

Advancing a Master Plan for Biosciences Development in Los Angeles County

Discussion of Final Draft Master Plan with Updated Industry and Venture Capital Trends

Battelle Technology Partnership Practice
October 2014

Today's Discussion

- **Recap Project Purpose & Approach**
- **Key Findings from Feasibility Assessment**
- **Overview of Strategic Priorities & Actions**
- **Detailed Discussion of Actions**
 - **Key Features**
 - **Priority**
 - **Resources**
- **Implementation Approach**

A Word on Battelle's Technology Partnership Practice

Battelle TPP is the economic development consulting arm of the world's largest independent, non-profit research and development organization.

Battelle TPP is nationally recognized for its thought leadership in biosciences development and hands-on experience in states and regions across the nation

- National Reports

- BIO State Bioscience Industry Report, 2002-2012 reports
- Biopharmaceutical International Report for PhRMA, 2012
- Impact of Human Genome Project, 2011
- Council for American Medical Innovation National Agenda, 2010

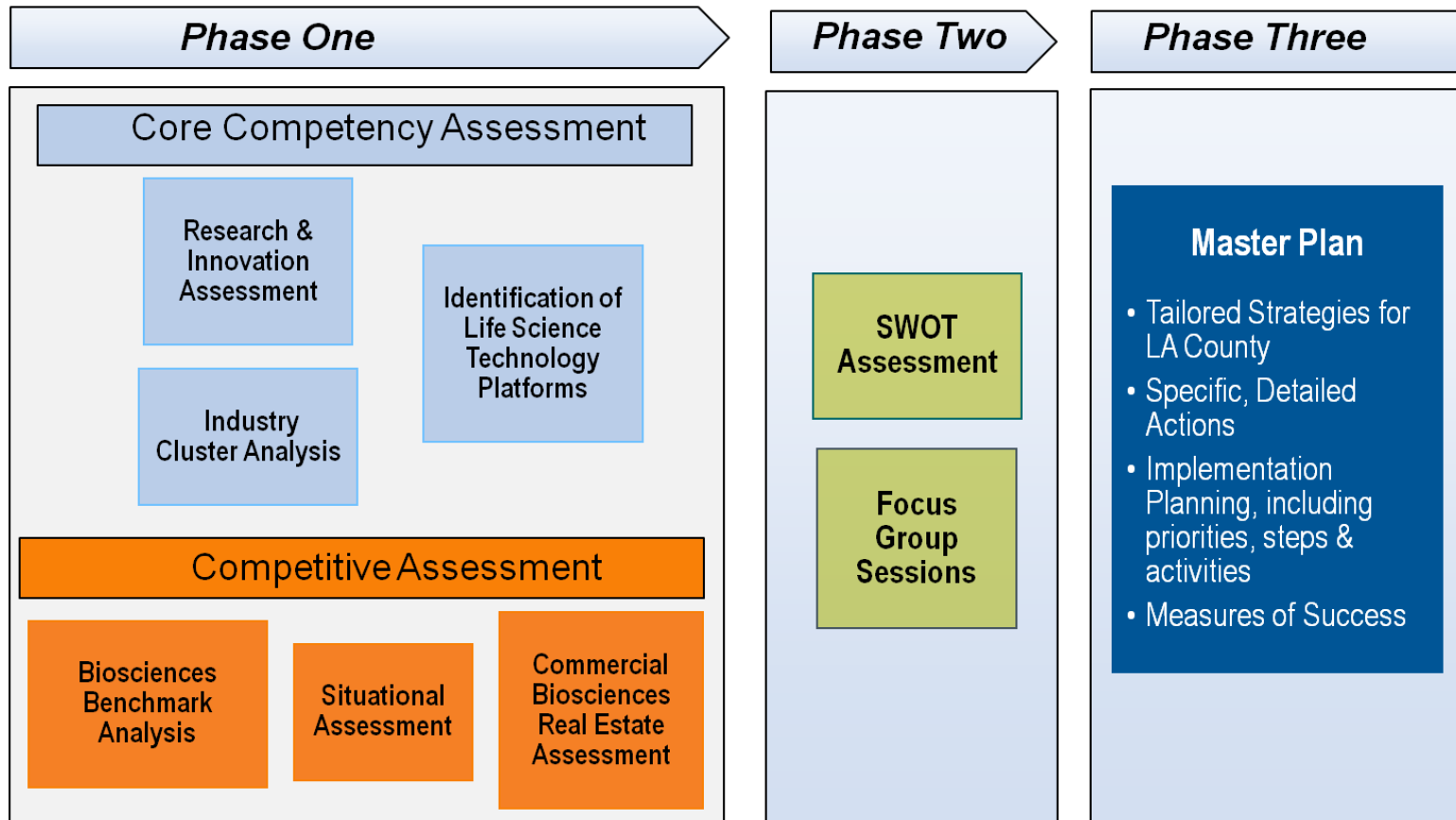


- Bioscience Strategies

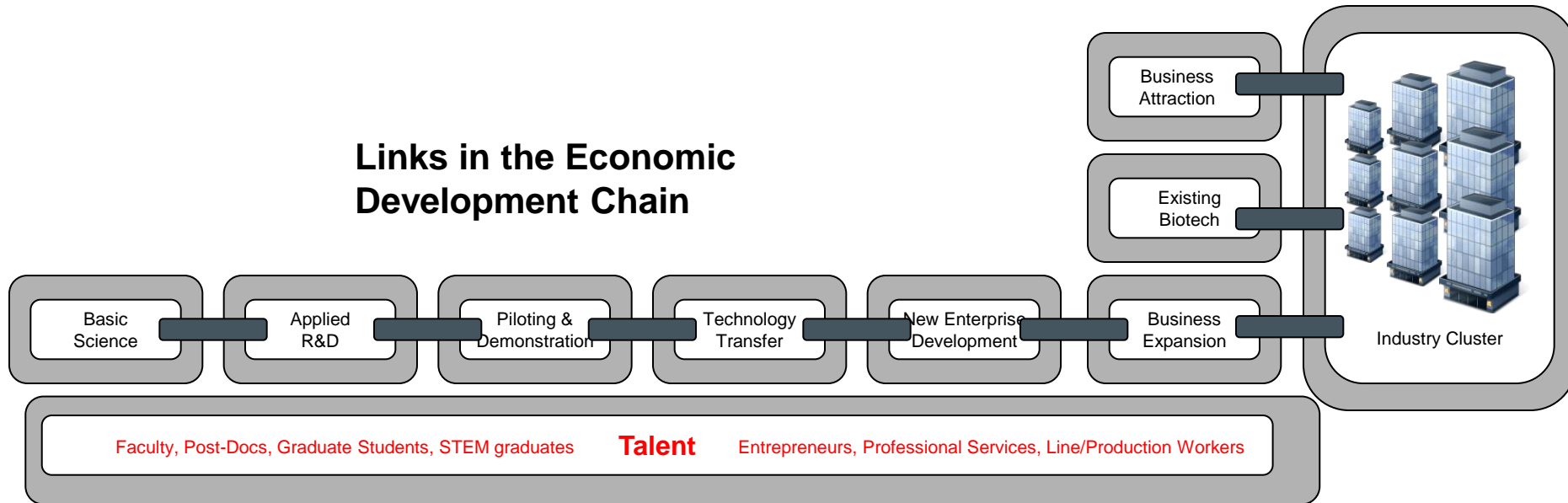
- States of Arizona, Colorado, Georgia, Iowa, Maryland, Michigan, Missouri, Nebraska, Utah, Mississippi
- Regions: Central Indiana, Central Ohio, Flagstaff, Memphis, Peoria, Oklahoma City, Pittsburgh, St. Louis, Tucson

Project Purpose & Approach

- PURPOSE:** *Develop a fact-based, comprehensive bioscience industry cluster development strategy to enable Los Angeles County to realize its full potential as a bioscience hub.*



Developing A Bioscience Industry Clusters Requires Attention to Every Link in the Development Chain



