Public Forum

Kidney Allocation Policy Development

Dallas, TX
February 8, 2007

OPTN

UNOS DONATE LIFE

Participants

- ~ 200 attendees here in Dallas
- Members of KARS and Kidney Committee
- UNOS, HRSA, and SRTR Leaders and Staff
- ~ 150 attendees by web-conference and/or phone

Today's Goals

- To explain the background of KARS
- To discuss the early findings of KARS including the rationale for considering net benefit in allocation
- To discuss net benefit: the Model and Simulations
- To outline policy development steps and the future of this endeavor

Today's Goals II

- To hear prepared comments - public testimony
- To provide ample time for and to stimulate discussion
- To obtain your feedback and answer your questions

Plan For The Day

- Morning: Presentations and Q & A
- Lunch
- Public Testimony
  - Brief focused commentary
- Table discussion of key issues
- Hear from discussion group leaders
- Summation

Ground Rules

- We want to hear your best comments and your best questions
  - State your name and institution
  - Make your point(s) succinctly
  - Ask clear and focused questions

Interactive Table Discussions

- Identify a speaker for each table
- There is a list of questions at each table to stimulate discussion. You may choose to focus your discussion on other aspects of kidney allocation policy.
- We will hear from one speaker from each table – to report on what you consider to be the most important comments to share at this forum
- We will bring microphones to your tables
- We ask that each speaker limit his or her comments to three minutes…

Charge of the OPTN/UNOS Kidney Transplantation Committee

Mark Stegall, MD

Committee Chair

Outline

- Why are we reviewing kidney allocation?
- What has been the process?
- What are likely changes?
- When will changes be implemented?

Why are we reviewing kidney allocation?

- Required by Final Rule
- 2004 Board charges Kidney Committee to conduct comprehensive review of allocation
- 2006 Board charges Kidney Committee to consider net survival benefit with modifiers to balance justice and utility

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OPTN Final Rule

Policy development should:

- "seek to achieve the best use of donated organs"
- Be "designed to avoid wasting organs"
- Set "priority rankings through objective and measurable medical criteria"
- De-emphasize the use of waiting time in rank ordering candidates

HRSA Fiscal Year 2007 Justification of Estimates for Appropriations*

- By 2013, ... Increase the average number of life-years gained in the first 5 years after transplantation for deceased kidney/kidney-pancreas transplants by 0.003 life-years until the goal of 0.436 life-years gained per transplant is achieved in 2013.

*http://www.hrsa.gov/about/budgetjustification07/HealthCareSystemsPerformanceAnalysis.htm

What has been the process?

I. KARS Process—comprehensive review, define general direction **Finished**

II. Benefit—create the model, simulate the impact of benefit **Finished**

III. Refining the Proposal—modifying benefit, eliciting feedback **Started**

IV. Finalizing the Proposal **Fall 2007**

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Overall

- Prior living donor
- Pediatric priority for donors <35
- SCD kidneys using benefit modified by time, sensitization and urgency
- SPK and Kidney alone intermixed
- ECD kidneys by waiting time

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Important Caveats

- This is not a final proposal
- Even after a final proposal is implemented, there will be ongoing changes

Acronyms

- Transplant Benefit: (Not specific, Value-laden)
- QENLSB: Quality Adjusted Estimated Net Lifetime Survival Benefit (Too Long)
- LYFT: Life Years From Transplant (Descriptive)

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Overview of the Current National Kidney Allocation System

Areas for Improvement

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Deceased Donor Kidney Waiting List

- 68,902 candidates for kidneys
  - 66,402 solitary kidney
  - 2500 simultaneous pancreas-kidney
- 2005 Kidney Transplants
  - 17,379 total
  - 10,816 deceased donors
    - 9914 solitary kidneys
    - 902 SPK
  - 6663 living donor (doubled over 15 years)

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Public Hearing Topics

- Review of Current Allocation System
- Scope of ESRD
- Ethical Issues
- Barriers to Access Issues
- OPO Issues
- Introduction to New Allocation Systems
- Histocompatibility Issues
- Patient Issues
- Minority Issues
- Specific Biologic Issues Such as Those of Diabetes
- Net Benefit Model
- Transplantation in Other Countries

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Problems with Current System

- Inefficient
  - e.g, high discard rate of difficult to place kidneys
  - No way to predict when a “high risk” candidate would be transplanted difficult to maintain updated workups

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Problems with the Current System

- Relatively arbitrary decisions regarding the importance of HLA and sensitization
  - 1 or 2 points for DR match
  - 4 Points for PRA >80%
- Absolute trump for 0-ABDR mismatch

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Problems with the Current System

- 19 y/o 0-ABDR mismatch donor kidney → 79 yo with many co-moribidities
- Shared→30% of all kidneys and increasing (0-ABDR and paybacks)
- 0-ABDR sharing was not evenly distributed

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Problems with the Current System

- PAYBACKS became a mess, competing with SPK and 0-ABDR mismatch
- Most kidneys are now allocated based mostly on by waiting time

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Did not use available technology

- A2→ B
- Identifying alloantibody specificities

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What is wrong with the current system?

- Poorly adherent to the Final Rule
  - Does not *seek to achieve the best use of donate organs*
  - Is not *designed to avoid wasting organs*
  - Does not set *priority rankings expressed, to the extent possible, through objective and measurable medical criteria*
- Currently there is no real "Goal" of kidney allocation

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New Allocation Schemas

- Liver→MELD
- Heart
- Lung
- All have in common—no other life-saving therapy except transplant
- All primarily focused on preventing death on the waiting list and maximizing early post-transplant survival (1 month to 1 year)

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End-Stage Renal Disease

- Dialysis = 300,000 people
- Living donor kidney transplant = 6600/yr
- Deceased donor kidney transplant = 10,000/yr
- Mortality not directly related to lack of an organ
- Mortality related to co-morbidities and dialysis-related deterioration
- Candidates with highest wait-list mortality generally have poorest long-term survival

What is the goal of a kidney transplant?

- Freedom from dialysis
- Better quality of life
- Prolongs life compared to dialysis
- Increase Life Years from Transplant (LYFT) = survival with kidney transplant – survival on dialysis

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Predicting Life Years From Transplant (LYFT)

Focus Upon Methods

Robert Wolfe, SRTR

Background

- Nearly all types of chronic renal failure patients are predicted to live longer with transplant than without (dialysis alone).
- Some types of patients are predicted to gain more Life Years From Transplant (LYFT) than others.
- Reference: Wolfe et al NEJM 1999
- Transplantation gives:
  - Longer life
  - Better quality of life

Life Years From Transplantation From A Donated Organ

- LYFT is the number of extra years of life that a candidate could expect to live with that donated organ compared to without a transplant.
- Example: Based on patient and donor characteristics the remaining lifetime might be estimated as:
  - 15 years with this transplant and
  - 5 years without transplant.
  - LYFT = 10 = 15 – 5 = Ten extra years of life

LYFT Combines Two Major Approaches to Organ Allocation

- Prioritize medical urgency
  - Higher priority if waitlist lifetime is shorter
- Prioritize graft survival
  - HLA matching
  - Avoid futile transplantation
  - Higher priority if post-transplant lifetimes are longer
- Prioritize both simultaneously: LYFT
  - Uses common metric of years of life

Why Allocate Organs to Candidates With Large LYFT?

- Achieving the greatest total LYFT among all the recipients, given the available organ pool, would yield the greatest total years of life among all the candidates.
- Allocation of each organ to the candidate with the greatest LYFT for that organ is a way to approach this goal.
- Simulation results show that such an allocation system achieves many more total years of life

Choices For Calculating LYFT

- How to measure lifetimes?
  - Median survival (stable to estimate)
  - Truncated lifetime (stable but incomplete)
  - Average Survival (area under the curve, less stable)
- Different weights for lifetimes
  - Urgency emphasis?
  - Quality of life considerations (dialysis vs. transplant)?
- Discounting future years compared to near years

A Hard Problem

- Limited follow-up available (15 years)
- Waiting list lifetimes are not completely observed for transplant recipients.
- Cox models have been developed to analyze such data and relate patient characteristics to survival rates.

Developing the Survival Benefit Model

- Time 1/1/92-12/31/04
- 110,777 adult Kidney and SPK candidates
- 96,275 transplants
- Extraplolated surivival—Post Tx and WL

Variables Considered In LYFT Model

- Age
- Time exposed to ESRD
- Albumin
- BMI
- Diagnosis:
  - HTN
  - Polycystic
  - Diabetic
  - Other
- Previous Transplant
- HLA
- Shared/local
- Donor Factors
- Peak PRA
- Ethnicity/Race
- Angina
- Peripheral Vascular Disease
- Calendar Year of Listing
- Gender
- NYHA Functional Class
- Primary Insurance Status
- Drug Treated Hypertension
- Type of Dialysis
- DSA (Surrogate for Geography)
- Dialysis modality
- Previous malignancy

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- ~~Primary insurance Status~~
- ~~Drug Treated Hypertension~~
- ~~Type of Dialysis~~
- ~~DSA (Surrogate for Geography)~~
- ~~Dialysis modality~~
- ~~Previous malignancy~~

Variables excluded:
gameable, poor data or not a major factor

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Variables Used In LYFT Model

- Age
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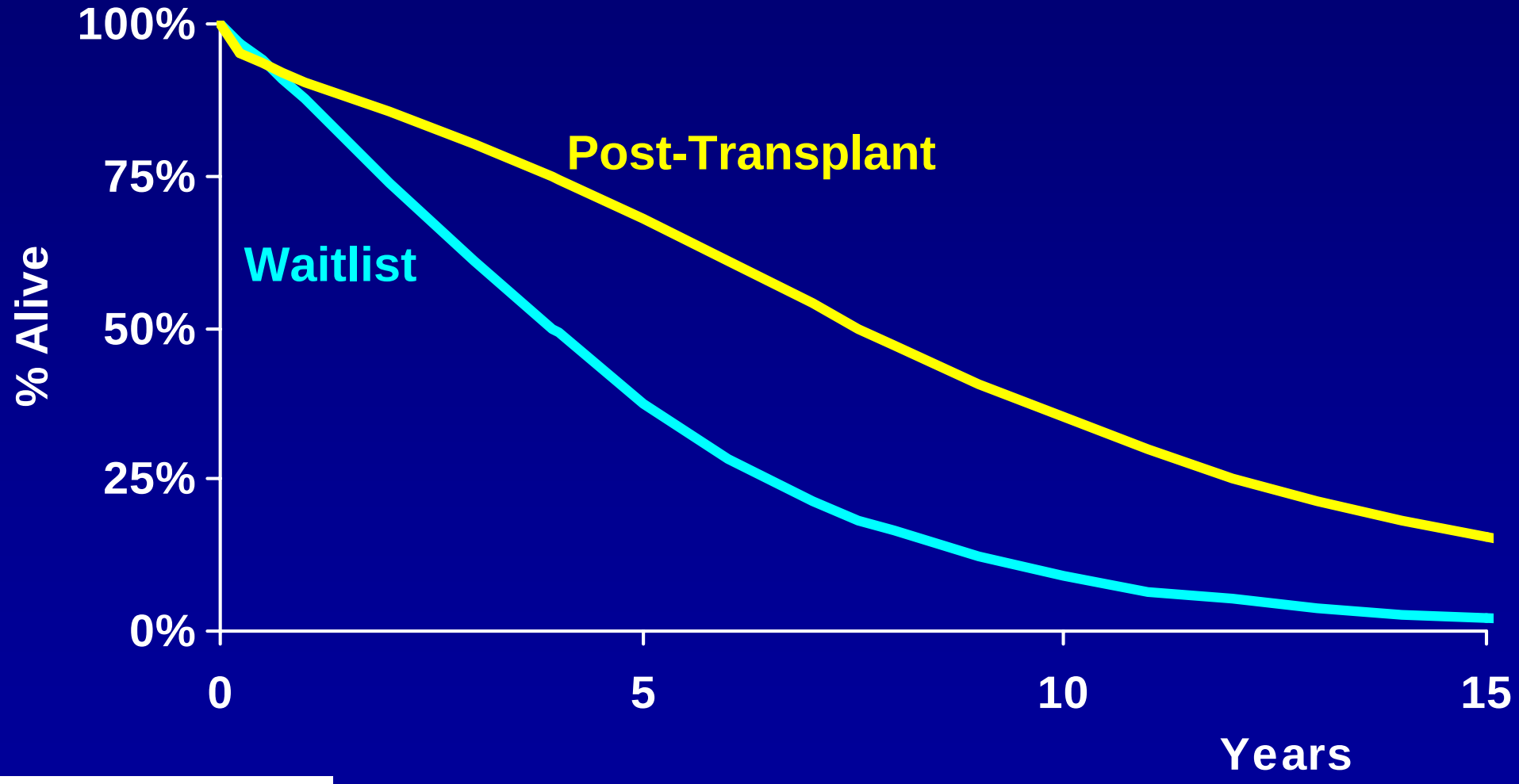
Variables included in LYFT calculation

Survival With / Without Transplant
Age 55, Diabetic, Kidney Candidate



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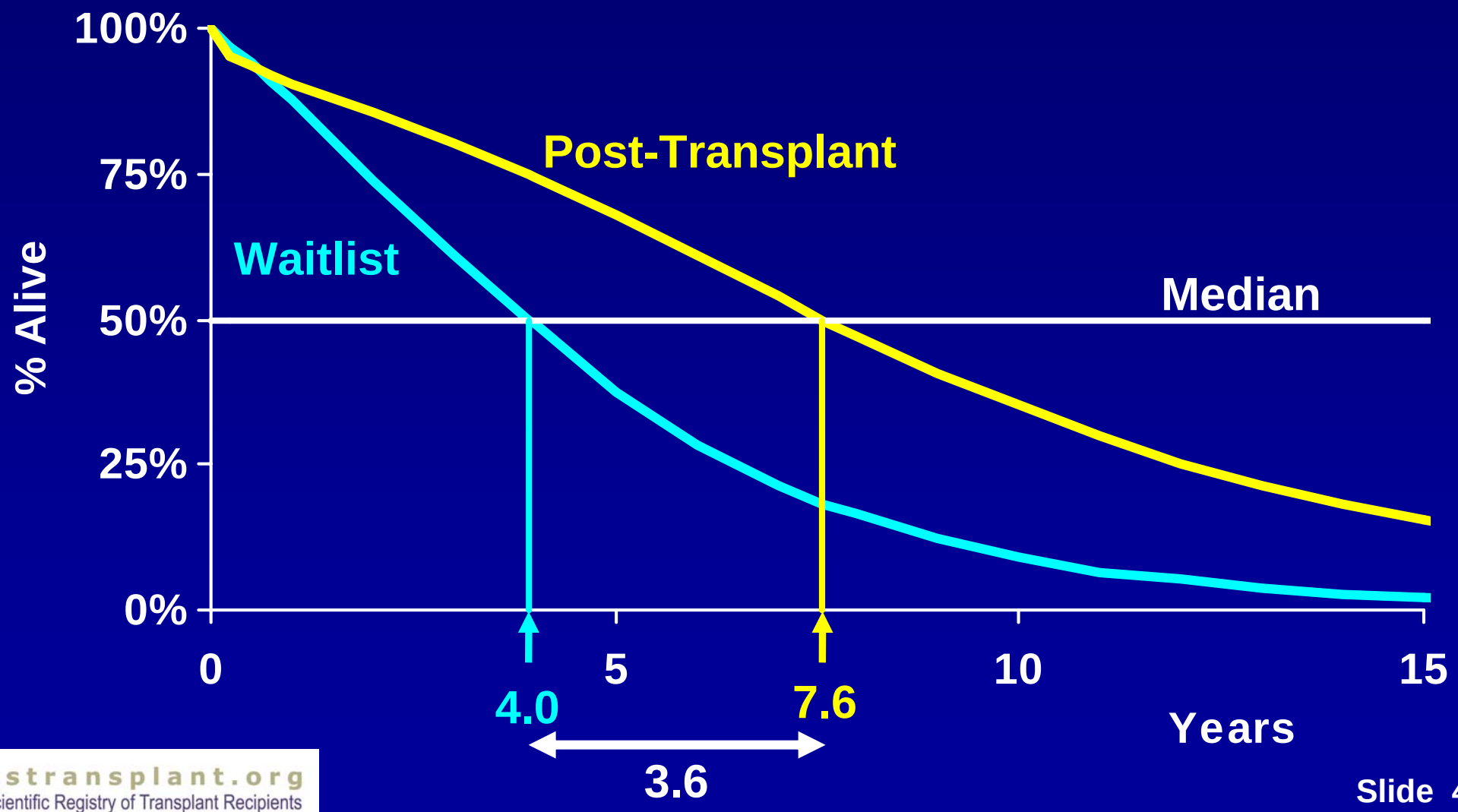
Median Survival And LYFT
Age 55, Diabetic, Kidney Candidate



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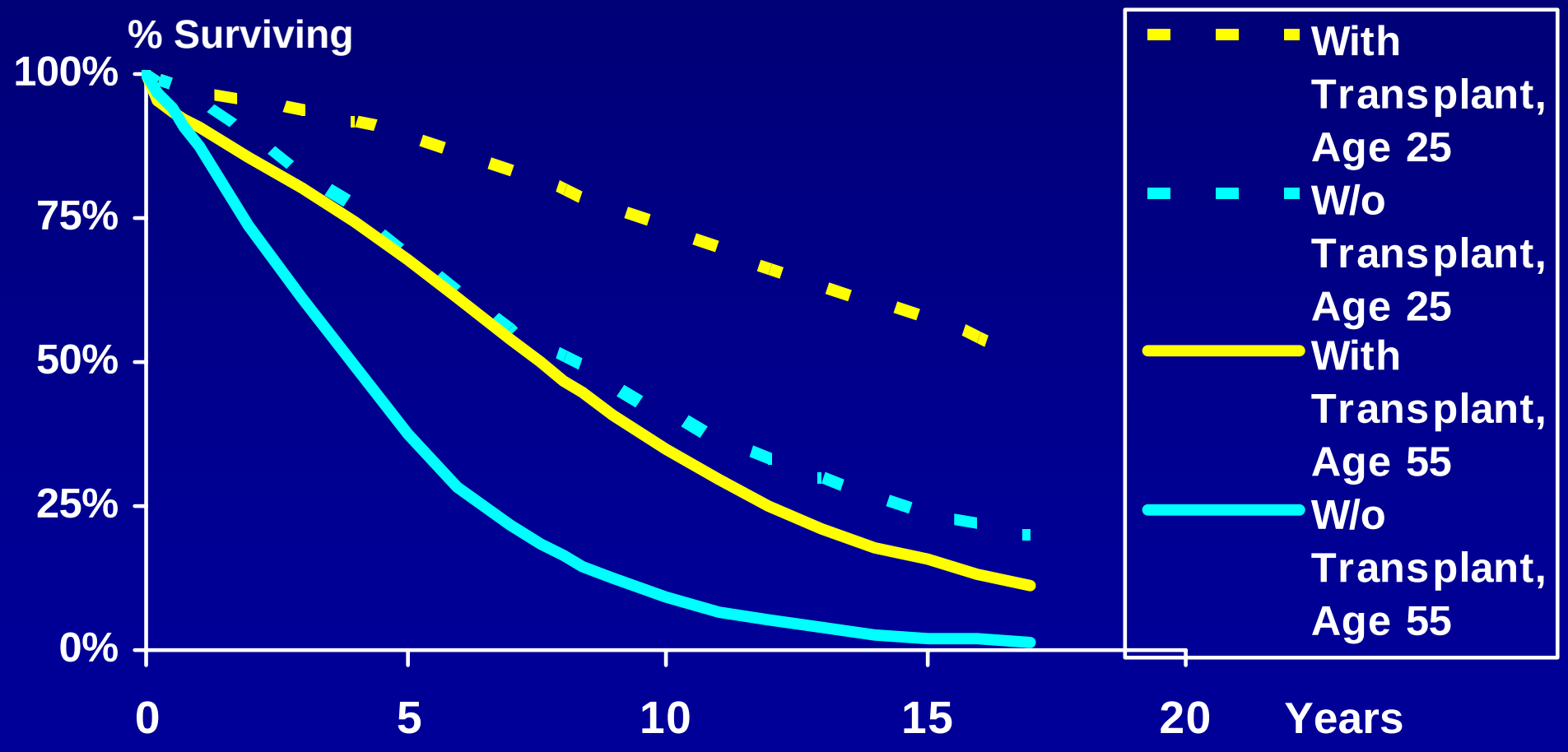
Median Survival

Survival Curves

Age 25 and 55, Diabetic, Kidney-alone candidate



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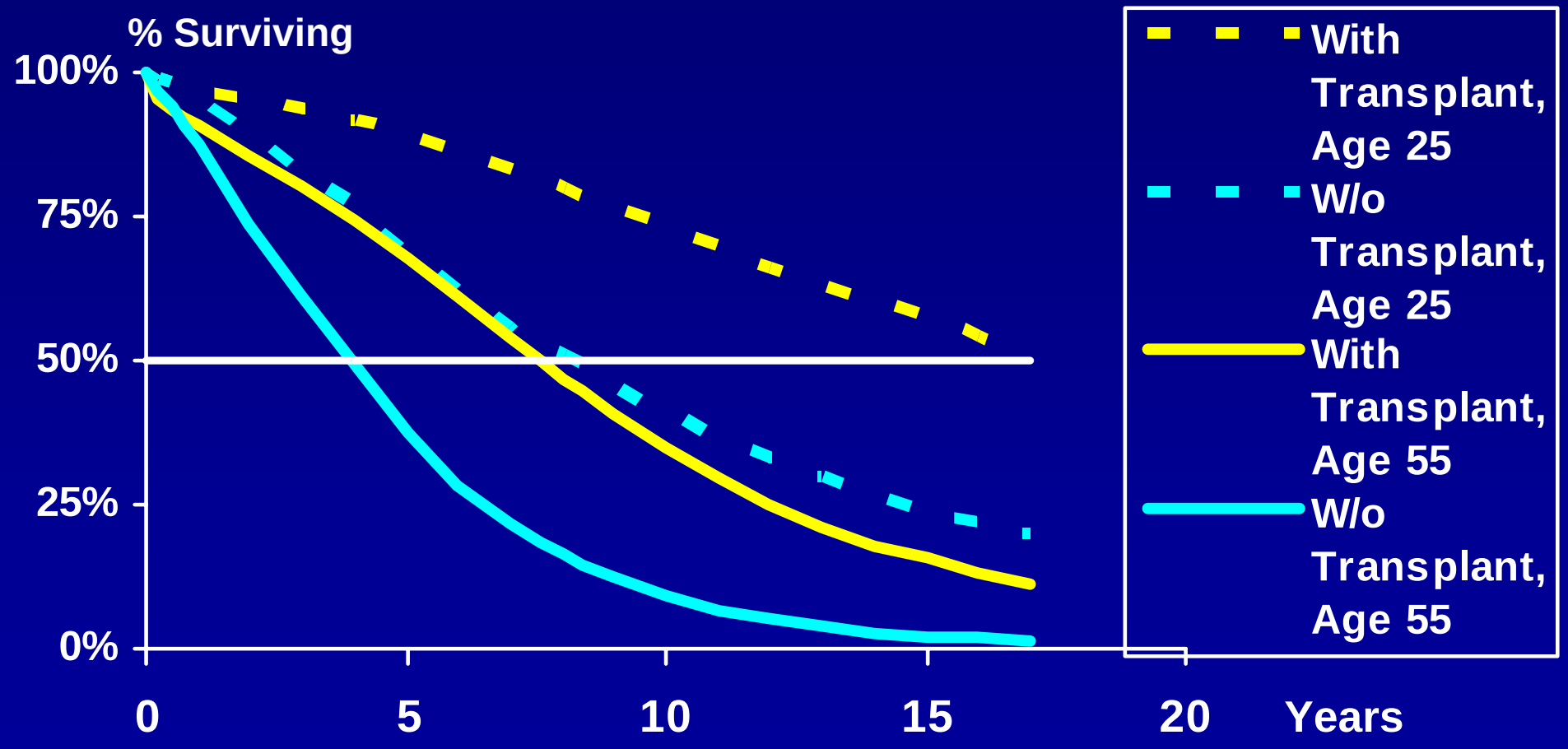

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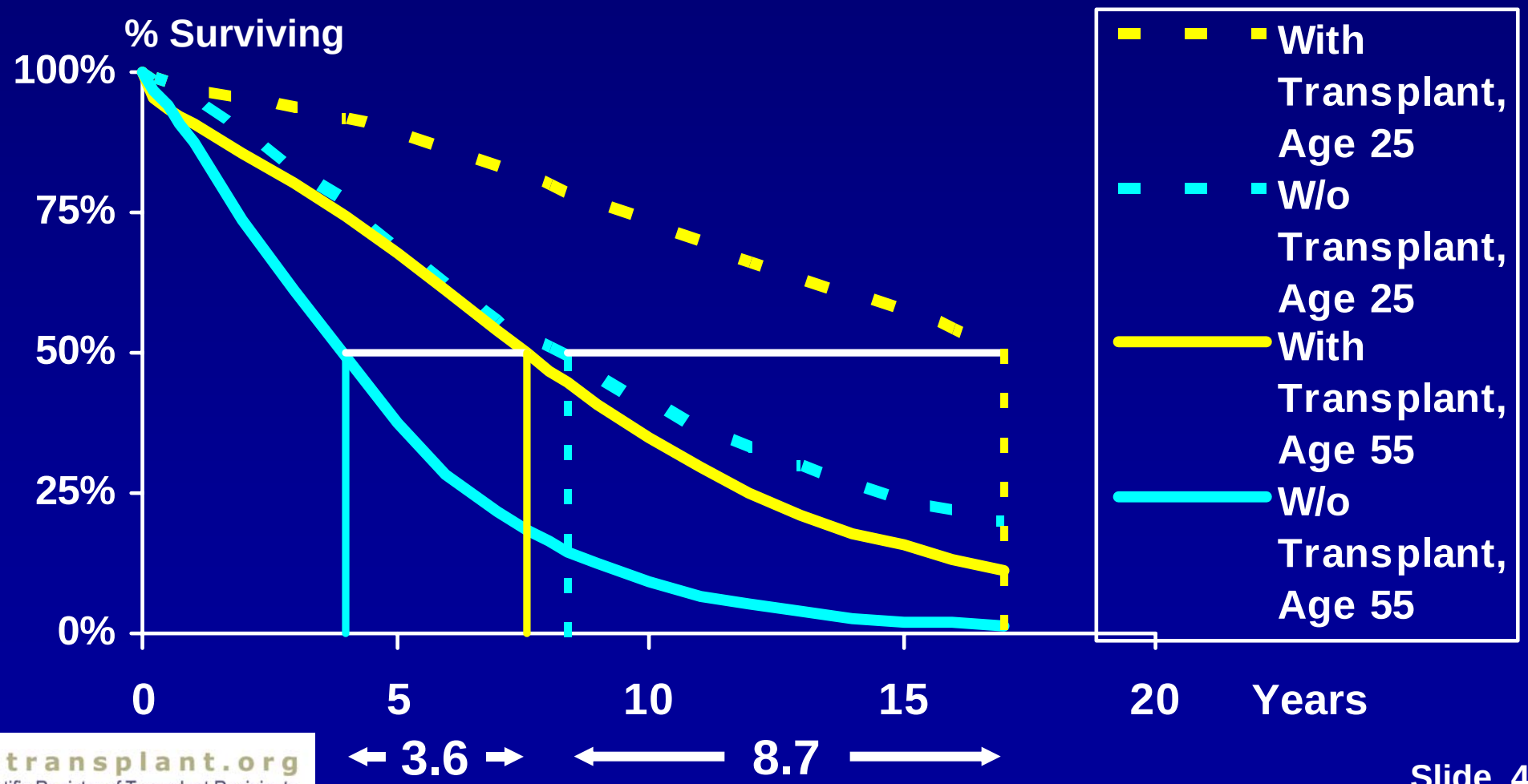

