

Expanding the PD GENERation study to increase clinical genetic testing and counseling using whole genome sequencing among diverse Parkinson's disease (PD) populations

Kamalini Ghosh Galvelis¹, Anna Naito¹, Megan Dini¹, Shilpa C. Rao¹, Rebeca De Leon¹, Anny Coral-Zambrano¹, Addison Yake¹, Lark Caboy¹, Tatiana Foroud², Priscila Hodges², Laura Heathers², Jennifer Verbrugge², Lola Cook², Jeanine Schulze², Michelle Totten², Anne Hall¹, Karen Marder³, Ignacio Mata⁴, Niccolo E. Mencacci⁵, Tanya Simuni⁵, Martha Nance⁶, Michael Schwarzschild⁷, Anne-Marie Wills⁷, Sarah W. Lawrence⁸, Penina Ponger¹⁰, Cornelis Blauwendraat⁹, James C. Beck¹, Roy N. Alcalay^{3, 10}

1. Parkinson's Foundation, New York, NY; 2. Indiana University, Indianapolis, IN; 3. Columbia University, New York, NY; 4. Cleveland Clinic, Cleveland, OH; 5. Northwestern University Feinberg School of Medicine, Chicago, IL; 6. Park Nicollet Struthers Parkinson's Center, Minneapolis, MN; 7. Massachusetts General Hospital, Boston, MA; 8. Navitas Clinical Research, Rockville, MD; 9. Aligning Sciences Across Parkinson's, Bethesda, MD; 10. Tel Aviv Sourasky Medical Center, Tel Aviv, Israel

Abstract

Objective: To provide Clinical Laboratory Improvement Amendments (CLIA) genetic testing using whole genome sequencing and disclosure of 7 PD relevant genes and secondary health-related genetic findings through genetic counseling to people with PD (PWP) globally. **Background:** The PD GENERation study, sponsored by the Parkinson's Foundation in partnership with the Global Parkinson's Genetics Program (GP2) (NCT04994015), is transitioning from CLIA testing of targeted exome to whole genome sequencing (WGS) and expanding to further include underrepresented populations in the Americas and Israel. **Methods:** This expansion involves collaboration with the Latin American Research consortium on the Genetics of Parkinson's Disease (LARGE-PD). To ensure wider accessibility, genetic counseling materials focused on WGS were developed in English and Spanish, empowering healthcare providers worldwide to deliver genetic results as part of standard of care. **Results:** The expansion of PD GENERation aims to yield an additional 8,400 participants in 2024, resulting in an overall cohort of 23,000+ PWP with genomic characterization. All clinical and genomic sequencing data will be made publicly available through the GP2 program. **Conclusion:** PD GENERation offers a flexible research study framework that can integrate globally, taking into consideration each country's infrastructure, cultural differences, and genetic counseling training needs. A decentralized study model and "train the trainer" methods allows PD GENERation to expand beyond the parameters of traditional genetic testing and genetic counseling.

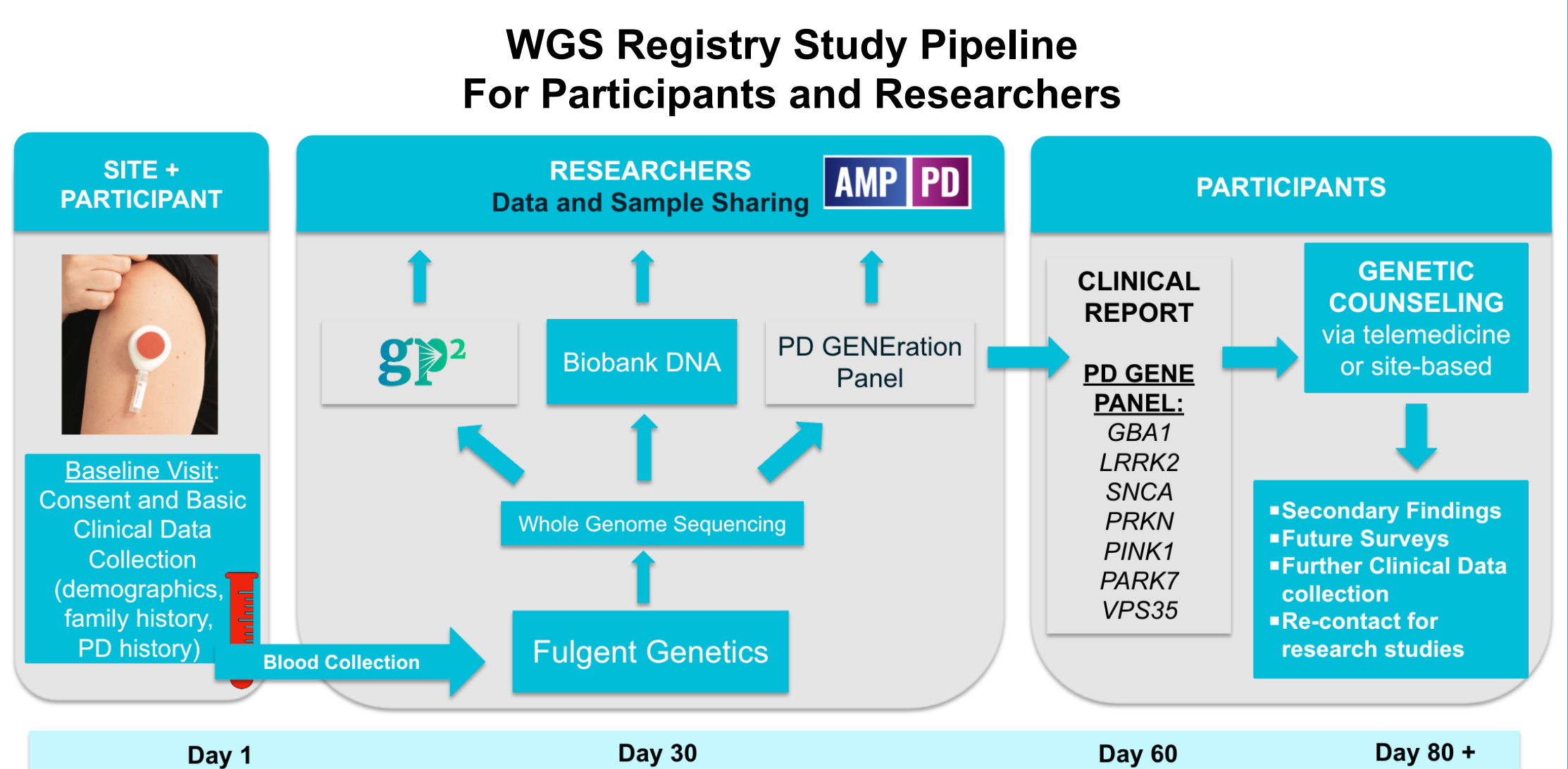
Methods

PD GENERation is a multi-center, observational study, offering genetic testing and counseling to those with PD in the United States, including Puerto Rico; Canada; the Dominican Republic; Israel; and in 5 Latin American Countries: Chile, Colombia, Mexico, Peru, Ecuador. DNA samples are analyzed by next-generation sequencing and deletion/duplication analysis (CLIA-certified; Fulgent Genetics). Variants classified as pathogenic/likely pathogenic and clinically actionable are disclosed.

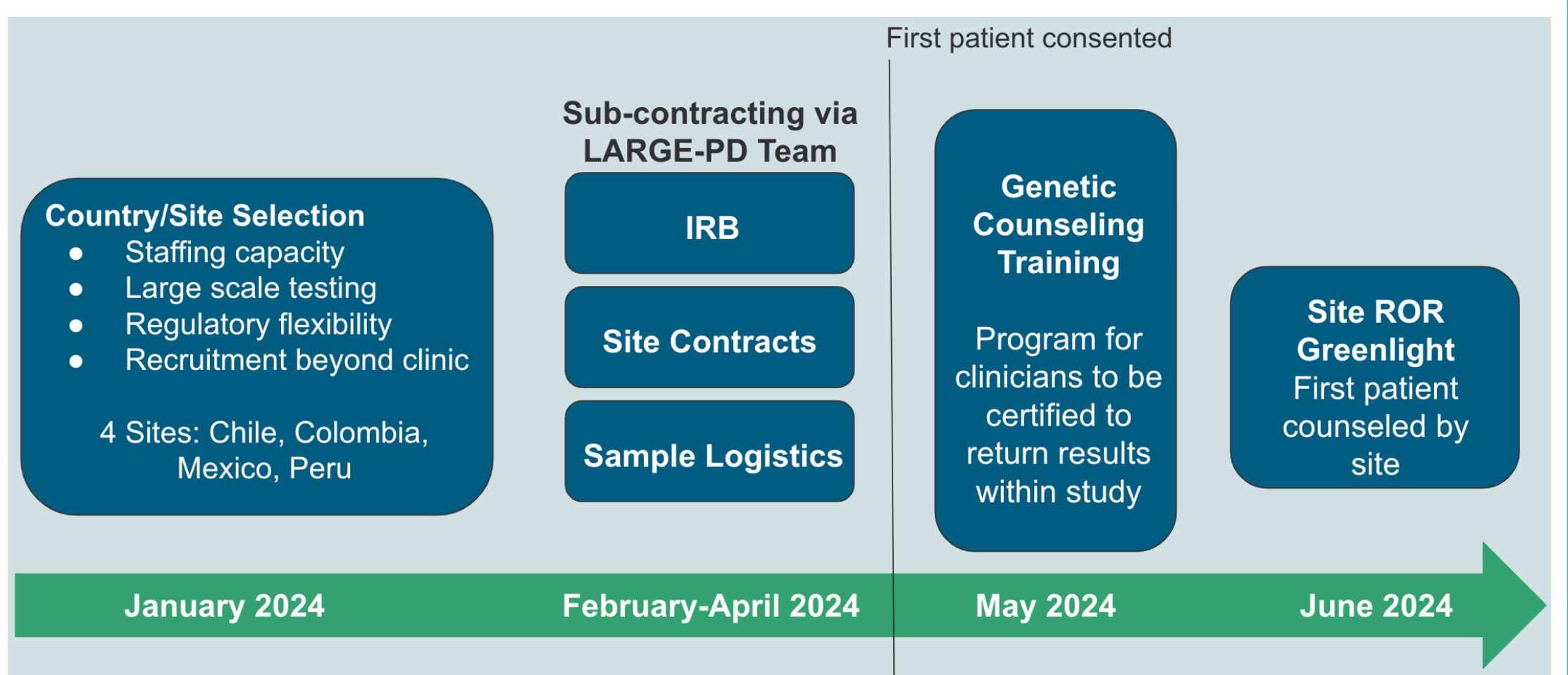
Four phases of PD GENERation:

- 1) Pilot study-** launched in Sep. 2019 and aimed at feasibility.
- 2) Clinical study-** launched in Nov. 2020- continuation of the Pilot study at a larger scale, aimed at frequency and characterization of clinical phenotypes.
- 3) Registry study-** launched in Jan. 2021 and aimed to make genetic counseling and testing accessible to 15,000 participants.
- 4) Registry study WGS-** launched in Mar. 2024 and aims to offer whole genome sequencing (WGS) genetic testing and counseling to 8,400 participants with return of results in primary PD and secondary findings, shown in the table below.

