University of California Press, 2012.

Hoffman, Kelly M., Sophie Trawalter, Jordan R. Axt, and M. Norman Oliver. “Racial Bias in Pain Assessment and Treatment Recommendations, and False Beliefs about Biological Differences between Blacks and Whites.” *Proceedings of the National Academy of Sciences of the United States of America* 113, no. 16 (2016): 4296–301. <https://doi.org/10.1073/pnas.1516047113>.

Malhotra, Jyoti, David Rotter, Jennifer Tsui, Adana A.M. Llanos, Bijal A. Balasubramanian, and Kitaw Demissie. “Impact of Patient-Provider

Race, Ethnicity, and Gender Concordance on Cancer Screening: Findings from Medical Expenditure Panel Survey.” *Cancer Epidemiology, Biomarkers and Prevention* 26, no. 12 (2017): 1804–11. <https://doi.org/10.1158/1055-9965.EPI-17-0660>.

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Persky, Susan, Kimberly A. Kaphingst, Vincent C. Allen Jr., and Ibrahim Senay. “Effects of Patient–Provider Race Concordance and Smoking Status on Lung Cancer Risk Perception Accuracy among African-Americans.” *Annals of Behavioral Medicine* 45, no. 3 (2013): 308–17. <https://doi.org/10.1007/s12160-013-9475-9>.

Sabin, Janice A., Rachel G. Riskind, and Brian A. Nosek. “Health Care Providers’ Implicit and Explicit Attitudes Toward Lesbian Women and Gay Men.” *American Journal of Public Health* 105, no. 9 (2015): 1831–41. <https://doi.org/10.2105/AJPH.2015.302631>.

Skloot, Rebecca. *The Immortal Life of Henrietta Lacks*. New York: Crown Publishers, 2010.

Traylor, Ana H., Julie A. Schmittiel, Connie S. Uratsu, Carol M. Mangione, Usha Subramanian. “Adherence to Cardiovascular Disease Medications: Does Patient–Provider Race/Ethnicity and Language Concordance Matter?” *Journal of General Internal Medicine* 25, no. 11 (2010): 1172–77. <https://doi.org/10.1007/s11606-010-1424-8>.

Washington, Harriet A. *Medical Apartheid*. New York: Anchor Books, 2007.

## Chapter Ten

In writing this chapter, I relied primarily on interviews with Gabriela and Ben, as well as on visits to their hospitals. I made use of reporting in Reuters and the *New York Times*, as well as data from the Centers for Disease Control and Prevention. The following published sources were especially useful:

Bartik, Alexander W., Marianne Bertrand, Zoë B. Cullen, Edward L. Glaeser, Michael Luca, and Christopher T. Stanton. “How Are Small Businesses Adjusting to Covid-19?” *National Bureau of Economic Research*, Working Paper 26989, April 2020. <https://doi.org/10.3386/w26989>.

Curtis, J. Randall, Donald L. Patrick, Ellen S. Caldwell, et al. “Why Don’t Patients and Physicians Talk About End-of-Life Care?” *Journal of the American Medical Association Internal Medicine* 160, no. 11 (2000): 1690–96. <https://pubmed.ncbi.nlm.nih.gov/10847263/>.

Davis, Matthew A., Brahmajee K. Nallamothu, Mousumi Banerjee, and Julie P. W. Bynum. “Patterns of Healthcare Spending in the Last Year of Life.” *Health Affairs* 35, no. 7 (2016): 1316–23. <https://doi.org/10.1377/hlthaff.2015.1419>.

Gawande, Atul. *Being Mortal: Medicine and What Matters in the End*. New York: Metropolitan Books, 2014.

Johnson, Kimberly S. “Racial and Ethnic Disparities in Palliative Care.” *Journal of Palliative Medicine* 16, no. 11 (2013): 1329–34. <https://doi.org/10.1089/jpm.2013.9468>.

Nuland, Sherwin. *How We Die: Reflections on Life’s Final Chapter*. New York: Vintage Books, 1994.

Pinching, Anthony J., Roger Higgs, and Kenneth M. Boyd. “The Impact of AIDS on Medical Ethics.” *Journal of Medical Ethics* 26, no. 1 (2000). <https://jme.bmj.com/content/26/1/3>.

Sabatino, Charles P. “The Evolution of Health Care Advance Planning Law and Policy.” *Milbank Quarterly* 88, no. 2 (2010): 211–39. <https://doi.org/10.1111/j.1468-0009.2010.00596.x>.

Sadownik, Sara, Hannah James, and David Auerbach. “Serious Illness Care in Massachusetts: Differences in Care Received at the End of Life by Race and Ethnicity.” *Massachusetts Health Policy Commission*, September 30, 2020. <https://www.mass.gov/doc/policy-brief-serious-illness-care-in-massachusetts-differences-in-care-received-at-the-end-of/download>.

