Scientific reasoning, statistical thinking, measurement issues, & use of graphics:

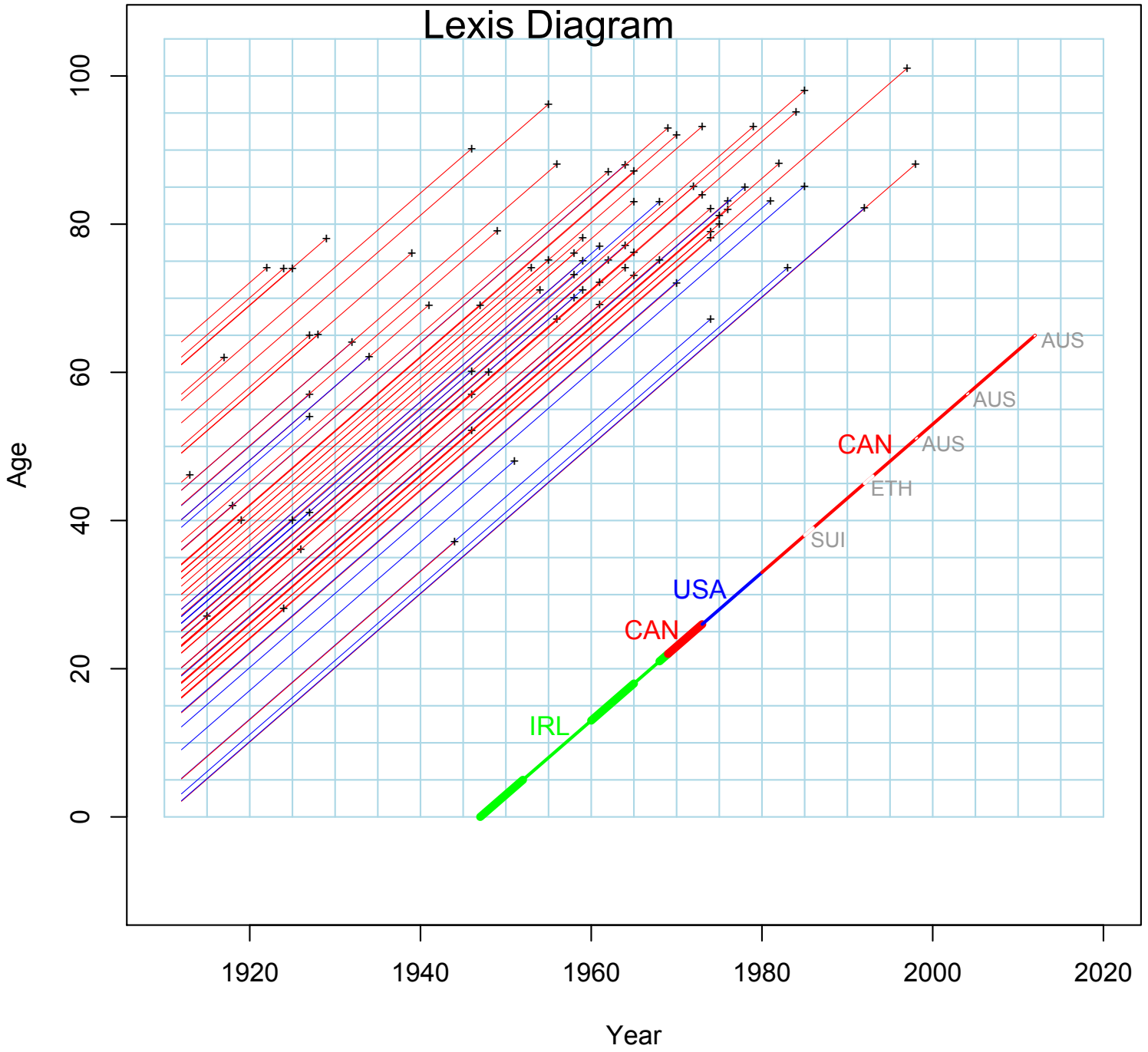
.

