



2018 EYE BANKING STATISTICAL REPORT

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2018 Analysis of Surgical Use and Indications for Corneal Transplant

Introduction:

The 2018 Eye Banking Statistical Report from the Eye Bank Association of America (EBAA) includes information on all EBAA member eye banks reporting data for the 2018 calendar year and represents a complete picture of eye banking activity of these eye banks. Data on utilization of tissue are provided for all tissue recovered by EBAA eye banks, with detailed analysis of outcomes of tissue recovered with intent for transplant use.

Changes to This Year's Analysis:

Starting in 2017, the summarized data for Indications for Transplant are segregated by where the tissue was used - domestically or internationally. Previously, the analysis of indications for transplant had combined the data for both internationally and domestically used corneas supplied by U.S. eye banks. However, the large number of unknowns, mostly from internationally used corneas, diminished the validity of the overall conclusions. The large percentage of unknown indications for transplant in U.S. tissue shipped internationally for transplant limits the conclusions made about surgical indications from this pool. In light of this, the Indications for Transplant data is now segregated by location of tissue use.

Donations and Tissue Supply:

There were 57 U.S. eye banks reporting in 2018, the same number as in 2017. These banks reported 68,565 total donors (0.7% decrease from 2017) and 133,596 total eyes/corneas recovered (1.2% decrease from 2017). Please see **Table 1** below for details on donations and distribution. Intermediate-term preserved corneas, which included all refrigerated tissue stored in Optisol GS™, Life4°C™, or Cornea Cold™ used for full thickness and lamellar procedures, increased from 77,579 in 2017 to 79,207 in 2018 (+2.1%). Despite recovering less tissue from fewer donors, the transplant rate increased from 68.3% in 2017 to 69.4% in 2018 (+1.1%). Fewer corneas were preserved long-term this year (-6.8% in 2018 relative to 2017), however distribution of long-term preserved corneas increased 7.8% in 2018.

Table1: Total Donations and Distribution of Tissue in 2018

Donations	2017	2018	% Change
Eye Banks Reported	57	57	0.0%
Total Whole Globes and Corneas Donated	135,203	133,576	(-1.2%)
Total Number of Donors	68,565	68,102	(-0.7%)
Distribution	2017	2018	% Change
Intermediate-Term Preserved Corneas	77,579	79,207	2.1%
Sclera	3,253	2,959	(-9.0%)
Long-Term Preserved Corneas	12,543	13,521	7.8%
Research	13,859	12,495	(-9.8%)
Training	10,539	10,666	1.2%

Corneal Transplants Supplied by U.S. Banks in Intermediate-Term Storage

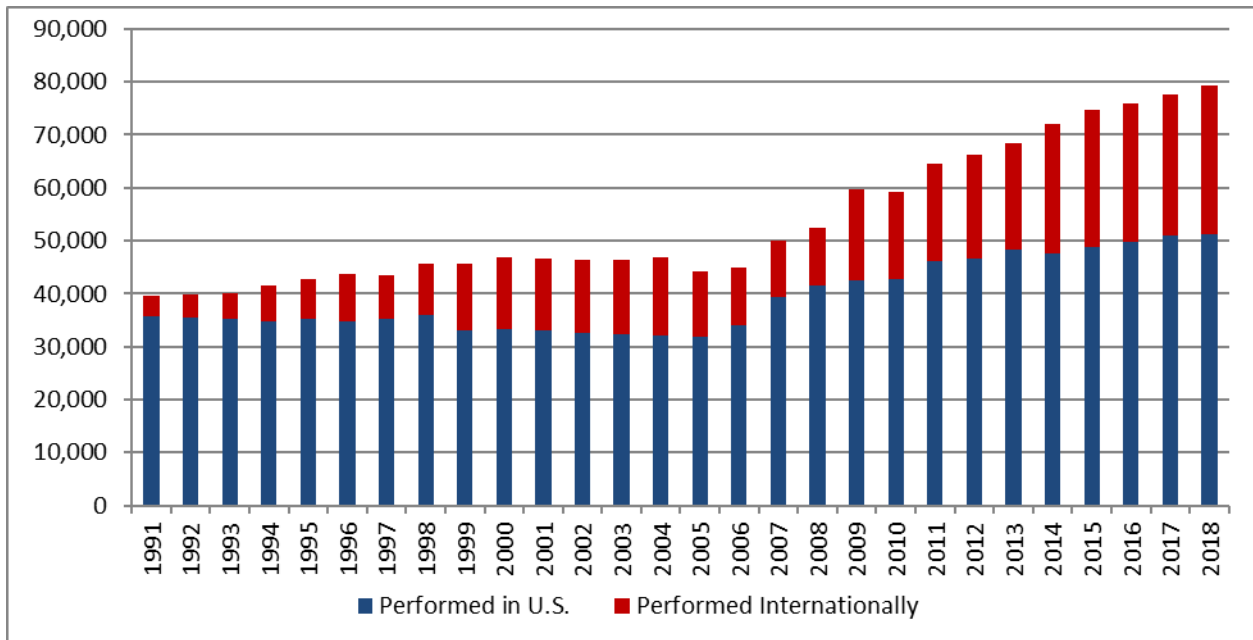


Figure 1. Usage of cornea tissue in the U.S. has grown only slightly over each of the last 8 years and excess tissue is exported abroad. Approximately one third of the cornea tissue recovered by US eye banks was exported abroad in 2018.

Table 2: Corneal Transplant Supplied by U.S. Eye Banks

Year	Total Provided by U.S.	Performed in U.S.	Performed Internationally
1991	39,515	35,831	3,684
1992	39,973	35,525	4,448
1993	40,215	35,173	5,042
1994	41,539	34,842	6,697
1995	42,740	35,300	7,440
1996	43,711	34,668	9,043
1997	43,492	35,209	8,283
1998	45,579	35,861	9,718
1999	45,765	33,020	12,745
2000	46,949	33,260	13,689
2001	46,532	33,035	13,497
2002	46,440	32,559	13,881
2003	46,436	32,240	14,196
2004	46,841	32,106	14,735
2005	44,329	31,952	12,377
2006	45,035	33,962	11,073
2007	50,122	39,391	10,731
2008	52,487	41,652	10,835
2009	59,784	42,606	17,178
2010	59,271	42,642	16,629
2011	67,590	46,196	18,307
2012	68,681	46,684	19,546
2013	72,736	48,229	20,213
2014	76,431	47,530	24,483
2015	79,304	48,792	25,832
2016	82,994	49,869	26,057
2017	84,297	50,934	26,645
2018	85,441	51,294	27,913

In 2018, U.S. eye banks continued to meet the growing needs of U.S. surgeons, but importantly, have also continued the growing trend of providing tissues for use internationally. This demonstrates continuing commitment on the part of the U.S. Eye Banks and our donors to assist with meeting international needs with the goal of reducing global blindness (**Figure 1** and **Table 2**).

Tissue Utilization:

Utilization of tissue supplied by U.S. eye banks is shown below and includes all tissue supplied by domestic eye banks that is used both domestically and internationally (**Table 3**). Total grafts in 2018 increased to 85,441, up 1.4% from 2017. Penetrating keratoplasty (PK) use decreased 5.3% in 2018 to 36,028. Tissue used for endothelial keratoplasty (EK) increased 5.0% to 35,071 in 2018 from 33,397 in 2017. There was an 7.3% decrease in tissue used for anterior lamellar keratoplasty (ALK) from 2,541 in 2017 to 2,355 in 2018. The number of corneas used for keratolimbal allograft (KLA) declined 16.3% from 104 in 2017 to 87 in 2018 and corneas used for keratoprosthesis (K-Pro) decreased 29.4% from 344 in 2017 to 243 in 2018. The number of corneas used for ALK, KLA and K-Pro procedures remain relatively small; these three procedures combined made up just 3.1% of total grafts from U.S. eye banks in 2018 (see below). The eye banks also provided 23,161 corneas for research and training continuing in their long-standing support education and advancement in corneal transplantation.

Table 3: Domestic and International Utilization of Tissue from U.S. Eye Banks in 2018

Use of Donated Tissue	2013	2014	2015	2016	2017	2018
Corneal Grafts Total	72,736	76,431	79,304	82,994	84,297	85,441
Penetrating Keratoplasty	36,998	38,919	39,554	38,413	38,025	36,028
Anterior Lamellar Keratoplasty	2,009	1,953	2,201	2,386	2,541	2,355
Endothelial Keratoplasty	27,298	28,961	30,710	32,221	33,397	35,071
Keratolimbal Allograft	110	88	107	97	104	87
Keratoprosthesis (K-Pro)	255	294	364	313	344	243
Glaucoma Shunt Patch or other non-keratoplasty use	687	755	527	917	1,368	1,058
Other keratoplasty (experimental surgery)	17	17	19	65	232	64
Unknown or Unspecified	1,068	1,026	1,142	1,514	1,568	4,301
Sclera	3,693	3,345	3,225	3,380	3,253	2,959
Long-Term Preserved Corneas	4,840	7,223	11,672	18,133	12,543	13,521
Keratoplasty	499	938	737	1,335	197	298
Glaucoma Shunt Patching	4,040	6,212	10,843	16,683	12,345	13,066
Other Surgical Uses	301	73	92	115	1	157
Research	17,384	17,670	16,924	17,023	13,859	12,495
Training	7,451	9,295	10,003	9,916	10,539	10,666

Domestic Use of Keratoplasty Tissue from U.S. Eye Banks:

Trends in the use of tissue within the U.S. since 2010 are provided below (**Table 4**). The number of penetrating grafts performed in the U.S. utilizing intermediate-term preserved tissue from U.S. eye banks decreased in each of the past 13 years, from a high of 42,063 in 2005 to 17,347 in 2018. Meanwhile, EK procedures increased from 1,308 in 2010 to 30,336 in 2018. The number of corneas used domestically for EK has increased every year since tracking started in 2005, and EK

surpassed PK in 2012, as seen in the graph (**Figure 2**). EK has been the most commonly performed keratoplasty procedure in the U.S. since 2012. The number of EK procedures (which includes both DSAEK and DMEK) continued to increase in 2018 to 30,336, up 4.6% from 28,993 in 2017 (**Figure 3**). Domestic endothelial keratoplasty numbers demonstrate that the increased use of DMEK tissue has accounted for the increase in endothelial keratoplasty numbers in each year since 2013 (**Table 5**). Starting in 2017, we also began collecting data for PDEK and other EK procedures; however, these numbers remain very small (37 in 2018). ALK procedures in the U.S. decreased 13.9% to 884 in 2018 after decreasing 16.6% from 2016 to 2017. ALK, KLA and K-Pro procedures have essentially been flat in the U.S. over the past 8 years and made up only 2.3% of domestic grafts performed in 2018.

Table 4: Domestic Use of Intermediate-Term Preserved Tissue from U.S. Eye Banks

Domestic Surgery Use	2010	2011	2012	2013	2014	2015	2016	2017	2018
Penetrating Keratoplasty	21,970	21,620	21,422	20,954	19,294	19,160	18,579	18,346	17,347
Endothelial Keratoplasty	19,159	21,555	23,049	24,987	25,965	27,208	28,327	28,993	30,336
Anterior Lamellar Keratoplasty	1,041	932	883	951	914	1,115	1,232	1,027	884
Keratolimbal Allograft	130	69	80	91	80	97	82	93	68
KPRO	342	332	236	223	260	323	279	304	225

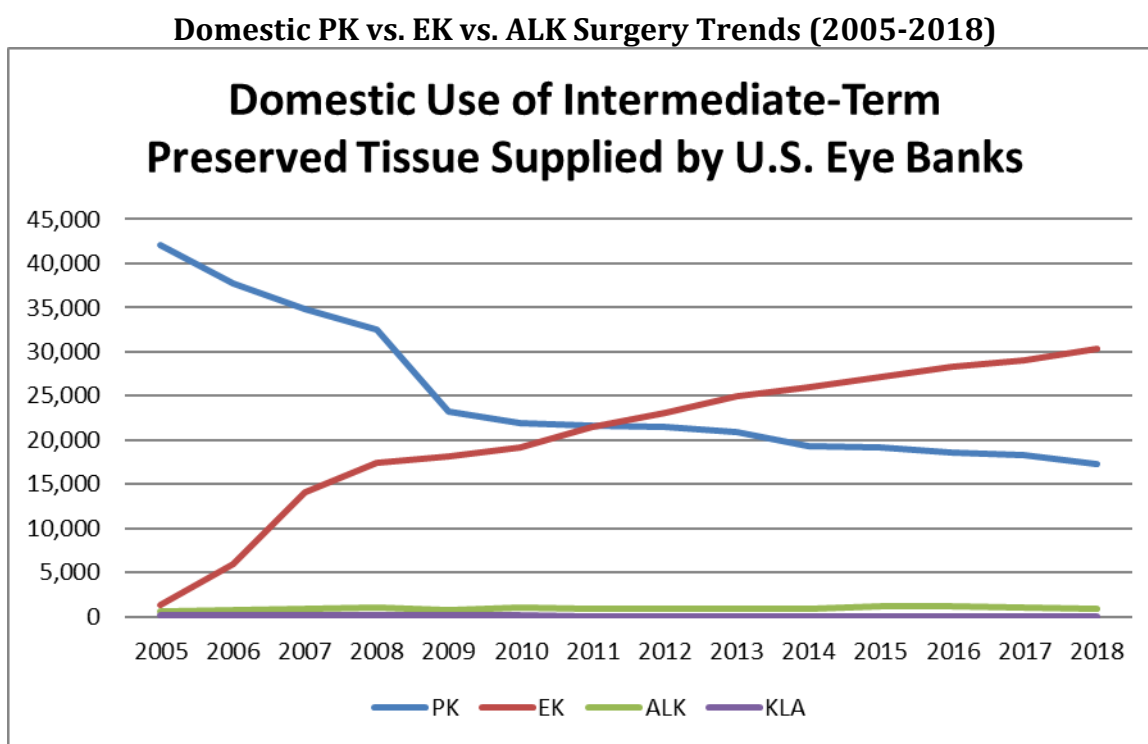


Figure 2. Domestic PK vs. EK vs. ALK Surgery Trends. The relative frequency of PK, EK, and ALK procedures performed in the U.S. over the last 14 years can be seen above.

Domestic PK, DSEK, and DMEK Trends (2014-2018)

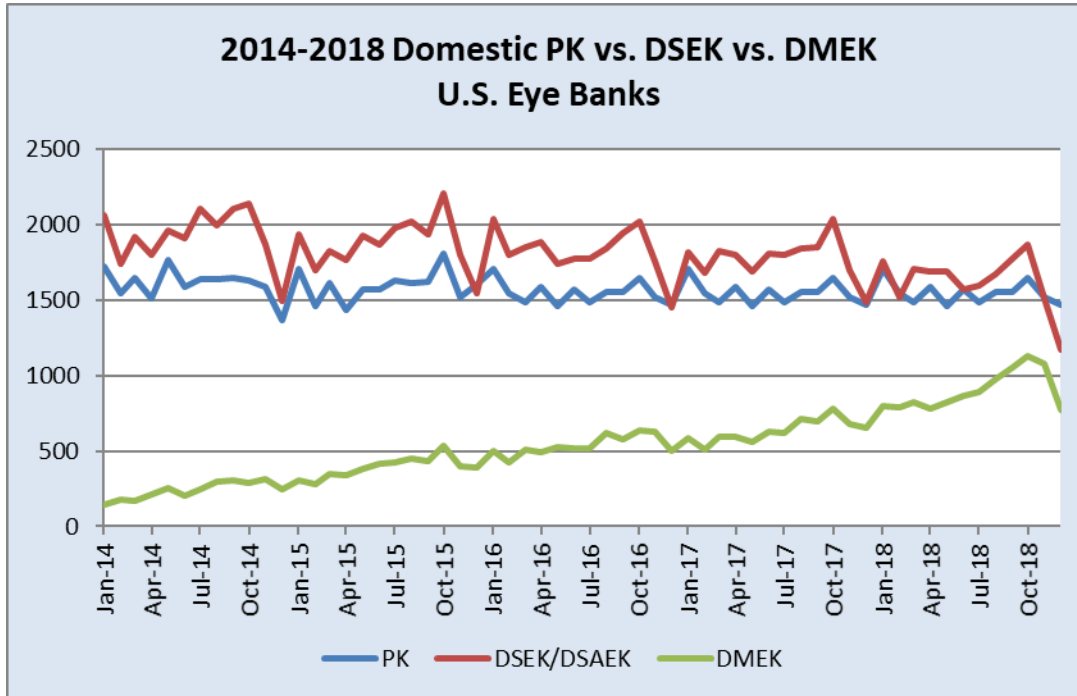


Figure 3. The numbers of PK, DSAEK, and DMEK procedures performed in the U.S. monthly from 2014 – 2018 using tissue from U.S. Eye Banks. The frequency of PK and DSAEK have been in slow decline over the past five years while DMEK continues to increase. Since 2014, DMEK growth has been relatively linear, similar to the growth profile of DSAEK starting in 2005.

Table 5: Annual Domestic Endothelial Keratoplasty Numbers (2012 – 2018)

Domestic Surgery Use	2012	2013	2014	2015	2016	2017	2018
Total Endothelial Keratoplasty Procedures	23,049	24,987	25,965	27,208	28,327	28,991	30,336
DSEK, DSAEK, DLEK Procedures	22,301	23,465	23,100	22,514	21,868	21,337	19,526
DMEK or DMAEK Procedures	748	1,522	2,865	4,694	6,459	7,628	10,773
PDEK						21	26
Other EK						7	11

Tissue for Glaucoma Shunts:

Use of eye bank tissue to cover glaucoma shunt procedures is shown below (**Table 6**). In 2011, sclera was the most commonly used tissue for glaucoma shunt patching but use of corneas stored in long-term solution (where endothelial cell counts are irrelevant) increased substantially from 2014 to 2018. Using corneal tissue for covering glaucoma tube shunts continues to be very popular with glaucoma surgeons. Corneas in long-term storage medium comprise nearly 82% of all ocular tissue used in 2018 to cover glaucoma shunts (**Figure 4**).

Table 6: Ocular Tissue Used for Glaucoma Shunt Patching (2011-2018)

Ocular Tissue Used for Glaucoma Shunt Patching - U.S. Eye Banks									
Ocular Tissue Used for Glaucoma Shunt Patching	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Long-Term Cornea	3,802	4,435	4,040	6,212	10,843	16,683	12,345	13,066	
Intermediate-Term Cornea	604	676	687	755	527	917	1,368	1,058	
Sclera	4,285	2,260	2,293	2,199	2,175	1,944	2,266	1,900	

Tissue Used for Glaucoma Shunt Patching 2018

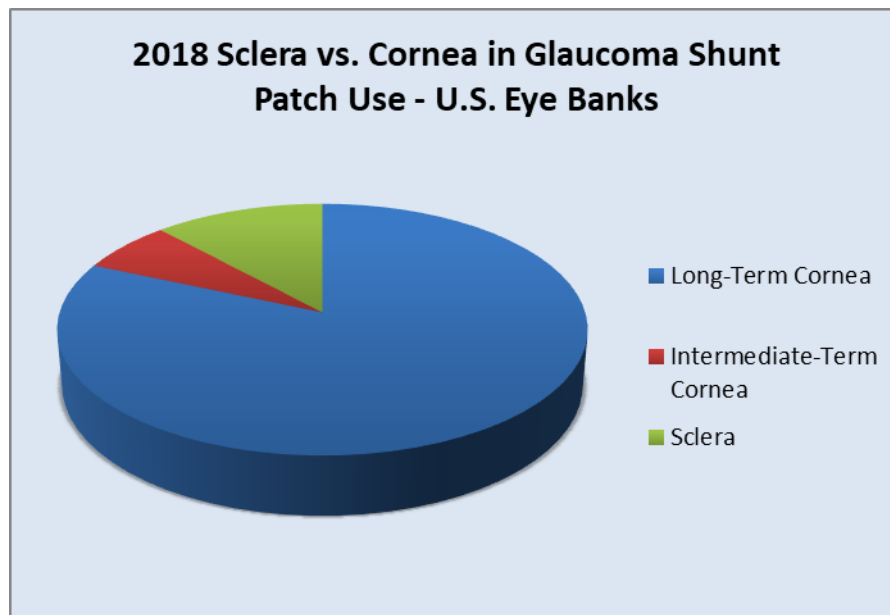


Figure 4. Eighty-two percent of ocular tissue used for glaucoma shunt patching in 2018 was long-term preserved corneas. Sclera, which for many years was the tissue of choice, has declined to 12% to the tissue used for glaucoma shunt patching.

Indications for Keratoplasty:

The indications for the 73,963 keratoplasty procedures performed utilizing corneas provided by U.S. eye banks were segregated by location of use (domestic vs. international) and keratoplasty type (PK, ALK, and EK). The data are displayed graphically separately for corneas used domestically and those used internationally (**Figure 5**). The large numbers of “unknown” or “unreported” are a persistent problem and compromises the analysis, since the diagnosis is missing for over 30% of all grafts (21.3% of domestic PKs and 66% of international PKs). To minimize this adverse impact on the validity of the conclusions drawn, the data has been split for domestic and international use for side by side comparison (**Table 7**). For this reason, the data in Table 7 may not be suitable for comparison with data from previous years, where domestic and international data were combined.

2018 Keratoplasty Indications Based on Location of Distribution (Domestic vs. International)

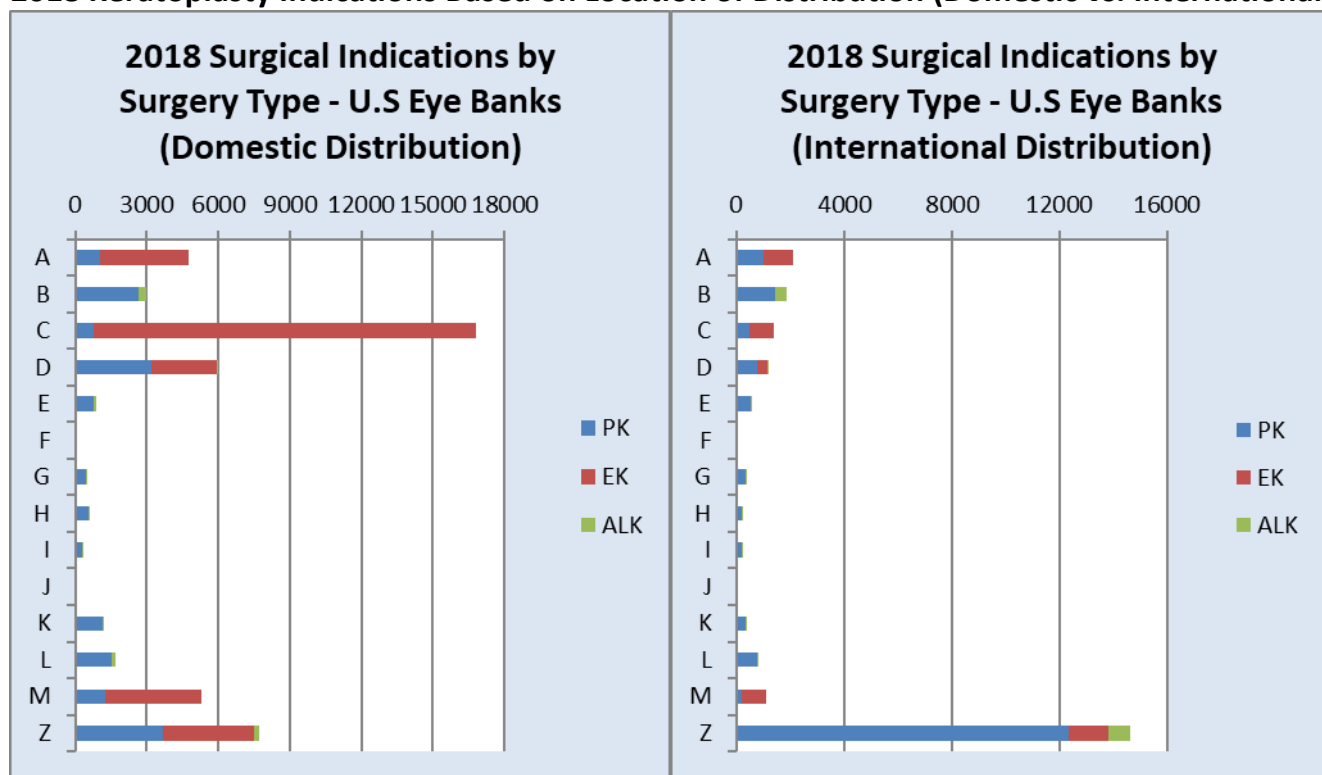


Figure 5. Surgical indication for corneal use based on domestic distribution (right panel) and international distribution (left panel). Note the very high number of unknown indications listed Z).
A – Post Cataract Surgery Edema. **B** – Ectasias/Thinnings. **C** – Endothelial Dystrophies. **D** – Repeat Corneal Transplant. **E** – Other Degenerations or Dystrophies. **F** – Refractive. **G** – Microbial Keratitis. **H** – Mechanical (Non-Surgical) or Chemical Trauma. **I** – Congenital Opacities. **J** – Pterygium. **K** – Non-Infectious Ulcerative Keratitis, Thinning, or Perforation. **L** – Other Causes of Corneal Opacification or Distortion. **M** – Other Causes of Endothelial Dysfunction. **Z** – Unknown or Unreported.

Table 7: Indications for Keratoplasty Reported by US Banks, 2018

Indications for Penetrating Keratoplasty 2018	Domestic Use		International Use	
A. Post-cataract surgery edema	1,029	5.9%	1,028	5.5%
B. Ectasias/Thinnings	2,633	15.2%	1,465	7.8%
C. Endothelial Dystrophies	772	4.5%	479	2.6%
D. Repeat Corneal Transplant	3,166	18.3%	782	4.2%
E. Other degenerations or dystrophies	794	4.6%	526	2.8%
F. Refractive	33	0.2%	6	0.0%
G. Microbial keratitis	423	2.4%	346	1.9%
H. Mechanical or chemical trauma	537	3.1%	203	1.1%
I. Congenital opacities	313	1.8%	203	1.1%
J. Pterygium	5	0.0%	1	0.0%
K. Non-infectious ulcerative keratitis or perforation	1,168	6.7%	328	1.8%
L. Other causes of corneal dysfunction or distortion	1,504	8.7%	770	4.1%
M. Other causes of endothelial dysfunction	1,268	7.3%	221	1.2%
Z. Unknown, unreported, or unspecified	3,703	21.3%	12,322	66.0%
Total Indications for Penetrating Keratoplasty	17,347		18,681	
Indications for Anterior Lamellar Keratoplasty	Domestic use		International Use	
B. Ectasias/Thinnings	333	37.7%	392	26.6%
D. Repeat Corneal Transplant	30	3.4%	15	1.0%
E. Other degenerations or dystrophies	73	8.3%	72	4.9%
F. Refractive	3	0.3%	0	0.0%
G. Microbial keratitis	10	1.1%	62	4.2%
H. Mechanical or chemical trauma	33	3.7%	3	0.2%
I. Congenital opacities	13	1.5%	12	0.8%
J. Pterygium	1	0.1%	0	0.0%
K. Non-infectious ulcerative keratitis or perforation	39	4.4%	20	1.4%
L. Other causes of corneal dysfunction or distortion	160	18.1%	73	5.0%
Z. Unknown, unreported, or unspecified	189	21.4%	822	55.9%
Total for Anterior Keratoplasty	884		1,471	
Indications for Endothelial Keratoplasty	Domestic Use		International Use	
A. Post-Cataract Surgery Edema	3,722	12.3%	1,067	22.5%
C. Endothelial Dystrophy	16,009	52.8%	924	19.5%
D. Repeat Corneal Transplant	2,770	9.1%	371	7.8%
M. Other Causes of Endothelial Dysfunction	4,019	13.2%	887	18.7%
Z. Unknown, unreported, or unspecified	3,816	12.6%	1,486	31.4%
Total for Endothelial Keratoplasty	30,336		4,735	

The indications for transplant for domestically used tissue from U.S. eye banks (**Table 8**), is arranged into four basic categories of principle diagnoses for which keratoplasty is performed: 1) endothelial cell failure, 2) stromal or full thickness (non-endothelial) disease, 3) regrafts and 4) unknown. Endothelial cell failure is the leading indication as a group for keratoplasty from U.S. provided tissue. Fifty-five percent of all keratoplasty procedures done in the U.S. in 2018 were performed for endothelial failure (Fuchs' endothelial dystrophy, post cataract surgery edema and other causes of endothelial cell failure). In the U.S., 16.6% of all keratoplasty procedures were performed for stromal or full thickness disease; within this category, 92.9% were PK and 8.2% were ALK. The "Unknown" category was the second most common indication listed (7,708, 15.9%), and repeat transplants were third (5,966, 12.3%), but had been fourth in 2015 and third in 2016. Specifically, regrafts made up 18.3% of all PKs performed, 9.1% of all of the EKs performed, and 3.4% of all of the ALKs performed.

Within these general anatomic diagnosis categories, the single most common specific indication reported for keratoplasty in 2018 was endothelial dystrophies (16,781, 34.6%), as has been the case the last 6 years. The data in Table 8 show 95.4% of patients with endothelial dystrophies were treated with EK and 4.6% had a PK. Unknowns (7,708, 15.9%) and regrafts (5,966, 12.3%) were the second and third most common specific indication given. "Other causes of endothelial cell failure" (than endothelial dystrophies) was the fourth most common specific indication (5,287, 10.9%). Post Cataract Surgery Corneal Edema (PCE) was the fifth most common indication (4,751, 9.8%). Among all patients with endothelial disease, 11.4% had PK and 88.6% had EK to address the condition.

Keratoconus and other ectasias were the sixth most common indication for transplant (2,966, 6.1%) in 2018. Of all transplants to treat keratoconus/ectasias specifically, there were 2,633 (88.8%) PK and 333 (11.2%) ALK procedures performed. Notably, there has not been an increasing trend of ALK procedures in the U.S. (**Table 8**). The technical difficulty of ALK and uncertainty over reimbursement continue to hold this ratio essentially unchanged for the past four years. Treatment of keratoconus by cross-linking may have reduced the number of PK surgeries performed worldwide to treat this surgical indication (**Figure 6**).

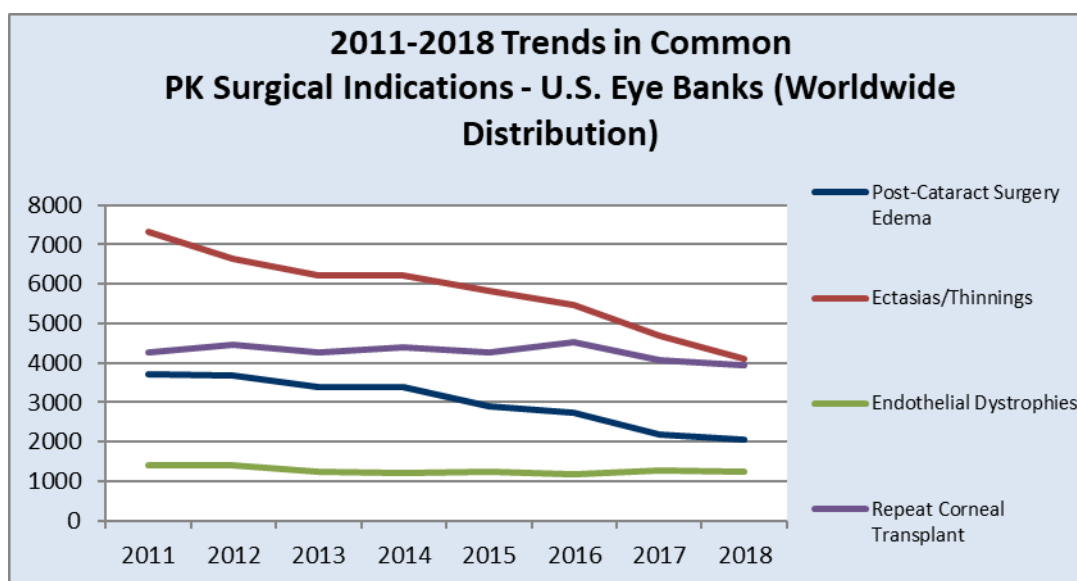


Figure 6: Trends in Common PK Surgical Indications Reported by U.S. Eye Banks

Table 8: Domestic Indications for Keratoplasty Reported by US Banks, 2018

Endothelial Cell Failure								
Surgical Diagnosis		PK		ALK		EK		TOTAL
A	Post-cataract surgery edema	1,029	21.7%	--	--	3,722	78.4%	4,751
C	Endothelial Dystrophies	772	4.6%	--	--	16,009	95.4%	16,781
M	Other causes of endothelial dysfunction	1,268	24.0%	--	--	4,019	76.0%	5,287
	Subtotal	3,069	11.4%	0	0.0%	23,750	88.6%	26,819
		17.7% of PK				78.3% EK		55.2% of grafts

Stromal or Full Thickness (non-endothelial) Disease								
Surgical Diagnosis		PK		ALK		EK		TOTAL
B	Ectasias /Thinnings	2,633	88.8%	333	11.2%	--	--	2,966
E	Other Degenerations of Dystrophies	794	91.6%	73	8.4%	--	--	867
F	Refractive	33	91.7%	3	8.3%	--	--	36
G	Microbial Keratitis	423	97.7%	10	2.3%	--	--	433
H	Mechanical or Chemical Trauma	537	94.2%	33	5.8%	--	--	570
I	Congenital Opacities	313	96.0%	13	4.0%	--	--	326
J	Pterygium	5	83.3%	1	16.7%	--	--	6
K	Non-infectious ulcerative keratitis or perforations	1,168	96.8%	39	3.2%	--	--	1,207
L	Other causes of corneal dysfunction or distortion	1,504	90.4%	160	9.6%	--	--	1,664
	Subtotal	7,410	91.8%	665	8.2%	0	0%	8,075
		42.7% of PK		75.2% of ALK				16.6% of grafts

Regraft								
Surgical Diagnosis		PK		ALK		EK		TOTAL
D	Repeat Corneal Transplant	3,166	53.1%	30	0.5%	2,770	46.4%	5,966
		18.3% of PK		3.4% of ALK		9.1% of EK		12.3% of grafts

Unknown / Unspecified								
Surgical Diagnosis		PK		ALK		EK		TOTAL
Z.	Unknown, unreported, or unspecified	3,703	48.0%	189	2.5%	3,816	49.5%	7,708
		21.3% of PK		21.4% of ALK		12.6% of EK		15.9% of grafts

		PK		ALK		EK		TOTAL
Total for Each Procedure		17,347	35.7%	884	1.8%	30,336	62.5%	48,567

Conclusions:

- 1) Endothelial keratoplasty was the most common domestic keratoplasty procedure in 2018 for the sixth year in a row (since 2012, **Figure 2**).
- 2) 55.2% of all domestic keratoplasty procedures were for endothelial disease in 2018 (**Table 8**).
- 3) The increase in domestic EK over the last 4 years was caused by the increase in DMEK.
 - a) DMEK increased 63.8% in 2015, 37.6% in 2016, 18.1% in 2017, and 41.2% in 2018.
 - b) DSEK decreased slightly in each of the last 5 years (**Table 5**).
- 4) The number of domestic penetrating keratoplasty procedures using tissue in intermediate-term storage solution decreased 5.4% in 2018, the 13th consecutive year PK procedures in the U.S. have declined (since 2005).
- 5) Tissue used for anterior lamellar keratoplasty, keratolimbal allografts and keratoprosthesis procedures have been essentially flat over the last 8 years (**Figure 2**).
- 6) Corneas in long-term storage solution are the most common ocular tissue used for patching glaucoma tube shunt procedures, and now make up 82.7% of the tube shunt covers using ocular tissue (**Figure 4**).
- 7) The number of patients receiving a cornea transplant for keratoconus within the US continues to fall. We anticipate that collagen cross-linking and newer RGP/scleral contact lenses may reduce the number of patients who have keratoplasty for keratoconus in the future (**Figure 6**).
- 8) 31.4% of U.S. eye bank tissue used internationally has no recipient diagnosis. Elimination of international tissue from U.S. Eye banks' recipient data analysis has reduced the overall unknown rate to 15.9% in 2018, 18.8% in 2017, slightly improved from overall unknown rates of 29.8% in 2016 when the data were combined together with international tissue indication data. Eye banks can further improve the domestic data by increased diligence of collecting recipient information when exporting tissue to other U.S. eye banks.

