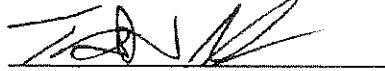# Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

NP-02 OIT Secure Colorado

Dept. Approval By: _____

OSPB Approval By: _____ 10/20/16

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information		FY 2016-17		FY 2017-18	FY 2018-19
		Initial	Supplementa		Change
	Fund	Appropriation	l Request	Base Request	Request	Continuation
	Total	**$393,394**	**$0**	**$661,802**	**$13,488**	**$23,058**
Total of All Line Items Impacted by Change Request	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$342,581	$0	$590,460	$8,514	$14,554
	RF	$50,813	$0	$71,342	$4,974	$8,504
	FF	$0	$0	$0	$0	$0

Line Item Information		FY 2016-17		FY 2017-18	FY 2018-19
		Initial	Supplementa	Base	Change
	Fund	Appropriation	l Request	Request	Request	Continuation
	Total	**$393,394**	**$0**	**$661,802**	**$13,488**	**$23,058**
01. Department Administrative Office, (A) Administrative Office - Payments to OIT	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$342,581	$0	$590,460	$8,514	$14,554
	RF	$50,813	$0	$71,342	$4,974	$8,504
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes _____	No _____	**If Yes, see attached fund source detail.**	
RF Letternote Text Revision Required	Yes _____	No _____		
FF Letternote Text Revision Required	Yes _____	No _____		
Requires Legislation?	Yes _____	No **X**		
Type of Request?	Department of Higher Education Non-Prioritized Request			
Interagency Approval or Related Schedule 13s:	None			

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Page 1

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

NP-03 OIT Deskside Staffing

Dept. Approval By: _____

OSPB Approval By: _____ 10/26/16

Supplemental FY 2016-17

X   Change Request FY 2017-18

_____ Budget Amendment FY 2017-18

Summary Information	Fund	FY 2016-17 Initial Appropriation	FY 2016-17 Supplementa l Request	FY 2017-18 Base Request	FY 2017-18 Change Request	FY 2018-19 Continuation
	Total	$393,394	$0	$661,802	$5,394	$5,639
	FTE	0.0	0.0	0.0	0.0	0.0
Total of All Line Items Impacted by Change Request	GF	$0	$0	$0	$0	$0
	CF	$342,581	$0	$590,460	$5,394	$5,639
	RF	$50,813	$0	$71,342	$0	$0
	FF	$0	$0	$0	$0	$0

Line Item Information	Fund	FY 2016-17 Initial Appropriation	FY 2016-17 Supplementa l Request	FY 2017-18 Base Request	FY 2017-18 Change Request	FY 2018-19 Continuation
	Total	$393,394	$0	$661,802	$5,394	$5,639
	FTE	0.0	0.0	0.0	0.0	0.0
01. Department Administrative Office, (A) Administrative Office - Payments to OIT	GF	$0	$0	$0	$0	$0
	CF	$342,581	$0	$590,460	$5,394	$5,639
	RF	$50,813	$0	$71,342	$0	$0
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes	No		If Yes, see attached fund source detail.
RF Letternote Text Revision Required	Yes	No		
FF Letternote Text Revision Required	Yes	No		

Requires Legislation?   Yes _____ No **X**

Type of Request?   Department of Higher Education Non-Prioritized Request

Interagency Approval or Related Schedule 13s: None

Cost and FTE

- The Department of Higher Education requests an increase of $20.5 million General Fund ($36.5 million) for public institutions and corresponding financial aid for FY 2017-18 in order to keep up with base costs and moderate tuition increases.

Current Program

- Over 210,000 Colorado residents are enrolled in 2 and 4 year public institutions. Two and four year institutions awarded over 55,000 postsecondary credentials in 2014.
- Past studies have shown Colorado public higher education institutions to be among the most productive in the nation. Colorado's public higher education systems' efficiency was confirmed in a recent study.
- In 2014 the General Assembly passed HB14-1319 which allocates higher education funding based on performance outcomes. These outcomes include degrees completed and institutional productivity, student retention, STEM degrees, and number of low-income (Pell) students.
- SB14-001 made significant General Fund investment in Colorado public higher education and capped resident tuition increases at no more than 6.0 percent for FY 2014-15 and FY 2015-16. State funding increases were flat for FY 2016-17 but even moderate base cost changes drive tuition increases.
- A 2.2 percent inflationary increase and payment for healthcare benefit drives a need for $74.1 million. Of this sum, about 22 percent is covered by General Fund. Each 1 percent increase in tuition results in about $9.7 million of revenue for institutions.

Problem or Opportunity

- From FY 2011-12 to FY 2016-17, tuition at four-year schools grew 38 percent while median income grew only 13 percent.
- Funding modest inflation on the General Fund higher education base plus health care costs results will help moderate tuition increases. That, along with a modest Financial Aid funding increase, will help stem the tide of tuition increases for resident undergraduate students.

Consequences of Problem

- In FY 2000-01, the state covered about two-thirds of the cost of college, while students and families picked up about one-third. Now those numbers have essentially reversed: students and families pay for two-thirds of the costs and the state pays for a third.

Proposed Solution

- An increase of $20.5 million General Fund will help maintain current levels of affordability for students in FY 2017-18. The General Fund increase will provide Governing Boards with $16.0 million, Local District Colleges and Area Technical Colleges with $631,397, and will provide $3.8 million for Financial Aid.

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Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

R-1 Operating Request for Public Colleges and Universities

Dept. Approval By: _[signature]_

OSPB Approval By: _[signature]_ _10/26/16_

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information	Fund	FY 2016-17 Initial Appropriation	Supplemental Request	FY 2017-18 Base Request	Change Request	FY 2018-19 Continuation
Total of All Line Items Impacted by Change Request	Total	$3,801,055,848	$0	$3,793,123,828	$36,549,617	$36,549,617
	FTE	24,044.7	0.0	24,044.7	0.0	0.0
	GF	$798,073,761	$0	$798,073,761	$20,506,613	$20,506,613
	CF	$2,355,974,483	$0	$2,348,042,463	$0	$0
	RF	$647,007,604	$0	$647,007,604	$16,043,004	$16,043,004
	FF	$0	$0	$0	$0	$0

Line Item Information	Fund	FY 2016-17 Initial Appropriation	Supplemental Request	FY 2017-18 Base Request	Change Request	FY 2018-19 Continuation
03. Colorado Commission on Higher Education Financial Aid, (A) Need Based Grants - Needs Based Grants	Total	$124,570,732	$0	$124,570,732	$3,793,722	$3,793,722
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$124,484,769	$0	$124,484,769	$3,793,722	$3,793,722
	CF	$0	$0	$0	$0	$0
	RF	$85,963	$0	$85,963	$0	$0
	FF	$0	$0	$0	$0	$0
04. College Opportunity Fund Program, (A) Stipends , (1) Stipends - Stipends for Public Students	Total	$289,362,877	$0	$289,362,877	$1,896,967	$1,896,967
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$289,362,877	$0	$289,362,877	$1,896,967	$1,896,967
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

04. College Opportunity Fund Program, (A) Stipends , (1) Stipends - Stipends Eligible FTE Students - Private Institutions	**Total**	**$1,443,375**	**$0**	**$1,443,375**	**$38,490**	**$38,490**
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$1,443,375	$0	$1,443,375	$38,490	$38,490
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0
04. College Opportunity Fund Program, (B) Fee-for-Service Contracts with State Institutions, (1) Fee-for-Service Contracts With State Institutions - Fee-for-Service Contracts With State Institutions	**Total**	**$240,810,512**	**$0**	**$240,810,512**	**$11,257,650**	**$11,257,650**
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$240,810,512	$0	$240,810,512	$11,257,650	$11,257,650
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0
04. College Opportunity Fund Program, (B) Fee-for-Service Contracts with State Institutions, (1) Fee-for-Service Contracts With State Institutions - Fee-for-Service Contracts/State Institutions/Specialty	**Total**	**$116,411,292**	**$0**	**$116,411,292**	**$2,888,387**	**$2,888,387**
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$116,411,292	$0	$116,411,292	$2,888,387	$2,888,387
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0
05. Governing Boards, (A) Trustees of Adams State University - Trustees of Adams State College	**Total**	**$40,723,138**	**$0**	**$40,723,138**	**$183,603**	**$183,603**
	FTE	331.6	0.0	331.6	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$26,646,778	$0	$26,646,778	$0	$0
	RF	$14,076,360	$0	$14,076,360	$183,603	$183,603
	FF	$0	$0	$0	$0	$0
05. Governing Boards, (B) Trustees of Colorado Mesa University - Trustees of Colorado Mesa University	**Total**	**$97,559,817**	**$0**	**$97,559,817**	**$1,670,432**	**$1,670,432**
	FTE	705.8	0.0	705.8	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$73,279,088	$0	$73,279,088	$0	$0
	RF	$24,280,729	$0	$24,280,729	$1,670,432	$1,670,432
	FF	$0	$0	$0	$0	$0

		Total	$172,582,069	$0	$172,582,069	$211,602	$211,602
05. Governing Boards, (C) Trustees of Metropolitan State College of Denver - Trustees of Metropolitan State College of Denver		FTE	1,453.2	0.0	1,453.2	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$121,167,068	$0	$121,167,068	$0	$0
		RF	$51,415,001	$0	$51,415,001	$211,602	$211,602
		FF	$0	$0	$0	$0	$0
		Total	$34,543,650	$0	$34,543,650	$286,970	$286,970
05. Governing Boards, (D) Trustees of Western State College - Trustees of Western State College		FTE	248.1	0.0	248.1	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$23,008,723	$0	$23,008,723	$0	$0
		RF	$11,534,927	$0	$11,534,927	$286,970	$286,970
		FF	$0	$0	$0	$0	$0
		Total	$619,485,003	$0	$619,485,003	$3,892,219	$3,892,219
05. Governing Boards, (E) Board of Governors, Colorado State University System - Board of Governors of the Colorado State University System		FTE	4,856.2	0.0	4,856.2	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$484,966,696	$0	$484,966,696	$0	$0
		RF	$134,518,307	$0	$134,518,307	$3,892,219	$3,892,219
		FF	$0	$0	$0	$0	$0
		Total	$58,111,091	$0	$58,111,091	$303,739	$303,739
05. Governing Boards, (F) Trustees of Fort Lewis College - Trustees of Fort Lewis College		FTE	430.4	0.0	430.4	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$46,629,891	$0	$46,629,891	$0	$0
		RF	$11,481,200	$0	$11,481,200	$303,739	$303,739
		FF	$0	$0	$0	$0	$0
		Total	$1,217,564,100	$0	$1,209,632,080	$7,785,541	$7,785,541
05. Governing Boards, (G) Regents of the University Of Colorado - Regents of the University Of Colorado		FTE	7,982.3	0.0	7,982.3	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$1,031,031,414	$0	$1,023,099,394	$0	$0
		RF	$186,532,686	$0	$186,532,686	$7,785,541	$7,785,541
		FF	$0	$0	$0	$0	$0
		Total	$167,618,512	$0	$167,618,512	$845,656	$845,656
05. Governing Boards, (H) Trustees of the Colorado School of Mines - Trustees of the Colorado School of Mines		FTE	896.8	0.0	896.8	0.0	0.0
		GF	$0	$0	$0	$0	$0
		CF	$146,979,462	$0	$146,979,462	$0	$0
		RF	$20,639,050	$0	$20,639,050	$845,656	$845,656
		FF	$0	$0	$0	$0	$0

	Total	**$146,156,024**	**$0**	**$146,156,024**	**$484,174**	**$484,174**
05. Governing Boards, (I) University of Northern Colorado - University of Northern Colorado	FTE	1,136.5	0.0	1,136.5	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$107,042,790	$0	$107,042,790	$0	$0
	RF	$39,113,234	$0	$39,113,234	$484,174	$484,174
	FF	$0	$0	$0	$0	$0
	Total	**$447,773,188**	**$0**	**$447,773,188**	**$379,068**	**$379,068**
05. Governing Boards, (J) State Board for Comm Colleges and Occupational Ed System - State Board for Comm Colleges and Occupational Ed System	FTE	6,003.8	0.0	6,003.8	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$294,443,041	$0	$294,443,041	$0	$0
	RF	$153,330,147	$0	$153,330,147	$379,068	$379,068
	FF	$0	$0	$0	$0	$0
	Total	**$7,508,926**	**$0**	**$7,508,926**	**$176,445**	**$176,445**
06. Local District Junior College Grants - Colorado Mountain College	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$7,143,039	$0	$7,143,039	$176,445	$176,445
	CF	$365,887	$0	$365,887	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0
	Total	**$8,859,821**	**$0**	**$8,859,821**	**$208,634**	**$208,634**
06. Local District Junior College Grants - Aims Community College	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$8,446,176	$0	$8,446,176	$208,634	$208,634
	CF	$413,645	$0	$413,645	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0
	Total	**$9,971,721**	**$0**	**$9,971,721**	**$246,318**	**$246,318**
07. Division of Occupational Education, (C) Area Vocational School Support - Area Vocational School Support	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$9,971,721	$0	$9,971,721	$246,318	$246,318
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes	No		**If Yes, see attached fund source detail.**
RF Letternote Text Revision Required	Yes	No		
FF Letternote Text Revision Required	Yes	No		
Requires Legislation?	Yes	No **X**		
Type of Request?	Department of Higher Education Prioritized Request			
Interagency Approval or Related Schedule None				

COLORADO

Department of Higher Education

John W. Hickenlooper
Governor

Diane Duffy
Acting Executive Director

FY 2017-18 Funding Request | November 1, 2016
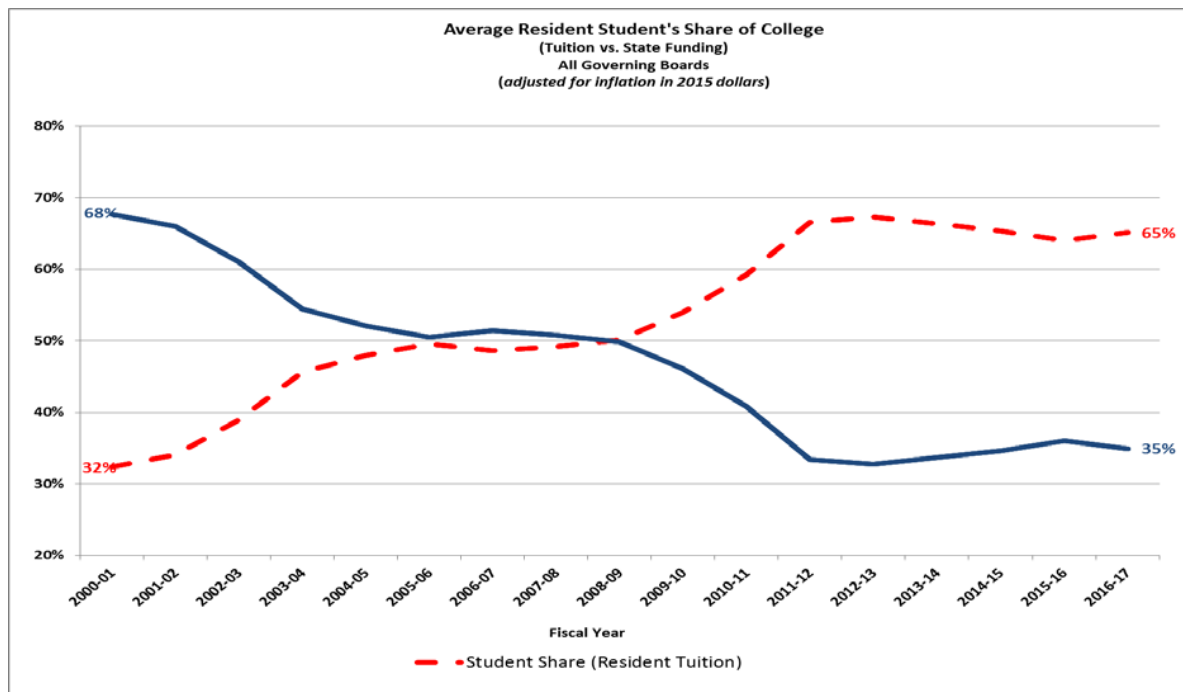
Department Priority: R-01
Request Detail: Operational Funding for Public College and Universities

Summary of Incremental Funding Change for FY 2017-18	Total Funds	General Fund
Operational Funding Increase for Public Colleges and Universities	$36,549,617	$20,506,613

The Department of Higher Education requests $20.5 million General Fund to pay for the General Fund share of minimum cost increases to the cost of college and to maintain moderate tuition increases in FY 2017-18. This request is comprised of three key components: (1) $16.0 million General Fund for the General Fund portion of inflationary increases on Education & General expenses ($14.7 million) and employee health benefit increases ($1.4 million); (2) $631,397 General Fund for the statutorily required increase for Local District Colleges and public area technical schools, and (3) $3.8 million General Fund for the financial aid calibration required pursuant to Section 23-3.3-103, C.R.S. Of this total request, $16.0 million will be further reappropriated to the Governing Boards. Thus, the $20.5 million plus the reappropriated $16.0 million equals the total funds request of $37.5 million.

Problem or Opportunity:

Rising tuition costs represent a significant concern for Colorado students and families. These increases take up a greater percentage of median family income and contribute to student debt levels. The last 15 years has witnessed a marked reversal in who bears the burden for higher education costs. As General Fund is reduced, tuition increases make up the difference – resulting in more costs for students and

Average Resident Student's Share of College
(Tuition vs. State Funding)
All Governing Boards
(adjusted for inflation in 2015 dollars)

families.

As the chart on the prior page reflects, in FY 2000-01, the state covered 68 percent of the cost of college, while students and families picked up 32 percent. By FY 2011-12, those numbers had reversed: students and families are covering two-thirds of the costs and the state pays for a third. This trend was tempered somewhat with the significant investment in higher education in FY 2014-15 and FY 2015-16, pursuant to SB14-001 and now state pays for about 35 percent of the cost of college. The table below shows the tuition levels for the Governing Boards from FY 2011-12 to FY 2016-17.

	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17
CU Boulder	$ 7,672	$ 8,056	$ 8,760	$ 9,048	$ 9,312	$ 9,768
CU Co Springs	6,720	7,050	7,470	7,710	7,980	8,280
CU Denver	6,776	7,980	8,460	8,760	9,090	9,420
CSU Fort Collins	6,307	6,875	7,494	7,868	8,300	8,716
CSU Pueblo	4,592	5,494	5,494	5,824	6,159	7,269
Fort Lewis	4,048	4,800	5,232	5,544	5,856	6,360
UNC	5,300	5,464	5,748	6,024	6,372	6,906
Adams	3,312	3,816	4,872	5,160	5,448	5,736
Co Mesa	5,780	6,102	6,438	6,812	7,185	7,572
Metro	3,809	4,304	4,691	4,973	5,222	5,693
Western State	3,922	4,627	5,275	5,539	5,844	6,312
Mines	12,585	13,590	14,400	14,790	15,225	15,690
Community Colleges	3,176	3,383	3,585	3,747	3,915	4,107
Four Year Institution Avg.	$ 5,902	$ 6,513	$ 7,028	$ 7,338	$ 7,666	$ 8,144

The following table summarizes the total tuition changes from FY 2011-12 to FY 2016-17. In total, tuition increased 38 percent over this time period for four year institutions.

Area	FY 2011-12	FY 2016-17	5 Yr. $ Change	% Change
Avg 4 Year Inst	5,902	8,144	2,242	38%
CU/CSU/Mines	7,442	9,857	2,415	32%
Other 4 Years	4,362	6,430	2,068	47%

This 38 percent four year change is compared relative to the change in median income over that time in the table below. While tuition at four year institutions increased by 38 percent during this time, as indicated above, median income increased only 13 percent.

	FY 2011-12	FY 2016-17	5 Yr. $ Change	% Change
Tuition 4 Yr	5,902	8,144	2,242	38%
Median Income	61,788	69,859	8,071	13%

As with any service providing entity, public institutions of higher education have fixed costs they must meet in order to keep their organizations performing at their current level. Unlike other organizations, institutions of higher education have not historically done an adequate job communicating the root of these costs to their primary funders. As a result, a level of frustration has taken hold with state policy makers, students and their families.

Higher Education Enhanced Accountability and Transparency

This budget request is submitted in our continuing effort to provide transparency about higher education costs. Like all service providers, public institutions of higher education have fixed costs they must cover in order to keep their organizations functioning. However, in Colorado higher education these base costs may have not been adequately quantified and communicated to policy makers. As a result, the need for annual revenue increases (whether from General Fund or from tuition) has often led to frustration amongst policy makers, students and their families.

2015 Colorado Higher Education Cost Study Shows Colorado Cost Containment

The Colorado Department of Higher Education contracted with the National Center for Higher Education Management Systems (NCHEMS) to perform an analysis of higher education costs in Colorado, and how these compared to national costs ("Why Higher Education Costs are What They Are" June 30, 2015). According to the NCHEMS report, the majority of costs at Colorado public institutions of higher education are a direct result of faculty and staff compensation. Remaining costs include supplies and operating expenses (utilities, insurance, office and laboratory supplies, maintenance of plant etc.), interest and depreciation. Among the findings, the study found:

- Colorado institutions have fewer resources to expend on activities designed to fulfill their missions than do other similar institutions elsewhere in the country.
- Colorado institutions are spending an increasing share of their resources on faculty and staff.
- Colorado institutions are more reliant on part-time faculty than their national counterparts.

Colorado Higher Education Core Base Costs

The U.S. Census Bureau's report on state government employment and payroll data for March 2013 shows that 56 percent of all State of Colorado government employees are working in public higher education. However, the state does not provide a direct increase in funding for these employees for cost-of-living and health, life and dental insurance through the compensation common policies. These increases are paid through state funding for operational funding for public colleges and universities (General Fund) or with tuition increases. At a minimum, these costs (e.g., supplies, utilities, employee cost of living increases and benefits) will increase by inflation.

Education and General Expenses are a Base Cost Center

Education and General Expenses (E&G) are a subset of expenses which includes education and related expenses plus state funded research. At public institutions of higher education these cost centers are primarily funded by two sources: (1) General Fund appropriations from the state, and (2) students and families from tuition.

The US Census Bureau's report on state government employment and payroll data for March 2014, the most recent data available, shows that 65 percent of all State of Colorado government employees are working in public higher education, resulting in 55 percent percent of the State's Full-time Equivalent (FTE) employees.[1] However, the state does not provide a direct increase in funding for these employees for

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[1] US Census Bureau, "2014 Annual Survey of Public Employment and Payroll." Web. 28 July 2016. <http://www.census.gov/govs/apes/>.

cost-of-living and health, life and dental insurance. While it is possible to pass insurance costs on to professors and institutional staff and not pay for salary increases, the academic job market is fluid. For Colorado institutions of higher education to recruit and retain the top researchers and instructors, they must offer competitive compensation. Other states that have seen state funding for higher education drop in recent years have seen an exodus of faculty from public universities.[2]

According to the Department of Personnel and Administration's June 2015 Workforce file, about one in four (22.6 percent) of the state's classified employees are working at a public institution of higher education. Unlike other state departments, institutions of higher education do not receive annual appropriations for changes to compensation common policies. At a minimum, these costs (e.g., supplies, utilities, employee cost of living increases and benefits) will increase by inflation from FY 2017 to FY 2018. In addition, colleges' contributions to employees' health benefits are projected to increase due to the cost of healthcare. According to the Centers for Medicare and Medicaid Services' National Health Projections, state and local government employer contributions to private health insurance premiums for employees are expected to increase at 5.5 percent in FY 2017 and 6.4 percent in FY 2018. These minimum increases to fixed costs – inflation and personnel – are, generally speaking, either picked up by the state in the form of increased state appropriations for operating, or increased costs to students and families in the form of tuition.

Higher Education Performance Outcomes Model

House Bill 14-1319 requires that the system of public higher education be allocated funding using a performance outcome allocation model. Last year the Department revised the HB14-1319 performance outcomes model following direction given by the JBC in its 2015 RFI and in its June 2015 meeting with the Department. Additionally, the JBC made further adjustments to the model during its FY 2016-17 figure setting deliberations on the Long Bill (HB16-1405). All changes in the FY 2017-18 Governing Board request are made through this revised model. Please see Appendix C for more information on the model.

Proposed Solution:

The Department requests a total of $20,506,613 in General Funds for public colleges and universities operating budgets ($16,043,003) and the statutorily required financial aid increase ($3,793,722). This request acknowledges the base cost increases for educational and general costs and for health insurance benefit employee costs that the institutions must bear in FY 2017-18. In doing so, this request represents a cost-sharing plan to partially offset tuition increases to students and families. The request is comprised of the following components:

Area of Increase	General Fund
Governing Board Inflation	14,654,213
Governing Board Health Benefits Increase	1,388,790
Local District Junior/Area Vocational	631,397
Financial Aid Calibration	3,793,722
Private School Stipend	38,490
Total FY 2017-18 Need	20,506,612

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[2] Gardner, Lee. "Turmoil Raises Specter of Faculty Exodus From Public Colleges." The Chronicle of Higher Education. N.p., 19 June 2016. Web. 28 July 2016. <http://chronicle.com/article/Turmoil-Raises-Specter-of/236854>.

Governing Boards ($16.0 million General Fund).   The requested $16.0 million General Fund for Governing Board operating costs results in a 2.4 percent increase to Governing Boards.   This sum is comprised of the inflationary increase of $14.7 million plus the health benefits component of $1.4 million.

The requested $16.0 million in operating funding results in a net 2.4 percent increase to public institutions, local district colleges and public area technical colleges and would cover the General Fund portion of the inflationary and Health benefit increases to E&G. The FY 2018 request calculates an estimated FY 2017 E&G using inflationary, projected health benefit, and PERA AED and SAED cost increases.   The cost calculation model then uses the estimated FY 2017 base to calculate the FY 2018 minimum cost increase using projected inflation and health benefit increases. Appendix A includes the calculations for the request.

In total, the Department estimates minimum cost increases to E&G for FY 2018 are $74,123,160.   The Department is solely requesting the General Fund portion of this increase in FY 2018 in order to keep the undergraduate resident tuition rate increase in FY 2018 similar to that of FY 2017. Currently, General Fund makes up 21.4 percent of total E&G revenues, non-resident tuition makes up 26.8 percent and resident tuition is 37.0 percent of total E&G revenues, with other sources making up the remainder.

Governing Board Distribution
The governing boards' distribution of the requested $16.0 million General Fund runs through the HB14-1319 higher education funding model. Money that runs through the funding model is distributed to one of three buckets: College Opportunity Fund stipend, 23-18-303, C.R.S. Fee-for-Service contracts (FFS) – comprised of Role & Mission and Performance Funding – and Specialty Education Program Fee-for-Service contracts (SEP FFS). Additionally, funding is provided to the institutions outside of the funding model through Limited Purpose Fee-for-Service Contracts for specific legislated programs. The distribution of the $16.0 million to governing boards amongst these four categories of funding is shown in the table below.

Governing Board Funding By Funding Mechanism

Long Bill Item	FY 2017 Appropriation		Requested Change		Requested Appropriation
COF Stipend	$	289,362,877	$	1,896,967	$	291,259,844
23-18-303, C.R.S FFS	$	240,810,512	$	11,257,650	$	252,068,162
SEP FFS	$	116,411,292	$	2,888,387	$	119,299,679
Limited Purpose FFS	$	336,960	$	-	$	336,960
Governing Board Total	$	646,921,641	$	16,043,003	$	662,964,644

The Department ran the $16.0 million through the funding allocation model using the FY 2017 JBC enacted changes to the model. As a result of increased general funds in the model, the Department adjusted the COF stipend per credit hour amount and Mission Differentiation amounts for each governing board by the total percent increase General Funds (2.5%).   For more details on the funding allocation model metrics and weights, please see Appendix C. The tables below include the requested governing board distribution of funds and change request for FY 2018.

FY 2018 Requested Governing Board Allocations

Governing Board	COF Stipend	23-18-203 FFS	SEP FFS	Limited Purpose FFS	Total
ASU	$2,829,163	$11,430,800			**$14,259,963**
CMU	$14,646,059	$11,305,102			**$25,951,161**
MSU Denver	$31,937,232	$19,689,371			**$51,626,603**
WSCU	$3,096,055	$8,725,842			**$11,821,897**
CSU	$44,082,292	$39,178,625	$55,149,609		**$138,410,526**
FLC	$3,928,733	$7,856,206			**$11,784,939**
CU	$64,865,863	$65,202,294	$64,150,070	$100,000	**$194,318,227**
Mines	$6,321,656	$15,163,050			**$21,484,706**
UNC	$15,477,118	$24,045,290		$75,000	**$39,597,408**
CCCS	$104,075,673	$49,471,582		$161,960	**$153,709,215**
TOTAL	**$291,259,844**	**$252,068,162**	**$119,299,679**	**$336,960**	**$662,964,645**

Change in Governing Board Allocations: FY 2017 to FY 2018 Request

Governing Board	COF Stipend	23-18-203 FFS	SEP FFS	Limited Purpose FFS	Total	Change
ASU	-$61,463	$245,066	$0	$0	**$183,603**	1.30%
CMU	$939,904	$730,528	$0	$0	**$1,670,432**	6.88%
MSU Denver	-$311,550	$523,152	$0	$0	**$211,602**	0.41%
WSCU	$128,779	$158,191	$0	$0	**$286,970**	2.49%
CSU	$1,034,576	$1,522,405	$1,335,238	$0	**$3,892,219**	2.89%
FLC	-$112,365	$416,104	$0	$0	**$303,739**	2.65%
CU	$2,513,323	$3,719,069	$1,553,149	$0	**$7,785,541**	4.17%
Mines	$127,123	$718,533	$0	$0	**$845,656**	4.10%
UNC	$36,240	$447,934	$0	$0	**$484,174**	1.24%
CCCS	-$2,397,600	$2,776,668	$0	$0	**$379,068**	0.25%
TOTAL	**$1,896,967**	**$11,257,650**	**$2,888,387**	**$0**	**$16,043,004**	2.48%

Local District Colleges/ATC ($631,397 General Fund). The increase provides $631,397 to fund the Local District Colleges and Area Technical Colleges at the same percent increase as the Governing Boards (per statute).

Financial Aid ($3.8 million General Fund). As in past years, statute (Section 23-3.3-103, C.R.S.) requires a proportional increase for categorical financial aid programs when operating funding for institutions increases. The requested 2.4 percent operating increase for institutions results in a corresponding financial aid increase of $3,793,722. For the proportional increase to financial aid calculations, see Appendix B.

The Department anticipates tuition increases will be 6 percent *on average* across the *range of increases* at Governing Boards if the state pays for the General Fund share of increased fixed costs at public institutions.

The requested increase, combined with a requested governing board tuition rate which takes into account the amount of state support institutions receive, would continue last year's concerted effort by the State of Colorado to implement a defined post-secondary cost-sharing policy. The Department believes that if the General Fund increases by its share of inflationary and health benefits increases annually, tuition increases can be held at an average of approximately 6.0 percent across governing boards. In other words, a commitment to minimal annual increases by the state will result in predictable and steady increases in tuition for students and families, leaving them better able to prepare for the costs of college. See the companion decision item "Tuition Revenue Spending Authority" for more information about estimated tuition revenue and spending authority.
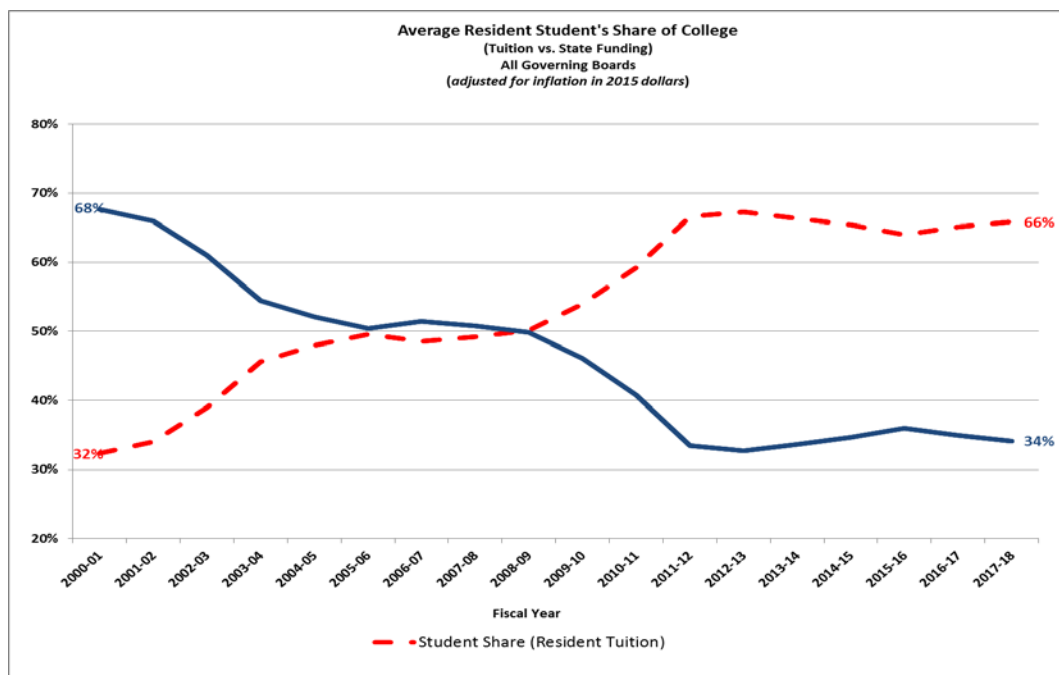
Average Resident Student's Share of College
(Tuition vs. State Funding)
All Governing Boards
(*adjusted for inflation in 2015 dollars*)

Various assumptions have been used to calculate the request. The Department uses a two-step process to calculate the FY 2018 minimum base cost increases. To build an estimated FY 2017 E&G base, this request uses:
- an estimated FY 2017 CPI of 2.6% on the FY 2016 base to determine the amount of inflationary cost increases the institutions will likely experience in FY 2017,
- the PERA AED and SAED increases for FY 2017, and
- a health benefits employer contribution growth rate of 2.9% (5.5% growth less 2.6% inflation).

To determine the FY 2018 minimum base cost increase, this request uses:
- an estimated FY 2018 CPI of 2.2% on the estimated FY 2017 E&G base,
- a health benefits employer contribution growth rate of 4.2% (6.4% growth less 2.2% inflation).

CPI estimates are derived from the Governor's Office of State Planning and Budgeting inflation forecasts, issued in September 2016. For the portion of the calculations that uses PERA AED and SAED increases, total classified salaries were calculated from actual FY 2016 expenditures from CORE.

Appendix A, tables one (1) through six (6), include detailed calculations for the request. Appendix B includes the detailed calculations for the Section 23-3.3-103, C.R.S. required proportional increase to financial aid.

Education and Related (E&G) costs are derived from institutional 2015 Budget Data Book submissions, FY 15-16 estimates.

More information about the Delta Cost Project definition of E&R can be found at: http://www.deltacostproject.org/sites/default/files/products/issuebrief_02.pdf

Appendix B includes the §23-3.3-103, C.R.S. financial aid calibration calculations.

Appendix C includes the HB14-1319 funding allocation model report with details on the metrics and weights used in the model.

Table A: Request Summary

Inflationary Requested Increase	14,654,213
Health Benefits Requested Increase	1,388,790
Total Requested for Governing Boards	**16,043,003**
Percentage Increase for Governing Boards	2.4702%
LDJC and AVS Operating Increase	**631,397**
Total Requested Operating Increase	**16,674,400**
Total Operating Percentage Increase	2.48077%
Financial Aid Callibration	**3,793,722**
Private COF Stipend (Stipend at $77)	**38,490**
Total Request Increase	**20,506,612**

STEP ONE: FY 2017 E&G BUILD-UP

A1 - 2017 E&G Increase due to PERA AED and SAED

	AED Increase [1]				SAED Increase [1]	0.5%

Governing Board	PERA Participating Salaries [2]	AED Increase	SAED Increase	Total Increase for PERA AED &SAED
Adams	11,377,636	45,511	56,888	102,399
Mesa	14,220,156	56,881	71,101	127,981
Metro	37,106,315	148,425	185,532	333,957
Western	4,994,487	19,978	24,972	44,950
CSU	148,271,530	593,086	741,358	1,334,444
Ft. Lewis	9,394,072	37,576	46,970	84,547
CU	279,777,931	1,119,112	1,398,890	2,518,001
Mines	60,513,440	242,054	302,567	544,621
UNC	35,225,117	140,900	176,126	317,026
CCC	263,418,652	1,053,675	1,317,093	2,370,768
TOTAL	864,299,336	3,457,197	4,321,497	7,778,694

(AED Increase 0.4%)

[1] Percent increase based on 4.8% blended contribution rate for PERA AED and 4.75% blended contribution rate for PERA SAED in FY 16-17 (24-51-411, C.R.S.); See https://www.copera.org/sites/default/files/documents/5-123.pdf

[2] Salaries salaries calculated from CORE Info Advantage Institutional expenditures and include PERA participating classified and non-classified employees.

A2 - 2017 E&G Increase due to Health Benefits

	FY 2017 Health Care Percent Increase [1]	
		2.90%

Governing Board	2016 Health Benefits Total [2]	2017 Estimated Health Benefits Increase
Adams	1,999,874	57,996
Mesa	3,842,408	111,430
Metro	6,945,510	201,420
Western	2,027,981	58,811
CSU	29,580,144	857,824
Ft. Lewis	3,348,097	97,095
CU	60,121,154	1,743,513
Mines	9,297,228	269,620
UNC	8,458,092	245,285
CCC	22,850,027	662,651
TOTAL	**148,470,516**	**4,305,645**

[1] 2017 health benefits increase taken from the Centers for Medicare and Medicaid Services' "National Health Expendtiture 2015-2025 Projections - Amounts and Average Annual Growth From Previous Year Shown, By Type of Sponsor, Selected Calendar Years 2009-2025";
State and Local Government employer contributions to private health insurance premiums, less the estimated inflation.

[2] 2016 health benefits extracted from CORE InfoAdvantage actual institutional expenditures for health benefits for FY 2016

A-3 2017 E&G with Inflationary and PERA Increases

2017 Percent Increase [1] | 2.6%

Governing Board	2016 E&G Total [2]	2017 Inflationary Increase	2017 Increase for PERA AED & SAED	2017 Estimated Health Benefits Increase	Estimated 2017 E&G
Adams	34,988,201	909,693	102,399	57,996	36,058,289
Mesa	83,385,546	2,168,024	127,981	111,430	85,792,981
Metro	171,976,653	4,471,393	333,957	201,420	176,983,423
Western	28,536,200	741,941	44,950	58,811	29,381,903
CSU	606,132,639	15,759,449	1,334,444	857,824	624,084,356
Ft. Lewis	51,777,408	1,346,213	84,547	97,095	53,305,262
CU	1,271,439,957	33,057,439	2,518,001	1,743,513	1,308,758,910
Mines	164,103,208	4,266,683	544,621	269,620	169,184,132
UNC	146,776,634	3,816,192	317,026	245,285	151,155,137
CCC	428,687,297	11,145,870	2,370,768	662,651	442,866,586
TOTAL	2,987,803,742	77,682,897	7,778,694	4,305,645	3,077,570,979

[1] Percent increase based on June 2016 OSPB FY 17 inflation projection (2.4%), page 65.

[2] Education & General (E&G) total derived from institutional 2015 Budget Data Book submissions, FY 15-16 estimates.

STEP TWO: FY 2018 MINIMUM COST INCREASE BUILD-UP
A-4 2018 E&G Increase due to Health Benefits

Governing Board	FY 2017 Healthcare Percent Increase [1] 2017 Estimated Health Benefits Total [2]	4.20% 2018 Estimated Health Benefits Increase
Adams	2,057,870	86,431
Mesa	3,953,838	166,061
Metro	7,146,929	300,171
Western	2,086,792	87,645
CSU	30,437,969	1,278,395
Ft. Lewis	3,445,192	144,698
CU	61,864,668	2,598,316
Mines	9,566,848	401,808
UNC	8,703,377	365,542
CCC	23,512,678	987,532
TOTAL	152,776,161	6,416,599

[1] 2018 health benefits increase taken from the centers for Medicare and Medicaid Services' "National Health Expendtiture 2015-2025 Projections - Amounts and Average Annual Growth From Previous Year Shown, By Type of Sponsor, Selected Calendar Years 2009-2025";
State and Local Government employer contributions to private health insurance premiums, less the estimated inflation.

[2] 2017 Estimated health benefits total from table A-2 above

A-5 2018 Minimum Cost Increases Build Up

	2018 Inflationary Increase [1]	2.2%	General Fund as a Percentage of E&G [2]	21.6%	

Governing Board	2017 E&G Total [3]	2018 Inflationary Increase	2018 Healthcare Benefits Increase [4]	Total FY 2018 Increase	Percent General Funded [5]	Total FY 2018 Request
Adams	36,058,289	793,282	86,431	879,713	40%	355,047
Mesa	85,792,981	1,887,446	166,061	2,053,507	29%	602,500
Metro	176,983,423	3,893,635	300,171	4,193,806	29%	1,223,036
Western	29,381,903	646,402	87,645	734,047	41%	299,523
CSU	624,084,356	13,729,856	1,278,395	15,008,251	22%	3,334,276
Ft. Lewis	53,305,262	1,172,716	144,698	1,317,414	23%	300,807
CU	1,308,758,910	28,792,696	2,598,316	31,391,012	15%	4,558,039
Mines	169,184,132	3,722,051	401,808	4,123,859	13%	516,347
UNC	151,155,137	3,325,413	365,542	3,690,955	28%	1,033,348
CCC	442,866,586	9,743,065	987,532	10,730,597	36%	3,843,544
TOTAL	**3,077,570,979**	**67,706,562**	**6,416,599**	**74,123,160**	**22%**	**16,043,003**

[1] Inflationary increase based on June 2016 OSPB FY 18 inflation projection (2.0%), page 65.

[2] General Fund as a Percentage of E&G is calculated using the institutional 2015 Budget Data Book submissions, FY 15-16 revenue estimates.

[3] Estimated 2017 Education & General (E&G) total derived from table A-2

[4] Estimated 2018 Healthcare benefits increase derived from table A-4

[5] Percent General Fund calculated using the institutional 2015 Budget Data Book submissions, FY 15-16 estimates.

Table A6: Local District Junior College and Area Vocational Schools Increase

Governing Board	FY 16 State Funding [1]	FY 17 Request
Colorado Mountain College	7,143,039	176,445
Aims Community College	8,446,176	208,634
Area Vocational Schools	9,971,721	246,318
TOTAL	25,560,936	631,397

[1] Appropriations from SB15-234, pages 78-79

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Appendix B: Calculation for Percentage Increase in Financial Aid

FY 2016-17 General Fund Base Calculation		FY 2017-18 Financial Aid Request	
GF FY 17-18 Base			GF FY 17-18 Continuance
Governing Boards	648,028,056	Need Based	124,570,732
(Private Stipends)	(1,443,375)	Work Study	21,432,328
		DTAP	672,000
		National Guard	800,000
Other schools (AV	25,560,936	Merit Aid	5,000,000
		Tuition Assistance for Career and Technical Education	
Total	672,145,617	Certificate Programs	450,000
		Total Fin Aid	152,925,060
	a		
Requested Operat	16,674,400		
% GF Increase	2.5%		
			b
FY 2017-18 increase required for Financial Aid GF			3,793,722

a = total requested increase of General Fund for Institutions of Higher Education per Decision Item #1
b = calculated percentage increase for financial aid per section 23-3.3-103, C.R.S.

Assumptions:

In order to comply with language in section 23-3.3-103, C.R.S. "higher education institutions" is calculated to include:
   All Governing Boards
   Local District Junior Colleges
   Area Vocational Schools

The calculation does not include General Fund for College Opportunity Fund stipends to private institutions of higher education.

Applicable financial aid programs used to calculate the base include:
   Need Based Grants
   Work Study
   Veterans'/Law Enforcement/POW Tuition Assistance
   National Guard Tuition Assistance
   Merit Aid
   Tuition Assistance for Career and Technical Education Certificate Programs

The base calculation for financial aid does not include the Ft. Lewis Native American Student Tuition Waiver. This financial aid provision is found under a different statutory title than is referenced in section 23-3.3-103, C.R.S. Because it does not fall within the scope of section 23-3.3-103, C.R.S., it is not included in the base calculation.

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Funding Allocation Model Definitions and Weights

College Opportunity Fund Stipend

Student stipends are authorized under the College Opportunity Fund Program (23-18-201, et.seq.); and must be at least 52.5 percent of "total state appropriation" Section 23-18- 305 (2) (a), C.R.S.

College Opportunity Fund (COF) Stipend		
Measurement in HB 14-1319 Model	**Stipend Rate**	**% of TSA**
Based on FY 2015-16 COF actuals.	$75 (subject to change)	53.5

Role & Mission

The Performance metrics reward institutions for the number of credentials awarded and students transferred [23-18-303(4)(a), C.R.S.]; as well as academic progress/retention [23- 18-303(4)(b), C.R.S.]. These metrics are based on the count of credentials awarded and transferred by a governing board and the student counts of those who are reaching these thresholds at each institution in a given academic year. In addition, the CCHE Funding Allocation Model includes an additional metric pursuant to 23-18-303 (4)(c), C.R.S. that rewards performance in a manner which recognizes institutional performance in relation to their size and capacity. Per the 2015-16 JBC Adopted Model, Weighted Student Credit Hours are also included, in order to offset the costs associated with delivering credits to resident students (non-residents are excluded).

As required in statute, the model includes specific weights for different academic award levels and identifies STEM and health care as "high priority" programs that receive a higher weight. Additional bonuses are provided for completions awarded to and transfers of Pell- eligible students (required by statute).

Role & Mission Factor Definitions and Data Sources		
Factor	**Definition**	**Date Source/Year**
Mission Differentiation	A flat amount is allocated based on the institution's size and type with a special factory adjustment for two institutions.	Based on JBC Adopted Model and adjusted based on funding changes.
Support Services for Pell-eligible Students	Credit hours for resident undergraduate Pell eligible students summed by institution. Use Pell-eligible credit hours as a percent of the College Opportunity Fund (COF) stipend (must never be less than 10 percent of COF). For FY 2017-18, weighted at 10% of the COF Stipend.	Student Unit Record Data System (SURDS)/ Academic Year (AY) 2015-16

Weighted Student Credit Hours	Provides funding based on the number of completed credit hours and the costs associated with delivering the credits (non-resident credit hours excluded).	Student Unit Record Data System (SURDS)/ Academic Year (AY) 2015-16

More on Mission Differentiation:

The Mission Differentiation factor is a flat amount allocated based on the institutional size and type with a special factor adjustment for two institutions. The dollar amounts allocated for Mission Differentiation are outlined in the table below. The special adjustments made for two institutions are outlined in the model allocations for the Role and Mission Factors.

Research institutions	
Research institution open the door (comp amount + $1.8 million)	6,600,000
Add-on for any stand-alone R institution smaller than 10,000	2,300,000
Add-on for any R institution larger than 20,0000	4,650,000
Comprehensive institutions	
Comp institution open the door	4,800,000
Add-on for any stand-alone institution smaller than 3,000	1,550,000
Add-on for any Comp institution larger than 15,000	300,000
Community colleges	
Community college open the door	1,000,000
Add-on for small rural institutions	600,000

Outcomes/Performance

The Performance metrics reward institutions for the number of credentials awarded and students transferred [23-18-303(4)(a), C.R.S.]; as well as academic progress/retention [23- 18-303(4)(b), C.R.S.]. These metrics are based on the student counts at each institution who are reaching these thresholds. In addition, FY 2016-17 funding allocation model includes an additional metric pursuant to 23-18-303 (4)(c), C.R.S. that rewards performance in a manner that recognizes institutional performance in relation to their size and capacity.

As required in statute, the model includes specific weights related to the academic award level and identifies STEM and health care as "high priority" subjects that receive a higher weight. Additional bonuses are provided for completions awarded to and transfers of Pell- eligible (required by statute).

Completion and Transfer weights are as follows:

Outcomes/Performance Metric Definitions and Data Sources		
Metric	**Definition**	**Data Source/ Year**
Completion	The number of certificates or degrees awarded an institution and the number of students who transfer from a community college to another institution after the completion of a minimum of 18 credit hours. The amount to be awarded for each certificate or degree is based on the subject and level of the credential. Certificates will be counted when issued for: • Programs spanning one year (24 credit hours) or more; or • Programs less than one year (24 credit hours) and meeting the federal "gainful employment" definition, or representing the highest award earned at stop-out. When multiple certificates of less than one year are earned by a student then only one is counted. Students earning multiple certificates in an academic year will have each earned certificate count as a separate outcome. A community college that receives an incentive for a transfer student cannot also receive a retention bonus for that student in the same year. The value shall be increased for each credential earned by or transfer of a Pell-eligible undergraduate student.	Student Unit Record Data System (SURDS)/ AY 2015-16
Retention	The number of students who make the following steps of academic progress: Four-year institutions –number of students who cross the threshold of completing: • 30 credit hours • 60 credit hours • 90 credit hours Two-year institutions - number of students who cross the threshold of completing: • 15 credit hours • 30 credit hours • 45 credit hours Concurrent enrollment will be included and each student will be counted only once at each academic progress interval. Students crossing multiple progress intervals are counted in the highest interval.	Student Unit Record Data System (SURDS)/ AY 2015-16

Outcomes/Performance Metric Definitions and Data Sources		
Metric	**Definition**	**Data Source/ Year**
Institutional Productivity	Calculated by: 1. Dividing an institutions total weighted degree total by Student Full-time Equivalent (SFTE) = "Awards per FTE" 2. Indexing individual institutions' "Awards per FTE" to the state average "Awards per FTE" 3. Multiply "indexed awards per FTE" by total "awards per FTE" funding to get allocation by institution for this metrics	Student Unit Record Data System (SURDS)/ AY 2015-16

Outcomes/Performance Metric Weights

Completion and Transfer Weights	
Credential Level	**Weight**
Transfer	.25
Certificates	0.25
Associates	0.50
Bachelors	1.00
Graduate Certificate	0.25
Masters	1.25
Specialists	1.25
Doctoral	1.25

Additional Undergraduate Completion/Transfer Bonus for Priority Populations	
Type	**Additional Bonus**
Pell-Eligible	1.6
STEM and Heath	1.5

Retention Weights (completed credit hours)	
Credit Hours Accumulated	**CCHE Adopted Model Weight**
15/30	.25
30/60	.50
45/90	.75

After the points have been calculated for the completion and retention metrics, weights are then

uniformly applied to the counts for each institution.

Completion and Retention Metric Weights	
Completion	85%
Retention	15%

Institutional Productivity
This metric functions as a "carve out" off the top of the amount allocated to the Performance component of the model and is capped at $10 million.

COLORADO
Department of
Higher Education

Cost and FTE

- The Department of Higher Education requests an additional $116.4 million in Cash Fund spending authority to reflect public institutions' tuition revenue for FY 2017-18. This increase is necessary to keep up with base costs and strategic initiatives with a moderate General Fund increase.

Current Program

- As of FY 2017, institutions' tuition revenue is appropriated in the Long Bill along with tuition assumptions that act as caps to tuition rate increases.
- A 2.2 percent inflationary increase and funding for health care increases drive a need for $74.1 million in total institutional base costs. Of this sum, about 22 percent is covered by General Fund. Each 1 percent increase in tuition results in about $9.7 million of revenue for institutions.

Problem or Opportunity

- Pursuant to Section 23-5-129 (6) (c), C.R.S. and Section 23-1-108 (12) (b), C.R.S., for FY 2016-17 and each year thereafter, the Commission of Higher Education is required to detail tuition recommendations for resident undergraduate students for each state institution of higher education in its budget request.
- Inflationary and health care costs ($74.1 million), along with other strategic initiatives, are covered by either General Fund or tuition revenue.

Consequences of Problem

- The higher education funding allocation model results in different General Fund operating increases for institutions, resulting in differing ability to cover inflationary and healthcare benefit cost increases with General Fund.

Proposed Solution

- An increase of $116.4 million Cash Fund spending authority for tuition revenue will allow institutions to stay financially viable and cover inflationary and healthcare benefit cost increase.
- The Department proposes individualizing institutions' resident undergraduate tuition limit assumptions to reflect their portion of General Fund increase from the funding allocation model.