Ingredients for building a critical mass in the biosciences in states and regions include:

- Engaged universities with active leadership
- Building entrepreneurial cultures with intensive networking across sectors and with industry
- Available capital covering all stages of business cycle
 - Discretionary federal or other R&D funding
 - Workforce and talent pool
 - Access to specialized facilities and equipment
- Supportive business, tax and regulatory policies
 - Patience and a long-term perspective

Key Findings

RECENT TRENDS:

Strong Growth and Promise of Biosciences for LAC

- **Biosciences industry emerging as key economic driver**
 - ***Gaining Competitive Share***
 - ***Key Local Economic Driver.***
 - ***Sizable Base***
- **Depth of research & innovation base offers several key technology platforms for growth**
- **But lack of venture financing creating a “leaky bucket” for LAC capturing innovation**

LOCATION:

Broad footprint with limited clustering

- **Widely distributed footprint** ... No “Hollywood” for Biosciences in LAC
- **Immature bioscience real estate market**, with few if any specialized facilities
- **Lack of continuum of space** beyond modest incubators reflects lack of footing in LA

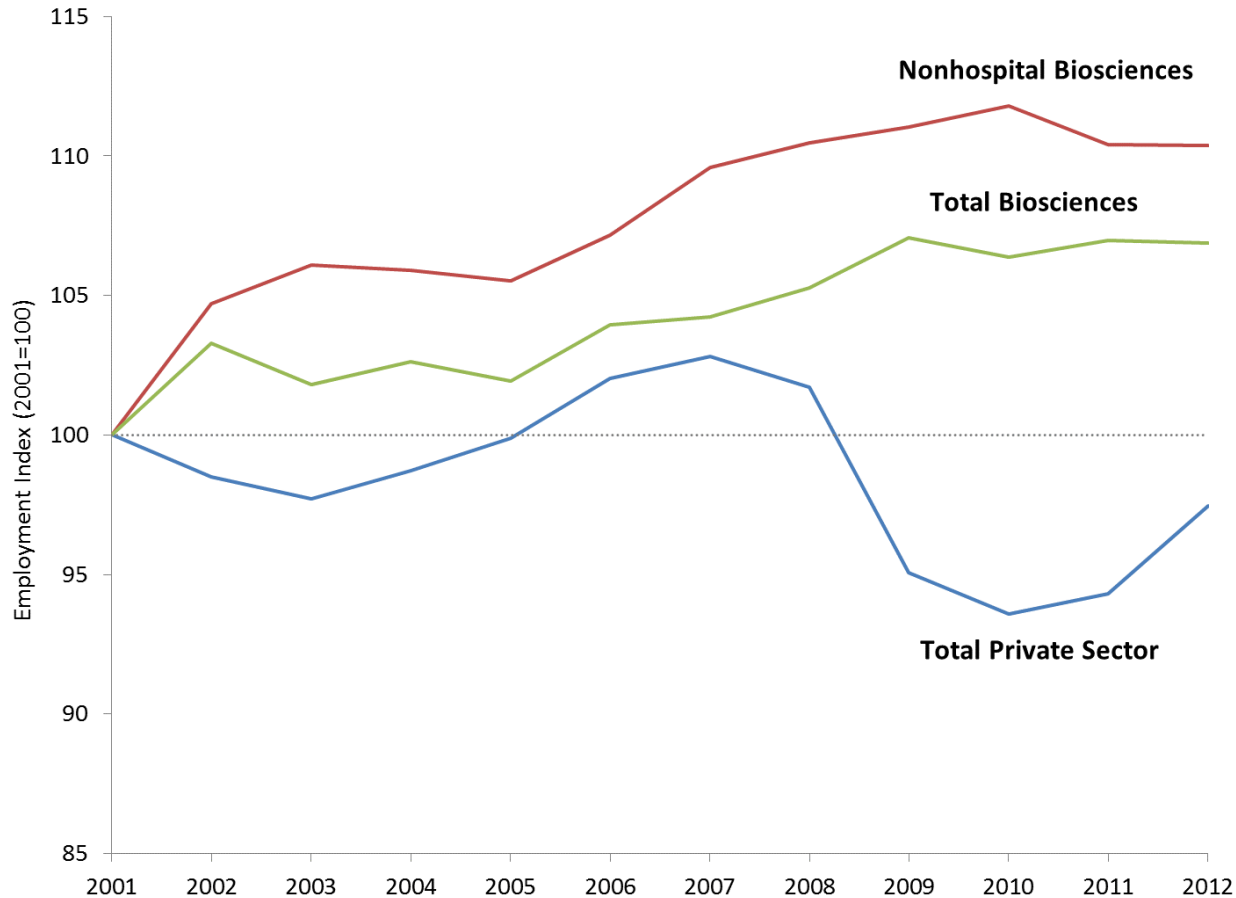
COMPETITIVENESS:

Despite promise, off pace of leading regions

- **Generally positive trends for LAC, but lag leading regions in:**
 - Industry growth
 - Research growth
 - Venture capital
 - Specialization of skills
 - Presence of commercial bioscience space

Where BioEconomy Stands Today: A Leading Economic Driver for LAC

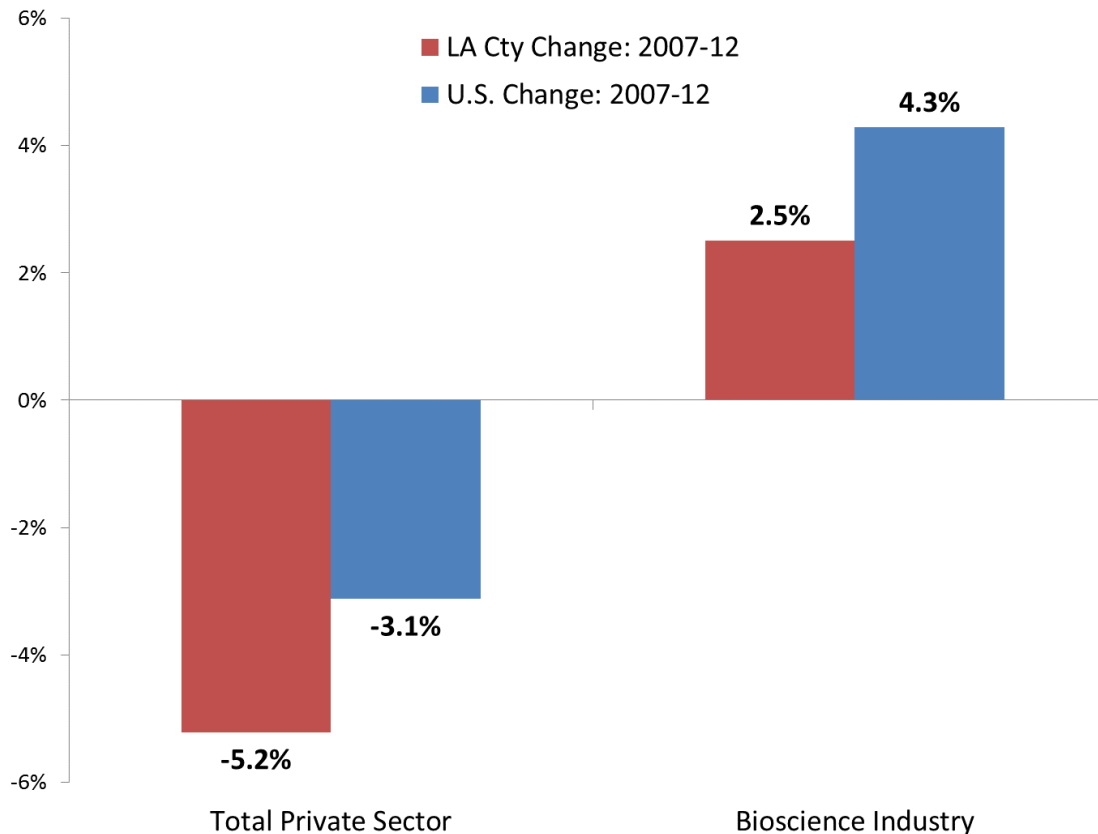
LA County Bioscience Industry Employment Trends



Source: Battelle analysis of Bureau of Labor Statistics, QCEW data; enhanced file from IMPLAN.