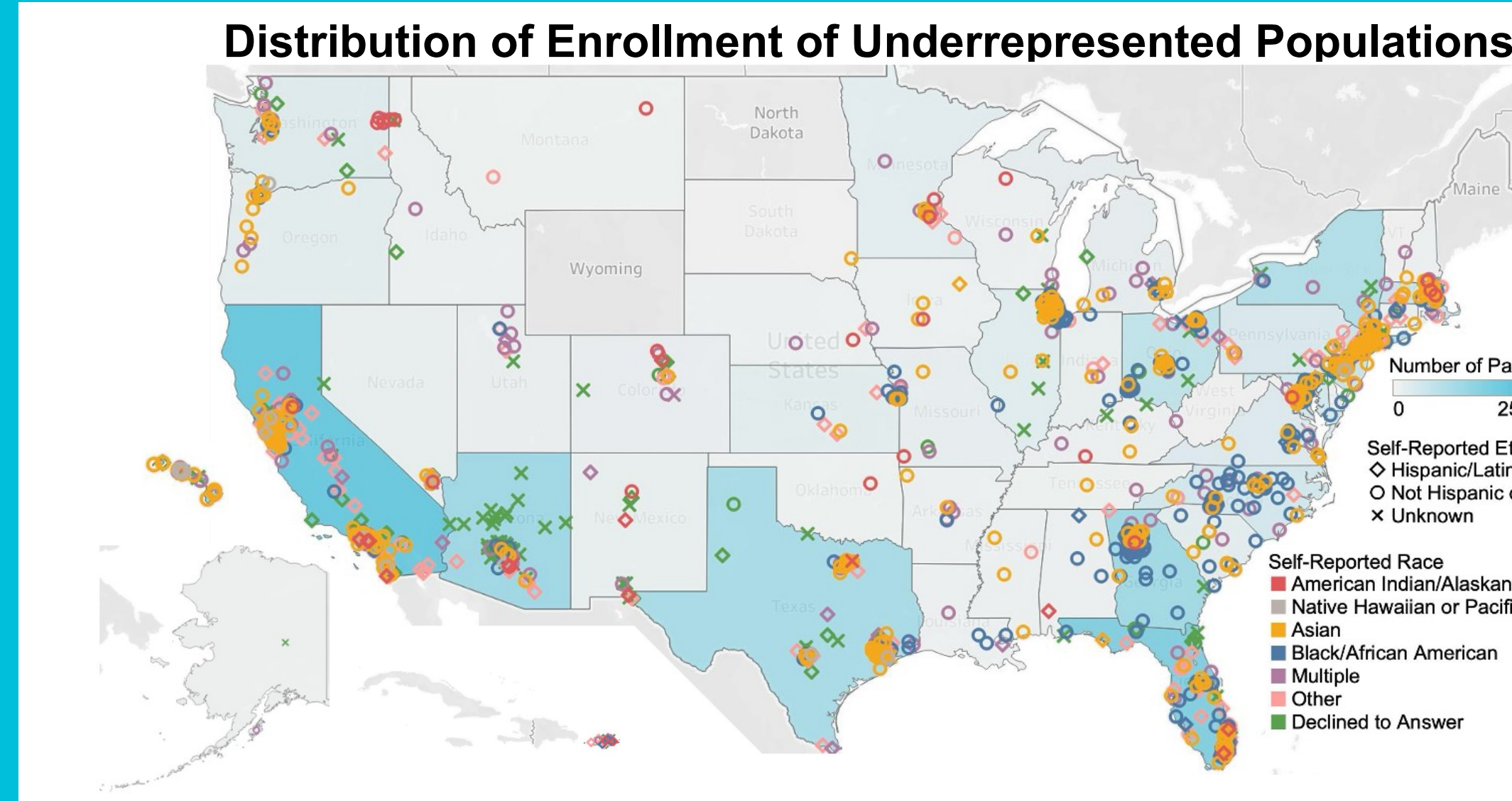
Primary 7 Gene Panel	Secondary Gene Panels
<p>GBA1 LRRK2 PRKN SNCA PARK7 PINK1 VPS35</p>	<p>21 PD related <i>RAB39B, VPS13C, PTRHD1, SYNJ1, POLG, DNAJC6, ATP13A2, DCTN1, ATP1A3, SLC6A3, TH, GCH1, FBXO7, PLA2G6, ATP7B, MAPT, GRN, TBK1, VCP1, RAB32, CHCHD2</i></p> <p>10 Non-PD related (CDC Tier 1) <i>BRCA1, BRCA2, MLH1, MSH2, MSH6, PMS2, EPCAM, LDLR, APOB, PCSK9</i></p> <p><i>Hereditary Breast and Ovarian Cancer Syndrome (HBOC) Lynch syndrome (LS) Familial hypercholesterolemia (FH)</i></p>



