# NEW YORK BLOOD CENTER PROXIMITY STUDY PEER REVIEW

Prepared for

Friends of the Upper East Side Historic Districts

Urbanomics, Inc

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# 1 Introduction

Friends of the Upper East Side Historic Districts (Friends) contracted with Urbanomics, Inc., an economic planning and consulting firm established in 1984, to prepare a peer review (the/this Review) of the March 25, 2021 HR&A New York Blood Center Proximity Study (HR&A Report) prepared for its client the New York Blood Center (NYBC). The HR&A Report evaluates, for its client, benefits arising from physical proximity to fellow researchers in the life science sector.

This Review focused on 3 points of inquiry: 1) definition of "proximity" in successful life science clusters; 2) whether geographic proximity is important to the life science industry today; and, 3) whether the proposed expansion of the NYBC into a 334' commercial tower at its East 67th Street address (two-thirds of which it will neither own nor have any control over) is fundamental to the development of the life science sector in New York City. Our scope of work is as follows:

- Review of HR&A Report and Its Academic Source Material
- New York City Life Sciences Cluster Profile
- Other U.S. Life Science Real Estate Markets
- Current State of Global Virtual Medical and Scientific Research

# 2 Executive Summary

## Review of HR&A Report and Its Academic Source Material

This Review includes a literature scan of the HR&A Report's cited sources, as well as other relevant life science studies to confirm that the citations used were accurate and complete. We located several current studies that are not included in the HR&A Report. We also identified areas of narrative in the HR&A Report where the HR&A Report drew conclusions from its source material that contradicted the source material itself. Our key findings (in **bold**) and summarized substantiating points follow.[1]

**The proximity arguments made in the HR&A Report are not substantiated; and further, are refuted by real estate studies, medical and scientific research professionals, and source marketing materials of examples of other clusters.**

- The HR&A Report concludes from its cited studies that a "viable industry cluster" is defined as being within walking distance so researchers can collaborate. However, the cited sources are either a) outdated, i.e., having been written or based on data from well before the emergence of today's standard of sharing and collaborating almost exclusively through technology, citywide, nationally and globally; or b) are not about the life science industry, thus rendering those cited sources irrelevant. [See footnote 4, pg 5; footnote 7, pg 6; footnote 11, pg 7; and footnotes 62-64, pg 28].

- According to both governmental sources discussing life science in New York City [see footnote 16, pg 12] (including Alexandria Center) [see footnote 7, pg 6] and New York City real estate and construction industry analyses of today's life science development [see footnotes 40-43, pgs 17-18 citing NY Building Congress, CBRE, and REIS], its life science industry is spread throughout the entire City. Examples of existing and upcoming facilities are BioBAT in South Brooklyn, Innolabs and the Bindery Building in Long Island City, Harlem BioSpace and the Taystee Building in Harlem, Hudson Research Center in Midtown West,125 West End Avenue on the Upper West Side, Alexandria Center and Life Sciences Innovation Campus in Midtown East, and the New York Genome Center, JLABS, and BioLabs@NYU-Langone in Hudson Square.

- New York City has, itself, described its vision of the future of the City's life science industry as being made up of hubs located throughout the City and boroughs outside of Manhattan. [See footnotes 50-51, pg 18].

- The most important locational factor for life science workers is access to public transportation. It is not being able to walk to where a fellow researcher is working. [See footnote 7, pg 6].

- The HR&A Report uses three life science locations in Kendall Square, Boston; Mission Bay, San Francisco; and the Alexandria Center, New York City as examples of clusters to assert that a similar cluster would be formed if the proposed NYBC tower is built at its East 67th Street address. Further, it claims that the NYBC can only successfully participate in such life science cluster if it builds the tower there. But the HR&A Report's extrapolation of its cited examples to its argu-

[1] Detailed discussion is located beginning on page 5.

ment that the NYBC must remain on East 67th Street is flawed at the outset because it misleadingly fails to describe those life science locations as only a small part of much larger market areas in their respective cities. [See section 3.1.2 Cluster Definitions, pgs 11-15].

**Contrary to the HR&A Report's assertion, there is no evidence that the NYBC has either exclusive or extensive collaboration (much less physical in-person collaboration) with the select East side hospitals and The Rockefeller University that in any way substantiates the NYBC's claim that relocating to a different address in the City would disrupt any relationships it may have.**

- 88.2% of the most recent[2] research publications where a NYBC researcher was named as a participating author, were prepared in collaboration with researchers located beyond the walking distance described as a "viable cluster." And of the papers published with only New York City affiliates, they were just as likely to be in collaboration with Albert Einstein College of Medicine in the Bronx as the nearer facilities referred to in the HR&A Report. [See Section 3.4.2 NYBC and Collaboration, pgs 29-30 and Figure 23, pg 30].

**The HR&A Report's rezoning comment is unsubstantiated.**

- The HR&A Report mentions the NYBC rezoning application only one time, in its conclusion. It does not discuss nor analyze the rezoning. It is a one sentence "recommendation," with no connection of the specific rezoning application to its nonspecific industry cluster proximity discussion.
- Specifically in connection to the NYBC's rezoning request we again note that none of the HR&A Report's cited sources provide any evidence, nor do they ever even state, that constructing a life science tower at NYBC's East 67th Street address is important, much less critical, to the ongoing development of the life science industry in New York City.

## NYC Life Sciences Cluster Profile

**This Review confirms that New York City's life science sector is not dependent on a single location or building as per its own vision of the future success of the sector in the City, which is based on life science development throughout the City.**

- Both New York City's Economic Development Corporation's initiative, LifeSci NYC, and real estate reports identify the New York City life science market as encompassing all of New York City, not as being limited geographically to specific individual clusters. [See footnotes 44-51, pg 18].
- Subsector searches of business and real estate databases for life science component uses such as flex research & development properties show widespread distribution throughout the City. [See Figure 12, pg 23].

[2] Published from January to August 2021. See page 30.

## Other U.S. Life Science Real Estate Markets

**Life science clusters in the cities cited in the HR&A Report and other growing sector markets, like New York City, extend beyond single buildings and submarkets to encompass city- and/or region-wide markets.**

- Like NYC, life science centers in other regions of the country are scattered citywide or in broader regional market areas. [See Section 3.3 Other U.S. Life Science Real Estate Markets, pgs. 24-27].

## Current State of Global and Virtual Medical and Scientific Research

**The current standard for medical and scientific research is collaboration on a national and global scale; it is no longer dependent on co-location within a small geographic area.**

- National and international collaboration in medical and scientific research has become the norm as supported by academic studies as well as communications from medical research experts. Supporting documentation for this statement is included with the public record documents filed in connection with the NYBC rezoning application. [See footnotes 61-66, pg 28].
- Analysis of the NYBC's own published research confirms this Review's conclusion that relevant, productive medical research being conducted today is so globally and nationally collaborative that the industry is now routinely characterized as virtual not in person. [See footnotes 67-68, pg 29].

## Conclusions

This Review concludes that the HR&A Report's proximity analysis is not a relevant resource to inform the question of whether the requested rezoning of the NYBC's location at 310 East 67th Street is either needed or justified.

The HR&A Report's proximity analysis is generic in scope and not specifically focused on the modern life science industry. It is based on sources that are sometimes out of date and/or not relevant to the life sciences sector. In addition, it misstates some of its cited sources' conclusions; and it is misleading in the comparisons it makes between other life science developments (both throughout the country and on the East River in Manhattan) and the proposed NYBC tower.

Furthermore, in failing to ever describe the physical constraints and neighborhood restrictions of the narrow block where NYBC's site at 310 East 67th Street is located or mention the Longfellow Real Estate Company's separate ownership of the majority of the proposed tower and consequently its independent business activity divorced from the NYBC, the HR&A Report's proximity analysis is deeply flawed as it is not specific to the NYBC/Longfellow proposed real estate development.

This Review confirms that increasing the life sciences inventory in New York City is vital to enabling industry growth and the continuation of investment. However, in the absence of any evidence in the HR&A Report, and because we could find none, we could not validate the HR&A Report's argument that the NYBC's development of its proposed life science tower needs to occur at 310 East 67th Street rather than instead, building its own new structure as-of-right, or constructing this tower in an appropriately zoned C or M district.

# 3 Discussion

## 3.1 Review of HR&A Report and Its Academic Source Material

This Review included a literature scan to confirm the original report's sources, as well as to determine if there are any additional articles/studies on the importance of proximity in the life sciences. In the review, we found several updates, and identified areas of narrative from the HR&A Report where its conclusions drawn from the source material differed from the source material itself. Conclusions **(in bold)** and key points of the analysis follow.

**The cluster and proximity arguments made in the HR&A Report are not substantiated. Key sources the HR&A Report cites to make its case for a 0.1 mile NYBC proximity are often not identified with the life sciences industry, but they also so significantly pre-date industry-changing advances to telecommunications and internet technology as to make those sources irrelevant.**

### 3.1.1 Source Material Interpretation

#### 3.1.1.1 Porter Findings

HR&A reports that:

"Few industries are better suited to reap the benefits of the cluster model than the life science industry", attributing this statement to Michael E Porter's 1998 article titled "Clusters and the New Economics of Competition."[3]

This article does not make this statement. Its focus is on vertical integration, relying on cluster case studies from the Italian leather fashion, California wine and Massachusetts medical device industries. No opinions are drawn on the life sciences sector being a strong opportunity for economic clustering. Further, the publication date of this article was 1998, in the infancy of the internet in terms of network communications, accessibility, and data sharing.[4] Additionally, the focus on device manufacturing renders any use of the study irrelevant to the Blood Center as researchers at the Blood Center are involved in medical treatments and blood products which is at the opposite end of the life science spectrum from medical devices (animal and clinical testing of new drugs typically takes five to eight years, whereas an FDA 510K review of a medical device is 90 days).

#### 3.1.1.2 2019 RESGroup Study Findings

HR&A reports that:

"…a 2019 study of life sciences laboratory space commissioned by the Philadelphia Industrial Development Corporation in partnership with real estate firms RESGroup and CBRE found that after access to a skilled scientific labor force, walking distance

[3] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 3.

[4] Porter, M. (1998, Nov.-Dec.). Clusters and the new economics of competition. *Harvard Business Review*. https://hbr.org/1998/11/clusters-and-the-new-economics-of-competition

proximity to similar firms and to research centers was cited by biotechnology and life science companies as their most important location requirement. Particularly for startup and midsize-stage companies, being in a life science cluster, close to research institutions, was one of the most frequently identified factors behind locational decisions."[5]

The article does list these items as well as two (2) others as being top locational requirements, but these items are not ranked in order of importance, as described by HR&A, but rather simply listed as locational requirements. Additionally, the RES Group report does not identify specific ideal geographic boundaries for clusters but instead notes that a half-mile to one-mile distance does represent reasonable walking distances in the Philadelphia study area. And, finally, it should be noted if not obvious that the mass transportation system in Philadelphia is not on par with that in New York City.

"To identify the most desirable locations for lab space, RESGroup mapped walkable distances from the current lab cluster at 34th and Market Streets…The half-mile radius indicates the prime location for life science companies within UCity, with the one-mile radius being less attractive but still reasonable…UCity's tight and expensive real estate market makes it unlikely that space will be available in the half-mile preferred radius, so the P3 should focus on (1) walkable and safe locations with retail and local amenities in the one-mile radius, and (2) locations outside the one-mile radius near transit hubs with bicycle and pedestrian connections, and in walkable and safe areas."[6]

During a July 27, 2021 Zoom meeting conducted by Urbanomics with Chris Maciejczak, Sr. Director of Life Sciences at CBRE, when asked what the most important characteristics of a property are for Life Sciences in New York City, he indicated that the most important feature was "Access to Public Transportation."[7]

#### 3.1.1.3 2012 Small Business Economics Findings

HR&A reported that:

"…a 2012 study in the journal Small Business Economics notes that "large number of studies have demonstrated…proximity effects from knowledge spillovers, network externalities and other forms of knowledge transfers among like firms." [8]

The authors acknowledge that the data referenced covered 23 years and that changes in technology over time may have changed the parameters, noting that: "The size and reach of research collaborations and networks have increased over time as communication costs have declined. These types of effects have also been mentioned in the literature[9] and such changes could have changed the geographic scope of the proximity effects."

Further, given the number and extent of clusters identified along the City's Life Science Avenue (see Figure 8, p. 15), there are few locations on the East Side that are not within a cluster and thus the benefits ascribed to clusters in this study would accrue to life science companies located practically anywhere in the City.

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[5] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 3.

[6] Author Unknown (2019, November). Market assessment of Lice Sciences Laboratory Space in Philadelphia. *RESGroup & CBRE. https://www.pidcphila.com/images/uploads/resource_library/PIDC_Lab_Space_Study_RESGroup_FINAL_VERSION_110819.pdf* pg 9.

[7] July 27, 2021 Zoom Interview with Chris Maciejczak, Sr. Director of Life Sciences at CBRE, Martin Bell, and Tina Lund, AICP, Urbanomics.

[8] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 3.

[9] Johnson, D., & Lybecker, K. (2012). Does Distance Matter Less Now? The Changing Role of Geography in Biotechnology Innovation. *Review of Industrial Organization, 40*(1), 21-35. http://www.jstor.org/stable/43550365

#### 3.1.1.4 Alexandria Co-location Strategy

HR&A attributes the following statement to an article from Forbes on the strategy of Alexandria Real Estate Equities, a major REIT that is among the largest developers, owners and operators of collaborative life sciences and technology campuses in urban locations:

"Co-location of science and medical research institutions with commercial entities expedites the commercialization of discoveries, enabling new products and treatments to improve public health and spur further scientific investigation."[10]

The article[11] actually presents a more complex view that is somewhat different from the HR&A interpretation, holding that it is the corporate strategy of Alexandria to develop its life-science/tech campuses with several key elements considered key to advancing life sciences/tech business environments: close proximity to academia, institutions, and related businesses as well as ability to access capital, a strong start-up ecosystem and available talent. Further, it references itself as "the missing element" in a "promising urban market;" in this case, New York City, not Midtown East. In fact, Alexandria's website promotes each of its facilities as serving the larger metropolis or metropolitan area, e.g., "Greater Boston", "San Francisco Bay Area", and "Maryland." In the case of the E. 29th Street location, it is described as "Serving New York City with its first world-class commercial laboratory space, the Alexandria Center enables the city to capitalize on its talent and speeds the translation of promising new life science discoveries "from bench to bedside."[12]

#### 3.1.1.5 COVID-19 Vaccine Production Dependence on Proximity

On page 5, HR&A reported that:

"The response to the Covid-19 pandemic has underscored the value added by an industry cluster in the life sciences and illustrated the impact of having a range of companies in close proximity to a research facility and to each other on the speed at which a research discovery can be turned into a critically needed medicine..."[13]

arguing that the close-proximity of Pfizer and Moderna to the Cambridge life sciences cluster was instrumental in the development and production of the vaccines.