Respectfully submitted,

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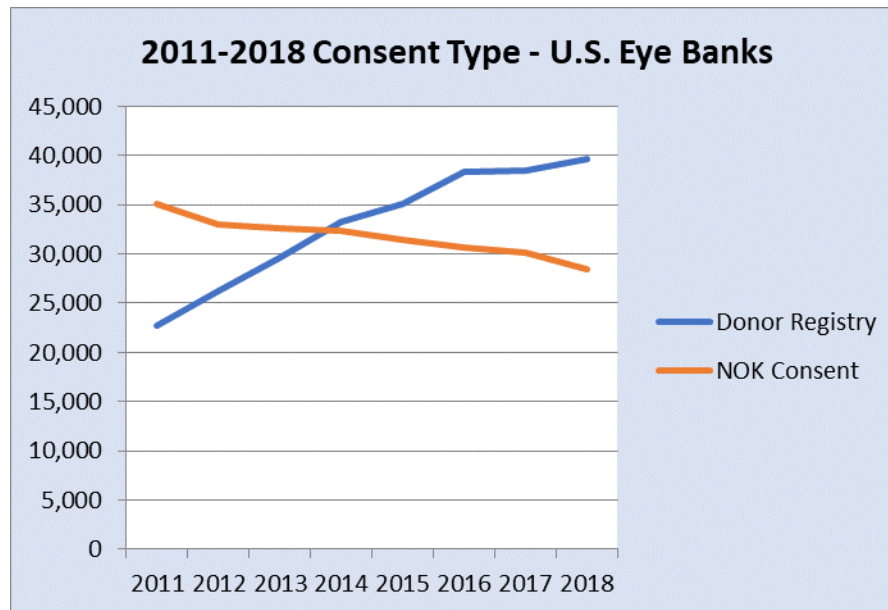
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2018 Eye Banking Statistics Reported by U.S. Banks: Death Referrals and Tissue Recoveries

Donations	2014	2015	2016	2017	2018
Number of Eye Bank Reporting Entities*	76	71	62	57	57
Total Whole Eyes and Corneas Donated	128,675	130,987	136,318	135,203	133,576
Total Number of Donors	65,558	66,526	69,049	68,565	68,102

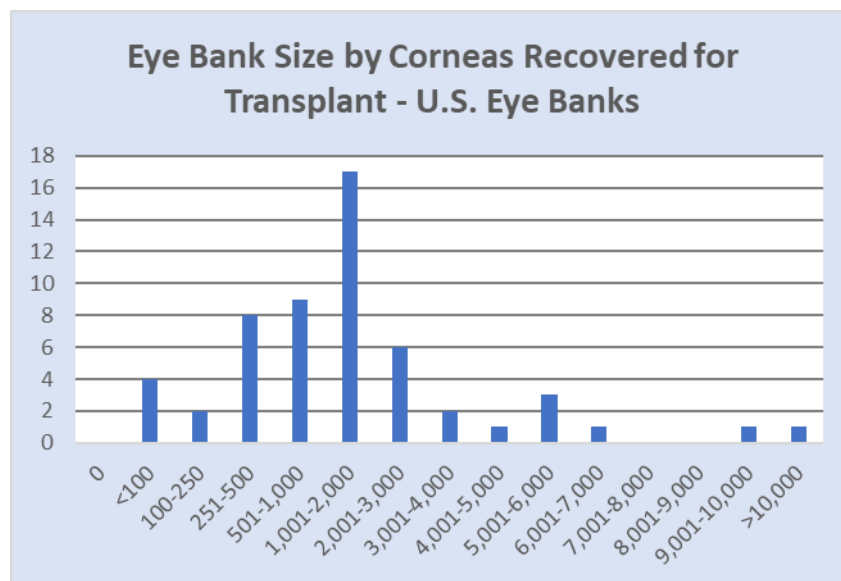
* Reporting entities may not reflect number of physical eye banks

Death Referrals	2016	2017	2018
Total Death Referrals	674,459	713,795	718,221
Death referrals determined eligible	179,316	158,535	168,569
Tissue Recoveries			
Total Donors	69,049	68,565	68,102
Donors recovered not found on donor registry or known to have first person consent	30,704	30,106	28,469
Donors recovered found on donor registry or known to have first person consent	38,345	38,459	39,633
Eyes or Corneas Recovered with Intent for Surgical Use	124,649	123,716	123,222
Eyes or Corneas Recovered for Other Uses	11,669	11,487	10,354



2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Comparison of Eye Bank Cornea Recovery Rates

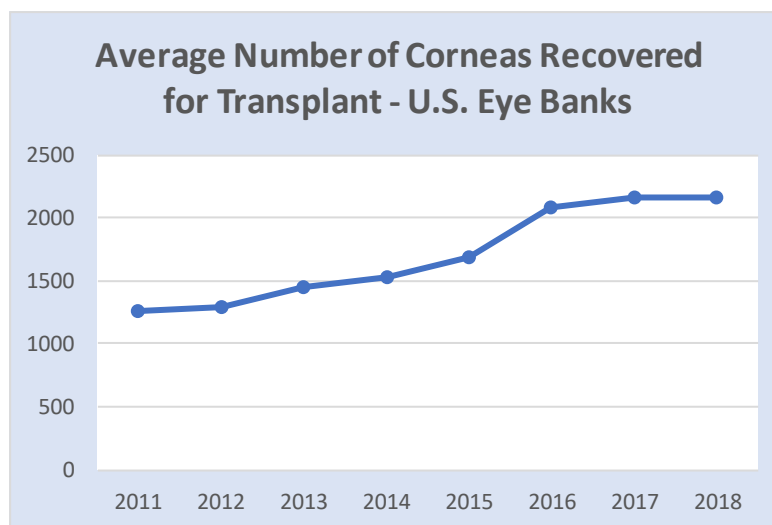
Eye Bank Activity - U.S. Eye Banks									
Recovered Corneas	2011	2012	2013	2014	2015	2016	2017	2018	Trends
0	2	0	2	2	1	1	0	0	
<100	2	2	3	4	2	2	3	4	
100-250	5	5	5	3	5	3	3	2	
251-500	13	18	16	13	12	8	7	8	
501-1,000	15	15	14	17	12	13	9	9	
1,001-2,000	29	20	22	23	19	15	17	17	
2,001-3,000	5	6	8	6	8	9	6	6	
3,001-4,000	5	3	1	2	1	1	3	2	
4,001-5,000	2	2	2	3	2	2	2	1	
5,001-6,000	1	1	1	1	2	1	1	3	
6,001-7,000	1	0	0	0	1	1	0	1	
7,001-8,000	1	0	0	0	0	0	0	0	
8,001-9,000	0	1	0	0	0	0	1	0	
9,001-10,000	0	0	1	0	0	1	0	1	
>10,000	0	0	1	2	2	2	1	1	
Avg. Corneas Recovered for Transplant	1,253	1,297	1,452	1,527	1,686	2,088	2,170	2,162	
Number of Eye Banks	81	80	76	76	71	62	57	57	



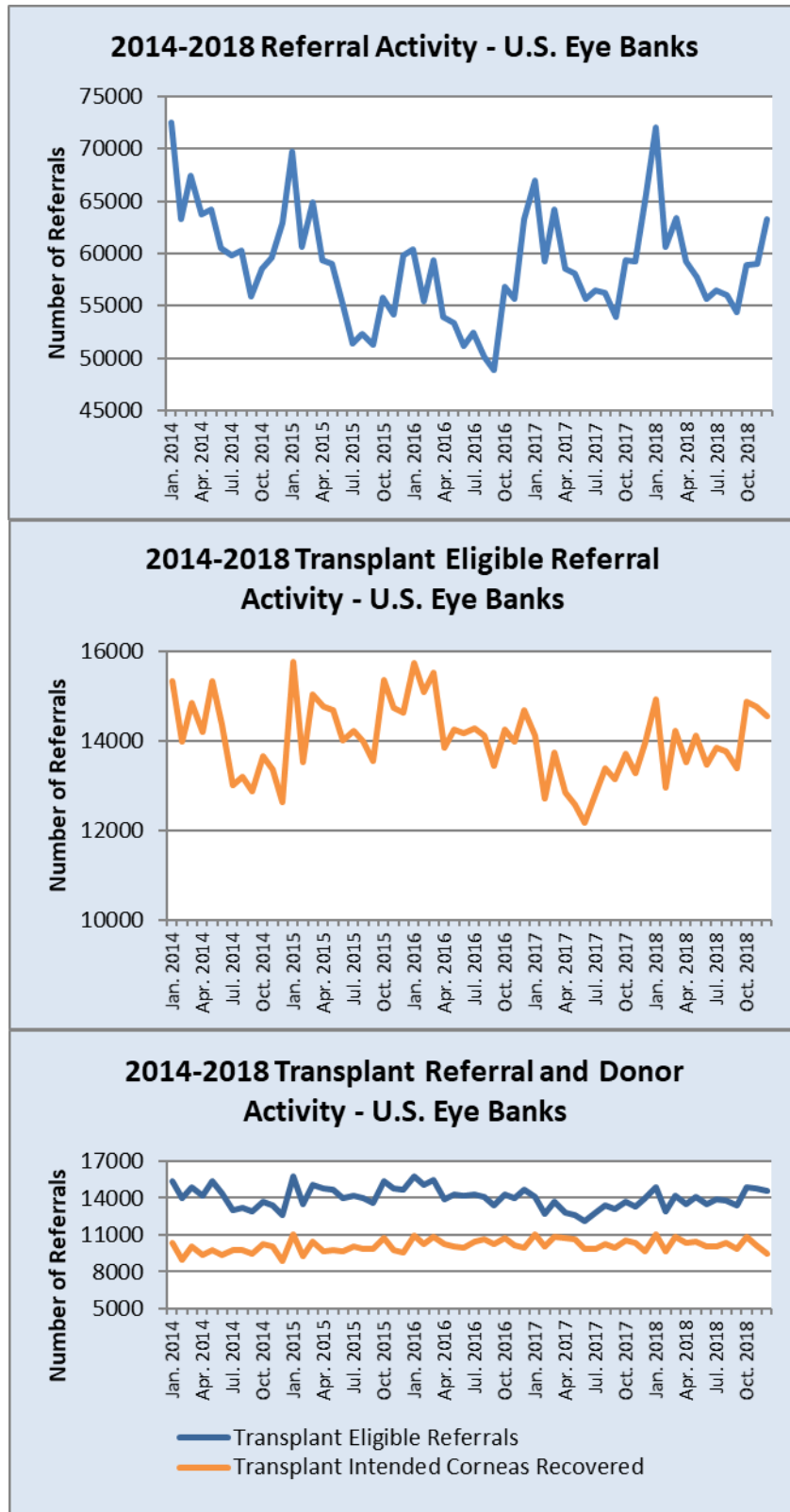
2018 Eye Banking Statistics Reported by U.S. Banks: Referral Trends, Transplant and Conversion Rates

Transplant & Conversion Rates - U.S. Eye Banks					
Month	Transplant Rate	Conversion Rate	Death Referrals	Transplant Eligible Referrals	Transplant Intended Corneas Recovered
Jan. 2018	71.1%	37.6%	73,398	14,997	11,087
Feb. 2018	74.4%	38.1%	60,678	12,958	9,662
Mar. 2018	69.3%	39.1%	63,369	14,223	10,892
Apr. 2018	71.0%	38.6%	59,190	13,533	10,304
May 2018	71.6%	37.7%	57,711	14,123	10,477
Jun. 2018	69.7%	38.0%	55,710	13,482	10,030
Jul. 2018	71.2%	37.1%	56,499	13,864	10,055
Aug. 2018	70.3%	38.5%	56,057	13,767	10,402
Sep. 2018	72.3%	37.3%	54,381	13,391	9,837
Oct. 2018	71.7%	37.2%	58,871	14,889	10,831
Nov. 2018	72.4%	35.1%	59,062	14,777	10,172
Dec. 2018	70.8%	33.3%	63,295	14,565	9,473
2014 Total	65.9%	35.4%	748,786	166,849	116,071
2015 Total	66.3%	34.9%	693,449	174,349	119,687
2016 Total	66.6%	35.2%	674,459	179,316	124,649
2017 Total	68.3%	39.6%	713,795	158,532	123,716
2018 Total	69.4%	37.3%	718,221	168,569	123,222
2018 Avg.	N/A	N/A	59,852	14,047	10,269
Std. Dev.	1.4%	1.6%	5,115	658	499

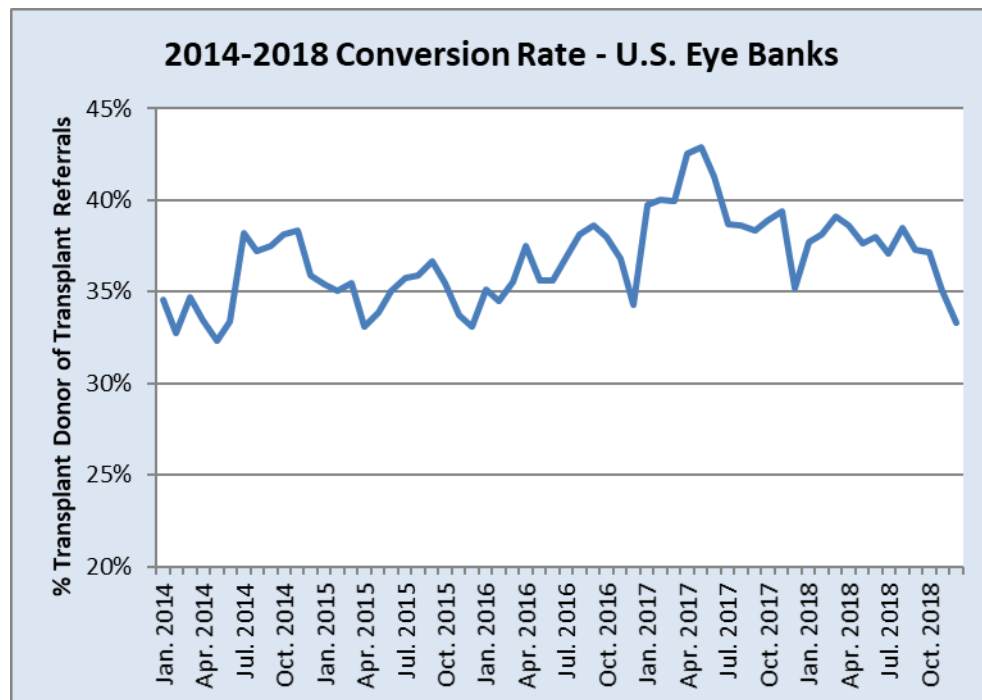
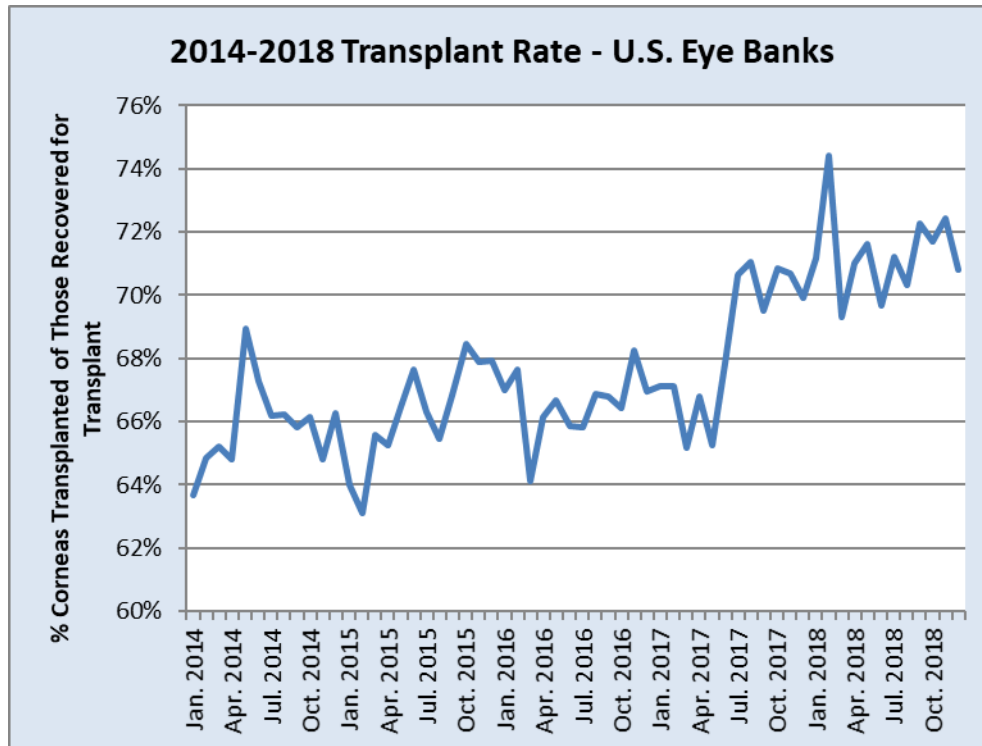
***Transplant rate** is the number of corneas used for transplant divided by the number recovered for transplant.
Conversion rate is the number of transplant donors divided by the number of transplant eligible referrals.



2018 Eye Banking Statistics Reported by U.S. Banks: Referral Trends, Transplant and Conversion Rates



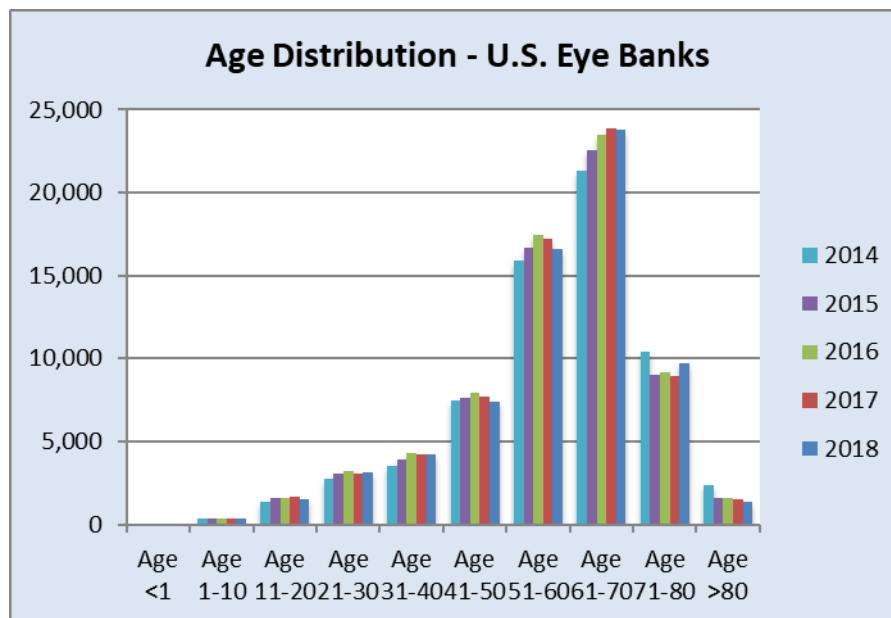
2018 Eye Banking Statistics Reported by U.S. Banks: Transplant and Conversion Rates



Transplant rate is the number of corneas used for transplant divided by the number recovered for transplant.
Conversion rate is the number of transplant donors divided by the number of transplant eligible referrals.

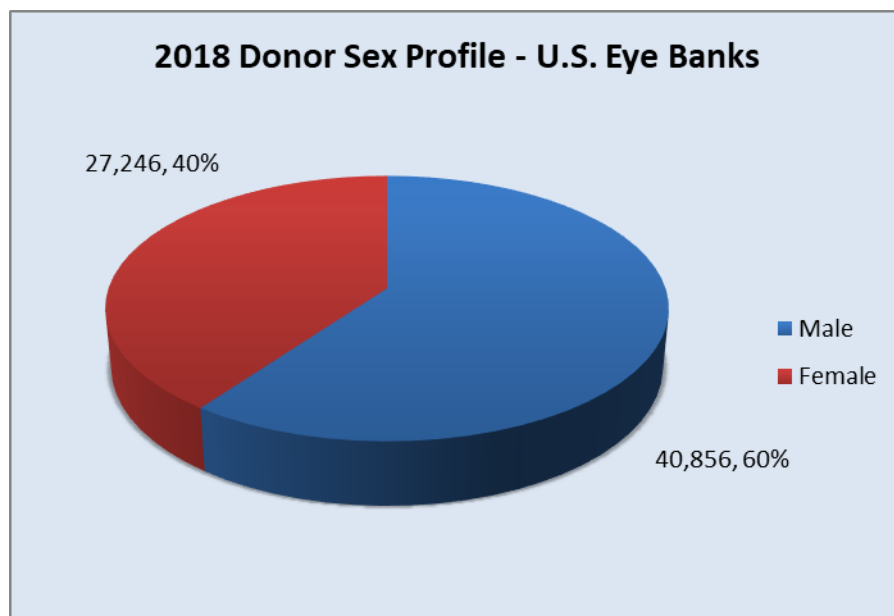
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Donors by Age Reported by U.S. Banks

Age Demographics - U.S. Eye Banks										
Year	Age <1	Age 1-10	Age 11-20	Age 21-30	Age 31-40	Age 41-50	Age 51-60	Age 61-70	Age 71-80	Age >80
2014	15	380	1,392	2,780	3,531	7,474	15,907	21,338	10,413	2,328
2015	15	359	1,602	3,035	3,917	7,657	16,717	22,586	9,055	1,583
2016	11	348	1,587	3,223	4,327	7,933	17,460	23,459	9,136	1,565
2017	13	324	1,643	3,079	4,249	7,669	17,244	23,913	8,959	1,472
2018	18	338	1,534	3,119	4,212	7,416	16,570	23,804	9,734	1,357
Monthly Avg	2	28	128	260	351	618	1,381	1,984	811	113
Std. Dev.	0.8	7.0	10.5	28.0	28.1	45.0	70.4	112.0	65.9	18.6



2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Donors by Gender Reported by U.S. Banks

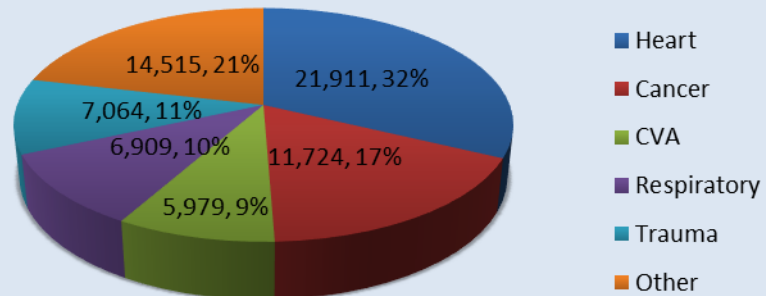
Sex Demographics - U.S. Eye Banks		
Year	Male	Female
2014 Total	39,975	25,583
2015 Total	40,990	25,536
2016 Total	42,079	26,970
2017 Total	40,898	27,667
2018 Total	40,856	27,246
Monthly Avg.	3,405	2,271
Std. Dev.	196.2	133.2



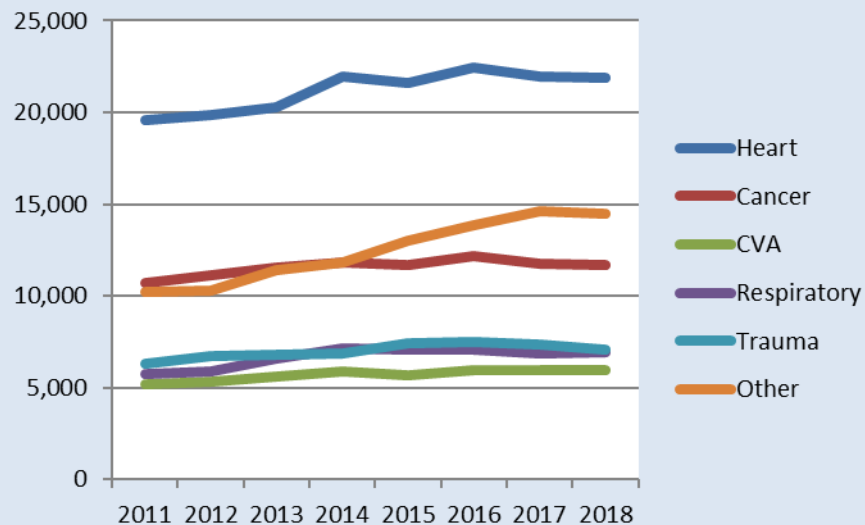
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Cause of Death Reported by U.S. Banks

Cause of Death Demographics - U.S. Eye Banks						
Year	Heart	Cancer	CVA	Respiratory	Trauma	Other
2014	21,969	11,831	5,884	7,134	6,893	11,847
2015	21,587	11,722	5,699	7,052	7,427	13,039
2016	22,447	12,201	5,987	7,104	7,479	13,831
2017	21,948	11,758	5,964	6,896	7,354	14,645
2018	21,911	11,724	5,979	6,909	7,064	14,515
Monthly Avg.	1,826	977	498	576	589	1,210
Std. Dev.	122.6	49.8	36.1	60.6	71.8	60.2

**2018 Donor Cause of Death Profile -
U.S. Eye Banks**



Cause of Death Trends - U.S. Eye Banks



2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Tissue Intended for Surgery Was Not Released

There are several reasons why tissue intended for surgery may not ultimately be used for surgery. These include positive serology results, defects noted at the time of evaluation (scars, infiltrates, low cell counts, etc.) and/or medical or social history information, all of which occur subsequent to initial screening and procurement.

Contraindications for Transplant ¹	2016		2017		2018	
Positive or Reactive Test for Communicable Disease Agent or Disease	10,523	30.8%	9,845	29.6%	10,065	31.2%
HIV Antibody (HIV I/II Ab)	185	0.5%	216	0.6%	274	0.9%
HIV Nucleic Acid Test (HIV NAT)	98	0.3%	94	0.3%	96	0.3%
Hepatitis B Surface Antigen (HBsAg)	1,457	4.3%	986	3.0%	1,028	3.2%
Hepatitis B Core Antibody (HBcAb)	4,755	13.9%	4,789	14.4%	4,954	15.4%
Hepatitis B Nucleic Acid Test (HBV NAT)	353	1.0%	300	0.9%	350	1.1%
Hepatitis C Antibody (HCV Ab)	1,996	4.3%	1,936	5.8%	1,923	6.0%
Hepatitis C Nucleic Acid Test (HCV NAT)	766	2.2%	783	2.4%	685	2.1%
Syphilis	468	1.4%	357	1.1%	383	1.2%
HTLV Antibody (HTLV I/II Ab)	143	0.4%	80	0.2%	109	0.3%
West Nile Virus Nucleic Acid Test (WNV NAT)	3	0.0%	22	0.1%	8	0.0%
Other Positive or Reactive Test	299	0.9%	282	0.8%	255	0.7%
Other Communicable Disease Testing Issue	632	1.9%	385	1.2%	319	1.0%
Medical Record or Autopsy Findings	7,578	22.2%	7,614	22.9%	6,599	20.5%
Dementia / Neurological Issues	778	2.3%	723	2.2%	732	2.3%
Sepsis	3,511	10.3%	3,304	9.9%	3,190	9.9%
Sepsis - (determined by positive blood cultures)	1,249	3.7%	1,355	4.1%	1,337	4.1%
Sepsis - (determined by other indicators)	2,262	6.6%	1,949	5.9%	1,853	5.8%
Plasma Dilution	346	1.0%	407	1.2%	315	1.0%
Unknown Cause of Death	192	0.6%	179	0.5%	132	0.4%
Other	2,751	8.1%	3,001	9.0%	2,230	6.9%
Medical/Social Interview	2,803	8.2%	3,067	9.2%	3,083	9.6%
Travel	418	1.2%	435	1.3%	507	1.6%
Dementia / Neurological Issues	216	0.6%	256	0.8%	312	1.0%
Other	2,169	6.4%	2,376	7.1%	2,264	7.0%
Body Exam	280	0.8%	325	1.0%	292	0.9%
Total eyes/corneas intended for transplant but not released for transplant	34,126		33,310		32,225	

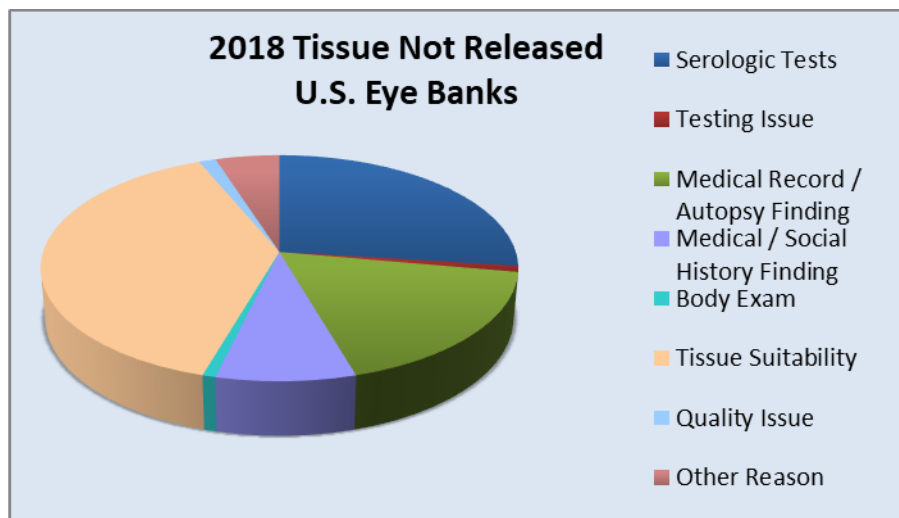
*Percentages read from this table should be read as "of the tissue not released for transplant"

¹ Some tissues had multiple contraindications.

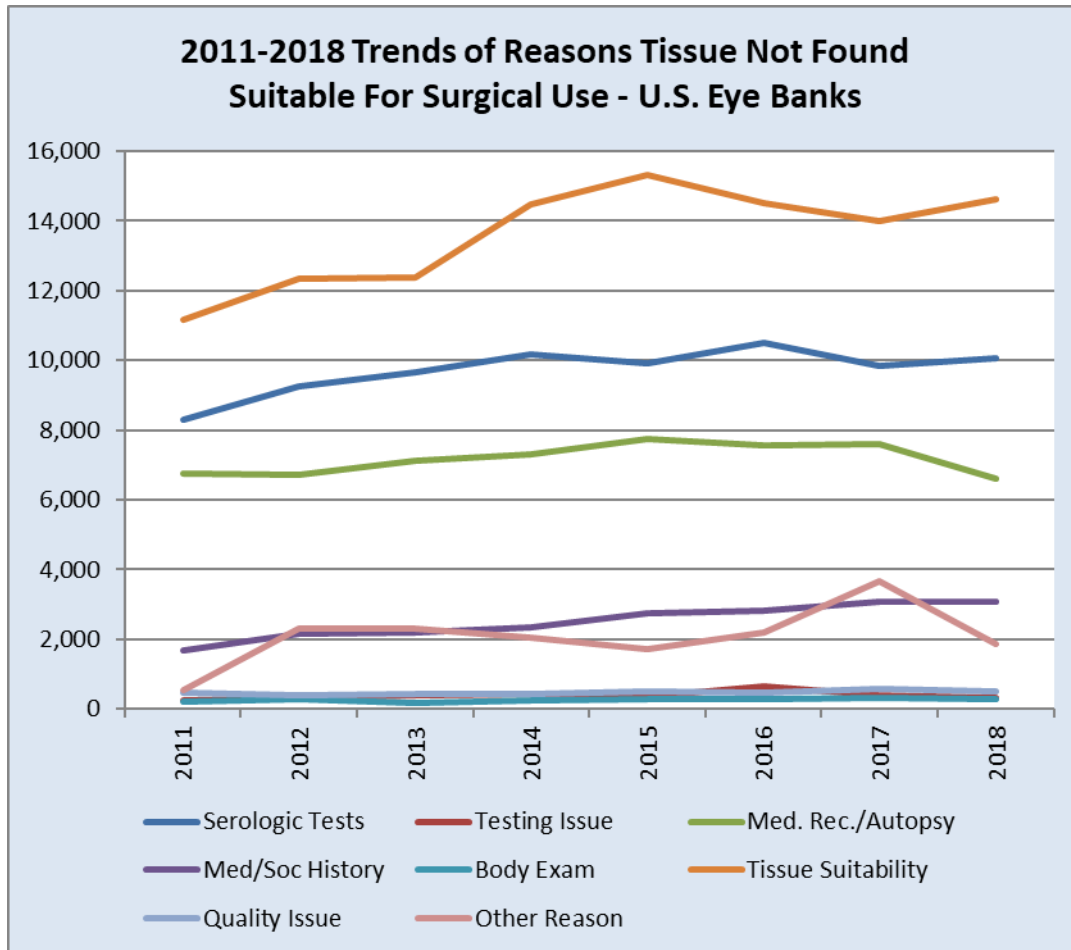
2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Tissue Intended for Surgery Was Not Released

Contraindications for Transplant (continued)	2017		2018	
Tissue Suitability (e.g. slit lamp/spec eval)	13,994	42.0%	14,631	45.4%
Epithelium	192	0.6%	218	0.7%
Stroma	7,135	21.4%	7,092	22.0%
Prior reactive surgery	424	1.3%	383	1.2%
Scar	1,030	3.1%	943	2.9%
Infiltrate	3,686	11.1%	3,600	11.2%
Foreign Body	170	0.5%	133	0.4%
Other	1,825	5.5%	2,033	6.3%
Descemet's membrane	293	0.9%	338	1.0%
Endothelium	6,374	19.1%	6,983	21.7%
Quality Issue	575	1.7%	493	1.5%
Storage	93	0.3%	108	0.3%
Labeling	9	0.0%	21	0.1%
Processing	403	1.2%	303	0.9%
Supply or Reagent	51	0.2%	37	0.1%
Environmental Control	19	0.1%	24	0.1%
Other Reason prior to Tissue Release	3,656	11.0%	1,857	5.8%
Total eyes/corneas intended for transplant but not released for transplant	33,310		32,225	

*Percentages read from this table should be read as "of the tissue not released for transplant"

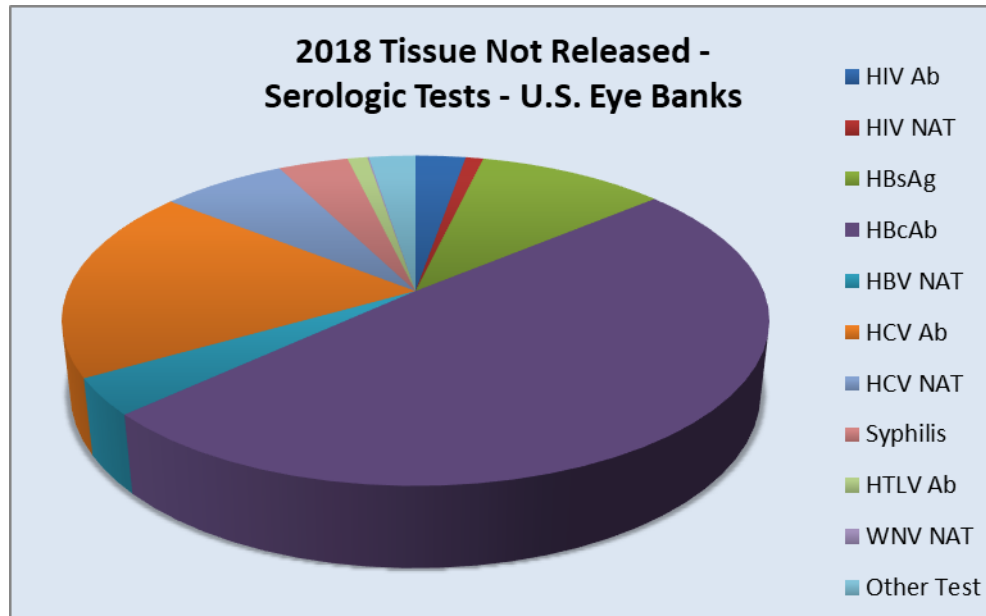


2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Tissue Intended for Surgery Was Not Released



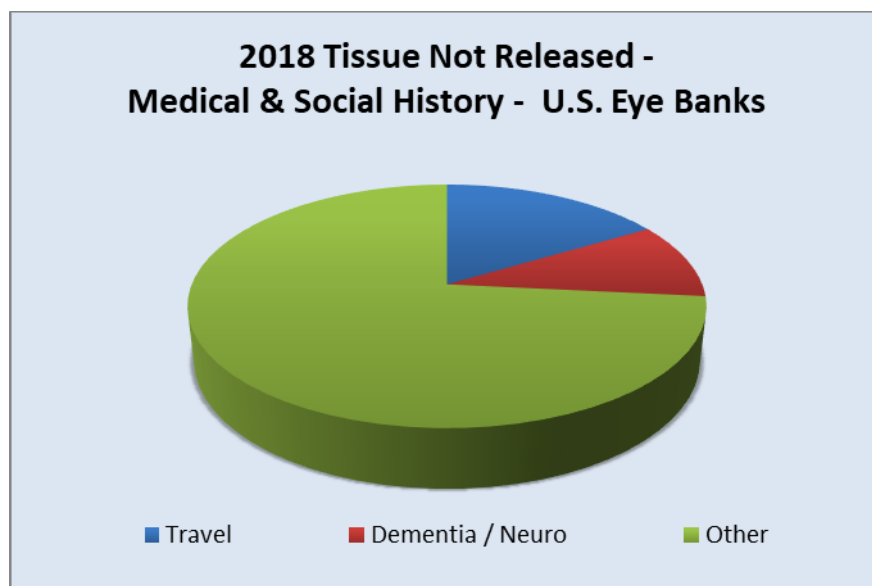
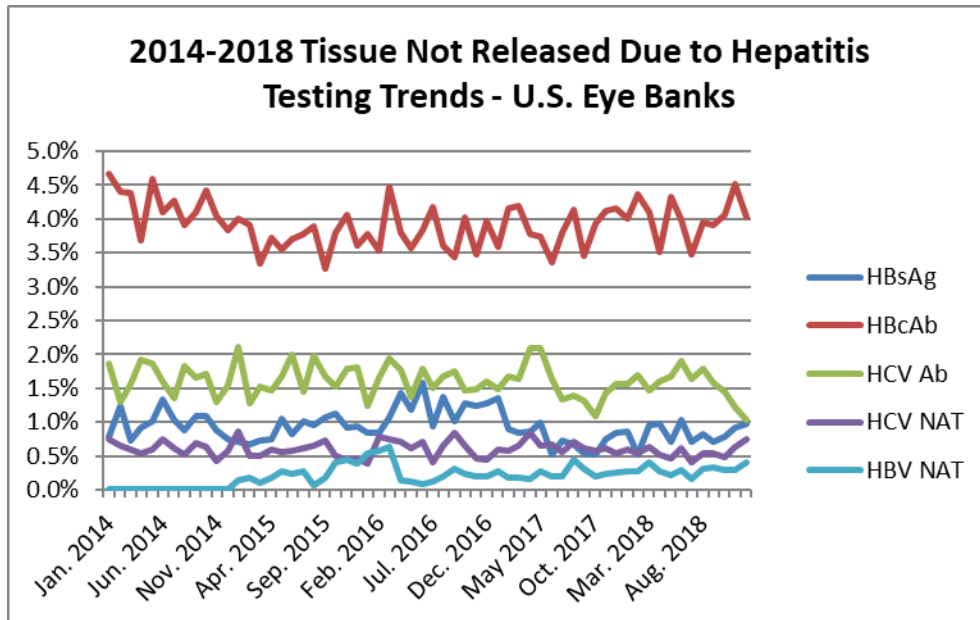
Reasons Corneas Recovered for Transplant Were Not Released - U.S. Eye Banks									
Reasons Not Released	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Serology Tests	8,299	9,250	9,656	10,161	9,903	10,523	9,845	10,067	
Testing Issue	246	307	375	423	368	632	385	319	
Med. Rec./Autopsy Finding	6,756	6,701	7,138	7,313	7,754	7,578	7,614	6,599	
Med Soc Hx Finding	1,694	2,158	2,200	2,331	2,745	2,803	3,067	3,083	
Body Exam	205	273	189	235	266	280	325	292	
Tissue Suitability	11,168	12,360	12,384	14,463	15,341	14,511	13,994	14,631	
Quality Issue	476	378	416	434	486	477	575	493	
Other Reason	542	2,296	2,294	2,065	1,708	2,194	3,656	1,857	

2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Tissue Intended for Surgery Was Not Released



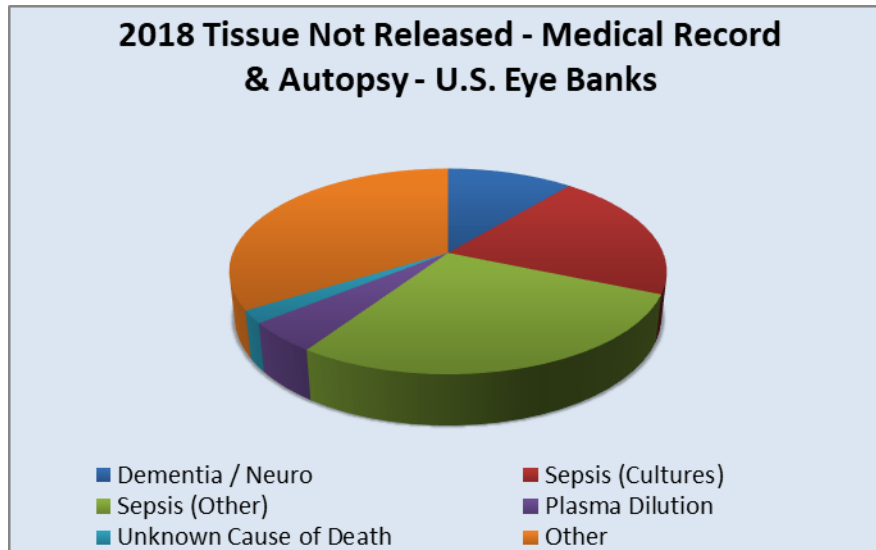
Corneas Not Released for Transplant (Serologic Testing) - U.S. Eye Banks									
Not Released - Serology	2011	2012	2013	2014	2015	2016	2017	2018	Trend
HIV	400	258	253	255	300	283	310	370	
HIV I/II Ab	164	173	169	185	220	185	216	274	
HIV NAT	236	85	84	70	80	98	94	96	
HBV	4,261	5,268	5,425	6,366	5,810	6,565	6,075	6,346	
HBsAg	723	876	786	1,130	1,070	1,457	986	1,028	
HBcAb	3,538	4,392	4,639	4,889	4,453	4,755	4,789	4,956	
HBV NAT	0	0	0	347	287	353	300	362	
HCV	2,637	2,623	2,791	2,598	2,725	2,762	2,719	2,596	
HCV Ab	1,925	1,957	2,029	1,889	2,025	1,996	1,936	1,911	
HCV NAT	712	666	762	709	700	766	783	685	
Syphilis	347	348	397	390	358	468	357	383	
HTLV	313	215	237	206	234	143	80	109	
WNV	0	0	0	4	10	3	22	8	
Other	341	538	553	342	466	299	282	255	