Timeline of Expansion to Latin America through LARGE-PD



Demographics

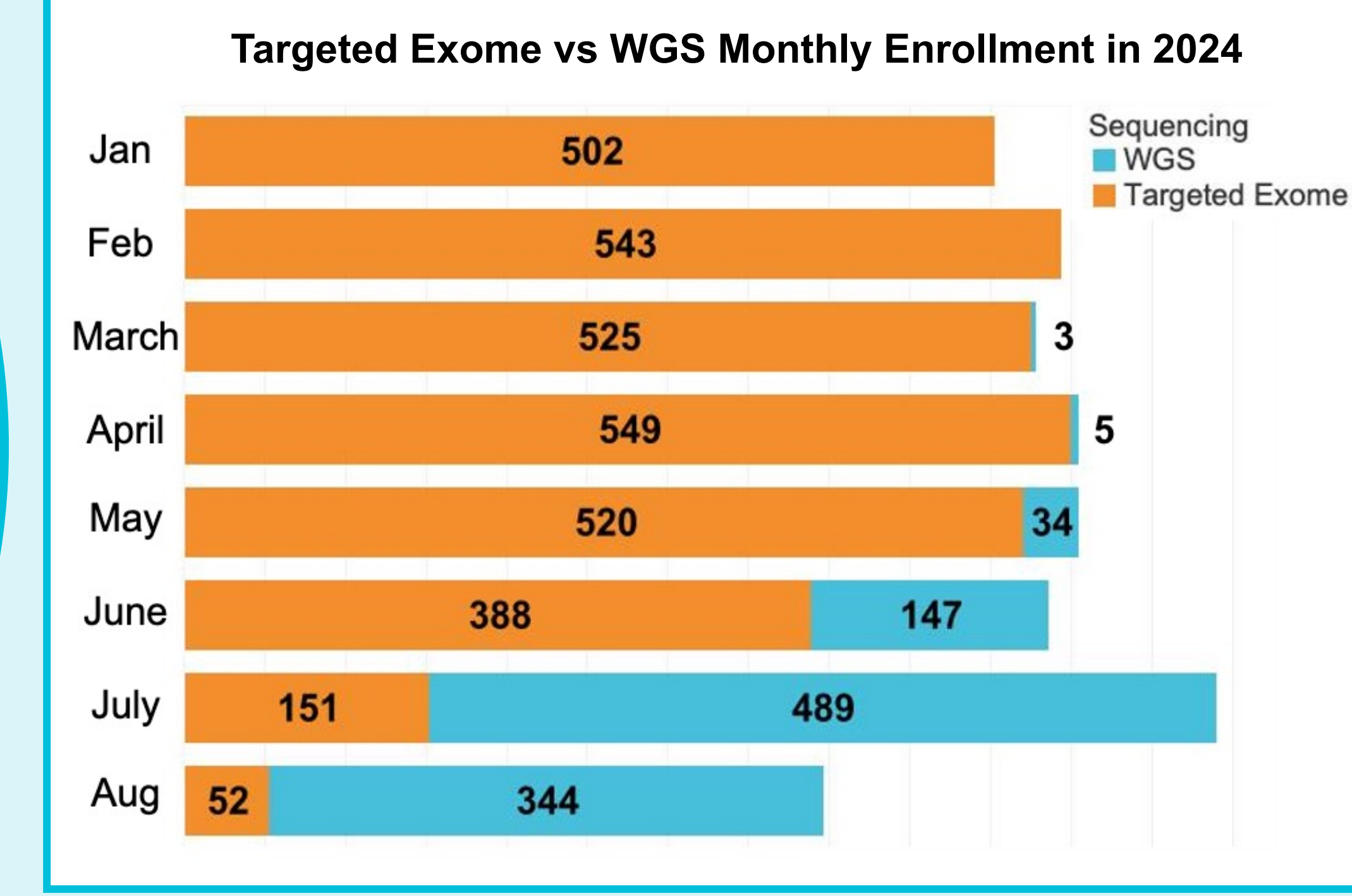
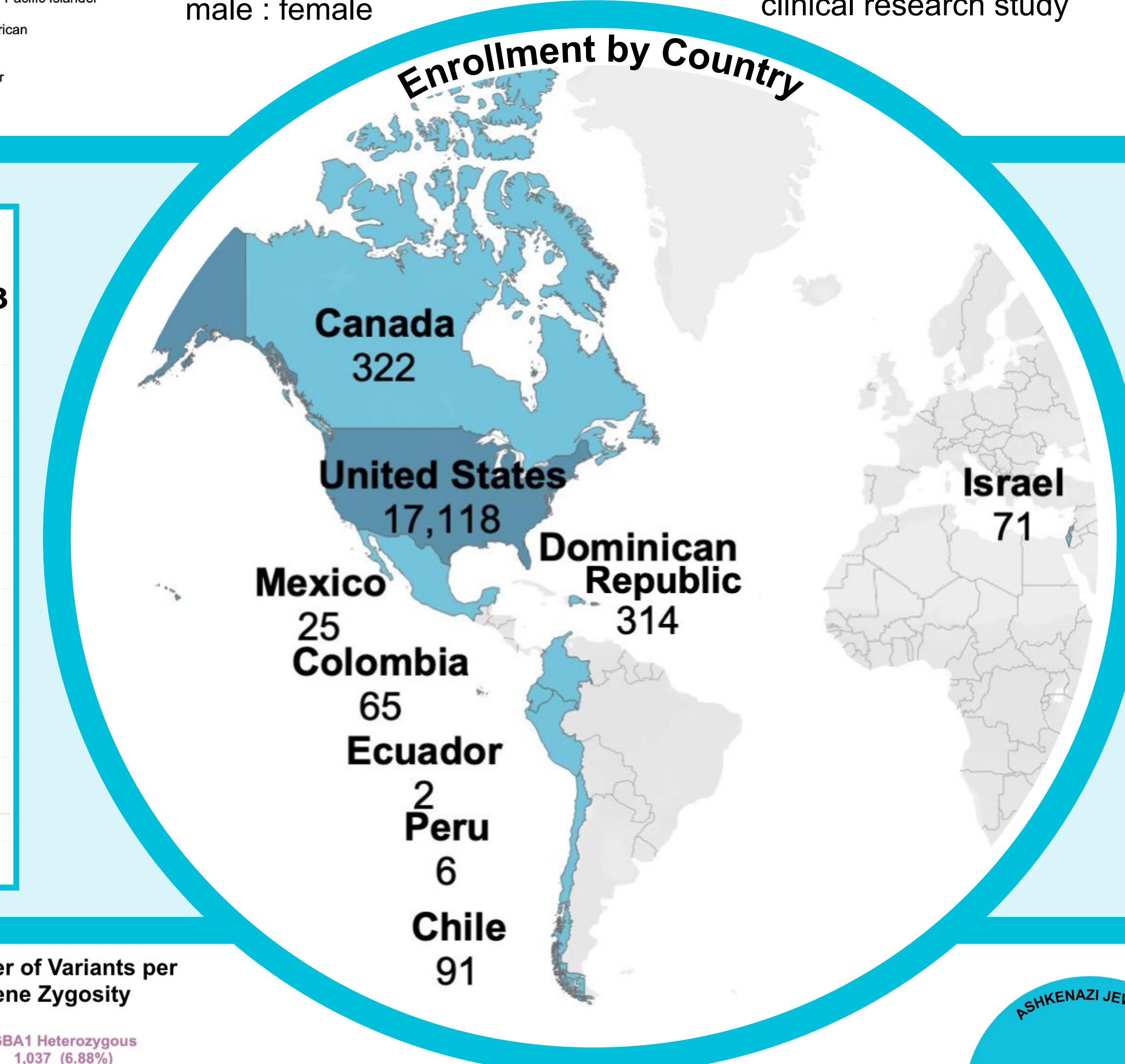
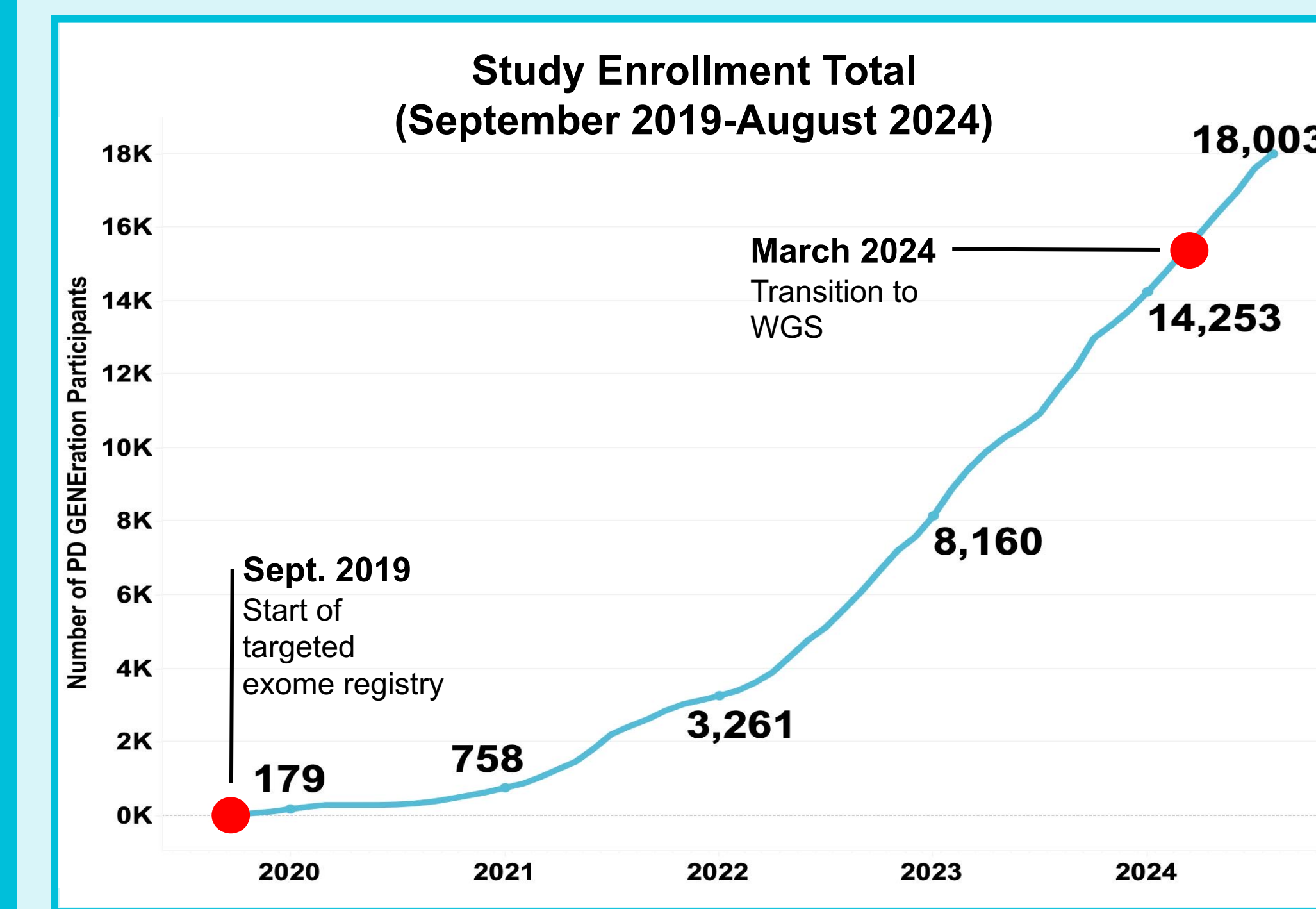


All results are as of August 26th, 2024.
PD GENERation has enrolled 18,003 participants.

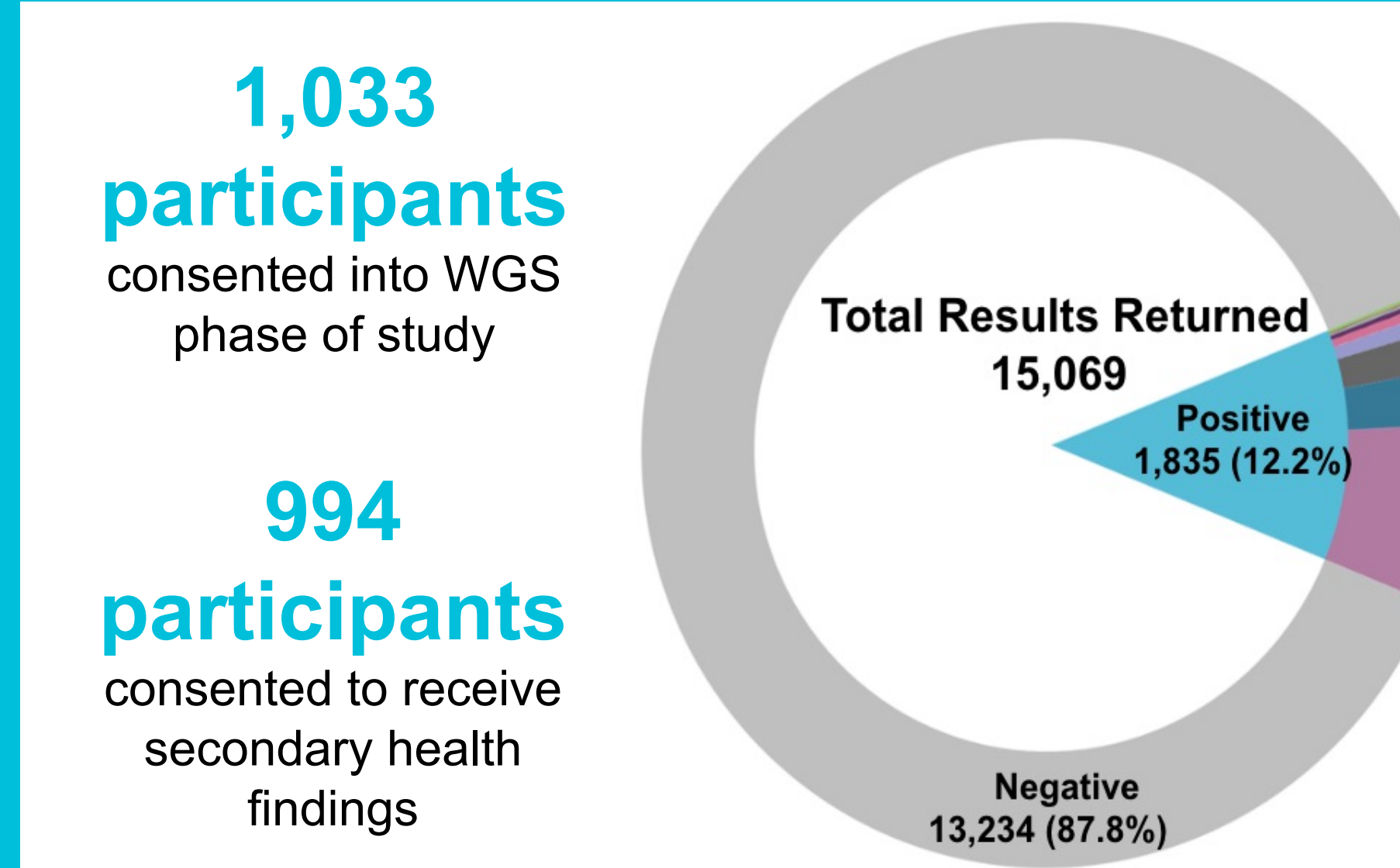
69 years average age at enrollment
60 years average age at onset
62 years average age at diagnosis
57% : 43% genetic sex ratio of male : female
37% diagnosed in the past 3 years
77% never participated in a clinical research study