examples from research on children

James Hanley

McGill Biostatistics Biostatistique

http://www.mcgill.ca/epi-biostat-occh/grad/biostatistics/


Lexis Diagram
Age
Year
0
20
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1920
1940
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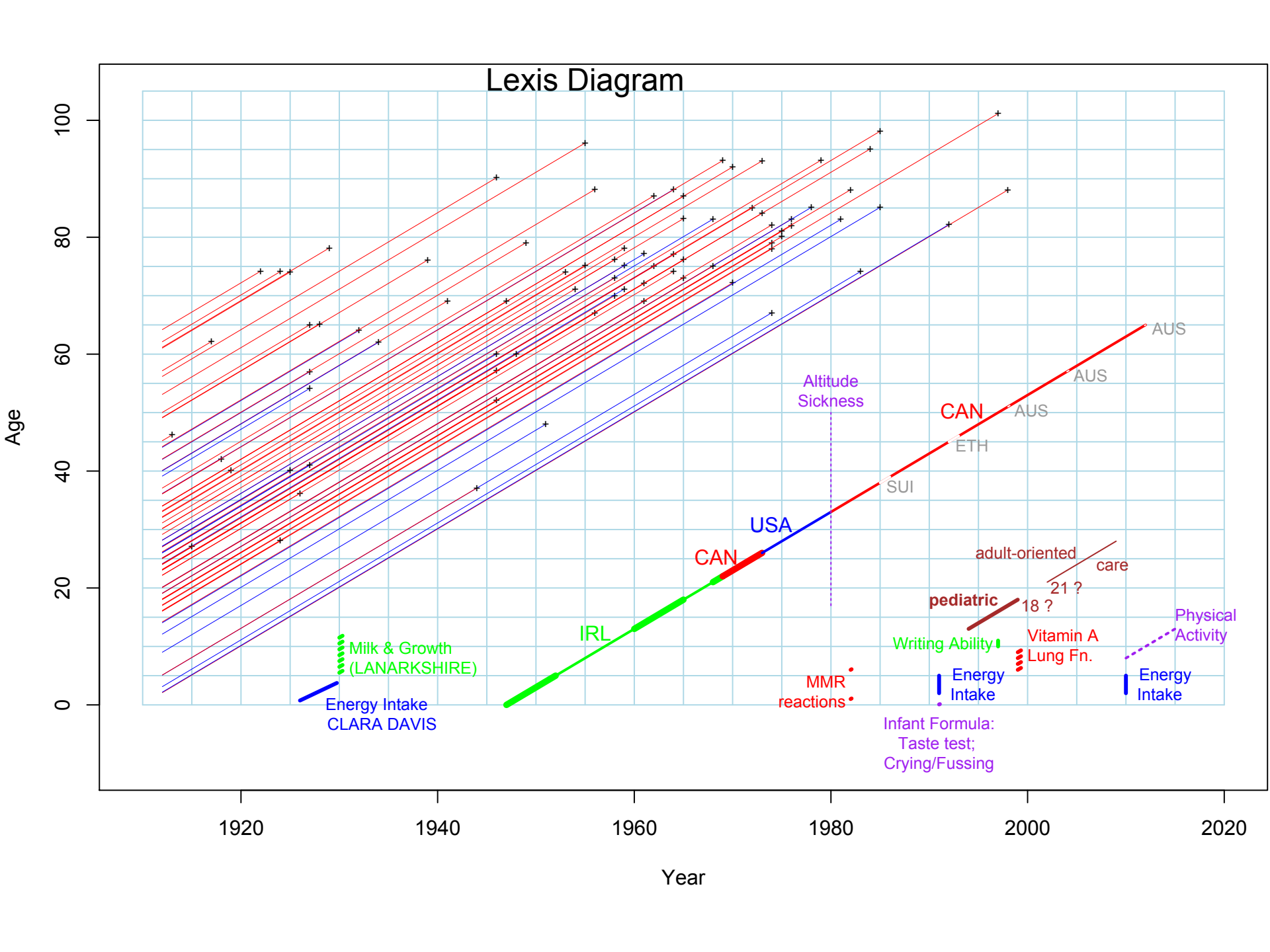
1980
2000
2020
AUS
AUS
CAN
AUS
ETH
SUI
USA
CAN
IRL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IRL
Altitude
Sickness
adult-oriented
care
21 ?
pediatric
18 ?
Physical
Activity
Writing Ability
Vitamin A
Lung Fn.
Milk & Growth
(LANARKSHIRE)
Energy Intake
CLARA DAVIS
MMR
reactions
Energy
Intake
Energy
Intake
Infant Formula:
Taste test;
Crying/Fussing

	Logic/ Design	Statistical Principles	Measurement	Graphics
Immortal Time	X			
Writing: Mac vs. PC	X		X	X
Lanarkshire Milk Exp't	X			X
MMR Reactions	X			X
Altitude Sickness	X			X
Inf. Formula: Cry/Fuss	X		X	
Vitamin A: Lung Function		X		
Transfer to Adult Care	X	X		
Energy Intake		X		
Physical Activity			X	X

SURVIVAL-TIMES AFTER CARDIAC ALLOGRAFTS

BRUNO J. MESSMER JAMES J. NORA
ROBERT D. LEACHMAN DENTON A. COOLEY

FROM THE CORA AND WEBB MADING DEPARTMENT OF SURGERY, BAYLOR COLLEGE OF MEDICINE, AND THE TEXAS HEART INSTITUTE OF ST. LUKE'S AND TEXAS CHILDREN'S HOSPITALS, HOUSTON, TEXAS

Summary During the period May 2, 1968, to March 1, 1969, fifteen patients underwent cardiac transplantation for end-stage heart-disease. Their survival-time is compared with that of forty-two potential recipients who did not receive allografts. Mean survival of the potential recipients was 74 days. The average for the transplant patients was 111 days (including 22 days waiting-time before operation). This difference does not justify wide clinical application of cardiac transplantation, but is an indication for its use in suitable cases where it may prolong life and relieve symptoms.