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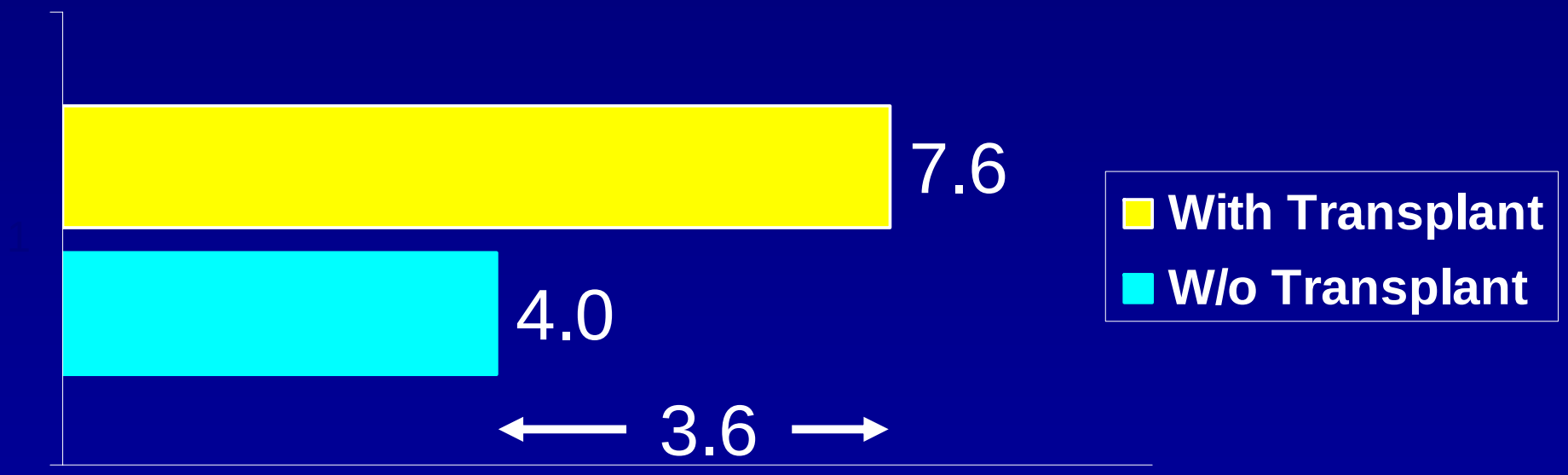
Median Survival

Median Lifetimes, Benefit

Age 55, Diabetic, Kidney-alone candidate



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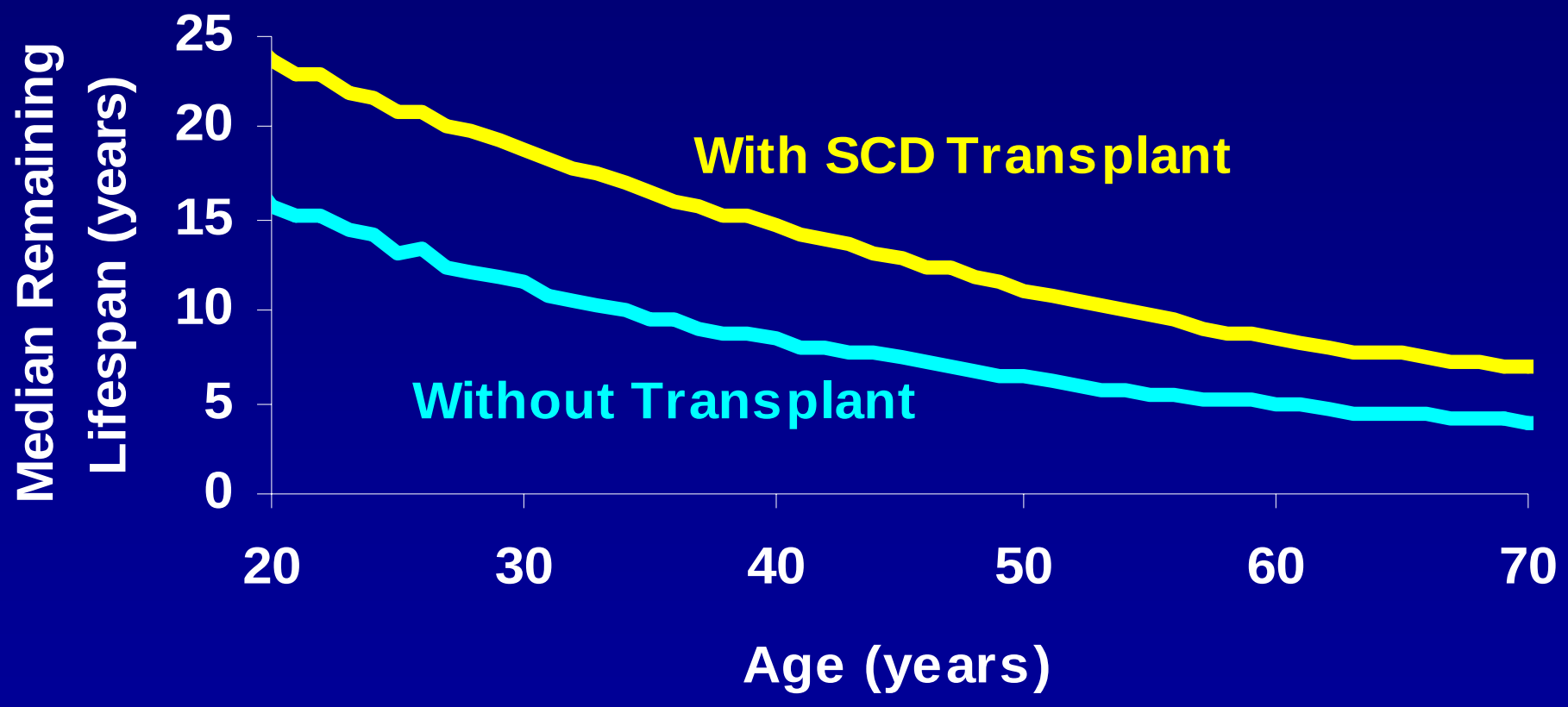
Median Survival by Age



Median lifespans with average SCD kidney and without any transplant are based on average of median survival estimated for candidates active on the waitlist on 1/1/2004.

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Quality of Life (QoL) for Candidates and Recipients

- LYFT could value post-transplant years and waitlist years equally
- However, several published studies indicate that QoL is lower on dialysis than with a functioning transplant
- Appropriate emphasis to post-transplant survival with a functioning graft can be incorporated into transplant benefit calculation in order to account for this difference:
  - Adjustment factor of 0.8 obtained from published literature
  - All candidates receive the same QoL adjustment

QoL Sources

What is the relative value of dialysis years v. years with functioning graft?

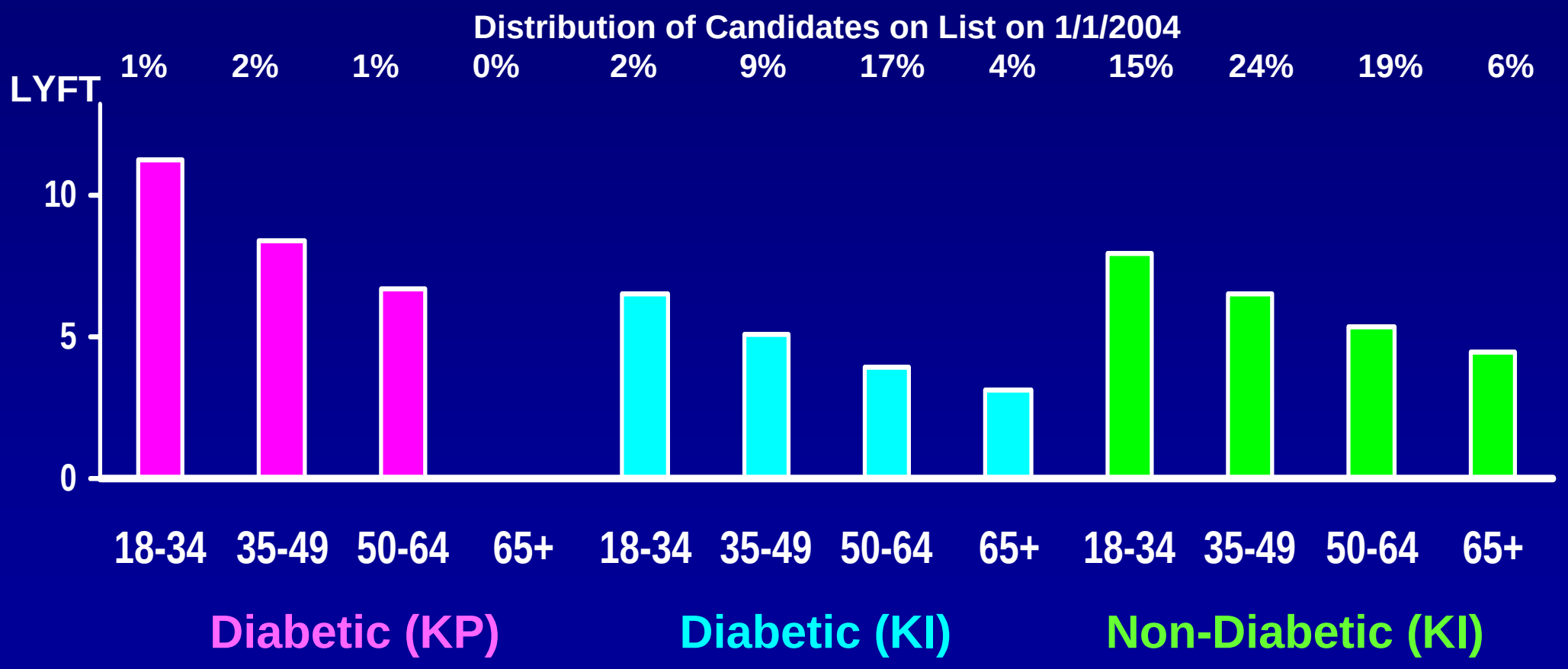
- Laupacis et al. (1996, Kidney International).
  - Time trade-off analysis
  - 168 Canadian patients
  - Ratio varies by time since transplant from 0.76 – 0.84
  - 0.80 seems a reasonable overall value

- Hornberger et al. (1997, Med. Decis. Making)
  - Health state value
  - 878 patients
  - Ratio = 0.81

Quality of Life (QoL) - Adjusted LYFT

- QoL adjustment weights dialysis years by 80%:
  - Transplant Lifetime (QoL) = Years with functioning graft + 0.8 * Dialysis Years after graft failure
  - Non-Transplant Lifetime (QoL) = 0.8 * Dialysis Years
- QoL adjusted LYFT is the difference between the adjusted lifetimes.
- Simulations use QoL adjusted LYFT

Distribution of KI & KP LYFT
By Candidate Age and Diabetes Status
Donor: Average SCD (Donor Age=32 yrs)



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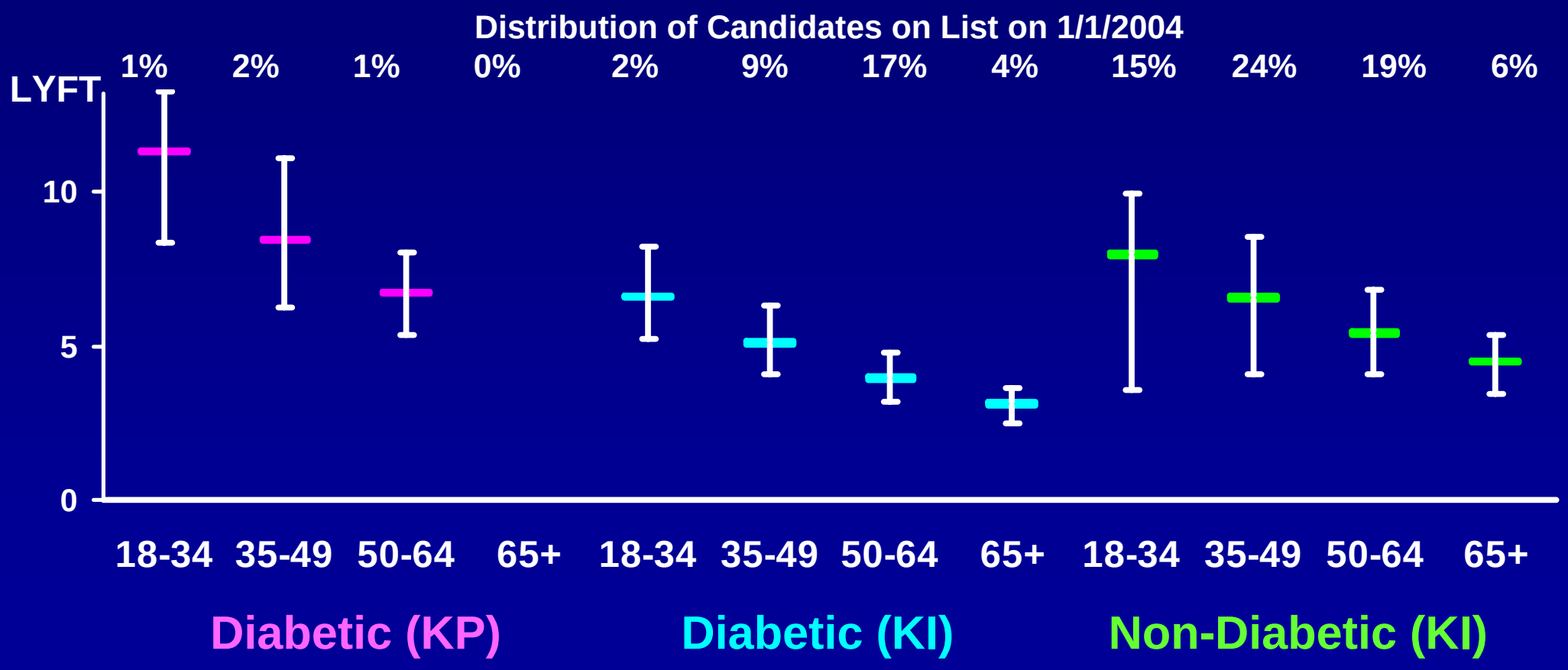

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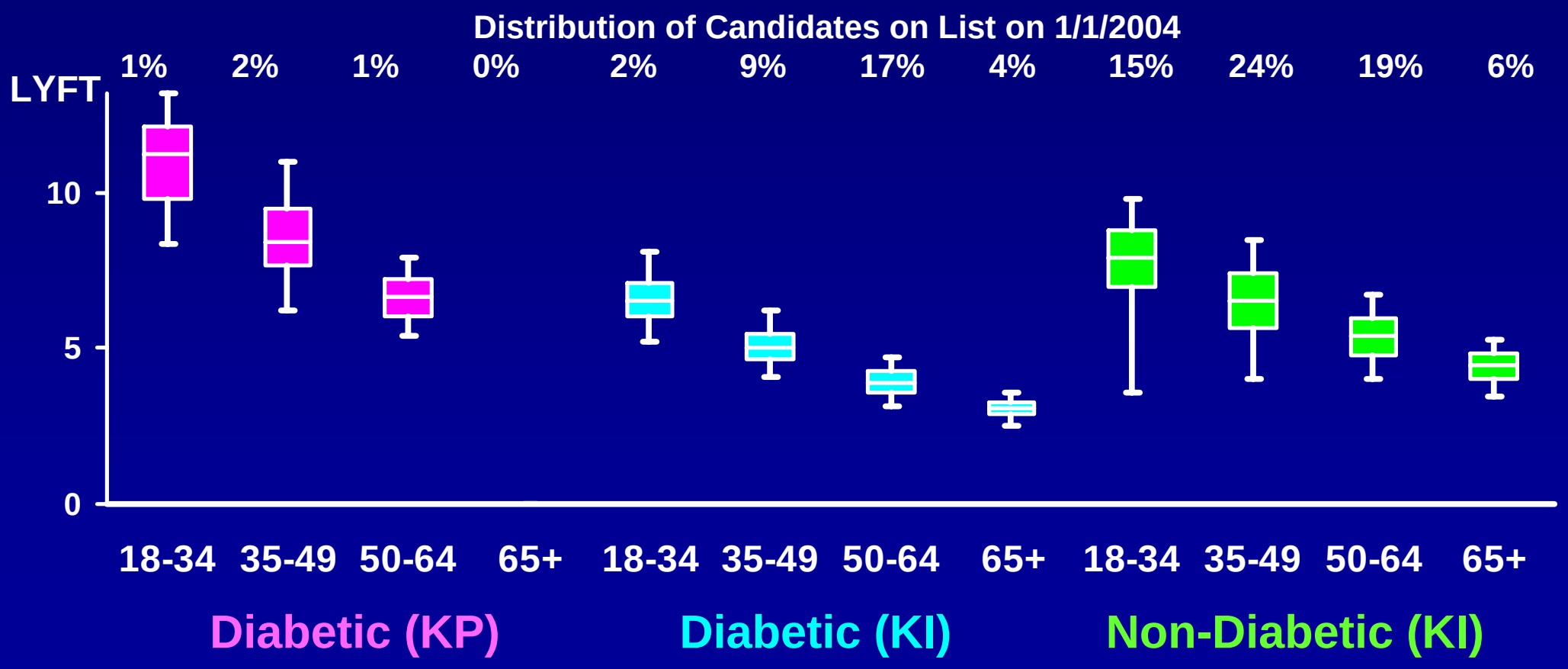

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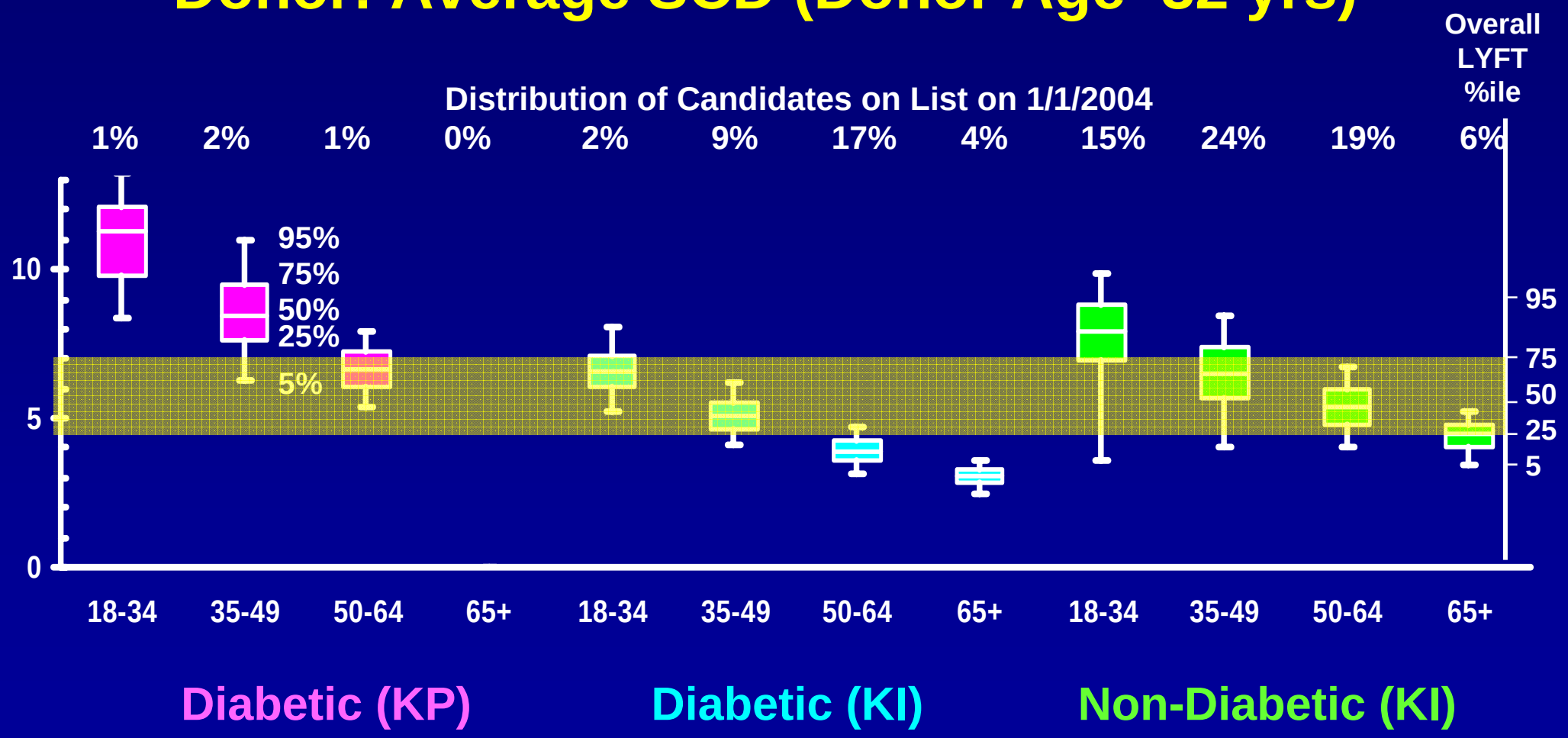

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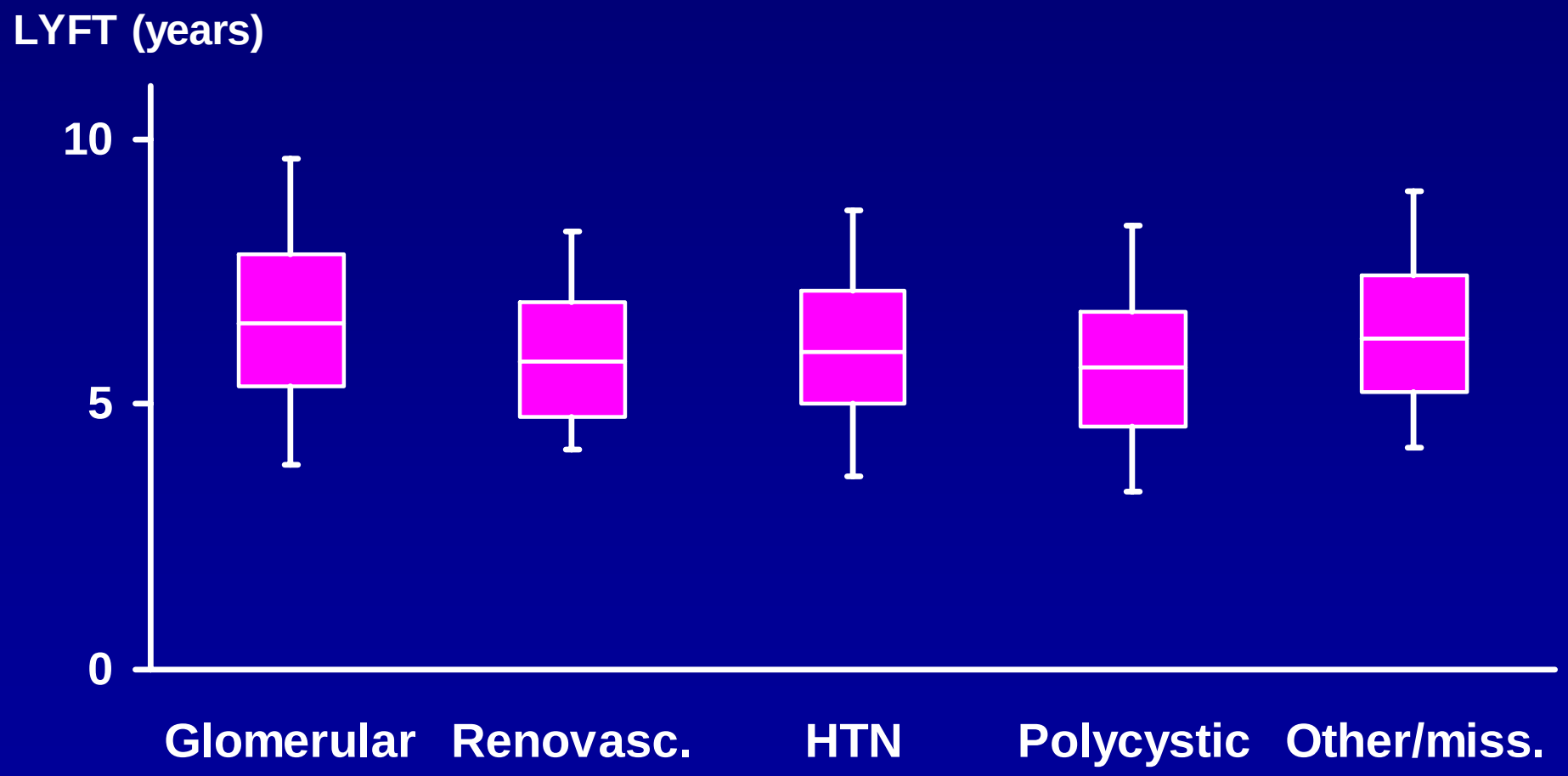
Distribution of LYFT
By Candidate Diagnosis (Among Non-DM)
Average SCD (Donor Age=32 yrs)



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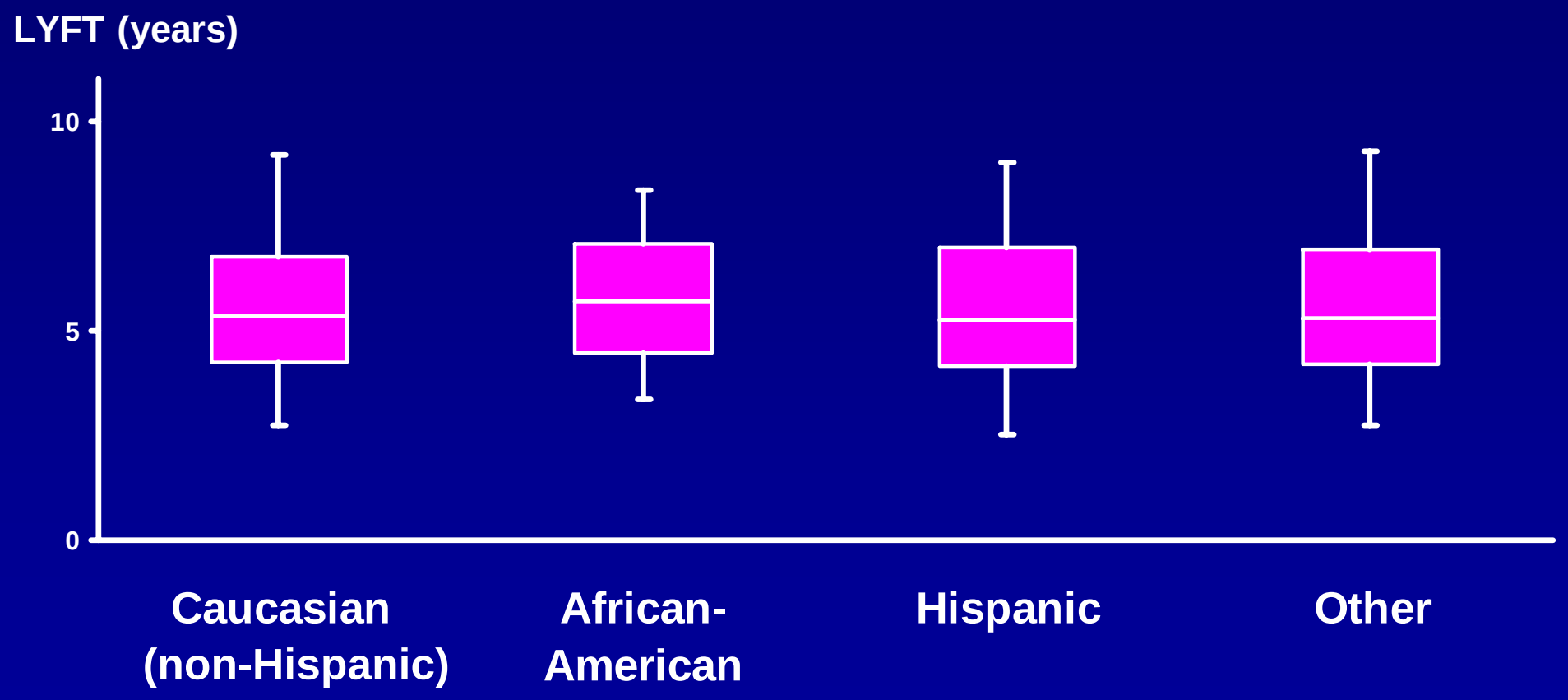
Distribution of LYFT
By Candidate Race/Ethnicity
Average SCD (Donor Age=32 yrs)