Participant Racial and Ethnic Demographics			
Self-Reported Race	US	Outside US	Total
White	14,963 (87.4%)	391 (43.6%)	15,354 (85.2%)
Other (i.e. Indian, Middle Eastern)	326 (1.9%)	356 (39.7%)	682 (3.8%)
Unknown/Declined to Answer	520 (3.0%)	82 (9.1%)	602 (3.3%)
Asian	503 (2.9%)	46 (5.1%)	549 (3.0%)
Black/African American	505 (3.0%)	13 (1.5%)	518 (2.9%)
Multiple	243 (1.4%)	7 (0.8%)	250 (1.4%)
American Indian/Alaskan Native	41 (0.2%)	1 (0.1%)	42 (0.2%)
Native Hawaiian/Pacific Islander	17 (0.1%)	17 (0.1%)	17 (0.1%)
Self-Reported Ethnicity	US	Outside US	Total
Not Hispanic or Latino	15,163 (88.6%)	286 (32.0%)	15,449 (85.8%)
Hispanic or Latino	1,376 (8.0%)	505 (56.3%)	1,881 (10.4%)
Unknown/Declined to Answer	580 (3.4%)	105 (11.7%)	685 (3.8%)

Enrollment



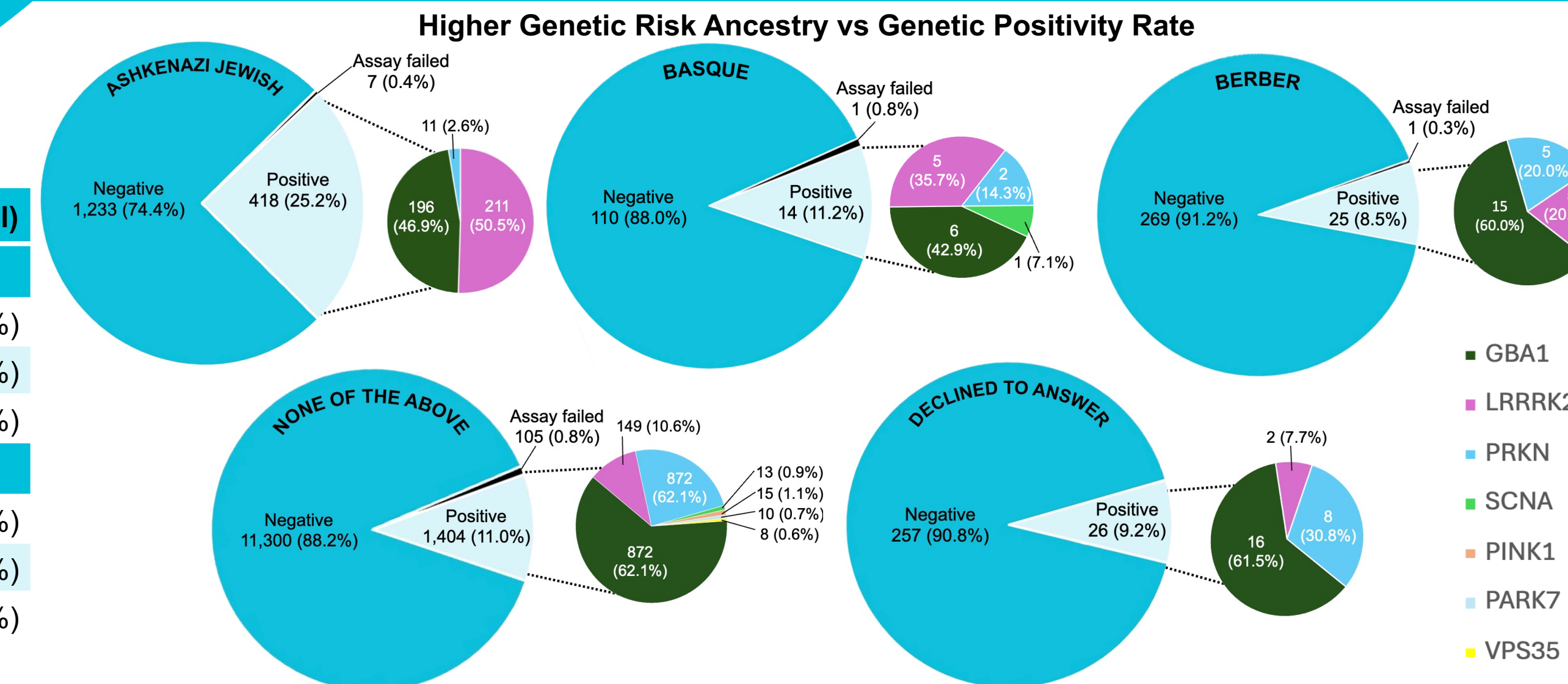
Genetics



Gene	Number of Variants	Gene Zygosity
GBA1 Heterozygous	1,037	6.88%
LRRK2 Heterozygous	327	2.17%
PRKN Heterozygous	234	1.55%
PRKN with 2+ mutations	99	0.66%
Carrier of mutation in multiple genes	57	0.38%
GBA1 with 2+ mutations	35	0.23%
VPS35 Heterozygous	7	0.05%
SNCA Heterozygous	12	0.08%
PINK1 Heterozygous	7	0.05%
PARK7 Heterozygous	7	0.05%

Higher Genetic Risk vs Genetic Positivity Rate (7-gene panel)

Diagnosis Age	Positive	Negative
50 years old or younger	391 (18.8%)	1,685 (81.2%)
More than 50 years old	1,406 (11.7%)	10,620 (88.3%)
Unknown Age	90 (9.4%)	864 (90.6%)
Family History	Positive	Negative
Positive first degree	418 (12.9%)	2,828 (87.1%)
No first degree	1,353 (11.9%)	10,044 (88.1%)
Declined to answer	5 (8.0%)	57 (92.0%)



Conclusion

PD GENERation offers a flexible research study framework that can integrate internationally, taking into consideration each country's infrastructure, cultural differences, and genetic counseling training needs. A decentralized study model and "train the trainer" methods allows PD GENERation to expand beyond the parameters of traditional genetic testing and genetic counseling.

More about PD GENERation



Engagement of the Black and African American Community in Parkinson's Genetic Research

Evelyn Stevens¹, Amasi Kumeh¹, Sherline Sauveur², David Oguoma-Richards², Richard Huckabee³, Angela Huckabee³, Denise Coley³, Bernard Coley³, Michael Fitts³, Phil Gee³, Evelyn Lewis³, Lisa Seghetti³, Tammyjo Best⁴, Kimberly Gamble⁵, Karen Williams⁶, Lance Wilson⁷, Reversa Joseph⁸, Hiral Shah⁹, Casey Gallagher¹, Christiana Evers¹, James C. Beck¹, Anna Naito¹, Chantale Branson²

1) Parkinson's Foundation; 2) Morehouse School of Medicine; 3) Parkinson's Foundation Research Advocate/Volunteer; 4) Emory University; 5) Atrium Health; 6) Northwestern University; 7) Jefferson Health; 8) Chalmers P Wylie Veterans Outpatient Clinic; 9) Columbia University

Background

- Advancements in understanding the biological pathways of Parkinson's disease (PD) have largely been focused on people of European ancestry.^{1,2}
- There is a critical need to understand genetic differences across populations, including people with African ancestry. Black and African American people with PD face health disparities that may be exacerbated by the paucity of representation in Parkinson's genetic research.^{1,2}
- PD GENERation is a multi-center, observational, registry based clinical trial offering clinical genetic testing, counseling and return of genetic test results at no cost to individuals with PD and aims to expand participation in the Black community to improve representation and advance health equity.

Black people have been historically excluded from PD research.

The Parkinson's Foundation is changing this.



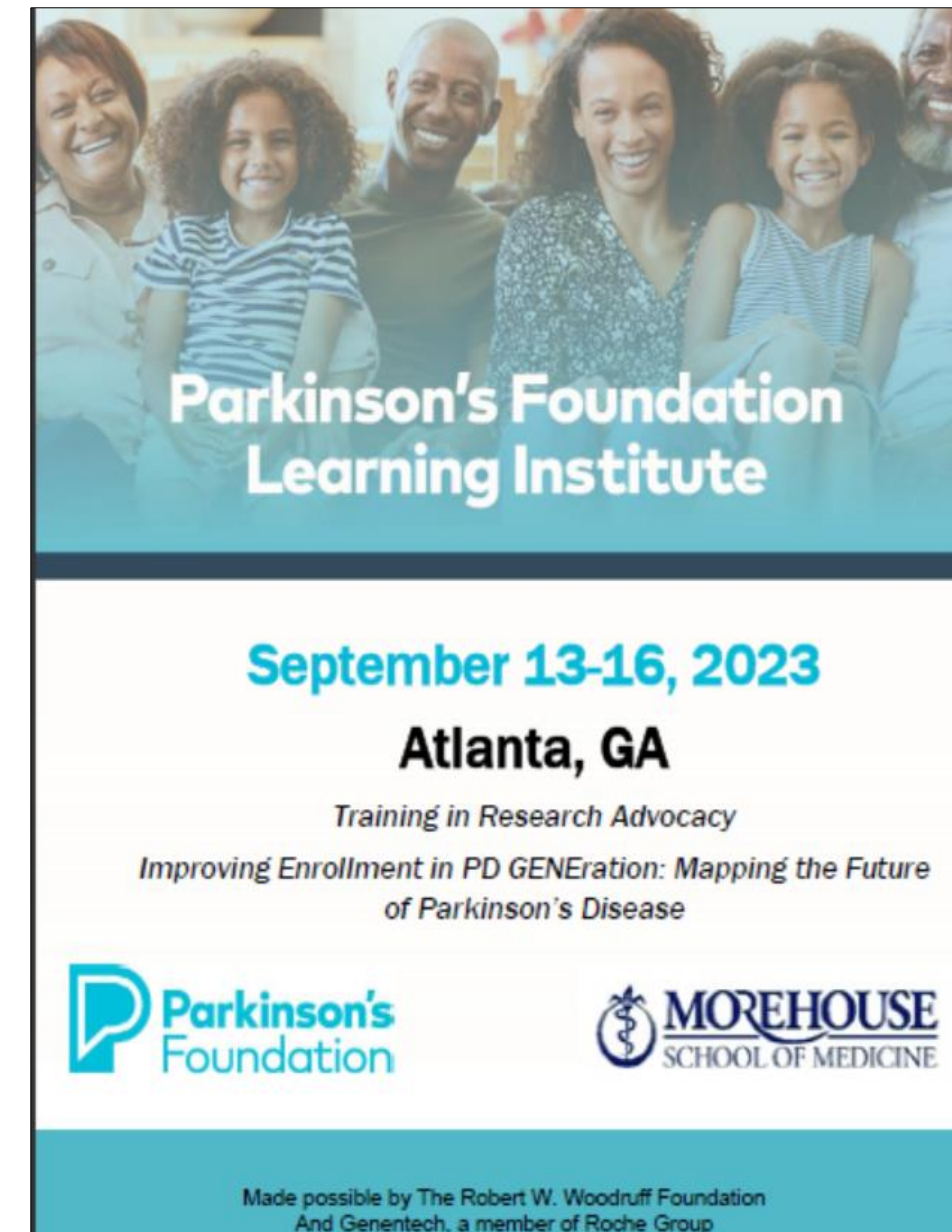
Methodology

Guided by best practices in diversity, equity and inclusion and patient engagement,^{3,4} the Parkinson's Foundation partnered with Morehouse School of Medicine (MSM), a historically Black institution of medicine to:

