

Facts on life science in Stockholm-Uppsala

Version 5

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NOTE this version is current until the 1 of September 2015. If you have this report in your hand you should know that there is an updated version of the report. To order the new report contact Ywonne Bölja, ywonne.bolja@suls.se

A tool...

...to provide a common picture of the life science activities in the region....

"One voice can change a room, and if one voice can change a room, then it can change a city, and if it can change a city, it can change a state, and if it change a state, it can change a nation, and if it can change a nation, it can change the world. Your voice can change the world."

Barack Obama

...that can be used to market the Stockholm-Uppsala region....

"Google actually relies on our users to help with our marketing. We have a very high percentage of our users who often tell others about our search engine."

Sergey Brin

...which is here for you to use!!!

"Knowledge is of no value unless you put it into practice."

Anton Chekhov

NOTE that the purpose of this report is to provide a fact-based material that can be used for example to prepare presentations and that the information should be adapted on the basis of the audience and situation.

En investering för framtiden



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Executive summary

This report provides an overview of ongoing, world leading academic research projects within life science in the Stockholm-Uppsala region.

Stockholm-Uppsala is home to one of Europe's largest and most productive life science clusters, and one of the most competitive business environments in Europe. In addition the region has excellent supporting expertise in IT, telecommunications, clean technology and energy have made Sweden a leading country within ICT. The report provides a special focus on digital health.

The cluster includes six major universities with life science-related education and world-leading research, including KI and Uppsala University, plus three university hospitals providing high-quality healthcare. Research areas with particularly strong in the region is cancer, infectious diseases, inflammation, and molecular science. In addition, several business incubators and support functions with close links to the universities are also present in the region.

Several ground-breaking projects backed by heavy investments are found in the region, such as SciLifeLab, a national infrastructure to support high-throughput and technically advanced research in the life science area. Leading government agencies such as the Medical Products Agency are also based in the region.

More than 600 life science companies are based in the region, including leading global life science companies such as AstraZeneca and GE Healthcare. The life science industry covers the entire life science business spectrum and employs 21,000 experts. A majority of the companies are engaged in research and development but the industry also comprises of service companies providing expertise ranging from pre-clinical product development to CRO, regulatory and CMO activities.

The region also attracts funding and recently Innolife, a consortium where KI and Uppsala University and KTH are a partners, were selected by the European Institute of Innovation and Technology (EIT) as the Knowledge and Innovation Community (KIC) for EIT Health and will receive a total volume of EUR 2.1 billion. This is one of the largest public funded initiatives for health worldwide.

Introduction

Aim

The aim with the report is to gather facts about the life science activity in the Stockholm-Uppsala region

Language

English. Some references (webpages) may be in Swedish.

The report

The report will be available to selected organizations as a pdf or word document.

References

Annual reports from companies, universities and universitetskanslerämbetet have for example been used. Information has also been retrieved through webpages and internal reports as well as personal communications. All information regarding references are stored on the server, see below.

Appendix

To limit the volume and scope of the report some of the information is compiled in an appendix. All information concerning the report and appendices should be stored on the common server: Meltwater at SSCI.

Distribution

Selected actors and organizations (primarily organizations working with cluster development, marketing and inward investment) will have unrestricted access to the complete report. Representatives from each organization will sign an agreement regulating how the information may be used. Selected parts of the report may be distributed to a larger number of actors (SULS ambassadors and innovation actors among other). A list of all organizations and actors that have access to the report or parts of it will be continuously updated.

Updates

The first version was launched in May 2011. Updated versions have been released on the following dates: September 2011, April 2012, September 2012 and December 2014 (this version, version number 5).

Future updates will be performed once every year in September (annual reports from companies and universities in the region are not available before this date).

Definitions

Life science

Research within any of several branches of science, such as biology, biotechnology, ecology, chemistry, or medicine, that deal with living organisms and their organization, life processes, and relationships to each other and their environment.

Also included in life science are the research and technologies and their applications within agriculture, medical device, diagnostics, food science, pharmaceuticals, bioengineering, and environmental science.

Vinnova's definition of life science

Pharmaceutical: Develop drugs and various other kinds of therapeutic products or methods. Includes diagnostics.

Medical technology: Develops medical products that are not drugs

Biotechnology: Companies developing the application of science and technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.

A comprehensive definition can be found in Appendix 1.

Digital health

The definition of digital health is extensive and includes all or elements of mHealth (also called mobile health), wireless health, health 2.0, eHealth, health IT, big data, health data, cloud computing, e-patients, quantified self and self-tracking, wearable computing, gamification, telehealth & telemedicine, precision and personalized medicine, plus connected health.

The region (geography)

The region includes three counties: Stockholm, Uppsala and Sörmlands.

Research at universities, university hospitals and research institutes

Key figures

Number of students

	KI	KTH	SU	SH	UU	SLU
Students	6	12	28	6	23	3 838
	122	026	776	741	914	
- Life science	6	2	3		6 985	3 838
	122	142	755			
PhD candidates	2	511	719	12	1318	386
	306					

Ranking

- Karolinska Institutet, Uppsala University and Stockholm University are among the top 30 universities in Europe. Karolinska Institutet is one of the world's leading medical universities

SciLifeLab

- Number of publications: 437

Research funding

- The universities in the region were granted a total of 16.7 billion SEK in research funding during 2013. Life science accounts for approximately 10 billion SEK of these.

Universities

Karolinska Institutet (KI)

Karolinska Institutet (KI) is one of the world's leading medical universities and offers the education and research within medicine and health sciences. Over 40% of the medical academic research conducted in Sweden is performed at KI and the research spans the entire medical field, from basic experimental research to clinical research. Strong research areas include cancer, structural biology, developmental biology, endocrinology and metabolism, public health, infection and inflammation, and neuroscience. Facilities for research and education are located both in Solna (the northern campus area), at Karolinska University hospital, in Huddinge (the southern campus area) as well as at the county hospitals; Danderyd Hospital, Söder hospital, S:t Erik eye hospital and Capio S:t Görans hospital. Since 1901 the Nobel Assembly at KI has selected the Nobel laureates in Physiology or Medicine.

Source: <http://www.ki.se/>

Royal Institute of Technology (Kungliga Tekniska Högskolan, KTH)

Life science related research is carried out in the borderland between technology, natural science, and medicine. Important areas of research include the mapping of all human proteins, the development of technology for large-scale genetic analysis, and Computational biology. Other relevant areas cover the development of biomedical materials, method development for pharmaceutical synthesis, technology for minimally invasive therapy, biological and medical imaging. Main campus is located in central Stockholm, however, research and education is also carried out at AlbaNova University Center and in Kista, Haninge, Flemingsberg and Södertälje. Research within this field presupposes close collaboration with KI, SU, and Stockholm County Council.

Source: <http://www.kth.se/>

Stockholm School of Economics (Handelshögskolan)

Stockholm School of Economics is a business school that offers bachelors, masters, MBA- and extensive education programs along with PhD programs in finance, economics and business administration.

Source: <http://www.hhs.se/>

Stockholm University (Stockholms Universitet, SU)

Life science related research and education is carried out at the Faculty of Science, which is divided into four sections: Mathematics-Physics Section, Chemistry Section, Biology Section, and the Section for Earth and Environmental Sciences. Strong areas of research include biological membranes, organic chemistry, biological modeling, and material chemistry. SU also offers education and research in humanities and social science including business administration.

Source: <http://www.su.se/>

Swedish University of Agricultural Sciences (Sveriges lantbruksuniversitet, SLU)

A majority of all biological research in Sweden is conducted at Swedish University of Agricultural Sciences (Sveriges lantbruksuniversitet, SLU). Research and education at the University spans the range from genes and molecules to biological diversity, animal health, sustainable forestry, and food supply. Main campus is located in Ultuna, Uppsala, however the university has several campuses in other parts of Sweden including Alnarp, Skara, and Umeå.

Source: <http://www.slu.se/>

Södertörn University (Södertörns Högskola, SH)

Södertörn University offers education and research in humanities, social sciences, natural sciences and education studies. Life science is not represented among the areas for which research education is offered, however relevant for life science is the Master's program in infectious disease control.

Source: <http://www.sh.se/>

Uppsala University (Uppsala Universitet, UU)

Uppsala University (UU) provides education and basic and clinical research within life science. Strong research areas include cell biology, physiology, genetics, genomics and molecular medicine. Sweden's only faculty of pharmacy is located in Uppsala and has national responsibility for research and higher education in the fields of pharmaceutical chemistry, pharmaceutical bioscience, and pharmacy. Life science related research is also conducted at the Faculty for Science and technology (evolutionary biology, microbiology and material science). Together with Uppsala Clinical Research (UCR), Uppsala University hospital successfully supports clinical research, clinical trials, and quality development.

Source: <http://www.uu.se/>

The Ludwig Institute for Cancer Research Ltd (Ludwiginstitutet)

The Ludwig Institute for Cancer Research Ltd is an international not-for-profit organization dedicated to cancer research. The Institutet is associated with KI (Stockholm branch) and UU (Uppsala branch).

Sources: <http://www.ludwigcancerresearch.org/location/stockholm-branch/>
<http://www.ludwigcancerresearch.org/location/uppsala-branch/>

University Hospitals and other clinical centers

Karolinska University Hospital

Karolinska University hospital is one of Europe's largest hospitals and is owned by the county council. Research is carried out in collaboration with KI and mainly based in Solna and Huddinge. Key research areas include the ones listed above under KI as well as pediatrics, regenerative medicine, epidemiology and clinical trials.

Source: www.karolinska.se

National Specialized Medical Care (licence from the National Board of Health and Welfare)

The county council in Stockholm is responsible for national care of cochlear implantation in infants, glaucoma in children, intrauterine treatments, liver transplantation and ocular oncology.

Uppsala University Hospital (Akademiska Sjukhuset, Uppsala)

Uppsala University Hospital is one of Sweden's biggest hospitals and has several different roles – county hospital, specialist hospital, training hospital and research hospital. Clinical research at the hospital is conducted in conjunction with Uppsala University. Key research areas include autoimmune disease, inflammation, cancer, neurotrauma and diagnostic tools.

Source: www.akademiska.se

National Specialized Medical Care (licence from the National Board of Health and Welfare)

The county council in Uppsala is responsible for national care of treatment of severe burns and craniofacial surgery.

