HANOVER RESEARCH

MARKET ANALYSIS

Master's in Animal Models and Stem Cell Research

Prepared for Northeastern University

March 2021

In the following report, Hanover assesses demand for master's degree programs in animal models and stem cell research, specifically highlighting demand trends within the Boston and Toronto metropolitan areas. This report includes an examination of student and labor market demand, and an analysis of potential competitor programs.

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RECOMMENDATIONS

Based on an analysis of degree completions, labor market demand, and market competitors, Hanover offers Northeastern University (Northeastern) the following recommendations:

DO NOT ESTABLISH A MASTER'S PROGRAM IN ANIMAL MODELS AND STEM CELL SCIENCE.

Because of the proposed program's narrow focus and lack of existing comparable programs, student demand data for a master's program in animal models and stem cell science are limited at all geographic levels studied. In the broader fields of animal science and molecular biology, master's degrees have experienced declining demand in Boston. Though there appears to be strong graduate student demand in Toronto for the related area of molecular genetics, the demand is mainly due to a single program at one institution.

The labor market outlook is favorable for employment opportunities related to animal modeling and stem cells, indicating a stable landscape. However, individuals with doctoral degrees may be preferred for positions related to animal modeling.

Finally, there do not appear to be any programs in the U.S. or Toronto that focus exclusively on animal modeling or animal modeling and stem cell science. The programs Hanover found to be most similar to Northeastern's proposed program are limited in number and size: there are few examples of such programs nationwide, and of the small number of programs similar to the proposed program, most have fewer than ten graduates per year.

As such, Northeastern should avoid significant investment in establishing a master's program in the field.

IF NORTHEASTERN PROCEEDS WITH A MASTER'S PROGRAM IN ADVANCED REGENERATIVE MEDICINE, CONSIDER ADDING AN ANIMAL MODELS CONCENTRATION TO CAPTURE THE FIELD'S TARGET AUDIENCE.

Regenerative medicine represents a broader field with more exemplary programs established in the country. If Northeastern chooses to establish a master's program in advanced regenerative medicine, it should consider adding an animal models concentration. This should allow Northeastern to ascertain the degree of student demand for the field without investing as many resources as a standalone graduate program would require.

EXECUTIVE SUMMARY

KEY FINDINGS

Conferral data are too limited to indicate demand for an animal models and stem cell science program. Student demand for the broader animal science and molecular biology graduate-level fields is declining in Boston.

There are few programs in the United States similar to Northeastern's proposed master's program in animal models and stem cell research, and this field is not represented by a specific instructional code(s). Broader fields, particularly animal sciences and molecular biology, are themselves niche programs that have recently experienced declining demand in the Boston metropolitan area. Greater Toronto Area enrollment data that include all master's and doctoral enrollments indicate a rise in student demand for related fields, particularly for molecular genetics, although the conferrals for molecular genetics are driven by a single institution.

Employment for animal science and stem cell science–related positions has a stable outlook, though individuals with a doctoral degree may be more sought after.

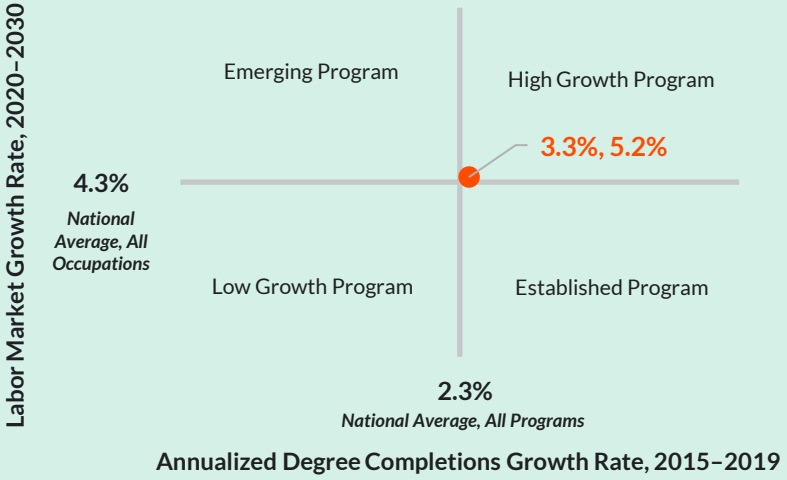
In the next decade, the number of positions in occupations related to the field is projected to grow at the rate equivalent to all occupations in the Boston metropolitan area. The Ontario biologist workforce is projected to grow as well, though there are fewer field-specific projections data available. Related industries, particularly biotechnology, also have a strong outlook both in the United States and outside of it.

Benchmarked programs are small, with most graduating under ten students per year.