- 1) improve inclusion in PD GENERation,
- 2) prioritize PD awareness, education and resources; and
- 3) tailor an in-person, research advocacy training program – the Learning Institute – to understand research and lived experiences of the Black and African American community affected by Parkinson's disease.

We have more posters for you to visit:

Abstract Title: Engage, Educate and Empower: Parkinson's Research Advocates from the Black and African American Community
Abstract Number: 1862



Attendees (n=59) included members of the planning committee, faculty speakers and participants being trained as research advocates. 90% identify as Black or African American.

Planning Committee/Faculty

- 5 people with Parkinson's, 4 care partners
- *All are current Research Advocates, attended a prior Learning Institute
- 3 Movement Disorder Specialists
- 3 Patient/Research Coordinators
- 1 Social Worker
- 7 Parkinson's Foundation Staff
- *Includes executive leadership, patient engagement team, research team

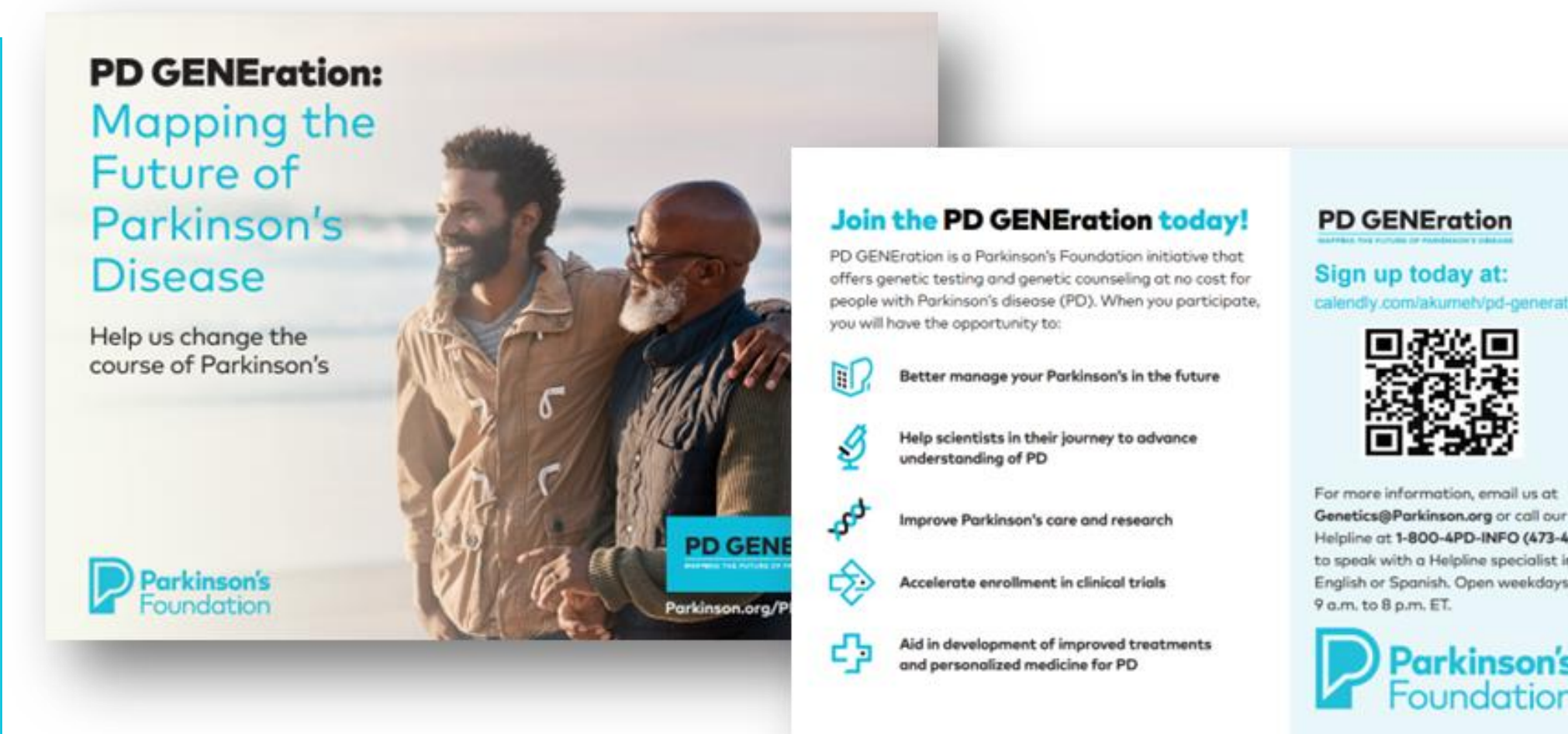
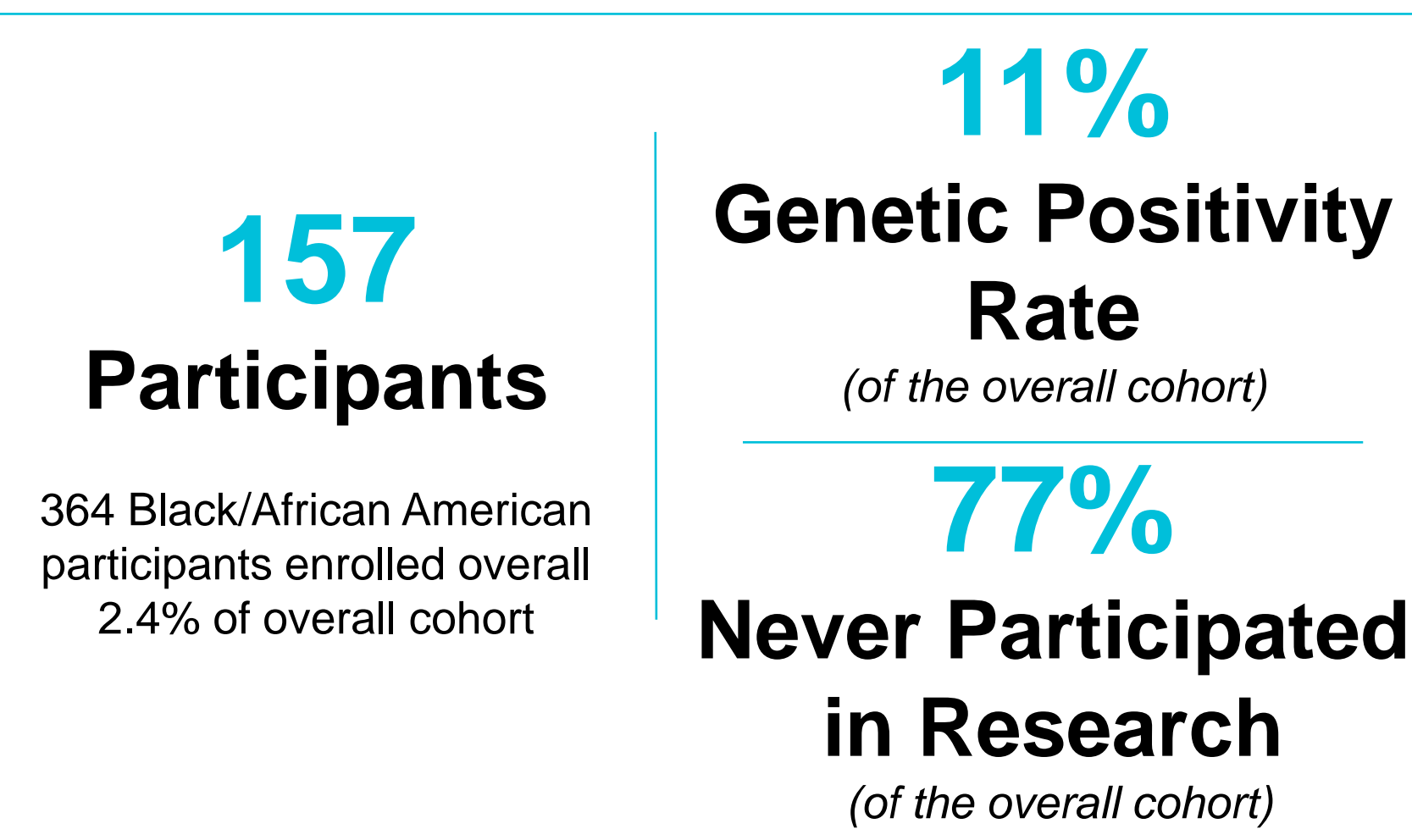
Research Advocates

- 17 care partners, 16 people with Parkinson's
- 73% receive care from a Movement Disorder Specialist
- 73% female
- Average age = 58 years old (range 30-79yrs old)
- Average years of diagnosis = 8 years (range 2-23 years)
- 90% live in suburban/urban area (recruited from Atlanta, Chicago, Charlotte)
- 71% have never been invited to take part in a clinical trial

Results

From November 2021 - March 2024, in partnership with Morehouse School of Medicine

Black / African American Participants



Why our Research Advocates Enrolled in PD GENERation:

When asked what factored into their decision to enroll:

- Determining genetic risk of Parkinson's
- Information for my family members
- Better treatments for the future
- Receiving consistent information, was explained well

Results (continued)

14 community education events were held, including the Learning Institute in September 2023.