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Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

R-2 Tuition Spending Authority Increase

Dept. Approval By: _[signature]_

OSPB Approval By: _[signature]_ 10/26/16

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	Initial Appropriation	Supplemental Request	Base Request	Change Request	Continuation
	Total	$3,002,116,592	$0	$2,994,184,572	$116,397,363	$116,397,363
Total of All Line Items Impacted by Change Request	FTE	24,044.7	0.0	24,044.7	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$2,355,194,951	$0	$2,347,262,931	$116,397,363	$116,397,363
	RF	$646,921,641	$0	$646,921,641	$0	$0
	FF	$0	$0	$0	$0	$0

Line Item Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	Initial Appropriation	Supplemental Request	Base Request	Change Request	Continuation
	Total	$40,723,138	$0	$40,723,138	$1,243,358	$1,243,358
05. Governing Boards, (A) Trustees of Adams State University - Trustees of Adams State College	FTE	331.6	0.0	331.6	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$26,646,778	$0	$26,646,778	$1,243,358	$1,243,358
	RF	$14,076,360	$0	$14,076,360	$0	$0
	FF	$0	$0	$0	$0	$0
	Total	$97,559,817	$0	$97,559,817	$4,009,647	$4,009,647
05. Governing Boards, (B) Trustees of Colorado Mesa University - Trustees of Colorado Mesa University	FTE	705.8	0.0	705.8	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$73,279,088	$0	$73,279,088	$4,009,647	$4,009,647
	RF	$24,280,729	$0	$24,280,729	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (C) Trustees of Metropolitan State College of Denver - Trustees of Metropolitan State College of Denver	Total	$172,582,069	$0	$172,582,069	$7,188,111	$7,188,111
	FTE	1,453.2	0.0	1,453.2	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$121,167,068	$0	$121,167,068	$7,188,111	$7,188,111
	RF	$51,415,001	$0	$51,415,001	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (D) Trustees of Western State College - Trustees of Western State College	Total	$34,543,650	$0	$34,543,650	$980,317	$980,317
	FTE	248.1	0.0	248.1	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$23,008,723	$0	$23,008,723	$980,317	$980,317
	RF	$11,534,927	$0	$11,534,927	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (E) Board of Governors, Colorado State University System - Board of Governors of the Colorado State University System	Total	$619,485,003	$0	$619,485,003	$23,057,191	$23,057,191
	FTE	4,856.2	0.0	4,856.2	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$484,966,696	$0	$484,966,696	$23,057,191	$23,057,191
	RF	$134,518,307	$0	$134,518,307	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (F) Trustees of Fort Lewis College - Trustees of Fort Lewis College	Total	$58,111,091	$0	$58,111,091	$2,137,651	$2,137,651
	FTE	430.4	0.0	430.4	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$46,629,891	$0	$46,629,891	$2,137,651	$2,137,651
	RF	$11,481,200	$0	$11,481,200	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (G) Regents of the University Of Colorado - Regents of the University Of Colorado	Total	$1,217,564,100	$0	$1,209,632,080	$46,565,987	$46,565,987
	FTE	7,982.3	0.0	7,982.3	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$1,031,031,414	$0	$1,023,099,394	$46,565,987	$46,565,987
	RF	$186,532,686	$0	$186,532,686	$0	$0
	FF	$0	$0	$0	$0	$0

05. Governing Boards, (H) Trustees of the Colorado School of Mines - Trustees of the Colorado School of Mines	Total	$167,618,512	$0	$167,618,512	$6,692,372	$6,692,372
	FTE	896.8	0.0	896.8	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$146,979,462	$0	$146,979,462	$6,692,372	$6,692,372
	RF	$20,639,050	$0	$20,639,050	$0	$0
	FF	$0	$0	$0	$0	$0

	Total	**$146,156,024**	**$0**	**$146,156,024**	**$5,702,857**	**$5,702,857**
	FTE	1,136.5	0.0	1,136.5	0.0	0.0
05. Governing Boards, (I) University of Northern Colorado - University of Northern Colorado	GF	$0	$0	$0	$0	$0
	CF	$107,042,790	$0	$107,042,790	$5,702,857	$5,702,857
	RF	$39,113,234	$0	$39,113,234	$0	$0
	FF	$0	$0	$0	$0	$0
	Total	**$447,773,188**	**$0**	**$447,773,188**	**$18,819,872**	**$18,819,872**
05. Governing Boards, (J) State Board for Comm Colleges and Occupational Ed System - State Board for Comm Colleges and Occupational Ed System	FTE	6,003.8	0.0	6,003.8	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$294,443,041	$0	$294,443,041	$18,819,872	$18,819,872
	RF	$153,330,147	$0	$153,330,147	$0	$0
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes _____ No _____	**If Yes, see attached fund source detail.**
RF Letternote Text Revision Required	Yes _____ No _____	
FF Letternote Text Revision Required	Yes _____ No _____	

Requires Legislation?   Yes _____ No **X** _____

Type of Request?   Department of Higher Education Prioritized Request

Interagency Approval or Related Schedule None

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Department of Higher Education

FY 2017-18 Funding Request | November 1, 2016

Department Priority: R-3
Request Detail: Tuition Spending Authority

Summary of Incremental Funding Change for FY 2017-18	Total Funds	General Fund
Tuition Spending Authority	$116.4 million (Cash Fund Spending Authority)	$0.0

The Department of Higher Education (the Department) requests a total increase of $116,397,362 in cash funds spending authority to reflect public institutions' tuition revenue for FY 2017-18. This increase is necessary to keep up with base costs and strategic initiatives with a moderate General Fund increase. Based on this request the total spending authority for tuition revenue in FY 2017-18 would be $2,196,626,033 cash funds.

In line with Department Request R-2, the Department anticipates an average rate increase for resident undergraduate students of 6% for FY 2017-18. A 2.2 percent inflationary increase and funding for health care increases drive a need for $74.1 million in total institutional base costs. Of this sum, about 22 percent is covered by General Fund. Each 1 percent increase in tuition results in about $9.7 million of revenue for institutions.

Problem or Opportunity:

Under current law, effective FY 2016-17, tuition revenue is again to be appropriated at all state institutions except the Colorado School of Mines. Also, pursuant to C.R.S §23-5-129 (6)(c) and C.R.S §23-1-108 (12)(b), beginning in FY 2016-17 and each year thereafter, the Commission shall be required to include in the annual budget request detailing tuition recommendations for resident undergraduate students for each state institution of higher education.


Proposed Solution:

HB 14-1319 [C.R.S. § 23-18-306(5)] directed the Colorado Commission on Higher Education to submit to the General Assembly by November 1, 2015, new tuition policies that ensure both accessible and affordable higher education for Colorado residents, while reflecting the level of state funding for institutions, and the need of each institution to enhance its financial position and sustainability. The Commission adopted a tuition policy, based on the idea of cost-sharing, which directly links tuition increases to the level of General Fund support. In other words, an increase in General Fund investment results in lower tuition increases, while a decrease in General Fund investment results in higher tuition increases.

Tuition Spending Authority and Footnote Language

The Department of Higher Education requests a total increase of $116.4 million in cash funds spending authority to support the anticipated increase in tuition revenue in FY 2017-18. Based on this request the total spending authority for tuition revenue in FY 2017-18 would be $2,196,626,033 cash funds with an average increase in resident undergraduate tuition of 6%. The statewide average increase of 6% is based on the based on the Department's R-1 Request, which demonstrates the a need for $74.1 million in total institutional base costs. Of this sum, about 22 percent is covered by R-1 General Fund. Each 1 percent increase in tuition results in about $9.7 million of revenue for institutions (see following table).

Linking the General Fund & Tuition:
Covering Core Minimum Cost Increases in FY 2017-18
DRAFT DOCUMENT—NOT FOR DISTRIBUTION
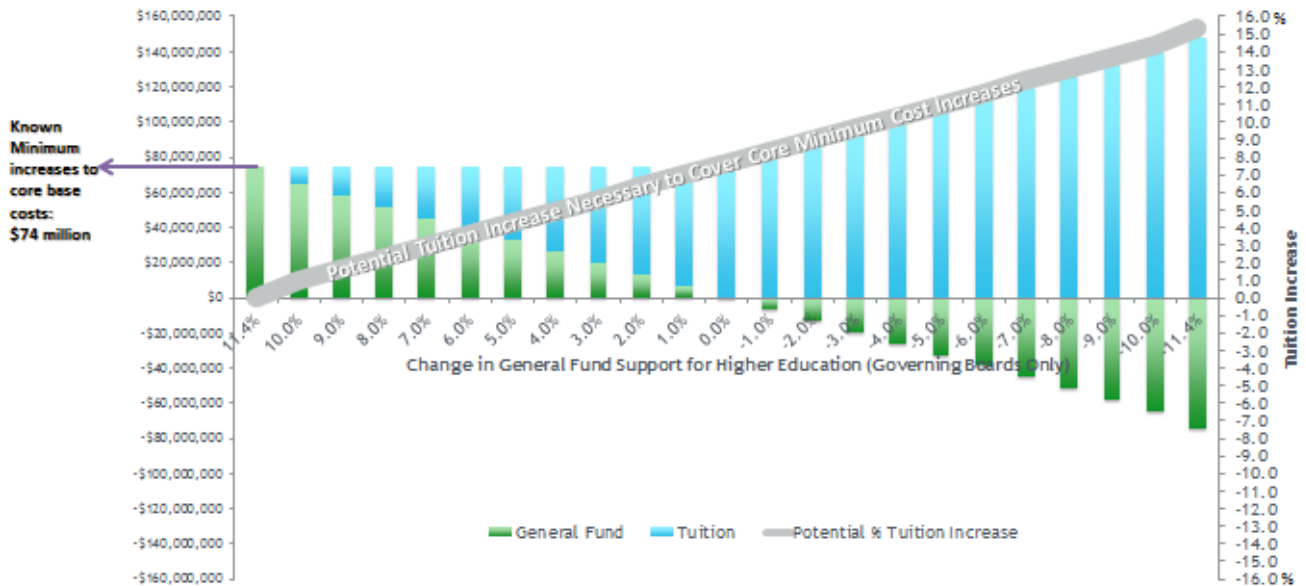
% Change in GF Appropriations	$ Change General Fund	$ Change Tuition	Potential % Tuition Increase
11.4%	74,123,160	$0	0.0
10.0%	64,836,506	$9,286,654	1.0
9.0%	58,352,856	$15,770,304	1.6
8.0%	51,869,205	$22,253,955	2.3
7.0%	45,385,554	$28,737,606	3.0
6.0%	38,901,904	$35,221,256	3.6
5.0%	32,418,253	$41,704,907	4.3
4.0%	25,934,603	$48,188,557	5.0
3.0%	19,450,952	$54,672,208	5.6
2.0%	12,967,301	$61,155,859	6.3
1.0%	6,483,651	$67,639,509	7.0
0.0%	-	$74,123,160	7.7
-1.0%	(6,483,651)	$80,606,811	8.3
-2.0%	(12,967,301)	$87,090,461	9.0
-3.0%	(19,450,952)	$93,574,112	9.7
-4.0%	(25,934,603)	$100,057,763	10.3
-5.0%	(32,418,253)	$106,541,413	11.0
-6.0%	(38,901,904)	$113,025,064	11.7
-7.0%	(45,385,554)	$119,508,714	12.3
-8.0%	(51,869,205)	$125,992,365	13.0
-9.0%	(58,352,856)	$132,476,016	13.7
-10.0%	(64,836,506)	$138,959,666	14.3
-11.4%	(74,123,160)	$148,246,320	15.3

COLORADO

However, since the higher education funding allocation model results in different General Fund operating increases for institutions, resulting in differing ability to cover inflationary and healthcare benefit cost increases with General Fund. As such, the recommended tuition limits reflect the Department's cost-sharing matrix and additional information provided by the governing boards reflecting a need for an additional increase.

The Department's request does not place any rate or revenue limits on allowable increases for resident graduate students and nonresident students. For budgeting purposes, the Department has assumed that governing boards incur inflationary and health benefits increases (less the general fund share) and a 1% increase to account for unknown factors (e.g., enrollment changes) to estimate the spending authority needed in FY 2017-18. It is likely that adjustments will be required through the supplemental process once governing boards have additional enrollment and General Fund projections and are able to begin setting tuition rates in 2017 for the 2017-18 academic year.

The following Table provides recommended tuition spending authority figures by Governing Board and the proposed tuition footnote language for the FY 2017-18 Long Bill (see appendices A and B for more information):

	FY 2016-17 Tuition Revenue Estimate	FY 2017-18 Requested Tuition Spending Authority Increase	FY 2017-18 Tuition Revenue Estimate
ASU	20,056,050	1,243,358	21,299,408

	FY 2016-17 Tuition Revenue Estimate	FY 2017-18 Requested Tuition Spending Authority Increase	FY 2017-18 Tuition Revenue Estimate
CMU	66,827,458	4,009,647	70,837,105
MSU	105,524,167	7,188,111	112,712,278
WSCU	17,874,830	980,317	18,855,147
CSU	417,008,560	23,057,191	440,065,751
Ft. Lewis	40,496,891	2,137,651	42,634,542
CU	931,319,730	46,565,987	977,885,717
Mines**	133,847,436	6,692,372	140,539,808
UNC	88,590,203	5,702,857	94,293,060
CCCOES	258,683,346	18,819,872	277,503,218
Total	2,080,228,671	116,397,362	2,196,626,033
**Shown for informational purposes only.			

The following table provides information on the tuition increase assumptions used to calculate the tuition spending authority. It is important to note that the resident undergraduate tuition increases represent the potential increase and do not reflect actual governing board action.

FY 2017-18 Tuition Revenue Increase Assumption										
	ASU	**CMU**	**MSU**	**WSCU**	**CSU**	**Ft. Lewis**	**CU**	**Mines**	**UNC**	**CCCOES**
Resident	7.0%	6.0%	7.0%	6.0%	6.0%	6.0%	5.0%	5.0%	7.0%	7.7%
Non-resident	5.0%	6.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

In addition, the following is suggested footnote language based on the tuition analysis provided above:

Department of Higher Education, Governing Boards, Trustees of Adams State University -- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than seven percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Trustees of Colorado Mesa University-- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than six percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Trustees of Metropolitan State University of Denver -- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than seven percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in

this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Trustees of Western State Colorado University-- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than six percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Board of Governors of the Colorado State University System-- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than six percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Trustees of Fort Lewis College-- The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than six percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Trustees of the Colorado School of Mines – The cash funds appropriation from tuition in this line item is for informational purposes only. Pursuant to the provisions of 23-41-104.6 (5) (c), C.R.S., the Board of Trustees has authority to establish resident and non-resident tuition rates for the Colorado School of Mines. The amount shown is based on the Colorado School of Mines' February 2016 tuition forecast. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2016-17 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, University of Northern Colorado--The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than seven percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, Regents of the University of Colorado--The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than five percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Department of Higher Education, Governing Boards, State Board for Community Colleges and Occupational Education State System Community Colleges--The amount in this line item is calculated based on the assumption that no undergraduate student with in-state classification will pay more tuition in FY 2017-18 than seven and seven-tenths percent over what a student would have paid in FY 2016-17 for the same credit hours and course of study. This amount is also calculated based on the assumption that the governing board will increase tuition rates for graduate and nonresident students based on its assessment of market conditions. The General Assembly intends to adjust the amount in this line item through supplemental action during fiscal year 2017-18 based on updated enrollment estimates and tuition rate information.

Anticipated Outcomes:

Tuition is inexorably tied to state general fund investment. The Department anticipates tuition increases of 6% on average if the State pays for its share of public higher education institutions' increases to fixed costs. Along with a moderate General Fund increase specified in the Department's Operating Request (R-1), the tuition spending authority request will allow Colorado's public institutions to keep up with base costs and provide flexibility to address strategic initiatives.

Assumptions and Calculations:

To derive the projected spending authority in this request, the Department utilized the tuition revenue figures in the FY 2016-17 Long Bill (H.B. 16-1405), and applied a 5% increase to nonresident tuition (unless otherwise stated) and applied the tuition rate from the Department's cost matrix to a governing boards allocation from the funding allocation formula. The sum of these two amounts, plus the FY 2016-17 base, is the total amount requested for the Governing Boards in FY 2017-18.

The Department collects its annual tuition and fee survey in mid-September. This survey will enable the calculation of actual base tuition rates and account for all differential rates. The Department collects the fall census enrollment report and the Budget Data Book submissions in mid-October, which combined, enable the most accurate enrollment and tuition revenue projections available. The Department anticipates using all of these reports to more accurately estimate tuition spending authority and will submit future budget amendments as necessary.

Supplemental, 1331 Supplemental or Budget Amendment Criteria:

If applicable, briefly describe supplemental or budget amendment criteria this request meets.

Appendix A
FY 2016-17 Tuition Revenue Estimate

	ASU	CMU	MSU	WSCU	CSU	Ft. Lewis	CU	Mines	UNC	CCCOES
Resident	12,027,750	53,461,966	95,595,121	8,657,545	220,676,301	11,280,629	451,142,678	53,235,636	63,667,346	217,989,081
Non-resident	8,028,300	13,365,492	9,929,046	9,217,285	196,332,259	29,216,262	480,177,052	80,611,800	24,922,857	40,694,265
Total	20,056,050	66,827,458	105,524,167	17,874,830	417,008,560	40,496,891	931,319,730	133,847,436	88,590,203	258,683,346

FY 2017-18 General Fund Increase

	ASU	CMU	MSU	WSCU	CSU	Ft. Lewis	CU	Mines	UNC	CCCOES
	183,603	1,670,432	211,602	286,970	3,892,219	303,739	7,785,541	845,656	484,174	379,068
	1.30%	6.88%	0.41%	2.49%	2.89%	2.65%	4.17%	4.10%	1.24%	0.25%

FY 2017-18 Tuition Revenue Assumption

	ASU	CMU*	MSU	WSCU	CSU	Ft. Lewis	CU*	Mines	UNC	CCCOES
Resident	7.0%	6.0%	7.0%	6.0%	6.0%	6.0%	5.0%	5.0%	7.0%	7.7%
Non-resident	5.0%	6.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

* These govening boards have asked for a tuition rate that is different from the rate which resulted from the tuition matrix. For additional details on tuition assumptions, please see the requested footnotes and appendix.

FY 2017-18 Tuition Revenue Estimate

	ASU	CMU	MSU	WSCU	CSU	Ft. Lewis	CU	Mines	UNC	CCCOES
Resident	12,869,693	56,669,684	102,286,779	9,176,998	233,916,879	11,957,467	473,699,812	55,897,418	68,124,060	234,774,240
Non-resident	8,429,715	14,167,422	10,425,498	9,678,149	206,148,872	30,677,075	504,185,905	84,642,390	26,169,000	42,728,978
Total	21,299,408	70,837,105	112,712,278	18,855,147	440,065,751	42,634,542	977,885,717	140,539,808	94,293,060	277,503,218

FY 2017-18 Requested Tuition Spending Authority Increase

	ASU	CMU	MSU	WSCU	CSU	Ft. Lewis	CU	Mines	UNC	CCCOES	Total
Resident	841,943	3,207,718	6,691,658	519,453	13,240,578	676,838	22,557,134	2,661,782	4,456,714	16,785,159	71,638,977
Non-resident	401,415	801,930	496,452	460,864	9,816,613	1,460,813	24,008,853	4,030,590	1,246,143	2,034,713	44,758,386
Total	1,243,358	4,009,647	7,188,111	980,317	23,057,191	2,137,651	46,565,987	6,692,372	5,702,857	18,819,872	116,397,362

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Appendix B—Tuition Spending Authority, Institutional/Governing Board Feedback

University of Colorado System:

> The proposed October 2016 Colorado Department of Higher Education (CDHE) tuition matrix links potential state funding amounts to potential tuition increases for FY 2017-18. Based on current information, the University of Colorado System believes that it would generally be able to operate at, or below, the potential tuition increases in the three scenarios presented by the CDHE. However, depending on the state funding scenario, exceptions to the tuition increase could be necessary. For example, CU Boulder's previously approved 4 year guaranteed tuition and mandatory fees for undergraduate resident students (5.0% in FY 2017-18) would not be accommodated under the 5% state funding increase scenario. Additionally, specific degree program tuition differentials that could be necessary in FY 2017-18 (such as differentials outlined in the H.B. 16-1405, FY 2016-17 - Long Bill footnote 28) would not be accommodated under various scenarios.

Colorado Mesa University:

> My understanding is that CDHE will be using the assumptions below, which were taken from the tuition matrix, based on overall Governing Board (in this case, CMU) state general fund change, to calculate 17-18 tuition spending authority for submission to OSPB and JBC. It is not intended to be a hard cap or limit on the rate increase. Further, it is my understanding that institutions will have an opportunity to update that spending estimate again in February as we have better current 16-17 revenue information and also, better 17-18 budget assumptions.

> | | |
> |---|---|
> | 5% overall higher education increase | 1.6% |
> | Flat overall higher education budget | 5.0% |
> | 5% overall higher education reduction | 8.3% |

> First, I must start out by reiterating CMU's long-held position that we don't support tuition limits. We believe our past tuition increase record suggests we have been good stewards of the broad authority granted to us, and have continued to keep student affordability at the forefront in our decisions and budgeting practices. In order to calculate a tuition spending authorization limit, if needed, CMU would request **added flexibility of 3% on top of each of the rates** noted above in the table. CMU has traditionally increased tuition for both student populations—resident and non-resident--at the same level, so we would request the same assumption be used for both.

This broad range of estimate is provided in light of the earliness of the projection and as noted below, certain cost elements are not fully represented in the standard core cost calculation. We are uncertain that we will utilize this maximum authority, but given it is early in the budget planning process keeping that option open would be helpful. As you know, CMU's increase has not exceeded five percent in more recent years. Furthermore, in four of the last six years, CMU has stayed below any tuition limit that has been put in place and the two years where we utilized the maximum capacity the increase was six percent. We plan to continue to be conservative in any rate increases, but seek flexibility to address the needs of a complex institution in a way that best addresses student and state needs.

The added flexibility will help address a number of uncertainties and also address cost increases which far exceed the assumptions used in the standard core cost calculation. For example,

- we don't yet know the outcome of ballot measures to increase the minimum wage. If passed, the minimum wage rate would increase from $8.31 to $9.30 in 2017 and to $10.20 in 2018, a 10-12% increase each year. CMU, as a form, of financial aid, has a robust student employment program. These increases would affect those programs.
- we don't have good enough information on projected utility cost increases yet; however, we anticipate them to be higher than the standard inflationary increase of 2.2-2.6% based on past experience. With regard to utilities, the core cost calculation also does not take into account that CMU will bring on-line in 17-18 two major new plant additions—Nursing and Engineering. These two facilities together add over 100,000 sf of space to CMU's inventory. These added custodial, maintenance and utility costs have not been recognized in the core cost calculation.
- CMU has/will experience health insurance cost increases of 5% in 2016 and 6% in 2017, which is more than the 2.9% and 4.2% assumed in the standard core cost calculation. We assume similar increases in 2018, perhaps even higher as the largest independent provider of health insurance in western CO merges with another carrier next year.
- The implications of the new federal wage threshold for FLSA and overtime requirements taking effect December 1, 2016 are not adequately addressed in the standard core cost calculation.
- In order to support accessibility, CMU has added (20) new faculty and student services staff positions in 16-17 to support continued growing enrollment. These new positions are not factored into the standard core cost calculation.
- CO statute 23-18-306 reads in part: *"tuition policies that ensure both accessible and affordable higher education for Colorado's residents. The tuition policies*

*must also reflect the level of state funding for institutions and the need of each institution to enhance the quality of educational programs and offerings and strengthen the financial position of the institution." T*he standard core cost calculation does not take into account that CMU…

- ✓ has traditionally ranked among the two lowest CO higher ed institutions in state support per resident student
- ✓ is adding new academic programs to address Western Slope and CO workforce needs including civil engineering (partnership program, with CU), occupational therapy, physical therapy and physician assistant. These investments in new programs align with the University's strategic goals to selectively add programs that enhance post-graduation opportunities
- ✓ is adding graduate certificate programs to assist K-12 teachers with required skill upgrades to continue support of non-current high school student enrollments.
- ✓ continues to increase funding for financial aid to address increasing enrollment and to maintain student affordability for those least able to afford a postsecondary education.
- ✓ routinely makes market salary adjustments to recruit and retain quality faculty and staff in response to competitive market pressures.

Colorado State University System:

In conjunction with the Financial Accountability Plan that was required under Senate Bill 10-03, Colorado State University had employed a system of differential tuitions for undergraduate students since beginning in FY 2012. Regardless of the level of the course taught, students who have accumulated 60 credits (30 credits in the case of Business classes) pay a differential tuition which depends on the subject area of the class. The university's undergraduate subject areas are currently classified into three groups, representing a lower, medium, and higher level of differential tuition for the upper-division students. For example, currently, Business, Engineering, and Construction Management classes have the higher level of differential tuition.

Factors that are taken into account when determining the level of differential tuition are: cost of instruction; demand for the classes; value of the degree program.

Occasionally a subject area will propose to move from one level to another level of differential tuition charged based upon changes in the respective program in these three categories. For FY 18, the following programs are proposed to change level:

Human Development and Family Studies: changing from lower level to middle level.

This action has been approved by the Board of Governors of the Colorado State University System.

Fort Lewis College:

Whether or not Fort Lewis College would need more resident tuition setting flexibility than what is shown in the matrix depends on what the JBC allows us to do with non-resident tuition. As you

know, last year there was an attempt to limit our non-resident tuition increase to 0%. That limitation was eventually removed – though, ultimately, we did not increase our non-resident tuition. Given that we haven't raised our non-resident tuition for seven years and that it is now the lowest in the State, our Board has discussed the possibility of raising it a nominal amount (4.0% to 5.0%). Without a non-resident tuition increase, we will most certainly need more flexibility on resident tuition increases.

Our resident tuition is among the lowest in the State, so the increases as depicted in the matrix do not generate the same amount of funding as other institutions (for example, Mines' **resident** tuition – at $15,716 - is only $356 less than our **non-resident** tuition). A final need for flexibility hinges on the fact that the matrix only addresses costs that are mandatory in nature. As such, the resulting tuition increases do nothing to address new quality initiatives or other Board priorities.

COLORADO
Department of
Higher Education

Priority: R-3
Fort Lewis Native American Tuition Waiver
FY 2017-18 Change Request

Cost and FTE

- The Department requests an increase of $88,300 General Fund to fund the Fort Lewis College Native American Tuition Waiver in FY 2017-18. This 0.5 percent increase would bring the total appropriation for the waiver to $17,452,548 General Fund.

Current Program

- Colorado is required via Federal agreement and state law to provide full tuition assistance to any qualified Native American student who attends Fort Lewis College.

Problem or Opportunity

- The Federal agreement with Colorado applies to all Native American students throughout the United States. Therefore, the appropriation must cover both resident and non-resident tuition for participating students. Current funding would fall short of the program cost by $88,300 General Fund in FY 2017-18.

Consequences of Problem

- If the funding for the Fort Lewis Native American Tuition Waiver is not increased, Colorado will be out of compliance with Section 23-52-105 (1) (b), C.R.S.

Proposed Solution

- The Department requests that the Fort Lewis College Native American Tuition Waiver funding be increased to cover Native American student enrollment and tuition costs.

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Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

R-3 Fort Lewis Native American Tuition Waiver

Dept. Approval By: _(signature)_

OSPB Approval By: _(signature)_ 10/26/16

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	**Initial Appropriation**	**Supplemental Request**	**Base Request**	**Change Request**	**Continuation**
	Total	$17,364,248	$0	$17,364,248	$88,300	$88,300
	FTE	0.0	0.0	0.0	0.0	0.0
Total of All Line Items Impacted by Change Request	GF	$17,364,248	$0	$17,364,248	$88,300	$88,300
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

Line Item Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	**Initial Appropriation**	**Supplemental Request**	**Base Request**	**Change Request**	**Continuation**
	Total	$17,364,248	$0	$17,364,248	$88,300	$88,300
U3. Colorado Commission on Higher Education Financial Aid, (D) Special Purposes - Native American Students/Fort Lewis College	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$17,364,248	$0	$17,364,248	$88,300	$88,300
	CF	$0	$0	$0	$0	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes	No ___		If Yes, see attached fund source detail.	
RF Letternote Text Revision Required	Yes	No ___			
FF Letternote Text Revision Required	Yes	No ___			

Requires Legislation?   Yes ___   No **X**

Type of Request?   Department of Higher Education Prioritized Request

Interagency Approval or Related Schedule None

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COLORADO
Department of Higher Education

John W. Hickenlooper
Governor

Diane Duffy
Acting Executive Director

FY 2017-18 Funding Request | November 1, 2016

Department Priority: R-3
Request Detail: Fort Lewis College Native American Tuition Waiver

Summary of Incremental Funding Change for FY 2016-17	Total Funds	General Fund
Fort Lewis College Native American Tuition Waiver	$88,300	$88,300

The Department of Higher Education requests an increase of $88,300 General Fund to fund the Fort Lewis College Native American Tuition Waiver in FY 2016-17. This increase would bring the total budget for this program to $17,452,548 General Fund.   This funding increase is necessary to fully comply with state statute and the Federal treaty.

Problem or Opportunity:

An increase in the funding for the Ft. Lewis College Native American Tuition Waiver is necessary to ensure that the State is in compliance with state statutory and federal requirements.

Statutory Requirements

Section 23-52-105 (1) (b), C.R.S. states, "*The general assembly shall appropriate from the state general fund one hundred percent of the money required for tuition for such qualified Indian pupils*" at Fort Lewis College. Fort Lewis College waives tuition for these students upfront and receives reimbursement for these students from the State in the subsequent fiscal year. Thus, the funding for this program is in arrears, such that this FY 2016-17 request covers the prior year's actual waivers granted in FY 2015-16.

Background

In 1910, the United States Commissioner of Indian Affairs recommended that the property encompassing Ft. Lewis College (which had been previously declared a federally owned Indian school) be transferred to Colorado if the state were willing to accept certain conditions. The Sixty-first Congress passed an Act which granted the State of Colorado the Ft. Lewis property provided that: " …said lands and buildings shall be held and maintained by the State of Colorado as an institution of learning, and that Indian pupils shall at all times be admitted to such school free of charge for tuition and on terms of equality with white pupils…"

In 1911, Colorado Governor John P. Shafroth signed the Executive Order which accepted Ft. Lewis under the conditions of the 1910 Act of Congress. By the 1960s, increasing numbers of Native American students were attending the school and the associated cost prompted the Colorado Legislature in 1971 to enact legislation that limited full tuition coverage to only Native American pupils who qualified for in-state

tuition in Colorado. This legislation was challenged by the Federal government in 1972 as a breach of the contract created by the 1910 Acts and 1911 Executive Order. Chief Judge Alfred A. Arraj ruled in favor of the Federal Government that the Act and the acceptance of its terms by Colorado resulted in a contract that required Colorado to admit _any_ Native American student to Ft. Lewis College free of charge for tuition. This decision was further upheld by the United States Court of Appeals, Tenth Circuit. It is this legal precedent that directs State policy and budgetary action regarding the Ft. Lewis Native American Tuition Waiver currently.

The estimates for the program are higher due to increases in student enrollment and resident tuition. The combination of these factors requires an addition $88,300 General Fund. If this request is not approved, the State will be out of compliance with Colorado statute and the federal treaty.

Proposed Solution:

The increase will fund the statutory obligations for paying student tuition associated with Native American student enrollments and tuition costs at Fort Lewis College.

Anticipated Outcomes:

The mission of the Colorado Department of Higher Education is to improve the quality of, ensure the affordability of, and promote access to postsecondary education for the people of Colorado. In fulfilling the terms of the Ft. Lewis Native American tuition waiver, the Department not only ensures compliance with statute but also promotes access to postsecondary education for a significantly underserved minority population.

Assumptions and Calculations:

Please see Attachment A for the detailed calculations used to arrive at this request. The following assumptions were used for these calculations:

- The FY 2017-18 budget request ($17,452,548 total, an increase of $88,300 General Fund) is based on the FY 2016-17 estimate of actual waivers (as all funding is made in arrears, based on the prior year).
- The FY 2016-17 appropriation was based on FY 2015-16 estimates; however, this calculated amount is recalibrated in this request.
- The request assumes that resident and non-resident student will represent the same percentage of total enrollments as actual FY 2016-17 enrollments.

The request accounts for a tuition increase in FY 2016-17 of 8.6% for resident students (0% for non-resident students) and enrollment increases of 2.5% and 2.7%, respectively, for resident and non-resident students. Around 94 percent of the students served in the Fort Lewis Native American Tuition Waiver are non-resident students and 6 percent are residents. Thus, the increase reflects the combined factors of changes to enrollment, resident tuition changes, and the change in the ratio of non-resident students in the program.

FORT LEWIS COLLEGE
NATIVE AMERICAN APPROPRIATION REQUEST
FY 17-18 ESTIMATED APPROPRIATION REQUEST
BASED ON FY 16-17 ESTIMATE OF ACTUAL WAIVERS

	FALL	WINTER	SUMMER SESSION I	PREVIOUS YEAR FUNDING ADJUSTMENT	TOTAL
Native American Appropriation FY 16-17	$8,428,029	$7,652,292	$1,067,490	216,437	$17,364,248
Request made in Feb 16					
Based on FLC Estimate of 100% Tuition Waivers for FY 15-16					
Actual Native American Tuition Waivers for FY 15-16	8,407,107	7,614,154	1,018,741	n/a	17,040,003
Source FGIBDST 6/30/16					
FY 15-16 Funding Adjustment	(20,922)	(38,138)	(48,749)	n/a	(107,808)
Funding Required For FY 16-17	8,674,948	7,859,783	1,025,626	(107,808)	17,452,548
Funded in Arrears, FY 16-17 Funding is for FY 15-16 Waivers					88,300

PROJECTED TUITION BY RESIDENCY STATUS
BASED ON ASSUMPTIONS BELOW

RESIDENT	527,806	517,442	86,936
NON-RESIDENT	8,147,142	7,342,341	938,690
TOTAL	8,674,948	7,859,783	1,025,626

ASSUMPTIONS:

RESIDENT BREAKDOWN PERCENTAGE	5.98%
NON-RESIDENT BREAKDOWN PERCENTAGE	94.02%
RESIDENT TUITION INCREASE	8.60%
NON-RESIDENT TUITION INCREASE	0.00%

PROJECTED NATIVE AMERICAN GROWTH (DECLINE) - BY TERM

Resident	2.50%	2.50%	0.00%
Non-Resident	2.70%	2.70%	0.00%

DOLLAR VALUE OF NATIVE AMERICAN WAIVERS

	RESIDENT	FY 2015-16 - Actual NON-RESIDENT	TOTAL	FY 2015-16 Waiver Est.	Diff $
FALL - 2015	474,155	7,932,952	8,407,107	8,428,029	(20,922)
Spirng - 2016	464,845	7,149,310	7,614,154	7,652,292	(38,138)
Summer - 2016	80,051	938,690	1,018,741	1,067,490	(48,749)
TOTAL	1,019,051	16,020,952	17,040,003	17,147,811	(107,808)
BREAKDOWN	5.98%	94.02%	100.00%		

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FORT LEWIS COLLEGE

October 18, 2016

Tonya Covarrubias
Department of Higher Education
1560 Broadway, Suite 1600
Denver, Colorado   80202

Re: Native American Appropriation

Dear Tonya,

The **adjusted** initial estimate of the Native American student tuition waivers to be granted for FY 2016-17 is $17,452,548, $671,799 lower than the estimate submitted in July. This amount also represents the estimate of the legislative appropriation needed for FY 2017-18. The appropriation increase over the prior year results from increased resident and non-resident Native American enrollment of 2.5% and 2.7% respectively, and an adjustment of the FY 2016-17 appropriation (FY 2015-16 reimbursement) from estimate to actual. As you are aware, the College did not increase non-resident tuition for FY 2011-12, FY 2012-13, FY 2013-14, FY 2014-15, FY 2015-16 or FY 2016-17 in an effort to mitigate the growth in the reimbursement needed.

I will provide revised estimates in February 2017 for the actual FY 2017-18 funding needed. If you have any questions or need additional information, please contact me at (970) 247-7435.

Sincerely,

Michele Peterson
Associate Vice President, Finance and Administration

cc: Amanda Bickel, Joint Budget Committee
        Henry Sobanet, Office of State Planning and Budget
        Alexis Senger, Office of State Planning and Budget
        Dene Kay Thomas, Fort Lewis College
        Steve Schwartz, Fort Lewis College
        Cheryl Wiescamp, Fort Lewis College
        Ed Bowditch, Fort Lewis College

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Cost and FTE

- The Department requests an increase of $44,125 Reappropriated Funds to fund the Western Interstate Commission on Higher Education Professional Student Exchange Program in FY 2017-18.

Current Program

- As a member of the Western Interstate Commission on Higher Education (WICHE), Colorado participates in a reciprocal program called the Professional Student Exchange Program. This student exchange program allows Colorado resident students to pursue professional degrees in optometry at designated out-of-state institutions at a tuition rate comparable to an instate tuition rate through payment of a "support fee" which is appropriated by the Colorado General Assembly.

Problem or Opportunity

- The program has not received an appropriation increase since FY 2007-08. The support fee amount, however, has risen by an average of 2 percent per year since the last appropriation increase in FY 2007-08. This mismatch between available funding and the funding need has resulted in a decreasing number of spots available for qualified students. The current funding level ($399,000) allows for just 22 funded spots based on a support fee amount of $17,425 – leaving the program funding short of the student demand.

Consequences of Problem

- If the appropriation for the Professional Student Exchange Program is not increased, qualified students will be denied access to this program. In 2016-17, five qualified students were eligible to receive funding, but because of the stagnant appropriation, rising support fee amount and cyclical nature of available spots, only two eligible students were accepted into the program.

Proposed Solution

- The Department requests that the Professional Student Exchange Program funding be increased to cover an additional three spots in FY 2017-18 ($44,125) for a total appropriation of $443,125. The appropriation needs to annually increase by 2 percent to keep up with the support fee increase.

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Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

R-4 WICHE PSEP Optometry Restoration

Dept. Approval By: _(signature)_

OSPB Approval By: _____

___	**Supplemental FY 2016-17**
X	**Change Request FY 2017-18**
___	**Budget Amendment FY 2017-18**

Summary Information	Fund	FY 2016-17		FY 2017-18		FY 2018-19
		Initial Appropriation	Supplemental Request	Base Request	Change Request	Continuation
Total of All Line Items Impacted by Change Request	Total	$399,000	$0	$399,000	$44,125	$51,625
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$0	$0	$0	$0	$0
	RF	$399,000	$0	$399,000	$44,125	$51,625
	FF	$0	$0	$0	$0	$0

Line Item Information	Fund	FY 2016-17		FY 2017-18		FY 2018-19
		Initial Appropriation	Supplemental Request	Base Request	Change Request	Continuation
02. Colorado Commission on Higher Education, (C) Special Purpose - WICHE - Optometry	Total	$399,000	$0	$399,000	$44,125	$51,625
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$0	$0	$0	$0	$0
	RF	$399,000	$0	$399,000	$44,125	$51,625
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes ___	No ___	If Yes, see attached fund source detail.	
RF Letternote Text Revision Required	Yes ___	No ___		
FF Letternote Text Revision Required	Yes ___	No ___		

Requires Legislation?   Yes ___   No **X**

Type of Request?   Department of Higher Education Prioritized Request

Interagency Approval or Related Schedule None

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COLORADO
Department of Higher Education

John W. Hickenlooper
Governor

Diane Duffy
Acting Executive Director

FY 2017-18 Funding Request | November 1, 2016

Department Priority: R-4
Request Detail: Professional Student Exchange Program Restoration

Summary of Incremental Funding Change for FY 2017-18	Total Funds	Reappropriated Funds
Professional Student Exchange Program	$44,125	$44,125

The Department of Higher Education requests an increase of $44,125 Reappropriated Funds to fund the WICHE Professional Student Exchange Program in FY 2017-18. This increase would bring the total budget for this program to $443,125 Reappropriated Funds. This request annualizes to $7,500 reappropriated funds in FY 2018-19. This funding increase is necessary to bring the appropriation back in line with pre-recessionary levels and grant full access to the program for qualified students, based on the increasing support fee amount.

Problem or Opportunity:

An increase in the funding for the Professional Student Exchange Program is necessary to ensure that all qualified students have access to professional optometry programs, which are not offered at public Colorado institutions of higher education.

Statutory Requirements

Section 23-1-112, C.R.S. states, "*The Commission shall identify those circumstances where the waiving of the nonresident differential in tuition rates, on a reciprocal basis with other states, would enhance the educational opportunities for Colorado residents*".   The resident/nonresident tuition differential is mitigated via a support fee paid through General Fund appropriation. The support fee amount is negotiated by WICHE with the designated institutions, rising by an average of 2% each year for the past 10 years.

Background

In 1978, the Colorado State General Assembly appropriated funds to assist 10 Colorado residents in their study of optometry at institutions participating in the WICHE Professional Student Exchange Program. In subsequent years, the General Assembly has provided continuation funding for the original students and for additional students each year. Because the State of Colorado does not have a public institution of higher education providing an optometry program, but does have a need for professionals in this field, the WICHE PSEP program is designed to allow Colorado residents to attend one of four participating in-region institutions, at a price comparable to that of resident student attending a state-supported institution. The state of Colorado pays a support fee (dispersed by WICHE) to make the lower price possible. In return for the benefit of a lower price, students must practice optometry in Colorado for the same number of years

they received the support fee or repay the total support fee amount provided at an interest rate equal to the Federal Direct PLUS student loan rate (for 2016-17, rate is 6.31%). According to WICHE's Student Exchange Program Statistical Report AY 2015-16, Colorado has one of the highest return rates of PSEP graduates at 87%.

Because the support fee amount has continued to grow, while the appropriation remained stagnant, the number of students able to participate in the program has steadily declined. The combination of these factors requires an additional $44,125 and a 2% increase annually, in order to offer funded program seats to all qualified students.

The program has not received an appropriation increase since FY 2007-08, however the support fee amount has risen by an average of 2% per year since the last appropriation increase in FY 2007-08. This has resulted in a decreasing number of spots available for qualified students. The current funding level ($399,000) allows for 22 funded spots based on a support fee amount of $17,425. In FY 2007-08, the support fee amount was $14,100, allowing for 28 funded spots in the program.

If the appropriation for the Professional Student Exchange Program is not increased, qualified students will continue to be denied access to this program due to lack of funds at a rate of approximately one spot every two years, assuming the support fee amount continues to increases by 2% every year. In AY 2016-17, five qualified students were eligible to receive funding, but because of the stagnant appropriation, rising support fee amount and cyclical nature of available spots, only two students were funded spots the program.

Proposed Solution:

The proposed solution will restore funding to FY 2013-14 levels, in line with the post-recessionary recovery experienced by many other State-funded departments and programs. The Department requests $443,125 re-appropriated funds in FY 2018, and an additional $7,500 re-appropriated funds in FY 2019, so the Department can pay for the 2% increase in the per student support fee amount. As an ongoing solution, the Department will seek annual increases of 2% in order to bring and keep the funding level more in line with historical precedent.

Anticipated Outcomes:

The mission of the Colorado Department of Higher Education is to improve the quality of, ensure the affordability of, and promote the accessibility of postsecondary education for the people of Colorado. In fully funding PSEP Optometry, the State is promoting access to a professional healthcare education program for which there is no publicly funded in-state alternative, and expanding access to optometric healthcare services across the state.

Assumptions and Calculations:

FY 2016-17 Appropriation	$399,000
FY 2017-18 Total (Request)	$443,125
FY 2017-18 Requested Increase	$44,125

FY 2017-18 Total Annualized	$450,625
FY 2017-18 Annualized Request	$7,500

- Please see Attachment A for the detailed calculations used to arrive at this request.
- Please see Attachment B for the WICHE Memorandum stating the increasing 2017-18 and 2018-19 support fee amounts.
- Please see Attachment C for WICHE's Academic Year 2015-16 Statistical Report on all WICHE Student Exchange Programs.
- Please see Attachment D for evidence of increasing workforce needs for optometric services.

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Attachment A - Detailed Calculations

Year	New students	appropriation and availability)	Graduating	Support Fee Amount	Support Fee	Appropriation	Available
2004-05	5	19	6	$ 11,100.00	-	$ 333,000.00	30
2005-06	4	16.03759398	5	$ 13,300.00	17%	$ 333,000.00	25.03759398
2006-07	12	8.485294118	4	$ 13,600.00	2%	$ 333,000.00	24.48529412
2007-08	7	15.29787234	6	$ 14,100.00	4%	$ 399,000.00	28.29787234
2008-09	5	14.32876712	8	$ 14,600.00	3%	$ 399,000.00	27.32876712
2009-10	6	15.42384106	5	$ 15,100.00	3%	$ 399,000.00	26.42384106
2010-11	5	13.57692308	7	$ 15,600.00	3%	$ 399,000.00	25.57692308
2011-12	12	6.253164557	7	$ 15,800.00	1%	$ 399,000.00	25.25316456
2012-13	3	14.7826087	7	$ 16,100.00	2%	$ 399,000.00	24.7826087
2013-14	5	14.32926829	5	$ 16,400.00	2%	$ 399,000.00	24.32926829
2014-15	7	8.75	8	$ 16,800.00	2%	$ 399,000.00	23.75
2015-16	8	13.33333333	2	$ 17,100.00	2%	$ 399,000.00	23.33333333
2016-17	2	15.89813486	5	$ 17,425.00	2%	$ 399,000.00	22.89813486
2017-18	5	11.51057828	6	$ 17,725.00	2%	$ 399,000.00	22.51057828
2018-19		13.13592233	9	$ 18,025.00	2%	$ 399,000.00	22.13592233

Year	% Change in Support Fee	Annual Increase (if requests were made and granted)	Total Line Item Appropriation (if requests were made and approved)	Possible 2018 Request amount based on back year support fee increases (unmet cost)
2007-08			$ 399,000	$ -
2008-09	3%	$ 13,664	$ 412,664	$ 101,070
2009-10	3%	$ 13,664	$ 426,329	$ 87,405
2010-11	3%	$ 13,664	$ 439,993	$ 73,741
2011-12	1%	$ 5,570	$ 445,563	$ 60,076
2012-13	2%	$ 8,302	$ 453,865	$ 54,507
2013-14	2%	$ 8,302	$ 462,168	$ 46,204
2014-15	2%	$ 11,004	$ 473,171	$ 37,902
2015-16	2%	$ 8,301	$ 481,473	$ 26,898
2016-17	2%	$ 8,980	$ 490,453	$ 18,597
2017-18	2%	$ 9,617	$ 500,070	$ 9,617
2018-19	2%	$ 9,805	$ 509,875	$ 9,805

Request Summary

FY 2016-17 Appropriation	$ 399,000.00
FY 2017-18 Total (Request)	$ 443,125.00
FY 2017-18 Requested Increase	$44,125
FY 2018-19 Total Annualized	$450,625
FY 2018-19 Annualized Request	$7,500

June 1, 2016

MEMORANDUM

TO: Deans, Directors and Department Contacts of Participating
           Professional Student Exchange Programs (PSEP)
          WICHE Certifying Officers and Staff
          Western State Higher Education Executive Officers

CC: WICHE Commissioners
          WICHE Veterinary Medicine Advisory Council

FROM: Jere Mock, Vice President, Programs and Services
          Margo Colalancia, Director, Student Exchange

SUBJECT: **Approved Support Fees for the 2017-18 and 2018-19 Biennium**

A document describing the proposed support fees for the 2017/2018 biennium was transmitted for your review and comment in February. This is to notify you that the WICHE Commission approved the support fee increase as detailed at their May 17th meeting in Laramie, Wyoming. In concert with the 2014-2015 HECA (Higher Education Cost Adjustment) index, the Commission approved 1.7 percent increase for the fields of dentistry, occupational therapy, optometry, osteopathic medicine, pharmacy, physical therapy, physician assistant, and podiatry.

The Commission voted to freeze support fees for the fields of allopathic medicine and veterinary medicine at the 2016-17 rates for the next biennium. Historically, support fees for allopathic medicine and veterinary medicine were set at a higher rate to cover a greater percentage (approximately 60 percent) of nonresident or full private tuition compared to the other fields (less than 40 percent). WICHE states supporting students in these fields believe that higher coverage of nonresident or full private tuition is no longer warranted as competition for admission has recently softened in some of the participating programs and the higher support fees were becoming prohibitive for the states supporting students in these two PSEP programs.

Field	2016-17*	2017-18	2018-19
Dentistry	$25,300	$25,750	$26,175
Allopathic Medicine	32,650	32,650	32,650
Occupational Therapy	13,250	13,475	13,700
Optometry	17,425	17,725	18,025
Osteopathic Medicine	21,650	22,025	22,400
Pharmacy	7,700	7,850	7,975
Physical Therapy	14,575	14,825	15,075
Physician Assistant	17,250	17,550	17,850
Podiatry	15,025	15,275	15,550
Veterinary Medicine	32,400	32,400	32,400

Fees for 2016-17, included for reference, were established by the Commission in May 2014.

Unless noted, the approved support fees are calculated based on standard program length. Adjustments to accommodate accelerated programs or other special circumstances are spelled out in the *Professional Student Exchange Program Manual* which can be accessed online at http://wiche.edu/psep/supp-fees, along with an updated chart of support fee amounts. We suggest you bookmark this site for future reference and keep a copy of this memorandum in your WICHE PSEP files.

REMINDER: New support fees policy for new students enrolling in public programs

PSEP support fees have not been meeting the resident/nonresident tuition differentials of some of our key cooperating programs in public institutions for several years. This is a reminder that programs at participating public institutions that are left with an unmet resident/nonresident tuition differential now have an option to recuperate lost revenues for new PSEP students that enrolled in fall 2013 and later. Prior to this change in policy, all public programs were required to charge a PSEP student resident tuition, even if the support fee did not adequately cover the resident/nonresident tuition differential. Public institutions whose differentials are not met are allowed to credit the support fee against full nonresident tuition and have the new student (that enrolled Fall 2013 or later) pay the balance. This new policy was approved to help programs that have been losing tuition revenues for WICHE students' sake. *Institutions currently benefiting from an incentive (in cases where the support fee and resident tuition exceed a program's nonresident tuition) still keep their incentive.* WICHE also wants to encourage programs where we are meeting tuition differentials to continue preferentially admitting PSEP students over other nonresidents.

We are asking our partnering programs with unmet resident/nonresident tuition differentials to grandfather continuing students through graduation. **Continuing students enrolled prior to fall 2013 should be charged resident tuition** as before, to remain consistent with contracts that the continuing student signed with his or her home state, just prior to enrollment.

Please read further to see how this policy might affect your public program. Be aware that the various cooperating PSEP programs at your institution may be affected differently; the support fee may continue to meet the differentials of some of your programs, but not others.

Scenario: Recouping Unmet Differential

Joe Smith is a PSEP student at Best Western University (BWU) enrolled through PSEP. Consider the following:

BWU nonresident tuition	$63,000
BWU resident tuition	$33,000
Resident/nonresident differential	$30,000
WICHE's PSEP support fee	$28,000
Uncovered difference	**$2,000**

Under the old policy, BWU had to charge Joe the resident tuition of $33,000 and absorb the unmet differential of the remaining $2,000. From AY 2013 forward, BWU can bill Joe for resident tuition ($33,000) and the unmet differential ($2,000) for a total of $35,000. Put more simply, the program can charge Joe nonresident tuition minus the support fee, and Joe will pay the balance:

BWU nonresident tuition	$63,000
WICHE's support fee for dentistry	- $28,000
WICHE Student balance for tuition	**$35,000**

Public programs are *not required* to charge the full differential to the student, but they have the option to do so.

WICHE certifying officers notify all WICHE certified applicants about the change, but if you are a public institution, we encourage you to remind your new WICHE students of this as well. Most WICHE state offices also required PSEP applicants to sign a statement of understanding that notes they are aware of the change, and that if they enrolled in a public program from fall 2013 or later, they may be charged more than resident tuition if the support fee does not cover the enrolling institution's resident/nonresident tuition differential.

Please contact Margo Colalancia at 303.541.0214 or mcolalancia@wiche.edu for more information.

Thank you for all you do for our WICHE students!

WICHE

ALASKA

ARIZONA

CALIFORNIA

COLORADO

COMMONWEALTH OF THE
NORTHERN MARIANA ISLANDS

HAWAI'I

IDAHO

MONTANA

NEVADA

NEW MEXICO

NORTH DAKOTA

OREGON

SOUTH DAKOTA

UTAH

WASHINGTON

WYOMING

www.wiche.edu/sep

Statistical Report
Academic Year 2015-16

Student Exchange Program

Coordinated by the
Western Interstate Commission for Higher Education

Table of Contents

Governors of Western states have long understood that **collaboration** is the only sustainable and affordable means for the West to have an educated workforce, a healthy population, and a robust regional economy. In 2016, the Western Interstate Commission for Higher Education (WICHE) celebrates its 65th anniversary. WICHE's Student Exchange Program (www.wiche.edu/sep) has significantly contributed to building the region's workforce and strengthening the economy since November 1951 when Western governors committed to share higher education resources on an interstate basis by signing the Western Regional Education Compact. As a result, public institutions maximize their resources by filling available capacity and reducing unnecessary duplication of programs. Regional partnerships facilitate the creation of programs in emerging fields and high workforce need areas. Highly specialized programs remain robust and attract the West's best and brightest students. Students' learning is enriched by the sharing of diverse perspectives – both geographic and ethnic.

