Exploring Business Opportunities in The World's State™

Clinical Service Center (CSC)

January 2025

choose new jersey

#1

Highest income per household

U.S. News & World Report

#1

Concentration of scientists and engineers in the country

National Science Board

#1

Busiest airport system in the world

Port Authority of NY and NJ

#1

Most diverse city (Jersey City)

Financial Times

#1

State for reproductive rights

Institute for Women's Policy Research

#1

Busiest port on the East Coast

Port Authority of NY and NJ

Data from 2022-2024

ECONOMIC MOMENTUM

Received 7 credit upgrades since March 2022

New Jersey has a robust workforce that includes skilled workers and highly educated talent

GDP has grown by $53 billion since 2018

The number of New Jersey small businesses has increased by 61K since 2018

Has been ranked #1 state in the Northeast for private-sector job growth in 2022

BIG THINGS ARE HAPPENING

Recent major investments in New Jersey

FIFA

FIFA chose New York/New Jersey to be a host city for the 2026 FIFA World Cup™. After a highly competitive selection process, MetLife Stadium in East Rutherford New Jersey, was selected to host the finals.

NOKIA BELL LABS

Nokia Bell Labs reaffirmed its commitment to New Jersey, upholding its 80-year heritage of cutting-edge research and innovation in the state, by establishing its R&D hub in the HELIX in New Brunswick, New Jersey.

NEW JERSEY WIND PORT

The New Jersey Wind Port is the nation's first purpose-built offshore wind marshaling port, promising to position New Jersey as a hub for the U.S. offshore wind industry.

NETFLIX

Netflix announced plans to build a 300-acre studio in Fort Monmouth – a $1 billion investment that will create one of the largest film production studios in the world.

GLOBAL CONNECTIVITY

With the #1 busiest regional airport system in the United States, you're one direct flight away from your destination

2,400+ Nonstop domestic flights serviced

900+ Nonstop international flights serviced

INFRASTRUCTURE

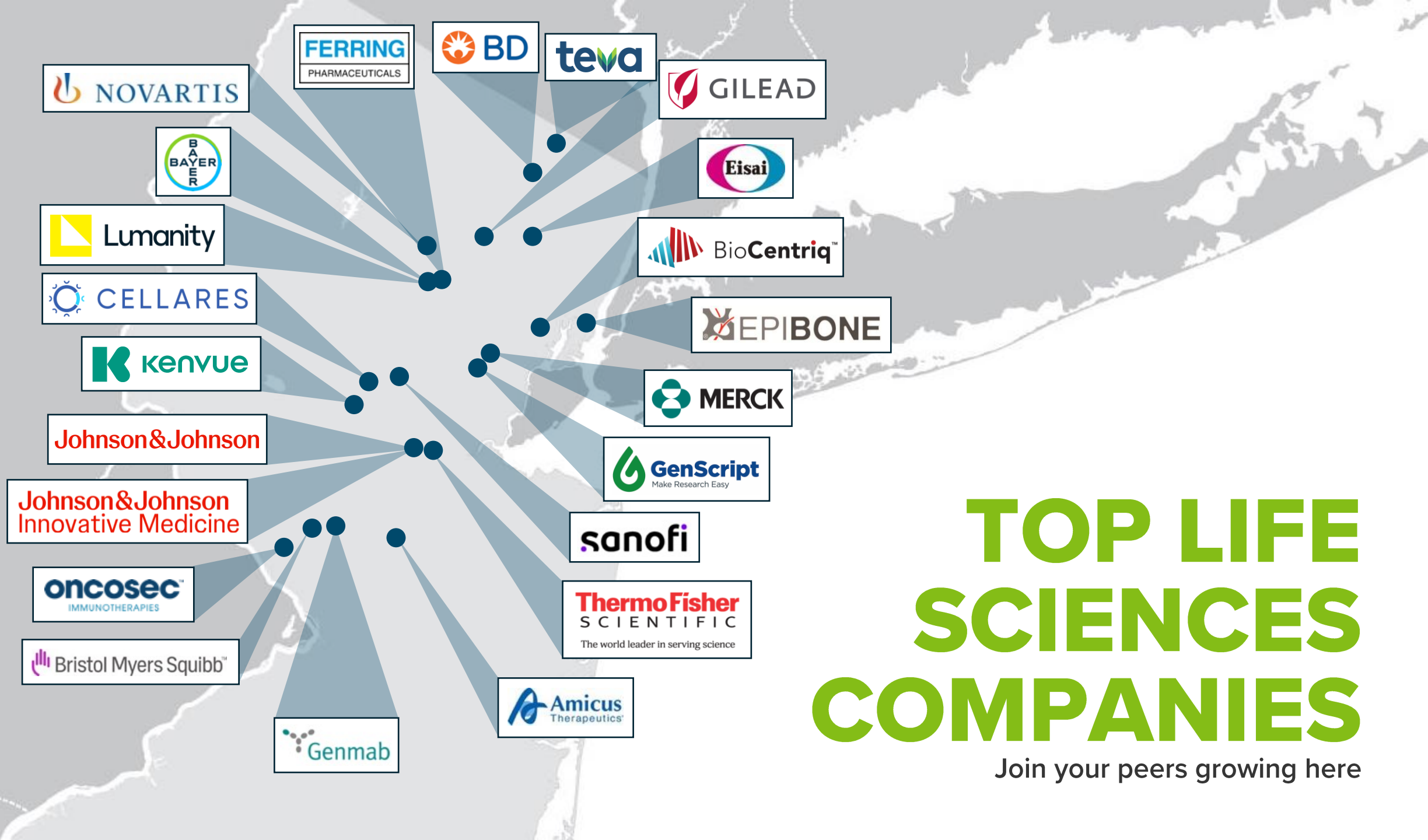
Our unparalleled infrastructure and well-connected location ensures people and goods get where they need to be — fast

The Port of New York and New Jersey is the #1 busiest port on the East Coast

One-third of the United States population and one-third of its economy can be reached in a single day's drive

Highest railroad density in the United States and served by the only high-speed rail connection in North America

5 strategically located foreign trade zones (FTZs) allowing for special customs procedures



TOP LIFE SCIENCES COMPANIES

Join your peers growing here

BY THE NUMBERS

Our success quantified

#1 Concentration of scientists and engineers	**#1** Region for pharmaceutical employment	**#2** State for cancer drugs in development	**#2** State for pharmaceutical manufacturing companies
#3 Employed biochemists and biophysicists	**#3** U.S. life sciences cluster	**8** Of the top 10 pharma companies	**9** Of the top 10 R&D companies
8 of the top **10** medical device companies	**83%** Increase in NIH funding since 2018	**40%** of cell and gene therapy drugs in development	**4,300+** bioscience establishments

BIOPHARMA MANUFACTURING

The world's top pharma companies choose New Jersey

TOP COMPANIES

8 out of the top 10 pharmaceutical companies in the world have a presence in New Jersey including:

- Johnson & Johnson
- Catalent
- Merck & Co.
- Sanofi

RESEARCH FACILITIES & HIGHER EDUCATION

Rutgers University is home to the Blanche and Irwin Lerner Center for the Study of Pharmaceutical Management, which focuses on biopharmaceutical research, development, and commercialization.

New Jersey Institute of Technology's Biomedical Engineering program combines the study of fundamental biological and physiological processes and engineering to tackle challenges such as paralysis, muscular degeneration, and traumatic brain injury.

MEDICAL DEVICES

Join the top medical device companies in the nation

ECOSYSTEM

Eight of the top 10 medical device companies in the United States have a presence in New Jersey.

Over 390 medical device manufacturing sites employ about 12,000 people.

Medical device manufacturing has nearly doubled in New Jersey in 25 years, producing $4B in revenue.

RESEARCH FACILITIES & HIGHER EDUCATION

Rutgers University's Laboratory for Biomaterials Research (LBR) engages in four thrust areas: design and synthesis of new monomers and polymers for medical applications; material and polymer science including physical characterization of polymers and polymer processing; Materiobiology, the exploration of the biological effects of biomaterials; and applications engineering and the translation of new biomaterials for applications in drug delivery, regenerative medicine, and tissue engineering.

HIGHER EDUCATION

Life sciences excellence at New Jersey universities

- Rutgers University spent $872.8M for R&D in 2022, resulting in 1,200+ patents.
- New Jersey Institute of Technology established six industry-facing innovation divisions.
- Rowan University is home to the South Jersey Technology Park (SJTP).
- Stevens Institute of Technology is home to The Center for Neuromechanics, the first of its kind in the United States.

#1

University in the United States, Princeton University

#2

Public university in the country New Jersey Institute of Technology

#2

Most educated state

#3

Concentration of STEM Awards in the United States

RESEARCH WITH NEW JERSEY

A program to help academia and industry work side-by-side

RESEARCH WITH NEW JERSEY

- Research with New Jersey, researchwithnj.com, is a free, public database sponsored by the New Jersey Commission on Science, Innovation and Technology
- Identifies the right experts and find research facilities at five of New Jersey's research universities
- 3,800+ faculty profiles
- 94,000+ publications

Montclair State University

NJIT New Jersey Institute of Technology

Princeton University

Rowan University

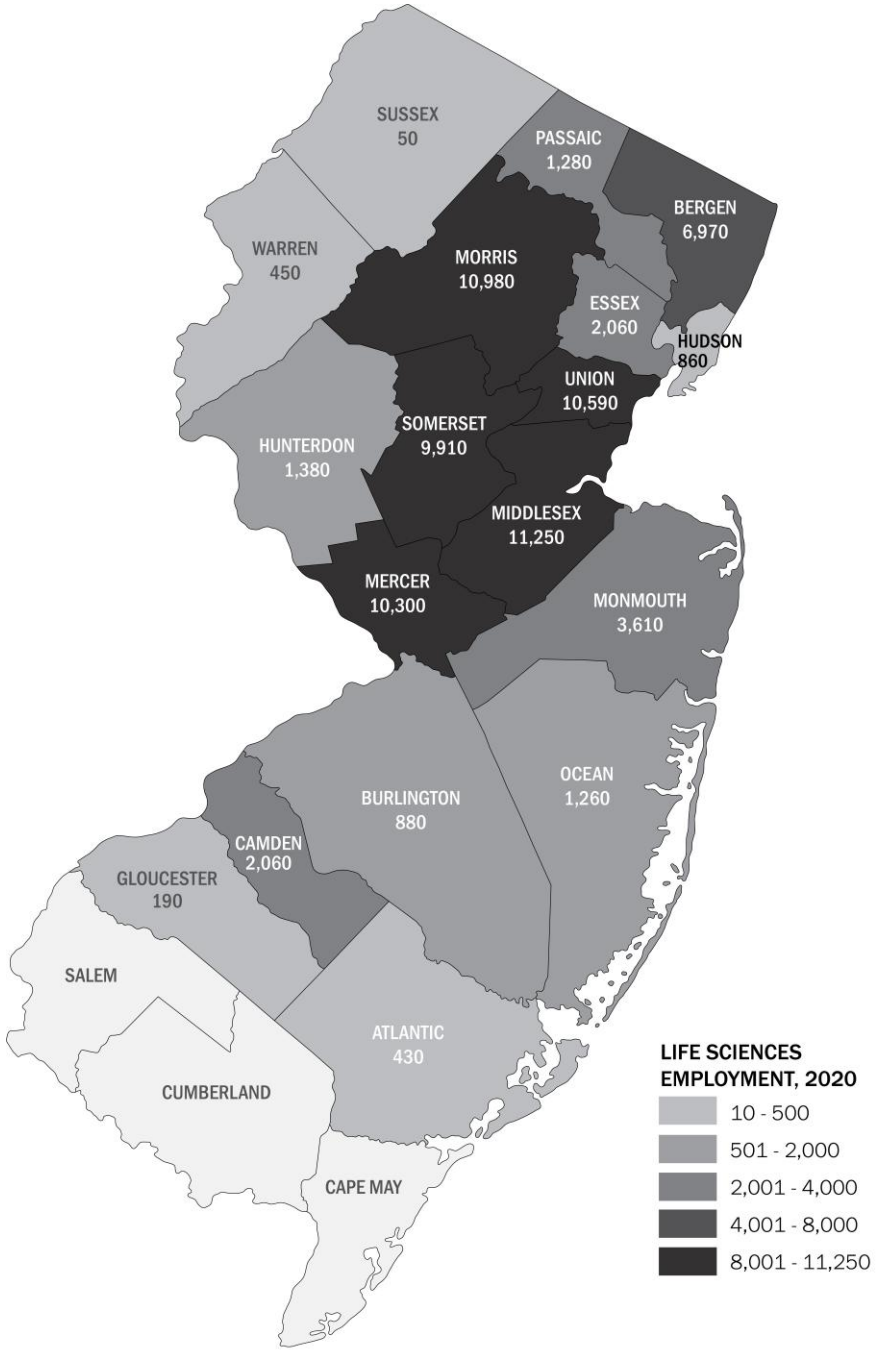
Rutgers The State University of New Jersey

Stevens Institute of Technology 1870

HIRING MADE EASY

Tap into New Jersey's highly skilled workforce

Our highly educated talent pool continues to attract life sciences companies. New Jersey has the 3rd highest employment rate in research, testing, and medical labs. It's also the #2 state for pharmaceutical manufacturing employment and has the 3rd most employed biochemists and biophysicists in the country.



LIFE SCIENCES ECOSYSTEM

A robust supply chain supporting life sciences

5 medical schools,
1 veterinary school

World-class hospital networks including Hackensack Meridian *Health* and RWJ Barnabas Health

42 teaching hospitals

LEADING CROS & CMOS
Advancing patient care and medical innovation in the State

CORIELL INSTITUTE
The world's most diverse biobank collection of cell lines, DNA, and other biomaterials

NEW JERSEY BIOSCIENCE CENTER

50,000 sq. ft. of incubator space, step-out labs, independent R&D facilities, and build-to-suit sites. Managed by the NJEDA, the Center's park tenants include Boehringer Ingelheim and Rutgers University.

NEW JERSEY CENTER OF EXCELLENCE

Research campus with 800,000 sq. ft. of R&D lab space. Home to Nestlé Health Science.

PRINCETON INNOVATION CENTER BIOLABS

Coworking space with wet labs for early-stage companies. Located minutes from the Princeton University campus.

NEW JERSEY INNOVATION INSTITUTE

Coworking space within the heart of New Jersey Institute of Technology and a network of experts to help launch startups.

AUDIBLE/EQUAL SPACE

The Business Attraction Program supports innovative companies in expanding or relocating to Newark, and founders of color and female founders are particularly encouraged to apply.

INCUBATORS & RESEARCH FACILITIES

We can accommodate companies at every stage of growth

NEST

HELIX

EXPANDING LAB SPACE

New Jersey's 22 million sq. ft. of lab space will expand by 27% by 2026

NEST, KENILWORTH

Northeast Science & Technology Center (NEST) offers over two million sq. ft. of existing, purpose-built R&D space waiting for your next big idea. The comprehensive 108-acre campus, available in 2024, includes a 30-acre development parcel, a turn-key vivarium and redundant utility infrastructure.

HELIX, NEW BRUNSWICK

The HELIX offers 1.7 million sq. ft. of mixed-use space across from the New Brunswick train station. It's a place where academic researchers, corporate innovators, and startups can collaborate.

SCITECH SCITY, JERSEY CITY

This 30-acre mixed-use campus will be a creative live-work-play community adjacent to the Liberty Science Center and will host EdgeWorks, the home to the next medical device innovation.

COST OF SPACE

Available space at an affordable price

Asset Class	New Jersey	New York	California	Massachusetts	Pennsylvania	Connecticut	North Carolina
Class A Office Space	$36.31 (North)	$80.98 (Manhattan)	$73.40 (San Francisco)	$79.13 (Cambridge)	$31.40 (Philadelphia)	$23.26 (New Haven)	$29.96 (Durham-Raleigh)
	$33.06 (Central)	$61.75 (Brooklyn)	$47.20 (Los Angeles)	$72.08 (Boston)	$28.52 (Pittsburgh)	$36.97 (Fairfield County)	
	$24.92 (South)		$46.80 (San Diego)				
Lab	$29.00 (Statewide)	$85.00 (Manhattan)	$78.00 (San Francisco)	$91.67 (Boston)	$43.31 (Philadelphia)	N/A	$39.00 (Durham-Raleigh)
			$73.20 (San Diego)				
Industrial	$18.83 (North)	$18.10 (Long Island)	$26.76 (San Mateo)	$15.36 (Boston)	$12.66 (Philadelphia)	$5.28 (Hartford)	$9.11 (Durham-Raleigh)
	$17.56 (Central)	$26.02 (Outer Boroughs)	$18.96 (Greater Los Angeles)		$10.19 (Pittsburgh)	$5.98 (New Haven)	
	$12.85 (South)		$20.28 (San Diego)				

SOURCE: Cushman & Wakefield 2023 Q4

DIVERSITY IS OUR STRENGTH

Feel at home in diverse communities where cultural differences are celebrated

#1

Foreign language education in the United States

#2

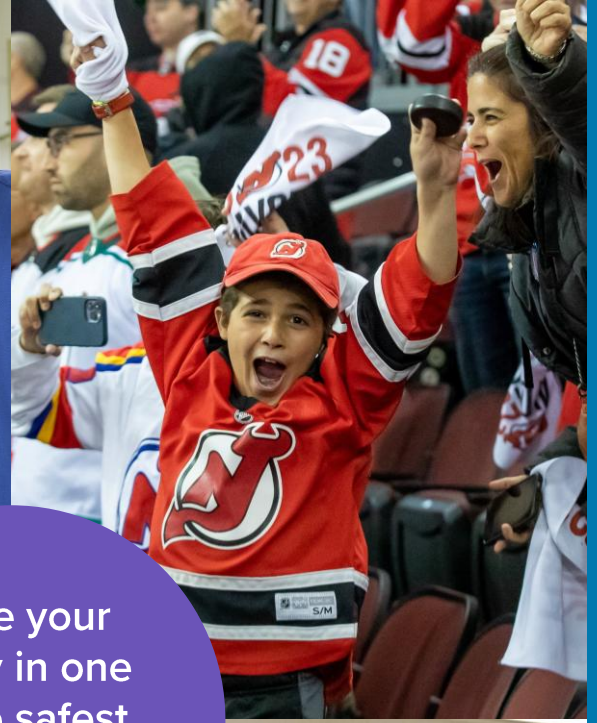
Most culturally diverse city in the United States – Jersey City

#2

State in the United States for foreign-born residents

#2

Most diverse university in the United States – Rutgers University Newark



Raise your family in one of the safest states in the United States

FAMILY FIRST

A great place to live and learn

#1 State to raise a child in the United States

#2 Public school system (Pre-K through 12th) in the United States

#2 STEM high school in the United States

#3 State to live in the United States

VALUES THAT MATTER

New Jersey protects your employees and family with inclusive laws that value human rights

100% clean energy goal by 2035

Strongest equal pay laws in the United States

A proponent of LGBTQ+ and women's rights

Gun safety laws that protect residents

WHAT WE CAN DO FOR YOU

MARKET INTELLIGENCE

Customize Request for Information (RFI) responses

SITE SELECTION ASSISTANCE

Find and tour properties that meet your requirements

STATE RESOURCES INFORMATION

Explain incentives and workforce development initiatives

INTRODUCTIONS TO PUBLIC AND PRIVATE PARTNERS

Connect you to higher education experts and legal, staffing, and accounting providers

PUBLIC RELATIONS SUPPORT

Publicize the good news after you locate in New Jersey

LET'S WORK TOGETHER

Ready to take your business to the next level? We're here to help.

choose new jersey

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U.S. BIOPHARMA JOBS

Occupation	New Jersey	Cambridge MSA	San Francisco MSA	San Diego MSA	Raleigh MSA	Durham MSA
Packaging and Filling Machine Operators	12,053	4,387	4,928	3,257	1,263	945
Chemical Equipment Operators and Tenders	7,633	1,263	1,185	842	568	639
Chemists	5,784	4,334	2,684	1,761	730	872
Inspectors, Testers, Sorters, Samplers	13,668	8,633	7,116	5,567	2,280	1,566
Natural Sciences Managers	7,677	5,317	3,929	2,518	913	1,161
Packers and Packagers, Hand	76,140	10,649	8,020	5,630	2,788	953
First-Line Supervisors of Sales Works	52,959	25,377	19,974	15,082	8,706	2,908
Biochemists and Biophysicists	2,013	6,103	2,446	1,501	118	172

SOURCE: JobsEQ Employment data as of 2023 Q2

NEW JERSEY BIOPHARMA JOBS

Occupation	Employment	Mean Wage
Packaging and Filling Machine Operators and Tenders	12,053	$40,800
Chemical Equipment Operators and Tenders	7,633	$52,700
Chemists	5,784	$99,300
Inspectors, Testers, Sorters, Samplers, and Weighers	13,688	$50,300
Natural Sciences Managers	7,677	$201,500
Packers and Packagers, Hand	76,140	$37,100
First-Line Supervisors of Sales Workers	52,959	$76,400
Biochemists and Biophysicists	2,013	$119,200
Chemical Technicians	3,412	$60,100
Mixing and Blending Machine Setters, Operators, etc.	2,330	$51,500

SOURCE: JobsEQ Employment data as of 2022 Q3

Rutgers Health:

The health care education, research, and clinical division at

Rutgers University

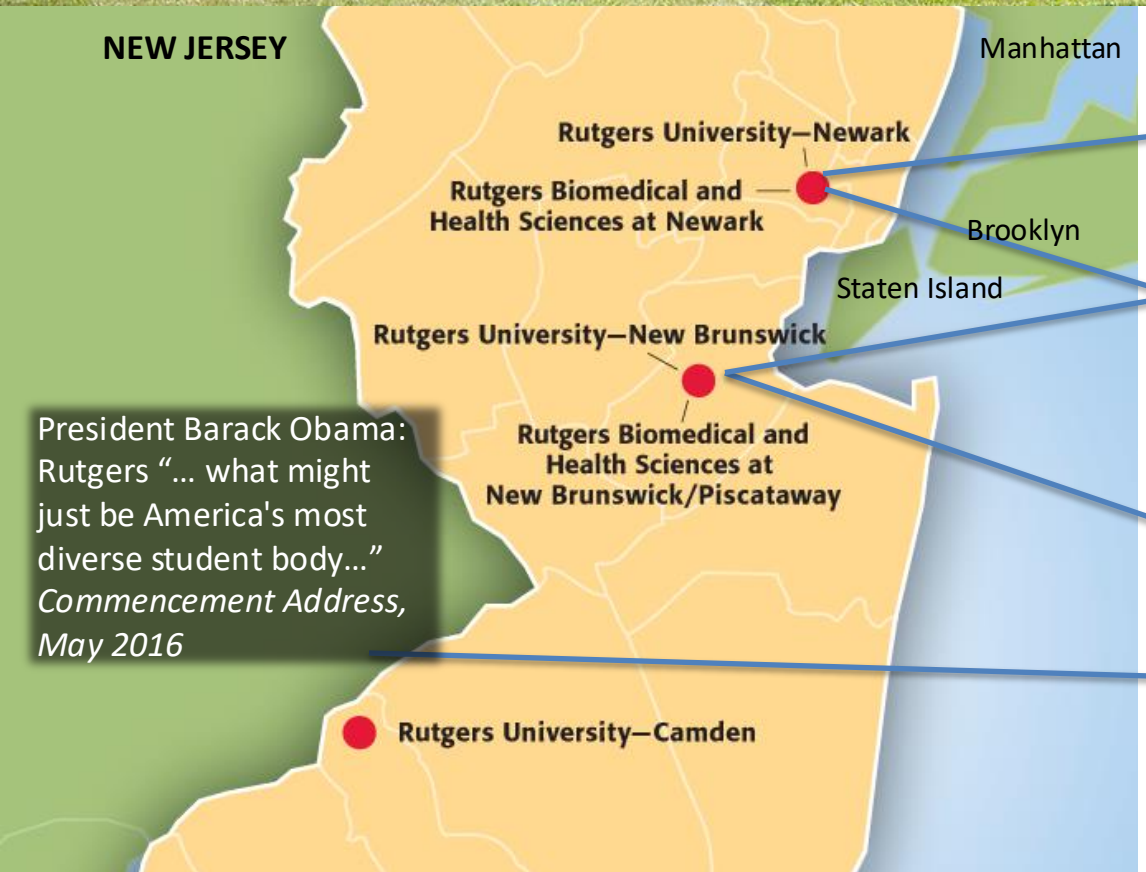
Jan 9, 2025

Najwa Borkadi, Ph.D.
Executive Director, Research Business Development

Rutgers Health

Empowering Health for All

Rutgers Health is a nationally-recognized leader in research and innovation, driving groundbreaking discoveries, cutting-edge clinical care, and economic growth. Through basic, clinical, population, and translational research, Rutgers Health researchers are transforming education, improving lives, and advancing knowledge across the life sciences, physical sciences, and social sciences.