These statements largely discount decades of research and development activities that took place concurrently on a global scale to allow for the opportunity of rapid vaccine development and production. In an article featured in Nature Magazine[14], it is stated that the Coalition for Epidemic Preparedness Innovations (CEPI), which launched in 2017 was heavily responsible for the swift roll-out of COVID-19 vaccine due to "CEPI's goal to create the technological infrastructure needed for rapid and affordable development of vaccines against several of the viruses known to have epidemic potential, including MERS, Ebola

[10] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 3.
[11] Steele, J. (2019, August 12). The future of life science and tech innovation is in clusters. *Forbes*. https://www.forbes.com/sites/jeffsteele/2019/08/12/the-future-of-life-science-and-tech-innovation-is-in-clusters/?sh=5beea690604a
[12] Author Unknown. (2021). New York City. Alexandria Real Estate Equities, Inc. https://www.are.com/new-york-city.html
[13] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 5.
[14] Ball, P. (2020, December 18) The lightning-fast quest for COVID vaccines — and what it means for other diseases. *Nature*. 589, 16-18. https://doi.org/10.1038/d41586-020-03626-1

and Zika. CEPI has partly funded work on SARS-CoV-2 vaccines, including that by Moderna and at Oxford." Nature Magazine reports that "A lot went into the mRNA platform that we have today," says immunologist Akiko Iwasaki at the Yale School of Medicine in New Haven, Connecticut, who has worked on nucleic-acid vaccines — those based on lengths of DNA or RNA — for more than two (2) decades. The basic research on DNA vaccines began at least 25 years ago, and RNA vaccines have benefited from 10–15 years of strong research, she says, some aimed at developing cancer vaccines. The approach has matured just at the right time; five (5) years ago, the RNA technology would not have been ready. The development of Pfizer's mRNA vaccine was largely laid out by Katalin Kariko's research in Pennsylvania at major institutions and private firms such as UPenn, Temple, and BioNTech. Also, while Pfizer does maintain facility space in Cambridge, the company is based roughly 45 mins north in Andover, Massachusetts with R &D locations globally and across the United States.[15]

#### 3.1.1.6 Future Life Science Demand and Built Space

HR&A reports that:

"New York City has a major dearth of life science space and needs to grow it significantly to remain competitive. As of Q3 2020, New York City was listed 12th in life sciences laboratory inventory by market; Boston and San Francisco are the top two, with around 18 times as much lab space as New York. While the supply of lab space in New York City is expected to double in the coming years, the City estimates that up to 3 million square feet of additional supply will be needed over the coming decade to create a critical mass of life science activity."[16]

As of Q2 2021, according to CBRE, the NYC life Sciences market has an additional 1.9 million square feet coming online through new construction and conversion to meet demand throughout the City in the near term. (See Figure 1.) Year-end 2020 projections estimate that by 2025 the inventory of lab space will be 5.1 million square feet, of which 4.2 million will be lab exclusive[17]. This is approximately 50% *more* than the 3.0 million square feet than HR&A says will be "needed". The City's own Life Science's program, LifeSci NYC identifies funding opportunities for specific spaces throughout Manhattan and the rest of the City including Harlem, the Upper East Side, Silicon Alley, SoHo, Brooklyn Army Terminal, and Central Brooklyn. Further, there are funding opportunities available to "life sciences companies interested in expanding their operations in one of the City's five (5) boroughs."[18]

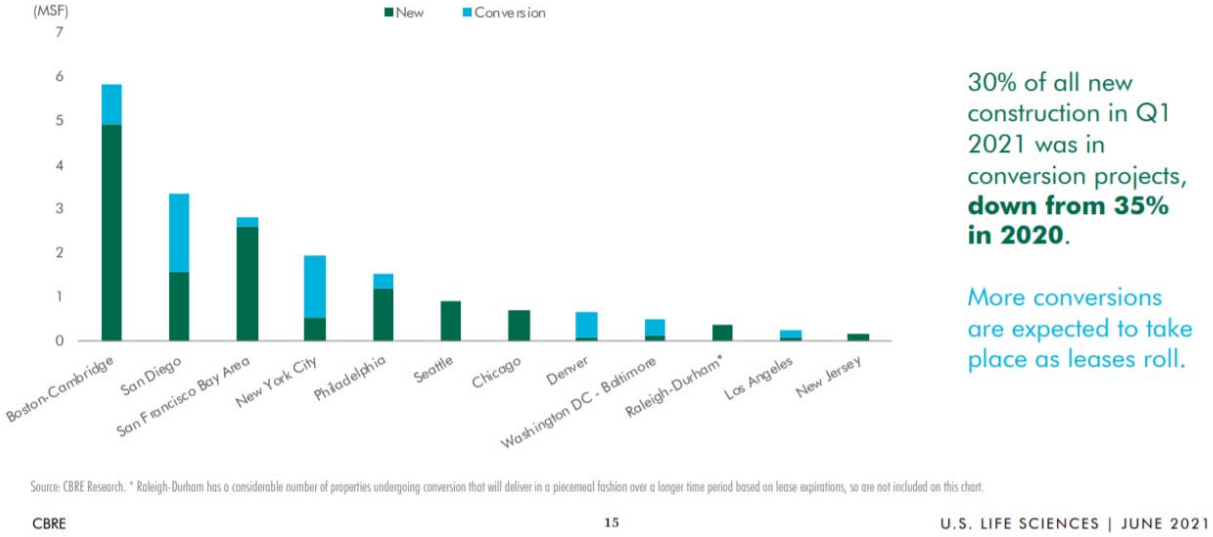
[15] Pfizer. (2021). R&D Locations. https://www.pfizer.com/science/research-development/centers

[16] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 11.

[17] Stern, P. (2020). New York City life sciences market statistics report, year-end 2020. *CBRE*. https://f.tlcollect.com/fr2/821/29120/New_York_City_Life_Sciences_Report_YE_2020.pdf

[18] Author Unknown. (2021). Key Resources. Life Sci NYC. https://lifesci.nyc/key-resources

**Figure 1. Lab / R&D Space Under Construction by Type, Q1 2021**




Source: Anderson, I., Duca, S., Channell, C., Barkham, R., et al. (2021, Midyear). U.S. life sciences outlook. *CBRE*. http://cbre.vo.llnwd.net/grgservices/secure/US%20Life%20Sciences%20Mid-year%202021.pdf?e=1628092989&h=3776ce1a92832a72e80e08c370d993de

### 3.1.1.7 NIH Funding Levels

According to HR&A, "The New York City metro area received $2.1B in NIH funding in 2018 – the second-highest amount nationally."[19]

Updated reports on NIH funding are available[20]. According to NIH, New York City had the highest amount of funding compared with any city in FY 2021 at $1.5 billion, slightly more than Boston, MA. In FY 2020, Boston had the largest amount of NIH funding at $2.3 billion, closely followed by New York City with $2.2 billion in NIH funding. It is notable that Cambridge, MA—which includes, but is not limited to, Kendall Square—ranks separately, and was number 26 on the list with only $206 million in funding in FY 2021 and 21st on the FY 2020 list in terms of funding.

[19] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 8.

[20] US Department of Health & Human Services. (2021). *NIH Research Portfolio Online Reporting Tools: NIH Awards by Location and Organization.* https://report.nih.gov/award/index.cfm?ot=&fy=2021&state=&ic=&fm=&orgid=&distr=&rfa=&om=n&pid

**Figure 2. NIH Funding by Municipality, FY2021**

| Rank | Location | Total NIH Funding |
|---|---|---|
| 1 | New York, NY | $1,521,547,085 |
| 2 | Boston, MA | $1,496,187,566 |
| 3 | Seattle, WA | $840,916,095 |
| 4 | Baltimore, MD | $736,963,006 |
| 5 | Philadelphia, PA | $724,159,308 |
| 6 | Los Angeles, CA | $665,368,663 |
| 7 | La Jolla, CA | $657,814,058 |
| 8 | Chicago, IL | $590,790,213 |
| 9 | San Francisco, CA | $551,203,265 |
| 10 | Houston, TX | $478,136,591 |
| 11 | Durham, NC | $473,492,389 |
| 12 | Pittsburgh, PA | $455,717,294 |
| 13 | Saint Louis, MO | $450,049,760 |
| 14 | Ann Arbor, MI | $409,760,764 |
| 15 | Stanford, CA | $407,802,589 |
| 16 | New Haven, CT | $382,758,152 |
| 17 | Atlanta, GA | $355,742,253 |
| 18 | Nashville, TN | $339,022,764 |
| 19 | Chapel Hill, NC | $319,768,705 |
| 20 | Minneapolis, MN | $253,131,213 |
| 21 | Madison, WI | $239,768,327 |
| 22 | Research Triangle Park, NC | $233,893,372 |
| 23 | Aurora, CO | $218,996,182 |
| 24 | Birmingham, AL | $213,765,673 |
| 25 | Portland, OR | $210,487,695 |
| 26 | Cambridge, MA | $206,071,313 |

**Figure 3. NIH Funding by Municipality, FY2020**

| Rank | Location | Total NIH Funding |
|---|---|---|
| 1 | Boston, MA | $2,255,545,302 |
| 2 | New York, NY | $2,189,287,343 |
| 3 | Seattle, WA | $1,548,654,175 |
| 4 | Philadelphia, PA | $1,156,360,024 |
| 5 | Los Angeles, CA | $1,155,907,117 |
| 6 | Baltimore, MD | $1,117,073,689 |
| 7 | Chicago, IL | $971,717,118 |
| 8 | Durham, NC | $920,657,595 |
| 9 | La Jolla, CA | $894,501,132 |
| 10 | San Francisco, CA | $836,050,597 |
| 11 | Houston, TX | $731,266,854 |
| 12 | Pittsburgh, PA | $675,284,176 |
| 13 | Ann Arbor, MI | $662,311,395 |
| 14 | Atlanta, GA | $626,655,355 |
| 15 | Frederick, MD | $625,459,930 |
| 16 | Saint Louis, MO | $584,147,452 |
| 17 | New Haven, CT | $564,537,514 |
| 18 | Stanford, CA | $561,482,419 |
| 19 | Chapel Hill, NC | $519,637,800 |
| 20 | Nashville, TN | $512,154,175 |
| 21 | Cambridge, MA | $455,333,587 |
| 22 | Research Triangle Park, NC | $429,085,075 |
| 23 | Minneapolis, MN | $378,486,627 |
| 24 | Madison, WI | $358,461,272 |
| 25 | Columbus, OH | $348,936,858 |
| 26 | Birmingham, AL | $342,066,693 |

Source: US Department of Health & Human Services. (2021). *NIH Research Portfolio Online Reporting Tools: NIH Awards by Location and Organization.* https://report.nih.gov/award/index.cfm?ot=&fy=2021&state=&ic=&fm=&or-gid=&distr=&rfa=&om=n&pid

### 3.1.2 Cluster Definitions

**Geographic definitions used in the HR&A report do not represent life science markets in full. Life science "clusters" identified in the HR&A report and implied to be self-sustaining enterprises reflect only small portions of the referenced markets from governmental and real estate perspectives.**

New York City's as well as life science clusters in other areas of the country are identified as city-wide ecosystems encompassing both smaller, more concentrated centers and a broader expanse of life science hubs located throughout an entire city or region. HR&A's examples of life science locales (Kendall Square, Boston; Mission Bay, San Francisco, and Kips Bay/Alexandria Center in NYC) are small parts of much larger market areas as described not only by real estate professionals, but by the facilities in question themselves.

The report identifies Kendall Square, Boston and Mission Bay, San Francisco as life science hubs within the broader Greater Boston-Cambridge and San Francisco Bay markets, identifying key facilities in each area. As duly noted in that report, the data provided is generally for larger market areas encompassing broad metropolitan regions as defined by real estate companies. This section provides examples of the diversity of geographic definitions, describing the extent of the areas the data reference, and mapping them for the specified Boston and San Francisco clusters.

The Newmark Life Sciences End of Year 2020 Report[21] used the following market areas: New York City; Northern, NJ (Princeton, Somerset / I-78, Route 18 / 8A Middlesex); Boston/Cambridge (Cambridge, Boston, and Greater Boston/Inner Suburbs stretching along the Route 495 Corridor as far as North as the New Hampshire border, south to Cape Cod Canal and west as far as Westborough, a roughly 60-90 minute commuter shed to MIT).

JLL US Life Sciences Outlook, 2019-2020[22]: Identifies New York City and the Greater Boston Area (combined area of the City of Boston, Cambridge and core suburbs of Somerville, Billerica, Andover, Watertown, Waltham, Lexington, Bedford, East Cambridge as markets (roughly equivalent to the Greater Boston Route 495 Corridor market area used by Newmark). Separate market areas exist for New Jersey, Westchester County, Long Island, and the San Francisco Bay Area (likely San Francisco, North, East, South Bays and Peninsula).