Tailored and targeted media was utilized to expand reach, engage the community, and raise awareness on Parkinson's disease and PD GENERation. This included **2 webinars, 5 podcasts and 6 blog/news articles.**

All research advocates with PD enrolled in PD GENERation and received a toolkit to support their advocacy efforts in their own communities

PD Library

PODCASTS

Episode 39: PD Across Race & Ethnicity: Outreach to the African American Community

[LISTEN NOW >](#)

PODCASTS

Episode 146: Parkinson's Disease in the Black Community

[LISTEN NOW >](#)

PODCASTS

Episode 134: Meet the Researcher: Disparities in PD Care

[LISTEN NOW >](#)

PODCASTS

Episode 165: Community Conversations – Re(building) Trust and Sharing Resources

[LISTEN NOW >](#)

PODCASTS

Episode 166: Navigating Disparities, Ethics, and Stigma in the Black Parkinson's Community

[LISTEN NOW >](#)

Conclusions: Looking Ahead

- Establishing partnerships with trusted sources of the Black community is critical to providing equitable access to PD education and resources, including PD GENERation.
- Media can be a successful engagement strategy for raising awareness.
- Focusing on diversity and inclusion in PD GENERation will accelerate breakthroughs towards a cure for PD.

References

1) Bailey M. et al (2020). Parkinson's Disease in African Americans: A Review of the Current Literature. *J Parkinsons Dis.* 10(3):831-841.; 2) Schneider MG . et al (2009) Minority enrollment in Parkinson's disease clinical trials. *Parkinsonism Relat Disord* 15, 258–262; 3) Vaswani PA, et al (2020). Overcoming Barriers to Parkinson Disease Trial Participation: Increasing Diversity and Novel Designs for Recruitment and Retention. *Neurotherapeutics*, 17(4):1724-1735. 4) Feeney M, et al (2020). Utilizing patient advocates in Parkinson's disease: A proposed framework for patient engagement and the modern metrics that can determine its success. *Health Expect.*(4):722-730. 5) Ladson-Billings, G. (1995) Toward a theory of culturally relevant pedagogy. *American Education Research Journal*, 32(3), 465-491

Kelly E. Lyons¹, Elizabeth Pollard², Denise Beran², Christine Hunter³, Heather Cianci⁴, Elaine Book⁵

¹ University of Kansas Medical Center, ² Parkinson's Foundation; ³Deceased; ⁴ University of Pennsylvania; ⁵ University of British Columbia

Objective

To determine if the improvements in confidence to provide and coordinate patient care and understanding of individual and other team member roles among interprofessional healthcare teams reported after Parkinson's Foundation (PF) Team Training (TT) are maintained long-term.

Background

PF TT offers training to interprofessional healthcare teams to better coordinate and improve care. Significant improvements were previously reported 6 months after TT in confidence in providing care and improving quality of life in persons with Parkinson's disease (PD) and care partners, as well as in understanding individual and other team member roles.

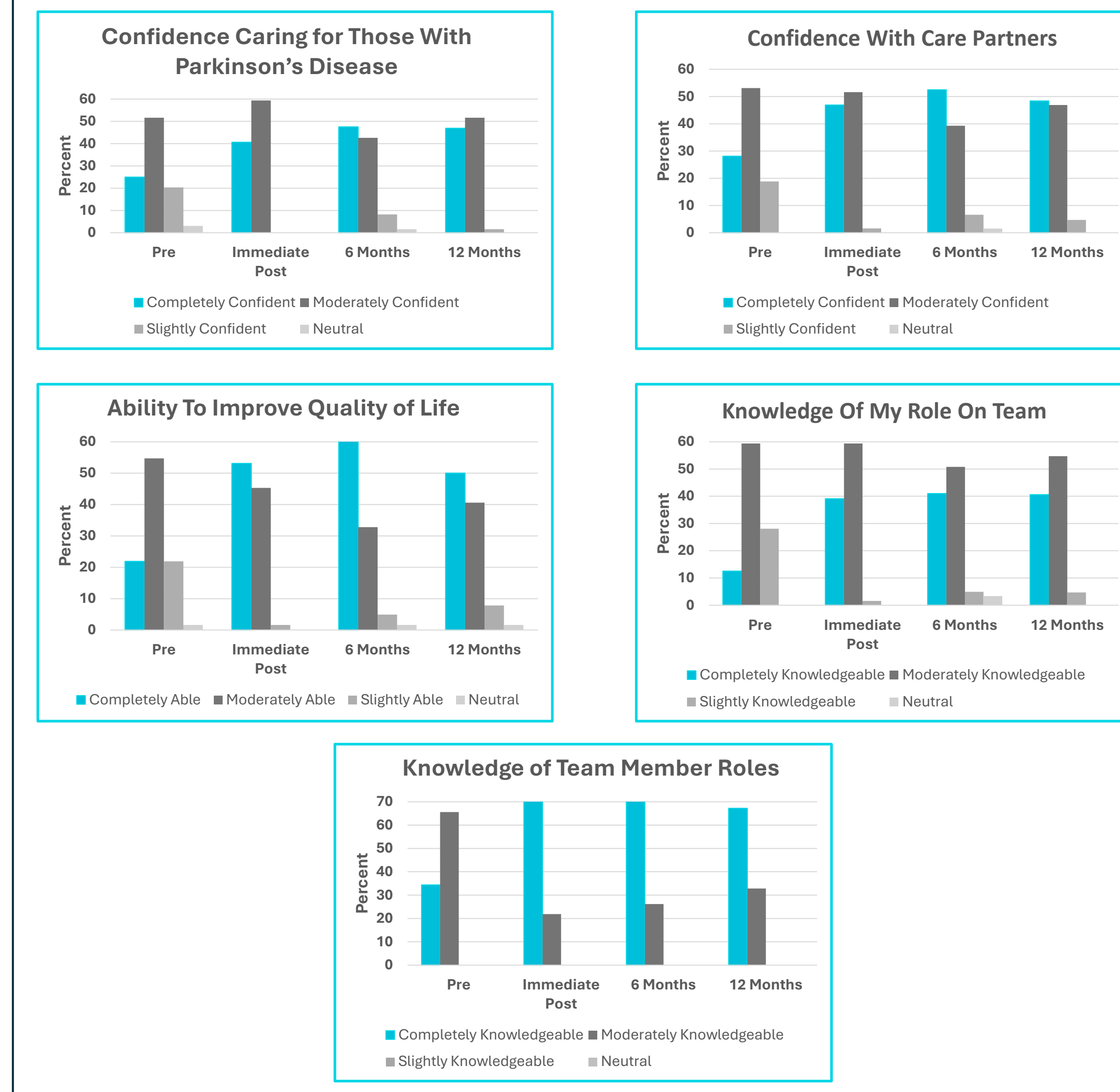
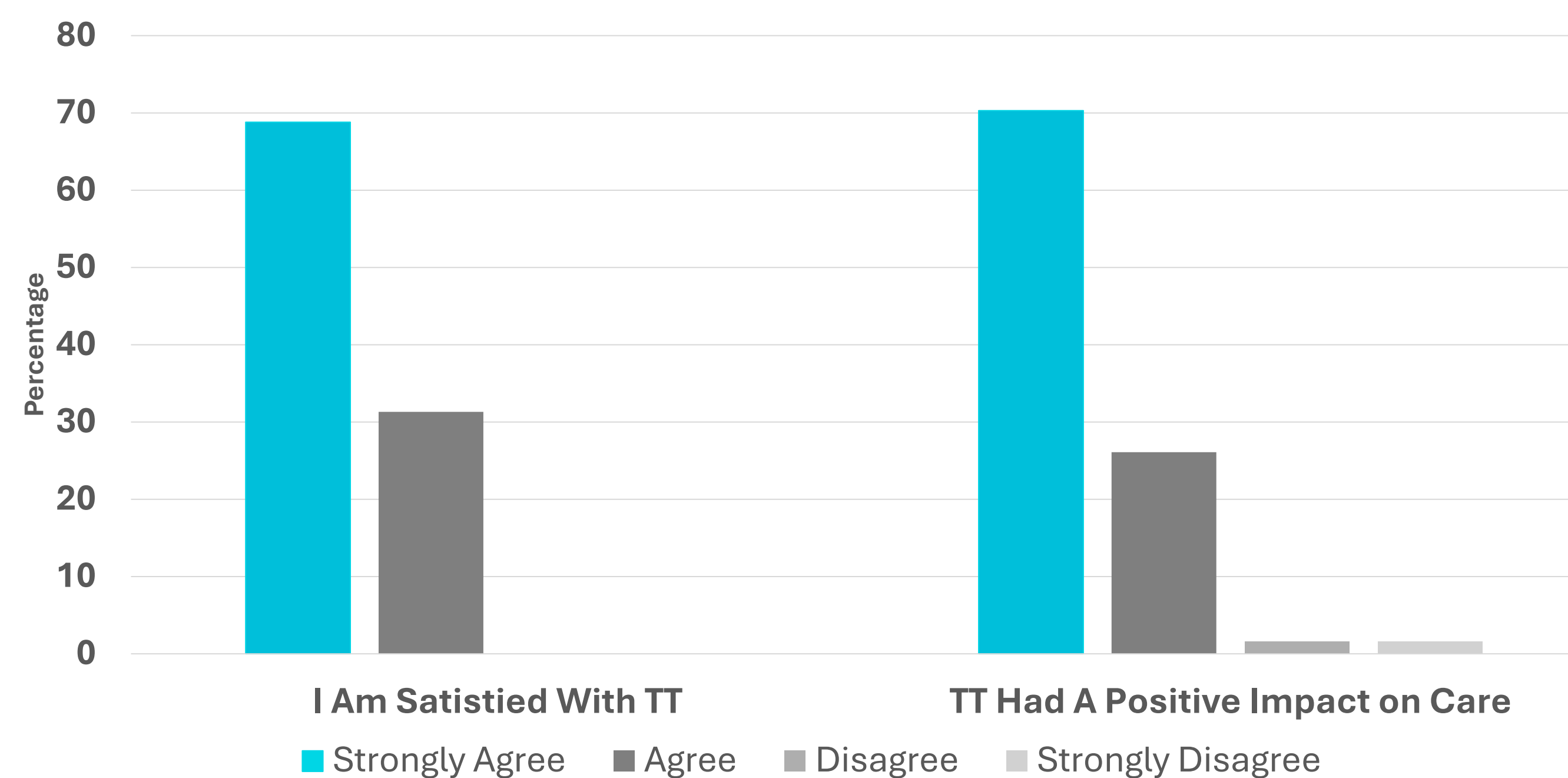
Methods

Healthcare professionals, including physicians, nurse practitioners, physician assistants, nurses, occupational, physical, and speech therapists, dieticians, psychologists, social workers, pharmacists, and other team members that attended PF TT in October 2022 completed 4 surveys to assess learning and TT impact. The surveys were completed prior to and immediately after, 6 months after, and 1 year after TT. For each survey, the attendees rated their confidence or knowledge in a scale of 1 to 7 in which a response of 1 represented the highest level of confidence or knowledge and 7 represented the lowest level.

