DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the Secretary

Washington, D.C. 20201

June 2, 1998

The attached letter was sent today by HHS Secretary Donna E. Shalala to 181 members of Congress who have an interest in the Department's April 2, 1998, regulation governing the Organ Procurement and Transplantation Network.

An identical letter went to each of the members.

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

JUN 1 1998

The Honorable
House of Representatives/ United States Senate
Washington, D.C. 20515-3601

Dear Member of Congress:

Thank you for your interest in the Department's April 2, 1998, regulation governing the Organ Procurement and Transplantation Network (organ network). I am deeply concerned about recent efforts by the contractor that manages the network, the United Network for Organ Sharing (UNOS), to misrepresent the provisions of the regulation. I have received numerous letters from Members of Congress, transplant professionals, patients, and the public that reflect the inaccuracies published by UNOS. I am especially distressed that UNOS is needlessly frightening transplant patients about the HHS regulation. I appreciate having the opportunity to set the record straight about the intent and effect of this important rule.

First, let me assure you that the Department's new regulation does not mandate specific organ allocation policies. We believe strongly that policies requiring medical expertise and judgment should be formulated by the organ transplant professionals who comprise the organ network. Our regulation simply asks that the organ network establish new policies that will be fairer to patients than the current system, especially to assure that allocation of organs will be based on common medical criteria, not accidents of geography.

Certain specific claims made by UNOS must be challenged at the outset:

For example, UNOS maintains that we would require a new single national waiting list for transplant patients. This is not true. To the contrary, we allow the organ network wide latitude as it devises new policies that are both fair to patients and medically sound. Indeed, a variety of alternatives have already been presented to UNOS by some of its own members.

UNOS also maintains that our regulation requires organs to be allocated to the very sickest patients first, leading to poor utilization of organs. This is also untrue. While organs should indeed be allocated with a primary emphasis on medical need, the regulation does not make any rigid directive that would require futile transplants. In fact, the regulation explicitly requires

that organ allocation policies must be designed to avoid organ wastage and poor utilization. Likewise, the regulation is quite clear in leaving to physicians and to the organ network the difficult but necessary decisions that must be made when a patient may be too ill to be successfully transplanted.

Finally the UNOS claim that fewer patients will be transplanted and fewer lives saved is simply specious. The most important fact to understand is that the HHS regulation calls on the organ network, and thus UNOS itself, to develop the new allocation policies. Therefore, when UNOS predicts that negative consequences will result from the regulation, the truth is that such negative effects could only occur if UNOS itself chose an unsound policy. HHS does not want such policies; our regulation does not call for such policies; in some instances, the regulation actually prohibits policies with the consequences that UNOS is predicting; and finally, when UNOS actually develops its allocation policies, I am certain that it will adopt approaches that will serve patients, physicians and its own member transplant centers.

A primary objective in issuing our regulation is to assure that patients receive organs based on standardized medical judgment and common medical criteria, no matter where they live or in which transplant center they are awaiting treatment. Patients who need an organ transplant should not have to gamble that an organ will become available within a particular arbitrary geographic area, nor should they have to travel to faraway transplant centers simply to improve their chances of getting an organ. Instead, patients throughout the country should have a more equal chance of receiving an organ, based on their medical condition and the judgment of their physician.

To achieve this result, the rule calls on the organ network to develop uniform medical criteria for determining the severity of a patient's medical status and eligibility for placement on a transplant waiting list. The rule also calls on the organ network to develop organ allocation policies that will reduce the current geographic disparities in patients' access to transplantable organs.

We have proposed these changes because we believe the current system is fundamentally unfair. Consider the recent case of a Maryland child who was transplanted in Florida within a week of listing there, though the child had been waiting for one year on the organ transplant list at a California hospital, and then four years on the organ transplant list at a hospital in Pennsylvania. No one -- especially those who cannot afford it -- should be required to list at several transplant hospitals and fly long distances for surgery that could be provided closer to home.

The most visible shortcoming of the current allocation system is the wide span in average waiting times for those on transplantation waiting lists. In some areas of the nation, patients wait at least 5 times longer for an organ than those in other areas. Less visible are the resulting inequities among those who receive organs. Where waiting times are the shortest, organs may go to patients who are less ill; while at the same moment, in areas where patients wait longer, organs often are not offered to patients with greater medical need. In the worst cases, patients die in areas where waiting times are long, while, at the same time, organs are being made available to less ill patients in areas with shorter waiting times. And, for many reasons, virtually all patients are on the waiting list of only one transplant center.

UNOS has not published a hospital-specific waiting time report, although one newspaper, using UNOS data, computed these times. The results illustrate that disparities in waiting times exist not only between different parts of the country, but also between transplant centers within the same State. For example, the median waiting times for the two major liver transplant centers in Kentucky were vastly different -- 38 days at one center, 226 at the other. Similarly, in Louisiana, the median waiting time at one center was reported to be 18 days, while at another, it was 262 days. In Michigan, the numbers were 161 days and 401 days. Although these numbers do not tell the whole story, they certainly reflect that unacceptable disparities in waiting times exist, even within States. I believe that basic fairness to patients demands that these disparities be substantially reduced and that the transplant community should ultimately develop the means to this end.

It is regrettable that since we issued our regulations UNOS has launched a campaign that factually misrepresents the Department's intent in issuing the rule and mischaracterizes its provisions. As the organ network contractor, UNOS has a special responsibility to help develop policies that reflect sound medical judgments concerning organ transplantation. Now is the time for UNOS to be working productively to design policies to implement the rule that incorporates the views of patients, the transplant community and the public. Instead, UNOS has embarked on a misleading lobbying campaign that has confused the public and caused fear among transplant patients and their families.

There is no doubt that the issues we are grappling with as we pursue equity in organ allocation are complex and difficult. Members of Congress, and the public at large, have important contributions to make as we seek to get it right. Unfortunately, rather than engage in a fair and thoughtful debate, UNOS has

decided to craft a set of fictional facts and choices in order to make plausible the dire scenarios that are necessary for their lobbying campaign to succeed. Perhaps most inappropriate has been the decision by UNOS to develop a hypothetical allocation policy and dub it the "HHS policy." UNOS then modeled computer runs on this hypothetical, using outdated 1991 transplant data, in order to predict undesirable results. This effort merely creates a fiction and a distraction. It is not credible.

UNOS also has claimed, without any factual support, that the rule will somehow reduce the rate of organ donation. Simply put, there is no evidence that our regulation would have this effect. A 1991 HHS Inspector General report, cited in the preamble to our regulation, notes that "Americans do not think that keeping a [donated] organ in a specific locality is an important goal in and of itself." And a 1994 survey by UNOS itself showed, again as stated in our regulation's preamble, that "...the overwhelming majority of donor families state as their preference that organs go to the neediest patient regardless of geography, so long as organs are not wasted."

This Administration, with dozens of partners, is committed to increasing the rate of organ donation by 20 percent within two years. Indeed, the urgency could not be greater. As you know, some 55,000 persons are on organ transplant waiting lists today, up from 16,000 in 1988. More importantly, about 4,000 Americans died in 1996 -- more than 10 each day -- while awaiting organ transplants. Increased organ donation is an absolute priority for all of us, and we will work very hard to achieve our commitment.

A final point of special importance is the need to improve the availability of transplant data. Useful, current transplant center-specific information needs to be available so that patients and health care providers can make informed choices. Likewise, good data must be available to HHS and to Congress in order to successfully carry out our oversight functions. The organ network contractor needs to perform better in this area, and our regulation makes this a requirement.

To offer a more detailed response to these and other issues that UNOS has raised, I am enclosing a letter from Claude Earl Fox, M.D., the Administrator of the Health Resources and Services Administration. I trust that you will find this information helpful.

Thank you again for your interest in this important subject. I believe we have made remarkable progress in the field of organ transplantation. But, we can do even better. We can help the organ network operate more effectively by establishing clear expectations through performance standards that serve the goals embodied in the National Organ Transplant Act. And, with the

leadership and expertise of the transplant community, we can assure Americans that organ allocation policies are equitable, and that those who need organ transplants will be treated according to medical need, no matter where in the country they may be hospitalized, or at which center they may be listed. I look forward to working closely with you to achieve this important goal.

Sincerely,

/S/

Donna E. Shalala

Enclosure

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public I Service

Health Resources and
Services Administration
Rockville MD 20857

JUN 1 1998

L.G. Hunsicker, M.D.
President, United Network for Organ Sharing
Suite 500, P.O. Box 13770
Richmond, VA 23225-8770

Dear Dr. Hunsicker:

Secretary Donna E. Shalala has asked me to respond to your letters of April 17 and April 27, 1998. I address both letters, and focus particularly on the issues raised in the April 27th one which comments on the alleged effects of newly implemented national guidelines governing liver urgency status and allocation.

As you know, the shortage of organs available for transplantation in our country is so severe that approximately ten people die every day while waiting for a transplant. Many of these people die because the current allocation system is geographically biased and does not distribute organs on the basis of medical urgency. This policy violates the requirements of the National Organ Transplant Act, which calls for a system, equitable across the nation, for distributing organs. It also breaches the American Medical Association's Code of Medical Ethics, which states:

> Organs should be considered a national, rather than a local or regional resource. Geographical priorities in the allocation of organs should be prohibited except when transportation of organs would threaten their suitability for transplantation.

The Department of Health and Human Services (HHS) is charged by statute with overseeing the Organ Procurement and Transplantation Network (organ network). In meeting this obligation, our greatest challenges are facilitating organ donation and reducing geographic access disparities for patients in need of transplants. We are addressing the first challenge by joining with public and private sector partners to implement the Administration's organ donation initiative and have taken steps to meet our goal of increasing organ donation by 20% within two years.

Our second challenge is addressed by HHS' organ network regulations which ask the transplant community to formulate new policies to eliminate the unfairness caused by the existing allocation systems. The regulations require the organ network, in devising the policies, to meet three broad performance goals: 1) standardization of listing criteria; 2) standardization of determining medical status of patients; and 3) that medical urgency, determined by the exercise

of sound medical judgment, not geography, be the main criterion for allocating organs. All three elements are necessary in our effort to achieve the best results for patients.

The regulations, which we first proposed in 1994, reflect substantial written public comments as well as testimony received during three days of public hearings in December 1996. UNOS responded to the published rule in writing and testified about the issues addressed by the rule at the 1996 hearings. You have a third opportunity for formal input, now on the newly-published final rule.

Your comments are welcome and should include any honest disagreement your organization may have with the final rule. But thus far, your response reflects a disappointing strategy of fostering conflict rather than cooperation. UNOS has lobbied to block the rule in a campaign not grounded in truth, and has used tactics that have frightened transplant patients and risk negatively affecting organ donation.

In fact, the UNOS campaign disregards your own precept. I remind you of the March 13, 1997, statement of former UNOS President, James Burdick. In reaction to the debate about allocation policies, Dr. Burdick provided the following admonition to the transplant community:

> "...the community must generally understand the likely impact of a new or revised policy. In recent months, there have been conflicting accounts in the news media of the potential effects of revisions to liver allocation policy. While diverse views are held within the community, we must realize that contradictory or inaccurate statements about the policy's effect can needlessly confuse or frighten those with the most at stake -- patients desperately awaiting transplants."

Despite Dr. Burdick's statement, UNOS has responded to HHS' regulations by providing inaccurate or otherwise misleading information to patients, transplant surgeons and Members of Congress. UNOS has created a "legislative action kit," as you know, and has advised patients and the professional transplant community to use the kit to block the regulation. ("We urge you to prevent these regulations from being implemented." UNOS Sample Letter to Congress, UNOS Legislative Action Kit.) The kit includes a form letter to be sent to Members of Congress by its recipients. Among the unfounded claims issued by your organization are the following, cited as examples, not a complete catalogue, of your misleading assertions.