Regionalt Cancercentrum (RCC)

Regionalt Cancercentrum (RCC) is a knowledge organization that aims to create a safer and more patient-focused and effective cancer care through regional and national collaboration. In the Stockholm-Uppsala region two of the six regional centers are represented: Uppsala-Örebro-center and Stockholm-Gotland center.

Source: <http://www.cancercentrum.se/uppsalaorebro/>
<http://www.cancercentrum.se/sv/stockholmgotland/>

University Animal Hospital (Universitetsdjursjukhuset vid SLU)

The University Animal Hospital in Uppsala provides animal care for pets and horses. Moreover, the clinic accommodates Sweden's largest unit for diagnostic imaging and clinical chemistry laboratory.

Source: www.universitetsdjursjukhuset.se

The Skandion Clinic

The Skandion Clinic is the first clinic in Scandinavia to treat cancer using proton therapy. Proton therapy makes it possible to treat cancer more effectively and with fewer side effects compared to conventional radiation therapy.

Source: <http://www.skandionkliniken.se/>

Digital health-academic centers

Selected research programs, strategic ventures and initiatives within ICT/life science are summarized below.

Department of Learning, Informatics, Management and Ethics (LIME)

Department of Learning, Informatics, Management and Ethics (LIME) at KI operates within several strategic areas in order to improve human health. One relevant unit is the Health Informatics Centre (HIC), a research center focused on the areas of clinical decision-making and integrated patient-centered information systems for cooperative care. Examples of projects at HIC are given below.

Source: <http://ki.se/en/lime/>
<https://kiedit.ki.se/en/lime/research-and-projects/>

Infobiotika

The goal with the project is to gather the requirements of a system that can provide ICU physicians with a full picture of a patient's infectious state in order to improve decision-making for antibiotics use in intensive care. Project leader: Magnus Falkenhav, magnus.falkenhav@karolinska.se.

My Care Pathways

The project strives towards the vision of enabling citizens to track their health by providing them with online access to past history, current state and prospective future events regarding their personal care pathways. Project leaders: Nina Lundberg, nina.lundberg@ki.se and Sabine Koch, sabine.koch@ki.se.

The Swedish e-Science Research Centre (SeRC)

The Swedish e-Science Research Centre (SeRC) was formed by KTH, SU, KI, and Linköping University (LiU) around the two largest high-performance computing centers in Sweden; the National Supercomputer Centre (NSC) at LiU and the Center for High Performance Computing (PDC) at KTH.

Source: <http://www.e-science.se/>

e-Science for Cancer Prevention and Cure (eCPC)

The project aims to apply eScience technologies to model cancer initiation and progression, and to test prevention and cure strategies on both simulated and real data.

Source: www.e-science.se/community/eCPC

PDC Center for High Performance Computing

PDC Center for High Performance Computing provides computational resources that primarily cater to the needs of Swedish academic research and education. PDC also takes part in international projects to develop high-performance computing. PDC is home to two supercomputers; the Blue Gene (neuroscience research) and Lindgren computers (metagenomic analysis). Both are available to researchers for their daily computing of Big Data.

Source: <http://www.pdc.kth.se/>

The KTH-SICS Cloud Innovation Center (C!C,)

One of PDC's projects is the KTH-SICS Cloud Innovation Center. C!C is an open consortium promoting cloud technologies in academia and industry.

Source: www.pdc.kth.se/research/projects/national

High-Performance Data Mining for Drug Effect Detection (DADEL)

The main goal of the project is to develop techniques and tools to support decision making and discovery of drug effects by analyzing patient records, drug registries, case safety reports and chemical compound data in the form of both structured and unstructured (free text) data. Project leader: Henrik Boström, henrik.bostrom@dsv.su.se.

Web-based stress management using a holistic approach

An interdisciplinary IT and health project (eHealth). The e-health system combines various flexible forms of learning and practical training in stress management. Project manager: Åsa Smedberg, asamed@dsv.su.se.

eSENCE

eSENCE is a strategic collaborative research program in eScience between Uppsala University, Lund University and Umeå University. The vision of eSENCE is to take Swedish eScience to the highest international level and build a creative research environment.

Source: <http://essenceofscience.se/>

Development of eScience methods for drug discovery

The project is a part of eSENCE and aims to develop methods for modeling pharmaceutical problems with Big Data and high computational demands, and also develop methods for distributed data and predictive modeling in computational toxicology. The project is carried out in close collaboration with AstraZeneca R&D.

Uppsala Multidisciplinary Center for Advanced Computational Science (UPPMAX)

Uppsala Multidisciplinary Center for Advanced Computational Science UPPMAX is a regional center for high-performance computing.

Source: <http://www.uppmax.uu.se/>

UPPmax NExt generation sequencing Cluster & Storage (UPPNEX)

As a part of UPPMAX, UPPNEX is a prominent project providing computing and storage resources as a national resource for the Next Generation Sequencing (NGS) community in Sweden.

Centre for Image Analysis (CBA)

Centre for Image Analysis's (CBA's) purpose is to conduct research and education in computerized image analysis and perceptualization, both within image processing itself and for developing better methods, algorithms and systems for applications primarily within biomedicine.

Source: <http://cb.uu.se/home.php/>

Students and employees

The total number of students at the six universities in the region that offers education within life science is: 80 761. Among these, 20 414 students are enrolled in programs and courses within medicine, natural science, odontology, pharmacology, and health care (technology students are excluded). The number of PhD students is 7 866 (includes all research areas).

Source. Annual report from universitetskanslerämbetet and annual reports from respective university.

Table 1. Number of students and employees during 2013.

	KI	KTH	SU	SH	UU	SLU
Students	6 122	12 026	29 776	6 741	23 914	3 838
- Life science	4 852	1 623	5 096	655	4 350	3 838
PhD students	2 090	2 184	1 209	60	1 608	715
Employees	3 944	2 758	3 673	601	4 774	2 668

Research projects and centers of excellence

The region is home to a large number of research projects or programs with a clear aim to advance knowledge and pave the way forward for preventive strategies, alleviation of disease symptoms or new cures. Some of the most prominent centers are listed below, however note that the list is based on what the universities and hospitals define as a center of excellence and may not be complete.

A comprehensive report on the centers of excellence in the region may be found in Appendix 3.

Table 2. Research projects and centers of excellence.

Center	University/Hospital	Area
Strategic research area in cancer (StratCan)	KI	Cancer
Center for Regenerative Medicine	KI	Cancer
U-CAN	UU	Cancer
Cancer Centrum Karolinska, CCK	Karolinska University hospital	Cancer
Endocrine Oncology Clinic	Uppsala University hospital	Cancer
Strategic Research Area in Care Sciences (SFO-V)	KI	Care Sciences
Theme Center for Cardiovascular Diseases	KI	Cardiovascular
Strategic Research Area in Diabetes (SRP Diabetes)	KI	Diabetes
ExoDiab	UU, LU	Diabetes
Uppsala Comprehensive Centre for Type 1 Diabetes	Uppsala University Hospital	Diabetes
Strategic Research Area in Epidemiology (SfoEpi)	KI	Epidemiology
EpiHealth	UU, LU	Epidemiology
Swedish e-Science Research Centre (SeRC)	KI, SU, KTH, LiU	e-Science
eSENCE	UU, LU, Umeå U	e-Science
Center for Infectious medicine (CIM)	Karolinska University hospital	Infectious

		diseases
Strategic Research Centre for Rational Approaches to Pathogen Inhibitor Discovery (RAPID)	UU	Infectious diseases
Action on Antibiotic Resistance (ReAct)	UU	Infectious diseases
Center of Excellence for Research on Inflammation and Cardiovascular disease (CERIC)	KI	Inflammation
Center of excellence inflammation	Uppsala University Hospital	Inflammation
The Strategic Research Area Neuroscience (StratNeuro)	KI	Neuroscience
International Neuroinformatics Coordination Facility (INCF)	KI, KTH	Neuroscience
Stockholm brain institute	KI, KTH, SU	Neuroscience
Swedish Brain Power	KI, UU	Neuroscience
Uppsala Brain Injury Center (UBIC)	UU	Neuroscience
Uppsala Berzelii Technology Center for Neurodiagnostics	UU	Neuroscience
Neurointensive Care	Karolinska University Hospital	Neuroscience
Neurotrama center (NIVA)	Uppsala University Hospital	Neuroscience
Science for Life Laboratory (SciLifeLab)	KI, UU	Protein/molecular science
ProNova	KTH	Protein/molecular science
Centre for Biomembrane Research (CBR)	SU	Protein/molecular science
Uppsala RNA Research Centre (URRC)	UU, SLU	Protein/molecular science
Center for Molecular Medicine (CMM)	Karolinska University Hospital	Protein/molecular science
The Strategic Research Area in Stem Cells and Regenerative Medicine (StratRegen)	KI	Regenerative medicine
Center for Regenerative Medicine	KI, SLL	Regenerative medicine
StemTherapy	UU, LU	Regenerative medicine
One Health	SLU, UU	Zoonotic infections

Research funding

The total amount of research funding (all areas) for the universities in the region (KI, SU, KTH, UU, and SLU) during 2013 was 16.7 billion SEK. Compared to 2012, the funding increased with 10% (1.5 billion SEK). The regions share of the total national research funding is 47%, which is the same as previous year. Figure 1 describes the major funding sources for Swedish universities and their distribution.

Source: <http://uka.se/>, annual report 2013 and 2014.