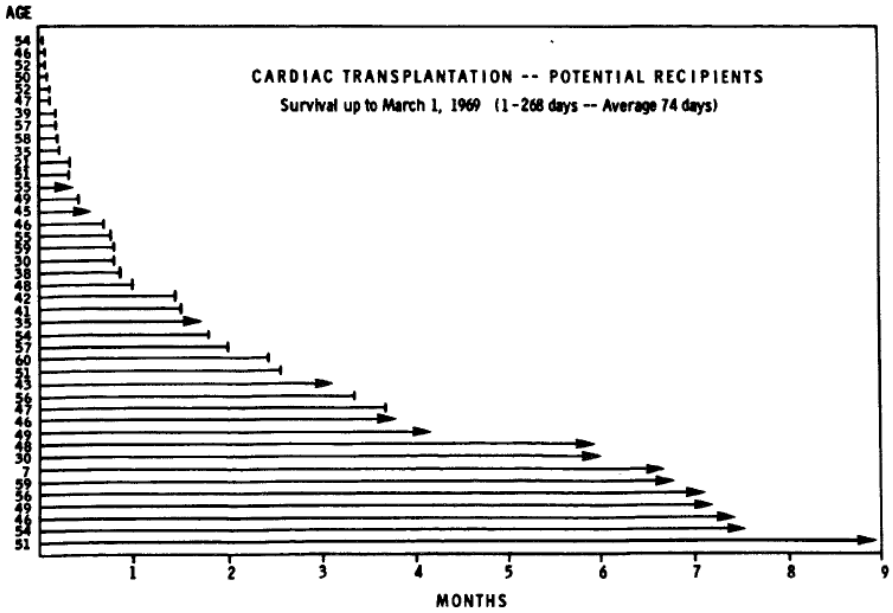

Fig. 1—Survival of forty-two potential recipients for heart transplant.
Arrow indicates patients still alive on March 1, 1969.

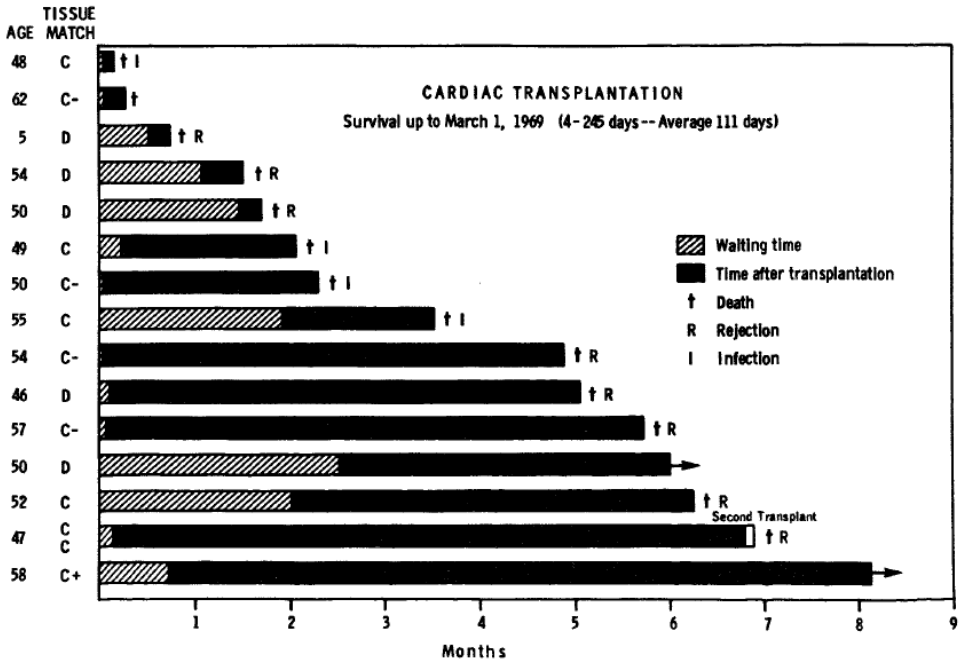

Fig. 2—Survival of fifteen patients given a cardiac allograft.
Arrow indicates patients still alive on March 1, 1969.

William Farr (1807 - 1883)
British epidemiologist
one of founders of medical statistics

VITAL STATISTICS:

A Memorial Volume of Selections from the Reports and Writings of

WILLIAM FARR

With an Introduction by
Mervyn Susser
and
Abraham Adelstein

Published under the auspices of the Library of The New York Academy of Medicine

The Scarecrow Press, Inc.
Metuchen, N.J. 1975

certain professions, stations, and ranks are only attained by persons advanced in years; and some occupations are only followed in youth; hence it requires no great amount of sagacity to perceive that "the mean age at death," or the age at which the greatest number of deaths occurs, cannot be depended upon in investigating the influence of occupation, rank, and profession upon health and longevity.