1. UNOS claim:

"[T]he impact of the regulations would be to lengthen the amount of time sick people must wait for transplants and reduce the number of people who are able to get them. The proposed federalization of the current system would take away control of the transplant system from doctors and patients in almost 300 transplant centers and hand it over to Federal regulators." March 30, 1998, letter from L.G. Hunsicker, M.D. to every Senator in the 105th Congress, included in UNOS' Legislative Action Kit.

The facts:

This statement is patently false. The regulations do not contain a new allocation system. The organ network itself will devise allocation policies. The regulations explicitly state that the organ network "... Board of Directors shall develop and propose policies for the equitable allocation of organs..." and empower the organ network to "[u]pdate policies developed in accordance with this section to accommodate scientific and technological advances."

Assertions about how long people will wait for transplants and/or the number of people who will get them are without foundation since the allocation policies have yet to be established by the organ network. Until the policies exist, it is not possible to observe what their effects will be. And it is hard to imagine that the organ network will develop a policies whose disadvantages outweigh its advantages.

2. UNOS claim:

"A single national list, which is what would be created, would result in more patients' deaths and longer waits for all patients..." UNOS letter [undated] from Donna Henry Wright, J.D. to Health Care Legislative Staff Members of the Congressional Black Caucus.

The facts:

The regulations do not require that organs be allocated from a priority ranked national waiting list. In fact, a directory of patients throughout the nation is currently maintained by UNOS, and lists all persons seeking transplants. That list does not now function as a priority wait list, and the regulations do not require that it ever do so. The notion of a national allocation-controlling list is purely fictional.

UNOS' own computer modeling, which is cited in the preamble to the regulations, shows that the removal of artificial barriers to organ sharing results in essentially the same number of people receiving transplants under at least two of the options considered by UNOS' liver committee, and more, not fewer, lives saved under all three of the UNOS-modeled options to the current policy.

The regulations do require that "... neither place of residence nor place of listing shall be a major determinant of access to a transplant." This simply means that fairness will be required for patients, and it means that patients will no longer die because of where they happen to live or list for a transplant.

3. UNOS claim:

The regulations will result in "...forcing doctors to transplant livers into the very sickest patients...". March 30, 1998 letter of L.G. Hunsicker, M.D. to every Senator in the 105th Congress, included in UNOS' Legislative Action Kit.

The facts:

Doctors will not be forced to treat patients in any respect contrary to their medical judgment. The regulations do not mandate transplants to the "sickest" first. As the preamble to the regulations state, "...those who are very ill but who, in the judgment of their physicians, have a reasonable likelihood of post-transplant survival - receive preference in organ allocation over those who are less medically urgent."

UNOS' current liver allocation system (with patients in Status 1, 2A, 2B or 3) ranks patients in order of medical urgency, recognizing that those in Status 1 are likely to die within a week or less if not transplanted. The regulations merely require that when the organ network establishes allocation policies, those policies take into account reducing geographic disparities as doctors continue to make the medical judgments they now do about who shall be transplanted.

4. UNOS claim:

"[C]losing down centers is likely to cause a decrease in donations as the efforts of transplant doctors and nurses to increase local donations cease. History shows that organ donation is a local phenomenon...". March 30, 1998, letter from L.G. Hunsicker, M.D., to every Senator in the 105th Congress, included in UNOS' Legislative Action Kit.

The facts:

We repeatedly note in the rule that nothing dictates, and no evidence supports, the conclusion that the rule would result in fewer organ donations. Indeed, the preamble to the regulations reference a 1994 organ network survey, among other supporting evidence, that shows that "... the overwhelming majority of donor families state as their preference that organs go to the neediest patients, regardless of geography, so long as organs are not wasted."

The Administration, with dozens of partners, has initiated a national organ and tissue donation initiative. Under conditions of participation regulations for hospitals, proposed in a separate rule, hospitals will be required to engage in activities to increase organ donation, or risk losing eligibility for Medicare and Medicaid. We have every expectation that, with your collaboration, and that of others, this initiative will be successful.

5. UNOS claim:

"[I]t is especially important that Congressional Black Caucus members are aware of the negative consequences of these regulations on minorities and the poor." UNOS letter [undated] from Donna Henry Wright, J.D. to Health Care Legislative Staff Members of the Congressional Black Caucus.

The facts:

Our regulation does not disadvantage minorities or the poor, though the current system does. A 1991 HHS Inspector General report, as well as soon to be released UNOS data, show that minorities wait longer under the current system. The UNOS data show that women wait longer as well. And, at our 1996 public hearings, several witnesses testified to the prohibitive costs to poor people should they need to travel to or list at several hospitals in order to get needed organs. With these facts as a predicate, our regulations state specifically that socioeconomic barriers to transplantation must be reduced.

6. UNOS claim:

"[T]he new system would allocate donated organs away from patients at the vast majority of the country's transplant centers and shift those organs to the largest centers. This in turn would...force many small and medium sized transplant centers (like mine) to shut their doors.". "Sample Letter" in UNOS' Legislative Action Kit to be sent to Members of Congress.

The facts:

When organs are allocated in the future with an emphasis on medical need, then small and medium-sized centers will receive organs because they also serve patients with the greatest medical need. Saving lives by serving patients with the greatest medical need is a desirable goal, and it is already accomplished by small as well as large centers.

The regulations specifically reject the imposition of volume standards that would cause smaller centers to close. Any effects on the operations of transplant centers will depend on policies developed and implemented by the organ network. Moreover, in the preamble to our regulations, we specifically commit to monitoring any impact on the centers of new policies designed by the organ network.

7. UNOS claim:

"The regulations will have a particularly harsh impact on individuals who will have to travel great distances...". March 30, 1998 letter of L.G. Hunsicker M.D. to every Senator in the 105th Congress, included in UNOS' Legislative Action Kit.

The facts:

The opposite is the case. For those patients fortunate enough to live near a transplant center and who choose to list there, reforms in the current allocation policies would mean that organs would be more likely to reach them and their centers because there would be a larger pool of donated organs from which to draw. By eliminating the current incentives for patients to travel to areas with shorter waiting times, the rule is actually less likely than the current situation to require unnecessary and expensive travel.

The guiding principle of our regulations is that the formulation of policies requiring medical judgment, such as the design of a more equitable allocation process, is the responsibility of the organ network. The preamble to the regulations state this point quite clearly.

> "The Department believes that the transplantation network must be operated by professionals in the transplant community, and that both allocation and other policies of the ...[organ network] should be developed by transplant professionals, in an open environment that includes the public, particularly transplant patients and donor families. It is not the desire or intention of the Department to interfere in the practice of medicine. This rule does not alter the role of the ...[organ network] to use its judgment regarding appropriate medical criteria for organ allocation nor is it intended to circumscribe the discretion afforded to doctors who must make the difficult judgments that affect individual patients. At the same time, the Department has an important and constructive role to play, particularly on behalf of patients. Human organs that are given to save lives are a public resource and a public trust."

The principle is firmly grounded in the organ transplant statute. The original law required the organ network to assist in the distribution of organs "which cannot be placed within the service areas of the [organ procurement] organizations [P.L. 98-507, title II, Sec. 201]." This language was removed in a 1988 amendment to the law, "so as to remove any statutory bias respecting the important question of criteria for the proper distribution of organs among patients," according to the Senate report on the amendment. In 1990, the statute was again changed, to require that the organ network "assist organ procurement organizations in the nationwide distribution of organs equitably among transplant patients." Without a doubt, Congress intends for the organ network to operate across the nation through a system that is free of any discrimination, whether it be the result of geographic bias or another form of prejudice.

Throughout the development of our regulations, this Department has created many opportunities for UNOS, the transplant community and the public to participate in the process. At this Department's 1996 public hearings on donation and allocation, UNOS was the first organization to present its views. More recently, the Department's Science Advisor and I met on several occasions with Dr. Burdick, then President of UNOS' Board and other UNOS staff to keep them informed of the Department's preliminary thinking and to receive feedback. On the day the

regulation was announced, HHS staff met at length with and briefed you and your staff on the particulars of the regulation and committed, yet again, to working with you and others in the transplant community to develop policies that treat patients fairly.

Though you disagree with provisions of the regulations, I ask that you or Dr. Bollinger, Chair of UNOS' Ad Hoc Advisory Committee, accept my offer to meet with me and other Departmental representatives. Through our discussions and during the public comment period, I urge you to offer constructive suggestions on how we can get this job done so that our main and shared goal of treating patients fairly is realized.

Sincerely,

Claude Earl Fox, M.D., M.P.H.
Administrator

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

JUL 23 1998

The Honorable
U.S. House of Representatives
Washington, DC 20515

Dear

Thank you for your letter regarding the Final Rule for the Organ Procurement and Transplantation Network (OPTN), which was published in the Federal Register on April 2, 1998, after extensive public comment and consultation. In issuing this rule, we paid close attention to the basic fairness of the system and sought to fulfill the responsibilities assigned to the Department of Health and Human Services (HHS) by Congress through the National Organ Transplant Act (NOTA), as amended.

This Rule preserves the OPTN's critical role in developing and implementing organ procurement and allocation policies. The preamble to the Final Rule states: "It is not the desire or intention of the Department to interfere in the practice of medicine." In the Rule, the Department calls on the transplant professionals of the OPTN itself to develop medically sound organ allocation policies.

Our goal in issuing this Final Rule was to ensure that the system of allocating these scarce resources is as fair as possible. Therefore, the regulation calls upon the OPTN to develop standardized medical criteria and to ensure that, no matter where patients live or in which transplant center they are awaiting treatment, they have a fair chance of receiving an organ, based on their medical condition and the judgment of their physician. Patients who need an organ transplant should not have to gamble that an organ will become available within a particular arbitrary geographic area, nor should they have to travel to far away transplant centers simply to improve their chances of getting an organ.

We are aware that significant concerns have been raised by what has been referred to as the "sickest first standard" in the Final Rule. I would like to take this opportunity to reassure you, as I said during the June 18th Congressional Hearing, that nothing in the Rule should be construed as direction from HHS to the OPTN

to waste organs by transplanting them to patients who are too ill to be viable transplant candidates. The Rule directs the OPTN to develop allocation policies based upon medical urgency and sound medical judgment. In fact, the regulation explicitly requires that organ allocation policies must be designed to avoid organ wastage and poor utilization. Likewise, the regulation is quite clear in leaving to physicians and to the organ network the difficult but necessary decisions that must be made when a patient may be too ill to be successfully transplanted.

At present, medical urgency is not always the main factor in deciding who lives or dies. The current system often gives more weight to geography than to medical urgency with the result that patients in one part of the country wait as much as five times longer than patients in other parts of the country who have the same severity of illness. Policies of the OPTN should be based on medical criteria, as developed by the transplant community itself. Non-medical criteria, such as where you live or list, should not drive policy anymore than a person's wealth, celebrity, religion, ethnicity or race should be a factor. I am enclosing a copy of my testimony for the recent Congressional Hearing which discusses this and other points in more detail.

We recognize that the shortage of donors plays a major role in the tragic reality of Americans dying while on waiting lists for organ and tissue transplants. This Administration, with dozens of partners, is committed to increasing the rate of organ donation by 20 percent within two years. The urgency could not be greater. As you know, some 55,000 persons are on organ transplant waiting lists today, up from 16,000 in 1988. More importantly, about 4,000 Americans died in 1996 -- more than 10 each day -- while awaiting organ transplants. Increased organ donation is an absolute priority for all of us, and we will work very hard to achieve our commitment.

I look forward to working closely with you, the constituencies of the transplantation community, and other interested groups to achieve our shared goals of increased organ donation and more equitable access to the public trust which donated organs represent.