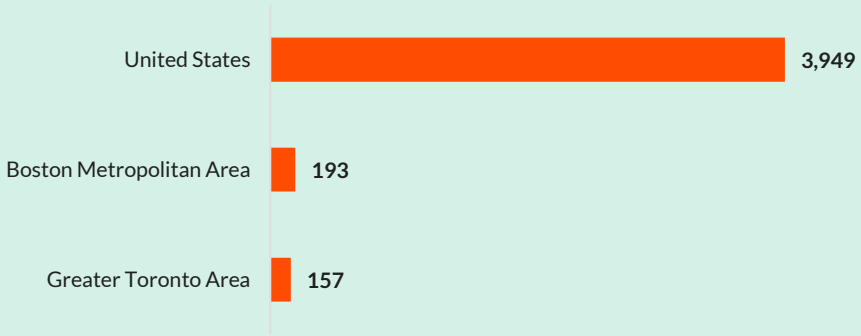
Six of the eight benchmarked programs reported fewer than ten completions in 2019, indicating narrow target audiences. Even so, some programs advertise career pathways across multiple sectors: research, academia, and veterinary medicine.

NATIONAL BENCHMARK ANALYSIS

Completions and relevant labor market data for master's programs in fields related to animal modeling and stem cell research compared to all completions and all occupations in the United States



ANNUAL ANIMAL MODELING–RELATED JOB POSTINGS



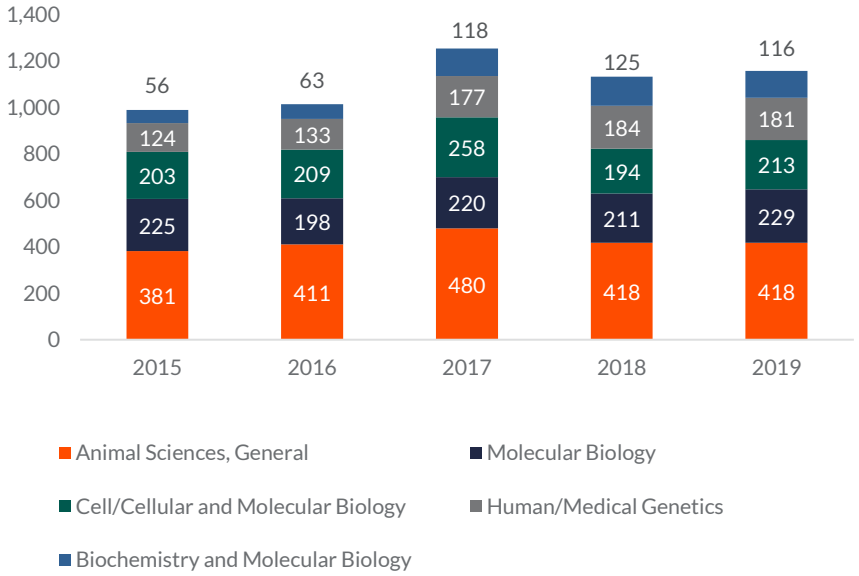
Note: Ads contain the keyword "animal models" and specify at least a bachelor's credential. For full details on methodology, see pp. 7–9.

STUDENT DEMAND ANALYSIS

Student demand for broader graduate programs related to animal models and stem cell research is declining in the Boston metropolitan area and rising in the Greater Toronto Area. There are few programs in the United States similar to the proposed master's program in animal models and stem cell research, and no instructional codes that represent the specific field. Broader fields, particularly animal sciences and molecular biology, are themselves niche programs that have recently experienced declining demand in the Boston metropolitan area—institutions reported 35 master's completions total in 2019 with an annualized rate of decline of 4.5 percent in the past five years. Across the United States, these programs have stable student demand, though data are limited for narrow fields like *Comparative and Laboratory Animal Medicine* that only reports 31 master's completions. Greater Toronto Area enrollment data that include all master's and doctoral enrollments indicate a rise in student demand for related fields, particularly for University of Toronto's molecular genetics graduate program.

NATIONAL DEGREE COMPLETIONS

United States distribution of master's degree completions from 2015 to 2019 (top five fields)



TOTAL DEGREE COMPLETIONS/ENROLLMENTS

Aggregate degree completions by geographic level (2019)