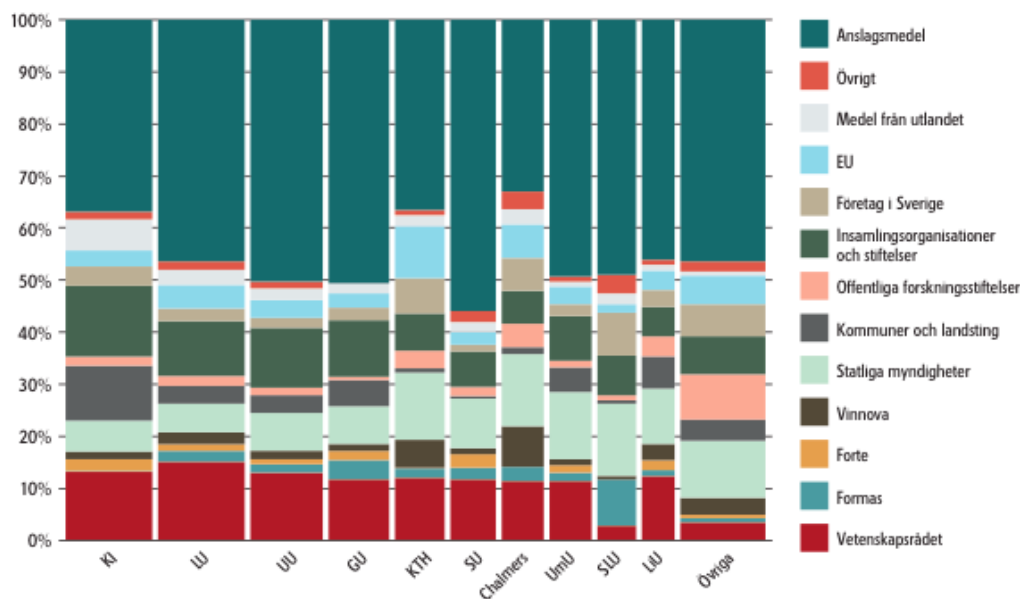


Figure 1. Revenues for research and research education divided by university and financier (2012). Source <http://www.vetenskapsradet.se/> annual, report 2013.

Research funding within life science

The total amount of research funding within life science for the universities (KI, SU, KTH, UU, and SLU) during 2013 was approximately 10 billion SEK (given that about 30-50% of the funding from SU and KTH are included). The table below describes the research funding within life science at respective university.

Table 3. Research funding within life science.

	Life science (million SEK)	Life science and technology (million SEK)	Comments
Karolinska Institutet ¹	4 802		
Karolinska University Hospital ²	799		
Royal Institute of Technology ³	500		Funding during 2011.
Stockholm University ⁴		1 532	
Uppsala University ⁵	1 479		Med/pharm
Uppsala University ⁶		1 582	Tech/Nat
Uppsala University Hospital ⁷	377		
Sörmlands County Council ⁸	9.75		
Swedish University of Agricultural Sciences ⁹	912		Including: Ultuna, Umeå Alnarp and Skara.

Source: ^{1,2,4,9} Annual reports (2013) from respective university/hospital

³ Life Science Technologies, Research office, personal communication, 2011

⁵ Medicine and pharmacy, Faculty office, personal communication, November 2014

⁶ Technology and Science, Faculty office, personal communication, November 2014

⁷ Head of research Uppsala University Hospital, personal communication, November 2014

⁸ Head of research at Sörmlands county council, personal communication, November 2014

Public funding in Sweden

VINNOVA

VINNOVA is a Swedish government agency working under the Ministry of Enterprise, Energy and Communications and acts as the national contact agency for the EU Framework Programme for research and development. Every year VINNOVA invests about SEK 2.7 billion in various initiatives.

Source: <http://www.vinnova.se/>

The Swedish Research Council (Vetenskapsrådet, VR)

The Swedish Research Council is an authority within the Ministry of Education and Research. During 2013, 4.5 billion SEK was invested in life science related research. Approximately half of this was invested in universities in the Stockholm-Uppsala region.

Source: <http://www.vr.se/>, Vetenskapsrådets årsredovisning 2013

Forte

Forte is a government agency under the Swedish Ministry of Health and Social Affairs that funds research for people's health, working life and welfare. A total of 472 million SEK was invested in research during 2013.

Source: <http://www.forte.se/> Annual report 2013

Other

Formas invest approximately 65 million SEK in research related to food, environmental toxicology and animal welfare.

Source: <http://www.formas.se/> Annual report 2013

The Research and Innovation Bill

In order to strengthen Sweden's position as a leading research nation, the government is investing 11.5 billion SEK in research and innovation over the years 2013-2016. The investment includes a special focus on life science including antibiotic resistance, drug development, healthy aging, and clinical research.

Table 4. Increased investments in research and innovation (MSEK).

	2013	2014	2015	2016
Life science	430	495	490	550
Recruitment of researchers	175	175	250	300
Universities	30	650	660	960
Targeted investments	145	155	155	180
Strategic innovations	75	175	225	225
Companies and society	50	100	150	300-
Research facilities and infrastructure	100	225	280	300
Utilization	95	155	185	195
Research funding (Vetenskapsrådet, Formas etc)	405	445	565	815
Other	230	100	100	175
Total	1735	2695	3060	4000

Table 5. Specific investments in life science (MSEK).

Life Science	2013	2014	2015	2016
SciLifeLab	150	150	150	200
Infection and antibiotics	40	75	75	75
Health and ageing	50	100	100	100
Drug development	40	40	40	50
Clinical research	20	50	75	75
Clinical trials	30	40	40	50
Process dev. catalysis	100	40	10	-
Total	455	545	540	600

The Swedish Foundation for Strategic Research (Stiftelsen för strategisk forskning, SSF)

The Swedish Foundation for Strategic Research was founded in 1994 with capital from the former wage-earner funds, with the objective to support research in natural science, engineering and medicine that strengthens Sweden's competitiveness. SSF provide annual funding of around 600 million SEK.

Source: <http://www.stratresearch.se/>

The Swedish Foundation for Strategic Environmental Research (Mistra)

The Swedish Foundation for Strategic Environmental Research (Mistra) makes annual investments of around 200 million SEK in research that confer benefits on society and a good living environment.

Source: <http://www.mistra.org/>

Private foundations in Sweden

Knut and Alice Wallenberg Foundation

The foundation is the largest private financier of research in Sweden. The Foundation primarily grants funding in natural sciences, technology, and medicine and during 2013 a total of 1.4 billion SEK was invested.

Strategic grants:

- Stem cell biology, research for new treatments for cardiovascular and muscle diseases and leukemia, SEK 100 million
- Human Protein Atlas Project, SEK 900 million
- Brainpower, an initiative targeting neurological diseases such as MS and Parkinson's, SEK 100 million

Source: <https://www.wallenberg.com/>

The Swedish Cancer Society (Cancerfonden)

The Swedish Cancer Society is an independent, nonprofit fundraising organization. In 2013, 412 million SEK was allocated to cancer research.

Source: <http://www.cancerfonden.se/>

Table 6. A selection of research funds.

Research fund	Homepage
Alzheimerfonden	http://www.alzheimerfonden.se/
Astma och allergi förbundet	http://allergiforskning.se/
Demensförbundet	http://www.demensforbundet.se/
Diabetesfonden	http://www.diabetes.se/diabetesfonden/
Forte	http://www.forte.se/
Hjärnfonden	http://www.hjarnfonden.se/
Lions cancerforskningsfond	http://www.lcff.se/
Läkare mot AIDS	http://www.aidsfond.se/
MS Forskningsfonden	http://www.msforkningsfonden.se/
Parkinson Fonden	http://www.parkinsonfonden.se/
PsykioterapiStiftelsen	http://www.psykioterapistiftelsen.se/
Radiumhemmets forskningsfonder	http://www.rahfo.se/
Reumatikerförbundet	https://reumatikerforbundet.org/
Sven och Dagmar Saléns Stiftelse	http://www.salenstiftelsen.se/
Svenska diabetesförbundets fonder	http://www.diabetes.se/sv/Medlem/Svenska-Diabetesforbundets-medlemsfonder/
Svenska Läkaresällskapet	http://sls.se/
Svenska sällskapet för medicinsk forskning	http://www.ssmf.se/
Sveriges ögonläkarförening	http://swedeye.org/
Sveriges Läkarförbund	http://www.slf.se/forskningsfond/
Systembolagets råd för alkoholforskning	http://www.can.se/sra
Sällskapsdjurens forskningsfond	http://www.slu.se/sff
Marianne och Marcus Wallenbergs stiftelse	http://www.wallenberg.com/

European funding

FP7: European Union's Research and Innovation funding programme

Since the start of the funding program, Sweden has received more than 1 billion SEK. This corresponds to 3.8% of the total approved funding, which puts Sweden in ninth place compared to the other participating countries in FP7 and in a fifth position among the 27 EU member states.

Four of the Universities in the region (KI, KTH, Uppsala University and SLU) are among the top 15 participants in Sweden and account for 46% of the awarded grants.

Source: <http://vinnova.se/>, Vinnova analys 2013:15

European research council (ERC) grants

The table below describes the number of research grants that Swedish researchers have been awarded from the European research council (ERC).

Table 7. The number of starting- and advanced grants within life science during 2011-2013.

	Stockholm-Uppsala	Other universities	Total	Stockholm-Uppsala (%)
Starting (2011-2013)	25	12	37	68%
Advanced (2011-2013)	8	7	15	53%
Total	33	19	42	63%

InnoLIFE

InnoLife is a consortium of more than 50 core partners (and in addition 90 associate organizations) of leading businesses, research centres and universities from nine EU countries (including KI, UU and KTH). The consortium has been selected by the European Institute of Innovation and Technology (EIT) as the Knowledge and Innovation Community (KIC) for EIT Health and will receive a total volume of EUR 2.1 billion. This is one of the largest public funded initiatives for health worldwide.

Source: <http://inno.life/>

International ranking

The universities in the region retain their strong position among the world's top universities. In 2014, Academic Ranking of World Universities (ARWU, also known as Shanghai ranking), ranks KI as number 47 overall in the world, number 12 in Europe, and number 2 in Europe in the field of Clinical Medicine and Pharmacy. Uppsala University is placed at position 60 in the world and number 19 in Europa. Additional information regarding ranking of the universities may be found in Appendix 2.

Source: <http://www.shanghai ranking/>

<http://www.timeshighereducation.com/>
<http://www.topuniversities.com/>

Table 8. Academic ranking of Universities according to the Academic Ranking of World Universities (ARWU), all faculties included not only life science.

	World Ranking					European Ranking				
	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
KI	42	44	42	44	47	8	10	8	10	12
UU	66	67	73	73	60	18	18	24	23	19
SU	79	81	81	82	78	25	25	25	29	29
KTH	231	201-300	201-300	201-300	201-300	75-123				
SLU	237	301-400	301-400	201-300	201-300	75-123				

Publications

Total number of publications during 2013 within the area of life science is approximately 10 500¹. Of these, SciLifeLab accounts for 437 of the publications.

Source: Annual report (2013) from respective university and SciLifeLab.

Table 9. Number of peer reviewed research publications at the universities.