If it were found, upon an inquiry into the health of the officers of the army on full pay, that "the mean age at death" of "Cornets, Ensigns, and Second Lieutenants" was 22 years; of "Lieu-"tenants" 29 years; of "Captains" 37 years; of "Majors" 44 years; of "Lieutenant-Colonels" 48 years; of general Officers, ages still further advanced—

—and that the ages of Curates, Rectors, and Bishops;

of Barristers of seven years' standing, leading Counsel and venerable Judges—differed to an equal or greater extent, a strong case may no doubt be made out on behalf of those young, but early-dying Cornets, Curates, and Juvenile Barristers, whose "mean age at death" was under 30! It would be almost necessary to make them Generals, Bishops, and Judges—for the sake of their health.

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Letters to the Editor

Longevity of popes and artists between the 13th and the 19th century

From MARIA PATRIZIA CARRIERI[1] and DIEGO SERRAINO[2*†]

Several steps were required before a cardinal could enter the Conclave, making longevity a necessary condition for being elected Pope. Bearing in mind this consideration, we aimed at investigating whether longevity of Popes was longer than that of other population groups of contemporary people,

after having taken into account that Popes had to have reached a certain age before being elected to papacy.

The study period was divided in two parts to classify Popes by calendar year at death (1200–1599 or 1600–1900).

For each period, the minimum age at starting pontificate was used to exclude artists who died before reaching that age (39 and 38 years, respectively)