President Barack Obama: Rutgers "… what might just be America's most diverse student body…" *Commencement Address, May 2016*

Newark

Arts & Sciences | Business | Law

Newark & New Brunswick

Medical School | Pharmacy | Nursing | Public Health | Health Professions | Hospital system

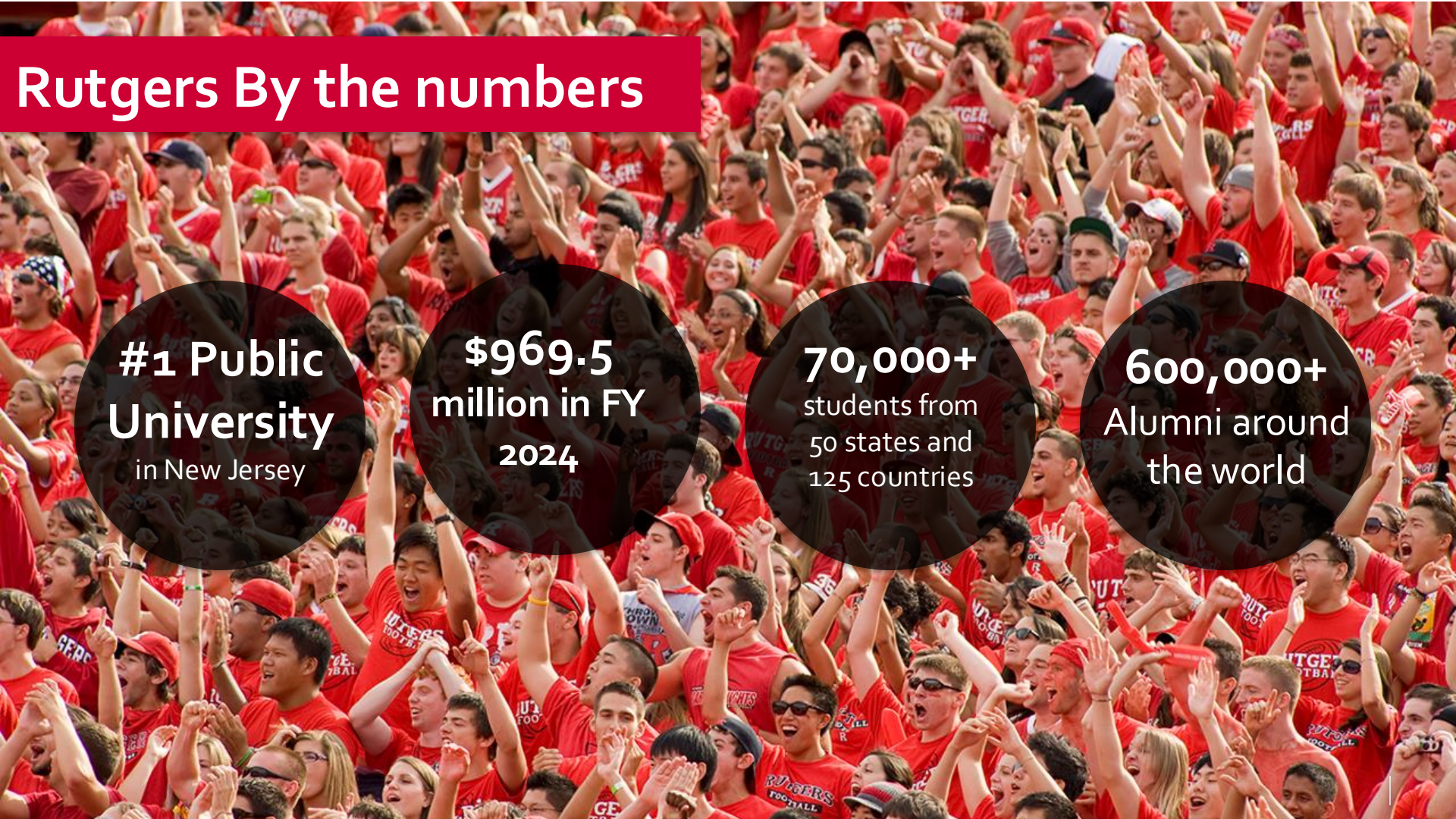
New Brunswick

Art & Sciences | Engineering | Public Policy | Social Work | Labor Relations | Business | Graduate Education | Communication & Information | Environmental & Biological Sciences

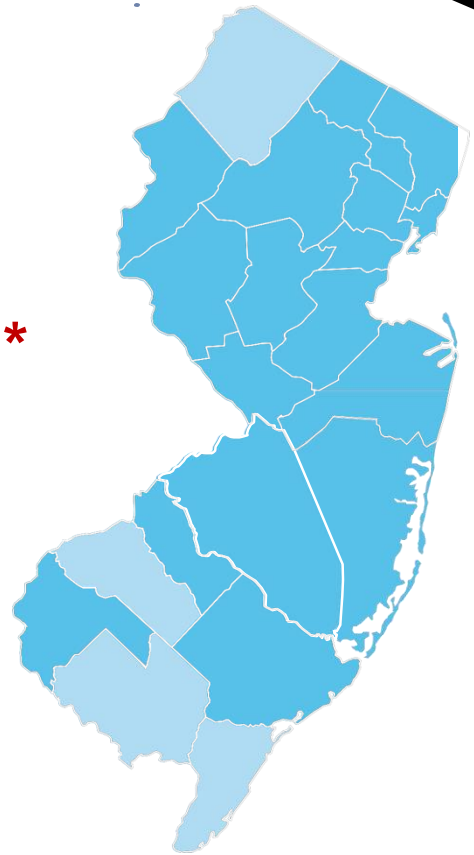
Camden

Arts & Sciences | Business | Law | Nursing

Rutgers By the numbers



RWJBarnabas Health and Rutgers locations offer a vast network of clinical providers in 17 of New Jersey's 21 counties.*



*Dark areas of the map represent the combined geographic coverage of RWJBarnabas Health and Rutgers which have signed in 2021 Letter of Partnership

RUTGERS HEALTH AT A GLANCE

Top 20 Best Graduate Schools

Rutgers Health is home to top-ranked masters and doctorate of nursing programs, according to U.S. News & World Report.

450+ Clinical Trials

Rutgers Health supports approximately 450 or more clinical trials at any given time, advancing medical research and innovation.

2.3M Annual Patient Visits

Rutgers Health serves millions of patients each year, providing high-quality, patient-centered care across New Jersey.

36 AAAS Faculty Fellow

Rutgers Health is home to 36 faculty members who are fellows of the American Association for the Advancement of Science, a prestigious honor.

Rutgers Health is an education, research, and health care powerhouse, driving excellence in medical education, groundbreaking research, and exceptional patient care across New Jersey and beyond.

Rutgers Health Entities

Schools

- Ernest Mario School of Pharmacy
- New Jersey Medical School
- Robert Wood Johnson Medical School
- Rutgers School of Dental Medicine
- School of Graduate Studies (joint with RU – New Brunswick)
- School of Health Professions
- School of Nursing
- School of Public Health

Centers/Institutes

- Brain Health Institute
- Center for Advanced Biotechnology and Medicin
- Environmental and Occupational Health Sciences Institute
- Institute for Health, Health Care Policy and Aging Research
- Institute for Infectious and Inflammatory Diseases
- Rutgers Cancer Institute of NJ
- Rutgers Institute for Translational Medicine & Science

Behavioral Health Care Unit

- University Behavioral Health Care

Rutgers Health

Rutgers Health
Rutgers Health Group

Established in 2016

RESEARCH ACROSS RUTGERS HEALTH SCHOOLS

Ernest Mario School of Pharmacy

Five academic departments are actively engaged in high-impact research programs, in areas that include drug discovery and delivery, experimental therapeutics, and pharmacy practice.

New Jersey Medical School

Researchers study brain injury, immunology and infectious diseases, stem cells and regeneration, public health, and neurology. The renowned Global Tuberculosis Institute is also housed at the school.

Robert Wood Johnson Medical School

Home to major research institutes that focus on a range of topics, from cardiovascular medicine to women's health.

Rutgers School of Dental Medicine

Research extending from the prevention of cavities and periodontal disease to potential therapies for cancer and drug-resistance illness.

School of Public Health

Home to a number of research centers including the Center for Public Health Workforce Development, Center for South Asian Quantitative Health & Education, and New Jersey's Center on Gun Violence Research, among the first such centers in the country.

TRANSLATING DISCOVERIES INTO HEALTH

Leveraging Expertise

Rutgers Health brings together world-class researchers, clinicians, and innovators to tackle complex health challenges and translate groundbreaking discoveries into practical solutions.

Accelerating Innovation

With state-of-the-art facilities, robust research infrastructure, and a collaborative culture, Rutgers Health drives the development of novel therapies, devices, and technologies that improve patient outcomes.

Fostering Partnerships

Rutgers Health forges strategic alliances with industry leaders, government agencies, and patient advocacy groups to ensure that scientific breakthroughs have meaningful impact on the health and well-being of individuals and communities.

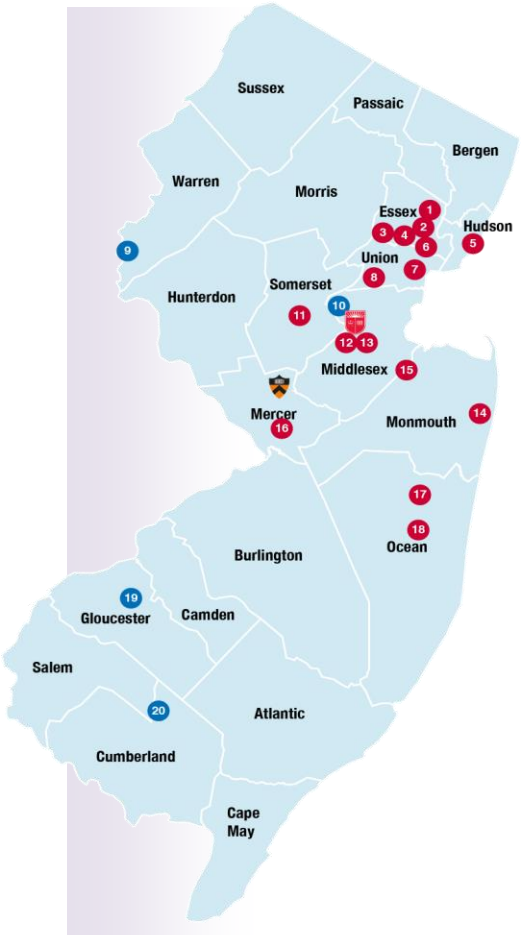
Impacting Lives

From pioneering new treatments for chronic diseases to developing cutting-edge digital health tools, Rutgers Health is dedicated to transforming biomedical research into real-world solutions that enhance the quality of life for people across New Jersey and beyond.

Rutgers Cancer Institute System

- 12 adult hospitals across NJ
- One Oncology Service Line
- Clinical trials open and actively accruing at 10 (RWJBH) and 2 (CINJ) sites
- All System Sites with open trials
- New Affiliates

RUTGERS
Cancer Institute of New Jersey
RUTGERS HEALTH



- Rutgers Cancer Institute of New Jersey
- 1 Clara Maass Medical Center
- 2 University Hospital
- 3 Cooperman Barnabas Medical Center
- 4 Children's Hospital of New Jersey at Newark Beth Israel Medical Center
- 5 Jersey City Medical Center
- 6 Newark Beth Israel Medical Center
- 7 Trinitas Regional Medical Center
- 8 Robert Wood Johnson University Hospital Rahway
- 9 St. Luke's Hospital – Warren Campus
- 10 Saint Peter's University Hospital
- 11 Robert Wood Johnson University Hospital Somerset
- 12 Robert Wood Johnson University Hospital
- 13 Briston Myers Squibb Children's Hospital at RWJUH
- 14 Monmouth Medical Center
- 15 Unterberg Children's Hospital at Monmouth Medical Center
- 16 Robert Wood Johnson University Hospital Hamilton
- 17 Monmouth Medical Center Southern Campus
- 18 Community Medical Center
- 19 Leading-Edge Cancer Center at Inspira Medical Center
- 20 The Frank and Edith Scarpa Regional Cancer Pavillion at Inspira Medical Center
- Princeton University

Unified Clinical Trials Infrastructure

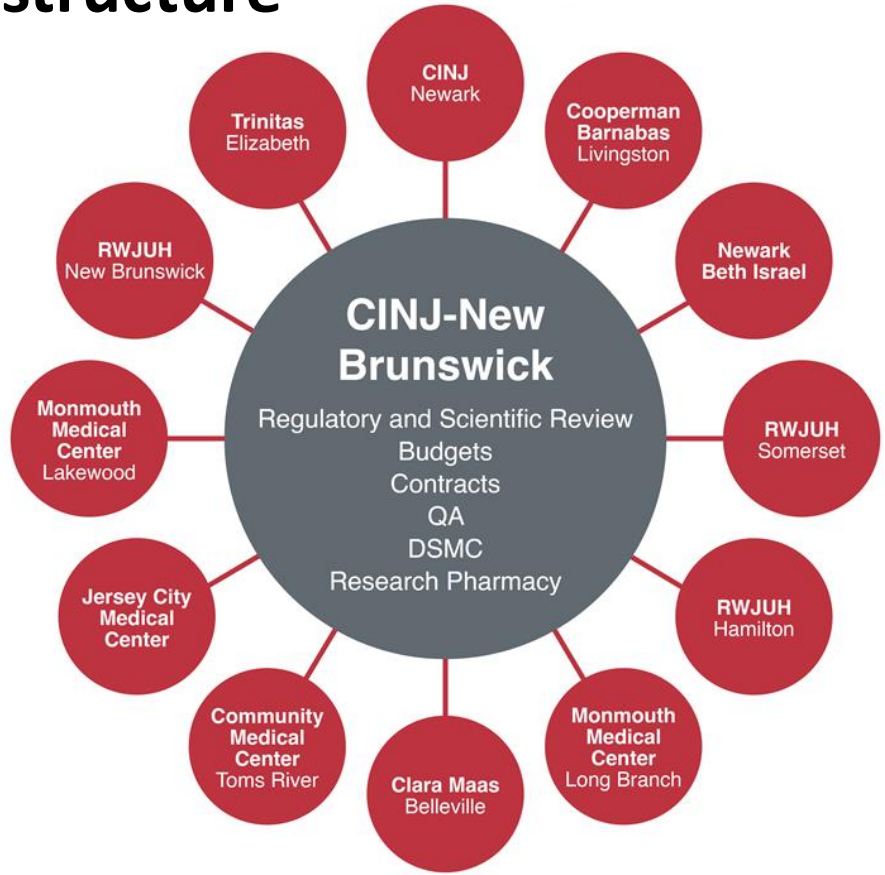
Our Concept:

Centralized

- Operations
- Data Management

Sites Contribute

- Ideas
- Protocols
- Principal Investigators
- Patient Enrollment
  Data Management



Unified Clinical Trials Infrastructure

Our Vision (2018)

- **One** IRB
- **One** Contract/Budget process
- **One** EMR
- **One** CTMS
- **One** Pharmacy
- **One** Clinical Trials and Quality Assurance Office

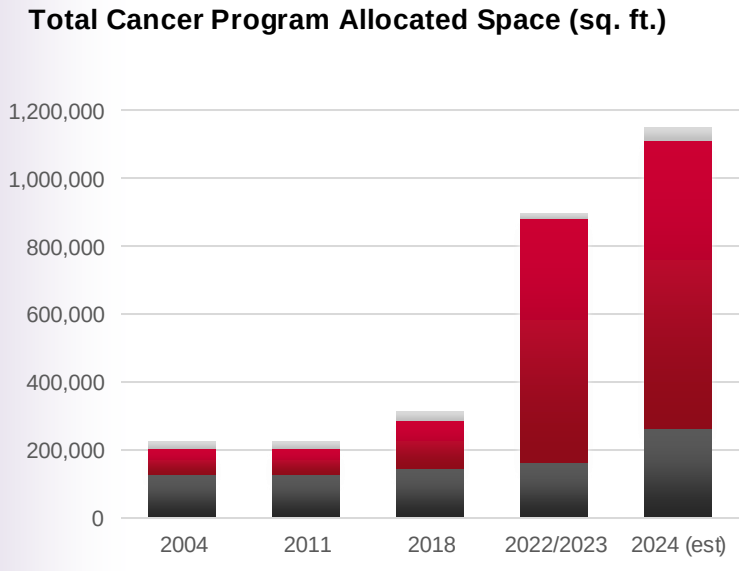
Growth: Facilities and Clinical Services

New Brunswick Today

- Primary clinical and research facility (225,000 sq. ft.)
- Dedicated oncology space (36,000 sq. ft.)
- Leased Administration (40,000 sq. ft.)
- RWJUH Oncology Hospital

New Brunswick Planned

- 520,000 sq. ft. Inpatient/Outpatient Morris Cancer Center
- Completion 2024



Jack and Sheryl Morris Cancer Center

Outpatient Care

- 86 infusion bays
- 84 exam rooms
- 4 linear accelerators; other advanced radiation oncology
- Diagnostic radiology equipment (e.g., CT, MRI, PET, mammography)
- Core and clinical laboratories
- Pharmacy
- Outpatient Urgent Care

Inpatient Care

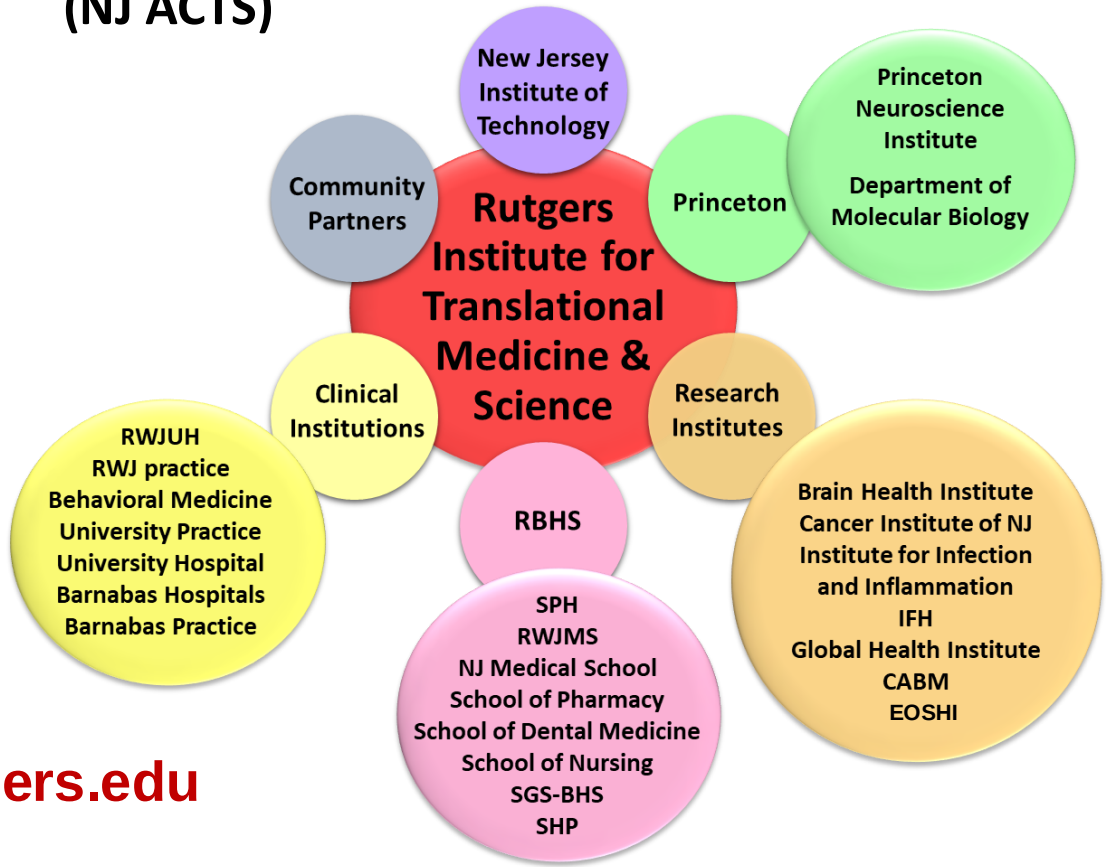
- 96 private room inpatient beds on three floors
- Dedicated floor for nine surgical and two procedure rooms
- Central sterile processing area
- Inpatient support spaces

Research

- 10 wet lab facilities and equipment to support ten research teams
- Office of Human Research Services
- Faculty offices

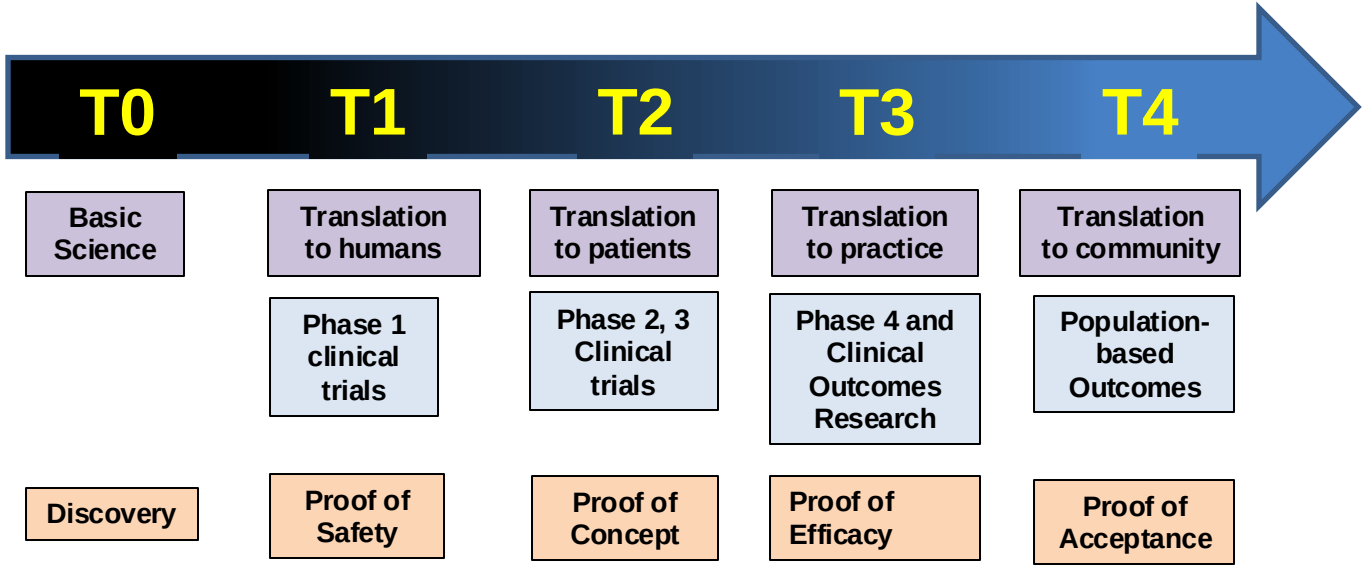
New Jersey Alliance for Clinical and Translational Science (NJ ACTS)

Rutgers Institute for Translational Medicine & Science



http://njacts.rbhs.rutgers.edu

Translational Research Is a Continuum



Academic assets for commercialization include new drugs, devices, diagnostics and software

RUTGERS UNIVERSITY

PRINCETON UNIVERSITY

NJIT New Jersey's Science & Technology University

RWJBarnabas HEALTH

Transformative Accomplishments over 5 years

- Established and implemented a Clinical Research Data Warehouse (CRDW).
- Built a robust Pilot Program fostering alliance partner collaboration.
- Supported a microcredentialing and badging program across Cores.
- Fostered a network of networks for community engaged research.
- Served as the Biomarker Core for the national pediatric Recover Program.
- Created a unique Clinical Trials Office to facilitate and catalyze clinical trials execution.
- Support the career development of 12 KL2 Scholars, 19 Predoc and 13 Postdoc trainees.
- Successfully competed for the continuation of NJ ACTS for 7 years.

Clinical Trials Office

NJ acts

Why create a Clinical Trials Office?