Though not performing as well as the nation

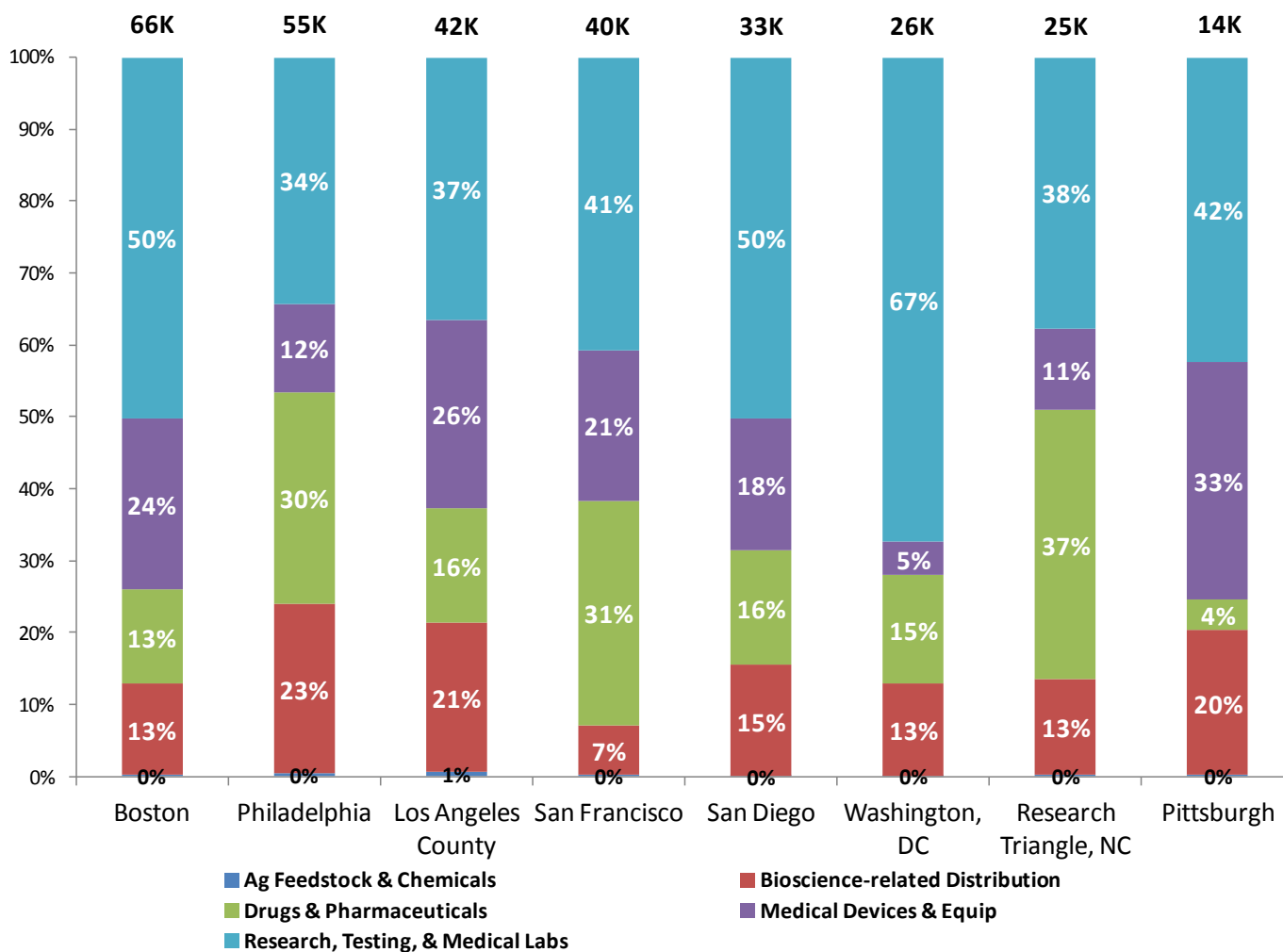
LA County & U.S. Bioscience Industry Employment Trends, 2007-12



Source: Battelle analysis of Bureau of Labor Statistics, QCEW data; enhanced file from IMPLAN.

Composition of the Nonhospital Biosciences by Region—LA Relatively Diverse

Employment Composition of the Nonhospital Biosciences, 2010



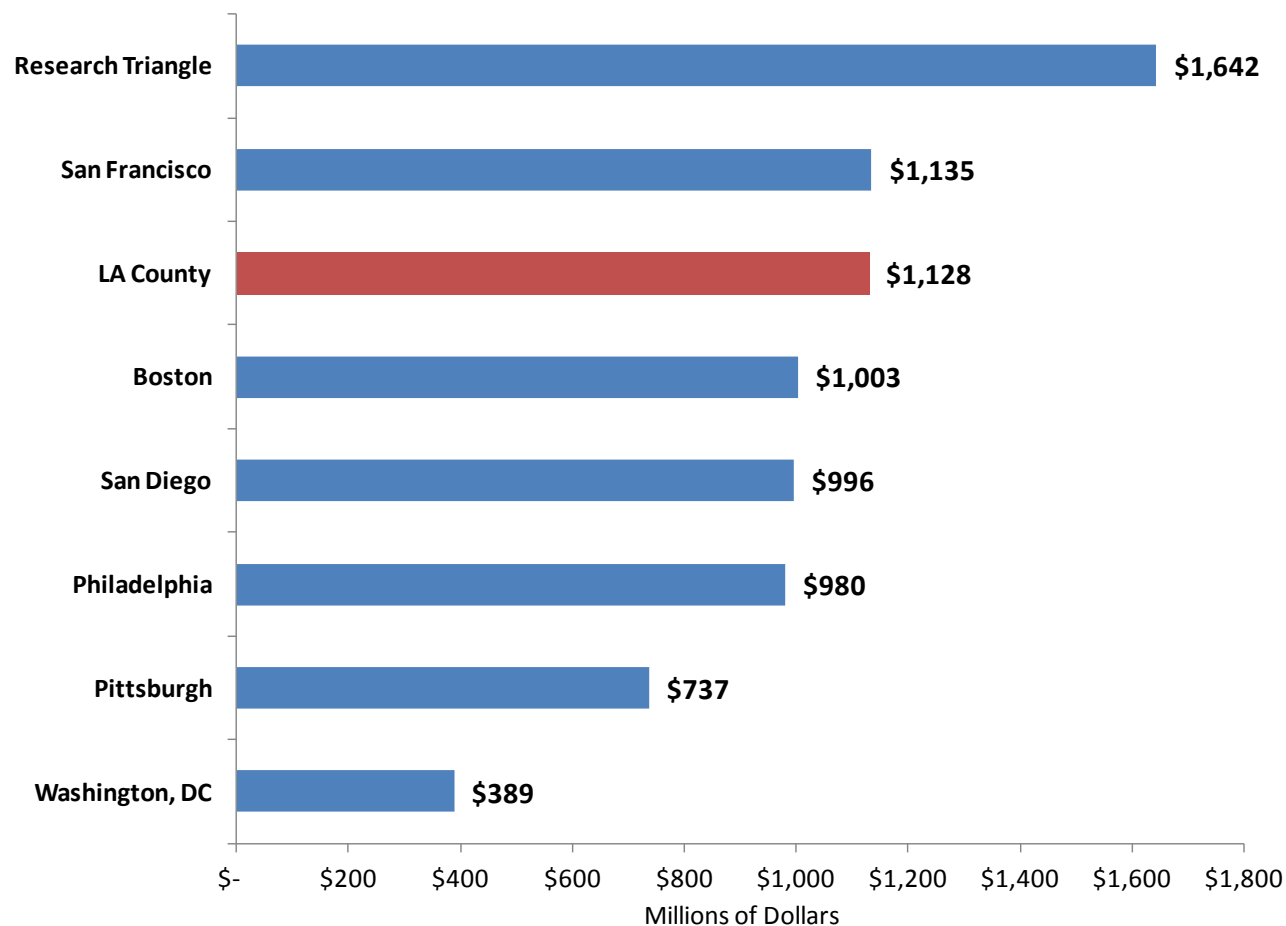
Source: Battelle analysis of Bureau of Labor Statistics, QCEW data; enhanced file from IMPLAN.