[21] Littman, D. (2021 January). 2020 year-end: Life science national overview & top market clusters. *Newmark*. Q4 2020. https://www.nmrk.com/insights/thought-leadership/2020-life-sciences-national-overview-and-top-market-clusters
[22] Symes, A. & Coffman, D. (2020). 2020 life sciences real estate outlook: United States. *JLL*. JLL Research Report. https://www.us.jll.com/en/trends-and-insights/research/life-sciences-trends

**Figure 4. Top U.S. Life Sciences Clusters Q1 2021 Market Indicators**

| Market | Inventory (SF) | Vacancy | Asking Rents (NNN) | # of Tenants Seeking Space | Total Demand (SF) | 9-month change in demand (%) | Under Construction (SF Lab/R&D) |
|---|---|---|---|---|---|---|---|
| Boston-Cambridge | 37,874,593 | 2.5% | $87.48 | 108 | 4,750,000 | 22.1% | 5,807,684 |
| Chicago | 1,501,364 | 24.3% | $46.29 | 22 | 597,500 | -9.2% | 704,454 |
| Denver-Boulder | 4,646,645 | 3.8% | $50.00 | 33 | 1,558,000 | 87.7% | 635,319 |
| Los Angeles | 7,802,591 | 9.1% | $38.40 | 11 | 417,000 | -4.1% | 229,398 |
| New Jersey | 20,400,000 | 9.1% | $27.00 | 15 | 1,200,000 | 233.3% | 147,000 |
| New York City | 1,868,960 | 1.9% | $90.73 | 43 | 1,124,500 | 32.6% | 1,936,514 |
| Philadelphia | 9,213,132 | 16.3% | $40.00 | 38 | 1,465,000 | 143.0% | 1,538,691 |
| Raleigh-Durham | 7,102,027 | 13.9% | $28.43 | 17 | 839,000 | - | 380,000 |
| San Diego | 16,736,539 | 4.3% | $59.88 | 40 | 2,800,000 | 55.6% | 3,324,826 |
| San Francisco Bay Area | 29,988,073 | 2.4% | $69.84 | 59 | 2,914,500 | 21.9% | 2,792,633 |
| Seattle | 8,028,396 | 3.0% | $28.52 | 20 | 500,000 | 42.9% | 913,000 |
| Washington, D.C.-Baltimore | 10,650,400 | 3.6% | $38.00 | 16 | 1,100,000 | 37.5% | 472,500 |
| **Total** | **155,812,720** | **5.6%** | | **422** | **19,265,500** | | **18,882,019** |

Source: Anderson, I., Duca, S., Channell, C., Barkham, R., et al. (2021, Midyear). U.S. life sciences outlook. *CBRE*. http://cbre.vo.llnwd.net/grgservices/secure/US%20Life%20Sciences%20Mid-year%202021.pdf?e=1628092989&h=3776ce1a92832a72e80e08c370d993de

The CBRE US Life Sciences 2020 Report[23] used the following market areas: New York City; New Jersey; Boston-Cambridge (Boston, Cambridge, Route 128-Core and Route 495-Core (somewhat smaller than the Route 495 Corridor Greater Boston market area used by Newmark); and San Francisco Bay Area (likely San Francisco, South Peninsula of Silicon Valley, Emeryville/Berkeley/Alameda, Hayward/Union City, Fremont/Newark).

#### 3.1.2.1 Kips Bay/Alexandria Center

Within the Kips Bay cluster, the Alexandria Center and Launch Labs consist of 745,000 square feet of floorspace, with another 550,000 square feet to be completed by 2022.[24] The Alexandria model of life science cluster development, which, by its own marketing description, is only a piece of a larger ecosystem: its researchers collaborate with researchers throughout the entire city and broader metropolitan area, not only from its own life science centers but from others.[25]

Alexandria Real Estate Equities, the owner of these facilities is constructing a second LaunchLab space in Harlem, and another 275,000 sf of lab/office space in Long Island City to take advantage of the full extent of the City's life science development potential.[26]

[23] Anderson, I., Duca, S., Channell, C., Barkham, R., et al. (2021, Midyear). U.S. life sciences outlook. *CBRE*. http://cbre.vo.llnwd.net/grgservices/secure/US%20Life%20Sciences%20Mid-year%202021.pdf?e=1628092989&h=3776ce1a92832a72e80e08c370d993de

[24] New York Building Congress. (2020, July). *NYC checkup: An examination of healthcare & life science construction. https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf* p. 37.

[25] Author Unknown. (2021). *Our Cluster Locations: New York City*. Alexandria Real Estate Equities. https://www.are.com/new-york-city.html

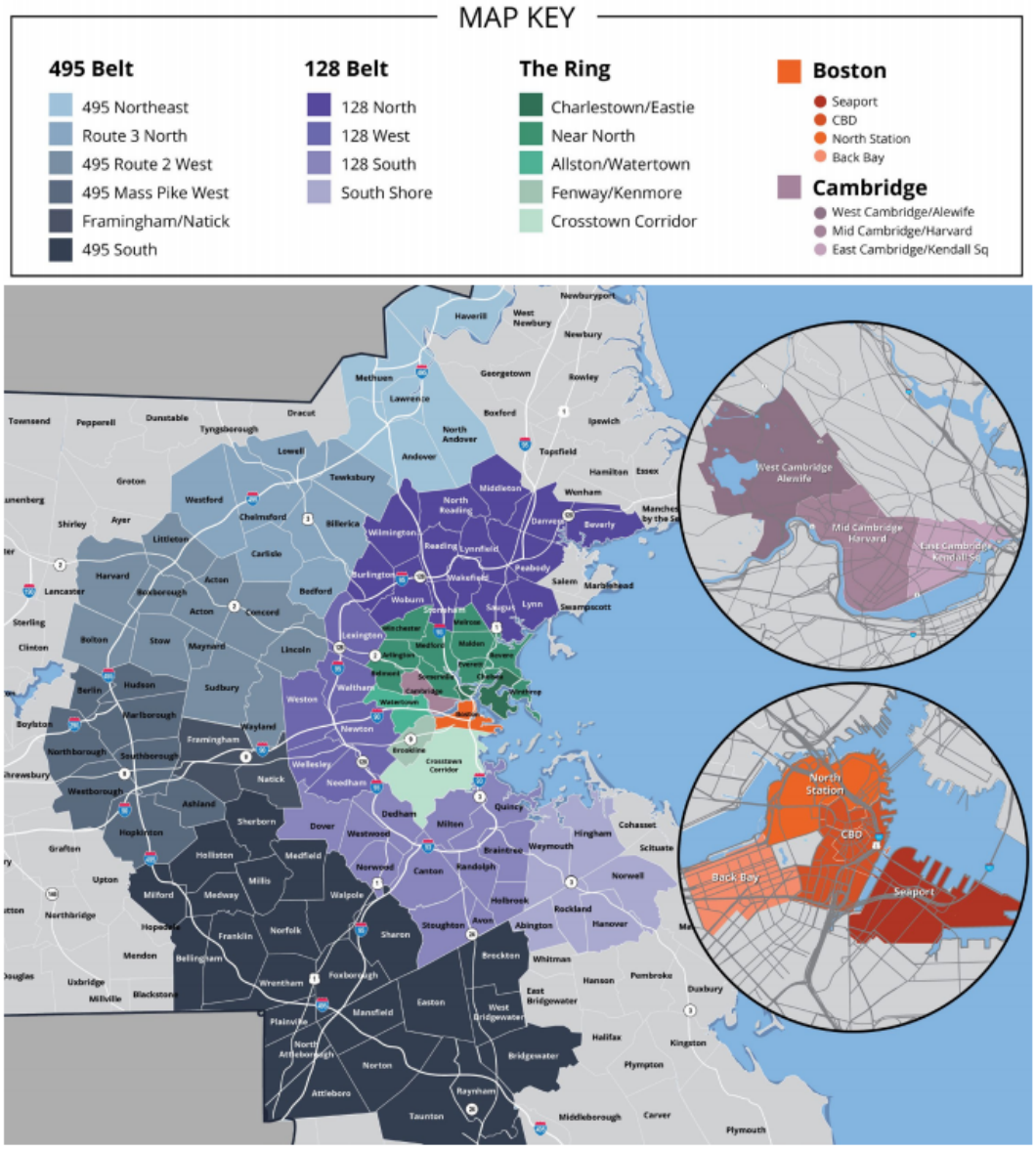
[26] New York Building Congress. (2020, July). *NYC checkup: An examination of healthcare & life science construction. https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf* p. 38.

### 3.1.2.2 Boston

The CBRE Boston Life Sciences 2020 Report highlights the substantial sprawl of life sciences property moving out of Boston-Cambridge out towards Route 128 within a 20-25 mile radius from MIT. This is largely due to meeting the needs of the workforce that cannot live in the inner suburbs due to lack of housing inventory/cost, and long commutes. When realtors refer to the Greater Boston Real Estate Market, they are roughly referring to this area where the vast majority of office parks/life science properties are located.

Note: Kendall Square is located in East Cambridge, one (1) of the three (3) lavender areas in the center of the Greater Boston real estate submarket map provided by Avison Young, a real estate services firm, that follows.

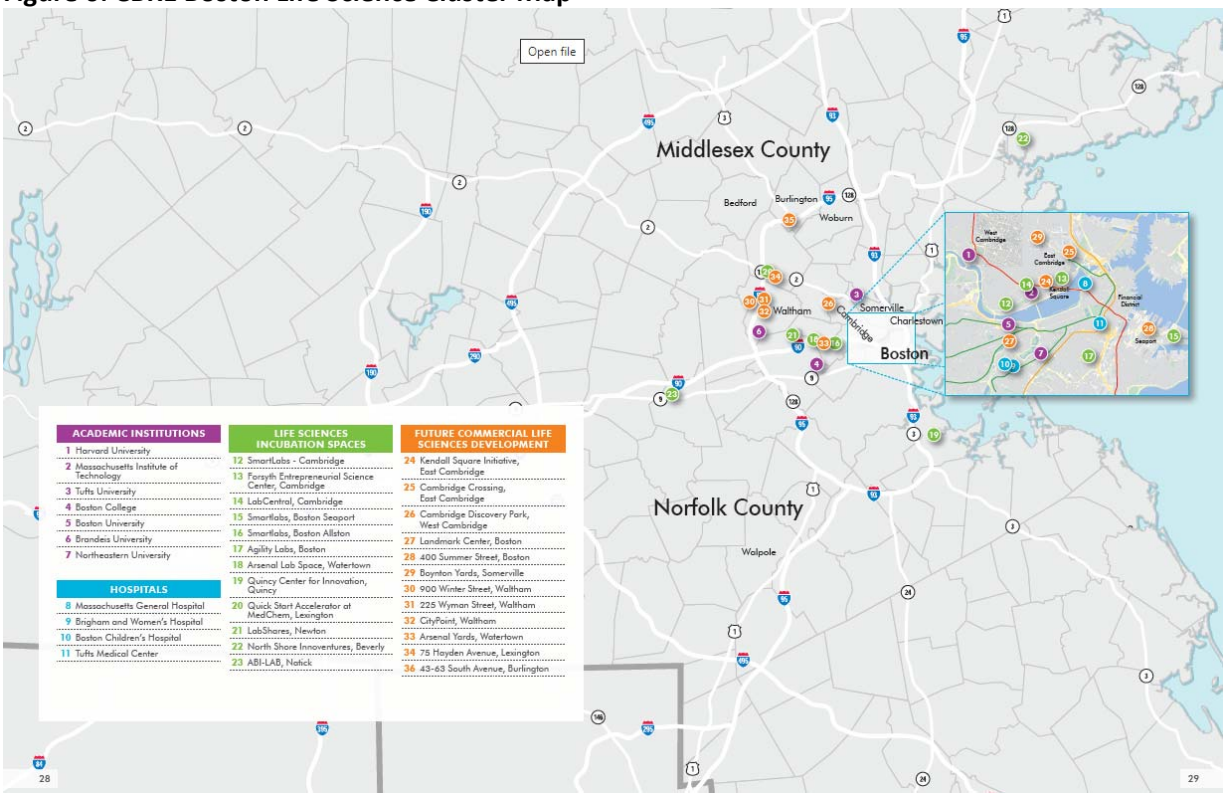
**Figure 5: Greater Boston Real Estate Submarkets**




Source: Collins, T. & Hart, C. (2021, Q1). Office market report: Greater Boston. *Avison Young*. First Quarter 2021. https://www.avisonyoung.us/documents/91034/94293702/Greater+Boston+Market+Report+%28Q1+2021%29/c7965dc7-e8c9-4a2e-95f5-c6d65007aa4e

CBRE's map of Greater Boston Life Sciences Clusters from the 2020 Boston Life Sciences Report extends from Boston-Cambridge to the suburban market areas but does not extend to Andover in Essex County, home of Pfizer's headquarters.