Sincerely,

Donna E. Shalala

Enclosure

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

FOR RELEASE UPON DELIVERY

TESTIMONY OF

DONNA E. SHALALA

SECRETARY OF HEALTH AND HUMAN SERVICES

BEFORE THE

SENATE LABOR AND HUMAN RESOURCES

AND

HOUSE COMMERCE COMMITTEES

JOINT HEARING ON ORGAN DONATION ALLOCATION

JUNE 18, 1998

Good Morning, Chairmen Jeffords and Bliley, Senators Kennedy and Frist, Representatives Dingell, Bilirakis, Brown, and other distinguished members, it is an honor to appear today before this joint hearing of the Senate Labor and Human Resources and House Commerce Committees . My testimony concerns one of the most important medical breakthroughs of the century, and perhaps the most wondrous: organ transplantation. Until the first half of the century, people routinely died of diseases of the liver, heart, lungs, kidneys and pancreas. The notion that patients with such diseases could be saved by transplanting organs from one human being to another was once beyond our imagination. In the short span of our lifetimes, organ transplantation has evolved from the impossible, to the conceptual, to the experimental, and now, nearly to the routine.

It is an odd notion, thinking of miracles as routine, yet the stunning survival rates of transplant recipients show that extraordinary surgical outcomes are a regular event. These successes are made possible by courageous and dedicated surgeons, physicians and nurses. A member of this heroic profession, one of America's great transplant surgeons, Senator Bill Frist, is cochairing this hearing.

There is much to celebrate about organ transplantation. There is much to celebrate because individuals like Senator Frist did not give up in the face of adversity. As a result of their tenacity and flexibility, the biggest obstacles to successful organ transplant surgery were gradually overcome. Today, donated organs can be preserved for longer periods of time, tissue typing is more accurate and immunosuppressant drugs are much more effective.

We must also remember the patients. Many of them, long forgotten except by friends and family, died during the evolution of transplant surgery. Because of their sacrifices, thousands more live today.

Just as medical professionals struggle to perfect transplant surgery, Federal policymakers also must grapple with difficult issues. These include finding new methods to increase organ donation and balancing our reliance on the medical judgment of the transplant community with statutory requirements to ensure fairness for transplant patients.

There was a time that transplant surgery was grossly unfair. Organs were sold to the highest bidder, often a wealthy foreign national. There were few transplant centers, with loose affiliations, which operated without national standards. As surgical accomplishments mounted, so did abuses and excesses. Eventually Congress intervened by passing the National Organ Transplant Act of 1984.

The Act made the buying and selling of organs a criminal offense. It created the Organ Procurement and Transplantation Network, commonly known as the OPTN. The Act now requires the OPTN to "assist organ procurement organizations in the nationwide distribution of organs equitably among transplant patients." Congress charged the Department of Health and Human Services with implementation of the Act.

We have come a long way from the pioneering days of organ transplantation. The Organ Transplant Act, and related changes to the Medicare law, provided for national policies and required transplant hospitals to abide by the rules of the national network. The network's primary goal is to ensure that all Americans in need have an equal opportunity to receive an organ transplant, consistent with sound medical judgment, regardless of who they are or where they live and choose to list.

Just as the pioneers of transplant surgery had to change their techniques and tinker with their approaches before they reached their goals, we must be prepared to adjust Federal policies to meet the intent of the Organ Transplant Act. Organ transplant policies are not yet fair to all Americans, and there is much that must be done before that aim is achieved.

There are about 55,000 people on waiting lists for organ transplants. Every day, more than ten of them die. They die because of a shortage of organs, and as the gap between the demand and supply of available organs grows, they may die in even greater numbers.

Approximately 10,000 to 15,000 deaths in the United States each year could result in viable organ donation. But only 5,500 cadaveric donors, about one half to one third of all potential donors, contribute organs for transplantation. While the number of cadaveric organ donors has increased by 30 percent, the number of deaths on the waiting lists has also grown, by nearly 177 percent during the same period.

Increasing organ donations must be our number one policy priority. Last December, we announced a nationwide initiative to increase organ donations. A national partnership of public, private and volunteer organizations is working together to identify and overcome known barriers to organ donation. The centerpiece of the initiative is a new regulation, which was proposed in December and issued in final form yesterday. This regulation requires hospitals participating in Medicare or Medicaid to report to organ procurement organizations all deaths so that medically suitable donors can be more readily identified. The rule is based on the effective Pennsylvania State law that requires the reporting of deaths to State organ procurement organizations. Our goal is for the new rule, combined with other work being accomplished by the partnership, to result in a twenty percent increase in organ donation within two years.

Increasing organ donation is our most important policy goal, but not the only one. We also must do a much better job of meeting the central goal of the National Organ Transplant Act, which is to ensure an equitable nationwide system for the distribution of transplantable organs. Under existing policies, where a patient lives and which transplant hospital a patient chooses are often the primary determinants of whether the patient receives an organ. In other words, where you live and where you list can determine whether you live or die.

Medical urgency - how badly a patient needs the transplant - is not always the main factor in deciding who lives and who dies. I believe that the emphasis on geography instead of medical judgment is the reason that patients in one part of the country wait as much as five times longer than patients in other parts of the country who have the same severity of illness. Policies of the

Organ Procurement and Transplantation Network should be based on medical criteria, as developed by the transplant community itself. Non-medical criteria, such as geography, should not drive policy anymore than a person's wealth, celebrity or religion ethnicity or race should be a factor.

The current policies appear to be particularly unfair to minorities, many of whom wait on lists at large urban transplant hospitals that have long waiting lists. African Americans wait twice as long as white Americans for kidney transplants. Certainly, part of the reason for this inequity has to do with biological matching factors. But I am convinced that geographic inequities also have a role in the disparity.

The National Organ Transplant Act was intended to reduce such inequities. The law's insistence on fairness is echoed by the American Medical Association's Code of Medical Ethics, which states:

> Organs should be considered a national, rather than a local or regional resource. Geographical priorities in the allocation of organs should be prohibited except when transportation of organs would threaten their suitability for transplantation.

In 1991, the HHS Inspector General found that the national Organ Procurement and Transplantation network was inequitable, particularly with respect to race and geography, and that it did not meet the intent of the 1984 Act. As you know, the Office of Inspector General is an

independent organization. Earlier this year, a House panel examining this issue asked the Inspector General to update its findings. Last week, the Inspector General issued its updated report, which found that the inequities identified in 1991 remain in the network, and in some cases have worsened, particularly for African Americans. Let me read you the conclusion reached by the Inspector General last week:

> Our brief review of these data lead us to reaffirm the importance of the central message we presented in our 1991 report — that the national organ allocation system should focus on equity among patients, not among transplant centers, and on common medical criteria, not the circumstances of a patient's residence or transplant center affiliation. We continue to believe that the April 2, 1998 HHS rule moves in that direction.

Under the current policy, less ill patients receive transplants while more severely ill patients, perhaps only a few miles away, die. We all have friends and relatives who live in different parts of the country. Should any one of them have a better chance of living than the other if they needed an organ transplant? Is it fair that patients with virtually identical medical needs are treated differently solely because of where they live?

The unfairness exists, not only between different parts of the country, but even within States. For example, the median waiting times for the two major liver transplant centers in the State of Kentucky are vastly different. One recent report found that the median waiting times for livers at

one of the centers was 38 days while it was 226 days at another. In Louisiana, the median waiting time at one center was 18 days, while it was 262 days at a different center. In Michigan, one center had a waiting time of 161 days while another major center in the State had a waiting time of 401 days. And so it goes across the country, inequity within States, and unfairness from one State to another.

These waiting list disparities are the most visible shortcoming of the current system. Less visible are the resulting inequities among those who receive organs. Where waiting times are the shortest, organs may go to patients who are less ill; while at the same moment, in areas where patients wait longer, organs often are not offered to patients with greater medical need. In the worst cases, patients die in areas where waiting times are long, while, at the same time, organs are being made available to less ill patients in areas with shorter waiting times.

The April 2 rule does not actually contain any allocation policy. Instead, it calls on an HHS contractor, the United Network for Organ Sharing, or UNOS, to develop an allocation policy that will reduce current inequities in the network. I want to be clear about this, because there appears to be misunderstanding about the rule. The April 2 rule contains no allocation policy. It calls on UNOS to develop the policy. The rule is consistent with the Department's long-standing position that the development of any policies requiring medical judgement be left to the transplant community. We will rely on the judgement of transplant professionals to establish policy reforms.

The rule contains three common sense goals which are consistent with the equity requirements of the National Organ Transplant Act. The first goal requires that criteria for placing patients on waiting lists be standardized and be based as much as possible on objective medical criteria. The network cannot be truly fair if the standards for placing patients on waiting lists differ across the country. UNOS agrees with this goal and is working toward it.

The second goal requires that criteria for determining the medical status of patients be standardized, again on the basis of objective criteria. Uniform criteria for determining medical status will prevent gaming of the system. UNOS also agrees with this goal and is working toward its accomplishment.

The third goal requires that medical urgency, not geography, be the main criterion for allocating organs. This goal also meets the intent of the Organ Transplant Act for an equitable nationwide organ transplant network. UNOS objects to this goal. In disregard of the Act, UNOS insists on maintaining the current inequitable system.

There is a central purpose to the performance goals, which is to ensure, to the maximum possible extent, that all patients, regardless of where they live, are treated the same. Because there are not yet enough organs to save everyone on the waiting lists, I believe we must, at a minimum, guarantee fairness, while we continue to strive to increase donation.

I recognize that there are legitimate diverse views in the transplant community about the third performance goal, which requires reform of allocation policies. Small transplant centers worry they will be swallowed by large transplant centers. Organ Procurement Organizations that have worked hard to obtain transplantable organs are concerned that organs will flow from their State, leaving a shortage. Such concerns must be debated by the transplant community and they should strive to reach consensus on the best policies for patients.

Unfortunately, to this point, UNOS has failed to seize the opportunity offered by the rule to develop consensus about policy improvements. In fact, UNOS has gone to great lengths to preserve the current unfair system. It has launched a cynical political lobbying campaign against the April 2 rule. This campaign has been characterized by misinformation and outright falsehoods. The essence of the UNOS campaign has been to create phantom policies and use scare tactics that have hospital administrators and patients around the country up in arms. UNOS has sent form letters, part of a self-described "legislative action kit," to surgeons and patients across the country. UNOS has been loud and vociferous in its lobbying and is working with some of the highest priced public relations and lobbying firms in town. As a result of their slick lobbying campaign, you are hearing protests about the April 2 rule.

I am deeply concerned about these efforts to misrepresent the provisions of the regulation. I have received numerous letters from Members of Congress, transplant professionals, patients, and the public that reflect inaccuracies published by UNOS. I am especially distressed that UNOS is needlessly frightening transplant patients. I appreciate having the opportunity today to set the record straight about the intent and effect of this important rule.

UNOS has claimed that the rule creates a single national waiting list for patients that would result in more patients' deaths and longer waits for all patients across the country. This claim is completely false. As I have said, the rule asks UNOS to develop the allocation policy. There is no requirement for a national waiting list anywhere in the rule .The rule calls for fairness. How the fairness is achieved in terms of allocation policy is primarily up to UNOS. Leading members of the transplant community have presented proposals to UNOS to remedy the current system's unfairness with very little, if any, adverse impact on local transplant centers. There have been several experiments in allocation policies involving broader sharing of organs that have been sanctified by UNOS. These experiments are interesting and worthy of consideration. But instead of consideration, UNOS has resorted to frightening patients and surgeons. The scare tactic of the national waiting list is a central theme of the phantom policy created by UNOS.

I reiterate that the Department does not have a preconceived notion of any allocation policies. We are relying on the transplant community to develop the policy. Any policy that is sensible, is based on sound medical judgment, and reduces geographic inequity, will be taken seriously by the Department.

UNOS has claimed that the rule will force doctors to transplant livers into the very sickest patients, contrary to sound medical judgment. This claim is also false. We know that transplanting the sickest patient is not always the best course. We believe that transplants should be performed on the basis of medical urgency, the definition of which includes viability and chances of survival. Further, it is up to UNOS to develop policies on medical urgency.

