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RESEARCH

Tectonic advances in precision oncology hold the promise of markedly improving the experience and outcomes of patients diagnosed with cancer. This motivates a pressing need to understand how these advances are translated into practice to improve human health. I study how treatment decisions are made between patients newly diagnosed with cancer and their clinicians (www.drstevenkatz.com). My research pinpoints the factors that drive patient treatment decisions. I also study the factors that influence clinician recommendations and how clinicians navigate the decision-making and communication process. My research has advanced methodologies in population and health systems research. I also develop and evaluate interventions to improve decision-making and accelerate the pace of adoption of advances in precision oncology into practice. Great science requires inspiration, creativity, gumption, perspicacity, and perseverance. High impact medical science requires a team effort. The Cancer Surveillance and Outcomes Research Team (www.cansort.org) centered at the University of Michigan generates pace-setting research in communication, decision-making, and quality of care for patients with cancer. The goal of this research is to improve the patient experience and maximize health outcomes of treatment and care support into survivorship. The key to the fountain of youth is life-long learning. I thank my colleagues, staff, and the patients and clinicians who participate in our research for the opportunity to stay young.

BIOGRAPHY

Dr. Steven J. Katz is Professor of Medicine and Health Management & Policy at the University of Michigan. He has received a numerous project and program grants from the National Institutes of Health (NIH) to lead research that addresses cancer treatment communication, decision-making, and quality of care. Dr. Katz leads the Cancer Surveillance and Outcomes Research Team (www.cansort.org) centered at the University of Michigan. CanSORT is an interdisciplinary research program focused on population and intervention studies of the quality of care and outcomes of cancer detection and treatment in diverse populations. He directed the Health Behavior and Outcomes (HBO) Program (2011-2021) of the Rogel Comprehensive Cancer Center, UM. Dr. Katz received a National Cancer Institute Established Investigator in Cancer Control, Behavioral and Population Sciences Research Award (2006-2012). Dr. Katz received the UM Department of Medicine Conn Research Award and the UM Medical School Dean's Award for Excellence in Health Services Research. He received his MPH in the Robert Wood Johnson Clinical Scholars Program at the University of Washington, his MD from the University of California, San Francisco, and completed residency in Internal Medicine at the University of California, Los Angeles.

EDUCATION

1976-1979	B.A., Biology/Environmental Sciences, University of California, Santa Barbara, California
1981-1985	M.D., Medicine, University of California, San Francisco, California
1989-1991	M.P.H., Health Services, University of Washington, Seattle, Washington

Postdoctoral Training:

1985-1988	Residency, Internal Medicine, University of California Medical Center, Internal Medicine, Los Angeles, California
1989-1991	Fellowship, Robert Wood Johnson Clinical Scholars Program, University of Washington, Seattle, Washington

POSITIONS AND EMPLOYMENT

1991-1998	Assistant Professor, Departments of Internal Medicine and Health Management & Policy, University of Michigan, Ann Arbor, Michigan
1998–2006	Associate Professor, Departments of Internal Medicine and Health Management & Policy, University of Michigan, Ann Arbor, Michigan
2006-Present	Professor, Departments of Internal Medicine and Health Management & Policy, University of Michigan, Ann Arbor, Michigan
2009-Present	Director, Health Behavior & Outcomes Program, University of Michigan Rogel Cancer Center, Ann Arbor, MI

HONORS AND PROFESSIONAL MEMBERSHIPS

1979	Graduate with Highest Honors, University of California, Santa Barbara, California
1989-1991	Robert Wood Johnson Clinical Scholar
1992	Outstanding Scientific Presentation, SGIM, 15th Annual National Meeting, Washington, D.C.
1994	Labelle Lectureship, McMaster University Health Sciences Center
1995-2000	Robert Wood Johnson Generalist Faculty Scholar
1997	Jerome W. Conn Award for Excellence in Research, University of Michigan Medical Center
1998-1999	Visiting Professor in Health Services Research, Spain Ministry of Education and Culture
2002-2007	NIH Study Section: Health Services Organization Delivery
2008-Present	NIH Study Sections, NCI Ad Hoc: SEP; NCI K; NCORP
2006-2012	National Cancer Institute Established Investigator in Cancer Prevention, Control, Behavioral and Population Sciences Research
2012	Clinical & Health Services Research Award; School of Medicine, University of Michigan
2019-2024	Rogel Scholar, Rogel Comprehensive Cancer Center, University of Michigan