Figure 1. Percent Change in High School Graduates (projected) by State, 2014-15 to 2019-20

Decline ▮▮▮▯▯▯ Growth
-15% or less / -15 to -5 / -5 to 0 / 0 to 5 / 5 to 15 / 15% or more

Source: Western Interstate Commission for Higher Education, *Knocking at the College Door: Projections of High School Graduates* (eighth edition). Boulder, CO: WICHE, 2012, available at www.wiche.edu/knocking.

> **"The miracle is this:**
> **the more we share, the more we have."**
> *– Leonard Nimoy*

The map on this page (Figure 1) illustrates how regional exchanges are an important tool in growing an educated workforce, particularly in the West, where some states are growing quickly while others have shrinking populations. Helping students migrate between states that face differing enrollment challenges provides a flexible, state-responsive solution.

Through the Western Undergraduate Exchange (WUE), the Western Regional Graduate Program (WRGP), and the Professional Student Exchange Program (PSEP), more than 37,700 residents of 15 Western states and the Commonwealth of the Northern Mariana Islands are currently enrolled at reduced levels of tuition in a variety of undergraduate, graduate, and professional programs. This year WUE helped 35,632 students and their families save an estimated $308.8 million by paying 150 percent of resident tuition – instead of the full nonresident rate – at some 160 participating WUE institutions. In fall 2015 1,439 graduate students enrolled in master's, doctoral, and graduate certificate programs of study through WRGP and saved an estimated $21.1 million. They pay resident tuition instead of nonresident and can choose from more than 380 participating programs at 60 institutions. Finally, some 650 students preparing for their professional degree in 10 healthcare professions paid significantly reduced tuition while enrolled through WICHE's PSEP.

This report covers fall 2015 enrollments for WUE, WRGP, and PSEP and details the funds that flow between students' home states and the enrolling PSEP institutions that receive them.

> *WICHE's Interstate Passport Initiative facilitates student completion of baccalaureate degrees. Passport students transfer more easily, especially across state lines, and do not have to repeat lower-division general education requirements. Learn more on pages 24 and 33.*
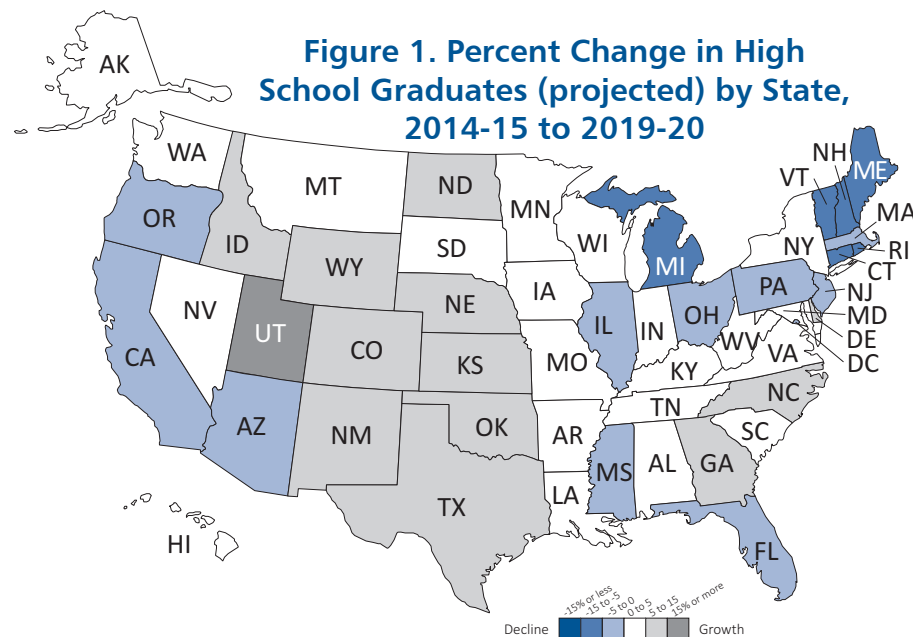
If you've had an appointment with your doctor or dentist, taken your dog or cat to the veterinarian, or had your eyes examined by an optometrist in the last few months, chances are good that one or more of your providers or one of their colleagues received their professional healthcare degree through WICHE's Professional Student Exchange Program (PSEP; www.wiche.edu/psep). WICHE has provided Western residents with affordable access to professional education through PSEP since the 1950s. Some 15,000 professionals have received their education through PSEP, most in the healthcare professions. They include dentists, occupational therapists, optometrists, pharmacists, physical therapists, physician assistants, physicians (allopathic and osteopathic), podiatrists, and veterinarians.

Healthcare workers of all kinds continue to be in high demand, especially in the West's chronically underserved rural areas. Educating more healthcare professionals is crucial, but given fiscal pressures and other factors, it doesn't always make sense for a state to create its own program in certain healthcare professions. State policymakers who are looking for the smartest investment of limited public funds to educate future practitioners understand that sharing educational resources within the West is a fiscally responsible approach. Our graduate return rate survey demonstrates that states participating in PSEP get an exceptional return on their investment when they appropriate funds to educate students in the healthcare professions at other institutions within the WICHE region.

Students enrolled through WICHE's PSEP pay reduced tuition at out-of-state public and private institutions. The student's home state legislature appropriates funds to buy down tuition costs in selected healthcare fields. Those funds are administered through WICHE and are sent directly to the enrolling institutions as a "support fee". The support fees for each professional field are negotiated biannually between WICHE and the cooperating programs.

Table 1. Institution and Program Totals, 2015-16

Number of Institutions		Number of Programs	
Within WICHE region		Within WICHE region	
Public	29	Public	62
Private	19	Private	60
Outside WICHE region		Outside WICHE region	
Public	2	Public	2
Private	3	Private	3
TOTAL INSTITUTIONS	**53**	**TOTAL PROGRAMS**	**127**

Table 2. Summary of Enrollments and Support Fees, by Profession

Professional Field	2014-15		2015-16		2016-17
	Number of Students	Support Fee Rate per Student	Number of Students	Support Fee Rate per Student	Approved Support Fee Rate
Group A Fields					
Dentistry	123	$24,400	127	$24,850	$25,300
Medicine	32	31,500	31	32,070	32,650
Occupational Therapy	33	12,800	30	13,050	13,250
Optometry	129	16,800	135	17,100	17,425
Osteopathic Medicine	54	20,900	57	21,300	21,650
Physical Therapy	46	14,055	46	14,300	14,575
Physician Assistant	16	16,667	12	17,000	17,250
Podiatry	21	14,500	23	14,770	15,025
Veterinary Medicine	182	31,300	170	31,900	32,400
Group B Field					
Pharmacy	21	7,400	17	7,525	7,700
Total Students	**657**		**648**		
Total Support Fees Paid		**$14,743,861**		**$14,666,391**	

Table 3. Student and Support Fee Totals, by State, 2015-16

State	Number of Students Sent	Total Fees Paid	Number of Students Received			Total Fees Received by Enrolling Institutions		
			Public	Private	Total	Public	Private	Total
Alaska	17	$282,900	0	0	0	$0	$0	$0
Arizona	169	3,888,102	3	147	150	96,210	2,679,803	2,776,013
California	0	0	12	81	93	319,370	1,513,840	1,833,210
CNMI	0	0	0	0	0	0	0	0
Colorado	23	393,300	164	13	177	4,881,207	220,900	5,102,107
Hawai'i	49	981,633	1	0	1	32,070	0	32,070
Idaho	0	0	1	0	1	17,000	0	17,000
Montana	81	2,260,980	4	0	4	50,425	0	50,425
Nevada	36	715,072	2	11	13	64,140	158,065	222,205
New Mexico	79	2,189,983	3	0	3	49,100	0	49,100
North Dakota	41	859,488	17	0	17	407,610	0	407,610
Oregon	0	0	25	64	89	732,185	1,042,916	1,775,101
South Dakota	0	0	2	0	2	0	0	0
Utah	44	667,513	2	0	2	30,050	0	30,050
Washington	0	0	60	9	69	1,562,150	161,650	1,723,800
Wyoming	109	2,427,420	0	0	0	0	0	0
Out of Region	n/a	n/a	9	18	27	215,900	431,800	647,700
TOTALS	648	$14,666,391	305	343	648	$8,457,417	$6,208,974	$14,666,391
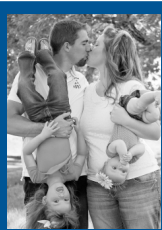
"I am immensely grateful for the assistance I have received from WICHE's PSEP! It has allowed me to focus on my studies and has relieved me of financial burdens that would have required me to consider a different career. I plan to return to my home state of Wyoming and practice family medicine. Without Wyoming's participation in PSEP, I probably would have been steered to a more lucrative specialty in order to pay back high student debt."

– Christopher, Wyoming resident, Class of 2016, University of Nevada, School of Medicine

Table 4. Enrollment and Support Fees, by Profession, 2015-16

Sending State	Dentistry	Medicine	Occupational Therapy	Optometry	Osteopathic Medicine	Pharmacy	Physical Therapy	Physician Assistant	Podiatry	Veterinary Medicine	TOTALS
Alaska	7 $165,667			2 $34,200		5 $40,133	3 $42,900				17 $282,900
Arizona	42 1,060,266		15 164,865	23 393,300	43 868,561			1 17,000	3 44,310	42 1,339,800	169 $3,888,102
California											0 $0
Colorado				23 393,300							23 $393,300
CNMI											0 $0
Hawai'i	8 207,083		4 47,850	14 239,400			14 200,200			9 287,100	49 $981,633
Idaho											0 $0
Montana	8 198,800	24 737,610	5 60,900	4 68,400	6 127,800				1 14,770	33 1,052,700	81 $2,260,980
Nevada				5 85,500		12 112,872		6 102,000		13 414,700	36 $715,072
New Mexico	48 1,201,083									31 988,900	79 $2,189,983
North Dakota	9 223,650			25 412,538						7 223,300	41 $859,488
Oregon											0 $0
South Dakota											0 $0
Utah				26 427,500					18 240,013		44 $667,513
Washington											0 $0
Wyoming	5 124,250	7 213,800	6 87,000	13 222,300	8 149,100		29 414,700	5 85,000	1 14,770	35 1,116,500	109 $2,427,420
TOTALS	127 $3,180,799	31 $951,410	30 $360,615	135 $2,276,438	57 $1,145,461	17 $153,005	46 $657,800	12 $204,000	23 $313,863	170 $5,423,000	648 $14,666,391

Table 5. Student Distribution and Support Fee Payments, by Profession, 2015-16

DENTISTRY

Sending State	ATSU	MDWST	LLU	UCLA	UCSF	UOP	USC	WUHS	COLO	UNLV	OHSU	WASH	Out of Region	Total Number Students	Total Fees Paid by Sending State
Alaska							1		6					7	$165,667
Arizona	9	17	1	1	1	2			8		1	2		42	1,060,266
Hawai'i						1	2		1		1	3		8	207,083
Montana	1								2		2	3		8	198,800
New Mexico	5	5				1			17		1		19	48	1,201,083
North Dakota		1							3		1		4	9	223,650
Wyoming									3		1		1	5	124,250
TOTALS	15	23	1	1	1	4	2	1	40	0	6	9	24	127	$3,180,799

MEDICINE

Sending State	AZ-TUC	AZ-PHX	LLU	STAN	UCB/SF	UCD	UCI	UCLA	UCSD	UCSF	USC	COLO	HAW	NEV	UNM	UND	OHSU	UTAH	Total Number Students	Total Fees Paid by Sending State
Montana		2	3						1	1		2	1	1		6	7		24	$737,610
Wyoming	1											2		1		2	1		7	213,800
TOTALS	1	2	3	0	0	0	0	0	1	1	0	4	1	2	0	8	8	0	31	$951,410

* See Table 6, pp. 9-12, for full names of institutions.

"WICHE's PSEP has helped me in my quest to become a dentist. Without it, my debt burden upon graduation would be significantly higher. I will be forever grateful to the State of New Mexico and WICHE for giving me this opportunity and helping me realize my dream. Upon graduation, I am planning to practice dentistry in New Mexico, and this program has made it feasible to do just that. Thank you, WICHE!"

– Silas, New Mexico resident, Class of 2017, A.T. Still University, Dentistry

Table 5. Student Distribution and Support Fee Payments, by Profession, 2015-16 (continued)

OCCUPATIONAL THERAPY

Sending State	Receiving Schools*																Total Number Students	Total Fees Paid by Sending State
	ATSU	MDWST	LLU	SMU	USC	ISU	TOURO-NV	UNM	WNMU	UND	PACU	USD	UTAH	EWU	UPS	WASH		
Alaska																	0	$0
Arizona	9	3						1			1				1		15	164,865
Hawai'i											1			2		1	4	47,850
Montana											2	1	1	1			5	60,900
Wyoming									1	3		1		1			6	87,000
TOTALS	9	3	0	0	0	0	0	1	1	3	4	2	1	2	3	1	30	$360,615

OPTOMETRY

Sending State	Receiving Schools*				Out of Region	Total Number Students	Total Fees Paid by Sending State
	MDWST	MBKU	WUHS	PACU			
Alaska				2		2	$34,200
Arizona	10	6	4	3		23	393,300
Colorado	5	3	2	10	3	23	393,300
Hawai'i		6	1	7		14	239,400
Montana				4		4	68,400
Nevada	1	2		2		5	85,500
North Dakota	8	3	2	12		25	412,538
Utah	12	8	1	5		26	427,500
Wyoming		5	1	7		13	222,300
TOTALS	36	33	11	52	3	135	$2,276,438

"Pacific University in Oregon is one of seven schools that now offer a doctoral degree in occupational therapy. I was immediately drawn to its prestige, diversity, and holistic approach to health practices. Once I was accepted into the program, the only set-back I faced was the cost. I'm from Montana, and private tuition is a big financial commitment for a three-year program. When I heard that WICHE's PSEP would reduce my tuition, I was elated. It's helped me think less about financial burdens and focus solely on the great education I'm getting. I wouldn't be able to do this without Montana's participation in PSEP. Thank you for helping me to pursue my dream!"

– Emmi, Montana resident, Class of 2018, Pacific University, Occupational Therapy

* See Table 6, pp. 9-12, for full names of institutions.

Table 5. Student Distribution and Support Fee Payments, by Profession, 2015-16 (continued)

OSTEOPATHIC MEDICINE

Sending State	Receiving Schools* ATSU MESA	MDWST	TOURO-CA	WUHS	RVU	TOURO-NV	PNWU	Total Number Students	Total Fees Paid by Sending State
Arizona	6	27	1	5	2	2		43	$868,561
Montana	1	1		2	1		1	6	127,800
Wyoming	1			2	2		3	8	149,100
TOTALS	8	28	1	9	5	2	4	57	$1,145,461

"I'm a Nevada resident and there's no public pharmacy school in my home state. I'm the first person in my family to attend professional school and a first-generation college graduate. Thanks to WICHE's PSEP, I was able to enroll in Washington State University's (WSU) College of Pharmacy and pay reduced tuition. Thank you to the State of Nevada for their participation in WICHE's PSEP, and for the opportunity to receive a great education at WSU! Washington has some innovative health care initiatives, and I look forward to bringing back what I learned to Nevada's public health system, to help those who are in need."

– Pierce, Nevada resident, Class of 2017, Washington State University, School of Pharmacy

PHARMACY

Sending State	ARIZ	MDWST	UCSF	UCSD	UOP	USC	WUHS	COLO	UH HILO	ISU	MONT	RUHS	UNM	NDSU	OSU	PACU	WASH	WSU	WYO	Total Number Students	Total Fees Paid by Sending State
Alaska		1									1				1		1	1		5	$40,133
Nevada		3										5				2		2		12	112,872
TOTALS	0	4	0	0	0	0	0	0	0	0	1	5	0	0	1	2	1	3	0	17	$153,005

PHYSICAL THERAPY

Sending State	ATSU	MDWST	CSF	CHAP	LLU	MSMU	SMU	UCSF/SFSU	UOP	USC	WUHS	COLO	REGIS	ISU	MONT	TOURO-NV	UNLV	UNM	UND	PACU	UTAH	UPS	EWU	WASH	Total Number Students	Total Fees Paid by Sending State
Alaska											1												2		3	$42,900
Hawai'i	2			3				1		2	1		2					1		1			1		14	200,200
Wyoming	1	2										2	6		3	1			6	5		2		1	29	414,700
TOTALS	3	2	0	3	0	0	0	1	0	2	2	2	8	0	3	1	0	1	6	6	0	2	3	1	46	$657,800

* See Table 6, pp. 9-12, for full names of institutions.

Professional Student Exchange Program

Table 5. Student Distribution and Support Fee Payments, by Profession, 2015-16 (continued)

PHYSICIAN ASSISTANT

Sending State	ATSU	MDWST	LLU	SMU	TOURO-CA	USC	WUHS	COLO	RRCC	ISU	TOURO-NV	PACU	OHSU	UTAH	WASH	Total Number Students	Total Fees Paid by Sending State
Alaska																0	$0
Arizona	1															1	17,000
Nevada											3			1	2	6	102,000
Wyoming							1	1		1					2	5	85,000
TOTALS	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**3**	**0**	**0**	**1**	**4**	**12**	**$204,000**

PODIATRY

Sending State	MDWST	SMU	WUHS	Total Number Students	Total Fees Paid by Sending State
Alaska				0	$0
Arizona	2		1	3	44,310
Montana	1			1	14,770
Utah	11	7		18	240,013
Wyoming	1			1	14,770
TOTALS	**15**	**7**	**1**	**23**	**$313,863**

VETERINARY MEDICINE

Sending State	UCD	WUHS	CSU	OSU	WSU	Total Number Students	Total Fees Paid by Sending State
Arizona	2		30	5	5	42	$1,339,800
Hawai'i	2		5		2	9	287,100
Montana	1		25	2	5	33	1,052,700
Nevada			8	2	3	13	414,700
New Mexico	1		26		4	31	988,900
North Dakota			6		1	7	223,300
Wyoming	1		17	1	16	35	1,116,500
TOTALS	**7**	**0**	**117**	**10**	**36**	**170**	**$5,423,000**

"My home state of Arizona doesn't have a public veterinary program. Out-of-state student loan debt can be crippling, but thanks to Arizona's participation in WICHE's PSEP, I was able to choose the best program for me – Oregon State University – and have the assurance that my financial obligations after graduation won't ruin my career goals or my future lifestyle. WICHE's PSEP has given me the confidence and support necessary to succeed as I prepare for the challenging, and rewarding journey ahead."

– Chase, Arizona resident, Class of 2019, Oregon State University, College of Veterinary Medicine

"WICHE's PSEP program has been instrumental in allowing me to pursue my biggest dream yet: becoming an optometrist. It's no secret that professional school is an expensive undertaking, but North Dakota's assistance through PSEP has helped immensely in alleviating this financial burden. I'm now able to fully focus on my studies, rather than being preoccupied by debt. When our legislators choose to continue PSEP support, they are choosing to invest in the future of quality medical care for our entire state. It's my sincere hope that this program will continue, so that a quality professional education is within arm's reach for future healthcare professionals."

– Casey, North Dakota resident, Class of 2016, Pacific University, College of Optometry

* See Table 6 or www.wiche.edu/psep for full names of institutions.

Table 6. Receipt of Support Fees, by State and Institution, 2015-16

ARIZONA

Institution	Number of Students	Support Fees by Field
PUBLIC		
University of Arizona, Phoenix (ARIZ-PHX)		
Medicine	2	$64,140
Institution Total	2	$64,140
University of Arizona, Tucson (ARIZ-TUC)		
Medicine	1	$32,070
Pharmacy	0	0
Institution Total	1	$32,070
Public Institution Total	**3**	**$96,210**
PRIVATE		
A.T. Still University Mesa Campus (ATSU MESA)		
Dentistry	15	$372,750
Occupational Therapy	9	103,965
Osteopathic Medicine	8	133,711
Physical Therapy	3	42,900
Physician Assistant	1	17,000
Institution Total	36	$670,326
Midwestern University (MDWST)		
Dentistry	23	$571,550
Occupational Therapy	3	13,050
Optometry	36	598,500
Osteopathic Medicine	28	564,450
Pharmacy	4	37,624
Physical Therapy	2	28,6000
Physician Assistant	0	0
Podiatry	15	195,703
Institution Total	111	$2,009,477
Private Institution Total	**147**	**$2,679,803**
ARIZONA TOTAL	**150**	**$2,776,013**

CALIFORNIA

Institution	Number of Students	Support Fees by Field
PUBLIC		
California State University, Fresno (CSF)		
Physical Therapy	0	$0
Institution Total	0	$0
University of California, Davis (UCD)		
Medicine	0	$0
Veterinary Medicine	7	223,300
Institution Total	7	$223,300
University of California, Irvine (UCI)		
Medicine	0	$0
Institution Total	0	$0
University of California, Los Angeles (UCLA)		
Dentistry	1	$24,850
Medicine	0	0
Institution Total	1	$24,850
University of California, San Diego (UCSD)		
Medicine	1	$0
Pharmacy	0	0
Institution Total	1	$0
University of California, San Francisco (UCSF)		
Dentistry	1	$24,850
Medicine (UCSF)	1	32,070
Pharmacy	0	0
Physical Therapy (UCSF/SFSU)	1	14,300
Institution Total	3	$71,220
Public Institution Total	**12**	**$319,370**

CALIFORNIA (continued)

Institution	Number of Students	Support Fees by Field
PRIVATE		
Chapman University (CHAP)		
Physical Therapy	3	$42,900
Institution Total	3	$42,900
Loma Linda University (LLU)		
Dentistry	1	$24,850
Medicine	3	96,210
Occupational Therapy	0	0
Physical Therapy	0	0
Physician Assistant	0	0
Institution Total	4	$121,060
Marshall B. Ketchum University (MBKU)		
Optometry	33	$564,300
Institution Total	33	$564,300
Mount St. Mary's University (MSMU)		
Physical Therapy	0	$0
Institution Total	0	$0
Samuel Merritt University (SMU)		
Occupational Therapy	0	$0
Physical Therapy	0	0
Physician Assistant	0	0
Podiatry	7	103,390
Institution Total	7	$103,390
Stanford University (STAN)		
Medicine	0	$0
Institution Total	0	$0
Touro University - California (TOURO-CA)		
Osteopathic Medicine	1	$21,300
Physician Assistant	0	0
Institution Total	1	$21,300

Table 6. Receipt of Support Fees by State and Institution, 2015-16 (continued)

CALIFORNIA (continued)

Institution	Number of Students	Support Fees by Field
University of the Pacific (UOP)		
Dentistry	4	$132,532
Pharmacy	0	0
Physical Therapy	0	0
Institution Total	4	$132,532
University of Southern California (USC)		
Dentistry	2	$49,700
Medicine	0	0
Occupational Therapy	0	0
Pharmacy	0	0
Physical Therapy	2	28,600
Physician Assistant	0	0
Institution Total	4	$78,300
Western University of Health Sciences (WUHS)		
Dentistry	1	$24,850
Optometry	11	173,138
Osteopathic Medicine	9	191,700
Pharmacy	0	0
Physical Therapy	2	28,600
Physician Assistant	1	17,000
Podiatry	1	14,700
Veterinary Medicine	0	0
Institution Total	25	$450,058
Private Institution Total	81	$1,513,840
CALIFORNIA TOTAL	**93**	**$1,833,210**

COLORADO

Institution	Number of Students	Support Fees by Field
PUBLIC		
Colorado State University (CSU)		
Veterinary Medicine	117	$3,732,300
Institution Total	117	$3,732,300
Red Rocks Community College (RRCC)		
Physician Assistant	0	$0
Institution Total	0	$0
University of Colorado Denver (COLO)		
Dentistry	40	$985,717
Medicine	4	117,590
Pharmacy	0	0
Physical Therapy	2	28,600
Physician Assistant	1	17,000
Institution Total	47	$1,148,907
Public Institution Total	**164**	**$4,881,207**
PRIVATE		
Regis University (REGIS)		
Physical Therapy	8	$114,400
Institution Total	8	$114,400
Rocky Vista University (RVU)		
Osteopathic Medicine	5	$106,500
Institution Total	5	$106,500
Private Institution Total	**13**	**$220,900**
COLORADO TOTAL	**177**	**$5,102,107**

HAWAI'I

Institution	Number of Students	Support Fees by Field
University of Hawai'i at Manoa (HAW)		
Medicine	1	$32,070
Institution Total	1	$32,070
University of Hawai'i at Hilo (HI-HILO)		
Pharmacy	0	0
Institution Total	0	$0
HAWAI'I TOTAL	**1**	**$32,070**

IDAHO

Institution	Number of Students	Support Fees by Field
Idaho State University (ISU)		
Occupational Therapy	0	$0
Pharmacy	0	0
Physical Therapy	0	0
Physician Assistant	1	17,000
Institution Total	1	$17,000
IDAHO TOTAL	**1**	**$17,000**

MONTANA

Institution	Number of Students	Support Fees by Field
University of Montana (MONT)		
Pharmacy	1	$7,525
Physical Therapy	3	42,900
Institution Total	4	$50,425
MONTANA TOTAL	**4**	**$50,425**

Table 6. Receipt of Support Fees by State and Institution, 2015-16 (continued)

NEVADA		
Institution	Number of Students	Support Fees by Field
PUBLIC		
University of Nevada, Las Vegas (UNLV)		
Dentistry	0	$0
Physical Therapy	0	$0
Institution Total	0	$0
University of Nevada, Reno (NEV)		
Medicine	2	$64,140
Institution Total	2	$64,140
Public Institution Total	2	$64,140
PRIVATE		
Roseman University of Health Sciences (RUHS)		
Pharmacy	5	$50,165
Institution Total	5	$50,165
Touro University, Nevada (TOURO-NV)		
Occupational Therapy	0	$0
Osteopathic Medicine	2	42,600
Physical Therapy	1	14,300
Physician Assistant	3	51,000
Institution Total	6	$107,900
Private Institution Total	11	$158,065
NEVADA TOTAL	13	$222,205

NEW MEXICO		
University of New Mexico (UNM)		
Medicine	0	$0
Occupational Therapy	1	13,050
Pharmacy	0	0
Physical Therapy	1	14,300
Institution Total	2	$27,350

NEW MEXICO (continued)		
Institution	Number of Students	Support Fees by Field
Western New Mexico University (WNMU)		
Occupational Therapy	1	$21,750
Institution Total	1	$21,750
NEW MEXICO TOTAL	3	$49,100

NORTH DAKOTA		
North Dakota State University (NDSU)		
Pharmacy	0	$0
Institution Total	0	$0
University of North Dakota (UND)		
Medicine	8	$256,560
Occupational Therapy	3	65,250
Physical Therapy	6	85,800
Institution Total	17	$407,610
NORTH DAKOTA TOTAL	17	$407,610

OREGON		
PUBLIC		
Oregon Health & Science University (OHSU)		
Dentistry	6	$149,100
Medicine	8	256,560
Physician Assistant	0	0
Institution Total	14	$405,660
Oregon State University (OSU)		
Pharmacy	1	$7,525
Veterinary Medicine	10	319,000
Institution Total	11	$326,525
Public Institution Total	25	$732,185

OREGON (continued)		
Institution	Number of Students	Support Fees by Field
PRIVATE		
Pacific University (PACU)		
Occupational Therapy	4	$47,850
Optometry	52	889,200
Pharmacy	2	20,066
Physical Therapy	6	85,800
Physician Assistant	0	0
Institution Total	64	$1,042,916
Private Institution Total	64	$1,042,916
OREGON TOTAL	89	$1,775,101

SOUTH DAKOTA		
University of South Dakota (USD)		
Occupational Therapy	2	$0
Institution Total	2	0
SOUTH DAKOTA TOTAL	2	$0

UTAH		
University of Utah (UTAH)		
Medicine	0	$0
Occupational Therapy	1	13,050
Physical Therapy	0	0
Physician Assistant	1	17,000
Institution Total	2	$30,050
UTAH TOTAL	2	$30,050

Table 6. Receipt of Support Fees by State and Institution, 2015-16 (continued)

WASHINGTON

Institution	Number of Students	Support Fees by Field
PUBLIC		
Eastern Washington University (EWU)		
Occupational Therapy	2	$13,050
Physical Therapy	3	42,900
Institution Total	5	$55,950
University of Washington (WASH)		
Dentistry	9	$223,650
Occupational Therapy	1	21,750
Pharmacy	1	7,525
Physical Therapy	1	14,300
Physician Assistant	4	68,000
Institution Total	16	$335,225
Washington State University (WSU)		
Pharmacy	3	$22,575
Veterinary Medicine	36	1,148,400
Institution Total	39	$1,170,975
Public Institution Total	**60**	**$1,562,150**
PRIVATE		
Pacific Northwest University of Health Sciences (PNWU)		
Osteopathic Medicine	4	$85,200
Institution Total	4	$85,200
University of Puget Sound (UPS)		
Occupational Therapy	3	$47,850
Physical Therapy	2	28,600
Institution Total	5	$76,450
Private Institution Total	**9**	**$161,650**
WASHINGTON TOTAL	**69**	**$1,723,800**

WYOMING

Institution	Number of Students	Support Fees by Field
University of Wyoming (WYO)		
Pharmacy	0	$0
Institution Total	0	$0
WYOMING TOTAL	**0**	**$0**

OUT OF REGION

Institution	Number of Students	Support Fees by Field
PUBLIC		
University of Missouri-Kansas City (UMKC), MO		
Dentistry	8	$198,800
Institution total	8	$198,800
Northeastern State University (NSU), OK		
Optometry	1	$17,100
Institution Total	1	$17,100
Public Institution Total	**9**	**$215,900**
PRIVATE		
Creighton University (CREI), NE		
Dentistry	15	$375,750
Institution Total	15	$375,750
Marquette University (MARQ), WI		
Dentistry	1	$24,850
Institution Total	1	$24,850
Salus University (SALUS), PA		
Optometry	2	$34,200
Institution Total	2	$34,200
Private Institution Total	**18**	**$431,800**
OUT OF REGION TOTAL	**27**	**$647,700**
TOTAL	**648**	**$14,666,391**

"WICHE's PSEP has been a huge blessing in my life. I am from Hawai'i, where there are no occupational therapy programs. It was encouraging that the State of Hawai'i was offering financial help because of my unique situation. I am very grateful for the affordable access to the educational experience that has prepared me for my future career. Thank you so much!"

– Leslie, Hawai'i resident, Class of 2016, University of Washington, Occupational Therapy

"I am currently studying medicine at Rocky Vista University. I am so excited to receive WICHE support thanks to PSEP. At the time I was accepted to medical school, my wife and I found out that she was pregnant with our first child. With no income, it would mean massive student loans. We'd done our best to save, but it just wasn't enough. Thanks to the WICHE program, we'll be able to stretch our budget and savings to cover at least two of the four years. Truly incredible! This is a wonderful program and I am grateful for the Arizona state legislature's support. I look forward to returning to my home state of Arizona to practice and serve in the communities there. Thank you again!"

– Zeke, Arizona resident, Class of 2019 Rocky Vista University, College of Osteopathic Medicine

Table 7. New and Continuing Students, by Gender and Race/Ethnicity, 2015-16

State	Total	Gender		Race/Ethnicity					
		Male	Female	AA	BL	LA	NA	WH	UK
Alaska	17	3	14						17
Arizona	169	71	98	8	1	7	1	74	78
Colorado	23	9	14	3	1			15	4
Hawai'i	49	20	29	33				4	12
Montana	81	23	58					80	1
Nevada	36	14	22	1					35
New Mexico	79	37	42	5	1	13	2	56	2
North Dakota	41	14	27					41	
Utah	44	41	3	3		2		35	4
Wyoming	109	42	67		1	2	1	102	3
TOTAL	**648**	**274**	**374**	**53**	**4**	**24**	**4**	**407**	**156**

NOTE: Abbreviations: AA = Asian American; BL = black; LA = Latino/a; NA = Native American; WH = white; UK = unknown. Race/ethnicity information is self-reported by applicants for state certification.

"New Mexico does not have a dental school and out-of-state tuition can be very high. The ability to attend Creighton's School of Dentistry at a reduced cost through WICHE's PSEP has decreased the stress of student debt and allowed me to focus on my education. The experiences I've had in school have also given me an appreciation for community involvement. One of the most rewarding experiences was the presentation I gave for the Student Clinicians of the American Dental Association (ADA) at the national convention in San Antonio. Thank you to New Mexico and the PSEP program for helping me achieve success in dental school."

— Gavin, New Mexico resident, Class of 2017, Creighton University, Dentistry

"I was always on the fence when it came to seeking a higher education, until my wife and I decided to bite the bullet and pursue the career that I am passionate about: physical therapy. My family and I had just moved to Arizona when I decided to attend undergraduate school. Then I found out that Northland Pioneer College (NPC) participates in WUE. WUE saved me from paying out-of-state tuition and has been an excellent program to jump start my career path to becoming a physical therapist. And, I now serve as one of the main contacts for the WUE program for NPC!"

— Morgan, Utah resident, Class of 2015, Northland Pioneer College, Pre-Physical Therapy Studies

"I'm originally from South Dakota and the first in my family to enroll in college. For my master's at Utah State University, I qualified for in-state tuition for the first time in my academic career, thanks to WRGP! I am currently a preschool teacher for deaf children in Utah, and I love my job!"

— Brynn, South Dakota resident, Class of 2015, Utah State University, Bilingual-Bicultural Deaf Education

Return Rates of WICHE PSEP Graduates, 2002-2011

WICHE states' return rates have improved considerably since last measured. In fall 2012, states that supported students through the Professional Student Exchange Program (PSEP) collected return rate data on their PSEP graduates. The average return rate for all reporting WICHE states is now 68 percent (up from 59 percent in 2006). Return rates for payback states (those where students are required to return and practice or pay back their state PSEP support) are still the highest, now averaging 85 percent and ranging as high as 89 percent, depending on the state and the profession. Return rates for honor system states have improved, too. They now average 52 percent, compared to only 39 percent in 2006.

During the period for which data was collected, five states contractually required their PSEP graduates to return and serve their home state residents: Arizona, Colorado, New Mexico, Nevada, and Washington (these are the "contractual payback states" listed in Table 8). Alaska, Hawai'i, Idaho, Montana, North Dakota, Utah, and Wyoming are listed as "honor system states": they encourage their graduates to return to their home state but do not contractually require them to do so. Effective Fall 2013, Wyoming implemented a service payback requirement for new students in all healthcare professions except veterinary medicine. The State of Hawai'i has implemented a non-contractual return of service requirement. Alaska's participation in PSEP remains distinctive: to make the benefits of PSEP available to its residents in the absence of state funding, Alaska treats the support fee as a loan to each PSEP student. Graduates must repay the loan, whether or not they return to Alaska.

Given the increased reliability of data, WICHE asked states to collect the return rate data over a 10-year period for the majority of the healthcare professions. Table 8 gives a "snapshot" in time of PSEP alumni who graduated between 2002 and 2011 and who were licensed or practicing in their home state as of 2012. Graduates who had fulfilled their practice obligations in their home state earlier were also counted as returned. Our return rates are conservative; payback states that measure return rates over a longer timeframe will demonstrate higher return rates than shown in our calculations. This is especially true for fields where graduates may be completing a residency, internship, or clinical experience, or may be on deferment for other reasons, though they will ultimately return to serve their state at a later date.

Allopathic and osteopathic medicine graduates are required to complete three- to four-year residencies. For these professions WICHE counted PSEP alumni who graduated between 2002 and 2006, in order to allow time for them to complete their residencies and set up practice in their home state.

We hope this information will prompt our member states to consider:

• Establishing a service payback requirement if your state does not currently require one. Although there is an administrative cost to tracking graduates, it may be in the state's best interest to build its healthcare workforce.

• Creating or increasing rural or underserved incentives, such as loan repayment programs that make it affordable for newly graduated healthcare professionals to live and work in these areas.

• Using repayment monies paid by nonreturning graduates to fund loan repayment incentives for graduates who return to their home state to practice in rural and underserved areas (for states with service payback requirements).

Policies for student eligibility and graduate service payback requirements vary by WICHE state. To learn more, see the appendices in our updated PSEP Administrative Manual, available online at www.wiche.edu/info/publications/PSEP_adminManual.pdf.

For any questions you might have about WICHE PSEP return rate data, please call WICHE's Student Exchange Program director at 303.541.0214.

Table 8. Return Rates of PSEP Graduates, by State and Profession
5-year D.O. and M.D. Rates (2002-06) and 10-year Rates for All Other Professions (2002-11)

	Total Number Students	Number Returning to State	Percent Returning
Alaska			
Dentistry	16	13	81%
Occupational Therapy	5	3	60
Optometry	3	0	0
Pharmacy	10	5	50
Physical Therapy	19	10	53
Physician Assistant	3	2	67
Podiatry	0	0	0
Alaska TOTAL	**56**	**33**	**59%**
Arizona*			
Dentistry	115	88	77%
Occupational Therapy	49	44	90
Optometry	52	43	83
Osteopathic Medicine **	20	12	60
Physician Assistant	83	77	93
Veterinary Medicine	157	132	84
Arizona TOTAL	**496**	**396**	**83%**
Colorado*			
Optometry	62	54	87%
Colorado TOTAL	**62**	**54**	**87%**
Hawai'i			
Dentistry	30	20	67%
Occupational Therapy	23	18	78
Optometry	23	19	83
Pharmacy	60	42	70
Physical Therapy	55	37	67
Veterinary Medicine	27	11	41
Hawai'i TOTAL	**218**	**147**	**67%**
Idaho			
Optometry	22	9	41%
Idaho TOTAL	**22**	**9**	**41%**

	Total Number Students	Number Returning to State	Percent Returning
Montana			
Dentistry	17	11	65%
Medicine **	31	12	39
Occupational Therapy	9	4	44
Optometry	12	7	58
Osteopathic Medicine **	4	2	50
Podiatry	0	0	0
Veterinary Medicine	86	60	70
Montana TOTAL	**159**	**96**	**60%**
Nevada*			
Optometry	22	18	82%
Pharmacy	39	33	85
Physician Assistant	24	22	92
Veterinary Medicine	38	36	95
Nevada TOTAL	**123**	**109**	**89%**
New Mexico*			
Dentistry	78	72	92%
Veterinary Medicine	90	75	83
New Mexico TOTAL	**168**	**147**	**88%**
North Dakota			
Dentistry	29	12	41%
Optometry	59	12	20
Veterinary Medicine	13	7	54
North Dakota TOTAL	**101**	**31**	**31%**
Utah			
Optometry	30	20	67%
Podiatry	9	7	78
Veterinary Medicine	57	39	68
Utah TOTAL	**96**	**66**	**69%**
Washington*			
Optometry	27	23	85%
Osteopathic Medicine **	5	3	60
Washington TOTAL	**32**	**26**	**81%**

	Total Number Students	Number Returning to State	Percent Returning
Wyoming			
Dentistry	44	27	61%
Medicine **	27	2	7
Occupational Therapy	11	1	9
Optometry	54	17	31
Osteopathic Medicine **	5	2	40
Physical Therapy	65	21	32
Physician Assistant	14	6	43
Podiatry	4	0	0
Veterinary Medicine	67	30	45
Wyoming TOTAL	**291**	**106**	**36%**

WICHE Return Rates by Field

	Total Number Students	Number Returning to State	Percent Returning
Dentistry	329	243	74%
Medicine **	58	14	24
Occupational Therapy	97	70	72
Optometry	366	222	61
Osteopathic Medicine **	34	19	56
Pharmacy	109	80	73
Physical Therapy	139	68	49
Physician Assistant	124	107	86
Podiatry	13	7	54
Veterinary Medicine	535	390	73
TOTAL for all Reporting WICHE PSEP States	**1,804**	**1,220**	**68%**
TOTAL for Contractual Payback States	**861**	**732**	**85%**
TOTAL for Honor System States	**943**	**488**	**52%**

IMPORTANT: Return rates reported by state offices may vary from WICHE calculations, due to different timeframes over which the return is measured.

* Contractual payback states during time periods measured.

** Graduates of allopathic and osteopathic medical programs are required to do residencies of three years or more after graduation. Residencies can be located outside of the graduate's home state. In order to give residents time to return to their home state to practice, we are using return data for 2002-2006 for graduates of allopathic and osteopathic medicine.

Growing the Elder Care Workforce

WICHE is interested in coordinating a regional approach to educate professionals prepared to work with our aging population. The importance of this issue grows as the world undergoes a dramatic demographic shift which has profound implications for our workforce and state and federal budgets. According to the U.S. Census Bureau, the number of people 65 years and older will increase from 46 million in 2014 to 74 million by 2030. The number of people 18-64 years old is proportionately declining, which means there will be fewer people in the workforce to support and care for the older population.[1]

Without focused efforts on workforce development, we will fall short in caring for the aging segment of society. When we think of "elder care," doctors and nurses are the first to come to mind, as well as social workers and direct-care workers (personal care aides and home health aides). According to the American Geriatrics Society, 20,000 geriatricians (physicians specializing in the care of older adults) are needed now to care for America's elderly, but there are only 7,369 certified geriatricians practicing, equating to a shortfall of some 12,600 geriatricians.[2] In the WICHE states (excluding the U.S. Territories), more than 4,500 geriatricians are needed now, but there are fewer than 1,500, representing a shortfall of more than 3,000 geriatricians in the West.[3] The projected shortages for geriatricians by 2030 are even more worrisome. Nationally, by 2030 our growing elderly population will need some 30,000 geriatricians, leaving the U.S. with a shortfall of 22,600 of these specialists.[4] The shortage of certified gerontological nurses is also severe. According to The John A. Hartford Foundation, fewer than one percent of registered nurses are certified gerontological nurses, and only three percent of advanced practice nurses are certified.[5]

Research also cites shortages of social workers and mental healthcare professionals trained in elder care, and direct-care workers are in great demand as well. Personal care and home health aides are listed among the fastest growing occupations; the Bureau of Labor Statistics projects demand will increase 25.9 and 38.1 percent (respectively) by 2024.[6] Yet, there is much to be done to attract and retain direct-care workers. They are poorly paid and receive little training or education to help them provide quality care. Furthermore, more can be done to develop career ladders to incentivize them and facilitate their professional growth.

We also need to train a myriad of other types of practitioners – from the associate's to the postdoctoral levels – to help the aging population "age-in-place." For example, planners are needed to redesign suburban communities so that more people can remain in their homes as long as possible. Administrators are needed to navigate complex housing, transportation, healthcare, end-of-life, legal and financial matters. Engineers are needed to design products that facilitate independent living.

Developing academic programs that support aging and devising strategies to attract students to these careers are key. In early 2015, the Association for Gerontology in Higher Education (AGHE; www.aghe.org) announced its *Online Directory of Educational Programs in Gerontology and Geriatrics*. This is an excellent resource for students, higher education institutions and state officials to see what's currently available to train the workforce. AGHE has also adopted a framework of *Gerontology Competencies for Undergraduate and Graduate Education*, a useful resource for higher education institutions to evaluate and improve current programs and to develop new ones.

The Gerontological Society of America and AGHE recognize the need to promote awareness about the broad range of elder care career opportunities and have developed some effective "Careers in Aging" materials to use with students, available on AGHE's website.

If your state higher education office or institutions are interested in collaborating to build the eldercare workforce in the Western region, please contact WICHE's director of student exchange at 303.541.0214.

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[1] U.S. Census Bureau. (March 2015). *Projections of the Size and Composition of the U.S. Population: 2014 to 2060*. Report Number: P25-1143. Available at: www.census.gov/library/publications/2015/demo/p25-1143.html.

[2] The American Geriatrics Society. (March 2015). *Current Geriatrician Shortfall*. Available at: www.americangeriatrics.org/files/documents/Adv_Resources/GeriShortageCurrentNumbers.pdf.

[3] Ibid.

[4] The American Geriatrics Society. (March 2015). *Projected Future Need for Geriatricians*. Available at: www.americangeriatrics.org/files/documents/pdfs/Projected_Future_Need_for_Geriatricians.pdf.

[5] The John A. Hartford Foundation. (October 2014). *Centers of Geriatric Nursing Excellence Recruit Faculty and Students Needed to Enhance the Care of Older Adults*. Available at: www.jhartfound.org/images/uploads/resources/academicnursing.pdf.

[6] Bureau of Labor Statistics. (December 8, 2015). *Fastest growing occupations*. Table 1.3. Available at: www.bls.gov/emp/ep_table_103.htm.

The Western Regional Graduate Program (www.wiche.edu/wrgp) is an exceptional educational resource for the West, allowing master's, graduate certificate, and Ph.D. students who are residents of WICHE's states to enroll in 383 high-quality programs at 60 institutions and pay resident tuition. In fall 2015, 1,439 students enrolled through WRGP and saved an estimated $21.1 million in tuition overall – an average of $14,637 per student. In spring 2015 more than 30 new graduate programs will be added, creating more opportunities for students from our Western states.

WRGP students pay resident tuition and can enroll directly in the program through WRGP. It is a tuition reciprocity program. Students are not dependent upon the approval of their home state to participate because the home state does not provide funding for each student.

WRGP is a tremendous resource for graduates looking for distinctive, highly specialized programs. It's also an opportunity for WICHE states to share these programs (and the faculty who teach them) to build the West's workforce in a variety of disciplines.

If a healthcare profession is not offered through PSEP, WRGP is an excellent option, offering some 125 healthcare-related programs, including a wide range of programs in graduate nursing, public health, mental health and psychology, audiology and speech pathology, biomedical sciences, and biomedical informatics and much more. WRGP even offers advanced degrees to train future faculty members, including an online doctorate in occupational therapy and a master's in dental hygiene.

If you know of a particular program that would be a good addition to the WRGP network, suggest they contact the director of WICHE's Student Exchange Program. The next request for proposals will be announced in fall 2016. Graduate deans, provosts, and chief academic officers at all public institutions and systems in the WICHE region will be notified.

To be eligible for WRGP, programs that aren't related to health must be "distinctive" or respond to a significant workforce need. Healthcare-related programs are not subject to the distinctiveness criteria, but must be of high quality. WICHE is particularly interested in reviewing nominations for high-need programs and those in new fields. These include professional science master's degrees and graduate certificate programs, as well as graduate degrees in elder care, robotics, data mining, data science and business analytics, biometrics, software programming and cyber security, emerging media and communications, biomedical engineering, alternative energy technology, and homeland security and emergency and disaster management, among others.

The tuition break offered by WRGP is a wonderful recruitment and retention tool. Within UND's Department of Counseling Psychology and Community Services, it has helped us to increase the diversity of our graduate cohorts by supporting the education of those from differing geographic locations. It has been particularly helpful in supporting graduate students from Western states who identify as first generation college students and/or racial-ethnic minorities. Most importantly, by supporting a diverse cohort of students, WRGP has promoted diversity of thought within our graduate programs, which is necessary for the advancement of our field.

– Dr. Rachel Navarro, Associate Professor and Department Chair, Counseling Psychology, University of North Dakota

"After completing my undergraduate degree at Boise State University, I was really looking forward to attending a graduate school where I could expand upon my knowledge and gain more credibility. The greatest potential roadblock I faced was paying for tuition. Fortunately, WRGP significantly reduced the cost and I was able to enroll in Utah State's management information systems program for my master's. USU's program is a perfect fit for me, and I am very grateful for WICHE's WRGP!"

– Promise, Idaho resident, Class of 2016, Utah State University, Management Information Systems

Table 9. Five-year Enrollment Summary, New and Continuing Students, 2011-2015

State (Number of Programs)	2011 Received	2011 Sent	2012 Received	2012 Sent	2013 Received	2013 Sent	2014 Received	2014 Sent	2015 Received	2015 Sent
Alaska (8)	14	19	15	27	8	33	5	40	10	35
Arizona (76)	199	53	235	57	274	56	370	86	442	83
California (17)	2	224	5	269	15	330	22	412	17	505
Colorado (98)	210	67	330	60	345	67	357	92	427	96
CNMI (0)*	0	0	0	0	0	0	0	0	0	1
Hawai'i (14)	49	17	47	24	41	22	39	19	37	21
Idaho (14)	21	56	35	72	56	70	70	67	101	69
Montana (15)	45	35	26	47	32	44	56	54	37	44
Nevada (7)	23	31	18	35	21	45	16	53	16	66
New Mexico (30)	62	46	31	55	26	70	28	78	34	103
North Dakota (10)	9	15	4	14	16	16	67	18	12	22
Oregon (12)	24	84	79	78	112	80	91	100	79	93
South Dakota (11)	10	20	8	19	12	26	11	28	6	23
Utah (47)	118	58	119	49	102	63	125	72	131	87
Washington (19)	71	92	54	154	71	160	86	172	86	144
Wyoming (6)	2	42	2	48	2	51	2	54	4	47
TOTAL (384)	859	859	1,008	1,008	1,133	1,133	1,345	1,345	1,439	1,439

CNMI joined WICHE in April 2013.

I grew up in a community where the educational expectations for girls were very different from boys. For example, I had higher grades in school than my brother, yet he received eight years of college tuition, while I was given a new car and a directive to marry well. After a few years, the car died, and I was a single parent. In my thirties, I found funding and persevered to achieve my bachelor's degree in education. I also found my niche in special education, becoming a strong advocate for individuals with disabilities. To be a stronger advocate, I needed more education, a master's degree. But when I looked at the balance of my student loans, my income as a teacher and my older age, it all seemed unobtainable. WICHE's WRGP eliminated the financial obstacles. Through this program, I will realize my goal of becoming a teacher of the visually impaired (TVI) with a master's degree. Without WRGP, I would lose my present position as a TVI working on a provisional license. Thanks to Portland State's participation in WRGP, I will become a highly qualified professional in my field, enhancing the lives of students and families. My future graduate degree will open doors, allowing me to advocate, teach, and influence individuals, families, and communities.