Smith, Cardinale B., Sofya Pintova, Kerin B. Adelson, and Jason Parker. “Disparities in Length of Goals of Care Conversations between Oncologists and Patients with Advanced Cancer.” *Journal of Clinical Oncology* 36, no. 34 (2018). [https://ascopubs.org/doi/10.1200/JCO.2018.36.34\\_suppl.19](https://ascopubs.org/doi/10.1200/JCO.2018.36.34_suppl.19).

Smith, Susan L. “War! What Is It Good For? Mustard Gas Medicine,” *Canadian Medical Association Journal* 189, no. 8 (2017). <https://doi.org/10.1503/cmaj.161032>.

## Chapter Eleven

In writing this chapter, I relied primarily on interviews with Iris and Elana. I interviewed other Covid-19 doctors, including Dr.

Lynn Fiellin, Dr. Lina Miyakawa, Dr. Doug Bails, Dr. Hilary Fairbrother, Dr. Lakshman Swamy, Dr. William Schaffner, Dr. Joshua Davis, Dr. Megan Ranney, Dr. Hashem Zikry, and Dr. Richina Bicette. I made use of data from the Centers for Disease Control and Prevention.

### **Chapter Twelve**

In writing this chapter, I relied primarily on interviews with Jay, Alicia, and their coworkers, as well as their photos and videos. I made use of data from the Centers for Disease Control and Prevention.

### **Chapter Thirteen**

In writing this chapter, I relied primarily on interviews with Gabriela. I made use of data from the Centers for Disease Control and Prevention.

### **Chapter Fourteen**

In writing this chapter, I relied primarily on interviews with Elana and data from the American Heart Association.

### **Chapter Fifteen**

In writing this chapter, I relied primarily on interviews with Sam. I made use of reporting in the *New York Times*, by Christina Goldbaum, Joseph Goldstein, William K. Rashbaum, and Alan Feuer, and in *The Intercept*, by Alleen Brown.

### **Chapter Sixteen**

In writing this chapter, I relied primarily on interviews with Ben, as well as a visit to his hospital. I interviewed other Covid-19 and palliative-care doctors, including Dr. Atul Gawande, Dr. Hashem Zikry, Dr. Megan Ranney, Dr. Andrew Thurston, Dr. Mizuho Morrison, Dr. Joshua Davis, Dr. Catherine Sarkisian, and Dr. Mitch Wong. I made use of reporting in the *New York*

*Times*, by Nicholas Kristof, and data from the Centers for Disease Control and Prevention.

### **Chapter Seventeen**

In writing this chapter, I relied primarily on interviews with Jay, her mother, and Jay's coworkers, as well as a visit to her hospital. I interviewed other Covid-19 doctors, including Dr. Amrapali Maitra and Dr. Rana Awdish. The following published sources were especially useful:

Dugdale, L.S. *The Lost Art of Dying: Reviving Forgotten Wisdom*. New York: HarperOne, 2020.

Onishi, Norimitsu. "A Generation in Japan Faces a Lonely Death." *New York Times*, November 30, 2017. <https://www.nytimes.com/2017/11/30/world/asia/japan-lonely-deaths-the-end.html>.

Wakam, Glenn K., John R. Montgomery, Ben E. Biesterveld, and Craig S. Brown. "Not Dying Alone—Modern Compassionate Care in the Covid-19 Pandemic." *New England Journal of Medicine* 382 (2020). <https://doi.org/10.1056/NEJMp2007781>.

### **Chapter Eighteen**

In writing this chapter, I relied primarily on interviews with Gabriela and her mother, as well as Gabriela's photos. I used Covid-19 data from the Centers for Disease Control and Prevention and reporting in CNBC and the *New York Times*.

### **Chapter Nineteen**

In writing this chapter, I relied primarily on interviews with Jay and Ben, as well as visits to their hospitals and Jay's photos. The following published sources were especially useful:

Potts, Amanda, and Elena Semino. "Cancer as a Metaphor." *Metaphor and Symbol* 34, no. 2 (2019): 81–95. <https://doi.org/10.1080/10926488.2019.1611723>.

Sontag, Susan. *Illness as Metaphor and AIDS and Its Metaphors*. New York: Macmillan, 2001.

## **Chapter Twenty**

In writing this chapter, I relied primarily on interviews with Iris, Benjamin, and Elana. The following published source was especially useful:

Park Hong, Cathy. *Minor Feelings*. New York: One World, 2020.

## **Chapter Twenty-One**

In writing this chapter, I relied primarily on interviews with Sam, his parents, Jeremy, and Bellevue's Dr. Doug Bails. I made use of reporting by Mihir Zaveri in the *New York Times* and by Danielle Ofri in the *New Yorker*. I used sickle-cell data from the Centers for Disease Control and Prevention.