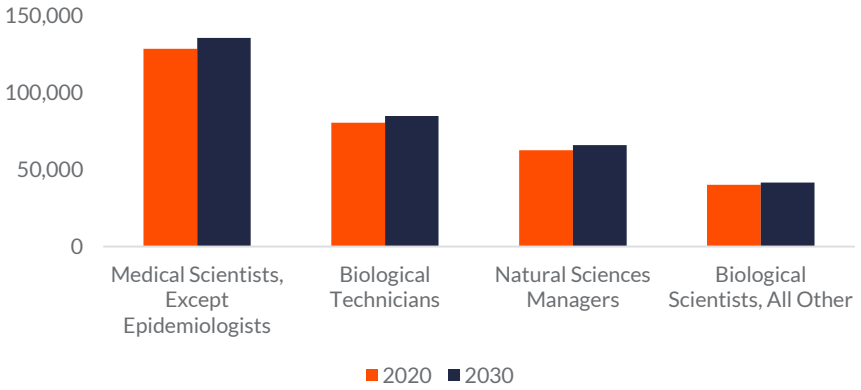
Classification of Instructional Programs	Master's Completions (2019)		All Graduate-Level Enrollments (2018–2019)	
	Boston	U.S.A.	Toronto	Ontario
Animal Sciences, General	1	418	0	136
Molecular Biology	0	229	0	0
Cell/Cellular Molecular Biology	18	213	0	235
Human/Medical Genetics	10	181	0	0
Biochemistry and Molecular Biology	0	116	73	73
Genetics, General	2	51	0	0
Chemical and Biomolecular Engineering	0	40	0	0
Molecular Medicine	0	27	0	0
Comparative and Laboratory Animal Medicine	4	31	0	0
Molecular Genetics	0	21	339	339
Total Completions, Observed Fields	**35**	**1,327**	**412**	**783**
Growth Rate, Observed Fields	**-4.5%**	**3.3%**	**11.5%**	**7.6%**
Growth Rate, All Fields	**4.2%**	**2.3%**	**3.7%**	**4.1%**

Source: National Center for Education Statistics and Ontario Ministry of Training Colleges and Universities
Note: Boston refers to the Boston–Cambridge–Newton, MA–NH metropolitan statistical area (MSA). Growth rates reflect compound annual growth rate (CAGR) from 2015 to 2019. Ontario data refer to fall, full-time graduate-level enrollments (both master's and doctoral) in the 2018–2019 year;Toronto refers to the Greater Toronto Area (GTA).

LABOR MARKET ANALYSIS

NATIONAL PROJECTED EMPLOYMENT

United States animal models and stem cell research–related positions as of 2020 and 2030 (projected)



TOTAL LABOR MARKET

Aggregate projected employment growth by geographic level

	Boston	U.S.A.	Ontario
Estimated Employment (2020)	22,578	311,238	Not available
Projected Employment (2030)	23,405	327,522	Not available
Employment Growth, Observed Occupations	**3.7%**	**5.2%**	**9.1–10.0%**
Total Annual Openings, Observed Occupations	**2,210**	**31,318**	**400–600**
Employment Growth, All Occupations	**3.7%**	**4.3%**	**Not Available**

Source: JobsEQ® (data as of 2020 Q3) and Ontario Ministry of Labour, Training and Skills Development

Note: Boston refers to the Boston–Cambridge–Newton, MA–NH metropolitan statistical area (MSA). Employment growth reflects the percent change from estimated 2020 employment to projected 2030 employment. Ontario employment data correspond to *Biologists and related scientists* for the 2017–2021 time period; data for the Greater Toronto Area were not available.

ANALYSIS

Labor market demand for animal models and stem cell research–degree recipients will be stable in the Boston metropolitan area, and slightly above average nationwide.

In the next ten years, the number of positions in occupations related to animal models and stem cell research is projected to grow at the rate equivalent to all occupations (3.7 percent) in the Boston metropolitan area. This indicates stable demand for the field's employment opportunities. The Bureau of Labor Statistics notes that *Medical Scientists* have an above-average projected growth rate across the country over the next decade, particularly as the number of elderly individuals grows.

Related industries also have favorable outlooks in the United States. IBISWorld reports that the biotechnology industry will rebound following the 2020 coronavirus pandemic as market consolidation continues and healthcare spurs further growth. IBISWorld also projects growth in Massachusetts for brand-name pharmaceutical manufacturing, though it notes it will be primarily because of consolidation and cost-cutting procedures.

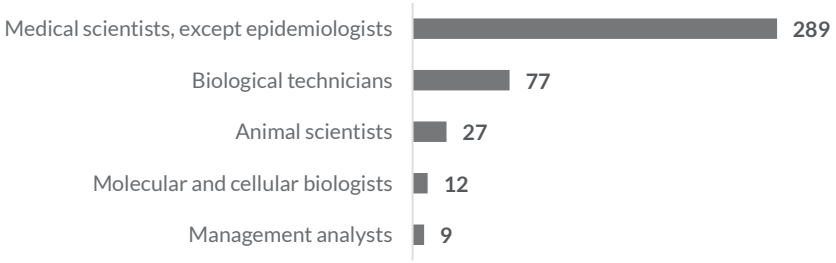
The Ontario biologist workforce is projected to grow as well, though there are fewer field-specific projections data available.