2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Tissue Intended for Surgery Was Not Released



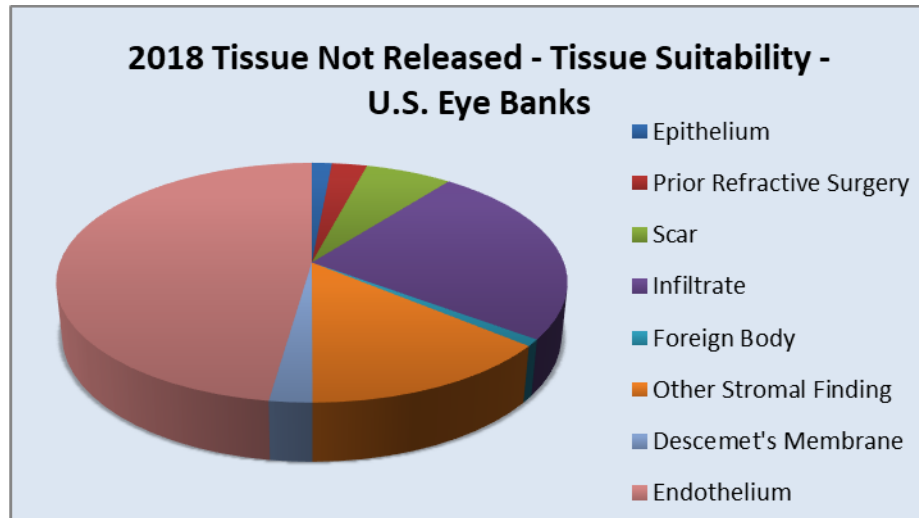
Corneas Not Released for Transplant (Med Soc Hx) - U.S. Eye Banks									
Not Released - Med Soc	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Travel	257	285	338	379	467	418	435	507	
Dementia/Neuro	146	174	198	139	180	216	256	312	
Other	1,291	1,699	1,664	1,813	2,098	2,169	2,376	2,264	

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Reasons Tissues Were Not Released

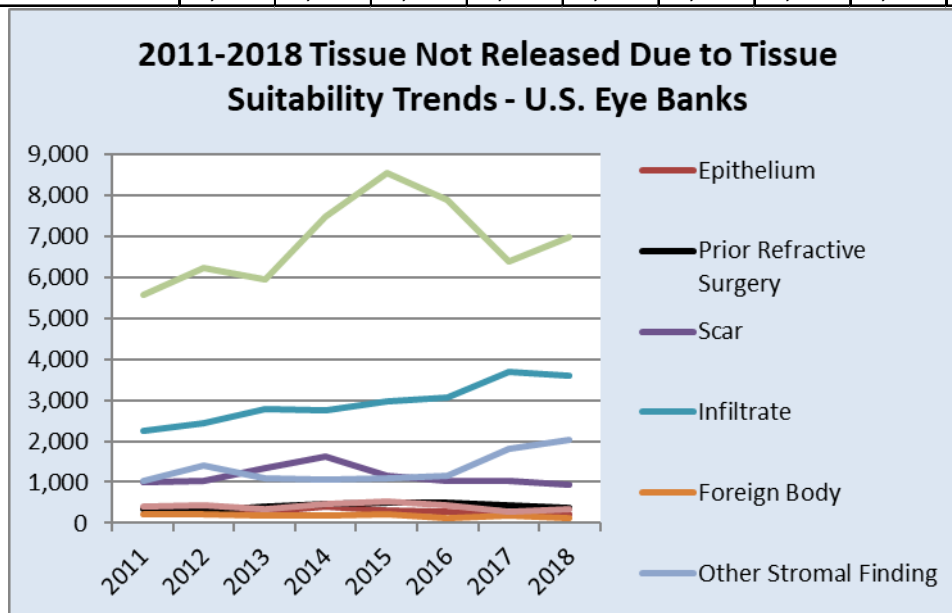


Corneas Not Released for Transplant (Medical Records) - U.S. Eye Banks									
Not Released - Med Rec / Autopsy	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Dementia/Neuro	491	542	660	733	827	778	723	732	
Sepsis (Cultures)	925	880	958	1,067	1,078	1,249	1,355	1,337	
Sepsis (Other)	2,356	2,511	2,628	2,443	2,443	2,262	1,949	1,853	
Plasma Dilution	422	353	447	445	381	346	407	315	
Unknown COD	507	416	485	388	326	192	179	132	
Other	2,055	1,999	1,960	2,237	2,699	2,751	3,001	2,230	

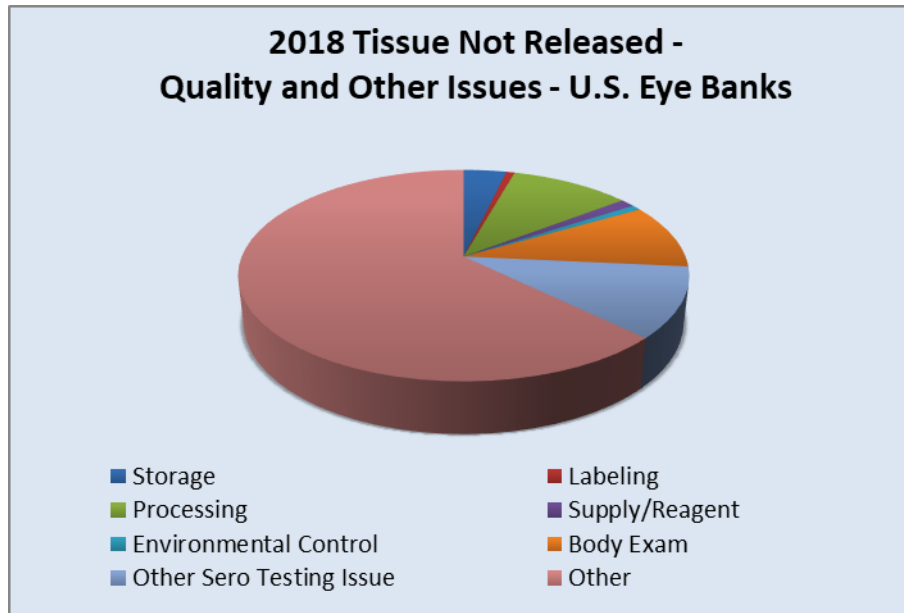
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Tissue Suitability Reasons Tissues Were Not Released



Corneas Not Released for Transplant (Tissue Suitability) - U.S. Eye Banks									
Not Released - Tissue Suitability	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Epithelium	368	288	279	403	313	272	192	218	
Prior Refractive Surgery	345	298	390	473	512	508	424	383	
Scar	989	1,036	1,329	1,628	1,151	1,040	1,030	943	
Infiltrate	2,246	2,455	2,800	2,755	2,983	3,076	3,686	3,600	
Foreign Body	218	200	188	187	210	135	170	133	
Other Stromal Finding	1,034	1,404	1,095	1,068	1,098	1,162	1,825	2,033	
Descemet's Membrane	403	438	346	455	520	425	293	338	
Endothelium	5,565	6,241	5,957	7,494	8,554	7,893	6,374	6,983	



2018 Eye Banking Statistics Reported by U.S. Banks: Quality Issues for Tissue Not Released

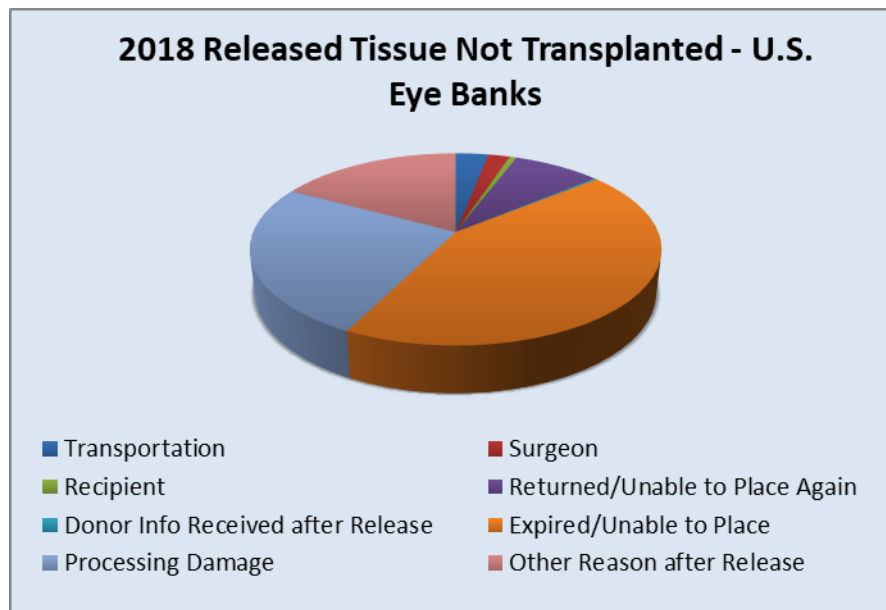


Corneas Not Released for Transplant (Quality) - U.S. Eye Banks									
Not Released - Quality Issues	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Storage Issue	173	123	101	136	135	131	93	108	
Labeling Issue	44	14	14	11	9	16	9	21	
Processing Issue (not released)	148	181	225	232	252	251	403	303	
Supply / Reagent Issue	84	40	47	24	58	57	51	37	
Environmental Control Issue	27	20	29	31	32	22	19	24	
Body Exam	205	273	189	235	266	280	325	292	
Other Sero Testing Issue	246	307	375	423	368	632	385	319	
Other Issue	542	2,296	2,294	2,065	1,708	2,194	3,656	1,857	

2018 Eye Banking Statistics Reported by U.S. Banks: Reasons Released Tissues Were Not Transplanted

Reasons Released Tissues Were Not Transplanted	2017		2018	
Transportation Issue	147	2.4%	175	3.1%
Surgeon Issue	111	1.8%	115	2.1%
Recipient Issue	52	0.9%	36	0.6%
Returned and Unable to Place Again	453	7.4%	467	8.4%
Donor Information Not Available at the Time of Tissue Release	21	0.3%	14	0.3%
Expired or Unable to Place Tissue	2,679	43.9%	2,473	44.5%
Tissue Damaged During Processing	1,113	18.2%	1,454	26.2%
Other Reason After Release of Tissue	2,007	32.9%	977	17.6%
Total eyes/corneas released for transplant but not used for transplant	6,109		5,556	

*Percentages read from this table should be read as "of the tissue not released for transplant"



Corneas Released but Not Transplanted - U.S. Eye Banks									
Released but Not Transplanted	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Transport Issue	127	116	109	169	226	139	147	175	
Surgeon Issue	199	146	162	150	140	103	108	115	
Recipient Issue	54	37	38	51	35	41	52	36	
Returned, Unable to Place Again	299	301	267	414	511	475	453	467	
Donor Info Received After Release	39	12	54	26	50	28	21	14	
Expired, Unable to Place	3,137	3,798	3,428	4,265	3,958	4,176	2,679	2,473	
Processing Damage After Release	283	440	501	596	764	1,030	1,113	1,454	
Other Reason After Release	393	270	714	1,063	1,359	1,511	2,007	977	

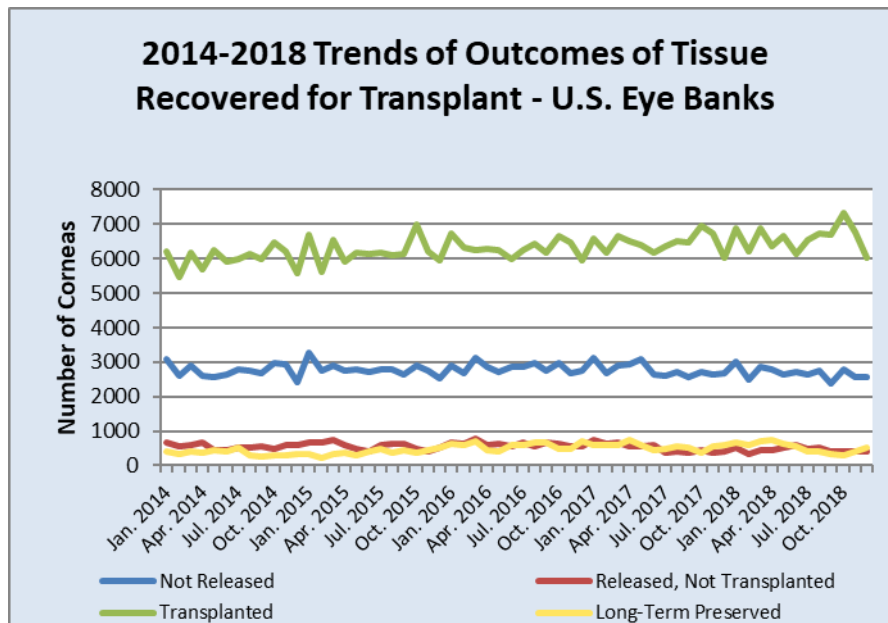
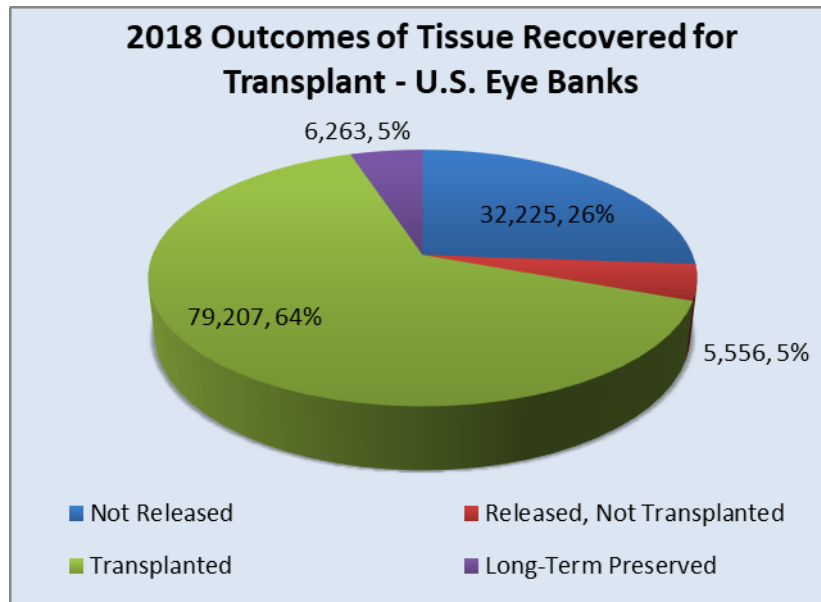
2018 Eye Banking Statistics Reported by U.S. Banks: Outcomes of Tissue Recovered for Transplant

Donations	2017	2018	% Change
Eye Banks Reported	57	57	0.0%
Total Whole Globes and Corneas Donated	135,203	133,576	(-1.2%)
Total Number of Donors	68,565	68,102	(-0.7%)
Distribution	2017	2018	% Change
Intermediate-Term Preserved Corneas	77,579	79,207	2.1%
Sclera	3,253	2,959	(-9.0%)
Long-Term Preserved Corneas	12,543	13,521	7.8%
Research	13,859	12,495	(-9.8%)
Training	10,539	10,666	1.2%

Outcomes of Corneas Recovered for Transplant Use - U.S. Eye Banks											
Month	Corneas Recovered for Transplant	Corneas Segmented	Corneal Segments Produced	Not Released		Released but Not Transplanted		Whole Corneas and Segments Transplanted		Preserved Long-Term	
Jan. 2018	11,087	0	0	3,002	27.1%	526	4.7%	6,873	62.0%	686	6.2%
Feb. 2018	9,662	0	0	2,500	25.9%	351	3.6%	6,228	64.5%	583	6.0%
Mar. 2018	10,892	0	0	2,853	26.2%	437	4.0%	6,887	63.2%	715	6.6%
Apr. 2018	10,304	0	0	2,778	27.0%	446	4.3%	6,348	61.6%	732	7.1%
May 2018	10,477	1	2	2,646	25.3%	534	5.1%	6,663	63.6%	635	6.1%
Jun. 2018	10,030	1	2	2,724	27.2%	607	6.1%	6,148	61.3%	552	5.5%
Jul. 2018	10,055	5	12	2,638	26.2%	484	4.8%	6,536	65.0%	404	4.0%
Aug. 2018	10,402	6	12	2,765	26.6%	524	5.0%	6,717	64.5%	402	3.9%
Sep. 2018	9,837	5	9	2,393	24.3%	411	4.2%	6,700	68.1%	337	3.4%
Oct. 2018	10,831	1	2	2,806	25.9%	404	3.7%	7,314	67.5%	308	2.8%
Nov. 2018	10,172	5	11	2,568	25.2%	426	4.2%	6,779	66.6%	405	4.0%
Dec. 2018	9,473	3	6	2,552	26.9%	406	4.3%	6,014	63.5%	504	5.3%
2014 Total	110,365	90	6	32,456	29.4%	5,182	4.7%	68,442	62.1%	4,294	3.9%
2015 Total	116,071	2	4	32,958	28.4%	6,681	5.8%	72,013	62.0%	4,420	3.8%
2016 Total	119,687	1	2	33,577	28.1%	6,806	5.7%	74,624	62.3%	4,681	3.9%
2017 Total	124,649	0	0	34,126	27.4%	7,529	6.0%	75,926	60.9%	7,068	5.7%
2018 Total	123,222	27	56	32,225	26.2%	5,556	4.5%	79,207	64.3%	6,263	5.1%
2018 Avg.	10,269	2	5	2,685	N/A	463	N/A	6,601	N/A	522	N/A
Std. Dev.	499	2.38	5.0	169	0.9%	73	0.7%	367	2.2%	150	1.4%

*Percentages read from this table should be read as "of the tissue recovered with transplant intent"

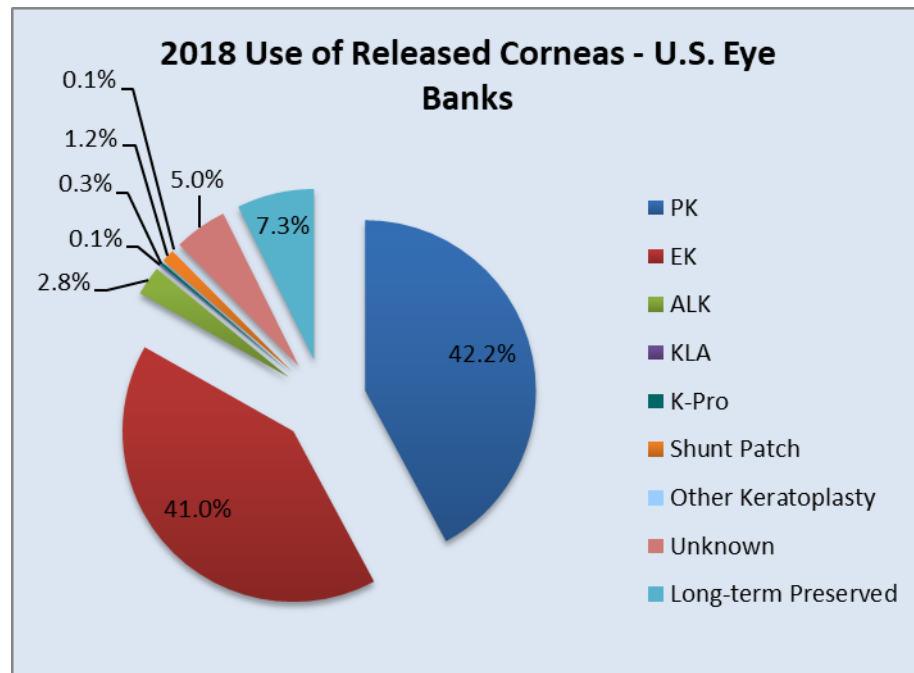
2018 Eye Banking Statistics Reported by U.S. Banks: Outcomes of Tissue Recovered for Transplant



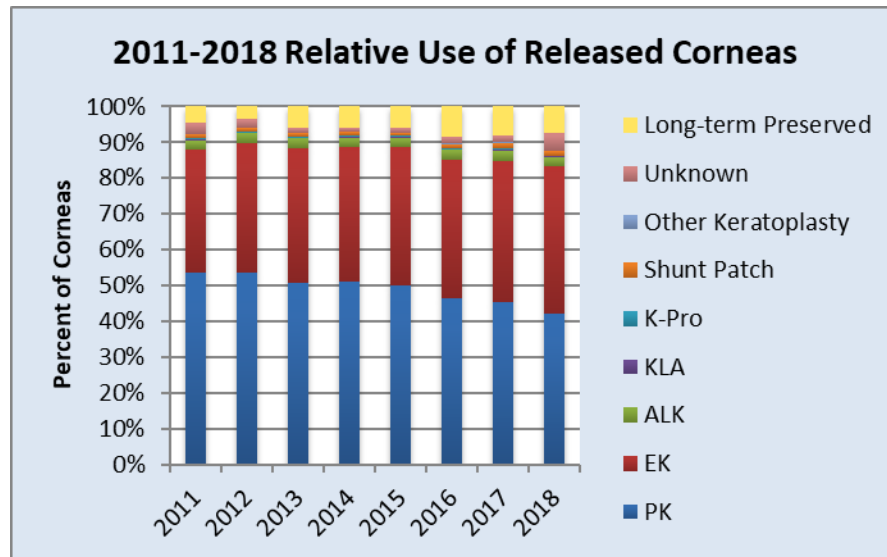
General Outcomes of Corneas Recovered for Transplant Use - U.S. Eye Banks									
Outcome	2011	2012	2013	2014	2015	2016	2017	2018	Trend
Not Released	29,407	30,185	32,456	32,958	33,577	34,126	33,310	32,225	
Released, Not	4,536	4,908	5,182	6,681	6,806	7,529	6,106	5,556	
Transplanted	67,520	68,684	68,442	72,013	74,624	75,926	77,582	79,207	
Long-Term Preserved	3,017	2,454	4,294	4,420	4,681	7,068	6,718	6,263	

2018 Eye Banking Statistics Reported by U.S. Banks: Use of Donated Tissues

Use of Donated Tissue	2014	2015	2016	2017	2018
Corneal Grafts Total	76,431	79,304	82,994	84,297	85,441
Penetrating Keratoplasty	38,919	39,554	38,413	38,025	36,028
Anterior Lamellar Keratoplasty	1,953	2,201	2,386	2,541	2,355
Endothelial Keratoplasty	28,961	30,710	32,221	33,397	35,071
Keratolimbal Allograft	88	107	97	104	87
Keratoprosthesis (K-Pro)	294	364	313	344	243
Glaucoma Shunt Patch or other non-keratoplasty use	755	527	917	1,368	1,058
Other keratoplasty (experimental surgery)	17	19	65	232	64
Unknown or Unspecified	1,026	1,142	1,514	1,568	4,301
Sclera	3,345	3,225	3,380	3,253	2,959
Long-Term Preserved Corneas	7,223	11,672	18,133	12,543	13,521
Keratoplasty	938	737	1,335	197	298
Glaucoma Shunt Patching	6,212	10,843	16,683	12,345	13,066
Other Surgical Uses	73	92	115	1	157
Research	17,670	16,924	17,023	13,859	12,495
Training	9,295	10,003	9,916	10,539	10,666

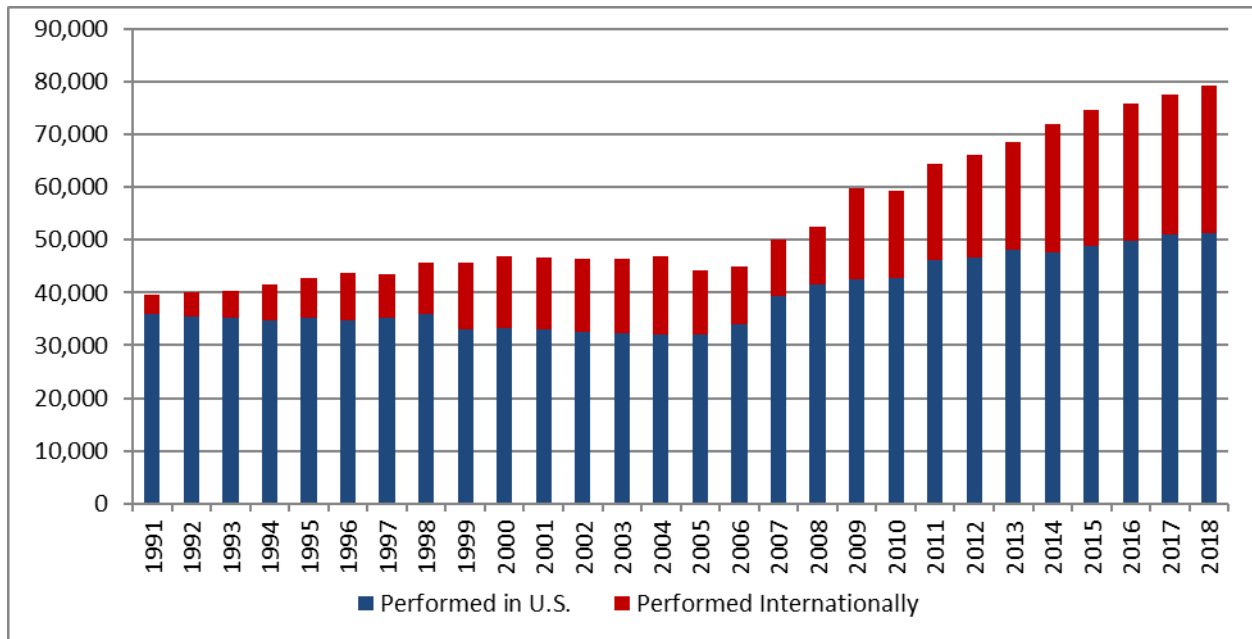


2018 Eye Banking Statistics Reported by U.S. Banks: Use of Donated Tissues



Surgical Outcomes of Corneas Recovered for Transplant Use - U.S. Eye Banks									
Surgery Type	2011	2012	2013	2014	2015	2016	2017	2018	Trend
PK	36,144	36,716	36,998	38,919	39,554	38,413	38,262	36,028	
EK	23,287	25,025	27,298	28,961	30,710	32,221	33,398	35,071	
ALK	1,778	1,855	2,009	1,953	2,201	2,386	2,541	2,355	
KLA	95	97	110	88	107	97	104	87	
K-Pro	358	263	255	294	364	313	344	243	
Shunt Patch	604	676	687	755	527	917	1,368	1,058	
Other Keratoplasty	14	44	17	17	19	65	232	64	
Unknown	2,223	1,554	1,068	1,026	1,142	1,514	1,568	4,301	
Long-term Preserved	3,017	2,454	4,294	4,420	4,681	7,068	6,718	6,263	

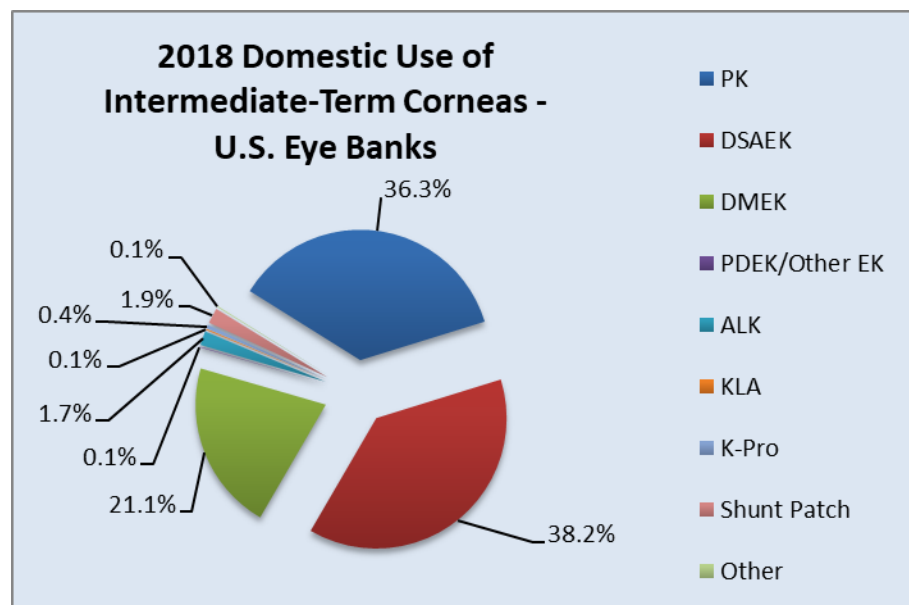
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Annual Number of Corneal Transplants Supplied by U.S. Banks



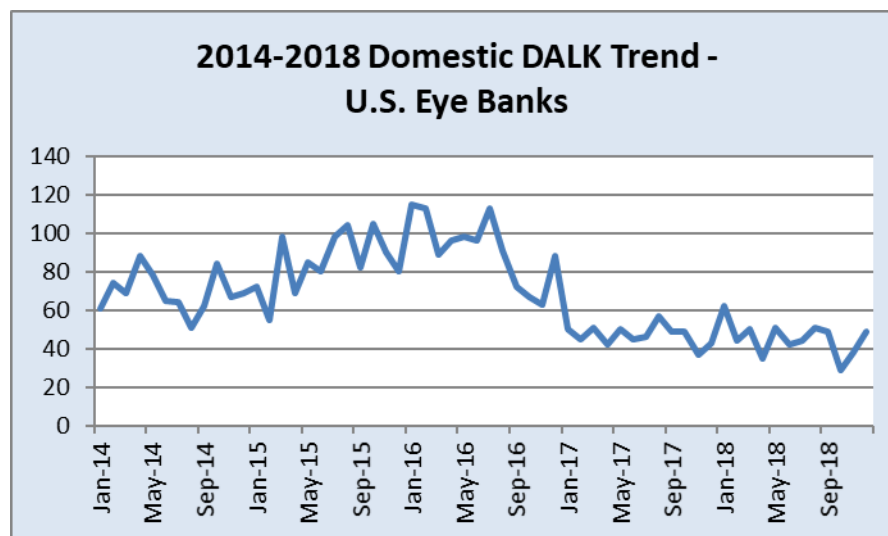
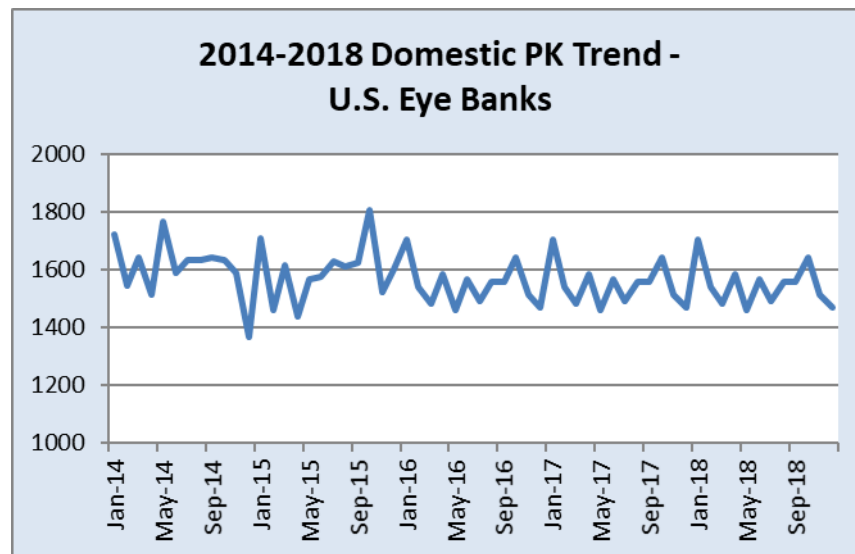
Year	Total Provided by U.S.	Performed in U.S.	Performed Internationally
1991	39,515	35,831	3,684
1992	39,973	35,525	4,448
1993	40,215	35,173	5,042
1994	41,539	34,842	6,697
1995	42,740	35,300	7,440
1996	43,711	34,668	9,043
1997	43,492	35,209	8,283
1998	45,579	35,861	9,718
1999	45,765	33,020	12,745
2000	46,949	33,260	13,689
2001	46,532	33,035	13,497
2002	46,440	32,559	13,881
2003	46,436	32,240	14,196
2004	46,841	32,106	14,735
2005	44,329	31,952	12,377
2006	45,035	33,962	11,073
2007	50,122	39,391	10,731
2008	52,487	41,652	10,835
2009	59,784	42,606	17,178
2010	59,271	42,642	16,629
2011	67,590	46,196	18,307
2012	68,681	46,684	19,546
2013	72,736	48,229	20,213
2014	76,431	47,530	24,483
2015	79,304	48,792	25,832
2016	82,994	49,869	26,057
2017	84,297	50,934	26,645
2018	85,441	51,294	27,913

2018 Eye Banking Statistics Reported by U.S. Banks: Domestic Surgery Use of Intermediate-Term Preserved Tissue

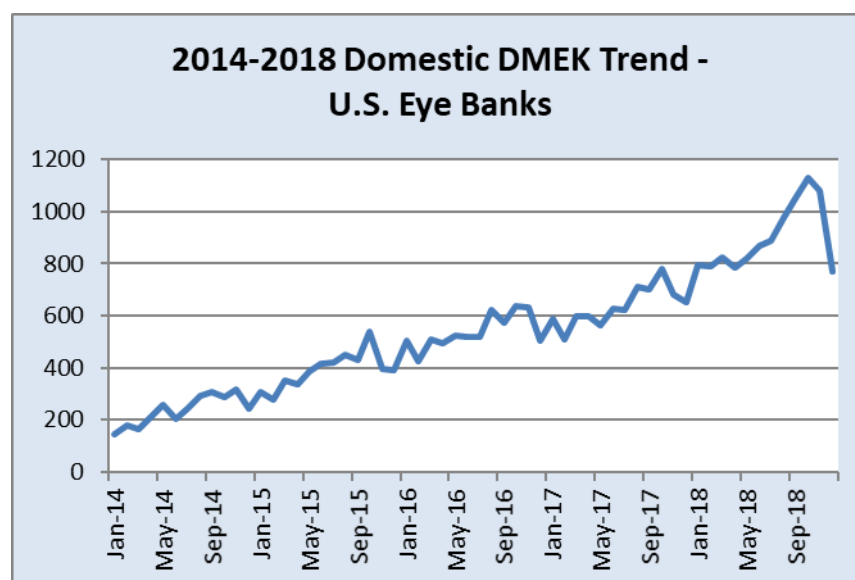
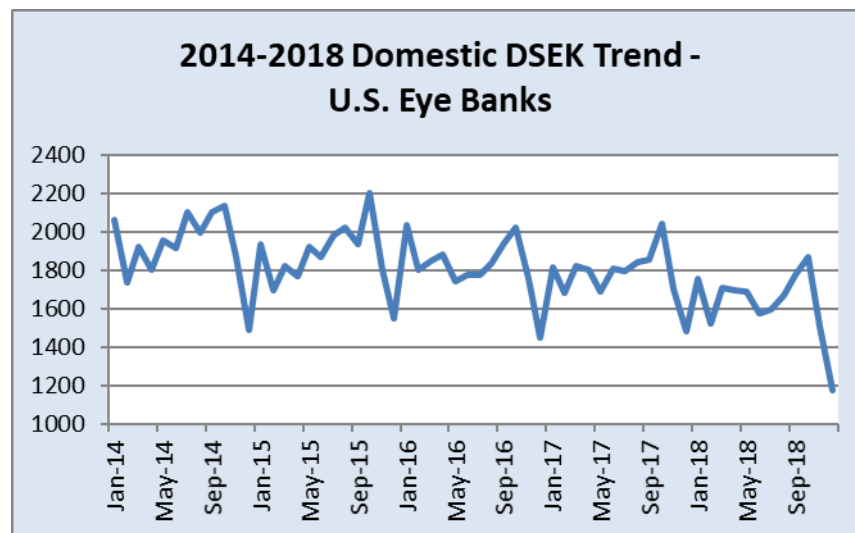
	2017	2018
Intermediate-term preserved corneas processed into corneal segments	0	27
Number of intermediate-term preserved corneas segments produced	0	56
Intermediate-term preserved corneas, corneal segments or whole eyes transplanted in the U.S for:	50,934	51,294
PK	18,346	17,347
EK	28,993	30,336
DSEK, DSAEK, DLEK	21,337	19,526
DMEK or DMAEK	7,628	10,773
PDEK	21	26
Other EK	7	11
ALK	1,027	884
DALK (Deep Anterior Lamellar Keratoplasty)	564	544
SALK (Superficial Anterior Lamellar Keratoplasty)	43	19
Other ALK (e.g. peripheral, eccentric, etc.)	420	321
KLA	93	68
Keratoprosthesis (K-Pro)	304	225
Glaucoma shunt patch or other non-keratoplasty use	1,326	979
Other Keratoplasty (e.g. experimental surgery type)	222	62
Unknown or Unspecified	623	1,393



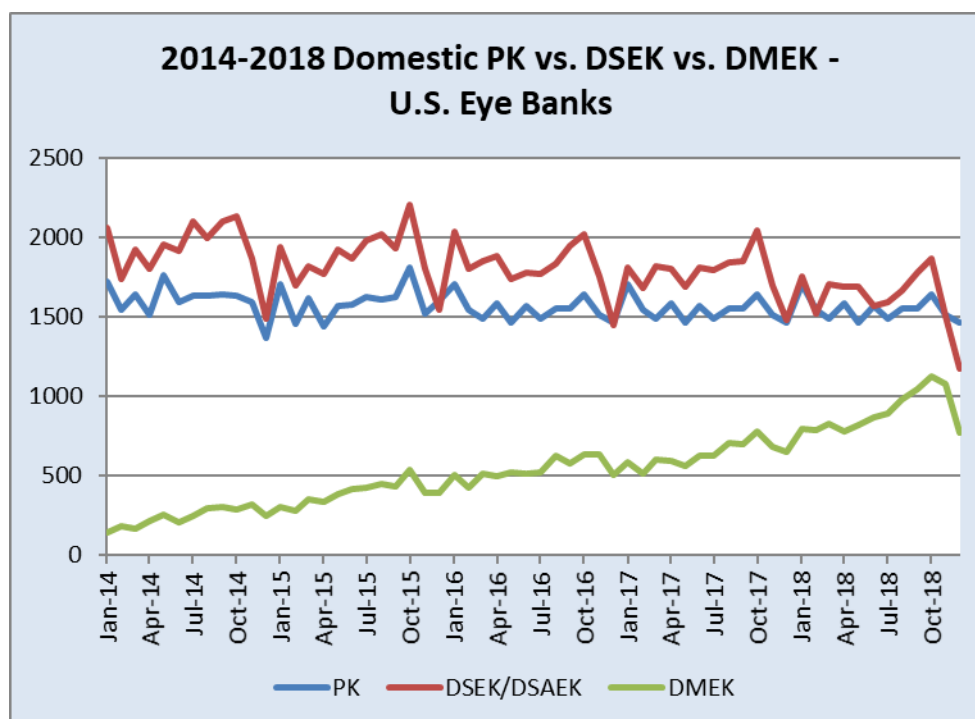
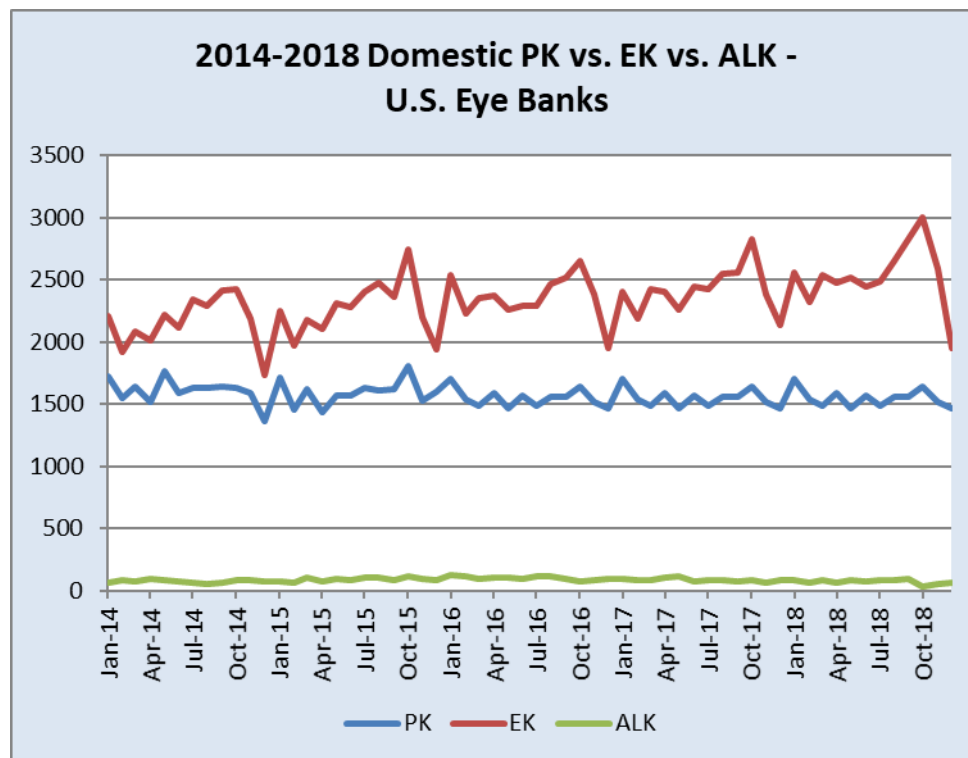
2018 Eye Banking Statistics Reported by U.S. Banks: Domestic Surgery Use of Intermediate-Term Preserved Tissue