UNOS claims the rule will force transplant centers to close. There is nothing in the regulation that would force any centers to close. On the contrary, a fairer distribution of organs should enhance the ability of all centers to have better access to matching organs for transplantation.

UNOS has claimed that organ procurement areas with excellent donation rates will lose organs to areas with poorer donation records. This is another false assertion. Already, over 35 percent of donated organs are used outside the local area. Our organ donation initiative should result in increased organs for every procurement area. Also, broader sharing will mean that patients will benefit from a wider pool from which to draw. Again, UNOS will set the policy.

I think the most outrageous UNOS claim is that the regulation would hurt minorities and the poor. In the first place, the current system is not fair to minorities, as the Inspector General has reported. Minorities can only benefit from the fairer policies the regulations attempt to encourage. As for UNOS claims about the poor, the truth is that Americans who cannot afford to pay for transplant surgery do not even get on the waiting list. So the opposite of UNOS's allegation is true: it is the current unfair system that has negative consequences for minorities and the poor. We are trying to change the system. UNOS is trying to preserve it.

Finally, I would like to comment on the UNOS claim that the Department lacks the authority to issue any rules governing the Organ Procurement and Transplantation Network. As I have said, the National Organ Transplant Act gives the Department the authority to oversee the network. The primary reason the Act was passed in the first place was because the unregulated network was rife with abuses. Also, the Department, through Medicare and Medicaid, pays for more than

half the transplant surgeries in the United States. Taxpayers pay for most of the listing fees charged by UNOS. To say we have no basis to issue regulations when our authority is clear is a disservice to Congress, which created the network, and to the patients, whose transplant bills are paid by taxpayers.

I regret that UNOS has frightened patients and perhaps jeopardized organ donation in some areas of the country. Only a year ago, a former President of UNOS, Dr. James Burdick, warned against such scare tactics. Dr. Burdick sent a statement to all UNOS members. It said:

> "...the community must generally understand the likely impact of a new or revised policy. In recent months, there have been conflicting accounts in the news media of the potential effects of revisions to liver allocation policy. While diverse views are held within the community, we must realize that contradictory or inaccurate statements about the policy's effect can needlessly confuse or frighten those with the most at stake — patients desperately awaiting transplants."

What has been the response to Dr. Burdick's warning? There have been charges that the April 2 rule will kill people. There have been charges that the April 2 regulation discriminates against minorities. There have been charges that patients will have to travel great distances for transplants. There have been charges that transplant centers will be shut down. All these charges come from UNOS and all of them are false. Dr. Burdick's responsible policy was flatly rejected.

Many of you have expressed reservations about the April 2 rule. I know your concerns are legitimate and I take them very seriously. I want to respond to every one of them. I know that members of both committees, and the Congress in general, are fair and agree that the debate should be based on facts and what is best for patients.

My fervent hope is that the polarization created by the UNOS lobbying campaign is the result of a misunderstanding of the rule and its intent. I say this because I believe that all of us - the Department, UNOS, and Members of Congress, want what is best for patients. Department representatives met with UNOS before the rule was issued to explain our intent. Meetings have occurred since the rule's publication and I hope that we will continue to meet so that UNOS has a complete understanding of the rule and what the Department hopes to accomplish.

I want you to ask the Department tough questions and examine the regulation from every angle. One of the reasons we delayed the implementation of the rule is so that there would be time for additional public comment as well the opportunity for Congress to have hearings on these issues. I am hopeful that you will conclude, as I do, that the April 2 rule is our best chance of meeting the goals of the National Organ Transplant Act.

Thank you for the opportunity to testify and set the record straight. I will be happy to answer any questions that you may have.

Organ Transplantation Legislative Action Kit

To:	Transplant Professionals Patients Donors	Donor Families Other interested parties
From:	Lawrence G. Hunsicker, M.D., President, UNOS	
Subject:	Legislative Action Kit	
Date:	March 31, 1998	
Additional Materials:	• Sample letter to Congress • Tips: Dealing with Congress effectively • Dr. Hunsicker's letter to Congress • Directory of U.S. Senators by State • Directory of U.S. House of Representatives	

Through these links you will find the necessary tools to assist you in educating your congressman and senators about the potential impact of the recently released organ transplantation regulations. This action kit contains the following information:

1) Links to the names, addresses, phone and fax numbers of your congressman and two senators.

2) A sample letter for you to send your congressman and senators.

3) A resources guide on:

- Writing An Effective Letter to a Member of Congress
- Having A Successful Meeting With a Member of Congress or Congressional Staff
- Understanding the Congressional Office

4) A copy of the letter that I have sent, on behalf of UNOS to every Member of Congress.

I encourage you to utilize these resources to contact your Members of Congress and alert them to your concerns with Secretary Shalala's approach to re-regulating the organ transplantation program.

As Congress will be in recess from April 2 through April 20, this is an ideal time for you to contact your Members while they are home. Letters should additionally be sent to their Washington, DC addresses for their review when they return. You should also feel free to call your Member's office and ask to speak to the staff person who handles health care issues to express your concerns as a follow up after you have sent a letter. Finally, please send me copies

of any letters you send so that we may maintain an accurate record of communications being made to Congress on this issue.

Return to Legislative Action Kit

Sample Letter

(Please modify to fit your writing style)

March , 1998

Honorable_____

_____

Washington, DC _____

Dear _____:

I am writing as the _(title)_____ of _(organization)__ on behalf of the _(number) transplant doctors, (number) transplant recipients and their families to alert you to our tremendous concern with the regulations recently released by the Department of Health & Human Services that could cause devastating harm to the nation's organ transplant program. A program that has allowed __(organization)__ to perform over _(number of transplants) successful transplants over the last 15 years.

The Department of Health & Human Services proposes to modify the system for allocating the scarce number of organs available for transplant throughout the country. The stated purpose of this proposal is to allocate a larger share of donated organs to the very sickest patients. While on the surface this might seem logical; in fact, it will not change the reality that there are not enough livers available for everyone who so desperately needs one. The solution to this problem, however, is not to federalize the allocation system, but to increase the number of donations by convincing more people to say "yes" to organ donation.

Instead of "fixing" the underlying organ supply problem, the Department's regulations will result in fewer patients being offered a life-saving transplant than under the current system. In the longhaul actually saving fewer lives. The reason for this unintended outcome is twofold. First, the new system would allocate donated organs away from patients at the vast majority of the country's transplant centers and shift those organs to the largest centers. This in turn would deny local availability to transplantation to patients in our area because it would force many small and medium sized transplant centers (like mine) to shut their doors. Second, history shows that organ recovery is largely a local phenomenon, with the recovery of donated organs rising in communities that have transplant centers and falling when those centers close. So, the inevitable outcome of the regulations will be fewer organs available overall even for the very sickest of patients.

As a transplant center, our concern has been and always will be with the outcome and well being of our patients. We are convinced, however, that the impact of the regulations would be to lengthen the amount of time sick people must wait for transplants and reduce the number of people who are able to get them. The proposed federalization of the current system would take away control of the transplant system from doctors and patients and hand it over to Federal regulators. This defies the clear intention of

the original National Organ Transplant Act that the medical community, and not the government, be responsible for administering this vital program.

We urge you to prevent these regulations from being implemented. Many of us have participated directly in UNOS' consensus process and we are eager to work to continue down the road of continuous improvement in the current system. Please feel free to call on me should you need any additional information or have any questions or concerns about your local transplant center.

Return to Legislative Action Kit

Tips: Dealing with Congress effectively

Writing an effective letter to a member on Congress

Suggest Approach

Show respect for your Member of Congress' office.
In writing your legislators, follow a proper format in the address and salutation. For example:

Senator James M. Jeffords United States Senate 728 Hart Senate Office Building Washington, DC 20510	The Honorable Thomas Bliley, Jr. United States House of Representatives 2409 Rayburn House office Building Washington, DC 20515
Dear Senator Jeffords:	Dear Congressman Bliley:

If you know your Member personally, feel free to use his or her first name in the salutation of the letter. This may help inform the Member's staff of your personal relationship and result in a faster response.

Write as a constituent.
Use your own stationery or stationery that identifies your organization.

Clearly identify your subject.
When writing to ask your legislator to support or oppose a specific regulatory initiative, note the title and sponsoring organization and provide a brief description. For example, you can refer to the Department of Health and Human Services regulations regarding the organ transplant program.

Provide facts.
In your own words, give reasoned support for your views. Explain what you would like to see accomplished in the regulation or legislation. Let your legislator know that you appreciate his or her consideration of your views. Avoid angry or abusive comments, including threats of retaliation at the polls.

Stick to the point.
Avoid raising a host of issues. Be sure to draw a crisp and clear

picture of your needs.

Be brief.
Get to the bottom line. Don't worry if your letter looks too short. If you think your letter looks to short, you've probably written a pretty good message.

Use plain English.
Avoid industry jargon. Substitute laymen's terms whenever possible and spell out acronyms. This will help your legislator better understand your concerns.

Ask for your Member's support.
Let your legislator know exactly what you want. When possible, it is better to ask him or her take the specific action such as writing to the Secretary of Health and Human Services to inquire about her justification for the proposed regulations, cosponsoring a particular bill or to vote "yes" or "no" on an issue, than simply asking for "support" on a matter. However, a letter is always an excellent means of informing your legislator about issues of importance to you and asking for assistance.

Be timely.
You have a greater chance of having an impact on your legislator's opinion if you write when the issue or legislation is being actively debated or shortly before a vote.

Follow-up.
If your legislator indicates support for your issues, or votes your way, write or call and say "thank you." If you legislator doesn't vote your way, thank him or her for taking your view into account (this also lets your legislator know you took the time to track his or her action on the issue).

Having a Successful Meeting With A Member of Congress or Congressional Staff

Background

Members of Congress generally allocate between 5 to 15 minutes for each constituent meeting. In order to maximize your time, organize your talking into the following four segments:

- Introduction of yourself
- Explain the purpose of the meeting and the two or three main issues or concerns
- Suggested solutions for your issues or concerns
- Closing statements and thank you

Suggested Approach

If this is your first meeting with your Member, or his or her staff, take a few minutes to briefly describe yourself.
Provide them with some basic information about your issue.

Concisely outline your positions or concerns.
Make the most salient points about your issues or concerns. You can leave more detailed materials with the Member for staff to review after your meeting.

Let the Member or staff know what you would like them to do to help you.
If possible, provide the Member with some suggested approach on how to help resolve your issues or concerns.

Ask for your Member's position or views on the issues you have discussed.
It is important to keep in mind that no Member will be supportive on all issues. If your Member lets you know that he or she does not share your views on a particular issue, ask --in a non-threatening manner-- for reasons why he or she has taken this position. Remember, there may be other times in the future when your Member will be supportive of other issues of importance to you.

If your Member is supportive of your positions, it is important to state your appreciation for their support.

Offer to serve as a resource or provide additional information about the issues you have raised with your Member.
Congressional schedules leave very little time for research. If a Member of Congress or staffer associates you with certain issues, it is likely one of them will call you when questions arise.

***Find out who is the appropriate staffer for you to stay in touch* with concerning the issues you have discussed.**

INSIDER'S TIP: If the appropriate staff have not been involved in your meeting with your Member, take a few extra minutes before you leave the office to introduce yourself to the staffer who handles the issues you've discussed with your Member.

Thank the staff for their assistance in setting up the appointments. It is important to build on your relationship with your Member's Staff because they will become primary contacts as you continue to work on your issues and concerns.

How a Typical Office may be Organized

Washington Staff

ADMINISTRATIVE ASSISTANT: This is the Member's top aide, and may be referred to as the Chief of Staff or Staff Director. The "AA" supervises the office, and manages the office personnel. The Member relies on the AA for legislative and political advice, and there is usually a long-standing relationship between the AA and the Member.