	2009	2010	2011	2012	2013
KI	4 001	4 131	4 223	4 348	4 505
KTH	1 900	1 885	2 119	2 340	2 600
SU, Science	1 242	1 382	1 846	1 792	1 655
UU, Med/Pharm	1 960	1 868	1 874	2 050	2 034
UU, Tech/Science	1 632	1 727	1 808	1 924	1 943
SLU	1 029	1 059	1 177	1 380	1 371

¹Given that all publications at KI, UU MedPharm, SU, and SLU are life science related and that at least 50% of the publications from UU Tech. KTH does not report the number of publications related to life science and a conservative estimate may be a couple of hundred publications.

Table 10. Number of peer reviewed research publications at SciLifeLab.

	2010	2011	2012	2013
SciLifeLab	114	215	302	437

Nobel Prize

In total, 14 Nobel Prize has been awarded to 15 laureates (one shared prize) affiliated to universities in the Stockholm-Uppsala region (4 in physics, 4 in chemistry and 6 in physiology or medicine).

Source: <http://www.nobelprize.org/>

Research Infrastructure

Key Figures

- **ScieLifeLab**
A national infrastructure to support high-throughput and technically advanced research in the life science area.
- **Biobanks and quality registries**
There are more than 100 national quality registries containing individual-based data on problems or diagnoses, treatment interventions and outcomes including Swedish twin registry.
- **Clinical research**
98 biotech and pharmaceutical companies with their head office in Sweden are actively working with drug development - 58% are located in the Stockholm-Uppsala region. In total 91 projects are ongoing in Phase I–III clinical trials. Phase II:55. Phase I:21. Phase III:15.

Science for Life Laboratory (SciLifeLab)

Science for Life Laboratory (SciLifeLab) was established in 2010 and is the largest investment in research within biotechnology and is collaboration between four universities: KI, KTH, SU and Uppsala University. In 2013, SciLifeLab was assigned to be a national resource center for molecular biosciences with focus on health and environmental research. The center combines frontline technical expertise with advanced knowledge of translational medicine and molecular bioscience. SciLifeLab is situated at two nodes: Stockholm and Uppsala. sciLifeLab stockholm is a center for high-throughput bioscience with focus on genome- and proteome profiling, bioimaging and bioinformatics with relevance for human

diseases. SciLifeLab Uppsala aims to explain the molecular basis for human complex disease by applying novel technologies to well characterized patient samples. Technologies and services at SciLifeLab can be found in Appendix 4.

Source: <http://www.scilifelab.se/>

Biobanks

The Swedish Act "Biobanks in Medical Care" (SFS 2002:297) allows that human biological specimens that have been collected and/or stored within healthcare can be used for research and clinical trials if the patients/donor have given consent to this.

Source: <http://www.biobanksverige.se/>

KI Biobank

KI Biobank is a core facility that offers services for sample collection, handling, and storing.

Source: <http://www.ki.se/forskning/ki-biobank/>

Karolinska University Hospital biobank

The aim of Karolinska University Hospital biobank is to ensure that sampling procedures follow confidentiality, safety and other regulatory standards.

Source: <http://www.karolinska.se/Verksamheternas/Administration/Kvalitet-och-patientsakerhet/Biobanksenheten/>

Stockholms Medicinska Biobank, SMB

KI and Stockholm county council (SLL), are planning to establish a common biobank during 2014.

Source: <http://sll.se/>

The Biobanking and Molecular Resource Infrastructure of Sweden (BBMRI.se)

The Biobanking and Molecular Resource Infrastructure of Sweden (BBMRI.se) is a national infrastructure for access, storage and analysis of samples. Hosted by KI, BBMRI.se collaborates with all medical faculties in Sweden and is linked to the corresponding European biobank program.

Source: <http://www.bbmri.se/>

Uppsala Biobank

Uppsala Biobank is collaboration between Uppsala University and Uppsala County Council to support academic and health care research with collection, handling and storage of human biological material.

Source: <http://www.uppsalabiobank.uu.se/>

Centre for Research Ethics & Bioethics (CRB)

Centre for Research Ethics & Bioethics (CRB) pursues education and research regarding ethical questions related to biobanks, registers, and informed consent.

Source: <http://www.crb.uu.se/>

Regional Biobank Center Uppsala/Örebro (RBC)

Regional Biobank Center Uppsala/Örebro (RBC) is a common resource for the counties in the health care region of Dalarna, Gävleborg, Södermanland, Uppsala, Värmland, Västmanland and Örebro. RBC acts as a central support for the counties' biobank coordinators, healthcare providers, researchers, pharmaceutical companies and the public.

Source: <http://www.rbcuppsalaorebro.se/>

SLU Biobank

SLU Biobank is a biorepository for biological material originating from other organisms than humans (animals, plants and microbes). SLU Biobank is located at three sites in Sweden: Uppsala, Umeå and Alnarp.

Source: <http://www.slu.se/slubiobank/>

Projects involving biobanks

Life Gene

Life Gene is a joint project between all medical faculties in Sweden and is hosted by KI. Half a million people in Sweden between the ages of 0 and 45 will be recruited and the aim is to get a better understanding of how our genes, our environment and our way of life affect our health.

Source: <http://www.lifegene.se/>

EpiHealth

EpiHealth is a collaboration between Uppsala University and Lund University. The goal is to build a national resource in the form of a multicenter longitudinal cohort study. The project will investigate the interactions between genes and life-style factors regarding the development of common diseases seen in the elderly in 300,000 Swedish men and women between the ages of 45 and 75 years.

Source: <http://epihealth.se/>

U-CAN

U-CAN collects and organizes patient samples that are taken before, during and after cancer therapy. Patient data and radiological images are also collected. The material is used to develop methods to fine tune diagnoses and to better characterize different tumor diseases, in order to be able to choose an optimal therapy for the individual patient.

Source: <http://www.u-can.uu.se/>

Quality registries

Over the decades, Sweden has created unique and invaluable population-wide registers that track patient histories and health outcomes. There are more than 100 national quality registries containing individual-based data on problems or diagnoses, treatment interventions and outcomes.

Source: <http://www.kvalitetsregister.se/>

<http://www.socialstyrelsen.se/register/register-service/nationellakvalitetsregister/>

Uppsala Clinical Research Center (UCR)

Uppsala Clinical Research Center (UCR) is designated by the municipalities and county councils to be a national competence center for quality registries. The Center provides service in clinical research, clinical trials, quality registries, and quality development. In addition, UCR also has a group of researchers in various fields that are closely associated with the center.

Source: <http://www.ucr.uu.se/>

Swedish Twin Registry

The Swedish Twin Registry was established in the 1960s and has information on approximately 85 000 twin pairs.

Source: <http://ki.se/forskning/svenska-tvillingregistret/>

Clinical research and clinical trials

Karolinska Trial Alliance (KTA)

Karolinska Trial Alliance (KTA) is a clinical research center at the Karolinska University Hospital, which conducts clinical trials and support for all phases (0-IV). KTA consists of three units:

KTA Phase 1: Conducts phase I-II clinical trials.

KTA Prim: Specialized on phase II-IV clinical trials in the open care.

KTA Support: Provides information, advice and guidance throughout the entire study process

Source: <http://kta.sll.se/>

S3 Clinical Research Centers

S3 Clinical Research Centers, in Vällingby performs clinical trials for pharmaceutical companies.

Source: <http://s3smo.se/>

The Centre for Pharmacoepidemiology (CPE)

The Centre for Pharmacoepidemiology (CPE) provides data on drug safety, drug utilization and rational drug use, including pharmacogenetics.

Source: <http://ki.se/en/meds/centre-for-pharmacoepidemiology/>

Karolinska Biomics Center (KBC)

Karolinska Biomics Center (KBC) is a resource and competence center for clinical research in the biomics area including genomics, proteomics and metabolomics.

Source: <http://www.biomics.se/>

Clinical Research Center (Kliniskt Forskningscentrum, KFC)

Clinical Research Center houses a research hotel and core facilities for experimental clinical research. The Center is a collaborative effort between Karolinska University Hospital and KI with facilities located in Novum Research Park, Huddinge.

Source: <http://ki.se/labmed/kliniskt-forskningscentrum/>

Vecura

Vecura is a core facility at Karolinska University Hospital for manufacturing of GMP grade gene therapy vectors and cell therapy products for clinical trials.

Source: <http://www.vecura.se/>

Uppsala Clinical Research Center (UCR)

Uppsala Clinical Research Center's (UCR) offers assistance with clinical research, clinical trials, and quality development.

Source: <http://www.ucr.uu.se/>

FoU-center Sörmland

The main tasks of FoU-center Sörmland are to stimulate, facilitate and coordinate the clinical, patient-oriented research in the local county council. FoU-center provides counseling and financial assistance to some 100 clinical research projects each year.

Source: <http://www.landstingetsormland.se/fou-centrum/>

Clinical research in Sweden

Swedish drug development

According to a report performed by SwedenBIO, 98 biotech and pharmaceutical companies with their head office in Sweden are actively working with drug development. Of these, 58% are located in the Stockholm-Uppsala region. More than 51 Swedish R&D companies have in total 91 ongoing projects in Phase I-III clinical trials. This is an increase as compared to last year when 81 projects were reported. Most projects, 55, are in Phase II, 21 projects are in Phase I, and 15 in Phase III. The pipeline is dominated by oncology projects, other strong areas are CNS and gastro-intestinal disorders.

Source: <http://www.swedenbio.se/> The Swedish drug development Pipeline 2014 (SwedenBIO and VINNOVA)

Clinical research grants

The Swedish Research Council (Vetenskapsrådet) supports clinical research within the Framework Grant in Clinical therapy. During 2013, 23 researchers were awarded approximately 300 million SEK.

Source: <http://www.vr.se/>

Other core facilities

Tools of Science

Tools of science is a platform that relies on two pillars; academic core facilities and industrial resources providing both services and people along the entire value chain.

Source: <http://www.toolsofscience.se/>

Public Health Agency of Sweden (Folkhälsomyndigheten)

The Public Health Agency houses Scandinavia's only laboratory facility for dangerous biological agents (bio safety level 4, BSL4).

Source: <http://www.folkhalsomyndigheten.se/>

Karolinska Institutet

Karolinska Core Facilities is an umbrella definition, which provides a list of service laboratories, resources and competence centers at KI.

Source: <http://ki.se/en/research/karolinska-institutet-core-facilities/>

Uppsala University

Uppsala University lacks a central organization for core facilities, however listed below are some core facilities that are provided.