Industry Landscape - Composite



In Biosciences-related Academic R&D, LA County among Top Tier of Benchmarks

Academic R&D Expenditures in Bioscience-related Fields, 2010



Source: NSF Survey of R&D Expenditures at Universities and Colleges.

BUSINESS SENSITIVE

Line of Sight to Possible Technology Platforms

Leading Biosciences Industry Products and Services

- **Current Strengths**
 - Electro-Medical Devices
 - Surgical Appliances & Supplies
 - Medical Labs
- **Emerging Strengths**
 - Biotech Commercial R&D
 - Pharmaceutical Mfg
 - Surgical & Medical Instruments
 - Hospitals
 - Drug Distribution
 - Testing Labs
 - Biological Products
 - In Vitro Diagnostics
- **Specialized Industries**
 - Medicinal/Botanical Mfg
 - Dental Equip & Supplies

Core Competency Areas

- **Primarily Applications**
 - Musculoskeletal Research and Implant Devices
 - Biologics for Therapeutics and Diagnostics
 - Electro-Medical Devices
 - Surgical Instruments & Devices
 - Biomedical Imaging
 - Dental Materials, Implants and Devices
 - Public Health & Healthcare Management
 - Health Informatics
- **Primarily Disease Areas**
 - Cancer
 - Psychological Disorders & Human Behavior
 - Neurodegenerative/Neurological Diseases
 - Infectious Diseases
 - Cardiovascular
 - Ophthalmology
 - Inflammatory Diseases
 - Transplantation
 - Nephrology & Urological Diseases
 - Respiratory Disorders
 - Drug Development & Delivery
- **Primarily Basic Biological Sciences**
 - Genetics & Genomics
 - Protein Sciences
 - Metabolic Biology
 - Stem Cell Biology

Likely Biosciences Technology Platforms

Novel Therapeutics & Diagnostics

Bioengineering Solutions for Treating Diseases and Medical Conditions

Innovations in Healthcare Delivery

What Distinguishes LA County in Specific Growing Markets for Preliminary Technology Platforms

Novel Therapeutics & Diagnostics

- Key focus on biologics both for therapeutics and diagnostics – seeing recent growth in industry in these areas as well.
- Emergence of stem cell research for advancing therapies and delivery mechanisms
- Also draws on strengths in Protein Sciences and Genetics/Genomics found in LA research institutions.
- Cancer is leading area of development from PI-initiated drug/biologics trials – but other active areas include: Psychiatric Disorders, Cardiovascular,

Bioengineering Solutions for Treating Diseases and Medical Conditions

- LA County unusual in having industry strengths across electro-medical, musculoskeletal and surgical devices as well as biomedical imaging + specialization in dental materials & devices.
- Seems very device oriented ... plays to strengths in engineering found in universities.
 - Application of microelectronic systems and nanotechnology key

Innovations in Healthcare Delivery

- LA County research institutions stand out in health care sciences and policy.
- Well over 10 NIH funded research centers focused on quality of care, health promotion, health disparities and community participatory research.
- Emergence of base of innovative health services and health informatics companies.
- Clinical excellence seen via PI-initiated clinical trials 9 hospitals with nationally ranked specialties, extensive GME programs → but hospital base low in concentration and lagging growth

In University Tech Transfer, LA County Stands out in Innovation Outcomes with Above-Average Generation of Disclosures, Start-ups & Patents

University Technology Transfer, Key Metrics, 2012

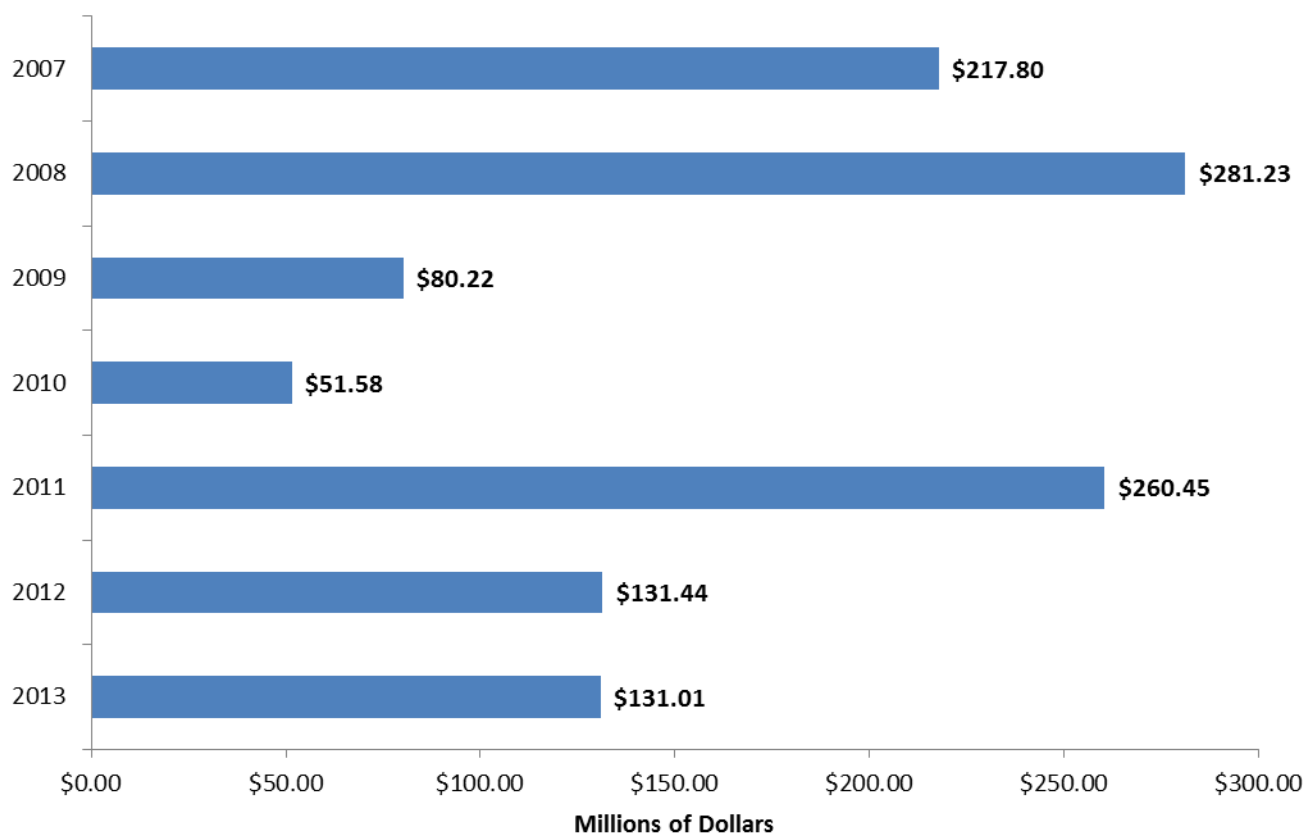
University	Total Research Expenditures	Invention Disclosures	Start-ups	Metrics per \$10M in Research Expenditures				
				Invention Disclosures	Start-ups	New Patent Applications	U.S. Patents Issued	Licenses & Options Executed
Total U.S. Universities Reporting to AUTM	\$ 56,126,493,039	21,033	647	3.75	0.12	3.50	0.81	0.98
Los Angeles County	\$ 1,918,858,181	876	27	4.57	0.14	7.26	1.53	0.47
UCLA	\$ 969,682,000	343	13	3.54	0.13	4.64	0.76	0.35
USC	\$ 542,898,332	190	7	3.50	0.13	5.27	1.55	0.37
Caltech	\$ 406,277,849	343	7	8.44	0.17	16.20	3.35	0.91

Source: Battelle analysis of AUTM U.S. Licensing Survey; Univ. of California System data from Technology Transfer Annual Report, 2012.