The Ontario Ministry of Labour, Training and Skills Development reports that *Biologists and related scientists* have an above-average outlook in the five-year period from 2017 to 2021, the most recent projections data available in the province. The workforce will increase between 9.1 and 10.0 percent, with an above-average projected number of job openings available due to growth. Regarding the biotechnology sector, IBISWorld notes that the global market will experience revenue growth, highlighting industry leaders such as Amgen and EMD Serono (Merck) that maintain a presence in Canada.

JOB POSTINGS INTELLIGENCE – BOSTON

TOP ANIMAL MODELS AND STEM CELL RESEARCH–RELATED OCCUPATIONS

Distribution of Boston MSA animal models and stem cell research–related positions by occupation



BOSTON EMPLOYMENT FACTS

Occupation	Avg. Salary	Unempl. Rate	Avg. Past Ann. Growth
Animal scientists	$75,100	5.1%	5.5%
Biological scientists, all other	$101,400	5.0%	11.8%
Biological technicians	$62,800	8.2%	7.1%
Management analysts	$111,400	5.3%	1.9%
Medical scientists, except epidemiologists	$107,000	3.9%	7.3%
Average, related occupations	**$103,800**	**5.3%**	**4.3%**
Average, all occupations	**$69,200**	**8.2%**	**0.1%**

Note: For this analysis, Hanover retrieved job postings data for animal models and stem cell research–related positions in the Boston–Cambridge–Newton, MA–NH MSA from JobsEQ, a proprietary database providing real-time job postings aggregated from over 15,000 sources. All data reflect postings from March 2020 to February 2021, whose ads include the keyword "animal models" and specify at least a bachelor's credential. JobsEQ is unable to provide employment facts for *Molecular and cell biologists*, instead providing data for the parent occupation, *Biological scientists, all other*. Average past annual growth figures derive from a five-year period.

ANALYSIS

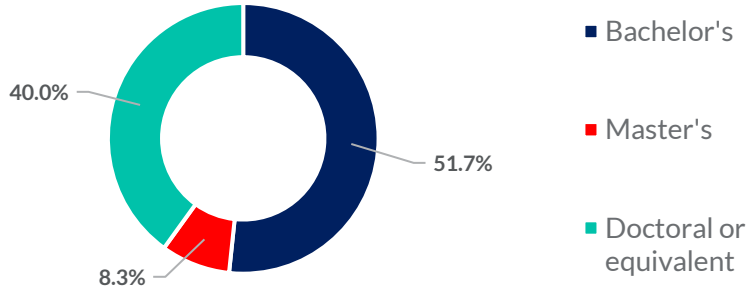
Boston employers typically look for animal modeling–related specializations in medical scientist roles, with doctoral-degree recipients likely holding an advantage.

In the past year, employers in the Boston metropolitan area posted a total of 193 positions related to animal models that specify at least a bachelor's degree. The most common occupation is *Medical scientists, except epidemiologists*, a position with above-average wages. However, in the Boston metropolitan area, a minority (22.1%) of workers in this group have attained a master's degree, while most have attained a doctoral degree (59.2%). This suggests that doctoral-degree recipients may be more competitive for many animal modeling roles.

TOP BOSTON EMPLOYERS

Massachusetts General Hospital	*Charles River Laboratories*	*Brigham & Women's Hospital*
Pfizer	*Flagship Pioneering*	*Massachusetts Institute of Technology*

EDUCATION REQUIREMENTS

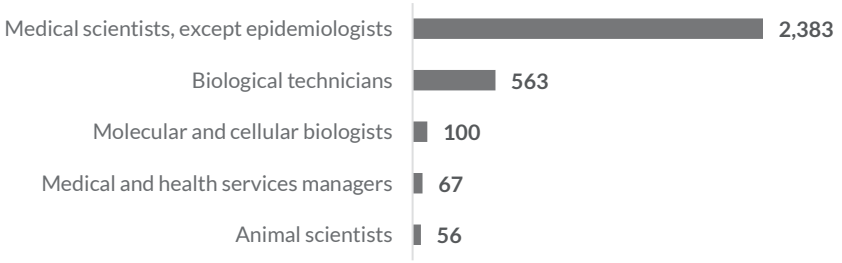


Note: Queries specified at least a bachelor's credential. If a posting lists multiple education levels, the lowest educational level is counted in the data above. If a posting lists a required and a preferred education level, the lowest required education level is included in the data above.