Department of Chemistry

The department of Chemistry provides core facilities that focus on amino acid identification, mass spectrometry and cryo-transmission electron microscopy (TEM).

Source: http://www.kemi.uu.se/Research/core_facilities/

Department of Biochemistry and Organic Chemistry

The department of Biochemistry and Organic Chemistry provides core facilities for NMR-spectroscopy, enantiomeric excess and photochemistry.

Source: <http://www.biorq.uu.se/Corefaciliteter/>

Department of Immunology, Genetics and Pathology

The department of Immunology, Genetics and Pathology offers core facilities for flow cytometry and microscopy, genetic analyses, protein analysis, and histopathology.

Source: <http://www.igp.uu.se/facilities/>

Myfab

Myfab is the Swedish national research infrastructure for micro and nano fabrication and offers high-quality cleanroom facilities. Laboratories are located at Ångströmlaboratoriet (Uppsala University), Electrum Laboratory (KTH) and MC2 Nanofabrication Laboratory (Chalmers).

Source: <http://myfab.se/>

Research institute

A list of research institutes that are located in the region can be found below.

Table 11. Research Institutes in the region.

Institute	Homepage
Acreo	http://www.acreo.se/
Interactive Institute	http://www.tii.se/
Research Institutes of Sweden	http://www.ri.se/
Skogforsk	http://www.skogforsk.se/
SP Technical Research Institute of Sweden	http://www.sp.se/
Swedish defense research agency (FOI)	http://www.foi.se/
Swedish Institute of Agricultural and Environmental Engineering (JTI)	http://www.jti.se/
Swedish Institute of Computer Science (SICS)	https://www.sics.se/
Swerea	http://www.swerea.se/

Digital Health-Research institutes

Acreo

Acreo is a research institute within electronics, optics and communication technologies. Its mission is to enhance service and technology development in industry and society by applying research-based technologies, especially ICT, thereby enabling sustainable growth, a better quality of life and increased competitiveness.

COPD - Home Treatment of Patients with Chronic Respiratory Insufficiency

The aim of this project is to develop a telemedicine solution for treatment of chronic respiratory insufficiency (COPD) patients at home. Project leader: Per-Olof Sjöberg, pos@sics.se

Platform for diagnosis of neurological diseases based on movement analysis

This platform is based on accelerometers and gyros that generate objective data on Parkinson's disease. The data will improve the process of finding the right treatment and thus reduce the time and cost of the healthcare provided. Contact: Jan Wipenmyr, jan.wipenmyr@agreo.se

The Interactive Institute

The interactive Institute is an experimental IT & design research institute that conducts applied research and innovation. Examples of projects within digital health:

Medipad

Medipad enables a new way of working at radiology workstations. The gesture-based interface enables radiologists to control their workstation with gestures instead of a mouse and keyboard. This can contribute to a more efficient way of working and ultimately change how radiologists interact with their workstation. Contact: Thomas Rydell, thomas.rydell@tii.se

Virtual Autopsy Table

The Virtual Autopsy Table is a unique medical visualization tool that allows people to explore the functions and processes inside of a human body. Multiple users can interact collaboratively and simultaneously, gain deeper understanding of the body. Contact: Thomas Rydell, thomas.rydell@tii.se

Swedish Institute of Computer Science (SICS)

SICS is a leading research institute for applied information and communication technology in Sweden. Examples of projects within digital health:

Affective Health

Affective Health is a system that measures movement and arousal level via biosensors attached to the body. These measurements can indicate how we live our lives over time; they can portray situations that are stressful, engaging as well as peaceful moments in our lives. The biosensor data is displayed in real time on a mobile phone. Project leader: Kristina Höök, kia@sics.se.

EveryCare

SICS also runs a strategic program, EveryCare, aimed at demonstrating integrated IT solutions for resource-efficient occupant services in home healthcare and elderly care, as well as sustainable living conditions in the home environment. Project leader: Sture Hägglund, sture.hagglund@santaanna.se

National Research Network within e-Health

The network aims to coordinate research related to the field of digital health. Project leader: Vivian Vimarlund, vivi@ida.liu.se

ICT-The next generation (TNG) consortium

The ICT TNG consortium is a strategic research area formed by KTH, SU, SICS and ACREO. The mission of this initiative is to secure and further develop Stockholm as a world-leading center of ICT research and innovation.

Source: <http://www.kth.se/en/tng>

Support for innovation

A large number of incubators and support structures for innovation are located in the Stockholm-Uppsala region, selected organizations are listed in the Table 12.

Table 12. Incubators and support structures.

Organization	Homepage
Stockholm	
Innovationskontoret	http://www.ki.se/om-ki/innovationskontoret/
Innovationsplatsen	http://www.karolinska.se/innovationsplatsen/
Interact	http://www.kth.se/innovation/interact/interact-1.294590/
KI Innovations (KIAB)	http://www.karolinskainnovations.ki.se
KTH Innovation	http://www.kth.se/en/innovation/
KTH Näringslivssamverkan	http://www.kth.se/samverkan/
Serendipity Innovations	http://www.serendipityinnovations.com
SLL Innovation inom Stockholms läns landsting	http://www.webbhotell.sll.se/sv/SLLInnovation/Om-SLL-Innovation/
Stockholm City Foundation	http://www.ssci.se/
Stockholm School of Entrepreneurship (SSES)	http://www.sses.se
SU Innovation	http://www.su.se/samverkan/foretag-organisation/innovationsstod/
Unit for bioentrepreneurship (UBE)	http://ki.se/en/lime/unit-for-bioentrepreneurship/
Venture Cup	http://www.venturecup.se
Flemingsberg	
Almi Stockholm-Sörmland	http://www.almi.se/Stockholm-Sormland
CTMH	http://www.ctmh.se/
Flemingsbergs Science	http://www.flemingsberg.se/Flemingsberg-Science/
Södertälje	
Connect Östra Sverige	http://connectost.se
Södertälje Kommun	http://www.sodertalje.se/Naringsliv--arbete/Starta_eget
Kista	
Stockholm Innovation and growth (STING)	http://www.stockholminnovation.com
Uppsala	
Almi Uppsala	http://www.almi.se/uppsala/
Bio-X	http://www.bio-x.nu/
CONNECT Uppsala	http://www.connectuppsala.se/
Forskarpatent Uppsala	http://www.fpatu.se/
Innovation Akademiska	http://www.akademiska.se/innovation
SLU Holding	http://www.slu.se/sv/centrumbildningar-och-projekt/sluholding/
Uppsala BIO	http://www.uppsalabio.se/
Uppsala Innovation centre (UIC)	http://www.uic.se/
Uppsala Universitets Utveckling AB (UUAB)	http://www.uuinnovation.uu.se/uuabholding/
Uppsala University Innovation	http://www.uuinnovation.uu.se/

The teachers exemption (Lärarundantaget)

In Sweden, lecturers, researchers and doctoral students own the right to their research results and patentable inventions even if they are made during working hours. (LAU 1949:345)

Science parks

Karolinska Institutet Science Park (KISP)

KI Science Park (KISP) AB provides a large selection of attractive and creative environments where growing companies can develop research ideas commercially. At present, 80 companies are established on the park premises, which are located in Solna and Flemingsberg.

Source: <http://sciencepark.ki.se>

Hagastaden

Hagastaden is one of the largest urban development projects in Sweden and strategically located close to KTH, KI and SU. By 2025, the area of Norra Station between the city of Stockholm and Solna, will be built and developed into an entirely new neighborhood with a mixture of apartments, workplaces, cultural attractions, green areas, world-leading research and highly specialized medical care.

Source: <http://www.hagastaden.se/>
<http://www.stockholm-life.se/>

Biovation park

Biovation park was inaugurated 2014 and offers office and lab space in AstraZenecas old premises in Södertälje. There are now more than 30 companies established in the park.

Source: <http://www.biovationpark.com/>

Uppsala SciencePark

Uppsala Science Park is located at the heart of the campus that has grown up around Uppsala's two universities. There are roughly 140 companies and organizations on the site. Predominant industries include biotechnology, material science, pharmaceuticals and IT.

Source: <http://uppsalasciencepark.se/>

Uppsala Business Park

Uppsala Business Park offers laboratories, clean room laboratories and facilities for drug manufacturing. Moreover, there is the possibility to rent office space, data center and climate room. The science park is home to 70 life science companies.

Source: <http://www.uppsalabusinesspark.se/>

Companies

Key figures

- **Companies**
The Stockholm-Uppsala region is home to 611 life science companies with a total of 20,852 employees. The total turnover of these companies amounts to over 177 billion SEK.
- **Subsectors**
A majority of the companies are engaged in research and development but the industry also comprises of service companies providing expertise ranging from pre-clinical product development to CRO, regulatory and CMO activities
- **Export revenues**
The Swedish pharmaceutical export during 2013 was estimated to 56 billion SEK.
- **Largest companies**
AstraZeneca, GE Healthcare, Fresenius Kabi AB, St. Jude Medical, Octapharma, Pfizer, Phadia, Maquet Critical Care, Swedish Orphan Biovitrum, Q-Med and Recipharm.

Number of companies, number of employees and revenue

The Stockholm-Uppsala region is home to 611 life science companies with a total turnover over 177 billion SEK. The life science industry covers the entire life science business spectrum and employs 20,852 experts, which equals more than 50% of Sweden's workforce within life science. About 13,500 employees (65%) work for in total 11 companies active in research, development and/or production, while marketing and sales companies employ 29% of the workforce. Six percent of the work force is active in the consulting sector. A summary of eligibility criteria for companies may be found in Appendix 5.

Source: <http://www.suls.se/> Facts and figures on Sweden's number one life science region.

A compiled list of companies in the region can be found at: <http://suls.se/company-database/>.

Export revenues

The Swedish pharmaceutical export during 2013 was estimated to 56 billion SEK, the lowest levels in 10 years. But yet an important part of Sweden's economy.

Source: <http://www.oresundsinstittet.org/>

Small, medium and large companies 2012

In the Stockholm-Uppsala region, 65 % of the life science companies have between one and ten employees, 24% have between 11 and 50 employees, 9% have between 51 and 250 employees and about 2 % have more than 250 employees (**Figure 2**, left bar).

Half of the region's employees work in a company with a work force of at least 250 people. Companies employing between 51 and 250 persons account for 28% of the workforce and companies employing between 11 and 50 persons account for 16%. Only 7% of employees work in a company with 1-10 employees (**Figure 2**, right bar). A comprehensive description of the companies in the region may be found in Appendix 9.