2018 Eye Banking Statistics Reported by U.S. Banks: Domestic Surgery Use of Intermediate-Term Preserved Tissue

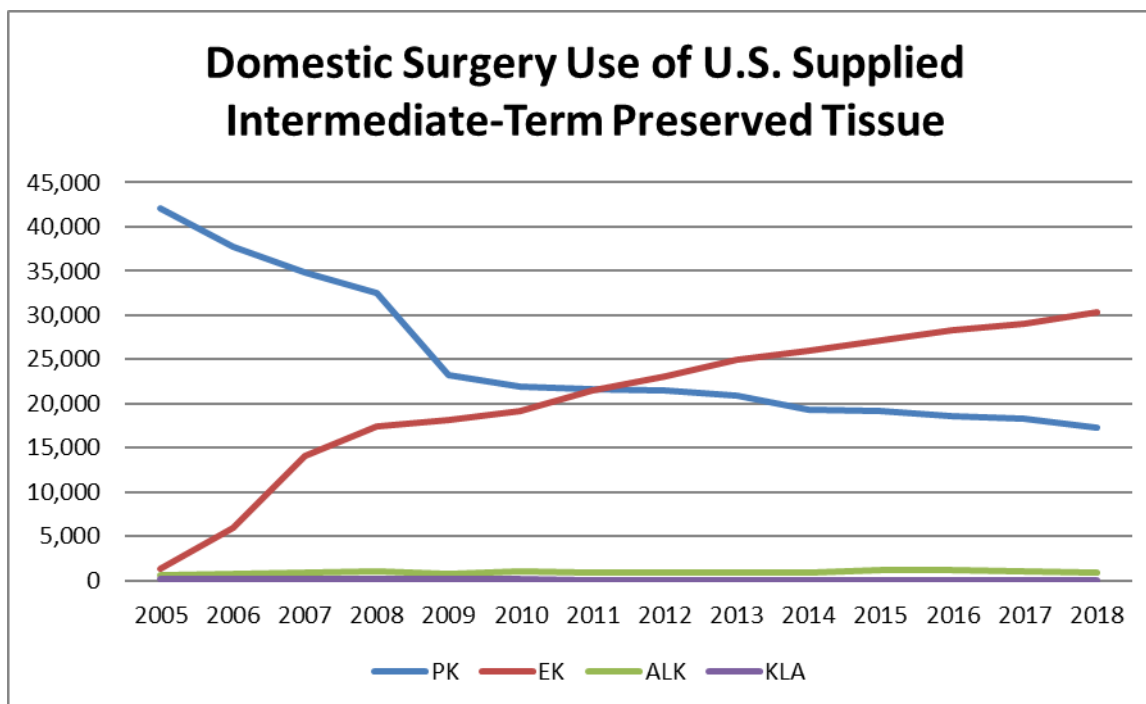


2018 Eye Banking Statistics Reported by U.S. Banks: Domestic Surgery Use of Intermediate-Term Preserved Tissue



Eye Banking Statistics Reported by U.S. Banks: Domestic Use of Intermediate-Term Preserved Tissues Annual Comparison 2005 - 2018

Domestic Surgery Use	2010	2011	2012	2013	2014	2015	2016	2017	2018
Penetrating Keratoplasty	21,970	21,620	21,422	20,954	19,294	19,160	18,579	18,346	17,347
Endothelial Keratoplasty	19,159	21,555	23,049	24,987	25,965	27,208	28,327	28,993	30,336
Anterior Lamellar Keratoplasty	1,041	932	883	951	914	1,115	1,232	1,027	884
Keratolimbal Allograft	130	69	80	91	80	97	82	93	68
K-Pro	342	332	236	223	260	323	279	304	225



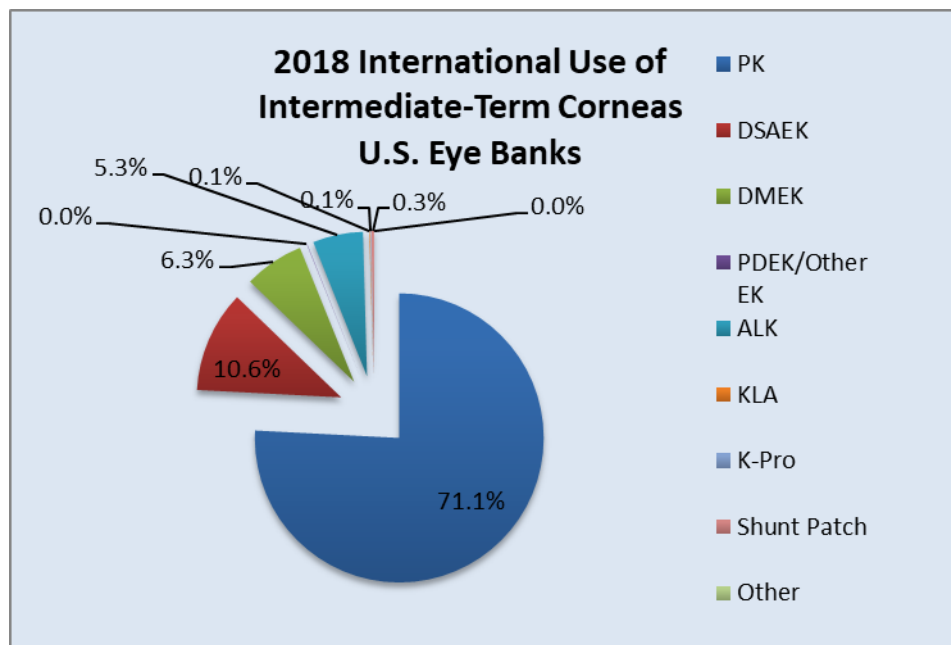
2018 Eye Banking Statistics Reported by U.S. Banks: Domestic Surgery Use of Intermediate-Term Preserved Tissue

Surgery Type (Domestically Distributed Corneas) - U.S. Eye Banks												
Month	PK	EK (DSEK)	EK (DMEK)	EK (Other)	ALK (DALK)	ALK (SALK)	ALK (Other)	KLA	K-Pro	Shunt Patch	Other	Unknown
Jan. 2018	39.2%	40.4%	18.3%	0.0%	1.4%	0.0%	0.5%	0.2%	0.3%	2.8%	0.0%	0.8%
Feb. 2018	38.5%	38.0%	19.7%	0.2%	1.1%	0.1%	0.4%	0.1%	0.5%	1.7%	0.0%	1.8%
Mar. 2018	34.2%	39.3%	19.0%	0.0%	1.2%	0.0%	0.9%	0.2%	0.5%	2.1%	0.1%	2.9%
Apr. 2018	37.9%	40.5%	18.7%	0.0%	0.8%	0.0%	0.8%	0.0%	0.5%	2.0%	0.3%	2.2%
May 2018	34.4%	39.7%	19.3%	0.1%	1.2%	0.1%	0.7%	0.1%	0.5%	2.1%	0.4%	3.7%
Jun. 2018	38.5%	38.5%	21.2%	0.0%	1.0%	0.0%	0.7%	0.1%	0.4%	2.0%	0.4%	3.3%
Jul. 2018	34.6%	37.0%	20.6%	0.0%	1.0%	0.0%	1.0%	0.1%	0.4%	1.8%	0.0%	3.2%
Aug. 2018	34.3%	36.8%	21.6%	0.1%	1.1%	0.0%	0.8%	0.2%	0.5%	1.6%	0.0%	3.4%
Sep. 2018	33.7%	38.4%	22.7%	0.0%	1.1%	0.1%	0.8%	0.1%	0.5%	1.3%	0.1%	2.7%
Oct. 2018	34.4%	39.0%	23.6%	0.1%	0.6%	0.0%	0.1%	0.1%	0.4%	1.8%	0.1%	2.1%
Nov. 2018	35.1%	35.0%	25.0%	0.0%	0.9%	0.0%	0.3%	0.1%	0.3%	1.6%	0.1%	3.1%
Dec. 2018	41.6%	33.2%	21.9%	0.1%	1.4%	0.0%	0.3%	0.3%	0.5%	2.2%	0.0%	3.3%
2014 Avg.	40.6%	48.6%	6.0%	N/A	1.8%	0.0%	0.1%	0.2%	0.5%	1.5%	0.0%	0.6%
2015 Avg.	39.3%	46.1%	9.6%	N/A	2.1%	0.1%	0.1%	0.2%	0.7%	0.9%	0.0%	0.9%
2016 Avg.	37.3%	43.9%	13.0%	N/A	2.2%	0.0%	0.2%	0.2%	0.6%	1.6%	0.1%	1.0%
2017 Avg.	36.5%	41.9%	15.0%	0.1%	1.1%	0.1%	0.8%	0.2%	0.6%	2.6%	0.4%	1.2%
2018 Avg.	36.2%	38.1%	21.0%	0.1%	1.1%	0.0%	0.6%	0.1%	0.4%	1.9%	0.1%	2.7%
Std. Dev.	2.6%	2.2%	2.1%	0.1%	0.2%	0.0%	0.3%	0.1%	0.1%	0.4%	0.1%	0.8%

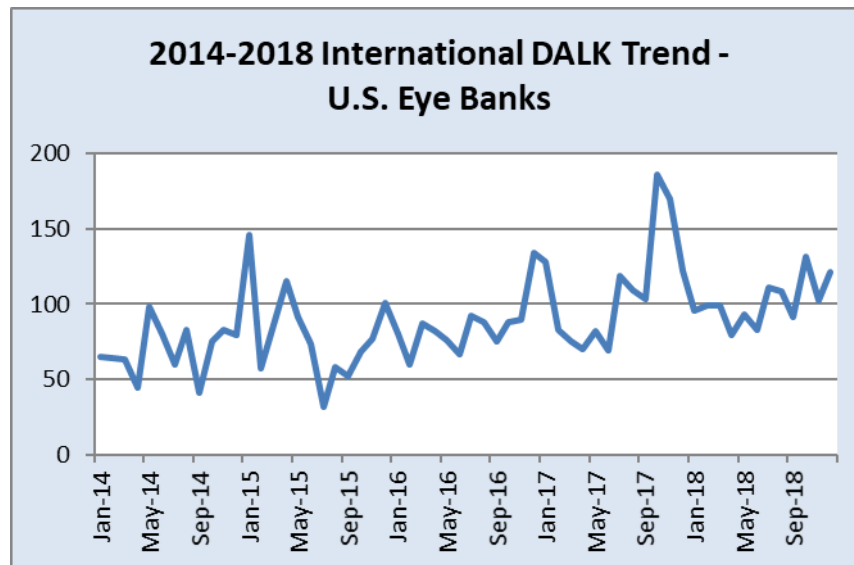
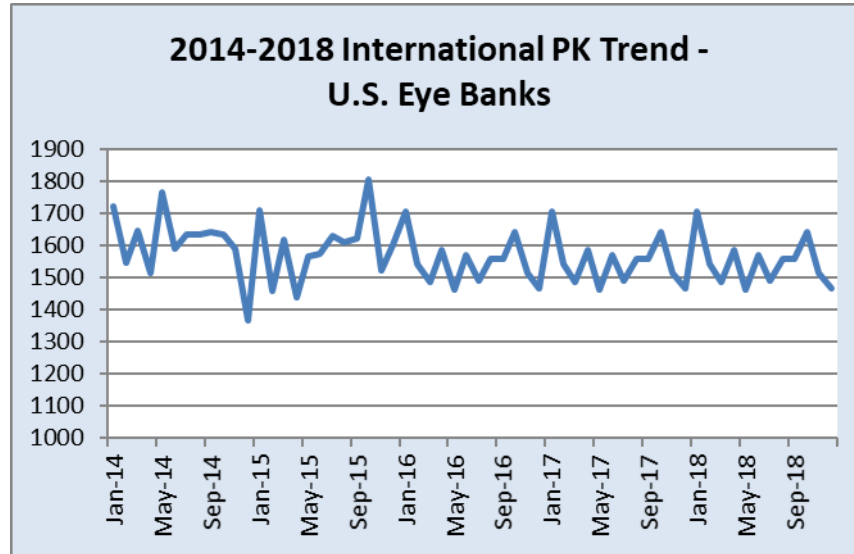
*Percentages read from this table should be read as "of the tissue distributed for transplant use domestically"

2018 Eye Banking Statistics Reported by U.S. Banks: International Surgery Use of Intermediate-Term Preserved Tissue

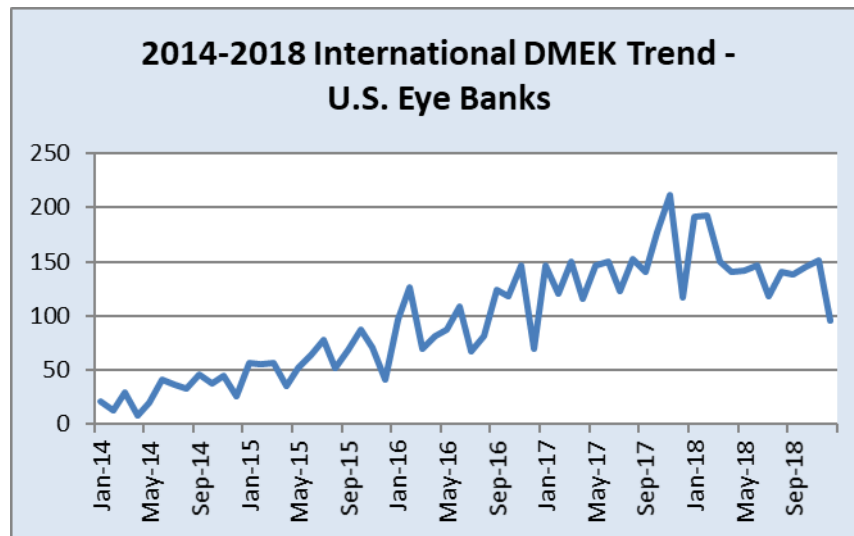
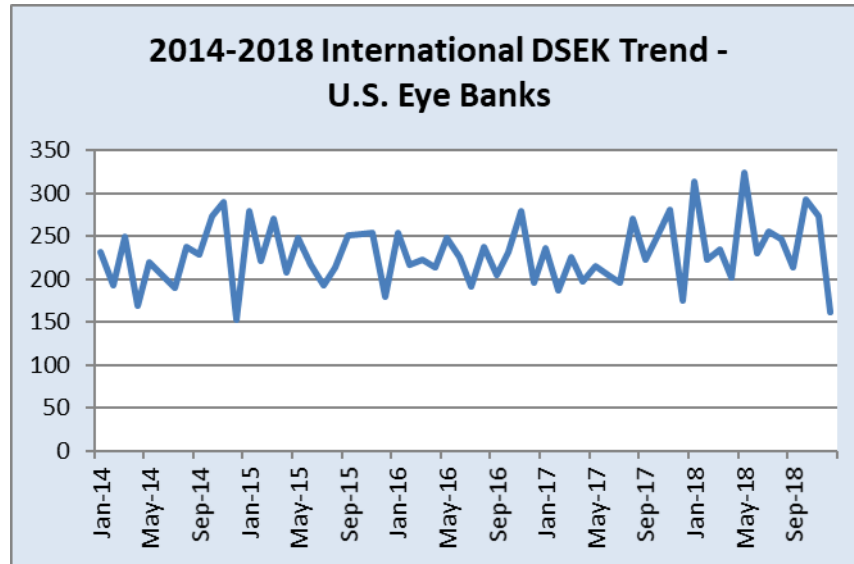
International Use of Intermediate-Term Corneas – U.S. Eye Banks		
	2017	2018
Intermediate-term preserved corneas, corneal segments or whole eyes transplanted internationally for:		
PK	19,679	18,681
EK	4,404	4,735
DSEK, DSAEK, DLEK	2,654	2,971
DMEK or DMAEK	1,749	1,751
PDEK	0	0
Other EK	1	13
ALK	1,514	1,471
DAEK (Deep Anterior Lamellar Keratoplasty)	1,316	1,213
SALK (Superficial Anterior Lamellar Keratoplasty)	20	33
Other ALK (e.g. peripheral, eccentric, etc.)	178	225
KLA	11	19
Keratoprosthesis (K-Pro)	40	18
Glaucoma shunt patch or other non-keratoplasty use	42	79
Other Keratoplasty (e.g. experimental surgery type)	10	2
Unknown or Unspecified	945	2,908
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for KERATOPLASY	76,211	78,149
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for TRANSPLANT	77,579	79,178



2018 Eye Banking Statistics Reported by U.S. Banks: International Surgery Use of Intermediate-Term Preserved Tissue



2018 Eye Banking Statistics Reported by U.S. Banks: International Surgery Use of Intermediate-Term Preserved Tissue



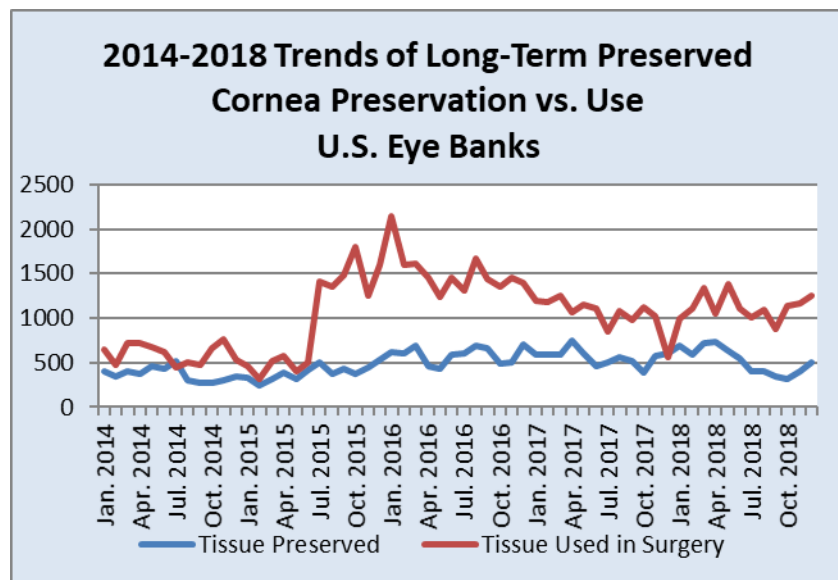
2018 Eye Banking Statistics Reported by U.S. Banks: International Surgery Use of Intermediate-Term Preserved Tissue

Surgery Type (Internationally Distributed Corneas) - U.S. Eye Banks												
Month	PK	EK (DSEK)	EK (DMEK)	EK (Other)	ALK (DALK)	ALK (SALK)	ALK (Other)	KLA	K- Pro	Shunt Patch	Other	Unknown
Jan. 2018	73.7%	12.4%	7.6%	0.2%	3.8%	0.0%	0.4%	0.1%	0.1%	0.2%	0.0%	7.2%
Feb. 2018	80.6%	10.0%	8.7%	0.0%	4.4%	0.0%	0.4%	0.0%	0.0%	0.2%	0.0%	8.4%
Mar. 2018	67.3%	9.2%	5.9%	0.0%	3.9%	0.0%	0.9%	0.0%	0.0%	0.4%	0.0%	9.9%
Apr. 2018	75.9%	9.3%	6.5%	0.0%	3.6%	0.1%	0.3%	0.0%	0.0%	0.1%	0.0%	7.4%
May 2018	72.6%	13.4%	5.9%	0.0%	3.9%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	8.5%
Jun. 2018	68.4%	11.1%	7.1%	0.0%	4.0%	0.0%	0.4%	0.0%	0.0%	0.1%	0.0%	10.5%
Jul. 2018	77.6%	11.5%	5.3%	0.2%	5.0%	0.0%	0.7%	0.1%	0.1%	0.4%	0.0%	9.3%
Aug. 2018	74.9%	11.3%	6.4%	0.1%	4.9%	0.2%	0.4%	0.1%	0.0%	0.2%	0.0%	9.3%
Sep. 2018	63.9%	10.2%	6.6%	0.0%	4.4%	0.2%	0.8%	0.1%	0.0%	0.4%	0.0%	13.8%
Oct. 2018	64.3%	11.6%	5.7%	0.0%	5.2%	0.2%	2.2%	0.2%	0.1%	0.7%	0.0%	11.2%
Nov. 2018	67.5%	11.1%	6.1%	0.0%	4.1%	0.2%	1.7%	0.1%	0.2%	0.4%	0.0%	12.8%
Dec. 2018	67.4%	6.5%	3.9%	0.0%	4.9%	0.4%	0.8%	0.0%	0.0%	0.3%	0.0%	16.4%
2014 Avg.	80.2%	0.7%	10.8%	N/A	3.4%	0.0%	0.8%	0.0%	0.1%	0.2%	0.0%	3.0%
2015 Avg.	78.9%	1.0%	10.8%	N/A	3.7%	0.1%	0.4%	0.0%	0.2%	0.3%	0.0%	2.8%
2016 Avg.	76.1%	10.4%	4.5%	N/A	3.9%	0.1%	0.5%	0.1%	0.1%	0.4%	0.0%	3.9%
2017 Avg.	74.4%	10.0%	6.6%	0.0%	4.9%	0.1%	0.7%	0.0%	0.2%	0.2%	0.0%	3.5%
2018 Avg.	71.1%	10.6%	6.3%	0.0%	4.3%	0.1%	0.8%	0.1%	0.1%	0.3%	0.0%	10.4%
Std. Dev.	5.4%	1.8%	1.2%	0.1%	0.5%	0.1%	0.6%	0.1%	0.1%	0.2%	0.0%	2.8%

*Percentages read from this table should be read as "of the tissue distributed for transplant use internationally"

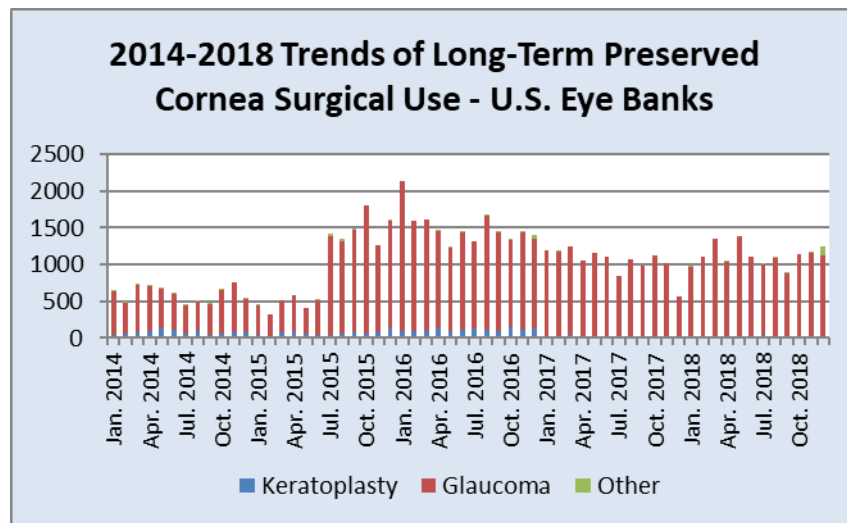
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Long-Term Preserved Tissue Distribution

Long-Term Preserved Tissue Preservation and Distribution		
	2017	2018
Long-term preserved corneas or whole globes PRESERVED for transplant	6,718	6,263
Long-term preserved corneas, corneal segments, or whole globes DISTRIBUTED for:	12,543	13,521
Keratoplasty	197	298
Glaucoma Shunt patching	12,345	13,066
Other Surgical Uses	1	157
Long-term preserved corneas, corneal segments, or whole globes FORWARDED to another entity for final distribution	540	789
Sclera or sclera segments PRESERVED for transplantation	3,139	4,332
Sclera or sclera segments DISTRIBUTED for:	3,253	2,959
Prosthesis following enucleation	523	515
Glaucoma shunt patching	2,266	1,900
Other surgical uses	464	544
Sclera or sclera segments FORWARDED to another entity for final distribution	258	172

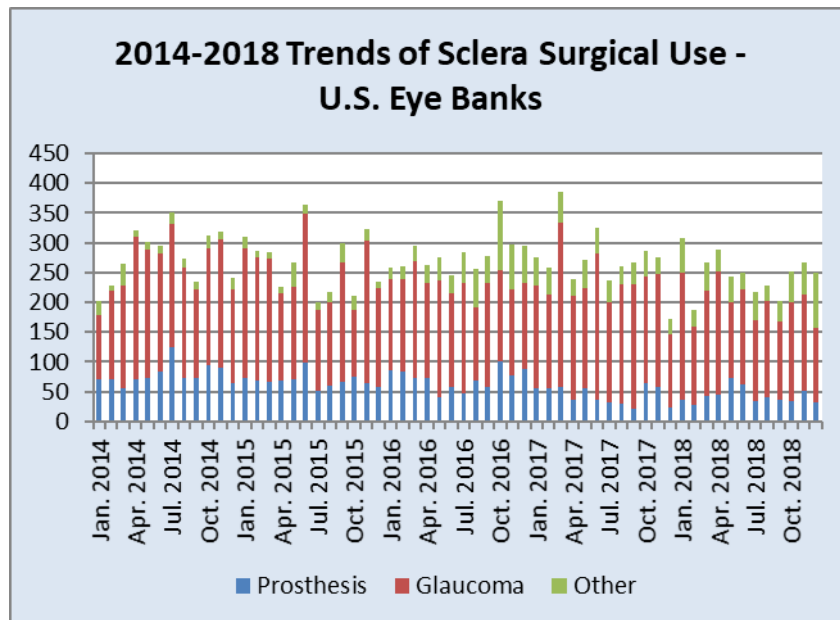
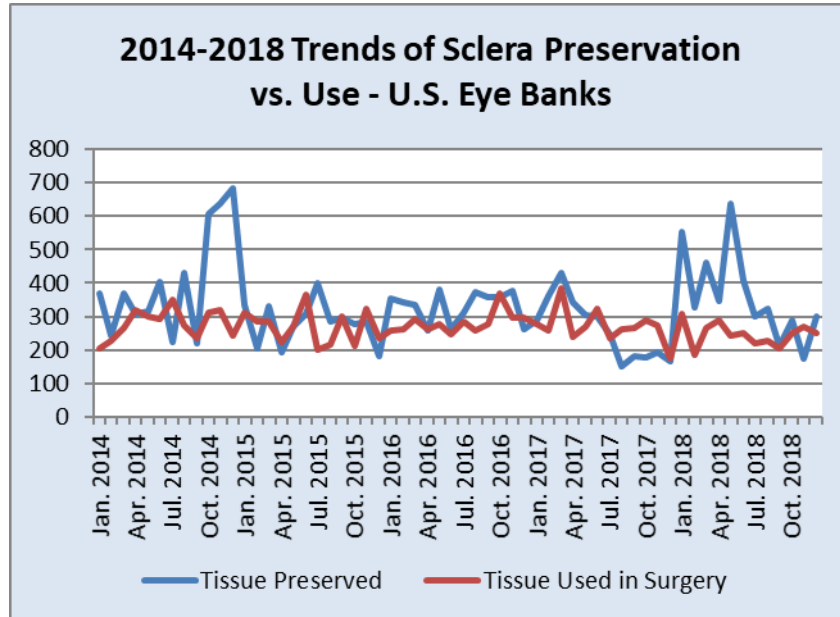


2018 Eye Banking Statistics Reported by U.S. Banks: Long-Term Preserved Tissue Distribution




Long-Term Tissue Trends - U.S. Eye Banks								
Month	Long-Term Preserved Corneas	Long-Term Cornea Use - Keratoplasty	Long-Term Cornea Use - Glaucoma	Long-Term Cornea Use - Other	Scleral Segments Preserved	Sclera Use - Prosthesis	Sclera Use - Glaucoma	Sclera Use - Other
Jan. 2018	686	25	944	18	553	36	214	57
Feb. 2018	583	24	1,079	0	326	28	131	28
Mar. 2018	715	28	1,314	0	463	42	178	46
Apr. 2018	732	17	1,026	5	348	44	208	36
May 2018	635	33	1,352	0	637	73	127	43
Jun. 2018	552	15	1,099	0	407	63	158	28
Jul. 2018	404	42	961	4	301	35	136	47
Aug. 2018	402	30	1,064	3	325	40	162	26
Sep. 2018	337	17	857	5	211	36	132	35
Oct. 2018	308	16	1,124	0	289	34	166	52
Nov. 2018	405	24	1,143	1	172	51	163	54
Dec. 2018	504	27	1,103	121	300	33	125	92
2014 Total	4,420	938	6,212	73	4,810	939	2,199	207
2015 Total	4,681	737	10,843	92	3,362	822	2,175	228
2016 Total	7,068	1,335	16,683	115	3,990	852	1,944	584
2017 Total	6,718	197	12,345	1	3,139	523	2,266	464
2018 Total	6,263	298	13,066	157	4,332	515	1,900	544
2018 Avg.	522	25	1,089	13	361	43	158	45
Std. Dev.	150	8	141	34	134	13	30	18

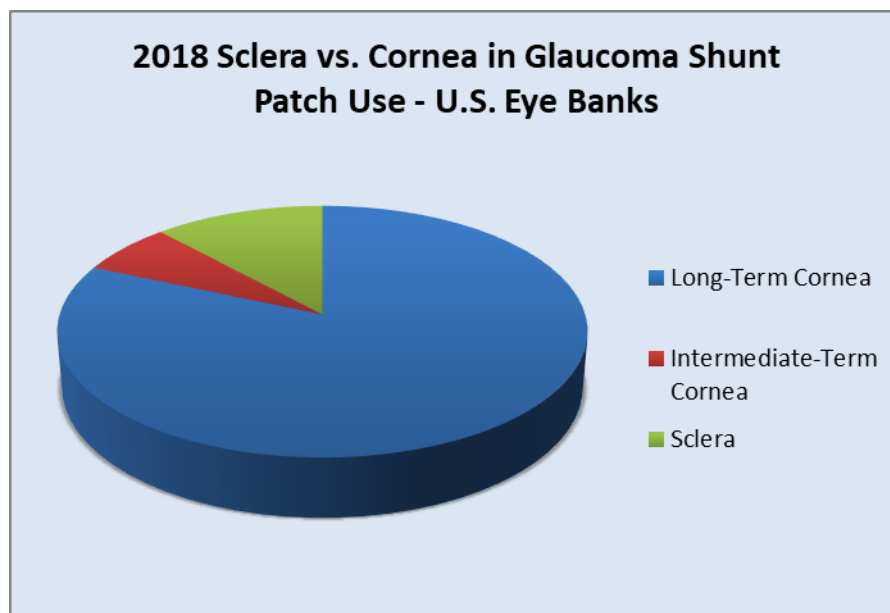
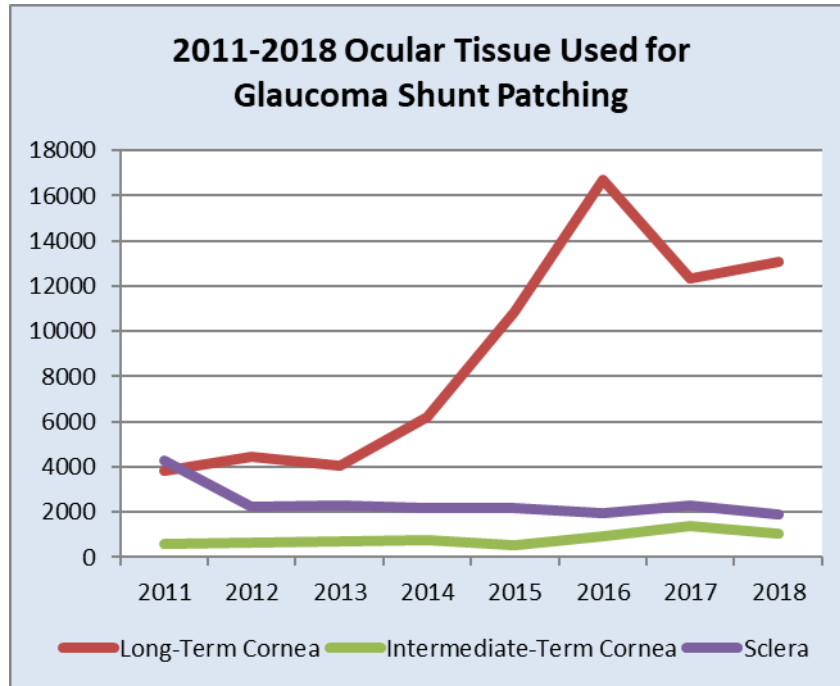


2018 Eye Banking Statistics Reported by U.S. Banks: Long-Term Preserved Tissue Distribution



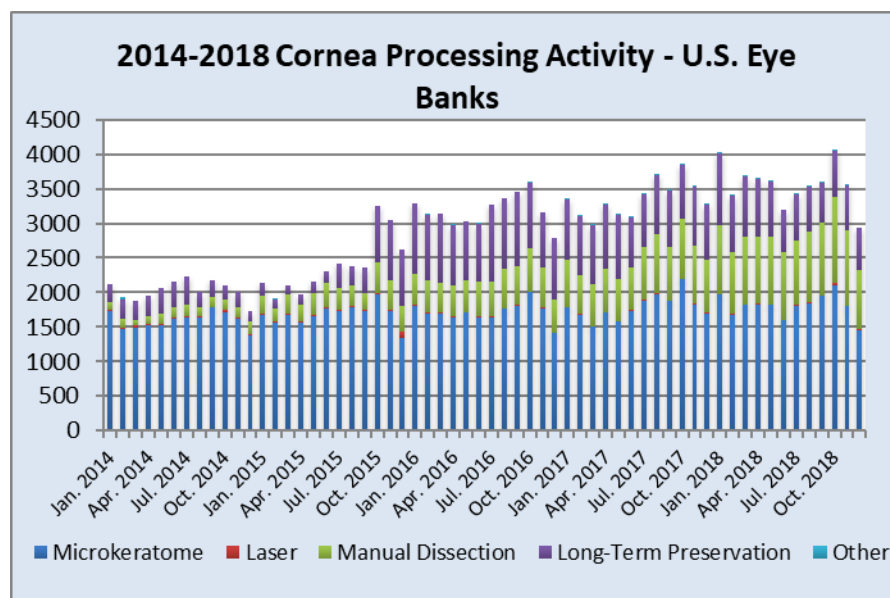
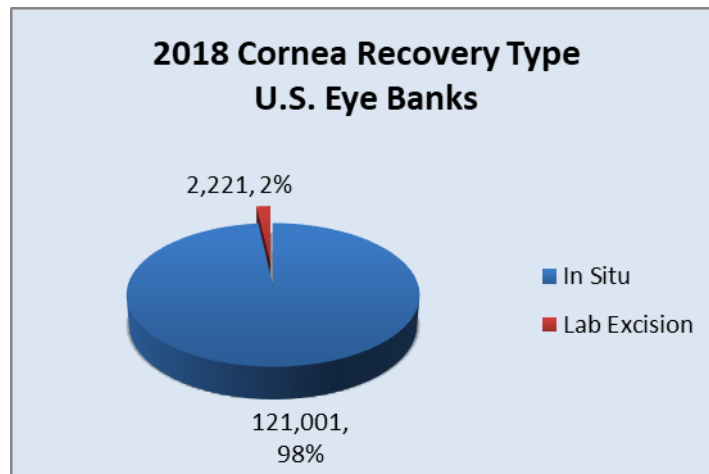
2018 Eye Banking Statistics Reported by U.S. Banks: Long-Term Preserved Tissue Distribution

Ocular Tissue Used for Glaucoma Shunt Patching - U.S. Eye Banks									
Ocular Tissue Used for Glaucoma Shunt Patching	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Long-Term Cornea	3,802	4,435	4,040	6,212	10,843	16,683	12,345	0	
Intermediate-Term Cornea	604	676	687	755	527	917	1,368	1,058	
Sclera	4,285	2,260	2,293	2,199	2,175	1,944	2,266	0	






2018 Eye Banking Statistics Reported by U.S. Banks: Tissue Processing for Transplant



Tissue Processing for Transplant		
	2017	2018
Eye Processing (does not include in situ excision)	2,855	2,221
Processed for corneal preservation only	576	323
Processed for sclera preservation	2,161	1,866
Processed for other ocular materials	118	32
Cornea Processing	40,167	42,650
Processed by microkeratome	21,409	21,683
Processed by laser	151	124
Processed by hand dissection	8,528	11,994
Processed by transfer into long-term preservation	10,019	8,803
Processed by other methods	60	46