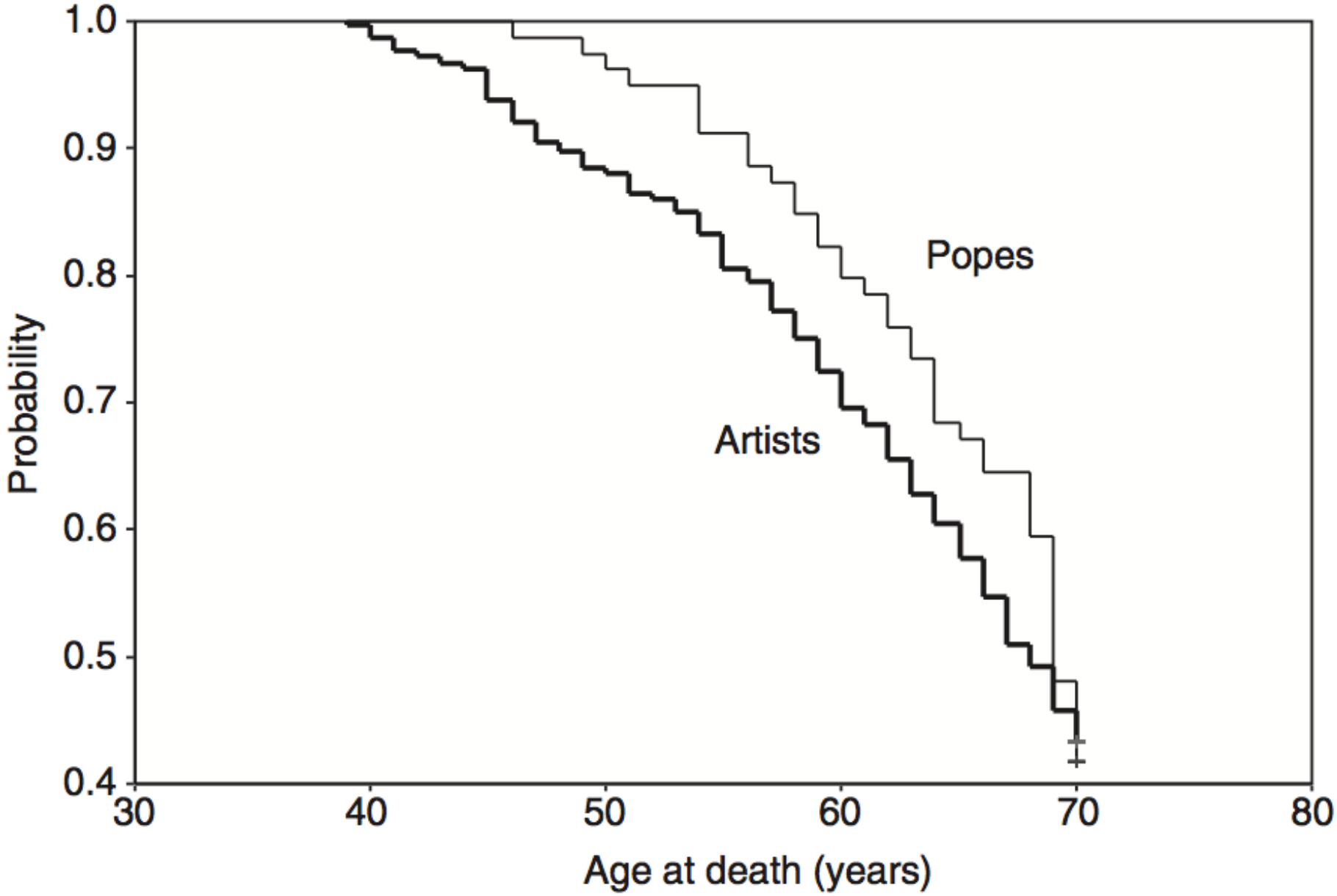

Figure 1 Probability of Popes and artists to survive up to 70 years of age

Int. J. Epidemiol. Advance Access published March 16, 2006

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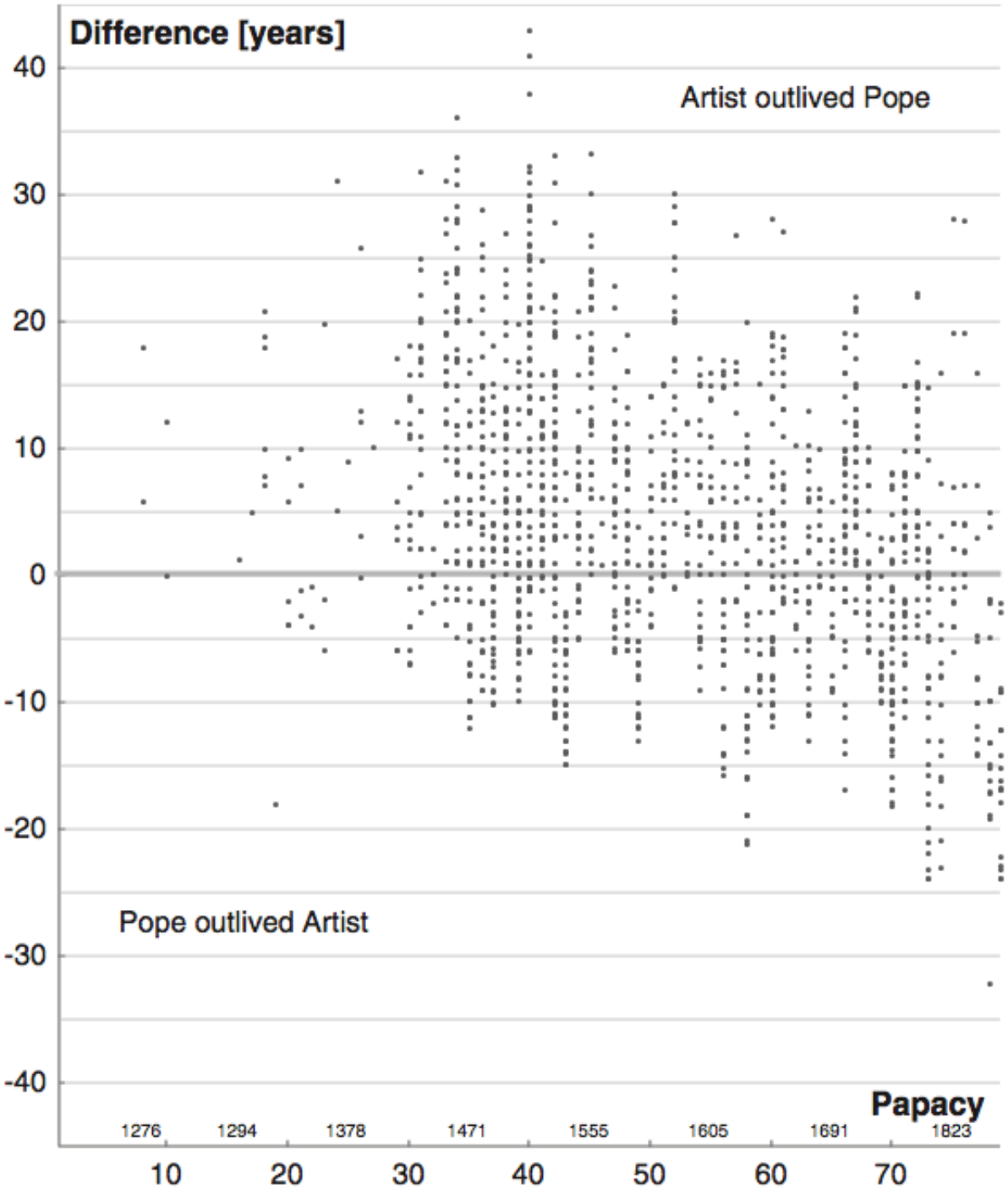
International Journal of Epidemiology
doi:10.1093/ije/dyl036

Letter to the Editor

Statistical fallibility and the longevity of popes: William Farr meets Wilhelm Lexis

From JAMES A HANLEY,[1]* MARIA PATRIZIA CARRIERI[2] and DIEGO SERRAINO[3]



The numbers of years by which artists, who had reached the same age as the Pope was when elected,

outlived
(positive differences, vertical axis),

or were outlived by (negative differences),

the Pope

Annals of Internal Medicine | Academia and Clinic

Do Oscar Winners Live Longer than Less Successful Peers? A Reanalysis of the Evidence