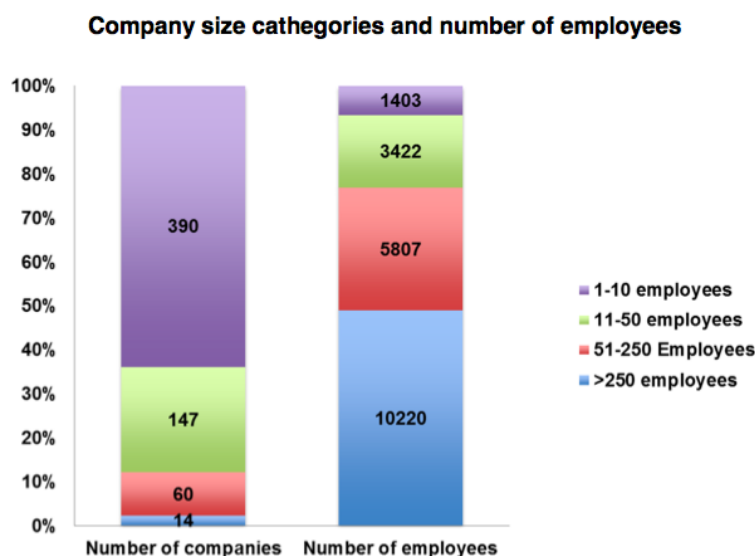


Figure 2. Number of companies vs. employees by size classes.

Number of employees per sub sector, 2012

Employment in pharmaceutical companies accounts for more than half (53%) of the work force, of which AstraZeneca's contribution is substantial (19%). Medical technology accounts for 24% and biotech tools and supply for 12%. CRO and Service contribute 6% and diagnostics 5%. Other biotechnology (environmental, agricultural and food-related combined) accounts for less than 1%.

Distribution of the workforce between sub-sectors, 2011

The number of employees by sub-sector and county in the region is represented in Figure 3., Uppsala and Sörmland account for 75%, 23% and 2% of the work force respectively.

Stockholm

Stockholm accounts for 75% of the work force. Pharmaceutical and Medical technology companies are the two predominant types of employers in the Stockholm area. AstraZeneca accounts for as much as one third of the life science industry in this part of the region. Of the remaining pharmaceutical companies, the two largest, Octapharma and Swedish Orphan Biovitrum

Uppsala

Uppsala accounts for 23% of the work force. In Uppsala, the predominant employers are within biotech tools and supply and the pharmaceutical industry. Uppsala has a proud history within protein chemistry/protein analysis dating back to the invention of the ultracentrifuge by The Svedberg. Uppsala-based companies include Q-Med, Fresenius Kabi, Abbott Medical Optics.

Sörmland

Sörmland accounts for 2% of the work force more than 90% of the work force belongs to the pharmaceutical sector. Strängnäs in Sörmland is home to Pfizer's biomanufacturing facility.

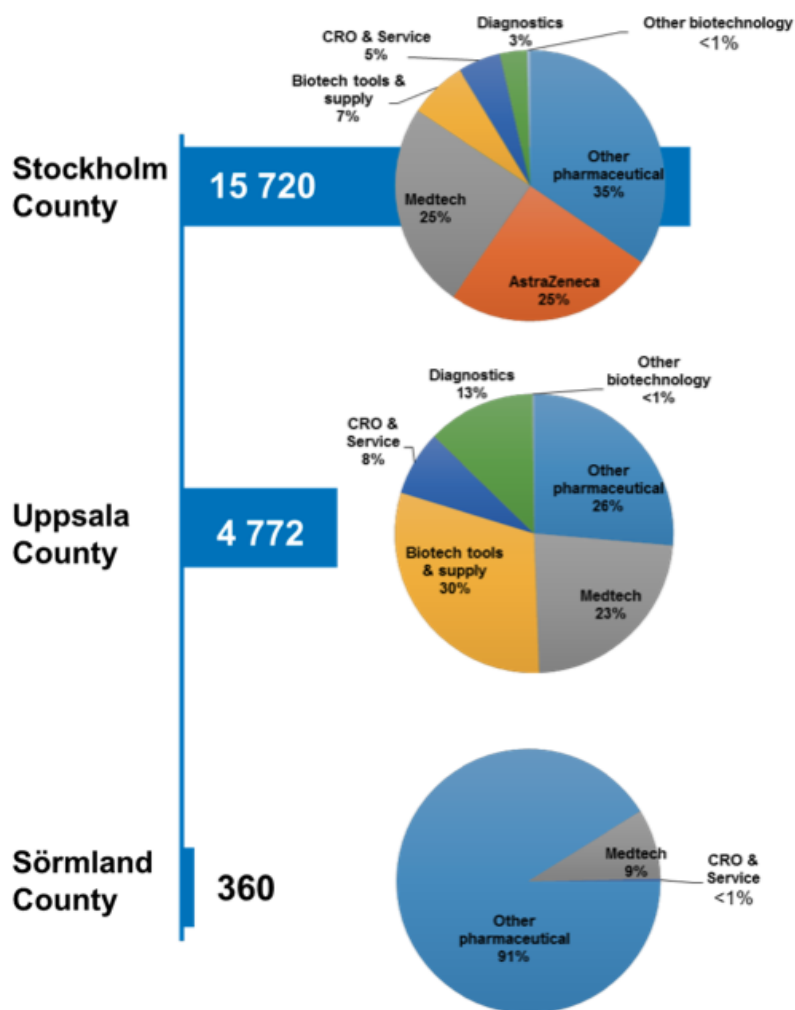


Figure 3. Distribution of the work force within the life science sector between the three counties in the region.

The largest companies in the region

Table 13. The largest companies – number of employees and turnover, 2012.

Company	Subsector	Number of employees	Turnover, (billion SEK)
Astrazeneca AB	Pharmaceutical	3943	56.8
GE Healthcare	Biotech tools & supply	1232	7.9
Fresenius Kabi AB	Pharmaceutical	1008	2.9
St. Jude Medical	Medtech	659	2.0
Octapharma	Pharmaceutical	629	0.9
Pfizer	Pharmaceutical	534	10.5
Phadia	Diagnostics	430	2.4
Maquet Critical Care	Medtech	409	1.6
Swedish Orphan Biovitrum	Pharmaceutical	378	2.5
Q-Med	Medtech	362	2.0
Recipharm	Pharmaceutical	353	2.8
Total		9 987	92,4
Proportion of entire company population		48%	-

Growth companies

The region is home to a large proportion of the most interesting technology companies in the country. Many companies in this size class get support from VINNOVA or funding from Industrifonden.

33-listan

33-listan is a list of the most interesting technology-companies in Sweden and is produced annually by Ny Teknik and Affärsvärlden. During the years 2012-2014, 20 med/tech companies were on the list, of these 13 (65%) are based in the Stockholm-Uppsala region.

Source: <http://www.nyteknik.se/33listan/>

Digital Health-Companies

Decades of experience within the areas of telecoms, wireless, electronics, computer game development and web applications/design have made Sweden a leading country within ICT. With their top-class international reputation, Swedish IT and telecom companies together form one of the country's largest export sectors. Underlying factors include highly skilled engineers, the presence of the world's leading technology companies, demanding corporate clients and strong technology adoption. Only in Stockholm the number of technology companies is over 22 000. A list of companies can be found in Appendix 6.

Medical products sector-Pharmacia and AstraZeneca

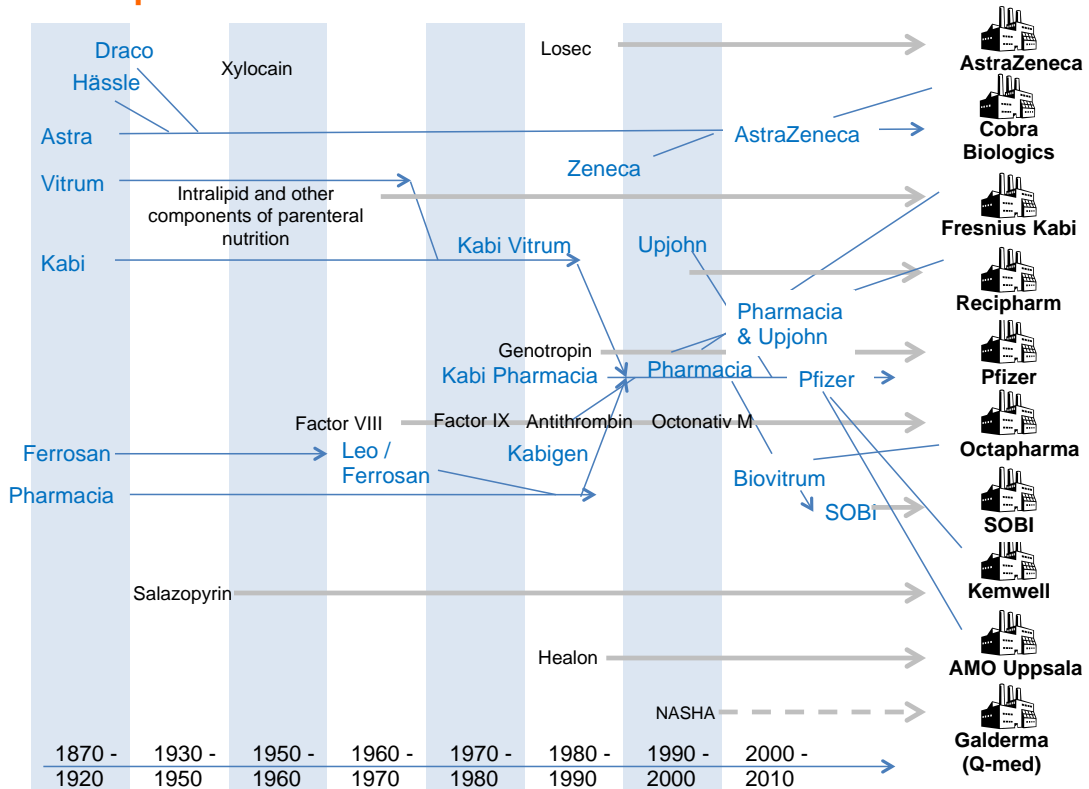


Figure 4. **Figurtext**

Capital investments

Key figures

- Venture capital**
 Sweden has one of the largest shares of venture capital funding in Europe. The total venture capital invested during 2012 was 1.8 billion of which 0.44 billion SEK was invested in life science.
- Results for the Stockholm Business Alliance (SBA)-region**
 Total number of investments during 2013 was 58, 46% of these were made in the Stockholm-Uppsala region.