LEGISLATIVE DIRECTOR: This individual is charged with oversight of legislative functions within the office. The Legislative Director supervises other staffers with legislative responsibilities,

and well often acts as the key contact person with the various committees on which their Member serves. The Legislative Director may be responsible for the legislative issue which is most important to the Member, and serves as the primary person who works on drafting legislation with the Legislative Counsel's Office.

PRESS SECRETARY: The Press Secretary is charged with handling media inquiries, and at the same time, creating media opportunities that portray the Member in a favorable manner. The Press Secretary also writes press releases, assists with speeches, and is usually in charge of producing the office newsletter.

SCHEDULER/APPOINTMENT SECRETARY: The Scheduler serves as the "gatekeeper" and is responsible for managing the Member's time. The Scheduler knows the Member's availability, and may have independent authority to make decisions concerning appointment requests.

OFFICE MANAGER: The Office Manager is responsible for the maintenance of the office systems, and manages the office accounts. The Office Manager makes sure that bills related to the office are "vouchered" or paid on a timely basis.

LEGISLATIVE ASSISTANTS: These aides are familiar with the legislative process, and must become "experts" on a variety of different issues. There are usually at least two or more "Las" in an office, and their responsibilities include: monitoring legislation; analyzing bills; advising the Member on what measures to support; and the preparation of position papers and briefing materials.

LEGISLATIVE CORRESPONDENTS: An office may or may not utilize an "LC." These are entry-level positions in a congressional office, and are the equivalent of junior Legislative Assistants. They draft responses to constituent mail, help monitor legislation, and may be assigned to handle non-priority issues.

RECEPTIONIST: The receptionist answers the phone, opens the mail and assigns it to staff, and greets visitors to the office. The Receptionist may also be responsible for booking constituent tours of the Capitol and the White House.

Committee Staff

Committee staffers are often policy experts, or long-time associates of high-ranking committee members. Like personal staff, they are appointed to their jobs, and serve at the pleasure of their boss. They are responsible for helping establish the legislative priorities of the committee, drafting legislation, and conducting hearings on issues before the committee.

STAFF DIRECTOR/CHIEF COUNSEL: As the top staffer on a committee, the Staff Director or Chief Counsel serves as political advisor to the Chairman, and often determines the strategy for successfully navigating legislation through the committee.

PROFESSIONAL STAFF: Members of the professional staff are policy specialists who assist with the development of legislation, provide policy analysis, and often oversee the drafting of legislation. They are often instrumental in reaching compromises

on legislation when differences need to be worked out between House and Senate bills.

The District or State Staff

Unlike most Washington offices, the district or state offices are generally staffed by people who are long-term residents of the area. Depending on the geographical size of the district or state, a Member may have multiple offices, usually located in federally-owned buildings.

DISTRICT or STATE DIRECTOR: The District or State Director is the in-state equivalent to the Washington "AA," and is usually the staffer who is the most knowledgeable about the area, and is particularly sensitive to constituent concerns. The District or State Director often speaks on the Member's behalf when he or she is not available, and often serves as a chief political advisor.

CASEWORKERS: Caseworkers are responsible for responding to non-legislative constituent concerns, and special problems or requests. Caseworkers act as the Member's liaison to various government agencies, and must develop an expertise in resolving constituent problems.

Understanding the Congressional Office

"Most of the work and most of the ideas come from the staffers. They are predominately young people, fresh out of college and professional schools. They are ambitious, idealistic, and abounding with ideas."

former U.S. Senator Norris Hatch (R-NH)

The demands on a Member of Congress" time make the role of their staff very important. Staff serve as the "eyes and ears" of the Member, and are responsible for bringing issues and constituent concerns to their attention. While there is no substitute for working directly with lawmakers at key points in the legislative process, building a good relationship with staff is essential for facilitating the ease with which messages are relayed to Members.

Members of the House of Representatives may hire no more than 17 full-time and 5 part-time personal staff members for their Washington and district offices. The average House Member's staff numbers 15. There is no limit to the number of employees a Senator may hire, so staffs in the Senate range in size from 13 to 71 with an average of about 30.

Every congressional office differs in how its staff is organized. These decisions are usually made based on the Member's own interests, and the make-up of the district's constituency. Members with interests in a particular issue may hire special policy experts, while others who focus more on constituent services hire experienced caseworkers. If a Member serves in a leadership capacity for a committee or subcommittee, the bulk of his or her policy and legislative work may shift from the personal staff to the

committee staff.

Congressional offices are somewhat informal environments that are very different from a corporate office. Office space is limited, and there are no clerical assistants on the Hill. All staffers - even those with law degrees - do their own typing and copying. Jobs on Capitol Hill are coveted (though often low-paying), and almost everyone working in an office has at one time been an unpaid intern or office receptionist. Mobility on Capitol Hill is fluid, and once some experience is gained, staff are promoted to higher positions, or go to work at an equivalent or better position with another Member.

UNOS

United
Network
for
Organ
Sharing

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804 • 330 • 8500
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Executive Director
Walter K. Graham

July 16, 1998

The Honorable John Dingell
Ranking Member, House Commerce Committee
2328 Rayburn House Office Bldg.
Washington, D.C. 20515

Dear Congressman Dingell:

Attached you will find detailed responses to the questions you requested UNOS answer in your letter to me dated June 24, 1998. Also included are the answers to questions you asked on June 18, 1998, the day of the Joint Hearing on "Putting Patients First: Resolving Allocation of Transplant Organs."

We in the transplant community certainly agree that our national organ procurement and allocation system and policies are vitally important issues. We appreciate the opportunity to respond to your questions. If you desire further information or have questions regarding the material provided here, please do not hesitate to contact me, or UNOS' Executive Director, Walter Graham, who can be reached at (804) 330-8506.

Sincerely yours,

L. G. Hunsicker, M.D.
Immediate Past President

Enclosure

cc: The Honorable Tom Bliley
Chairman, Commerce Committee

UNOS Repsonses to Questions From Representative John Dingell

Information Requested in the Letter Dated June 24, 1998

1. **Question: Please provide, for each organ, the number of persons by race and by economic status who (a) need an organ, (b) are listed at a transplant facility, and (c) receive an organ. Please provide this information for each of the five most recent years for which this information is available.**

   Answer: The information contained in the OPTN data system includes a person's race and UNOS collects that information regarding an individual once they are placed on the waiting list. Economic data, such as income, are not explicitly collected by the OPTN. The OPTN waiting list as described in the Federal Register Vol. 55, No. 174, Friday, September 7, 1990, does not require inclusion of information regarding an individual's economic status. Though not identical, education level was used as an approximation for socio-economic status for persons over 21. For consistency, race was tabulated separately for pediatrics (<= 21 years) and adults (> 21 years). UNOS does not have information about persons who may need an organ transplant who have not yet been identified to UNOS or placed on the UNOS waiting list.

   To examine whether patients are receiving transplants at the same rate that they are represented on the waiting list, we tabulated: (1) the number and percentage of patients receiving transplants from cadaveric donors between January 1993 and December 1997, by year, (2) the number and percentage of patients on the waiting list at any time during the same time period (i.e., the potential recipients of transplants during this time.) Attachment A includes information regarding the number of persons on the national waiting list during the preceding five years broken out by race, education level and type of transplant received. (Please note that education level has been collected only since April 1, 1994.)

   Based on UNOS data as of June 4, 1998, the distribution of race for patients on the waiting list during 1993-1997 and the distribution of race for patients receiving a cadaveric donor transplant during the same time period are extremely similar for both pediatric and adult patients for all organs. (There are very few pediatric patients listed for either pancreas or kidney-pancreas, thus there is slightly less consistency seen in the distribution of race in this population than for other organs.) Education level is similarly distributed for waiting patients and for transplant recipients in adult patients for all organs. This indicates that patients are represented essentially equally on the waiting list and in the transplant group when examined by race or education level.

   As an example, consider adult liver patients. The distribution of race for patients on the waiting list during 1995 was 76.4% White, 6.0% Black, 13.1% Hispanic and 3.8% Asian. The corresponding percentages for adult liver transplant recipients are 76.6%, 5.7%, 12.8% and 2.7%. Though these distributions are not identical, they are very similar.

2. **Question: Have you directly or indirectly contacted any persons on waiting lists with respect to the April 2 regulation? If so, please describe in detail the nature of these contacts.**

Answer: UNOS has not "directly contacted" patients who are on waiting lists with respect to the regulation. Only those who may be included on routine mailing provided by UNOS to UNOS members or committee representatives received information regarding the regulation. UNOS' membership includes individuals who may be patients on waiting lists and UNOS' various committees include such persons. UNOS has not conducted a mailing directed at patients on transplant waiting lists regarding the OPTN regulation except as otherwise described above. UNOS officials have participated in public discussions of issues relating to the regulation and have responded to questions from the public which may have included individuals who were on transplant waiting lists. However, in such instances UNOS was responding to requests for information. UNOS places information on its internet home page which is financed with private funding and not included within the offices of the OPTN or Scientific Registry contracts. This internet site has included information regarding UNOS' views pertaining to the regulation.

3. **Question: Have you directly or indirectly contacted any transplant facilities with respect to the April 2 regulation? If so, please describe in detail the nature of these contacts.**

Answer: As a membership organization, UNOS has provided information regarding the April 2 regulation to its members, which include all U. S. transplant centers. UNOS provided mailing labels to HRSA for UNOS' membership so that HRSA could provide UNOS' members with the April 2 Federal Register notice. As a further service to its members, UNOS also provided them with information about the potential impact of the regulation and with information and professional advice to assist them to effectively express their views and concerns regarding the April 2 regulation. This information and advice was provided in response to specific requests for assistance the most effective means of preparing and presenting concerns regarding the effects of the April 2 rule. Such requests were expressed to officers, directors, and staff at regional meetings and committee meetings as well as through direct personal communications from UNOS members and volunteer participants on UNOS committees, including the UNOS Patient Affairs Committee.

4. **Question: What persons or entities does UNOS intend to contact with its Web Page?**

Answer: The UNOS Internet site on the World Wide Web (http://www.unos.org) is UNOS' privately funded corporate communications site intended to make available a wide range of information to persons who wish to contact UNOS. The information describing activities in which UNOS is engaged is made available to the public. Anyone who has Internet access, including UNOS members, may view the site. Information that UNOS has provided to its members or the public is often posted on the site, which serves as a publicly accessible archive. The site is essentially an electronic bulletin board that is not used to contact anyone, but provides information to those accessing it. The site is not operated under either of the Federal contracts that UNOS has with HHS, and no Federal appropriated funds are used in

the maintenance of its software or information as presented on the site, although electronic copies of materials previously delivered under the contracts are made available on this site.

5. **Question: Is the sample letter regarding the April 2 regulation and memorandum on how to have an effective contact with members of congress lobbying? Are they direct or indirect contacts with transplant facilities or patients?**

   Answer: As stated previously (answer to question #3), UNOS provided a variety of materials to its membership leading up to and after the release of the HHS regulation. These materials were designed to inform UNOS members of many of the details contained in the regulation and the potential impact on the transplant community and UNOS as an organization. Included in this material was a "legislative action kit" which included a sample letter to Members of Congress and a memorandum on how to have an effective contact with a Member of Congress. The legislative kit was sent directly to transplant program directors, OPO executive directors, transplant administrators, counselors/associate counselors. These materials were designed to assist UNOS members in communicating with their Members of Congress if they chose to do so. They do constitute direct contact with transplant facilities, but not patients.

6. **Question: Please list all persons or entities (without limitation, but for example, law firms, consulting firms, or public relations firms) that have been paid by UNOS for the purpose of discussing the April 2 regulation with any public official, media outlet, potential transplant patient, or transplant facility. Please describe the nature of their assignment and the amount paid to such person or firm by UNOS.**

   Answer: UNOS entered into a contract with the public relations firm Burson-Marsteller on March 30, 1998, for the purpose of assisting UNOS in communicating with its members and in expressing its views to the public generally. The firm Black, Kelly, Scruggs & Healey, a wholly owned subsidiary of Burson-Marsteller, is registered to lobby on behalf of UNOS.