SELECTED PUBLICATIONS (from over 200)

1. Kurian AW, Abrahamse P, Bondarenko I, Hamilton AS, Deapen D, Gomez SL, Morrow M, Berek JS, Hofer TP, **Katz SJ***, Ward KC*. Association of Genetic Testing Results With Mortality Among Women With Breast Cancer or Ovarian Cancer. *J. Nat Cancer Inst.* Published online August 9, 2021 <https://doi.org/10.1093/jnci/djab151> Katz SJ and Ward KC shared equally in this work.
2. Kurian AW, Ward KC, Abrahamse P, Bondarenko I, Hamilton AS, Deapen D, Morrow M, Berek, JS, Hofer TP, **Katz SJ**. Time Trends in Receipt of Germline Genetic Testing and Results for Women Diagnosed With Breast Cancer or Ovarian Cancer, 2012-2019. *Journal of Clinical Oncology* 39, no. 15 (May 20, 2021) 1631-1640.
3. Kurian AW, Ward KC, Abrahamse P, Hamilton AS, Deapen D, Morrow M, Jaggi R, **Katz SJ**. Association of Germline Genetic Testing Results With Locoregional and Systemic Therapy in Patients With Breast Cancer. *JAMA Oncol.* Published online February 6, 2020. doi:10.1001/jamaoncol.2019.6400.
4. Kurian AW, Ward KC, Howlader N, Deapen D, Hamilton AS, Mariotto A, Miller D, Penberthy LS, **Katz SJ**. Genetic Testing and Results in a Population-based Cohort of Breast Cancer Patients and Ovarian Cancer Patients. *J Clin Oncol.* 2019 May 20;37(15):1305-1315.
5. **Katz SJ**, Ward KC, Hamilton AS, Abrahamse P, Hawley ST, Kurian AW. Association of Germline Genetic Test Type and Results With Patient Cancer Worry After Diagnosis of Breast Cancer. *JCO Precis Oncol.* Published online December 19, 2018. doi: 10.1200/PO.18.00225.
6. Morrow M, Jaggi R, McLeod MC, Shumway D, **Katz SJ**. Surgeon Attitudes Toward the Omission of Axillary Dissection in Early Breast Cancer. *JAMA Oncol.* 2018;4(11):1511-1516.
7. **Katz SJ**, Bondarenko I, Ward KC, Hamilton AS, Morrow M, Kurian AW, Hofer TP. Association of Attending Surgeon With Variation in the Receipt of Genetic Testing After Diagnosis of Breast Cancer. *JAMA Surg.* 2018;153(10):909-916.