— Sonja, Idaho resident, Class of 2017,
Portland State University, Visually Impaired Learner Program

Table 10. Fall 2015 WRGP Enrollment, by State, Institution, and Program

State (Total WRGP Enrollment)/ Institution and Program	
ALASKA (10)	
University of Alaska Anchorage (2)	
Early Childhood Special Education (MA)	0
Global Supply Chain Management (MS)	0
Project Management (MSPM)	0
Social Work (MSW)	2
University of Alaska Fairbanks (8)	
Administration of Justice (MA)	0
Clinical-Community Psychology, Rural Indigenous Emphasis (PhD) (UAF/UAA)	7
Northern Studies (MA)	1
Rural Development (MA)	0
ARIZONA (442)	
Arizona State University (75)	
American Indian Studies (MS)	12
Architecture (MArch)	0
Built Environment (MSBE)	0
Design (MSD)	1
Industrial Design (MID)	3
Interior Architecture (MIA)	2
Justice Studies (MS/PhD)	17
Landscape Architecture (MLA)	0
Materials Science and Engineering (PhD)	1
Nanoscience (PSM)	0
Natural Science (MNS)	1
Public Administration (PhD)	0
Science and Technology Policy (PSM)	2
Social and Cultural Pedagogy (MA)	2
Social Work (MSW/PhD)	33
Solar Energy Engineering and Commercialization (PSM)	0
Urban Design (MUD)	0
Visual Communication Design (MVCD)	1
Arizona State University/Downtown (5)	
Community Resources and Development (MS/PhD)	2
Nonprofit Leadership and Management (MA)	0
Nursing (Care Coordination and Nursing Educator) (MS)	1
Nursing and Healthcare Innovation (PhD)	2
Nursing Practice (DNP)	0
Arizona State University/West Campus (7)	
Communication Studies (MA)	1
English (MAE)	0
Interdisciplinary Studies (MA)	0

Psychology (MS)	1
Social Justice and Human Rights (MA)	3
Social Technologies (MAST)	2
Northern Arizona University (108)	
Administration (MA)	8
Anthropology, Applied Emphasis Program (MA)	7
Applied Geospatial Sciences (MS)	0
Applied Sociology (MA)	0
Assistive Technology (Grad Cert)	5
Autism Spectrum Disorders (School-Based) (Grad Cert)	1
Bilingual and Multicultural Education (ESL) (MEd)	1
Business Administration (MBA)	3
Career and Technical Education (MEd)	7
Climate Science and Solutions (PSM)	7
Communication (Documentary Studies) (MA)	0
Community Planning (Grad Cert)	1
Counseling-Student Affairs (MEd)	1
Disability Policy and Practice (Grad Cert)	0
Educational Leadership (MEd/EdD)	8
Educational Technology (MEd/Grad Cert)	8
Elementary Education, Continuing Professional/ Reading K-12 (MEd)	0
English, General (MA/MS)	7
English, Rhetoric, Writing, and Digital Media Studies (MA)	20
English, Professional Writing (MA)	8
Environmental Sciences & Policy (MS)	0
Forestry (MF)	3
Human Relations (MEd)	4
Mathematics Education (MS)	0
Music (Suzuki Violin/Viola) (MA)	0
Nursing (MS)	1
Positive Behavior Support (Grad Cert)	3
Science Teaching (MA)	0
Sustainable Communities (MA)	2
Teaching Science with Certification (MA)	3
University of Arizona (247)	
Anthropology-Linguistics (PhD)	1
Arid Lands Resource Sciences, Interdisciplinary (PhD)	0
Atmospheric Sciences (MS/PhD)	0
Cancer Biology (Graduate Interdisciplinary Program) (PhD)	1
Ecology and Evolutionary Biology (PhD)	12
Gender and Women's Studies (MA/JD)	6
Genetics, Interdisciplinary (PhD)	3
Human Language Technology (MS)	2

Native American Languages and Linguistics (MA)	1
Neuroscience/Interdisciplinary (PhD)	3
Nursing (PhD)	24
Nursing Practice (DNP)	74
Optical Sciences (MS/PhD/Grad Cert)	64
Physiological Sciences, Interdisciplinary (MS/PhD)	0
Public Health (MPH/DrPh)	48
Second Language Acquisition and Teaching (SLAT) (MA/PhD/Grad Cert)	8
Teaching and Teacher Education, Teaching Mexican American Students (PhD)	0
CALIFORNIA (17)	
California State University, East Bay (0)	
Multimedia (MA)	0
Recreation and Tourism (MS)	0
California State University, Monterey Bay (3)	
Applied Marine and Watershed Science (MS)	3
California State University, Stanislaus (0)	
Nursing (Education and Gerontology) (MSN)	0
Humboldt State University (8)	
English (Composition Studies and Pedagogy; Literary and Cultural Studies; International Program/TESL/TEFL) (MA)	0
Environment and Community (MA)	3
Environmental Systems (MS)	2
Natural Resources (MS)	2
Public Sociology, Social Justice and Action (MA)	1
San Francisco State University (0)	
Biomedical Science, Biotechnology and Stem Cell Science (PSM)	0
Engineering, Energy Systems Concentration (MS)	0
Museum Studies (MA)	0
University of California, San Francisco (2)	
Biological and Medical Informatics (PhD)	0
Chemistry and Chemical Biology (PhD)	1
Pharmaceutical Sciences and Pharmacogenomics (PhD)	1
University of California, San Francisco and Berkeley (4)	
Bioengineering (PhD)	4
University of the Pacific (0)	
Healthcare Management (MBA)	0
COLORADO (427)	
Adams State University (0)	
Higher Education Administration and Leadership (HEAL) (MA/Grad Cert)	0

Table 10. Fall 2015 WRGP Enrollment, by State, Institution, and Program (continued)

State (Total WRGP Enrollment)/ Institution and Program	
Colorado School of Mines (38)	
Applied Chemistry (MS/PhD)	6
Environmental Engineering Science (MS/PhD)	4
Geochemistry (MS/PSM/PhD)	0
Geological Engineering (MS/ME/PhD)	2
Hydrology (MS/PhD)	14
Mineral and Energy Economics (MS/PhD)	8
Mining and Earth Systems Engineering (MS/PhD)	2
Petroleum Engineering (MS/PhD)	2
Colorado State University (26)	
Agriculture/Integrated Resource Management (MAg)	0
Animal Reproduction and Biotechnology Laboratory (MS/PhD)	0
Construction Management (MS)	0
Education & Human Resource Studies (PhD)	2
Environmental Health Sciences (MS/PhD)	8
Political Science, Environmental Politics & Policy Emphasis (PhD)	0
Public Communication and Technology (MS/PhD)	4
Radiological Health Sciences (MS/PhD)	0
Social Work - Rural & Changing Communities (MSW/PhD)	12
Colorado State University-Pueblo (0)	
Engineering, Mechatronics or Railroad Engineering (MS)	0
Industrial and Systems Engineering (MS)	0
University of Colorado at Boulder (72)	
Aerospace Engineering Sciences (MS/ME/PhD)	10
Anthropology and Business (MA/MBA)	0
Astrophysical & Planetary Sciences (PhD)	1
Atmospheric & Oceanic Sciences (MS/PhD)	5
Audiology (AuD)	10
East Asian Languages (MA/PhD)	2
Engineering for Developing Communities (MS/PhD/Grad Cert)	8
Environmental Studies (MS/MBA)	0
German Studies (MA/MBA)	0
Linguistics (MA/PhD)	8
Philosophy (MA/PhD)	0
Physics, General (MS/PhD)	7
Speech Language Pathology (MA)	19
Studio Art/Art History and Business (MFA/MBA)	0
Telecommunications and Business (MS/MBA)	1
Theatre (PhD)	1
Theatre/Theatre Management (MA/MBA)	0

University of Colorado at Colorado Springs (22)	
Applied Geography (MA)	2
Communications (MA)	0
Counseling and Human Services (MA)	7
Engineering, Space Operations (ME)	1
Psychology, Sciences Track (MA)	3
Public Administration (MPA/Grad Cert)	6
Sociology (MA/Grad Cert)	3
Teaching English to Speakers of Other Languages (TESOL) (MA)	0
University of Colorado Denver (53)	
Anthropology (MA)	4
Clinical Health Psychology (PhD)	3
Computer Science and Information Systems (PhD)	0
Construction Engineering and Management (MEng/Grad Cert)	1
Design and Planning (PhD)	1
Environmental and Sustainability Engineering (MS/PhD)	1
Geographic Information Systems (MEng)	3
Health and Behavioral Sciences (PhD)	0
Historic Preservation (MS)	0
Landscape Architecture (MLA)	1
Public Administration, Gender-Based Violence & Public Policy (MPA)	0
Public Administration, Nonprofit Organizations (MPA/Grad Cert)	22
Public Administration, Public Affairs (PhD)	1
School Psychology (PsyD)	1
Urban and Regional Planning (MURP)	15
Urban Design (MUD)	0
University of Colorado Denver, Anschutz Medical Campus (143)	
Bioengineering (MS/PhD)	4
Biomedical Sciences and Biotechnology (MS)	0
Biostatistics (MS/PhD)	4
Computational Bioscience (PhD)	0
Epidemiology (MS/PhD)	1
Family Psychiatric Mental Health Nurse Practitioner (MS)	0
Health Services Research (PhD)	1
Health Services Research, Policy and Administration (MS)	1
Innovation in Leadership and Administration (i-LEAD) (MS/Grad Cert)	11
Modern Human Anatomy (MS)	7
Nursing (PhD)	15
Nursing, Health Care Informatics (MS)	12
Nursing Practice (DNP)	8

Public Health (MPH/DrPH/Grad Cert)	79
Rehabilitation Science (PhD)	0
University of Northern Colorado (73)	
Audiology (AuD)	4
Biomedical Sciences (MBS)	2
Chemical Education (MS/PhD)	0
Clinical Mental Health Counseling (Couples, Marriage and Family) (MA)	0
Counseling Psychology (MA/PhD)	16
Counselor Education and Supervision (PhD)	3
Earth Sciences (MA)	2
Educational Mathematics (PhD)	0
Educational Psychology (MA/PhD)	0
Educational Technology (PhD)	0
Foreign Languages (Spanish Teaching) (MA)	0
Gerontology (MA)	1
Human Rehabilitation (PhD)	0
Music (DA)	13
Nursing Education (PhD)	0
Rehabilitation Counseling (MA)	0
School Counseling (MA)	0
School Psychology, Educational Specialist (EdS/PhD)	4
Special Education, Low Prevalence Disabilities (MA/EdD)	0
Speech-Language Pathology (MA)	13
Sport and Exercise Science (MS/PhD)	15
HAWAI'I (37)	
University of Hawai'i at Manoa (37)	
Biomedical Sciences, Tropical Medicine (MS/PhD)	1
Communication and Information Sciences (Interdisciplinary) (PhD)	1
East Asian Languages and Literatures (MA/PhD)	12
Entomology, Tropical (MS/PhD)	0
Geosciences for Professionals (MGeo)	0
Marine Biology (MS/PhD)	3
Natural Resources and Environmental Management (MS/PhD)	1
Oceanography (Interdisciplinary) (MS/PhD)	1
Pacific Islands Studies (MA)	0
Philosophy, Asian and Comparative (MA/PhD)	5
Second Language Studies (MA/PhD)	8
Theatre and Dance (Asian) (MA/MFA/PhD)	1
Tropical Plant and Soil Sciences (MS/PhD)	1
Urban and Regional Planning (MA/PhD)	3

Table 10. Fall 2015 WRGP Enrollment, by State, Institution, and Program (continued)

State (Total WRGP Enrollment)/ Institution and Program	
IDAHO (101)	
Boise State University (0)	
Raptor Biology (MS)	0
Idaho State University (101)	
Audiology (AuD)	15
Biological Sciences (MS/PhD/DA)	0
Clinical Psychology (PhD)	7
Deaf Education (MEd)	1
English and the Teaching of English (MA/PhD)	2
Environmental Science and Management (MS)	0
Experimental Psychology (PhD)	4
Historical Resources Management (MA)	0
Mathematics (DA)	0
Medical Laboratory Science (MS)	0
Political Science (DA)	0
Public Health (MPH)	2
Speech-Language Pathology (MS)	70
MONTANA (37)	
Montana State University, Billings (9)	
Applied Behavioral Analysis, Special Education (MS/Grad Cert)	0
Athletic Training (MS)	6
Education, Reading Option (MEd)	0
Health Administration (MHA)	0
Rehabilitation and Mental Health Counseling (MS)	3
Montana State University, Bozeman (6)	
Microbiology and Immunology (MS/PhD)	1
Land Rehabilitation (MS)	5
Mathematics, Math Education (MS)	0
Montana Tech of the University of Montana (11)	
Geoscience (MS)	10
Metallurgical/Mineral Processing Engineering (MS)	1
Technical Communication (MSTC)	0
University of Montana, Missoula (11)	
Communication Studies (MA)	2
Environmental Science and Natural Resource Journalism (MA)	5
Global Youth Development (MA)	4
Natural Resources Conflict Resolution (Grad Cert)	0

NEVADA (16)	
University of Nevada, Las Vegas (0)	
Hotel Administration (MS)	0
Management Information Systems (MS/MIS)	0
Sociology (Urban and Community) (MA/PhD)	0
University of Nevada, Reno (16)	
Chemical Physics (PhD)	0
Hydrologic Sciences (MS/PhD)	0
Public Health (MPH)	1
Social Psychology (Interdisciplinary) (PhD)	15
NEW MEXICO (34)	
Eastern New Mexico University, Portales (0)	
Nursing Education (MS)	0
New Mexico Highlands University (0)	
Media Arts and Computer Science (MA/MS)	0
New Mexico Institute of Mining and Technology (0)	
Chemistry (MS/PhD)	0
Physics (MS/PhD)	0
New Mexico State University (1)	
Applied Geography (Geospatial Science) (MAG)	0
Chemical and Materials Engineering (MS/PhD)	0
Community Health Education (MPH)	0
Criminal Justice (MCJ)	0
Economic Development (DED)	0
Nursing (Multiple Concentrations) (MSN/DNP)	1
Nursing, Border Health Issues and Disparities (PhD)	0
Online Teaching and Learning (Grad Cert)	0
Rhetoric and Professional Communication (Interdisciplinary) (PhD)	0
Space Physics (MS)	0
Spanish (Online) (MA)	0
Water Science and Management (MS/PhD)	0
University of New Mexico (33)	
American Studies (MA/PhD)	12
Art and Ecology (MFA)	2
Art History, Art of the Americas (MA/PhD)	2
Art History, Art of the Modern Age (MA/PhD)	2
Educational Linguistics (PhD)	2
Electronic Arts (MFA)	4
Latin American Studies (MA/PhD/MBA)	2
Nursing Executive and Organizational Leadership (NEOL DNP)	0

Optical Science & Engineering (MS/PhD)	0
PhD in Nursing (PhD)	1
Printmaking (MFA)	1
Public Economics (Health Economics) (MA/PhD)	0
Water Resources Administration (MWR)	5
NORTH DAKOTA (12)	
North Dakota State University (1)	
Coatings and Polymeric Materials (MS/PhD)	1
University of North Dakota (11)	
Counseling Psychology (PhD)	7
Ecology of the Northern Great Plains (PhD)	0
History (DA)	0
Medical Laboratory Science (MS)	0
Nursing (PhD)	1
Public Health (MPH)	3
Space Studies (MS)	0
Theatre Arts (MA)	0
Valley City State University (0)	
Education (MA)	0
OREGON (79)	
Oregon Health & Science University (9)	
Nursing Practice (DNP)	4
Nursing Science (PhD)	5
Portland State University (51)	
Education, Visually Impaired Learner (MS)	9
Environmental Science (MEM/MS/PhD)	3
Public Administration (MPA)	0
Public Administration (Health Administration) (MPA:HA)	0
Urban and Regional Planning (MURP)	20
Urban Studies (MUS/PhD)	19
Southern Oregon University (16)	
Clinical Mental Health Counseling/Counselor (MA/MS)	8
Environmental Education (MS)	8
University of Oregon (0)	
Historic Preservation (MS)	0
Western Oregon University (3)	
Rehabilitation Counseling with the Deaf (MS)	3
SOUTH DAKOTA (6)	
Black Hills State University (0)	
Integrative Genomics (MS)	0
Sustainability (MSS)	0

Table 10. Fall 2015 WRGP Enrollment, by State, Institution, and Program (continued)

State (Total WRGP Enrollment)/ Institution and Program	
Dakota State University (1)	
Health Informatics (MS)	1
South Dakota School of Mines and Technology (5)	
Atmospheric and Environmental Sciences (MS/PhD)	3
Computational Sciences and Robotics (MS)	0
Materials Engineering and Science (MS/PhD)	0
Nanoscience and Nanoengineering (PhD)	0
Paleontology (MS)	2
South Dakota State University (0)	
Athletic Training (MS)	0
Chemistry Education (MS)	0
University of South Dakota (0)	
Addiction Studies (MA)	0
UTAH (131)	
Southern Utah University (3)	
Arts Administration (MFA)	3
University of Utah (78)	
Architectural Studies (MSAS)	0
Audiology (AuD)	17
Audiology/Speech & Language Pathology (PhD)	0
Biomedical Informatics (MS/PhD/Grad Cert)	0
Chemical Engineering (ME/MS/PhD)	0
City and Metropolitan Planning (MCMP)	0
Clinical Nursing Informatics (MS)	0
Coaching Wellness (MS)	0
Computational Science (PSM) (PMST)	0
Exercise and Sport Science, Sport Pedagogy (MS)	0
Geographic Information Science (MS)	0
Gerontology (MS)	0
Healthcare Administration (MBA/MHA, MPA/MHA, MPH/MHA)	0
Human Development and Social Policy (MS)	1
Information Systems (MSIS/Grad Cert)	0
International Affairs and Global Enterprise (MS)	2
Modern Dance (MFA)	1
Neonatal Nurse Practitioner (DNP)	0
Neuroscience, Interdisciplinary (PhD)	13
Nurse Midwifery & Women's Health Nurse Practitioner (DNP)	0
Nursing (PhD)	11
Nursing Education (MS)	0
Occupational Therapy, Clinical Doctorate (OTD)	31

Outreach Nurse Practitioner (DNP)	0
Parks, Recreation and Tourism (MS/PhD/EdD)	0
Psychiatric Mental Health Nurse Practitioner (MS)	0
Public Policy (MPP)	2
Science Instrumentation (PSM) (PMST-SI)	0
Social Work (PhD)	0
Sustainability (Grad Cert)	0
Women's Health Nurse Practitioner (DNP)	0
Utah State University (50)	
American Studies (Folklore Specialization) (MA/MS)	0
Applied Environmental Geoscience (PSM)	4
Audiology (AuD)	5
Climate Science (MS/PhD)	0
Deaf Education (MEd)	12
Electrical Engineering, Space Studies (MS/PhD)	0
Food Safety and Quality (MFSQ)	0
Horticulture/Water Efficient Landscaping (MS)	0
Human Resources (MHR)	11
Management Information Systems (MMIS)	2
Second Language Teaching (MSLT)	1
Speech-Language Pathology (MA/MS)	15
Toxicology (MS/PhD)	0
Upper Atmospheric Physics (MS/PhD)	0
Watershed Science (MS/PhD)	0
WASHINGTON (86)	
Central Washington University (17)	
Primate Behavior (MS)	8
Resource Management (MS)	9
Eastern Washington University (13)	
Communication Disorders (MS)	3
Creative Writing (MFA)	0
Dental Hygiene (MS)	1
Public History (MA)	0
Social Work, Rural Regional & Small Urban Emphasis (MSW)	9
University of Washington (37)	
Audiology (AuD)	17
Public Health (eMPH/Grad Cert)	0
Landscape Architecture (MLA)	15
Speech-Language Pathology (MS)	5
Washington State University (5)	
American Studies (MA/PhD)	0
Archaeology (MA/PhD)	0
English, Rhetoric and Composition Studies (MA/PhD)	0

Food Science (MS/PhD)	5
Neuroscience Interdisciplinary Graduate Program (MS/PhD)	0
Public History (MA/PhD)	0
Washington State University Spokane (14)	
Dietetics, Nutrition & Exercise Physiology (MS)	0
Health and Policy Administration (MHPA)	14
WYOMING (4)	
University of Wyoming (4)	
American Studies/Historic Preservation (MA)	0
Environment & Natural Resources (Dual Masters)	0
Infrared Astrophysics (MS/PhD)	0
Nurse Educator (MS)	0
Nursing Practice (DNP)	4
Social Work (MSW/Grad Cert)	0
TOTAL WRGP ENROLLMENT	**1,439**

"I'm a non-traditional student with many family responsibilities: aging parents, high school and college-age children, and I live on a farm in Montana. I never would have been able to afford out-of-state tuition for a graduate nursing program. But by taking part-time classes, I've been able to keep up with my responsibilities at home and pay for my classes as I go. I'm in my last semester of classes and was recently hired for a nursing informatics position at a local hospital. None of this would have been possible without WRGP."

— Sandi, Montana resident, Class of 2016, University of Colorado Denver, Nursing Informatics Master's Program (online)
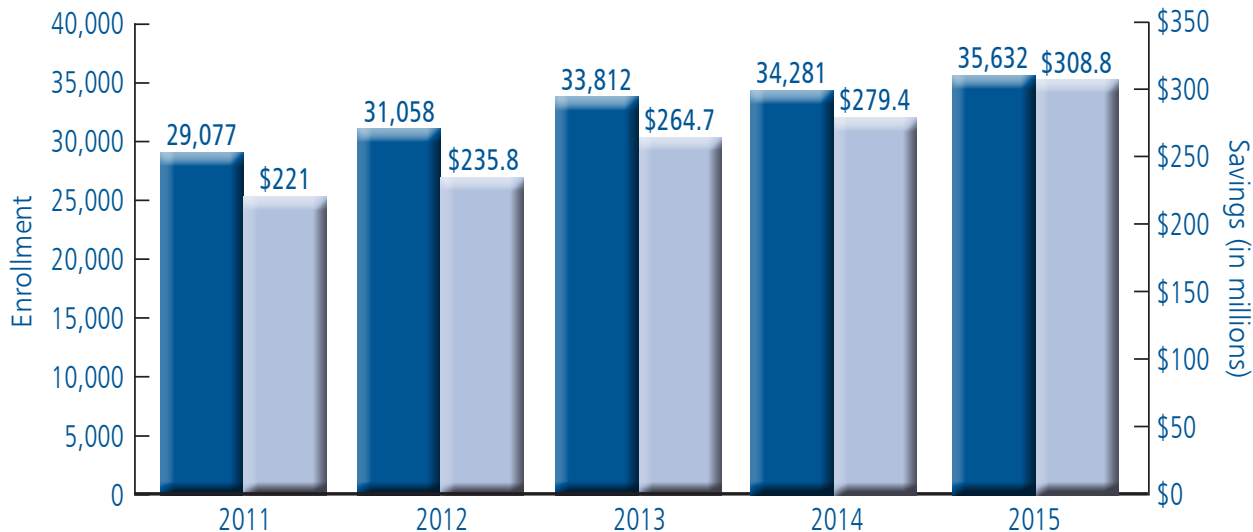
The Western Undergraduate Exchange (WUE; www.wiche.edu/wue), is a regional tuition-reciprocity agreement that enables students from WICHE states to enroll in participating two- and four-year public institutions at 150 percent of the enrolling institution's resident tuition. The multilateral exchange has been operating for more than 25 years and is the largest program of its kind in the nation. In 2015-16 some 35,600 WUE students and their families saved more than $308.8 million in tuition costs. Residents of WICHE member states can choose from 162 participating WUE institutions.

Since the first exchanges began in 1988, WUE has provided WICHE students and their parents with discounts on more than 463,400 annual tuition bills – saving them, overall, an impressive $2.85 billion.

Figure 2 shows the continued growth of the program over the past five years. Table 12 shows the number of WUE students received in and sent from each state over the last five years. Fort Lewis College (in Colorado) is WUE's newest member.

WUE as a Tool to Help Institutions Achieve Their Enrollment Goals

Participating WUE institutions attest to the value of the WUE network as a tool to meet their recruitment and enrollment goals. Institutions, with the guidance of their state higher education agencies, have significant latitude in the way they can use WUE. Our WUE partner institutions formulate admissions policies that work best for them and their state workforce, but also benefit enrolled students and their families from elsewhere in the West.

The majority of participating institutions make all or most of their majors available at the WUE rate. Institutions can exclude majors in high demand by home-state residents. About 20 percent of institutions use WUE as a merit scholarship but more than half automatically award the discounted rate to applicants from a WICHE state. Most WUE institutions offer the discounted rate to transfer students.

Institutions like WUE because they can attract high-caliber students, maximize their student housing capacity, increase student diversity, and give students an affordable education in their major. Our WUE partner institutions find that WUE students are academically motivated and are likely to complete their degrees more quickly compared to their other undergraduate student pools. For students, WUE is especially important when their program of study is not offered in their home state.

Contact WICHE's director of student exchange at 303.541.0214 or info-sep@wiche.edu if your institution is interested in joining WUE.

Figure 2. WUE Enrollment and Savings (in millions), 2011-2015

"When I was accepted into the University of Northern Colorado's program, I knew it was the perfect fit. UNC's theatre program is incredible, and being offered a place in the acting program was a dream come true. However, I was unable to afford out-of-state tuition, especially for a degree program in a career field that is difficult to penetrate. WUE has allowed me to pursue my dream career and be a part of an exceptional program. I will be graduating with very little debt thanks to WUE, and I could not be more thankful."

– Yasmine, Arizona resident, Class of 2017, University of Northern Colorado, Theatre Arts, Acting

What's Trending in WUE Student Enrollment

The Fall 2015 WUE enrollments mirror trends similar to last year's. WUE students' top majors continue to align well with some of the West's most crucial workforce needs that include healthcare, the biological and biomedical sciences, engineering, and business.

Nursing – at institutions that offer it at the WUE rate – is among the most popular healthcare majors. The allied health professions are also a favorite. These include physical therapy, occupational therapy, radiology, respiratory therapy, nuclear medical technology, audiology, and clinical laboratory science. Dental hygiene, healthcare administration, and healthcare information technology are also popular.

Biological and biomedical science majors targeted by WUE students include biochemistry, biotechnology, genetics, microbiology, botany, zoology, and marine biology. WUE enrollment in business majors is strong. WUE students are seeking degrees in accounting, business administration and management, finance, hospitality and hotel administration, human resource management, construction management, and international business. Finally, engineering majors of interest to WUE students include specialties in biomedical, chemical, civil, computer, electrical, mechanical, mining and mineral, nuclear, petroleum, industrial, geological and geophysical, and electrical engineering.

Request Detailed WUE Enrollment Reports

WICHE staff is pleased to provide detailed reports for institutions and their state higher education offices. CIP code-based reports show which out-of-state programs residents of a WICHE state are seeking through WUE. Administrators can also analyze which of their state's programs attract the most WUE students. To request these custom reports, contact our office at 303.541.0214 or info-sep@wiche.edu.

Introducing "The Passport"

A complementary tool to WUE is the Interstate Passport, a new block transfer framework that focuses on outcomes-based, lower-division general education. Students who earn a Passport at one participating institution and transfer to another one – even across state lines – will have their learning achievement recognized. They will not be required to repeat courses at the receiving institution to meet lower-division general education requirements. Seven WICHE states currently participate in the Passport. When the framework is complete in spring 2016, all WICHE states and institutions will be invited to join. The Passport can save students time and money, and significantly streamline the transfer process.

For more information, see page 33 and www.wiche.edu/passport.

WUE has been a game-changer for my students in Southern California! Currently, students face a very challenging admissions environment with both the University of California and California State University systems, due to record numbers of freshman applicants. This has reduced access to academic majors and campuses throughout the state. WUE mitigates these issues by offering students a wonderful array of affordable college options in the West. Most WUE institutions have availability in most majors, and they also offer families a significant tuition savings and the opportunity for students to graduate in four years. My own daughter attends a WUE university, and all of us are extremely pleased with the quality and availability of courses as well as the significant tuition savings.

– Becky Marchant, Co-Lead Guidance Counselor,
Brea Olinda High School, California

Table 11. Fall 2015 Enrollment Summary, New and Continuing Students

State of Attendance (Number of WUE Institutions)	State of Residence																Attendance Totals
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
Alaska (3)	–	26	184	52	0	15	26	15	15	4	4	41	2	17	126	6	**533**
Arizona (26)	182	–	4,934	453	3	352	105	28	403	160	21	164	22	206	319	18	**7,370**
California (14)	28	86	–	55	3	100	31	8	89	8	1	88	3	14	190	3	**707**
Colorado (25)	120	318	1,332	–	0	360	83	58	151	205	35	124	80	196	212	229	**3,503**
CNMI (1)	0	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	**0**
Hawai'i (4)	47	92	1,797	194	2	–	31	13	39	22	4	93	12	26	290	10	**2,672**
Idaho (6)	71	25	563	40	2	18	–	110	110	7	6	124	4	34	354	14	**1,482**
Montana (12)	169	68	430	340	0	12	350	–	74	20	47	193	57	77	655	168	**2,660**
Nevada (7)	53	97	3,819	88	3	388	45	33	–	15	4	79	11	53	127	8	**4,823**
New Mexico (10)	13	256	490	56	0	31	9	12	38	–	1	15	11	14	53	15	**1,014**
North Dakota (11)	73	142	632	186	0	45	60	127	72	33	–	68	190	66	213	191	**2,098**
Oregon (7)	132	57	1,312	57	5	362	91	33	133	16	4	–	2	25	493	11	**2,733**
South Dakota (6)	31	114	310	346	0	6	21	78	41	20	173	29	–	12	99	189	**1,469**
Utah (9)	18	160	427	96	2	63	157	30	224	12	2	46	3	–	99	38	**1,377**
Washington (7)	152	38	456	106	0	101	274	82	68	10	7	247	3	38	–	12	**1,594**
Wyoming (9)	12	31	98	509	0	8	110	394	35	14	17	28	114	182	45	–	**1,597**
Two-Year (69)	130	135	1,078	580	2	202	286	481	295	114	43	151	138	525	245	110	**4,515**
Four-Year (88)	971	1,375	15,706	1,998	18	1,659	1,107	540	1,197	432	283	1,188	376	435	3,030	802	**31,121**
Grand Total (157)	**1,101**	**1,510**	**16,784**	**2,578**	**20**	**1,861**	**1,393**	**1,021**	**1,492**	**546**	**326**	**1,339**	**514**	**960**	**3,275**	**912**	**35,632**

For answers to all your questions about WUE, visit www.wiche.edu/askWICHE

Table 12. Five-year Enrollment Summary, New and Continuing Students, 2011-2015

State	2011		2012		2013		2014		2015	
	Received	Sent	Received	Sent	Received	Sent	Received	Sent	Received	Sent
Alaska	562	1,496	588	1,421	587	1,355	599	1,237	533	1,101
Arizona	5,208	1,173	5,946	1,256	6,788	1,336	7,053	1,438	7,370	1,510
California	987	9,717	907	11,677	901	13,992	927	15,304	707	16,784
Colorado	2,912	2,312	3,419	2,374	3,786	2,675	3,882	2,652	3,503	2,578
CNMI	0	0	0	0	0	2	0	19	0	20
Hawaiʻi	2,253	1,596	2,431	1,634	2,586	1,734	2,574	1,788	2,672	1,861
Idaho	2,380	1,235	2,272	1,189	2,031	1,274	1,376	1,343	1,482	1,393
Montana	2,097	1,273	2,158	1,230	2,310	1,211	2,361	1,058	2,660	1,021
Nevada	2,795	1,256	2,974	1,266	3,624	1,449	4,202	1,437	4,823	1,492
New Mexico	942	630	1,069	643	1,116	621	992	591	1,014	546
North Dakota	1,876	394	2,074	366	2,077	362	2,051	347	2,098	326
Oregon	2,147	1,490	2,239	1,536	2,409	1,447	2,401	1,449	2,733	1,339
South Dakota	1,435	546	1,554	505	1,632	517	1,528	522	1,469	514
Utah	661	885	629	898	814	913	1,085	918	1,377	960
Washington	1,124	3,848	1,136	3,800	1,289	3,837	1,459	3,184	1,594	3,275
Wyoming	1,698	1,226	1,662	1,263	1,862	1,087	1,791	994	1,597	912
TOTAL	29,077	29,077	31,058	31,058	33,812	33,812	34,281	34,281	35,632	35,632

NOTE: University of Wyoming's WUE enrollment numbers are based on end-of-fall data from the previous year.

"WUE is much more than just an affordable college experience. WUE challenged me academically by setting guidelines to keep my discounted tuition. It also kept me on track to graduate within four years. The higher academic standards required of WUE students motivated me to reach my goals."

– Camden, Hawaiʻi resident, Class of 2015,
University of Colorado Denver, Pre-Med Biology and Public Health

Table 13. Fall 2015 WUE Enrollment, by State and Institution

State (Total WUE)/Institution	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	Total
						State of Residence											
ALASKA (533)																	
University of Alaska, Anchorage (all UAA campuses and Prince William Sound Community College)	–	12	81	19	0	12	6	3	7	3	0	23	1	11	28	3	209
University of Alaska, Fairbanks	–	9	78	26	0	3	16	10	6	0	4	15	1	5	88	3	264
University of Alaska, Southeast	–	5	25	7	0	0	4	2	2	1	0	3	0	1	10	0	60
ARIZONA (7,370)																	
Arizona State University, Downtown Campus	0	–	128	14	0	2	3	0	5	4	3	3	1	2	9	0	174
Arizona State University, Polytechnic Campus	1	–	185	13	0	7	2	0	23	4	4	3	2	5	18	1	268
Arizona State University, West Campus	2	–	134	18	0	1	4	1	5	0	0	6	3	0	15	0	189
Northern Arizona University	123	–	3,952	292	2	233	54	14	211	106	4	97	9	36	174	10	5,317
Northern Arizona University, Yuma	0	–	28	0	0	0	0	0	0	0	0	0	0	0	0	0	28
University of Arizona	0	–	4	2	0	0	1	1	1	0	0	0	0	1	2	0	12
University of Arizona, South	0	–	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Arizona Western College	3	–	0	6	0	17	4	2	16	2	0	2	0	7	9	1	69
Central Arizona College	1	–	21	4	0	5	2	1	3	3	0	1	1	0	9	1	52
Chandler-Gilbert Community College	4	–	13	4	0	7	1	0	4	4	3	0	1	2	4	0	47
Cochise College	1	–	15	0	0	0	1	0	11	0	0	0	0	5	4	1	38
Coconino Community College	12	–	225	8	0	11	0	0	10	7	0	9	3	1	7	0	293
Eastern Arizona College	4	–	18	10	0	20	3	0	3	2	0	3	0	8	6	1	78
Estrella Mountain College	0	–	2	1	0	1	0	0	0	0	0	1	0	0	1	0	6
Gateway Community College	2	–	2	1	0	0	2	0	0	0	1	1	0	2	1	0	12
Glendale Community College	3	–	13	10	1	0	1	2	3	2	0	3	0	2	8	0	48
Mesa Community College	3	–	24	11	0	4	4	0	10	8	1	8	1	10	11	1	96
Mohave Community College	0	–	37	2	0	1	2	0	67	0	0	1	1	111	2	0	224
Northland Pioneer College	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paradise Valley Community College	1	–	4	6	0	0	8	1	4	0	0	2	0	0	3	0	29
Phoenix College	4	–	10	10	0	5	2	1	3	2	0	2	0	5	3	0	47
Pima Community College	3	–	30	2	0	23	1	0	7	0	0	6	0	4	11	1	88
Rio Salado Community College	1	–	25	6	0	0	2	0	5	4	0	1	0	2	2	0	48
Scottsdale Community College	13	–	32	22	0	9	1	4	8	10	5	11	0	2	14	1	132
South Mountain Community College	0	–	1	8	0	1	0	0	0	1	0	0	0	1	6	0	18
Yavapai College	1	–	30	3	0	5	7	1	4	1	0	4	0	0	0	0	56

Table 13. Fall 2015 WUE Enrollment, by State and Institution (continued)

State (Total WUE)/Institution	State of Residence																Total
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
CALIFORNIA (707)																	
California State University, Bakersfield	0	9	–	4	0	1	1	0	7	2	0	1	0	1	10	1	37
California State University, Channel Islands	0	0	–	0	0	0	0	1	0	0	0	0	0	0	0	0	1
California State University, Chico	5	10	–	8	0	5	13	1	19	0	0	27	0	1	24	0	113
California State University, Dominguez Hills	0	2	–	1	0	0	0	0	1	0	0	0	0	0	0	0	4
California State University, East Bay	1	12	–	5	1	23	0	1	10	0	0	6	2	1	14	1	77
California State University, Maritime Academy	13	4	–	4	0	15	2	0	7	2	0	13	0	0	63	0	123
California State University, Monterey Bay	0	8	–	13	0	14	1	2	7	1	0	11	0	5	12	0	74
California State University, Northridge	1	10	–	0	0	1	0	0	2	0	0	0	0	1	0	0	15
California State University, Sacramento	4	12	–	7	1	16	1	1	15	0	0	8	1	4	30	0	100
California State University, San Bernardino	0	4	–	1	0	2	0	0	6	0	0	0	0	0	2	0	15
California State University, San Marcos	1	2	–	4	0	6	2	0	3	1	0	2	0	1	2	0	24
California State University, Stanislaus	0	4	–	0	0	0	1	0	3	0	1	3	0	0	5	0	17
Humboldt State University	3	8	–	8	1	15	10	2	9	2	0	17	0	0	28	1	104
University of California-Merced	0	1	–	0	0	2	0	0	0	0	0	0	0	0	0	0	3
COLORADO (3,503)																	
Adams State University	4	31	38	–	0	1	2	2	3	0	0	9	0	6	9	0	105
Colorado Mesa University	32	73	235	–	0	148	14	11	35	24	3	24	9	78	16	69	771
Colorado State University - Fort Collins	7	14	115	–	0	14	8	2	9	12	0	16	5	7	15	1	225
Colorado State University - Pueblo	15	38	142	–	0	11	5	3	15	25	3	3	1	3	11	6	281
Fort Lewis College **	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0
Metropolitan State University of Denver	2	21	36	–	0	2	6	3	4	9	0	0	6	5	4	10	108
University of Colorado, Colorado Springs	14	29	225	–	0	25	5	9	9	29	7	9	10	3	23	9	406
University of Colorado Denver	8	17	115	–	0	33	15	8	5	25	8	13	13	7	28	14	309
University of Northern Colorado	23	54	255	–	0	97	11	6	36	35	5	30	20	4	71	53	700
Western State Colorado University	3	9	44	–	0	3	2	2	3	7	0	7	1	6	9	2	98
Aims Community College	1	0	10	–	0	7	2	1	0	5	0	0	1	3	2	4	36
Arapahoe Community College	0	1	3	–	0	1	0	0	0	2	1	1	0	0	1	2	12
Colorado Mountain College	2	3	26	–	0	3	2	2	1	4	1	2	3	0	8	4	61
Colorado Northwestern Community College	1	1	7	–	0	0	3	0	2	2	0	2	0	52	0	3	73
Community College of Aurora	4	5	8	–	0	3	2	2	3	3	0	1	4	1	2	5	43
Community College of Denver	0	2	9	–	0	3	2	2	1	2	1	0	0	3	2	1	28

** New WUE institution for 2015-2016.

Table 13. Fall 2015 WUE Enrollment, by State and Institution (continued)

State (Total WUE)/Institution	State of Residence																Total
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
COLORADO (continued)																	
Front Range Community College	1	6	31	–	0	5	1	3	6	6	3	2	5	1	4	11	85
Lamar Community College	0	3	4	–	0	1	2	0	1	0	1	1	0	5	1	2	21
Morgan Community College	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0
Northeastern Junior College	0	1	1	–	0	1	0	0	3	1	0	0	0	0	0	13	20
Otero Junior College	1	1	7	–	0	2	1	0	7	11	0	0	0	6	0	2	38
Pikes Peak Community College	0	1	6	–	0	0	0	0	2	1	0	1	1	0	0	0	12
Pueblo Community College	2	4	3	–	0	0	0	0	0	1	0	0	0	2	1	0	13
Red Rocks Community College	0	0	4	–	0	0	0	0	1	1	0	0	0	1	3	13	23
Trinidad State Junior College	0	4	8	–	0	0	0	2	5	0	2	3	1	3	2	5	35
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS (0)																	
Northern Marianas College	0	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0
HAWAI'I (2,672)																	
University of Hawai'i, Hilo	17	13	181	25	0	–	5	4	12	4	0	18	2	7	34	4	326
University of Hawai'i, Manoa	30	77	1,607	165	2	–	26	9	27	18	4	75	10	19	255	6	2,330
University of Hawai'i West Oahu	0	2	9	4	0	–	0	0	0	0	0	0	0	0	1	0	16
University of Hawai'i Maui College	0	0	0	0	0	–	0	0	0	0	0	0	0	0	0	0	0
IDAHO (1,482)																	
Boise State University	31	17	478	21	2	10	–	28	54	3	2	72	1	16	211	1	947
Idaho State University	12	4	39	12	0	3	–	10	13	1	2	7	2	11	21	10	147
Lewis-Clark State University	2	0	2	1	0	0	–	3	7	1	0	4	0	2	26	0	48
University of Idaho	13	0	31	4	0	2	–	18	6	0	0	22	0	0	93	0	189
College of Southern Idaho	2	1	1	2	0	1	–	3	27	0	1	7	0	1	3	1	50
North Idaho College	11	3	12	0	0	2	–	48	3	2	1	12	1	4	0	2	101
MONTANA (2,660)																	
Montana State University, Billings	10	15	39	22	0	0	28	–	12	1	17	13	3	4	45	75	284
Montana State University, Bozeman	79	8	112	230	0	0	100	–	10	9	9	67	31	12	233	40	940
Montana State University, Northern	6	5	41	1	0	0	13	–	10	0	0	10	0	2	65	5	158
Montana Tech, University of Montana	14	2	42	16	0	1	31	–	5	0	6	10	1	3	42	11	184

Table 13. Fall 2015 WUE Enrollment, by State and Institution (continued)

State (Total WUE)/Institution	State of Residence																Total
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
MONTANA (continued)																	
University of Montana, Missoula	49	27	156	59	0	5	93	–	15	8	9	68	20	23	213	23	768
University of Montana, Western	4	8	31	8	0	5	71	–	17	2	0	20	2	5	49	11	233
Dawson Community College	1	0	2	2	0	0	4	–	2	0	5	2	0	18	2	1	39
Flathead Valley Community College	3	0	0	0	0	1	0	–	0	0	0	0	0	0	1	0	5
Great Falls College, Montana State University	1	0	0	0	0	0	2	–	1	0	0	1	0	0	0	0	5
Helena College of Tech, University of Montana	2	1	2	0	0	0	1	–	0	0	0	1	0	0	2	1	10
Highlands College of Montana Tech	0	0	0	1	0	0	0	–	0	0	1	0	0	0	3	1	6
Miles Community College	0	2	5	1	0	0	7	–	2	0	0	1	0	10	0	0	28
NEVADA (4,823)																	
Nevada State College	0	5	11	0	0	5	0	0	–	0	0	2	0	1	0	0	24
University of Nevada, Las Vegas	9	49	459	48	1	260	10	15	–	7	3	22	5	11	56	5	960
University of Nevada, Reno	34	24	3,108	29	1	77	25	13	–	6	1	43	4	7	49	3	3,424
College of Southern Nevada	4	14	55	9	1	40	5	3	–	2	0	6	1	6	11	0	157
Great Basin College	0	2	10	0	0	0	4	0	–	0	0	0	1	9	0	0	26
Truckee Meadows Community College	5	2	157	1	0	4	1	1	–	0	0	3	0	3	7	0	184
Western Nevada Community College	1	1	19	1	0	2	0	1	–	0	0	3	0	16	4	0	48
NEW MEXICO (1,104)																	
Eastern New Mexico University, Portales	0	33	50	25	0	3	1	0	4	–	1	1	3	1	7	2	131
New Mexico Highlands University	0	15	50	1	0	0	1	0	2	–	0	0	0	1	1	0	71
New Mexico Institute of Mining & Technology	1	2	13	0	0	0	0	0	0	–	0	0	0	0	4	1	21
New Mexico State University	9	179	180	10	0	12	4	11	16	–	0	11	2	4	28	7	473
Northern New Mexico College	0	0	0	0	0	0	0	0	0	–	0	0	0	0	0	0	0
University of New Mexico	2	24	140	11	0	9	1	0	13	–	0	3	6	6	10	3	228
Western New Mexico University	1	2	55	0	0	6	1	0	3	–	0	0	0	1	3	2	74
Eastern New Mexico University, Roswell	0	1	1	8	0	1	1	1	0	–	0	0	0	1	0	0	14
New Mexico Junior College	0	0	1	1	0	0	0	0	0	–	0	0	0	0	0	0	2
Santa Fe Community College	0	0	0	0	0	0	0	0	0	–	0	0	0	0	0	0	0

Table 13. Fall 2015 WUE Enrollment, by State and Institution (continued)

State (Total WUE)/Institution	State of Residence																Total
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
NORTH DAKOTA (2,098)																	
Dickinson State University	5	10	74	5	0	4	8	0	5	1	–	1	0	2	9	27	151
Mayville State University	12	5	36	3	0	5	4	0	2	1	–	3	0	0	6	2	79
Minot State University	9	21	136	13	0	5	8	80	16	2	–	18	12	11	32	6	369
North Dakota State University	7	12	47	12	0	2	1	43	14	3	–	4	176	1	18	5	345
University of North Dakota	17	43	217	100	0	16	19	1	15	16	–	25	0	21	106	41	637
Valley City State University	9	14	42	7	0	8	4	0	3	0	–	4	0	3	3	80	177
Bismarck State College	5	16	55	32	0	1	10	0	10	8	–	6	0	18	23	23	207
Dakota College at Bottineau	8	9	12	7	0	2	1	0	2	0	–	2	0	1	6	2	52
Lake Region State College	0	2	4	1	0	1	1	2	3	2	–	0	2	0	6	3	27
North Dakota State College of Science	1	1	3	4	0	1	0	0	0	0	–	0	0	0	3	0	13
Williston State College	0	9	6	2	0	0	4	1	2	0	–	5	0	9	1	2	41
OREGON (2,733)																	
Eastern Oregon University	5	7	68	3	1	10	0	7	21	2	1	–	0	3	0	5	133
Oregon Institute of Technology	17	6	114	7	0	43	15	5	15	1	0	–	0	2	63	4	292
Portland State University	16	12	128	14	0	29	24	15	11	3	2	–	0	10	85	0	349
Southern Oregon University	69	12	798	14	0	94	18	1	61	9	1	–	1	5	117	2	1,202
University of Oregon**	1	2	0	8	0	2	3	0	9	0	0	–	0	1	5	0	31
Western Oregon University	24	18	204	11	4	184	31	5	16	1	0	–	1	4	223	0	726
Klamath Community College*	0	0	0	0	0	0	0	0	0	0	0	–	0	0	0	0	0
SOUTH DAKOTA (1,469)																	
Black Hills State University	6	9	32	73	0	0	3	45	11	3	45	1	–	4	6	77	315
Dakota State University	2	20	37	7	0	1	2	2	9	0	18	1	–	3	11	5	118
Northern State University	2	11	25	3	0	2	4	3	2	1	5	0	–	0	18	9	85
South Dakota School of Mines & Technology**	7	40	72	192	0	3	7	19	6	10	65	11	–	1	39	70	542
South Dakota State University	7	21	83	29	0	0	4	6	6	4	32	9	–	3	22	14	240
University of South Dakota	7	13	61	42	0	0	1	3	7	2	8	7	–	1	3	14	169

*New WUE institution for 2015-2016.

**Institution no longer receiving new WUE students as of Fall 2015 or prior.

Table 13. Fall 2015 WUE Enrollment, by State and Institution (continued)

State (Total WUE)/Institution	State of Residence																Total
	AK	AZ	CA	CO	CNMI	HI	ID	MT	NV	NM	ND	OR	SD	UT	WA	WY	
UTAH (1,377)																	
Dixie State University	4	16	64	6	0	11	21	2	9	2	0	2	0	–	7	4	148
Southern Utah University	2	35	90	8	2	9	6	3	123	0	2	3	0	–	4	1	288
University of Utah	1	5	31	17	0	4	20	5	8	2	0	9	2	–	11	4	119
Utah State University	2	3	28	15	0	1	24	6	17	2	0	8	1	–	10	5	122
Utah Valley University	8	84	174	33	0	30	54	10	47	4	0	20	0	–	54	13	531
Weber State University	1	9	34	9	0	6	17	3	11	1	0	3	0	–	8	9	111
Utah State University Eastern	0	0	0	0	0	0	0	0	0	0	0	0	0	–	0	0	0
Salt Lake Community College	0	5	4	2	0	1	8	0	9	1	0	1	0	–	5	2	38
Snow College	0	3	2	6	0	1	7	1	0	0	0	0	0	–	0	0	20
WASHINGTON (1,594)																	
Central Washington University	29	11	105	17	0	29	28	6	14	2	0	64	0	4	–	3	312
Eastern Washington University	17	0	22	1	0	2	22	6	2	0	0	13	1	0	–	1	87
Washington State University	51	15	260	26	0	53	114	31	29	0	3	81	0	12	–	6	681
Washington State University, Tri-Cities	0	0	1	0	0	1	1	0	0	0	0	2	0	0	–	0	5
Western Washington University	48	12	56	61	0	14	42	30	14	8	4	79	2	13	–	2	385
Spokane Community College	2	0	3	0	0	0	23	2	0	0	0	4	0	5	–	0	39
Spokane Falls Community College	5	0	9	1	0	2	44	7	9	0	0	4	0	4	–	0	85
WYOMING (1,597)																	
University of Wyoming	1	0	12	124	0	1	3	7	0	0	1	3	3	1	4	–	160
Casper College	2	6	18	50	0	3	14	27	2	3	3	5	11	10	6	–	160
Central Wyoming College	2	4	10	26	0	0	28	4	5	3	3	1	2	27	7	–	122
Eastern Wyoming College	0	0	5	24	0	0	1	17	3	0	0	1	15	6	2	–	74
Gillette College	0	1	7	14	0	0	2	19	1	3	1	2	22	0	2	–	74
Laramie County Community College	3	1	21	218	0	1	10	9	5	2	2	4	16	8	8	–	308
Northwest College	1	2	10	10	0	0	33	155	10	2	2	7	7	26	10	–	275
Sheridan College	0	7	5	20	0	3	6	149	5	0	4	2	38	2	2	–	243
Western Wyoming Community College	3	10	10	23	0	0	13	7	4	1	1	3	0	102	4	–	181
Enrollment by state resident totals	**1,101**	**1,510**	**16,784**	**2,578**	**20**	**1,861**	**1,393**	**1,021**	**1,492**	**546**	**326**	**1,339**	**514**	**960**	**3,275**	**912**	**35,632**

www.wiche.edu/wue

The Interstate Passport: A New Framework for Transfer

The **Interstate Passport Initiative** is a new learning outcomes-based framework for transfer that seeks to improve graduation rates, shorten time to degree, and save students money. The goal is to eliminate unnecessary repetition of academic work after students transfer. The new framework focuses on lower-division general education, which is the common denominator among institutions. The Passport focuses on these requirements as a whole (instead of individual courses), and allows for a cross-border "match" of outcomes-integrated general education for block transfer. Students who earn a "Passport" at one participating institution and transfer to another one will have their learning achievement recognized; they will not be required to repeat courses at the receiving institution to meet lower-division general education requirements.

The Passport framework is made up of Passport Learning Outcomes (PLOs) and Passport Transfer-Level Proficiency Criteria (PC) in nine knowledge of concept and skill areas:

- Oral communication
- Written communication
- Quantitative literacy
- Natural sciences
- Human cultures
- Critical thinking
- Creative expression
- Human society and the individual
- Teamwork and value systems.

Faculty members from both two-and four-year Passport institutions have worked work collaboratively to develop the PLOs and PC, completing the framework in spring 2016. Faculty acknowledge that their institutions' lower-division general education learning outcomes are equivalent to the PLOs. Institutions are not required to use the same language as the PLOs in their learning outcomes, but they must ensure alignment to the PLOs. Passport's academic areas map to the Liberal Education and America's Promise Essential Learning Outcomes (LEAP ELOs) developed by the Association of American Colleges and Universities and widely adopted by institutions across the country.

Faculty members also will construct each institution's Passport Block, which contains the learning experiences and/or courses that impart the PLOs. Seventeen institutions from seven states are participating: California, Hawai'i, North Dakota, Oregon, South Dakota, Utah, and Wyoming. The project has been supported over a five-year period by the Carnegie Corporation of New York, the Bill & Melinda Gates Foundation, Lumina Foundation, and a First in the World (FITW) grant from the U.S. Department of Education.

Beginning in 2016 the National Student Clearinghouse (NSC) will operate Passport's data repository and academic tracking process. NSC will provide two services: Passport Verify and Academic Progress Tracking (APT). The Passport Verify service will allow Passport institutions to query the Clearinghouse to find out if an incoming transfer student has earned the Passport. Through the new APT service, NSC will calculate aggregate academic progress data reported by receiving institutions. The Clearinghouse will produce and deliver reports to the sending institutions about the performance of their former students, and deliver a composite report to the Passport Review Board.

Over 50 institutions from four states outside the WICHE region will be participating in a project component to map institution learning outcomes to the PLOs and construct Passport Blocks. The Passport is also expanding to other institutions and states beyond the WICHE region. Nationwide participation in the Passport project will make transfer significantly easier for students, leading to improved completion rates, simplified processes for institutions, and cost savings for students, institutions, and states.

INTERSTATE PASSPORT

Study. Transfer. Succeed.

"I am a nurse practitioner (NP) working at a safety-net clinic in Oakland. California has very restrictive practice laws for NPs and for that reason, California schools prepare NPs for practice with physician oversight. However, my long-term goal is to work independently in a rural or urban setting that is underserved by physicians. To prepare, I needed to deepen my clinical training in a state where NPs practice independently. Training for independent practice will prepare me for the responsibilities, liabilities and clinical sensibility that is required of independent practice. Oregon is the perfect training environment because its NPs practice independently. Thanks to WRGP, I am training in a full-practice authority state, enrolled at OHSU and paying resident tuition. WRGP has facilitated my preparation for independent practice in an underserved area of California – bringing healthcare to the neediest of our state."

*– Suzanne, California resident, Class of 2017,
Oregon Health & Science University, Doctorate of Nursing Practice*

The WICHE Commission's 16 members include representatives from 15 states – Alaska, Arizona, California, Colorado, Hawaiʻi, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming – and the Pacific Island U.S. territories and free-standing states (the Commonwealth of the Northern Mariana Islands is the first to join).

By promoting innovation, cooperation, resource sharing, and sound public policy among states and institutions, WICHE strengthens higher education's contributions to the region's social, economic, and civic life.

WICHE

Western Interstate Commission for Higher Education

"I am so grateful to be paying reduced tuition thanks to the WUE program. It has made it possible for me to attend an out-of-state university that offered my major: a bachelor's in dental hygiene. Not only has WUE made school affordable, but it's also challenged me to work for my goals in a set time frame. I would not be where I am today without the reduced tuition through WUE."

*– Megan, Arizona resident, Class of 2017,
Idaho State University, Dental Hygiene*

I'm a Colorado native and received my bachelor's in social work in my home state. After I returned from my service with the Peace Corps, I knew that graduate school was next, but I wanted to expand my social work knowledge to another state. Contrary to popular belief, Peace Corps service does not forgive all student loan types, and the pay is not sustaining. So with graduate school on my mind, concerns about money accompanied it. WRGP allowed me to complete my graduate degree in another state, and I plan to return to Colorado to work in the future."

*– Caitlin, Colorado resident, Class of 2016,
Arizona State University, Master's of Social Work*

I started my doctoral studies at Oregon Health & Science University while serving as an active duty nurse officer with the U.S. Public Health Service on a rural Indian reservation in Arizona. Thanks to WRGP, the non-resident portion of my tuition was waived. Programs like WRGP are a strong incentive for licensed healthcare professionals working at the bedside to pursue a terminal academic degree and advance in their career. Ultimately, a more educated workforce will strengthen the nursing profession.