- **Mandate through CTSA to improve the efficiency & quality of the clinical trials conducted here; the goal is also to increase the volume of trials**

- **Scope: Rutgers Health** non-oncology clinical trials **and non-clinical trials with billable clinical procedures**

Rutgers Institute for Translational Medicine & Science

ADVARRA OnCore

Study team submits documents through OnCore ePRMS (before IRB & RAPSS)

CTO Feasibility Navigator reviews submission, conducts Intake Assessment

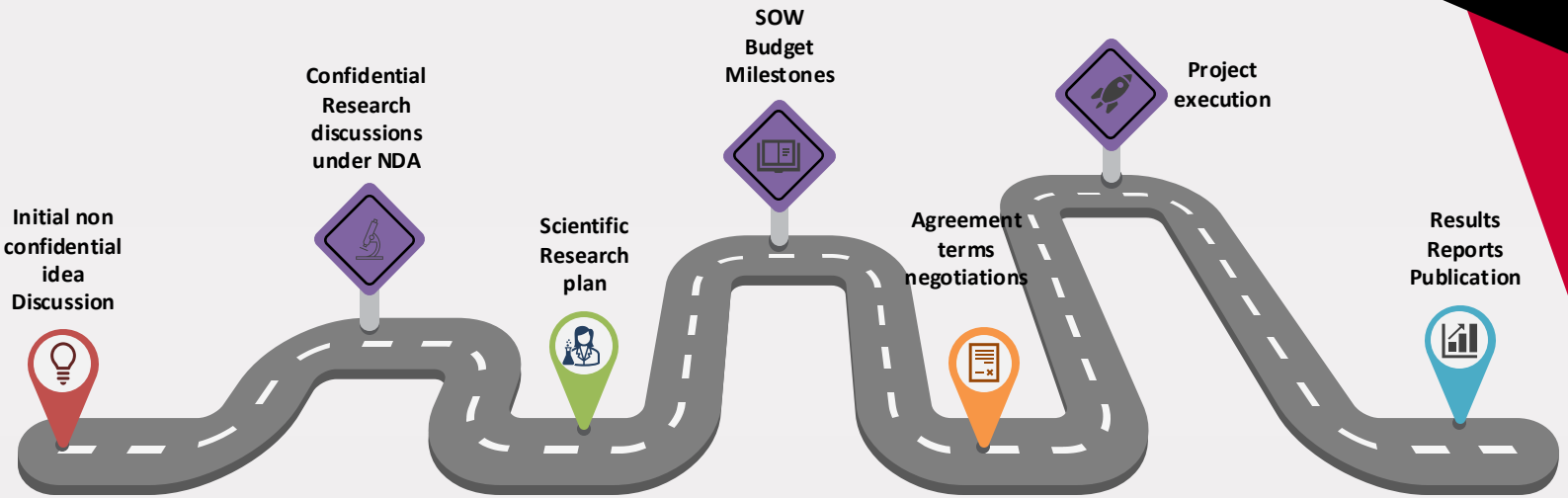
Once study determined feasible, task lists used in OnCore to delegate:

1. Contract negotiation
2. Budget Negotiation
3. Medicare Coverage Analysis
4. Study Build in OnCore
5. Partner Hospital processes*
6. IRB submission (to study team)

*UH-Newark: CTO handles partner hospital submission RWJBH: Study teams are responsible

ALIGNING RUTGERS HEALTH INTEREST WITH INDUSTRY FOCUS

The RBHS Roadmap for a research Agreement



Rutgers checkpoints

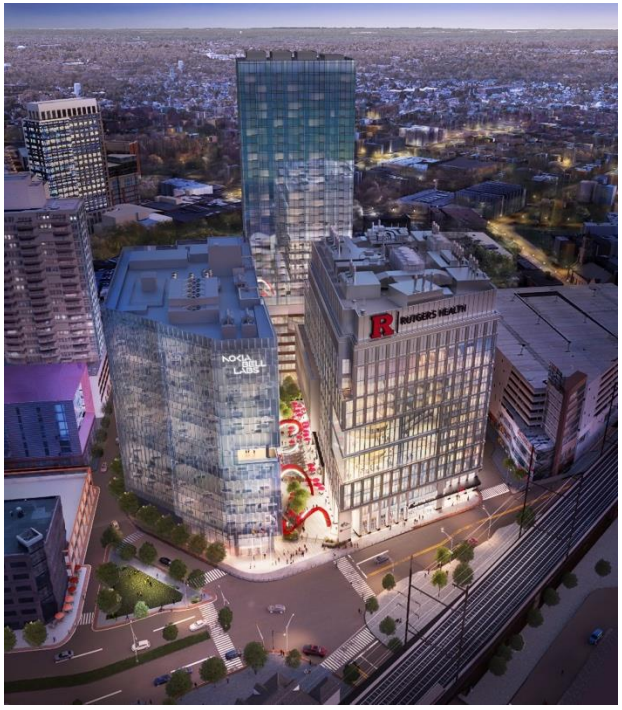
The Business Research Development team assists the PIs with these checkpoints to make the collaboration move at Business Speed

Rutgers Internal process

The different units at the Office for Research facilitate every step the Rutgers' research administration process.

The Development

- Preliminary site plan and building sizes have been revised
- RH Building (RWJMS, Translational Research, Chancellor Office) is largest occupant in first building



- Phase 1 – RH space, Lab and Office, Innovation Hub/Coworking, RU-NB space
- Phase 2 – Nokia Bell Labs
- Phase 3 – TBD

Discussion

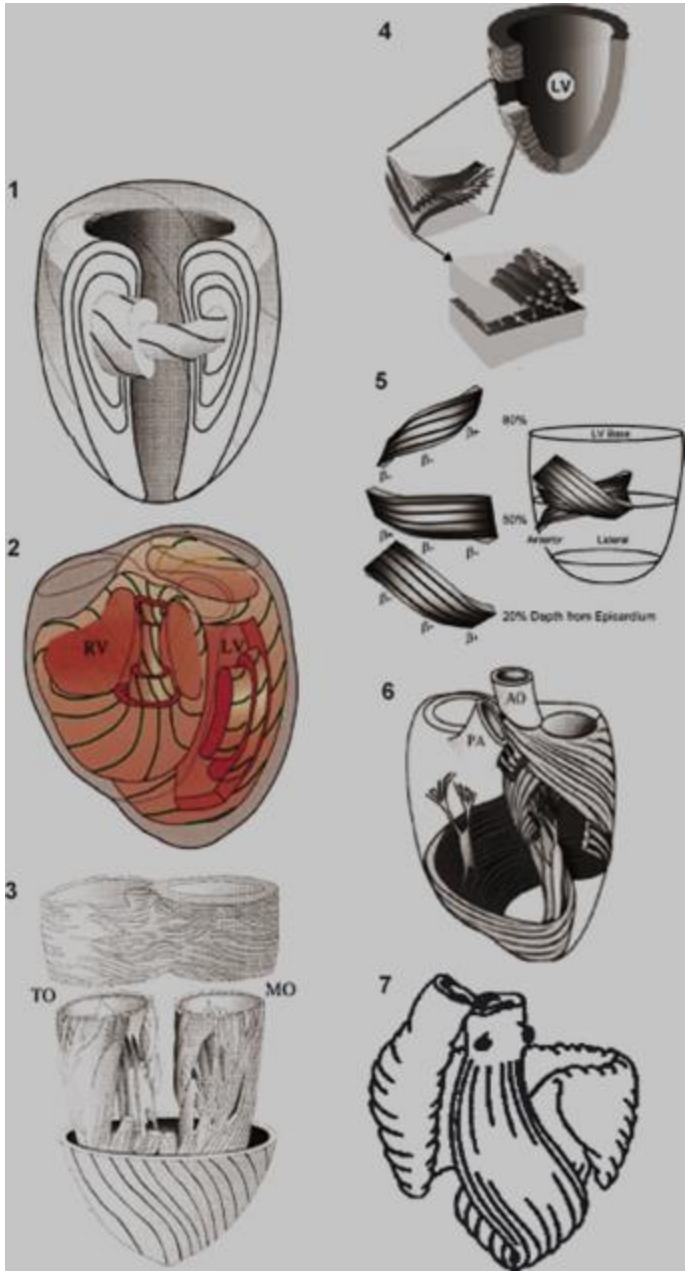
Thank you

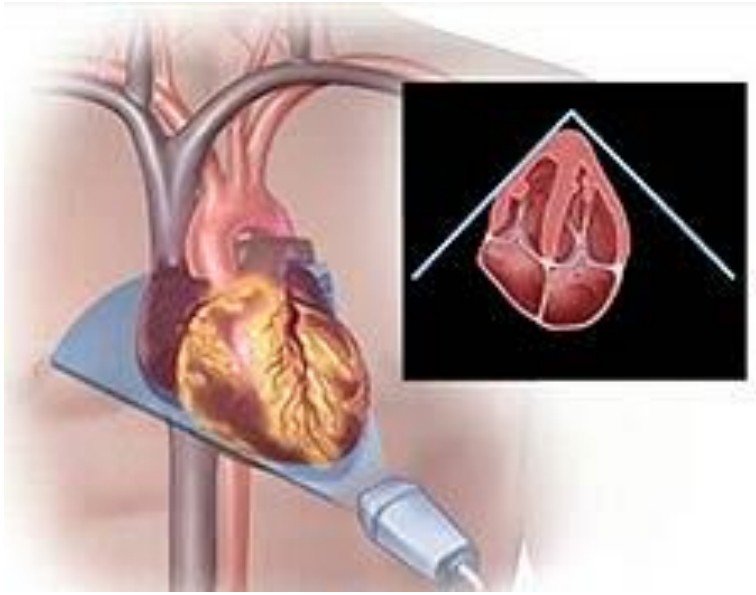
RUTGERS HEALTH

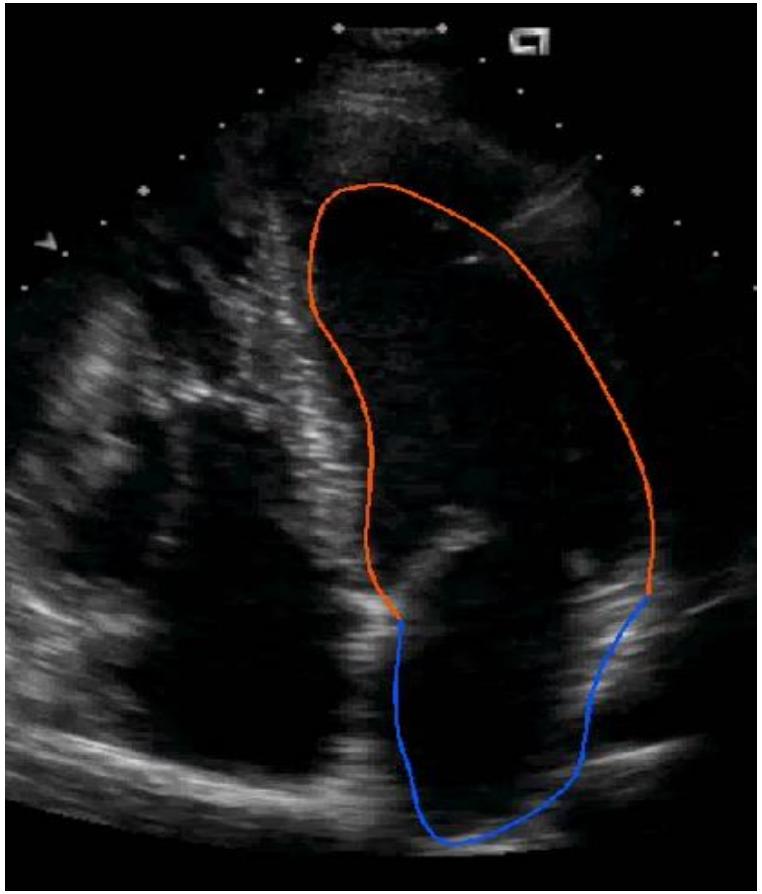
RWJBarnabas HEALTH

Center for Innovation

Advancing Health through Digital Technologies and Strategic Partnerships





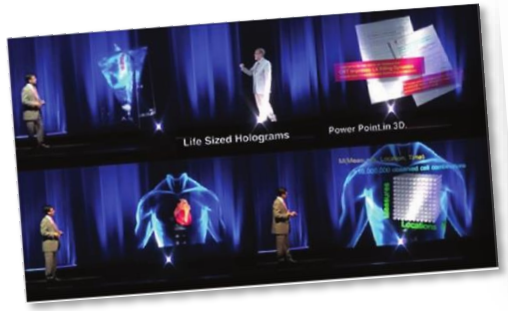


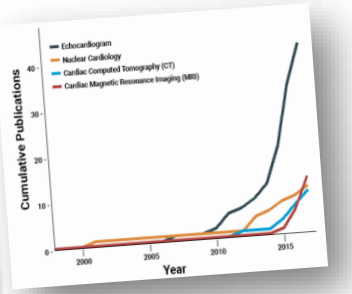
Gilbert et al. Eur J Cardiothorac Surg 2007;32:231-49

JACC Cardiovascular Imaging

Intelligent Platforms for Disease Assessment

Novel Approaches in Functional Echocardiography





Machine Learning for Data-Driven Discovery

The Rise and Relevance*

Predicting Preclinical Heart Failure Progression

The Rise of Machine-Learning for Population Health*

Enforcing Quality in Strain Imaging Through AI-Powered Surveillance*

Building Trust in AI

Opportunities and Challenges for Cardiac Imaging

Automated Interpretation of Myocardial Perfusion Images

Tell Me AI Where to Look*

Imaging With Deep Learning

Sharpening the Cutting Edge

The heart is not a squeezing pressure pump!

Journal of the American College of Cardiology
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Vol. 48, No. 10, 2006
ISSN 0735-1097/06/$32.00
doi:10.1016/j.jacc.2006.08.030

FOCUS ISSUE: CARDIAC IMAGING

State-of-the-Art Paper

Left Ventricular Function

Left Ventricular Structure and Function

Basic Science for Cardiac Imaging

Partho P. Sengupta, MBBS, MD, DM,* Josef Korinek, MD,*
Marek Belohlavek, MD, PhD, FACC, FESC,* Jagat Narula, MBBS, MD, DM, PhD, FACC, FAHA,†
Mani A. Vannan, MBBS, FACC,† Arshad Jahangir, MD, FACC,*
Bijoy K. Khandheria, MD, FESC, FASE, FACC‡
Rochester, Minnesota; Irvine, California; and Scottsdale, Arizona

The myofiber geometry of the left ventricle (LV) changes gradual
in the subendocardium to a left-handed helix in the subepica
associate the LV myofiber architecture with emerging concep
sequence in a beating heart. We discuss: 1) the morphogenesis
of muscle fibers in the adult LV; 2) the sequence of depolarizatio
physiological inhomogeneity of transmural myocardial mecha
sequence of longitudinal and circumferential deformation; 4) t
LV deformation and the intracavitary fl
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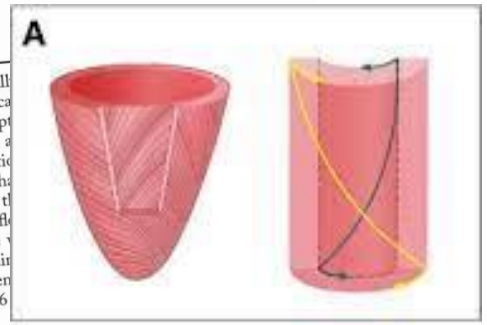
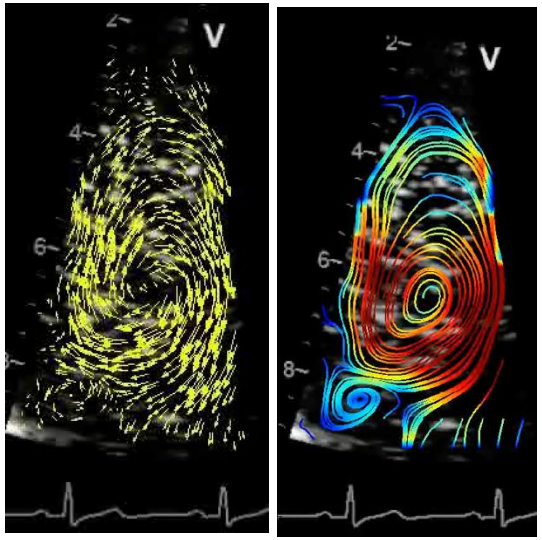




ORIGINAL RESEARCH

A Network-Based "Phenomics" Approach for Discovering Patient Subtypes From High-Throughput Cardiac Imaging Data

Jung Sun Cho, MD, PhD,[a,b] Sirish Shrestha, MS,[a] Nobuyuki Kagiyama, MD, PhD,[a] Lan Hu, RN, MPH,[a]
Yasir Abdul Ghaffar, MD,[a] Grace Casaclang-Verzosa, MD,[a] Irfan Zeb, MD,[a] Partho P. Sengupta, MD, DM[a]

ABSTRACT

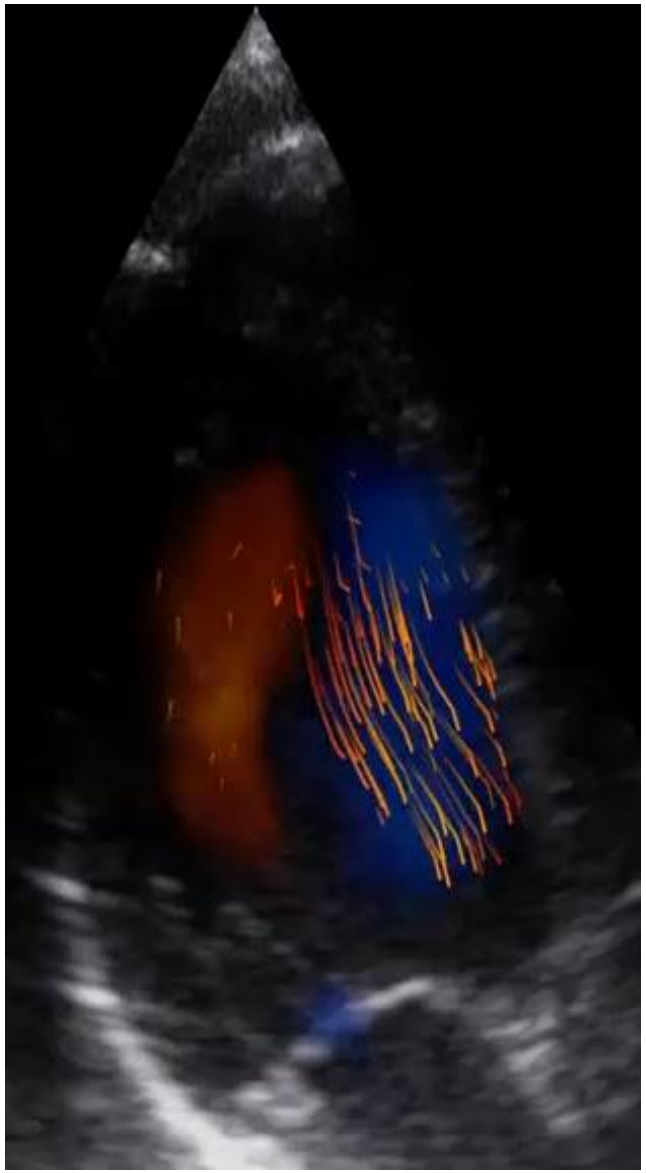
OBJECTIVES The authors present a method that focuses on cohort matching algorithms for performing patient-to-patient comparisons along multiple echocardiographic parameters for predicting meaningful patient subgroups.

BACKGROUND Recent efforts in collecting multiomics data open numerous opportunities for comprehensive integration of highly heterogenous data to classify a patient's cardiovascular state, eventually leading to tailored therapies.

METHODS A total of 42 echocardiography features, including 2-dimensional and Doppler measurements, left ventricular (LV) and atrial speckle-tracking, and vector flow mapping data, were obtained in 297 patients. A similarity network was developed to delineate distinct patient phenotypes, and then neural network models were trained for discriminating the phenotypic presentations.

RESULTS The patient similarity model identified 4 clusters (I to IV), with patients in each cluster showed distinctive clinical presentations based on American College of Cardiology/American Heart Association heart failure stage and the occurrence of short-term major adverse cardiac and cerebrovascular events. Compared with other clusters, cluster IV had a higher prevalence of stage C or D heart failure (78%; $p < 0.001$), New York Heart Association functional classes III or IV (61%; $p < 0.001$), and a higher incidence of major adverse cardiac and cerebrovascular events ($p < 0.001$). The neural network model showed robust prediction of patient clusters, with area under the receiver-operating characteristic curve ranging from 0.82 to 0.99 for the independent hold-out validation set.

CONCLUSIONS Automated computational methods for phenotyping can be an effective strategy to fuse multidimensional parameters of LV structure and function. It can identify distinct cardiac phenogroups in terms of clinical characteristics, cardiac structure and function, hemodynamics, and outcomes. (J Am Coll Cardiol Img 2020;13:1655-70)



3D Printed Organs And Blood Vessels

FROM PICTURES TO PRACTICE PARADIGMS

Twist Mechanics of the Left Ventricle

Principles and Application

Partho P. Sengupta, MBBS, MD, DM, A. Jamil Tajik, MD,
Krishnaswamy Chandrasekaran, MD, Bijoy K. Khandheria, MD
Scottsdale, Arizona

Left ventricular (LV) twist or torsion represents the mean longitudinal gradient of the net difference in clockwise and counterclockwise rotation of the LV apex and base, as viewed from LV apex. Twist during ejection predominantly deforms the subendocardial fiber matrix, resulting in storage of potential energy. Subsequent recoil of twist deformation is associated with the release of restoring forces, which contributes to LV diastolic relaxation and early diastolic filling. Noninvasive techniques such as magnetic resonance imaging and echocardiography are useful for understanding LV twist dynamics in clinical settings, and data regarding their relative merits and pitfalls are rapidly accumulating. This review is a focused update on the current and evolving applications of LV twist mechanics in clinical cardiology. First, the theoretical framework for understanding the physiological sequence of LV twist during a cardiac cycle is presented. Second, variations in LV twist encountered in different experimental and clinical situations are discussed. Finally, the review presents an algorithm for routine application of LV twist in clinical differentiation of patterns of LV dysfunction encountered in day-to-day practice. (J Am Coll Cardiol Img 2008;1:366–76)

SPECIAL ARTICLE

Definitions for a Common Standard for 2D Speckle Tracking Echocardiography: Consensus Document of the EACVI/ASE/Industry Task Force to Standardize Deformation Imaging

Jens-Uwe Voigt,† Gianni Pedrizzetti,† Peter Lysyansky,† Tom H. Marwick, Hélène Houle, Rolf Baumann, Stefano Pedri, Yasuhiro Ito, Yasuhiko Abe, Stephen Metz, Joo Hyun Song, Jamie Hamilton, Partho P. Sengupta, Theodore J. Kolias, Jan d'Hooge, Gerard P. Aurigemma, James D. Thomas,† and Luigi Paolo Badano†, *Leuven, Belgium; Trieste, Genova, and Padova, Italy; New York, New York; Haifa, Israel; Hobart, Australia; Mountain View, California; Unterschleissheim, Germany; Tokyo and Tochigi-ken, Japan; Andover and Worcester, Massachusetts; Seoul, Korea; Ann Arbor, Michigan; and Cleveland, Ohio*

Recognizing the critical need for standardization in strain imaging, in 2010, the European Association of Echocardiography (now the European Association of Cardiovascular Imaging, EACVI) and the American Society of Echocardiography (ASE) invited technical representatives from all interested vendors to participate in a concerted effort to reduce intervendor variability of strain measurement. As an initial product of the work of the EACVI/ASE/Industry initiative to standardize deformation imaging, we prepared this technical document which is intended to provide definitions, names, abbreviations, formulas, and procedures for calculation of physical quantities derived from speckle tracking echocardiography and thus create a common standard. (J Am Soc Echocardiogr 2015;28:183-93.)