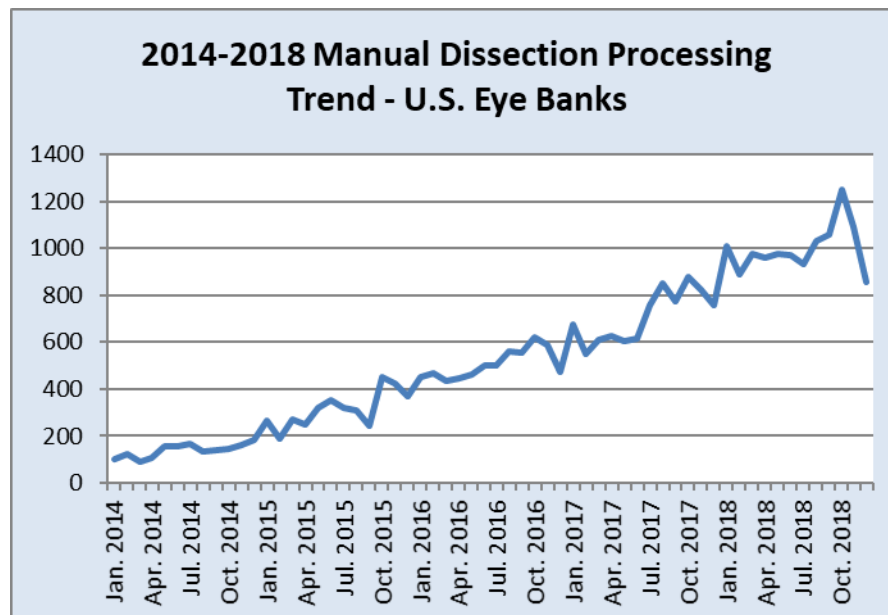
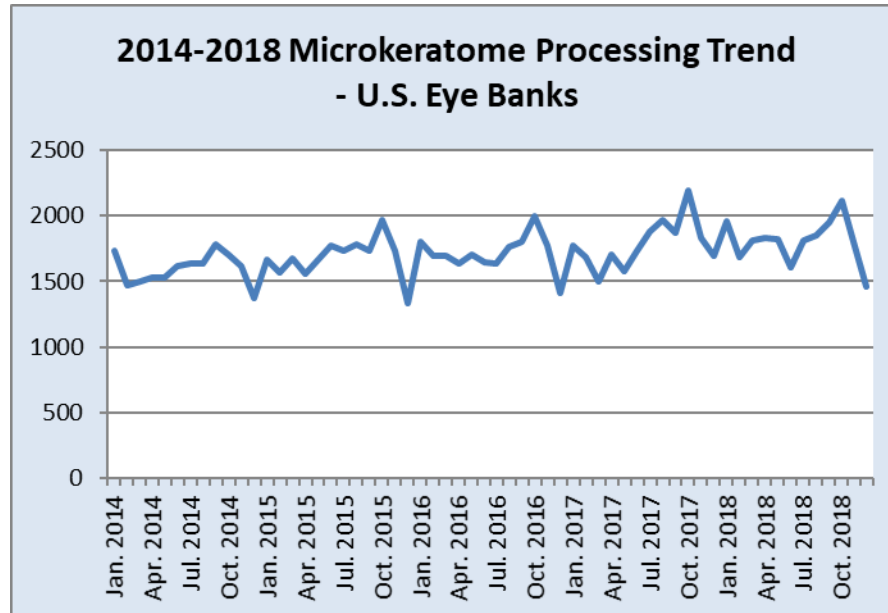
2018 Eye Banking Statistics Reported by U.S. Banks: Tissue Processing for Transplant

Cornea Processing - U.S. Eye Banks					
Month	Processing - Microkeratome	Processing - Laser	Processing - Manual	Processing - Long-Term Preservation	Processing - Other
Jan. 2018	1,963	10	1,007	1,032	5
Feb. 2018	1,680	16	888	818	1
Mar. 2018	1,815	10	976	874	5
Apr. 2018	1,829	11	960	836	1
May 2018	1,817	9	975	802	2
Jun. 2018	1,602	6	969	620	0
Jul. 2018	1,809	12	931	662	7
Aug. 2018	1,848	6	1,031	649	3
Sep. 2018	1,949	7	1,061	575	2
Oct. 2018	2,110	22	1,251	663	19
Nov. 2018	1,802	10	1,089	653	1
Dec. 2018	1,459	5	856	619	0
2014 Total	19,124	232	1,649	3,304	38
2015 Total	20,193	262	3,759	4,440	6
2016 Total	20,604	154	6,071	11,346	5
2017 Total	21,409	151	8,528	10,019	60
2018 Total	21,683	124	11,994	8,803	46
2018 Avg.	1,807	10	1,000	734	4
Std. Dev.	170	5	103	137	5

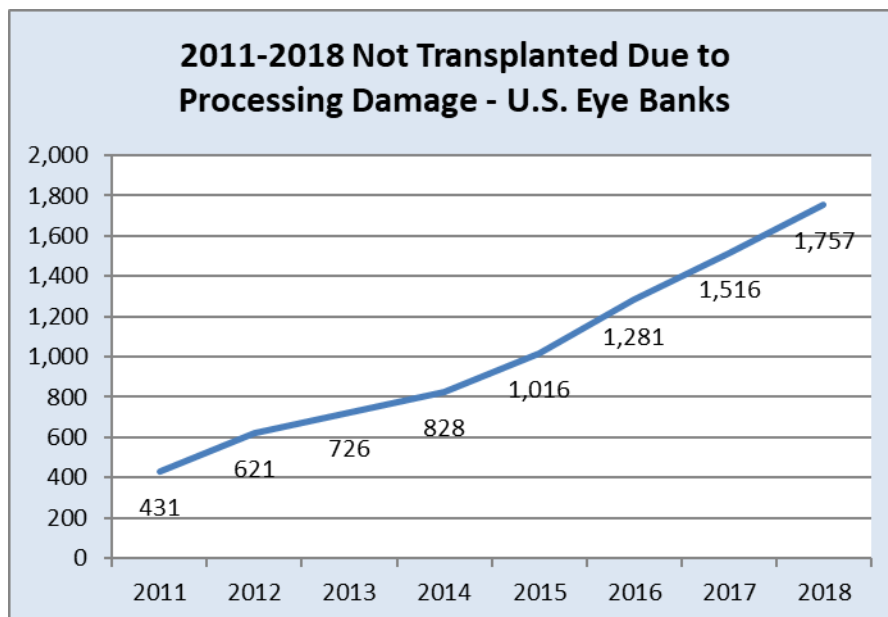
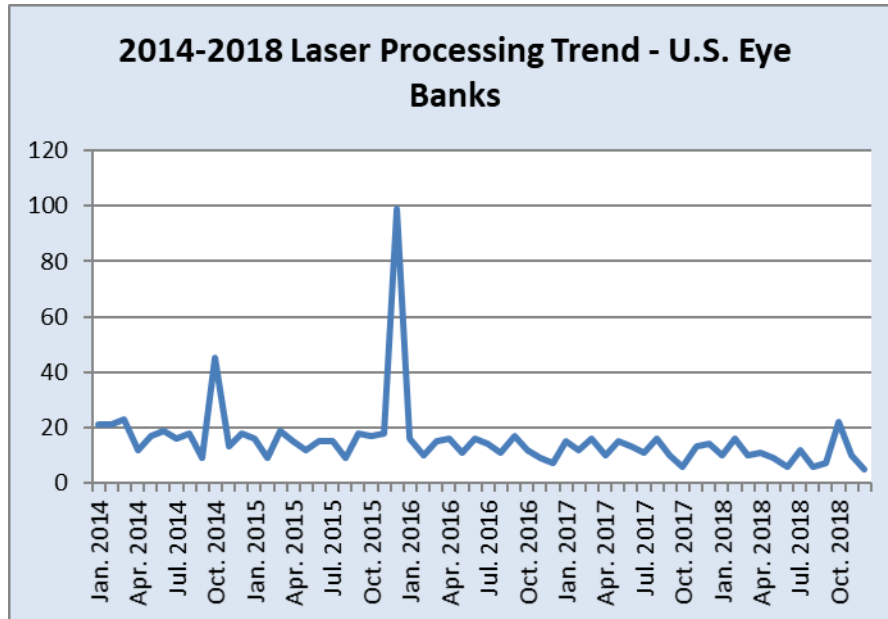
Cornea Processing Success Rates - U.S. Eye Banks									
	2011	2012	2013	2014	2015	2016	2017	2018	Trends
Processing Events	18,455	22,599	24,168	24,347	28,660	38,180	40,167	42,650	
Failed Processing	431	621	726	828	1,016	1,281	1,516	1,757	
Success Rate	97.7%	97.3%	97.0%	96.6%	96.5%	96.6%	96.2%	95.9%	

Cornea Recovery Methods - U.S. Eye Banks									
	2011	2012	2013	2014	2015	2016	2017	2018	Trends
In Situ	96,847	98,512	106,710	113,163	117,250	121,971	120,861	121,001	
Lab Excision	4,686	5,262	3,655	2,908	2,437	2,678	2,855	2,221	

2018 Eye Banking Statistics Reported by U.S. Banks: Tissue Processing for Transplant



2018 Eye Banking Statistics Reported by U.S. Banks: Tissue Processing for Transplant



2018 Eye Banking Statistics Reported by EBAA Members: Countries of Destination

NORTH AMERICA			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks - Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Antigua and Barbuda	1	0	1
Barbados	24	0	24
Canada	191	3241	3,432
Costa Rica	67	10	77
Curacao	13	0	13
Dominica	2	0	2
Dominican Republic	467	0	467
El Salvador	103	0	103
Guatemala	144	0	144
Haiti	4	0	4
Honduras	400	0	400
Jamaica	28	0	28
Mexico	1,337	0	1,337
Nicaragua	9	0	9
Saint Vincent	2	0	2
Trinidad and Tobago	31	0	31
United States	51,294	0	51,294
TOTAL	54,117	3,251	57,368

SOUTH AMERICA			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks - Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Argentina	501	0	501
Bolivia	145	0	145
Brazil	188	0	188
Chile	202	0	202
Colombia	2	0	2
Curacao	13	0	13
Ecuador	122	0	122
Guyana	21	0	21
Paraguay	8	0	8
Peru	235	0	235
Suriname	21	0	21
Uruguay	36	0	36
Venezuela	187	0	187
TOTAL	1,681	0	1,681

EUROPE			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks - Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Aland Islands	1	0	1
Albania	2	0	2
Bulgaria	5	0	5
Cyprus	9	0	9
Germany	1,301	13	1,314
Greece	203	0	203
Ireland	2	0	2
Italy	5	0	5
Latvia	14	0	14
Macedonia	34	0	34
Netherlands	16	0	16
Norway	44	0	44
Serbia	40	0	40
Switzerland	52	0	52
United Kingdom	50	0	50
TOTAL	1,778	13	1,791

AFRICA			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks- Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Algeria	416	0	416
Burundi	5	0	5
Congo	5	0	5
Djibouti	1,472	0	1,472
Egypt	4,882	0	4,882
Ethiopia	3	0	3
Ghana	96	0	96
Kenya	296	0	296
Liberia	13	0	13
Mali	3	0	3
Mauritius	48	0	48
Morocco	420	0	420
Mozambique	27	0	27
Namibia	13	0	13
Nigeria	153	0	153
Rwanda	25	0	25
Senegal	3	0	3
South Africa	911	0	911
Sudan	79	0	79
Tanzania	41	0	41
Tunisia	689	0	689
Uganda	52	0	52
Zambia	27	0	27
Zimbabwe	23	0	23
TOTAL	9,702	0	9,702

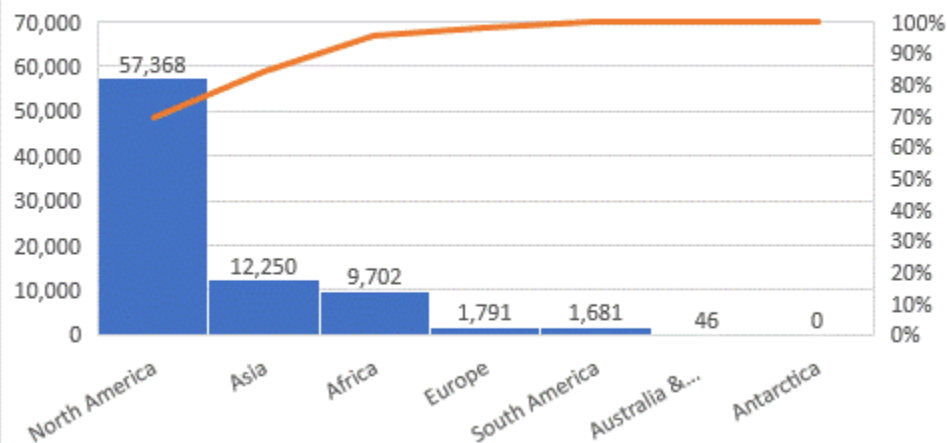
AUSTRALIA and OCEANIA			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks - Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Fiji	2	0	2
New Zealand	44	0	44
TOTAL	46	0	46

ASIA			
Country	US Member Eye Banks - Transplanted Corneas	Non-US Member Eye Banks- Transplanted Corneas	All EBAA Member Eye Banks - Transplanted Corneas
Afghanistan	58	0	58
Armenia	105	0	105
Azerbaijan	7	0	7
Bahrain	23	0	23
Bangladesh	362	0	362
Cambodia	9	0	9
China	1,281	11	1,292
Georgia	42	0	42
Hong Kong	84	217	301
India	315	0	315
Indonesia	34	0	34
Iraq	277	0	277
Israel	344	72	416
Japan	1,976	53	2,029
Jordan	248	0	248
Kazakhstan	65	0	65
Korea, North	2	0	2
Korea, South	603	0	603
Kuwait	90	0	90
Lebanon	437	0	437
Malaysia	344	0	344
Mongolia	19	0	19
Oman	27	0	27
Pakistan	1,590	14	1,604
Palestine	37	0	37
Qatar	19	0	19
Saudi Arabia	1,189	0	1,189
Singapore	405	0	405
Syrian Arab Republic	680	0	680
Taiwan	193	0	193
Tajikistan	22	0	22
Thailand	139	0	139
Turkey	327	0	327
United Arab Emirates	255	0	255
Uzbekistan	21	0	21
Viet Nam	254	0	254
TOTAL	11,883	367	12,250

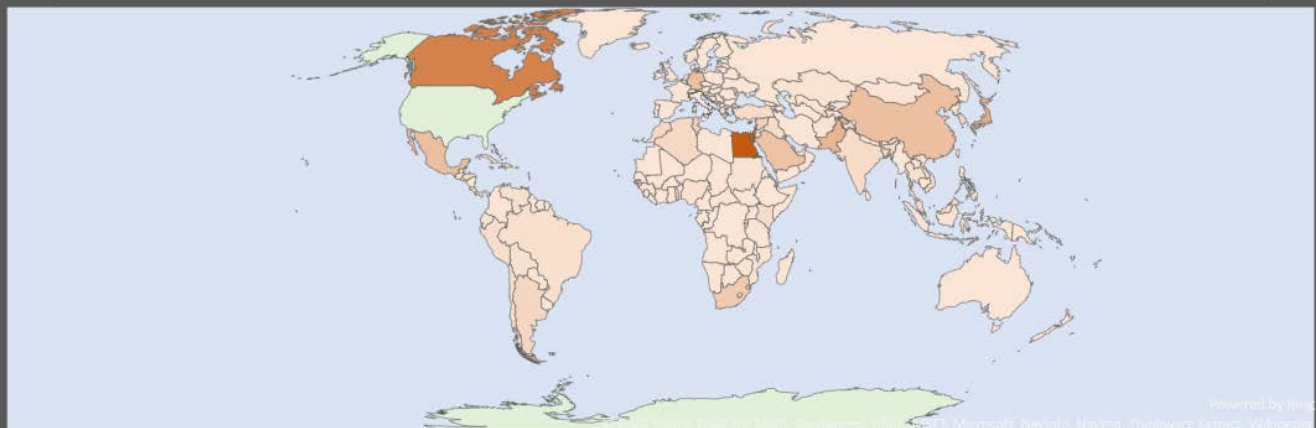
2018 Eye Banking Statistics Reported by EBAA Member Banks: Countries of Destination

EBAA Member Eye Bank Distribution by Continent (Transplanted Corneas Stored in Intermediate-Term Solution)			
Continent	U.S. EBAA Member Eye Bank	International EBAA Member Eye Bank	EBAA Member Total
Asia	11,883	367	12,250
Africa	9,702	0	9,702
North America	54,117	3,251	57,368
South America	1,681	0	1,681
Antarctica	0	0	0
Europe	1,778	13	1,791
Australia & Oceania	46	0	46
TOTAL	79,207	3,631	82,838

2018 EBAA Member Eye Bank Distribution of Transplant Corneas



International Distribution of Intermediate-Term Preserved Transplant Corneas (U.S. Omitted)



All EBAA Member Eye Banks - Transplanted Corneas

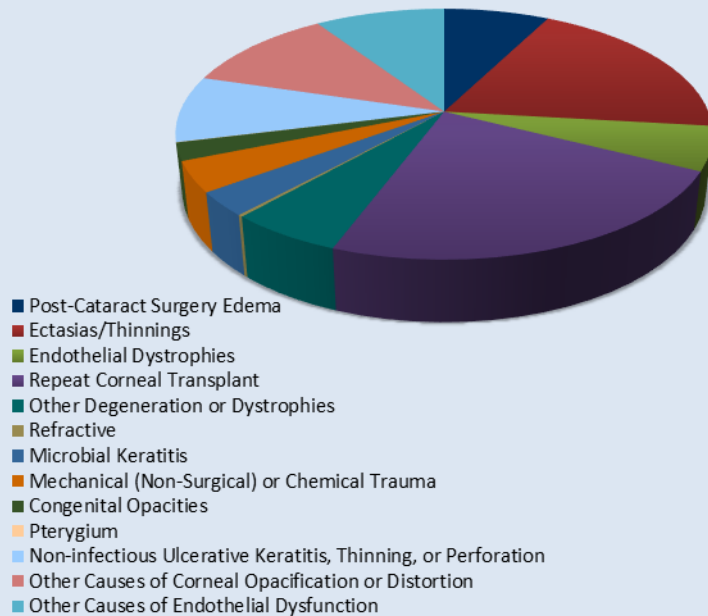
0 4,882

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks

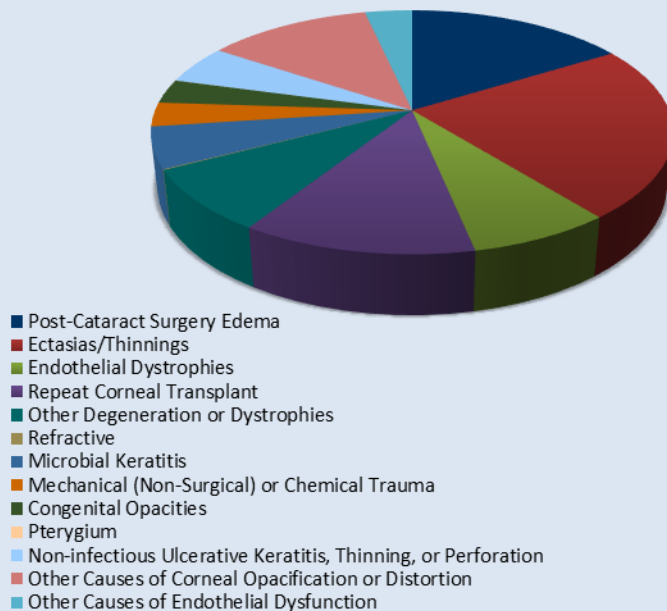
Indications for Penetrating Keratoplasty 2018	Domestic Use		International Use	
A. Post-cataract surgery edema	1,029	5.9%	1,028	5.5%
B. Ectasias/Thinnings	2,633	15.2%	1,465	7.8%
C. Endothelial Dystrophies	772	4.5%	479	2.6%
D. Repeat Corneal Transplant	3,166	18.3%	782	4.2%
E. Other degenerations or dystrophies	794	4.6%	526	2.8%
F. Refractive	33	0.2%	6	0.0%
G. Microbial keratitis	423	2.4%	346	1.9%
H. Mechanical or chemical trauma	537	3.1%	203	1.1%.
I. Congenital opacities	313	1.8%	203	1.1%
J. Pterygium	5	0.0%	1	0.0%
K. Non-infectious ulcerative keratitis or perforation	1,168	6.7%	328	1.8%
L. Other causes of corneal dysfunction or distortion	1,504	8.7%	770	4.1%
M. Other causes of endothelial dysfunction	1,268	7.3%	221	1.2%
Z. Unknown, unreported, or unspecified	3,703	21.3%	12,322	66.0%
Total Indications for Penetrating Keratoplasty	17,347		18,681	
Indications for Anterior Lamellar Keratoplasty	Domestic use		International Use	
B. Ectasias/Thinnings	333	37.7%	392	26.6%
D. Repeat Corneal Transplant	30	3.4%	15	1.0%
E. Other degenerations or dystrophies	73	8.3%	72	4.9%
F. Refractive	3	0.3%	0	0.0%
G. Microbial keratitis	10	1.1%	62	4.2%
H. Mechanical or chemical trauma	33	3.7%	3	0.2%
I. Congenital opacities	13	1.5%	12	0.8%
J. Pterygium	1	0.1%	0	0.0%
K. Non-infectious ulcerative keratitis or perforation	39	4.4%	20	1.4%
L. Other causes of corneal dysfunction or distortion	160	18.1%	73	5.0%
Z. Unknown, unreported, or unspecified	189	21.4%	822	55.9%
Total for Anterior Keratoplasty	884		1,471	
Indications for Endothelial Keratoplasty	Domestic Use		International Use	
A. Post-Cataract Surgery Edema	3,722	12.3%	1,067	22.5%
C. Endothelial Dystrophy	16,009	52.8%	924	19.5%
D. Repeat Corneal Transplant	2,770	9.1%	371	7.8%
M. Other Causes of Endothelial Dysfunction	4,019	13.2%	887	18.7%
Z. Unknown, unreported, or unspecified	3,816	12.6%	1,486	31.4%
Total for Endothelial Keratoplasty	30,336		4,735	

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks

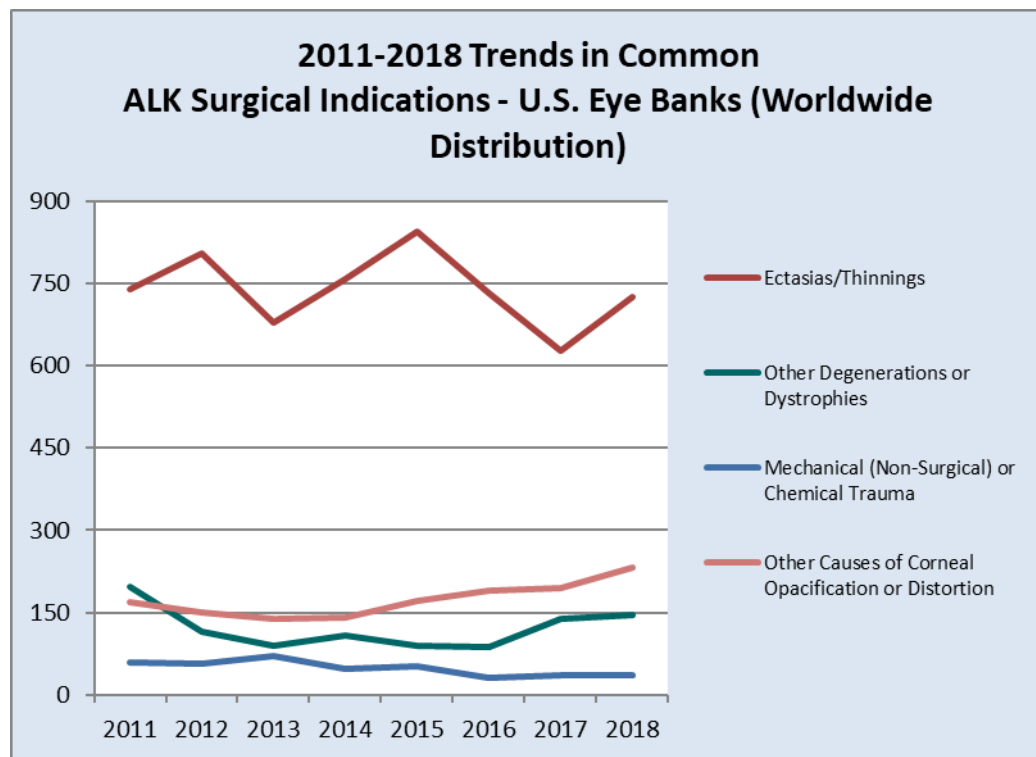
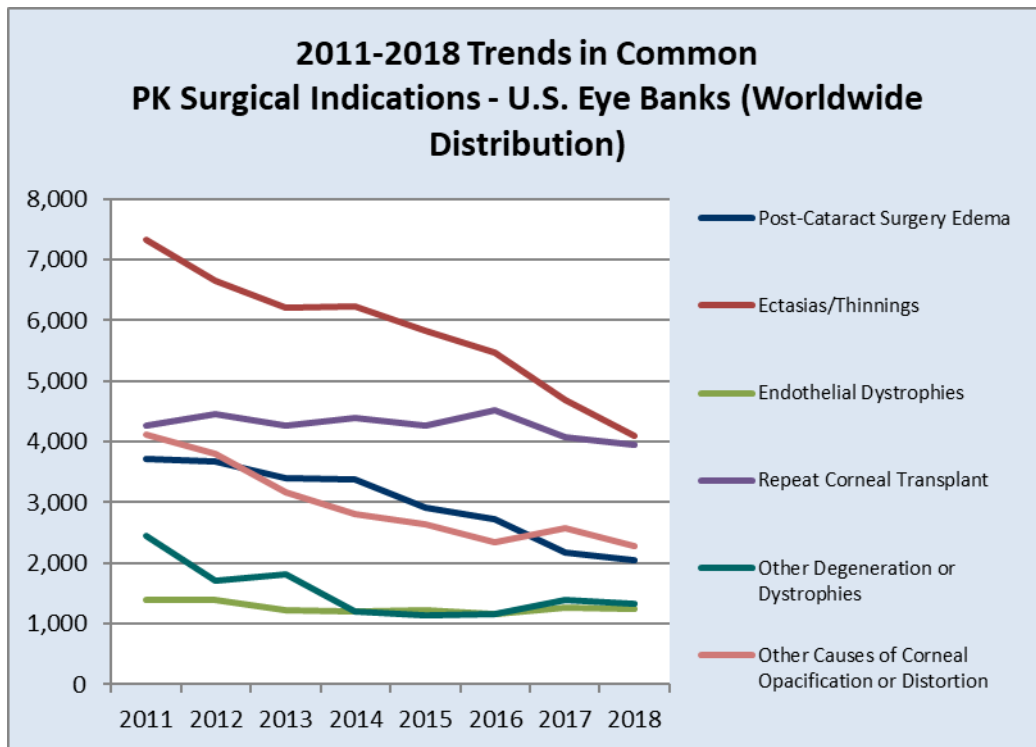
**2018 Indications for Penetrating Keratoplasty -
U.S. Eye Banks (Domestic Distribution)**



**2018 Indications for Penetrating Keratoplasty -
U.S. Eye Banks (International Distribution)**

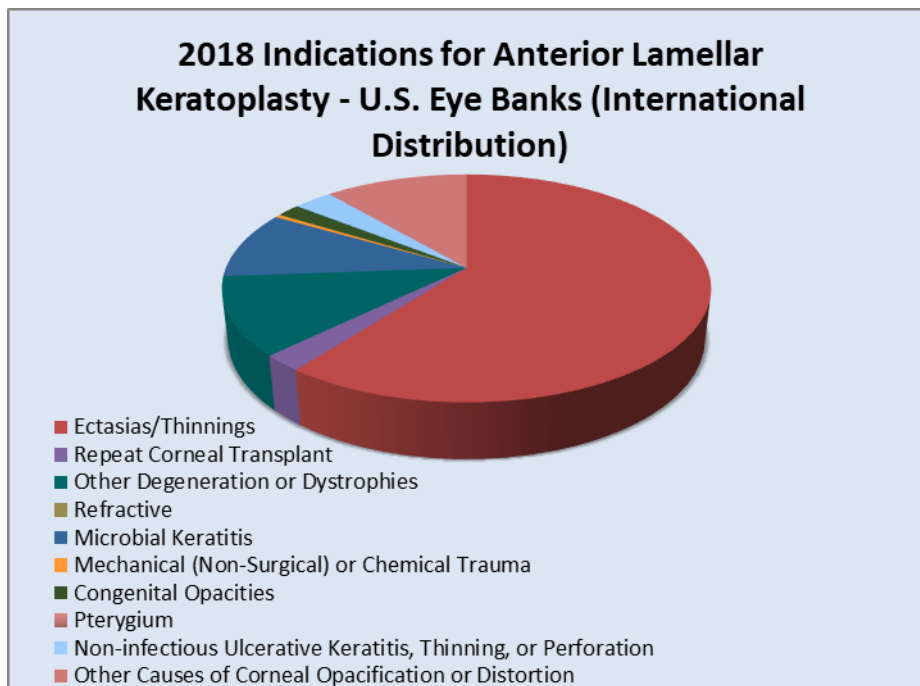
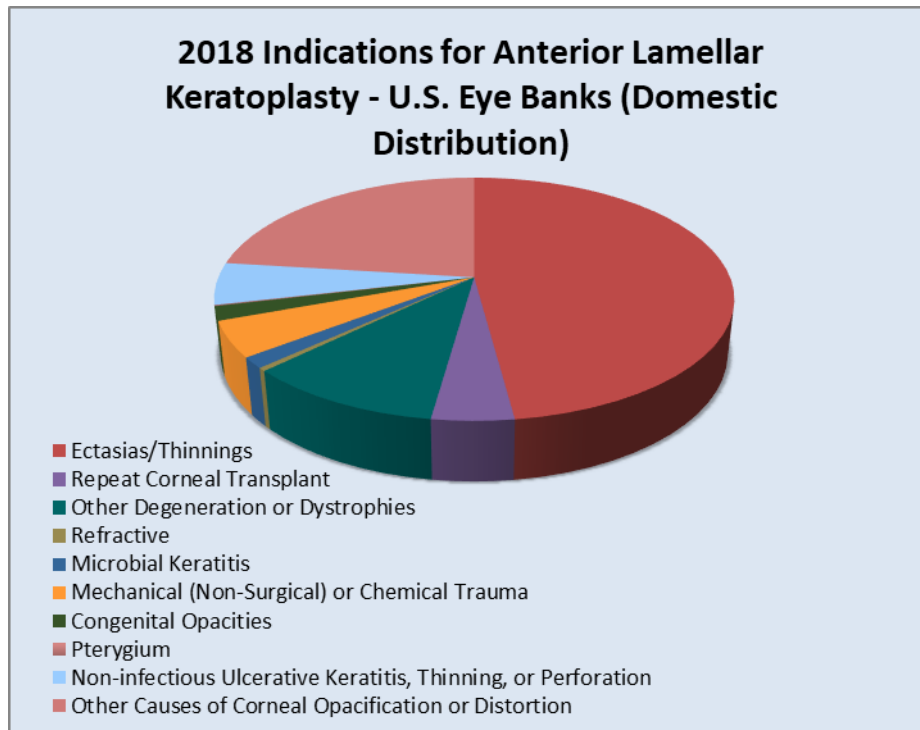


2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks



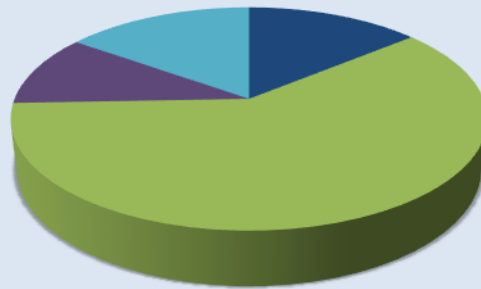
*Worldwide Distribution = Combined Domestic and International Distribution

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks



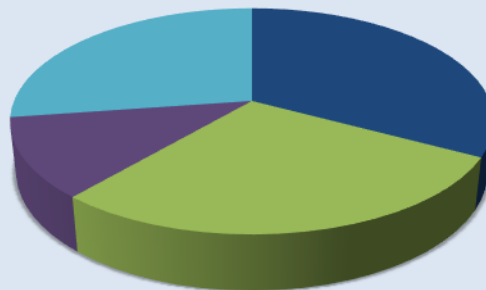
2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks

**2018 Indications for Endothelial Keratoplasty - U.S. Eye Banks
(Domestic Distribution)**



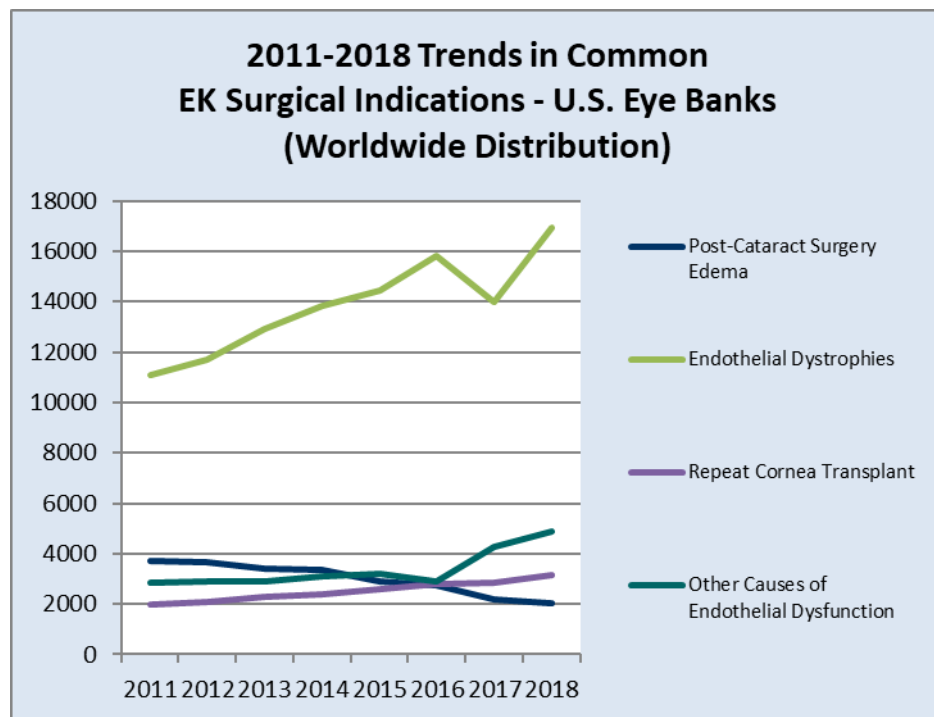
- Post-Cataract Surgery Edema
- Endothelial Dystrophies
- Repeat Corneal Transplant
- Other Causes of Endothelial Dysfunction

**2018 Indications for Endothelial Keratoplasty
- U.S. Eye Banks (International Distribution)**



- Post-Cataract Surgery Edema
- Endothelial Dystrophies
- Repeat Corneal Transplant
- Other Causes of Endothelial Dysfunction

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks



***Worldwide Distribution = Combined Domestic and International Distribution**

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks

2018 (Domestically Distributed Corneas Only) - U.S. Eye Banks

	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	1,028	2,633	772	3,166	794	33	423	537	313	5	1,168	1,504	1,268	3,702
EK	3,722		16,009	2,770									4,019	3,816
ALK		333		30	73	3	10	33	13	1	39	160		189

2018 (Internationally Distributed Corneas Only) - U.S. Eye Banks

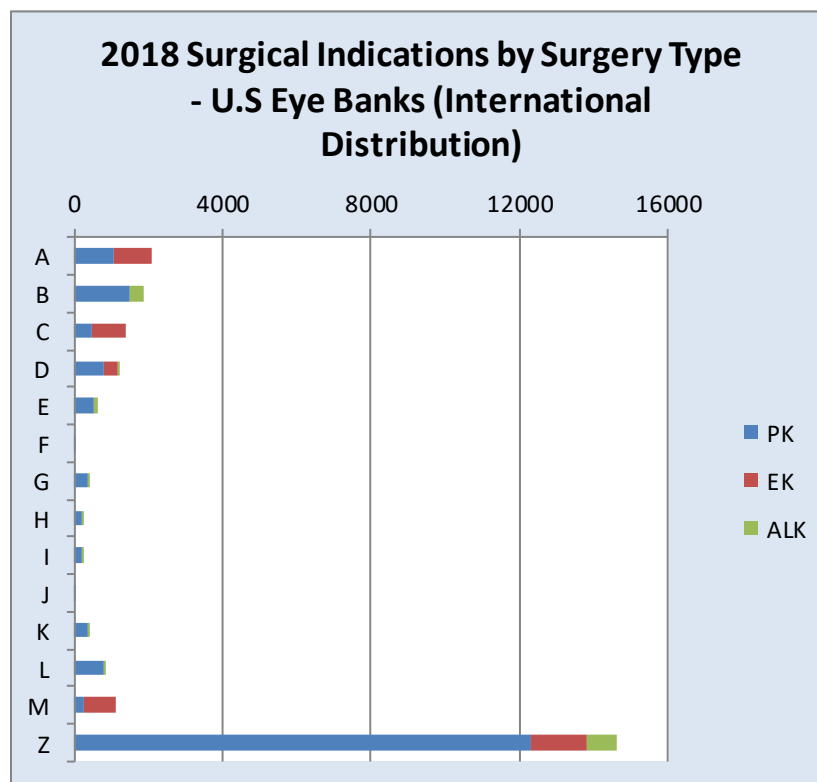
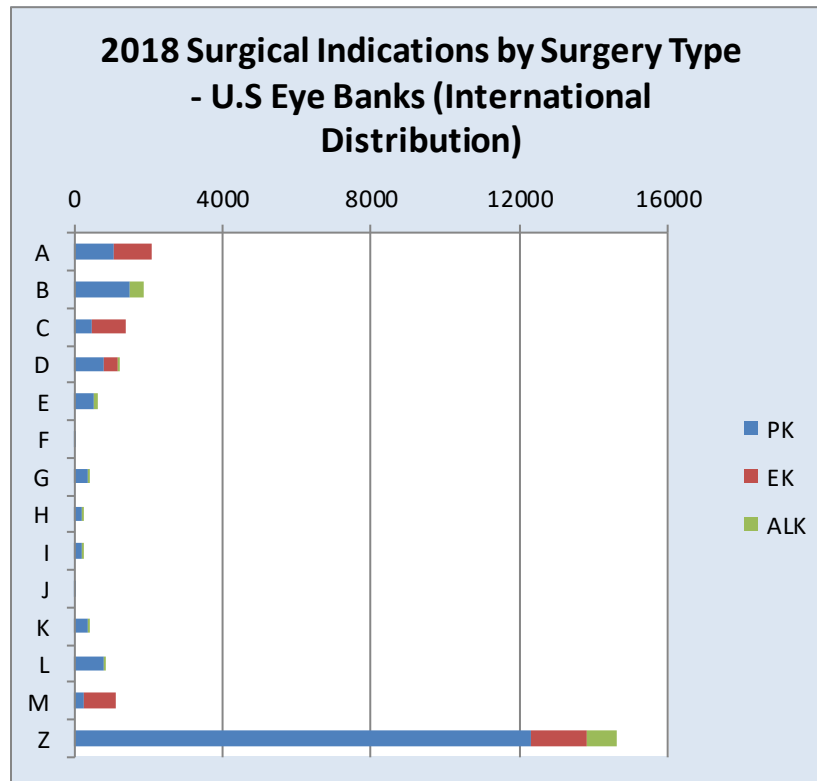
	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	1,029	1,465	479	782	526	6	346	203	203	1	328	770	221	12,323
EK	1,067		924	371									887	1,486
ALK		392		15	72	0	62	3	12	0	20	73		822

2018 (Combined Domestic & International Distributed Corneas) - U.S. Eye Banks

	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	2,057	4,098	1,251	3,948	1,320	39	769	740	516	6	1,496	2,274	1,489	16,025
EK	4,789		16,933	3,141									4,906	5,302
ALK		725		45	145	3	72	36	25	1	59	233		1,011