8. Jagsi R, Ward KC, Abrahamse PH, Wallner LP, Kurian AW, Hamilton AS, **Katz SJ**, Hawley ST. Unmet Need for Clinician Engagement Regarding Financial Toxicity After Diagnosis of Breast Cancer. *Cancer*. 15 September 2018;124(18):3668-3676.
9. **Katz SJ**, Jagsi R, Morrow M. Reducing Overtreatment of Cancer With Precision Medicine: Just What the Doctor Ordered. *JAMA*. 2018;319(11):1091-1092.
10. **Katz SJ**, Ward KC, Hamilton AS, McLeod MC, Wallner LP, Morrow M, Jagsi R, Hawley ST, Kurian AW. Gaps in Receipt of Clinically Indicated Genetic Counseling After Diagnosis of Breast Cancer. *J Clin Oncol*. 2018;36(12):1218-1224.
11. Hawley ST, Li Y, An LC, Resnicow K, Janz NK, Sabel MS, Ward KC, Fagerlin A, Morrow M, Jagsi R, Hofer TP, **Katz SJ**. Improving Breast Cancer Surgical Treatment Decision Making: The iCanDecide Randomized Clinical Trial. *J Clin Oncol*. 2018;36(7):659-666.
12. **Katz SJ**, Janz NK, Abrahamse P, Wallner LP, Hawley ST, An LC, Ward KC, Hamilton AS, Morrow M, Jagsi R. Patient Reactions to Surgeon Recommendations About Contralateral Prophylactic Mastectomy for Treatment of Breast Cancer. *JAMA Surg*. 2017;152(7):658-664.
13. Kurian AW, Bondarenko I, Jagsi R, Friese CR, McLeod MC, Hawley ST, Hamilton AS, Ward KC, Hofer TP, **Katz SJ**. Recent Trends in Chemotherapy Use and Oncologists' Treatment Recommendations for Early-Stage Breast Cancer. *J Natl Cancer Inst*. 2018;110(5):493-500.
14. **Katz SJ**, Hawley S, Hamilton A, Ward K, Morrow M, Jagsi R, Hofer T. Surgeon Influence on receipt of contralateral mastectomy: Does it Matter who you see for breast cancer surgery? *JAMA Surg*. 2018;153(1):29-36.
15. Morrow M, Abrahamse P, Hofer TP, Ward KC, Hamilton AS, Kurian AW, **Katz SJ**, Jagsi R. Trends in Reoperation After Initial Lumpectomy for Breast Cancer: Addressing Overtreatment in Surgical Management. *JAMA Oncol*. 2017;3(10):1352-1357.
16. Kurian AW, Li Y, Hamilton AS, Ward KC, Hawley ST, Morrow M, McLeod MC, Jagsi R, **Katz SJ**. Gaps in Incorporating Germline Genetic Testing Into Treatment Decision-Making for Early-Stage Breast Cancer. *J Clin Oncol*. 2017;35(20):2232-2239.
17. **Katz SJ**, Wallner LP, Abrahamse PH, Janz NK, Martinez KA, Shumway DA, Hamilton AS, Ward KC, Resnicow KA, Hawley ST. Treatment experiences of Latinas after diagnosis of breast cancer. *Cancer*. 2017;123(16):3022-3030.
18. **Katz SJ**, Janz NK, Abrahamse P, Wallner LP, Hawley ST, An LC, Ward KC, Hamilton AS, Morrow M, Jagsi R. Patient Reactions to Surgeon Recommendations About Contralateral Prophylactic Mastectomy for Treatment of Breast Cancer. *JAMA Surg*. 2017;152(7):658-664.
19. Kurian AW, Friese CR, Bondarenko I, Jagsi R, Li Y, Hamilton AS, Ward KC, **Katz SJ**. Second Opinions From Medical Oncologists for Early-Stage Breast Cancer: Prevalence, Correlates, and Consequences. *JAMA Oncol*. 2017;3(3):391-397.
20. Kurian AW, Griffith KA, Hamilton AS, Ward KC, Morrow M, **Katz SJ**, Jagsi R. Genetic Testing and Counseling Among Patients With Newly Diagnosed Breast Cancer. *JAMA*. 2017;317(5):531-534.
21. Wallner LP, Martinez KA, Li Y, Jagsi R, Janz NK, **Katz SJ**, Hawley ST. Use of Online Communication by Patients With Newly Diagnosed Breast Cancer During the Treatment Decision Process. *JAMA Oncol*. 2016;2(12):1654-1655.
22. Wallner LP, Abrahamse P, Uppal JK, Friese CR, Hamilton AS, Ward KC, **Katz SJ**, Hawley ST. Involvement of Primary Care Physicians in the Decision Making and Care of Patients With Breast Cancer. *J Clin Oncol*. 2016;34(33):3969-3975.
23. Morrow W, **Katz SJ**. Addressing Overtreatment in DCIS: What Should Physicians Do Now? *J Natl Cancer Inst*. 2015;107(12):djv290.
24. **Katz SJ**, Kurian AW, Morrow M. Treatment Decision Making and Genetic Testing for Breast Cancer: Mainstreaming Mutations. *JAMA*. 2015;314(10):997-998.
25. **Katz SJ**. Cancer Care Delivery Research and the National Cancer Institute SEER Program Challenges and Opportunities. *JAMA Oncol*. 2015;1(5):677-678.

CURRENT PROJECTS

U01CA254822 (NCI)

Katz, An, Kurian (PIs)

09/15/20 – 08/31/25

A Population-Based Virtual Solution To Reduce Gaps In Genetic Risk Evaluation And Management In Families At High Risk For Hereditary Cancer Syndromes: The Georgia-California Genelink Trial