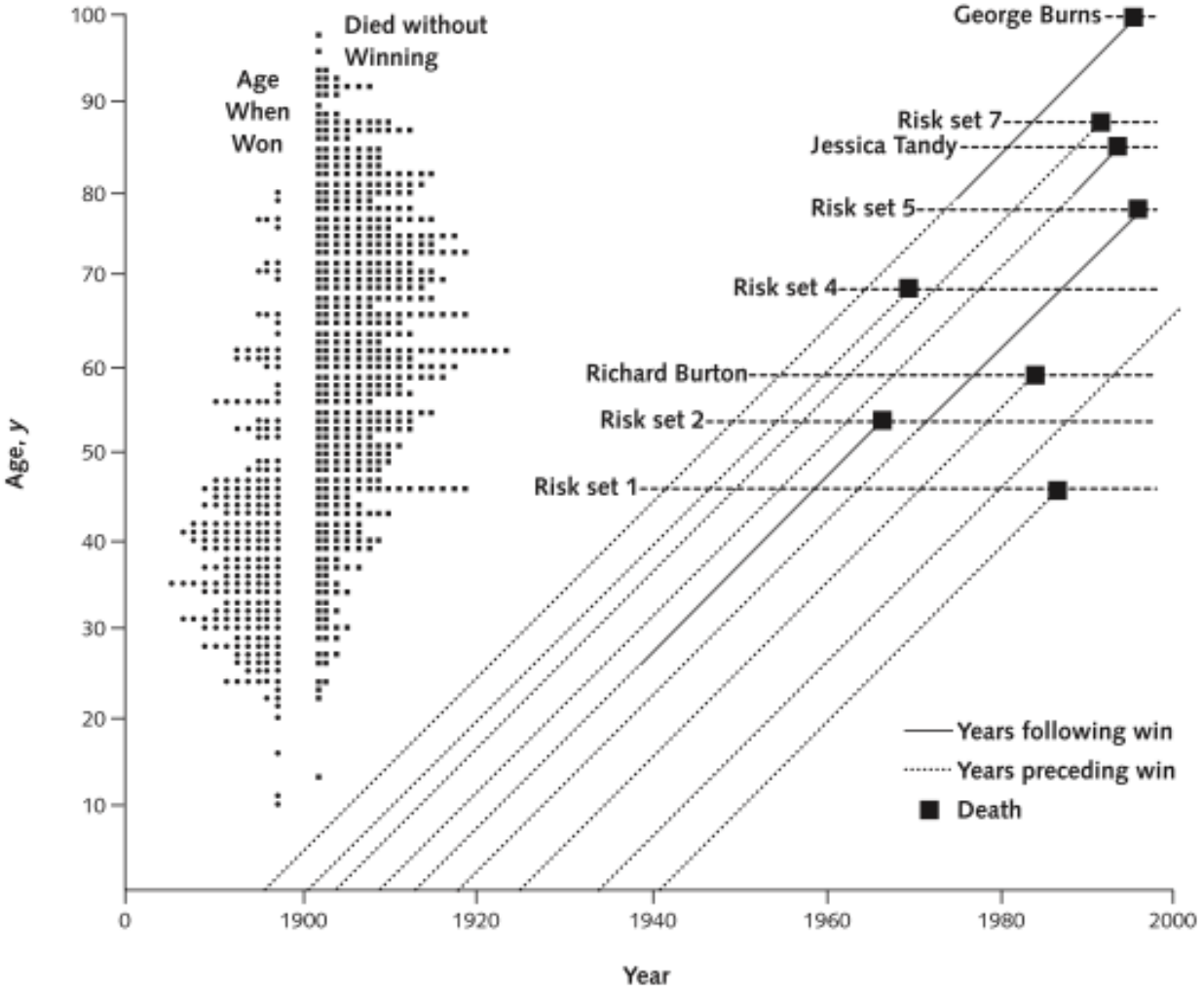
Marie-Pierre Sylvestre, MSc; Ella Huszti, MSc; and James A. Hanley, PhD

In an article published in *Annals of Internal Medicine* in 2001, Redelmeier and Singh reported that Academy Award–winning actors and actresses lived almost 4 years longer than their less successful peers. However, the statistical method used to derive this statistically significant difference gave winners an unfair advantage because it credited an Oscar winner's years of life before winning toward survival subsequent to winning. When the authors of the current article reanalyzed the data using methods that avoided this "immortal time" bias, the survival advantage was closer to 1 year and was not statistically significant. The type of bias in Redelmeier and Singh's study is not limited to longevity comparisons of persons who reach different ranks within their profession; it can, and often does, occur in nonexperimental studies of life- or time-extending benefits of medical interventions. The current authors suggest ways in which researchers and readers may avoid and recognize this bias.

Ann Intern Med. 2006;145:361-363. www.annals.org

For author affiliations, see end of text.

Figure. **Lexis diagram showing life course for 9 selected performers (all nominated), along with their status at the time of the 8 risk sets (1 at each death).**



A Lexis diagram (4) represents each performer's time course as a diagonal line, with advancing age on the vertical axis and advancing calendar time on the horizontal axis. Winners, by virtue of their having lived long enough to win, were, in hindsight, "immortal" in the years that preceded their win. Circles and squares at the left of the figure indicate ages at which winners won and ages at death of those who died without winning.