Note: not all regional institutions complete the AUTM survey.

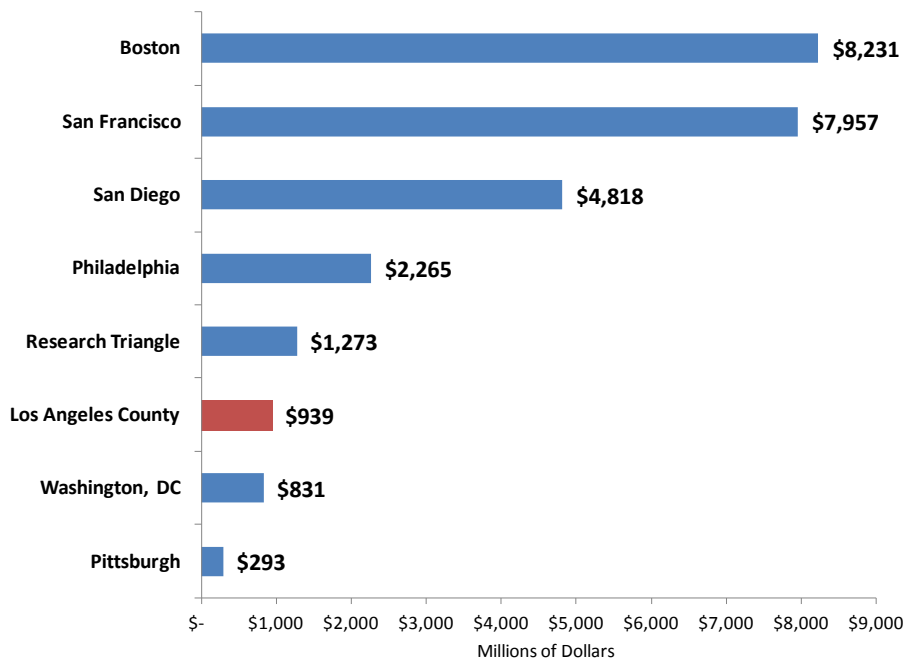
Bio-related Venture Capital Investments in LAC Have Not Been Sustained Year-to-Year

Bioscience-related Venture Capital Investments, 2007-2013

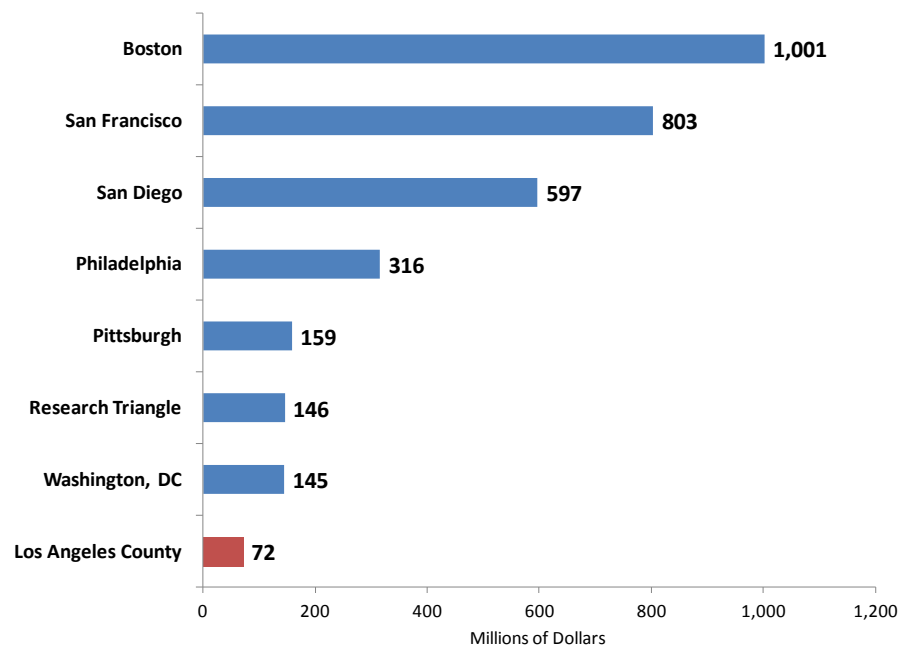


In Bio-related Venture Capital, LA County Lagging Other Regions in Funding & Deals

Bioscience-related Venture Capital Investments, 2007-Q2:2012



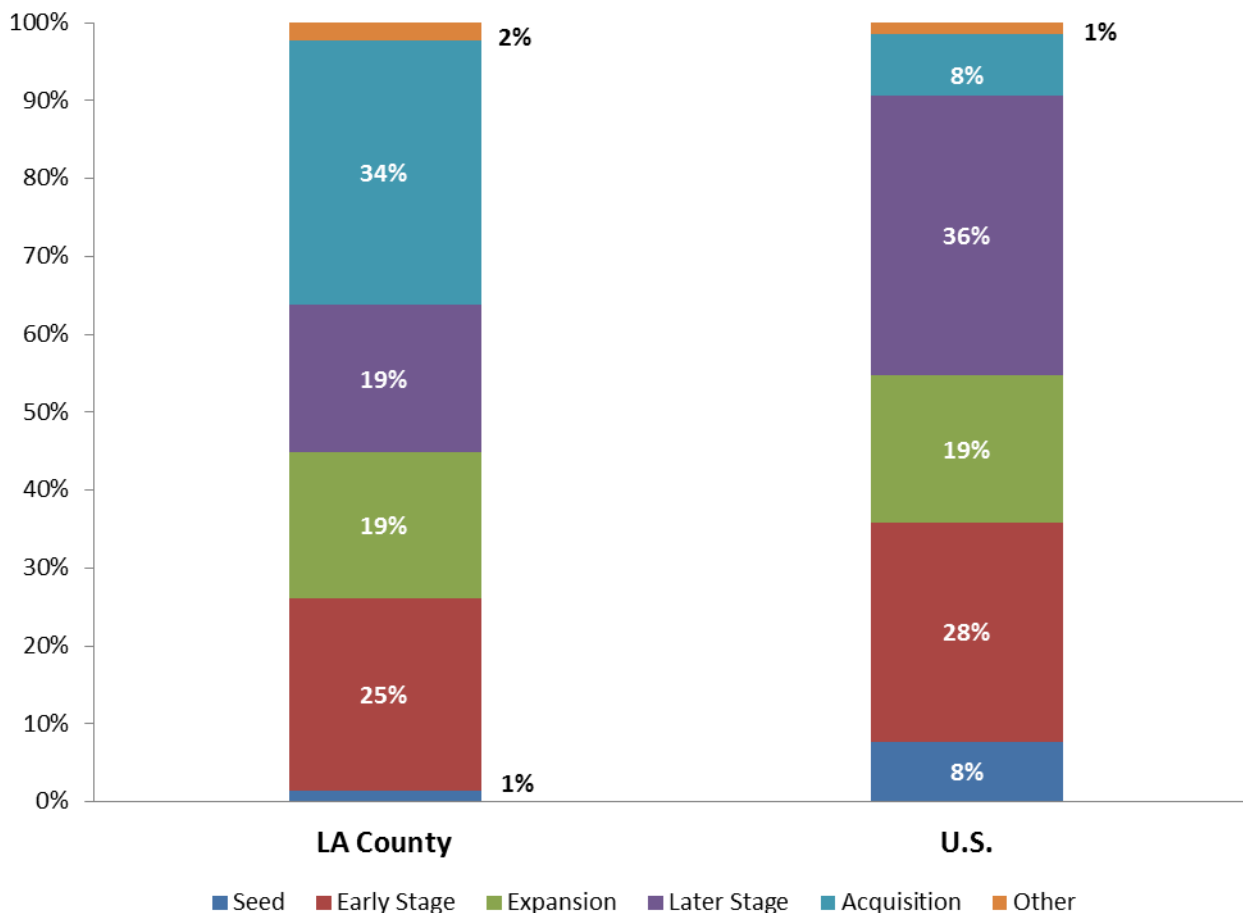
Bioscience-related Venture Capital Deals, 2007-Q2:2012



Source: Thomson Reuter's ThomsonOne database.