**Figure 6: CBRE Boston Life Science Cluster Map**

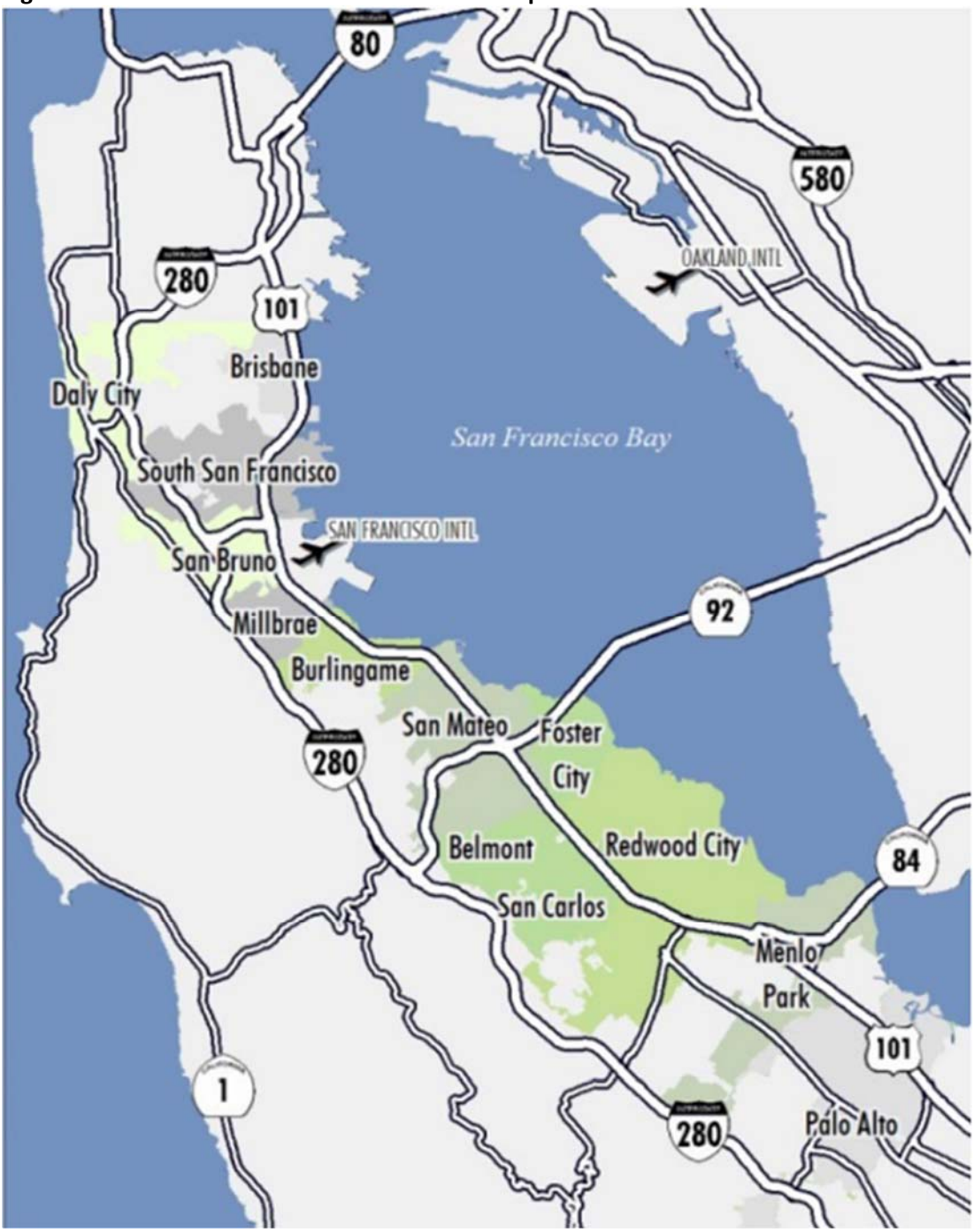



Source: Larusso, N., Duca, S., & Wurtzel, B. (2020). Boston life sciences 2020. *CBRE*. http://cbre.vo.llnwd.net/grgservices/secure/Boston_LifeScience_2020_11_LOW_.pdf?e=1628093632&h=2be4e296bcf275a1025f32f958cf5c61

### 3.1.2.3 San Francisco

In San Francisco, CBRE includes Life Sciences within the R&D (research and development) classification, the submarket for which includes the entire San Francisco Peninsula extending from Daly City and Brisbane in the north to Palo Alto in the South, as shown in Figure 7.

**Figure 7: CBRE San Francisco R&D Submarket Map**




Source: Miller, Ryo and Forker, Shane. (2021) CBRE Marketview: San Francisco Peninsula R&D Q2 2021. *CBRE*. http://cbre.vo.llnwd.net/grgservices/secure/Q2%202021%20SF%20Peninsula%20RD%20MarketView.pdf?e=1630075562&h=1204ec92ca6dc7c0134aab6cf93c7c48

### 3.1.3 HR&A Conclusions

HR&A put forth the following conclusions in their March 21, 2021 report.

"New York City has a major dearth of life science space and needs to grow it significantly to remain competitive. As of Q3 2020, New York City was listed 12th in life sciences laboratory inventory by market; Boston and San Francisco are the top two, with around 18 times as much lab space as New York. While the supply of lab space in New York City is expected to double in the coming years, the City estimates that up to 3 million square feet of additional supply will be needed over the coming decade to create a critical mass of life science activity. Early-stage companies also require access to spaces that allow them to commence or expand operations immediately following new rounds of funding. Without an adequate supply, New York City will be unable to accommodate startups as they grow and expand, resulting in a loss of local talent and intellectual property to competitive markets with greater inventory. The new Center East development will provide some of that critical space needed for dynamic life science companies to start, grow, and most importantly, stay in New York City."[27]

#### 3.1.3.1 Demand for Space is Being Met

Responding to the "dearth of space", it is acknowledged that the Life Science real estate market is very tight, especially for immediately available space. However, as noted previously, there are 1.9 million square feet of Life Science space set to come online in the immediate future and further CBRE forecasts that by year-end 2025 the inventory of lab space will be 5.1 million square feet, of which 4.2 million will be lab exclusive[28] thereby meeting the forecasted demand for an additional 3 million square feet. As the Blood Center Tower will not come online for at least five (5) years, its benefit to the New York City life science lab marketplace is speculative, at best.

#### 3.1.3.2 NYBC and East 67th Street Location are not Critical to NYC Life Sciences Industry

This Review confirms that increasing the Life Sciences Inventory in New York City is vital to enabling industry growth and the continuation of investment. However, we could not validate the argument that this development needs to occur at 310 E 67th Street. According to both New York City sector sources (including the referenced Alexandria) and the real estate industry, the Life Sciences Industry is spread throughout the City as a whole and the primary immediate locational factor is access to public transportation for the workforce.

"NYBC is a critical part of New York City's life science ecosystem, providing vital services and generating cutting-edge research from the same location where it has been successfully doing so for decades. That location on 67th Street, a stone's throw from some of the world's premier patient care, academic, and clinical research institutions, has allowed NYBC and its scientists to create deep and longstanding relationships that continue to lead to important scientific advancements." [29]

The NYBC is located in the UES Life Science Cluster, but was not considered "critical" enough to be included as part of the Tri-Institutional Therapeutics Discovery Institute with neighboring institutions Memorial Sloan Kettering Cancer Center, The Rockefeller University, and Weill Cornell Medicine. This may be because the NYBC does little work with neighboring institutions as determined by affiliations in recent publications. This Review's research of the NYBC's scientific collaborative published papers reveals

[27] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 11.
[28] Stern, P. (2020). New York City life sciences market statistics report, year-end 2020. *CBRE*. https://f.tlcollect.com/fr2/821/29120/New_York_City_Life_Sciences_Report_YE_2020.pdf
[29] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 11.

that only six (6.6%) of 76 papers were prepared in collaboration with other UES neighborhood institutions (See Figure 23 of this report.) The Rockefeller University, the NYP Koch Center, and MSK Mortimer B Zuckerman Research Center were not listed as affiliates on any of the 2021 NYBC publications.[30]

#### 3.1.3.3 Relocating NYBC will not Damage Relationships with Neighboring Institutions

The HR&A Report's statement that the NYBC must build the greatly enlarged "Center East" life science commercial tower in order for it to maintain relationships with personnel from the two hospitals and one research center a few blocks away, and that moving the NYBC would disrupt these relationships, is nowhere substantiated in its Report. The Report provides no evidence that these relationships exist, nor are there examples of other such disruptions ever having occurred where an institution moved from one City address to another.

Furthermore, if the proposed NYBC's proposed tower were indeed to move forward, the NYBC would have to move. It would not be at its East 67th Street address for the 5+ year construction period, — per Longfellow Real Estate company, the proposed tower is estimated for completion in late 2026. This would seem to also negate the HR&A Report's argument that the NYBC's relationships with nearby hospitals and Rockefeller University rely on physical proximity.

#### 3.1.3.4 Rezoning Recommendation is not Substantiated

"The proposed rezoning and development at NYBC's current site will provide critical commercial and research space, capitalizing on the symbiotic relationships seen in other life science clusters around the country. Without the ability to expand at this location, both NYBC and its neighboring institutions will lose out on research partnerships and will be hindered in their ability to bring discoveries from theory to practical application, and the City will miss a unique opportunity to leverage a complex of world-class academic and clinical institutions into a dynamic, leading life sciences cluster. Center East represents an urgent opportunity to grow New York City's life science ecosystem, to provide high quality and accessible jobs to thousands of New Yorkers, and to establish the city at the forefront of life sciences research and innovation."[31]

Previous to this point, the rezoning of the area or conditions thereof have not been discussed. Further, none of the sources cited provide any evidence that the development of a life science facility on NYBC's current site is critical to the development of the Life Science sector in New York City.

### 3.2 New York City Life Sciences Cluster Profile

This section provides an overview of the life sciences sector in New York City under both current and emerging conditions and as a result quantifies the role the proposed NYBC's enlarged transformation into a life science hub plays in the development of the sector. Primary resources this Review used include documentation and vision plans from New York City Economic Development Corporation's LifeSci NYC initiative[32], documents and press releases from Empire State Development, the Governor's Office,

[30] Page 31.
[31] Author Unknown (2021, March 25). Memorandum: NYBC Proximity Study. *HR&A.* pg 11.
[32] Author Unknown. (2021). *Life Sci NYC*. Life Sci NYC. https://lifesci.nyc/

the Mayor's Office, NYC's budget for Fiscal Year 2022[33], and real estate and construction studies and listings from the New York Building Congress[34], Moody's REIS[35] (formerly Real Estate Information Services) and CBRE[36], which describe site availability and development activity.

**This section of the Review concludes that the New York City life sciences sector extends citywide and the NYBC plays a very small role in its ongoing development.**

### 3.2.1 New York City Administrative Documentation

The development of City's life science sector is not concentrated in a single area, but extends citywide. In April of 2021, the Mayor's Office NYC released its Ten Year Capital Strategy FY2022-2031, which includes life sciences investments to establish LifeSci Avenue from Kips Bay to Harlem in Manhattan, along with neighborhood clusters in Long Island City, Sunset Park, Central Brooklyn, and Hudson Square among others as shown in Figure 8.[37]

As shown in Figure 8, LifeSci NYC identifies eleven (11) individual life science clusters throughout New York City, in addition to Cornell Tech on Roosevelt Island. Two (2) clusters are located in Brooklyn, one (1) in Long Island City, Queens, and one (1) in Morris Park in the Bronx, the remaining seven (7) are in Manhattan. Three (3) of these, East Harlem, Upper East Side (UES), and Kips Bay make up "LifeSci Ave" which runs along Manhattan's East Side[38]. The NYBC is only one of the ten (10) identified institutions included in the UES cluster.

[33] Author Unknown. (2021, April). Ten-year capital strategy, fiscal years 2022-2031. *The City of New York*. https://www1.nyc.gov/assets/omb/downloads/pdf/typ4-21.pdf

[34] *https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf*

[35] Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com

[36] Stern, P. (2020). New York City life sciences market statistics report, year-end 2020. *CBRE*. https://f.tlcollect.com/fr2/821/29120/New_York_City_Life_Sciences_Report_YE_2020.pdf

[37] Author Unknown. (2021, April). Ten-year capital strategy, fiscal years 2022-2031. *The City of New York*. https://www1.nyc.gov/assets/omb/downloads/pdf/typ4-21.pdf. pgs .I-31.

[38] LifeSci Ave is roughly defined as running from Kips Bay to East Harlem. Author Unknown. (2021, January). Life Sci NYC: Leading the way in life sciences innovation. *Life Sci NYC.* https://lifesci.nyc/sites/default/files/2021-01/Life-Sci-Vision-Plan-January-2021.pdf. pg.8

**Figure 8: Life Science NYC Landmarks Map**


Source: Author Unknown. (2021). *Landmarks Map*. Life Sci NYC. https://lifesci.nyc/landmarks-map.

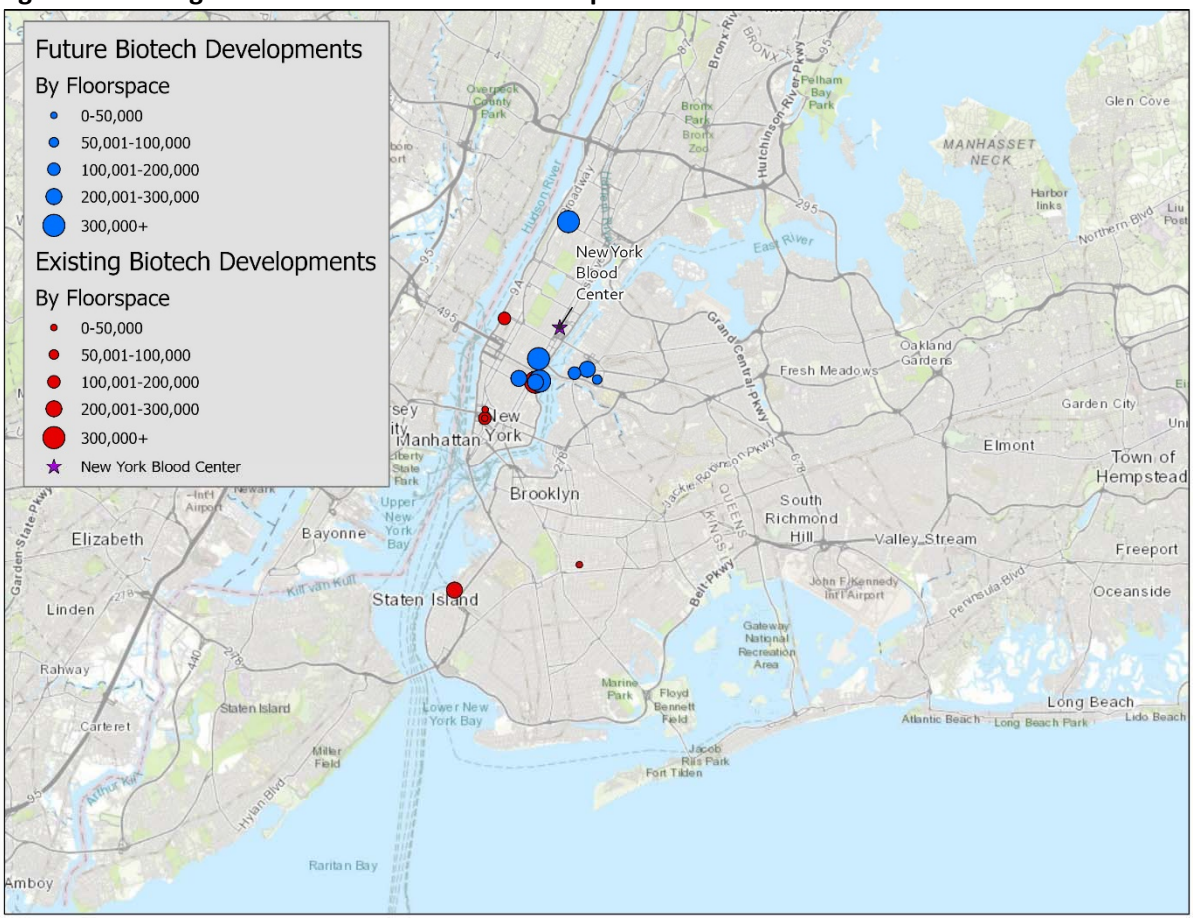
### 3.2.2 Real Estate and Construction Industry Documentation

The New York Building Congress (Building Congress) prepared a report in July of 2020 examining the level of investment and extent of life sciences employment in New York City. In addition, it identified the existing and future incubator and lab/office facilities by name, type, floorspace and year of completion. The Building Congress quantifies existing life science space at 1.38 million square feet citywide, with an additional 2.36 million square feet expected to be constructed in the near future.[39] These facilities,

[39] New York Building Congress. (2020, July). *NYC checkup: An examination of healthcare & life science construction. https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf* pp. 37-38.

mapped in Figure 9, are distributed throughout the City, with specified hubs of development that include: Harlem, Hudson Square, Midtown East, Midtown West, South Brooklyn, and Long Island City.[40] As identified by the Building Congress, the NYBC is not included in any existing or future biotech developments.