*– Kaori, Alaska resident, Class of 2016,
Oregon Health & Science University, Doctoral Nursing Program*
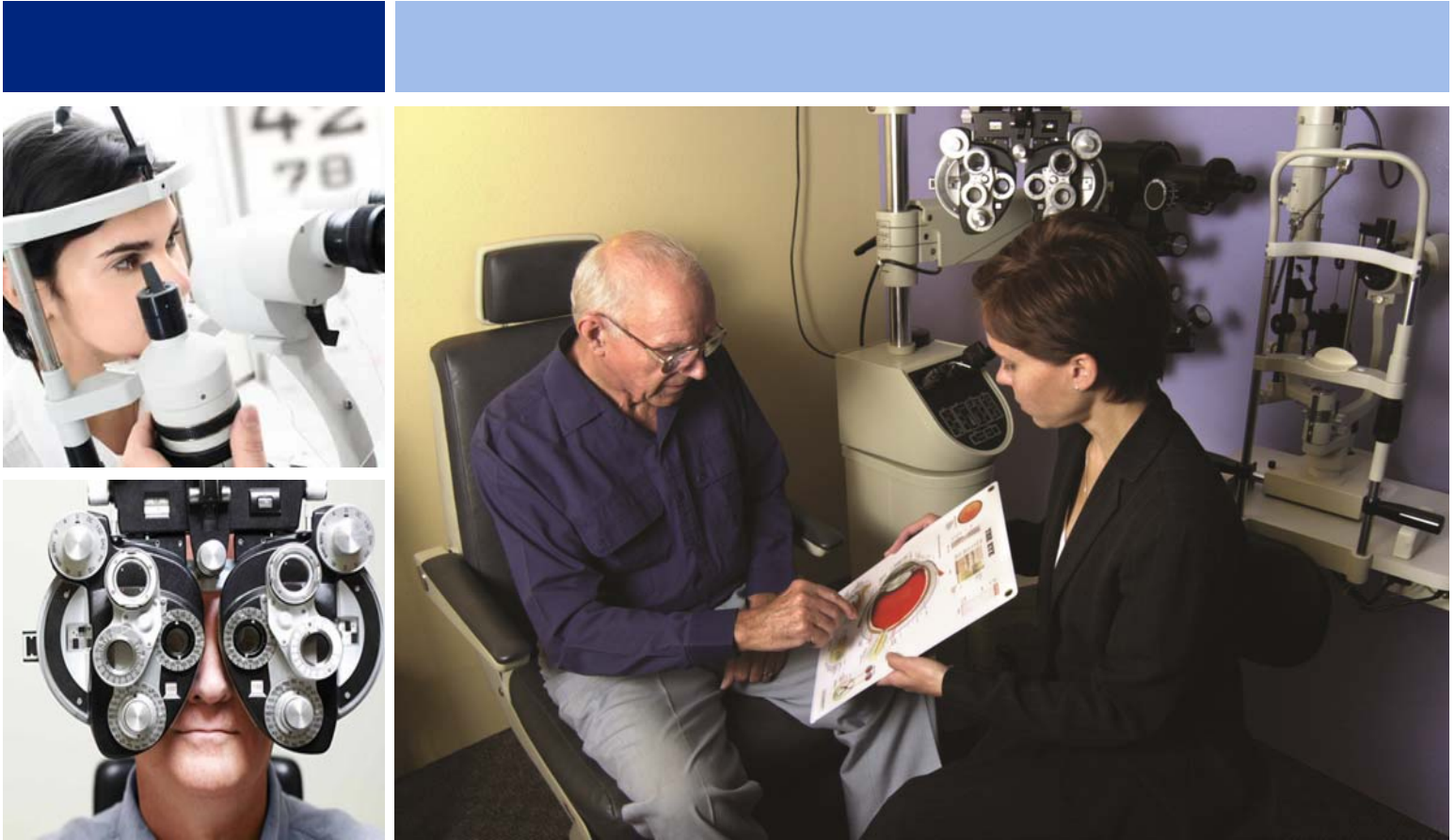
Eye Care Workforce Study: Supply and Demand Projections

Final Report

Prepared for: **American Optometric Association and the Association of Schools and Colleges of Optometry**

Submitted by: **The Lewin Group**

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Table of Contents

List of Abbreviations

Abbreviation	Definition
AAMC	Association of American Medical Colleges
ABIM	American Board of Internal Medicine
AMA	American Medical Association
AOA	American Optometric Association
ASCO	Association of Schools and Colleges of Optometry
BHPr	Bureau of Health Professions
CMS	Centers for Medicare & Medicaid Services
CHIP	Children's Health Insurance Program
COGME	Council on Graduate Medical Education
CPT	Current Procedural Terminology
dNHI	de-identified Normative Health Information
DO	Doctor of Osteopathic Medicine
FTE	Full-time equivalent
HRSA	Health Resources and Services Administration
ICD-9	International Classification of Diseases, Ninth Revision
IMG	International Medical Graduate
MD	Medical Doctor
MEPS	Medical Expenditure Panel Survey
MGMA	Medical Group Management Association
NPPES	National Plan and Provider Enumeration System
OD	Doctor of Optometry
ACA	Affordable Care Act of 2010
PSPS	CMS Physician Supplier Procedure Summary Masterfile
WSPT	Workforce Study Project Team
TEP	Technical Expert Panel
UHG	*UnitedHealth Group*

Glossary of Statistical Terms

Statistical Term	Definition
Coefficient	A value placed in front of a variable and which multiplies that variable. It is typically estimated using regression analysis.
Mean	Arithmetic average.
Median	Middle value. Half of observations lie above, half lie below the median.
Regression	Statistically fitting a line to data to minimize the deviations of the data from the line.
Standard error	A measure of how far a random variable will deviate from its expected value in repeated samples.
t-ratio	The ratio of an estimated coefficient to its standard error. A t-ratio greater than 1.96 indicates that the estimated coefficient is statistically significant at the 0.05 level of significance.

Executive Summary

In 1999, Abt Assoc. Inc. produced the Workforce Study of Optometry for the American Optometric Association (AOA). Over a decade later, the AOA, in conjunction with the Association of Schools and Colleges of Optometry (ASCO), embarked on a new workforce study to assess the current climate of the eye care market in the United States. In 2011, The Lewin Group was commissioned to conduct a new workforce study for optometry and to develop a flexible model to predict future changes in the supply of and demand for eye care.

The primary purpose of this report is to analyze the supply of and demand for optometrists in the U.S., and to exposit the computer-based model developed to aid in the analysis. Optometry workforce requirements are influenced by the overall market for eye care services which includes services provided by ophthalmologists. In an effort to more accurately predict the future eye care workforce requirements, both optometrists and ophthalmologists have been considered in the model.

In this report, we provide a baseline assessment of the supply of and demand for eye care providers through 2025. We also consider the impact of alternative factors that are likely to affect supply and demand in the future. The projections of supply and demand are made by applying the workforce model developed as part of this project. In addition, we provide an exposition of the basic methods and data underlying the analysis and supporting the computer-based model of supply and demand.

A.   Optometry and Ophthalmology Workforce

We estimate that there were 39,580 optometrists providing direct care to patients in the United States in the beginning of 2012. This estimate is based on merging data from Provider 360, a proprietary list of practicing providers that is updated continually, and the AOA's data base of optometrists. Information from the National Plan and Provider Enumeration System (NPPES), maintained by the Centers for Medicare & Medicaid Services (CMS), was also used in the estimation. The demographic mix of the optometry workforce is shown in *Exhibit ES-1*.

Exhibit ES-1 2012 Optometry Workforce Demographics

	Female	Male	Total
Number	15,913	23,667	39,580
Percent	40.2%	59.7%	100%
Average Age	40.2	50.9	46.6
Percentage Age 50+	17.4%	56.4%	40.7%

The 2012 workforce was about 60 percent male and 40 percent female. However, women in the optometry workforce were, on average, significantly younger than men, on average. This suggests that the workforce will consist of a growing proportion of women over time, as a higher proportion of men enter retirement age and leave the workforce.

At the beginning of 2012, we estimate there were 16,404 board certified or board eligible ophthalmologists in the United States. This estimate is based on the American Medical

Association (AMA) Masterfile. To be included, the ophthalmologist was engaged in clinical practice as their primary activity, as reported in the AMA Masterfile, was not engaged in research or administration, and was not classified as inactive. ***Exhibit ES-2*** shows the corresponding demographic mix for the ophthalmology workforce at the beginning of 2012. The ophthalmology workforce was 78 percent male. Moreover, almost 55 percent of the workforce was over age 50, compared to 41 percent of the optometrist workforce, suggesting that there will be significant losses from the ophthalmology workforce as the older ophthalmologists retire.

Exhibit ES-2. 2012 Ophthalmology Workforce Demographics

	Female	Male	Total
Number	3,638	12,766	16,404
Percent	22%	78%	100%
Average Age	46.3	51.9	50.7
Percent Age 50+	38.9%	59.2%	54.7%

B. Methods and Data

The supply and demand model projects the supply of and demand for optometry and ophthalmology services from a base year period of 2012 through 2025. We model optometry and ophthalmology separately, but then combine the results into one overall model of the supply and demand for eye care services.

Supply projections of the eye care workforce begin with the number of providers, by age and gender, in the base year, 2012. Attrition rates, representing retirement rates and mortality rates by age and gender, are applied to obtain the number of providers remaining in the workforce in the next year (T+1). Then, new entrants, who are graduates from schools of optometry or who are completing ophthalmology residencies in year T, enter the workforce and are counted in the workforce in T+1. Conceptually, active supply in the next year (T+1) is a function of supply in the current year (T) minus attrition and plus new entrants. This projection framework is represented by the following equation:

$$Active\ Supply_{T+1} = Active\ Supply_T - Attrition_T + New\ Entrants_T$$

We measure the count of these providers in two ways. The first is simply the number of providers. The second measure is full-time equivalent supply or "FTE supply." Hours spent in patient care and productivity, measured as the number of patients seen in a given time period, vary by provider type and by age and gender. This FTE measure normalizes the count of optometrists and ophthalmologists each year by average hours of work and average patient visits resulting from the age and gender distribution of the eye care providers in the base year, 2012. As the age and gender distribution changes over time, the number of providers may deviate from the number of "FTE." This is because the demographics of the workforce may have shifted towards providing fewer (or greater) hours of patient care and patient visits per year, relative to those provided by the demographic distribution of the workforce in the base year.

Demand projections also begin with the base year period, 2012, and are a measure of utilization. For optometrists and ophthalmologists, respectively, we begin with a per capita measure of utilization that varies by age and gender cells (e.g., males age 0-4) corresponding to the age and gender of prospective patients who are utilizing eye care services. This measure of utilization per capita is calculated as the ratio of the total number of visits by patients in a given age and gender cell divided by the total U.S. population in that age and gender cell, in the base period of 2012. As a practical matter, we estimate per capita utilization in five age ranges by gender, where these ranges encompass the total population.

Base year demand, in terms of visits or utilization, is then estimated by multiplying the base year per capita utilization by the base year population in each cell, and adding across cells to obtain total demand. This demand, in terms of total visits or utilization, is converted into demand in terms of the FTE required to provide those visits. Hence, the same FTE measure defined in the supply discussion above is used to convert demand, as measured by visits, into demand as measured by FTE providers required to provide that demand. The equations for projecting baseline demand, that is the future population demand under the standard utilization patterns observed by age and gender groups in 2012, are shown in the following:

$$Demand\ (Visits\ )_{T+1} = (Visits\_Per\_Capita_{2012} * Population_{T+1})$$
$$Demand\ (FTE\ )_{T+1} = (Demand\ (Visits\ )_{T+1} / Visits\_per\_FTE_{2012})$$

The baseline projections of supply and demand can be modified to reflect additional factors affecting supply or demand, or to consider alternative scenarios. On the supply side, for example, one can specify changes in the number of schools of optometry or changes in the class size affecting the number of graduates entering the workforce in future years. Similarly, changes in residency positions in future years will affect the future supply of ophthalmologists.

On the demand side, changes in the baseline projections are achieved by estimating the effect that a given change will have on per capita utilization in a future year as well as the population, by age and gender, which will be affected. The estimated *change* in per capita utilization multiplied by the population affected results in the change in total utilization. This is added (or subtracted) to the baseline total utilization, providing an estimate of the new level of demand in the particular projection year.

The description above is a high-level overview of the major drivers of the Eye Care Workforce Model. The data sources for the key estimates and parameters of the model are summarized in *Exhibit ES-3*.

Exhibit ES-3. Data Sources of Supply and Demand Projections

Parameter	Data Sources	
	Optometrists	**Ophthalmologists**
SUPPLY PROJECTIONS		
Active Supply	Provider360 , AOA Member Lists, and National Plan and Provider Enumeration System (NPPES)	American Medical Association's Masterfile
New Entrants	Number of new graduates and historical trends in number of optometry graduates (ASCO) and research by The Lewin Group.	Ophthalmology Residency Match sponsored by the Association of University Professors in Ophthalmology (AUPO)
Attrition Rate	Retirement rates derived from the 2012 National Eye Care Workforce Study. Mortality Rates from the CDC National Vital Statistics System Mortality Data, adjusted for clinical providers, with adjustments according to Johnson NJ, Sorlie PD, Backlund E., "The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography;* 1999 Aug;36:355-367.	Retirement rates from AAMC/AMA Survey of Physicians Over Age 50 Survey (2006). Mortality Rates from the CDC National Vital Statistics System Mortality Data, with adjustments according to Johnson NJ, Sorlie PD, Backlund E., "The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography;* 1999 Aug;36:355-367.
DEMAND PROJECTIONS		
Population Projection	2010 Decennial U.S. Census	
Utilization Rate	2010 Medical Expenditure Panel Survey Data from the Agency for Healthcare Research and Quality, Data from Medicare 5% sample and commercial claims data from OptumInsight's de-identified Normative Health Information system (dNHI)	
Annual Visits	2012 National Eye Care Workforce Study	Medical Group Management Associates (MGMA) productivity data MEPS 2010

A particularly important source of data was the 2012 National Eye Care Workforce Survey of Optometrists. The 2012 National Eye Care Workforce Survey of Optometrists was developed by The Lewin Group and the AOA-ASCO Workforce Expert Panel, consisting of optometrists, other clinicians and other health care professionals, in consultation with the Workforce Study Project Team. The survey aimed to identify characteristics of individual optometrists and their work settings, including workload, patient mix, and the organization of their practice.

The survey contributed several key elements of data to the workforce model and the assessment of the eye care workforce. These include: (1) an estimate of the total number of visits provided by optometrists in 2012; (2) an estimate of "excess capacity" of the optometry workforce—the number of visits that optometrists could have provided above those actually provided without increasing hours allocated to patient care; (3) retirement rates by age and gender of the optometrist. A complete report on the 2012 National Eye Care Workforce Survey of Optometrists is available in a separate document.

C. Results

The Eye Care Workforce Model was applied to produce a baseline assessment of the supply of and demand for eye care providers. In *Exhibit ES-4*, we present the baseline for the eye care market as a whole through 2025. The market is described in terms of FTE optometrists. Using this measure, ophthalmologist supply and demand are transformed into optometrist equivalent FTE where one ophthalmologist FTE is the equivalent of 1.36 optometrist FTEs. In the baseline case, the demand for eye care services increases because of the growth and aging of the population. Because utilization varies by age and gender, the aging of the population adds to demand along with overall population growth, as a greater proportion of the population enters older age groups that have higher utilization. However, the baseline case does not consider other potential factors that may change over time to affect demand.

In the baseline supply, we begin with the 2012 workforce of both optometrists and ophthalmologists, and the services that workforce provided, as the starting point for supply. Supply is projected through 2025. Supply changes over time as a result of attrition from the workforce, as older optometrists and ophthalmologists leave the workforce through retirement or death. New entrants into the workforce are determined by planned changes in class sizes for schools of optometry over the next several years, with class sizes assumed to be unchanged beyond 2019. For ophthalmologists, residency positions, which determine new entrants into the workforce, are assumed to remain unchanged from their 2012 level through 2025.

Exhibit ES-4 suggests that, in this baseline case, there will be excess demand for eye care providers throughout the projection period. In fact, the excess demand grows continually over the period until, by 2025, a gap of approximately 4,300 FTE optometrist providers will emerge. Hence, under the baseline case, without considering additional factors, there is projected to be a shortage of eye care providers.

Exhibit ES-4. Total Eye Care Market Baseline Supply and Demand
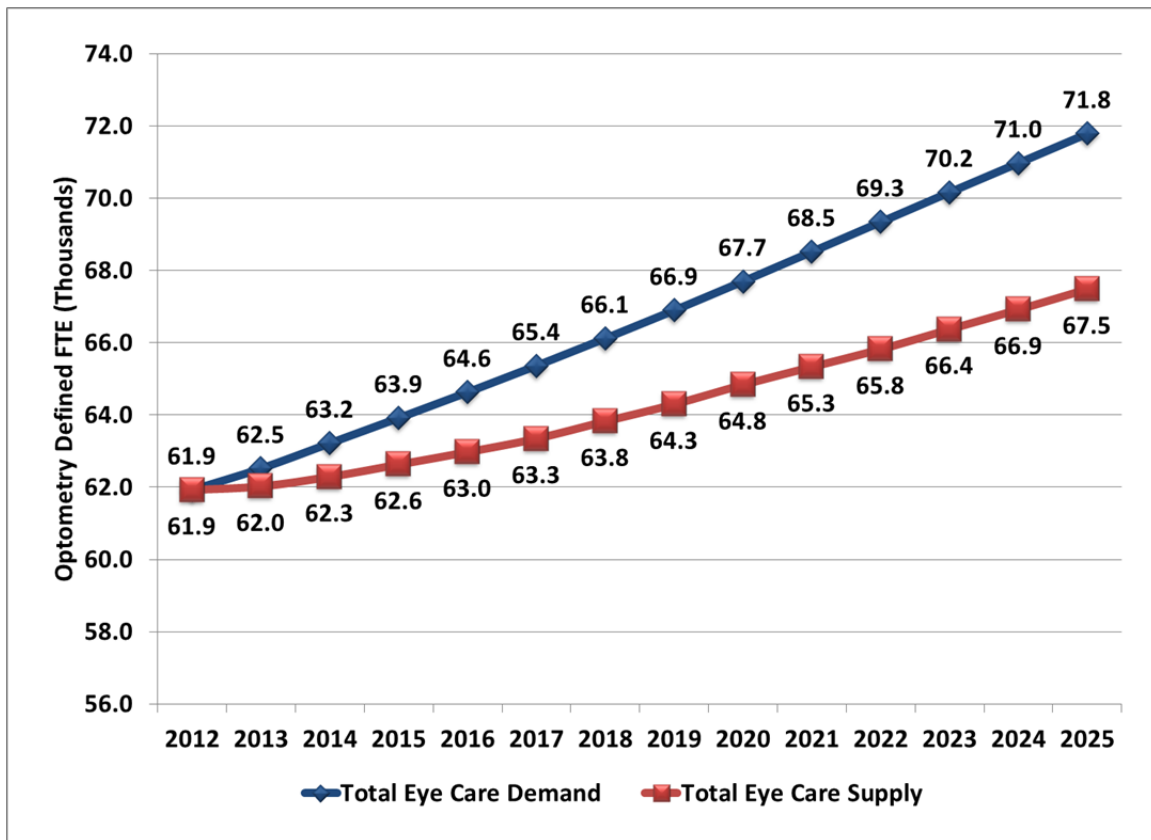
1. *Estimated Impact of Additional Factors Affecting Demand*

We expand beyond the baseline analysis to include several factors that may affect the demand for eye care services in the near future and persist throughout the forecast period, through 2025. The first factor we consider is the effect on demand of increased insurance coverage, and a minimum essential eye care benefit for children, under the Affordable Care Act (ACA). Next, we consider the possible implications of an increase in the prevalence of type 2 diabetes mellitus on the demand for eye care services. The workforce model can be used to consider other factors that may affect demand. The effect of the ACA on insurance coverage, and the potential impact on demand, is a particularly important one to examine, as it is likely to have a significant impact on the demand for eye care services. The effect that an increase in the prevalence of diabetes may have on demand is also potentially large.

The methods, data and assumptions underlying the estimates of the effect of the ACA on demand, and the potential effect that increased prevalence of diabetes may have on demand, are presented in Section IV: Methods and Data. The effects of these factors are uncertain. However, we are making initial estimates based on the information available, which is itself limited. One value of a workforce model is that the sensitivity of general conclusions to alternative assumptions regarding the impact of these factors can be readily tested.

We consider an estimate of the effect of eye care coverage under the ACA that includes the effect of ACA added coverage on demand for both children and adults. The estimate is based on the total eye care market, for which both optometrists and ophthalmologists are providers. First, consider the effect that ACA may have on demand through the increased health insurance coverage of children. Since eye care coverage for children is a minimum essential benefit required by the ACA, including an annual eye examination for children, we consider two dimensions of the impact: (1) the number of children who will become newly covered for eye care and (2) the number of additional visits per newly covered child.

We estimate that 8.4 million currently uninsured children will be newly covered under ACA, and that this results in 0.25 additional visits per year from each individual in this group. Utilization increases from 0.08 visits per child per year to 0.33 visits per child per year for these children. The 8.4 million estimate was based on an analysis of data from the American Community Survey. Children were included if (a) they were not eligible for Medicaid or the Children's Health Insurance Program (CHIP) based on family income; and (b) they were not covered by insurance. The increase of 0.25 visits as a result of eye care coverage was estimated based on Medical Expenditure Panel Survey data, comparing eye care visits for those with and without medical insurance. It is an imperfect measure, as medical insurance is not required to cover an annual routine eye examination, but the ACA insurance is likely to do so as a minimum essential benefit for children. This includes not only the estimated 8.4 million currently uninsured children, but also a currently unknown number of children with health insurance coverage that will gain a comprehensive eye exam and materials benefit under the ACA.

Next, we consider the effect of the ACA's health insurance expansion to non-Medicare eligible adults on eye care demand. The coverage for adults does not include an annual comprehensive eye examination in the minimum essential benefit package. The ACA is estimated to insure 25 million Americans by full implementation in 2017-2018.[1] Using data from the Medical Expenditure Panel Survey to compare eye care utilization of those who have medical insurance to those who do not, we estimate that newly insured adults will increase utilization by 0.19 visits per newly insured person, from about 0.13 visits per person per year to 0.33 visits per person per year.

Finally, we consider the possible impact that increased prevalence of Type 2 diabetes may have on the demand for eye care services. We consider a case in which the prevalence of diabetes increases from 7.4 percent in 2012 to 12 percent by 2025. This *potential* increase in prevalence, though speculative, provides a future scenario that is consistent with recent trends.[2] For those additional individual cases of diabetes resulting from the higher prevalence rates, we estimate that those newly diagnosed will have 0.43 additional eye care visits per year, with utilization increasing from 0.58 visits per person per year prior to the diagnosis of diabetes, to 1.01 visits per person per year after diagnosis. This is based on the difference in utilization between those with diabetes and those without.

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[1] Congressional Budget Office, "Updated Budget Projections: FY 2013-2023," and in particular, "Baseline Projections for Health: Effect of the Affordable Care Act on Health Insurance Coverage," May 14, 2013. http://www.cbo.gov/publication/44176.

[2] This prevalence increase in diabetes is based on Boyle, James P., Theodore J. Thompson, Edward W. Gregg, Lawrence E. Barker, and David F. Williamson, "Projection of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality, and pre-diabetes prevalence." *Popul Health Metr* 8, no. 1 (2010): 29.

The potential impact on demand of increased insurance coverage under ACA and increased prevalence of diabetes is shown in *Exhibit ES-5*. The lines labeled *Total Supply* and *Total Eye Care Demand* are the same baseline supply and demand estimates shown in *Exhibit ES-4*. The effect of ACA on demand, through coverage of additional children and additional adults, is labeled *Total Eye Care Demand w/ACA Adult Ins & Child Ins*. It represents an upward shift from the baseline demand due to additional insurance coverage under ACA. Finally, the line labeled *Total Eye Care Demand w/ACA Adult Ins, Child Ins & Diabetes* represents the cumulative effect on demand, starting with the baseline demand, of the ACA effect through insurance coverage, and the increased demand due to a higher prevalence of diabetes.

The estimated effect of the ACA on demand is to increase excess demand from 4,300 FTE in 2025 in the baseline to about 6,400 FTE by 2025. When the scenario of increased prevalence of diabetes is included, this gap grows to 9,000 FTE, or almost a 40 percent increase in the estimated gap from the effect of the ACA and baseline demand alone. Note, however, that the increase in diabetes prevalence, though based on extrapolation of trends, is speculative.

Exhibit ES-5. Eye Care Market Impact of ACA and Increased Diabetes Prevalence
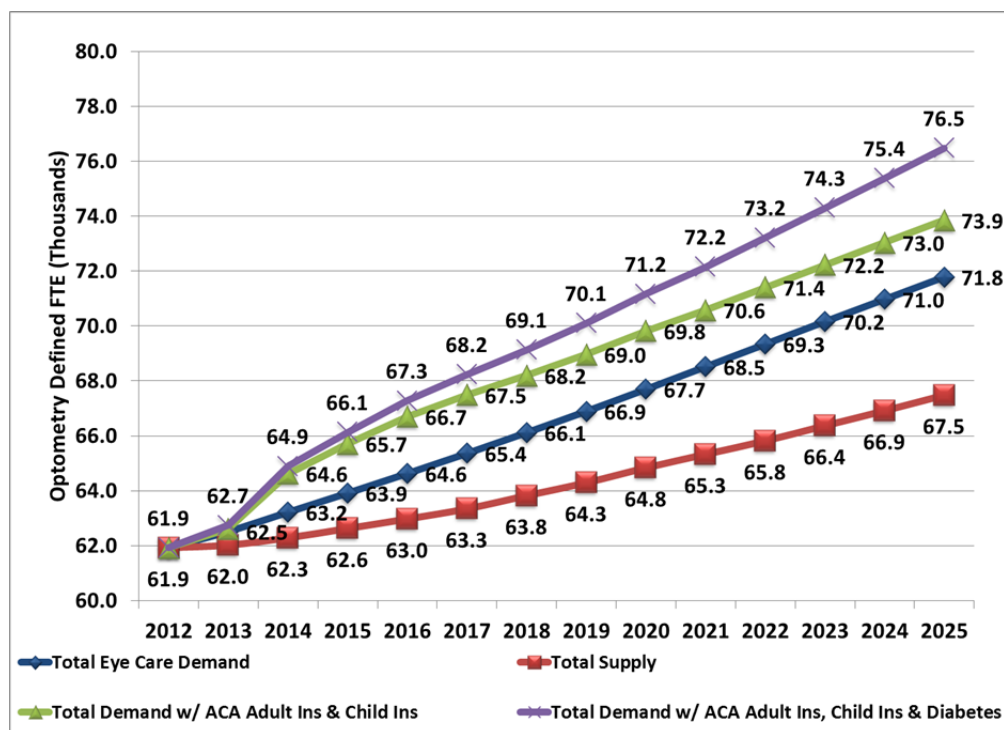
2. Eye Care Supply Recognizing Potential Excess Capacity among Optometrists

We now consider an alternative baseline supply for eye care services where optometrists' self-reported "excess capacity" is included in the potential supply of services by optometrists. In the 2012 National Eye Care Survey of Optometrists, responding optometrists indicated that, if they were able to operate at their full capacity without increasing their current patient care hours, they could provide about 32 percent more patient visits per year than they were actually providing. This recognizes, among other factors, that the self-reported excess capacity reflected ideal scheduling of patients, which may be difficult to achieve or sustain.

Exhibit ES-6 shows a substantial shift in the baseline supply of eye care services, to include the services of both optometrists and ophthalmologists, if optometrists were able to provide an additional 32 percent of services per year due to excess capacity. Total Eye Care Demand is the baseline demand introduced in *Exhibit ES-4*. While it is not precisely clear how to interpret the self-reported "excess capacity," if it means that the typical optometrist can (and desires to) increase patient visits, effective supply could increase significantly.

Exhibit ES-6. Alternative Supply Adjusted for Potential Excess Capacity among Optometrists
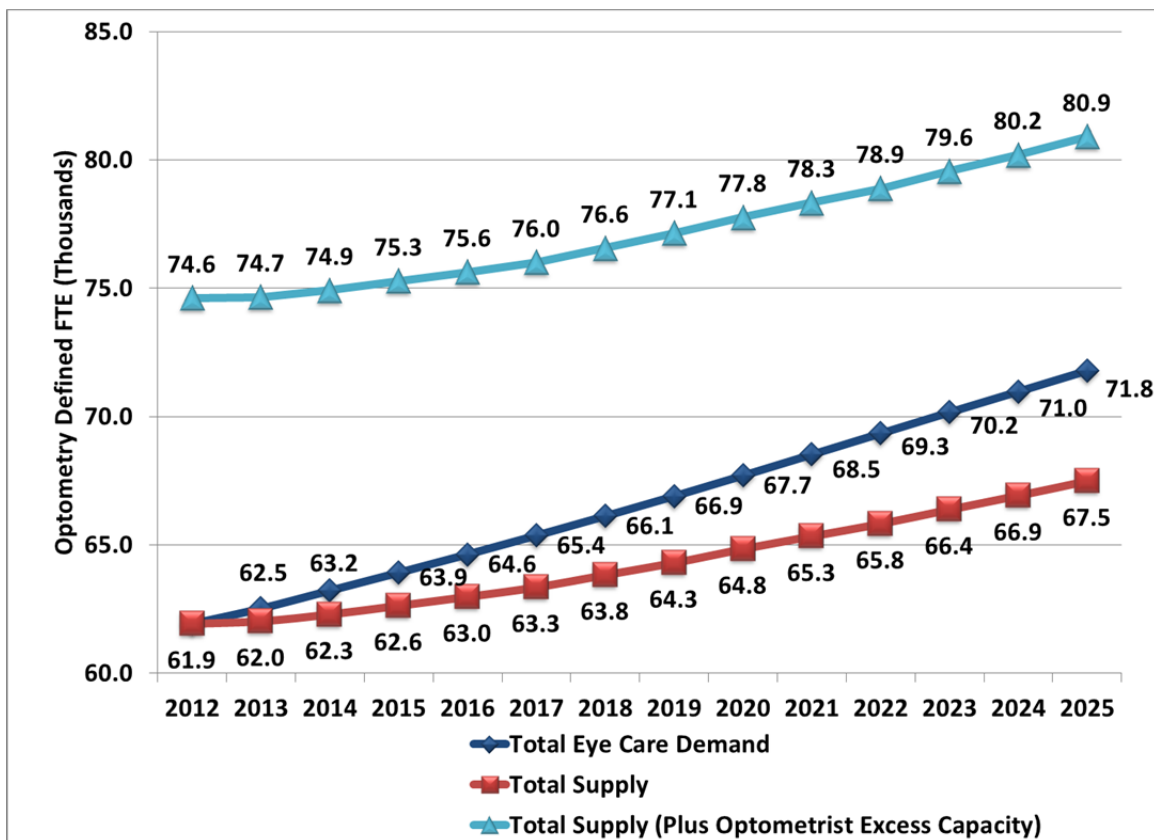
Accounting for this potential excess capacity on the supply side, excess demand in the eye care market is eliminated and replaced by excess supply, in the baseline case. However, excess supply continuously declines over the forecast period, from 12,700 FTE in 2012 to 9,100 FTE by 2025. Note that this excess supply gap exists because we have taken the existing optometry workforce and increased its capacity by 32 percent, or approximately 933 visits per year by each practicing optometrist, based on the survey respondents' self-assessment of excess capacity.

Next, in *Exhibit ES-7*, we consider the same case on the supply side that includes excess capacity, but in addition to the baseline demand, we include the full effects of the ACA on demand and the effect of increased diabetes prevalence, initially presented in *Exhibit ES-5*. When these effects on demand are included, the excess supply gap that results in the eye care market is reduced to 4,400 FTE by 2025.

Exhibit ES-7. Supply with Excess Capacity Compared to Baseline Demand and Demand w/ ACA and Diabetes Impact
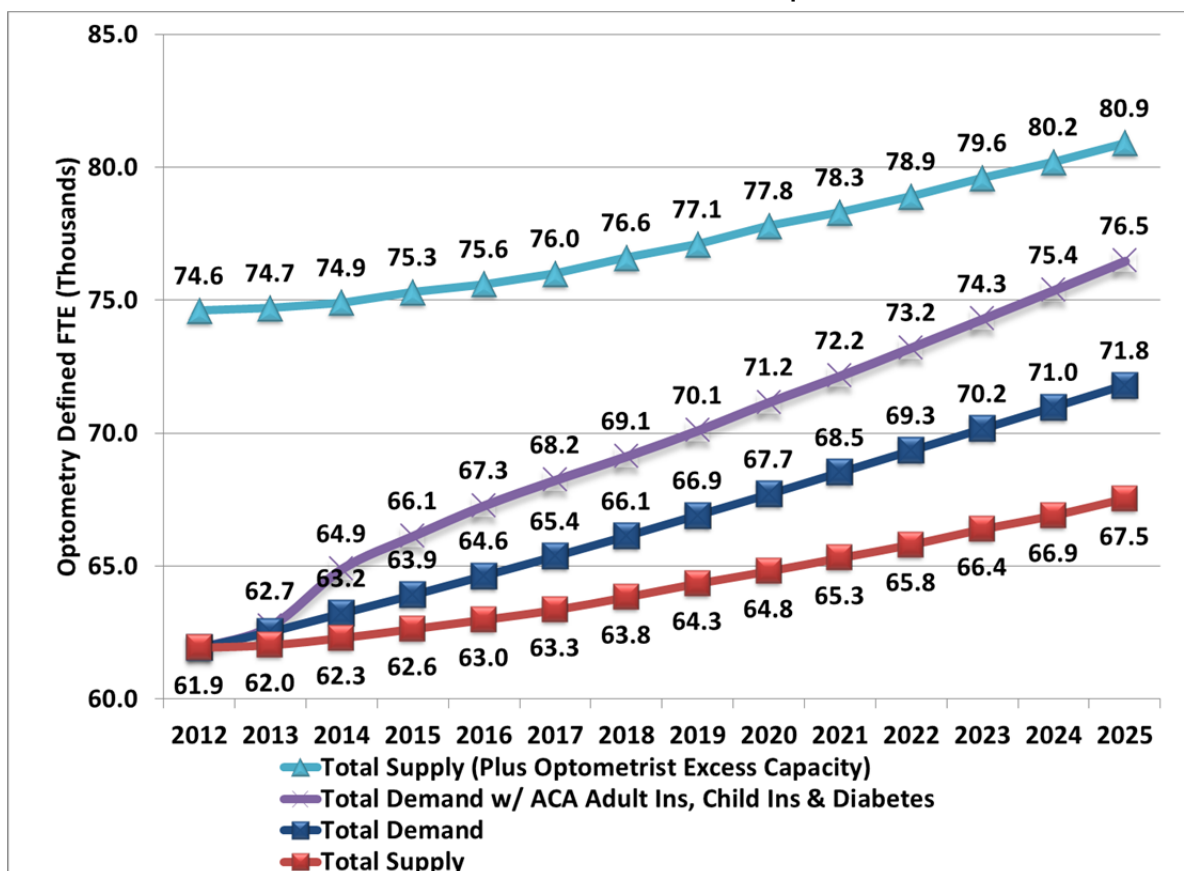
D. Summary and Conclusion

In this report, we have described the methods, data and assumptions underlying the Eye Care Workforce Model. A major source of the optometrist data was the 2012 National Eye Care Survey of Optometrists. A complete review of the survey is available in a separate report.

We apply the Eye Care Workforce Model to provide an assessment of the eye care workforce over the period 2012-2025. In the baseline case, where demand for eye care grows due to the growth and aging of the population, our results indicate that excess demand emerges and grows over the period. By 2025, we project excess demand equivalent to 4,300 FTE optometrists.

There is potential for greater growth in demand from at least two sources. First, there is likely to be increased demand from expanded eye care insurance coverage for children and adults under the ACA. Second, demand is likely to increase as the prevalence of diabetes increases, as some have predicted. Should the prevalence of diabetes increase, the increase in demand could be substantial. We estimate that the combined effect of these two factors will increase excess demand to the equivalent of 9,000 FTE by 2025, or twice the excess demand of the baseline demand case.

However, baseline supply may be understated. In the 2012 National Eye Care Survey of Optometrists, responding optometrists indicated that they could provide, on average, 32 percent

more visits per year than they were currently providing. If we take this excess capacity into account and compare supply including excess capacity to the baseline demand, there is no longer excess demand. In fact, our estimates indicate that there is significant excess supply when this excess capacity is included and, though it declines modestly over the forecast period, it remains substantial at about 9,100 FTE by 2025. Accounting for two of the factors that could increase demand, increased insurance coverage under ACA and increased prevalence of diabetes, excess supply is reduced substantially to 4,400 FTE by 2025. Hence, if these sources of demand are realized, then excess capacity in the workforce will be substantially reduced, but not eliminated.

E. Limitations

The projections of future supply and demand for eye care are subject to uncertainty. This uncertainty has multiple roots, and affects both the supply and the demand side of the estimates. On the supply side, key parameters of the supply projections, specifically retirement rates, are from surveys. They are subject to sampling variance and, perhaps more importantly, result from respondents' own uncertain projections of when they will leave the workforce for retirement. Actual retirement decisions may, in practice, be affected by a variety of factors that vary over time such as the state of the economy and the stock market, which are difficult to predict. The estimates of excess capacity are subject to both sampling variance and to the subjective nature of the question itself. Moreover, at the most fundamental level, there is no single, definitive list of practicing optometrists. The base year workforce must be estimated by combining multiple data sources. While we believe we have a very good estimate, there remains some uncertainty.

On the demand side, underlying parameters of the model itself are estimated from historical data that are necessarily uncertain and less than perfect. Because there is no single data source that includes all of the visits that optometrists provide, we have used a combination of data from the MEPS and the 2012 National Eye Care Survey of Optometrists to obtain estimates of total demand. The claims data we consider provides valuable insights regarding what medical services optometrists and ophthalmologists bill insurance providers. However, the medical claims data do not capture self-pay or services provided through vision plans, which are primary sources of reimbursement among optometrists. Hence, we must do the best we can with extant data.

In addition, the data and information necessary to estimate the impact of anticipated changes on demand is imperfect. Consider the impact of greater insurance coverage due to ACA. No prior experiment resembles the magnitude and type of change that will be brought about by the ACA. In addition, in the case of both children's and adult's insurance coverage, the comparison of utilization of those with and without medical insurance may overstate the effect on demand. The reason for this is that, in the existing data, the decision to purchase medical insurance is a choice that individuals and families make. It is not "randomly assigned." Those that anticipate greater health care utilization due to personal circumstances may, other things being equal, be more likely to have coverage.

Other factors not anticipated in the model, such as future changes in technology, epidemiology of eye diseases, growth in supply through changes in class sizes or number of optometry schools, or other factors that cannot reasonably be anticipated based on current information, can significantly affect future supply and demand, especially when projecting over a period of ten years or more.

Limitations such as those discussed above are inevitably present in studies that project future supply and demand. An advantage of the Eye Care Workforce Model itself is that one can quickly ascertain the implications for future supply and demand of different values of the key parameters of the model. Moreover, using the model, one can test whether key qualitative conclusions may change under alternative assumptions regarding future factors affecting supply and demand. There is no way to eliminate this uncertainty. Moreover, the precise quantitative estimates are subject to greater uncertainty. However, we believe that the overall qualitative implications of the analysis conducted using the workforce model developed as part of this project are robust with respect to reasonable variations in parameters or assumptions affecting future supply and demand.

I. Introduction

In 1999, Abt Assoc. Inc. produced the Workforce Study of Optometry for the American Optometric Association (AOA). Over a decade later, the AOA in conjunction with the Association of Schools and Colleges of Optometry (ASCO), embarked on a new workforce study to assess the current climate of the eye care market in the United States. In 2011, The Lewin Group was commissioned to conduct a new workforce study for optometry and to develop a flexible model to predict future changes in the supply of and demand for eye care.

The primary purpose of this report is to analyze the supply of and demand for optometrists in the U.S., and to exposit the computer-based model developed to aid in the analysis. Optometry workforce requirements are influenced by the overall market for eye care services, which includes services provided by ophthalmologists. In an effort to more accurately predict the future eye care workforce requirements, both optometrists and ophthalmologists have been considered in the model.

In this report, we provide a baseline assessment of the supply of and demand for eye care providers through 2025. We also consider the impact of alternative factors that are likely to affect supply and demand in the future. The projections of supply and demand are made by applying the workforce model developed as part of this project. In addition, we provide an exposition of the basic methods and data underlying the analysis and supporting the computer-based model of supply and demand.

This study benefited from the efforts of the AOA/ASCO Workforce Study Project Team and the AOA/ASCO Workforce Expert Panel (see *Exhibit I-1*). The Workforce Study Project Team provided oversight and advice continuously throughout the study. In addition, the Workforce Expert Panel was instrumental in the development of the 2012 National Eye Care Workforce Survey of Optometrists.

Exhibit I-1. Workforce Study Project Team and Workforce Expert Panel Members

Workforce Study Project Team	Expert Panel Members
Randolph E. Brooks, O.D. (chair); Kevin L. Alexander, O.D., Ph.D.; Mamie Chan, O.D.; Elizabeth Hoppe, O.D., M.P.H., Dr.PH; David I. Rosenstein, D.M.D., M.P.H.; and Jennifer S. Spangler, M.B.A., M.P.H.	Randolph E. Brooks, O.D.; Mark K. Colip, O.D.; Michael Duenas, O.D.; Edwin C. Marshall, OD, M.S., M.P.H.; Jeffrey C. Michaels, O.D.; John C. Whitener, O.D., M.P.H.; Gary L. Robbins, CAE; Mort Soroka, Ph.D.; Jennifer S. Spangler, M.B.A., M.P.H.; Roger Wilson, O.D.; Christopher W. Wroten, O.D.; Robert Zeiss, Ph.D.

In Section II of this report, we provide background information regarding the eye care market and the role of optometrists and ophthalmologists, and the demographic composition of the eye care workforce. In Section III, we review the literature on previous workforce studies of optometry. In Section IV, we provide an exposition of the model developed to project the supply of and demand for eye care services and the methods and data used to develop the model. In Section V, we provide a brief exposition of a major data source for the model, the 2012 National Eye Care Workforce Survey of Optometrists. We focus on the data and results that are used in the workforce model. A separate report, The Report on the 2012 *National Eye Care Workforce Survey of Optometrists*, provides all results obtained from the survey, including those elements that were not

incorporated into the workforce analysis and development of the model. Section VI presents the results of applying the model to the market for eye care services and the workforce providing those services. An overall assessment of the supply of and demand for eye care providers, optometrists and ophthalmologists is presented using the projections from the workforce model. Section VII provides a brief summary of the report, an assessment of the overall workforce market and a discussion of limitations of the model.

II. Background on the Eye Care Workforce

A. Providers of Eye Care

Optometrists and ophthalmologists provide eye care to the United States population. Both optometrists and ophthalmologists are professionals who provide routine eye care, correct vision conditions associated with refractive errors and diagnose, treat and manage diseases of the eye and visual system. The quantity and types of services both optometrists and ophthalmologists provide is a factor of state regulated scope of practice, insurance coverage, and patient preference. With the exception of cataract surgery and other intraocular procedures, which are performed only by ophthalmologists, the overwhelming majority of eye care services demanded by patients are provided by both optometrists and ophthalmologists.

Although medical payers including Medicare and commercial payers cover medical eye care, many other eye care services are paid for out-of-pocket by the patient or through a stand-alone vision plan. However, for those services which are paid through a medical claims system, the evidence from this claims data shows there is significant overlap in the services provided by optometrists and ophthalmologists.

Exhibit II-1 lists the top 10 current procedure terminology (CPT) codes billed to Medicare Part B by optometrists and ophthalmologists over the years 2006, 2007, and 2008.[3] Services provided by both professions are in bold font in Exhibit II-1.[4] Six of the top ten CPT-4 codes were billed by both optometrists and ophthalmologists. CPT 92014 "Eye exam and treatment" was the most frequently billed service by both. The column labeled "count" is the total number of services recorded in this data. The column labeled "Percent of All Services" refers to the percent of all services in the data base represented by that particular service for that provider type. For example, CPT 92014 represents 27.4 percent of all services billed by optometrists in the Medicare Part B data. The primary implication is that optometrists and ophthalmologists provide many of the same services and can be considered alternative providers for most eye care services. Hence, it is reasonable to consider one overall market for eye care services, with optometrists and ophthalmologists as the providers in that market.

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[3] These were the most recent data available at the time the analysis was conducted. The purpose is to illustrate that the services provided by optometrists and ophthalmologists overlap significantly.

[4] This data is from the Centers for Medicare & Medicaid Services (CMS) Physician Supply and Procedure Summary for years 2006, 2007 and 2008. The following short description is from CMS: "This file is a 100% summary of all Part B Carrier and DMERC Claims processed through the Common Working File and stored in the National Claims History Repository. The file is arrayed by carrier, pricing locality, Healthcare Common Procedure Coding (HCPC), modifier 1, modifier 2, specialty type of service and place of service. The summarized fields are total submitted services and charges, total allowed services and charges, total denied services and charges, and total payment amounts. This file is produced annually and is usually available in July."

Exhibit II-1. Top 10 Medicare Part B Services Provided by Optometrists and Ophthalmologists 2006 - 2008

Rank	Top CPT: Optometrists				Top CPT : Ophthalmologists			
	CPT	Description	Count	Percent of All Services	CPT	Description	Count	Percent of All Services
1	*92014*	Eye exam and treatment	2,776,503	27.4%	*92014*	Eye exam and treatment	8,012,591	22.7%
2	*99213*	Office/outpatient visit established patient (expanded problem focused history/exam)	1,188,375	11.7%	*92135*	Scanning computerized ophthalmic diagnostic imaging, posterior segment, (e.g., scanning laser) with interpretation and report, unilateral*	5,872,905	16.7%
3	*92012*	Eye exam established patient	1,077,411	10.6%	*92012*	Eye exam established patient	5,697,800	16.2%
4	*92135*	Scanning computerized ophthalmic diagnostic imaging, posterior segment, (e.g., scanning laser) with interpretation and report, unilateral*	1,008,187	9.9%	*99213*	Office/outpatient visit established patient (expanded problem focused history/exam)	2,853,674	8.1%
5	92004	Eye exam new patient	923,832	9.1%	J3396	Verteporfin injection	2,722,177	7.7%
6	92250	Eye exam with photos	911,881	9.0%	J0585	Injection, onabotulinumtoxin A	2,194,761	6.2%
7	99214	Office/outpatient visit established patient (detailed history/exam)	658,031	6.5%	*92083*	Visual field examination(s)	2,169,447	6.2%
8	*92083*	Visual field examination(s)	604,400	6.0%	J2778	Ranibizumab injection	1,983,365	5.6%
9	99212	Office/outpatient visit established patient (problem focused history/exam)	559,455	5.5%	92226	Special eye exam subsequent	1,886,529	5.4%
10	*66984***	Cataract surg w/iol 1 stage	436,338	4.3%	*66984*	Cataract surg w/iol 1 stage	1,839,795	5.2%
	Total		**10,144,413**				**35,233,044**	

*The 2011 CPT Coding Manual, effective January 1, 2011, replaced CPT code 92135 with the following codes: 92132, 92133 and 92134.

**Optometrists generally do not perform this procedure but do bill this surgical code when they provide pre-op and post-op care to patients.

Source: Physician/Supply Procedure Summary (PSPS) years 2006, 2007, 2008. The estimates are based on the annual average over the three years.

Similarly, *Exhibit II-2* lists the top ten diagnoses associated with visits to optometrists and ophthalmologists as reported in the 2009-10 Medical Expenditure Panel Survey (MEPS) data.[5] MEPS includes data from a variety of public and private payors, as well as self-pay, in addition to Medicare. Nine of the top ten diagnoses associated with visits to optometrists and ophthalmologists are the same. Caution should be taken when using MEPS data for utilization of optometrists since the dataset only includes optometrists who practice in a physician-based office setting (MD or DO) or who are employed in a hospital or other health care institutional setting. Optometrists practicing in an OD-only office setting are not captured in this portion of the MEPS dataset. The column in the table labeled "Percent of All Diagnoses" presents the percentage of all diagnoses in this data source represented by that particular diagnosis, for that provider type. For example, ICD-9 367 represents 27.3 percent of all diagnoses made by optometrists in this data source.

Exhibit II-2. Top 10 Diagnoses of Optometrists and Ophthalmologists

Rank	Diagnoses Made by Optometrists			Diagnoses Made by Ophthalmologists		
	ICD-9	Diagnosis	Percent of All Diagnoses	ICD-9	Diagnosis	Percent of All Diagnoses
1	367	Refraction disorder	27.3%	366	Cataract	29.3%
2	366	Cataract	15.8%	365	Glaucoma	15.1%
3	365	Glaucoma	8.3%	362	Retinal disorder	8.1%
4	369	Visual loss	6.6%	360	Disorder of globe	5.1%
5	379	Ill-Defined Eye Dis Nec	6.2%	250	Diabetes mellitus	4.6%
6	368	Visual disturbance	5.3%	379	Ill-Defined Eye Dis Nec	4.6%
7	250	Diabetes mellitus	4.2%	367	Refraction disorder	4.4%
8	375	Lacrimal syst dis	4.1%	375	Lacrimal syst dis	3. 0%
9	360	Disorder of globe	3.5%	368	Visual disturbance	3.5%
10	362	Retinal disorder	3.0%	361	Retinal detachment	2.0%

Source: MEPS 2009-2010 Medical Provider Component file data.

Exhibit II-3 provides information regarding the 10 most frequently billed optometry services in the Optum medical claims data. The Optum medical claims data base, called the Normative Health Information (NHI) data base includes claims for more than 25 million covered lives. Exhibit II-3 displays the proportion of those services provided by optometrists, rather than ophthalmologists, in this data source. It is important to note, once again, that services provided for patients who are self-pay or who are included in vision plans are not included in this data. For every service shown, the proportion of visits provided by optometrists increased between

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[5] The Medical Expenditure Panel Survey (MEPS) is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States. MEPS is the most complete source of data on the cost and use of health care and health insurance coverage. It is assimilated and published by the Agency for Healthcare Research and Quality (AHRQ). These data are for 2009-2010.

2006 and 2010. Of the top ten services billed by optometrists, the proportion of total eye care billed by optometrists increased from 25 percent in 2006 to 30 percent in 2010.

Exhibit II-3. Proportion of Eye Care Billed by Optometrists for Each of Top Ten Service Codes from Commercial Claims Data
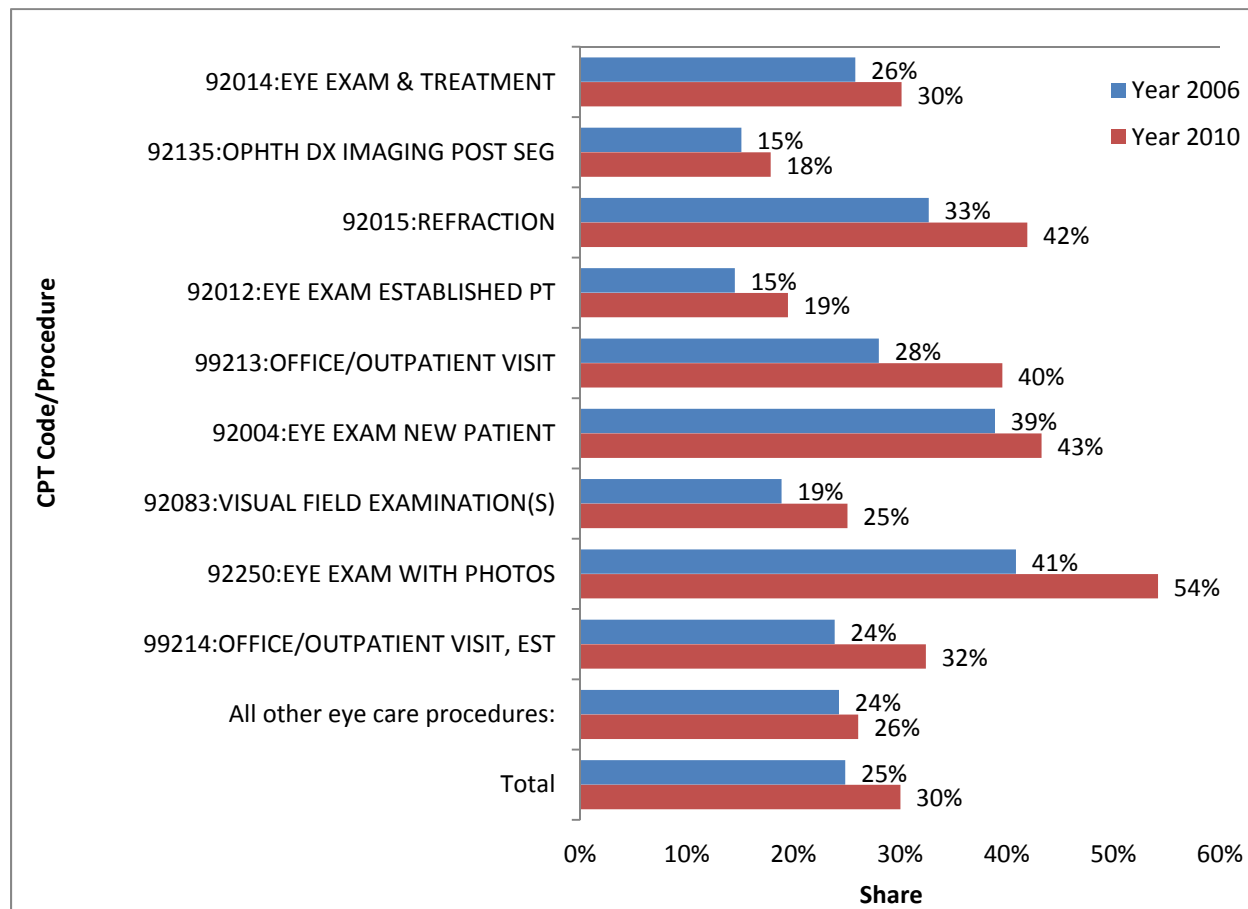
Source: Optum Normative Health Information claims data base, 2006 and 2010.