   Both of these firms were retained at the request of the UNOS board and provide a variety of services, such as (but not limited to): strategic counsel; assistance in responding to press inquiries; assistance in responding to UNOS member inquiries; assistance in informing Members of Congress on UNOS' position regarding the April 2 regulation; assistance in answering inquiries from congressional staff regarding UNOS activities and positions on a variety of issues, including the April 2 regulation.

   As of June 24, 1998, Burson-Marsteller has been paid $186,522.19, and Black, Kelly, Scruggs & Healey has been paid 81,916.25.

7. **Question: Please indicate whether UNOS or any person or firm acting on its behalf or direction is registered to lobby under Federal law?**

   Answer: No employee, officer or director of UNOS is registered to lobby under federal law. The firm Black, Kelly, Scruggs & Healey has been retained by UNOS and is registered to lobby on behalf of UNOS.

8. **Question: Please list all activities of UNOS that directly or indirectly have as their purpose the advancement of UNOS' views with respect to the April 2 regulation.**

Answer: The April 2 regulation will have a direct impact on UNOS as an organization as well as the members of UNOS and the patients served by UNOS and its members. Therefore, as a membership organization, UNOS and its members have, in a variety of forums and media, including those listed below, exchanged information, analyses, and concerns regarding the provisions and anticipated effects of the April 2 regulation as well as the accuracy, completeness, and consistency of supplementary information included with the regulatory text in the Federal Register:

- UNOS committee meetings;
- UNOS regional meetings;
- UNOS board of directors meetings;
- UNOS staff and management meetings;
- Correspondence and discussions to and from and among UNOS members, officers, directors, and staff;
- Written and verbal communications from members, officers, directors, and staff of UNOS to HHS and to elected and appointed representatives;
- Responses to requests from news media representatives for information and opinions;
- Inclusion of information and opinions expressed by members, officers, directors, and staff of UNOS in UNOS' newsletter, the UNOS Update;
- Recapitulation and archival of many of the materials described above on the UNOS Internet World Wide Web site;
- Participation in Internet newsgroups, bulletin boards and chat rooms as well as attendance at public forums to present information and answer questions;
- Testimony by UNOS members, officers, directors, and staff at Congressional hearings and response to staff and Congressional inquiries for information and views.

9. **Question: Please list all assumptions used in the models UNOS has used to analyze the April 2 regulation. If you know, please describe the differences between the models and assumptions used by UNOS and HHS in their respective analysis of the April 2 regulation. Where there is a difference, why did UNOS choose the model and assumptions that it did?**

Answer: Assumptions under ULAM Under the current liver allocation policy, patients are ranked according to medical urgency, blood type compatibility with the donor, and waiting time. The organ is offered first locally, then regionally, and then nationally according to the ranked waiting list within each of these areas. The UNOS Liver Allocation Model (ULAM) operates as does the current matching system. When a donor is procured by an OPO (organ procurement organization), that donor is matched against the ranked waiting list, with the order determined by the allocation policy being modeled, to identify the highest ranked candidate. Because the organ is not always accepted for the highest ranked candidate on the list, ULAM includes statistical probabilities derived from historical data for whether an organ will be accepted or declined based on donor quality and the patient's medical urgency status.

Historical data is also used to estimate patient status change probabilities (i.e., the way that patients move from one medical urgency status to another), survival probabilities on the waiting list, survival probabilities following transplantation and probabilities of being added back on to the waiting list if the liver graft fails. The outcomes of each model, such as the waiting time to transplant, characteristics of patients transplanted, etc. are all determined based on these probabilities.

Comparison of ULAM and CONSAD models The model referred to in the question as being used by HHS is presumably the calculation approach used by CONSAD Research Corporation, a private consulting firm employed by the University of Pittsburgh Medical Center. In addition to providing them here, thorough documentation of the model assumptions used in ULAM have been presented in both government reports and scientific publications. To the best of our knowledge, neither the assumptions used for the CONSAD calculations, nor the actual calculations themselves, have been subjected to scientific or clinical peer review or made fully available to scientists, clinicians, and patients on UNOS committees and staff. Therefore, UNOS is unable to address all of the differences between the two models However, we are now aware of two major assumptions made by CONSAD that differ from those used in ULAM. CONSAD's approach uses higher overall survival rates and higher liver recovery rates than does ULAM. These alternative assumptions may have the effect of improving the projected outcome of the allocation policy advocated by CONSAD and the University of Pittsburgh. We believe that the constant rates developed for the ULAM model are more realistic based on the following information.

The parameters used in ULAM are derived from actual historic data and statistical analyses. ULAM was developed under the oversight of the UNOS Liver Allocation Modeling Oversight Committee and a government oversight Committee appointed by HHS; the major assumptions in the model have been reviewed and approved by the Oversight Committee. UNOS believes that the assumptions of constant survival rates and constant liver recovery for 1998-2003 are very reasonable assumptions, based on recent trends.

1. Survival Rates. The survival rates in ULAM are based on the cohort of patients transplanted between 1991 and 1995. When ULAM was initially constructed in 1995-1996, the 1991-1992 cohort of transplants was used to estimate survival and relisting probabilities, because this was the most recent era for which 3-year survival could be computed. In 1998, ULAM was updated to include survival curves derived from the 1991-1995 cohort.

   The survival curves used in ULAM are stratified by patient status at transplant, previous transplant status, and transplant center volume; thus, a total of 16 individual survival curves are used in ULAM to estimate post-transplant mortality. This level of stratification requires a large enough cohort so that no stratification level is too sparse to compute statistically meaningful rates.

   An analysis of patient survival rates by status at transplant shows that, while overall unadjusted survival rates appear to be increasing over time, these rates are not statistically significant for all status codes. This analysis shows that survival

rates for status 1 transplants performed between 1991 and 1995 are not statistically significant when stratified by year. This is true for status 2 transplants as well. The increase in overall survival appears to be primarily due to changes in survival for status 3 and 4 patients.

2. Organ Procurement Rates. ULAM currently uses projected recovery rates of 4,000 livers recovered and transplanted per year. This projection does not include living donor, foreign donor or split liver transplants, as they are not included in ULAM. The projected liver recovery rates are based on recent historical trends, which are shown below:

Cadaveric livers recovered and transplanted, per year:

1988	1682
1989	2151
1990	2645
1991	2894
1992	3011
1993	3379
1994	3572
1995	3858
1996	3977
1997	4039

Thus, the rate of increase has been declining since 1995. Between 1996 and 1997 the liver recovery rate increased by only 1.6%. Based on these data, ULAM uses a conservative estimate of 4,000 donors per year. The UNOS subcommittee comprised of four past Liver Committee chairs approved of this assumption during a conference call on June 12, 1998.

While ULAM currently uses these historical rates, it is possible to alter any of these parameters if there is strong consensus with the liver transplant community to do so.

Modeling the HHS Policy HHS has stated that it did not intend that the result of the April 2 regulation be a new allocation system that was effectively a "single national list." This is welcome news because the results of ULAM calculations shows that the impact of a liver allocation policy that always allocates organs via a single national list to the most urgent patient nationally would likely have very harmful consequences for transplant patients as well as the nation's transplant system. Based upon a literal reading of the regulation, UNOS and members of the transplant community came to the conclusion that the final rule does, in fact, require such an allocation system, and the regulations establish the following decision sequence for allocation:

1) the patient to be selected is actively listed (i.e., the patient's doctor does not think a transplant will be futile) and the circumstances of this case will not result in organ wastage due to ischemia - - ;

2) the patient to be selected is so sick that he or she is listed in the most urgent category; and

3) the patient to be selected has the longest waiting time among all patients listed in the most urgent status group.

Because the rule states that neither the patient's place of listing nor place of residence may be *a major determinant*, a logical interpretation of the regulations would be that those two considerations could only be taken into account as a fourth step in the sequence. Otherwise, they would be *major* determinants. This would effectively eliminate the patient's place of residence or place of listing as a factor in the allocation policy. It is plausible that under such an interpretation, the patient's place of listing could be used as a tiebreaker for patients with the same waiting time in status, but if it were a criterion that was considered sequentially prior to waiting time or urgency, it would be a major determinant, which the rule prohibits.

The logical outcome of this set of requirements would be that organs would be effectively distributed via a national pool of patients. This kind of allocation scheme is often referred to in the transplant community's vernacular as a "single national list." The following example illustrates why this is the logical outcome of the Secretary's policy:

> Assume that the country is divided into only two regions - - East and West, and that there are no adverse consequences resulting from long ischemia times. Assume further that an organ is procured in the East, and that there is a patient in the West who is listed in the most urgent category and has accumulated more waiting time in that status than any other patient in the country. The literal reading of the rule described above would require that the organ must be allocated to that patient in the West – even if the Eastern patient closest to the donor were listed in the same urgency category as the Western patient with a waiting time that was only one day shorter than that of the Western patient. To allocate the organ to the nearby patient in the East would mean that both patients' place of listing would be a major determinant of each of the two patients' access to a transplant, which is prohibited by the April 2 regulation.

This example illustrates why April 2 rule could render meaningless and unnecessary any subdivision of the country even a large as East and West, and, as a result, no geographic subdivisions could be used in organ allocation and that organs could be allocated only via a single national list.

10. **Question: Has UNOS provided HHS with complete hospital specific transplant data and any other data requested by HHS (for example, but not by way of limitation, morbidity, mortality, retransplantation, and survival year data) for the purpose of evaluating the OPTN? Please be specific.**

Answer: Quarterly, UNOS provides HCFA with a data tape consisting of all records that have been entered into the UNOS data system for Scientific Registry and OPTN paper forms.

Additionally, UNOS provides HCFA a snapshot of the active waiting list and waiting list removal files for every organ. This tape contains all center and patient identifiersIt provides personnel at HCFA the same opportunity to analyze center-specific data that UNOS staff has. The data tape was originally provided on a monthly basis, but was reduced to a quarterly exchange at HCFA's request in 1997.

UNOS has responded to 189 government data requests for national and center-specific data between January 1, 1995, and June 16, 1998. UNOS assigns data requests from the government the highest priority for response; and all requests from the government were fulfilled by UNOS. Approximately 56% of these requests have been fulfilled within one day, with 82% being filled within one week. A copy of a report of government data requests is included in Attachment B.

Included in the 189 data requests UNOS has provided to the government are: (1) a listing of center-specific median waiting times provided to the Department of Transplantation (DOT) on May 17, 1996; and (2) a listing of transplant programs with more than 5% of their transplant recipients being non-resident aliens in 1997 provided to DOT on June 16, 1998. UNOS voiced concerns at the time that the first of these two requests was provided, because we felt that releasing unadjusted median waiting times (i.e., median waiting times for all patients at a center, regardless of medical urgency status, ABO, etc.) could produce potentially misleading results. In spite of these concerns, UNOS complied with DOT's request to provide unadjusted results.

Under the OPTN contract, UNOS has produced the 1997 Report of the OPTN: Waiting List Activity And Donor Procurement. This report includes median waiting times by OPO for all organs, stratified by factors which were determined on an organ-specific basis. This stratification addresses concerns regarding releasing the waiting time data in an unadjusted form, which we discussed with HHS when we responded to prior requests for these data as noted above. Waiting list activity (e.g., number of patients added to the list, number removed for transplant, number died on the waiting list, number still waiting) is provided for each transplant program within each OPO. The number of organ-specific donors recovered within each OPO is also tabulated in the report. A camera-ready version of this report was submitted to HHS in April, 1998; it will be available to the public when it has completed the clearance and printing process.