There is growing evidence that targeting genetic risk evaluation (GRE) in families where a cancer susceptibility gene pathogenic variant (PV) has been identified may be the most cost-effective approach to reduce the population burden of cancer through prevention. However, there are enormous challenges to implementing successful cascade genetic risk evaluation in families with hereditary cancer syndromes. The clinical context of GRE after cancer diagnosis is increasingly complex: As MGP testing has become the norm, guideline organizations have converged on a list of >40 cancer susceptibility genes in which PVs are clinically actionable, with wide variability in cancer threat and a myriad of strategies for prevention and early detection. A daunting challenge is that the cancer patient is responsible for communication and engagement of relatives for GRE. Despite the shared health threat among at risk relatives (ARRs), the social and contextual factors that affect family communication are complex. Furthermore, ARRs are dispersed world-wide and receive care in disparate health care practices. Importantly, there is little incentive and limited resources for clinicians to engage cancer patients' relatives and genetic counseling services are increasingly strained. Given the lack of guidance for families, it is not surprising that most ARRs of cancer patients with PVs do not undergo GRE. We are uniquely positioned to develop and optimize a direct-to-family virtual genetic risk evaluation and testing solution offered to all at risk relatives of a population-based sample of adults recently diagnosed with cancer in Georgia and California who tested positive for a clinically relevant PV. We will use a unique data infrastructure we pioneered to identify and invite a diverse cohort of cancer patients with clinically relevant PVs and their families to participate in our study. We propose a 2 x 3 factorial randomized trial of 900 patients diagnosed in 2018-2019 in the two states who had a clinically significant PV detected by genetic testing that will offer genetic risk evaluation and testing to all 1st and 2nd degree relatives. We will evaluate the effects of two intervention design features on patient- and relative-centered outcomes: 1) the level of personalized family genetic risk support (a technology assisted personally tailored patient and family member education and communication tool called the Family Genetic Health Program, FGHP) vs. the FGHP plus direct assistance from a human FGHP Navigator); and 2) the price offered to the relatives for the genetic test (standard \$200 vs. \$100 vs. \$50 per test). We will determine the independent effects of the two design features on 1) the cancer patient's appraisal of communication and their engagement with relatives about hereditary cancer and GRE; 2) the invited relative's appraisal of decision-making and receipt of genetic testing; and 3) on the enrolled relative's completion of formal GRE. We will also explore the effect of the features on the outcomes across patient SES subgroups. The findings of this study have enormous potential to improve cancer prevention and early detection in families at high risk of hereditary cancer syndromes in the US.

American Cancer Society

Katz (PI)

09/01/20 – 06/01/24

Gaps in genetic risk prevention in breast cancer patients and their family

Project Summary: Breast cancer is the first common health condition to be subjected to widespread extensive genetic testing after diagnosis. Multigene panel tests - comprising sequencing of at least 20 genes - have become the standard in the US which has resulted in tectonic changes in the distribution of results and the implications for patients and families regarding cancer prevention and control. The broadening of criteria for genetic risk evaluation after diagnosis of cancer combined with the extensiveness of the genes tested has fomented enormous challenges for clinicians, patients, and their families. **Objective/Hypothesis:** We propose a population-based survey study of patient experiences with germline genetic testing and patient communication with family members about hereditary cancer risk and prevention. We suspect that there is growing mismatch between test results and patient's attitudes and behaviors about hereditary cancer risk and prevention. We speculate that growing variability in the implications of test results on cancer threat may cause gaps and disparities in communication between patients and their relatives – especially in high-risk families. **Specific Aims:** 1) To examine potential gaps and disparities in patients' attitudes and behaviors about cancer risk reduction strategies (preventive surgery and high-risk surveillance) in relation to their genetic test results; 2) To examine potential gaps and disparities in family communication about genetic test results reported by patients

with abnormal test results; and 3) To examine barriers to genetic risk evaluation reported by relatives of patients with pathogenic variants. Study Design: We propose a population-based survey of patients diagnosed with breast cancer in 2018 in the states of Georgia and California who received germline genetic testing (N=3,140) and their first-degree relatives (FDRs). Patients will be selected based on their genetic test results and race/ethnicity from our Georgia-California Genetic Testing Linkage Initiative data infrastructure. We will survey all FDRs (N= 620) with whom patients with pathogenic variants discussed test results. Survey information will be merged with SEER and genetic test data and a de-identified dataset will be constructed for analyses.