**Figure 9: Existing and Future NYC Biotech Developments**

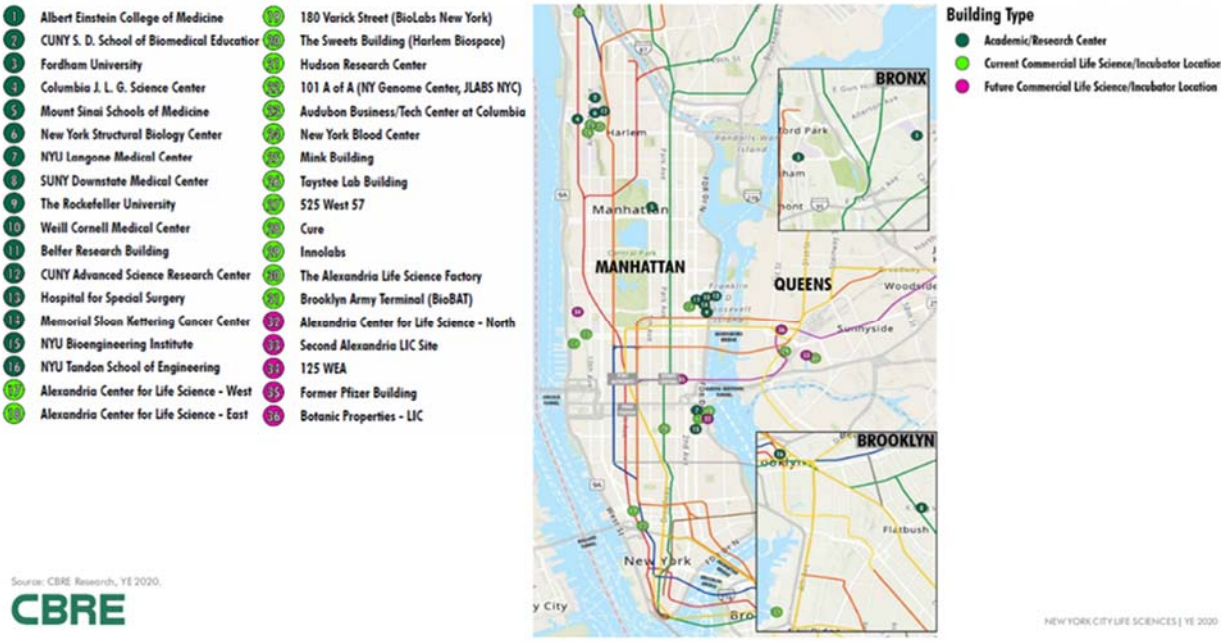



Source: New York Building Congress. (2020, July). *NYC checkup: An examination of healthcare & life science construction.* https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf ; Map by Urbanomics.

CBRE, a global real estate services company, describes New York City's life science market at year end 2020 as including four out of the five boroughs in New York City, identifying the following clusters in its map below: Manhattan's East Side, Manhattan's West Side, Long Island City, and Brooklyn. CBRE identifies these "NYC Life Science Landmarks" below in Figure 10.

[40] Ibid. pp. 37-38.

**Figure 10: CBRE NYC Life Science Landmarks**



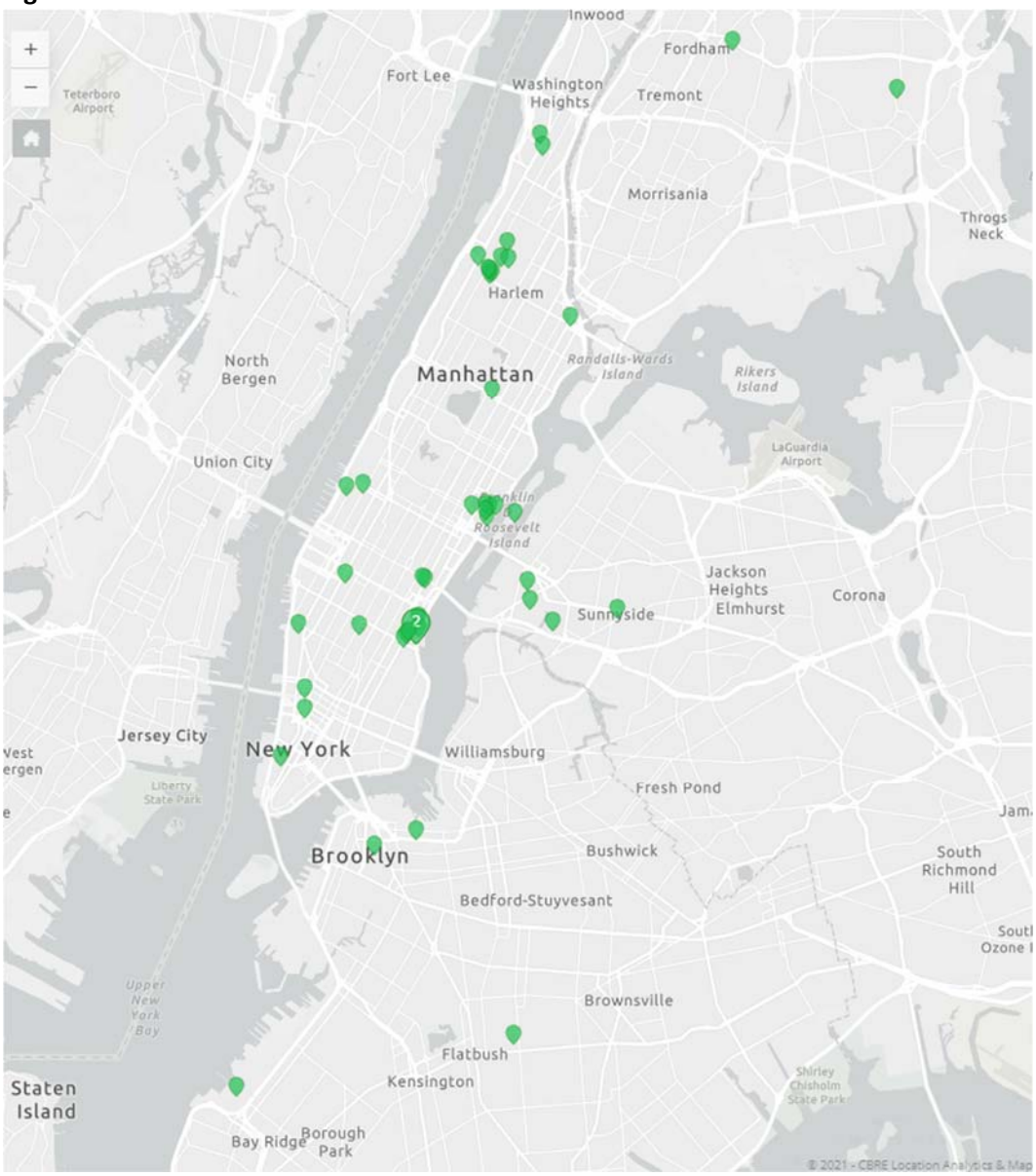

Source: Stern, P. (2020). New York City life sciences market statistics report, year-end 2020. *CBRE*. https://f.tlcollect.com/fr2/821/29120/New_York_City_Life_Sciences_Report_YE_2020.pdf.

As of year-end 2020, CBRE cataloged New York City's life science space at 17 buildings totaling 1.9 million square feet of which, 15 (1.68 million SF) were exclusive lab space. [41] The majority of these buildings are located in Manhattan, including 13 of the 17 buildings. While availability rates seem high, 42.4 percent for all properties and 26.2 percent for lab-exclusive properties, the availability rate for "occupancy-ready, pre-built available space" was 0 percent regardless of status or location.[42] (As noted on page 8, there is an additional 2.36 million square feet coming online in the near future including the 600,000 Factory District Taystee Building in Harlem and the 550,000 sf Alexandria Center North Tower.)[43]

A search for life science lab space on CBRE's property site[44] identified available life science space in all New York City boroughs except for Staten Island. The geographic distribution has 36 of the 46 properties located in Manhattan as shown in Figure 3. Four (4) each are located in Brooklyn and Queens (Long Island City), while an additional two (2) are in the Bronx. Twenty-two (22) of the available properties are part of academic institutions; twelve (12) are in potential commercial life science incubators; ten (10) are in current or existing commercial life science incubators, and two (2) are LifeSci NY RFEI sites.

[41] Stern, P. (2020). New York City life sciences market statistics report, year-end 2020. *CBRE*. https://f.tlcollect.com/fr2/821/29120/New_York_City_Life_Sciences_Report_YE_2020.pdf
[42] Ibid.
[43] New York Building Congress. (2020, July). *NYC checkup: An examination of healthcare & life science construction. https://www.buildingcongress.com/uploads/July_Healthcare_Life_Sciences_Report_v9_digital_distro_b.pdf* p. 38
[44] CBRE. (2021). Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease.

**Figure 11: CBRE NYC Life Science Availabilities**

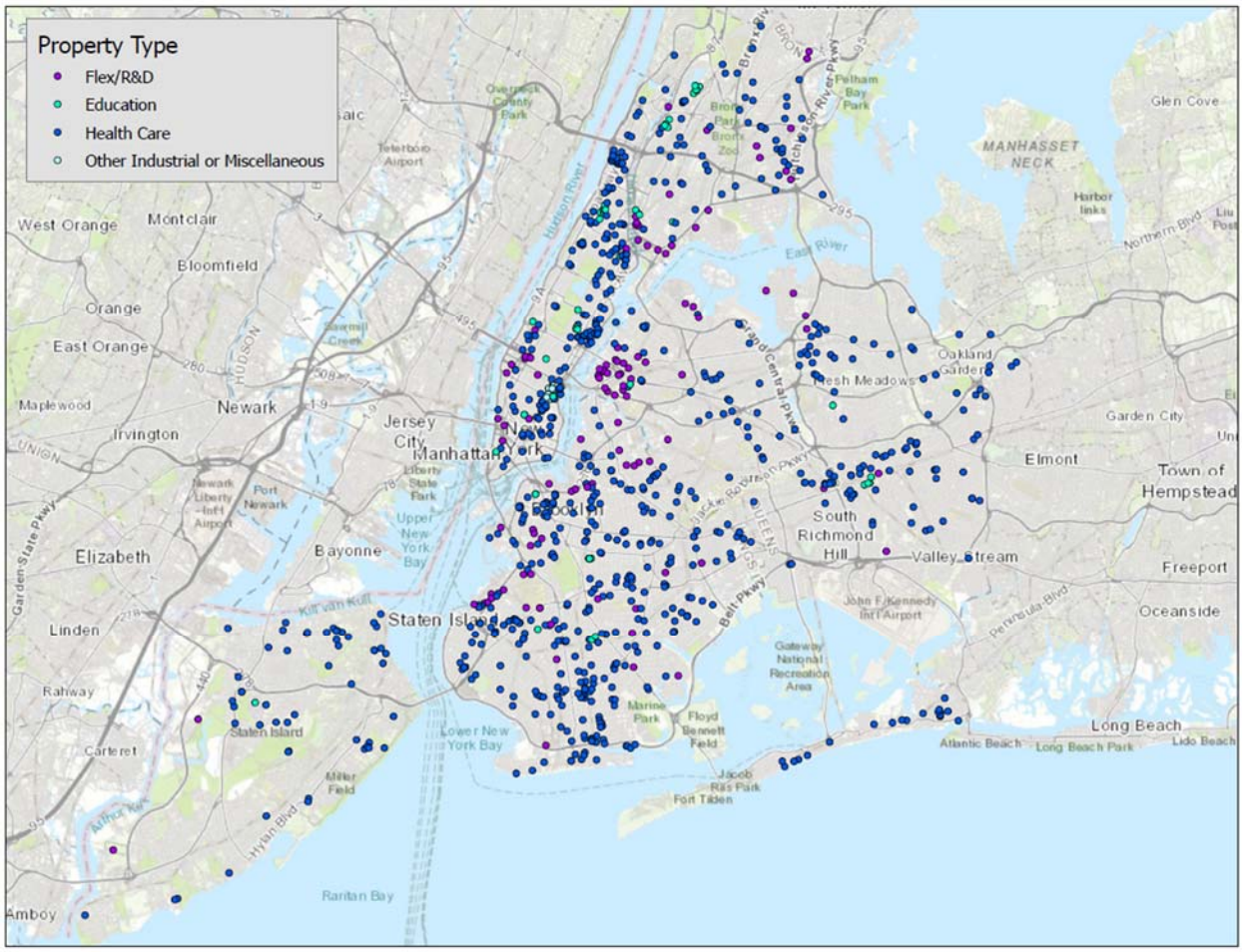



Source: CBRE. (2021). Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease.

CBRE tracks space that meets the criteria for laboratories, i.e., correct zoning and building infrastructure (i.e., data systems, power loads, natural gas hookups, and ventilation systems), and statistics for lab space. Lab exclusive space is solely used for lab space; overall lab space includes both "lab-exclusive" as well as "lab-capable" space that meets lab criteria but is available to both lab and office tenants. While CBRE specifically tracks life science spaces in the New York City and Boston markets, as mentioned in the following section describing Kendall Square, they are only a small part of the overall healthcare and science infrastructure of the industry.