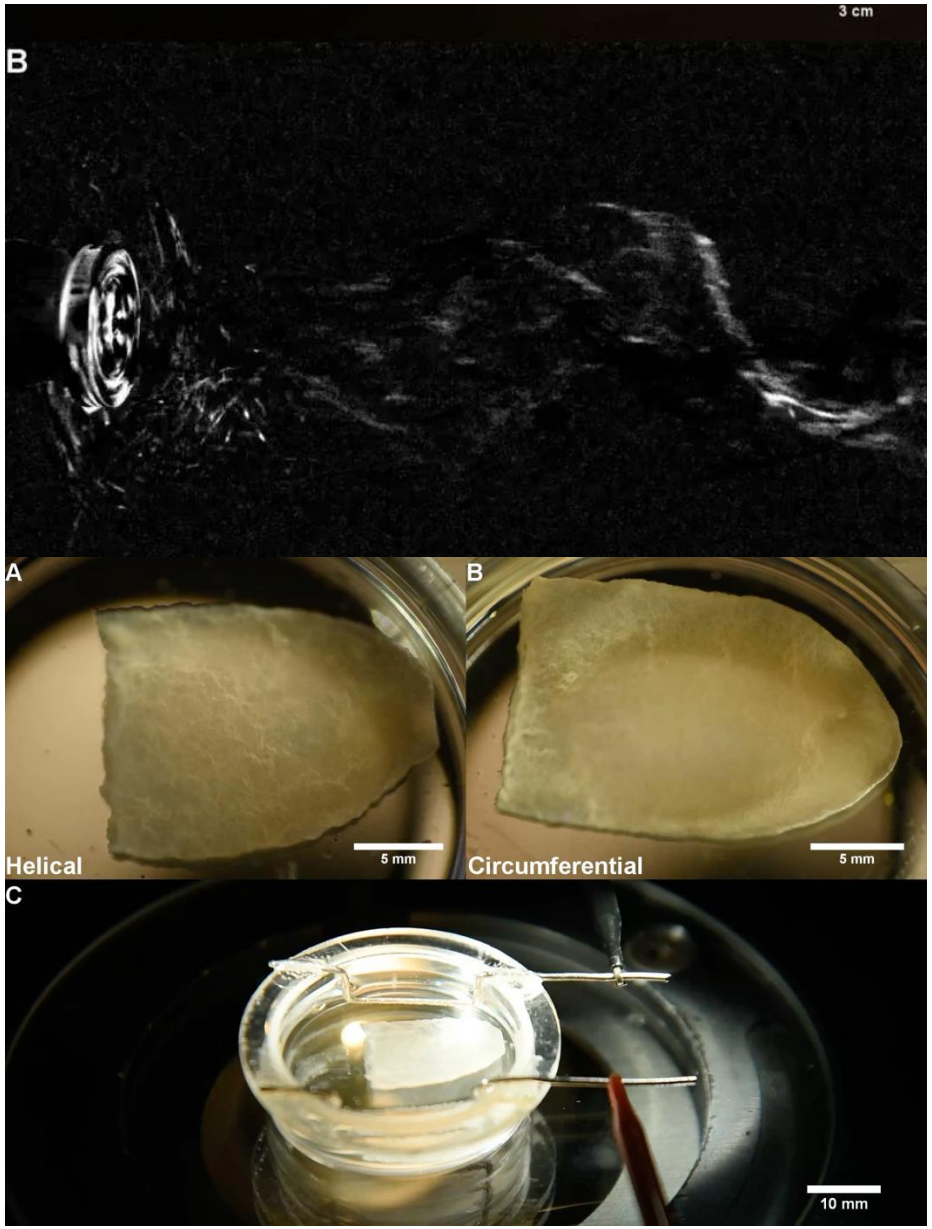
RESEARCH

BIOENGINEERING

Recreating the heart's helical structure-function relationship with focused rotary jet spinning

Huibin Chang[1]†, Qihan Liu[1,2]†, John F. Zimmerman[1]†, Keel Yong Lee[1], Qianru Jin[1], Michael M. Peters[1], Michael Rosnach[1], Suji Choi[1], Sean L. Kim[1], Herdeline Ann M. Ardoña[1,3], Luke A. MacQueen[1], Christophe O. Chantre[1], Sarah E. Motta[1,4], Elizabeth M. Cordoves[1], Kevin Kit Parker[1]*

Helical alignments within the heart's musculature have been speculated to be important in achieving physiological pumping efficiencies. Testing this possibility is difficult, however, because it is challenging to reproduce the fine spatial features and complex structures of the heart's musculature using current techniques. Here we report focused rotary jet spinning (FRJS), an additive manufacturing approach that enables rapid fabrication of micro/nanofiber scaffolds with programmable alignments in three-dimensional geometries. Seeding these scaffolds with cardiomyocytes enabled the biofabrication of tissue-engineered ventricles, with helically aligned models displaying more uniform deformations, greater apical shortening, and increased ejection fractions compared with circumferential alignments. The ability of FRJS to control fiber arrangements in three dimensions offers a streamlined approach to fabricating tissues and organs, with this work demonstrating how helical architectures contribute to cardiac performance.



Sep 14th, 2022

CREATING SOLUTIONS WITH TECHNOLOGY

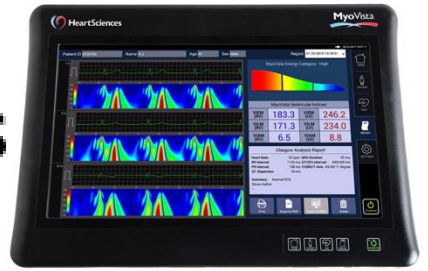
A NEW CENTER FOR INNOVATION BUILDS PATHWAYS TO MEDICAL BREAKTHROUGHS.

NSF

NIH National Heart, Lung, and Blood Institute

Center for Innovation: Partnerships

HeartSciences



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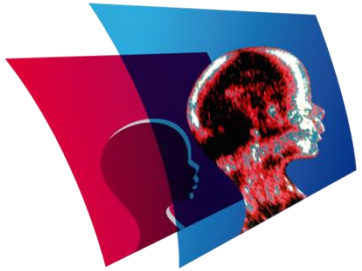
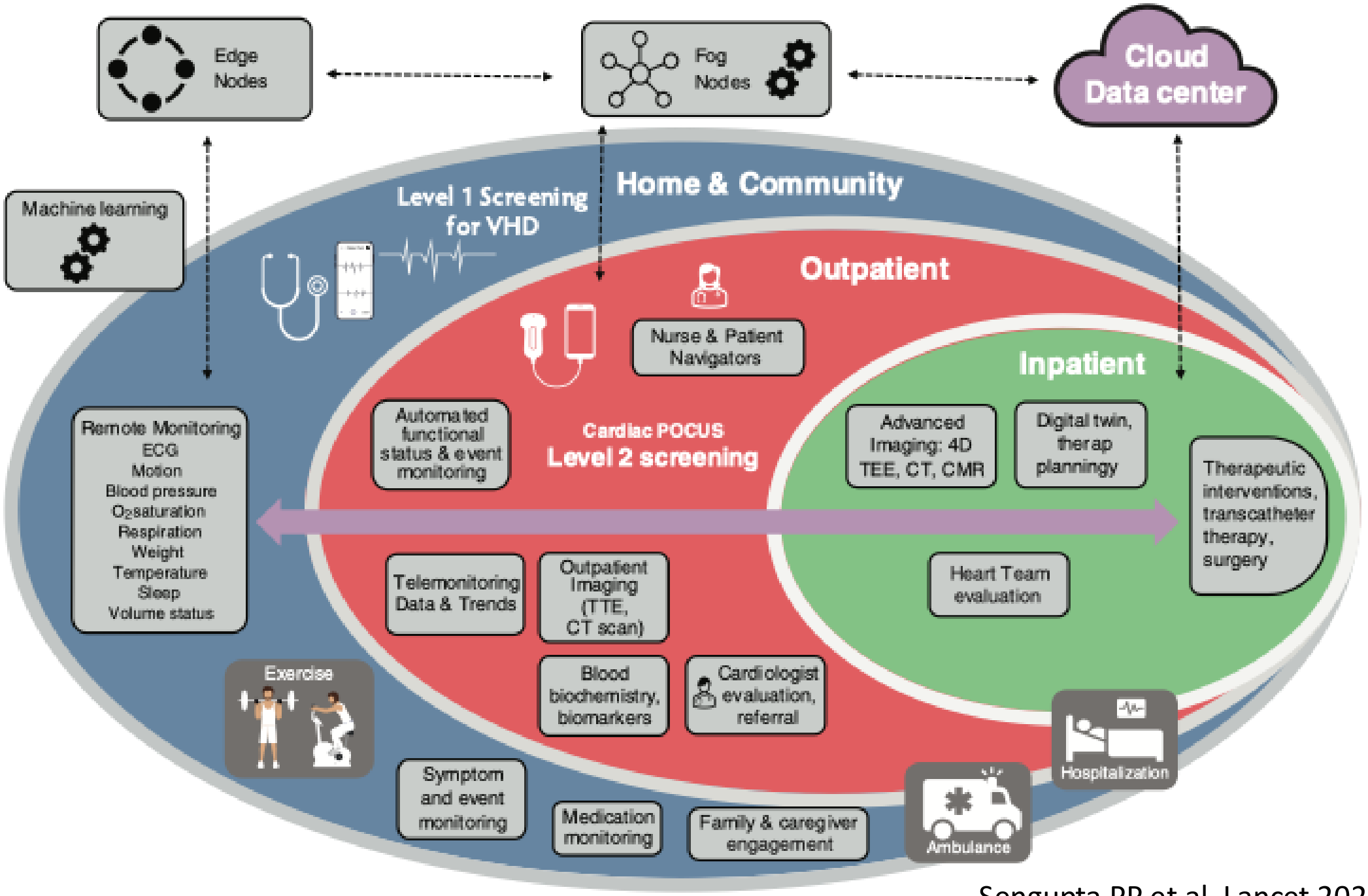
QuanBio

biofourmis

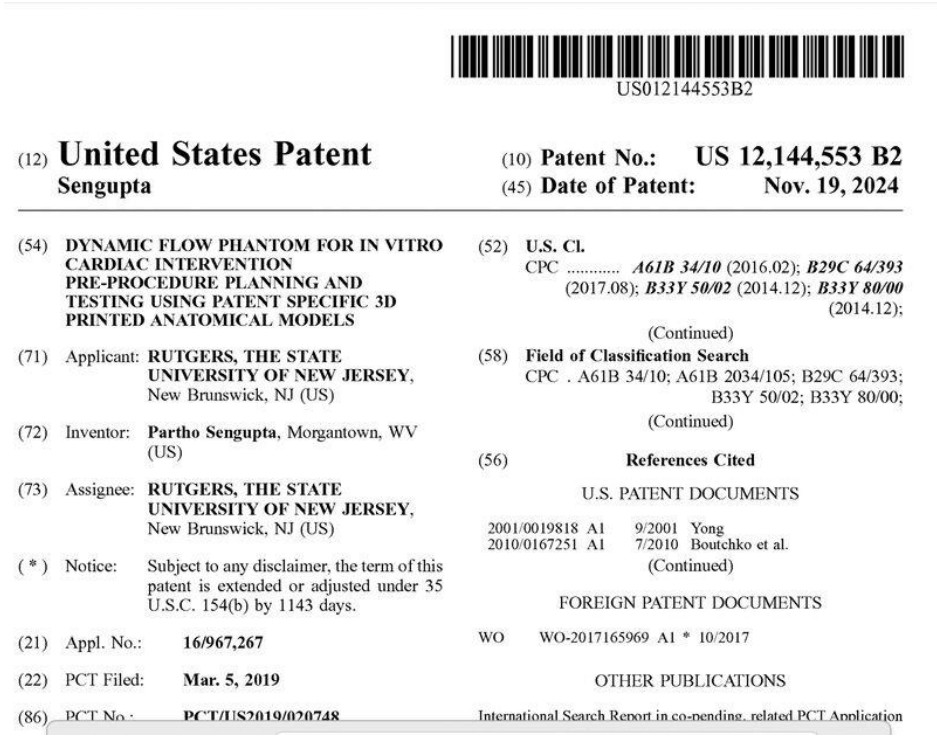


AdEchoTech
Imaginons ensemble l'image de demain
Let us picture the future

Us2.AI



Sengupta PP et al, Lancet 2023



US012144553B2

(12) **United States Patent**
Sengupta

(10) **Patent No.: US 12,144,553 B2**
(45) **Date of Patent: Nov. 19, 2024**

(54) **DYNAMIC FLOW PHANTOM FOR IN VITRO CARDIAC INTERVENTION PRE-PROCEDURE PLANNING AND TESTING USING PATENT SPECIFIC 3D PRINTED ANATOMICAL MODELS**

(71) Applicant: **RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY**, New Brunswick, NJ (US)

(72) Inventor: **Partho Sengupta**, Morgantown, WV (US)

(73) Assignee: **RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY**, New Brunswick, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1143 days.

(21) Appl. No.: **16/967,267**

(22) PCT Filed: **Mar. 5, 2019**

(86) PCT No.: **PCT/US2019/020748**

(52) **U.S. Cl.**
CPC ***A61B 34/10*** (2016.02); ***B29C 64/393*** (2017.08); ***B33Y 50/02*** (2014.12); ***B33Y 80/00*** (2014.12);
(Continued)

(58) **Field of Classification Search**
CPC . A61B 34/10; A61B 2034/105; B29C 64/393; B33Y 50/02; B33Y 80/00;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2001/0019818 A1 9/2001 Yong
2010/0167251 A1 7/2010 Boutchko et al.
(Continued)

FOREIGN PATENT DOCUMENTS

WO WO-2017165969 A1 * 10/2017

OTHER PUBLICATIONS

International Search Report in co-pending, related PCT Application

Synthetic Echocardiogram from ECG

Summary: Echocardiography (echo) uses high-frequency sound waves to create images of the heart and show its size, shape, and function. It is a valuable tool for detecting blood clots, tumors, structural defects, muscle performance, and heart size, among others, for men, women, and children. Moreover, there are no side effects, and it is a painless procedure....

Inventor(s): Naveena Yanamala, Partho Sengupta

Categories: Artificial Intelligence & Machine Learning, Healthcare & Life Sciences, Software & Algorithms, Software & Copyright

Dynamic Flow Phantom for Cardiac Intervention Pre-Planning and Testing

Summary: Heart disease is the leading cause of death for both men and women in the United States. During the past 50 years, the landscape for heart disease has been changed by pharmacological advancements and device innovation. Routine preoperative imaging is necessary for optimal planning of surgical interventions and procedures. 3D printing is a widely used...

Inventor(s): Partho Sengupta

Categories: Artificial Intelligence & Machine Learning, Healthcare & Life Sciences, Software & Algorithms, Software & Copyright

Low-cost pipeline for assessing tissue remodeling and fibrosis using ultrasound

Summary: Tissue characterization of myocardial pathology has been an area of intense research and development due to the rising incidence of cardiovascular conditions and the growing geriatric population globally. Although Cardiac Magnetic Resonance (CMR) is largely used to associate myocardial imaging features with pathological assessments, its cost limits...

Inventor(s): Partho Sengupta

Categories: Artificial Intelligence & Machine Learning, Healthcare & Life Sciences, Software & Algorithms, Software & Copyright

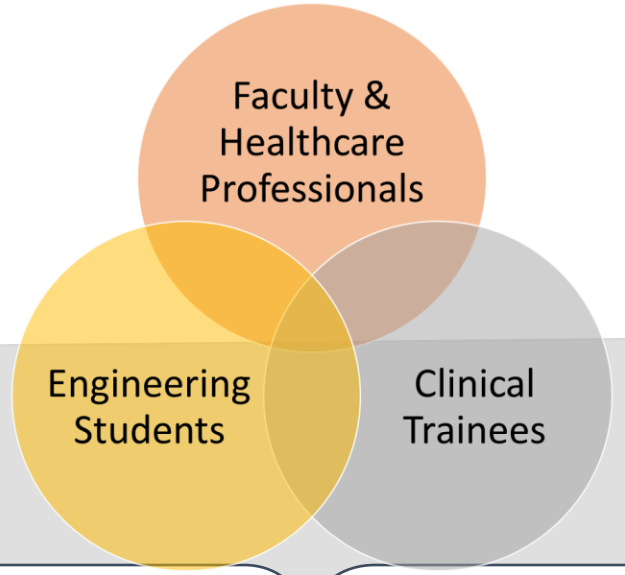
Risk Stratification Integrating mHealth and Artificial Intelligence

Summary: Cardiovascular disease is the leading cause of death in the United States, resulting in more than 600,000 deaths. Over 28 million Americans are diagnosed with heart disease and contribute more than $30 billion in healthcare-related expenses. Many patients who experience a heart attack do not undergo cardiac imaging and have a higher risk of adverse...

Inventor(s): Naveena Yanamala, Partho Sengupta

Categories: Artificial Intelligence & Machine Learning, Healthcare & Life Sciences, Medical Imaging, Software & Algorithms, Software & Copyright

“ Bridging the Gap ”



Center for Innovation

IT Infrastructure, Software & Computational Resources

- Computer Vision
- Signal Processing
- NLP
- Deep Learning

AI/ML

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- Time Series Data
- Longitudinal Data
- Continuous Signals

BIG DATA

- Robotics
- Wearables
- POC Devices
- Remote Monitoring Devices

mHealth

- Genomics
- Transcriptomics
- Metabolomics
- Radiomics

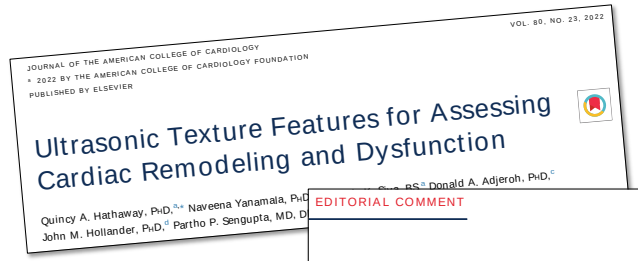
Precision Medicine@Health

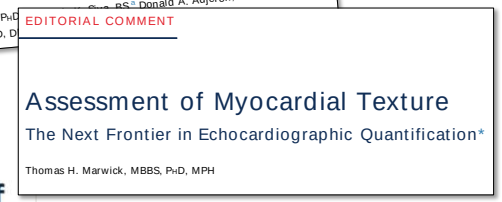
Leverage AI/ML techniques for clinical decision support, risk scoring, and early detection of diseases and to improve the quality of care at large.

Center for innovation: New Breakthroughs

Point of Care Ultrasound Devices (LEVEL-2 SCREENING)

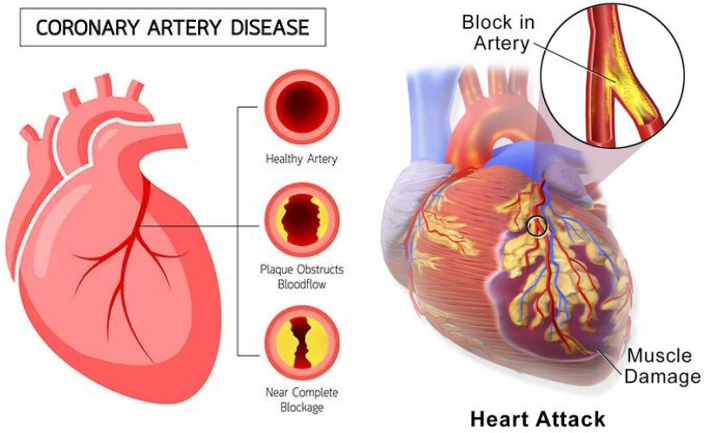
Ultrasonic Texture Features



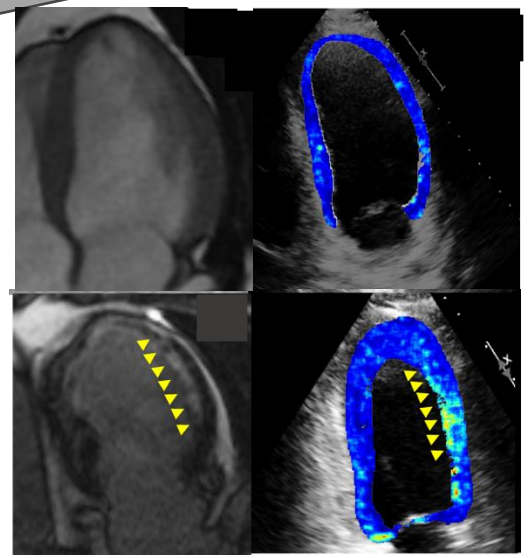


IDEATE

AMERICAN COLLEGE of CARDIOLOGY



AI



Predicts severe obstructive and high-risk CAD better than conventional 2D-Echo.

Distinguishes between healthy & infarcted myocardium & its Location!

Opens new opportunities for advancing myocardial tissue characterization using basic echocardiography imaging, which was **previously only possible through advanced imaging techniques.**

Ultrasonic Texture Features for Assessing Cardiac Remodeling and Dysfunction

Quincy A. Hathaway, PhD,[a,*] Naveena Yanamala, PhD,[b,*] Nanda K. Siva, BS,[a] Donald Adjeroh, PhD,[c] John M. Hollander, PhD,[d] Partho P. Sengupta, MD, DM[b]

ABSTRACT

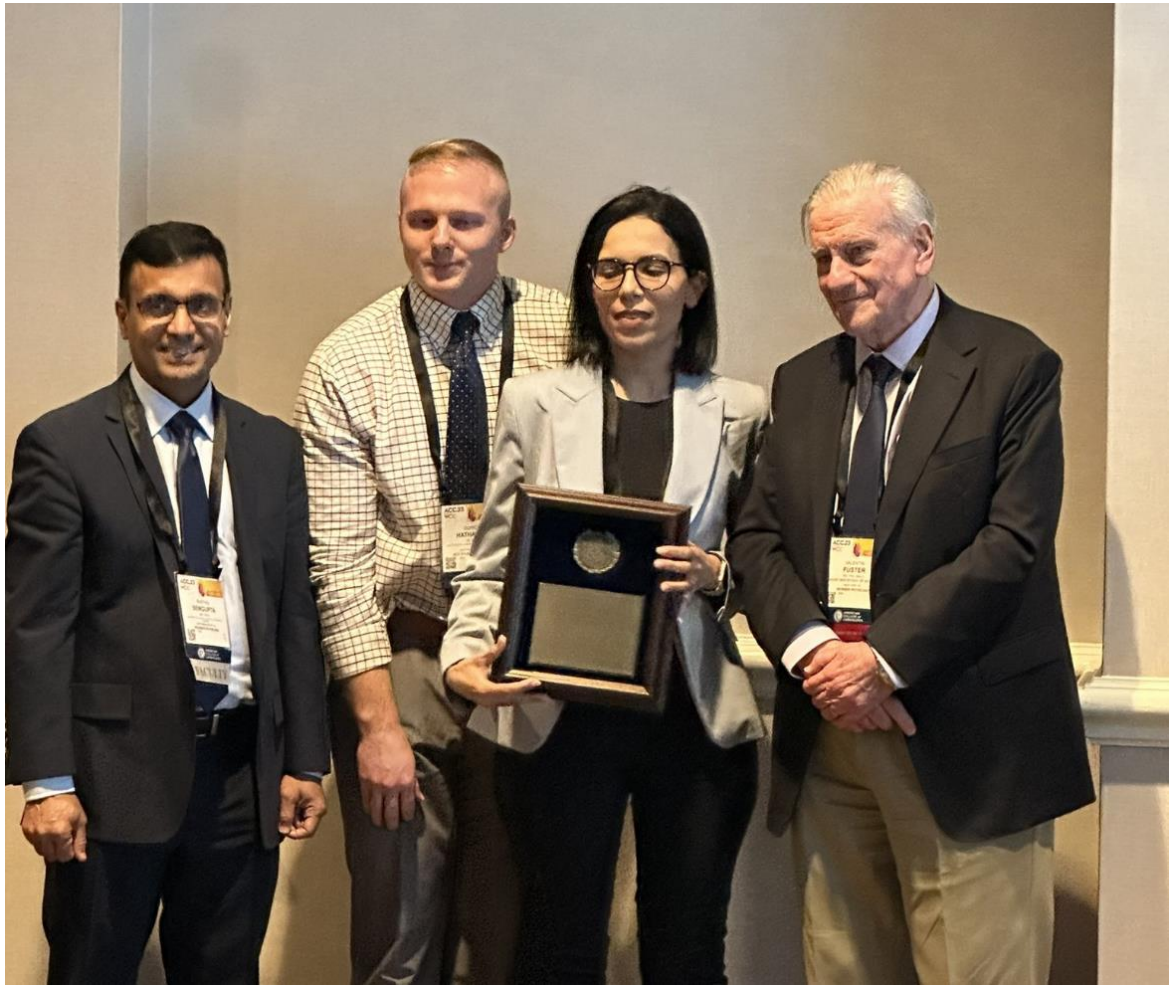
BACKGROUND Changes in cardiac size, myocardial mass, cardiomyocyte appearance, and, ultimately, the function of the entire organ are interrelated features of cardiac remodeling that profoundly affect patient outcomes.