Bio-related VC Investments in LA Less Concentrated in Critical Seed & Early Stages—26% vs. 36% Nationally

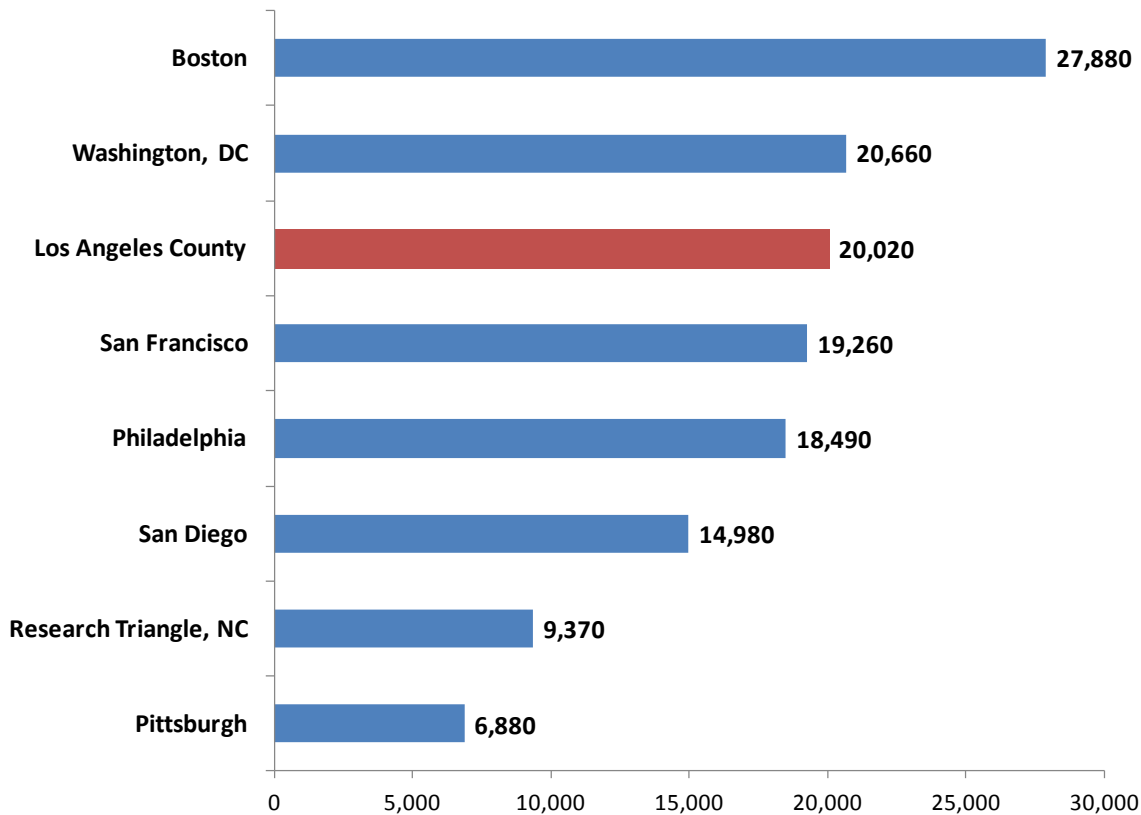
Bioscience-related Venture Capital Investments by Company Stage, 2007-2013



Source: Thomson Reuter's ThomsonOne database.

While LA County Employs a Large Number in Key Bio-related Occupations, it is Less Concentrated Overall Relative to its Economy Compared with the Benchmark Regions

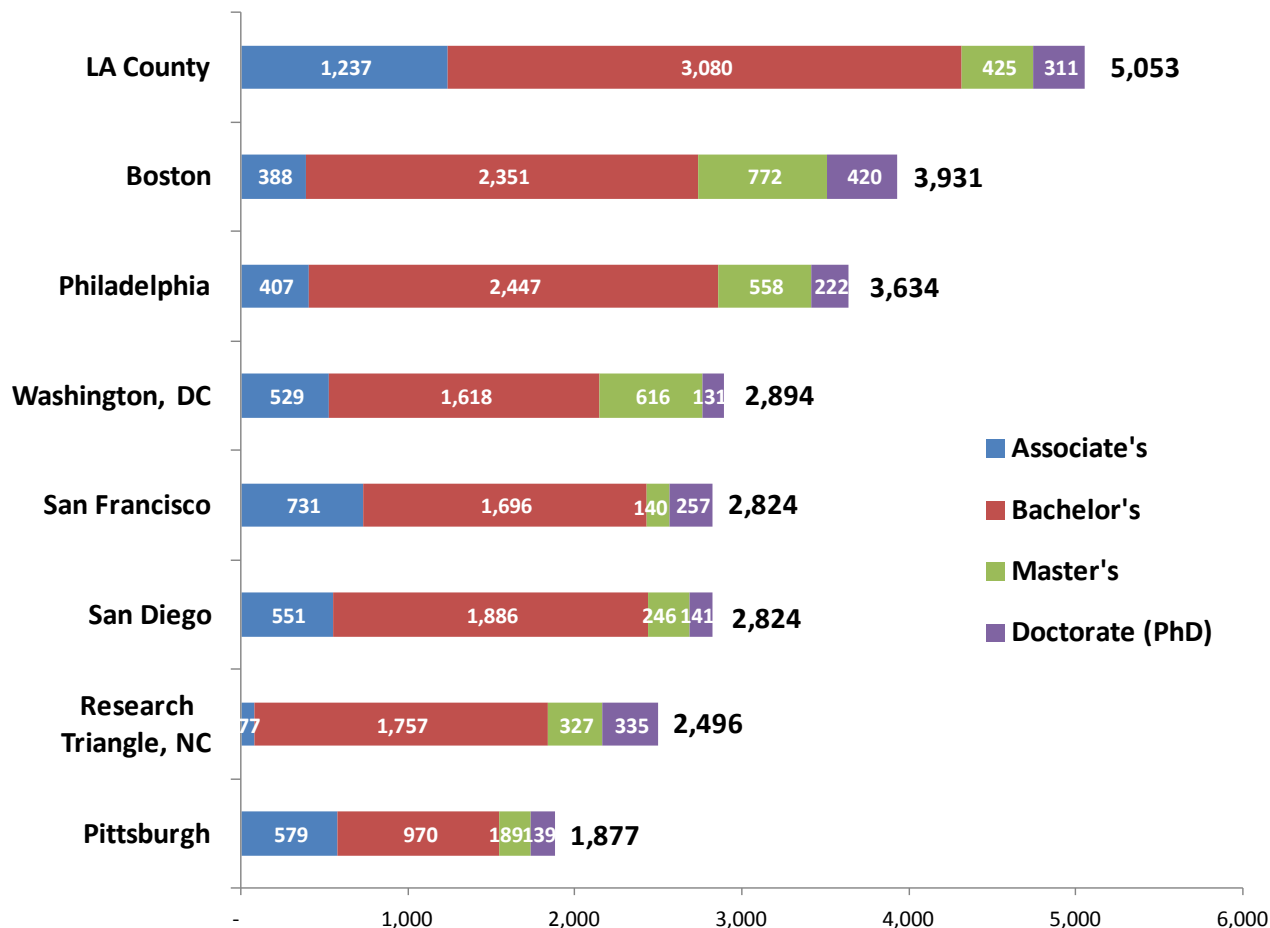
Bioscience-related Occupational Employment, 2011



Region	Bio-related Occupations: Location Quotient, 2011
Research Triangle, NC	2.21
San Diego	2.20
Boston	2.07
San Francisco	1.83
Washington, DC	1.31
Philadelphia	1.28
Pittsburgh	1.12
Los Angeles County	0.95

LA County Generating Most College Graduates with Bio-related Degrees Among Comparison Regions; As a Share of Grads, though, LA Somewhat Lagging in MA/MS & PhD Levels

Higher Education Bioscience Degrees, 2010



Source: NCES, IPEDS database

Note: These bioscience-related degree areas **do not** include professional degrees such as MD, DDS, DVM, or Nursing.