JOB POSTINGS INTELLIGENCE – USA

TOP ANIMAL MODELS AND STEM CELL RESEARCH–RELATED OCCUPATIONS

Distribution of United States animal models and stem cell research–related positions by occupation



NATIONAL EMPLOYMENT FACTS

Occupation	Avg. Salary	Unempl. Rate	Avg. Past Ann. Growth
Animal scientists	$75,100	5.1%	5.5%
Biological scientists, all other	$101,400	5.0%	11.8%
Biological technicians	$62,800	8.2%	7.1%
Medical and health services managers	$139,400	2.7%	3.2%
Medical scientists, except epidemiologists	$107,000	3.9%	7.3%
Average, related occupations	**$110,700**	**4.3%**	**5.9%**
Average, all occupations	**$69,200**	**8.2%**	**0.1%**

Note: For this analysis, Hanover retrieved job postings data for animal models and stem cell research–related positions in United States from JobsEQ, a proprietary database providing real-time job postings aggregated from over 15,000 sources. All data reflect postings from March 2020 to February 2021, whose ads include the keyword "animal models" and specify at least a bachelor's credential. The most field-relevant top occupations were selected for analysis. JobsEQ is unable to provide employment facts for *Molecular and cell biologists*, instead providing data for the parent occupation, *Biological scientists, all other*. Average past annual growth figures derive from a five-year period.

ANALYSIS

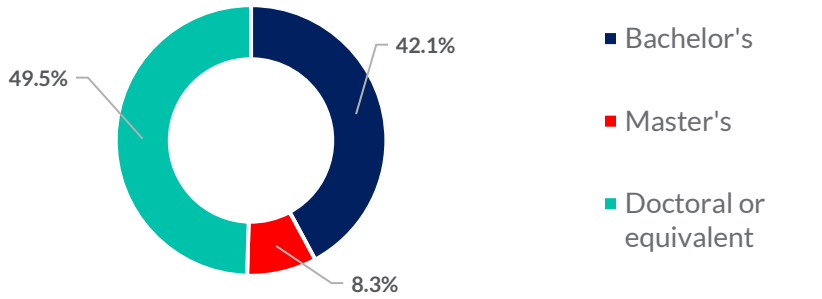
National employment opportunities for animal modeling positions share similarities with those in the Boston metropolitan area, particularly with regard to occupations and educational attainment.

In the past year, employers across the United States posted a total of 3,949 positions related to animal models that specify at least a bachelor's degree. Nearly half of these positions request the applicant have a doctoral degree, indicating a high educational attainment for the field. As with the job postings data for the Boston metropolitan area, United States employment opportunities fall primarily within the *Medical scientists, except epidemiologists* occupational group.

TOP U.S. EMPLOYERS

Weill Cornell Medicine	*Mount Sinai*	*Charles River Laboratories*
University of Colorado	*University of Minnesota*	*Genentech*

EDUCATION REQUIREMENTS

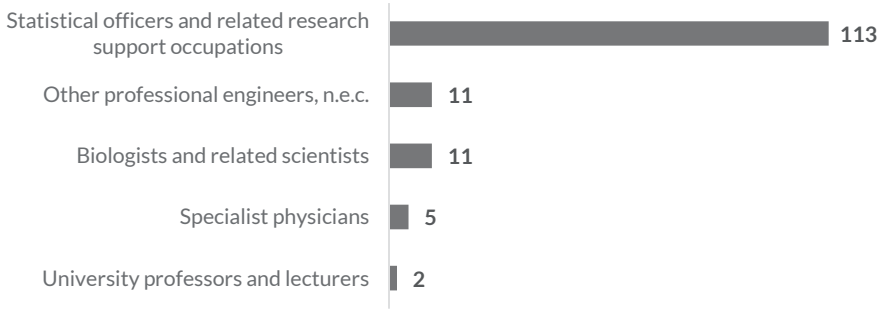


Note: Queries specified at least a bachelor's credential. If a posting lists multiple education levels, the lowest educational level is counted in the data above. If a posting lists a required and a preferred education level, the lowest required education level is included in the data above.

JOB POSTINGS INTELLIGENCE – TORONTO

TOP ANIMAL MODELS AND STEM CELL RESEARCH–RELATED OCCUPATIONS

Distribution of Toronto animal models and stem cell research–related positions by occupation



ONTARIO EMPLOYMENT FACTS

Occupation	Avg. Salary	Unempl. Rate
Biologists and related scientists	$74,703	4.3%
Other professional engineers, n.e.c.	$89,420	3.4%
Specialist physicians	$122,926	0.8%
Statistical officers and related research support occupations	$61,786	6.0%
University professors and lecturers	$124,878	5.1%

Source: Emsi and Ontario Ministry of Labour, Training and Skills Development
Note: For this analysis, Hanover was provided job postings data for animal models and stem cell research–related positions in the Greater Toronto Area from Emsi. All data reflect postings from March 2020 to February 2021, whose ads include the keyword "animal models" and specify at least a bachelor's credential.