OBJECTIVES This study proposes that the application of radiomics for extracting cardiac ultrasonic textural features (ultrasomics) can aid rapid, automated assessment of left ventricular (LV) structure and function without requiring manual measurements.

METHODS This study developed machine-learning models using cardiac ultrasound images from 1,915 subjects in 3 clinical cohorts: 1) an expert-annotated cardiac point-of-care-ultrasound (POCUS) registry (n = 943, 80% training/testing and 20% internal validation); 2) a prospective POCUS cohort for external validation (n = 275); and 3) a prospective external validation on high-end ultrasound systems (n = 484). In a type 2 diabetes murine model, echocardiography of wild-type (n = 10) and Leptr$^{-/-}$ (n = 8) mice were assessed longitudinally at 3 and 25 weeks, and ultrasomics features were correlated with histopathological features of hypertrophy.

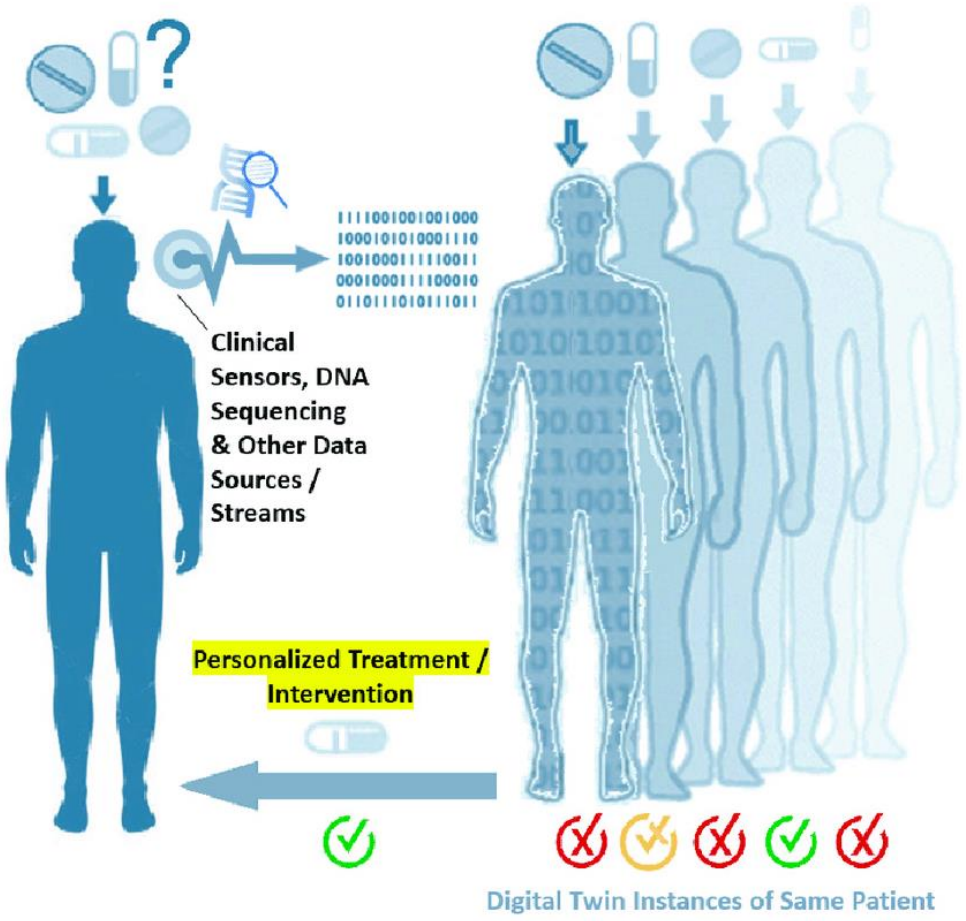
RESULTS The ultrasomics model predicted LV remodeling in the POCUS and high-end ultrasound external validation studies (area under the curve: 0.78 [95% CI: 0.68-0.88] and 0.79 [95% CI: 0.73-0.86], respectively). Similarly, the ultrasomics model predicted LV remodeling was significantly associated with major adverse cardiovascular events in both cohorts ($P < 0.0001$ and $P = 0.0008$, respectively). Moreover, on multivariate analysis, the ultrasomics probability score was an independent echocardiographic predictor of major adverse cardiovascular events in the high-end ultrasound cohort (HR: 8.53; 95% CI: 4.75-32.1; $P = 0.0003$). In the murine model, cardiomyocyte hypertrophy positively correlated with 2 ultrasomics biomarkers ($R^2 = 0.57$ and 0.52, $Q < 0.05$).

CONCLUSIONS Cardiac ultrasomics-based biomarkers may aid development of machine-learning models that provide an expert-level assessment of LV structure and function. (J Am Coll Cardiol 2022;80:2187-2201) © 2022 by the American College of Cardiology Foundation.



2023, JACC Parmley Young Author Achievement Award

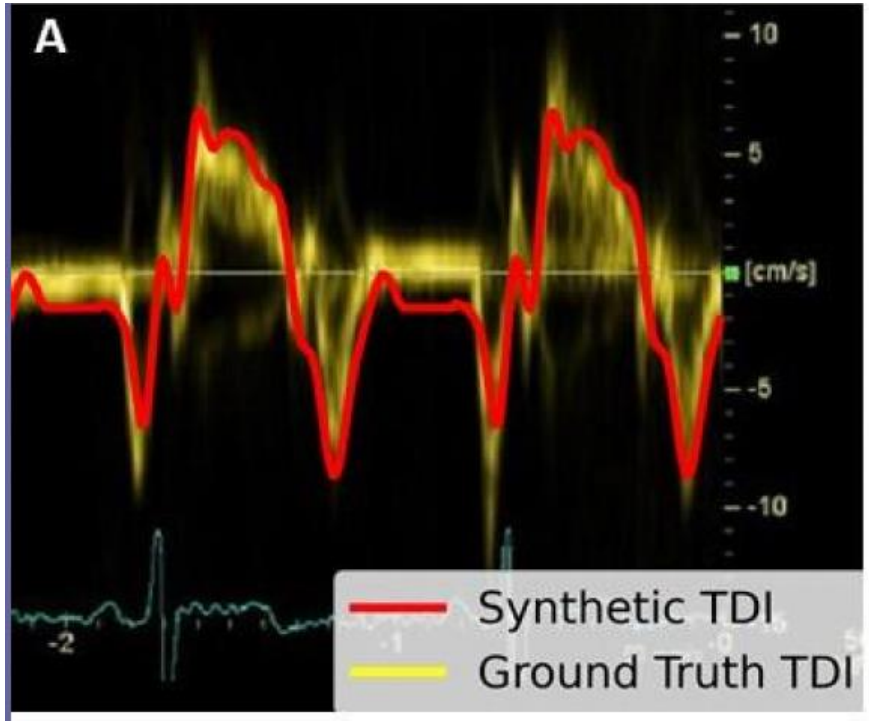
The Future: The Digital Twin



RE: Abstract Number 24-A-1164-ASE

Dear Aditya Radhakrishnan, Other,

Congratulations! The American Society of Echocardiography (ASE) invites you to join us in Portland, Oregon on June 14-16, for the 35th Annual ASE Scientific Sessions. Your abstract entitled "**Clinical Evaluation of Left Ventricular Tissue Doppler Waveform Developed as a Digital Twin from Surface ECG**" has been accepted as one of four finalists in the **2024 Arthur E. Weyman Young Investigator's Award Competition.** This annual competition is supported by the National Board of Echocardiography in honor of their first President, Dr. Arthur E. Weyman, FASE.



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Expert Site

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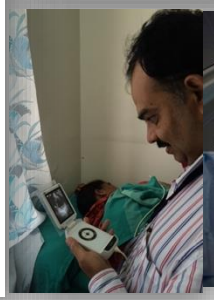
Let us picture the future

Installation of a Clinical Robotic Tele-Ultrasound System.

First in the US!

Screening: Smart Clinics



SPECIAL ARTICLE: THE ASE-REWARD STUDY

American Society of Echocardiography: Remote Echocardiography with Web-Based Assessments for Referrals at a Distance (ASE-REWARD) Study

Shanemeet Singh, MBBS, Manish Bansal, MD, FASE, Puneet Maheshwari, MD, David Adams, RCS, RDCS, FASE, Shantanu P. Sengupta, MD, FASE, Rhonda Price, BS, LeaAnne Dantin, FASE, Mark Smith, MSME, Ravi R. Kasliwal, MD, Patricia A. Pellikka, MD, FASE, James D. Thomas, MD, FASE, Jagat Narula, MD, and Partho P. Sengupta, MD, for the ASE-REWARD Study Investigators, *Sirsa, Gurgaon, and Nagpur, India; Durham and Raleigh, North Carolina; Morrisville, North Carolina; Milwaukee, Wisconsin; Rochester, Minnesota; Cleveland, Ohio; New York, New York*

A Randomized Trial of Pocket-Echocardiography Integrated Mobile Health Device Assessments in Modern Structural Heart Disease Clinics

Sanjeev P. Bhavnani, MD,[a] Srikanth Sola, MD,[b] David Adams, RCS, RDCS,[c] Ashwin Venkateshvaran, PhD,[b] P.K. Dash, MD,[b] Partho P. Sengupta, MD, DM,[d] for the ASEF-VALUES Investigators

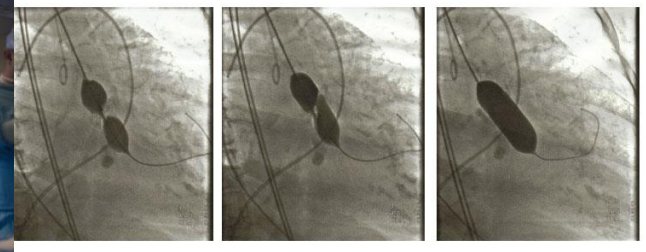
ABSTRACT

OBJECTIVES This study sought to determine whether mobile health (mHealth) device assessments used as clinical decision support tools at the point-of-care can reduce the time to treatment and improve long-term outcomes among patients with rheumatic and structural heart diseases (SHD).

BACKGROUND Newly developed smartphone-connected mHealth devices represent promising methods to diagnose common diseases in resource-limited areas; however, the impact of technology-based assessments has not been rigorously evaluated.

METHODS A total of 253 patients with SHD were randomized to an initial diagnostic strategy of mHealth clinics (n = 139) or to standard-care (n = 114) in India. mHealth clinics were equipped with tools including pocket-echocardiography, smartphone-connected-electrocardiogram blood pressure measurements, activity monitoring, and portable brain natriuretic peptide laboratory testing. All patients underwent comprehensive transthoracic echocardiography to assess the severity of SHD. The primary endpoint was referral for therapy with percutaneous valvuloplasty or surgical valve replacement. Secondary endpoints included probability of a cardiovascular hospitalization and/or death over 1-year.

RESULTS An initial mHealth assessment was associated with a shorter time to referral for valve replacement (83 ± 79 days vs. 180 ± 101 days, p <0.001) and was associated with an increased probability for



Innovation & Beyond

Community based Cardiac Screening Events

Leverage modern innovations to advance cardiac health, enhance preventive care, and foster community well-being.

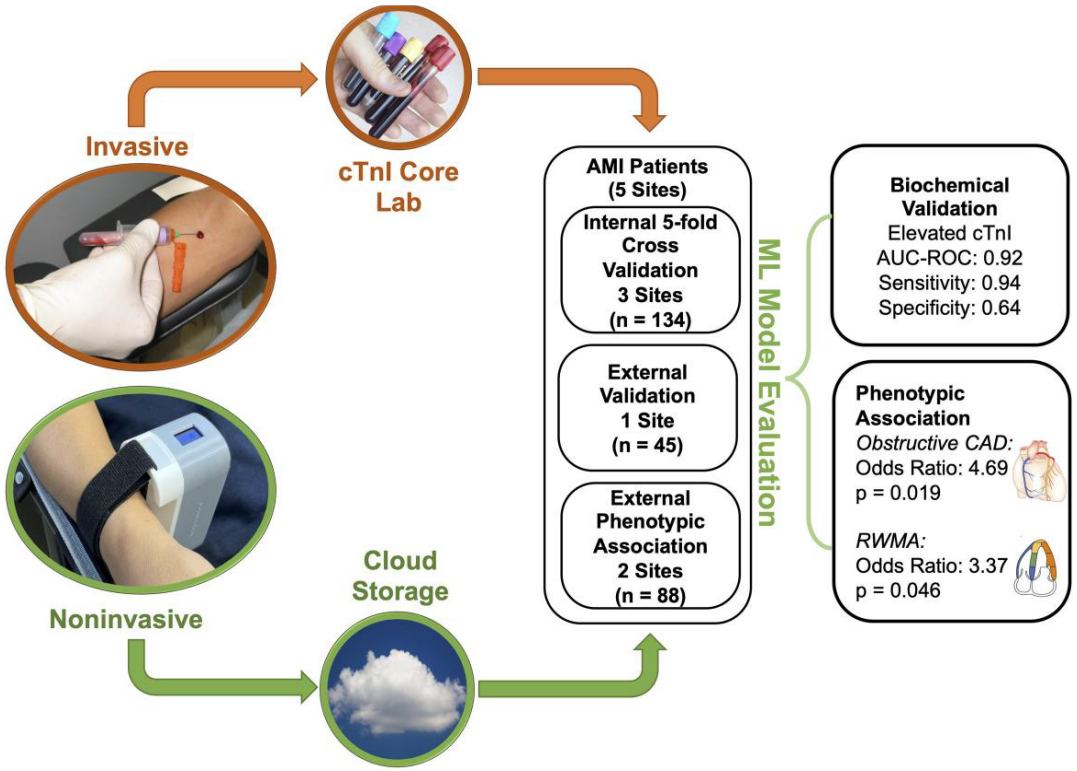
ESC European Society of Cardiology
European Heart Journal - Digital Health (2023) **00**, 1–10
https://doi.org/10.1093/ehjdh/ztad015

ORIGINAL ARTICLE
Digital health – other

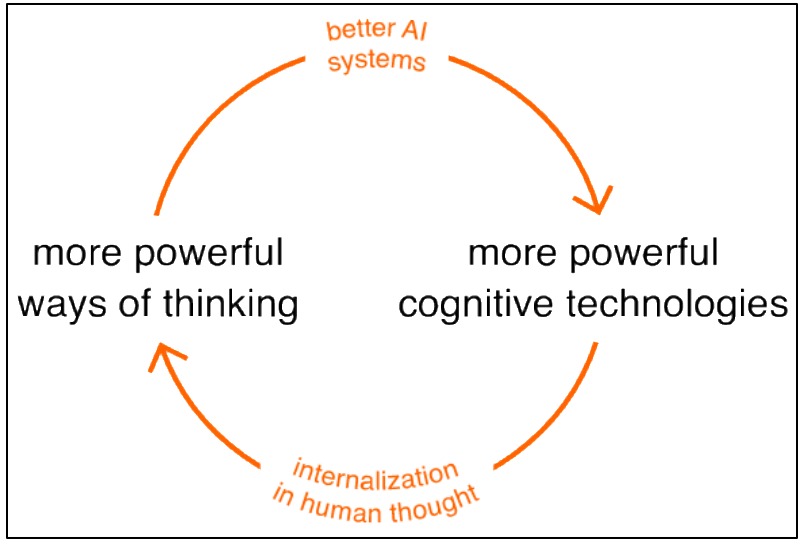
A novel breakthrough in wrist-worn transdermal troponin-I-sensor assessment for acute myocardial infarction

Shantanu Sengupta [1], Siddharth Biswal[2], Jitto Titus[2], Atandra Burman[2], Keshav Reddy[3], Mahesh C. Fulwani[4], Aziz Khan[5], Niteen Deshpande[6], Smit Shrivastava[7], Naveena Yanamala[3], and Partho P. Sengupta[3,*]

[1]Sengupta Hospital and Research Institute, Nagpur- 440033, Vidarbha (Dist), India; [2]RCE Technologies, 2292 Faraday Avenue, Carlsbad, CA 92008, USA; [3]Division of Cardiovascular Disease and Hypertension, Rutgers-RobertWood Johnson Medical School, 125 Patterson St, New Brunswick, NJ 08901, USA; [4]Shrikrishna Hrudayalay and Critical Care Center



Augmented Physicians



Future Physician: Augmented Physicians Embracing New Tools of Inquiry to Improve Efficiency, Fight Burnout, & Elevate Joy in Medicine

https://www.planning.org/blog/9269515/augmented-planners-in-an-era-of-generative-ai/

New Jersey's Life Sciences Trade Association

BioNJ

Because Patients Can't Wait®

LIFE SCIENCES INNOVATION

New Jersey's history of life sciences excellence at a glance

Birthplace of immunology

Home to the cure for Hepatitis-C

1st ever CAR-T cell therapy

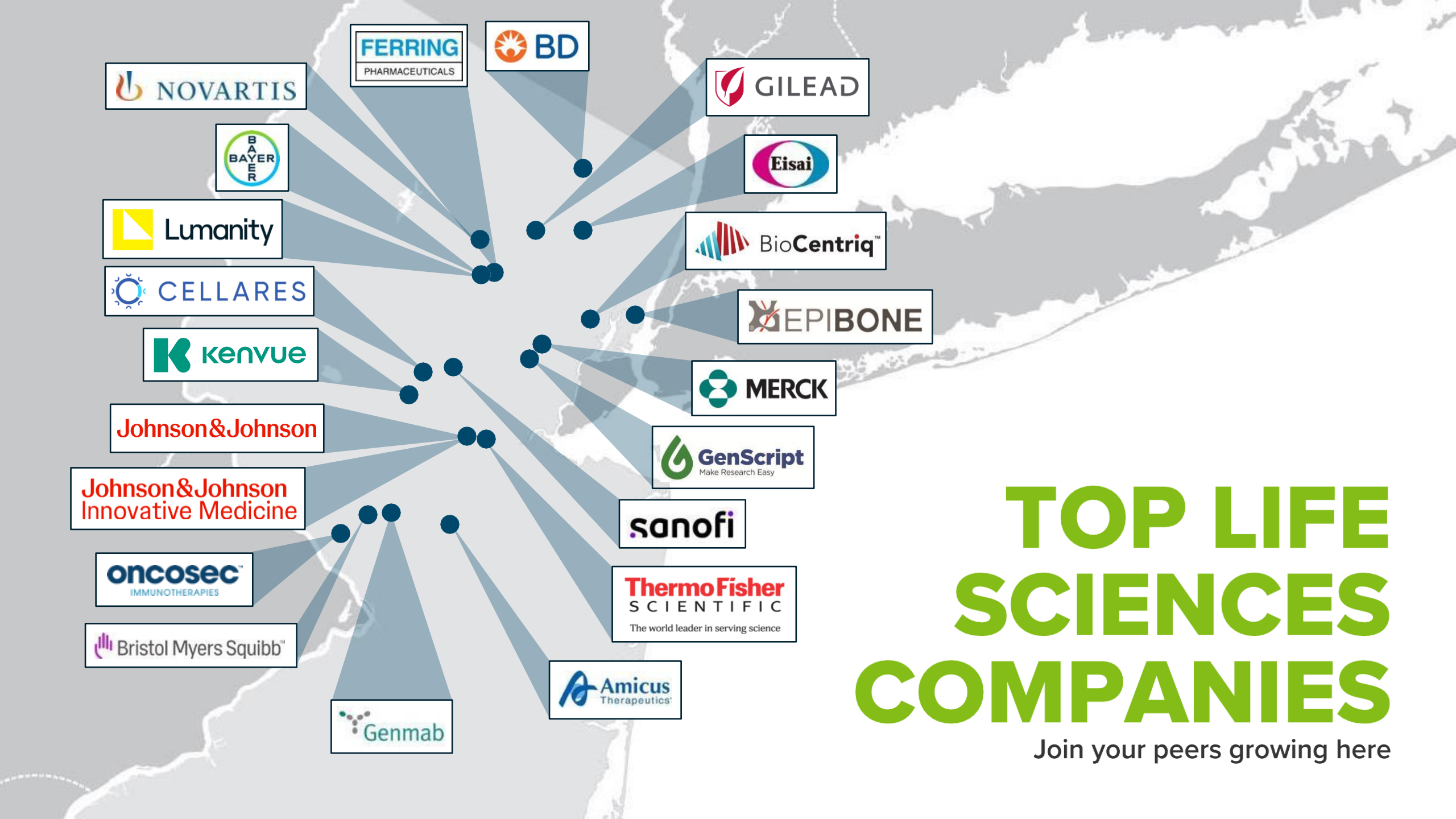
1st FDA-approved 3D-printed drug

1st FDA-approved digital medicine system

A Life Sciences Powerhouse

New Jersey's thriving life sciences ecosystem includes research universities, incubators, accelerators, funding sources and top-notch talent.

- More than 50% of FDA drug approvals in 2023 came from companies with a footprint in NJ
- Nearly 5,600 biopharma establishments, including 8 out of the top 10 global pharma companies and 9 out of the top 10 R&D companies
- 180 FDA-registered biopharma manufacturing facilities (leading the nation!)
- 40% of all cell and gene therapies in development are being done in New Jersey region
- Outstanding pool of talent from early-stage innovators to marketing and commercialization experts
- World's highest concentration of scientists and engineers
- New Jersey's manufacturing workforce ranks #2 in the country
- Home to elite research universities – including 63 academic institutions
- Medical devices & equipment establishments have grown by 21.4% relative to 2018


FERRING PHARMACEUTICALS
BD
NOVARTIS
GILEAD
BAYER
Eisai
Lumanity
BioCentriq
CELLARES
EPIBONE
kenvue
MERCK
Johnson&Johnson
GenScript
Make Research Easy
Johnson&Johnson
Innovative Medicine
sanofi
oncosec
IMMUNOTHERAPIES
ThermoFisher
SCIENTIFIC
The world leader in serving science
Bristol Myers Squibb
Amicus
Therapeutics
Genmab
TOP LIFE SCIENCES COMPANIES
Join your peers growing here

Unique Incentives

ANGEL INVESTOR TAX CREDIT PROGRAM

Provides refundable tax credits for up to 20% of qualified investment in an emerging technology business with a physical presence in New Jersey that conducts research, manufacturing, or technology commercialization.

EMERGE PROGRAM

Provides per-job tax credits to projects that invest private capital into the State and create new or retain good-paying jobs. Projects are eligible for $500-$4,000 per job – and up to $8,000 with bonuses – depending on location and other aspects of the project.

NJ INNOVATION EVERGREEN FUND

Secures funding and strategic support from the sale of State corporate tax credits in a competitive auction, which is later matched and managed by professional venture capital firms and invested into high-growth, early-stage start-up businesses across the State.

MANUFACTURING VOUCHER PROGRAM (MVP)

New Jersey Manufacturing Voucher Program provides equipment grants sized at 30%-50% of the cost of the eligible equipment (including installation) up to a maximum award of $250,000. It assists manufacturers who purchase equipment that integrates advanced or innovative technologies, processes, and materials.

TECHNOLOGY BUSINESS TAX CERTIFICATE TRANSFER (NOL)

The Technology Business Tax Certificate Transfer (NOL) program enables qualified, unprofitable New Jersey-based technology or biotechnology companies with fewer than 225 U.S. employees to sell a percentage of net operating losses (NOL) and research and development tax credits to unrelated profitable corporations.

NJCSIT GRANTS

The Commission on Science, Innovation, and Technology Grants propels New Jersey's early-stage technology R&D, life sciences, and maternal and infant health companies. Eligible applicants can apply for vouchers up to $40,000 to help offset the cost of leveraging R&D resources, facilities, and equipment at the state's academic universities and colleges, and federal and non-profit laboratories to advance their technology development.