Moody's REIS R&D data[45] mapped in Figure 4, while lacking the breakdown of the CBRE life science tracking, do provide an overview of real estate throughout the City that is considered both appropriate and available for life science and complementary sector development. Further, the Moody's REIS data are similar for each of the comparable markets across the U.S. All of the properties shown are classified as Flex/R&D space and then further identified by more detailed property type: R&D, Healthcare, Education, or Other.

**Figure 12: Moody's REIS NYC R&D Spaces**




Source: Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com; Urbanomics.

### 3.2.3 Chapter Conclusions

The ecosystem that supports the life science sector is not limited to the Upper East Side, but extends throughout New York City. The HR&A Report claim that the NYBC's proposed expansion to a life sciences hub must occur at its current location to maintain proximity to neighboring institutions is contradicted by evidence from NYC life science real estate analyses, national life science real estate studies, and New York City's own description of future life science development.

[45] Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's*

## 3.3 Other U.S. Life Science Real Estate Markets

This chapter of the Review provides an overview of the extent of existing and emerging life science clusters outside of New York City in order to ascertain whether any of the commonly referenced markets exist within the limited (0.1 mile) geographic bounds used to define clusters in the HR&A Report. This Review used Moody's REIS and CBRE data sources for each area to identify and map availability of lab and flex/research and development (R&D)[46] activity.

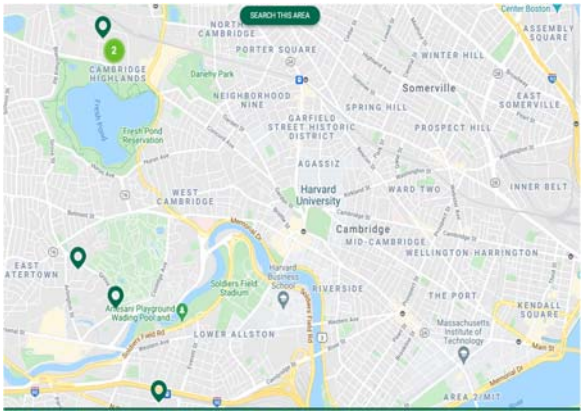
The HR&A Report presented examples of two additional life science clusters outside of New York City[47] in Cambridge, MA and San Francisco, CA. **For these centers as well as other commonly acknowledged markets such as Raleigh-Durham and Denver, data sources below demonstrate that the life science market areas for each of these centers are not focused in one particular area as indicated in the HR&A report, but extend throughout the entirety of each municipality.**

All comparative statistics can be found in Figures 20 and 21.

### 3.3.1 Boston-Cambridge

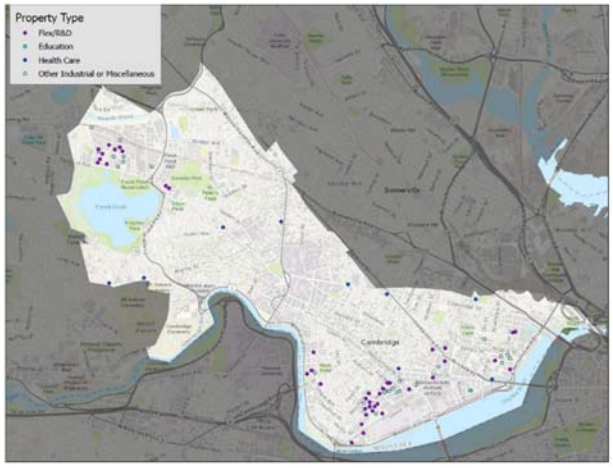
The Boston-Cambridge market area received a total of $1.7 billion dollars in NIH funding in 2021, of which a fraction went to Cambridge. The largest life sciences region in the United States, the area as traced by CBRE, has some 37.9 million SF of life science space, with another 5.8 million SF under construction. The vacancy rate is only 2.5 percent with asking rents of $87.48. In high demand, 108 prospective tenants were seeking 4.75 million SF of additional space in the first quarter of 2021. The limited life science availability is mapped in Figure 6.

**Figure 13: CBRE Boston Life Science Availabilities**




Source: CBRE. (2021). Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease.

**Figure 14: Moody's REIS Cambridge R&D Spaces**




Source: Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com; Urbanomics.

[46] R&D space includes both office and industrial properties that may be appropriate for research laboratory use. It should be noted that even using the same data source, properties may be classified slightly differently as each area follows unique local historical designation conventions; however these data are still useful in establishing the extent of each life science real estate-market.

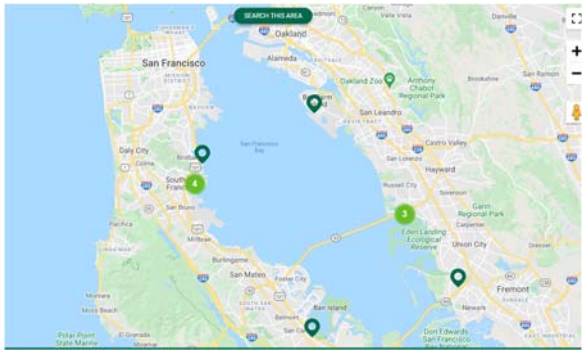
[47] The HR&A Report also referenced the Alexandria Tower in NYC, which was discussed in detail in sections 3.1.2.1 and 3.2.

When looking at R&D properties (Moody's REIS tracking) in the Cambridge submarket as shown in Figure 7, there are some 76 properties encompassing 7.9 million SF of space. These spaces are classified as Flex R&D properties (41), Laboratories (14), Hospital affiliated (9), Universities (1), and Other (25). Only 13 of Cambridge's R&D properties are located in Kendall Square.

### 3.3.2 San Francisco

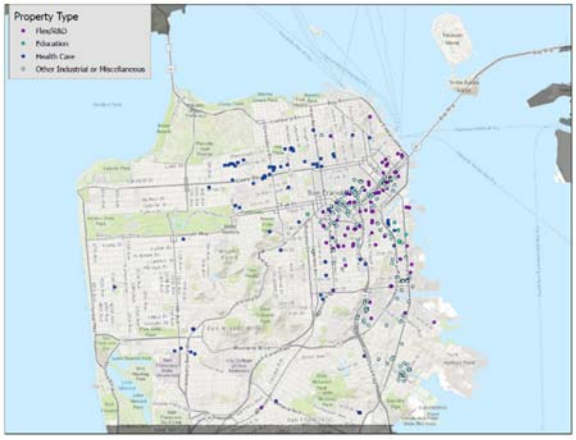
The recipient of $551 million in NIH funding in 2021, the San Francisco life science market is the second largest in the country, consisting of 30 million SF of existing space and has another 2.8 million SF under construction. With relatively low rents for an established market at $69.84 PSF, the vacancy rate is a low 2.4 percent (see Figure 8). The first quarter of 2021 saw 59 prospective tenants seeking a total of 2.9 million SF of space.

**Figure 15: CBRE San Francisco Life Science Availabilities**




Source: CBRE. (2021). Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease.

**Figure 16: Moody's REIS San Francisco R&D Spaces**



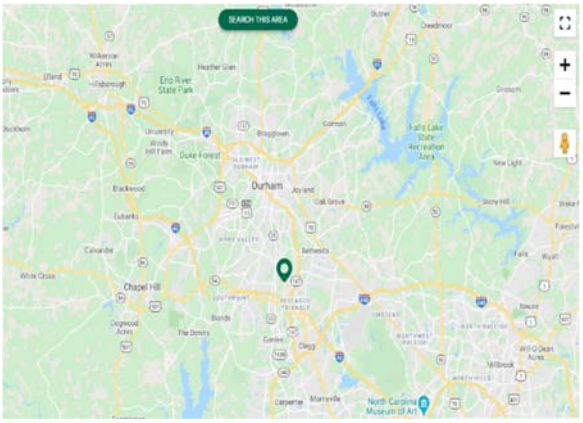

Source: Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com.

Moody's REIS identified 298 R&D properties (11 million SF) in San Francisco County as shown in Figure 9. Almost half (140) of R&D properties were designated as "Other," while the rest were split between Flex/R&D and those affiliated with hospitals. Thirty-nine or 13 percent of these properties were located in the Mission Bay area, indicating that the Mission Bay area is not a stand-alone life science cluster.

### 3.3.3 Raleigh- Durham

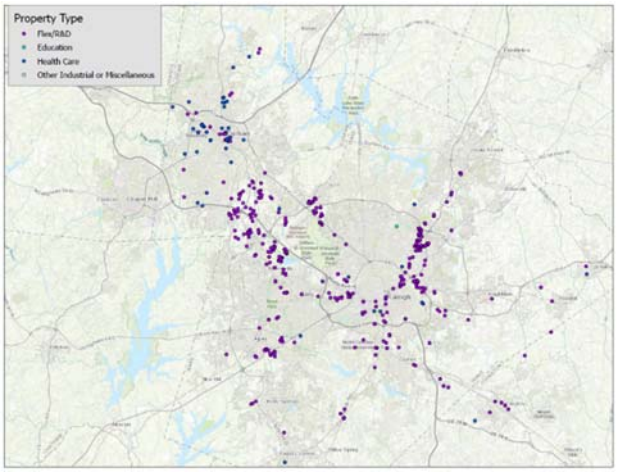
The Raleigh-Durham area received $473 million in NIH life science funding in 2021. The market is comprised of 7.1 million SF of space, with another 380,000 SF under construction. Asking rents are the lowest of any of the compared areas at only $28.43 PSF, while the vacancy rate is the highest at 13.9%. However, only one property was listed in the CBRE life science property search as shown in Figure 17.

**Figure 17: CBRE Raleigh-Durham Life Science Availabilities**




Source: CBRE. (2021). Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease.

**Figure 18: Moody's REIS Raleigh-Durham R&D Spaces**



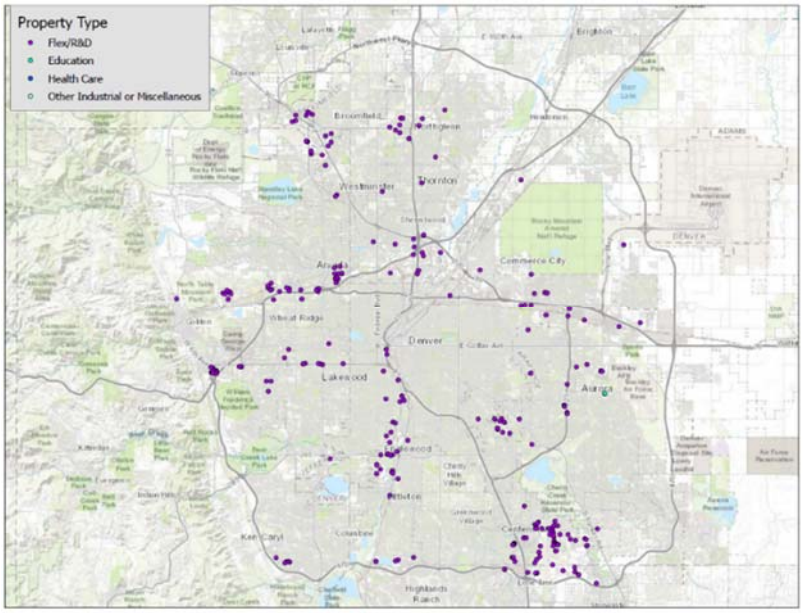

Source: Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com.

Figure 18 presents the R&D space identified in a search of Moody's REIS. The 16.7 million SF of inventory are located in 396 buildings, the vast majority of which have the Flex R&D designation. Forty-five are associated with hospitals; 40 are designated labs; and, one (1) with an academic institution.

### 3.3.4 Denver

Denver received the least NIH funding of the areas examined, at only $219 million in 2021. With 4.6 million SF of life science inventory and 635,000 SF under construction, it has the lowest inventory outside of New York City. The vacancy rate is 3.8 percent and rents are at $50 PSF. What is notable is the current level of demand—in the first quarter of 2021, 33 tenants were seeking 1.6 million SF of new space.

**Figure 19: Moody's REIS Denver R&D Spaces**




Source: Author Unknown. (2021). Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com.

As shown in Figure 19, Denver's R&D space is distributed in groupings along the city's major highways. These 392 properties (16.7 million SF), are designated as Flex R&D (281), Labs (110), and University-affiliated (1).