From this review of the medical claims data, we can conclude that there is a significant overlap in the services provided by optometrists and ophthalmologists. We can consider one overall market for eye care services, with both optometrists and ophthalmologists providing the services demanded by the market.

B. Optometry Workforce

We estimate that there were 39,580 optometrists in the United States engaged in clinical practice (that is, optometrists who provide direct care to patients) as of January 2012, or roughly 1.3 optometrists per 10,000 persons in the United States.[6] Nearly 60 percent of the 2012 workforce

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[6] This estimate is based on merging data from Provider 360, a proprietary list of practicing providers that is updated continually, and the AOA's data base of optometrists, which also includes a list of optometrists from the Centers for Medicare & Medicaid Services National Plan and Provider Enumeration System (NPPES). The combined lists were de-duplicated and verified statistically. Section IV: Methods and Data, contains additional information regarding how the optometry universe was defined.

was male and the average age of practicing optometrists was 46.6 years. Male optometrists were significantly older, on average, than female optometrists. The average age of men was 50.9 while that of women was 40.2. Two-fifths of the optometry workforce was 50 years of age or older at the beginning of 2012. The proportion of the workforce over age 50 is important, as it is after age 50 that the number of doctors exiting the workforce increases due to retirement and mortality. While 56.4 percent of the male workforce was aged 50 years or older, only 17.4 percent of the female workforce was over the age of 50 (See *Exhibit II-4*.)

Exhibit II-4. 2012 Optometry Workforce Demographics

	Female	Male	Total
Number	15,913	23,667	39,580
Percent	40.2%	59.7%	100%
Average Age	40.2	50.9	46.6
Percentage Age 50+	17.4%	56.4%	40.7%

Exhibit II-5 graphically illustrates the age and gender distribution of the optometry workforce. Two aspects are striking and are important for understanding how the workforce is likely to evolve over time. First, the number of female optometrists 43 years of age and younger is larger than the number of male optometrists under age 43. In the younger portion of the workforce, through age 43, women are in the majority. Second, a significant proportion of the workforce is 50 years of age or older. However, men constitute the overwhelming proportion of the workforce in this age range. As those over age 50 retire, the entire workforce will consist of an increasing proportion of women as more men than women retire and are replaced by entry cohorts that consist of a larger portion of women than men.

Exhibit II-5. Age Distribution of the 2012 Optometry Workforce by Gender
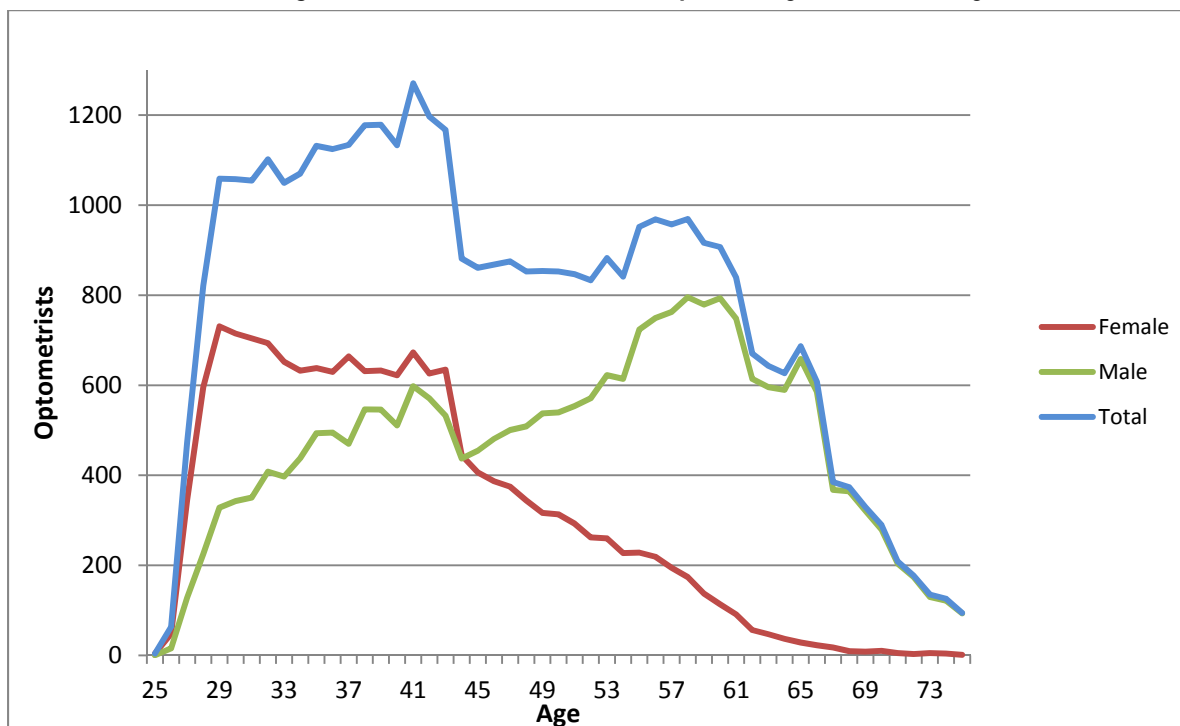
C.   Ophthalmology Workforce

At the beginning of 2012, we estimate that there were approximately 16,404 board certified or board eligible ophthalmologists engaged in clinical practice.[7] Twenty two percent of this workforce was female. The average age of practicing ophthalmologists was 50.7 years; four years older than the average age of optometrists. Female ophthalmologists were, on average, younger than males, with an average age of 46.3 years compared to 51.9 years for male ophthalmologists as reported in the year 2012. More than half (54.7 percent) of the ophthalmology workforce was 50 years of age or older. The workforce is likely to shrink, or grow only very slowly, over the next ten years as large cohorts of older ophthalmologists near retirement age. The workforce consisted of 38.9 percent female ophthalmologists age 50 or older and 59.2 percent of the male workforce was age 50 or older. *Exhibit II-6* summarizes these demographics.

Exhibit II-6. 2012 Ophthalmology Workforce Demographics

	Female	Male	Total
Number	3,638	12,766	16,404
Percent	22%	78%	100%
Average Age	46.3	51.9	50.7
Percent Age 50+	38.9%	59.2%	54.7%

The age and gender distribution of the ophthalmology workforce for 2012 is shown graphically in *Exhibit II-7.* This chart illustrates that a large portion of the ophthalmology workforce is entering an age range of higher retirement incidence. The overall workforce was overwhelmingly male (78 percent). Of all those in the workforce who were over age 50 (8,973 individuals or 54.7 percent of workforce), 84.2 percent (7,557) were male. The losses from the workforce that will likely be experienced over the next few years will be disproportionately male ophthalmologists. While the overall proportion of men in the workforce in 2012 was 78 percent, the proportion of men completing residencies and entering the workforce in 2012 was only 60 percent.[8] Hence, cohorts of new entrants emerging from residencies are likely to have a higher portion of women, implying that the future workforce will consist of a growing proportion of women.

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[7] These estimates are based on the American Medical Association (AMA) Masterfile. To be included, the ophthalmologist was engaged in clinical practice; their primary activity, as reported in the AMA Masterfile could not be research or administration, and they could not be classified as inactive. They must have been board certified or board eligible. In addition to those in office-based practice, we included those who were hospital staff, those who were medically teaching, and those with no classification among those engaged in clinical practice. Section IV: Methods and Data, contains additional information regarding how the optometry universe was defined.

[8] See Section IV on Methodology and Data.

Exhibit II-7. Age Distribution of the 2012 Ophthalmology Workforce
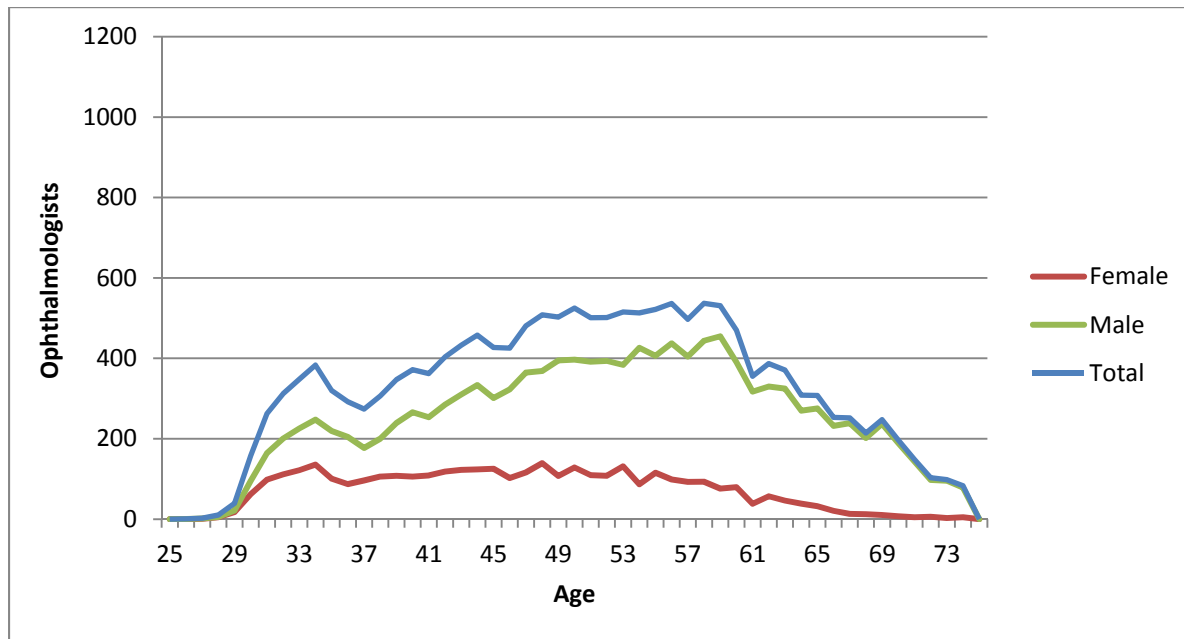
D. Summary

In this section, we have provided background information in two areas. First, evidence from medical claims indicates that there is one market for eye care services, and that the two primary providers in this market are optometrists and ophthalmologists. With the exception of intraocular surgery, most eye care services can be performed by either an optometrist or ophthalmologist. This observation is important because it means that we must consider a workforce model where there is an overall demand for eye care services and this demand is satisfied by both optometrists and ophthalmologists. Both must be considered in the workforce analysis.

Second, we have examined the number, age distribution and gender distribution of the 2012 workforces of optometrists and ophthalmologists. This distribution is important, because it will affect the growth path of supply over the projection horizon of the workforce model.

III. Previous Eye Care Workforce Analyses

There has been little published research on the optometry workforce or on the eye care workforce in general, and very little recently. The studies reviewed below are older studies, but they are the most recent that have attempted a comprehensive analysis of the eye care workforce.

A. RAND Study (1995)

Lee et al (1995) published a study of the eye care market, to include both ophthalmologists and optometrists.[9] The approach taken in this study (also known as the RAND study) emphasized a "bottom-up" approach that included a detailed analysis of incidence and prevalence of specific diseases of the eye and the time required by ophthalmologists to treat these diseases. Two estimates of "requirements" were made: one based on "demand"—defined as services likely to be realized in the market given income, insurance status, and other factors affecting ability to pay—and an estimate based on "need"—defined by the epidemiology of eye disease and the ideal treatment, from a public health perspective, of those diseases.

This study has several important limitations. The authors made a major point of building up measures of demand and supply for ophthalmologists from a highly disaggregated and detailed foundation, based on the actual distribution of specific visits and procedures, and the time required by ophthalmologists to complete each. This approach, in considering the actual time required to complete each individual procedure or visit type, is in contrast to an approach which considers the "typical" visit as the basic building block. But, despite the detail with which the epidemiology of specific eye diseases was analyzed for ophthalmology demand, ultimately the authors used the National Ambulatory Medical Care Survey (NAMCS) to put aggregate totals on visits. However, because NAMCS did not have detailed clinical information on the nature of the visit, the actual estimates were not truly based on data from actual visit types. Hence, the model reverts toward the "visit" based model which the authors originally attempted to improve upon through disaggregation.

The second and perhaps more troublesome problem is that NAMCS contained data only on physician office visits. Optometrists were not included in NAMCS. This means that the analysis of optometrist demand was entirely assumption-based, rather than empirically based. Further, while the assumption used to generate the "demand" associated with optometrists' workload was somewhat obscure, it appears to be based on a supply-side estimate of capacity. Hence, it is not clear that the authors captured the total demand for eye care services.

Similarly, the analysis on the supply side of workforce for optometrists was also limited by the data. The actual inventory and age/gender distribution of practicing optometrists, taken largely from Census and state licensing data, is subject to uncertainty because of duplications, unrecorded retirements and deaths, and other factors. Moreover, other major drivers of results are propelled by assumption rather than data. For example, the rates at which optometrists substitute for ophthalmologists was entirely based on assumption, rather than empirical evidence.

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[9] "Estimating Eye Care Provider Supply and Requirements," Paul P. Lee, Catherine A. Jackson, and Daniel Relles, RAND Corporation, 1995.

Overall, the analysis of the optometrist component of the eye care market in particular was not well grounded empirically. This suggests that the overall results should be interpreted with some caution.

B.   Abt (2000)

White et al (2000), in a study for the AOA (also known as the Abt Associates study) intending to improve upon some of the data limitations of Lee et al (1995), developed a workforce model for optometrists.[10] The model provides forecasts of FTE supply and FTE demand through 2030. The supply side of the model projects future workforce and was based on modeling new entrants emerging from optometry schools, retirements, and mortality. The demand side of the model was driven by age and gender utilization patterns. A major weakness of the earlier RAND study was the lack of optometry-specific estimates of demand. Significant improvement was made on the demand-side of the forecasts for optometrists in the Abt study. The initial universe of optometrists was obtained from the 1997 Project Hope Census of Optometrists, which was compiled from state licensure data and supplemented by addition information from the American Optometric Association. A survey was used to solicit estimates of number of visits, by type of visit, for a random stratified sample of practicing optometrists. The estimated total number of visits and the FTE necessary to supply those visits was significantly larger in the Abt study compared to the earlier RAND study. The higher demand estimates, due especially to "routine eye examination" visits, when taken into account in the analysis, significantly reduced the excess supply of optometrists, but did not eliminate it, according to the Abt study projections.

This study's focus on the optometry workforce clearly produced a better forecast of both the future demand and supply for optometrists than the earlier RAND study. For example, the study considered the demographic composition of the optometry workforce and how it changes over time. The workforce was predicted to age over time and annual retirements were predicted to increase, rising from about 600 per year in 1997 to over 1,000 per year in 2020. Moreover, the gender composition was predicted to change, from slightly more than 20 percent female in 1997 to over 40 percent by 2020. The study concluded that this would have an effect on the supply of services because female optometrists work, on average, fewer hours than male optometrists.

The study concluded that optometrists are likely to be in excess supply though 2020 and beyond, but the amount of the excess supply forecasted is significantly less than that of the RAND study. The primary reasons for the differences with the Rand study were: (1) a larger estimate of the demand for the services of optometrists based on a survey conducted for that purpose and (2) more precise forecasts of the future optometry workforce, the age and gender composition of the future workforce, and the implications of this for supply. A weakness of this study is that, in contrast to the RAND study which included optometry but provided only cursory assumption-driven estimates of the optometrist workforce supply and demand, the Abt study focused almost exclusively on optometry, neglecting, to some extent, the ophthalmology workforce supply and demand.

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[10] "Workforce Projections for Optometry," Alan J. White, Ph.D., Teresa Doksum, Ph.D., and Chapin White, M.P.P., Abt Associates. In *Optometry*, *Journal of the American Optometry Association*, May 2000, v. 71/Number 5.

C.   Demand for Ophthalmic Services and Ophthalmologists—A Resource Assessment[11]

Harmon and Merritt (2009) analyzed the supply of and demand for ophthalmologists. On the demand side, they estimated the current and future of six key diagnoses: cataract/IOL surgical procedures; vitrectomies; refractive surgical procedures; glaucoma patients; neovascular AMD patients; and vision-threatening diabetic retinopathy. The data for these estimates were taken from Market Scope forecasts. The estimates were forecast into the future based on population growth and the aging of the population, given a prevalence rate by age and gender.

On the supply side, a random sample of 400 ophthalmologists was taken from the membership directory of the American Academy of Ophthalmology. Using "on line public data bases," the authors were able to infer the age distribution and retirement probabilities of ophthalmologists, though the precise method used to infer retirement probabilities was not specified. [12]

The authors projected supply and an indicator of demand from 2008 through 2015. On the supply side, they projected that the number of ophthalmologists will remain roughly constant over the period 2008 to 2015, increasing from 15,100 to 15,158. However, on the demand side, the measure of demand was projected to increase by 18 percent. Hence, the authors concluded that there would be a 17 percent shortfall in the number of ophthalmologists by 2015.

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[11] David Harmon, MS, and Josh Merritt, BS, "Demand for Ophthalmic Services and Ophthalmologists—A Resource Assessment," A Study Prepared by Market Scope, April 2009. It is published on the web at http://www.meditec.zeiss.com/C1256CAC0038CEFF/EmbedTitelIntern/Market_Resource_White_Paper_04-2009/$File/Market_Resource_White_Paper_04-2009.pdf

[12] Harmon and Merritt (2009) p. 1.

IV. Methodology and Data

In this section, we provide a description of the methods and data for projecting the supply of and demand for eye care services and a full description of the model we have developed for these projections. The analysis and the model can be divided into a "supply side" and a "demand side." We first provide a brief, high level overview of the supply and demand model. Next, we provide the detailed mathematical structure of the supply component and demand component of the model, including the basic equations that are applied for projecting future supply and demand. The data that support the estimation of the parameters of the model is described next, along with a description of how that data is used to estimate key parameters of the model. Hence, in this section we provide an explanation of the model at three levels: the first is an overview; the second is a detailed mathematical exposition; and the third is an explanation of the data and how the data is applied in the model.

A. Overview

The supply and demand model projects the supply of and demand for optometry and ophthalmology services from the base year period of 2012 through 2025. We model optometry and ophthalmology separately but then combine the results into one overall model for eye care services supply and demand. This will be described below.

Supply projections of the eye care workforce begin with the number of providers by age and gender in the base year, 2012. Attrition rates, representing retirement rates and mortality rates by age and gender, are applied to obtain the number of providers remaining in the workforce in the next year (T+1). Then, new entrants, who are graduates from schools of optometry or ophthalmology residents in year T, enter the workforce and are counted in the workforce in T+1. Conceptually, active supply in the next year (T+1) is a function of supply in the current year (T) minus attrition and plus new entrants. This projection framework is represented by the following equation:

$$Active\ Supply_{T+1} = Active\ Supply_T - Attrition_T + New\ Entrants_T$$

We measure the count of these providers in two ways. The first is simply the number of providers. The second measure is full-time equivalent supply or "FTE supply." Hours spent in patient care and productivity, measured as the number of patients seen in a given time period, vary by provider type and by age and gender. This FTE measure normalizes the count of optometrists and ophthalmologists each year by average hours of work and average patient visits resulting from the age and gender distribution of the eye care providers in the base year, 2012. As the age and gender distribution changes over time, the number of providers may deviate from the number of "FTE." This is because the demographics of the workforce may have shifted towards providing fewer (or more) hours of patient care and patient visits per year relative to those provided by the demographic distribution of the workforce in the base year.

The supply in each future year is then estimated by the number of providers in each age and gender cell for that year to obtain total numbers and by adding the age and gender cells weighted by the FTE factor to obtain full-time equivalents.

Demand projections also begin with the base year period, 2012, and are a measure of utilization. For optometrists and ophthalmologists, respectively, we begin with a per capita measure of utilization that varies by age and gender cells (e.g., males age 0-4) corresponding to the age and gender of prospective patients who are utilizing eye care services. This measure of utilization per capita is calculated as the ratio of the total number of visits by patients in a given age and gender cell divided by the total U.S. population in that age and gender cell, in the base period of 2012. As a practical matter, we estimate per capita utilization in five age ranges by gender, where these ranges encompass the total population.

Base year demand, in terms of visits or utilization, is then estimated by multiplying the base year per capita utilization by the base year population in each cell, and adding across cells to obtain total demand. This demand, in terms of total visits or utilization, is converted into demand in terms of the FTE required to provide those visits. Hence, the same FTE measure defined in the supply discussion above is used to convert demand as measured by visits into demand as measured by FTE providers required to provide that demand. The equations for projecting baseline demand, that is the future population demand under the standard utilization in 2012, are shown below:

$$Demand\ (Visits\ )_{T+1} = (Visits\_Per\_Capita_{2012} * Population_{T+1})$$
$$Demand\ (FTE\ )_{T+1} = (Demand\ (Visits\ )_{T+1} / Visits\_per\_FTE_{2012})$$

The baseline projections of supply and demand can be modified to reflect additional factors affecting supply or demand or to consider alternative scenarios. On the supply side, for example, one can specify changes in the number of schools of optometry or changes in the class size affecting the number of graduates entering the workforce in future years. Similarly, changes in residency positions in future years will affect the future supply of ophthalmologists.

On the demand side, changes in the baseline projections are achieved by estimating the effect that a given change will have on per capita utilization in a future year as well as the population, by age and gender that will be affected. The estimated *change* in per capita utilization multiplied by the population affected results in the change in total utilization. This is added (or subtracted) to the baseline total utilization, providing an estimate of the new level of demand in the particular projection year.

B. Mathematical Exposition

In this section, we provide an exposition of the basic set of equations used to generate projections of supply and demand using the model. Because of the nature of the model, it is useful to describe the model using the notation of linear algebra. We also provide a verbal description of the key equations so that the reader who is not versed in the mathematical notation can understand the intent of the equations. The data supporting the parameters of the model will be described in a subsequent section below.

1. Supply Component of the Model

In this section, we specify the mathematical structure of the supply component of the model. We focus on the supply of optometrists, but the structure for the ophthalmologist supply is the same, with necessary changes made, such as the age of entrance into the workforce. For the supply component of the model, we allow productivity and attrition behavior (retirement and mortality) to vary by the age and gender of the provider. Hence, in the exposition below we preserve these dimensions.

Let $S_{T,M,OPT}$ be a column vector of length k representing the number of male optometrists (M) in each of k ages in the base period T (2012). The age cells range from age 25 through age 75. Hence, the number of male optometrists who were age 50 in 2012 is given by element 26 (that is element i=50-24) of $S_{T,M,OPT}$. Similarly, $S_{T,F,OPT}$ is a column vector representing the number of female optometrists at each of k ages in the base period. The number of female optometrists who were age 45 in 2012, for example, is given by element i=21 in $S_{T,F,OPT}$. We can express the total number of male and female optometrists as in the base period, T, as:

Number of optometrists (T) = $\sum_{i=1}^{k}(S_{T,M,OPT}(i) + S_{T,F,OPT}(i))$

where we simply add across the age elements of each vector to obtain the total number of optometrists.

We now consider how to project the number of optometrists over time. Let $P_{R,M,OPT}$ be a vector of length k giving the probabilities that male optometrists will remain in the active work force and not retire, at each age k. $P_{R,M,OPT}(i)$ is the ith element of the vector and provides the probability that a male optometrist will not retire until at least age i+24, $(for\ all\ i\ \leq k)$. $P_{R,F,OPT}$ is a similar vector of retirement probabilities for female optometrists.

Let $P_{D,M,OPT}$ be a vector of length k in which the ith element indicates the probability of male optometrists surviving (i.e., not dying) until at least age i+24 $(for\ all\ i\ \leq k)$. $P_{D,F,OPT}$ is a corresponding vector of survival probabilities for female optometrists.

Now, we define a third vector for male and female optometrists. This is the probability that the optometrist survives and remains in the workforce at least through age i+24. Each element in this vector is the product of the corresponding elements from the probability of not retiring and the survival vectors. For male optometrists, for example, we define the probability of staying in the workforce at least to age 24+i as:

$$P_{STAY,M,OPT}\ (i) =\ P_{R,M,OPT}(i) * P_{D,M,OPT}(i),\ (for\ all\ i\ \leq k)$$

Finally, using the elements of this matrix, we can obtain the attrition rates from the workforce at each age. These attrition rates at a given age, i+24, are conditional on remaining in the workforce until age i+24-1. The attrition rate, $A_{M,OPT}(i)$ at age i+24, for men is defined as:

$$A_{M,OPT}(i-1) =\ [P_{R,M,OPT}(i-1) * P_{D,M,OPT}(i\ \text{-}1) - P_{R,M,OPT}(i) * P_{D,M,OPT}(i)]/\ (P_{R,M,OPT}(i-1) * P_{D,M,OPT}(i\ \text{-}1))$$

This vector of attrition rates, which is defined in a similar way for female optometrists, is the probability that the optometrist leaves, due either to retirement or mortality, at each age i+24, given that the optometrist is in the workforce at age i-1+24.

Next, we define the number of optometry school graduates, by age and gender, in year T as two vectors, each of length k, $G_{T,M,OPT}$, and $G_{T,F,OPT}$, respectively. These two vectors represent the number of new male graduates (M) and female graduates (F) completing school in year T and entering the workforce in year T+1. The vectors, respectively, represent the number of graduates by their age in T+1, when they are assumed to enter the workforce. Note that most optometry school graduates will be in the age range of 25 through 30 when they enter the workforce, so that many of the elements will be zero. It is dimensioned, however, to have the same number of elements as the supply vector.

Finally, we define two vectors of weights, $W_{M,OPT}$ and $W_{F,OPT}$, that are the ratios of the productivity of the typical optometrist at a given age to the productivity of the average optometrist, across all ages, in the base period, 2012, for male and female optometrists, respectively. We define the productivity of the average, or typical, optometrist, as the productivity of one full-time equivalent (FTE). These weights convert numbers of optometrists into full-time equivalent optometrists. If there were no differences in productivity by age or gender, compared to the average FTE in 2012, the elements of the vector would all be equal to 1.0. In general, all age ranges have weights within about +/- 0.1 of 1.0. Optometrists in the younger age ranges and those in the older age ranges have weights that are, generally, slightly less than 1.0, while those in the middle age ranges are slightly above 1.0. Female optometrists generally have slightly lower weights than males.

To project the supply of optometrists in the next period, T+1, we "age" the current supply—all optometrists become one year older—and subtract the numbers, at each age, that are expected to leave the workforce because of retirement or mortality. The basic supply equation, for number of optometrists in year T+1 given the number in year T, is given by the recursive equations for male and female optometrists.

$$S_{T+1,M,OPT}(i + 1) = S_{T,M,OPT}(i) - A_{M,OPT}(i) * S_{T,M,OPT}(i) + \lambda_{OPT} * G_{T,M,OPT}(i)$$

$$\text{and}$$

$$S_{T+1,F,OPT}(i + 1) = S_{T,F,OPT}(i) - A_{F,OPT}(i) * S_{T,F,OPT}(i) + \lambda_{OPT} * G_{T,F,OPT}(i)$$

for all i ≤ k. Note that $S_{T+1,M,OPT}$ and $S_{T+1,F,OPT}$ are both column vectors of length k. Element i of each vector represents the number of optometrists at age 24+i.

In words, the number of practicing optometrists at a given age, i+24+1, in period T+1 is equal to the number at age i+24 in year T, less the number leaving the workforce plus new optometry workforce entrants who are age i+24+1 by estimated age of entry into the workforce in period T+1. Note that not all new graduates from optometry schools enter the workforce in the United States. For example, some may practice in other countries or some may not enter the clinical workforce at all. We account for this by the parameter λ_{OPT} which is a scalar with value less than or equal to 1.0, representing the proportion of new graduates that enter into the active practice of optometry in the United States.

The total number of optometrists, by age, in T+1 is given by the 1xk vector:

$$S_{T+1,OPT} = S_{T+1,M,OPT} + S_{T+1,F,OPT}$$

and the total number overall is given by adding across ages:

$$Total\_Number_{T+1,OPT} = \sum_{i=1}^{k} S_{T+1,OPT}(i)$$

The equations are recursive in the sense that the projection for T+2 applies the same relationships, except that we start with the workforce and graduates in period T+1, rather than period T. More generally, the projection for male optometrists at age i+24 in period T+j is:

$$S_{T+j,M,OPT}(i + 1) = S_{T+j-1,M.OPT}(i) - A_{M,OPT}(i) * S_{T+j-1,M,OPT}(i) + \lambda_{OPT} * G_{T+j-1,M,OPT}(i)$$

To obtain "full-time equivalent" optometrists in year T+1, we multiply each of the elements of the male and female supply vectors by the respective "weight" from the elements of the vectors $W_{M,OPT}$ and $W_{F,OPT}$:

$$S_{T+1,M,OPT,FTE}(i) = S_{T+1,M,OPT}(i) * W_{M,OPT}(i) \text{ for all } i \leq k, \text{ and}$$

$$S_{T+1,F,OPT,FTE}(i) = S_{T+1,F,OPT}(i) * W_{F,OPT}(i) \text{ for all } i \leq k,$$

The total number of FTE optometrists, by age, in year T+1 is given by:

$$S_{T+1,OPT,FTE} = S_{T+1,M,OPT,FTE} + S_{T+1,F,OPT,FTE}$$

The total number of FTE optometrists in period T+1 is given by:

$$Total\_Number_{T+1,OPT,FTE} = \sum_{i=1}^{k} S_{T+1,OPT,FTE}(i)$$

A similar set of equations is used to project future numbers and FTE of ophthalmologists. The basic equation for projecting the supply of ophthalmologists, using the same notation as that for optometrists, with changes made to the notation to designate ophthalmologists rather than optometrists, is the following for male (M) and female (F) ophthalmologists, respectively:

$$S_{T+j,M,OPHTH}(i + 1) = S_{T+j-1,M,OPHTH}(i) - A_{M,OPHTH}(i) * S_{T+j-1,M,OPHTH}(i) + RG_{T+j-1,M,OPTHTH}(i)$$

$$S_{T+j,F,OPHTH}(i + 1) = S_{T+j-1,F,OPHTH}(i) - A_{F,OPHTH}(i) * S_{T+j-1,F,,OPHTH}(i) + RG_{T+j-1,F,OPTHTH}(i)$$

In words, the number of male ophthalmologists in year T+j at age 24+i+1 is equal to the number at age 24+i in year T+j-1, less the number at age 24+i in year T+j-1 who leave the workforce during the year due to retirement or mortality, plus any new male residents (RG) entering the workforce in year T+j who were age 24+i in year T+j-1. (Note that most of the new entrants will be under age 35.) Moreover, the method of estimation of FTE ophthalmologists is similar to that of optometrists:

$$S_{T+1,M,OPHTH,FTE}(i) = S_{T+1,M,OPHTH}(i) * W_{M,OPHTH}(i) \text{ for all } i \leq k, \text{ and}$$

$$S_{T+1,F,OPHTH,FTE}(i) = S_{T+1,F,OPHTH}(i) * W_{F,OPHTH}(i) \text{ for all } i \leq k,$$

where the weights, W, are defined as they were for optometrists, except with ophthalmologist-specific data.

The baseline supply for optometrists and ophthalmologists is defined by applying the equations to project from the base period, 2012, through 2025. However, the model is structured so that key input parameters can be changed easily, and the implications for future supply can be assessed quickly. Parameters that can be readily changed in the supply component include retirement and mortality rates, and future numbers of new graduates (or residents) entering the workforce.

2. Demand Component of the Model

The demand component of the optometry model begins with a vector of per capita utilization of the eye care services of optometrists, by age and gender of the population. The U.S. population is divided into ten population cells consisting of five age groups by gender in the 2012 base period. For each of the cells, utilization per person is calculated. In particular, let $U_{T,M,OPT}$ be a 1x5 vector of per capita utilization of optometry services for males in the U.S. population, by five age groups, and $U_{T,F,OPT}$ be the corresponding vector for females. Note that the elements of these vectors provide an estimate of the optometrist visits per person in the population, by age and gender, in the base period T (2012). Total demand, in terms of visits in the base period, T, is obtained by multiplying visits per capita, by age and gender cell, by the population in that cell. Let $P_{T,M}$ and $P_{T,F}$, be vectors of the population size, by the same age groups defined in the per capita utilization, for males and females, respectively, in period T, the base year. Then, demand measured as visits in population age group i is given by:

$$D_{T,OPT}(i) = P_{T,M}(i) * U_{T,M,OPT}(i) + P_{T,F}(i) * U_{T,F,OPT}(i)$$

$$for\ all\ i\ \leq 5.$$

In words, we are multiplying the population at each age group by per capita utilization for that age group, for males and females, and then adding the two components (male and female) at each age group to obtain an overall vector of demand, in visits, by age group. The resulting vector, $D_{T,OPT}$, is a vector of utilization by each of the five population groups. Adding utilization demand across the population groups provides total demand in the base year, T:

$$Total\_Demand_{T,OPT} = \sum_{i=1}^{k} D_{T,OPT}(i)$$

Total demand for visits across the population is equal to the addition across population groups of visit demand for each population group.

A similar set of equations may be used for the demand for the services of ophthalmologists, with corresponding notational changes:

$$D_{T,OPHTH}(i) = P_{T,M}(i) * U_{T,M,OPHTH}(i) + P_{T,F}(i) * U_{T,F,OPHTH}(i)$$

$$for\ all\ i\ \leq 5.$$

The per capita utilization matrix is an estimate of the per capita utilization, in the base year period of 2012, for the visit demand for ophthalmologists.

3. Changes in Demand

Changes or shifts in demand are always constructed relative to the base year utilization matrix. The event that causes the shift—for example, an increase in insurance coverage under the Affordable Care Act (ACA) – will result in a change in per capita utilization for a subset of the population. For example, consider optometrists' demand. Assume that, beginning in 2016, there is an increase in per capita utilization because a proportion of the population in each age group is newly covered by insurance. Before accounting for the effect of increased coverage, demand would equal:

$$D_{T+4,OPT}(i) = P_{T+4,M}(i) * U_{T,M,OPT}(i) + P_{T,F}(i) * U_{T,F,OPT}(i)$$

$$for\ all\ i\ \leq k.$$

After estimating the population, by age, that is affected, and the incremental effect it will have on their utilization (the *change* in utilization for this subpopulation), we obtain the revised demand in 2016 (T+4):

$$D_{T+4,OPT}(i)' = P_{T+4,M}(i) * U_{T,M,OPT}(i) + \Delta P_{T+4,M}(i) * \Delta U_{T,M}(i) + P_{T,F}(i) * U_{T,F,OPT}(i) \\ + +\Delta P_{T+4,F}(i) * \Delta U_{T,F}(i)$$

$$for\ all\ i \leq k.$$

Estimates for the change in population affected by the particular scenario and the change in utilization are the result of analyses conducted outside of the model. Once the effect of population and per capita utilization is estimated, the effects can be entered into the model in a straightforward manner. In addition, a number of specific demand-related cases are included directly in the model and can be incorporated in an analysis at the discretion of the model's user.

4. Supply and Demand

In the demand section, we concluded with an estimate of total demand in "visits." A visit is defined as a face-to-face encounter between the patient and doctor, which may include follow up visits that are not billable. A visit is not the number of unique patients and could in fact be the same patient seen multiple times (e.g., the same patient was seen by the doctor four times in a year and therefore is counted as four visits). On the supply side, we estimate the number of optometrists and ophthalmologists each year. The link to visits is based on the hours of work and productivity (visits per hour) of these providers. To bring supply and demand together in a common metric, we use the concept of an FTE. Our empirical definition of an FTE is the expected number of patient visits that the "typical" or average optometrist or ophthalmologist, working the average number of clinical hours, provides in a year. Hence, the number of FTE optometrists is the measure of supply in T, the base year, and the measure in subsequent years. The number of FTE represents the capacity for providing a given number of visits in a year.

For "demand" to be comparable to the supply measure in a given year, we must either convert supply to "visits" or demand to FTE. Consistent with convention in the health professional workforce modeling literature, we measure both demand and supply in "FTE." Let $V_{OPT,FTE}$ be the number of visits supplied by an FTE optometrist, which is itself defined as the hours and visits supplied by a typical or average optometrist in the base period, 2012. Then, demand in T, in terms of FTE, is equal to:

$$D_{T,OPT,FTE} = Total\_Demand_{T,OPT}/V_{OPT,FTE}$$

Optometry demand is, then, compared to optometry supply in FTE:

$$D_{T+j,OPT,FTE} \lesseqgtr S_{T+j,OPT,FTE}$$
$$for\ all\ j.$$

A similar relationship exists for ophthalmologist demand. We can define $V_{OPHTH,FTE}$ as the number of visits supplied by an FTE ophthalmologist per year, which is the number of visits supplied by the average or typical ophthalmologist in the base year, 2012. Then, demand in year T, in terms of FTE ophthalmologists, is equal to:

$$D_{T,OPHTH,FTE} = Total\_Demand_{T,OPHTH}/V_{OPHTH,FTE}$$

5. Market for Eye Care Services

Before now, we have presented equations describing the supply of and demand for optometrists and ophthalmologists, respectively. We now combine the analysis, producing one overall demand for eye care services. However, we define the overall market supply and demand in terms of optometrist FTE. This means that we must convert ophthalmologist FTE into the corresponding number of optometrists FTE. The conversion ratio, CR, is simply:

$$CR_{OPHTH\_to\_OPT} = \frac{V_{OPHTH,FTE}}{V_{OPT,FTE}}$$

Then, total eye care supply, in terms of optometrist FTE in year T, is given by:

$$S_{T,eyecare} = S_{T,OPT} + CR_{OPHTH\_to\_OPT} * S_{T,OPHTH}$$

Similarly, total eye care demand, in terms of optometrist FTE in year T, is given by:

$$D_{T,eyecare} = D_{T,OPT} + CR_{OPHTH\_to\_OPT} * D_{T,OPHTH}$$

Both equations hold for period T+j, for all j.

Note that the choice of optometrist FTE as the unit for measuring the supply of and demand for the eye care market as a whole is arbitrary. We could have chosen ophthalmologist FTE, where the conversion ratio would have been:

$$CR_{OPT\_to\_OPHTH} = \frac{V_{OPT,FTE}}{V_{OPHTH,FTE}}.$$

In the next section, we present the data sources for the parameters of the model.

C. Data

In this section, we describe the data used in developing the model. We first provide the overall sources of data. We next describe how each parameter of the model is estimated using the data. *Exhibit IV-1* provides an overview of the data sources used in the model.

Exhibit IV-1. Data Sources of Supply and Demand Projections

Parameter	Data Sources	
	Optometrists	**Ophthalmologists**
SUPPLY PROJECTIONS		
Active Supply	Provider360 , AOA Member Lists, and National Plan and Provider Enumeration System (NPPES)	American Medical Association's Masterfile
New Entrants	Number of new graduates and historical trends in number of optometry graduates (ASCO) and research by The Lewin Group.	Ophthalmology Residency Match sponsored by the Association of University Professors in Ophthalmology (AUPO)
Attrition Rate	Retirement rates derived from the 2012 National Eye Care Workforce Study. Mortality Rates from the CDC National Vital Statistics System Mortality Data, adjusted for clinical providers, with adjustments according to Johnson NJ, Sorlie PD, Backlund E., "The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography;* 1999 Aug;36:355-367.	Retirement rates from AAMC/AMA Survey of Physicians Over Age 50 Survey (2006). Mortality Rates from the CDC National Vital Statistics System Mortality Data, with adjustments according to Johnson NJ, Sorlie PD, Backlund E., "The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography;* 1999 Aug;36:355-367.
DEMAND PROJECTIONS		
Population Projection	2010 Decennial U.S. Census	
Utilization Rate	2010 Medical Expenditure Panel Survey Data from the Agency for Healthcare Research and Quality, Data from Medicare 5% sample and commercial claims data from OptumInsight's de-identified Normative Health Information system (dNHI)	
Annual Visits	2012 National Eye Care Workforce Study	Medical Group Management Associates (MGMA) productivity data MEPS 2010

1.   Initial (Baseline) Supply

The initial supply of optometrists, by age and gender for the 2012 base period, was obtained from a combination of three sources: Provider360, AOA membership lists, and the Provider Enumeration System. Provider360 is a continually updated, comprehensive data base of health professionals practicing in the United States, produced by OptumInsight. It includes demographic data, location, credentials and some practice information on allopathic and osteopathic physicians, optometrists, dentists, advanced practice nurses (nurse practitioners, certified nurse specialists, nurse midwives, and certified registered nurse anesthetists), chiropractors and other health professionals. The data sourcing process leverages more than 600 data sources, then continuously and rigorously cleans, standardizes, validates, and further verifies the data through provider phone outreach. Industry relationships provide access to accurate repositories of healthcare provider information not available to most other sources. In addition, OptumInsight aggregates data directly from nearly

every federal and state medical licensing and enumeration agency. The National Plan and Provider Enumeration System (NPPES), for example, developed and maintained by the Centers for Medicare & Medicaid Services of the Department of Health and Human Services, contains a data base with a national provide identification (NPI) number file uniquely assigned to providers and which contains limited practice-related provider information including a cross-walk to state licensing information.

Data on practicing optometrists from Provider360 was merged with AOA membership data, and de-duplicated. In addition, information from National Plan and Provider Enumeration System (NPPES) was used to further refine the estimates. Using the data sources above, we estimate that 39,580 optometrists were practicing in the United States at the beginning of 2012. *Exhibit IV-2* shows the age and gender distribution of the optometrists which formed the base year supply.

Exhibit IV-2. 2012 Optometry Workforce Demographics

	Female	Male	Total
Number	15,913	23,667	39,580
Percent	40.2%	59.8%	100%
Average Age	40.2	50.9	46.6
Percentage Age 50+	17.4%	56.4%	40.7%

At the beginning of 2012, we estimate that there were approximately 16,404 board certified or board eligible ophthalmologists engaged in clinical practice. These estimates are based on the American Medical Association (AMA) Masterfile. To be included, the ophthalmologist was engaged in clinical practice as their primary activity, as reported in the AMA Masterfile, could not be in research or administration, and could not be classified as inactive. They must have been board certified or board eligible. In addition to those in office-based practice, we included those who were hospital staff, those who were medically teaching, and those with no classification among those engaged in clinical practice. Since primary activity is self-reported when clinicians are assigned National Provider Identifiers (NPI) by the NPPES and retirement is not indicated by the Masterfile instantly, there may be some ophthalmologists included in our estimate that may be non-clinical or inactive. *Exhibit IV-3* presents the age and gender distribution of the ophthalmology workforce at the beginning of 2012, the base period.

Exhibit IV-3. 2012 Ophthalmology Workforce Demographics

	Female	Male	Total
Number	3,638	12,766	16,404
Percent	22.0%	78.0%	100%
Average Age	46.3	51.9	50.7
Percent Age 50+	38.9%	59.2%	54.7%

2. New Entrants

a. Optometrists

New entrants into the optometry workforce consist of annual optometry school graduates who enter clinical practice in the United States. Because we count the supply at the beginning of the year in question, graduates from schools of optometry in a given calendar year become workforce "entrants" and are counted in the workforce supply in the subsequent year. Moreover, a small portion of graduates do not enter clinical practice in the U.S. workforce. Some graduates who are foreign nationals may return to practice in their country, and a few graduates may choose not to enter the clinical workforce. The precise proportion of graduates who do not enter practice in the U.S. is not known, and will also vary from year to year. We estimate that it is less than 10 percent, but clearly greater than zero. In our baseline estimates, we assume that 5 percent of graduates do not enter clinical practice in the United States. Data from cohorts of optometry graduates between 2000 and 2010 indicate that only 2-8 percent of graduates left the U.S. market or didn't practice. Between 2010 and 2012, the number of optometry graduates ranged from 1,332 to 1,404 (*Exhibit IV-4*). Younger cohorts of optometrists are primarily female. In 2012, roughly 64 percent of graduates were female. This is an important attribute of the workforce to consider; as these younger optometrists age, the overall composition of the optometry workforce will shift from being predominately male to one that is more evenly split or even predominantly female.

Exhibit IV-4. Optometry Graduates (2010-2012)

	2010	2011	2012
Male	479	483	499
Female	877	849	905
Total	**1356**	**1,332**	**1,404**

Source: Association of Schools and Colleges of Optometry

There are currently 22 accredited optometry schools in the United States. Three of these schools produced graduates for the first time in 2013. Midwestern University - Arizona College of Optometry, University of the Incarnate Word, and Western University of Health Sciences opened in 2009 and produced their first graduates in the spring of 2013. Matriculation data from 2010-2012 show that cohorts at these three new schools increased, on average, from 64 to 69 students. Consequently, the new schools provide an initial estimated increase of 195 graduates in 2013 and a gradual increase up to 206 graduates in 2015, at which time we assume that enrollment will stabilize at current schools. Massachusetts College of Pharmacy and Health Sciences will graduate its first cohort of an estimated 75 students in the spring of 2016, and a planned school of optometry in Southeastern Kentucky is expected to enroll its first class in 2015 with its first graduating class of approximately 48 students in the spring of 2019. Since there is no data on the growth of class sizes for these two new optometry schools, we assume for the purposes of this report that class sizes will remain at planned levels. As a result of these new and growing schools, the entrants into the optometry workforce are expected to increase from 2013 through 2020, at which time the number of new entrants is currently projected to plateau.

Exhibit IV-5. Established and Planned Optometry Programs

	2012 Graduates
Established Schools	
Inter American University of Puerto Rico, School of Optometry	48
Illinois College of Optometry	168
Indiana University, School of Optometry	80
Michigan College of Optometry at Ferris State University	36
New England College of Optometry	120
Nova Southeastern University, College of Optometry	104
Northeastern State University - Oklahoma College of Optometry	27
The Ohio State University, College of Optometry	60
Pennsylvania College of Optometry at Salus University	148
Pacific University, College of Optometry	90
Southern California College of Optometry	96
Southern College of Optometry	121
State University of New York, State College of Optometry	70
University of Alabama at Birmingham, School of Optometry	36
University of California - Berkeley, School of Optometry	62
University of Houston, College of Optometry	91
University of Missouri at St. Louis, College of Optometry	47
New Schools*	
Midwestern University - Arizona College of Optometry	0
University of the Incarnate Word, Rosenberg School of Optometry	0
Western University of Health Sciences, College of Optometry	0
Massachusetts College of Pharmacy and Health Sciences	0
planned School of Optometry, Southeastern Kentucky	0

Source: Association of Schools and Colleges of Optometry.
*These five programs, as of 2012, have not graduated their first cohort. Midwestern University - Arizona College of Optometry, University of the Incarnate Word, and Western University of Health Sciences will be producing their first graduates in the spring of 2013. Massachusetts College of Pharmacy and Health Sciences will graduate its first cohort in the spring of 2016, and Planned School of Optometry, Southeastern Kentucky will graduate its first class in the spring of 2019.

This increase in the number of optometry programs producing graduates will have an impact on optometrist supply. *Exhibit IV-6* charts the actual and projected graduates from schools of optometry between 2012 and 2020. The increases seen in years 2013-2016, and 2019 demonstrate the increase in graduates produced by these emerging and planned programs.[13] These new graduates, who are counted as entrants into the workforce at the beginning of the year following graduation, form the basis of the new entrants in the baseline optometrist supply projections. Note that, after 2019, our baseline projections assume that new graduates plateau at slightly below 1,800 per year throughout the remainder of the projection period because we cannot predict future changes in the number of schools or students beyond that year. The Excel-based model can

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[13] Planned School of Optometry, Southeastern Kentucky enrollment for the AY2015-2016 is estimated to be 48 students.

be adjusted to account for changing class sizes at each school and the number of schools graduating optometrists in the future.

Exhibit IV-6. Actual and Projected Graduates from Optometry Schools
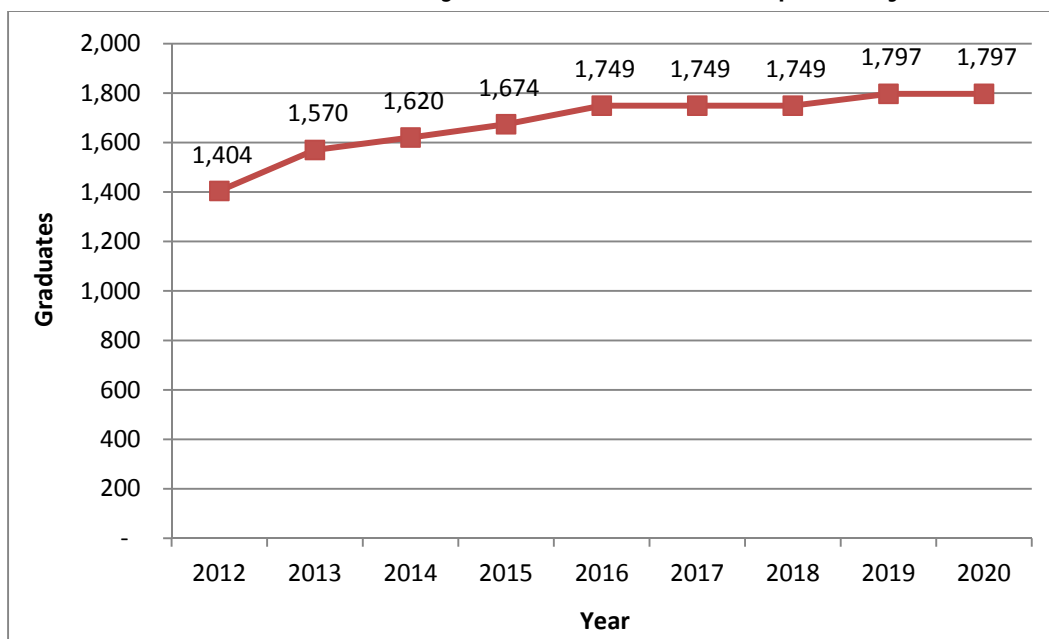
b.   Ophthalmology

Ophthalmologists completing residencies in 2012 were estimated at 458 (*Exhibit IV-7*). These new entrants into practice will be counted in the workforce at the beginning of 2013. For modeling purposes, we assume all residents complete their training within three years of the start date. From 2002 to 2012, there has been an increase of 20 positions, or an average increase of about two positions (a growth rate of 0.5 percent) per year. Moreover, though there has been a slight increase in positions since 2000, the number of positions is significantly lower than numbers prior to 1990. For purposes of our current model, we held ophthalmology residents constant at 458.