ANALYSIS

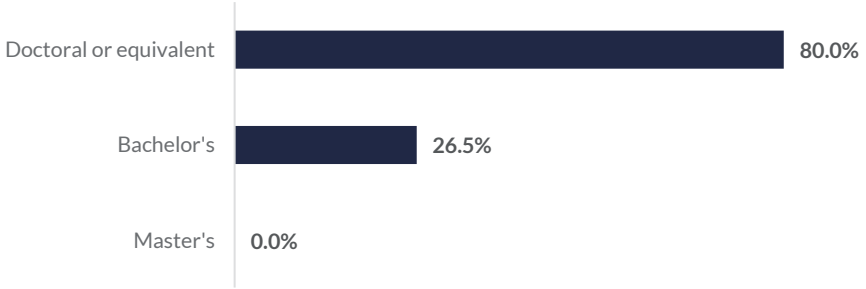
Greater Toronto Area animal modeling–related employment opportunities are also primarily designated for individuals with a doctoral degree.

In the past year, employers in the Greater Toronto Area posted a total of 157 positions related to animal models that specify at least a bachelor's degree. Among these positions, 80.0 percent are seeking candidates with a doctoral degree, indicating that these specialized research and research support occupations are best suited for doctoral-degree recipients.

TOP TORONTO EMPLOYERS

Sunnybrook Health Sciences Centre	*University of Toronto*	*The Hospital for Sick Children*
University Health Network	*Fusion Genomics Corp*	*PerkinElmer Canada Inc*

EDUCATION REQUIREMENTS



Note: Queries specified at least a bachelor's credential.

ANALYSIS

There is insufficient data to determine the market saturation for animal models and stem cell science master's programs, as the field is not well defined in reported conferrals codes. Benchmarked programs closest in subject matter are small, most with fewer than ten graduates per year.

As discussed on p. 5, the field has no corresponding instructional code, and in Hanover's scan of potential competitors, it could only find programs with potential subject-matter overlap in laboratory animal science, comparative medicine, and integrative biology. These programs, as conferrals data show below, are small: the largest program (Drexel) reported 20 master's completions in 2019, while six of the eight programs reported below ten completions in the same year.

BENCHMARKED PROGRAM SUMMARY

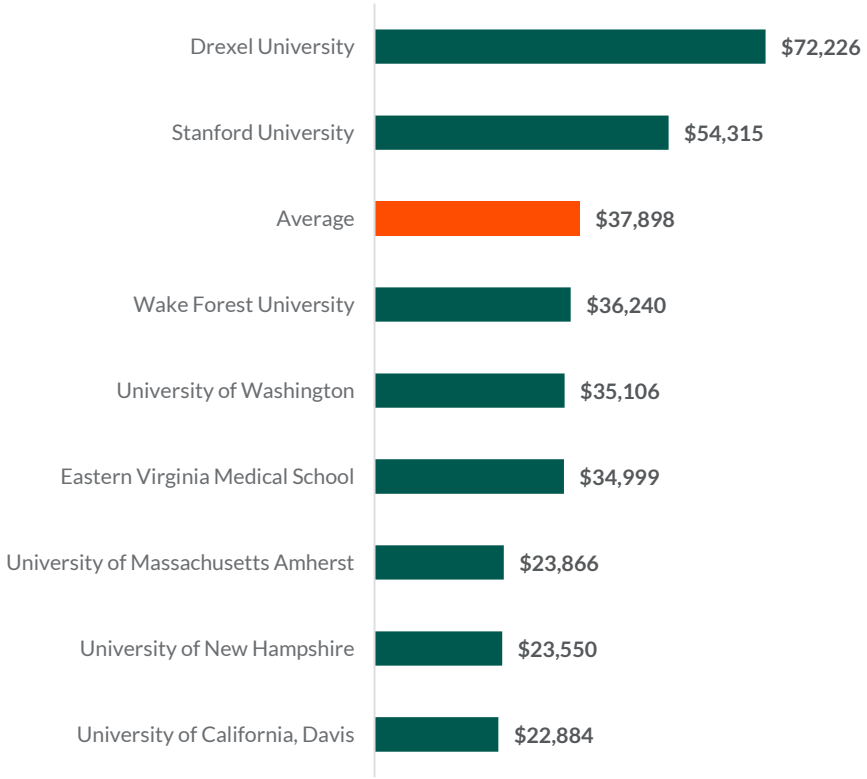
Institution	Location	Program	Reported Instructional Program	Master's Completions (2019)	CAGR (2015–2019)
Drexel University	Philadelphia, Penn.	Master of Laboratory Animal Science	*Animal Sciences, Other*	20	N/A
Eastern Virginia Medical School	Norfolk, Va.	Master of Laboratory Animal Science	*Comparative and Laboratory Animal Medicine*	11	N/A
Stanford University	Stanford, Calif.	Master of Laboratory Animal Science	*Comparative and Laboratory Animal Medicine*	5	N/A
University of California, Davis	Davis, Calif.	MS in Integrative Genetics and Genomics	*Animal Sciences, Other*	8	41.4%
University of Massachusetts Amherst	Amherst, Mass.	MS in Animal Biotechnology and Biomedical Sciences	*Animal Sciences, General*	1	0.0%
University of New Hampshire	Durham, N.H.	MS in Integrative and Organismal Biology	*Animal Sciences, General*	1	-24.0%
University of Washington	Seattle, Wash.	MS in Comparative Medicine	*Comparative and Laboratory Animal Medicine*	4	41.4%
Wake Forest University	Winston-Salem, N.C.	Master's in Comparative Medicine	*Comparative and Laboratory Animal Medicine*	0	N/A