During 1996, DOT requested information regarding the number of local offers that had been accepted or refused at each transplant center. UNOS felt that to release this information in a responsible manner required developing an appropriate method of analysis and modification of UNOS data release policies. Without appropriately adjusting for differences in donor characteristics and centers' waiting lists, the results could be misleading. Thus in 1997, UNOS produced the Report of Center Specific Organ Acceptance Rates for organs offered between July 1, 1995 and June 30, 1996. This study provided acceptance information for individual transplant programs and examined whether organ acceptance rates can be used to reliably predict other measures of center performance. The analysis compared each center's actual acceptance rate for heart, liver and kidney organ offers to a statistically determined expected rate for that center based on the national acceptance rate for similar offers. The

report concluded that center acceptance rates are not necessarily predictive of other measures of center performance, including waiting times, survival rates, waiting list deaths, and the number of transplant surgeons on staff. The report can be found in its entirety on the UNOS home page.

UNOS has produced a comprehensive Center Specific Report every 3 years that includes graft and patient survival rates for all solid organ transplants performed at U.S. transplant centers. This has been a valuable tool for the transplant community and for the UNOS membership in evaluating the effectiveness of transplantation in general, and for monitoring the performance of individual transplant programs. The entire report is available on the UNOS web site. A copy of the Executive Summary has been enclosed for your review (see Attachment C). In addition to providing survival rates following transplantation, this report also includes the distribution of transplant recipient and donor characteristics at each transplant program.

11. **Question: Please describe the sources and amounts of revenues (for example, but not by way of limitation, federal dollars and patient listing fees) received by UNOS? Does UNOS have an audited financial statement? Please provide a copy of UNOS' most recent auditors report with its answers to these questions.**

Answer: UNOS Sources of Revenue -- 1997

- Computer Registration Fees (74.3%) – these are the fees that are charged to transplant centers and OPOs that register transplant candidates on the UNOS transplant waiting list.

- Federal Contracts (15.2%) – these are the revenues UNOS receives from its two federal contracts. Scientific Registry (SR) revenues were $1,699,000 and the Organ Procurement and Transplantation Network (OPTN) revenues were approximately $610,000 in 1997.

- Educational Products/Data Services (5.7%) – these are revenues UNOS receives from the sale of various educational products (books, teaching curriculum, etc.) as well as certain data and consulting services provided to third parties.

- Education Assessment (2.8%) – these are contributions UNOS receives from its membership (transplant centers, OPOs and histocompatability labs) which are used solely to fund efforts to increase organ donation.

- Contributions (1.5%) are primarily charitable contributions UNOS receives periodically to finance specific projects, publications, etc.

- Interest Income (.5%) are earnings UNOS receives on its investments.

These sources of revenue are summarized graphically for 1996 and 1997 (in Attachment D) and included for your review along with UNOS' 1997 audited financial statements from Arthur Andersen, LLP.

12. **Question: How is the amount of the patient listing fee established? How much of the patient listing fees are ultimately paid for by government insurance programs such as Medicare and Medicaid?**

Answer: UNOS does not charge its members dues or individual fees for each of the many services it provides. Instead, as a not-for-profit corporation, UNOS collects reimbursement for the cost of services to its members through a fee paid by its member institutions when they use the UNOS computer system to register candidates for transplantation. The UNOS "computer registration fee" is therefore a single, inclusive fee for the cumulative services provided by UNOS to its members. This fee is derived by spreading the cost of UNOS operations according to relative membership activity and usage of services as measured by the number of new registrations added each month.

The amount of the fee is set by UNOS members through their representatives on the UNOS Finance Committee and the UNOS Board of Directors who determine the services to be provided in the coming year and the estimated number of registrations expected during that year. The Finance Committee reviews, modifies, and recommends approval of detailed operating and capital budgets for the coming year. These budgets take into account all UNOS services related to organ procurement and transplantation required and approved by the Board of Directors, UNOS' permanent standing committees, and UNOS members. The budget also includes services provided on behalf of UNOS members under the OPTN and Scientific Registry contracts, to the extent that such services are not reimbursed by Federal appropriated funds. The 1998 computer registration fee is $357, which represents a 5% increase over the 1997 fee. Over the past 12 years, the computer registration fee has increased by an average of approximately 5% per year. At the same time, the amount of funding under the OPTN contract has declined from $1,467,000 in 1990 to $565,000 in 1998.

UNOS' contract with HRSA for the establishment and operation of the OPTN is a cost sharing arrangement in which UNOS is required to provide private funds to offset approximately 88% of the allowable cost of services provided under the contract. HRSA provides approximately 12% of the funding for allowable costs under the OPTN contract from appropriated Federal funds. According to HHS Acquisition Regulations, "cost-sharing should generally not be requested if cost-sharing would require the Government to provide funds through some other means (such as fees) to enable the organization to cost-share." [HHSAR 335.070-1(a)(3)]

Computer registration fee revenues collected by UNOS are not Federal funds. UNOS is paid directly by its members for services provided, and UNOS is not privy to information relating to the source of funds used by the member to pay UNOS. Even in those cases where the primary payer of the transplant procedure itself is a Federal program such as Medicare, UNOS will not be informed as to whether the registration fee is reimbursed by such program. Nor is the institution's obligation to UNOS to pay for services contingent upon the

institution's being reimbursed for such cost. Payment of the computer registration fee is voluntary. However, because the fee represents reimbursement for valuable services provided, members do pay the fee.

Currently, approximately 37% of the registrations on the UNOS waiting list of patients awaiting organ transplantation have Medicare, Medicaid, or Champus coverage. However, UNOS is unaware of whether the computer registration fee assessed the listing institution will be reimbursed to that institution by any of those programs.

13. **Question: For each OPO and by organ type, please state how many organs have been transplanted outside of the OPO since 1990.**

Answer: The number of cadaveric donor organs recovered by each OPO, regardless of where they were transplanted, is included in Attachment E. Additionally, the number and percentage of cadaveric organs that were transplanted at transplant centers outside of the OPO's service area ("shared") are also tabulated. (Please note that four OPOs (GAMC, NYSB, WANW, and WASH) either merged together or with other OPOs prior to January, 1997, so they are reported as recovering no organs during 1997.) Nationwide, approximately one-third of all cadaveric kidneys, livers and hearts in 1997 were shared and transplanted. There is a considerable amount of variability across OPOs and, over time, in the percentage of organs that were shared. For example, in 1997, the percentage of livers shared by OPO ranged from 0% to 100%.

There is also considerable variability in the percentage of organs that were shared across organ types. For example, approximately 60% of the pancreases that were transplanted during 1997 as pancreas-alone transplants were the result of organs that were shared outside of the OPO's service area. This is not surprising since there are relatively few pancreas transplants that involve only the pancreas; currently, most pancreases are transplanted as part of a kidney-pancreas combination.

There is an extensive amount of sharing taking place between OPOs. In fact, the percentage of livers shared in 1996 exceeded the percentage of patients leaving their home OPOs to be listed at a transplant center located in another OPO's service area. In 1996, 30% of patients receiving a liver transplant were transplanted at a center located outside the service area of the patient's home OPO, and 34% of livers were transplanted into patients waiting at hospitals outside the service area of the OPO procuring the liver.

This level of sharing is the result of distribution practices. For example, in liver allocation there are several OPOs that have joined together to create sharing arrangements for the first or "local" level of organ distribution. Several of the UNOS regions have also elected to participate in region wide sharing of livers for the most urgent categories of patients. Otherwise, livers are allocated first to patients awaiting transplantation at transplant centers located within the OPO's service area, which have an established relationship with the OPO. If the liver is not a suitable match for any of the patients in the OPO or "local" area, it is then distributed via a regional list of all patients waiting at transplant centers.

With respect to kidney transplants, UNOS policy requires OPOs to send kidneys to any patient whose antigen profile matches perfectly with that of the donor. The purpose of this policy is to enhance success rates for kidney transplants so that the number of retransplants can be minimized thereby maximizing the number of people who can benefit from kidney transplantation. It also provides enhanced access for patients who are difficult to match because of high levels of preformed antibodies.

14. **Question: With respect to possible renewal of the OPTN contract, how would a delay of the April 2 regulation until November 1, 1999 affect UNOS' OPTN contract with HHS? How would such a delay affect the timing, terms, and conditions of any renewal of the OPTN contract? Would such a delay help or hinder the ongoing discussions between UNOS and HHS with respect to resolving their different points of view on the affects of the April 2 regulation?**

Answer: UNOS' current contract with HHS to operate the OPTN expires on September 29, 1999. The contract includes two one-year renewal options, the first to expire on September 29, 2000, and the second to expire on September 29, 2001. UNOS does not advocate any delays in the April 2 regulation beyond the time necessary to satisfactorily resolve the issues voiced by members of the transplant community regarding the final rule published on April 2, 1998. Should the final rule be delayed until November 1, 1999, an extension of the term of the current contract until that date would be necessary to avoid any interruption of OPTN operations. HRSA has the option as described above of extending the contract on the same terms and conditions as the present contract, and UNOS has agreed in the past to short extensions to accommodate HRSA's administrative needs. Therefore, any interruption of OPTN services could be avoided.

<u>Additional Questions Posed to UNOS before the Joint Hearing on June 18, 1998</u> (but not requested in the June 24, 1998 letter)

1. **Question: Do you challenge the authority of HHS to promulgate the April 2 regulation?**

Answer: We do not challenge the Secretary's authority to promulgate regulations. We are concerned, however, with various provisions of the regulation and the extent to which the regulations may exceed in some instances the Secretary's legal authority.

2. **Question: Now, you are a contractor of HHS are you not?**

Answer: UNOS holds two contracts with HHS: a cost reimbursement contract for operation of the Scientific Registry of organ transplant recipients and a cost sharing contract for operation of the OPTN. The OPTN contract is unusual in that UNOS provides 89% of the funds to cover allowable costs for operation of the OPTN. HRSA provides the other 11% from appropriated federal funds. The funds provided by UNOS must be private funds.

3. **Question: Could you provide us with any written opinions of counsel or other memoranda upon which you base your answer to this question? Have you received any written memos on this matter from your counsel?**

Answer: UNOS has received written opinions of counsel regarding the nature of the OPTN and the powers and authorities under the National Organ and Transplant Act. A copy of those memoranda are attached as Attachment F.

4. **Question: Are UNOS or any of its officers, directors or employees registered to lobby under federal law?**

Answer: No

5. **Question: Would you elaborate on any modeling assumptions that went into your point that a national program would increase the distance that a donated liver would travel to 1,093 compared with 168 miles under current policy?**

Answer: A literal reading of the specific text of the regulation lead UNOS to conclude that the regulation requires that organs be allocated to the most urgent person anywhere in the United States without any intermediate boundaries or distribution areas such as OPOs. Therefore, UNOS modified the parameters of its computer modeling system to include such an assumption as opposed to the current system which allocates organs to the most urgent patients within an OPO or approved alternative local unit before distributing organs within 11 UNOS regions or nationally.

The UNOS Liver Allocation Model (ULAM) operates the same as the current matching system. When a donor is procured by an OPO (organ procurement organization), that donor is matched against the ranked waiting list, as dictated by the allocation policy, to determine the appropriate candidate. In ULAM, organs are accepted or declined based on donor quality and the patient's medical urgency status, using statistical probabilities derived from historical data.

Under the current liver allocation policy, patients are ranked according to medical urgency, blood type compatibility with the donor, and waiting time, and the organ is offered first locally, then regionally, then nationally. One of the many policies modeled with ULAM allocated organs based on a single national waiting list, with no geographic boundaries. In the single national list policy, the organ is offered in order of medical urgency (i.e., the sickest patient first) to patients anywhere in the country. Because of the high likelihood that there will be a non-local patient who is compatible with the donor organ, organs tend to travel longer distances with a single national list compared to the current system, which also gives priority to the sickest patient, but within a local area. This accounts for the increase in distance traveled.

In March and April of 1998, ULAM was updated to incorporate the most recent data available for patient status change probabilities (the way the patients move from one medical urgency status to another), organ acceptance rates, and survival and relist probabilities.