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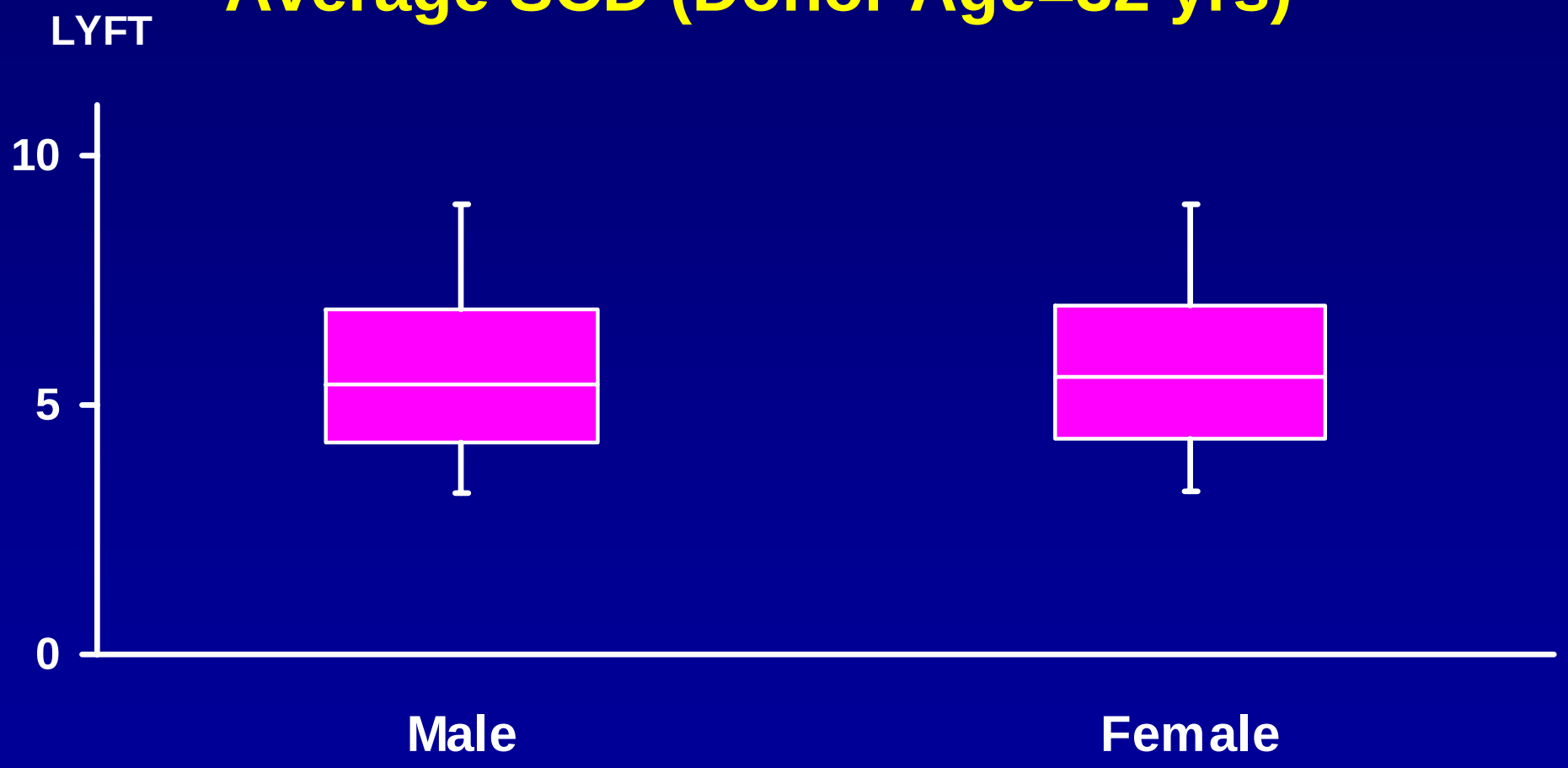
Distribution of LYFT By Candidate Gender

Average SCD (Donor Age=32 yrs)



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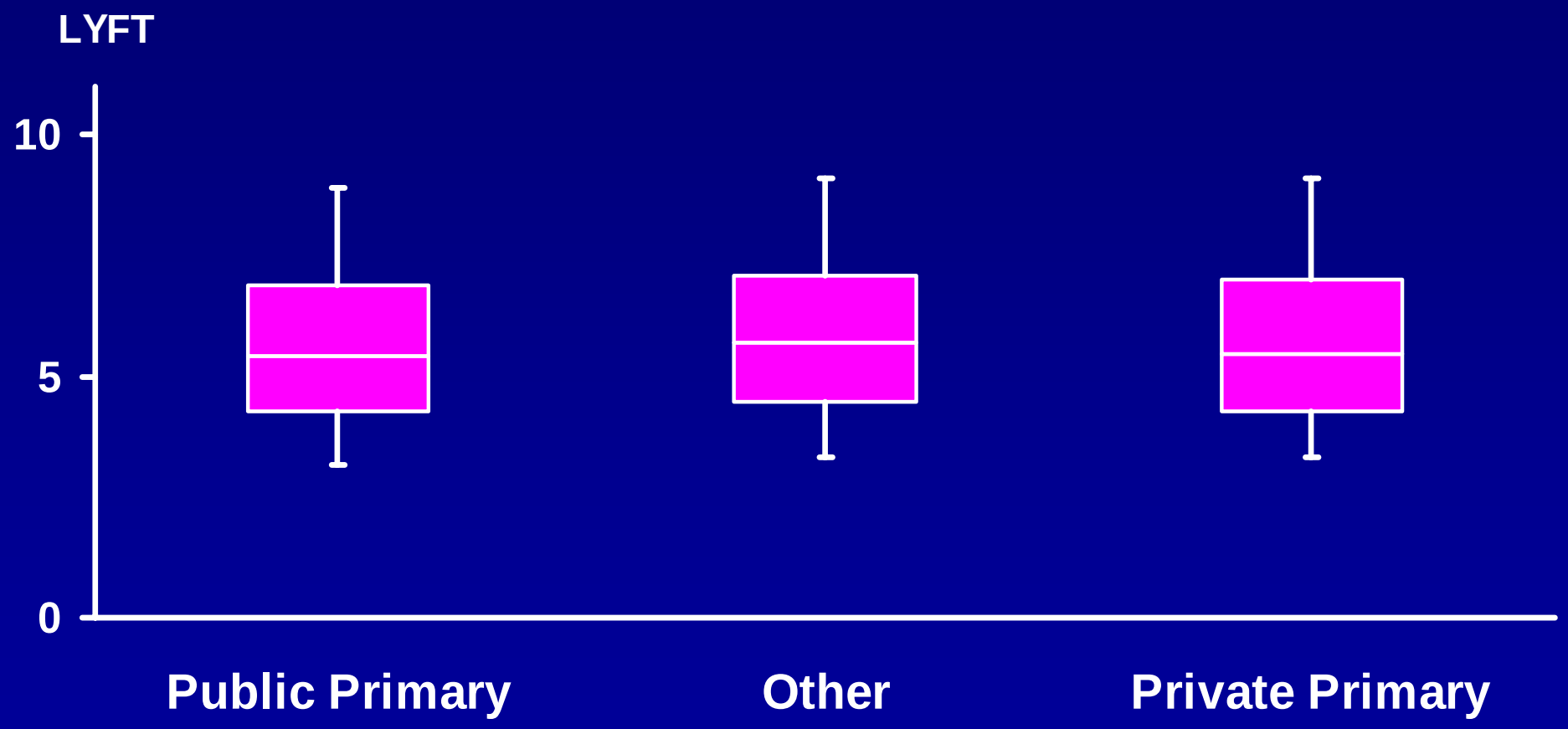
Distribution of LYFT
By Candidate Insurance Status
Average SCD (Donor Age=32 yrs)



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Summary – Methods

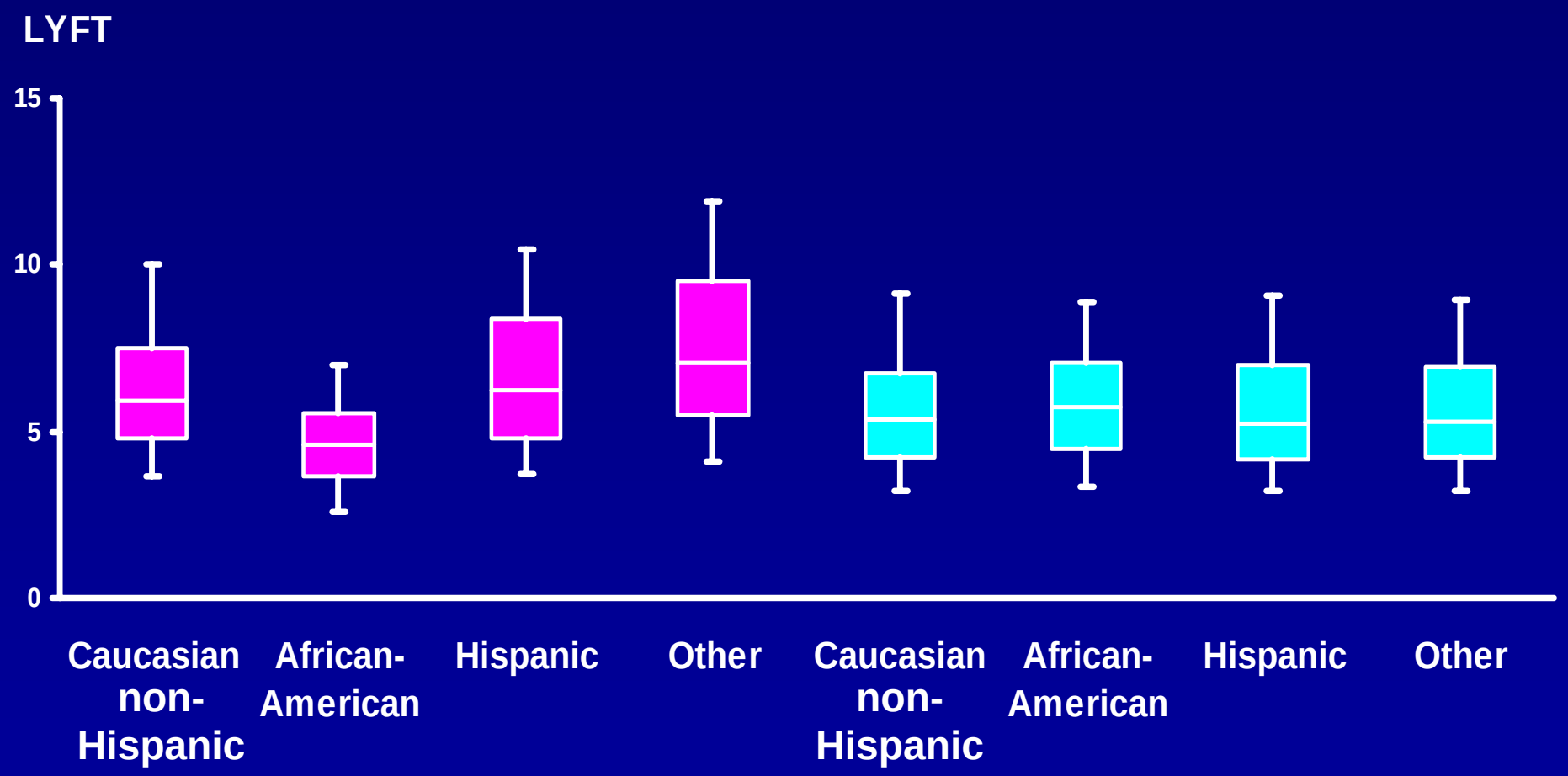
- LYFT due to a kidney transplant can be estimated using information known about the potential recipients and the donor
  - Based on median lifetimes
  - Modest extrapolation beyond 15 years required for Dialysis lifetimes
  - Moderate extrapolation required for Transplant lifetimes
  - Predictors based on predictive value, data quality, objectivity
  - Dialysis years weighted to 80% of years with functioning transplant
- LYFT varies greatly among candidates primarily by age, diabetes (Range 1 to 15 years for average SCD organ)
- LYFT is similarly distributed by race, gender, and insurance type.

Thank you

- **Back-Up Slides Follow**

Distribution of Estimated QENLSB By Candidate Race/Ethnicity

Average SCD (Donor Age=32 yrs)



Race used in model

Race not used in model

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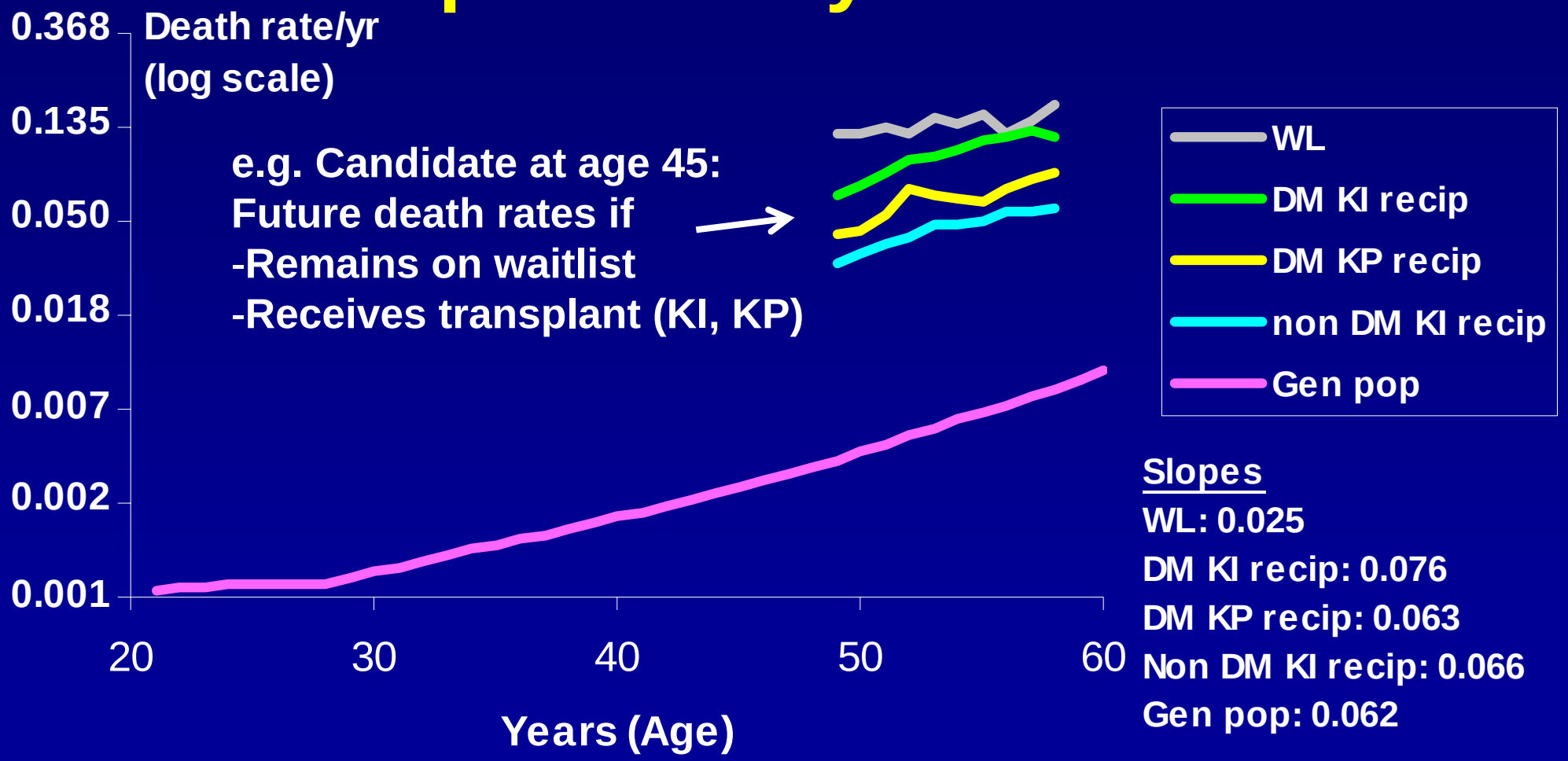
What Net Benefit does NOT do

- Remove geographic inequities
- Remove barriers for sensitized patients (prior pregnancy)
- Hard problems:
  - Optimize HLA matching of candidates
  - Decide whether to accept an offer
  - Account for age matching

Death Rates Increase Roughly Exponentially Per Year



Slopes

WL: 0.025

DM KI recip: 0.076

DM KP recip: 0.063

Non DM KI recip: 0.066

Gen pop: 0.062

General population death rates are by age, WL and PT death rates
rage 45 year-old from 4 years after offer/transplant

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LYFT Approximation for KPSAM

- A linear regression approximation is used within the context of KPSAM to speed up processing
  - The linear regression includes all variables used to create QENSLB, plus additional terms for additional interactions
  - The Spearman correlation between LYFT and its estimate is 0.97; patients are ranked largely the same way
- With this approximation, KPSAM runs take approximately 10 hours for each iteration of run 3 (current rules, pediatric/adult separation, LYFT instead of points)
- Actual allocation systems will not require this approximation, as they do not need to process an entire years' worth of allocation quickly

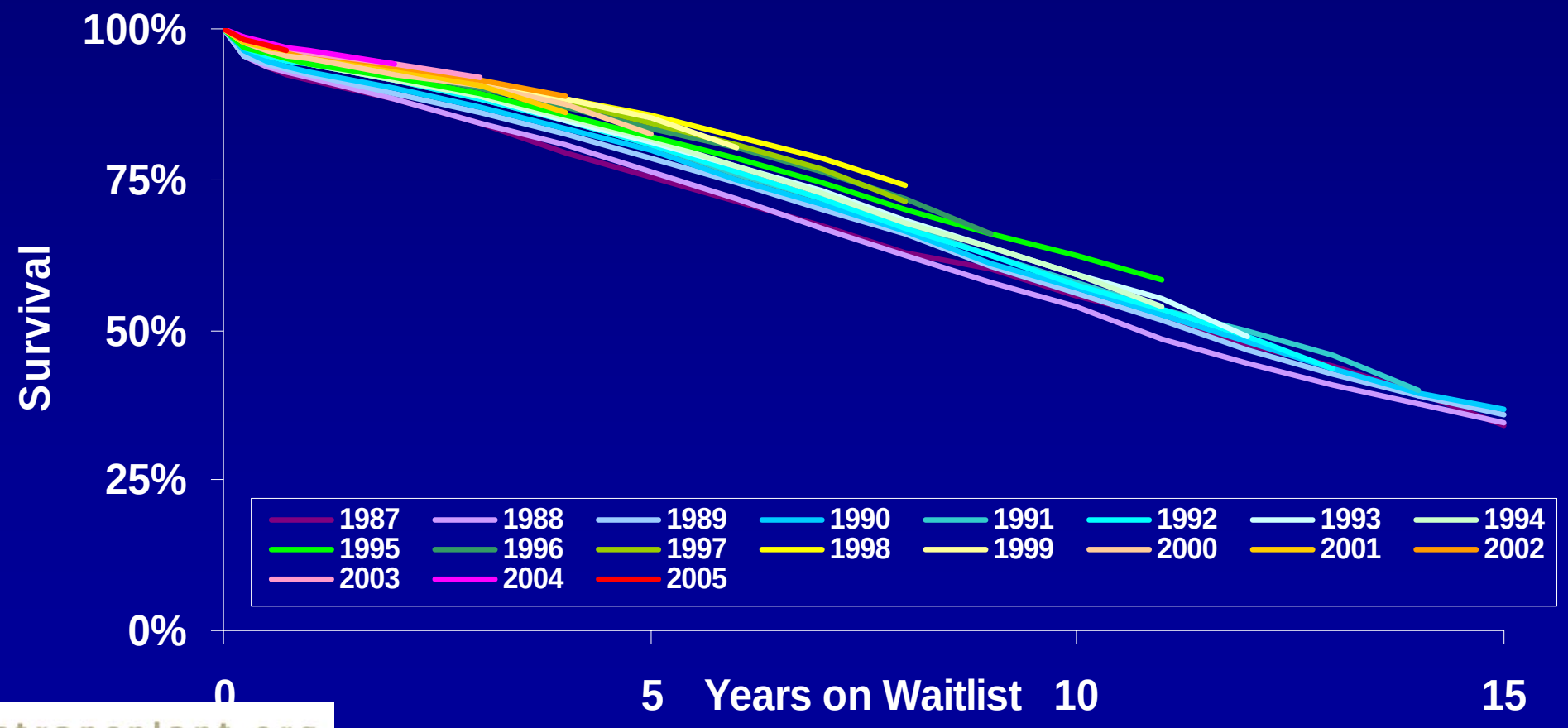
Study Samples

- Cross-section of waiting list represents active candidates who must be ranked.
- Lifetime data from prior transplants, up to 15 years ago are used to project future lifetimes.
- Similar to insurance company projections of future lifetimes based on most recent death rates

Study Sample for Transplant

- Use most recent data to represent current practice. Use older data to represent long follow-up. Account for changes with statistical adjustment, with appropriate assumptions about relative hazards.
- Include post-failure survival

Adjusted Patient Post-Transplant Survival by Cohort (strata)



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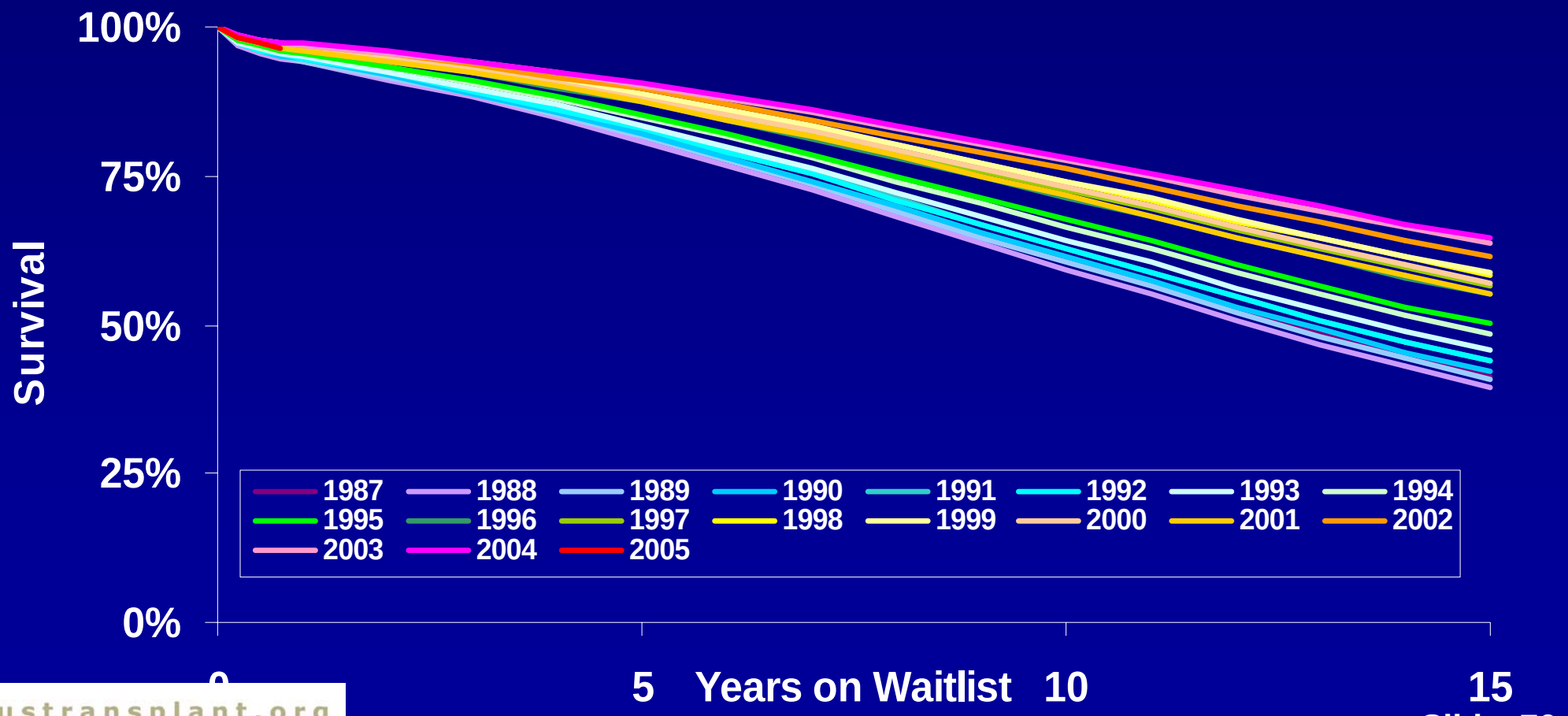
Adjusted Patient Post-Transplant Survival by Cohort (Covariate)



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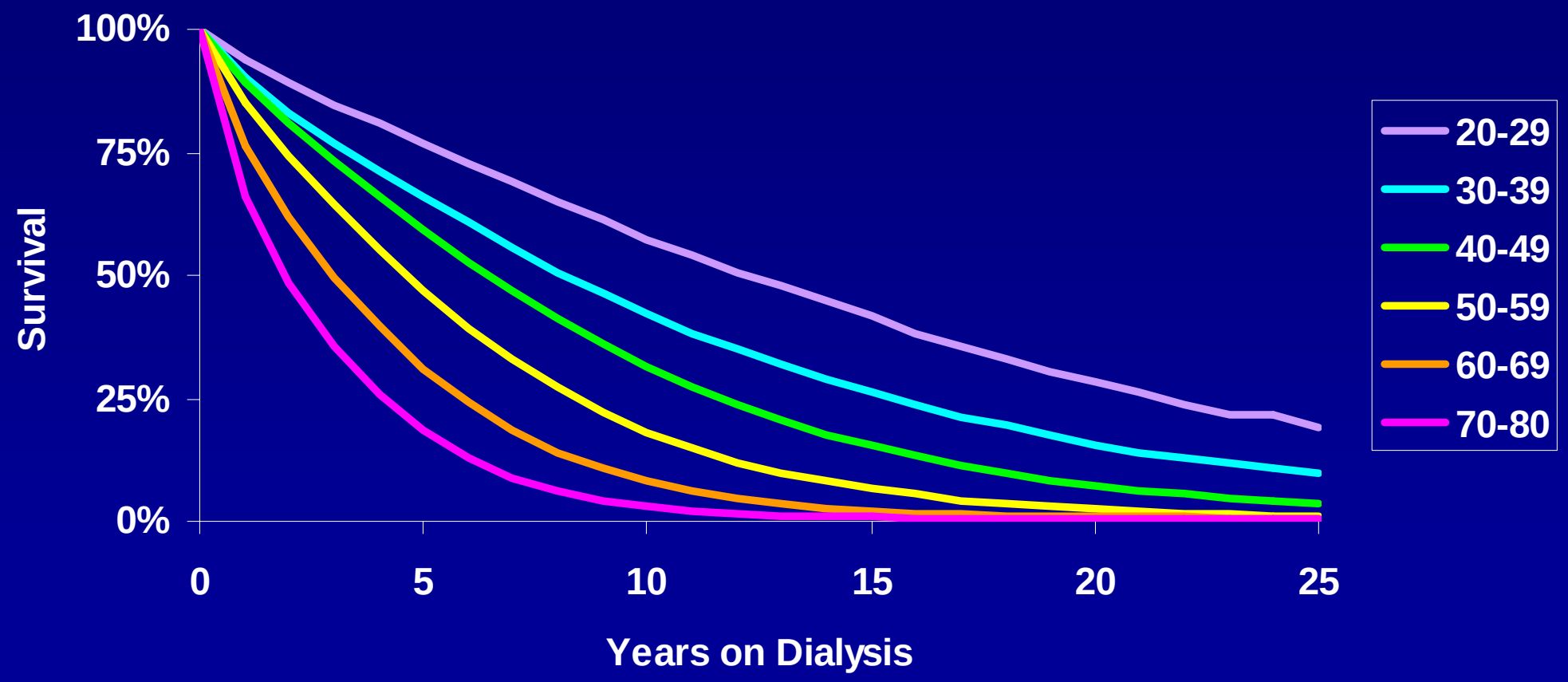
Non-Diabetics on Dialysis (1980+) CMS Data