*2024 Life Sciences Research Report

The Life Sciences Trade Association for New Jersey

Mission

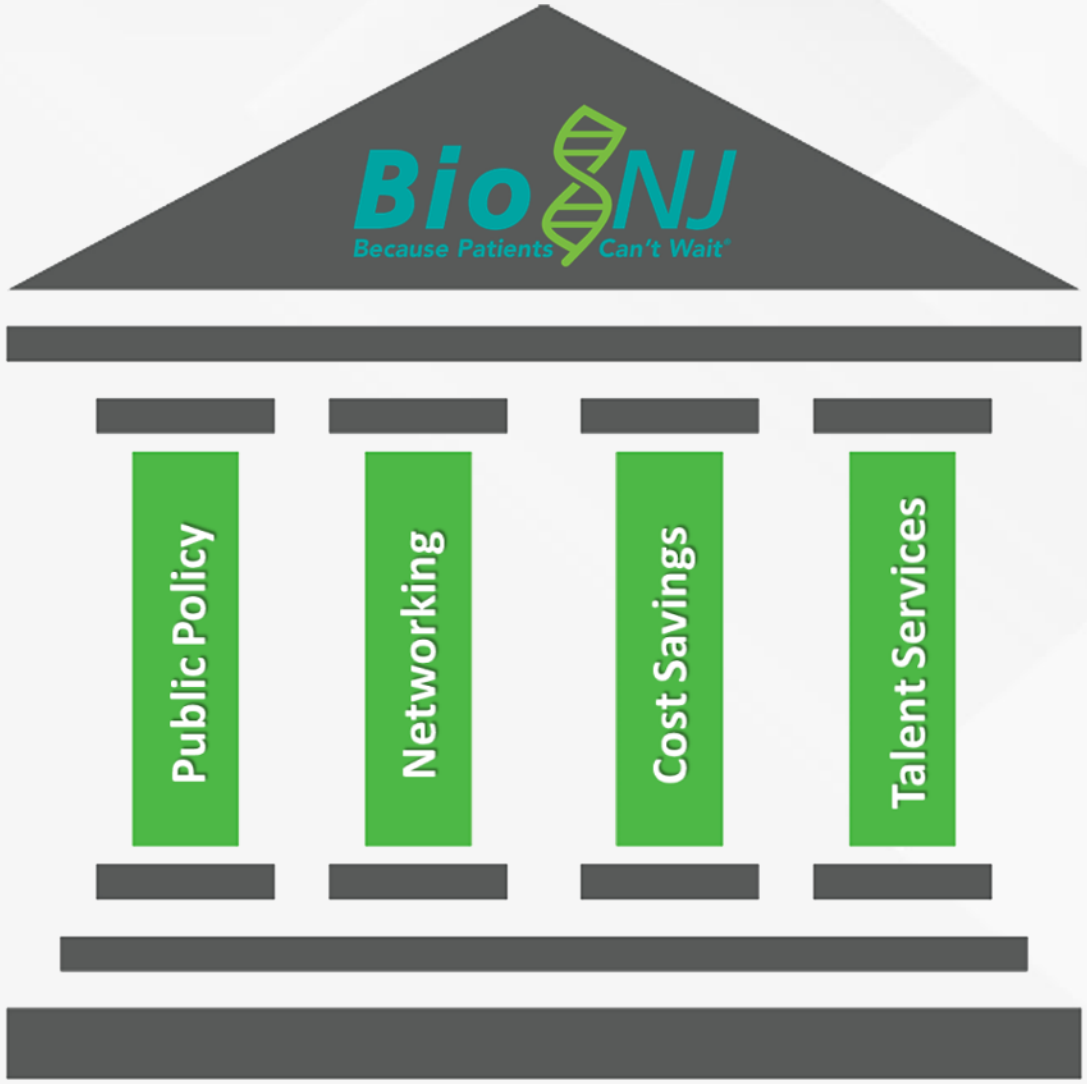
OUR MISSION

To propel the New Jersey biotechnology industry forward in support of Patients - Because Patients Can't Wait®

OUR VISION

BioNJ is dedicated to propelling a vibrant ecosystem where Science is Supported, Companies are Created, Drugs are Developed and Patients are Paramount.

Pillars


BioNJ
Because Patients Can't Wait
Public Policy
Networking
Cost Savings
Talent Services

The Many Benefits of BioNJ Membership

BioNJ
Because Patients Can't Wait®

Helping Our Members Help Patients

As New Jersey's life sciences trade association, BioNJ Members represent the full life sciences ecosystem from research-based innovator companies, academics and Patient advocacy groups to economic development organizations and service providers.

Public Policy/Advocacy

BioNJ advocates in both Trenton and Washington D.C. to ensure that government fosters medical innovation and Patient access.

- Drug Pricing Proposals
- Pharmacy Benefit Managers
- Step Therapy
- Inflation Reduction Act

Education/Networking

BioNJ acts as a conduit for idea sharing, learning, collaboration and mentorship through its many networking and educational programs.

- Connections
- Committees
- Conferences
- Thought Leadership

Deep Cost Savings

BioNJ provides deep savings through our Purchasing Consortium so Member companies can preserve their working capital.

BioNJ Members SAVED nearly $20 MILLION on Fisher Scientific products and services alone over the last two years!

Extended Marketing Arm

BioNJ offers a platform to showcase your science, services and thought leadership to a broad network.

- *The Weekender*
- Social Media
- Speaking Opportunities
- Media Coverage

Talent Services

BioNJ helps companies access the employees they need to ensure that New Jersey's life sciences ecosystem has the talent needed to drive medical innovation forward.

BioNJTalentNetwork.org
The go-to resource for life sciences professionals in the tri-state area.

Entrepreneur Resources

BioNJ works hard to ensure that entrepreneurs have the tools they need to flourish, from capital and State incentives to incubator workspaces.

- BioPartnering Conference
- Intros to investors/partners
- Mentoring/coaching
- Visibility

For more information on BioNJ Membership, please contact Cheri Hennessy at CHennessy@BioNJ.org or call 609 890 3185.

BioPartnering Conference

BioNJ ENTREPRENEURS

FIFTEENTH ANNUAL BIOPARTNERING CONFERENCE

TOGETHER. FORWARD.

Co-Sponsored by

J.P.Morgan | Morgan Lewis

Save the Date!

May 13, 2025

Liberty Science Center
Jersey City, NJ

Connecting Innovators, Investors, and Industry

- 1:1 Partnering
- Panels and presentations
- Company / Startup Pitches
- Industry Connections – Office hours with biopharma companies
- Networking throughout the day
- 500+ attendees

- Apply to present: **January 13, 2025**

AI & Digital Health Day

2024 Conference:

November 18, 2024

Stevens Institute of Technology

Hoboken

- **2nd Annual AI & Digital Health Day**
- **Title Sponsors:** Morgan Stanley, DLA Piper
- Full day in-person event featuring:
  - **Lightning Pitches** from 18 innovative companies
  - **Panel discussions**: Getting started with AI, accelerating innovation and commercialization
  - **Help Desks** – NJEDA, Tech Council Ventures, Payor, Provider, Legal, Finance/Banking
  - **Networking** reception
  - 150+ attendees

A Robust Calendar of Events

Including signature programs, such as BioNJ's…

- **Annual Dinner Meeting & Innovation Celebration –** The industry's kickoff event of the year
- **BioPartnering Conference –** Facilitates collaborations, partnerships and investment opportunities
- **AI & Digital Health Day –** Highlights emerging trends, provides access to investors, thought leaders and experts and addresses challenges faced as entrepreneurs create innovative AI and digital health solutions
- **HR Conference –** Bringing together New Jersey's life sciences HR leaders and professionals
- **Manufacturing Briefing –** Engaging discussions with industry thought leaders on timely topics and emerging trends around biomedical manufacturing
- **C-Suite Summit –** Bringing together high-level, world-class leaders within the industry to share their guidance and wisdom
- **Patient Advocacy Summit –** Patients, advocates, caregivers and R&D professionals come together for a morning of Education, Engagement and Empowerment
- **Inspiring Women in STEM Conference –** Designed for women (*and men*) involved in all aspects of STEM to learn from one another
- **Plus, numerous forums, briefings and webinars!**

Entrepreneurs Exchange

- Quarterly meetings for founders and entrepreneurs
- Virtual meeting to share ideas, challenges and resources
- Presentations from experts on request
- **2 in-person networking events** per year
- **Request an invitation: https://tinyurl.com/2wcptksn**

Find other resources for BioNJ Entrepreneurs:

https://bionj.org/bionj-entrepreneurs-overview/

Entrepreneurs Exchange

BioNJ ENTREPRENEURS

Meet the Investors

Hackensack Meridian Health

Working with Healthcare Providers

Merck BD&L

Partnering with Large BioPharma

Andrew Latham, Ph.D.
Business Development & Licensing
Merck & Co.

- Interactive sessions with industry experts
- Access to valuable resources

BioNJ's Entrepreneurs Website!
Featuring resources, events and news for entrepreneurs!

Check it out at www.BioNJ.org/Entrepreneurs!

Including a Brand-New Entrepreneur Membership Package for Early-Stage Entrepreneurs!

Increase Your Purchasing Power & Your Working Capital Through BioNJ's Purchasing Consortium

www.BioNJ.org/Purchasing-Consortium


BioNJ
Connecting Top Talent with
Leading Life Sciences Companies In New Jersey
Featured Companies
SAMPLED
BeiGene
Looking for Quality Talent?
Look No Further Than
BioNJ's Career Portal.
www.BioNJTalentNetwork.org

Thank You

BioNJ

Because Patients Can't Wait®

www.BioNJ.org

NJ Life Science Overview

November 2024

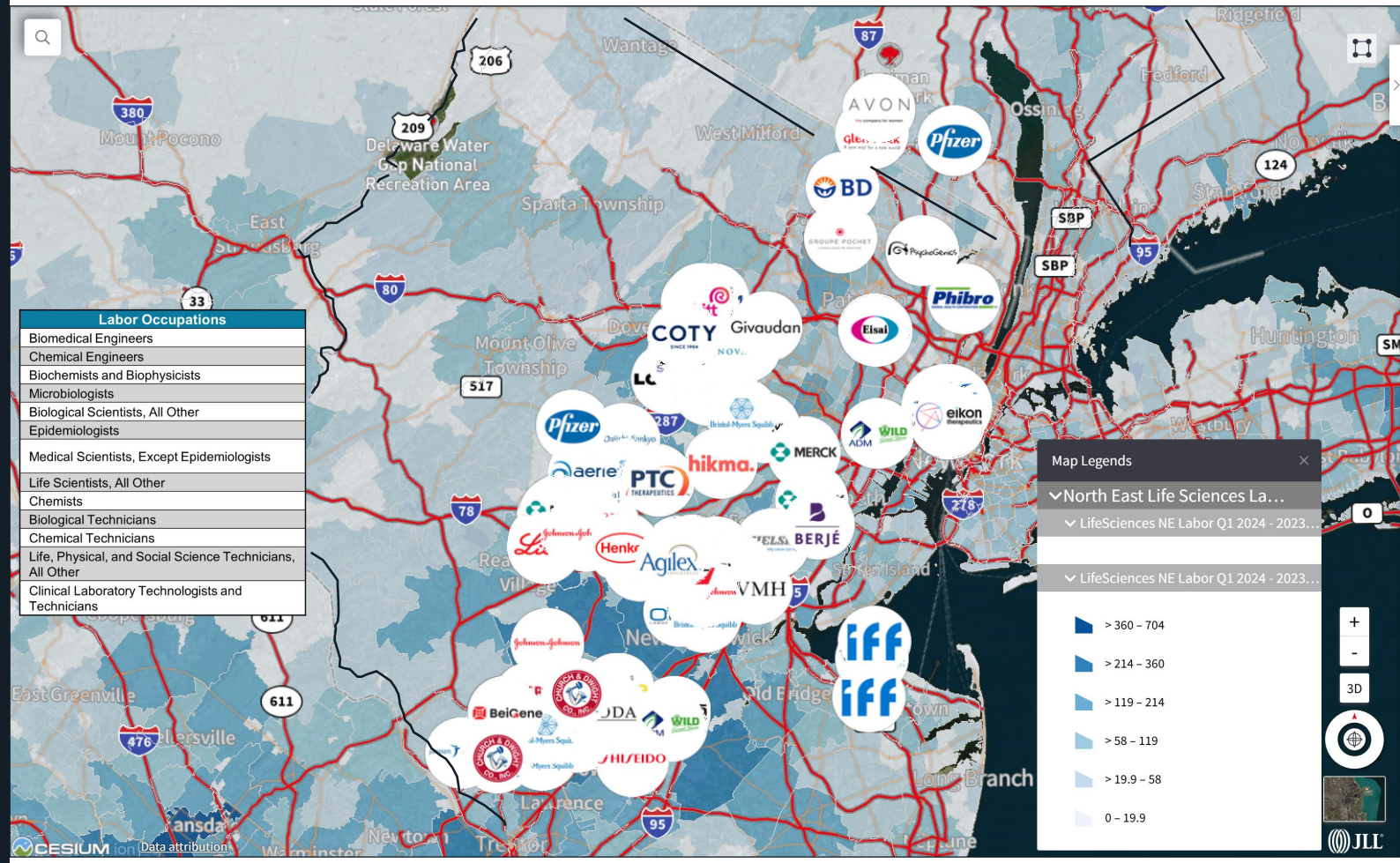
JLL SEE A BRIGHTER WAY

Talent concentration

Talent concentration with NJ based LS and Consumer Product companies

Life science & consumer product companies

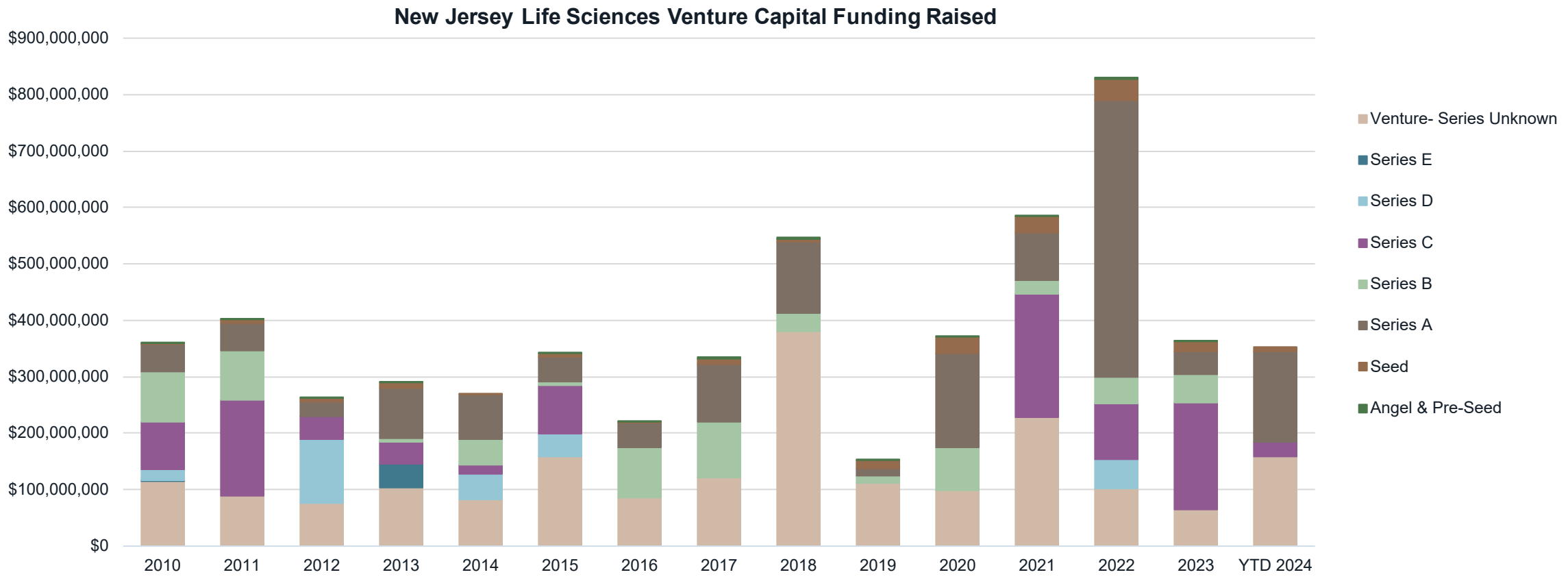
- Beckton Dickinson
- Glenmark
- Psycho Genesis
- Eisai
- Cambrex
- Modern Meadow
- Teva
- Ferring Pharmaceuticals
- DSM
- Pacira
- Zoetis
- Gilead
- Alovgen
- Bayer
- Shinogi
- Cellularity
- Pfizer
- Abbvie
- Merck
- Leo Pharma
- Lonza
- Hikma
- Bristol Myers Squibb
- Helsinn
- Actavis
- Mitsubishi Tanabe Pharma
- Organon
- Biolabs NYU Langone
- Mispro
- Lilly
- Pfizer
- Kadmon
- NYU Langone Health
- Amneal
- Pfizer
- Daiichi-Sankyo
- Ipsen
- Aurobindo
- GSK
- Sanofi
- Ethicon
- Amarin Corporation
- Jansen
- Johnson & Johnson
- Ortho Clinical Diagnostics
- Roche
- Lilly
- Advaxis
- Sandoz
- Firmenich
- Novo Nordisk
- WuXi
- Bioclinica
- Otsuka
- Akros Pharma
- Aurobindo
- BMS
- Prevail
- Cellectis
- Alexandria Launch Labs
- Astra Zeneca
- Mallinckrodt
- Janssen



Northeast Corridor Rail Line

Lab demand driver #1: Funding

More than $353 million of VC funding poured into New Jersey's life sciences industry during 1H 2024, with nearly 50% of capital raised in the Series A stage

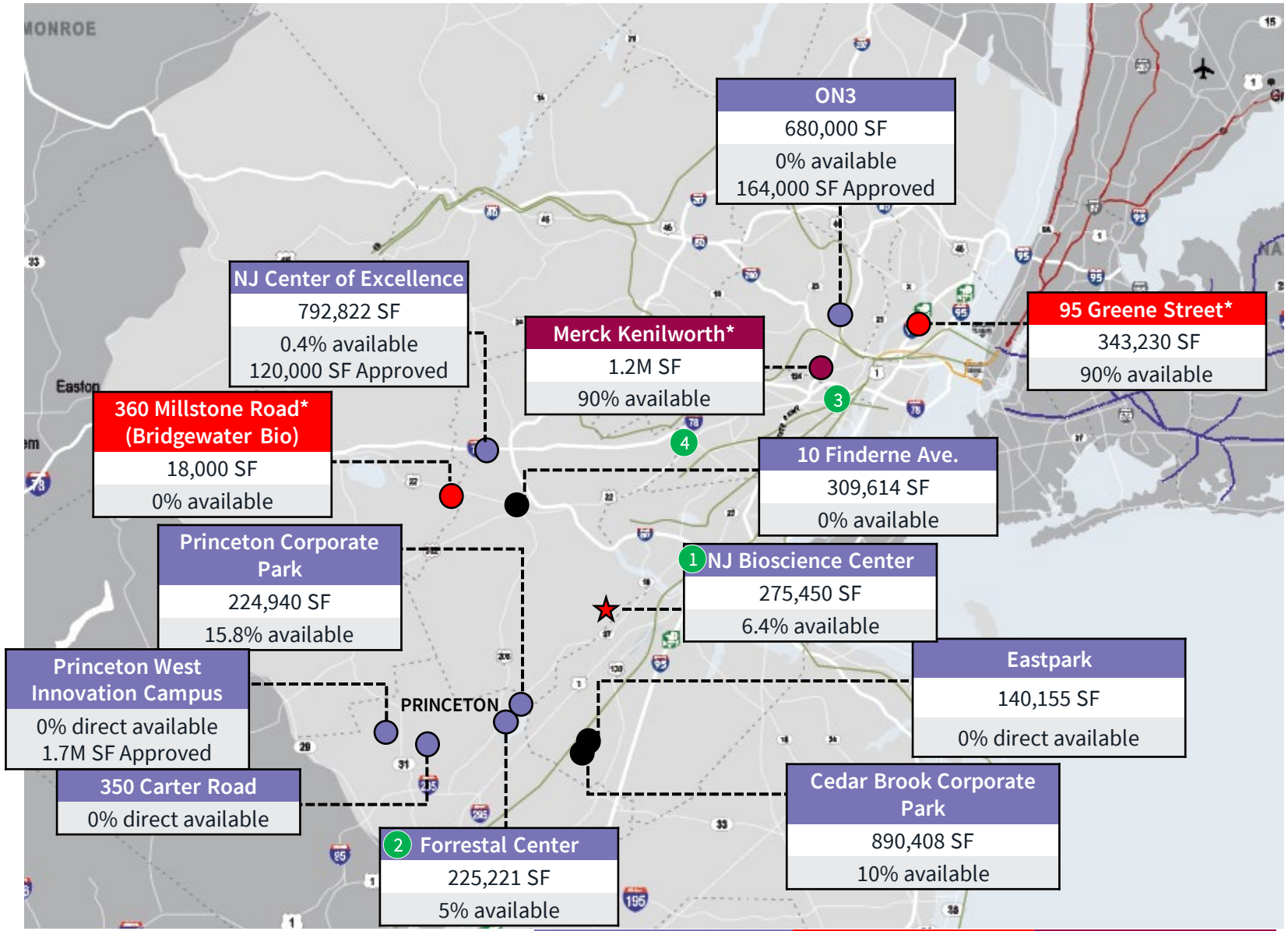


Source: Crunchbase

Section 2

Cluster map and stats

Incubators, multi-tenant R&D campuses & manufacturing clusters



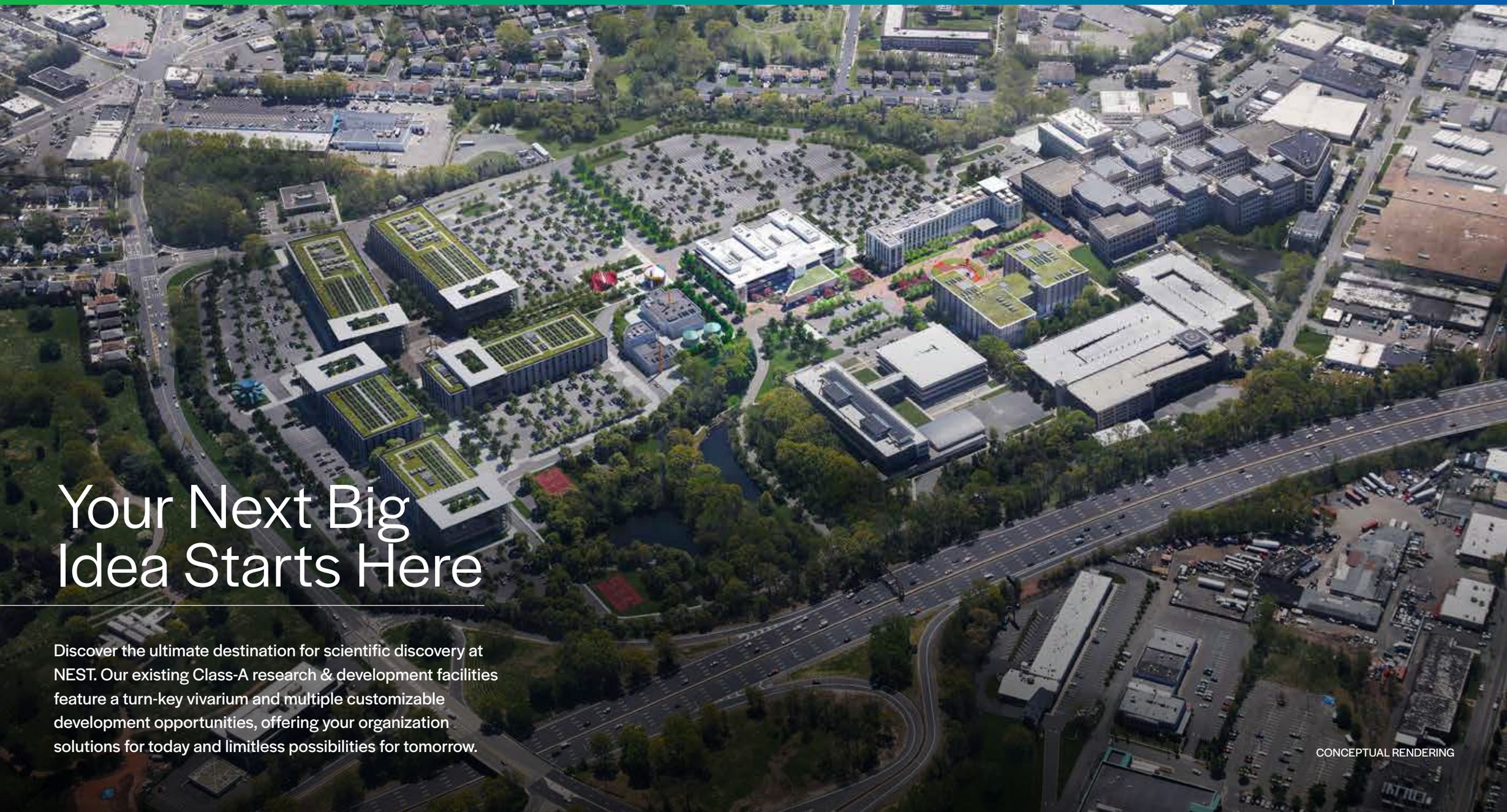
% Available is for laboratory space / excludes office or flex available