PROGRAM TRENDS

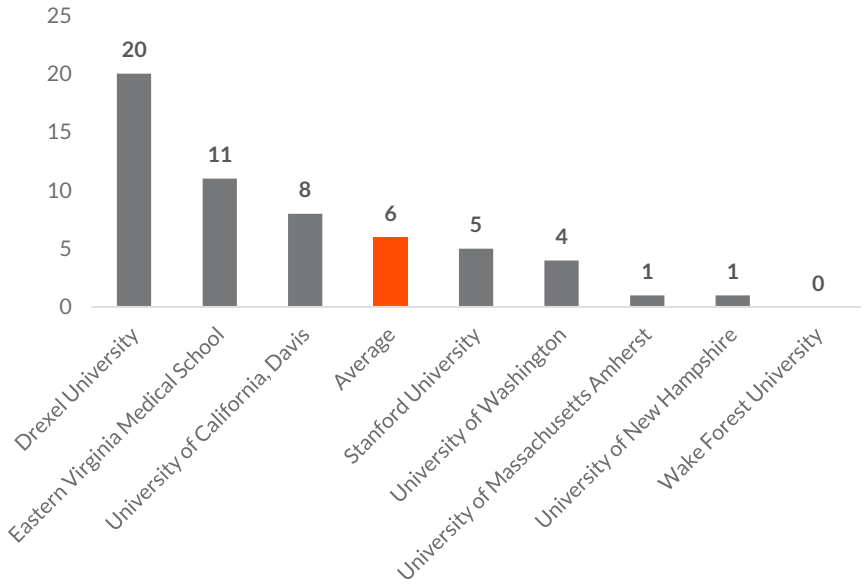
TOTAL TUITION

On average, benchmarked animal models and stem cell research–related programs charge a total tuition of $37,898.

Programs range in total price from $22,884 at UC Davis to $72,226 at Drexel. In order to be competitive in the market, Northeastern University should set its total program tuition at or below $37,898.



PROGRAM COMPLETIONS (2019)



DELIVERY METHODS

2 of 8 benchmarked master's programs offer fully or mostly online formats.

9 of 10 benchmarked master's programs offer an on-campus format

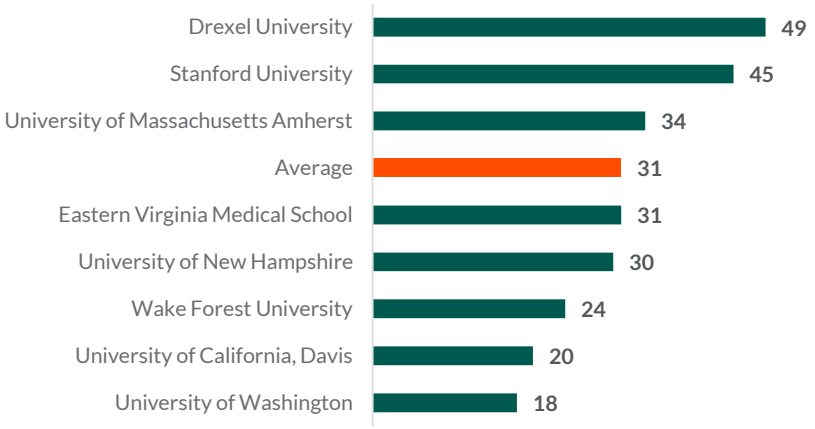
Note: See p. 8 for further details on reported completions fields by program.

PROGRAM TRENDS

CURRICULAR STRUCTURE

Competitor programs on average require 31 credits for graduation.

These credit requirements may not include all research requirements, as some are not credit-bearing. In addition, curricular structures vary beyond core course requirements, such as those that include internships, independent research, electives, and a thesis.



CONTRIBUTING DEPARTMENTS

Most programs require coursework with prefixes within one department in which the program is housed, though a few pull from several units.

Five of the eight programs require courses exclusively from their home department. Drexel is one of the few that does not—its program includes courses from: Laboratory Animal Science, Interdisciplinary Health Sciences, Medical Science, Physiology, and Pharmacology.

CAREER OUTCOMES

Programs typically advertise outcomes in research, academia, and veterinary medicine, though a few programs target veterinary professionals exclusively.