Financing in different stages.

The following table describes how companies are financed in different stages.

Table 14. Financing in different stages.

Stage of development	Actors
Seed	Governmental funding such as Almi, Tillväxtverket and Länsstyrelsen. Crowdfunding.
Start-up	Holding companies at the universities and business angels.
Early growth	Venture capital firms, investments and governmental funds.
Expansion	Venture capital and governmental funding such as Industrifonden and Norrlandsfonden.
Buyout	Governmental funding such as Sjätte Ap-fonden and private equity

Source: <http://www.uic.se/finansiering/>

Examples of external investments are: new establishment, capital investments (private/public), licensing, private equity, re-investments, investments in academia, and strategic alliance (company-company/company-academia), innovation and research support, business angels, crowd funding, bootstrapping, venture capital, initial public offering (IPO) governmental funding (eller är detta public capital investment).

Venture capital

Sweden has one of the highest shares of venture capital funding in Europe. In 2012, the total venture capital was estimated to 1.8 billion SEK. Of this, the private venture capital accounts for 1 billion from which 31% was invested in Life science. Public venture capital investments were around 0.8 billion SEK of which life science accounts for 16% (0.128 billion SEK). Venture capital investments are heavily concentrated to Stockholm that attracted over half of all venture capital invested in 2011.

Source: <http://www.tillvaxtanalys.se/> Riskkapitalmarknaden i Sverige 2013. (2013:07)

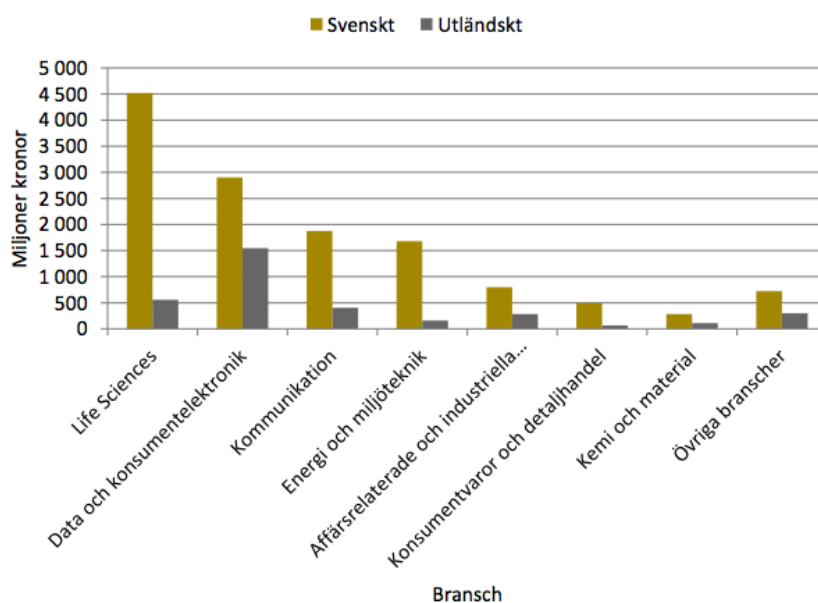


Figure 5. National and international venture capital investments 2007-2012, million SEK.

Venture capital firm/Private equity

There are approximately 20 venture capital firms/private equity firms that invest in life science, a compiled list may be found in Appendix 7.

Investments

The total number of investments was 63 and 58 during 2012 and 2013 in respective, see Table 15. Although the total number of investments in Sweden decreased between these years, the percentage of investments in the Stockholm-Uppsala region increased from 43% to 46%.

Source: Stockholm Business Region Development (SBRD) AB¹.

Table 15. Number of investments in Sweden

	2012	2013
Total number of investments in Sweden	63	58
Investments that SBA was involved in	27 (43%)	28 (46%)
Investments in the Stockholm region	27 (43%)	26 (45%)

Results for the Stockholm Business Alliance (SBA)-region¹ during 2013

- The total amount of invested capital was 525.4 million SEK. Of these, 328.7 million SEK (63%) was invested in Stockholm and 196.7 million (37%) in Uppsala.
- The investments lead to 121 new jobs, 115 in Stockholm and 6 in Uppsala.
- Investing countries: South Korea (6), India (5), USA (4), Japan (4), Taiwan (2), France (29), China (2), UK (1), UAE (1), Morocco (1), Greece (1), Germany (1), Australia (1).

Table 16. Investments by industry or result type, 2013.

Investments by industry	No	Investments by result type	No
ICT	6	Establishment	11
Life Science	4	Business collaboration	9
Tourism	4	Capital investment	4
Cleantech	3	Other result	4
Paper	3		
Other	8		
Total	28	Total	28

Source: Stockholm Business Region Development (SBRD) AB¹.

¹SBRD is the coordinator of SBA, a network of 51 counties in the Stockholm region.

National and international authorities and organizations

National food agency (Livsmedelsverket)

The National Food Agency is the central administrative authority for matters concerning food. Using regulations, recommendations and communication as a tool, the agency aims to promote healthy dietary habits, safe foods and fair practices in the food trade.

Source: <http://www.slv.se/>

Medical product agency (Läkemedelsverket)

The Medical Products Agency is the Swedish national authority responsible for regulation and surveillance of the development, manufacturing and sale of drugs and other medicinal products. The Swedish Medical Products Agency is one of the leading regulatory authorities in EU. Together with other EU authorities, the agency strives to progress and develop the control of medicines within Europe.

Source: <http://www.lakemedelsverket.se/>

MistraPharma

MistraPharma works to identify human pharmaceuticals that are likely to be of concern to aquatic ecosystems and address the risk for antibiotic resistance promotion in the environment. MistraPharma is funded by the Swedish Foundation for Strategic Environmental Research (Mistra). The research program started in 2008 and will end in 2015.

Source: <http://www.mistrapharma.se/>

Public Health Agency of Sweden (Folkhälsomyndigheten)

Public Health Agency of Sweden was established on January 1, 2014 as a merger of the Swedish National Institute of Public Health (Folkhälsoinstitutet) and the Swedish Institute for Communicable Disease Control (Smittskyddsinstitutet). The agency has the aim to identify and highlight public health issues where effective interventions can be made.

Source: <http://www.folkhalsomyndigheten.se/>

The Dental and Pharmaceutical Benefits Agency, (Tandvårds- och läkemedelsverket, TLV)

The Dental and Pharmaceutical Benefits Agency is a central government agency with the remit to determine whether a pharmaceutical product or dental care procedure shall be subsidized by the state. In addition, the agency also contributes to quality service and accessibility of pharmacies.

Source: <http://www.tlv.se/>

The National Veterinary Institute (Statens veterinärmedicinska anstalt)

The National Veterinary Institute is a Swedish national authority that has expert knowledge in prevention, diagnosis and the control of infectious diseases in animals and zoonotic agents spread to humans.

Source: <http://www.slv.se/>

The European Centre of Disease Prevention and Control (ECDC)

Seated in Stockholm, the European Centre of Disease Prevention and Control is a EU agency with the aim to strengthen Europe's defenses against infectious diseases. The mission is to identify, assess and communicate current and emerging threats to human health posed by infectious diseases.

Source: <http://ecdc.europa.eu/>

International organizations and networks

International Neuroinformatics Coordinating Facility (INCF)

International Neuroinformatics Coordinating Facility (INCF) was established through the Global Science Forum of the OECD to develop an international neuroinformatics infrastructure, which promotes the sharing of data and computing resources to the research community. The central office is located at KI.

Source: <http://www.incf.org/>

ReAct-Action on Antibiotic Resistance

ReAct is an independent global network for concerted action on antibiotic resistance with its administration based in Uppsala.

Source: <http://www.reactgroup.org/>

Uppsala Monitoring Centre (UMC)

Uppsala Monitoring Centre (UMC) is an independent foundation and a center for international service and scientific research. The program was set up by the World Health Organization (WHO) to improve safety of patients and the safe and effective use of medicines in every part of the world.

Source: <http://who-umc.org/>

Industry and trade promoting organizations

Table 17. Swedish industry and trade promoting organizations.

	Organization	Home page
Industry	Läkemedelsindustriföreningen (LIF)	http://www.lif.se
	SwedenBIO	http://www.swedenbio.se
	Swedish Medtech	http://www.swedishmedtech.se
	Swedish Labtech	http://www.swedishlabtech.se
	Innovativa Mindre Life Science Bolag (IML)	http://www.lif.se/default.aspx?id=49784
Trade	Swecare	http://www.swecare.se

Healthcare

Key figures

- **Hospitals**
There are 22 hospitals in the region, of which three are university hospitals –one for animals and two for humans.
- **Web-based healthcare**
Several web-based healthcare projects are under development including a mobile app for child healthcare and Innovation Hub for care at a distance
- **Value based healthcare**
Projects at Karolinska University hospital and Uppsala University hospital have been initiated improve health by investigating ways in which clinical research results can be converted more rapidly into new improved treatments.

Healthcare

The Stockholm-Uppsala region is a test bed for setting up clinical research, development and new treatments. Quality- and patient registries together with personal identity number offer a great opportunity to perform high-quality translational research, clinical trials and to develop the healthcare sector. According to a report performed by OECD, Sweden delivers high quality health and elderly care and is still among the best in the world.

Table 18. Number of employees and operating expenses in the regions three county counsels.

	Employees	Operating expenses (SEK)
Stockholm county council	43 000	73 billions
Uppsala county council	12 000	12 billions
Sörmlands county council	6500	10.4 billions

Source: <http://www.sll.se> annual report 2013
<http://www.landstingetsormland.se> annual report 2013
<http://www.lul.se> annual report 2012
OECD reviews of health care quality in Sweden 2013

Hospitals

There are 22 hospitals in the region, of which three are university hospitals –one for animals and two for humans. Outpatient clinics are not included.

Table 19. Hospitals in the region.