Multi-tenant R&D campuses | Lab ready buildings | Coming to market

	Market Size (SF)	Direct Available SF	Direct Vacancy Rate
Central NJ	6,666,425	830,394	12.5%
Northern NJ	1,894,125	450,368	23.8%
Leased inventory			
Note - 139 FDA licensed Biopharma MFG facilities, most in US (Primarily owned)			

EXISTING INCUBATORS

No.	Address	Availability/Notes
1	NJ Bioscience Center 685 Route 1, North Brunswick	• Small incubator availabilities only • Accelerator is fully leased
2	Princeton BioLabs 303 College Road East, Princeton	• Open office & general lab availabilities only
3	Institute of Life Science & Entrepreneurship 1085 Morris Avenue, Union	• 15,000 SF fully occupied
4	Incubation & Collaboration Center Off of Route 78, Summit	• 16,000 SF office and lab facility within BMS Summit West campus • Rigorous application process required • Legacy Celgene initiative



Your Next Big Idea Starts Here

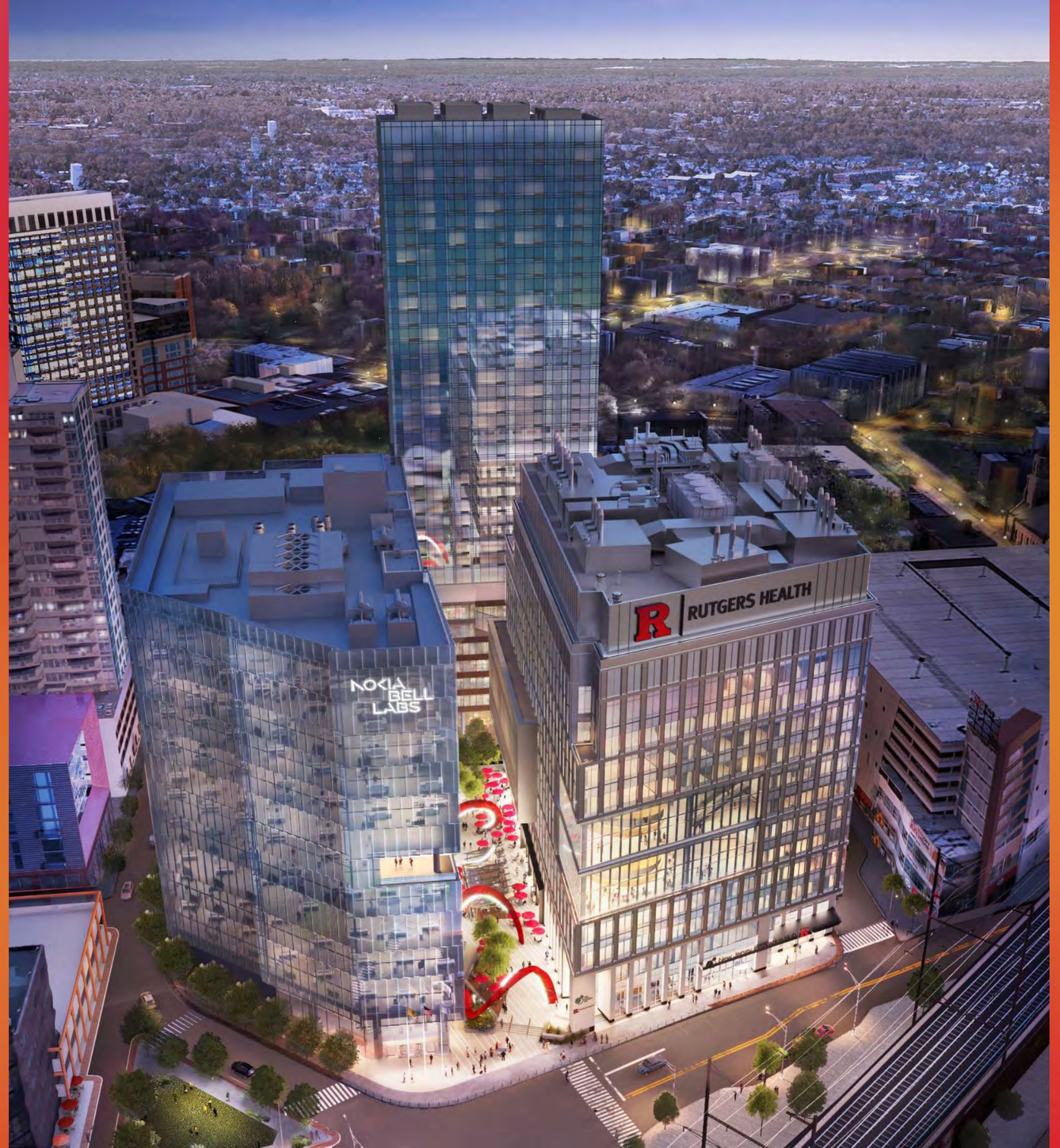
Discover the ultimate destination for scientific discovery at NEST. Our existing Class-A research & development facilities feature a turn-key vivarium and multiple customizable development opportunities, offering your organization solutions for today and limitless possibilities for tomorrow.

CONCEPTUAL RENDERING

HELIX NJ

Health +
Life Science
Exchange

New
Jersey
Innovation
Hub™



6,785
Parking spaces within ¼ mile

172
Shopping & Services

83
Restaurants

17
Bars & Taverns

8
Hotels & Conference Centers

5
Entertainment Venues

NEW BRUNSWICK


ALBANY STREET
ALBANY STREET
ALBANY STREET
H-1
H-2
Nokia
Bell Labs
H-3
Future Building
KIRKPATRICK STREET
SPRING STREET
NELSON STREET
PATERSON STREET
PATERSON STREET

SITE PLAN

H-1

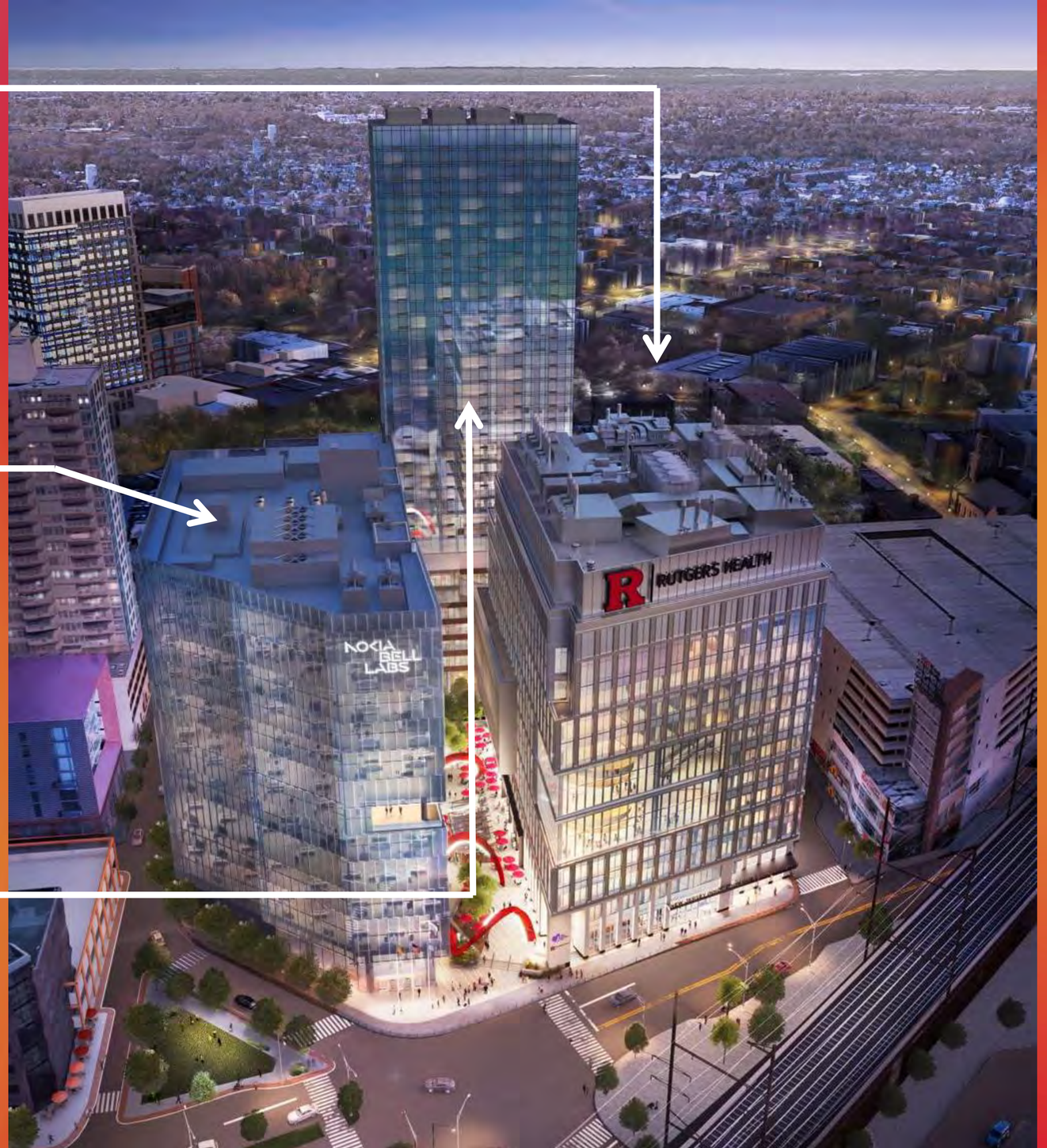
Home to the New Jersey Innovation Hub, Rutgers Health's Translational Research, and the Rutgers School of Medicine, with additional key partners such as RWJBarnabas Health, Hackensack Meridian Health, Johnson & Johnson, New Jersey Economic Development Authority, Middlesex County and multiple international universities.

H-2

The Nokia Bell Labs new R&D facility opening in 2028 will consist of 380,000 square feet for their continued pursuit of new technologies such as 6G connectivity, industrial automation, artificial intelligence, photonics, quantum computing, and much more.

H-3

The vision for H-3 is to be a complementary component and catalyst to the overall district. The plan for H-3 will consider expanding existing HELIX NJ infrastructure and introducing new features. These considerations will include laboratories, office/workspaces, new venues, retail environments, residential units, and more.



H-1 STACKING PLAN

MECHANICAL

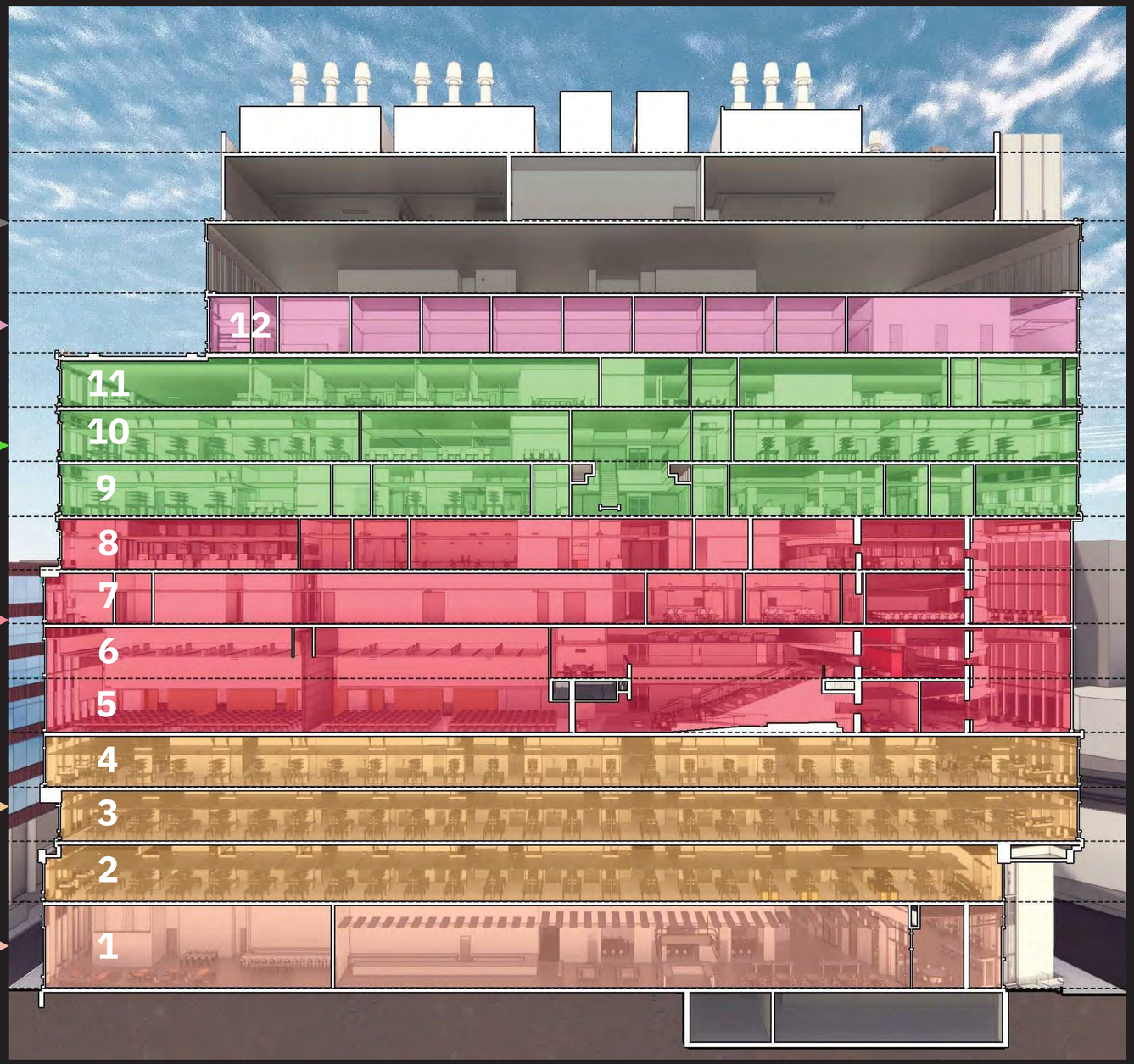
VIVARIUM

NJ INNOVATION HUB

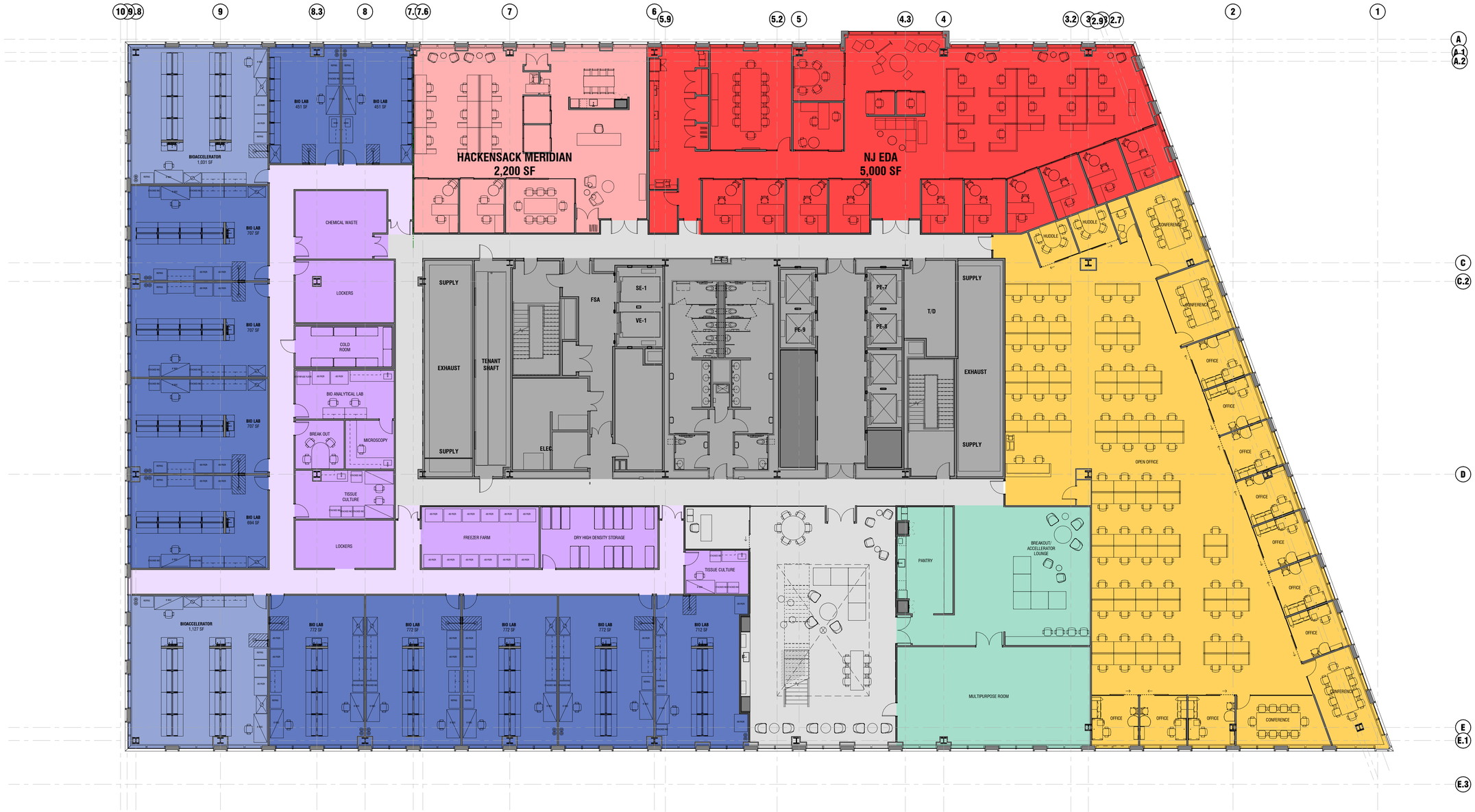
RUTGERS MEDICAL SCHOOL

RUTGERS TRANSLATIONAL RESEARCH

MARKET HALL, RESTAURANT & MAKER SPACE



9TH FLOOR INNOVATION HUB
COLLABORATIVE SPACE



Wet Lab / Support Summary			
Wet Lab Benches (60" x 30")	112		
Equipment Count		Support Space Count	
Biosafety Cabinets	19	Tissue Culture	2
Freezers	37	Storage Rooms	2
Incubators	23	Cold Storage/Freezer Rooms	2
Sinks	19	Microscopy	1
Fume Hoods	15	Bioanalytical Lab	1

Office / Dry Lab Summary	
Space Count	
Desks	80
Conference Room Seats	37
Private Offices	10

0 4 8 16 32 FT N

New Jersey Innovation HUB — Ninth Floor

Wet Lab / Support Summary				Office / Dry Lab Summary	
Wet Lab Benches (60" x 30")	202				
Equipment Count		Support Space Count		Space Count	
Biosafety Cabinets	12	Tissue Culture	8	Private Offices	7
Freezers	32	Flex Room	4	Workstations	90
Incubators	24	Receiving / Lab Support	5	Conference Room Seats	33
Sinks	13	Storage	5		
Fume Hoods	6	Imaging	1		

0 4 8 16 32 FT N

New Jersey Innovation HUB - Tenth Floor

Section 3

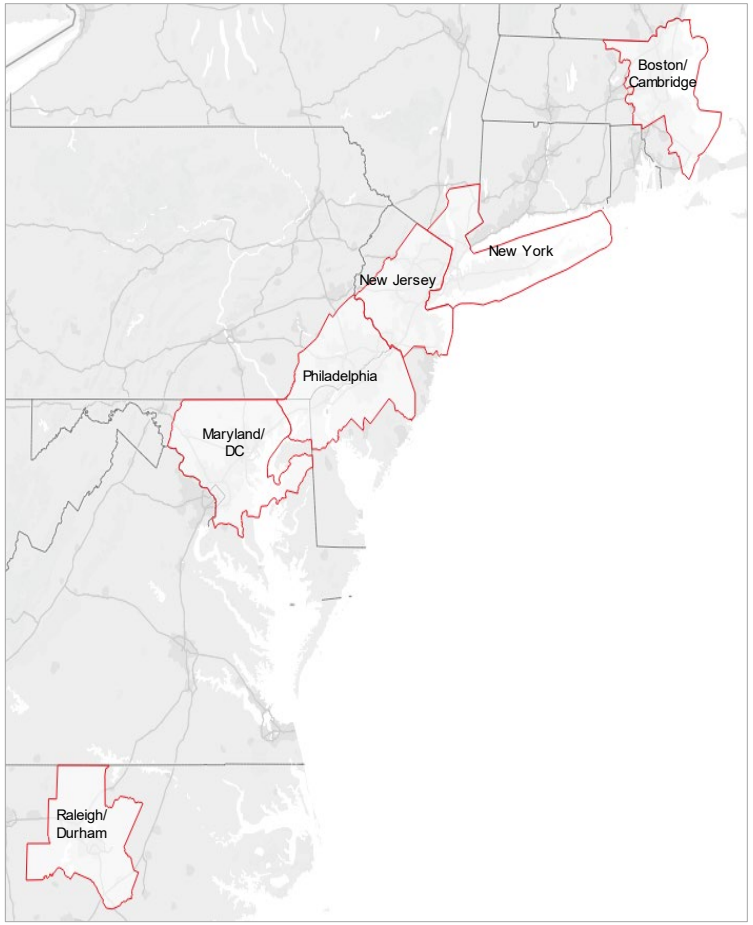
Northeast Life Sciences Corridor

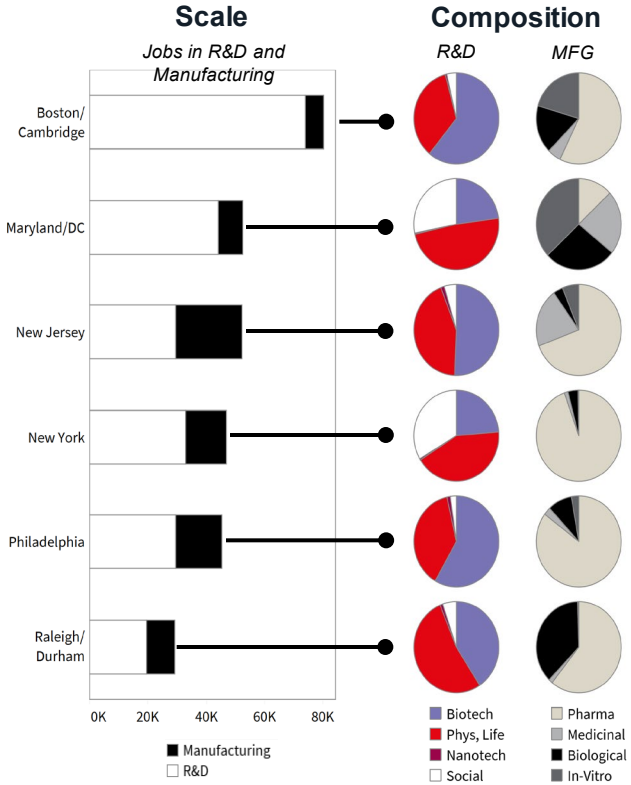
Northeast life science labor and incentives

R&D and Manufacturing functions

The scale and composition of Research & Development and Life Science related Manufacturing positions across multiple markets show that there is an abundance of talent and a relatively comparable sized labor pool from Maryland north to Manhattan. Boston/Cambridge is leading the way and Raleigh/Durham has experienced tremendous growth in recent years. All markets provide the general talent depth and experience levels to scale which allows for them to be considered and contrasted on other metrics.