Dialysis survival for patients with first service date 1980-2004 censored at first transplant or 9/30/2005

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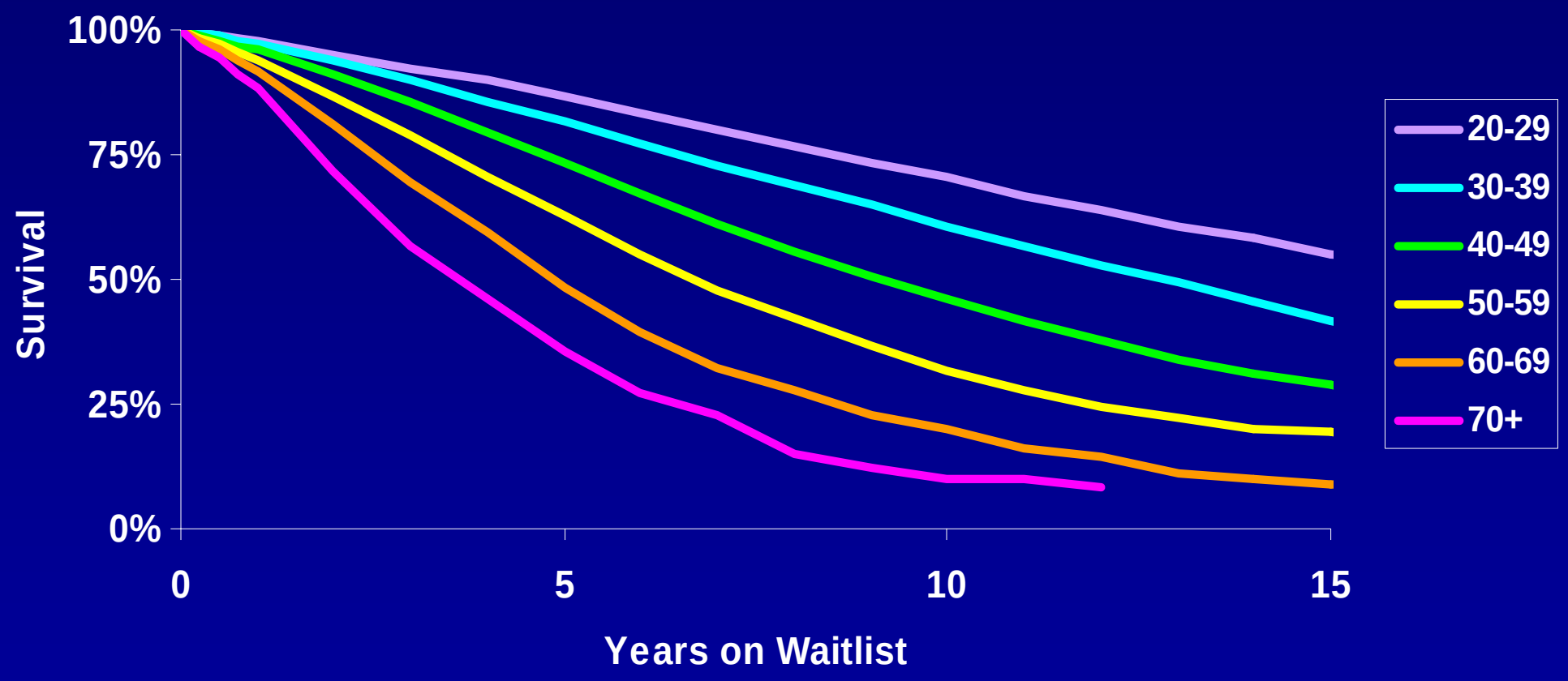
Non-Diabetics on Kidney Waitlist



Waitlist survival for cross-sections of active candidates on the kidney waitlist on 1/1/1988, 1990, 1994, 1998, and 2002

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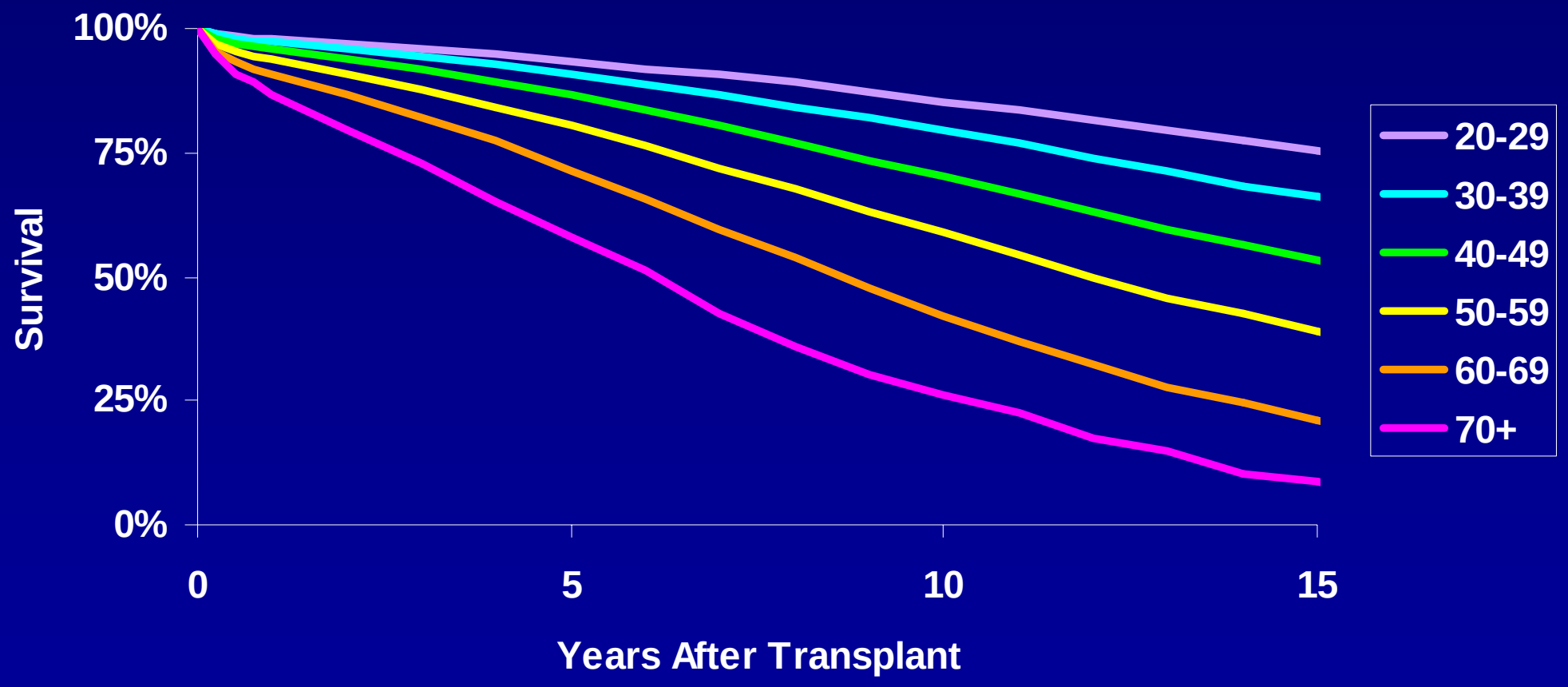
Non-Diabetics With Kidney Transplant



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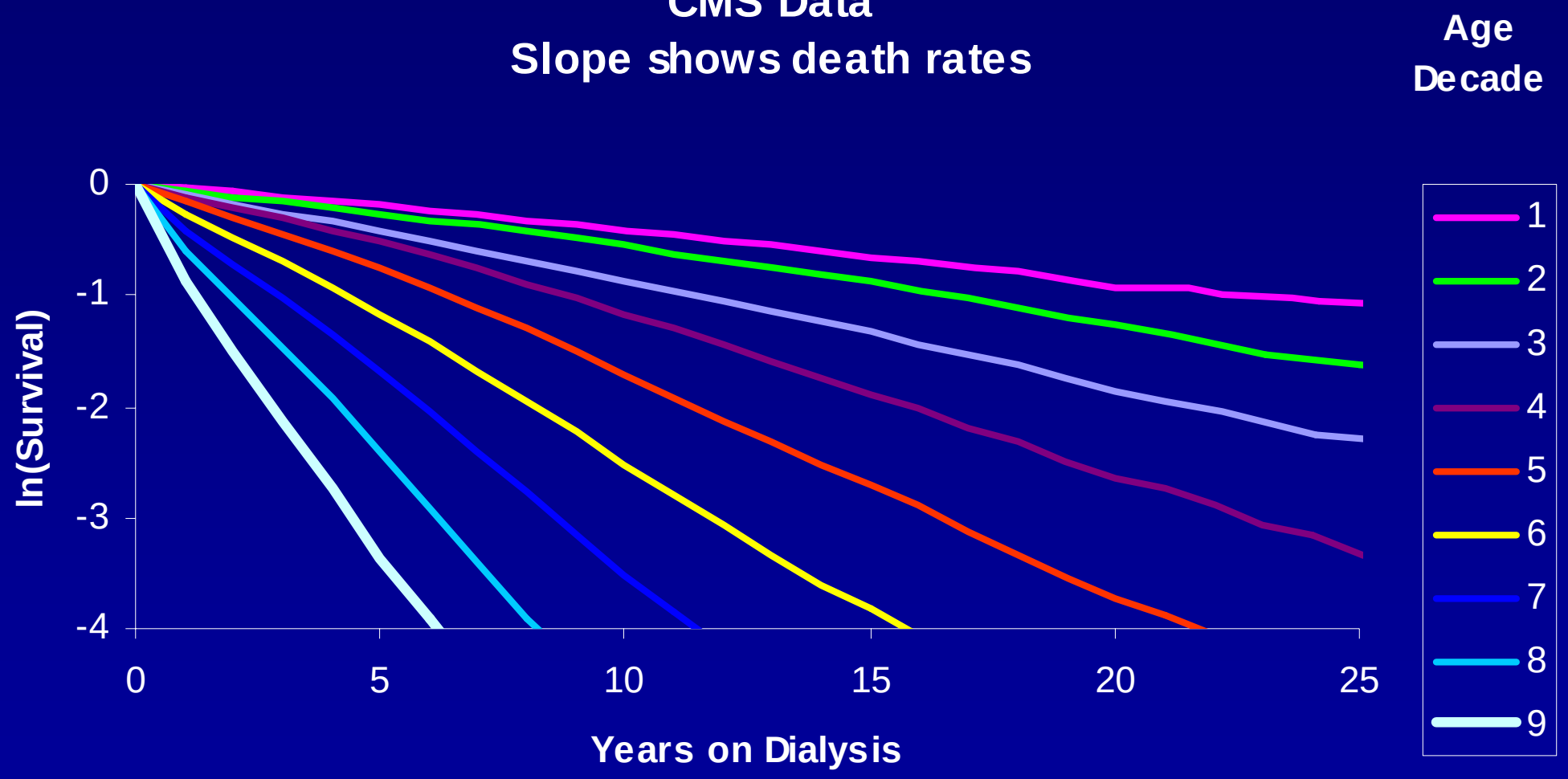
al post-transplant for recipients of kidneys between 1987 and 2005

Non Diabetics on Dialysis (1980+)
CMS Data
Slope shows death rates



Dialysis survival for patients with first service date 1980-2004 censored at first transplant or 9/30/2005

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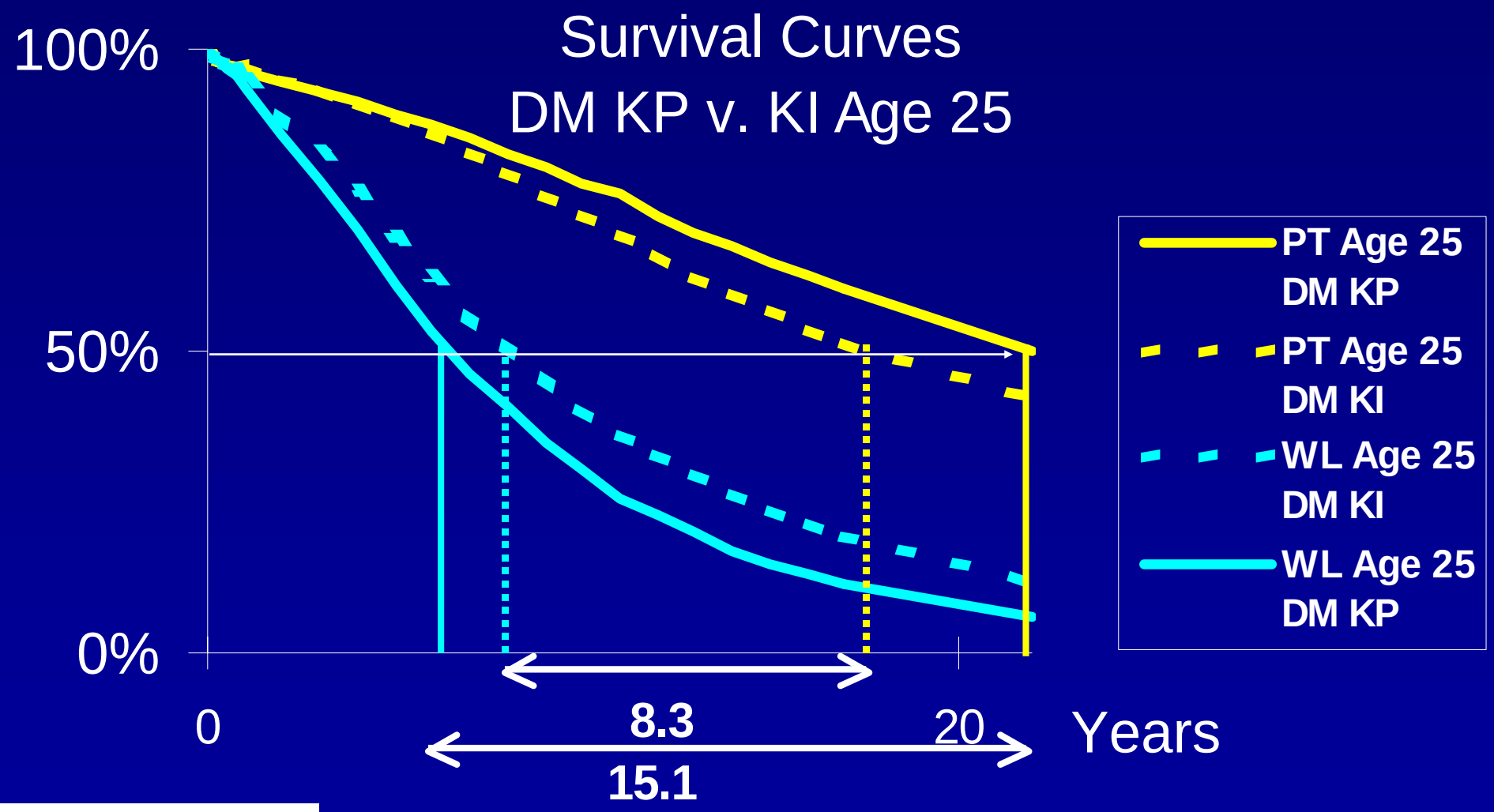
Median Survival



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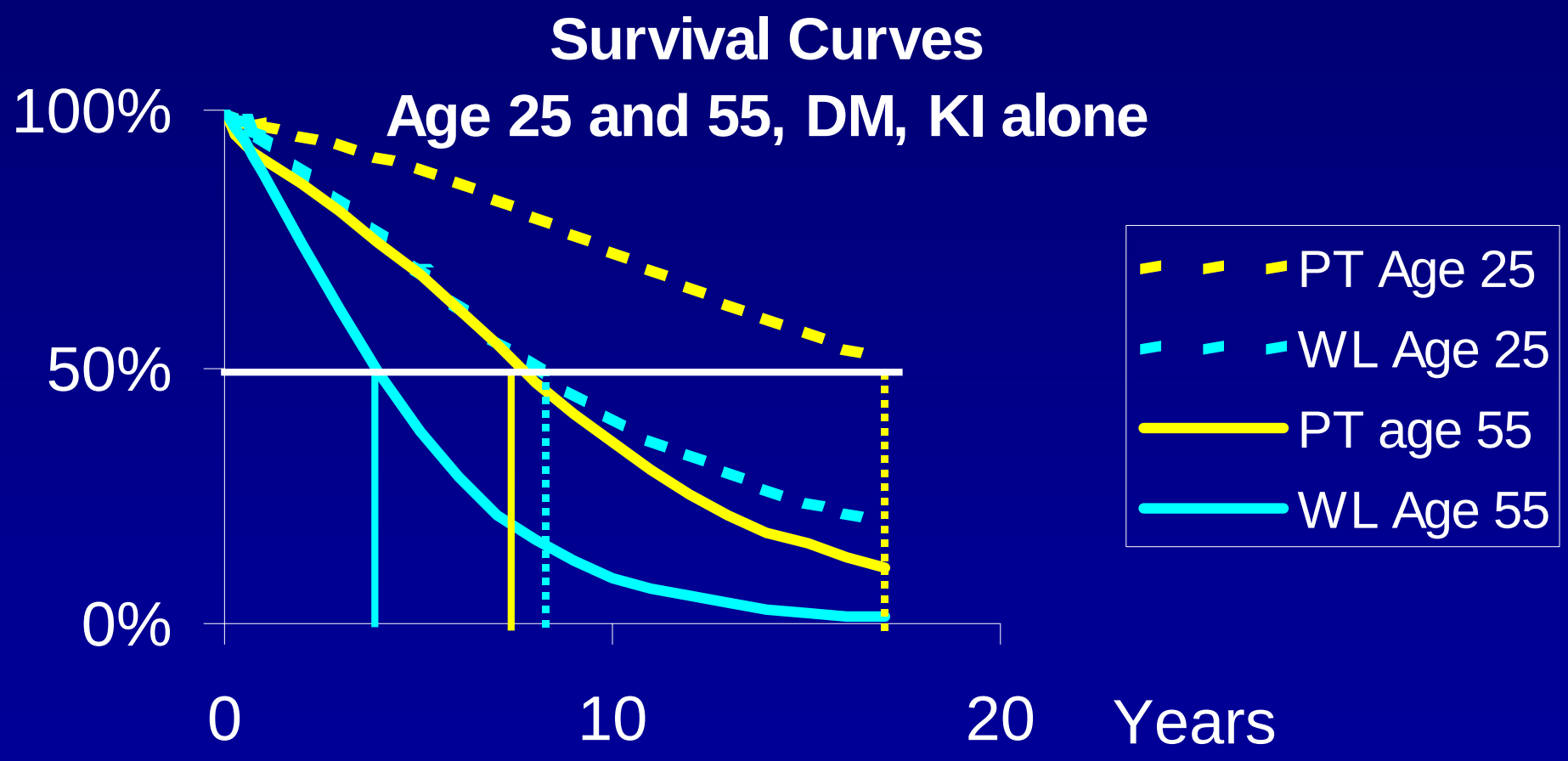
Median Survival



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Retransplant

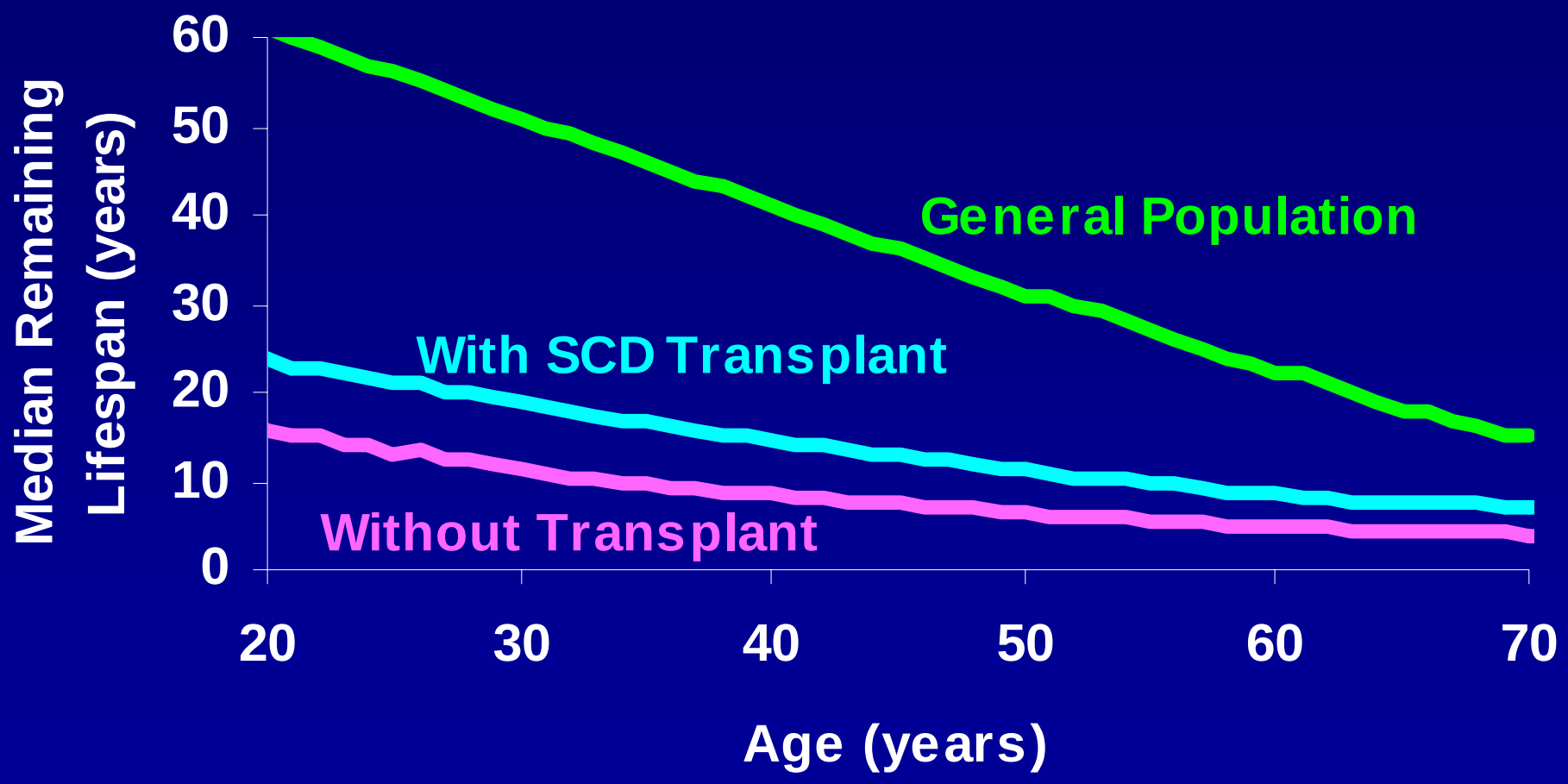
- Transplant lifetime should be with current organ.
  - Count retransplant as death for organs without alternative therapies.
  - Censor at retransplant and append a non-transplant remaining lifetime with alternative therapy (e.g, dialysis)

Estimated Median ESRD Lifetimes Are Less Than Averages for U.S. Population, But Above Estimates for Dialysis Population, by Diabetes Status

	DM				non DM			
age	Dialysis	WL	PT KI	PT KP	Dialysis	WL	PT	Gen Pop
20	5	8	21	31	13	18	33	61
40	4	6	14	20	7	10	22	41
60	3	4	9	12	3	6	14	22

Sources:
Dialysis: CMS USRDS data for patients whose first ESRD service date was between 1980 and 2004
WL: SRTR data. Waitlist average expected median lifetime based on samples of kidney and kidney-pancreas candidates active on January 1st of 1988, 1990, 1994, 1998, 2002.
PT: SRTR data. Post-transplant average expected median lifetime based on 1987 – 2004 KI, KP transplants. Follow-up for WL and PT ended June 1, 2005.
Gen Pop: 1996 Interpolated Abridged Life Table from Public Health Service, U.S. Department Of Health And Human Services, Unpublished Data

Median Survival by Age



Median lifespans with average SCD kidney and without any transplant are based on average of median survival estimated for candidates active on the waitlist on 1/1/2004. General data from 1996 Interpolated Abridged Life Table from Public Health Service,

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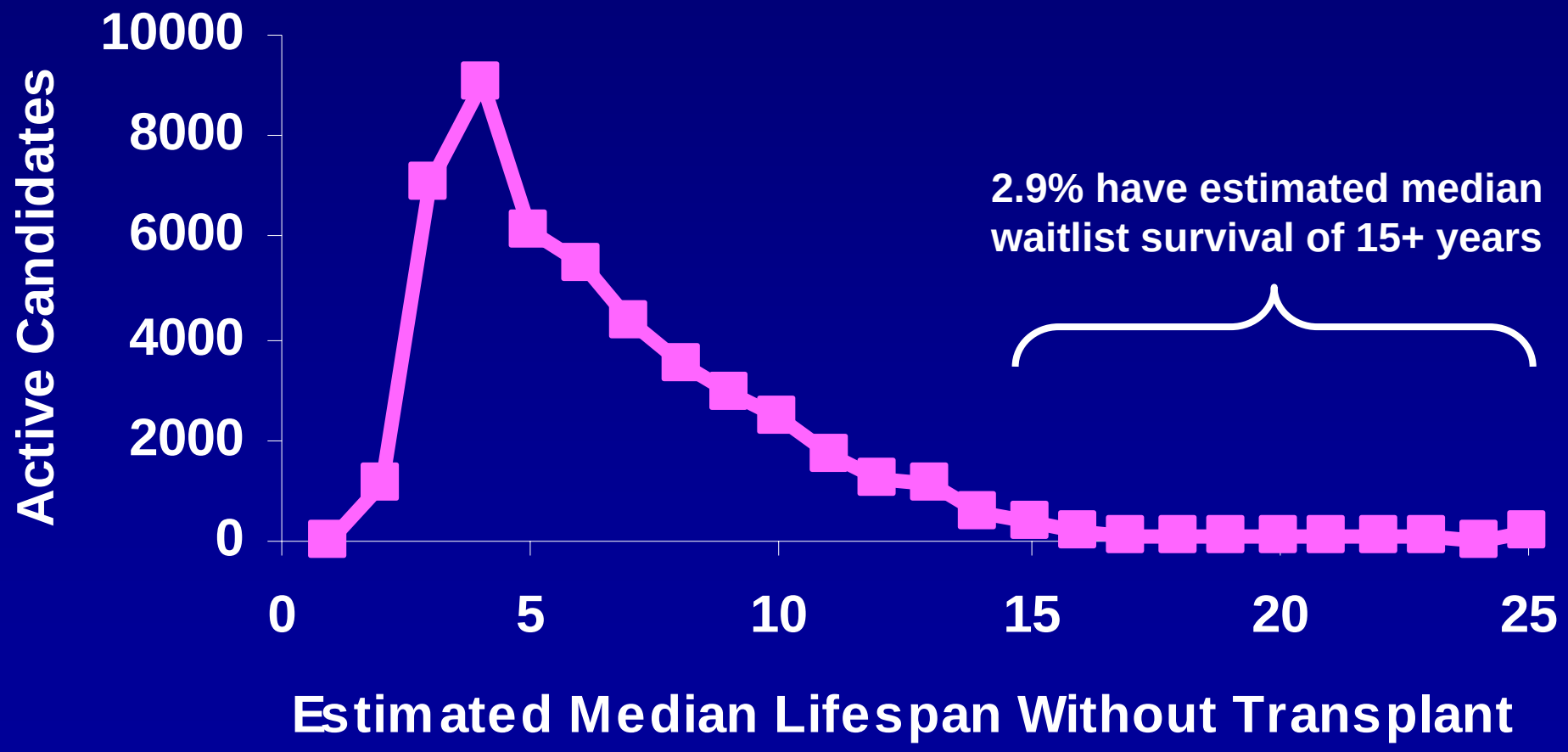
Distribution of Median Survival Times Without Transplant