A - Post-Cataract Surgery Edema
 B - Ectasias/Thinnings
 C - Endothelial Dystrophies
 D - Repeat Corneal Transplant
 E - Other Degeneration or Dystrophies
 F - Refractive
 G - Microbial Keratitis
 H - Mechanical (Non-Surgical) or Chemical Trauma
 I - Congenital Opacities
 J - Pterygium
 K - Non-infectious Ulcerative Keratitis, Thinning, or Perforation
 L - Other Causes of Corneal Opacification or Distortion
 M - Other Causes of Endothelial Dysfunction
 Z - Unknown or Unreported

2018 U.S. Eye Banking Statistics Reported by U.S. Banks: Indications for Corneal Transplant Reported by U.S. Banks

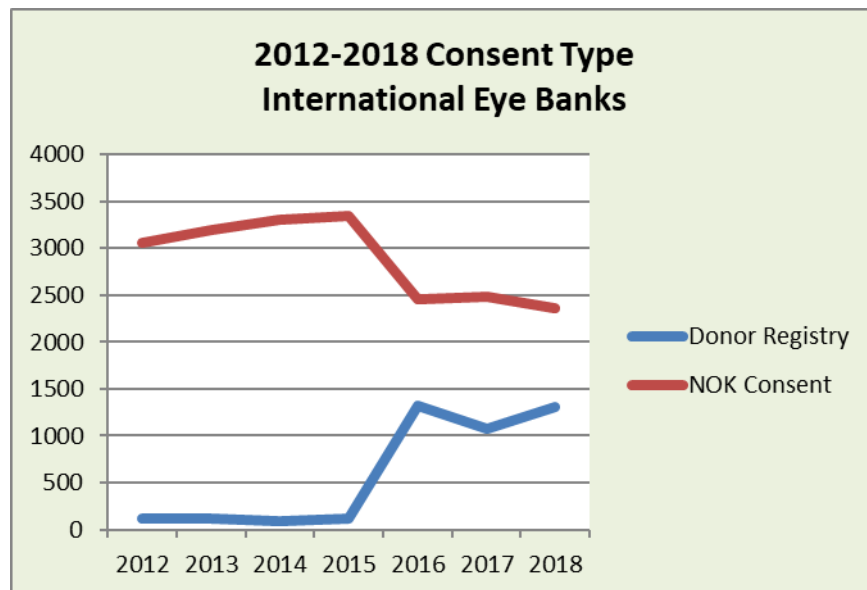


2018
Eye Banking Statistics
From EBAA
International Members

2018 International Eye Banking Statistics Donations and Tissue Recoveries

Donations	2014	2015	2016	2017	2018
Number of Eye Banks Reporting	10	10	11	11	11
Total Whole Eyes and Corneas Donated	6,769	6,846	7,520	7,061	7,291
Total Number of Donors	3,398	3,466	3,776	3,547	3,677

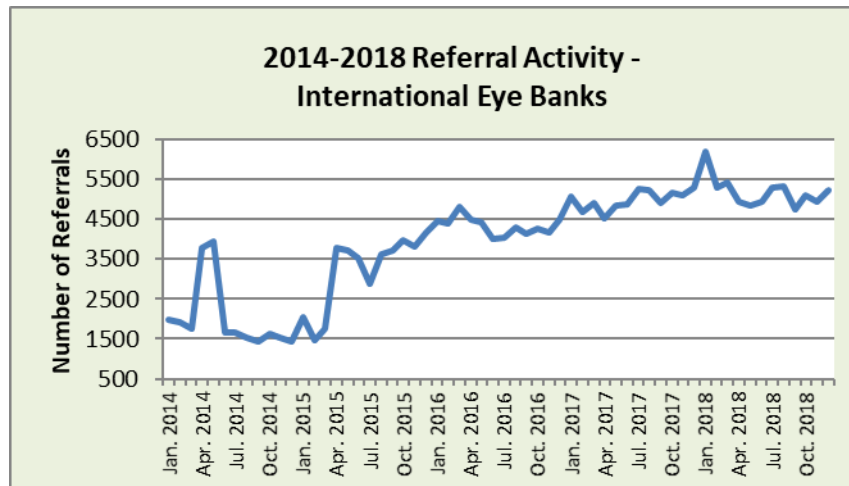
Death Referrals	2016	2017	2018
Total Death Referrals	51,946	59,833	62,270
Death referrals Determined Eligible	12,333	12,169	11,993
Tissue Recoveries			
Total Donors	3,776	3,547	3,677
Donors recovered not found on donor registry or known to have first person consent	2,451	2,478	2,367
Donors recovered found on donor registry or known to have first person consent	1,325	1,069	1,310
Eyes or Corneas Recovered with Intent for Surgical Use	7,333	6,753	6,559
Eyes or Corneas Recovered for Other Uses	187	308	732



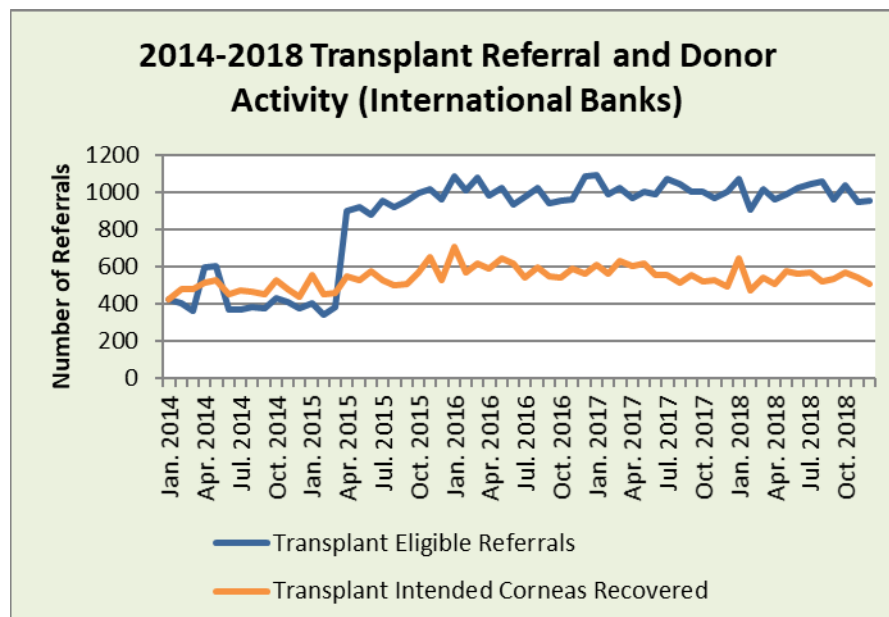
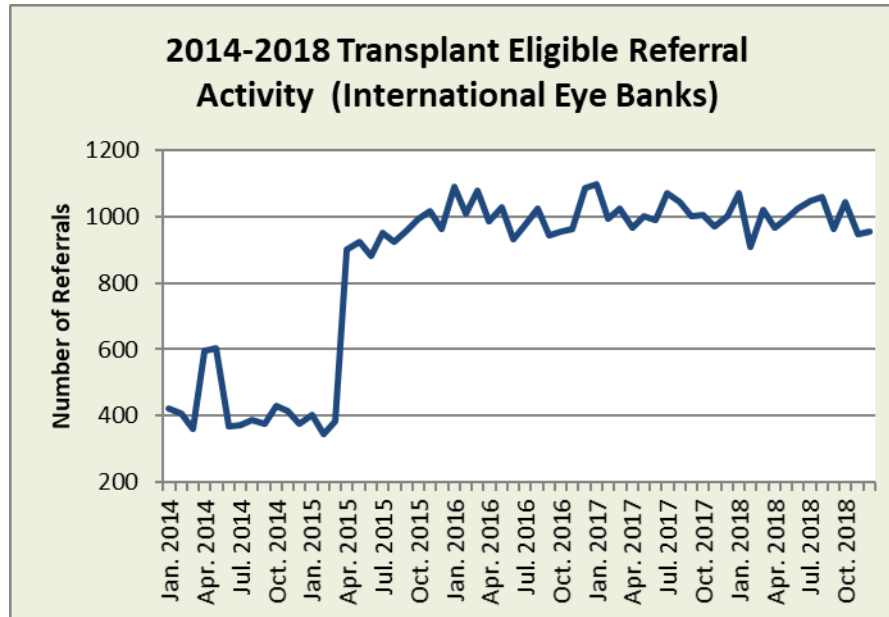
2018 International Eye Banking Statistics Referral Trends, Transplant and Conversion Rates

Transplant & Conversion Rates - International Eye Banks					
Month	Transplant Rate	Conversion Rate	Death Referrals	Transplant Eligible Referrals	Transplant Intended Corneas Recovered
Jan. 2018	54.3%	30.4%	6204	1070	645
Feb. 2018	54.9%	26.3%	5304	908	477
Mar. 2018	59.7%	26.8%	5419	1020	543
Apr. 2018	62.6%	26.5%	4928	965	505
May 2018	55.1%	29.1%	4842	992	577
Jun. 2018	51.1%	27.8%	4947	1026	564
Jul. 2018	52.4%	27.6%	5286	1046	573
Aug. 2018	59.5%	24.8%	5338	1058	521
Sep. 2018	59.4%	28.5%	4730	964	535
Oct. 2018	59.6%	27.6%	5115	1042	572
Nov. 2018	62.1%	28.8%	4939	947	541
Dec. 2018	59.9%	26.7%	5218	955	506
2014 Total	66.9%	56.1%	24284	5121	5726
2015 Total	59.5%	33.6%	38418	9651	6403
2016 Total	56.1%	29.9%	51946	12333	7333
2017 Total	54.5%	27.9%	59833	12169	6753
2018 Total	57.4%	27.6%	62270	11993	6559
2018 Avg.	N/A	N/A	5189	999	547
Std. Dev.	3.8%	1.5%	388	51	44

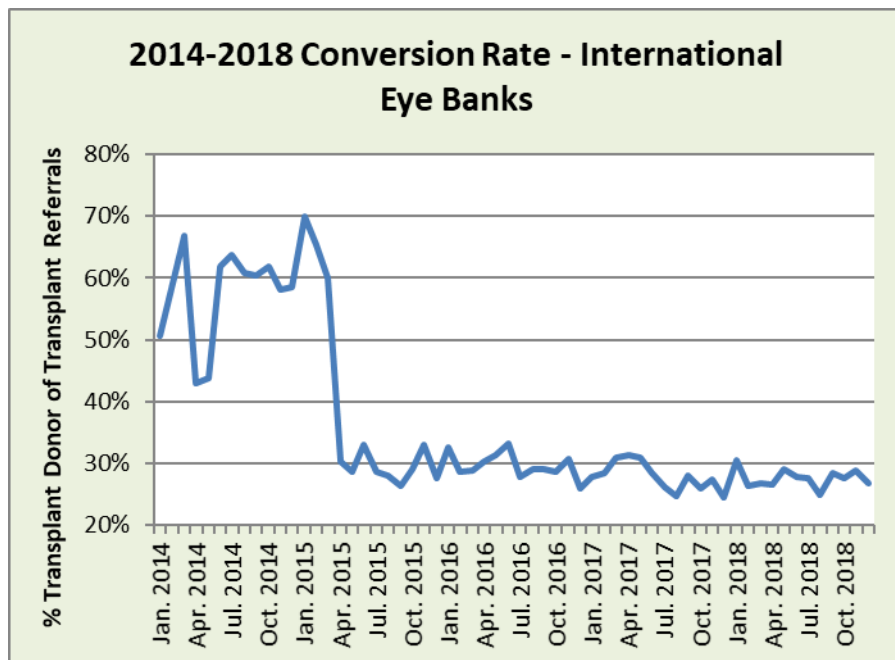
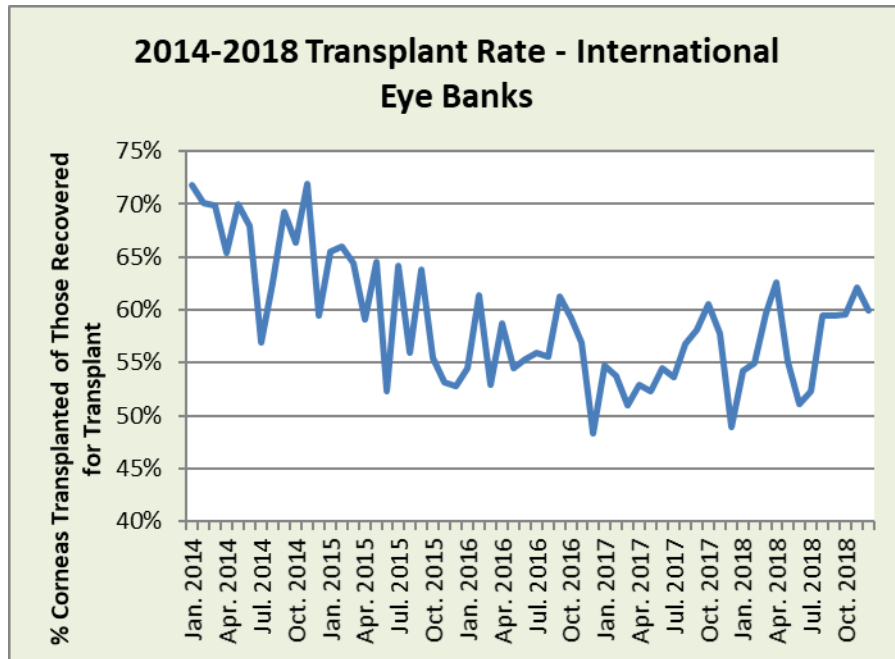
*Transplant rate is the number of corneas used for transplant divided by the number recovered for transplant.
Conversion rate is the number of transplant donors divided by the number of transplant eligible referrals.



2018 International Eye Banking Statistics Referral Trends, Transplant and Conversion Rates



2018 International Eye Banking Statistics Transplant and Conversion Rates

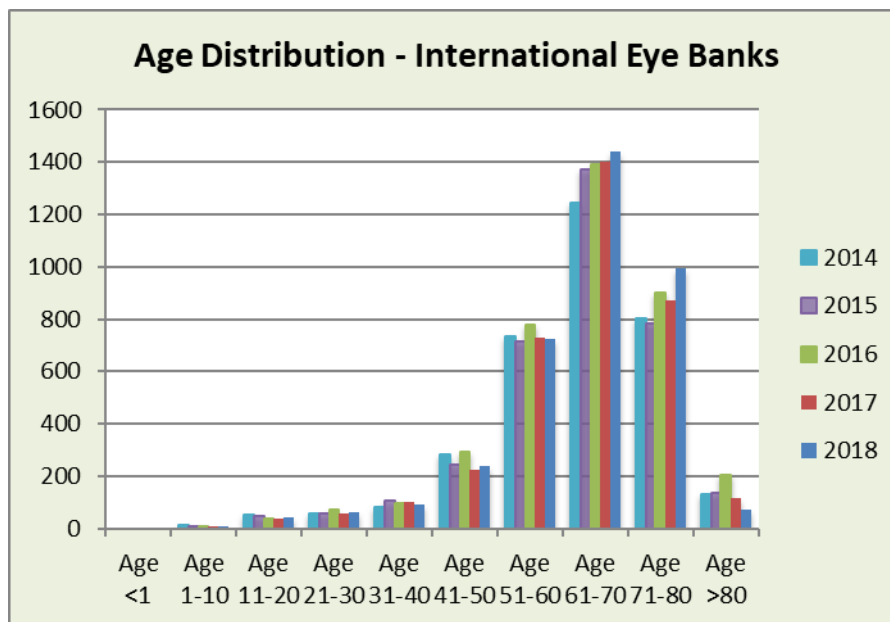


Transplant rate is the number of corneas used for transplant divided by the number recovered for transplant.
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2018 International Eye Banking Statistics

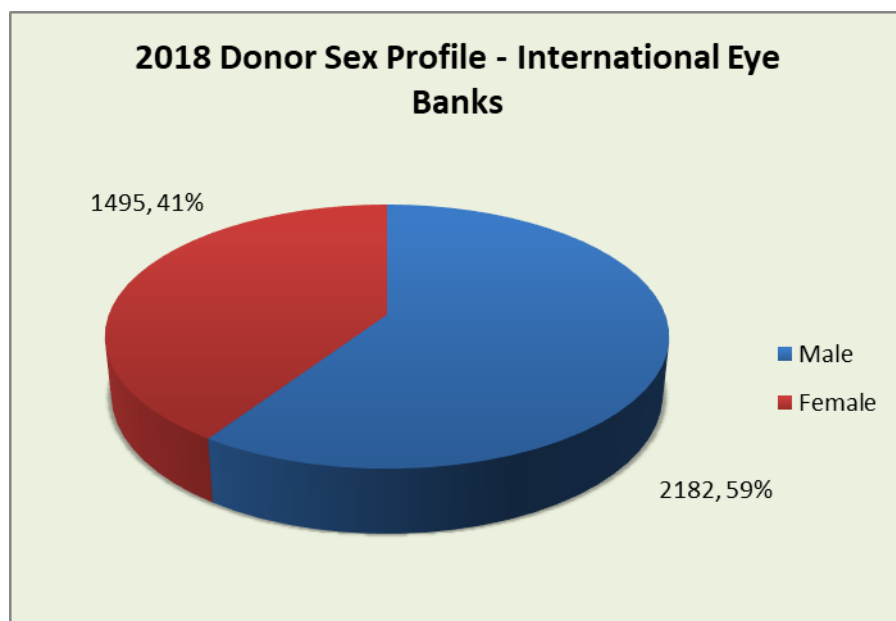
Donor Profiles: Age

Age Demographics - International Eye Banks										
Year	Age <1	Age 1-10	Age 11-20	Age 21-30	Age 31-40	Age 41-50	Age 51-60	Age 61-70	Age 71-80	Age >80
2014	0	11	50	55	83	284	736	1,242	805	132
2015	0	8	45	59	104	244	715	1,372	784	135
2016	0	7	35	71	94	291	778	1,393	901	206
2017	0	8	35	58	101	222	731	1,403	873	116
2018	0	9	40	64	93	240	724	1,439	995	73
Monthly Avg.	0	1	3	5	8	20	60	120	83	6
Std. Dev.	0.0	0.8	1.4	2.8	5.6	4.3	7.1	8.9	14.2	1.9



2018 International Eye Banking Statistics Donor Profiles: Gender and Cause of Death

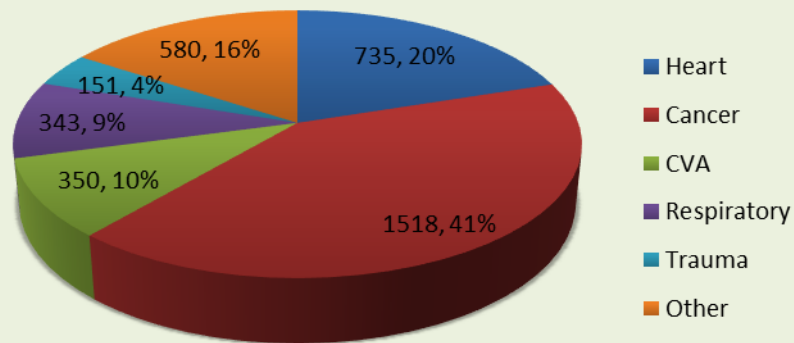
Sex Demographics - International Eye Banks		
Year	Male	Female
2014	2009	1389
2015	2058	1408
2016	2252	1524
2017	2,077	1,470
2018	2,182	1,495
Monthly Avg.	182	125
Std. Dev.	21.9	12.6



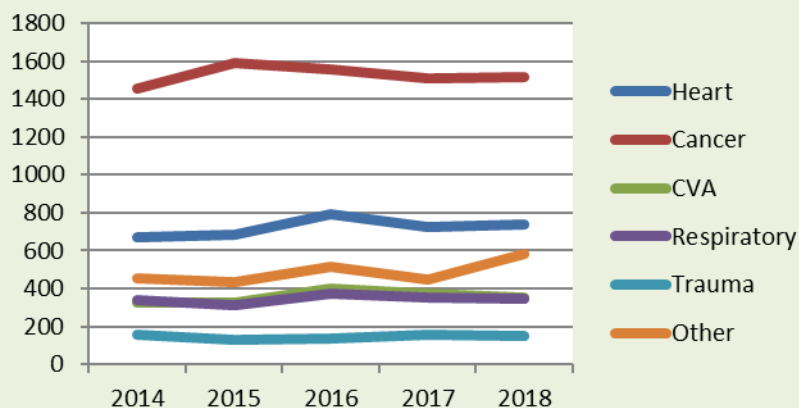
2018 International Eye Banking Statistics Donor Profiles: Cause of Death

International Eye Banks - Cause of Death Profile						
Year	Heart	Cancer	CVA	Respiratory	Trauma	Other
2014 Total	671	1,453	327	338	154	455
2015 Total	681	1,588	325	310	130	432
2016 Total	793	1,557	403	371	134	518
2017 Total	722	1,507	370	351	153	444
2018 Total	735	1,518	350	343	151	580
Monthly Avg.	61	127	29	29	13	48
Std. Dev.	10.0	15.6	5.3	7.3	2.9	8.9

**2018 Donor Cause of Death Profile -
International Eye Banks**



**Cause of Death Trends - International Eye
Banks**



2018 International Eye Banking Statistics

Reasons Tissue Intended for Surgery Was Not Suitable For Transplant

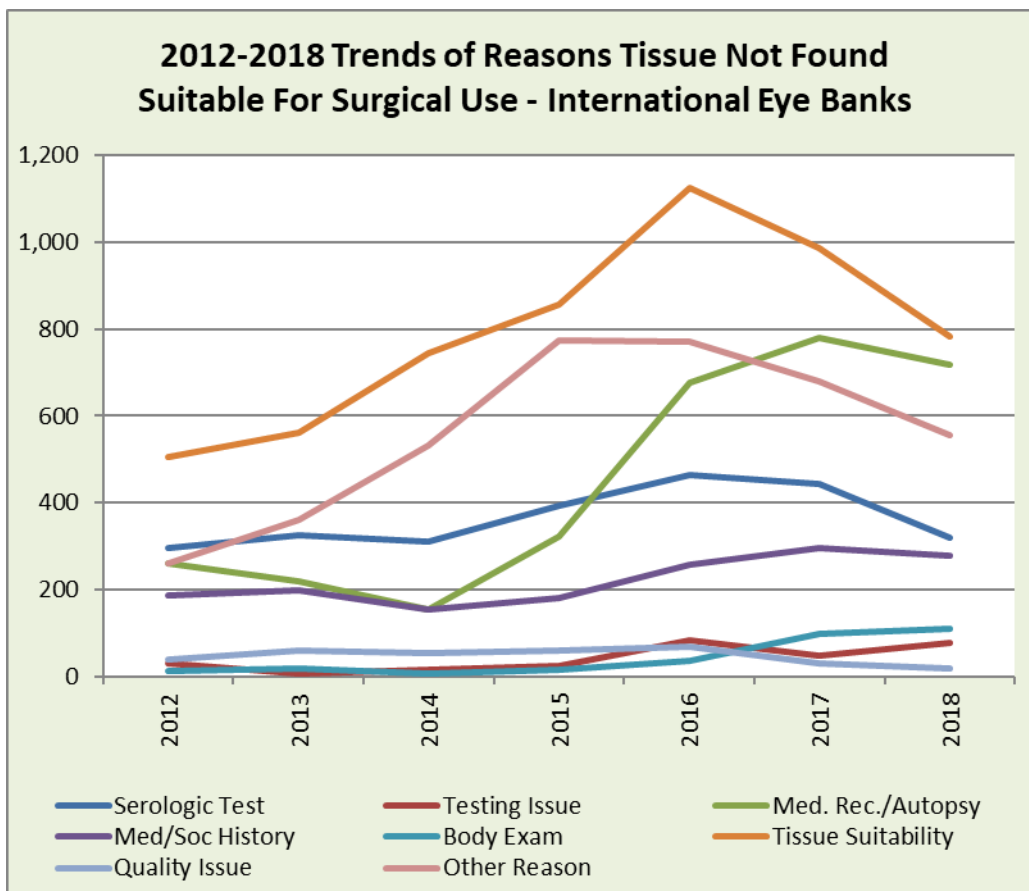
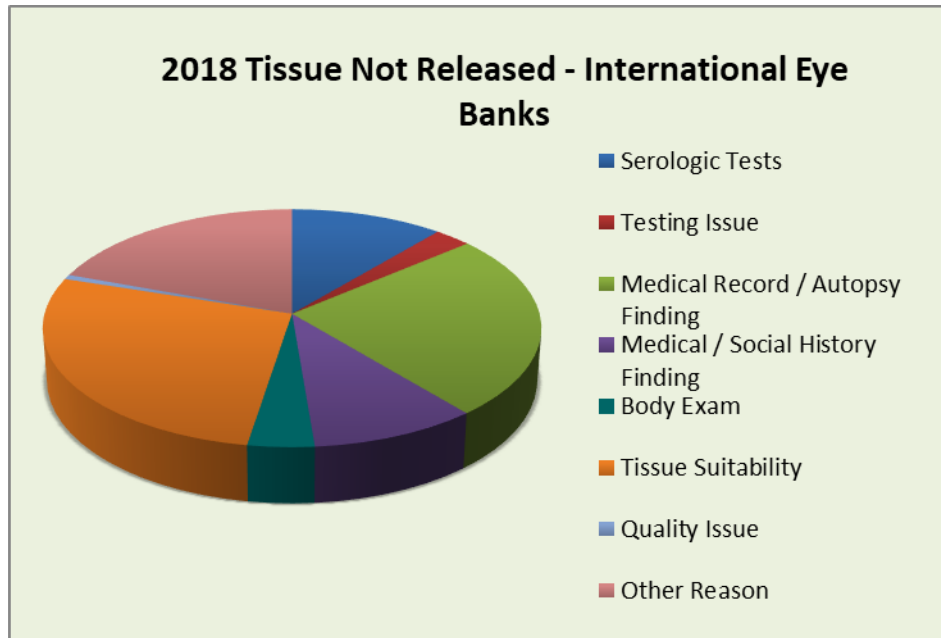
Contraindications for Transplant ¹	2017		2018	
Donor Eligibility	1,664	61.8%	1,501	60.2%
Positive or reactive test for communicable disease agent or disease	442	16.4%	318	12.8%
Other communicable disease testing issue	47	1.7%	77	3.1%
Medical record or autopsy findings	780	29.0%	718	28.8%
Medical/social history interview	297	11.0%	278	11.2%
Body Exam	98	3.6%	110	4.4%
Tissue Suitability	987	36.7%	783	31.4%
Quality Issue	29	1.1%	18	0.7%
Other reason prior to tissue release	678	25.2%	554	22.2%
Total eyes/corneas intended for transplant but not released for transplant	2,692		2,492	

*Percentages read from this table should be read as "of the tissue not released for transplant"

Reasons Corneas Recovered for Transplant Were Not Released - International Eye Banks								
Reasons Not Released	2012	2013	2014	2015	2016	2017	2018	Trends
Serology Tests	296	326	310	394	464	442	318	
Testing Issue	31	8	16	24	83	47	77	
Med. Rec./Autopsy Finding	260	219	155	323	675	780	718	
Med Soc Hx Finding	186	197	154	182	258	297	278	
Body Exam	12	18	8	16	37	98	110	
Tissue Suitability	506	561	743	856	1125	987	783	
Quality Issue	38	61	55	60	70	29	18	
Other Reason	260	360	531	775	770	678	554	

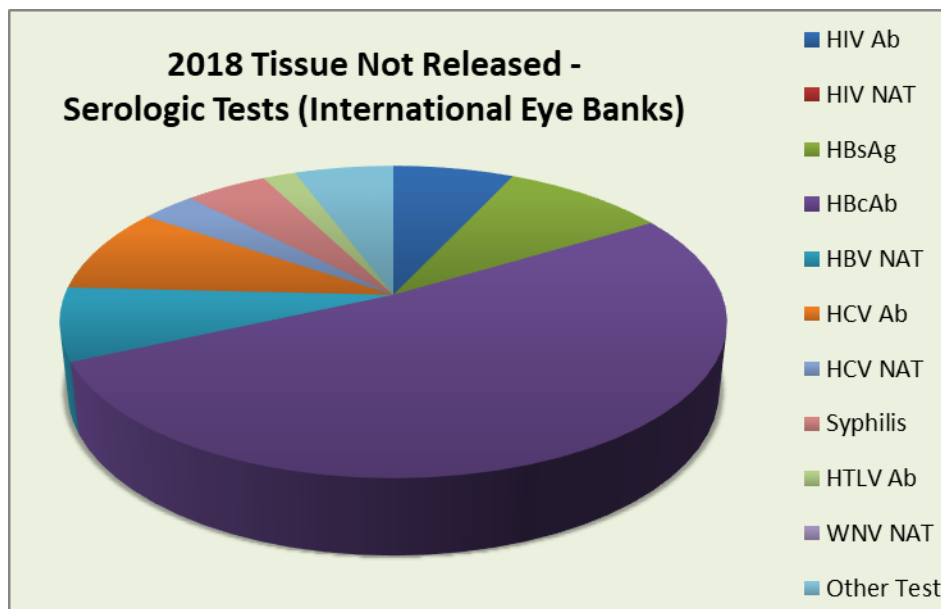
¹ Some tissues had multiple contraindications.

2018 International Eye Banking Statistics Reasons Tissue Intended for Surgery Was Not Released



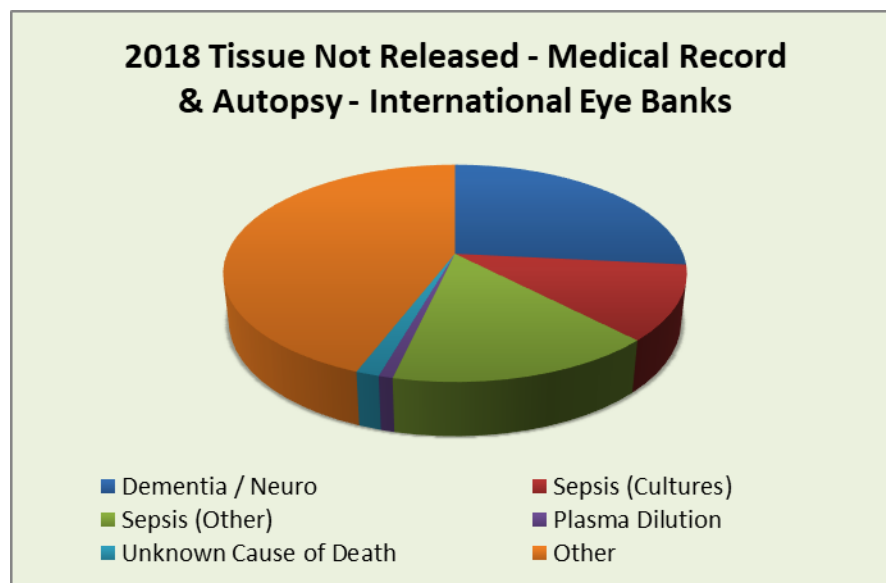
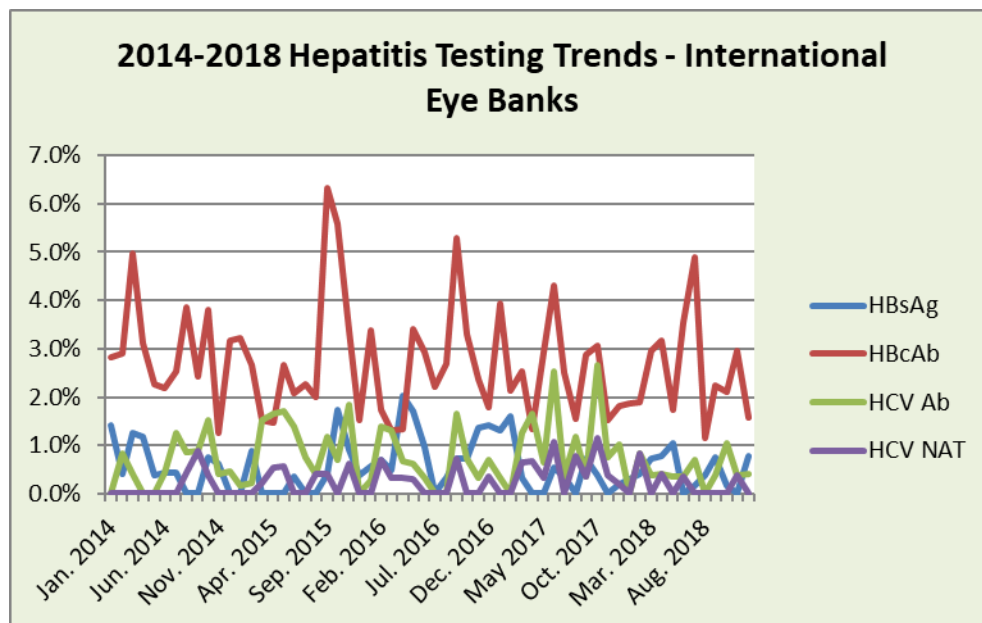
2018 International Eye Banking Statistics

Reasons Tissue Intended for Surgery Was Not Released



Corneas Not Released for Transplant (Serologic Testing) - International Eye Banks								
Not Released - Serology	2012	2013	2014	2015	2016	2017	2018	Trend
HIV	10	18	22	37	30	34	22	
HIV I/II Ab	8	6	20	37	30	32	22	
HIV NAT	2	12	2	0	0	2	0	
HBV	165	200	203	213	263	209	219	
HBsAg	6	20	33	26	66	31	30	
HBcAb	159	180	169	187	187	173	165	
HBV NAT	0	0	1	0	10	5	24	
HCV	85	59	42	78	63	102	38	
HCV Ab	75	43	34	63	47	71	28	
HCV NAT	10	16	8	15	16	31	10	
Syphilis	6	16	22	41	64	59	15	
HTLV	12	11	14	5	20	12	6	
WNV	0	0	4	0	0	2	0	
Other	18	22	3	20	24	24	18	

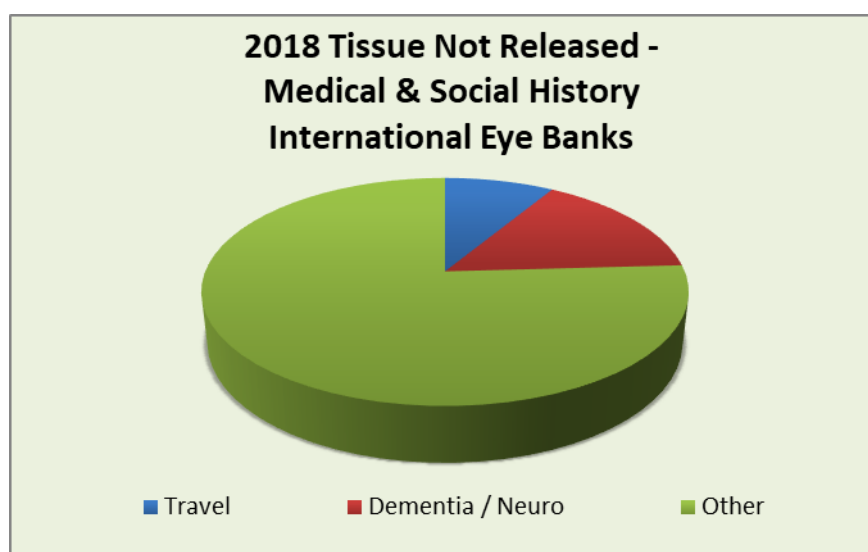
2018 International Eye Banking Statistics Reasons Tissue Intended for Surgery Was Not Released



2018 International Eye Banking Statistics

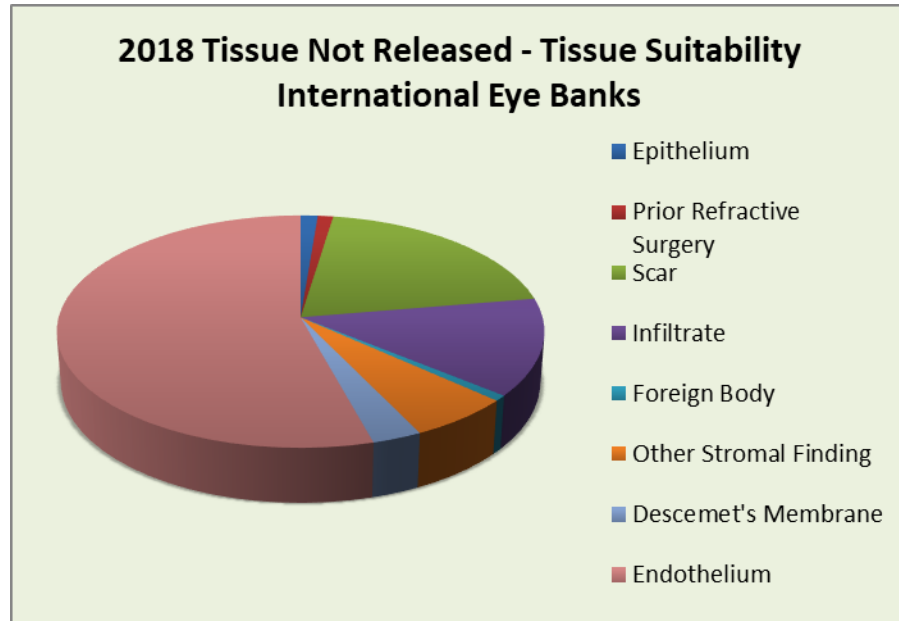
Reasons Tissue Intended for Surgery Was Not Suitable

Corneas Not Released for Transplant (Medical Records) - International Eye Banks								
Not Released - Med Rec / Autopsy	2012	2013	2014	2015	2016	2017	2018	Trends
Dementia/Neuro	16	20	20	48	171	161	191	
Sepsis (Cultures)	68	39	23	26	50	46	80	
Sepsis (Other)	79	80	50	111	140	145	114	
Plasma Dilution	10	6	6	4	10	10	6	
Unknown COD	35	26	22	28	24	12	10	
Other	52	48	34	106	280	406	317	



Corneas Not Released for Transplant (Med Soc Hx) - International Eye Banks								
Not Released - Med Soc	2012	2013	2014	2015	2016	2017	2018	Trends
Travel	36	36	30	16	24	38	24	
Dementia/Neuro	2	24	30	40	19	24	43	
Other	136	137	94	126	215	235	211	

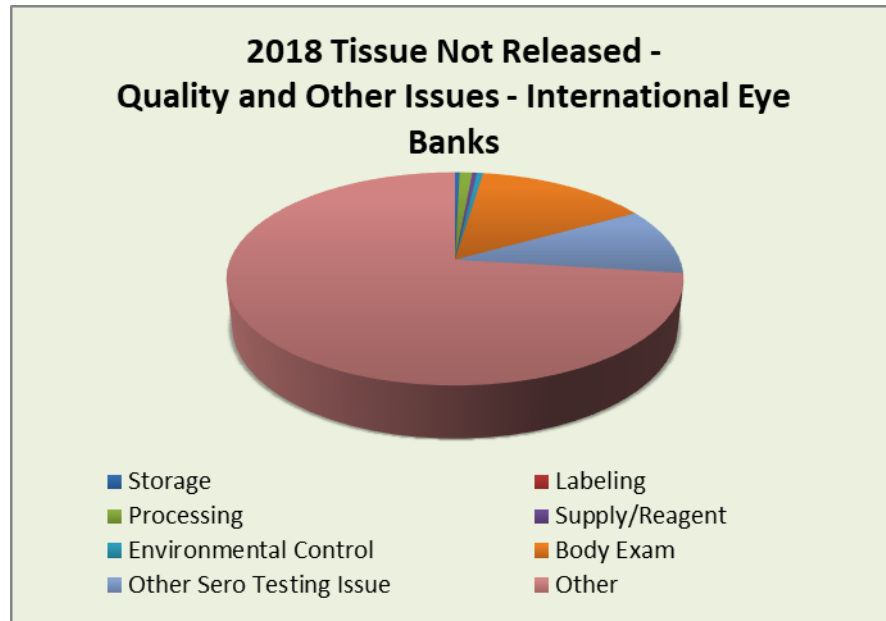
2018 International Eye Banking Statistics Tissue Suitability Reasons Tissue Was Not Released