Strongest East Coast Life Science Markets



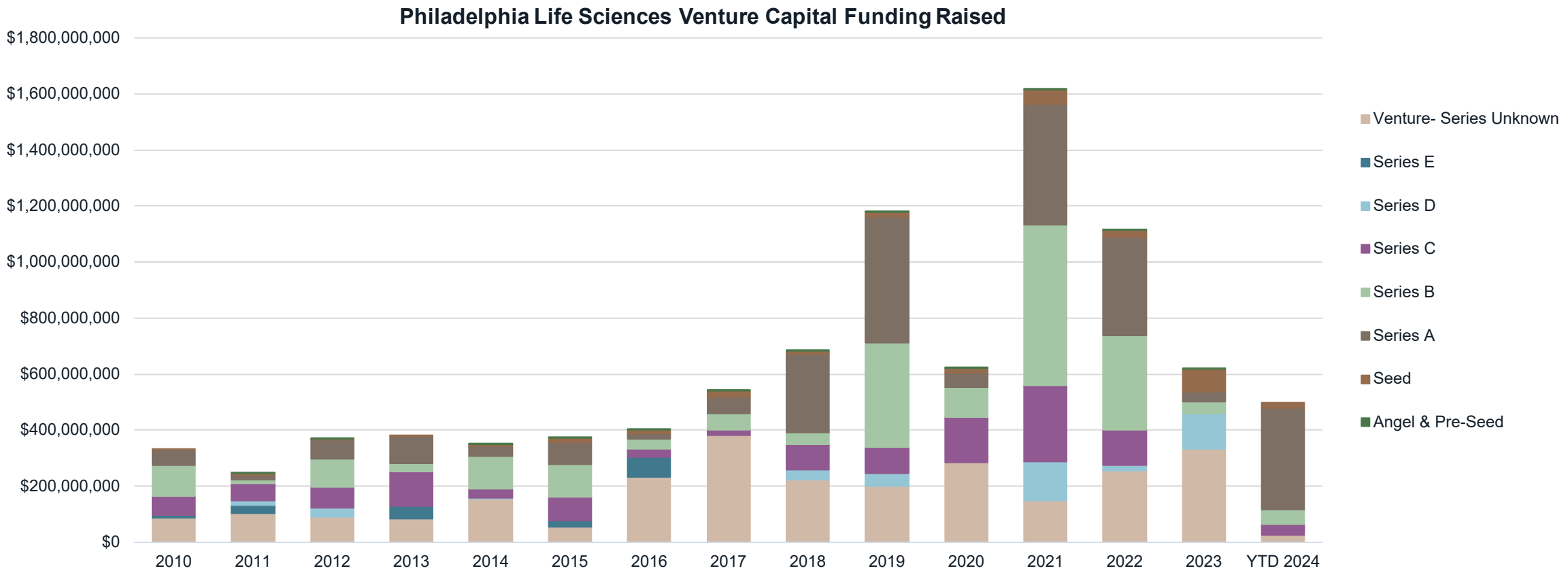


	Cost*		Pop. (000s)	
Location	Average Salary	Index (US=100)	w/ Bachelor's	Graduate+
Boston/ Cambridge	$108,094	114	793	688
Maryland/DC	$109,399	116	907	849
New Jersey	$105,824	112	1,087	727
New York	$108,891	115	1,925	1,460
Philadelphia	$101,229	107	920	632
Raleigh-Durham	$98,634	104	385	258

** Includes Bioprocess Engineers, Bioprocess Scientists, Biochemical Engineers, and Bioinformatics Engineers*

Lab demand driver #1: Funding

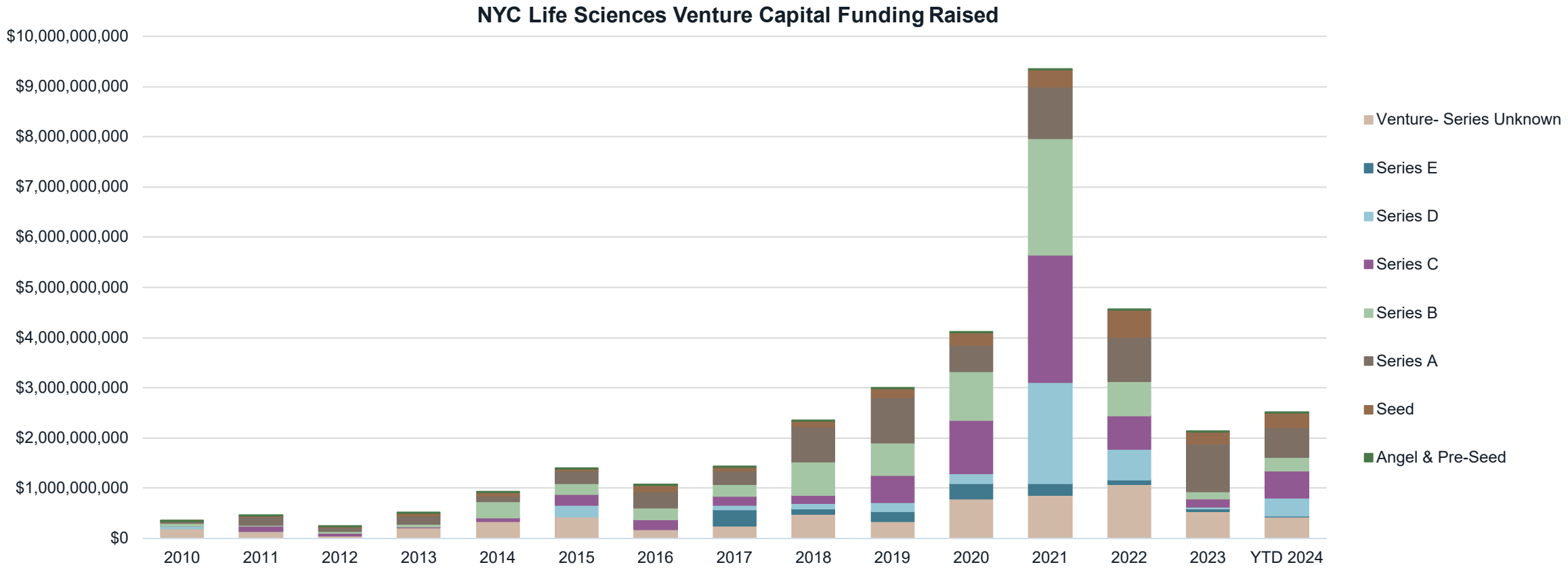
Nearly $500 million of VC funding was invested in Philadelphia's life sciences industry during 1H 2024, with nearly 3/4 of capital raised in the Series A stage



Source: Crunchbase

Lab demand driver #1: Funding

More than $2.5 billion of VC funding poured into the NYC's sciences industry during 1H 2024, which rivaled the $2.1 billion in funding raised during all of 2023

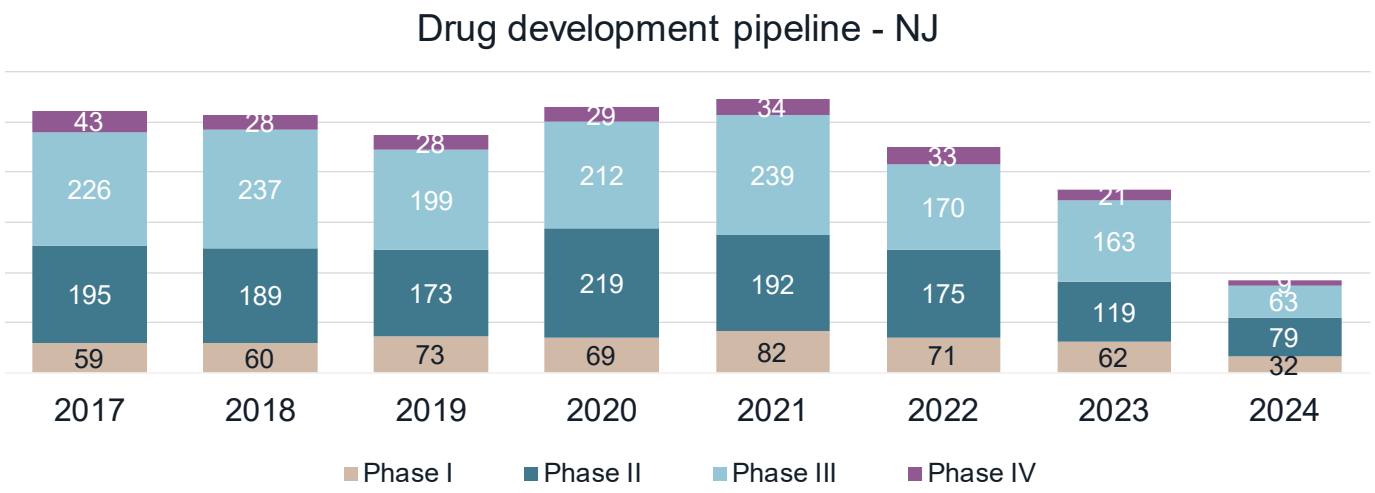


Source: Crunchbase

New Jersey clinical trial production boom

Drug pipeline points to a wave of demand for clinical trial production progressing from Phase III to FDA drug review

Stage	Drugs in pipeline: NJ	% of U.S. pipeline	Overall success	Projected successful drugs to market
Phase 1	62	7%	13.8%	9
Phase 2	119	9%	21.0%	25
Phase 3	163	29%	59.0%	96
Total	**344**	**12%**	**13.8%**	**47**



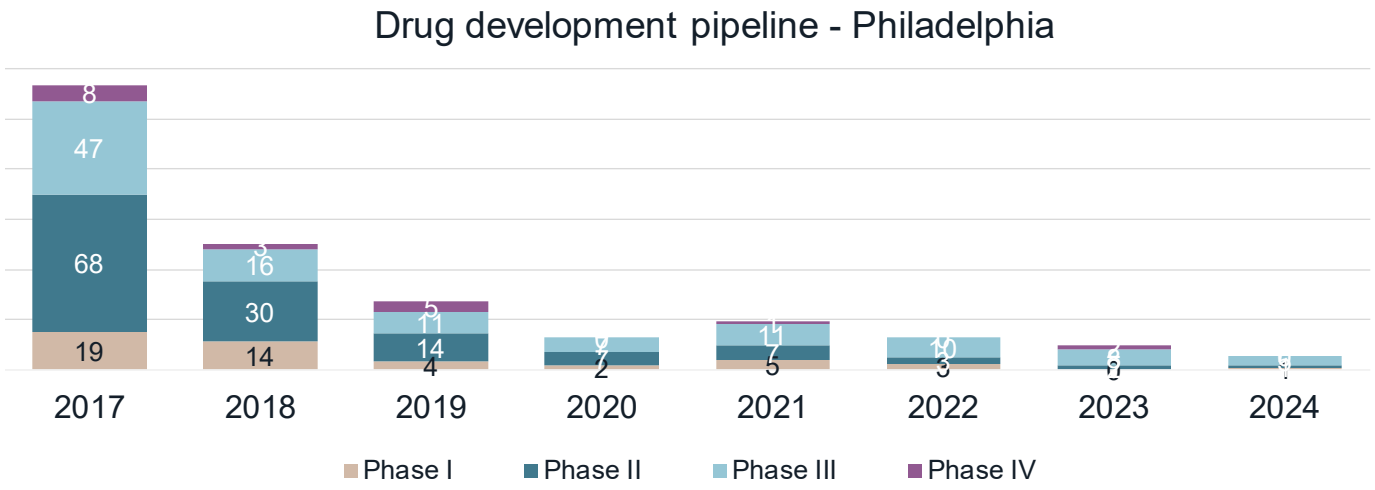
Source: Global Data; MIT

- New Jersey is responsible for 12% of drugs in the U.S. pipeline.
- Nearly 50% of therapies in the Garden State's drug development pipeline were in the Phase III stage at year-end 2023.
- Artificial intelligence (AI) methods are now critical in the R&D process and throughout the drug development pipeline. Implementation of AI technology can accelerate productivity in drug discovery, clinical trials, testing of existing drugs for new uses and aggregation of data at scale.
- Established biopharma companies are increasingly investing in AI-focused start-ups, and this field will continue to be a primary driver of the life sciences innovation engine.

Philadelphia clinical trial production boom

Drug pipeline points to a wave of demand for clinical trial production progressing from Phase III to FDA drug review

Stage	Drugs in pipeline: Phila.	% of U.S. pipeline	Overall success	Projected successful drugs to market
Phase 1	0	0%	13.8%	0
Phase 2	2	0%	21.0%	0
Phase 3	8	1%	59.0%	5
Total	**10**	**0%**	**13.8%**	**1**



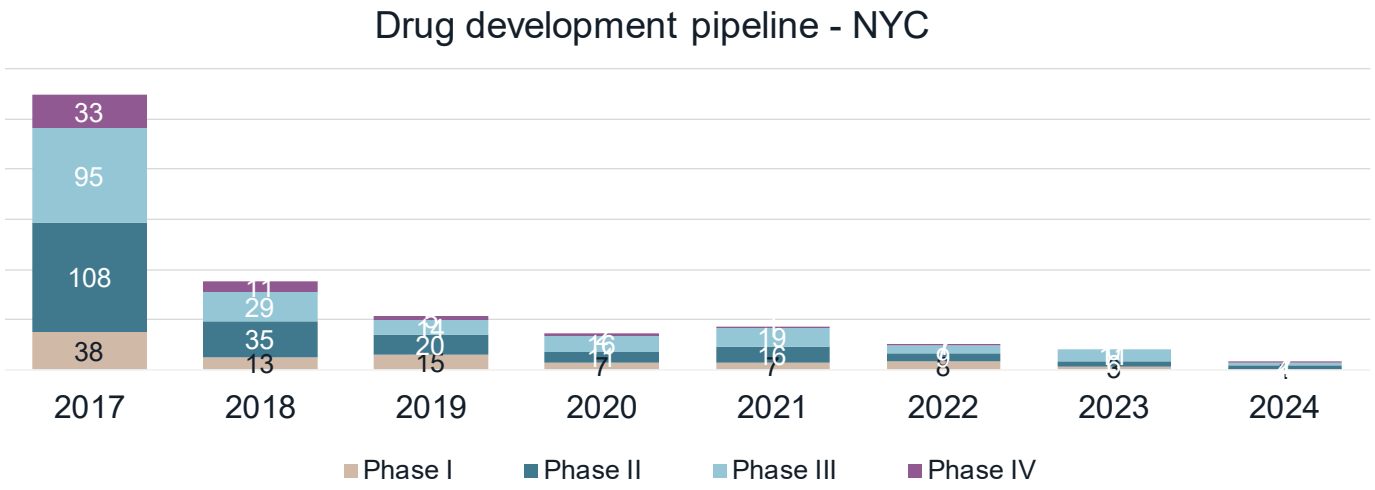
Source: Global Data, MIT

- Approximately 80% of therapies in the Philadelphia drug development pipeline were in the Phase III stage at year-end 2023.
- Artificial intelligence (AI) methods are now critical in the R&D process and throughout the drug development pipeline. Implementation of AI technology can accelerate productivity in drug discovery, clinical trials, testing of existing drugs for new uses and aggregation of data at scale.
- Established biopharma companies are increasingly investing in AI-focused start-ups, and this field will continue to be a primary driver of the life sciences innovation engine.

NYC clinical trial production boom

Drug pipeline points to a wave of demand for clinical trial production progressing from Phase III to FDA drug review

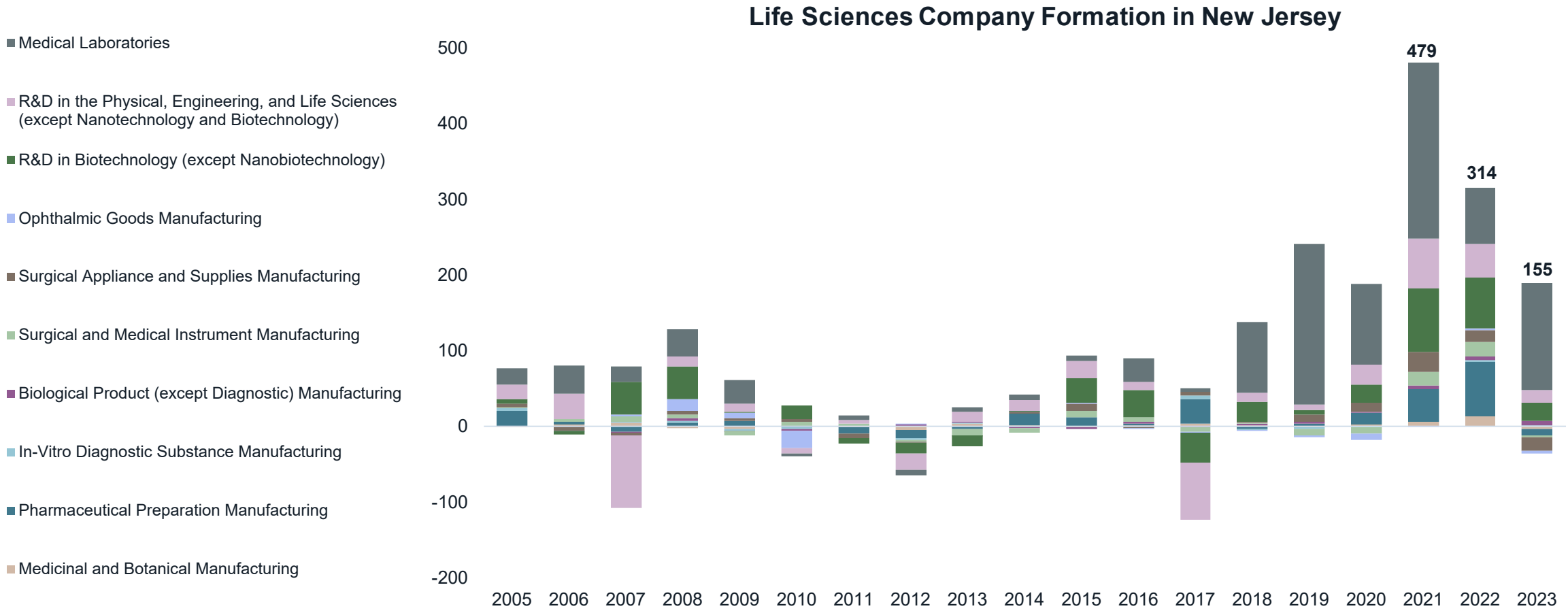
Stage	Drugs in pipeline: NYC	% of U.S. pipeline	Overall success	Projected successful drugs to market
Phase 1	3	0%	13.8%	1
Phase 2	6	0%	21.0%	1
Phase 3	11	2%	59.0%	7
Total	**20**	**1%**	**13.8%**	**3**



Source: Global Data, MIT

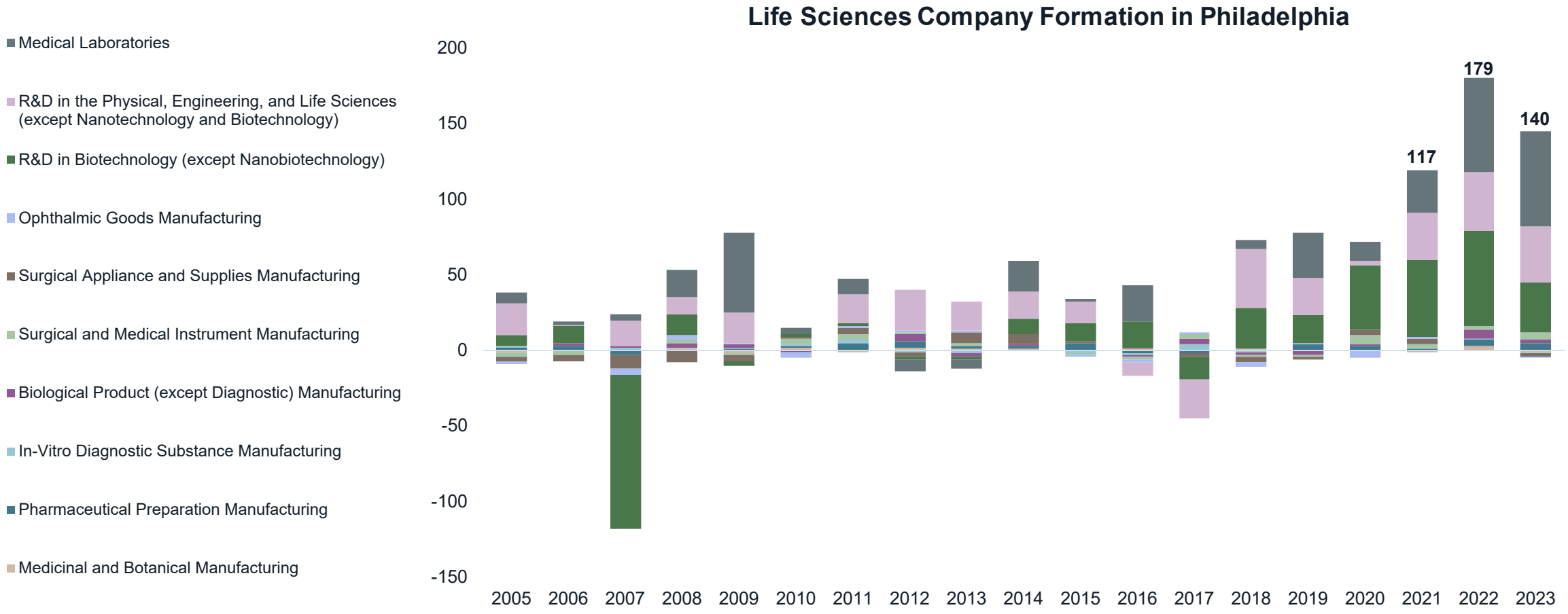
- Approximately 55% of therapies in the NYC drug development pipeline were in the Phase III stage at year-end 2023.
- Artificial intelligence (AI) methods are now critical in the R&D process and throughout the drug development pipeline. Implementation of AI technology can accelerate productivity in drug discovery, clinical trials, testing of existing drugs for new uses and aggregation of data at scale.
- Established biopharma companies are increasingly investing in AI-focused start-ups, and this field will continue to be a primary driver of the life sciences innovation engine.

New Jersey company formation timeline suggests sustained local manufacturing demand



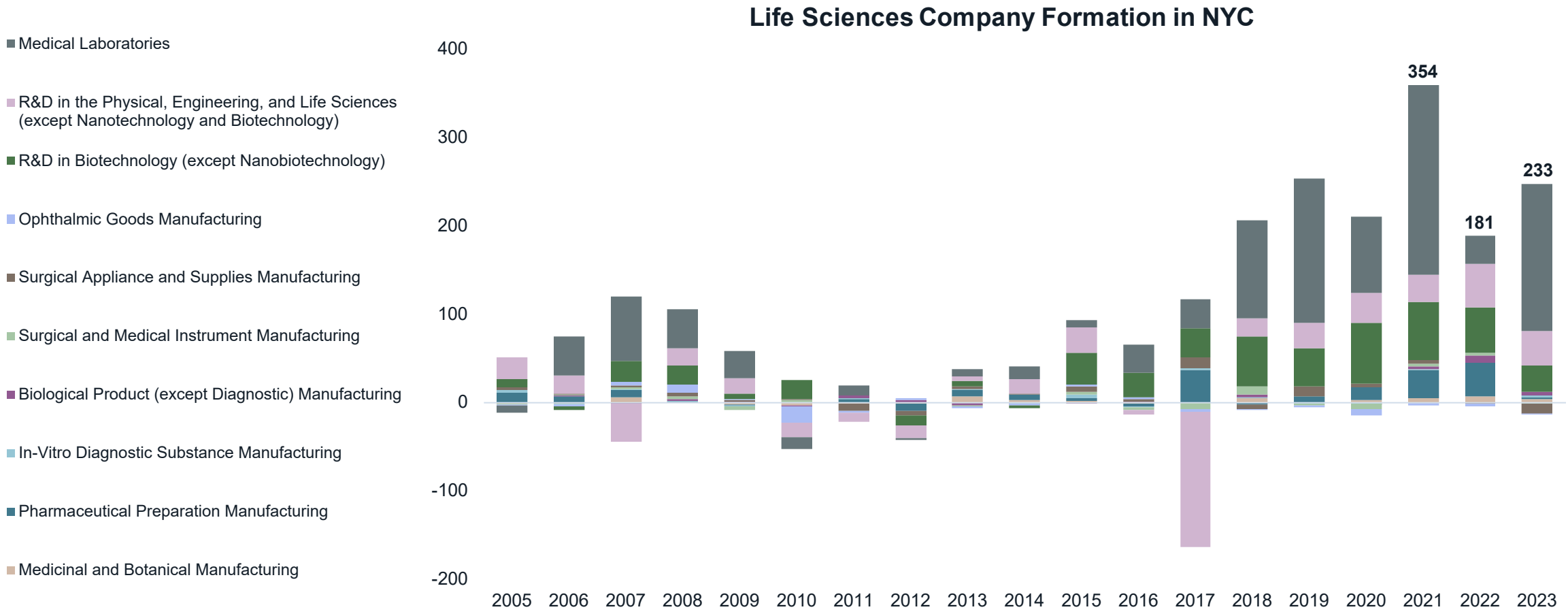
Source: Lightcast

Philadelphia company formation timeline suggests sustained local manufacturing demand



Source: Lightcast

NYC company formation timeline suggests sustained local manufacturing demand



Source: Lightcast