Among Candidates Active on 1/1/2004



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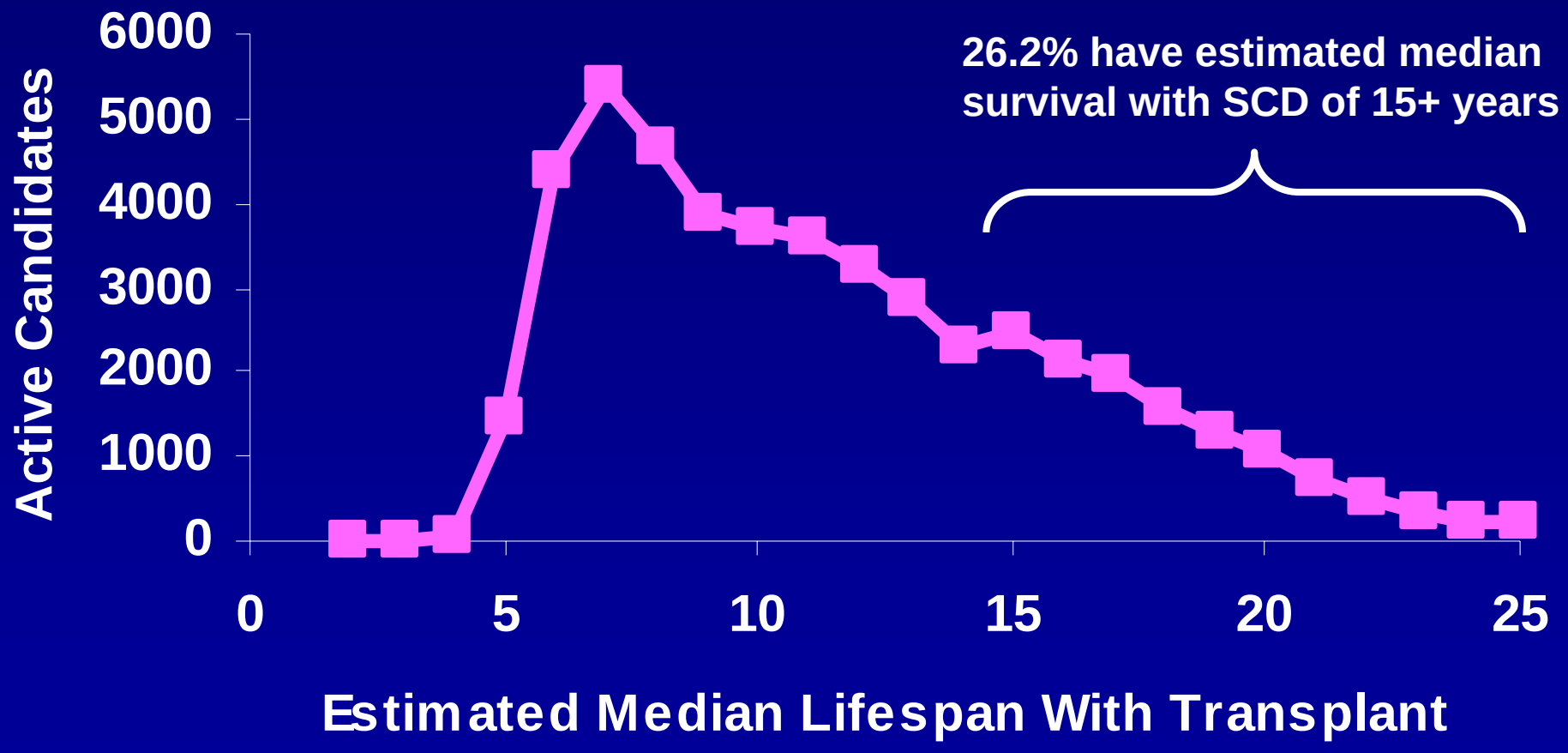
Distribution of Median Survival Times With Transplant

Among Candidates Active on 1/1/2004



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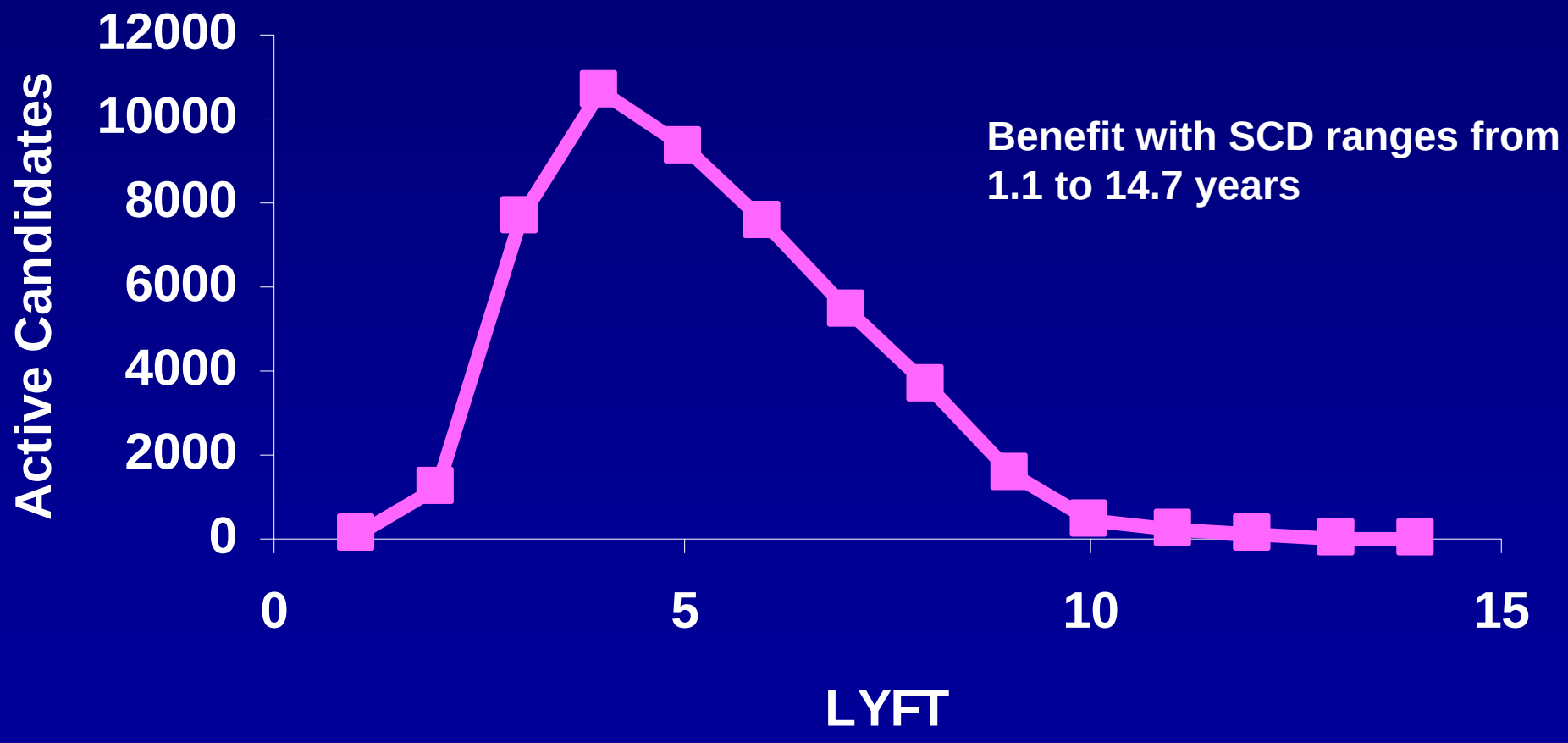
Distribution of LYFT
Among Candidates Active on 1/1/2004



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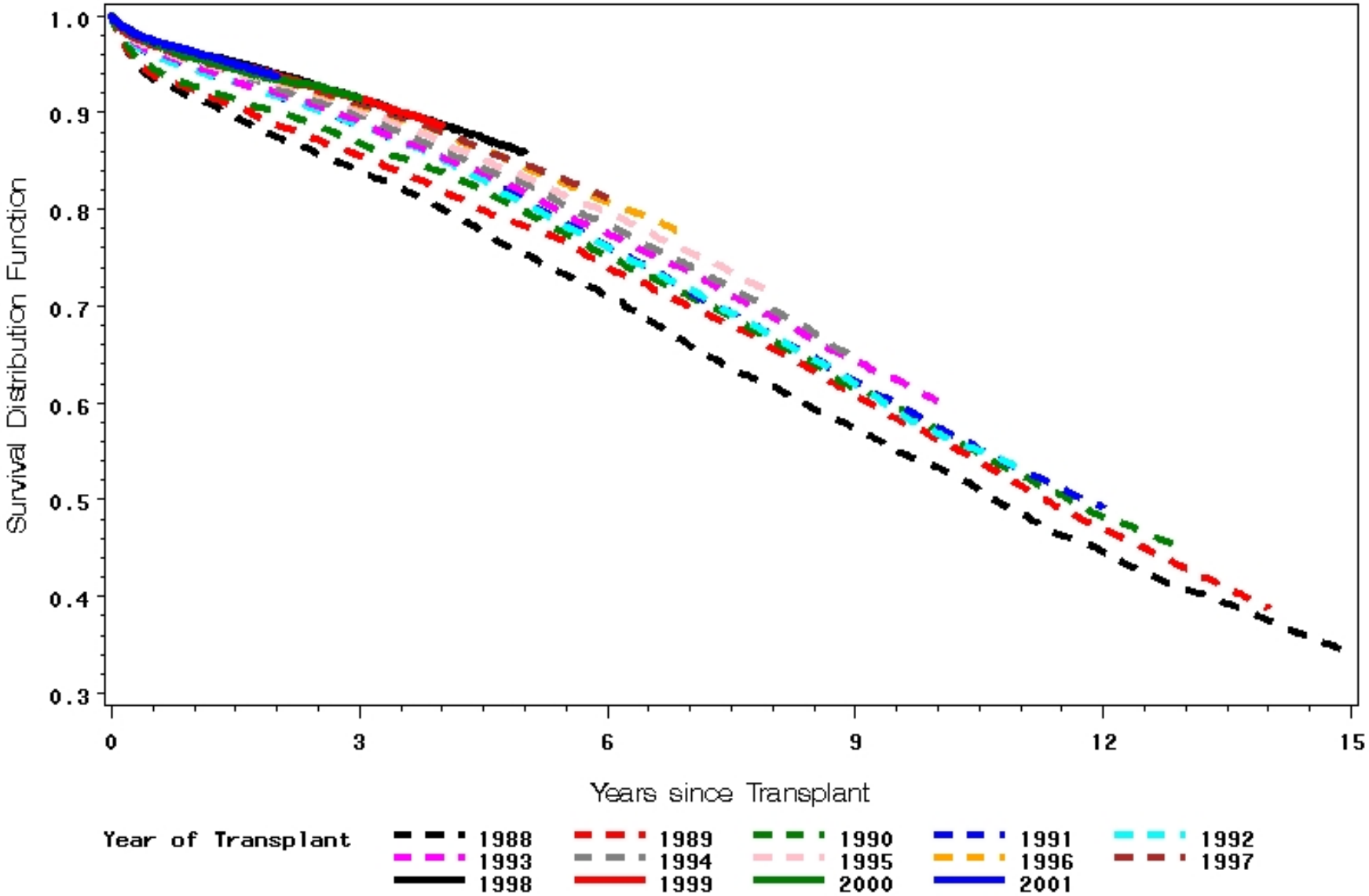
Approximate Contribution of Each Covariate to Overall LYFT (Total 100%)

Covariate group	% Explained
Candidate had not developed full ESRD by sample date	32.5%
Candidate age at offer	24.4%
KI DM/KI non-DM/KP DM	15.8%
Donor age + spline	9.2%
HLA MM	5.7%
ln(years since ESRD start + 1)	3.4%
Year of offer	1.8%
Donor weight variable + missing	1.8%
DCD	1.3%
Donor cause of death category	1.2%
Previous transplant	0.6%
Shared organ	0.5%
Donor CMV negative	0.4%
BMI variable + spline + missing	0.4%
Albumin	0.4%
Candidate diagnosis (excluding DM)	0.3%
Candidate peak PRA category	0.3%
Donor HTN	0.0%
D	0.0%

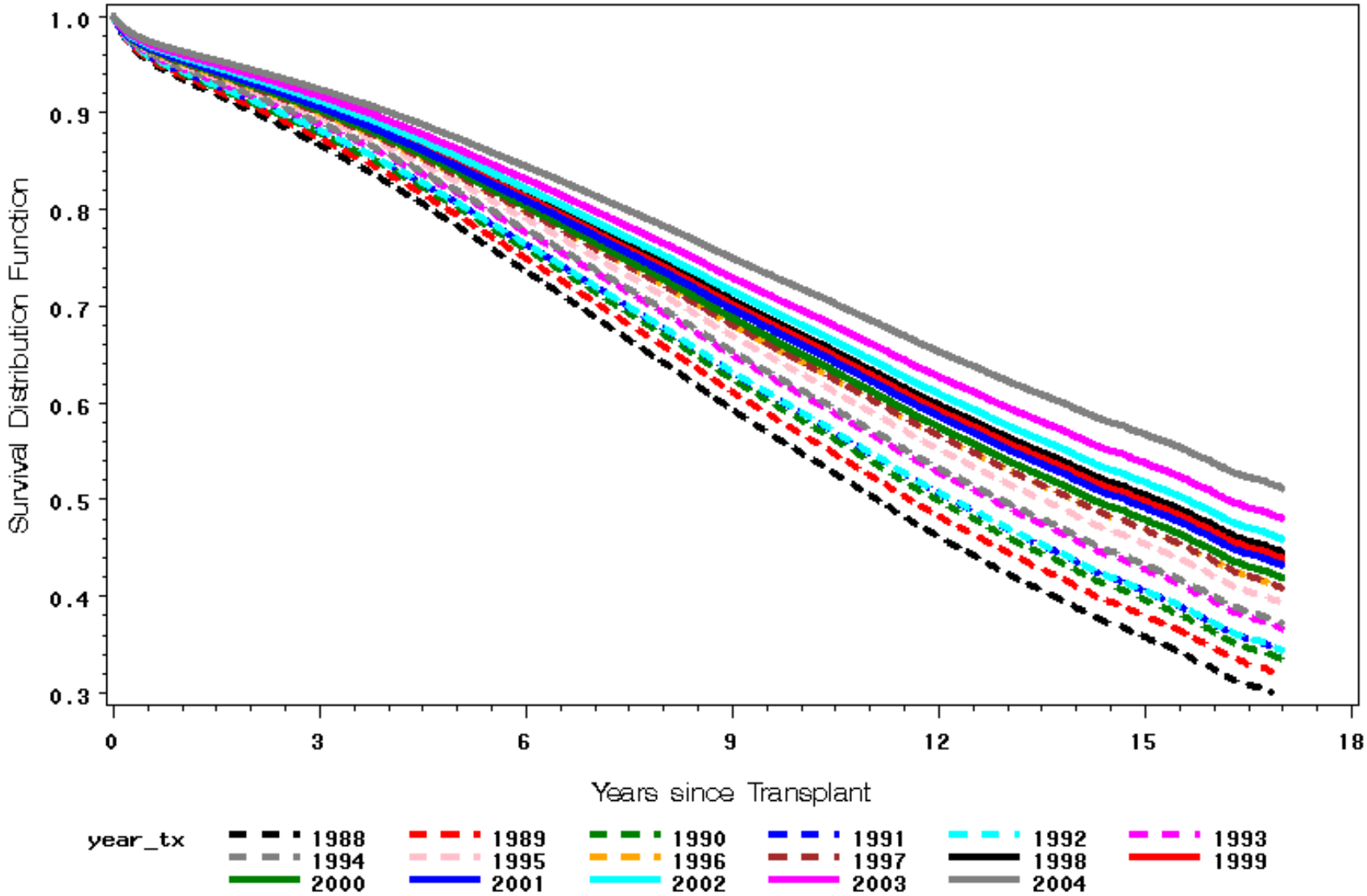
Adjusted Patient Survival Post—Kidney Transplantation

Recipients of Deceased Donor Kidneys (Excludes Multi-Organ & Previous Tx), 1988-2001
Adjusted for Recipient Age, Race, & Diabetes and Donor Age



Transplant Mortality

Recipients of Deceased Donor Kidneys (Excludes Multi-Organ), 1/1/1988-7/31/2004
Adjusted with dummies for age decade and year of transplant, Adjusted to age 40



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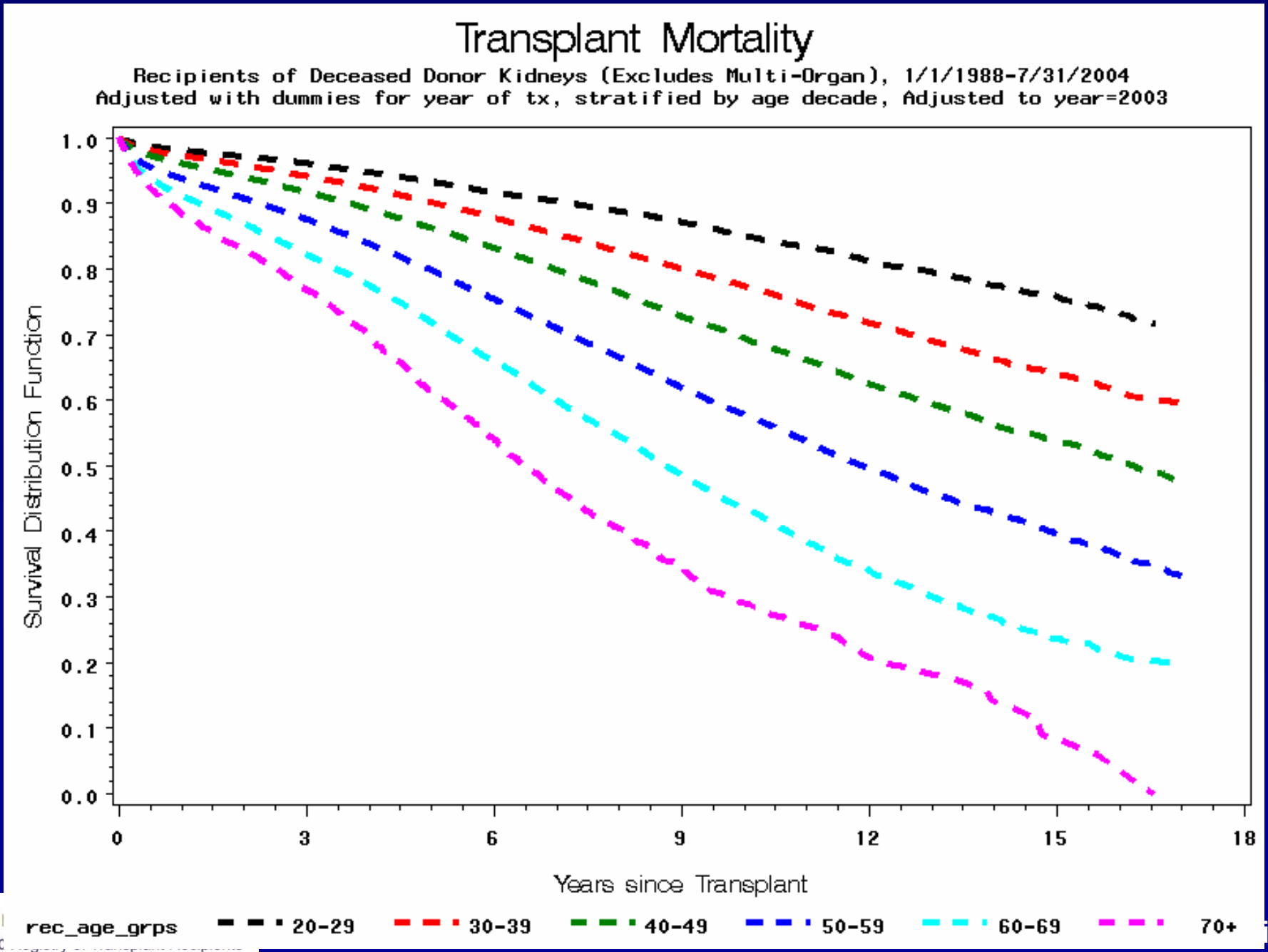
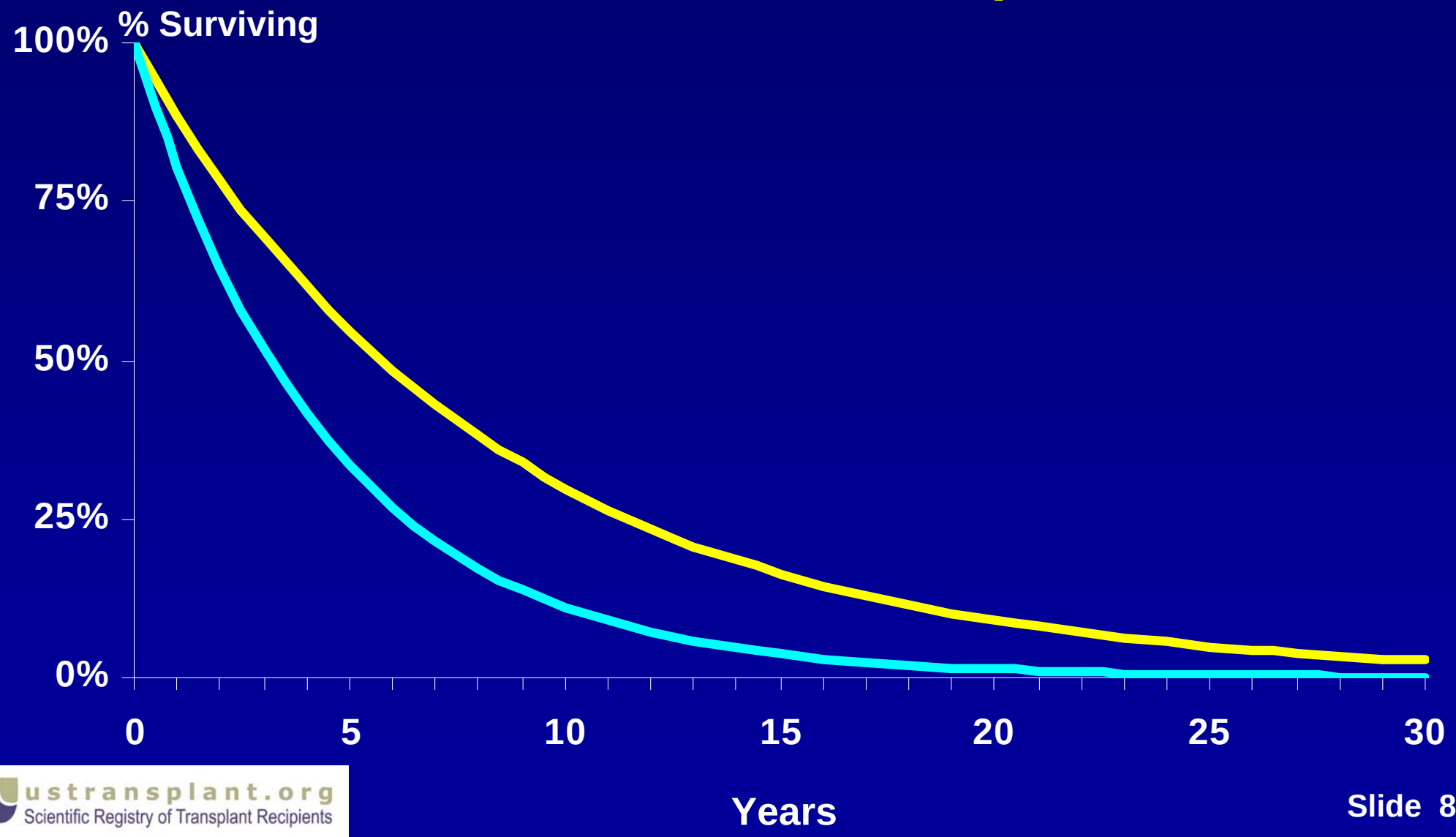

Transplant Mortality
Recipients of Deceased Donor Kidneys (Excludes Multi-Organ), 1/1/1988-7/31/2004
Adjusted with dummies for year of tx, stratified by age decade, Adjusted to year=2003
Survival Distribution Function
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
3
6
9
12
15
18
Years since Transplant
rec_age_grps
20-29
30-39
40-49
50-59
60-69
70+

Lifetimes Are The Areas Below Each Survival Curve: With and Without Transplant



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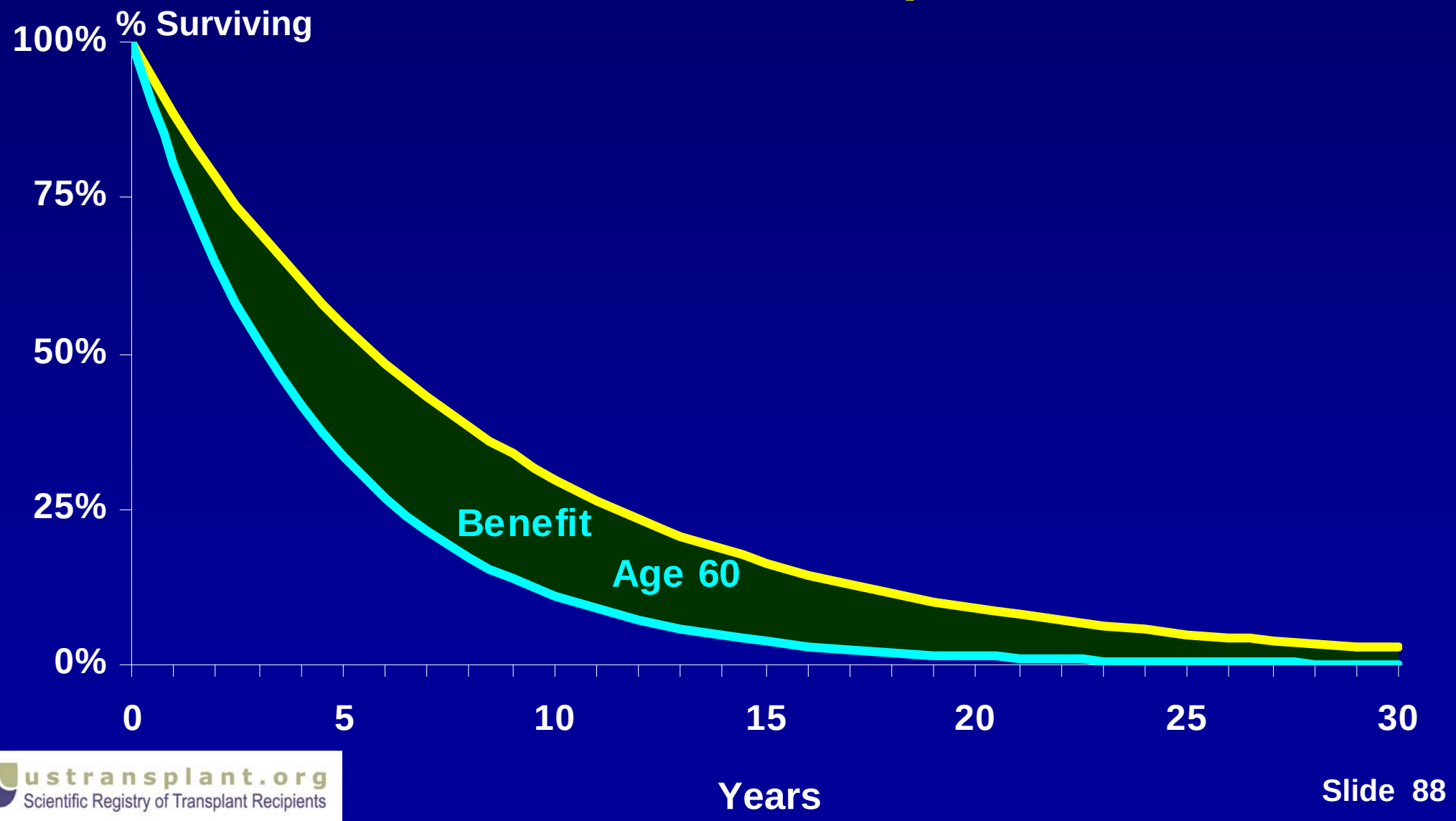
Extra Years Are Area Between Survival Curves With and Without Transplant