Brought to our attention by B. Foster, MD
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CLINICAL RESEARCH www.jasn.org

Transplant Nephrectomy Improves Survival following a Failed Renal Allograft

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*Department of Clinical Research, Renal Consultants of Houston, Houston, Texas; †Physicians Clinical Research, San Antonio, Texas; ‡Veterans Administration Hospital, San Antonio, Texas; §Transplantation Research Center, Renal Division, Brigham and Women's Hospital and Children's Hospital Boston, Harvard Medical School, Boston, Massachusetts; ‖Division of Research, Kaiser Permanente of Northern California, Oakland, California; and ¶Departments of Epidemiology, Biostatistics, and Medicine, University of California at San Francisco, San Francisco, California

ABSTRACT

There is a growing number of patients returning to dialysis after a failed kidney transplant, and there is increasing evidence of higher mortality among this population. Whether removal of the failed renal allograft affects survival while receiving long-term dialysis is not well understood. We identified all adults who received a kidney transplant and returned to long-term dialysis after renal allograft failure between January 1994 and December 2004 from the US Renal Data System. Among 10,951 transplant recipients who returned to long-term dialysis, 3451 (31.5%) received an allograft nephrectomy during follow-up. Overall, 34.6% of these patients died during follow-up. Receiving an allograft nephrectomy associated with a 32% lower adjusted relative risk for all-cause death (adjusted hazard ratio 0.68; 95% confidence interval 0.63 to 0.74) after adjustment for sociodemographic characteristics, comorbidity burden, donor characteristics, interim clinical conditions associated with receiving allograft nephrectomy, and propensity to receive an allograft nephrectomy. In conclusion, within a large, nationally representative sample of high-risk patients returning to long-term dialysis after failed kidney transplant, receipt of allograft nephrectomy independently associated with improved survival.