Results

A total of 64 healthcare professionals from both new and established PD interprofessional care programs completed surveys before and 1 year after TT. There were significant improvements in the percentage of those that felt completely confident in various measures of providing care and team coordination that were reported immediately after TT and maintained throughout the 6 month and 1-year surveys ($p \leq 0.005$). Improvements were seen in confidence to provide care to persons with PD (88%), confidence in working with a care partner of someone with PD (72%), ability to directly improve the quality of life for a person with PD (128%), knowledge about the individual's role in the interprofessional care team (225%) and understanding of the role of each team member and how they can assist in the care of persons with PD (95%).

Team Training Satisfaction and Impact



Conclusions

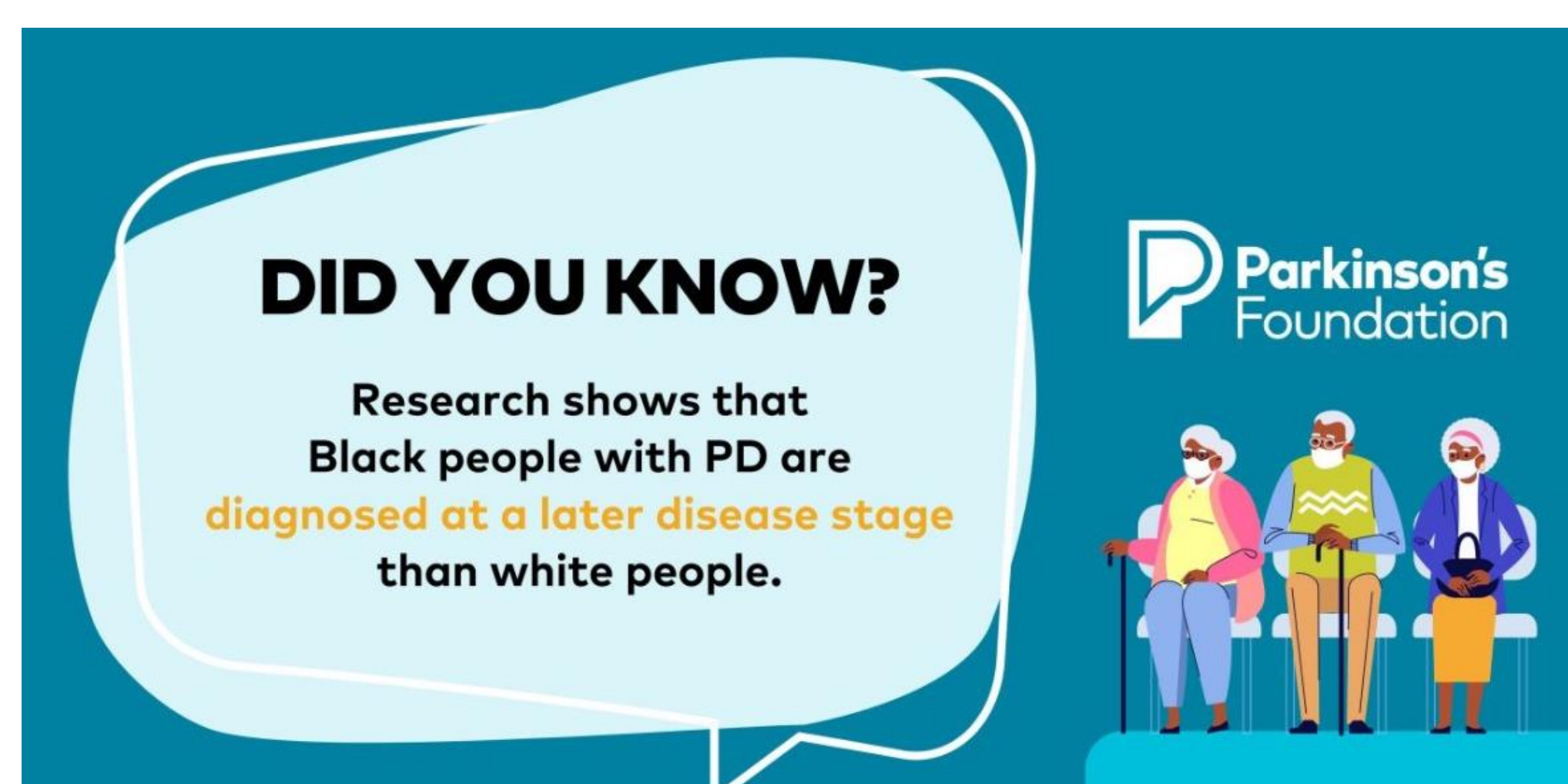
Parkinson's Foundation Team Training resulted in significant and sustained improvements in healthcare professional confidence in caring for and working with persons with PD and their care partners, as well as in the understanding of individual and team member roles in the care of persons with PD.

Engage, Educate and Empower: Parkinson's Research Advocates from the Black and African American Community

Reversa Joseph¹, Kimberly Gamble², Tammyjo Best³, Karen Williams⁴, Lance Wilson⁵, Denise Coley⁶, Bernard Coley⁶, Michael Fitts⁶, Phil Gee⁶, Richard Huckabee⁶, Angela Huckabee⁶, Evelyn Lewis⁶, Lisa Seghetti⁶, Chantale Branson⁷, Hiral Shah⁸, Amasi Kumeh⁹, Casey Gallagher⁹, Christiana Evers⁹, Evelyn Stevens⁹

¹ Chalmers P Wylie Veterans Outpatient Clinic; ² Atrium Health; ³ Emory University; ⁴ Northwestern University; ⁵ Jefferson Health; ⁶ Parkinson's Foundation Research Advocate/Volunteer; ⁷ Morehouse School of Medicine; ⁸ Columbia University; ⁹ Parkinson's Foundation

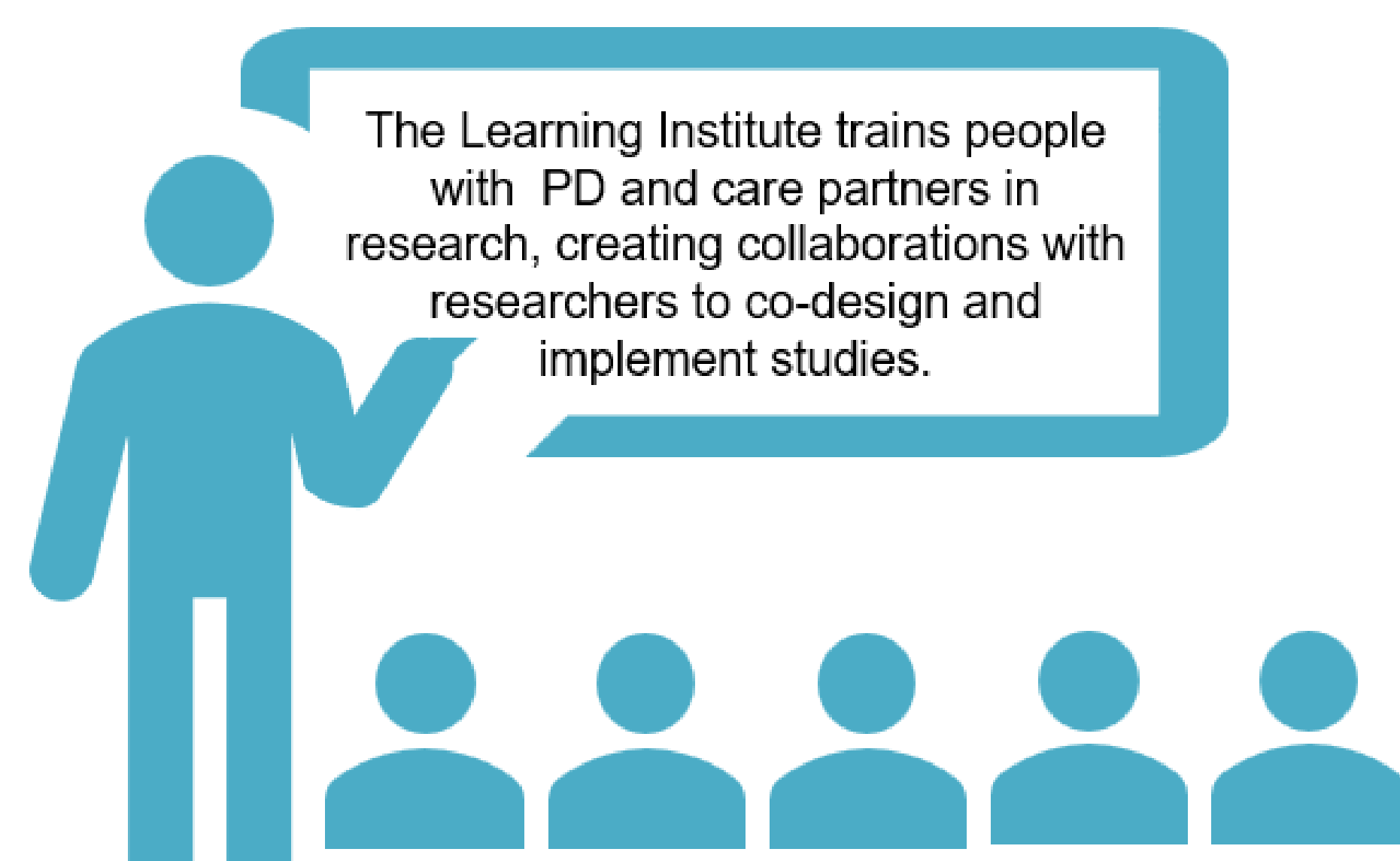
Background



- Black and African American people with Parkinson's disease (PD) face significant disparities in care, including delays in diagnosis and treatment, limited access to care, and historical exclusion from research.^{1,2}
- To address these challenges, the **Parkinson's Foundation Research Advocacy Training** program, the **Learning Institute**, was tailored to engage, educate, and empower the Black community in Parkinson's research.