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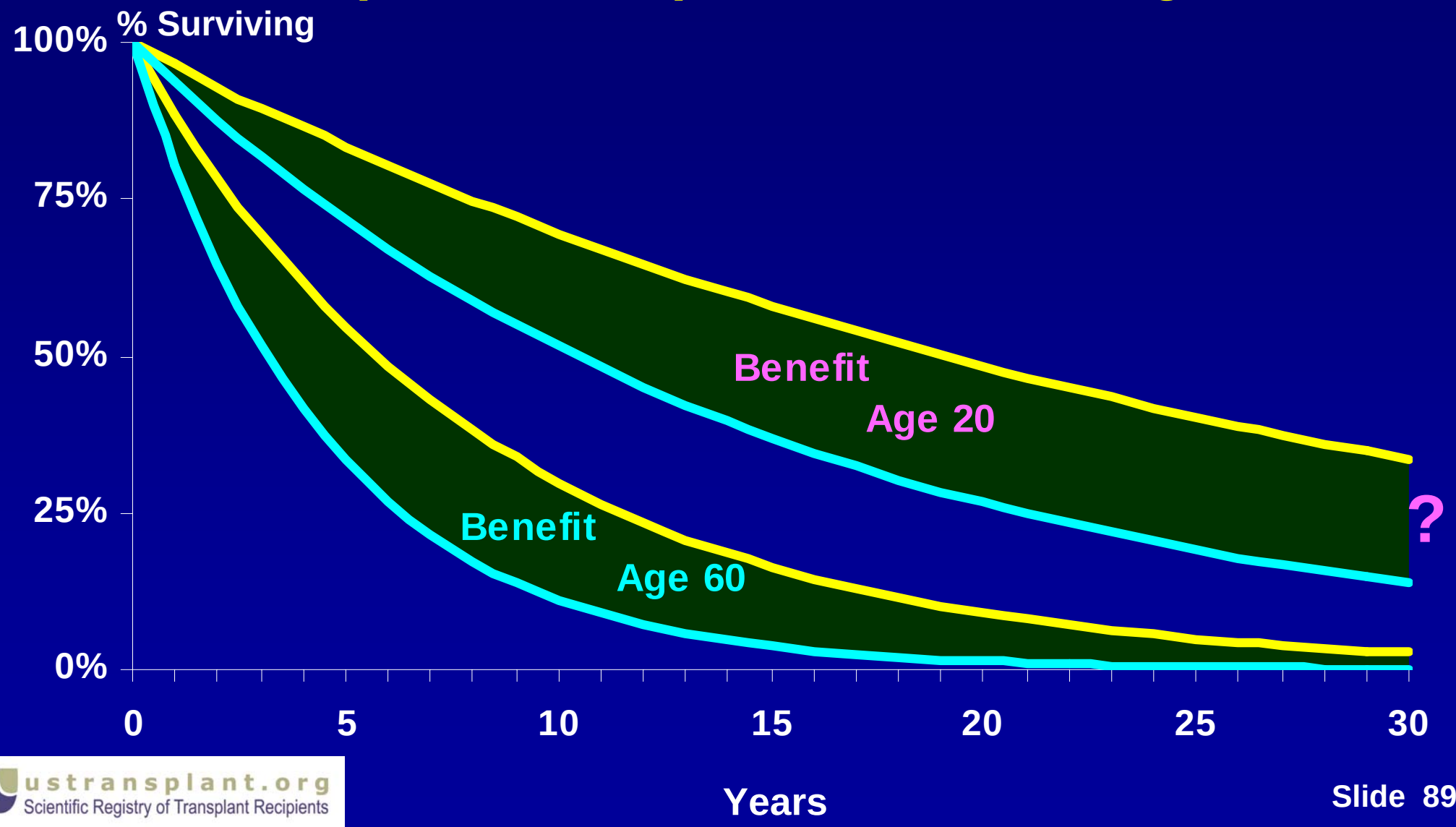
Extra Years of Life Differs By Age. Requires Extrapolation for Young



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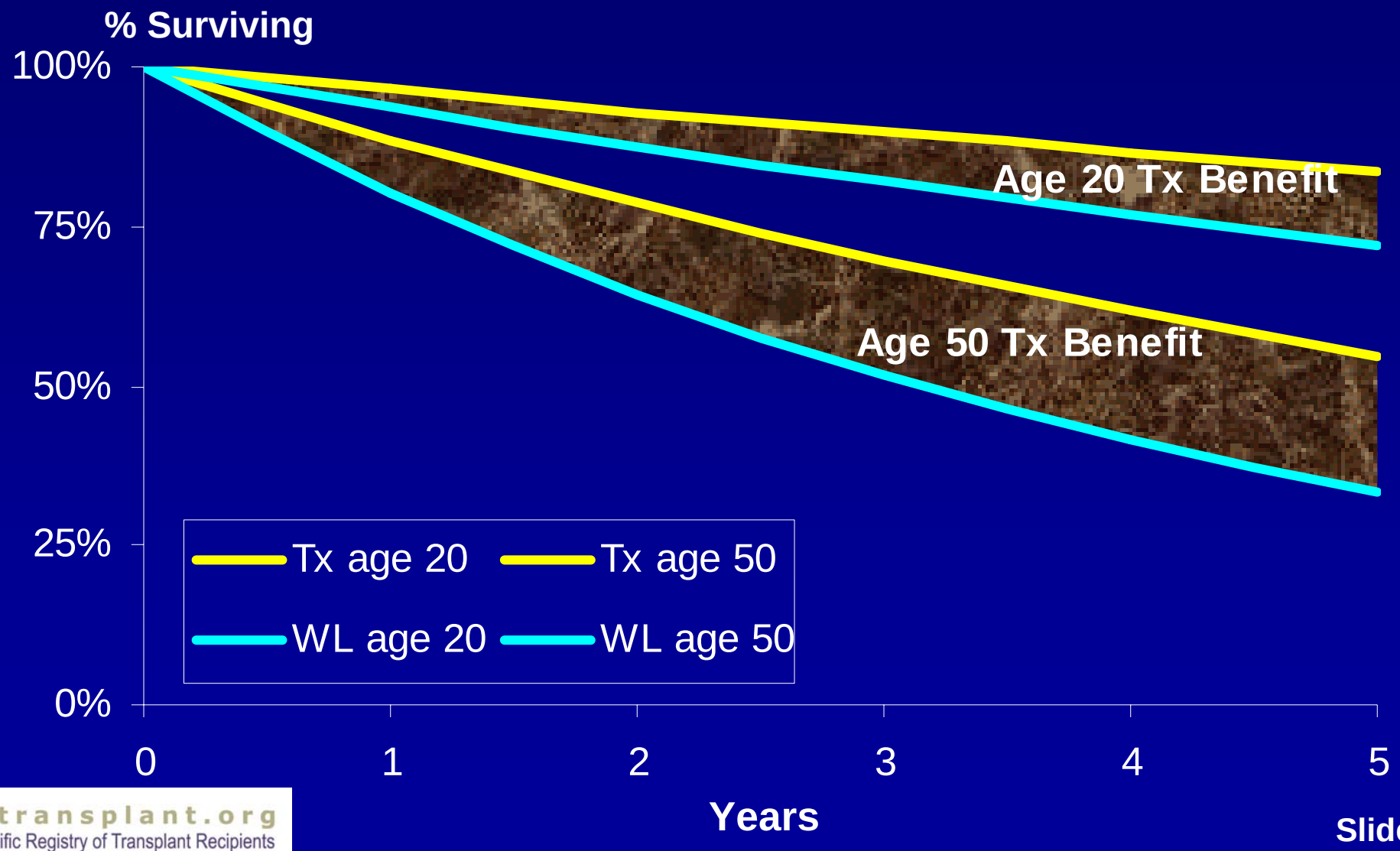
5-Year Truncated Time Window Shows Greater LYFT (Area Between Curves) for Older Recipients



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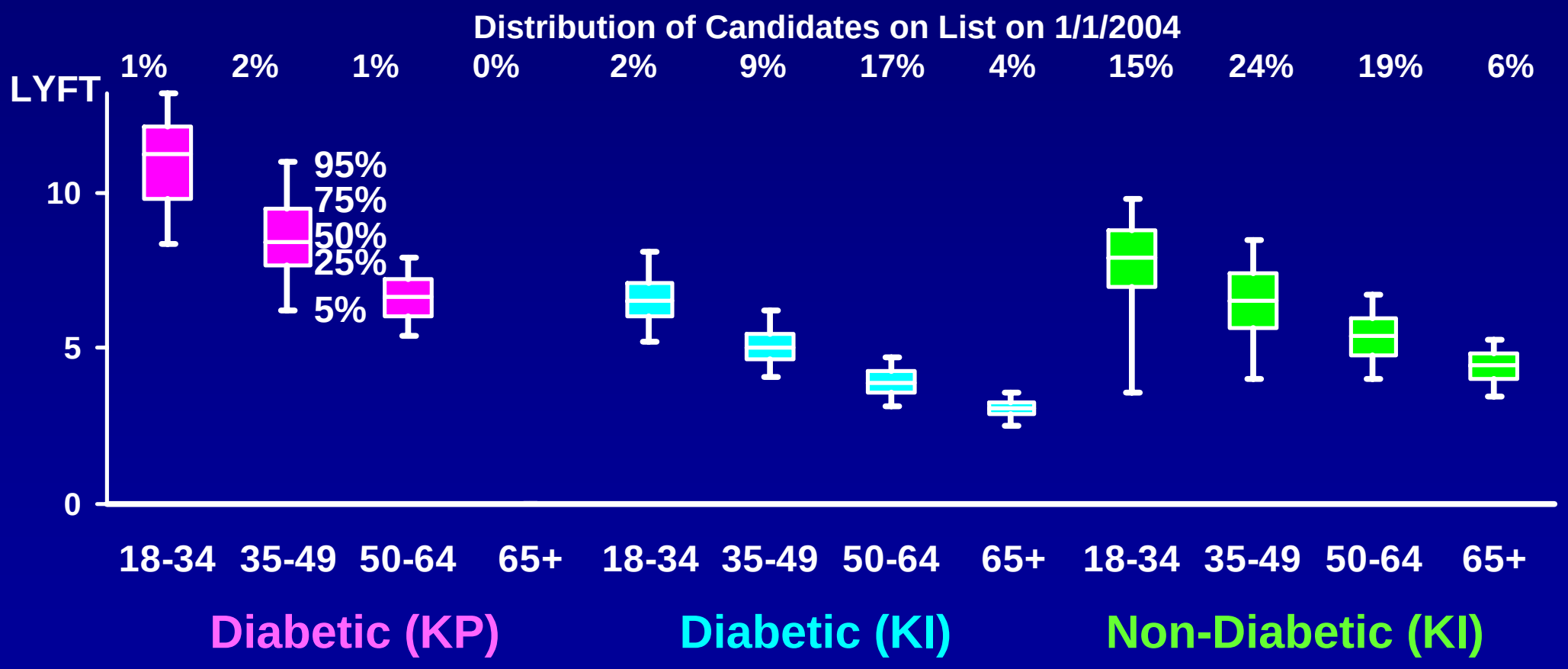
Distribution of KI & KP LYFT By Candidate Age and Diabetes Status

Donor: Average SCD (Donor Age=32 yrs)



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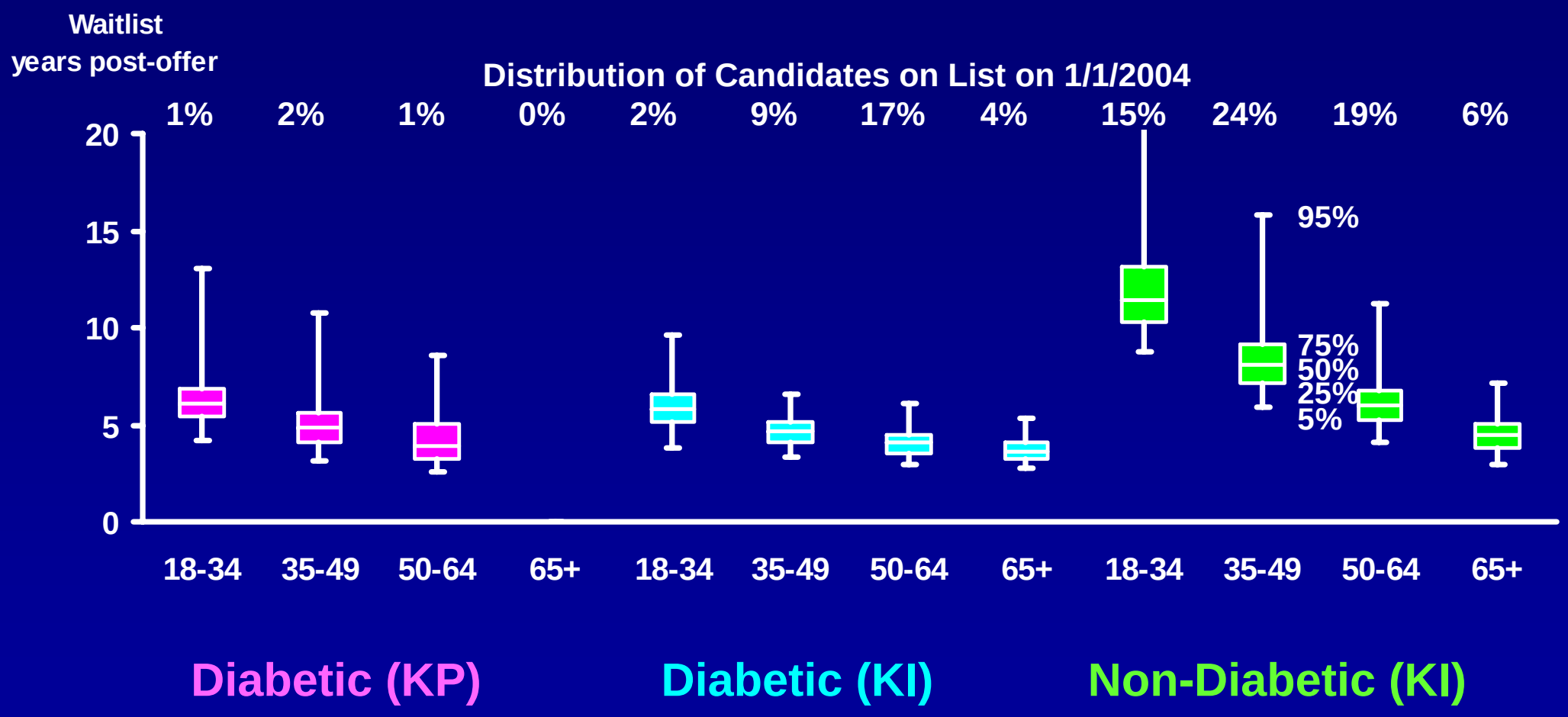
Distribution of KI & KP Waitlist Lifespan By Candidate Age and Diabetes Status



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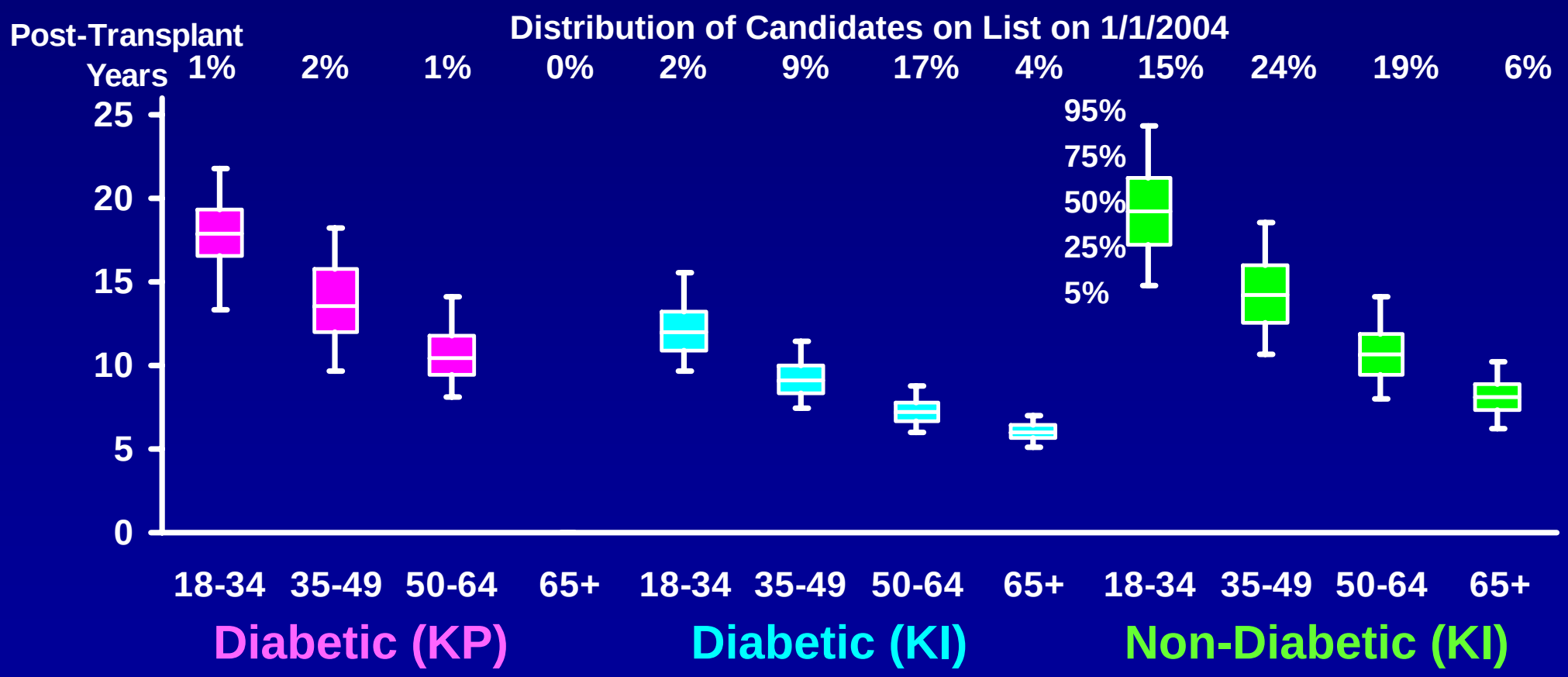
Distribution of KI & KP Recipient Lifespan By Candidate Age and Diabetes Status

Donor: Average SCD (Donor Age=32 yrs)



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Simulations Integrating a Measure of Life Years From Transplant (LYFT) into Deceased Donor Kidney Allocation

Kidney Allocation Review Subcommittee
Public Forum
February 8, 2007

Alan Leichtman, M.D.
Scientific Registry of Transplant Recipients

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Scientific Registry of Transplant Recipients (SRTR) Collaborators

- Robert Wolfe
- Keith McCullough
- Ann Rodgers
- Mary Guidinger
- Laura Christensen

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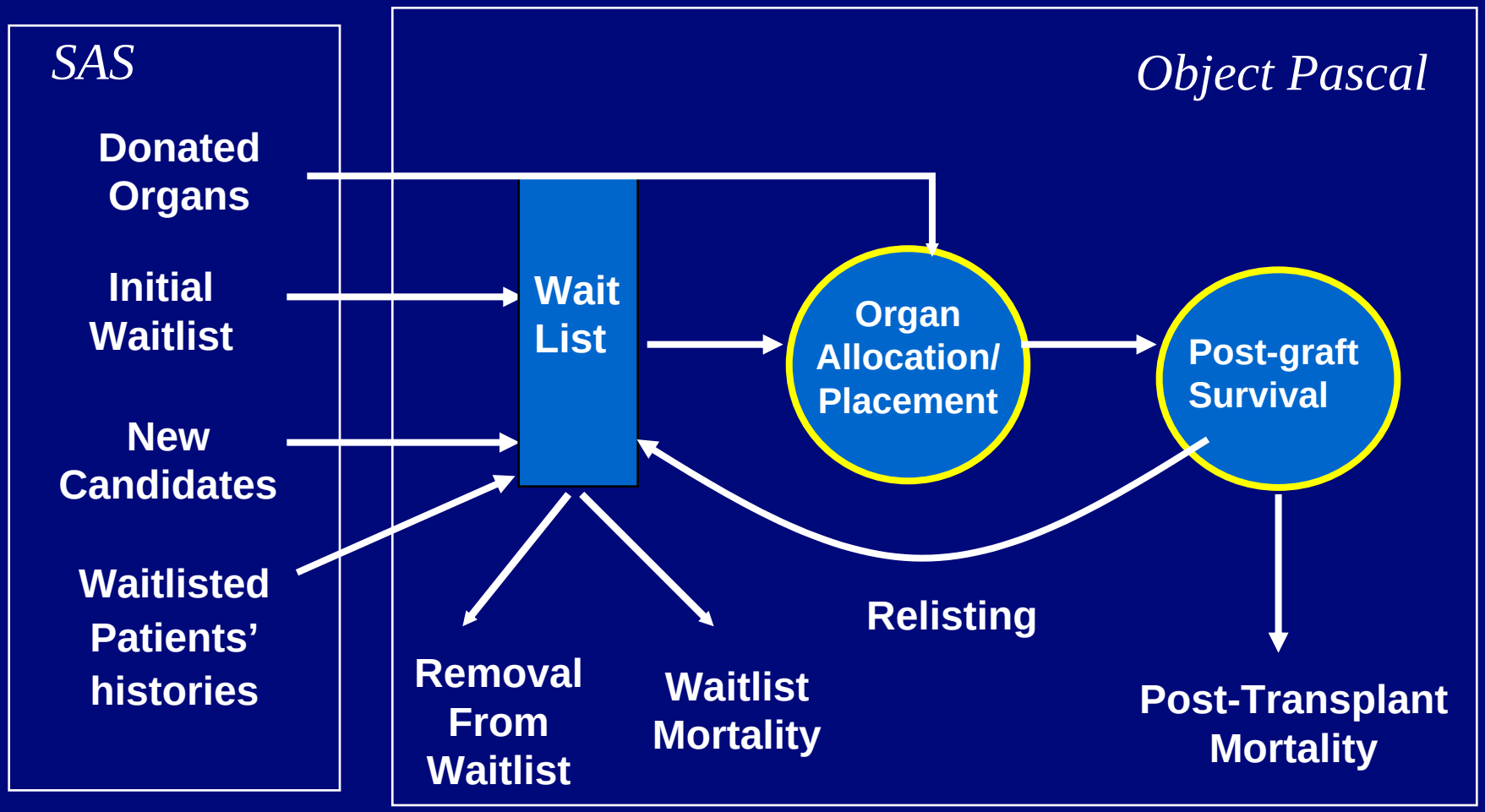
What is the Kidney and Pancreas Simulation Allocation Model (KPSAM)?

- KPSAM is a sophisticated computer program that can
  - replicate the results of the current kidney allocation system
  - predict the consequences of proposed policy changes before they are instituted
  - allow comparisons between alternative allocation rules or algorithms

What is the Kidney and Pancreas Simulation Allocation Model (KPSAM)?