Specific Biosciences Development Challenges Identified in Los Angeles County

Commercialization

- Lack of locally-based early stage venture capital
- Inadequate entrepreneurial culture to mentor and advance new biosciences start-ups
- Result → “Leaky Bucket” with many promising new start-ups based on academic research leaving LAC

Bioscience Lab Space

- No identifiable real estate market for commercial bioscience lab space – no equivalent of a “Hollywood” for the biosciences
- Biosciences companies must bear cost of tenant improvements and face long delays and uncertainties with permitting
- Lack of multi-tenant space despite biosciences industry adding over 4,000 jobs in the past decade

Talent

- Difficulties in recruiting experienced, senior level biosciences scientific & management talent, particularly in biopharma sector
- Lack of entrepreneurial talent with serial experience
- Hard to retain “best and brightest” among recent biosciences graduates
- Other skill gaps – regulatory affairs, bioprocessing, quality control

Marketing

- Despite significant job gains and strong prospects for the future, lack of local awareness of biosciences growth and potential
- Need to grow larger biopharma partnerships and overseas relationships

Overview of Strategic Priorities and Actions



Setting the Context for Discussion of Strategy and Action Plan

- **Guiding Principles:**

- Seek to engage private sector participation and leadership to advance sustainable public-private partnerships
- Make strategic use of limited county resources as a catalyst for change
- Build on successful activities to date
- Focus on leveraging private sector investments, including philanthropic support

Recommendations on Implementation

- **Seek to make the “whole greater than the sum of the parts”**
- **Consider packaging the Master Plan into a comprehensive “Biosciences Economic Development Fund”**
 - Operating Funding: \$1.75 to \$3.5 m annually or \$8.75-\$17.5 m over 5 years
 - Capital Funding: \$11 million one time over the 5 years
 - Total Package -- ~\$20 to \$30 million over 5 years
- **Consider a dedicated biosciences development organization to facilitate implementation under contract to Los Angeles County**
 - Have a private sector led Board of Directors
 - Management contract with clear scope of work and accountability measures

Commercialization Initiative (1 of 3)

Proposed Action: LAC Biosciences Fund of Funds

- **Leverage local institutional investment funds/high net worth individuals to invest in early stage, biosciences venture capital**
- **Size of Fund:** At least \$250 million from institutional funds and high net worth individuals
- **Key Criteria:**
 - Open LAC office
 - Match every \$1 invested with another \$3 from other private investors
 - Majority of funding targeted to early stage (Series A) investments with some follow-on funding with other investors – average \$3-5 million per company in total investment by LAC Biosciences Fund of Funds
- **Selection of Venture Capital Funds**
 - Recommend a local investment committee comprised of local institutional fund investors + local biosciences industry experts
 - Can outsource to an investment bank, but need to enforce criteria
- **Best Practices:** Maryland, Indiana
- **Los Angeles County Role**
 - Enact LAC Biosciences Venture Capital Trust Fund
 - Appropriate resources for staffing to facilitate institutional investment fund participation and managing selection/oversight of venture funds
 - Consider a first loss fund incentive—either direct investment or contingency tax credits
- **Private Sector Leverage:** Substantial

Commercialization Initiative (2 of 3)

LAC Commercialization Collaborative

- **Augment efforts of linking university technology transfer to engage local biosciences entrepreneurial community & root start-ups in LAC on a university by university basis**
- **Build on ongoing collaboration efforts by SoCalBio:**
 - Continue to leverage the existing SoCalBio efforts in using its network of qualified serial entrepreneurs & technology experts to work with university tech transfer offices
 - Currently used for mentoring, shepherding new technologies and leveraging angel financing across universities and academic health centers in Los Angeles County.
 - Example of success stories – Kythera Biopharmaceutical from LABioMed via the SoCalBio Investor Conference; Finding entrepreneur for ImmunoCellular Therapeutics out of Cedars Sinai; Finding entrepreneur for Pagnani Biopharma out of UCLA.
 - Leverage ongoing efforts of angel investors, such as Tech Coast Angels in LA
- **Key Augmentation**
 - Resources to establish “entrepreneurs in residence” (EIR) to troll halls and identify promising tech opportunities
 - Establish proof of concept funding & seed funding
 - Consider creation of an “innovation club” to offer a systematic program to move university technologies forward in concert with VCs, CROs
- **Best Practices:** Innovation Center of the Rockies, Georgia Research Alliance VentureLabs, Pittsburgh Life Science Greenhouse
- **Los Angeles County Role**
 - \$500,000 to \$1 m in annual operating support for staffing, including EIRs
 - One time \$5 to \$10 m investment in PoC/Seed Fund
- **Private Sector Leverage:** Matching investments by institutions and angel investors, plus seek foundation and federal sources of funding

Commercialization Initiative (3 of 3)

Healthcare Delivery Innovation Network

- **Address quality, access and affordability in healthcare delivery, leveraging shift to accountable care organizations and broad community in Los Angeles County, including:**
 - **County hospitals (eConsultLA.net initiative) and presence of innovative health services/informatics companies + academic medical center and health care providers (i.e. Kaiser) with expertise in health care sciences and policy + digital media ventures.**
- **Key Features:**
 - **Innovation Network to advance facilitation and dialogue to create a community of interest between innovators in health care delivery and digital technology:** Engage specialty-primary care work groups being established by the Los Angeles County Department of Health Services.
 - **Another focus of the Innovation Network will be on incubating new applications and tools to advance healthcare delivery:** Have competitions among teams combining healthcare delivery innovators and digital technology innovators for pilot funding.
 - **A third focus of the Innovation Network will be on testing and demonstration:** Public healthcare system of LAC will provide access to testing and demonstrating new applications and tools.
- **Best Practices:** New York City eHealth Digital Accelerator
- **Los Angeles County Role:** Leverage presence of County hospitals; \$1 million for pilot grants
- **Private Sector Leverage:** Seek matching investments by institutions, foundations, associations, federal sources and private industry

Commercial Biosciences Lab Space (1 of 2)

Create 2–3 Signature Biosciences Innovation “Hubs”

- **Offer multi-tenant space for start-ups and emerging biosciences companies involved in R&D and manufacturing with support services and proximity to universities and academic hospital centers, leveraging County hospital campuses and availability of County land.**
- **Possible “Hub” Developments:**
 - UCLA Harbor in concert with LABioMed
 - USC-County—possibility of a “medical district”
 - MLK-Drew (no current industry proximity, so start smaller and co-locate key facilities like healthcare delivery innovation platform)
 - UCLA-Westside – another medical district opportunity, but need to identify County land or partner on old Hospital redevelopment
 - City of Hope (leverage presence of GMP biomfg. facility, IND/clinical trials support, proximity to Caltech).
- **Development Model Approach:**
 - Institutional agreements with academic medical centers to be tenants of last resort
 - Partnership with private developers on a site by site basis
 - Consider transfer of county land to non-profit entities to use as collateral to advance facility development
 - Marketing to biosciences community by non-profit entity.
 - Offer SoCalBio membership
 - Facilitate virtual network of specialized lab and equipment access across academic medical centers
- **Best Practices:** Cleveland Health Tech Corridor, Pittsburgh
- **Los Angeles County Role:** County land; \$250,000–\$500,000 for non-profit to support deal packaging and marketing
- **Private Sector Leverage:** Significant through engagement with private developers, consider use of federal new market tax credits and EB5 mechanisms