Hospital	Webpage
Stockholm county	
Aleris Specialistvård Täby	http://www.aleris.se/har-finns-vi/taby/aleris-specialistvard-taby/
Astrid Lindgrens Barnsjukhus	http://www.karolinska.se/AstridLindgrensBarnsjukhus/
Capio S:t Görans sjukhus	http://www.capiostgoran.se/
Danderyds sjukhus	http://www.ds.se/
Ersta sjukhus	http://www.erstadiakoni.se/sv/sjukhus/
Karolinska Universitetssjukhuset	http://www.karolinska.se/
Nacka närsjukhus	http://www.aleris.se/har-finns-vi/nacka/aleris-specialistvard-nacka/
Norrälje sjukhus	http://www.tiohundra.se/norrtaljesjukhus/
Röda korsets sjukhus	http://www.rks.se/
S:t Eriks Ögonsjukhus	http://www.sankterik.se/
Södersjukhuset	http://www.sodersjukhuset.se/
Södertälje sjukhus	http://www.sodertaljesjukhus.se/
Sörmlands county	
Kullbergsska sjukhuset	http://www.landstingetsormland.se/halsa-ward/sjukhus/kullbergsska-sjukhuset-katrineholm/
Mälarsjukhuset in Eskilstuna	www.landstingetsormland.se/
Nyköpings lasarett	http://www.landstingetsormland.se/Halsa-ward/sjukhus/Nykopings-lasarett/
Regionsjukhuset Karsudden	http://www.landstingetsormland.se/halsa-ward/sjukhus/karsudden/
Uppsala county	
Akademiska barnsjukhuset	http://www.akademiska.se/barnsjukhuset/
Akademiska sjukhuset	http://www.akademiska.se/
Elisabethsjukhuset	http://www.aleris.se/har-finns-vi/uppsala/elisabethsjukhuset/
Lasarettet i Enköping	http://www.lul.se/lasarettet/enkoping/
University Animal Hospital	http://www.universitetsdjursjukhuset.se/

Ongoing development for better healthcare

Web-based health care

Selected initiatives within web-based healthcare are shown below.

National eHealth - the strategy for accessible and secure information in health and social care

The National Strategy for eHealth was developed during 2005 and 2006 after national consensus was reached on the need to develop and introduce nationally coordinated ICT support and more integrated information management. Inera coordinates the work and projects within this initiative and the aim is to develop registry and security solutions to guarantee integrity and data protection, draft new legislation, and develop measures to ensure high quality information and uniform terms and concepts.

Source: <http://www.inera.se/>
<http://www.government.se/sb/d/574/a/167985/>

Swedish eHealth Agency (eHälsomyndigheten)

The Swedish eHealth Agency was formed on 1 January 2014 and aims to contribute to improved health care and the nation's health by development of a national e-health infrastructure.

Source: <http://www.ehalsomyndigheten.se/>

Innovation Hub for care at a distance

The aim with the project is to meet the needs of current and future healthcare by making it easier for healthcare providers to implement healthcare at a distance, and by reducing the gap between health care needs and the solutions the industry has to offer to help create more innovations.

Source: <http://www.vinnova.se/sv/Resultat/Projekt/Effekta/Innovationshubb-for-ward-pa-distans/>

Mobile app Child healthcare

The app will serve as a tool for parents to assess their children for acute illness or injury based largely on the symptoms exhibited by the child. Depending on the parents' assessment, they are given advice

to seek help at the right level of care. Project leaders: Johan Kaarmes johan.kaarmes@akademiska.se and Gunnar Limingas, gunnar.limingas@akademiska.se

Innovative intensive care nurse and critical care physician at central ICU

The project is a new technology system for automatic printing of pharmaceutical labels based on a virtual platform. The system's primary purpose is to facilitate and secure handling during the preparation of drugs for administration to patients based on . Project leaders: Joakim Engström, joakim.engstrom@akademiska.se and Henrik Reinius, henrik.reinius@akademiska.se.

Value based health care

Program 4D

Program 4D (four diagnoses) is a project initiated by KI and Stockholm County Council with the goal to improve health by investigating ways in which clinical research results can be converted more rapidly into new improved treatments. In the first instance, Project 4D will study four major diagnoses concerning their flow of patients and informatics: type 2 diabetes, breast cancer, heart failure, and rheumatology. After giving consent, patients covered by these diagnoses will be monitored throughout all stages of their illness, from initial symptoms and testing through to treatment and follow-up. Long-term monitoring of individual illnesses connected to biobank samples will put Sweden in a good position to further develop its health and medical care resources and practices.

Source: <http://www.vardgivarguiden.se/utbildningutveckling/Projekt/Program-4D/>

Uppsala University Hospital (Akademiska)

Akademiska hospital is currently investing in value based health care, and three pilot projects (diabetes, esophagus cancer, geriatrics) have been initiated which will be further evaluated.

Source: Uppsala University Hospital media service

Supporting sectors

Information and communication technologies (ICT)

Stockholm

Stockholm is a hotspot for ICT innovation and one of Europe's leading ICT cluster lies in Kista Science City. Today, the area hosts more than 1000 ICT companies that combined employ around 25,000 people. Many innovative fast-growing technology companies such as, King, MySQL, Mojang (Minecraft) and Spotify have their origins in the region. The region is world leading for expertise in mobile and fixed communication. Some of the most important mobile communication technologies including GSM, wCDMA and LTE originate from the Stockholm region.

Source: <http://www.investstockholm.com>

Uppsala

The Uppsala region is of national importance to the ICT sector as Uppsala University provides a major part of the IT education in Sweden. Today, many ICT companies are located in Uppsala and great part of them operates at the crossroads between ICT and life science. Companies such as Skype and Kazaa have their origin in the region.

Source: <http://www.ictuppsala.se/>

<http://www.chamber.se/> Stockholms handelskammars analys 2014:3

Material Science

Research and development within material science includes nano- and microtechnology and is carried out at SciLifeLab, KTH, SU and Uppsala University (Ångströmlaboratoriet). Material sciences may be applicable in/across several areas within life science including biomaterials, electron microscopy, diagnostics and surface science.

Table 20. Research and development within material science.

Center	Webpage
SciLifeLab	http://www.scilifelab.se/
Biomolecular Tools and Biomaterials at KTH	http://www.kth.se/forskning/forskningsplattformar/lifescience/research/biomolecular-tools-and-biomaterials-at-kth-1.85167/
Medical devices at KTH	http://www.kth.se/forskning/forskningsplattformar/lifescience/research/medical-devices-1.85170/
Berzeliicentret Exselent at SU	http://www.exselent.su.se/
Ångströmlaboratoriet at UU	http://www.teknat.uu.se/forskning/styrkeomraden/funktionella-material/

Regional condition's and infra structure

General information

The Stockholm-Uppsala region is one of the fastest growing regions in Sweden. With a population of 2 786 092, the area accounts for almost one third of the total population in the country. The workforce is highly educated with 35% having post secondary education (compared to 25% in the whole country).

According FDI Magazine and Financial Times, the Stockholm-Uppsala region is one of top future regions in Europe and also one of the top areas for economic potential. In addition, the Stockholm-region generates 30% of Swedish gross domestic product (GDP) and the Stockholm County has one of the highest gross regional product (GRP) per capita in Europe.

Source: <http://www.Scb.se/>

<http://www.tillvaxtanalys.se/> Regional tillväxt 2013, rapport 2013:06,

<http://www.tillvaxtanalys.se/> Rapport 2011_11-population

<http://www.fdiintelligence.com/> Rapport 2014/15

Distance

Stockholm-Uppsala region has an excellent transport infrastructure, which makes it possible to travel from north to south either by public transport or by car in little bit more than one hour. The region is also globally connected through several airports, roads, railways and ports.

Construction and development plans

Several construction projects are planned in the region and in total more than 87 billion will be invested.

Hagastaden and New Karolinska Solna

New Karolinska Solna (NKS) is the project name for the state-of-the-art hospital currently under construction next to Karolinska University Hospital in Solna. The new university hospital will open its doors to the first patients at the end of 2016. In the area surrounding NKS, Hagastaden is under development. Over the next 15 years, businesses and institutions will work together to make the region "the world's leading area for life science". The area will also host 6000 new dwellings and has access to good transports links. The area is due for completion in 2025 and approximately 60 billion SEK will be invested in the project.

Source: <http://www.hagastaden.se/>

<http://www.nyakarolinskasolna.se/>

<http://www.stockholm-life.se/>

Biomedicum

Biomedicum in Solna will be one of the largest medical research facilities in Europe and will have space for approximately 1,700 researchers and other personnel. Scheduled for completion in 2018. Approximately 2.8 billion SEK will be invested in the project

Source: <http://ki.se/om-ki/biomedicum-framtidens-laboratorium/>

Flemingsberg

In the coming 15 years, Huddinge county, Botkyrka county and Stockholm county will together invest 12 billion SEK to transform Flemingsberg into a unique meeting place for healthcare, academia and world-class medical technology. The investment will also include expansion of student accommodation, renovation and modernization of the Karolinska University Hospital, new motorway and train tracks.

Source: <http://www.flemingsberg.se/>

Albano, *planned project*

A new campus district will be located between SU, KTH and the KI. Albano will house university activities but it will also have accommodation for students and visiting researchers. Approximately 3.7 billion SEK will be invested in the project

Source: <http://www.akademiskahus.se/>. Akademiska hus, annual report 2013

The future Uppsala University hospital

In 2013, the project "Future Akademiska" was initiated, with the aim to modernize and expand Uppsala University Hospital. The project will be finished in 2020 and by then the hospital will increase the size with 58 000 m². Approximately 6.2 billion SEK will be invested in the project

Source: <http://www.akademiska.se/>

The Veterinary and Domestic Animal Centre (VHC)

The Veterinary and Domestic Animal Centre (VHC) will be the only university animal hospital in Sweden and it will be the foremost research centre in Europe within veterinary medicine and domestic animal science. Scheduled for completion in 2014. Approximately 1.39 billion SEK will be invested in the project.

Source: <http://www.akademiskahus.se/>. Akademiska hus, annual report 2013

Skandion Clinic for Uppsala University

The Clinic is the first clinic in Scandinavia where proton rays are used for cancer treatment. This is a collaborative project involving seven county counsels. Scheduled for completion in 2014/2015. Approximately 765 million SEK will be invested in the project.

Source: <http://skandionkliniken.se/>
<http://www.akademiskahus.se/>. Akademiska hus, annual report 2013

Ångströmlaboratoriet

A new building is intended for the Department of Information Technology and will house teaching premises and a hall. Approximately 1.1 billion SEK will be invested in the project.

Source: <http://www.akademiskahus.se/>. Akademiska hus, annual report 2013

Appendix

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