Both University of Washington and Wake Forest advertise that their programs are primarily for veterinary professionals interested in further research experience, indicating very small, targeted audiences. Nonetheless, some programs advertise a variety of post-graduate pathways. For instance, Drexel's Master of Laboratory Animal Science program advertises: "graduates are employed by universities, biotechnology institutions, government agencies, and pharmaceutical companies as supervisors, managers, trainers, veterinary technicians, educators, consultants and sales representatives." University of Hampshire's MS in Integrative and Organismal Biology lists the following potential career areas for its graduates:

PROGRAM BENCHMARKING

Institution	Program	Delivery Format	Total Tuition	Related Offerings	Curricular Structure	Contributing Departments in Coursework	Career Outcomes
Drexel University Philadelphia, Penn.	Master of Laboratory Animal Science	▪ On campus or online	$72,226	▪ MS in Biotechnology ▪ MS in Molecular & Cell Biology ▪ MS in Molecular Medicine	49 credits total ▪ 28-credit core ▪ 6 credits of electives ▪ 15-credit practicum	▪ Laboratory Animal Science ▪ Interdisciplinary Health Sciences ▪ Medical Science ▪ Physiology ▪ Pharmacology	▪ Veterinary school candidates ▪ Biomedical research ▪ Sample positions include veterinary research technician, staff biologist, research compliance specialist, etc.
Eastern Virginia Medical School Norfolk, Va.	Master of Laboratory Animal Science	▪ Online ▪ 1-wk. residency required	$34,999	▪ Master of Biomedical Sciences	31 credits total ▪ All courses are required ▪ 2-credit internship	▪ Laboratory Animal Science	▪ Veterinary care ▪ Teaching ▪ Animal resource mgmt. ▪ Refinement of animal models ▪ Independent research
Stanford University Stanford, Calif.	Master of Laboratory Animal Science	▪ On campus	$54,315	▪ None	45 credits total ▪ 17-credit core ▪ Research ▪ Thesis required	▪ Comparative Medicine (home unit)	▪ Biomedical research in animal modeling, biomethodology, laboratory animal science, org. mgmt., facility design, regulatory & compliance, & animal welfare
University of California, Davis Davis, Calif.	MS in Integrative Genetics and Genomics	▪ On campus	$22,884	▪ None	20–24 credits total (for thesis and non-thesis options)* ▪ 12-credit core* ▪ 8 credits of electives*	▪ Integrative Genetics and Genomics	▪ Professional research ▪ Teaching

Source: Institutional websites (see embedded hyperlinks)
Note: Total tuition correspond to in-state resident rates when applicable.
*Converted from the quarter system to semester system.

PROGRAM BENCHMARKING

Institution	Program	Delivery Format	Total Tuition	Related Offerings	Curricular Structure	Contributing Departments in Coursework	Career Outcomes
University of Massachusetts Amherst Amherst, Mass.	MS in Animal Biotechnology and Biomedical Sciences	▪ On campus	$23,866	▪ MS in Molecular and Cellular Biology ▪ MS in Organismic and Evolutionary Biology	34 credits total ▪ 12 credits of seminars (faculty rotate offerings) ▪ 10-credit thesis ▪ 1-credit journal club each semester	▪ Animal Science ▪ Immunology ▪ Molecular Genetics ▪ Reproduction & Development ▪ Toxicology	▪ Academia ▪ Animal biotechnology/ biomedicine industry
University of New Hampshire Durham, N.H.	MS in Integrative and Organismal Biology	▪ On campus	$23,550	▪ MS in Molecular and Cellular Biotechnology ▪ MS in Molecular and Evolutionary Systems Biology ▪ MS in Genetics	30 credits total ▪ 2-credit required course ▪ Other coursework approved by committee ▪ 6–10–credit thesis	▪ Biological Sciences ▪ Agriculture, Nutrition & Food Systems	▪ Biological research ▪ Biotechnology ▪ Conservation biology ▪ Education ▪ Genetics ▪ Medical research ▪ Veterinary research
University of Washington Seattle, Wash.	MS in Comparative Medicine	▪ On campus	$35,106*	▪ None	18 credits of graded coursework ▪ 10-credit core ▪ 8 credits of electives ▪ Research project and thesis required	▪ Comparative Medicine	▪ No outcomes advertised ▪ Program intended for veterinarians (in laboratory animal medicine residency) and others
Wake Forest University Winston-Salem, N.C.	Master's in Comparative Medicine	▪ On campus	$36,240	▪ MS in Biomedical Science	24 credits total ▪ 15-credit core ▪ 6 credits of research ▪ 3-credit elective	▪ Pathology/Comparative Medicine	▪ Provides graduate research training specifically for individuals holding the DVM degree

Source: Institutional websites (see embedded hyperlinks)
Note: Total tuition correspond to in-state resident rates when applicable.
*Assuming two-year completion time.

HANOVER RESEARCH

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