Corneas Not Released for Transplant (Tissue Suitability) - International Eye Banks								
Not Released - Tissue Suitability	2012	2013	2014	2015	2016	2017	2018	Trends
Epithelium	31	55	65	45	54	37	10	
Prior Refractive Surgery	4	9	33	33	40	21	9	
Scar	68	93	142	238	282	328	156	
Infiltrate	76	81	107	106	164	85	106	
Foreign Body	7	3	28	21	25	23	6	
Other Stromal Finding	59	40	34	77	77	119	48	
Descemet's Membrane	4	3	34	16	35	10	23	
Endothelium	257	277	300	320	448	364	425	

2018 International Eye Banking Statistics

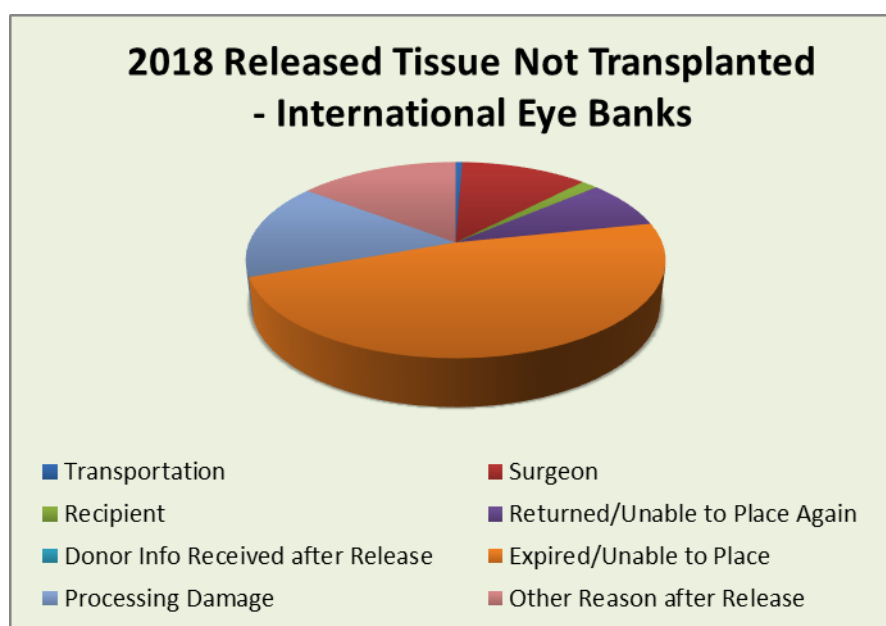
Quality Reasons Tissue Intended for Surgery Was Not Released



Corneas Not Released for Transplant (Quality) - International Eye Banks								
Not Released - Quality Issues / Other	2012	2013	2014	2015	2016	2017	2018	Trends
Storage Issue	13	22	16	23	13	4	3	
Labeling Issue	0	5	11	9	10	0	0	
Processing Issue (not released)	21	14	10	8	11	8	8	
Supply / Reagent Issue	2	14	8	5	5	6	3	
Environmental Control Issue	2	6	10	15	31	11	4	
Body Exam	12	18	8	16	37	98	110	
Other Sero Testing Issue	31	8	16	24	83	47	77	
Other Issue	260	360	531	775	770	678	554	

2018 International Eye Banking Statistics Reasons Released Tissues Were Not Transplanted

Reasons Released Tissues Were Not Transplanted	2016		2018	
Transportation Issue	1	0.3%	2	0.7%
Surgeon Issue	46	12.1%	38	12.5%
Recipient Issue	6	1.6%	5	1.6%
Returned and Unable to Place Again	35	9.2%	26	8.6%
Donor Information Not Available at the Time of Tissue Release	2	0.5%	0	0.0%
Expired or Unable to Place Tissue	219	57.5%	156	51.3%
Tissue Damaged During Processing	47	12.4%	52	17.1%
Other Reason After Release of Tissue	44	11.6%	48	15.8%
Total eyes/corneas released for transplant but not used for transplant	380		304	



Corneas Released but Not Transplanted - International Eye Banks								
Released But Not Transplanted	2012	2013	2014	2015	2016	2017	2018	Trends
Transport Issue	10	0	26	2	8	1	2	
Surgeon Issue	23	11	20	53	24	46	38	
Recipient Issue	5	3	5	6	6	6	5	
Returned, Unable to Place Again	55	53	56	24	32	35	26	
Donor Info Received After Release	0	0	0	2	7	2	0	
Expired, Unable to Place	246	198	316	234	215	219	156	
Processing Damage After Release	32	41	54	41	55	47	52	
Other Reason After Release	12	9	10	24	42	44	48	

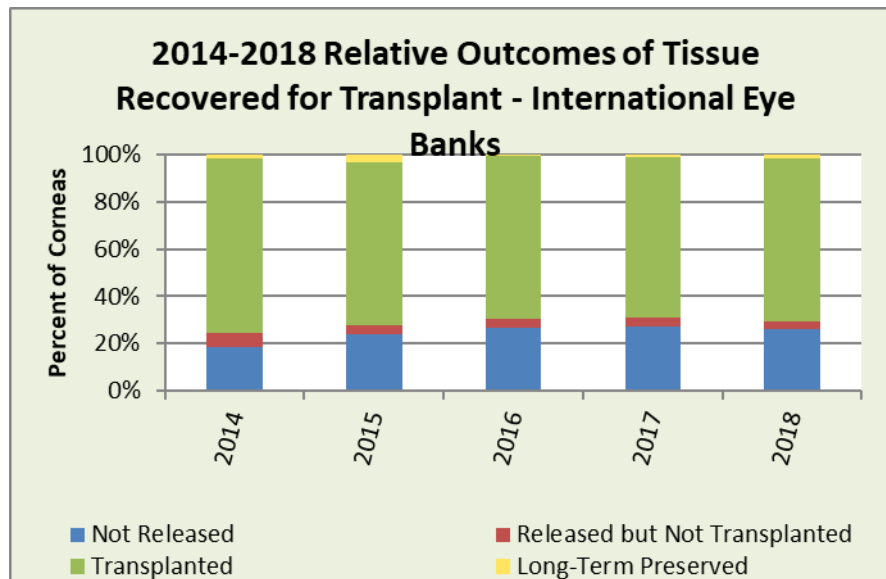
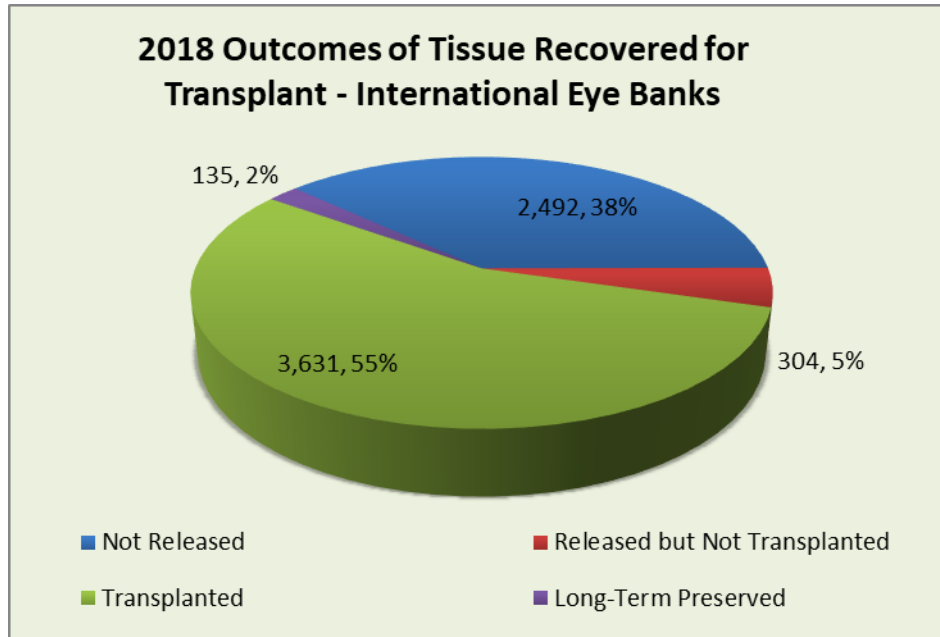
2018 International Eye Banking Statistics Outcomes of Tissue Recovered for Transplant

Donations	2017	2018	% Change
Eye Banks Reported	11	11	0.0%
Total Whole Eyes and Corneas Donated	7,061	7,291	3.3%
Total Number of Donors	3,547	3,677	3.7%
Distribution	2017	2018	
Intermediate-Term Preserved Corneas	3,570	3,628	1.6%
Sclera	995	1,193	19.9%
Long-Term Preserved Corneas	93	88	(-5.4%)
Research	200	310	55.0%
Training	1,992	1,997	0.3%

Outcomes of Corneas Recovered for Transplant Use - International Eye Banks											
Month	Corneas Recovered for Transplant	Corneas Segmented	Corneal Segments Produced	Not Released		Released but Not Transplanted		Whole Corneas and Segments Transplanted		Preserved Long-Term	
Jan. 2018	645	2	4	263	40.8%	34	5.3%	337	52.1%	13	2.0%
Feb. 2018	477	0	0	194	40.7%	21	4.4%	253	53.0%	9	1.9%
Mar. 2018	543	0	0	186	34.3%	33	6.1%	318	58.6%	6	1.1%
Apr. 2018	505	0	0	168	33.3%	21	4.2%	306	60.6%	10	2.0%
May 2018	577	1	2	233	40.4%	27	4.7%	305	52.8%	13	2.2%
Jun. 2018	564	0	0	246	43.6%	30	5.3%	280	49.6%	8	1.4%
Jul. 2018	573	0	0	248	43.3%	25	4.4%	282	49.2%	18	3.1%
Aug. 2018	521	0	0	189	36.3%	22	4.2%	297	57.0%	13	2.5%
Sep. 2018	535	0	0	201	37.6%	16	3.0%	306	57.2%	12	2.2%
Oct. 2018	572	1	1	208	36.4%	23	4.0%	327	57.2%	14	2.4%
Nov. 2018	541	0	0	181	33.5%	24	4.4%	326	60.3%	10	1.8%
Dec. 2018	506	0	0	175	34.6%	28	5.5%	294	58.1%	9	1.8%
2014 Total	5,726	6	10	1,443	25.2%	459	8.0%	3,718	64.9%	110	1.9%
2015 Total	6,403	29	30	2,217	34.6%	380	5.9%	3,500	54.7%	307	4.8%
2016 Total	7,333	0	0	2,838	38.7%	379	5.2%	4,035	55.0%	81	1.1%
2017 Total	6,753	1	1	2,692	39.9%	380	5.6%	3,570	52.9%	111	1.6%
2018 Total	6,559	4	7	2,492	38.0%	304	4.6%	3,631	55.3%	135	2.1%
2018 Avg.	547	0	1	208	N/A	25	N/A	303	N/A	11	N/A
Std. Dev.	44	0.65	1.2	32	3.7%	5	0.8%	24	3.9%	3	0.5%

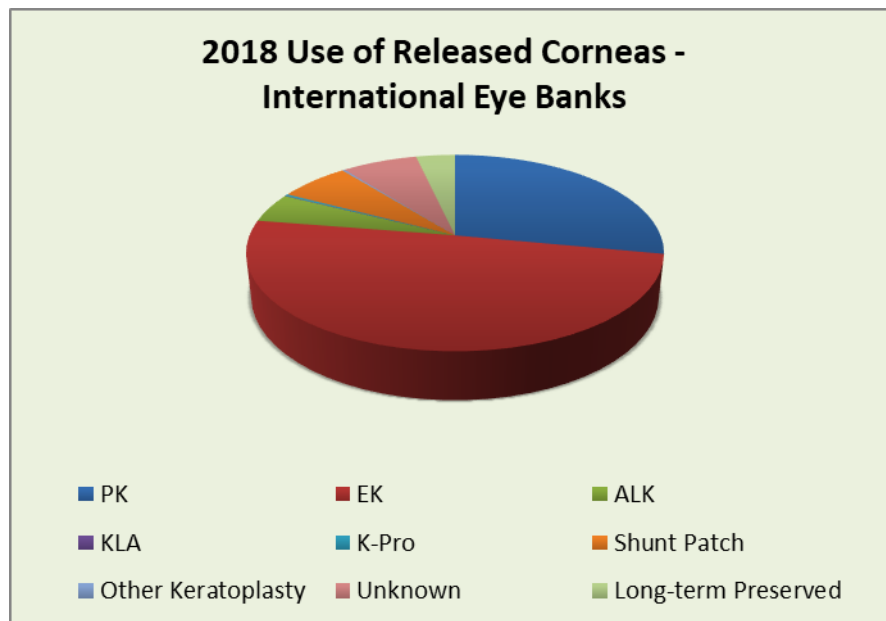
*Percentages read from this table should be read as "of the tissue recovered with transplant intent"

2018 International Eye Banking Statistics Outcomes of Tissues Recovered for Transplant



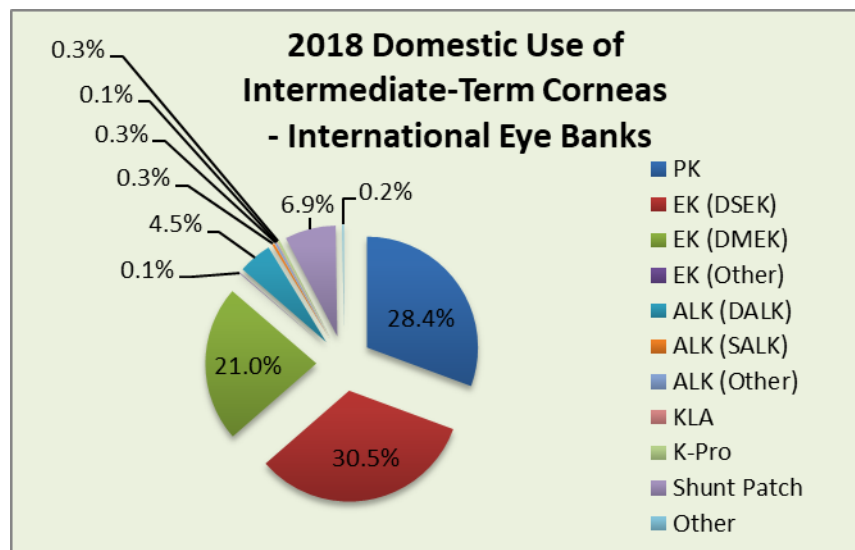
2018 International Eye Banking Statistics Use of Donated Tissues

Use of Donated Tissue	2014	2015	2016	2017	2018
Corneal Grafts Total	3,824	3,806	4,116	3,681	3,628
Penetrating Keratoplasty	1,539	1,403	1,399	1,248	1,055
Anterior Lamellar Keratoplasty	150	192	142	174	182
Endothelial Keratoplasty	1,669	1,523	1,890	1,736	1,865
Keratolimbal Allograft	0	8	4	6	3
Keratoprosthesis (K-Pro)	20	15	24	10	11
Glaucoma Shunt Patch or other non-keratoplasty use	304	240	313	229	245
Other keratoplasty (experimental surgery)	0	1	3	3	8
Unknown or Unspecified	36	118	260	164	262
Sclera	1,010	882	1,077	995	1,193
Long-Term Preserved Corneas	113	108	92	93	88
Keratoplasty	12	5	2	6	3
Glaucoma Shunt Patching	101	102	89	62	62
Other Surgical Uses	0	1	1	25	23
Research	291	402	300	200	310
Training	1,301	1,547	1,663	1,992	1,997



2018 International Eye Banking Statistics Intermediate-Term Tissue Distribution

Intermediate-Term Tissue Distribution of Source Eye Bank Corneas for Domestic Use		
	2017	2018
Intermediate-term preserved corneas, corneal segments or whole eyes transplanted domestically for:		
PK	1,046	1,003
EK	1,672	1,825
DSEK, DSAEK, DLEK	1,055	1,078
DMEK or DMAEK	615	744
PDEK	0	0
Other EK	2	3
ALK	165	180
DALK (Deep Anterior Lamellar Keratoplasty)	146	160
SALK (Superficial Anterior Lamellar Keratoplasty)	10	11
Other ALK (e.g. peripheral, eccentric, etc.)	9	9
KLA	6	3
Keratoprosthesis (K-Pro)	10	11
Glaucoma shunt patch or other non-keratoplasty use	228	243
Other Keratoplasty (e.g. experimental surgery type)	3	8
Unknown or Unspecified	164	262
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for KERATOPLASTY	3,341	3,386
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for TRANSPLANT	3,570	3,628



2018 International Eye Banking Statistics

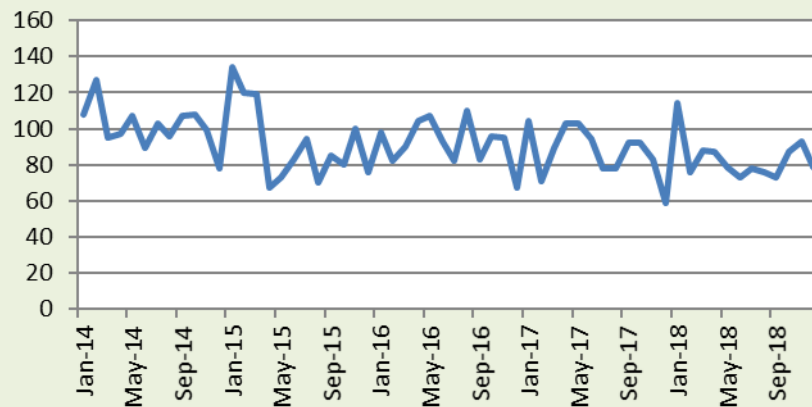
Domestic Surgery Use of Intermediate-Term Preserved Tissue

Surgery Type (Domestically Distributed Corneas) - International Eye Banks												
Month	PK	EK (DSEK)	EK (DMEK)	EK (Other)	ALK (DALK)	ALK (SALK)	ALK (Other)	KLA	K-Pro	Shunt Patch	Other	Unknown
Jan. 2018	34.1%	27.8%	21.6%	0.6%	5.7%	0.6%	0.3%	0.0%	0.3%	4.8%	0.0%	4.2%
Feb. 2018	30.0%	31.6%	19.8%	0.0%	2.8%	0.0%	0.0%	0.0%	0.8%	9.5%	0.0%	5.5%
Mar. 2018	29.3%	31.0%	20.3%	0.0%	4.3%	0.0%	0.0%	0.0%	0.7%	9.7%	0.0%	4.7%
Apr. 2018	28.6%	31.3%	18.8%	0.0%	3.6%	0.7%	0.0%	0.3%	1.0%	7.9%	0.0%	7.9%
May 2018	26.2%	31.9%	20.3%	0.0%	4.3%	0.3%	0.3%	0.0%	0.0%	8.6%	0.3%	7.6%
Jun. 2018	26.1%	31.4%	25.7%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	5.7%	0.4%	6.4%
Jul. 2018	31.0%	33.7%	17.5%	0.0%	2.8%	0.8%	0.4%	0.0%	0.0%	4.8%	0.0%	9.1%
Aug. 2018	26.7%	31.2%	23.5%	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%	5.3%	1.1%	7.0%
Sep. 2018	23.9%	31.4%	21.6%	0.3%	5.6%	0.3%	1.3%	0.7%	0.3%	6.2%	0.0%	8.5%
Oct. 2018	27.7%	34.4%	21.7%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%	7.3%	0.6%	3.2%
Nov. 2018	28.9%	27.6%	21.4%	0.0%	4.7%	0.3%	0.3%	0.0%	0.3%	10.6%	0.0%	5.9%
Dec. 2018	27.8%	23.2%	20.1%	0.0%	5.3%	0.7%	0.4%	0.0%	0.4%	1.8%	0.4%	20.1%
2014 Avg.	38.3%	38.2%	7.6%	N/A	4.3%	0.0%	0.2%	0.0%	0.6%	9.6%	0.0%	1.1%
2015 Avg.	35.7%	35.6%	12.4%	N/A	5.9%	0.0%	0.1%	0.3%	0.5%	7.7%	0.0%	1.8%
2016 Avg.	30.1%	33.7%	16.1%	N/A	3.5%	0.0%	0.2%	0.1%	0.7%	8.5%	0.1%	7.1%
2017 Avg.	31.8%	32.0%	18.7%	0.1%	4.4%	0.3%	0.3%	0.2%	0.3%	6.9%	0.1%	5.0%
2018 Avg.	28.4%	30.5%	21.0%	0.1%	4.5%	0.3%	0.3%	0.1%	0.3%	6.9%	0.2%	7.4%
Std. Dev.	2.7%	3.0%	2.1%	0.2%	1.0%	0.3%	0.4%	0.2%	0.3%	2.6%	0.3%	4.3%

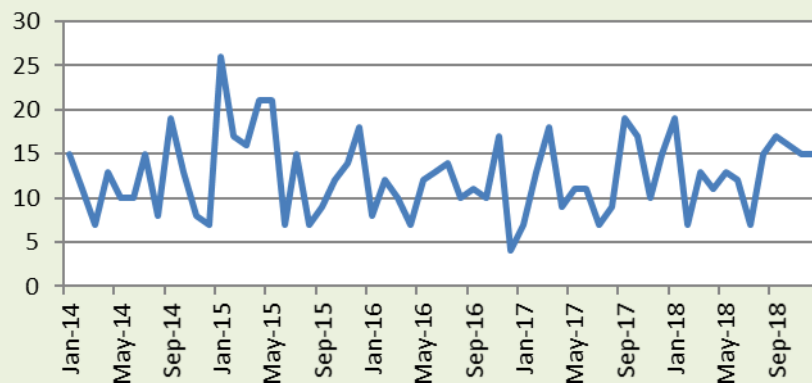
*Percentages read from this table should be read as "of the tissue distributed for transplant use domestically"

2018 International Eye Banking Statistics Trends of Domestic Use

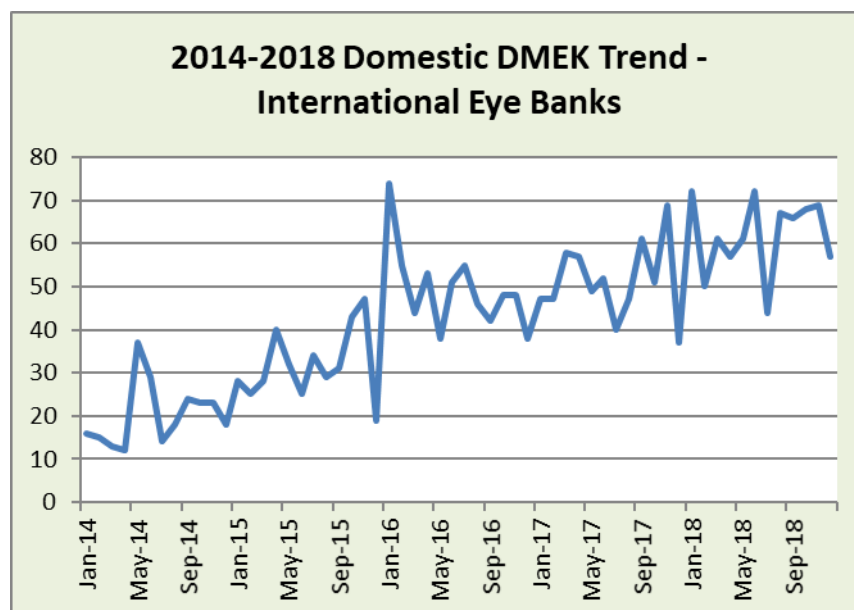
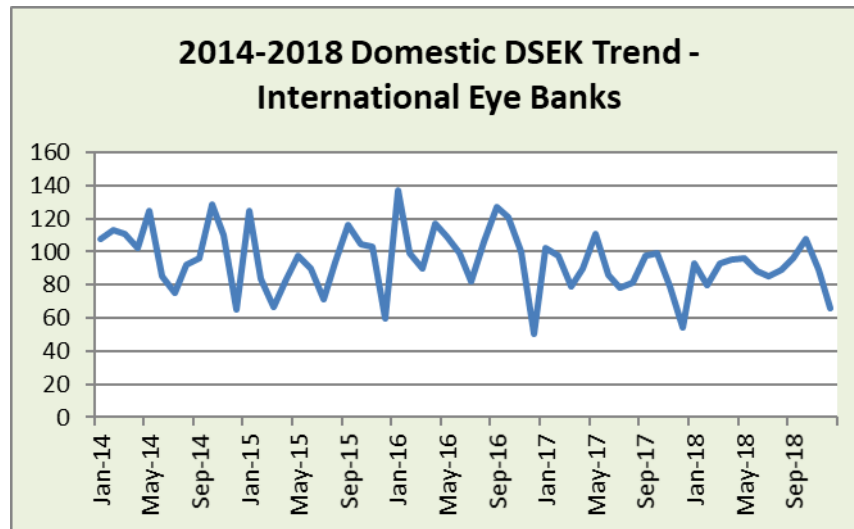
**2014-2018 Domestic PK Trend -
International Eye Banks**



**2014-2018 Domestic DALK Trend -
International Eye Banks**

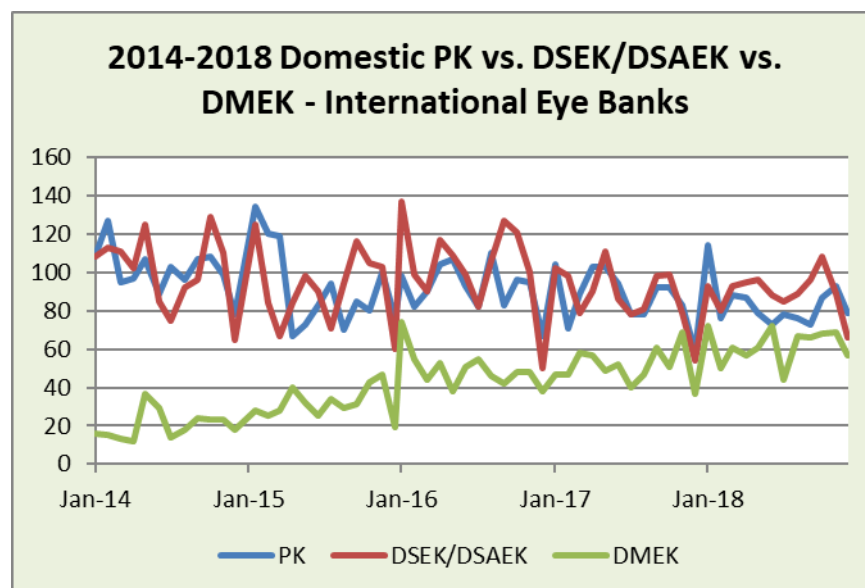
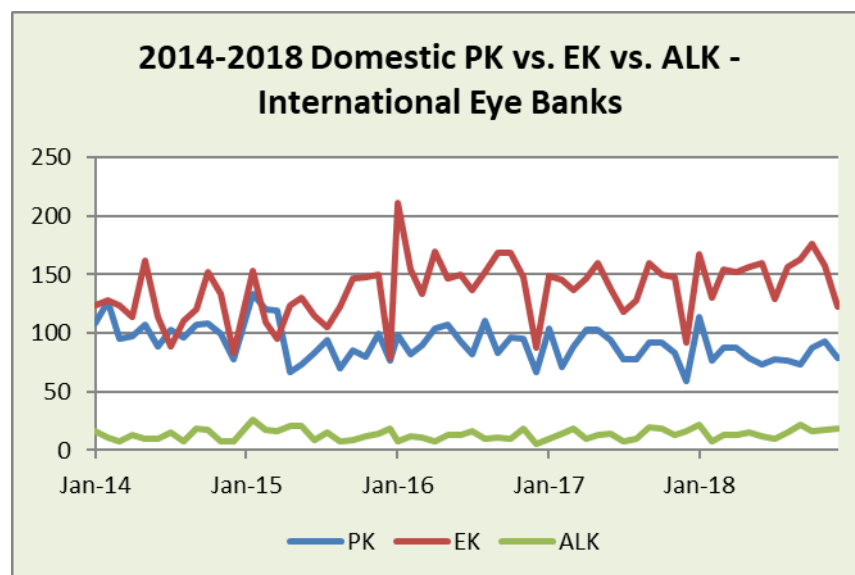


2018 International Eye Banking Statistics Trends of Domestic Use



2018 International Eye Banking Statistics

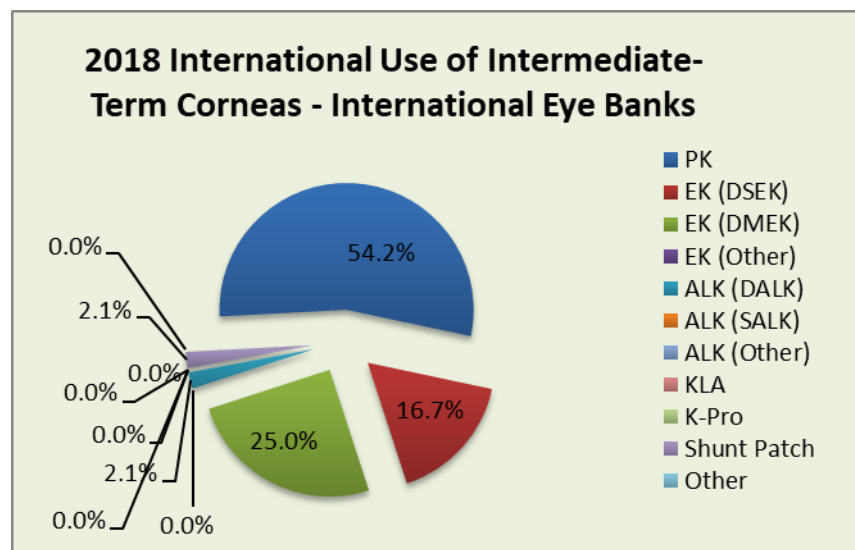
Domestic Surgery Use of Intermediate-Term Preserved Tissue



2018 International Eye Banking Statistics

International Surgery Use of Intermediate-Term Preserved Tissue

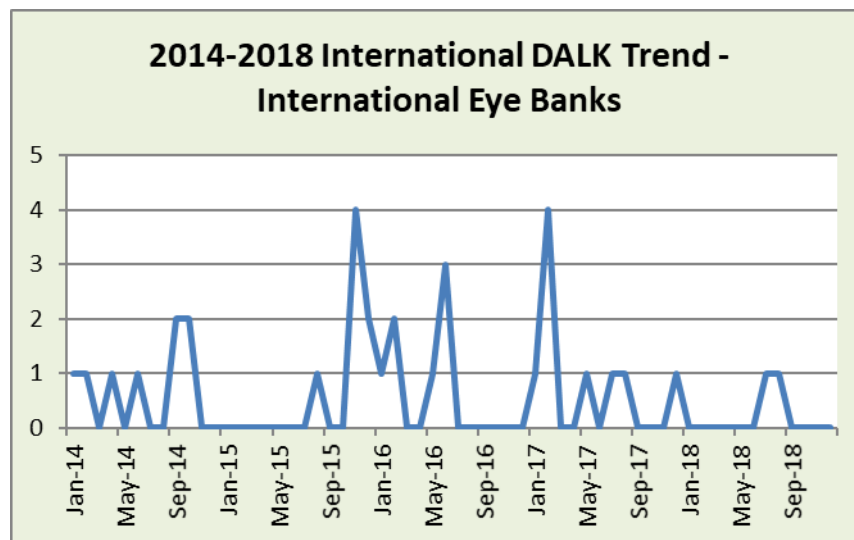
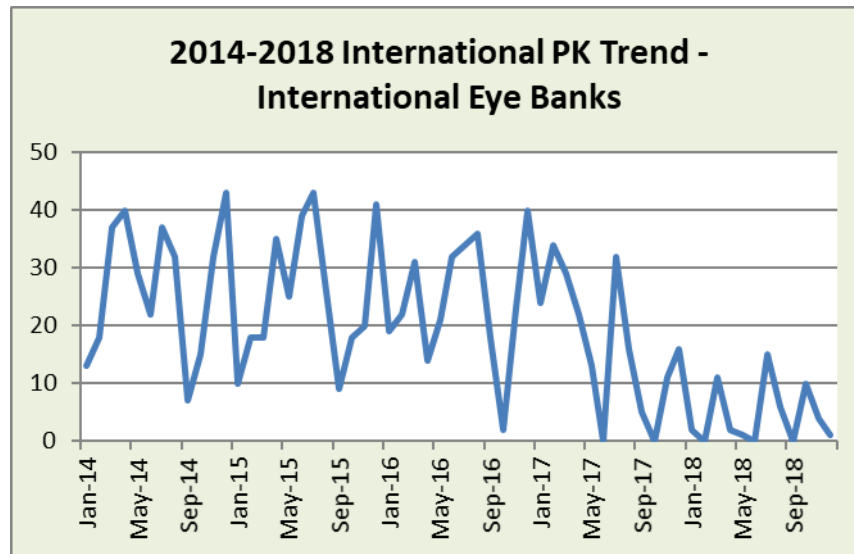
International Use of Intermediate-Term Corneas – International Eye Banks		
	2017	2018
Intermediate-term preserved corneas, corneal segments or whole eyes transplanted for:		
PK	276	96
EK		
DSEK, DSAEK, DLEK	202	52
DMEK or DMAEK	64	40
PDEK	27	16
Other EK	37	24
ALK	0	0
DALK (Deep Anterior Lamellar Keratoplasty)	9	2
SALK (Superficial Anterior Lamellar Keratoplasty)	0	0
Other ALK (e.g. peripheral, eccentric, etc.)	0	0
KLA	0	0
Keratoprosthesis (K-Pro)	0	0
Glaucoma shunt patch or other non-keratoplasty use	1	2
Other Keratoplasty (e.g. experimental surgery type)	0	0
Unknown or Unspecified	0	0
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for KERATOPLASTY	3,341	3,386
Total intermediate-term preserved corneas, corneal segments, and whole eyes used for TRANSPLANT	3,570	3,628



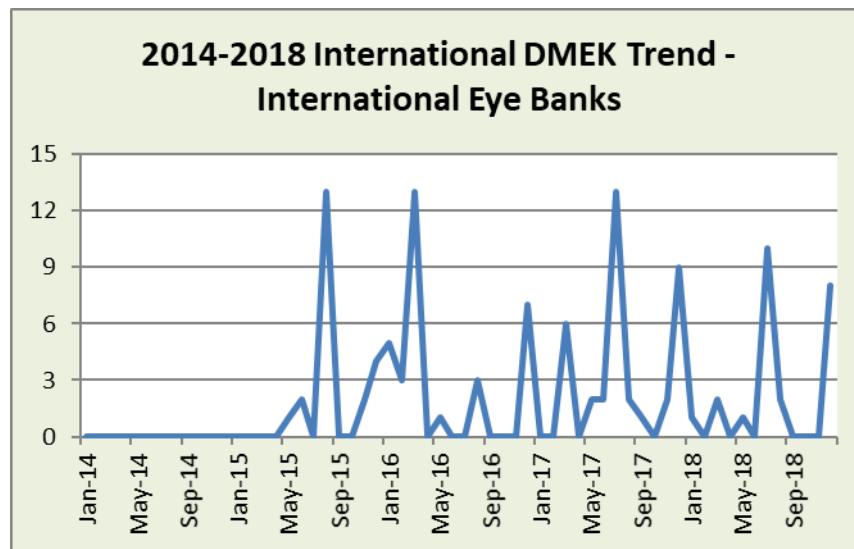
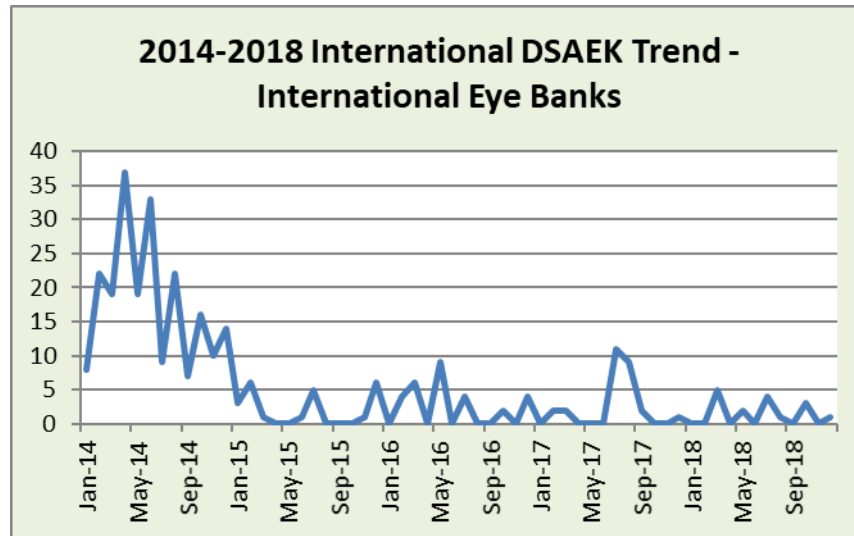
2018 International Eye Banking Statistics

International Surgery Use of Intermediate-Term Preserved Tissue

Surgery Type (Internationally Distributed Corneas) - International Eye Banks												
Year	PK	EK (DSEK)	EK (DMEK)	EK (Other)	ALK (DALK)	ALK (SALK)	ALK (Other)	KLA	K-Pro	Shunt Patch	Other	Unknown
2013	227	73	0	0	9	0	1	0	3	0	0	23
2014	325	216	0	0	7	0	1	0	1	1	0	0
2015	302	23	22	0	7	0	0	0	0	1	0	61
2016	292	29	32	0	7	0	0	0	0	2	1	0
2017	202	27	37	0	9	0	0	0	0	1	0	0
2018	52	16	24	0	2	0	0	0	0	2	0	0

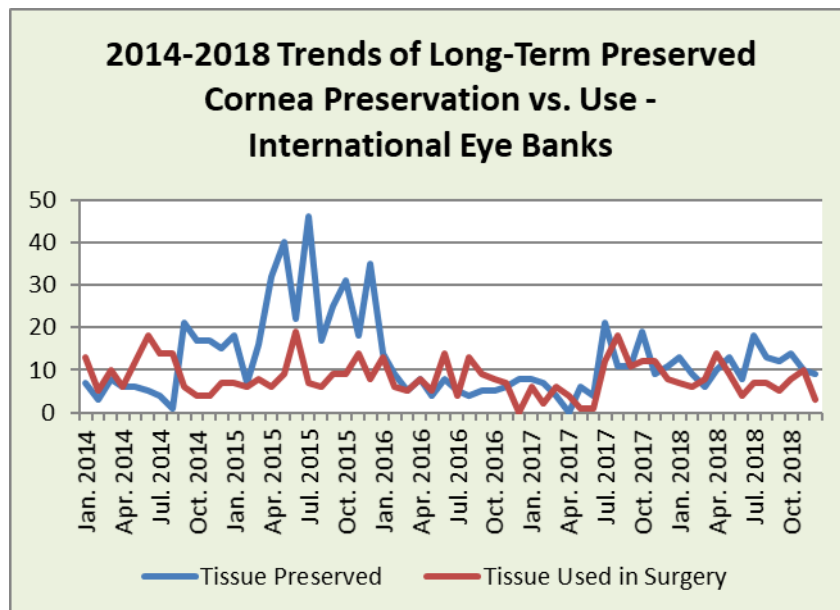


2018 International Eye Banking Statistics Trends of International Use






2018 International Eye Banking Statistics Long-Term Tissue Distribution

Long-Term Preserved Tissue Preservation and Distribution		
	2017	2018
Long-term preserved corneas or whole globes PRESERVED for transplant	111	135
Long-term preserved corneas, corneal segments, or whole globes DISTRIBUTED for:	93	88
Keratoplasty	6	3
Glaucoma Shunt patching	62	62
Other Surgical Uses	25	23
Long-term preserved corneas, corneal segments, or whole globes FORWARDED to another entity for final distribution	0	5
Sclera or sclera segments PRESERVED for transplantation	1,097	1,352
Sclera or sclera segments DISTRIBUTED for:	995	1,193
Prosthesis following enucleation	20	36
Glaucoma shunt patching	737	893
Other surgical uses	238	264
Sclera or sclera segments FORWARDED to another entity for final distribution	11	0