J Am Soc Nephrol 21: 374–380, 2010. doi: 10.1681/ASN.2009050480

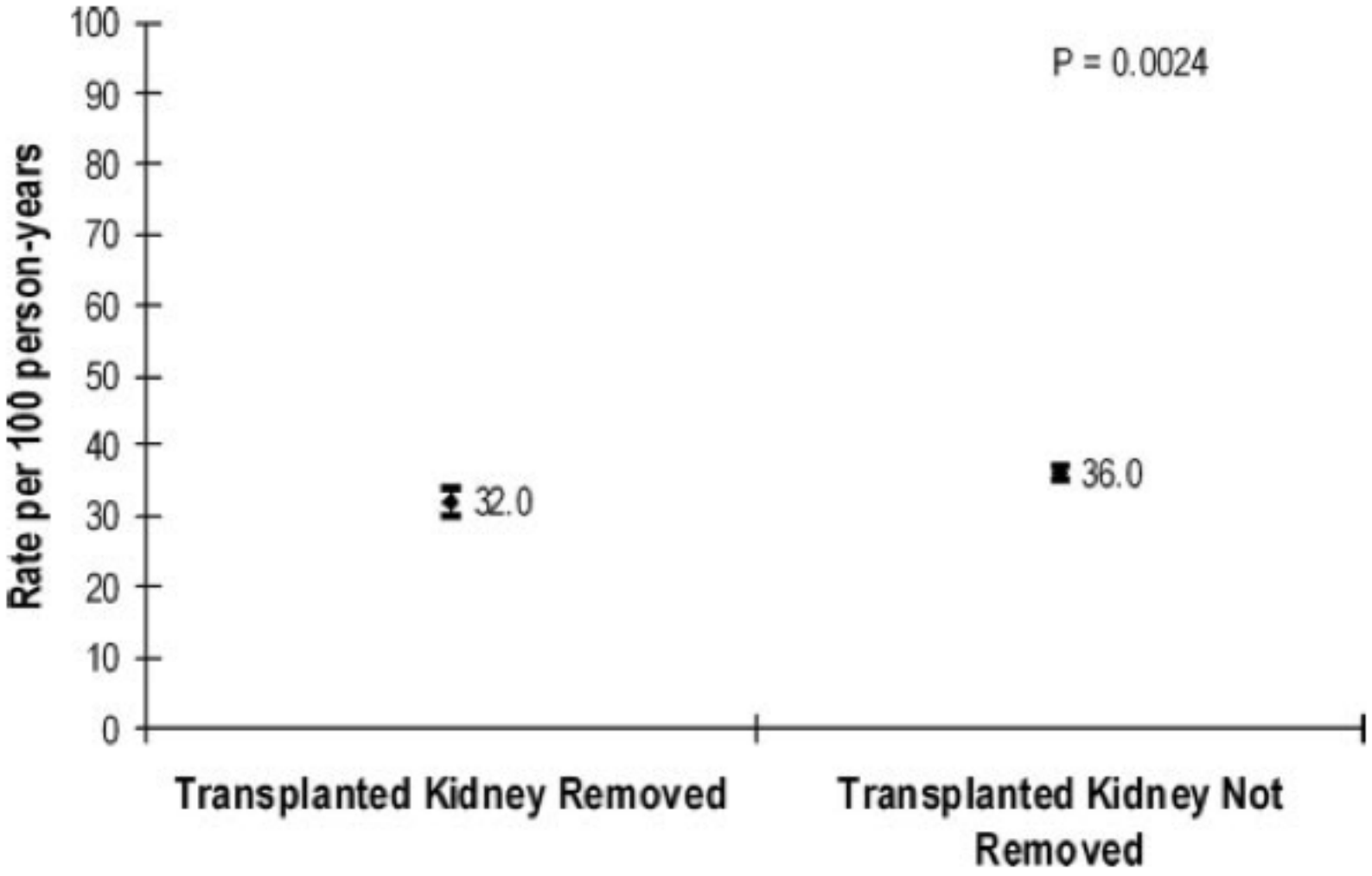

Figure 2. Unadjusted rate of death from any cause associated with or without receipt of renal allograft nephrectomy in 10,951 patients returning to maintenance dialysis after a failed kidney transplant between January 1, 1994, and December 31, 2004, is shown.

Receipt of Allograft Nephrectomy and Death from Any Cause

Overall, the mean follow-up was 2.93 ± 2.26 yr, and 3785 patients of the cohort were identified as having died by the end of follow-up (1106 in nephrectomy group, 2679 in non-nephrectomy group) in December 2004. Only 124 patients met criteria for being lost to follow-up during the study period. The unadjusted rate of death was significantly lower with receipt of nephrectomy compared with no nephrectomy (Figure 2). In multivariable extended Cox regression analyses, after adjustment for the propensity score to receive nephrectomy and other potential confounders, receipt of allograft nephrectomy was associated with a 32% reduction (95% confidence interval [CI] 26 to 37%) in the relative rate of death compared with not receiving nephrectomy (Table 1). We conducted six additional sensitivity analyses including or excluding specific patient subgroups that may have influenced estimates of treatment effectiveness for allograft nephrectomy, but there were no clinically relevant differences in the favorable point estimates associated with receipt of nephrectomy (Table 1).

Table 1. Multivariable association of receipt of allograft nephrectomy with death from any cause in patients who had a failed kidney transplant and returned to dialysis

Analysis	Adjusted HR (95% CI) for Death for Nephrectomy *versus* Non-nephrectomy
Main	
original cohort (n = 10,951)	0.68 (0.63 to 0.74)
original cohort with adjustment for transplant center (n = 10,951)	0.68 (0.63 to 0.74)
Sensitivity	
original cohort + patients whose transplants failed <90 d after initial transplant date (n = 13,702)	0.67 (0.63 to 0.71)
subset of original cohort who survived ≥30 d after transplant failure (n = 10,886)	0.69 (0.66 to 0.74)
original cohort + patients without documented Medicare fee-for-service coverage within 90 d after transplant failure (n = 14,352)	0.67 (0.63 to 0.72)
original cohort + patients with two transplants in which the transplant sequence was uncertain or unknown (n = 11,237)	0.68 (0.63 to 0.73)
subset of original cohort whose duration of transplant before failure was <12 mo (n = 1545)	0.76 (0.65 to 0.90)
subset of original cohort whose duration of transplant before failure was ≥12 mo (n = 9318)	0.65 (0.60 to 0.71)

Results are given for the overall cohort and six sensitivity analyses examining the potential influence of inclusion or exclusion of specific patient subgroups. All models were adjusted for quartile of propensity score, age, gender, race, lack of medical insurance, coronary disease, previous myocardial infarction, previous cardiac arrest, congestive heart failure, cerebrovascular disease, diabetes, diagnosed hypertension, chronic obstructive pulmonary disease, cancer, inability to ambulate, inability to transfer, obesity, serum creatinine, serum albumin, hemoglobin, donor age, donor race, anoxia, donor cause of death, cold ischemia time, year of transplantation, and interim hospitalizations for any of the following: Complication of anemia, abdominal pain, urinary obstruction, sepsis, urinary tract infection, malnutrition, or complication of transplanted kidney. HR, hazard ratio.

27 factors

RESULTS

Patient Characteristics

Among 10,951 patients who returned to dialysis after failed kidney transplant, 3451 (31.5%) received nephrectomy of the transplanted kidney during follow-up. In patients receiving allograft nephrectomy, median time between return to dialysis and nephrectomy was 1.66 yr (interquartile range 0.73 to 3.02 yr).

	Logic/ Design	Statistical Principles	Measurement	Graphics
Immortal Time	X			
Writing: Mac vs. PC	X		X	X
Lanarkshire Milk Exp't	X			X
MMR Reactions	X			X
Altitude Sickness	X			X
Inf. Formula: Cry/Fuss	X		X	
Vitamin A: Lung Function		X		
Transfer to Adult Care	X	X		
Energy Intake		X		
Physical Activity			X	X