Commercial Biosciences Lab Space (2 of 2)

Provide Incentives for Multi-Tenant Bio Lab Facilities

- Offer incentives for private development of multi-tenant bio lab facilities.
- **Key Features:**
 - Use of long-term bond financing repaid by developers and expedited permitting in concert with local governments
 - Create a dedicated pool of tenant improvement financing for wet lab space to be repaid from tenant leases.
- **Best Practices:** Connecticut Biotechnology Facilities Fund
- **Los Angeles County Role:** \$1 million for TI financing per year over 5 years
- **Private Sector Leverage:** Significant through engagement with private developers

Talent Initiative (1 of 3)

Proposed Action: High Skills Biosciences Career Service

- **“High Touch” matching service to more easily learn about opportunities in bioscience firms across the county for experienced scientists, engineers and management workers—address concerns that if a specific job doesn’t work out then no other opportunities locally.**
- **Key Features:**
 - Maintaining an up-to-date database of available high skilled positions among the county’s biosciences firms
 - Providing a single point of contact for senior scientific and management workers seeking new positions in Los Angeles County
 - Serving as an honest broker to match interested senior biosciences workers with bioscience county employers either through their HR departments or executive search firms
 - Developing a cadre of trained, volunteer peer career mentors
 - Working with trailing spouses
 - Partnering with university alumni and career services offices to identify alumni working in the biosciences who would be interested in learning about opportunities in LAC
- **Best Practices:** Iowa Careers Consortium, Oklahoma Project Boomerang, Pittsburgh Digital Greenhouse
- **Los Angeles County Role:** Operating Support
- **Private Sector Leverage:** Foundations, Federal Government and Private Industry Fees

Talent Initiative (2 of 3)

Proposed Action: Postdoc and PhD Bridges to Industry

- **Tap into large base of top talent being generated from robust university research base to make them aware, develop skills and help place them in industry.**
- **Key Features:**
 - Recognize ongoing activities in LAC at Keck Graduate Institute, UCLA, USC
 - Create a Biosciences Industry Exploration Program available to all postdocs and doctoral level students
 - Biosciences internship program—offset costs of internship, connect companies and students
 - Advance postdoc/PhD entrepreneur assistance program—one year stipend, mentorship, entrepreneurial development classes, etc.
- **Best Practices:** Massachusetts, Ohio Third Frontier, Kauffman Foundation
- **Los Angeles County Role:** Operating Support
- **Private Sector Leverage:** Foundations, Federal Government and Private Industry Fees

Talent Initiative (3 of 3)

Proposed Action: Targeted Biosciences Skills Development

- **Build on success of winning recent biomanufacturing technician training program, continue to pursue other training programs to address needed biosciences skills.**
- **Key Features:**
 - Link with ongoing K-12 STEM initiatives in LA County
 - Focus on education-industry consortiums
 - Offer planning grants to pursue federal and foundation grants
 - Needs expressed in skills relating to regulatory affairs, quality control
- **Los Angeles County Role:** Matching funds for planning resources
- **Private Sector Leverage:** Institutions, Foundations, Federal Government and Private Industry Fees

Marketing Initiative

Proposed Action: Concerted Effort in Marketing

- **Pursue a targeted, pro-active marketing strategy to raise awareness and image of LAC internally and externally, generate more leads and advance strategic partnerships with large biosciences and Asia.**
- **Key Features:**
 - **Raise Local Awareness and Brand** – Celebrate successes; support an earned media campaign; reach students and parents; establish a consistent biosciences brand and collateral materials that all institutions and industry use.
 - **Alliance Marketing:** Generate leads in concert with institutions and leading businesses
 - **Attract National and International Biosciences Conferences**
 - **Advance Partnering Initiatives** – Stimulate international consortiums through planning grants; sponsor workshops, site visits, etc. Example of recent R&D partnership between Beijing Pharma and the USC School of Pharmacy facilitated by SoCalBio.
- **Best Practices:** NCBiotech Center, Massachusetts
- **Los Angeles County Role:** Operating support for staffing capacity, outreach to prospects, grants to support local consortiums and planning efforts
- **Private Sector Leverage:** Matching support for marketing effort from local economic development organizations, private industry and institutional support

If NYC Can Do It ... LAC Can As Well!

- **In recent years, New York City – another sleeping giant in biosciences – has awakened:**
 - **Lab Space:**
 - **Alexandria Center™ for Life Science** along East River with over 900,000 sf on 3.5 acre City-owned site with anchor tenants NYU, Eli Lilly, Pfizer and Roche
 - **\$15m Lab Space Loan Fund** established by the Partnership for New York City to provide loans to help companies build out basic biology and chemistry laboratory space at Alexandria Center for Life Science
 - **Several incubators:** Columbia's Audubon Center, SUNY Downstate, BioBat at Brooklyn Army Terminal and Harlem BioSpace
 - **Venture Capital:**
 - **Early-Stage Life Sciences Funding Initiative**, a \$50 million fund for matching seed and Series A funding to launch life sciences technology ventures with provided by NYCEDC, Eli Lilly & Co., Celgene, and GE Ventures.
 - **Accelerator Corporation of Seattle** expanding to NYC with \$51 million fund
 - **Commercialization/Entrepreneurship:**
 - **Pilot Health Tech NYC** -- a \$1m competition designed to link early-stage health tech companies with city health care organizations – seeking to support 10 innovators, plus Innovate Health Tech NYC, another competition for software and hardware developers to solve health care problems.
 - **eLab**, a competitive 6-month entrepreneurial training and mentoring program supported by NYCEDC for graduate students, post-docs, medical residents, etc. interested in forming new ventures in the life sciences and healthcare technology sectors.
 - **SBIR Impact NYC** – technical assistance for life science companies pursuing SBIRs
 - **Support for Emerging Biotech Companies:**
 - **NYC Biotech Tax Credit** for property, research and workforce training

Overview of Strategic Priorities and Actions



Thank You!

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Summary of Proposed Initiatives and Specific Actions (1 of 2)

Initiative	Actions	Timing	County Resources		Potential for Private Sector Leverage
			Operating/ annual	Capital/ one-time	
Commercialization Initiative	<i>Fund of Funds</i>	Immediate to Near Term	\$500,000 \$1 million	Not Required	Significant -- provide investment funds
	<i>Bio Commercialization Collaborative</i>			\$5-10m	Matching funding from universities/angel investors
	<i>Healthcare Delivery Innovation Network</i>			\$1 m	Matching funding from philanthropic, angel investors, health care providers
Bioscience Lab Space Initiative	<i>3-5 Biosciences Innovation Hubs</i>	Near Term to Long Term	\$250,000- \$500,000	Leverage County Land & Shell Bldgs	Leverage private developer funding
	<i>Incentives for Tenant Improvements</i>	Immediate		\$5 m	Repayment of TI costs from tenant lease payments

Summary of Proposed Initiatives and Specific Actions (2 of 2)

Initiative	Actions	Timing	County Resources		Potential for Private Sector Leverage
			Operating/ annual	Capital/ one-time	
Talent Initiative	<i>High Skills Career Service</i>	Immediate	\$500,000 to \$1 million	Not Required	Generate grants from state, federal and philanthropic sources Potential for user fees for access to services by industry
	<i>Bridges to Industry</i>				
	<i>Targeted Bio Skills Development</i>				
Marketing Initiative	<i>Local Awareness & Branding</i>	Immediate	\$500,000 to \$1 million	Not Required	Raise funding from local economic development organizations for generating leads and marketing the region Leverage activities of universities, private companies and international regions on strategic partnerships
	<i>Alliance Marketing</i>				
	<i>International & National Conferences</i>				
	<i>Strategic Partnerships</i>				