- KPSAM uses specified allocation rules and the characteristics of actual candidates and donors
  - The order of offers of organs to candidates is based on the specified allocation rules being considered
  - Data from actual candidates and donors are used to predict
    - candidate, recipient and allograft outcomes
    - probability of accepting an offer
  - Outputs include demographic and survival outcomes resulting from application of the rules under consideration

KPSAM Simulations Process Events in Time Order



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KPSAM Simulations Incorporating a Measure of LYFT into Deceased Donor Kidney Allocation

KPSAM simulations fall into three broad categories:

1. **determine a baseline for comparison to the current allocation system**
2. **simulate rules intended to incorporate and maximize attainable LYFT**
3. **model rules that provide allocation priority based on considerations other than maximizing LYFT**
   - **in progress: time on dialysis, PRA**
   - **pending: medical urgency, quotas, discounting future years**

KPSAM Simulations of the Current Kidney and Pancreas Allocation System

- Uses the rules of the current national allocation system applied to the 2003 cohorts of candidates and donors
- Assumes a single national allocation system, i.e. no alternative local allocation units (ALUs) or alternative local allocation systems (variances)
- Assumes that every center and OPO follows the allocation rules
- Replicates the results seen nationally, but not by DSA

KPSAM Simulations to Incorporate LYFT

- LYFT used in place of current allocation points (wait time, PRA, HLA-DR match) for ordering offers of SCD kidneys to adult candidates
- For allocation of SCD kidneys, candidates that are to be ranked by LYFT are separated from candidates to be ranked by waiting time or by "allocation points"
  - pediatric v. adult
  - SPK v. pancreas alone
- Preserve current
  - absolute priority for zero mismatch
  - pediatric priority for donors under the age of 35 years
  - ECD allocation system

KPSAM Simulations Removing Barriers to Improving Attainable LYFT

- LYFT – Paybacks: Eliminate the existing payback system
- LYFT – 0MM Priority: Eliminate 0 HLA MM sharing and absolute priority (includes changes made in LYFT – Paybacks)
- LYFT + $A_2 \rightarrow B$: Nationalize Blood Type $A_2 \rightarrow B$ and $A_2B \rightarrow B$ (includes changes made in LYFT – 0MM Priority and LYFT - Paybacks)
- Eliminate local allocation boundaries, i.e. national allocation of SCD kidneys to adults (in progress)

Years of Life Expected With LYFT-Based Allocation of Kidneys

	Current System	LYFT
Years after transplant	113,541	139,334
Total graft years	75,940	85,388
Total extra life years	43,940	55,397
Δ years after transplant		25,793
Δ graft years		9,448
Δ extra life years		11,457

Each Δ (change) is relative to the prior simulation in this cumulative series

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Years of Life Expected With LYFT-Based Allocation of Kidneys

	Current System	LYFT	LYFT - Pay-Back	LYFT - 0MM Priority	LYFT + $A_2 \rightarrow B$
Years after transplant	113,541	139,334	140,556	145,174	145,879
Total graft years	75,940	85,388	86,019	86,221	86,525
Total extra life years	43,940	55,397	56,371	58,030	58,363
Δ years after transplant		25,793	1,222	4,618	705
Δ graft years		9,448	631	202	304
Δ extra life years		11,457	974	1,659	333

Each Δ (change) is relative to the prior simulation in this cumulative series

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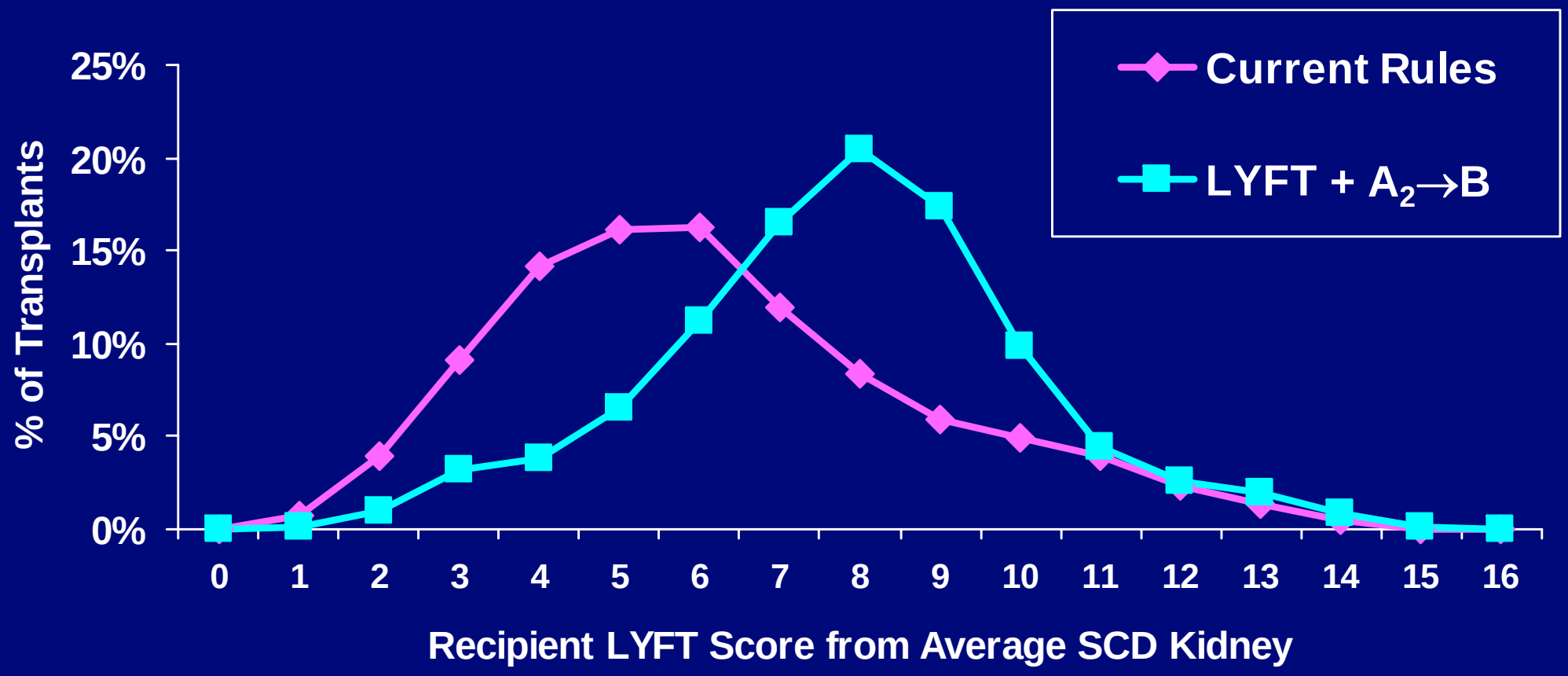
Incorporation of LYFT, Changes the Distribution of LYFT among SCD Kidney Recipients



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority

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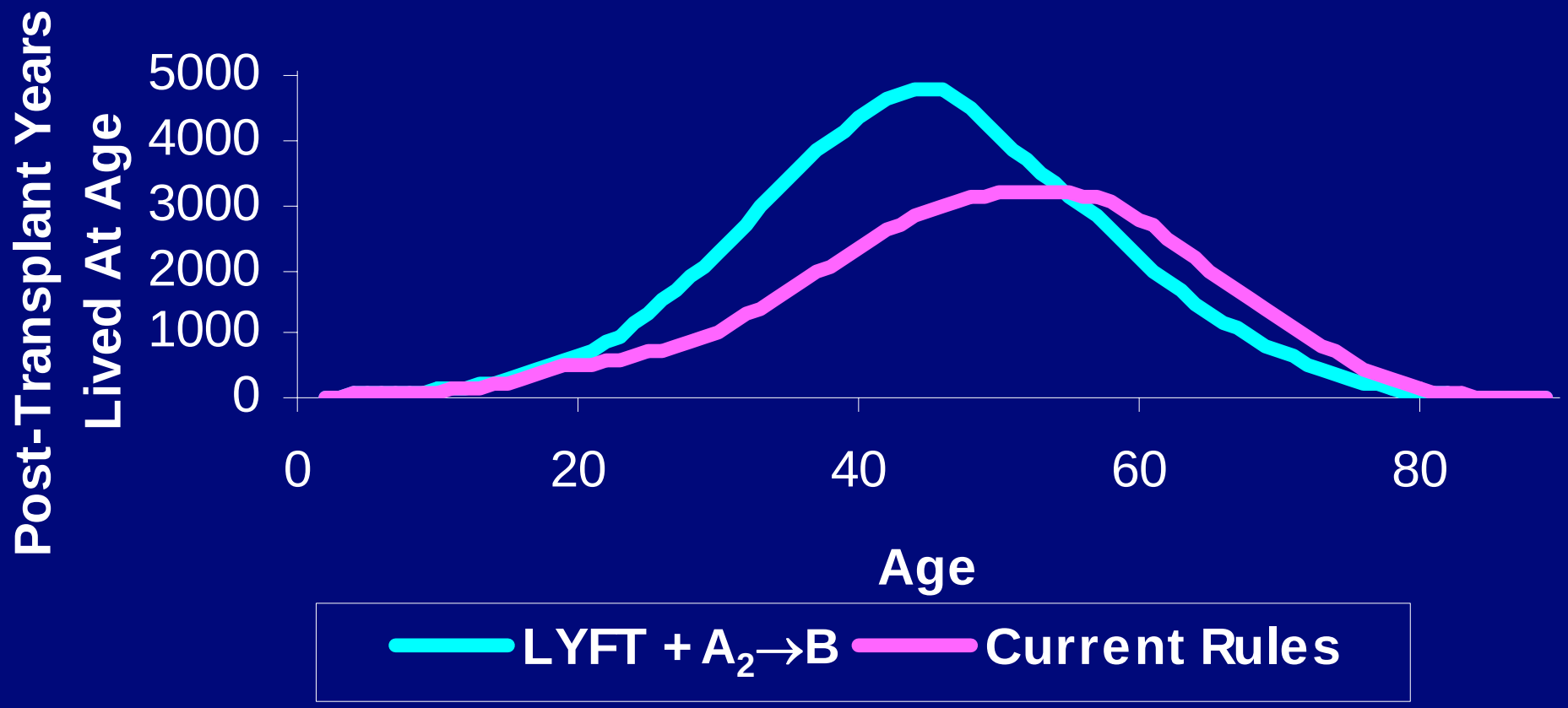
Distribution of Recipients' Post-Transplant Years Lived At Each Age



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority.

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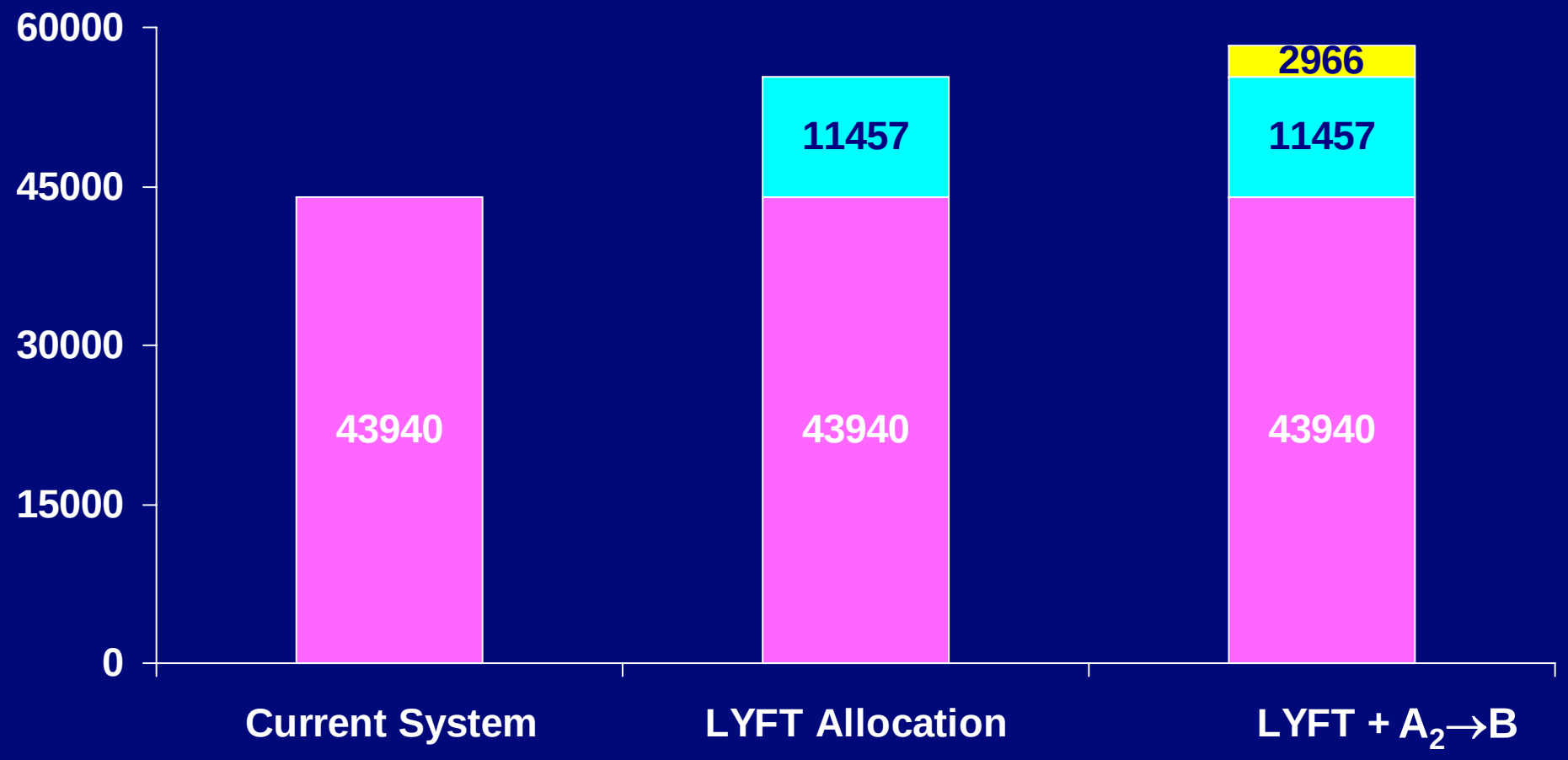
Summary of KPSAM Results
Additional Life-Years Gained by LYFT Allocation



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority

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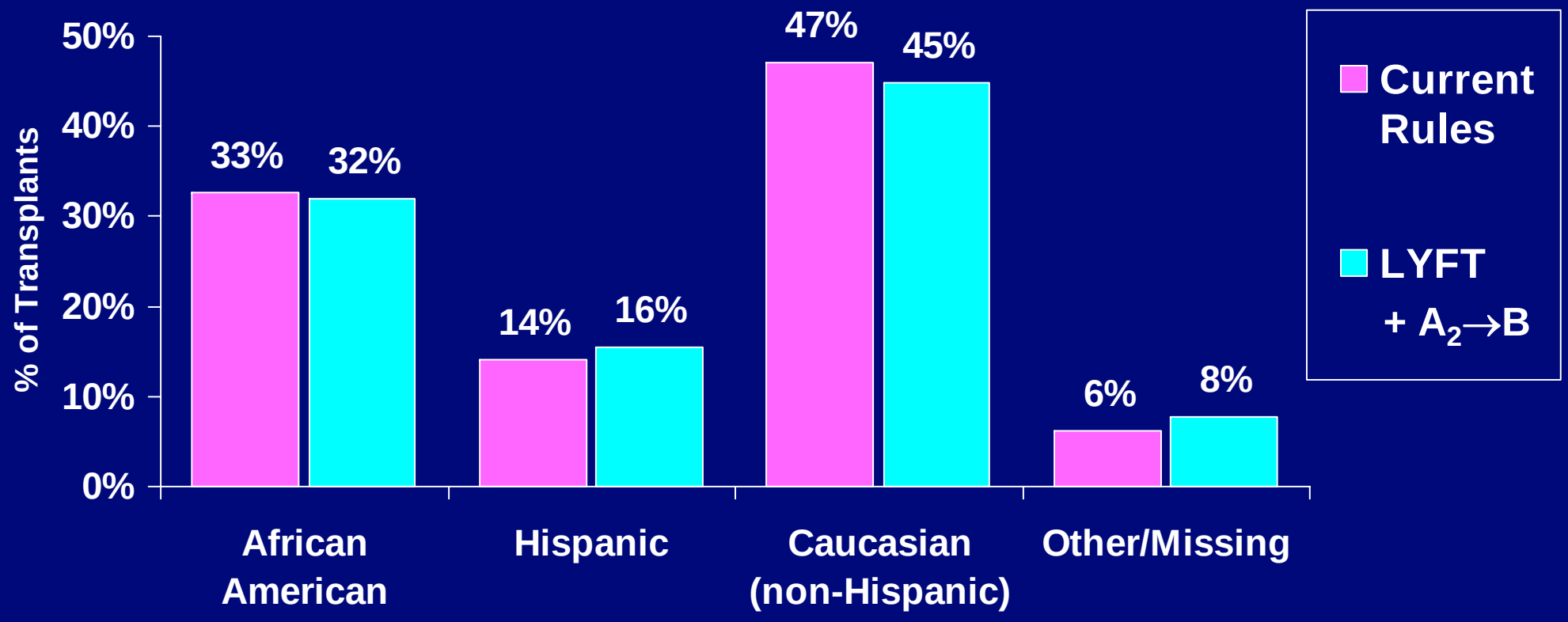
Racial Distributions of SCD Kidney Recipients Are Similar



<u>LYFT</u> + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority.

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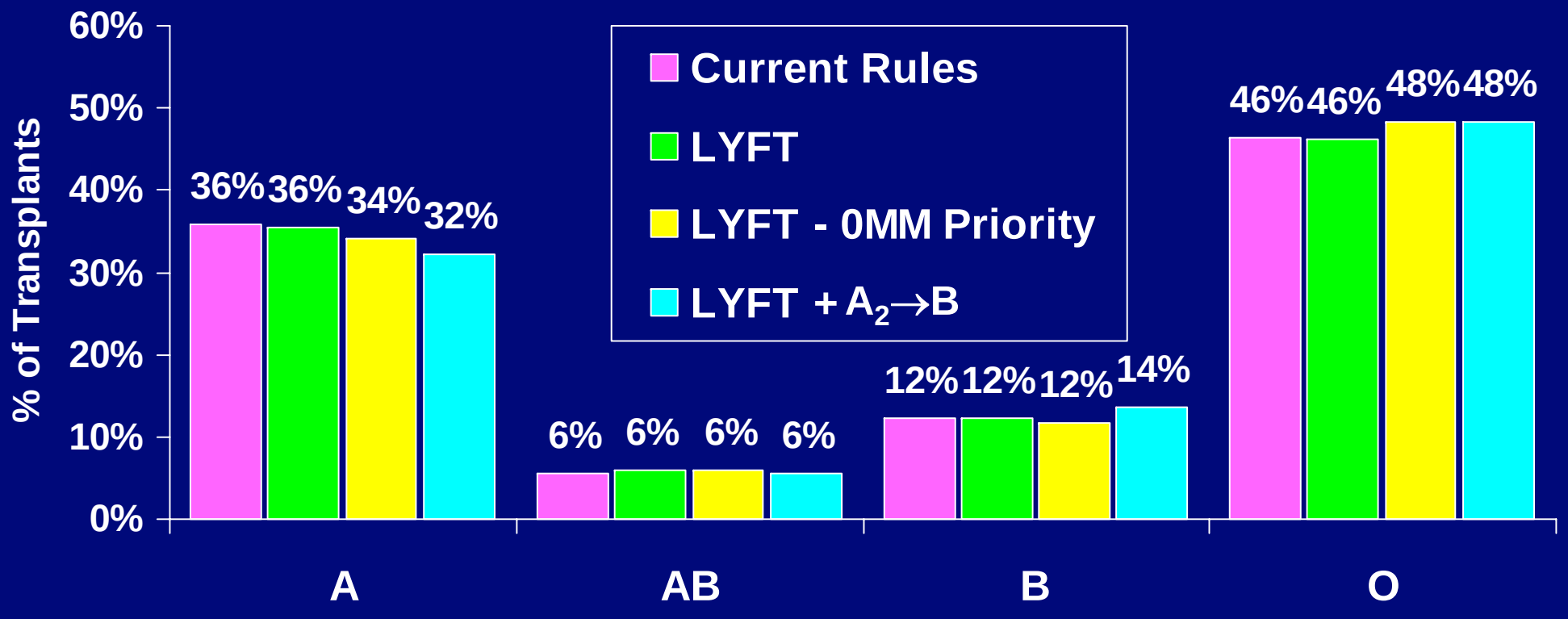
Blood Type Distributions of SCD Kidney Recipients Are Similar



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority

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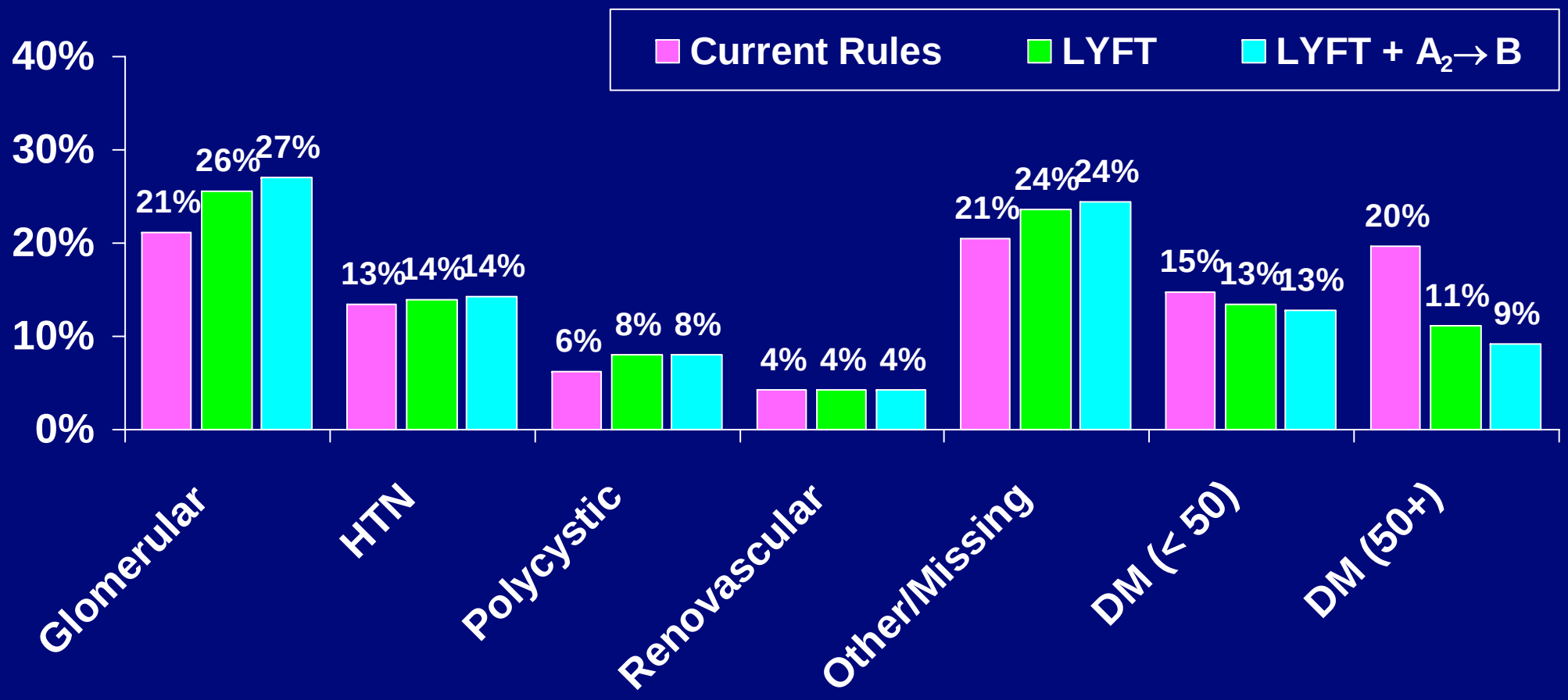
Distribution of Diagnoses of All Kidney (ECD, SCD, & SPK) Recipients Changes When LYFT Is Used



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority

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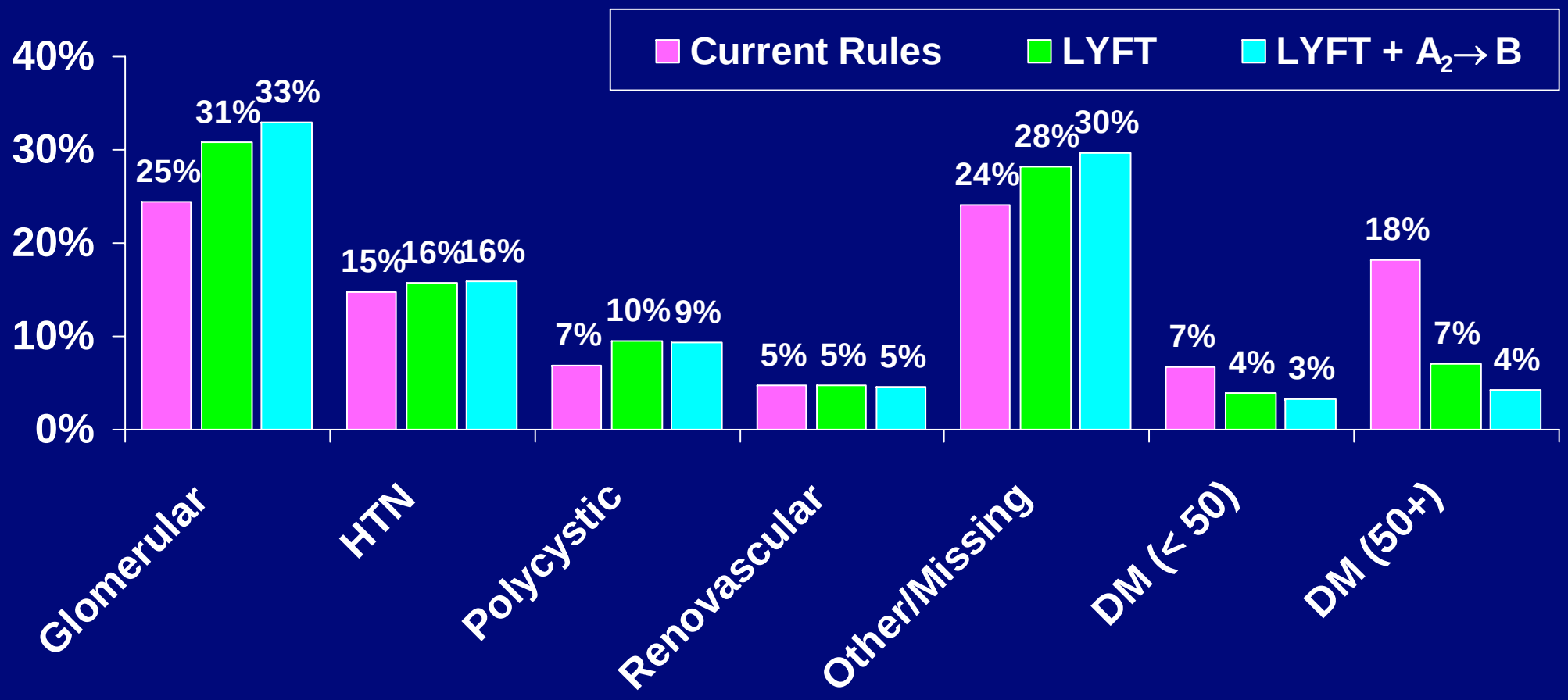
Distribution of Diagnoses of SCD Kidney Recipients Changes When LYFT Is Used



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority

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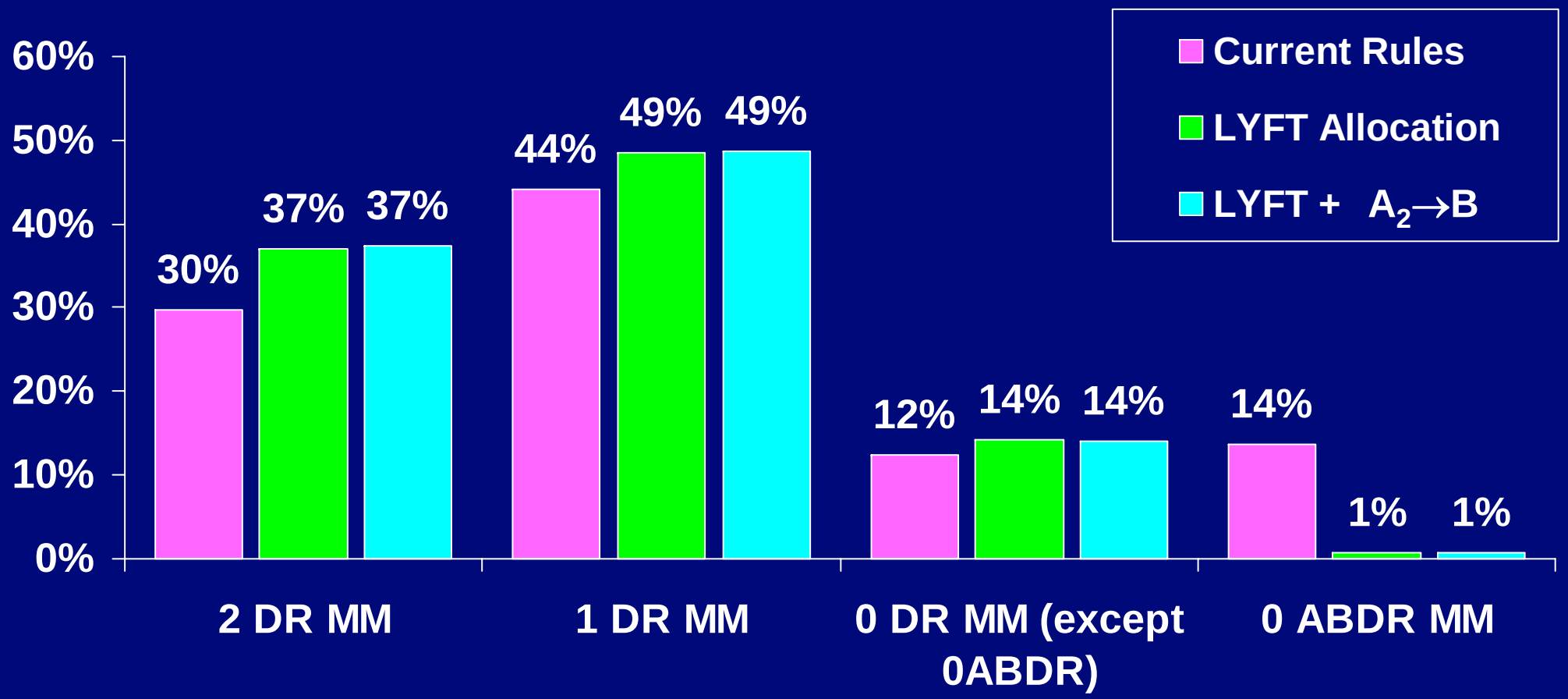
HLA Distribution of SCD Kidney Recipients Changes When 0MM Priority is Eliminated



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and 0MM priority.