Exhibit IV-7. Ophthalmologists Completing Residency (2010-2012)

	2010	2011	2012
Male	269	272	275
Female	180	181	183
Total	**449**	**453**	**458**

Source: Ophthalmology Residency Match Report, January 2012

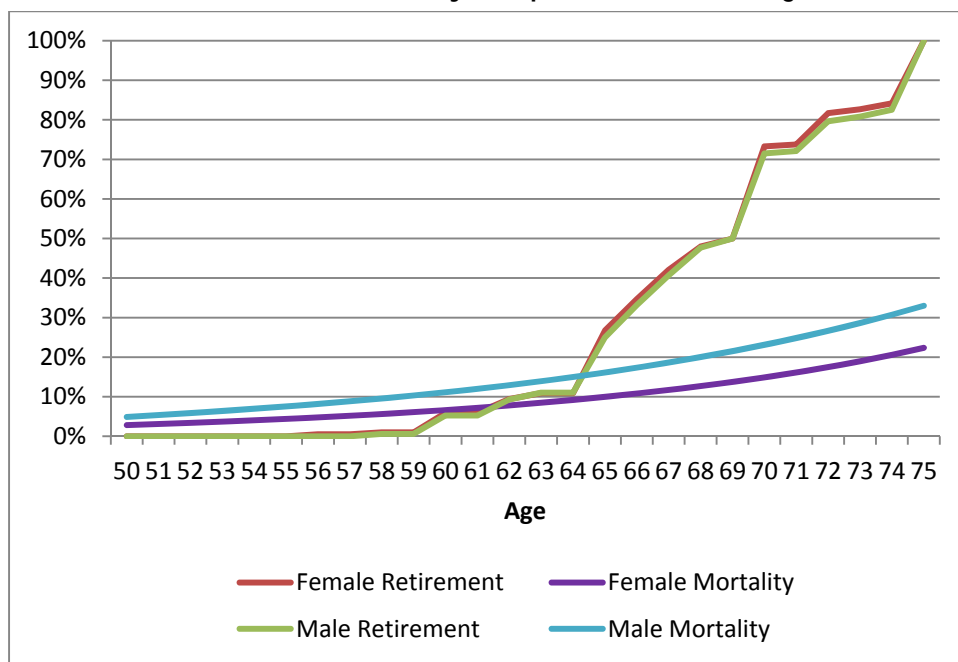### 3.   Attrition from the Workforce

Attrition in this study is defined as any provider leaving the workforce due to retirement or death. Retirement is defined as the point an optometrist or ophthalmologist stops work entirely, reducing his or her hours worked to zero. Retirement and mortality probabilities vary by age and gender. Hence, our estimates vary by these dimensions.

a. Optometrist Attrition

Exhibit IV-8 charts the two factors impacting attrition: retirement and mortality probabilities. The mortality rates shown in the diagram represent the cumulative probability of mortality at each age shown. The mortality probabilities are from the Centers for Disease Control and Prevention (CDC) National Vital Statistics System Mortality Data. They are adjusted downward to reflect that professional occupations, such as physicians, have lower mortality rates under age 65 than the general population.[14]

Cumulative probabilities of retirement for both male and female optometrists are also shown. These probabilities are estimated from responses to the 2012 National Eye Care Survey. We assume, for modeling purposes, that all optometrists are retired by age 75. We base this assumption on the results from the National Eye Care Survey, where only four respondents, out of 248 respondents over age 50, indicated an anticipated retirement age beyond age 75. Moreover, for estimating supply, it is not likely that the small numbers of optometrists who would remain in practice beyond age 75 will provide a significant amount of services.

Exhibit IV-8. Cumulative Probability of Optometrists Leaving the Workforce

Source: 2012 National Eye Care Workforce Survey and CDC Mortality Rates

Attrition rates, mathematically derived from mortality and retirement rates, are displayed in *Exhibit IV-9*, for male and female optometrists. These rates, which vary by age and gender, represent the percentage of optometrists at a given age who are expected to leave, conditional on surviving in the workforce to that age. That is, for example, of all optometrists who remain in the workforce through age 62, 2.3 percent of female and 3.0 percent of male optometrists will leave at age 63.

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[14] See Johnson NJ, Sorlie PD, and Backlund E.,"The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography.* 1999 Aug;36:355-367.

Exhibit IV-9. Annual Attrition Rates by Age for Optometrists

Age	Female	Male	Age	Female	Male
50	0.3%	0.4%	63	2.3%	3.0%
51	0.3%	0.5%	64	0.8%	1.2%
52	0.3%	0.5%	65	18.5%	16.8%
53	0.3%	0.6%	66	11.6%	12.1%
54	0.3%	0.6%	67	12.3%	12.7%
55	0.4%	0.6%	68	11.2%	13.3%
56	0.9%	0.7%	69	5.0%	6.2%
57	0.4%	0.7%	70	47.2%	44.2%
58	1.0%	1.4%	71	3.3%	4.2%
59	0.5%	0.8%	72	31.3%	28.9%
60	5.5%	5.5%	73	7.1%	8.2%
61	0.6%	1.0%	74	10.4%	11.8%
62	4.3%	5.3%	75	100.0%	100.0%

b.   *Ophthalmologist Attrition*

The factors affecting workforce attrition for ophthalmologists are the same as those affecting optometrists: retirement and mortality. The mortality probabilities are from CDC National Vital Statistics System Mortality Data, which is the same source as the optometrist mortality data. These are also adjusted downward to reflect that professional occupations have lower mortality rates under age 65 than the general population.[15]

Unlike the case of optometrists, we do not have a recent ophthalmologist specific survey from which to estimate retirement rates. We use the Association of American Medical Colleges (AAMC) Over 50 Survey, and from calculations based on the American Medical Association Masterfile reported as part of the effort.[16] Unfortunately, ophthalmology is not broken out separately in the survey and analyses. As a proxy, we use the retirement probabilities of internal medicine specialists. They are the largest specialty considered.

In *Exhibit IV-10*, we show the cumulative probabilities of "not retiring" for three groups. The first group is internal medicine (IM), which are the probabilities we use as proxies for ophthalmologists. We also include orthopedic surgeons in the comparison. Ophthalmologists are also surgeons. Hence, we can determine whether internal medicine specialists, who are not surgeons, have significantly different retirement patterns than surgeons. Finally, we consider the retirement patterns of all other specialties together that were not reported separately. This group will include ophthalmologists, but also other specialties.

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[15] See Johnson NJ, Sorlie PD, and Backlund E., "The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography.* 1999 Aug;36:355-367.

[16] *The American Association of Medical Colleges, American Medical Association Survey of Physicians Over Age 50,* American Association of Medical Colleges, 2006.

The greatest variance in cumulative retirement probabilities is between men and women practitioners, not between specialties. In particular, comparing male and female internal medicine specialists with male and female orthopedic surgeons, the cumulative probabilities never differ by more than 2 percentage points. Finally, using these probabilities to calculate the expected age at retirement, we find the expected age of retirement of male internal medicine specialists and male orthopedic surgeons is about the same, at 66.34 and 66.31 years, respectively. While it still may be the case that retirement patterns for ophthalmologists, which we do not observe directly, may differ significantly from IM, orthopedic and "other specialties" (which include ophthalmologists), it is not likely. Across specialties, physicians' retirement patterns are similar and good proxies for each other.

Exhibit IV-10. Probabilities of Remaining in the Workforce Rather than Retiring
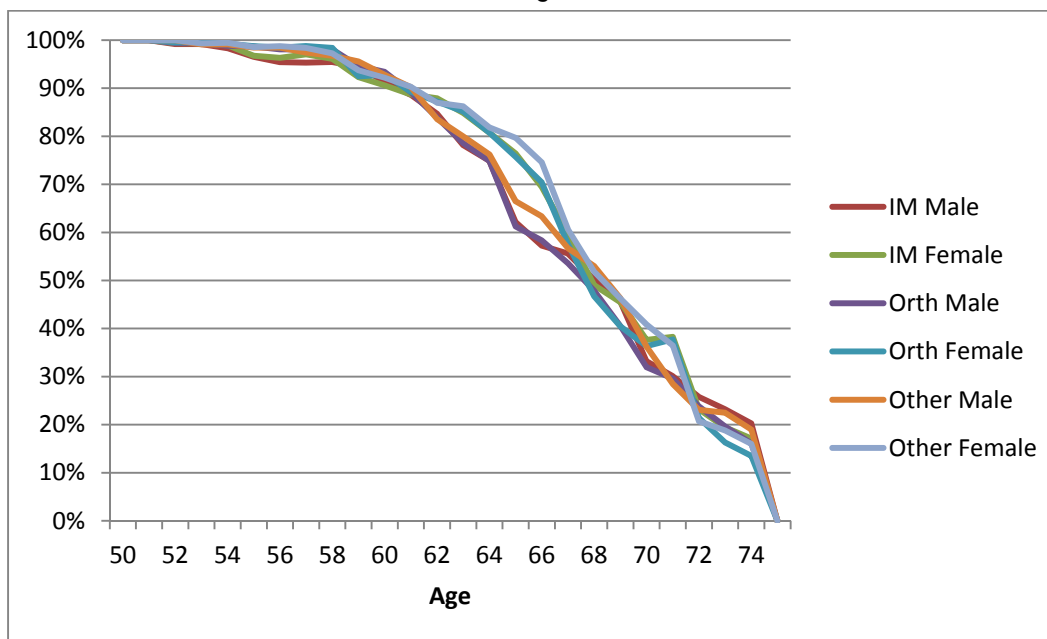

Exhibit IV-11 shows the two factors impacting attrition for ophthalmologists: retirement and mortality probabilities. The mortality rates shown in the diagram represent the cumulative probability of mortality at each age shown. The mortality probabilities are from CDC National Vital Statistics System Mortality Data. They are adjusted downward to reflect that professional occupations have lower mortality rates and higher life expectancies.[17] The cumulative retirement probabilities are from the AAMC/AMA Survey of Physicians Over Age 50.

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[17] See Johnson NJ, Sorlie PD, and Backlund E.,"The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study." *Demography.* 1999 Aug; 36:355-367.

Exhibit IV-11. Cumulative Probabilities of Ophthalmologist Retirement and Mortality
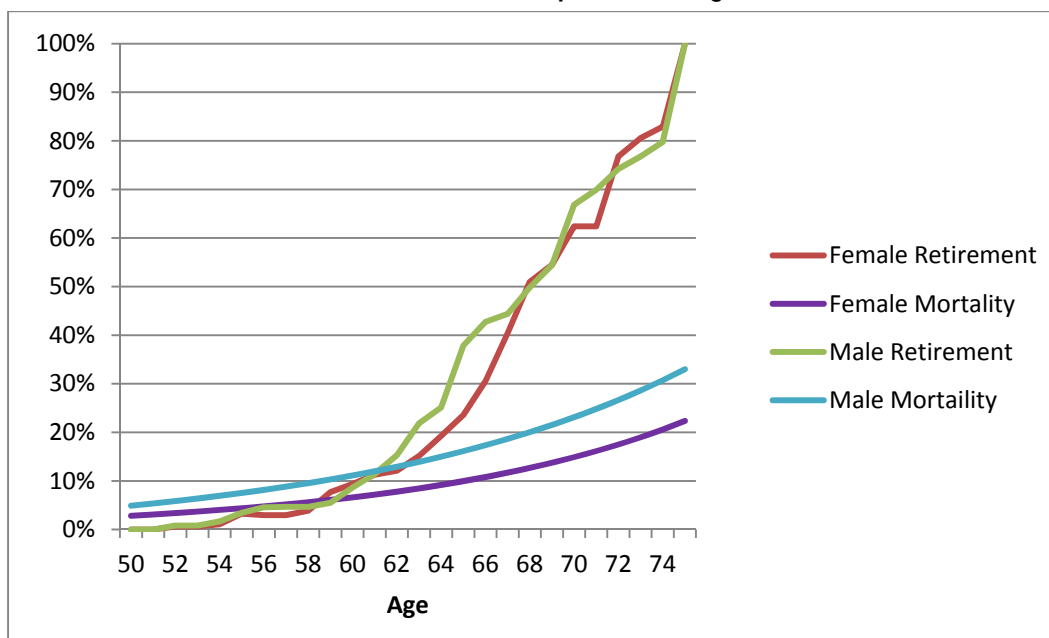
Annual attrition rates—the probability that an ophthalmologist will leave the workforce at a particular age given that he or she has survived to that age—are shown in *Exhibit IV-12*. They are derived by combing mortality and retirement probabilities, as described in the Mathematic Exposition section. For example, for all ophthalmologists who remain in the workforce through age 65, 10.0 percent of female and 9.2 percent of male ophthalmologists will leave the workforce at age 66.

Exhibit IV-12. Annual Attrition Rates by Age for Ophthalmology

Age	Female	Male	Age	Female	Male
50	0.3%	0.4%	63	4.1%	8.8%
51	0.3%	0.5%	64	5.6%	5.4%
52	0.9%	1.3%	65	6.2%	18.1%
53	0.3%	0.6%	66	10.0%	9.2%
54	0.8%	1.4%	67	15.1%	4.4%
55	2.6%	2.5%	68	18.6%	11.3%
56	0.1%	1.8%	69	8.3%	10.9%
57	0.4%	0.8%	70	18.4%	28.7%
58	1.4%	0.8%	71	1.5%	11.3%
59	4.5%	1.7%	72	39.3%	16.4%
60	2.4%	4.2%	73	17.8%	12.3%
61	2.7%	4.0%	74	13.8%	15.3%
62	1.6%	5.4%	75	100.0%	100.0%

4. *Baseline Demand*

Baseline demand estimates are based on data from Medical Expenditure Panel Survey (MEPS), the 2012 National Eye Care Workforce Survey and data and projections published by the Census Bureau and based on the 2010 Decennial Census. MEPS is a nationally administered survey that includes observations on utilization of healthcare services for a random sample of households. MEPS consists of two parts. First, a nationally administered household survey captures self-reported visits for both ophthalmologists and optometrists. Second, for visits that occurred in a medical doctor (MD) or osteopathic physician (DO) office, there is a detailed follow-up at the office level to capture the precise details of services and diagnoses of those captured in the household sample. Hence, in principle, the household component should adequately capture the number of visits for both optometrists and ophthalmologists. In practice, because there is no follow-up for optometry visits that did not occur in an MD's or DO's office, the number of optometry visits appear to be understated.

We use the MEPS survey to develop the age and gender distribution of visits or utilization per capita for both ophthalmologists and optometrists. For ophthalmologists, we also use the MEPS to estimate total visits. For optometrists, however, MEPS understates total visits. Hence, we rely on the National Eye Care Survey to estimate total visits for optometrists in the base year, 2012. We believe that, for optometrists, the age and gender mix of visits represents an unbiased estimate of the actual proportion of visits by age and gender. The distribution of visits, by age and gender, for optometrists, is consistent with the distribution of visits by patient age reported in the 2012 National Eye Care Survey.

a. *Optometrist Baseline Demand*

The MEPS data is used to provide the share or proportion of all visits to optometrists represented by each age and gender combination. Since MEPS does not adequately capture optometry visits, we do not rely on MEPS for estimates of total optometrist visits. From the 2012 National Eye care Survey, we estimate that there were 117,008,735 optometry visits in 2012.[18] *Exhibit IV-13* shows the number of visits in each of the age and gender patient combinations in 2012.

Exhibit IV-13. Estimated Visits to Optometrists in 2012, by Age and Gender

Age	Optometry Visits	
	Male	**Female**
0-4	562,975	205,894
5-17	10,492,218	10,412,614
18-40	11,358,825	18,741,282
41-64	16,347,860	29,358,408
65+	8,271,731	11,256,928

The per capita utilization rate is estimated by dividing the annual visits, by age and gender, by the U.S. population, by age and gender. *Exhibit IV-14* provides the baseline utilization matrix for optometrists.

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[18] A 95% confidence interval around this estimate is +/- 4,439,175 visits.

Exhibit IV-14. Per Capita Baseline Utilization for Optometrists
(Visits per Person)

Population Age	Male	Female
0-4	0.05	0.02
5-17	0.38	0.40
18-40	0.23	0.39
41-64	0.33	0.58
65+	0.44	0.46

Baseline demand is projected into the future by multiplying the baseline utilization by the population in the future year, for the respective age and gender combinations, and adding across the cells to obtain total demand in terms of visits. By the nature of the baseline demand, factors affecting utilization rates in the future, such as changes in insurance coverage or changes in the epidemiology of diseases, are held constant in the "baseline" projections.

To estimate the effect on future demand of changes in policies or disease epidemiology, we analyze the potential effects and change demand by including changes in the future utilization and/or population variables. For example, under the Affordable Care Act, we estimate the possible increase in utilization among adults based on MEPS data. MEPS data allow us to estimate the utilization of eye care services for those with health insurance compared to those without. Holding other factors affecting utilization constant in the regression analysis, such as age, gender and income of the patient, we estimate the difference in utilization of eye care services between those with, and those without, health insurance. Similarly, using data from the Congressional Budget Office, we estimate the number in the population that will gain health insurance.[19] For each projection year, the increase in utilization is estimated by multiplying the number of people who gain insurance under the ACA by the change or increase in utilization due to insurance coverage. This additional utilization is then added to the baseline utilization for that year to obtain the demand under the Affordable Care Act.

b.   *Ophthalmologist Baseline Demand*

MEPS data is also used to estimate the baseline utilization matrix for ophthalmologists. Recall in the case of optometrists, we use the MEPS data to obtain the percentage distribution of visit utilization across the age and gender cell categories, but we did not use it to obtain the total number of visits. For ophthalmologists, the total number of visits is estimated from the MEPS data as well as the distribution across age and gender cells. Visits from the 2010 data, by age and gender cells, are divided by population for 2010 to obtain the baseline utilization matrix. The 2010 MEPS data provides the baseline utilization matrix which indicates the per capita number of ophthalmology visits, by age and gender cells of the population. The baseline utilization matrix for ophthalmologists is shown in *Exhibit IV-15*.

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[19] Congressional Budget Office, "Updated Budget Projections: FY 2013-2023," and in particular, "Baseline Projections for Health: Effect of the Affordable Care Act on Health Insurance Coverage," May 14, 2013. http://www.cbo.gov/publication/44176.

Exhibit IV-15. Baseline Per Capita Utilization for Ophthalmologists

	Ophthalmology	
Age	Male	Female
0-4	0.03	0.01
5-17	0.08	0.08
18-40	0.06	0.10
41-64	0.17	0.24
65+	0.72	0.78

As in the case of optometrists, baseline demand is projected into the future by multiplying the baseline utilization by the population in the future year, for the respective age and gender combinations, and adding across the cells to obtain total demand in terms of visits. When applied to the 2012 population, this results in a total of 66,058,692 ophthalmology visits in 2012, the base year. By the nature of the baseline demand, factors affecting utilization rates in the future, such as changes in insurance coverage or changes in the epidemiology of diseases, are held constant in the "baseline" projections. Estimation of the effect on future demand of changes in policies, epidemiology or other factors is accomplished in a way similar to optometry demand changes. Analysis of the effect of the change on the utilization of the affected population, and the size of the affected population, combine with the baseline forecast to produce the new demand.

5. Full Time Equivalent (FTE) Optometrists and Ophthalmologists

In the description of data supporting the supply model above, the resulting supply estimates were the number of individual practicing optometrists and ophthalmologists in a given year. The demand estimates, on the other hand, were the number of visits demanded by patients in a given year. It is convenient, and consistent with the health workforce literature, to compare supply and demand in terms of a common metric, "full-time equivalents" (FTE). We define a "full-time equivalent" (FTE) optometrist and ophthalmologist, respectively, as the amount of services that can be provided by a typical or average optometrist or ophthalmologist, working a typical or average number of clinical hours.

We use the concept of an FTE to represent supply because the number of full-time equivalent optometrists or ophthalmologists that the workforce represents is a measure of the capacity of that workforce to deliver health care services. We use "FTE optometrist" and "FTE ophthalmologist" to measure demand, in that the number of FTE optometrists or FTE ophthalmologists demanded is a measure of the services (represented by an FTE) demanded for each provider. Hence, by measuring both supply and demand in a common metric, FTE, we can more readily compare supply with demand.

We adopt an empirical definition of a full-time-equivalent (FTE) optometrist and ophthalmologist. Our empirical definition is that an FTE is the expected number of patient visits that the "typical" or average optometrist or ophthalmologist, working the average number of clinical hours, provides in a year. We use the base year, 2012, to define an FTE. For optometrists, it is based on the results of the 2012 National Eye Care Survey of Optometrists, weighted to represent the population of all practicing optometrists in 2012. For ophthalmologists, we define a FTE as the number of patient visits produced by the typical or average ophthalmologist in 2012.

Note that this *empirical* definition has no normative significance. That is, it does not represent a normative standard for either hours of work or productivity for either optometrists or ophthalmologists. Based on this empirical definition, one FTE optometrist provides 2,956 visits per year (visits per week multiplied by weeks per year). [20] This corresponds to 1,641 patient care hours per year (hours per week multiplied by weeks per year) as the definition of "FTE." Because hours and productivity vary by the age and gender of the optometrist, the average productivity of the workforce will change as the demographic mix of the workforce changes. Workforce productivity is measured relative to the empirical standard FTE established in the base year. Hence, the same number of optometrists may provide slightly different FTE, depending on the relative productivity, which varies by age and gender composition of the optometrists. In particular, the number of FTE may be smaller (or larger) than the number of practicing optometrists as the age and sex distribution of the optometry workforce changes over time.

One FTE optometrist, defined below as an optometrist working the average number of hours and at the average productivity observed in 2012, represents the potential to supply a specific amount of services to patients. *Exhibit IV-16* shows the hours of work and productivity, in terms of patient visits, for the average optometrist in 2012. One FTE provides 2,956 visits per year.

Exhibit IV-16. An FTE Optometrist

1	2	3	4	5
Hours per Week	Weeks per Year	Hours per Year (1)*(2)	Visits per Week	Visits per Year (2)*(4)
34.64	47.37	1,641	62.35	2,956

Source: Data from the 2012 National Eye Care Survey of Optometrists

The empirical definition of an FTE ophthalmologist is straightforward. Recall we estimate that there were 16,404 practicing ophthalmologists in 2012, providing an estimated 66,058,692 patient visits. Hence, the average or typical ophthalmologist provided 4,027 visits.[21] Note that this FTE calculation includes ophthalmologists who are engaged in full time clinical practice, but it also includes academic and other ophthalmologists who, though engaged in clinical practice, will have fewer hours devoted to clinical practice. Hence, this is likely to understate the number of visits performed annually by an ophthalmologist who is engaged solely in clinical practice.

In our analysis, we combine the supply and demand for eye care services into a single, overall market. To do this, we use the common metric of an optometrist FTE to combine the supply and demand of both optometrists and ophthalmologists. In terms of visits, our respective definitions of FTE for optometrists and ophthalmologists suggest that one FTE ophthalmologist, who provides 4,027 visits, is the equivalent of 1.36 FTE optometrists, who provides 2,956 visits. Hence, when combining the market into a total market for eye care services while using a single measure, an optometrist FTE, we use the relationship that one ophthalmologist FTE is the equivalent of 1.36 optometrist FTEs, in terms of annual visits.

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[20] A visit is defined as a face-to-face encounter between the patient and doctor, which may include follow up visits that are not billable. A visit is not the number of unique patients and could in fact be the same patient seen multiple times (e.g., the same patient was seen by the doctor four times in a year and therefore is counted as four visits).

[21] This does not include visits provided by optometrists who practice in ophthalmology offices.

6.   Factors Affecting Demand

The workforce model is structured to analyze changes in demand as long as one can determine (1) the population affected by the change; and (2) the per person magnitude of the change, in visits. The change equations were provided earlier in section IV.B.3. In this section, we describe the methods and data used for two factors potentially affecting the demand for eye care services within our projection period of 2012 through 2025. These two factors are (a) the potential effect of increased insurance coverage under the Affordable Care Act on the demand for eye care services; and (b) the potential effect of increased prevalence of diabetes mellitus, specifically type 2 diabetes, on the demand for eye care services.

To provide an estimate on these effects, we again use the Medical Expenditure Panel Survey data set. In the MEPS data, we can distinguish patients who have insurance from those who do not, and patients who have diabetes from those who do not. Based on differences in total eye care visits, we can infer how demand might change if those without insurance were to become covered, and those without diabetes were to be diagnosed with diabetes. In the analysis, we use multivariate regression to control for age, gender, family income and other factors that may also affect demand, so that the effect of insurance and diabetes are less likely to be confounded by other factors.

a.   Estimates of the Effects of Insurance and Diabetes on Demand

We separately consider two populations who will obtain insurance coverage under ACA: children and adults under age 65. We consider them separately because of a difference in the coverage benefits. The minimum essential benefit package required under ACA includes an annual vision exam, as well as medical coverage, for children under age 19.[22] This annual vision exam is not included as a minimum essential benefit for adults in the ACA.

Using data from the 2011 American Community Survey, we estimate that approximately 8.4 million children are without health insurance.[23] For the adult population below Medicare age, we rely on estimates from the Congressional Budget Office. The ACA is estimated to insure 25 million Americans by full implementation in 2017-2018.[24]

The estimate of the change in per capita utilization for children who become insured is derived from an analysis of the MEPS data. The dependent variable is the number of eye care visits during the year for an individual child, as recorded in the MEPS data.[25] This analysis shows how the dependent variable, eye care visits, changes with a change in a particular variable. The results indicate that eye care visits for children increase with family income and age, and are greater for

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[22] See, for example, "AOA's Frequently Asked Questions on the Essential Health Benefit and the Insurance Marketplaces," http://www.aoa.org/Documents/advocacy/FAQ_on_EHB.PDF.

[23] The Children's Defense Fund, using data from the Current Population Survey, estimated that there were 7.9 million uninsured children in the United States in 2009 (http://www.childrensdefense.org/policy-priorities/childrens-health/uninsured-children/uninsured-children-state.html.) The Assistant Secretary for Planning and Evaluation, Health and Human Services, using Bureau of the Census Current Population Survey data for 2102 estimated that there were 7.8 million children under age 19 were uninsured in 2012. (http://aspe.hhs.gov/health/reports/2012/uninsuredintheus/ib.shtml#who).

[24] Congressional Budget Office, "Updated Budget Projections: FY 2013-2023," and in particular, "Baseline Projections for Health: Effect of the Affordable Care Act on Health Insurance Coverage," May 14, 2013. http://www.cbo.gov/publication/44176.

[25] Note that MEPS data, projected to the population, understates total visits because not all optometry visits are included. We adjust for this when estimating the market impact for eye care services.

females than males, although this difference is not statistically significant. Most importantly, the effect of insurance on visits is positive and indicates that those with Medicaid have more visits than those with no insurance, and those with commercial and other types of insurance also have more visits per year than otherwise similar children with no insurance. It is this estimate that we used in our analysis of the ACA impact for children.

An analysis for the demand for eye care for adults includes both the effect of insurance coverage on demand, compared to those who do not have insurance, and the effect of diabetes on demand, compared to otherwise similar individuals who do not have diabetes. Other things being equal, in the MEPS data, those with insurance have more visits per year than those without insurance. Those with diagnosed diabetes also have more visits per year than otherwise similar individuals who do not have diagnosed diabetes.

b.   *Effect of ACA and Diabetes on Demand*

Based on both the MEPS data as well as an adjustment for the understatement of eye care visits in the MEPS data, Exhibit IV-17 provides an estimate of the effect of insurance and of diabetes on the demand for eye care services. The effect from the analysis of MEPS as adjusted upward by the percentage by which the MEPS data understate total eye care visits.[26] Results are presented at the individual level. That is, individuals who are diagnosed with diabetes, for example, will have 0.43 more eye care visits annually than they otherwise would. In Exhibit IV-17, "Prior Utilization Visits per Year" refers to the average utilization for individuals prior to either (a) gaining insurance coverage; or (b) being diagnosed with diabetes. "Post Utilization Visits per Year" is the average utilization after (a) gaining insurance; or (b) being diagnosed with diabetes. Note that these are averages. Individuals will have different levels of utilization based on other circumstances, such as family income, and so forth. However, the difference or change in utilization will apply to all of the individuals. The estimates in *Exhibit IV-17* will be used in Section VI Results to project the effect that additional insurance coverage under ACA will have on demand for eye care services, and to project the effect that possible increased prevalence of diabetes may have on the demand for eye care services.

Exhibit IV-17. Effect of ACA and Diabetes on Per Capita Annual Utilization

Case	Population Sex	Population Age	Prior Utilization Visits per Year	Post Utilization Visits per Year	Utilization Effect (change)
ACA Children	Male and Female	<18	0.08	0.33	0.25
ACA Adults	Male and Female	>=18	0.13	0.32	0.19
Diabetes	Male and Female	>=18	0.58	1.01	0.43

The analysis, arguably, ground the estimated impact of the changes in an empirical foundation. They are an attempt to infer from past behavior likely changes in future behavior resulting from changes in an individual's status. As will be discussed in Section VII under "Limitations," the projected effects of these factors should be interpreted with caution.

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[26] Recall that the MEPS data understates eye care visits because it does not include visits to optometrists who were not working in the office of an allopathic or osteopathic physician. This adjustment increases the impact to adjust for the understatement of visits in the MEPS data.

V. National Eye Care Workforce Survey of Optometrists

A. Overview

The 2012 National Eye Care Workforce Survey of Optometrists was developed by The Lewin Group, and the AOA-ASCO Workforce Study Project Team, in consultation with the Workforce Study Expert Panel, consisting of optometrists, other clinicians and other health care professionals. The survey aimed to identify characteristics of individual optometrists and their work settings, including workload, patient mix, and the organization of their practice and is comprised of 26 questions. The purpose of this section is to provide information regarding the survey information that was directly used in the workforce model. The reader is referred to the 2012 National Eye Care Workforce Survey of Optometrists report for a more general description of the survey questions and results.

The survey was fielded to a random stratified sample of 4,000 clinically active optometrists from a universe of 39,580 actively practicing optometrists. Eighty-one surveys were returned with incorrect addresses, bringing the adjusted sample down to 3,919. The sampling frame was formed by a combination of Provider360 and the AOA membership list, as described in the Section I, Methodology and Data. The survey had an 18.1 percent response rate. A total of 726 surveys were returned. Of these, however, three were duplicates and two surveys were not usable for analysis, resulting in a usable sample size of 721. The practical implications of this is that the sample size of 721 results in population estimates that are within 3.6 percentage points of the true population proportion with 95% confidence. However, within the overall response rate, the actual responses varied by question.

Exhibit V-1 presents a basic demographic profile of the responding optometrists. The second column lists the percent of the optometrist population composed of specified demographic groups and the fourth column lists the percent of survey respondents within each group. Our sampling design attempted to ensure that the distribution of respondents by each demographic grouping resembled that of the optometry universe. Of those optometrists responding, 67 percent were male and over 61.7 percent were between the ages of 40 and 65.

Exhibit V-1. Respondent Demographics

Demographics	Percent of Universe	N	Percent of Total Responses
Overall		721	
Gender			
Male	59.80%	480	66.57%
Female	40.20%	241	33.43%
Age Band			
Under 30	6.11%	30	4.16%
30-39	27.99%	171	23.72%
40-49	25.16%	162	22.47%
50-65	33.84%	283	39.25%
Over 65	6.89%	75	10.40%
Census Division			
East North Central	16.64%	142	19.69%
East South Central	6.12%	43	5.96%
Mid-Atlantic	13.39%	86	11.93%
Mountain	7.19%	55	7.63%
New England	6.10%	31	4.30%
Pacific	15.10%	107	14.84%
South Atlantic	16.92%	98	13.59%
West North Central	8.86%	100	13.87%
West South Central	9.67%	59	8.18%

Note: The sampling frame was not stratified by race or ethnicity.

The topics covered in the survey included demographic characteristics, professional characteristics, hours worked and workload, practice organization, revenues and income, and job satisfaction and retirement. Specific components of the survey have been used directly as data inputs to the Eye Care Workforce Model or to provide validation for data that has been used in the Model. These include:

- Optometrist hours of work by age and gender

- Optometrist weeks of work by age and gender

- Optometrist visits per week by age and gender

- Optometrist self-reported excess capacity in visits per week by age and gender

- Retirement rates by gender

In the survey, optometrists were asked to provide total number of hours worked per week, weeks worked per year, total number of visits provided per week, and an estimate of their excess capacity, as measured by the number of additional visits they could provide in a given week. The self-reported measure of excess capacity assumed that all patients attend their appointments, scheduling

was efficient, and practice patterns remain constant. Optometrists age 50 years and older were also asked to provide an estimate of the age at which they plan to retire. These components are highlighted below and their contributions to the final Eye Care Workforce Model are explained.

B.   Survey Data Used in Eye Care Workforce Model

Exhibit V-2 displays patient care hours of work per week by age and gender. Overall, responding optometrists averaged 34.7 patient care hours of work per week. Men averaged slightly higher patient care hours per week with 35.6 hours compared to females averaging 33.2 hours. The difference in hours worked by age group ranged from 32.9 hours worked by optometrists over age 65 to 35.7 hours by optometrists between the ages of 50 and 65.

Exhibit V-2. Patient Care Hours Worked per Week by Age and Gender

Age	Male		Female		Overall	
	N	*Mean*	*N*	*Mean*	*N*	*Mean*
Under 30	9	35.70	21	35.00	30	35.21
30-39	75	36.16	94	34.22	169	35.08
40-49	89	35.43	71	31.51	160	33.69
50-65	230	36.30	42	32.05	272	35.65
Over 65	66	32.50	6	37.67	72	32.93
Overall	**469**	**35.57**	**234**	**33.17**	**703**	**34.65**

Optometrists were asked to provide the average number of weeks worked in 2011. *Exhibit V-3* summarizes the results of the annual weeks worked question posed on the survey. Optometrists averaged 47.4 weeks per year with optometrists between the ages of 30 and 39 reporting the greatest number of weeks worked at 48.0 weeks. Male optometrists worked roughly one week more, on average, than female optometrists.

Exhibit V-3. Weeks Worked per Year by Age and Gender

Age	Male		Female		Total		
	N	*Mean*	*N*	*Mean*	*N*	*Mean*	*Standard Error*
Under 30	9	43.00	19	37.95	28	39.51	2.68
30-39	75	48.60	94	47.55	169	47.98	0.52
40-49	89	48.26	70	47.53	159	47.91	0.59
50-65	232	47.88	43	48.53	275	48.02	0.29
Over 65	66	47.10	6	39.17	72	46.84	0.95
Overall	**471**	**47.87**	**232**	**46.72**	**703**	**47.37**	**0.28**

In addition to workload as a function of hours worked per week and weeks worked per year, optometrists were surveyed concerning the number of patient visits they provided in an average week. The survey used a comprehensive definition of a patient "visit" to include comprehensive eye health or vision exams, emergency and walk-in visits, visits in which other medical eye care services were performed, and all other visits not included in these categories. *Exhibit V-4* presents the average number of patient visits per week, by age and gender. There is no attempt to adjust for visit "complexity." Optometrists between the ages of 40 and 49 reported the highest number of visits per week, with an average of 65.0 visits. Optometrists over the age of 65 reported the least number of visits, with an average of 55.7 visits per week.

Exhibit V-4. Average Number of Patient Visits per Week Supplied by Age and Gender

Age	Male		Female		Overall	
	N	*Mean*	*N*	*Mean*	*N*	*Mean*
Under 30	8	54.75	19	63.11	27	60.63
30-39	70	76.27	86	54.72	156	64.39
40-49	86	72.03	66	55.92	152	65.04
50-65	210	65.42	38	46.62	248	62.54
Over 65	58	56.57	3	38.00	61	55.66
Overall	432	67.11	212	54.16	644	62.35

Using results for the average number of patient visits per week and patient care hours per week, we can calculate a measure of productivity—visits per hour—by age and gender. Visits per hour is derived by dividing reported visits per week by patient care hours worked per week, and is presented in *Exhibit V-5*. The average number of visits per hour ranged from 1 visit for female optometrists over 65 to 2.1 visits by 30-39 year old male optometrists.

Exhibit V-5. Visits per Hour Worked by Age and Gender

Age	Male	Female	Overall
Under 30	1.53	1.80	1.72
30-39	2.11	1.60	1.84
40-49	2.03	1.77	1.93
50-65	1.80	1.45	1.75
Over 65	1.74	1.01	1.69
Overall	1.89	1.63	1.80

Patient visits per week (*Exhibit V-4)* are multiplied by weeks worked per year (Exhibit I-3). This results in average annual optometry visits per optometrist, by age and gender. The universe sampling weights, explained in Appendix B, are then used to project visits per year.

In particular, let $S_{i,j}$ represent the sampling weight for a respondent in age category i, and gender category j, and let $V_{i,j,k}$ be the weekly number of visits reported by respondent k who is in age category i and gender category j, and $W_{ij,k}$ is the number of weeks worked by respondent k in age category I and gender category j. Then, the annual number of visits is estimated as:

$$Total\ Annual\ Visits = \sum_{k=1}^{R_{i,j}} \sum_{i=1}^{5} \sum_{j=1}^{2} V_{i,j,k} * W_{i,j,k} * S_{i,j}$$

where $R_{i,j}$ is the number of respondents in age category i and gender category j. Note that there are five age categories (i=1,…,5) and two gender categories (j=1,2).

The total number of annual visits in 2012, estimated from the survey and projected to a universe of 39,580 practicing optometrists, was 117,008,735. A 95% confidence interval around this estimate is 112,569,560 (lower bound) and 121,447,910 (upper bound). *Exhibit V-6* shows total annual optometry visits, and annual visits by age and gender category, for the 2012 base year.

Exhibit V-6. Total Number of Visits per Year Supplied by All Optometrists

Age	Male	Female	Overall	Lower 95% CL for Mean	Upper 95% CL for Mean
Under 30	1,639,813	4,127,589	5,767,402	4,049,491	7,485,313
30-39	16,632,079	17,155,674	33,787,752	29,785,174	37,790,332
40-49	17,839,928	12,831,520	30,671,448	27,504,502	33,838,394
50-65	33,547,970	6,068,507	39,616,477	36,781,147	42,451,807
Over 65	7,037,674	127,982	7,165,655	6,242,812	8,088,500
Overall	76,697,464	40,311,271	117,008,735	112,569,560	121,447,910

Optometrists were asked to indicate the number of additional visits they *could* provide per week if they were fully booked with zero no-shows, above those provided and reported in *Exhibit V-4*. *Exhibit V-7* presents the results. Overall, optometrists indicated that they had additional capacity of 19.8 visits per week, on average. This was based on all respondents who answered the question, even if the answer was that they did not have excess capacity. The results suggest excess capacity of about 32 percent, on average. This excess capacity question was used in the Eye Care Workforce Model to explore possible market implications of optometrist excess capacity in an alternative supply scenario. Note the small sample sizes for some of the reporting cells. The implications for the confidence interval around estimated excess capacity are shown in *Exhibit V-8*, where an inference is made regarding excess capacity for the entire workforce population.

Exhibit V-7. Excess Capacity: Additional Number of
Visits per Week by Age and Gender

Age	Male		Female		Overall	
	N	Mean	N	Mean	N	Mean
Under 30	17	21.11	9	22.12	26	21.77
30-39	82	30.95	69	16.52	151	23.12
40-49	61	24.66	79	17.80	140	21.67
50-65	31	18.40	197	11.03	228	17.40
Over 65	2	16.48	58	8.50	60	16.22
Overall	176	21.49	403	16.45	579	19.81

Based on the respondents to this excess capacity question, when excess capacity for additional visits is projected to a full year for the entire optometry workforce, the implication is that 37,149,838 additional visits could be provided per year. A 95% confidence interval around this estimate is 28,231,191 visits per year as the lower bound of the interval and 45,335,192 visits per year as the upper bound of the interval. Workforce capacity for additional visits by age and gender and overall is shown in *Exhibit V-8*. Note that the confidence intervals are wide in general and particularly for certain age and gender cells, such as those under 30, where the number of respondents was especially small.

Exhibit V-8. Excess Capacity: Additional Number of Visits per Year by All Optometrists

Age	Male	Female	Overall	Lower 95% CL for Mean	Upper 95% CL for Mean
Under 30	632,264	1,446,826	2,079,090	760,410	3,521,392
30-39	6,749,091	5,179,221	11,928,312	9,031,049	13,744,945
40-49	6,107,213	4,084,671	10,191,884	7,987,346	12,654,802
50-65	9,437,758	1,435,820	10,873,577	9,138,132	12,573,118
Over 65	2,048,346	28,628	2,076,974	1,314,255	2,840,936
Overall	24,974,672	12,175,165	37,149,838	28,231,191	45,335,192

Exhibit V-9 displays the average age at which optometrists reported they plan to retire. We limited our analysis to those optometrists over 50 years of age in an effort to narrow the responses to those individuals most likely to have retirement plans. The expected age of retirement reported by female optometrists was younger than the expected age indicated by male optometrists. When the responses to this question are transformed into implied annual attrition rates, however, the correlation of these rates between male and female optometrists is relatively high, about 0.94. Hence, the patterns of retirement are similar between male and female optometrists.

Exhibit V-9. Expected Age at Retirement
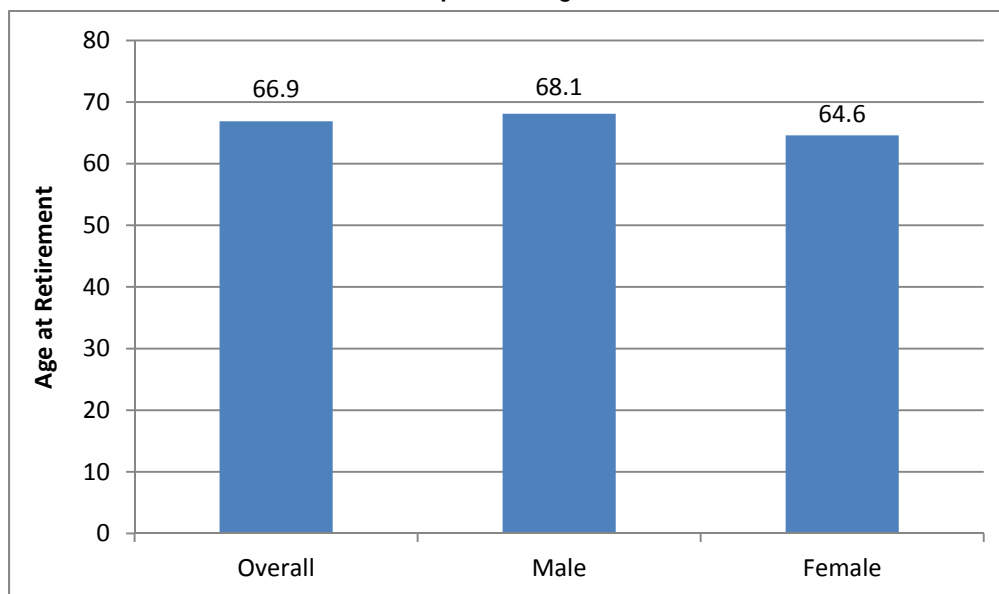
Note: This chart reports only those optometrists over the age of 50

Exhibit V-10 displays the distribution of retirement rates reported by optometrists over the age of 50. These are conditional retirement probabilities. They indicate the probability that the optometrist will retire at age t given that the optometrist has not yet retired by age t-1. On average, male optometrists plan to retire slightly later than female respondents. However, the retirement patterns of men and women are similar. The conditional retirement rates presented in *Exhibit V-10* are incorporated into the attrition calculations that are applied in the Eye Care Workforce Model. In many health professions, providers maintain licensure even though they enter retirement. In the model, we assume that all providers leave the workforce by age 75. Note that only four

respondents, out of a total of 248 respondents over the age of 50, indicated an expected retirement age beyond age 75.

Exhibit V-10. Retirement Rates by Age and Gender
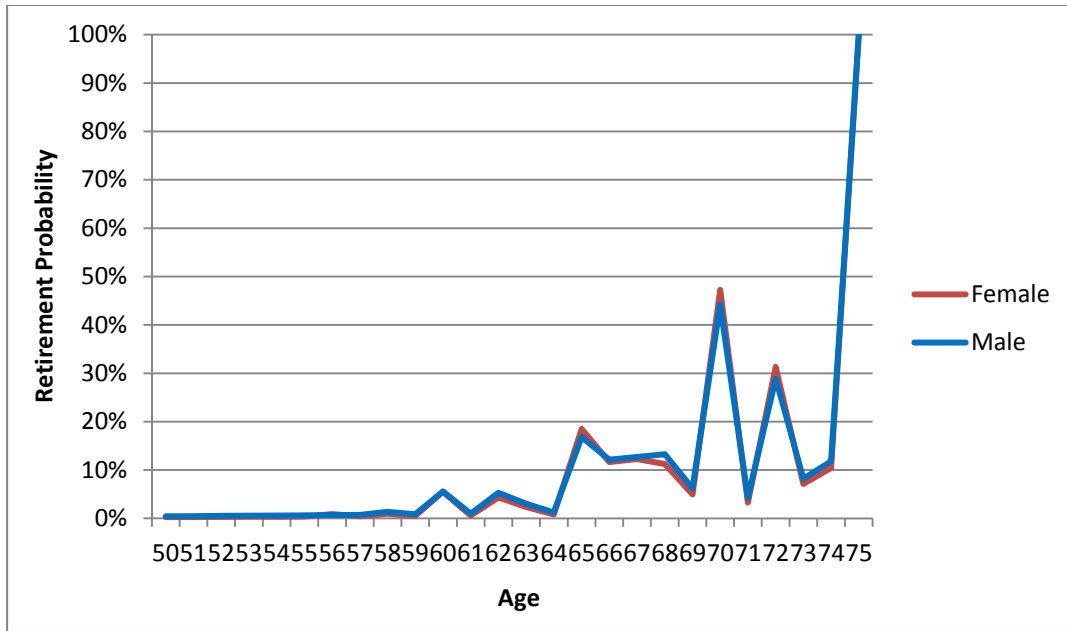
In this section, we present and discuss only that data which directly supports the Eye Care Workforce Model. Estimates of annual visits provided an estimate of current demand. The application of this estimate to the model is discussed in Section IV: Methods and Data. However, this same data, augmented by estimates of excess capacity, is used on the supply side of the model as well. In addition, survey respondents' estimates of retirement age are used directly in the model to describe how the workforce will age over time. The 2012 National Eye Care Survey of Optometrists contains a rich source of data on the optometrist workforce in many other dimensions not discussed in this report, and the interested reader is referred to the survey report.

VI. Results

In this section, we present estimates of the supply of, and demand for, eye care services using the model developed for that purpose. First, we present baseline supply of and demand for optometrists, ophthalmologists, and the combined market for eye care services. Next, we consider the effects that the Affordable Care Act (ACA) may have on demand, through its effect on health insurance. We consider two ways that the ACA affects the demand for eye care: (1) the inclusion of pediatric eye care as a benefit to previously uninsured children and (2) the expansion of health insurance coverage to millions of Americans who were previously without medical insurance. In addition, we consider the effect that increases in the incidence and prevalence of diabetes may have on demand. In assessing these demand effects, we compare the demand that results from the model's assumptions to the baseline supply, to assess the projected effects on the market. Finally, we consider the effects that projected excess capacity in the optometry workforce may have on the combined market for eye care services.

A.   Baseline Supply and Demand

First, we present the baseline supply of and demand for optometrists. Next, we present the baseline supply of and demand for ophthalmologists. Finally, we combine the results into one total market for eye care services.

### 1.   Optometry Baseline Supply and Demand

In *Exhibit VI-1*, we present the baseline supply of optometrists. We project both the numbers of optometrists and the FTE optometrists.[27] As discussed in Section IV: Methods and Data, the supply projections are based on: (1) the number of practicing optometrists in 2012 by age and gender; (2) estimated mortality and retirement rates, by age and gender; and (3) planned and projected graduates that result in new entrants into the optometry workforce. Based on the number of schools and colleges of optometry in operation at the time of the survey, planned graduates will increase though 2019 and then remain constant.

The number of FTE optometrists is projected to grow by 11 percent over the period 2012-2025, while the number of practicing optometrists is projected to grow by about 18 percent over the same period. The difference that emerges between FTE optometrists and the number of practicing optometrists arises because of the changing demographics of the workforce. As older, experienced optometrists leave the workforce, they are replaced by younger, less experienced optometrists. Moreover, there is a trend toward an increasing proportion of women among the new entrants to the workforce. Younger optometrists and female optometrists typically provide fewer visits per year than older, male optometrists.[28]

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[27] The 2012 National Eye Care Workforce Survey revealed that an average FTE optometrist provides 2,956 visits per year.
[28] See *Exhibit V-4* on visits by age and gender in the Section V on the 2012 National Eye care Survey.

Exhibit VI-1. Optometry Baseline Supply: FTE and Number of Practitioners
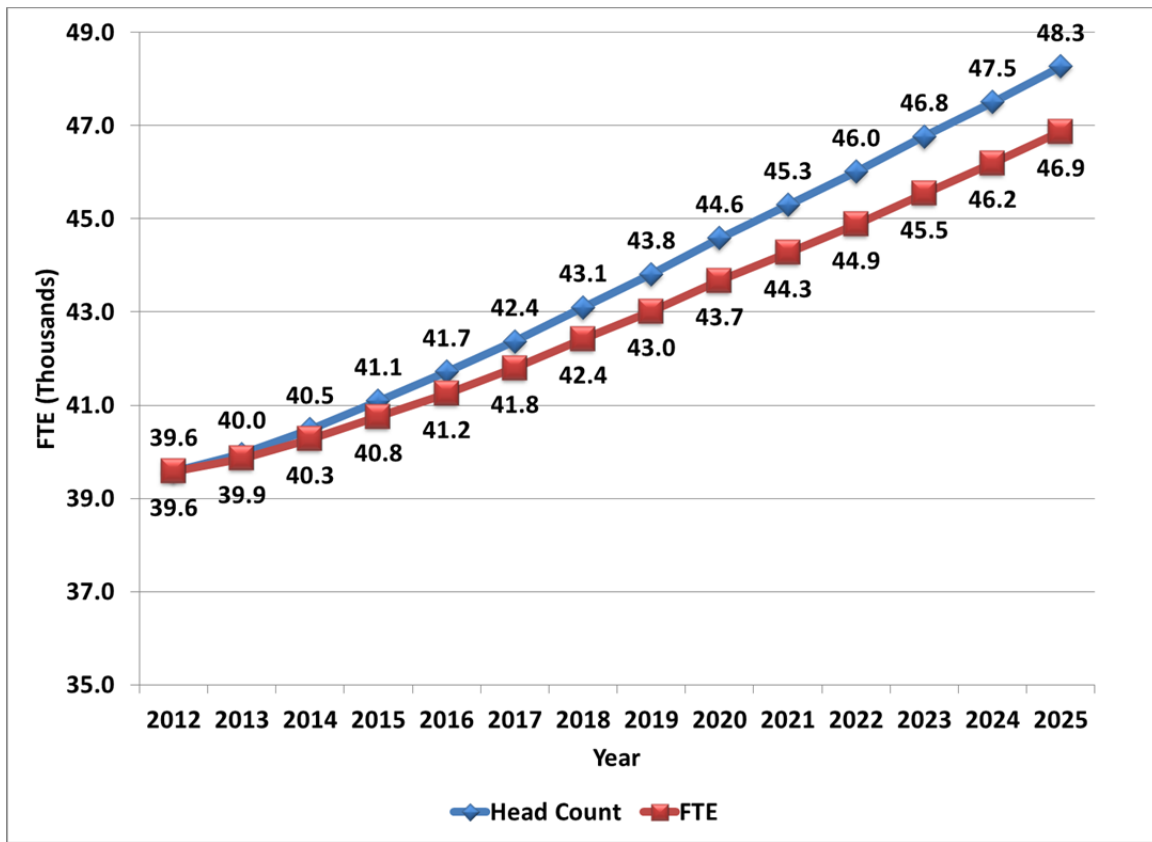
On the demand side, the baseline projections are based on an eye care utilization matrix, indicating the number of visits per capita by age group and gender, for the base year. Projections for each subsequent year are based on applying the year's population levels, by age and gender, to the utilization matrix. Section IV: The Methods and Data describes how the baseline is constructed in greater detail.

Exhibit V I-2 presents the baseline supply and demand for optometrists. Note that, in this projection, demand is defined only narrowly as the "optometry" portion of the market. From this narrow perspective, excess supply begins to emerge beginning in 2015 and continues throughout the projection period. However, as we will present shortly, when the entire eye care market is considered, this is not the case.

## Exhibit VI-2. Optometry Baseline Supply and Demand
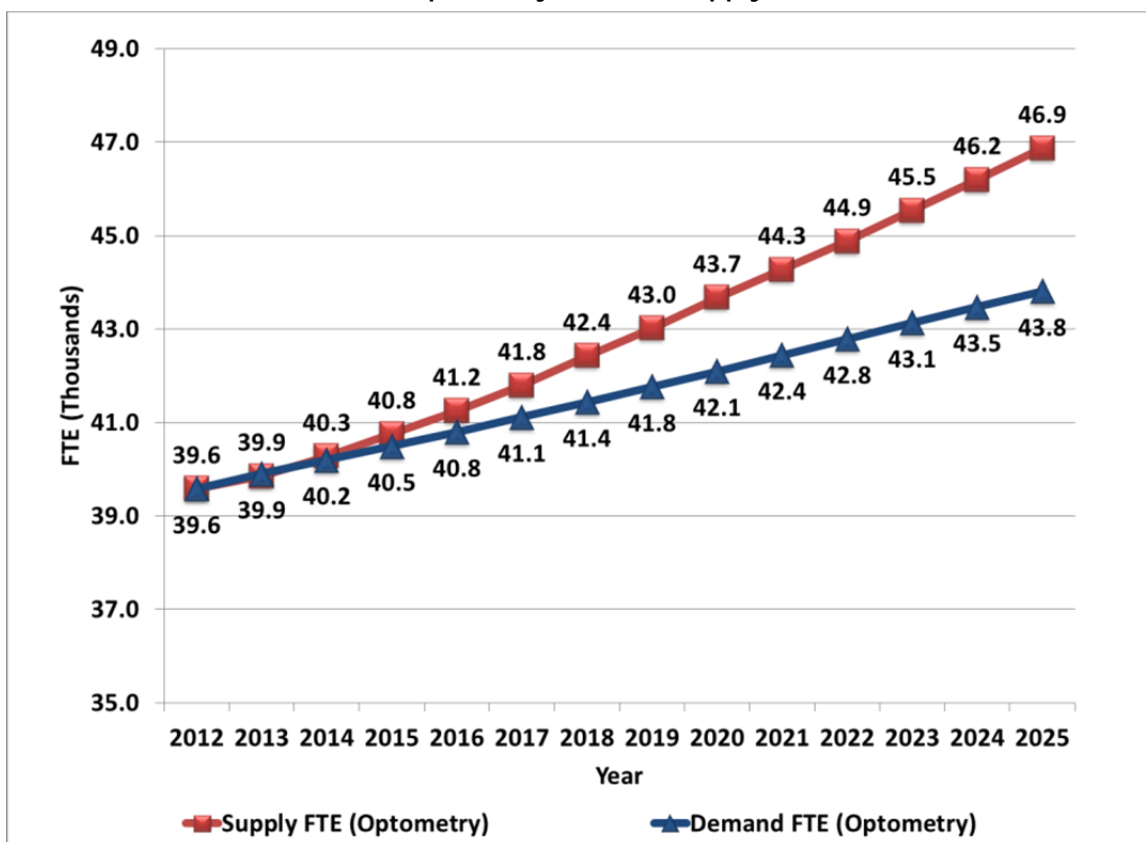
2. *Ophthalmology Baseline Supply and Demand*

Exhibit VI-3 presents the baseline estimates of ophthalmology supply. As described in Section IV: Methods and Data, supply estimates are based on: (1) an estimate of the number of board certified or board eligible ophthalmologists who are engaged in clinical practice (i.e., who are not inactive, or primarily engaged in administration or research) at the beginning of the baseline period as inferred from the AMA Masterfile; (2) estimated mortality and retirement rates by age and gender; and (3) current and projected future ophthalmology residency positions.