R01CA225697 (NCI)

Kurian, Katz (PIs)

03/01/18 – 02/28/22

Genetic Testing, Treatment Use, and Mortality After Diagnosis of Breast and Ovarian Cancer: The Georgia-California GeneLINK Initiative

Project Summary: Genetic testing is essential to identify and manage hereditary breast and ovarian cancer syndrome (HBOC), enabling precision prevention and screening and potentially reducing morbidity, mortality, and cost. Testing cancer patients is thus the gateway to population-wide improvements in HBOC care. Yet genetic testing is difficult to integrate into the complex care of a newly diagnosed cancer patient. A major concern is that the increasing volume, complexity and ambiguity of results may worsen gaps in testing use, treatment quality, and health outcomes. To advance precision prevention of HBOC, there is great need to understand deployment of genetic testing and results management. Concerns include potential disparities in test use and results among sociodemographic and clinical subgroups and the impact of results on cancer treatment and mortality. To address these concerns we will examine potential gaps in genetic testing use, test results and treatment (including surgery, radiation and chemotherapy) among newly diagnosed breast and ovarian cancer patients, according to pre-test HBOC risk and sociodemographics. We will study approximately 150,000 breast cancer patients and 12,000 ovarian cancer patients who were diagnosed in 2013–2016 and reported to the statewide Georgia and California SEER registries, and then accrued into a Georgia-California SEER Genetic Testing Linkage Initiative (GeneLINK). We will examine whether more intensive regimens (e.g., anthracyclines or platinums) are more prevalent in mutation carriers than other chemotherapy recipients, controlling for tumor factors. Among ovarian cancer patients with BRCA1/2 mutations who are indicated for targeted therapy with a PARP inhibitor, those with sociodemographic vulnerability factors less often receive it. Among breast and ovarian cancer patients who received chemotherapy, mortality will be lower in pathogenic mutation carriers than in non-mutation carriers.

American Cancer Society

Wallner LP. (PI)

7/1/20-6/30/23

Disparities in the Delivery and Quality of Breast Cancer Survivorship Care American Cancer Society Research Scholars Grant.

Project Summary: Background: The care of breast cancer survivors is complex, as it requires coordination among many providers over time and encompasses cancer-related follow-up care, management of late-term effects of treatment and general preventive care. However, coordination among providers and implementation of shared care models where oncologists work together with primary care physicians (PCPs) to deliver survivorship care remain significantly challenging. In addition, many survivors do not receive guideline-concordant survivorship care and significant socioeconomic disparities in the quality of cancer care remain. Yet, whether or not these disparities persist throughout the survivorship period is less clear, particularly as it relates to the delivery and coordination of survivorship care, and the receipt services that reduce the risk of mortality from recurrence and second primary cancers, including genetic testing. Objective: The goal of this study is to further our understanding about the quality of survivorship care by assessing disparities in both the delivery and quality of breast cancer survivorship care and examining whether more PCP involvement in survivorship care results in improved quality, particularly among vulnerable populations. Specific Aims: The specific aims of this project are: 1) to characterize provider roles in the delivery of breast cancer survivorship care among vulnerable populations, 2) examine disparities in the quality and coordination of breast cancer survivorship care and 3) explore whether more PCP involvement in survivorship care improves the quality and coordination of breast cancer survivorship care, particularly among vulnerable populations. We hypothesize that oncologists will lead the delivery of survivorship care for most women, PCP involvement in survivorship care will be lower among vulnerable populations, and significant disparities in the coordination quality of survivorship care will exist across patient-reported sociodemographic factors. However, we hypothesize that

these disparities will be reduced among women with high PCP involvement in their survivorship care. Study Design: We will accomplish this by conducting a follow-up survey study 5 years after diagnosis in women who participated in the iCanCare Study, a racially and economically diverse, population-based study of 2502 women with early-stage breast cancer in Los Angeles County and Georgia diagnosed in 2014-15. We will utilize rich patient-reported socioeconomic measures (race, ethnicity, acculturation, literacy, education, and insurance) as well as extensive clinical information collected during initial treatment. Findings from this study will directly inform future cancer care delivery strategies, address how survivorship care delivery patterns impact the quality of survivorship care, identify important disparities in the delivery and quality of survivorship care, and guide the development of culturally-tailored interventions to improve survivorship care. Role (Co-I)

1R01CA237046 (NCI)

Hawley ST, Jaggi R (PIs)

12/2/20-11/30/24

Improving Patient-Centered Communication in Breast Cancer: A RCT of a Shared Decision Engagement System (ShaDES).