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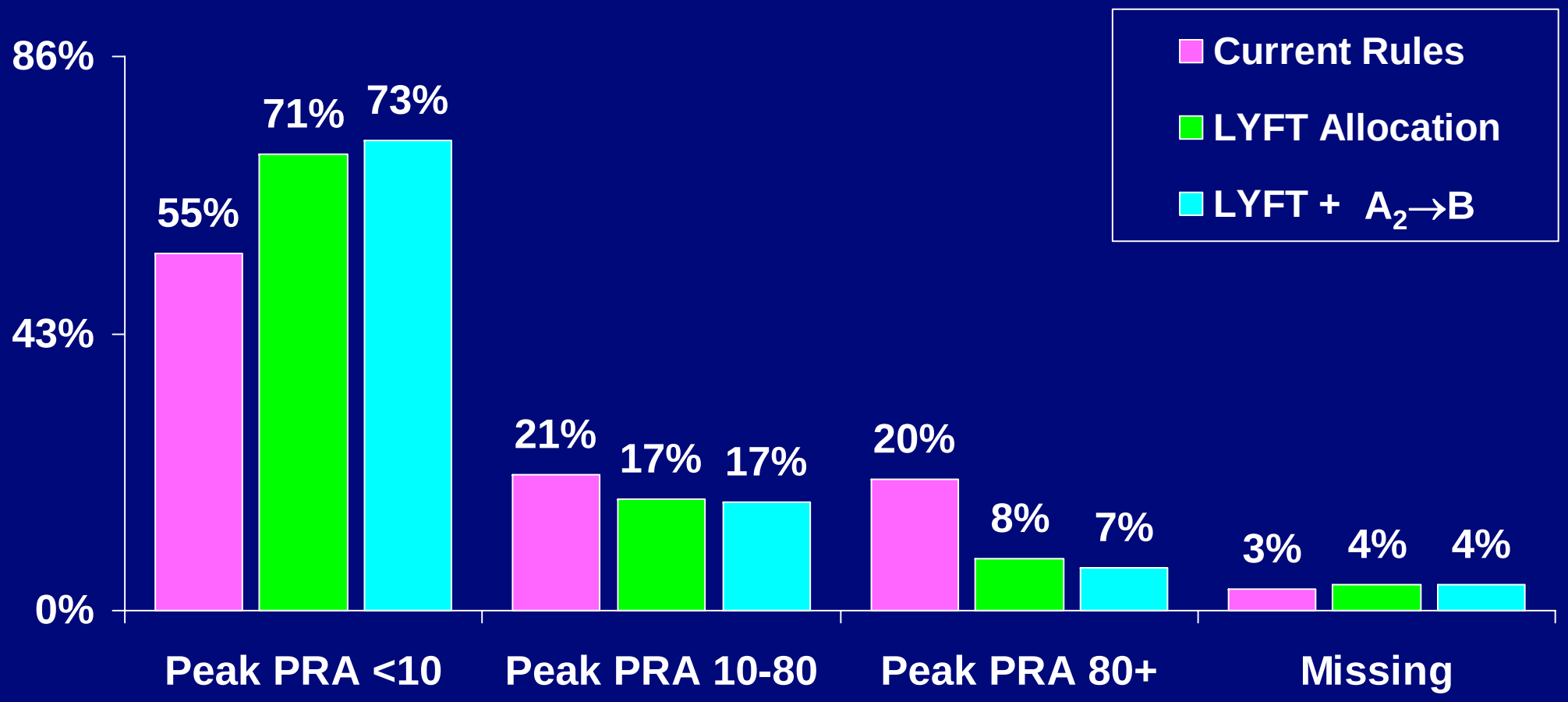
PRA Distribution of SCD Kidney Recipients Changes When LYFT* Is Used



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and absolute 0MM priority and does not add 4 points for PRA 80+ candidates

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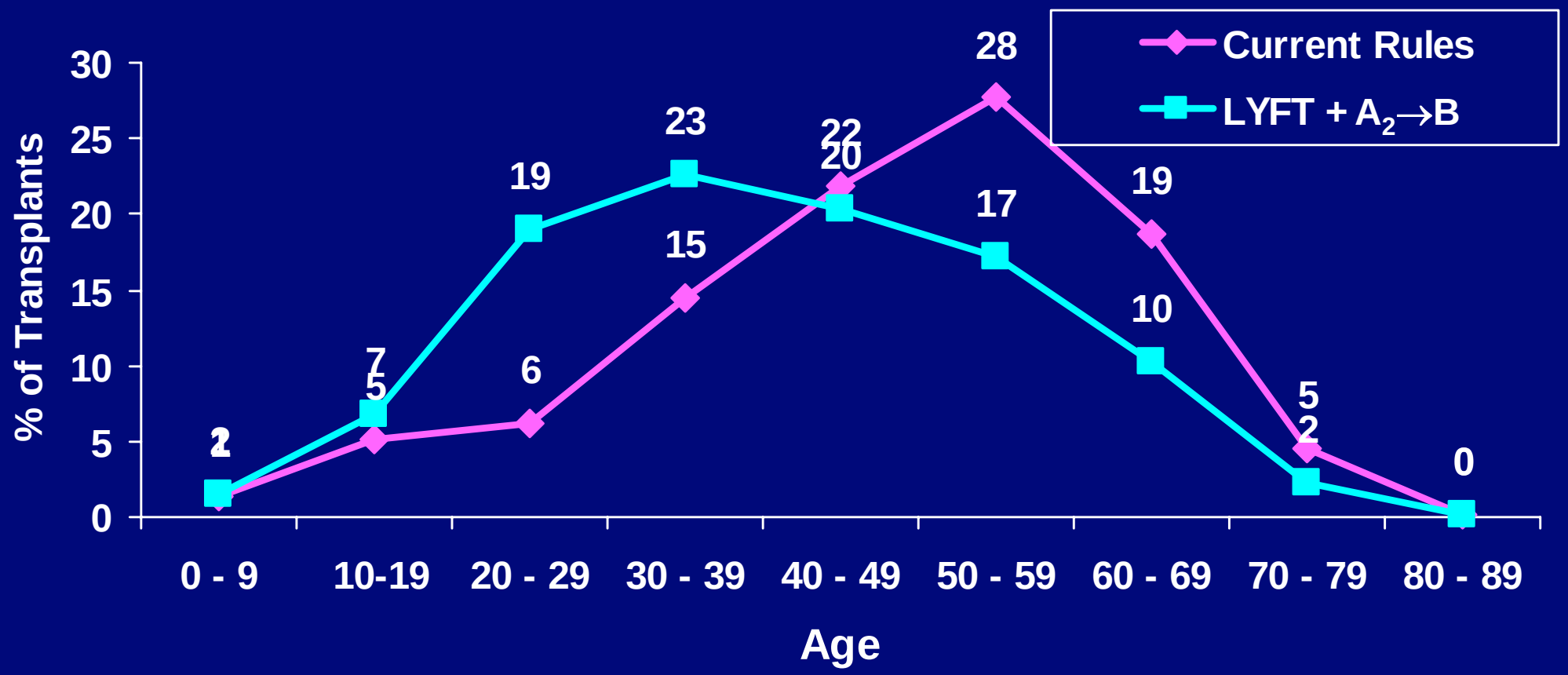
Age Distribution of All Kidney Alone Recipients Changes When Allocation Incorporates LYFT



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and 0MM priority.

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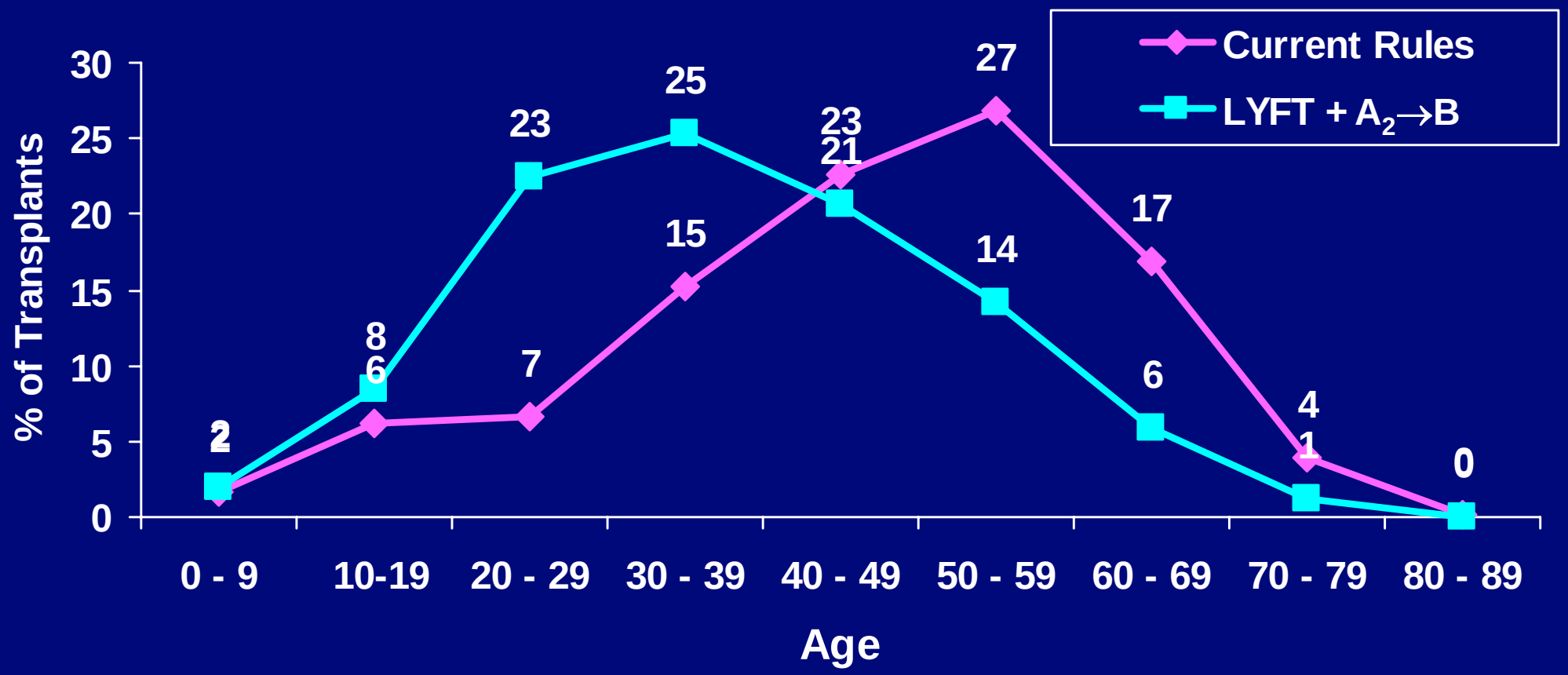
Age Distribution of SCD Kidney-Alone Recipients Changes When Allocation Incorporates LYFT



LYFT + $A_2 \rightarrow B$ allocation also includes elimination of paybacks and 0MM priority.

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Conclusions

- When compared to the current system, SCD kidney allocation incorporating LYFT would:
  - Have little effect on the racial and blood type distribution of recipients
  - Shift kidney transplants towards non-diabetics and lower PRA candidates
  - Reduce (with elimination of zero HLA MM sharing and priority) the number of zero HLA MM kidney transplants
  - Increase the percentage of higher LYFT recipients
  - Shift kidney transplants towards younger recipients

Conclusions

- When compared to the current system, SCD kidney allocation incorporating LYFT would increase the number of years of life that can be achieved each year with the current donor pool by more than 10,000 life years
- Wider geographic sharing would increase life years gained from transplantation
- Future runs will test the consequences of allocation incorporating time on dialysis, PRA, medical urgency, quotas, removal of HLA A and B from the LYFT calculation, and discounting of future life-years

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Ethical Considerations in Organ Allocation

Michael Shapiro, MD

OPTN

UNOS DONATE LIFE

“Men are not indifferent to how the greater benefits produced by their joint labors are distributed.”

UNOS DONATE LIFE

An Organ Allocation System Should:

- Be Fair
  - Equity, Justice
- Provide Value, Be Useful
  - Utility

UNOS DONATE LIFE

The “Final Rule”

- The OPTN Shall:
  - Develop…policies for the equitable allocation of cadaveric (sic) organs. (Equity)
  - Be based on sound medical judgment.
  - Be designed to avoid wasting organs, avoid futile transplants, promote patients access, promote efficient management… (Utility)

UNOS DONATE LIFE

Current Kidney Allocation

- Based primarily on Waiting Time
  - 1 point for each year waiting
- Influence of Utility measures has decreased from original system.
  - Originally 7 points for 4 BDR match
  - Now 2 points maximum for 2 DR match
- Additional considerations for equity –
  - 4 points for high PRA patients
  - Paybacks for 0-MM kidneys
- Relatively limited geographic sharing – possible inequity.

Extra-Renal Organ Allocation

- Primarily designed to avoid wait-list deaths
- In some cases, may sacrifice long-term utility (survival) for short term utility.
- Waiting time only as tie-breaker for patients of like severity of illness, and generally only time in class, not overall time.
- Equity recently addressed by increasing the geographic sharing areas.

UNOS DONATE LIFE

How to consider “Fairness” (Equity)

- All Patients might have an equal chance of getting an organ
  - Lottery
    - No attempt to get the right organ to the right patient.
    - Patients might never win in the lottery.
  - Waiting List
    - Not all patients have the same potential to wait for an organ.
    - Some patient’s “window of opportunity” may close while waiting.

“Fairness” (Equity), Cont’d

- All Patients should have an equal chance of living a “normal lifespan”.
  - 30 yr-old has more claim to an organ for “dialysis-free years” than 70 yr-old with recent onset renal disease
  - Older patient might do just as well with an organ with shorter predicted survival to get to same age as younger patient with longer-lasting kidney.

UNOS DONATE LIFE

Utility in Allocation

- The goal of allocation from a *Utility* perspective should be to do as much *net good* as possible.
- With kidney transplantation, as opposed to extra-renal organs, the goal is to improve quality of life and survival compared to the alternative therapy, i.e., dialysis.
- The existence of dialysis both creates the problem with allocation and provides an alternative therapy, which might be better for some patients.

Measures of Medical Utility

- Graft (kidney) survival
- Patient survival
- Improved Quality of Life
- Years added to Life
- Avoid medically inefficient use of scarce resource.

UNOS DONATE LIFE

Inappropriate to Use for Organ Allocation

- Ethnicity (Race)
  - Difficulty of objective definition.
  - May already be disadvantaged in referral and listing for transplantation.
- Gender
- Socioeconomic status
- Social Utility of Recipient
  - Who would decide?
  - Who's value system?

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If a system of kidney allocation based largely on “net benefit” (a utility measure) is likely to save 11,000 life-years annually, is there sufficient “unfairness” (inequity) in that system to suggest it shouldn’t be enacted? Can we address any potential inequity and still achieve significant net benefit?

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Modeled and Simulated "Pure LYFT"

Where do we go from here?

How much should allocation depend on LYFT?

- 100%--unlikely
- 75%?
- 50%?

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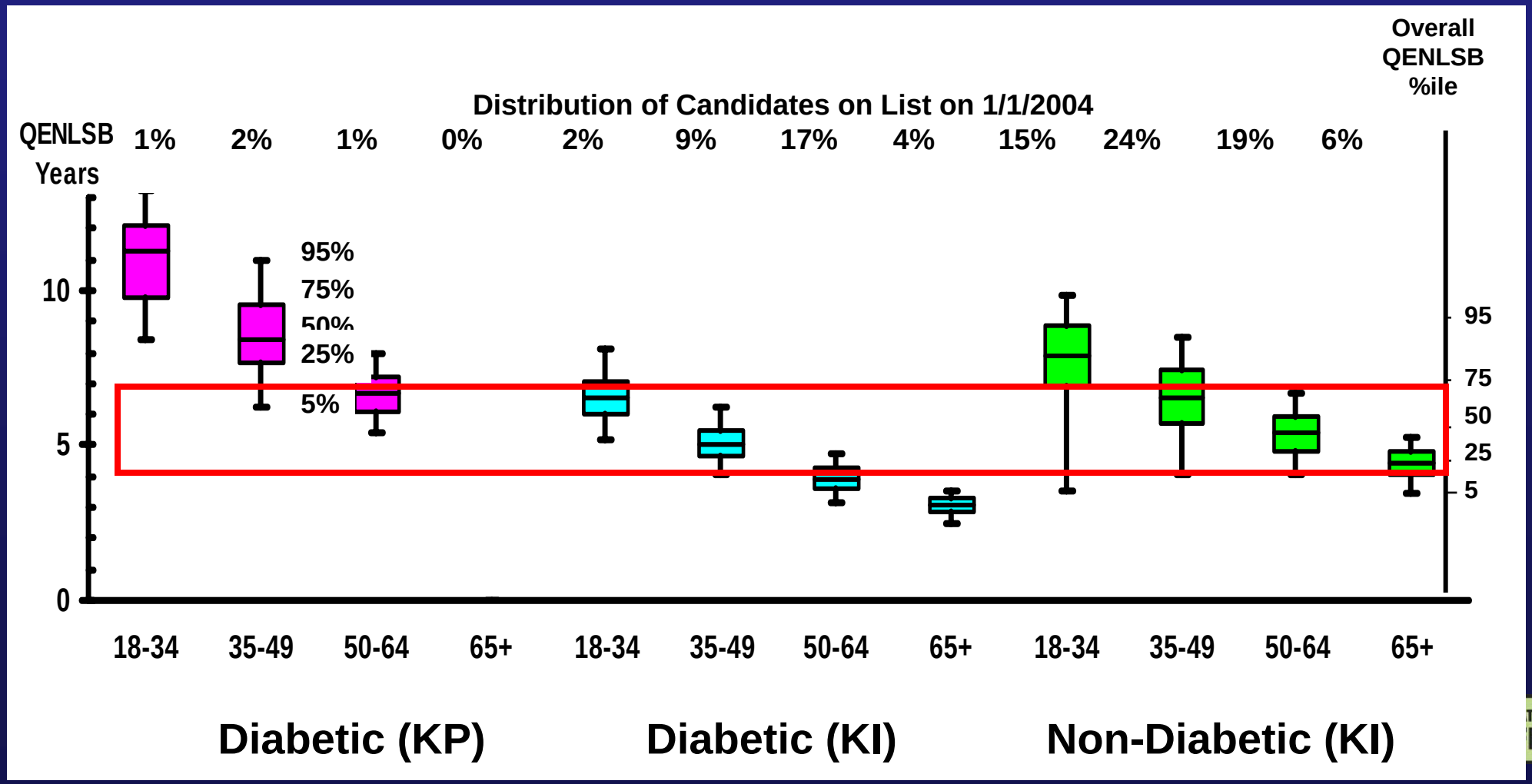
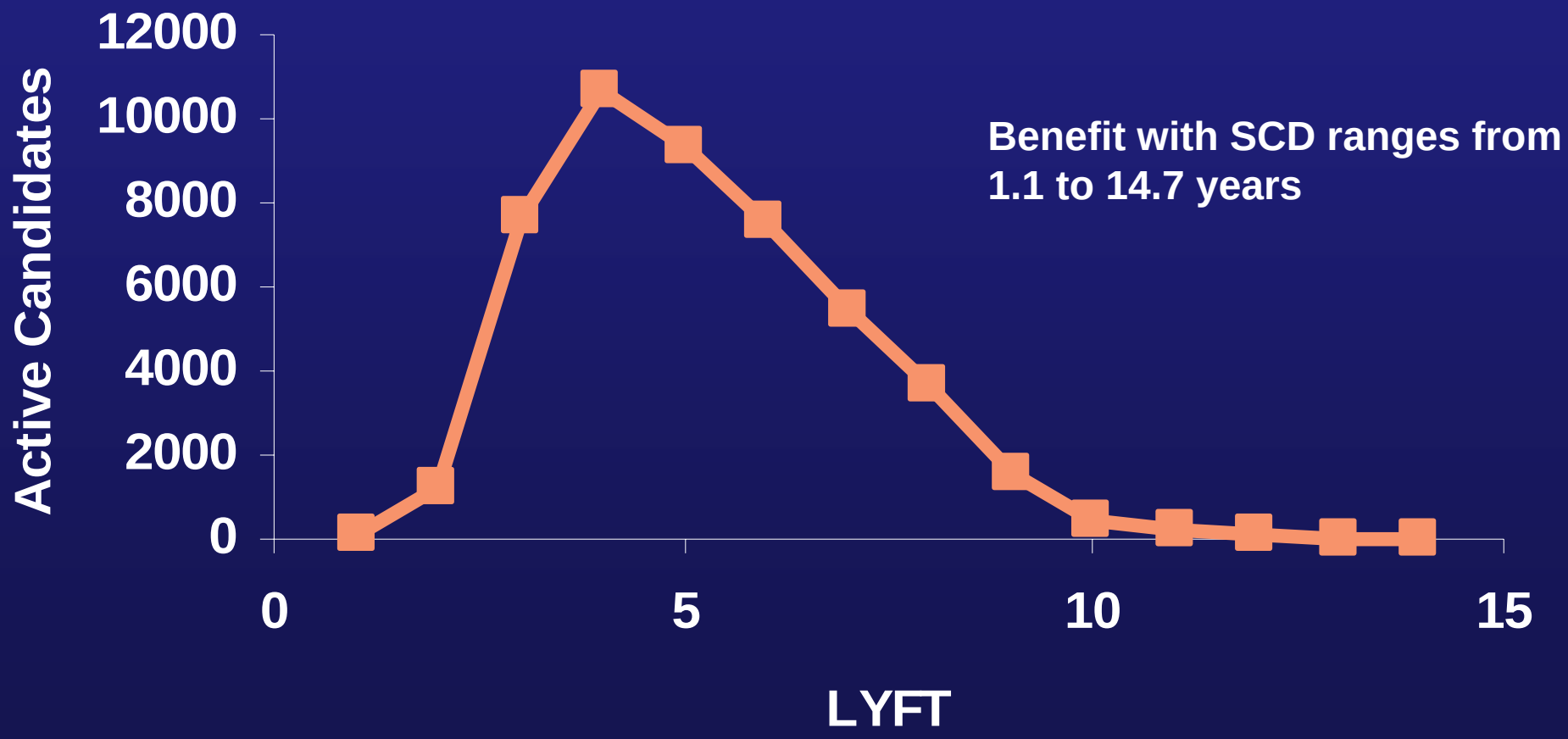
QENLB—Overlapping Scores



Distribution of LYFT
Among Candidates Active on 1/1/2004



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Time on Dialysis adjustment

- Allows patients to move up the list
- The impact of this modifier can be simulated using different weights for time on dialysis

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Modifying LYFT to Achieve Other Goals

- Restore 0MM sharing for adult candidates with PRA ≥ 80 (wider geographic exposure)
- Provide incremental 0.01 points per PRA percent
- Add points for ESRD time
  - 0.2 points per year of ESRD
  - 0.5 points per year of ESRD
  - 1.0 point per year of ESRD

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Outcomes When LYFT is Modified by Alternative Allocation Priorities

	Current	LYFT alone	A2→B PB/0MM	LYFT + 0.2* ESRD Yrs	LYFT + 0.5* ESRD Yrs	LYFT + 1.0* ESRD Yrs
Years after transplant	113,541	139,334	145,960	143,959	137,980	128,360
Years with graft	75,940	85,388	86,414	84,889	81,114	77,111
Total extra life years	43,940	*55,397*	58,468	58,200	*55,514*	51,060
Δ Years after transplant		25,794	6626	-1,920	-7,899	-17,519
Δ Years with graft		9448	1026	-1,636	-5,411	-9,414
Δ extra life years		11,457	3071	-163	-2,849	-7,303

LYFT + 0.01*PRA and LYFT + X*ESRD Yrs (X = 0.2, 0.5, 1.0) each incorporate a single rule change from the "0MM Share PRA 80+" and are not cumulative with each other.
All Δ's are in reference to the A2->B run.
These runs have not been reviewed by the OPTN Kidney Committee

SCD Changes with "Time"

	Current	*LYFT Alone*	*B + A2 no 0-MM*	*+0.5 Time*
Recipient Afric Am	32.7%	29.3%	31.7%	33.2%
50-64	36.5%	21.7%	17.1%	17.1%
PRA> 80%	20.4%	8.1%	6.7%	14.1%

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Increasing Waiting Time*

A2→B

A2B→B

Will help to equalize access to transplant for AB, A and B candidates

Ex. Bryan et al Transplantation 2006; 80:75-80

A	1084	1141
O	1767	1840 (5.04 yrs)
B	1981	>2000 (estimated)

*Median #days to 50% of wait-listed patients transplanted

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HLA Matching? Incorporated into LYFT Score

- No “absolute trump” for O-ABDR matching
- No separate points for DR matching
- No paybacks
- Allow HLA to have its appropriate impact on candidate LYFT

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Sensitized Patients

- Old methods outdated
- Now can identify “unacceptable” antigens in sensitized patients
- Larger geographic sharing for high LYFT sensitized candidates
- Place highest combined score on national list: LYFT+Sensitized
- Allocate if “virtual crossmatch” negative

Ex. Bray AJT 2006; 6: 2307-2315.

SPK

- Most have high LYFT scores
- Simulated direct competition with other kidney candidates

Overall

- Prior living donor
- Pediatric priority for donors <35
- SCD kidneys using LYFT modified by time, sensitization and urgency
- SPK and Kidney alone intermixed
- ECD kidneys by waiting time

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Important Caveats

- This is not a final proposal
- Even after a final proposal is implemented, there will be ongoing changes

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Advantages of this Approach

- Clear, objective goal of kidney allocation
- Medical criteria emphasized
- Time de-emphasized, but not completely
- Objective, non-gameable system
- Significantly increases patient and graft survival of transplanted candidates

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Equal to a 31% increase in both patient and graft survival for SCD kidneys

Total	4.6	5.9	1.3 (↑28%)
SCD	5.1	6.7	1.6 (↑31%)
ECD			(-4%)
SPK			(↑7%)
Total			616 8%)

Improvement comparable to the introduction of cyclosporine

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Advantages II

- Likely to increase transplant rate in younger recipients
- Might actually decrease the number of candidates on the list—especially younger candidates
- Possibly increase utilization of ECD kidneys

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Advantages III

- Maintains Peds priority
- Increases transplants in B blood group recipients
- Uses new alloantibody detection technology--?eliminate ROP trays
- Gives HLA, sensitization, SPK their appropriate medical significance

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Advantages IV

- No major changes in % transplants for ethnic groups
- Increases transplant rate for <50 y/o candidates to that of 10 years ago

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Advantages V

- Reduces sharing
  - 26.8%→12.4%
- No or very few paybacks
- 0-ABDR for children and good-benefit, highly-sensitized
- DR MM unchanged
  - 1 DR MM: 42.3→45%
  - 0 DR MM: 12.9→8.3%

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What do I tell patients?

- Clearly delineates a candidates transplant LYFT (Website will be developed for SCD, ECD, living donor)
- Different impact on different programs
- More predictable waiting list
- Maintain workups for top candidates

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Disadvantages?

Decreases SCD transplants in:

- Type II diabetic candidates 18.2%→4.5%
- Older candidates
  - 50-64: 36.5%→17.1%
  - 65+: 9.9%→2.7%
- 0-ABDR MM
  - 6.1%→0.2%

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Disadvantages II

- Does not address geographical variations in access to transplant
- Does provide a mechanism of comparing similar candidates

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Unknowns

- Impact on living donation
- Psychological impact on “hope” given a more predictable list
- Impact on acceptance of ECD kidneys
- Impact on the waiting list over time

To Consider

- Alternative systems?
- Stratify ECD schema?
- Finalize sensitized candidate schema
- Legal opinions
- Urgency concept—regional review boards

The Process

- Public Forum, Feb 8th Dallas
- Kidney Committee Approval
- Public Comment x2
- Regional Meetings in the Fall
- Second Public Forum
- Board consideration and approval