Both the numbers of ophthalmologists and the number of FTE ophthalmologists are projected to decline from 2012 through 2025, by about 7 percent and 8 percent, respectively. See Section IV: Methodology and Data, for a discussion of how ophthalmology FTEs are calculated. This is the result of two factors: (1) a high proportion of the workforce is in the age range of retirement, which means that there will be significant losses over the next ten years and (2) the number of new entrants, as determined by the number of residency positions, is projected to be constant at 458 per year, which will not replace all of the retirees.

Exhibit VI-3. Ophthalmology Baseline Supply: FTE and Number of Practitioners
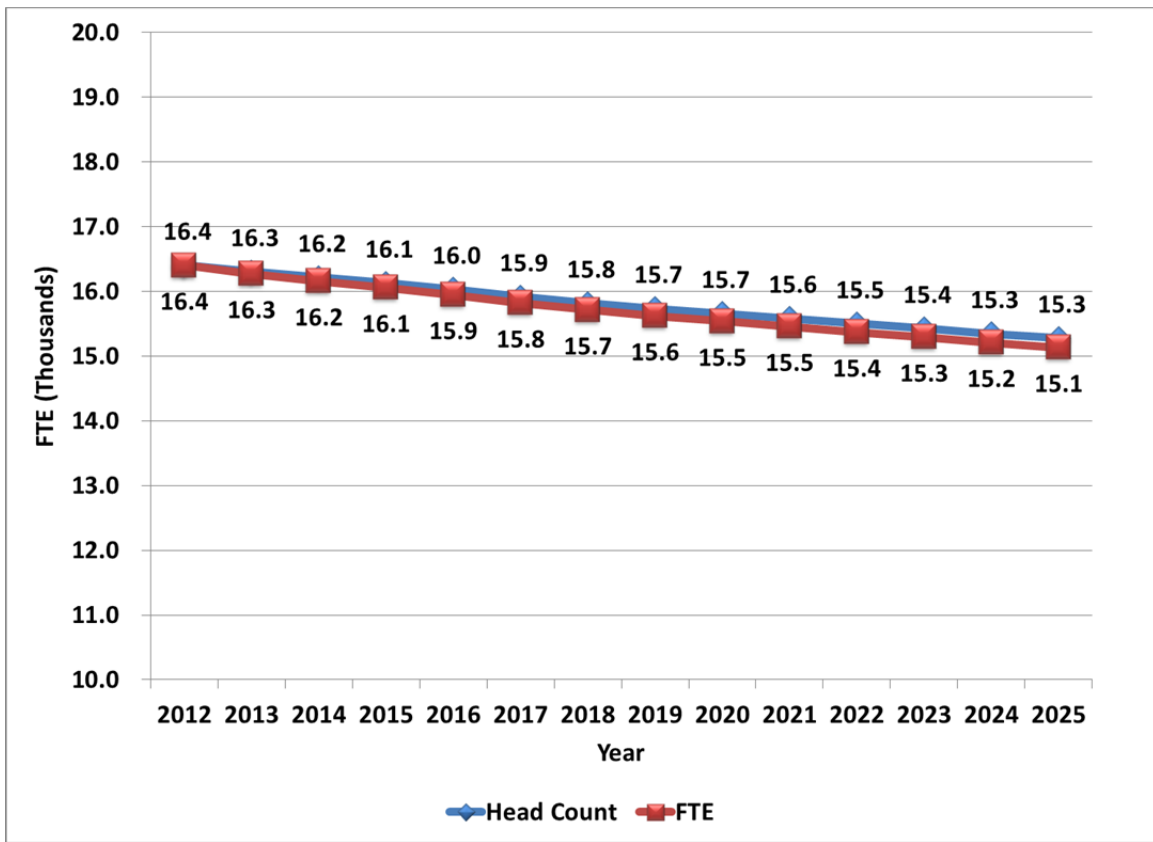
On the demand side, the baseline projections are based on a utilization matrix for the base year, shown in Section IV: Methods and Data, indicating the per capita number of ophthalmology visits by age and gender group. Projections for each year are based on applying the year's population levels, by age and gender group, to the utilization matrix.

Exhibit VI-4 illustrates that demand for ophthalmology exceeds the supply of ophthalmologists, when considering the market narrowly defined to that served by ophthalmologists in the base period.

**Exhibit VI-4. Ophthalmology Baseline Supply and Demand**
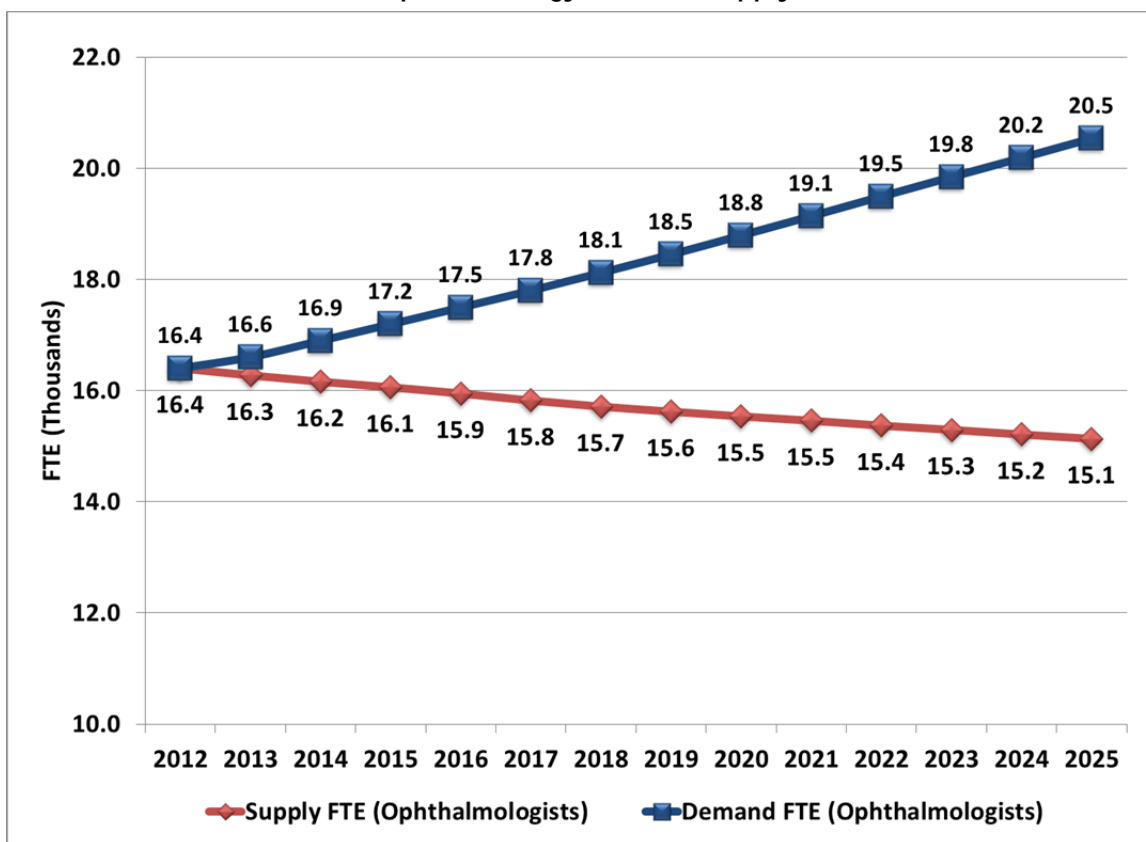
3. Eye Care Market Baseline Supply and Demand

The previous sections focused separately on the supply of and demand for optometrists and on the supply of and demand for ophthalmologists. This narrow analysis is misleading and arguably artificial. A better perspective is to consider a single, total market for eye care services, with optometrists and ophthalmologists as the primary providers in that market. In Section II, we presented evidence indicating that it is a single market for eye care services. However, in some areas, barriers exist for reimbursement to optometrists for services that both ophthalmologists and optometrists can provide, and for which ophthalmologists receive reimbursement. These reimbursement issues will need to be resolved to fully realize a single market for eye care. In *Exhibit VI-5*, we combine the baseline supply and demand for optometry and ophthalmology, respectively, into one total baseline for the eye care market as a whole. As discussed earlier, while there are some services that only one type of provider offers, most eye care services can be provided by either an optometrist or ophthalmologist. Hence, there is, in that sense, one total market for eye care services. The market is described in terms of FTE optometrists. Using this measure, ophthalmologist supply and demand are transformed into optometrist equivalent FTE where one ophthalmologist FTE equals the productivity of 1.36 optometrist FTEs, as described in Section IV: Methodology and Data.

Exhibit VI-5 suggests that there will be excess demand for eye care providers throughout the projection period. In fact, the excess demand grows continually over the period until, by 2025, a gap of approximately 4,300 FTE optometrist providers will emerge in the baseline case. Hence,

under the baseline case, without considering additional factors, there is projected to be a shortage of eye care providers.

Exhibit VI-5. Total Eye Care Market Baseline Supply and Demand
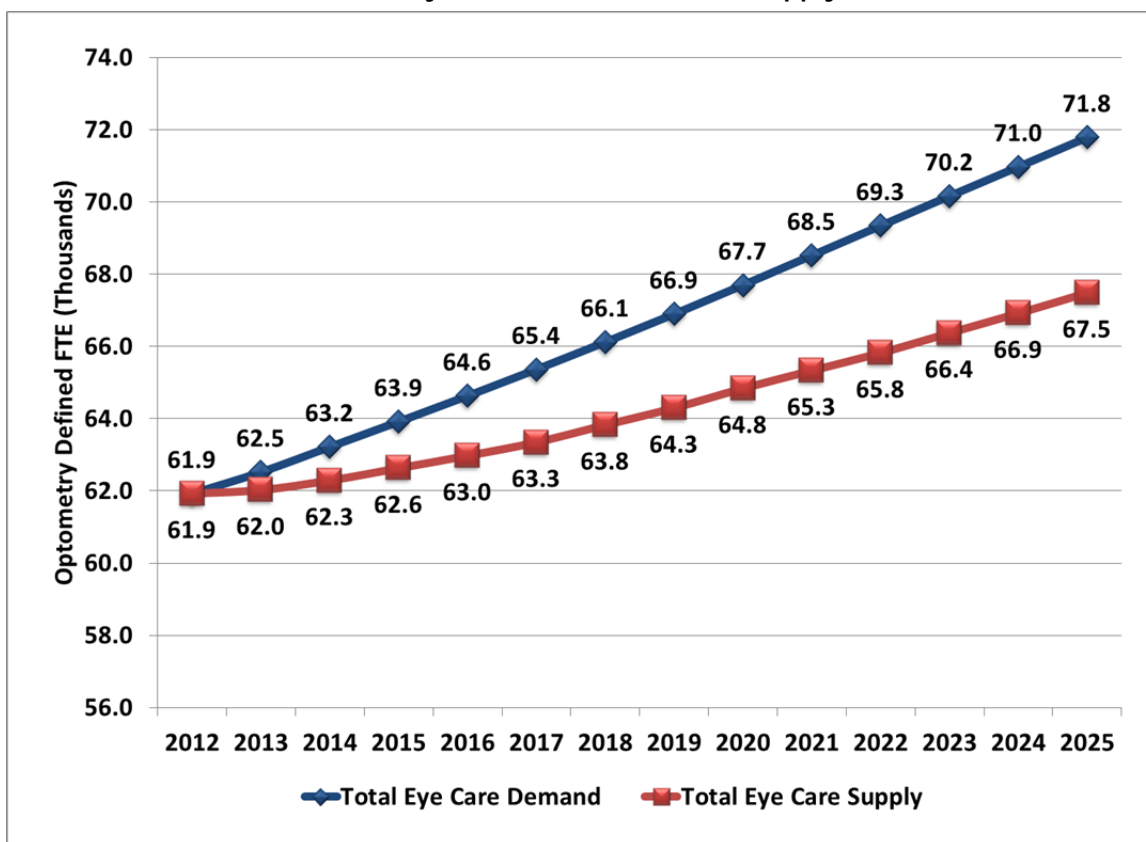
B. Estimated Impact of Additional Factors Affecting Supply and Demand

In this section, we expand the analysis to include several factors that may affect the demand for eye care services in the near future and persist throughout the forecast period through 2025. The first factor we consider is the effect on demand of greater insurance coverage, and minimum essential benefits, under the Affordable Care Act (ACA). Next, we consider the possible implications of an increase in the prevalence of type 2 diabetes mellitus on the demand for eye care services. The workforce model can be used to consider other factors that may affect demand. The effect of the ACA on insurance coverage, and the potential impact on demand, is a particularly important one to examine, as is the effect that an increase in the prevalence of diabetes may have on demand.

The methods, data and assumptions underlying the estimates of the effect of ACA on demand, and the potential effect that increased prevalence of diabetes may have on demand, are presented in Section IV: Methods and Data. The effects of these factors are uncertain. We are making initial estimates based on the information available, which is itself limited. One value of a workforce model is that the sensitivity of general conclusions to alternative assumptions regarding the impact of these factors can be readily tested.

1.   *Increased Demand for Eye Care Services under the Affordable Care Act*

We consider an estimate of the effect of eye care coverage under the ACA that includes the effect of ACA added coverage on demand for both children and adults. The estimate is based on the total eye care market, for which both optometrists and ophthalmologists are providers. First, consider the effect that ACA may have on demand through the increased health insurance coverage of children. Since eye care coverage for children is a minimum essential benefit required by the ACA, including an annual eye examination for children, we consider two dimensions of the impact: (1) the number of children who will become newly covered for eye care and (2) the number of additional visits per newly covered child.

In *Exhibit VI-6*, we present an estimate of the potential effect of ACA on the eye care market through its coverage of previously uninsured children. We estimate that 8.4 million children will be newly covered under ACA, and that this results in 0.25 additional visits per year from each individual in this group. The estimate of 8.4 million was based on an analysis of data from the American Community Survey. Children were included if (a) they were not eligible for Medicaid or the Children's Health Insurance Program (CHIP) based on family income; and (b) they were not covered by insurance. The increase of 0.25 visits as a result of eye care coverage was estimated based on Medical Expenditure Panel Survey data, comparing eye care visits for those with and without medical insurance. It is an imperfect measure, because medical insurance may not cover an annual routine eye examination, but the insurance provided under ACA will include such coverage for children. See Section IV: Methods and Data, for additional discussion. This estimate, labeled *Total Demand w/Child Ins* results in a modest increase in demand. This aspect of ACA utilization is projected to increase demand for eye care providers by approximately 700 FTEs per year, compared to the baseline demand. However, because many children who are currently covered by medical insurance did not, prior to ACA implementation, have coverage that included an annual comprehensive vision exam, limiting the effect of ACA on those children who are uninsured, as this estimate does, may understate the demand effect.

The ACA is widely understood as an effort to reduce the uninsured population in the United States. To the extent that the ACA is successful at expanding the insured population, this estimate expects demand for eye care services to increase. The ACA is less widely known for its provision to raise the adequacy of existing insurance, primarily by requiring coverage of the essential health benefits, including pediatric vision care. This estimate does not consider the potential increase in demand due to more adequate insurance coverage that now includes pediatric vision coverage in addition to medical eye care. Many small group and individual health plans did not cover pediatric vision benefits previously and the number of children who had separate vision plan coverage is unknown. All of these health plans will have pediatric eye health and vision care coverage under the ACA rules, but this estimate does not factor that growth and, thus, might understate future demand.

Exhibit VI-6. Effect of ACA's Coverage for Children on Total Eye Care Market
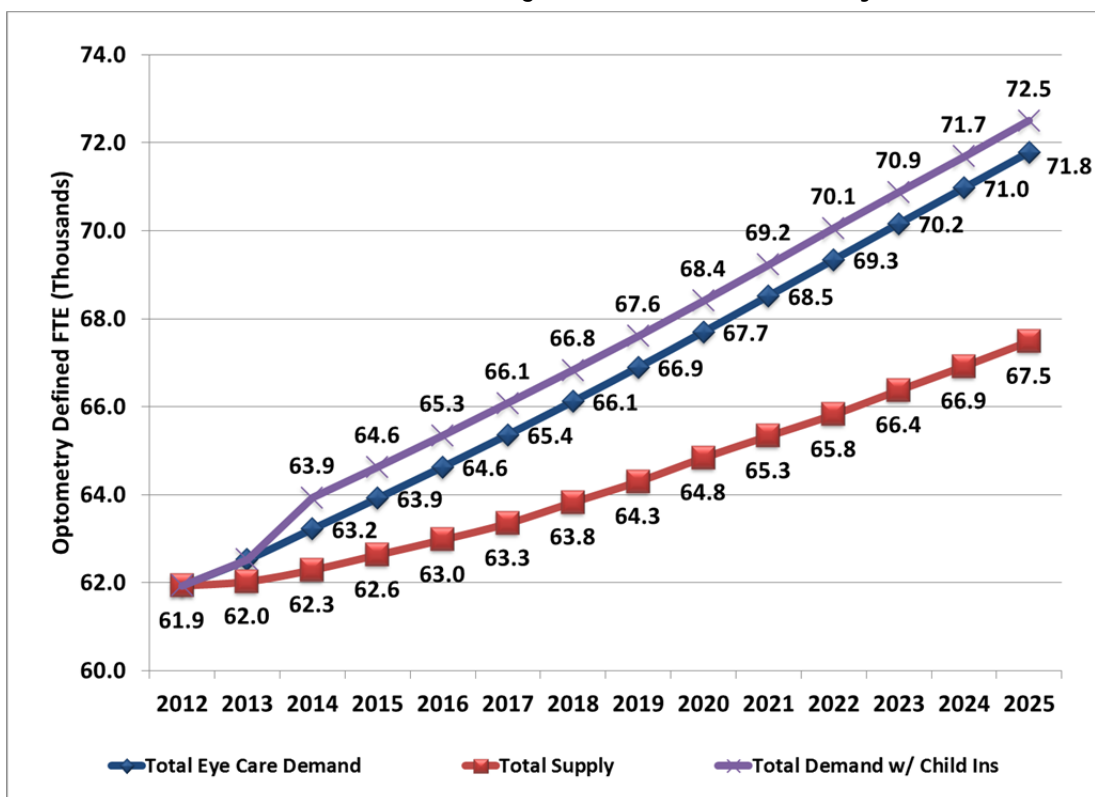

Next, we consider the effect of ACA's health insurance expansion to non-Medicare eligible adults on eye care demand. The coverage for adults does not include an annual comprehensive eye examination in the minimum essential benefit package. The ACA is estimated to insure 25 million Americans by full implementation in 2017-2018.[29] Bringing newly insured adults to patterns of use equal to the currently insured adults generates an additional 0.19 visits per newly insured person.[30] See Section IV: Method and Data, for additional discussion of the estimate.

ExhibitV I-7 presents (1) the baseline supply and demand, (2) baseline demand adjusted for the estimated effect of childrens' insurance under ACA, labeled *Total Demand w/Child Ins* and (3) baseline demand adjusted for both the effect of health insurance expansion to children and adults, labeled *Total Demand w/ ACA Adult Ins & Child Ins*. Note that the ACA extends health insurance coverage to more adults than children. This is the primary reason why the increase in demand from adults is greater than the estimate of childrens' demand increase. By 2025, newly insured adults are projected to demand an estimated 1,400 additional FTEs, compared to 700 additional FTEs from childrens' demand.

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[29] Congressional Budget Office, "Updated Budget Projections: FY 2013-2023," and in particular, "Baseline Projections for Health: Effect of the Affordable Care Act on Health Insurance Coverage," May 14, 2013. http://www.cbo.gov/publication/44176.

[30] This is in the range of the increase in demand we have found for other health professionals.

Exhibit VI-7. The Effect of ACA on Eye Care Demand: Children and Adults
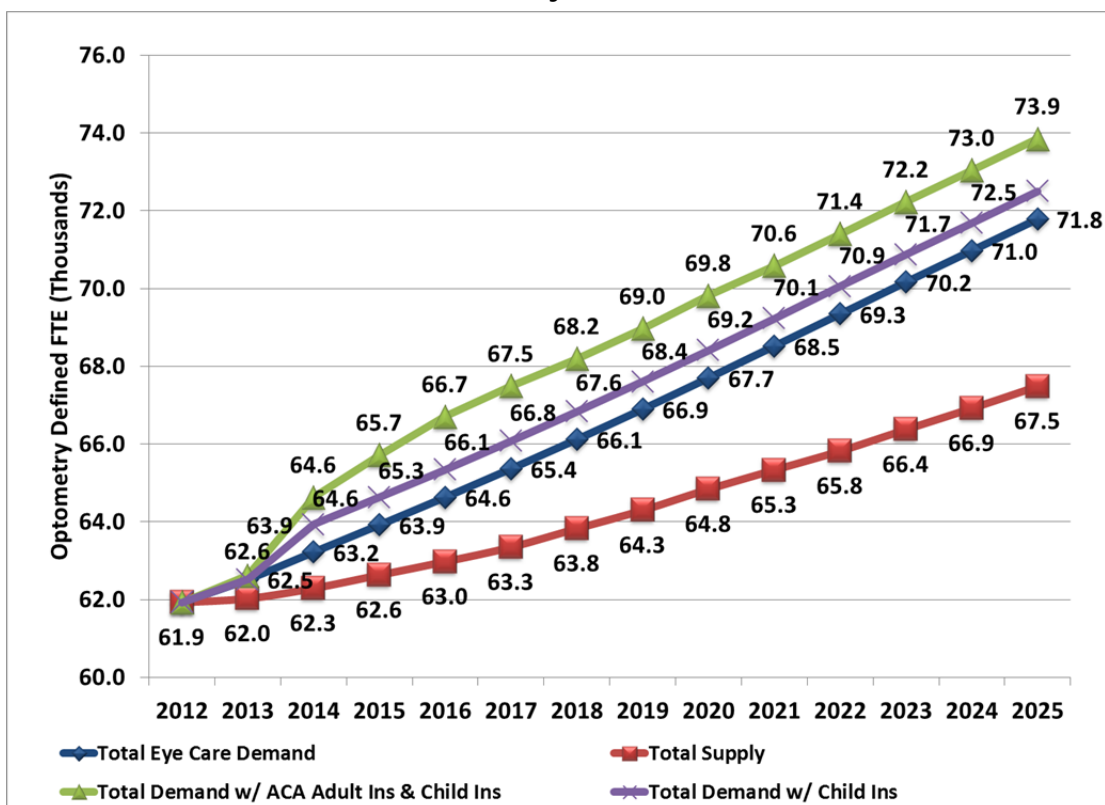

2. *Eye Care Demand under ACA Coverage Expansion and Increased Diabetes Prevalence*

In *Exhibit VI-8*, we contrast the baseline supply estimate to (1) the baseline demand estimate; (2) the baseline demand plus the effect of ACA (*Total Demand w/ACA Adult Ins & Child Ins)* and (3) an estimate that adds the potential impact of increased diabetes prevalence. This demand estimate, labeled *Demand with Adult Ins, Child Ins & Diabetes* adds to the ACA impact the potential impact associated with diabetes prevalence that increases from 7.4 percent in 2012 to 12 percent by 2025. This *potential* increase in prevalence, though speculative, provides a future scenario that is consistent with recent trends.[31] For those additional individual cases of diabetes resulting from the higher prevalence rates, we estimate that those newly diagnosed will have 0.43 additional eye care visits per year. This is based on the difference in utilization between those with diabetes and those without. The estimate is discussed in greater detail in Section IV: Methods and Data.

The additional effect of increased prevalence of diabetes on demand is substantial in this scenario. In the case that includes an estimate of the effect of ACA on demand, an excess demand of about 6,400 FTE emerges by 2025. When the scenario of increased prevalence of diabetes is included, this gap grows to 9,000 FTE, or almost a 40 percent increase in the estimated gap from the effect of ACA and baseline demand alone. Note, however, that the increase in diabetes prevalence, though based on extrapolation of trends, is speculative.

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[31] This prevalence increase in diabetes is based on Boyle, James P., Theodore J. Thompson, Edward W. Gregg, Lawrence E. Barker, and David F. Williamson, "Projection of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality, and pre-diabetes prevalence." *Popul Health Metr* 8, no. 1 (2010): 29.

Exhibit VI-8. Eye Care Market Impact of ACA and Increased Diabetes Prevalence
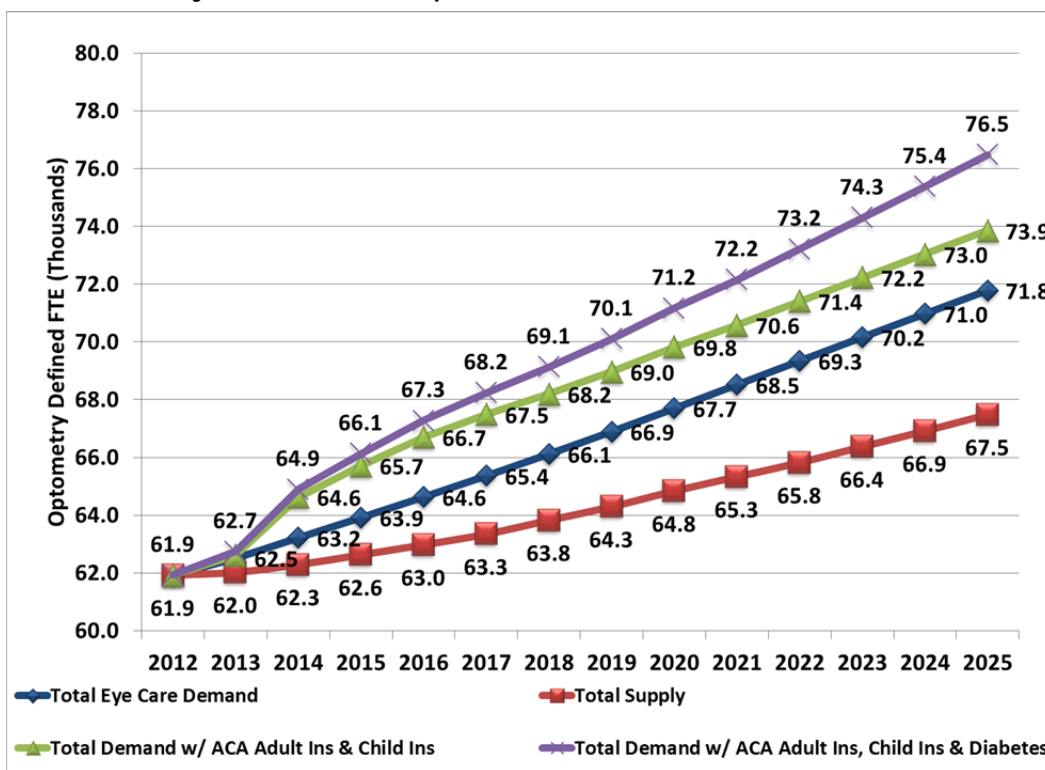

3. *Eye Care Supply Recognizing Potential Excess Capacity among Optometrists*

We now consider an alternative baseline supply for eye care services where optometrists' self-reported "excess capacity" is included in the potential supply of services by optometrists. In the 2012 National Eye Care Survey of Optometrists, a summary of the relevant portions of which is presented in Section V, responding optometrists indicated that, if they were able to operate at their full capacity without adding additional patient care hours, they could provide about 32 percent more patient visits per year than they were actually providing. This recognizes, among other factors, that the self-reported excess capacity reflected ideal scheduling of patients, which may be difficult to achieve or sustain.

Exhibit V I-9 shows a substantial shift in the baseline supply of eye care services, to include the services of both optometrists and ophthalmologists, if optometrists were able to provide an additional 32 percent of services per year due to excess capacity. While it is not precisely clear how to interpret the self-reported "excess capacity," if it means that the typical optometrist can, and desires to, increase patient visits, effective supply could increase significantly.

Exhibit VI-9. Alternative Supply Adjusted for Potential Excess Capacity among Optometrists
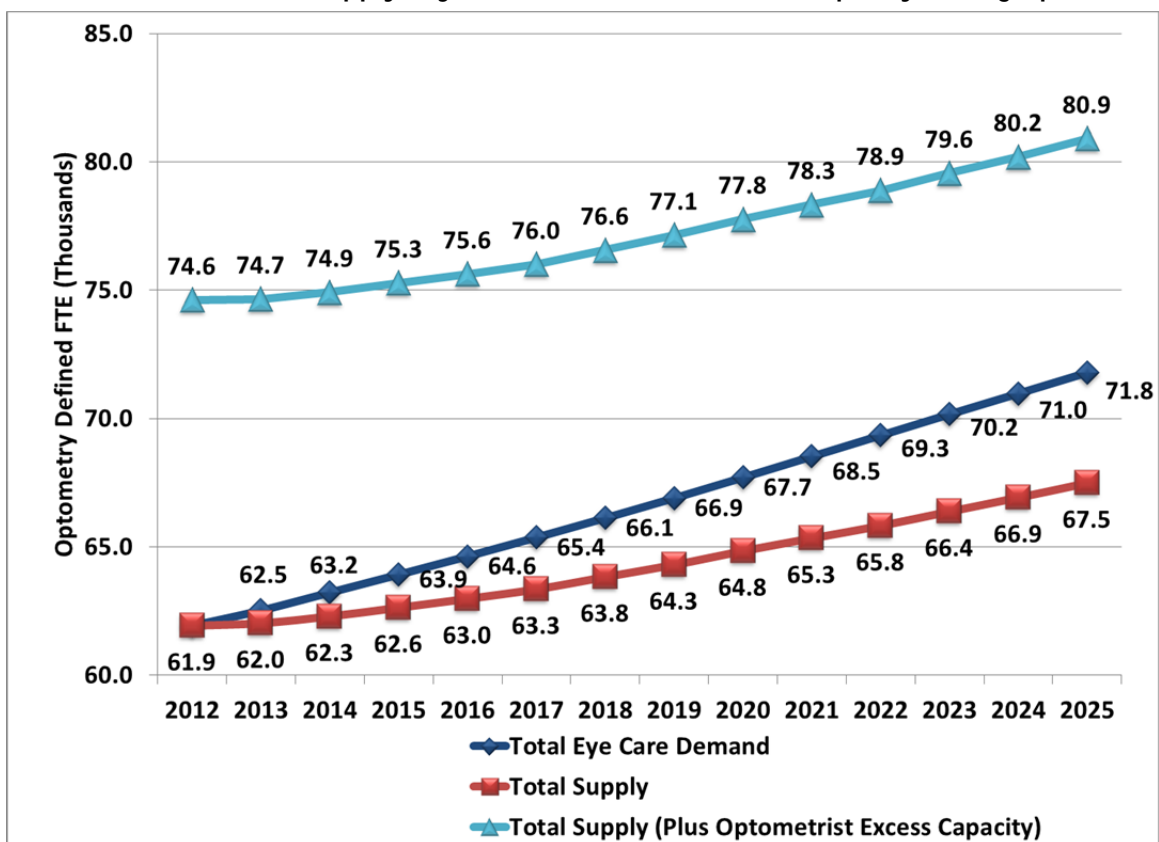
Accounting for this potential excess capacity on the supply side, excess demand in the eye care market is eliminated and replaced by excess supply, in the baseline case. However, excess supply continuously declines over the forecast period, from 12,700 FTE in 2012 to 9,100 FTE by 2025. Note that this excess supply gap exists because we have taken the existing optometry workforce and increased its capacity by 32 percent, or approximately 933 visits per year by each practicing optometrist, based on the survey respondents' self-assessment of excess capacity.

Next, in *Exhibit VI-10*, we consider the same case on the supply side that includes excess capacity but, in addition to the baseline demand; we include the full effects of the ACA on demand and the effect of increased diabetes prevalence, initially presented in *Exhibit VI-8*. When these effects on demand are included, the excess supply gap that results in the eye care market is reduced to 4,400 FTE by 2025.

Exhibit VI-10. Supply with Excess Capacity Compared to Baseline Demand and Demand w/ ACA and Diabetes Impact
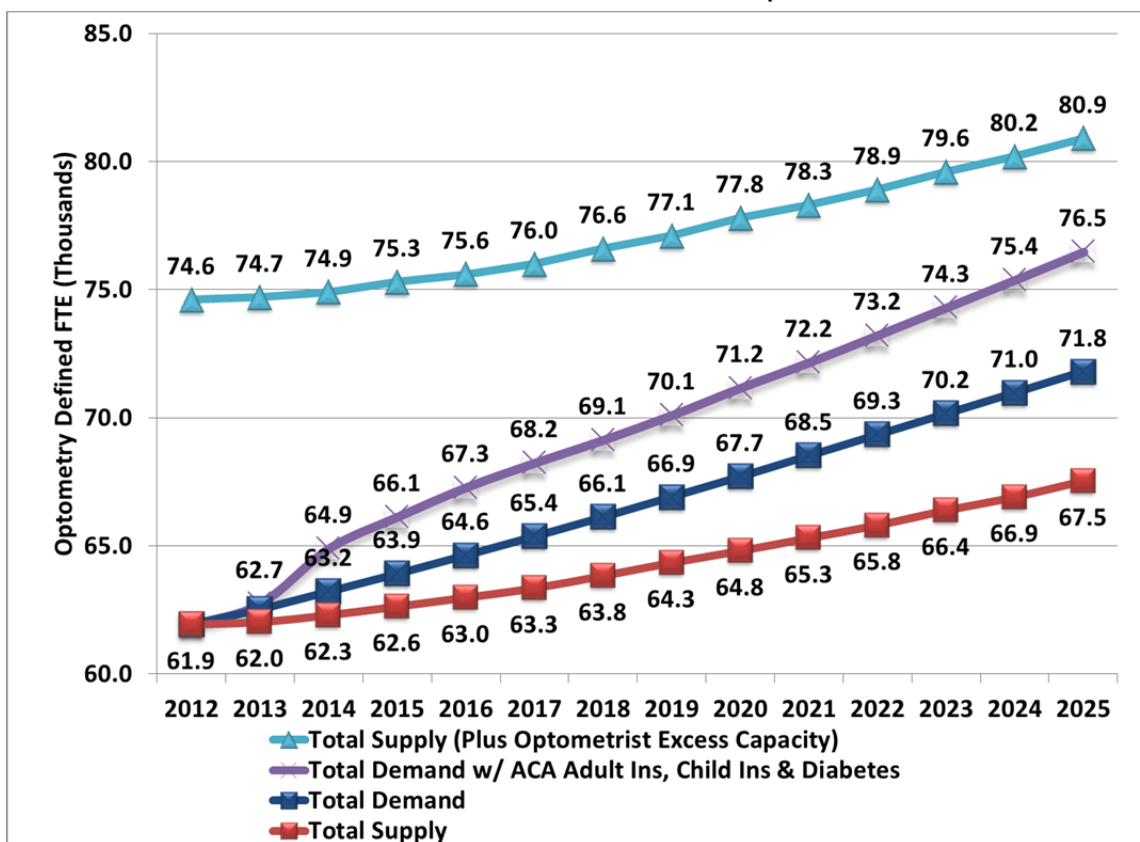
C. Summary and Discussion

We began this section with the presentation of baseline supply of and demand for both optometrists and ophthalmologists. We then combined those cases into one baseline supply and demand in the market for eye care services as a whole. Optometrists and ophthalmologists are, together, the primary providers of services in this market. In the baseline analysis, excess demand for eye care services emerges and persists throughout the forecast period. The excess demand gap grows to 4,300 FTE (optometrist equivalent) providers by 2025.

The baseline demand accounts for the changes in demand over time due to an increasing population. It also accounts for an aging population. This is important because the demand for eye care services in older age groups is greater than the demand in younger age groups. However, the baseline holds underlying utilization of eye care services per person, by age and gender, constant.

We relaxed this assumption and estimated the effect on demand for eye care services from the full implementation of the ACA and from a scenario in which the prevalence of diabetes increases over the forecast period. Compared to baseline supply, an excess demand gap grows from 4,300 FTE in 2025 under the baseline case to 6,400 FTE when the potential effects of greater insurance coverage under the ACA are considered. When the potential effect of increased prevalence of diabetes is added to the ACA effect, excess demand increases to 9,000 FTE by 2025. The increased

prevalence of diabetes and its effect on demand is probably an upper-bound estimate of the effect on demand. Nevertheless, the analysis suggests the robust qualitative conclusion that there is likely excess demand for eye care services through 2025.

Next, we examined the possibility that there may be significant excess capacity in the optometry workforce. That is, the visits per year that we observe in the workforce may significantly understate workforce capacity to provide care. This was suggested in the 2012 National Eye Care Survey of Optometrists and presented in Section V of this report. Respondents to the survey indicated that, under conditions of ideal scheduling, they could provide about 32 percent more visits than they were currently providing without adding additional patient care hours. This suggests that the baseline supply may be understated. When this increased supply projection is compared with the baseline demand case, excess supply emerges. The effect of this potential excess capacity is that, compared to baseline demand, there is excess supply of 11,000 FTE in 2016. By the end of the forecast period in 2025, this excess supply is reduced slightly to 9,000 FTE. When the effects of the ACA and the potential increase in diabetes prevalence are considered, the excess supply is reduced to 4,400 FTE by 2025.

The implication of this analysis is that, without considering excess capacity on the supply side, an excess demand for eye care services is very likely to emerge over the next 10 to 13 years. The baseline case, which involves the least amount of speculation regarding future changes in demand or supply, is consistent with this conclusion. Further, after accounting for the possible but uncertain effect of the ACA and rising prevalence of diabetes on demand, the excess demand could be substantial.

However, the 2012 National Eye Care Survey of Optometrists indicated that there may be as much as 32 percent excess capacity in the optometry workforce. If we take this into account in the projections, excess demand does not emerge in the baseline demand case. In fact, excess supply will persist throughout the period of 2012-2025, though it declines toward the end of the period. However, if we consider that there may be significant excess capacity in the current optometry workforce, growth in demand due to the ACA and other factors is unlikely to be sufficient to eliminate excess supply in the eye care market prior to the end of the forecast period. If the projected effects of ACA and diabetes prevalence on demand are realized, excess capacity will not be eliminated, but optometrists will have significantly less excess capacity in 2025 than they do currently.

VII. Summary, Conclusion and Limitations

A. Summary and Conclusion

In this report, we have described the construction of the Eye Care Workforce Model, a supply and demand model for the eye care market. In this market, the demand for eye care services by patients is met by optometrists and by ophthalmologists. We have described the methods, data and assumptions underlying the model. A major source of the optometrist data was the 2012 National Eye Care Survey of Optometrists, key results of which are included in this report. In addition, a complete report on the survey is available.

Projections of future supply and demand are always uncertain. The advantage of the Eye Care Workforce Model is that it offers a tool to test the sensitivity of general conclusions to changes in key parameters or to alternative scenarios regarding insurance coverage of the population, epidemiology, and other factors. This allows for testing alternative factors that may affect the workforce, either on the supply or demand side. The precise effect of such factors on the workforce is, of course, uncertain but the model provides a tool to assess this uncertainty and to come to some general conclusions about the future workforce.

We apply the Eye Care Workforce Model to provide an assessment of the eye care workforce over the period 2012-2025. In the baseline case, where demand for eye care grows due to the growth and aging of the population, our results indicate that excess demand emerges and grows over the period. By 2025, we project excess demand equivalent to 4,300 FTE optometrists.

There is potential for greater growth in demand, from at least two sources. First, there is likely to be increased demand from expanded eye care insurance coverage for children and adults under ACA. Second, demand is likely to increase as the prevalence of diabetes increases, as some have predicted. Should the prevalence of diabetes increase as predicted, the increase in demand could be substantial. We estimate that the combined effect of these two factors will increase excess demand to the equivalent of 9,000 FTE by 2025, or twice the excess demand of the baseline demand case.

However, baseline supply may be understated. In the 2012 National Eye Care Survey of Optometrists, responding optometrists indicated that they could provide, on average, 32 percent more visits per year than they were currently providing. If we take this excess capacity into account and compare supply, including excess capacity to the baseline demand, there is no longer excess demand. In fact, our estimates indicate that there is significant excess supply and, though it declines modestly over the forecast period, it remains substantial at about 9,100 FTE by 2025. Accounting for two of the factors that could increase demand, increased insurance coverage under ACA and increased prevalence of diabetes, excess supply is reduced substantially to 4,400 FTE by 2025. Hence, if these sources of demand are realized, excess capacity in the workforce will be substantially reduced but not eliminated.

B. Limitations

The projections of future supply and demand for eye care are subject to uncertainty. This uncertainty has multiple roots, and affects both the supply and the demand side of the estimates. On the supply side, key parameters of the supply projections, specifically retirement rates, are from surveys. They are subject to sampling variance and, perhaps more importantly, result from

respondents' own uncertain projections of when they will leave the workforce for retirement. Actual retirement decisions may, in practice, be affected by a variety of factors that vary over time such as the state of the economy and the stock market, which are difficult to predict. The estimates of excess capacity are subject to both sampling variance and to the subjective nature of the question itself. Moreover, at the most fundamental level, there is no single, definitive list of practicing optometrists. The base year workforce must be estimated by combining multiple data sources. While we believe we have a very good estimate, there remains some uncertainty.

On the demand side, underlying parameters of the model itself are estimated from historical data that are necessarily uncertain and less than perfect. Because there is no single data source that includes all of the visits that optometrists provide, we have used a combination of data from the MEPS and the 2012 National Eye Care Survey of Optometrists to obtain estimates of total demand. The claims data that we consider provides valuable insights regarding what medical services optometrists and ophthalmologists bill to insurance providers. However, the medical claims data do not capture self-pay, or services provided through vision plans which are primary sources of reimbursement among optometrists. Hence, we must do the best we can with extant data.

In addition, the data and information necessary to estimate the impact of anticipated changes on demand is imperfect. Consider the impact of greater insurance coverage due to ACA. No prior experiment resembles the magnitude and type of change that will be brought about by the ACA. Nevertheless, we use MEPS data comparing eye care utilization of those with and without insurance to provide an estimate of the effect that increased insurance coverage may have on demand.

In the case of children's insurance under ACA, there are potentially two effects: (1) the effect on demand of having no medical insurance to one of having medical insurance coverage; and (2) the effect of the minimum essential benefit for children of an annual eye examination. The latter benefit is not often included in medical insurance. Medicaid generally includes a similar benefit, which we explored to obtain an estimate of the effect. In our regression analysis using MEPS data (see Exhibit IV-17), we separately included those children who are covered by Medicaid in an attempt to estimate the impact of the annual comprehensive vision benefit on utilization demand. The effect on annual visits for those covered under Medicaid, compared to those with no insurance, was *less* than the effect of coverage under other medical insurance types (e.g., private, Tricare) , compared to those with no insurance. Hence, to the extent that there may be an additional impact of the minimum essential benefit that is not captured by the comparison of children with and without medical insurance, the effect on demand may be understated.

Many small group and individual health plans did not cover pediatric vision benefits previously and the number of children who had separate vision plan coverage is unknown. All of these health plans will have pediatric eye health and vision care coverage under the ACA rules, but this estimate does not factor that corresponding growth and, thus, might understate future demand.

Also, in the case of both children's and adults' insurance coverage, the comparison of utilization of those with and those without medical insurance may overstate the effect on demand. The reason for this is that, in the existing data, the decision to purchase medical insurance is a choice that individuals and families make. It is not "randomly assigned." Those that anticipate greater health care utilization due to personal circumstances may, other things being equal, be more likely to have coverage. Hence, those newly obtaining coverage under ACA may not increase

utilization by as much as the historical comparison would indicate, due to factors that we cannot observe and capture in the data. This is a form a "selection bias" that is discussed in the literature. The differences in the utilization of eye care services of those with diabetes, compared to otherwise similar individuals who have not been diagnosed with diabetes, is less likely to suffer from potential "selection bias" in that the incidence of diabetes is not likely to be a matter of individual choice. Finally, the ACA itself appears to be evolving. While the long run implications of reform are likely to be unchanged, the timing of increases in coverage is subject to uncertainty.

Other factors not anticipated in the model, such as future changes in technology, epidemiology of eye diseases, growth in supply through changes in class sizes or number of optometry schools, or other factors that cannot reasonably be anticipated based on current information, can significantly affect future supply and demand, especially when projecting over a period of ten years or more.

These limitations are inevitably present in studies that project future supply and demand. The advantage of the Eye Care Workforce Model, itself, is that one can quickly ascertain the implications for future supply and demand of different values of the key parameters of the model, and can test the validity of qualitative conclusions under alternative assumptions regarding future factors affecting supply and demand. There is no way to eliminate this uncertainty. Moreover, the precise quantitative estimates are subject to greater uncertainty. However, we believe that the overall qualitative implications of the analysis conducted using the workforce model developed as part of this project are robust with respect to reasonable variations in parameters or assumptions affecting future supply and demand.

COLORADO
Department of Higher Education

Cost and FTE

- The Department requests an increase of $4,000 reappropriated funds to pay for the annual dues increase for the Western Interstate Commission for Higher Education (WICHE) in FY 2017-18. This request annualizes to $8,000 reappropriated funds in FY 2018-19.

Current Program

- WICHE is a regional organization comprised of 15 western states which provides interstate student and research benefits.
- Membership allows Colorado higher education institutions to participate in the Western Undergraduate Exchange program whereby students can pay 150 percent of resident tuition to attend the out-of-state institutions.

Problem or Opportunity

- WICHE has increased its participation dues for FY 2017-18, from $145,000 to $149,000.

Consequences of Problem

- Payment for these dues is from the WICHE line item which has no other spending authority.

Proposed Solution

- An increase of $4,000 reappropriated funds for the WICHE line item will allow the Department to pay the increased fees and maintain its membership in FY 2017-18.

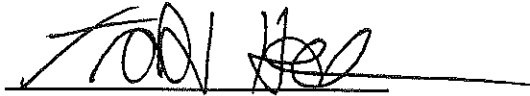This page is intentionally left blank.

Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

R-5 Western Interstate Commission on Higher Ed Dues Increase

Dept. Approval By: _____

OSPB Approval By: _____ 10/26/16

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information	Fund	FY 2016-17 Initial Appropriation	FY 2016-17 Supplemental Request	FY 2017-18 Base Request	FY 2017-18 Change Request	FY 2018-19 Continuation
Total of All Line Items Impacted by Change Request	Total	$145,000	$0	$145,000	$4,000	$8,000
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$0	$0	$0	$0	$0
	RF	$145,000	$0	$145,000	$4,000	$8,000
	FF	$0	$0	$0	$0	$0

Line Item Information	Fund	FY 2016-17 Initial Appropriation	FY 2016-17 Supplemental Request	FY 2017-18 Base Request	FY 2017-18 Change Request	FY 2018-19 Continuation
02. Colorado Commission on Higher Education, (C) Special Purpose - Western Interstate Commission For Higher Education (WICHE)	Total	$145,000	$0	$145,000	$4,000	$8,000
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$0	$0	$0	$0	$0
	RF	$145,000	$0	$145,000	$4,000	$8,000
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes ___	No ___	**If Yes, see attached fund source detail.**	
RF Letternote Text Revision Required	Yes ___	No ___		
FF Letternote Text Revision Required	Yes ___	No ___		

Requires Legislation? Yes ___ No **X**

Type of Request? Department of Higher Education Prioritized Request

Interagency Approval or Related Schedule None R-5

Page 1

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COLORADO
Department of Higher Education

John W. Hickenlooper
Governor

Diane Duffy
Acting Executive Director

FY 2017-18 Funding Request | November 1, 2016

Department Priority: R-5
Request Detail: WICHE Dues Increase

Summary of Incremental Funding Change for FY 2017-18	Total Funds	Reappropriated Funds
Western Interstate Commission on Higher Education (WICHE)	$4,000	$4,000

Problem or Opportunity:

The Department of Higher Education received notification from the Western Interstate Commission on Higher Education (WICHE) that it would increase participation dues from the current rate of $145,000 in FY 2016-17 to $149,000 in FY 2017-18, a $4,000 year-over-year increase. The Department does not have adequate spending authority within the WICHE line item to cover the new required dues. WICHE also indicated that dues would further increase in FY 2018-19 to $153,000, an additional $4,000 over the FY 2017-18 request.

The Western Interstate Commission for Higher Education is a regional organization created in 1953 and comprised of 15 member states and the Commonwealth of Northern Mariana Islands to facilitate resource sharing among the higher education systems of the west. WICHE was created to expand educational opportunities for the citizens of member states, and to provide educational programs, research and policy analysis to augment the capabilities of individual member states. WICHE also develops other interstate initiatives to improve higher education, and convenes policy-makers to address issues of concern to member states.

Membership in WICHE allows Colorado institutions of higher education to participate in the Western Undergraduate Exchange Program in which member states allow students to pay 150 percent of resident tuition to attend the out-of- state institution. The Western Undergraduate Exchange (WUE) program helps institutions build enrollment base, fill excess capacity, provide student diversity and (for border institutions) better serve communities in the local vicinity. According to WICHE, over the last five years, Colorado residents have saved over $86 million due to Colorado's participation in WUE, a 131-fold return on the state's investment.

Dues represent approximately one-third of WICHE's annual budget and are used to support core programs. The dues are equally apportioned among the fifteen (15) members. The state dues support the WICHE administrative structure to operate the student exchange programs. Grants from foundations and corporations, federal support and other fees leverage the state investments and represent the remainder of WICHE's annual budget.

Proposed Solution:

The Department requests $4,000 re-appropriated spending authority for the WICHE line item in FY 2018, and an additional $4,000 re-appropriated spending authority for the WICHE line item in FY 2019, so the Department can pay for the increase in dues.

Anticipated Outcomes:

Approval of this request will allow Colorado to continue its participation in WICHE, thereby maintaining the benefits afforded the state and the students in the Western Undergraduate Exchange Program.

Assumptions and Calculations:

FY 2016-17 Appropriation (HB16-1405)	$145,000
FY 2017-18 Total WICHE Dues (Request)	$149,000
FY 2017-18 Requested Increase	$4,000
FY 2017-18 Total WICHE Dues Annualized	$153,000
FY 2017-18 Annualized WICHE Dues	$8,000

Schedule 13

Funding Request for the FY 2017-18 Budget Cycle

Department of Higher Education

Request Title

NP-01 Resources for Administrative Courts

Dept. Approval By: _____

OSPB Approval By: _____ 10/26/16

	Supplemental FY 2016-17
X	Change Request FY 2017-18
	Budget Amendment FY 2017-18

Summary Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	Initial Appropriation	Supplementa l Request	Base Request	Change Request	Continuation
Total of All Line Items Impacted by Change Request	Total	$7,475	$0	$8,018	$76	$0
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$7,475	$0	$8,018	$76	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

Line Item Information		FY 2016-17		FY 2017-18		FY 2018-19
	Fund	Initial Appropriation	Supplementa l Request	Base Request	Change Request	Continuation
01. Department Administrative Office, (A) Administrative Office - Administrative Law Judge Services	Total	$7,475	$0	$8,018	$76	$0
	FTE	0.0	0.0	0.0	0.0	0.0
	GF	$0	$0	$0	$0	$0
	CF	$7,475	$0	$8,018	$76	$0
	RF	$0	$0	$0	$0	$0
	FF	$0	$0	$0	$0	$0

CF Letternote Text Revision Required	Yes ___	No ___	If Yes, see attached fund source detail.		
RF Letternote Text Revision Required	Yes ___	No ___			
FF Letternote Text Revision Required	Yes ___	No ___			

Requires Legislation? Yes ___ No X

Type of Request? Department of Higher Education Non-Prioritized Request

Interagency Approval or Related Schedule 13s: None