Project Summary: Improving Patient-Centered Communication in Breast Cancer: A RCT of a Shared Decision Engagement System (ShaDES). The diagnosis of breast cancer triggers a cascade of decisions as patients consider multiple treatment modalities navigated by different specialists. Precise evaluative treatment algorithms have better individualized treatment recommendations, yet sifting through the complexity of the test information and treatment options can be often challenging to patients and can often cause anxiety. Thus, the advances of precision medicine cannot be realized without parallel advances in patient-centered communication (PCC). This rapidly evolving decision context has fueled a pressing need for more patient-centered communication to address the full breadth of issues—both cognitive and emotional—faced by patients in making breast cancer treatment decisions. There is a critical need for tools that can engage the patient both emotionally and cognitively and be integrated into the breast oncology care clinical workflow. This project is a multi-level, factorial study that crosses a patient-level RCT of 700 newly-diagnosed breast cancer patients within 25 breast surgical oncology practices to evaluate a shared decision engagement system (ShaDES) to support PCC. The system links an emotional support-enhanced version of the research group's previously developed iCanDecide patient-facing decision tool with a clinic level trial of a Clinician Dashboard to help clinicians address remaining cognitive and emotional needs in their patients. In collaboration with the Alliance NCORP Research Base and its Statistics and Data Core, the trial will: 1) evaluate the impact of the emotional support enhancements to iCanDecide on primary and secondary outcomes measuring patient appraisal of PCC, 2) evaluate the impact of the Clinician Dashboard on patient appraisal of PCC, 3) examine potential mediators of the patient and clinic interventions, and 4) conduct a process evaluation of the two intervention components to inform revision and future widespread implementation of ShaDES. The results will lay the groundwork for broad implementation of a shared decision engagement system to improve patient-centered communication in breast cancer. Role (Co-I)

1R37CA251464

VEENSTRA, CHRISTINE (PI)

05/01/2021-4/30/2025

A Registry-Based Study of Patterns of Use of Targeted Therapies for Metastatic Cancers in Diverse Populations

One of the most important cancer care advances in recent history is the rapid dissemination of targeted therapies (molecularly targeted kinase inhibitors and immune checkpoint inhibitors) into the care of patients with metastatic cancer. The marked expansion of indications for use of these novel therapies has been fueled by growing enthusiasm among medical oncologists regarding their potential impact on survival for patients with very poor prognosis. Although the survival benefit of these therapies is modest for most patients, a small proportion experience long-term remission and potentially even cure of previously incurable cancer. Despite the exciting promise of these therapies, they are very expensive – sometimes exceeding \$10,000 per month. Because of the high cost and high stakes of these therapies, it is critical to understand their patterns of use; yet very little is known about targeted therapy use across diverse populations. Moreover, the impact of clinician factors on variations in use is not known. In the absence of such knowledge it is difficult to develop effective interventions to support equitable delivery of these therapies to the growing population of patients living with metastatic cancer. Therefore, we will investigate patterns of use of targeted therapy among a diverse sample of 2,240 patients diagnosed in 2019 with metastatic non-small cell lung cancer, genitourinary cancer, and melanoma, and ascertained by the Georgia and Los Angeles county SEER registries. We will first characterize patient factors associated with non-receipt, by creating a powerful combination of archival clinical and

sociodemographic registry data augmented with additional treatment data that SEER staff will collect directly from clinicians and practices. We hypothesize that significant variations exist in patient use of targeted therapy across age, race/ethnicity, socioeconomic status, and geography. We will then identify clinician factors that are associated with tendency to prescribe targeted therapy. Informed by qualitative data that we will collect through interviews with medical oncologists, we will survey the medical oncologists (clinicians) who treat these patients, including many who practice in resource-limited settings. We will assess clinicians' knowledge & attitudes about targeted therapy, ask specific details about their practice setting, and use clinical vignettes to measure their tendency to prescribe targeted therapy. We will survey 1025 clinicians and anticipate a 65% response rate, based on our prior work. We hypothesize that certain clinicians are less likely to prescribe targeted therapy, including those with less knowledge around targeted therapy and those who practice in resource-limited settings. Finally, we will merge clinician data with patient data to quantify and explain the influence of clinicians on variations in patients' use of targeted therapy. We hypothesize that most (>50%) of the variation occurs at the clinician level, and that clinician knowledge and attitudes drive most of the variation. The findings from this study will inform the development of multilevel interventions to improve equitable receipt of targeted therapies across diverse patient populations and practice settings.