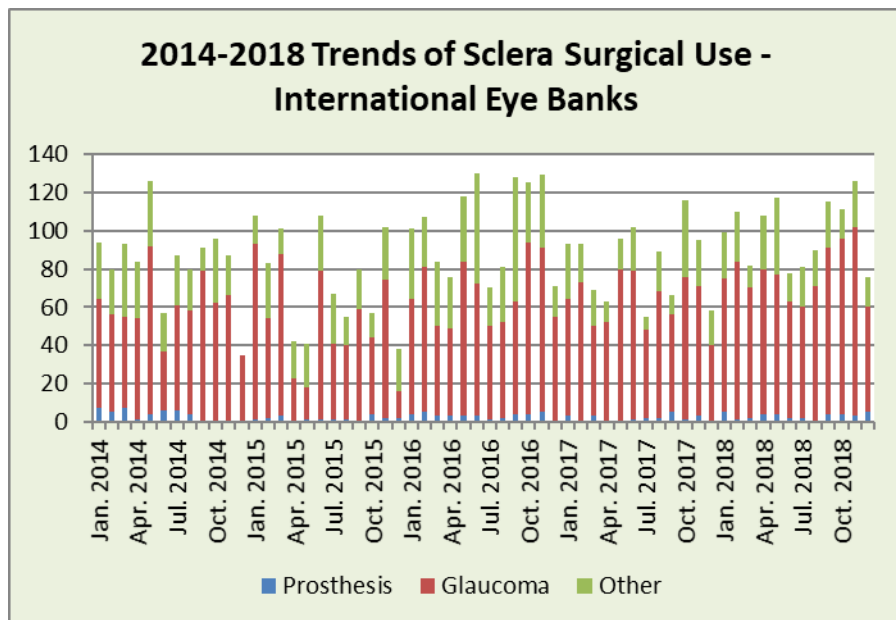
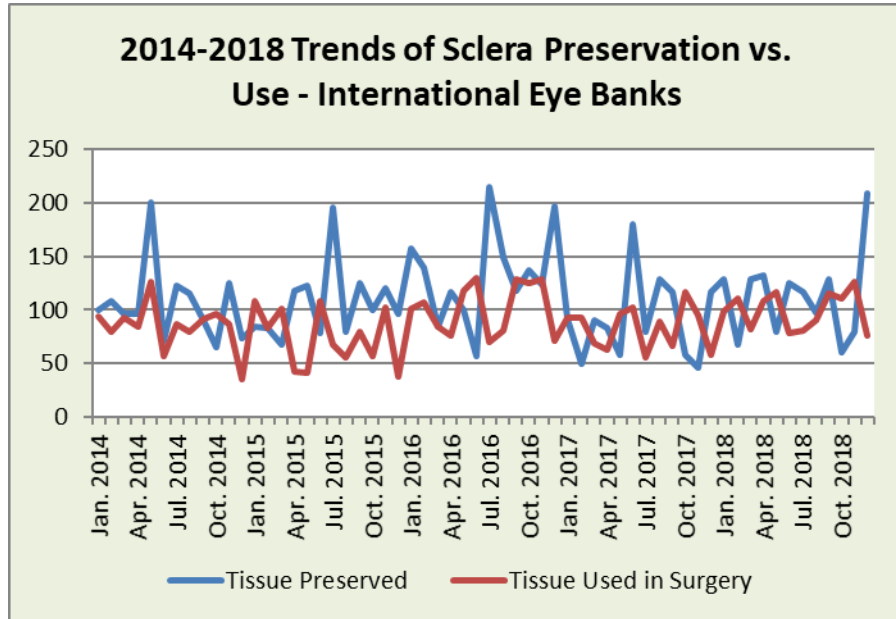


2018 International Eye Banking Statistics Long-Term Tissue Trends

Long-Term Tissue Trends - International Eye Banks								
Month	Long-Term Preserved Corneas	Long-Term Cornea Use - Keratoplasty	Long-Term Cornea Use - Glaucoma	Long-Term Cornea Use - Other	Scleral Segments Preserved	Sclera Use - Prosthesis	Sclera Use - Glaucoma	Sclera Use - Other
Jan. 2018	13	0	6	1	128	5	70	24
Feb. 2018	9	0	2	4	68	1	83	26
Mar. 2018	6	0	3	5	128	2	68	12
Apr. 2018	10	0	12	2	132	4	76	28
May 2018	13	0	5	4	79	4	73	40
Jun. 2018	8	0	4	0	125	2	61	15
Jul. 2018	18	0	6	1	117	2	58	21
Aug. 2018	13	0	5	2	98	0	71	19
Sep. 2018	12	0	4	1	128	4	87	24
Oct. 2018	14	1	6	1	60	4	92	15
Nov. 2018	10	2	7	1	80	3	99	24
Dec. 2018	9	0	2	1	209	5	55	16
2014 Total	110	12	101	0	1,261	40	679	291
2015 Total	307	5	102	1	1,269	18	611	253
2016 Total	81	2	89	1	1,398	39	773	265
2017 Total	111	6	62	25	1,097	20	737	238
2018 Total	135	3	62	23	1,352	36	893	264
2018 Avg.	11	0	5	2	113	3	74	22
Std. Dev.	3	1	3	2	40	2	14	8

Ocular Tissue Used for Glaucoma Shunt Patching - International Eye Banks								
Ocular Tissue Used for Glaucoma Shunt Patching	2012	2013	2014	2015	2016	2017	2018	Trends
Long-Term Cornea	119	110	101	102	89	62	62	
Intermediate-Term Cornea	169	227	304	240	313	229	245	
Sclera	609	597	679	611	773	737	893	

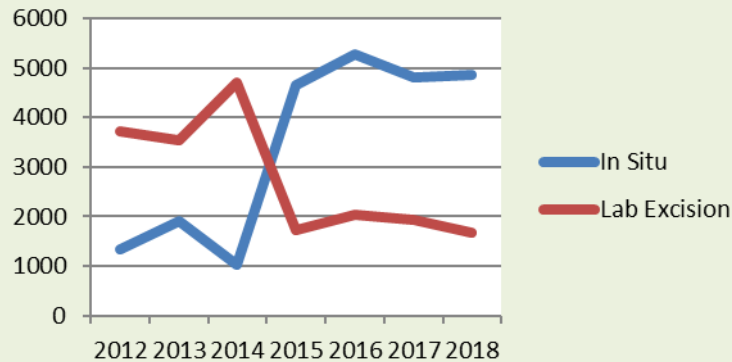
2018 International Eye Banking Statistics Long-Term Tissue Trends



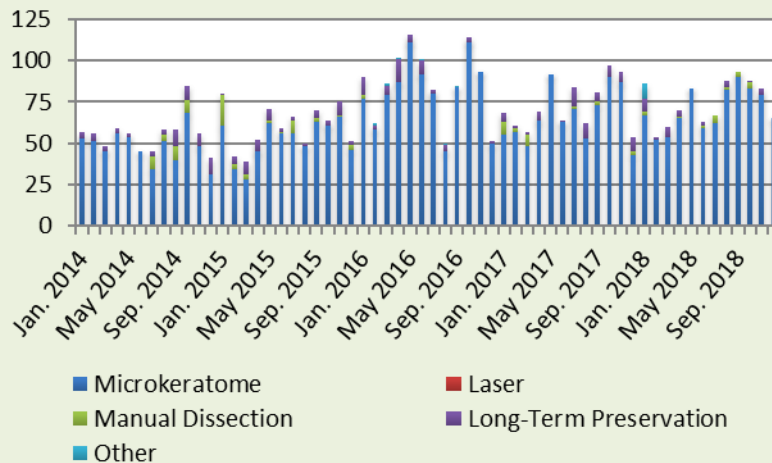
2018 International Eye Banking Statistics Tissue Processing

Tissue Processing for Transplant – International Eye Banks		
	2017	2018
Eye Processing (does not include in situ excision)	1,940	1,687
Processed for corneal preservation only	1,484	1,280
Processed for sclera preservation	420	371
Processed for other ocular materials	36	36
Cornea Processing	882	900
Processed by microkeratome	796	841
Processed by laser	0	0
Processed by hand dissection	22	19
Processed by transfer into long-term preservation	64	31
Processed by other methods	0	9

Cornea Recovery Type - International Eye Banks








2014-2018 Cornea Processing Activity - International Eye Banks



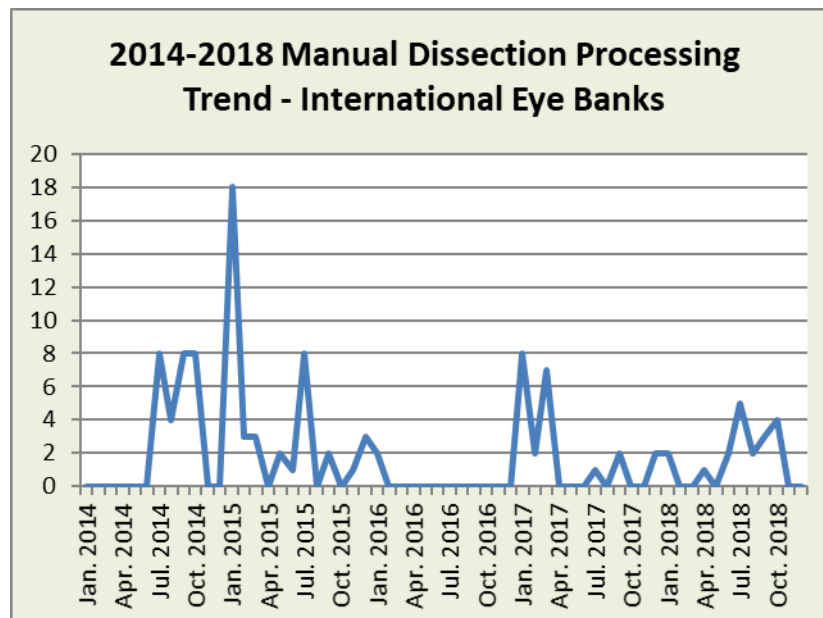
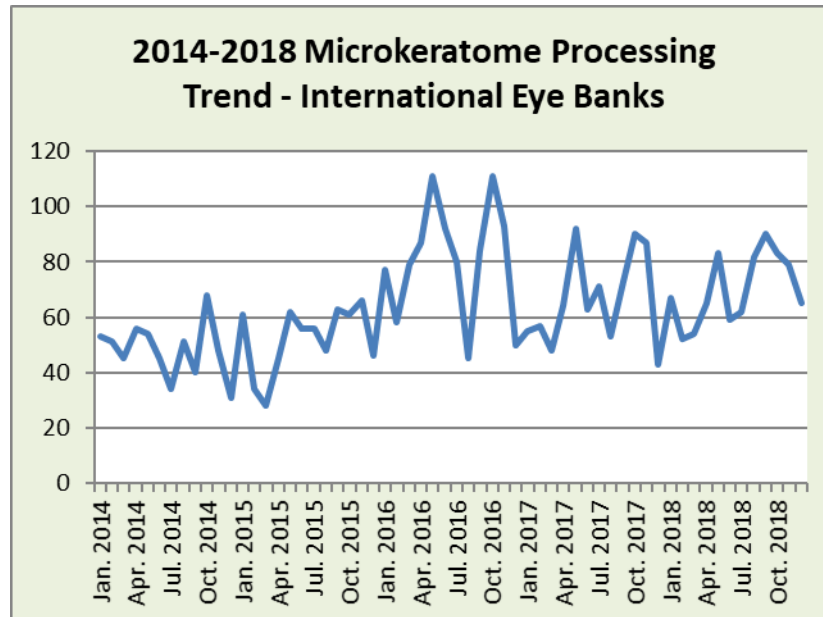
2018 International Eye Banking Statistics Tissue Processing

Cornea Processing - International Eye Banks					
Month	Processing - Microkeratome	Processing - Laser	Processing - Manual	Processing - Long-Term Preservation	Processing - Other
Jan. 2018	67	0	2	8	9
Feb. 2018	52	0	0	2	0
Mar. 2018	54	0	0	6	0
Apr. 2018	65	0	1	4	0
May 2018	83	0	0	0	0
Jun. 2018	59	0	2	2	0
Jul. 2018	62	0	5	0	0
Aug. 2018	82	0	2	4	0
Sep. 2018	90	0	3	0	0
Oct. 2018	83	0	4	1	0
Nov. 2018	79	0	0	4	0
Dec. 2018	65	0	0	0	0
2014 Total	576	0	28	60	0
2015 Total	626	0	41	52	0
2016 Total	864	0	2	57	6
2017 Total	796	0	22	64	0
2018 Total	841	0	19	31	9
2018 Avg.	70	0	2	3	1
Std. Dev.	13	0	2	3	3

Cornea Processing Success Rates - International Eye Banks								
	2012	2013	2014	2015	2016	2017	2018	Trends
Processing Events	556	451	664	719	929	882	900	
Failed Processing	53	55	64	49	66	55	60	
Failure Rate	90.5%	87.8%	90.4%	93.2%	92.9%	93.8%	93.3%	

Cornea Recovery Methods - International Eye Banks								
	2012	2013	2014	2015	2016	2017	2018	Trends
In Situ	1,327	1,897	1,024	4,667	5,283	4,813	4,872	
Lab Excision	3,731	3,530	4,702	1,736	2,050	1,940	1,687	

2018 International Eye Banking Statistics Tissue Processing



2018 International Eye Banking Statistics

Indications for Corneal Transplant

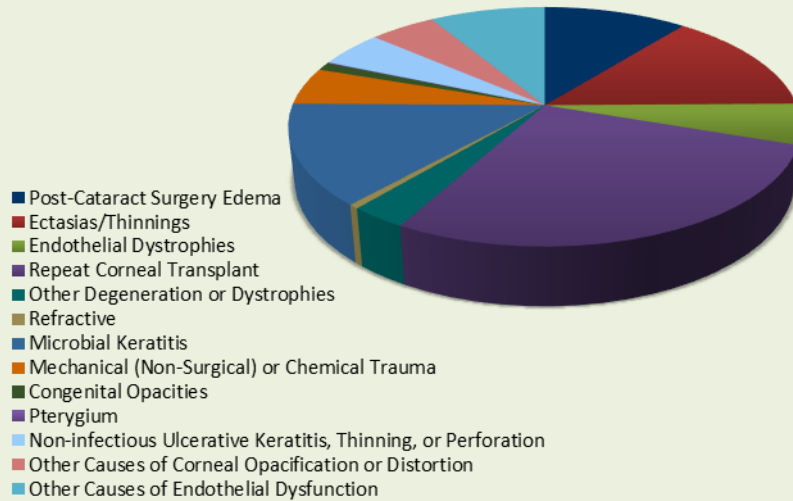
Indications for Penetrating Keratoplasty 2018	Domestic Use		International Use	
A. Post-cataract surgery edema	98	9.8%	9	17.3%
B. Ectasias/Thinnings	128	12.8%	9	17.3%
C. Endothelial Dystrophies	50	5.0%	1	1.9%
D. Repeat Corneal Transplant	253	25.2%	10	19.2%
E. Other degenerations or dystrophies	28	2.8%	0	0.0%
F. Refractive	5	0.5%	0	0.0%
G. Microbial keratitis	124	12.4%	7	13.5%
H. Mechanical or chemical trauma	46	4.6%	2	3.8%
I. Congenital opacities	10	1.0%	0	0.0%
J. Pterygium	1	0.1%	0	0.0%
K. Non-infectious ulcerative keratitis or perforation	45	4.5%	0	0.0%
L. Other causes of corneal dysfunction or distortion (non-endothelial)	45	4.5%	1	1.9%
M. Other causes of endothelial dysfunction	79	7.9%	1	1.9%
Z. Unknown, unreported, or unspecified	91	9.1%	12	23.1%
Total Indications for Penetrating Keratoplasty	1,003		52	

Indications for Anterior Lamellar Keratoplasty	Domestic Use		International Use	
B. Ectasias/Thinnings	90	50.0%	2	100%
D. Repeat Corneal Transplant	11	6.1%	0	0.0%
E. Other degenerations or dystrophies	12	6.7%	0	0.0%
F. Refractive	3	1.7%	0	0.0%
G. Microbial keratitis	14	7.8%	0	0.0%
H. Mechanical or chemical trauma	3	1.7%	0	0.0%
I. Congenital opacities	2	1.1%	0	0.0%
J. Pterygium	0	0.0%	0	0.0%
K. Non-infectious ulcerative keratitis or perforation	7	3.9%	0	0.0%
L. Other causes of corneal dysfunction or distortion	12	6.7%	0	0.0%
Z. Unknown, unreported, or unspecified	26	14.4%	0	0.0%
Total for Anterior Keratoplasty	180		2	

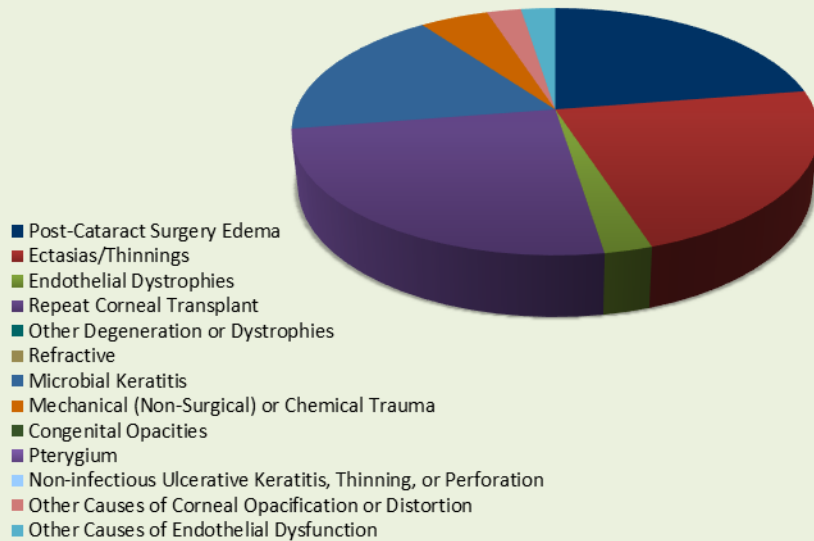
Indications for Endothelial Keratoplasty	Domestic Use		International Use	
A. Post-Cataract Surgery Edema	469	25.7%	13	32.5%
C. Endothelial Dystrophies	898	49.2%	6	15.0%
D. Repeat Corneal Transplant	256	14.0%	5	12.5%
M. Other Causes of Endothelial Dysfunction	97	5.3%	2	5.0%
Z. Unknown, unreported, or unspecified	105	5.8%	14	35.0%
Total for Endothelial Keratoplasty	1,825		40	

2018 International Eye Banking Statistics Indications for Corneal Transplant

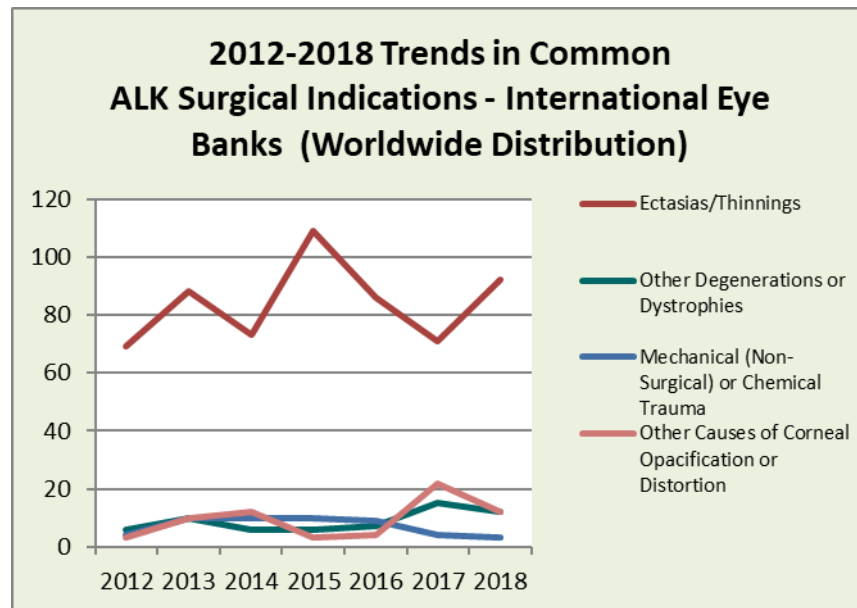
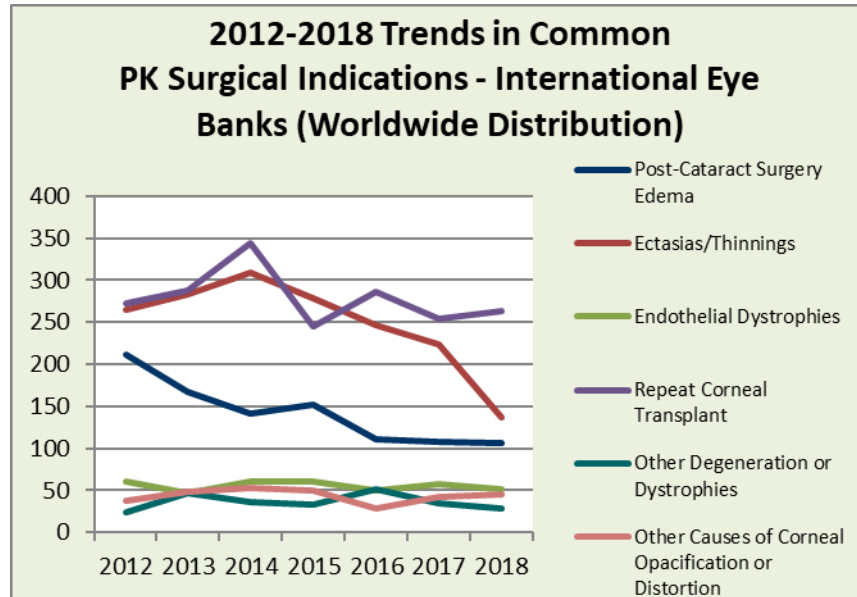
**2018 Indications for Penetrating Keratoplasty -
International Eye Banks (Domestic Distribution)**



**2018 Indications for Penetrating Keratoplasty -
International Eye Banks (International Distribution)**



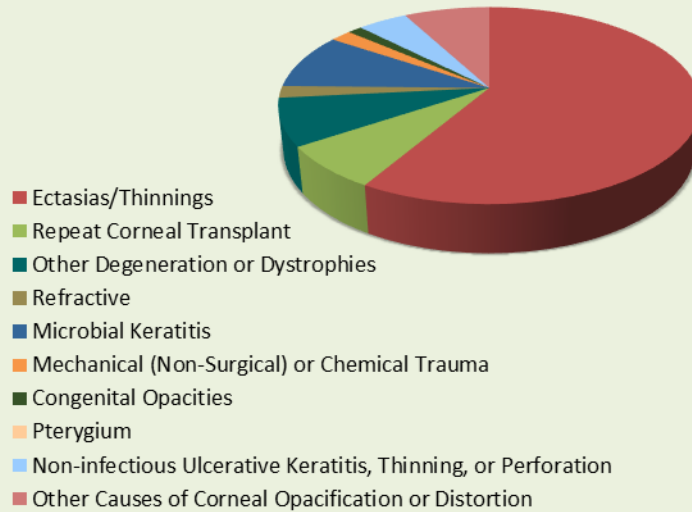
2018 International Eye Banking Statistics Indications for Corneal Transplant



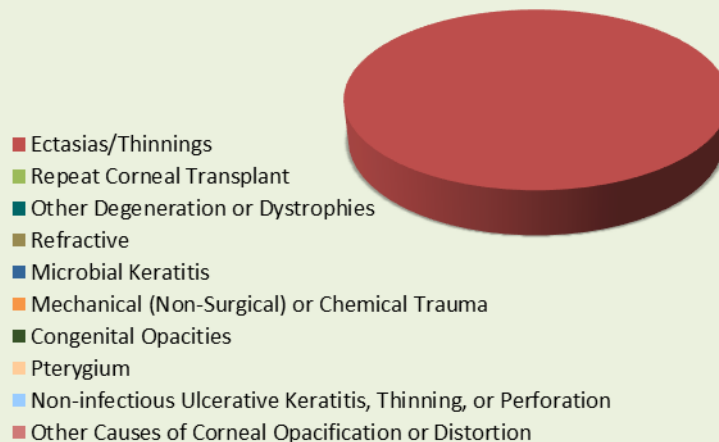
***Worldwide Distribution = Combined Domestic and International Distribution**

2018 International Eye Banking Statistics Indications for Corneal Transplant

**2018 Indications for Anterior Lamellar
Keratoplasty - International Eye Banks
(Domestic Distribution)**

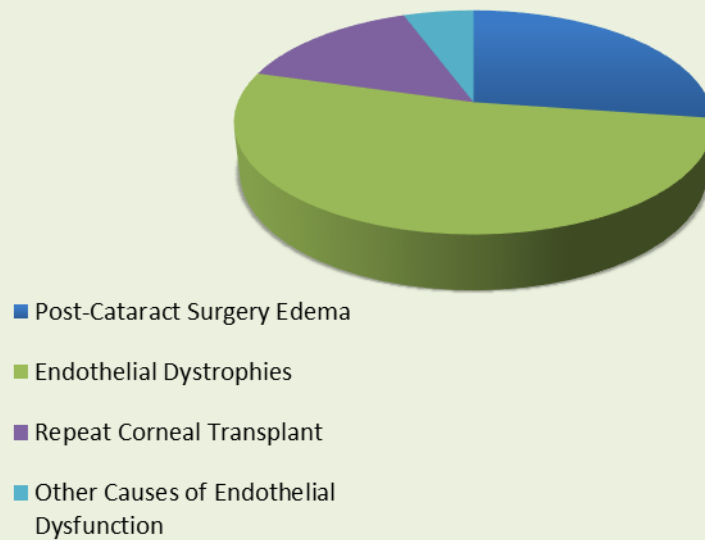


**2018 Indications for Anterior Lamellar
Keratoplasty - International Eye Banks
(International Distribution)**

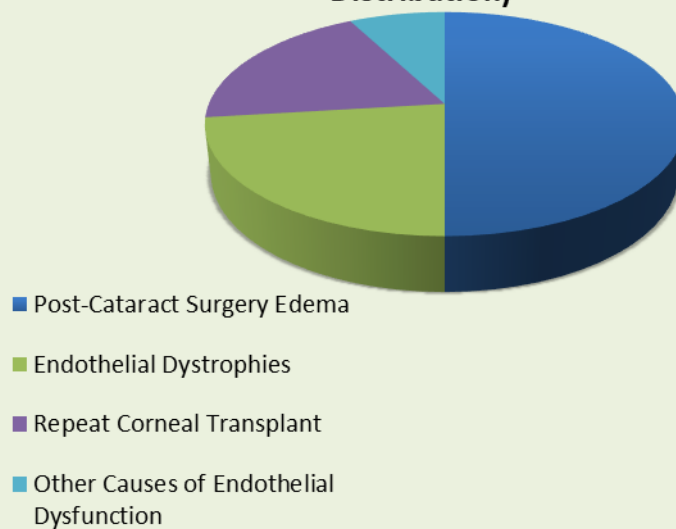


2018 International Eye Banking Statistics Indications for Corneal Transplant

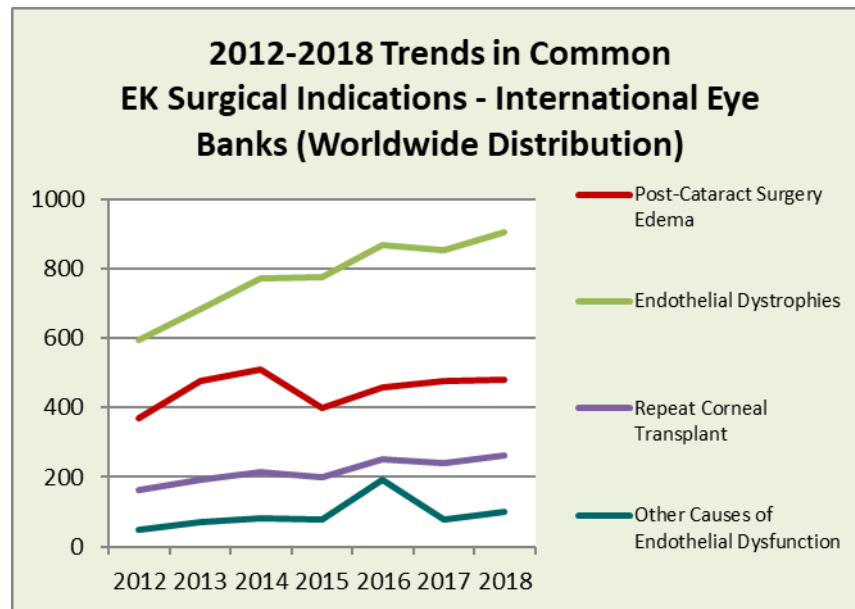
**2018 Indications for Endothelial Keratoplasty -
International Eye Banks (Domestic Distribution)**



**2018 Indications for Endothelial Keratoplasty -
International Eye Banks (International
Distribution)**



2018 International Eye Banking Statistics Indications for Corneal Transplant



***Worldwide Distribution = Combined Domestic and International Distribution**

2018 International Eye Banking Statistics Indications for Corneal Transplant

2018 (Domestically Distributed Corneas Only) - International Eye Banks														
	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	98	128	50	253	28	5	124	46	10	1	45	45	79	91
EK	469		898	256									97	105
ALK		90		11	12	3	14	3	2	0	7	131		26

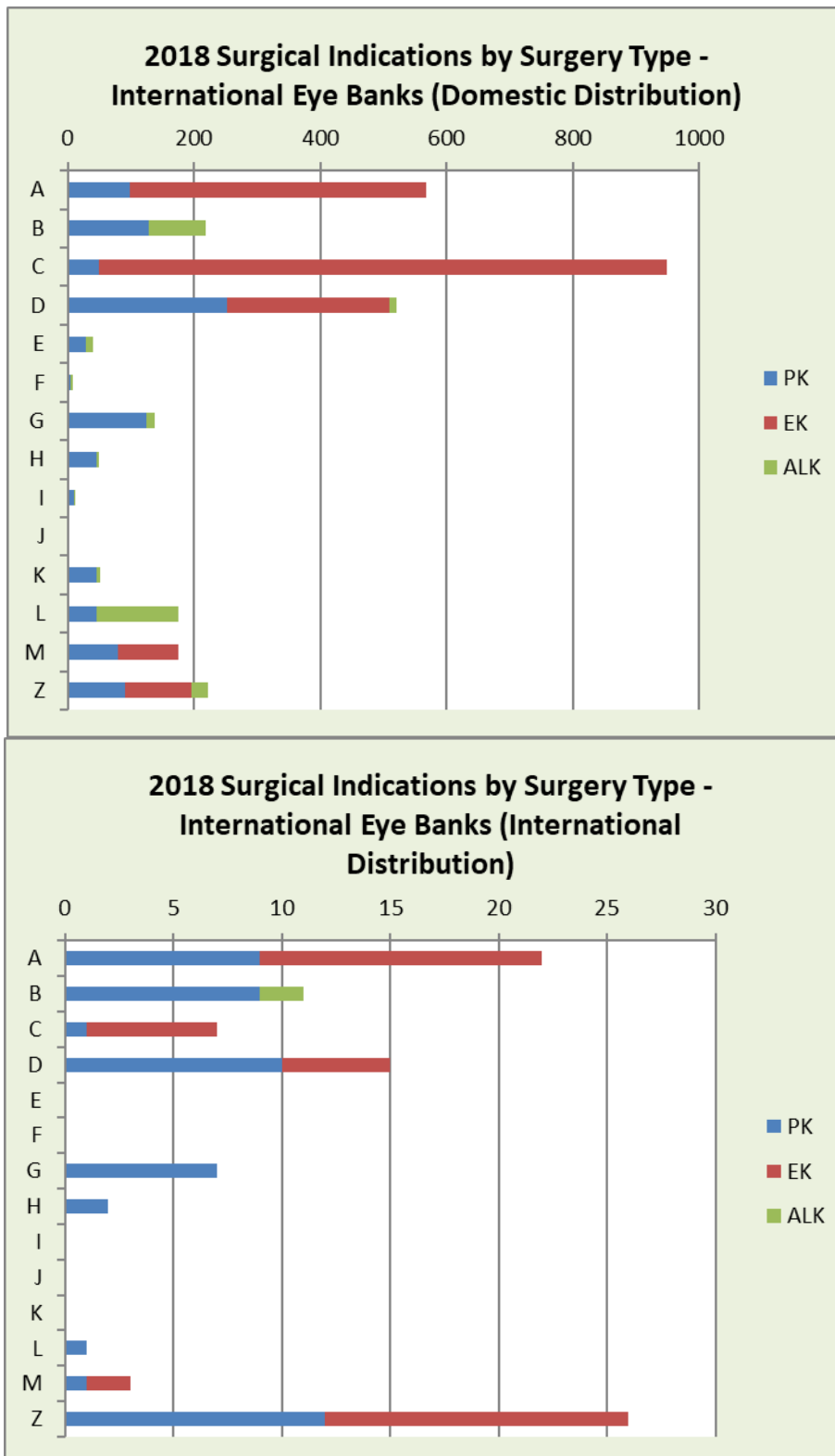
2018 (Internationally Distributed Corneas Only) - International Eye Banks														
	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	9	9	1	10	0	0	7	2	0	0	0	1	1	12
EK	13		6	5									2	14
ALK		2		0	0	0	0	0	0	0	0	0		0

2018 (Combined Domestic & International Distributed Corneas) - International Eye Banks														
	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
PK	107	137	51	263	28	5	131	48	10	1	45	46	80	103
EK	482		904	261									99	119
ALK		92		11	12	3	14	3	2	0	7	12		26

*Worldwide Distribution = Combined Domestic and International Distribution

- A - Post-Cataract Surgery Edema
- B - Ectasias/Thinning
- C - Endothelial Dystrophies
- D - Repeat Corneal Transplant
- E - Other Degeneration or Dystrophies
- F - Refractive
- G - Microbial Keratitis
- H - Mechanical (Non-Surgical) or Chemical Trauma
- I - Congenital Opacities
- J - Pterygium
- K - Non-infectious Ulcerative Keratitis, Thinning, or Perforation
- L - Other Causes of Corneal Opacification or Distortion
- M - Other Causes of Endothelial Dysfunction
- Z - Unknown or Unreported

2018 International Eye Banking Statistics Indications for Corneal Transplant



Eye Banks Submitting Data for the 2018 Eye Banking Statistical Report

STATE	EYE BANK NAME	CITY
AL	Alabama Eye Bank	Birmingham
AR	Arkansas Lions Eye Bank & Laboratory	Little Rock
AZ	Donor Network of Arizona	Phoenix
CA	One Legacy	Los Angeles
	San Diego Eye Bank	San Diego
	Sierra Donor Services Eye Bank	West Sacramento
CO	Rocky Mountain Lions Eye Bank	Aurora
FL	Florida Lions Eye Bank	Miami
	Lions Eye Institute for Transplantation and Research	Tampa
GA	Georgia Eye Bank	Atlanta
HI	Hawaii Lions Eye Bank & Makana Foundation	Honolulu
IA	Iowa Lions Eye Bank	Coralville
ID	Envision	Boise
IN	VisionFirst	Indianapolis
KS	Kansas Eye Bank & Cornea Research Center	Wichita
KY	Kentucky Lions Eye Bank	Louisville
LA	Baton Rouge Regional Eye Bank	Baton Rouge
	Southern Eye Bank	Metairie
MD	KeraLink Corporate	Baltimore
MI	Eversight Corporate	Ann Arbor
MN	Lions Gift of Sight	Minneapolis
MO	Mid-America Transplant	St. Louis
	Saving Sight	Columbia
MS	Mississippi Lions Eye Bank	Flowood
NC	LifeShare of the Carolinas	Charlotte
	Miracles in Sight.	Winston-Salem
NE	Lions Eye Bank of Nebraska, Inc.	Omaha
NV	Nevada Donor Network, Inc.	Las Vegas
NY	Central New York Eye Bank	Syracuse
	Sight Society of Northeastern New York	Albany
	The Lions Eye Bank for Long Island	Valley Stream
	The Eye-Bank for Sight Restoration	New York
	Upstate New York Transplant Services, Inc.	Williamsville
OH	Central Ohio Lions Eye Bank, Inc.	Columbus
	Cincinnati Eye Bank for Sight Restoration, Inc.	Cincinnati
	Lions Eye Bank of West Central Ohio	Dayton
OK	Oklahoma Lions Eye Bank	Oklahoma City
OR	Lions VisionGift	Portland

STATE	EYE BANK NAME	CITY
PA	Center for Organ Recovery & Education (CORE)	Pittsburgh
	Gift of Life Donor Program Eye Bank	Hershey
	Lions Eye Bank of Delaware Valley	Philadelphia
	Lions Eye Bank of Northwest Pennsylvania, Inc.	Erie
PR	Lions Eye Bank of Puerto Rico	San Juan
SD	Dakota Lions Sight and Health	Sioux Falls
TN	East Tennessee Lions Eye Bank, Inc.	Knoxville
	Mid-South Eye Bank for Sight Restoration, Inc.	Memphis
TX	Great Plains Lions Eye Bank, Inc.	Lubbock
	Lions Eye Bank of Texas at Baylor College of Medicine	Houston
	Lone Star Lions Eye Bank	Manor
	Transplant Services Center, UT Southwestern Medical Center	Dallas
	Western Texas Lions Eye Bank Alliance	San Angelo
UT	Utah Lions Eye Bank	Murray
VA	Lions Medical Eye Bank & Research Center of Eastern VA, Inc.	Norfolk
	Old Dominion Eye Foundation, Inc.	Richmond
WA	SightLife Corporate	Seattle
WI	Lions Eye Bank of Wisconsin	Madison
WV	Medical Eye Bank of West Virginia	Charleston

COUNTRY	EYE BANK NAME	CITY
Canada	Lions Eye Bank	Calgary, AB
	Eye Bank of British Columbia	Vancouver, BC
	Misericordia Eye Bank	Winnipeg, MB
	New Brunswick Organ and Tissue Program- Ocular Division	Saint John, NB
	Regional Tissue Bank	Halifax, NS
	Eye Bank of Canada, Ontario Division	Toronto, ON
	Eye Bank of Saskatchewan	Saskatoon, SK
China	Daqing Eye Bank	Daqing
Germany	Hornhautbank Munich gGmbH	Munich
Hong Kong	Hospital Authority Eye Bank	Kowloon
Japan	Cornea Center & Eye Bank	Ichikawa City