Methodology

- The Parkinson's Foundation Learning Institute was established in 2008 and has trained over 400 volunteers in research and patient engagement (research advocacy), creating a national network of research advocates around the U.S. that are actively changing the face of Parkinson's disease research.³



Scan QR code for more information on our Research Advocates program

- Black and African American people living with Parkinson's, care partners, clinicians, social workers, nurses and researchers were invited to join a coalition as key partners of planning and implementation

The first goal of the coalition was to **redesign and execute the Parkinson's Foundation Learning Institute** in a culturally responsive way for Black and African American communities and improve enrollment in **PD GENERation: Mapping the Future of Parkinson's Disease**, our groundbreaking initiative offering genetic testing, counseling and return of results at no cost to people living with Parkinson's

Results

From September 2023 through April 2024:

17 meetings on continued education and engagement were held by the Parkinson's Foundation patient engagement team. All research advocates have been engaged in at least one meeting.

17 advocacy tasks were completed by 26 Research Advocates. Of those tasks 16 were community engagements (e.g., presentation at local churches and health fairs, panelists at a Parkinson's Foundation community-based program), and one was a partnership with a professional coalition to inform Parkinson's care.

- The Learning Institute was held in September 2023. 33 people from the Black community were trained in research advocacy (16 people with Parkinson's, 17 care partners; Average age=58 years; Average years of diagnosis=8 years).
- Community awareness and education was rated as the most interesting area for research advocacy (56%), followed by Collaborations with Industry (25%). **See Figure 1**
- 79% of Research Advocates indicated feeling prepared to begin research advocacy and 83% indicated feeling excited about the work they can do as a Research Advocate. **See Table 1**

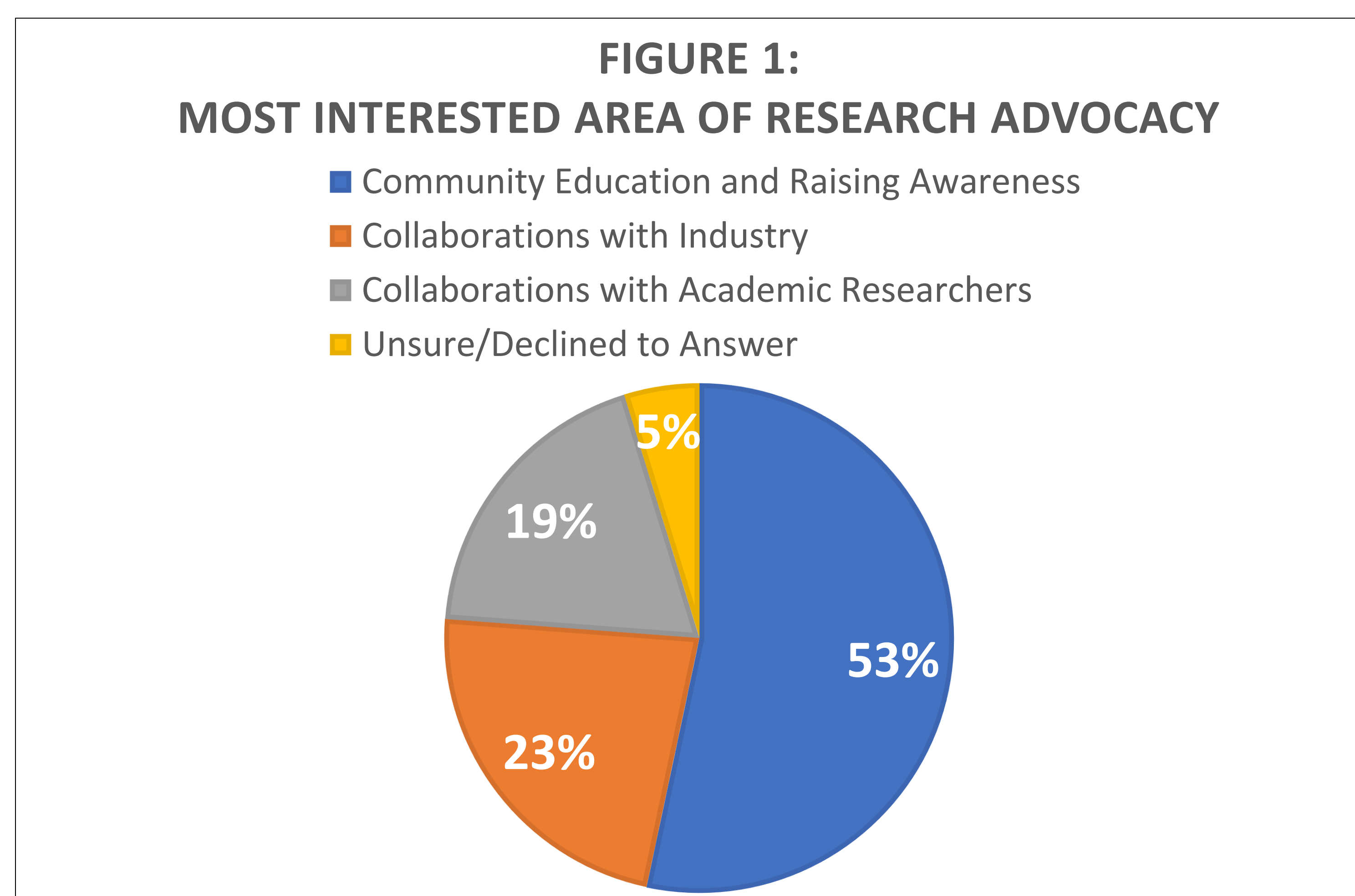


Table 1: Attitudes Post Learning Institute

After attending the Learning Institute....	Moderate/Very
How prepared do you feel about getting involved in Parkinson's advocacy?	79%
How much has your perspective changed regarding the role people with Parkinson's and care partners can play in the research process?	91%
How excited are you about the work you can do as a Research Advocate?	83%

We have more posters for you to visit:

Abstract Title: Engagement of the Black and African American Community in Parkinson's Genetic Research
Abstract Number: 1654



Conclusions: Looking Ahead

- Engagement of the Black Parkinson's community as Research Advocates is important to advancing health equity.
- Continued awareness, education and skill-building on research and patient engagement is needed as research advocates form partnerships with researchers and scientists developing treatments.
- The Parkinson's Foundation Learning Institute is a model to provide tailored training, shift perspectives, and generate excitement to help bridge the gaps in Parkinson's research and care.

References

1) Bailey M. et al (2020). Parkinson's Disease in African Americans: A Review of the Current Literature. *J Parkinsons Dis.* 10(3):831-841.; 2) Schneider MG . et al (2009) Minority enrollment in Parkinson's disease clinical trials. *Parkinsonism Relat Disord* 15, 258-262; 3) Feeney M, et al (2020). Utilizing patient advocates in Parkinson's disease: A proposed framework for patient engagement and the modern metrics that can determine its success. *Health Expect.*(4):722-730. 5) Ladson-Billings, G. (1995) Toward a theory of culturally relevant pedagogy. *American Education Research Journal*, 32(3), 465-491

Hospital Care Learning Collaborative: Sharing Strategies to address the Parkinson's Foundation Inpatient Clinical Care Standards



Annie Brooks, MSW, Director, Strategic Initiatives, Parkinson's Foundation; **Emily Buetow, MSW**, Director, Strategic Initiatives, Parkinson's Foundation; **Sheera Rosenfeld**, Vice President, Chief Strategic Initiatives Officer, Parkinson's Foundation; **Katherine Amodeo, MD**, Movement Disorders Specialist Westchester Medical Center, MidHudson Regional Hospital; **Hooman Azmi, MD, FAANS**, Director, Division of Functional and Restorative Neurosurgery, Hackensack Meridian Health; **Peter Pronovost, MD, PhD, FCCM**, Chief Quality & Clinical, Transformation Officer, University Hospitals; **Benjamin Walter, MD, MBA**, Section Head of Movement Disorders, Medical Director of DBS Program Cleveland Clinic

Parkinson.org

Background

The Parkinson's Foundation is committed to leading the national effort to improve hospital care and drive systemic change.

In April 2023, in partnership with *Hackensack Meridian Health, Henry Ford Health, and University of Florida Health Norman Fixel Institute for Neurological Diseases*, the Foundation released the Parkinson's Foundation Hospital Care Recommendations to address major gaps in hospital safety for people with Parkinson's disease (PD).

The Recommendations introduce five clinical care standards in areas frequently associated with preventable harm: medication management, mobility, and swallowing function.



Objectives

The Parkinson's Foundation made another significant step toward its vision to eliminate preventable harm and promote higher reliability in care with the launch of its Hospital Care Learning Collaborative, a peer-learning group for professionals from twenty leading healthcare systems who are independently working to implement quality improvement projects focused on improving hospital safety for people with PD.

Methods

For one year, participants met bi-monthly to share strategies to address one of the five hospital care standards.

Results

Care Standards and associated strategies reviewed within the Learning Collaborative are outlined in the chart below.

Conclusion

Find the complete Recommendations along with information and tools for providers and hospital systems at: Parkinson.org/HospitalCare. Want to learn more or get involved? Email: ABrooks@Parkinson.org

Customize All Medication Orders	Prevent Medication Delays	Avoid Contraindicated Medications	Prioritize Regular Movement	Address Risk of Dysphagia/Aspiration
<p><i>Allan Wu, MD</i> shared a framework to work with IT to request EHR optimizations, including the ability to customize PD medication orders.</p>	<p><i>Hooman Azmi, MD, FAANS</i> shared how quality improvement programs led by multidisciplinary teams have advanced safer care including sustained improvements in timely medication administration.</p>	<p><i>Ryan Schell, PharmD, MMHC</i> shared a nuanced alert for contraindicated medications that offers alternative prescriptions as approved by the Pharmaceutical & Therapeutics committee.</p>	<p><i>Peter Pronovost, MD, PhD, FCCM</i> reviewed ways to tap into existing ambulation and mobility goals to improve PD mobilization practices.</p>	<p><i>Benjamin Walter, MD, MBA</i> reviewed strategies to mitigate medication delays in the event of safety concerns due to dysphagia, including the administration of crushed medication and use of an automated trigger for SLP evaluation</p>
Epic Turbocharger	Nursing Careplan	Best Practice Advisory Alert	Nursing Admission Navigator	Dynamic Note Template