### 3.3.5 Market Comparisons

**Figure 20: Comparative NIH Funding and CBRE Life Science Stats**

| | | | CBRE Life Science Stats | | | | | |
|---|---|---|---|---|---|---|---|---|
| Market | Submarket | NIH Funding 2021 | Inventory (SF) | Vacancy | Asking Rents | # Tenants Seeking Space | Total Demand (SF) | Under Construction (SF) |
| NYC | All NYC | $1.52 billion | 1,868,960 | 1.9% | $ 90.73 | 43 | 1,124,500 | 1,936,514 |
| | Manhattan | NA | 1,377,169 | 9.0% | $ 115.68 | NA | NA | NA |
| | East Side Corridor | NA | NA | NA | NA | NA | NA | NA |
| | Upper East Side | NA | NA | NA | NA | NA | NA | NA |
| Boston | All Boston | $1.7 billion | 37,874,593 | 2.5% | $ 87.48 | 108 | 4,750,000 | 5,807,684 |
| Cambridge | All Cambridge | NA | NA | NA | NA | NA | NA | NA |
| | Lower Cambridge | NA | NA | NA | NA | NA | NA | NA |
| | Kendall Square | NA | NA | NA | NA | NA | NA | NA |
| | Harvard Square | NA | NA | NA | NA | NA | NA | NA |
| San Francisco | All SF County | $551 Million | 29,988,073 | 2.4% | $ 69.84 | 59 | 2,914,500 | 2,792,633 |
| | Mission Bay District | NA | NA | NA | NA | NA | NA | NA |
| Raleigh Durham | Raleigh Durham | $473 million | 7,102,027 | 13.9% | $ 28.43 | 17 | 839,000 | 380,000 |
| Denver | Denver | $219 million | 4,646,645 | 3.8% | $ 50.00 | 33 | 1,558,000 | 635,319 |
| Minneapolis | Minneapolis | $253 million | NA | NA | NA | NA | NA | NA |

Source: NIH https://report.nih.gov/; CBRE. Search for Properties. Retrieved August 3, 2021. https://www.cbre.us/properties/properties-for-lease

**Figure 21: Comparative Moody's REIS R&D Stats**

| | REIS R&D Property Stats | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of Properities Identified (NA if not identified) | | | | | | SF | | | | | |
| Submarket | Total | #R&D | # Labs | #Hospitals (Health Care) | # Universities/ Education | #Other | Total | #R&D | # Labs | #Hospitals (Health Care) | # Universities /Education | #Other |
| All NYC | 959 | 111 | 0 | 779 | 53 | 16 | 107,106,710 | 7,856,962 | - | 81,609,050 | 12,065,000 | 5,575,698 |
| Manhattan | 241 | 13 | 0 | 190 | 22 | 16 | 51,035,884 | 1,923,175 | - | 37,540,657 | 5,996,354 | 5,575,698 |
| East Side Corridor | 98 | 1 | 0 | 78 | 3 | 16 | 24,895,885 | 30,000 | - | 18,725,223 | 564,964 | 5,575,698 |
| Upper East Side | 44 | 0 | 0 | 39 | 5 | 0 | 9,743,501 | - | - | 8,057,419 | 1,686,082 | - |
| All Boston | | | | | | | | | | | | |
| All Cambridge | 76 | 41 | 14 | 9 | 1 | 25 | 7,871,383 | 4,258,665 | 755,581 | 134,585 | 13,624 | 3,464,509 |
| Lower Cambridge | 53 | 30 | 0 | 5 | 1 | 17 | 7,347,296 | 3,948,833 | 483,787 | 114,036 | 13,624 | 3,270,803 |
| Kendall Square | 13 | 5 | 1 | 1 | 1 | 6 | 2,566,972 | 977,209 | 255,441 | 45,000 | 13,624 | 1,531,139 |
| Harvard Square | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - | - |
| All SF County | 298 | 79 | 0 | 73 | 6 | 140 | 11,069,204 | 5,196,559 | - | 4,901,297 | 51,800 | 919,548 |
| Mission Bay District | 39 | 15 | 0 | 6 | 0 | 18 | 1,138,283 | 899,819 | - | 111,672 | - | 126,792 |
| Raleigh Durham | 396 | 350 | 40 | 45 | 1 | 0 | 20,004,319 | 17,707,865 | 2,305,583 | 2277798 | 18,656 | - |
| Denver | 282 | 281 | 110 | 0 | 1 | 0 | 16,746,900 | 16,635,192 | 6,107,874 | - | 111,708 | - |
| Minneapolis | 838 | 823 | 4 | 14 | 1 | 0 | 64,502,827 | 63,449,518 | 387,620 | 1,053,309 | - | - |

Source: Real estate information services (REIS) network: property search. *Moody's Analytics*. https://www.reis.com.

### 3.3.6 Chapter Conclusion

The real estate data collected on other U.S. life science clusters show that each market includes millions of square feet of R&D and life science laboratory space distributed throughout each of the cities in question. None of these well-known life science markets are limited to a single walkable area as indicated is necessary for success by the HR&A Report.

## 3.4 Current State of Global and Virtual Medical Research

The last two (2) years of pandemic research and quarantine requirements have fast-tracked virtual cooperation among labs nationally and internationally. This Review seeks to ascertain the current extent of global virtual collaboration as well as identify what, if any, research and development activities require

proximity through examination of research activities and referenced documents from medical professionals submitted as public record regarding this rezoning application.

### 3.4.1 Trends in Global Virtual Medical and Scientific Collaboration

Global collaboration in medical and scientific research has increased in frequency and complexity in the last two (2) decades. More than ten (10) years ago, Ghazwan Butrous noted in the Annals of Thoracic Medicine that one-fifth of medical and scientific papers had international co-authors[48], and the level of collaboration has only grown with breakthroughs in technology. C.S. Wagner hypothesizes that international collaboration is motivated by the desire to increase visibility, share project costs, gain/share access to resources, achieve greater leverage by sharing data, and increase creativity by exchanging ideas.[49]

"International collaboration brings opportunity - the more rapid completion of clinical trials, enhanced generalizability of the results of these trials, and a focus on questions that have evoked international curiosity. It has changed practice, improved outcomes, and enabled an international response to pandemic threats."[50]

Many United States academic medical institutions have been involved in international research for decades. However, the COVID-19 pandemic has fast-tracked international cooperation and collaboration as academic institutions and pharmaceutical companies worked together to identify treatments and ultimately, vaccines, even while many labs and supporting facilities were closed or forced to operate with reduced in-person staffing in the attempt to slow the spread. The necessities of this situation have created new tools for collaboration both internally and on an international scale. Buitendijk et. al., propose that several key strategies have come out of the pandemic that will ensure that global cooperation in research remains the norm including: the shift to online, digital interactions from learning to professional consultation; increased and enhanced connections with institutions from the "Global South", and a (proposed) reformed funding and reward structure that will eliminate jurisdictional limitations on funding.[51] The first two (2) elements were fast-tracked during the pandemic and these new methods of communication and institutional ties are likely only to be enhanced in the future.

In addition to published studies, several letters written by medical professionals were submitted to the public record as part of the rezoning application review process. Among these were letters from Dr. John Burnett, Jr., Director of the Cardiorenal Research Laboratory of the Mayo Clinic[52] and Dr. Elias Zerhouni, former director of NIH (2002-2008) and former president of R&D for Sanofi (2010-2018)[53], both of which stated emphatically that close proximity is not required for scientific collaboration. (See Appendix B.)

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[48] Butrous G. (2008). International cooperation to promote advances in medicine. Annals of thoracic medicine, 3(3), 79–81. https://doi.org/10.4103/1817-1737.41913.

[49] Wagner, C. S. 2006. "International Collaboration in Science and Technology: Promises and Pitfalls." In *Science and Technology Policy for Development, Dialogues at the Interface*, edited by L. Box and R. Engelhard. London: Anthem Press.

[50] Marshall J. C. (2017). Global Collaboration in Acute Care Clinical Research: Opportunities, Challenges, and Needs. Critical care medicine, 45(2), 311–320. https://doi.org/10.1097/CCM.0000000000002211.

[51] Buitendijk, S., Ward, H., Shimshon, G., Sam, A. H., Sharma, D., & Harris, M. (2020). COVID-19: an opportunity to rethink global cooperation in higher education and research. *BMJ global health*, *5*(7), e002790. https://doi.org/10.1136/bmjgh-2020-002790.

[52] Burnett, Dr. John C. (2021, March 31) Letter to the Community Board.

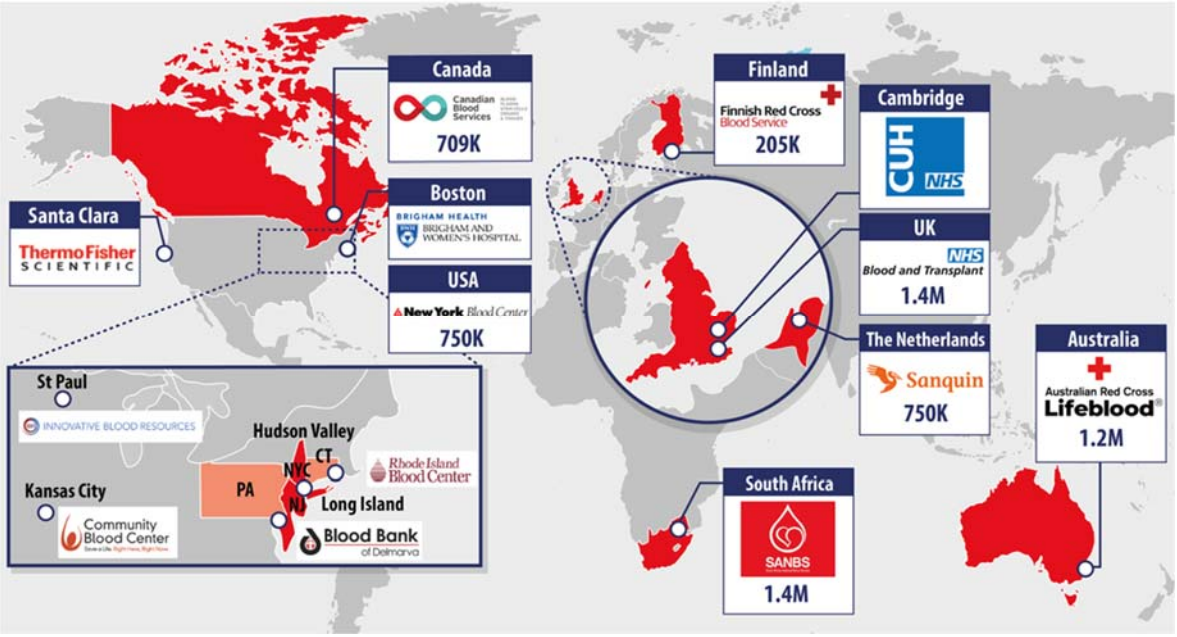
[53] Zerhouni, Dr. Elias. (2021, April 22) Letter to Gale Brewer, Manhattan Borough President.

**In short, national and international collaboration in medical and scientific research has become the standard and virtual cooperation will become even more common for all aspects of medical and scientific research and instruction in the future. All trends contradict the HR&A Report's assertion of a link between physical proximity and enhanced collaboration in medical and science research.**

### 3.4.2 NYBC and Collaboration

The NYBC, itself, has been immersed in large-scale domestic and global collaboration for years. It is one of ten (10) members (see Figure 22) of the newly formed Blood Transfusion Genomics Consortium (www.bgc.io) to develop more streamlined blood typing technology[54] along with collaborators in Great Britain (Cambridge University Hospitals, NHS Blood and Transplant), the Netherlands (Sanquin), Massachusetts (Brigham and Women's Hospital), California (ThermoFisher Scientific), Australia (Australian Red Cross Lifeblood), Canada (Canadian Blood Services), Finland (Finnish Red Cross Blood Service), and South Africa (SANDBS). These NYBC relationships do not appear to suffer from a lack of physical proximity.

**Figure 22: The 10 Member Organizations of the Blood Transfusion Genomics Consortium**




Source: Author Unknown. (2021, June 16). Blood centers from around the world unite to develop more streamlined blood typing technology. *New York Blood Center*.

Further, this Review searched PubMED.gov,[55] on August 2, 2021 for articles associated with the NYBC and then filtered the search to reflect only the year 2021 to establish the most recent/current state of its research and collaboration.

[54] Author Unknown. (2021, June 16). Blood centers from around the world unite to develop more streamlined blood typing technology. *New York Blood Center*. https://www.nybc.org/news/articles/blood-centers-around-world-unite-develop-more-streamlined-blood-typing-technology.

[55] PubMed is a source for more than 32 million citations from biomedical literature from multiple online sources. PubMed is associated with the National Institute for Health, National Library of Medicine, and National Center for Biotechnology Information.

A total of 76 articles and documents were returned from a search for articles published in 2021 with the following keywords: "Affiliation" and "New York Blood Center" and then limited to the New York, NY location. Of these, four (4) articles had authors affiliated with the NYBC alone; five (5) were collaborations with neighboring institutions, while an additional six (6) had authors with affiliations within New York City ranging from NYU, Cornell-Weill, to Albert Einstein in the Bronx. The other 61 articles (80.3%) were split between international and domestic collaborations with partners throughout the world and the United States, as shown in the table that follows.

**Figure 23: 2021 NYBC Research Collaborations by Mutually Exclusive Geographic Distribution**

| | Research Papers | Share of Total |
|---|---|---|
| Total | 76 | 100.0% |
| NYBC Alone | 4 | 5.3% |
| NYBC Neighborhood Collaborations | 5 | 6.6% |
| Other NYC Collaborations | 6 | 7.9% |
| United States Collaborations | 31 | 40.8% |
| International Collaborations | 30 | 39.5% |

**Only 6.6 percent of NYBC research efforts to date in 2021 were prepared in affiliation with neighborhood institutions.** Thus, the research published with the New York Blood Center's staff in 2021 alone shows the extent of widespread geographic collaboration, thus completely refuting the HR&A's Report's argument that close proximity (0.1 of a mile) is required for NYBC's successful collaboration and research. (The article titles, authors, and affiliations can be found in Appendix A.)

### 3.4.3 310 East 67th Street Research Activities

Little of the activity at 310 East 67th Street is classified as research under existing conditions. Only 3.3 percent ($15.8 million out of $476.4 million) of 2019 revenues were attributed to research. Expenditures follow the same pattern with only 3.0 percent of expenditures being classified as research ($15.1 million of a total $498.7 million) as documented in NYBC's financials. [56]

Under proposed development conditions, the NYBC's research capacity is unlikely to change as the majority of the proposed tower will not by occupied by the NYBC itself, but by commercial tenants of the developer, Longfellow. There is no way to ascertain the extent to which potential future tenants will interact with local medical institutions or even if they will be life science firms. Subsequently, the HR&A Report claim that denying the tower will curtail the NYBC's activities and restrict the development of the Upper East Side's life science cluster is not supported by existing evidence.

### 3.4.4 Chapter Conclusions

Both the literature review and documentation from experts confirm that the trend of global cooperation in medical and scientific research is the industry standard and the extent of virtual collaborations will

[56] KPMG. (2020, March 30) New York Blood Center Financial Statements and Supplementary Information on Federal Awards Programs.

continue to grow. These trends contradict the HR&A Report's assertion of a link between physical proximity and enhanced collaboration in medical and science research.

NYBC follows the global research trend of widespread collaboration. The majority of the NYBC's research partners in the recent past and planned future are distributed all over the world as shown by past affiliations and future plans. As such there is no way to defend the statement that the NYBC must be located on its current site in order to maintain its partnerships and collaborations.

The argument that the expansion to a life science tower on East 67th Street is necessary to maintain NYBC's continued research capacity and relationships is unsubstantiated given so little of the NYBC's activities are devoted to research.

# 4 Conclusions

**This Review concludes that the HR&A Report's proximity analysis is not a relevant resource to inform the question of rezoning NYBC's location at 310 East 67th Street. There is no evidence in the HR&A Report to support the assertion that the tower expansion of the NYBC at its existing location is important to the life sciences sector in New York City, the Upper East Side cluster, or even to the NYBC itself.**

The HR&A Report's proximity analysis is generic in scope and not specifically focused on the modern life science industry, being based on sources that are sometimes out of date and/or not relevant to the life sciences sector. In addition, it misstates some of its cited sources' conclusions; and is misleading in the comparisons it makes between other life science developments (both throughout the country and on the East River in Manhattan) and the proposed NYBC tower.

The HR&A Report's argument that a viable life science cluster must exist within walking distance proximity is disputed by real estate data collected for other well-known and documented U.S. life science clusters that show that each market includes millions of square feet of R&D and life science laboratory space distributed throughout each of the cities reviewed. None of these well-known life science markets are limited to a single walkable area as asserted is necessary by the HR&A Report.

Trends in virtual medical and science research contradict the HR&A Report's assertion of a link between physical proximity and enhanced collaboration in medical and science research. Both the literature review and documentation from experts confirm that citywide, national, and global collaboration in medical and scientific research is the current industry standard. The extent of virtual collaborations continues to grow.

The HR&A Report's claim that the NYBC's proposed physical expansion into a commercial life sciences tower must occur at its current location in order to maintain proximity to neighboring institutions is contradicted by evidence from NYC life science real estate analyses, national life science real estate studies, and New York City's own description of future life science development. The City's life science ecosystem is not limited to the Upper East Side, but rather extends throughout New York City as documented by real estate and industry sources as well as New York City's administrative bodies.

The HR&A Report's claim that the NYBC will not be able to maintain its existing relationships with neighboring institutions if the tower cannot be constructed at 310 East 67th Street cannot be substantiated. The NYBC devotes only a tiny fraction of its resources to research activities. Most of its research is not

done in collaboration with neighboring institutions today. Instead, the NYBC follows the national and global research trend of widespread collaboration. The majority of the NYBC's research partners are distributed all over the world as shown by past affiliations and public documents related to ongoing and future projects. As such there is no way to defend the statement that NYBC's proposed commercial tower must be located on its current site in order to maintain its partnerships and collaborations.

Any claim on the necessity of tower construction at 310 East 67th Street to maintaining relationships with neighboring institutions is negated by the required relocation of the NYBC during the minimum five year construction period. There would be no guarantee of future collaboration either, given that the majority of the proposed tower would be under the control of Longfellow Real Estate Company.

In the absence of any evidence in the HR&A Report, and because we could find none, we could not validate the HR&A Report's argument that the NYBC's development of its proposed life science tower needs to occur at 310 East 67th Street rather than instead, building its own new structure as-of-right, or constructing this tower in an appropriately zoned C or M district.

# Appendix A

**August 2, 2021, PubMed.gov Search: Affiliation New York Blood Center**

The article titles, authors and affiliations follow:

**Learning from the past: development of safe and effective COVID-19 vaccines**

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**When Alarmins Are "Therapeutic"**

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**p53 activation during ribosome biogenesis regulates normal erythroid differentiation**

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**Reshaping Erythrophagocytosis and Iron Recycling by Reticuloendothelial Macrophages**

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**Seroprevalence of anti-SARS-CoV-2 antibodies in a cohort of New York City metro blood donors using multiple SARS-CoV-2 serological assays: Implications for controlling the epidemic and "Reopening"**

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**Declining bone marrow harvest quality over 24 years: a single institution experience**

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**Overcoming Drug Interference in Transfusion Testing: A Spotlight on Daratumumab**

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**Transfusion reactions associated with COVID-19 convalescent plasma therapy for SARS-CoV-2**

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**TRUST: Assessing the Efficacy of an Intervention to Increase HIV Self-Testing Among Young Black Men Who have Sex with Men (MSM) and Transwomen**

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**Loss of 4.1N in epithelial ovarian cancer results in EMT and matrix-detached cell death resistance**

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**NIH Workshop 2018: Towards Minimally Invasive or Noninvasive Approaches to Assess Tissue Oxygenation Pre- and Post-transfusion**

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**Characteristics of coronavirus disease 19 convalescent plasma donors and donations in the New York metropolitan area**

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**Interplay between cofactors and transcription factors in hematopoiesis and hematological malignancies**

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**Impact of RHD genotyping on transfusion practice in Denmark and the United States and identification of novel RHD alleles**

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**Iron Toxicity and Chelation Therapy in Hematopoietic Stem Cell Transplant**

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**Vaccine efficacy probable against COVID-19 variants**

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**Variation in Neonatal Transfusion Practice**

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**Safety and benefits of automated red cell depletion-exchange compared to standard exchange in patients with sickle cell disease undergoing chronic transfusion**

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**Use of U.S. Blood Donors for National Serosurveillance of SARS-CoV-2 Antibodies: Basis for an Expanded National Donor Serosurveillance Program**

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**Evaluating blood donor experiences and barriers/facilitators to blood donation in the United States using YouTube video content**

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**Transfusion practices in a large cohort of hospitalized children**

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**The wider perspective: cord blood banks and their future prospects**

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**COVID-19 convalescent plasma: Interim recommendations from the AABB**

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**Mysterious clumping in a cell therapy product**

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**Screening out the Exposome to Improve Transfusion Quality**

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**Design, synthesis, and antiviral activity of a series of CD4-mimetic small-molecule HIV-1 entry inhibitors**

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**Requirement for antiapoptotic MCL-1 during early erythropoiesis**

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**Recent lessons learned for ex-vivo platelet production**

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**Just4Us: Development of a Counselor-Navigator and Text Message Intervention to Promote PrEP Uptake Among Cisgender Women at Elevated Risk for HIV**

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**Hemolysis inhibits humoral B-cell responses and modulates alloimmunization risk in patients with sickle cell disease**

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**Frequency of rare, serious donor reactions: International perspective**

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**HIV, HCV, and HBV incidence and residual risk in US blood donors before and after implementation of the 12-month deferral policy for men who have sex with men**

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**Minipool testing for SARS-CoV-2 RNA in United States blood donors**

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**Hormetic endoplasmic reticulum stress in hematopoietic stem cells**

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**Severe delayed hemolytic transfusion reaction due to anti-Fy3 in a patient with sickle cell disease undergoing red cell exchange prior to hematopoietic progenitor cell collection for gene therapy**

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**Women's views on communication with health care providers about pre-exposure prophylaxis (PrEP) for HIV prevention**

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**A pair of S-silencing single nucleotide variants cis-linked on GYPB**

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**A randomized double-blind controlled trial of convalescent plasma in adults with severe COVID-19**

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**Temporal Analysis of Serial Donations Reveals Decrease in Neutralizing Capacity and Justifies Revised Qualifying Criteria for Coronavirus Disease 2019 Convalescent Plasma**

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**Transfusion Practices in Pediatric Cardiac Surgery Requiring Cardiopulmonary Bypass: A Secondary Analysis of a Clinical Database**

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**ABO maternal-child discordance: Evidence of variable allelic expression and considerations for investigation**

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**Design of gp120 HIV-1 entry inhibitors by scaffold hopping via isosteric replacements**

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**SARS-CoV-2 spike protein: a key target for eliciting persistent neutralizing antibodies**

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**Individual, social and structural factors influencing PrEP uptake among cisgender women: a theory-informed elicitation study**

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**Impairment of human terminal erythroid differentiation by histone deacetylase 5 deficiency**

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**Regulation of RNA Polymerase II Activity is Essential for Terminal Erythroid Maturation**

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**Biomechanical characterization of SARS-CoV-2 spike RBD and human ACE2 protein-protein interaction**

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**Rational Design of A Novel Small-Molecule HIV-1 Inactivator Targeting Both gp120 and gp41 of HIV-1**

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**Comprehensive phenotyping of erythropoiesis in human bone marrow: Evaluation of normal and ineffective erythropoiesis**

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**Epigenetic inactivation of ERF reactivates γ-globin expression in β-thalassemia**

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**Further evidence for the benefit of therapeutic plasma exchange for acute multi-organ failure syndrome refractory to red cell exchange in sickle cell disease**

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**Type I interferon is induced by hemolysis and drives antibody-mediated erythrophagocytosis in sickle cell disease**

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**Non-Transferrin-Bound Iron in the Spotlight: Novel Mechanistic Insights into the Vasculotoxic and Atherosclerotic Effect of Iron**

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**Evidence for continued dose escalation of plerixafor for hematopoietic progenitor cell collections in sickle cell disease**

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**Rectal and vaginal tissue from intravenous VRC01 recipients show protection against ex vivo HIV-1 challenge**

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**EpoR-tdTomato-Cre mice enable identification of EpoR expression in subsets of tissue macrophages and hematopoietic cells**

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**The safety of COVID-19 convalescent plasma donation: A multi-institutional donor hemovigilance study**

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**Locating the Risk: Using Participatory Mapping to Contextualize Perceived HIV Risk across Geography and Social Networks among Men Who Have Sex with Men in the Deep South**

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**A vaccine inducing solely cytotoxic T lymphocytes fully prevents Zika virus infection and fetal damage**

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**Dynamic changes in murine erythropoiesis from birth to adulthood: implications for the study of murine models of anemia**

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**Rh alloimmunization in chronically transfused patients with thalassemia receiving RhD, C, E, and K matched transfusions**

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**The effect of the SARS-CoV-2 pandemic and civil unrest on massive transfusion protocol activations in Minneapolis 2020**

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**Pleckstrin-2 is essential for erythropoiesis in β-thalassemic mice, reducing apoptosis and enhancing enucleation**

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**The equilibrative nucleoside transporter ENT1 is critical for nucleotide homeostasis and optimal erythropoiesis**

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**Sequence and Properties of Cagein, a Coiled-Coil Scaffold Protein Linking Basal Bodies in the Polykinetids of the Ciliate Euplotes aediculatus**

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**Drugs that target early stages of Onchocerca volvulus: A revisited means to facilitate the elimination goals for onchocerciasis**

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**Murine bone marrow mesenchymal stromal cells have reduced hematopoietic maintenance ability in sickle cell disease**

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**An IDH1-vitamin C crosstalk drives human erythroid development by inhibiting pro-oxidant mitochondrial metabolism**

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**Screening of blood donors for sickle cell trait using a DNA-based approach: Frequency in a multiethnic donor population**

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**Potentially modifiable predictors of cell collection efficiencies and product characteristics of allogeneic hematopoietic progenitor cell collections**

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**Onchocerca volvulus bivalent subunit vaccine induces protective immunity in genetically diverse collaborative cross recombinant inbred intercross mice**

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**Vasculo-toxic and pro-inflammatory action of unbound haemoglobin, haem and iron in transfusion-dependent patients with haemolytic anaemias**

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**Results from the blood donor competence, autonomy, and relatedness enhancement (blood donor CARE) randomized trial**

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**Supercoiling Structure-Based Design of a Trimeric Coiled-Coil Peptide with High Potency against HIV-1 and Human β-Coronavirus Infection**

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**Process and procedural adjustments to improve CD34+ collection efficiency of hematopoietic progenitor cell collections in sickle cell disease**

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**Convalescent plasma for adults with acute COVID-19 respiratory illness (CONCOR-1): study protocol for an international, multicentre, randomized, open-label trial**

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# Appendix B

MAYO CLINIC

200 First Street SW
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507-284-4343

**John C. Burnett, Jr., M.D.**
Director, Cardiorenal Research Laboratory

March 31, 2021

To the Community Board, Manhattan,

I have been asked to comment on a statement by the LFKRI that states that physical proximity is an essential or even a factor in medical research. Thus, this letter provides my thoughts on on cutting-edge biomedical research and how it operates today.

I write this letter based on my experience at the Mayo Clinic as the Marriott Family Professor of Cardiovascular Research, Professor of Medicine, Physiology and Bioengineering, Director of the Cardiorenal Research Laboratory, Mayo Distinguished Investigator and a previous Director of Research for the Mayo Clinic. I have been funded continuously by the NIH for over 30 years and have over 500 publications and 28 patents.

Biomedical research today is a national and international network of collaborating investigators utilizing advanced technology spread around the world and connected by constant exchange of faculty and also employing the latest virtual technologies such as Zoom and other methodologies. Here in our research laboratory and team in Rochester MN our principal collaborators are in Japan, Australia, Denmark, Italy, China and soon India. Critical time sensitive samples of blood and plasma are routinely sent and processed from all these other countries using state of the art methods. We hold regular meetings face to face by Zoom or Facetime. Let me make it clear that adjacent location geographically is no longer a requirement or needed. Let me also state that one of the most important in person meetings (halted because of COVID) is at small and large biomedical research annual meetings at which the key opinions worldwide gather which facilitates further research and breakthroughs.

Let me state the following. I think biomedical research is today follows an exciting new path of how it is performed leading to successes and progress. If I were to draw a picture of our group in the Guggenheim Building in Rochester MN and draw lines to our collaborators none would connect in Rochester but throughout the US and the world. An example (one of many) is our efforts in drug discovery which has resulted in 3 biotech companies. Currently, a collaborator in Germany is developing a test to measure a newly discovered enzyme in the heart critical in heart failure. The blood from a group of volunteers and patients with specific heart problems will be then obtained in Denmark. All samples will be sent to us here at Mayo

to run the key assay. Indeed, research could be considered a paradigm of remote connections much as the world is and has become in this the 21st Century.

Sincerely,

John C. Burnett, Jr. MD
Marriott Family Professor of Cardiovascular Research
Professor of Medicine, Physiology and Bioengineering
Mayo Distinguished Investigator

**From:** Elias Zerhouni <[redacted]>
**Date:** April 22, 2021 at 11:14:50 AM MDT
**To:** GBrewer@manhattanbp.nyc.gov
**Cc:** [redacted]
**Subject: My feedback on the close physical proximity argument for scientists related to blood bank project**

Dear Ms. Brewer

I have been asked to provide my opinion on the necessity of close physical proximity of scientists for a project under your consideration.
Many years ago when communications technologies and rapid systems of shipping and delivery close proximity was essential. Today modern scientific organizations do not generally require such proximity. In fact these organizations are driven to access to skilled talents wherever they are located and work virtually ( as demonstrated by the current pandemic).
As president of R&D for a large company I managed sites that were located across all continents. As former director of NIH the criterion of close proximity was not required for collaborating scientists.
I hope this helps you in your deliberations.
Best regards
Elias Zerhouni, MD
15 th director NIH ( 2002-2008)
Former president R&D ,Sanofi 2010-2018

Sent from my iPhone