Additionally, the assumptions relating to future organ procurement were updated based on current liver recovery trends.

6. **Question: Would you please comment on the situation for example where under the current system the organ could be harvested, moved several hundred miles and implanted in a status 3 patient who has waited a month, at the same time that a status 2 patient has waited significantly longer than a month and who lives a couple of miles away from the donor does not get the organ because the simple fact that the first patient in the same region as the donor and the other patient lives in a different region. Would you comment on that please?**

Answer: UNOS understands the National Organ Transplant Act (NOTA) and related Federal laws to place responsibility for organ allocation, in the first instance, with OPOs. OPO service areas are to be designated consistent with this responsibility to assure maximum effectiveness in organ procurement and equitable distribution. The OPTN has no authority under these laws to bypass the OPO as the primary level of organ allocation. The following are specific references to the applicable statutes upon which our understanding is based:

- OPO service areas must be " ... of sufficient size to assure maximum effectiveness in the procurement and equitable distribution of organs." 42 U.S.C. ə 273(b)(1)(E).
- OPOs must " ... have a system to allocate donated organs equitably among transplant patients according to established medical criteria ... " 42 U.S.C. ə 273(b)(3)(E).
- The OPTN must "assist OPOs in the nationwide distribution of organs equitably among transplant patients." 42 U.S.C. ə 274(b)(2)(D).
- The OPTN is required to "establish membership criteria and medical criteria for allocating organs ... " and OPOs are required to "participate" in the OPTN. 42 U.S.C. əə 274(b)(2)(B), 273(b)(3)(H).

Additionally, in 1993, the General Accounting Office (GAO) issued a report on the effectiveness of the organ procurement and allocation system. Among the GAO's findings was the conclusion that "the only legally acceptable reasons for not allocating organs using an OPO-wide list are those which are based on medical criteria." Otherwise, not all patients within an OPO's service area would have the same opportunity to be considered for organ offers. A patient listed for organ transplantation with the OPO who is assigned a priority for the needed organ that is higher than that assigned for other patients within the OPO service area could miss a chance to receive a transplant. Unless based on medical criteria, such a result "would violate the [NOTA]." The GAO recommended, therefore, use of single OPO-wide waiting lists for organ allocation unless a center-specific allocation is justified for medical reasons.

In 1994, Congress amended section 1138 of the Social Security Act to require a hospital to have an agreement to identify potential organ donors with the organ procurement organization designated for the service area in which the hospital is located, unless granted a waiver to work with another OPO. Waivers are permissible under the legislation upon determination that: (1) the waiver is expected to increase organ donation, and (2) the waiver will assure equitable treatment of patients referred for transplantation within the service areas

of the OPO with which the hospital is asking permission to work as well as the hospital's designated OPO (*i.e.,* the OPO with which the hospital would be required to work without grant of a waiver). The law presumes, therefore, that organ donation and equitable patient treatment are maximized at the level of the designated OPO service area. A contrary expectation must be demonstrated and approved to obtain an exemption from the general rule.

Consistent with this regulatory framework, which itself is consistent with community practice and the historic development of organ procurement and allocation protocols, UNOS adopted the current definition of "local" as the OPO in most cases. UNOS agreed with Federal regulators and public commentators that "local," in general, should be larger than the individual transplant center and monitorable. NOTA indicates that the OPO is the maximum outer limit for this first level of organ allocation.

It is important to note that 54% of deaths of patients waiting for a liver transplant in 1997 were patients who were listed as status 3 as their last active status prior to their death. Because such patients are at risk of death, the present organ allocation system provides opportunities for transplantation to such patients. All OPOs presently provide transplants to status 3 patients . Under a single national list, such as we interpreted to be written in the text of the April regulation, our computer estimates indicate that less than 1% of transplants would go to status 3 patients thereby increasing risk of death in that patient population group.

7. **Question: Do you agree with this statement: Organs should be considered a national rather than a local or regional resource. Geographic priorities in the allocations of organs should be prohibited except when the transplantation of organs would threaten their suitability for transplantation.**

Answer: Human organs donated for transplantation are a human resource that is a wonderful "gift of life" given by a person to a person as provided under the laws of the various states (Uniform Anatomical Gift Act as adopted in each state). We are not aware of any legally authoritative statement proclaiming human anatomical parts, i.e., human cadaveric organs or tissues, to be a "national resource," nor do we know the legal import of such a term. The Uniform Anatomical Gift Act makes it possible for a person in a state to make an anatomical gift under certain circumstances in a certain manner in a prescribed manner to certain persons. Every state has adopted a version of the Uniform Anatomical Gift Act, and it is this law that gives rise to the act of organ donation, and makes organ transplantation possible. We are unaware of any federal law superceding the Uniform Anatomical Gift Act or preempting the Uniform Anatomical Gift Act or other state laws regarding organ donation and transplantation.

The question presented appears to be a quotation taken from the American Medical Association's Code of Medical Ethics, and it is worth noting that the same Code of Medical Ethics also says "[r]ecipients of organs for transplantation should be determined in accordance with the Counsel's guidelines on the allocation of limited medical resources." These guidelines state that "[t]hough there are several ethically acceptable strategies for implementing these criteria, no single strategy is ethically mandated. Acceptable approaches

include a three-tiered system, a minimal threshold approach, and a weighted formula." UNOS agrees with the statement contained in the question taken in the fuller context of the AMA's complete statement regarding the subject. It is also worth noting that the Task Force on Organ Transplantation established under the National Organ Transplant Act refers to human organs for transplantation as a "national," "public," and "community" resource. The Task Force stated, "[o]rgans are donated on behalf of all potential recipients; this implies that the organ is to be used for the good of the community, and ultimately the community must decide what best serves the public interest." UNOS fully supports the idea of the development of policies regarding the distribution of organs with extensive public input and endeavors to incorporate such input into its policy making. In that regard, UNOS includes members of the public on its Board of Directors which presently includes up to 1/3 of its membership as patient, and family members of patients and organ donors. All UNOS committee and board meetings at which organ allocation policies are developed are open to the public and all polices regarding organ allocation are decided in public meetings. UNOS submits its proposed policies and their scientific, clinical and ethical rationale to the public for an opportunity to submit public comments to the UNOS committees and board prior to the final adoption of policies. In the past UNOS has conducted extensive public hearings as required by certain issues and has solicited the assistance of HHS which placed notifications regarding such hearings and opportunities for public comment in the Federal Register to provide notice to the public. In recent years UNOS has developed an extensive capability via its internet home page which also makes available information regarding policies upon which the public may submit comments.

With respect to the question regarding geographic priorities in the allocation of organs, UNOS notes that the National Organ Transplant Act requires that OPOs allocate organs and that the service areas of OPOs be of "sufficient size to assure maximum effectiveness in the procurement and equitable distribution of organs." UNOS further notes that the 1993 report of the General Accounting Office which was required by the 1990 amendments to the National Organ Transplant Act states that:

> "... the only legally acceptable reasons for not allocating organs using an OPO-wide list are those which are based on medical criteria.
>
> To better ensure that the national organ procurement and allocation system allocates organs equitably and obtains the greatest number of available organs, GAO is making several recommendations ... These include requiring OPOs and transplant centers to ... use a single OPO-wide list when allocating organs unless a center-specific allocation is justified for medical reasons ..."

ATTACHMENT A

Attachment A

United Network for Organ Sharing

Racial Distribution of Waiting List vs. Cadaveric Transplants
Patients 21 Years of Age or Younger: 1993-1997

Organ	Racial Category	Registrations Ever Waiting 1995-1997										Cadaveric Transplants 1995-1997									
		1993		1994		1995		1996		1997		1993		1994		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kidney	White	1242	48.8	1184	47.3	1130	45.2	1160	45.0	1166	43.6	264	54.2	314	53.1	246	46.5	247	51.6	209	52.1
	Black	781	30.7	805	32.2	773	30.9	795	30.9	854	32.0	119	24.4	174	29.4	154	29.1	127	26.5	101	25.2
	Hispanic	406	16.0	397	15.9	461	18.5	473	18.4	500	18.7	80	16.4	70	11.8	100	18.9	75	15.7	64	16.0
	Asian	92	3.6	96	3.8	112	4.5	126	4.9	128	4.8	10	2.1	19	3.2	18	3.4	21	4.4	16	4.0
	Other	23	0.9	22	0.9	22	0.9	23	0.9	24	0.9	14	2.9	14	2.4	11	2.1	9	1.9	11	2.8
	Total	2544	100.0	2504	100.0	2498	100.0	2577	100.0	2672	100.0	487	100.0	591	100.0	529	100.0	479	100.0	401	100.0
Kidney-Pancreas	White	8	72.7	6	54.6	10	62.5	7	53.9	11	61.1	5	100.0	2	66.7	2	66.7	3	50.0	4	66.7
	Black	3	27.3	4	36.4	5	31.3	5	38.5	5	27.8	0	0.0	1	33.3	1	33.3	3	50.0	1	16.7
	Hispanic	0	0.0	1	9.1	1	6.2	1	7.7	2	11.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Asian	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	16.7
	Total	11	100.0	11	100.0	16	100.0	13	100.0	18	100.0	5	100.0	3	100.0	3	100.0	6	100.0	6	100.0
Liver	White	864	64.6	940	63.4	925	60.5	1013	62.1	1202	64.9	340	61.8	336	60.1	298	57.5	291	57.1	334	61.6
	Black	200	15.0	231	15.6	241	15.8	282	17.3	299	16.1	100	18.2	97	17.4	82	15.8	109	21.4	91	16.8
	Hispanic	173	12.9	230	15.5	253	16.6	234	14.3	263	14.2	76	13.8	91	16.3	98	18.9	78	15.3	66	12.2
	Asian	68	5.1	66	4.5	92	6.0	77	4.7	67	3.6	11	2.0	14	2.5	23	4.4	19	3.7	20	3.7
	Other	32	2.4	15	1.0	18	1.2	26	1.6	21	1.1	23	4.2	21	3.8	17	3.3	13	2.6	31	5.7
	Total	1337	100.0	1482	100.0	1529	100.0	1632	100.0	1852	100.0	550	100.0	559	100.0	518	100.0	510	100.0	542	100.0
Heart	White	459	69.6	424	66.9	489	67.3	492	65.6	527	68.6	221	69.5	214	72.3	194	64.7	210	67.3	224	72.0
	Black	117	17.7	107	16.9	122	16.8	145	19.3	130	16.9	54	17.0	43	14.5	53	17.7	66	21.2	46	14.8
	Hispanic	64	9.7	78	12.3	90	12.4	93	12.4	92	12.0	36	11.3	28	9.5	34	11.3	27	8.6	28	9.0
	Asian	16	2.4	19	3.0	22	3.0	16	2.1	18	2.3	6	1.9	7	2.4	11	3.7	5	1.6	6	1.9
	Other	4	0.6	6	1.0	4	0.6	4	0.5	1	0.1	1	0.3	4	1.3	8	2.7	4	1.3	7	2.3
	Total	660	100.0	634	100.0	727	100.0	750	100.0	768	100.0	318	100.0	296	100.0	300	100.0	312	100.0	311	100.0
Lung	White	220	87.0	246	84.0	338	85.1	369	86.6	416	86.0	48	88.9	45	84.9	68	87.2	58	86.6	67	84.8
	Black	12	4.7	15	5.1	23	5.8	21	4.9	28	5.8	1	1.9	3	5.7	3	3.9	3	4.5	5	6.3
	Hispanic	12	4.7	26	8.9	28	7.1	30	7.0	31	6.4	1	1.9	3	5.7	2	2.5	6	9.0	4	5.1
	Asian	8	3.2	5	1.7	5	1.3	6	1.4	9	1.9	0	0.0	2	3.8	1	1.3	0	0.0	3	3.8
	Other	1	0.4	1	0.3	3	0.8	0	0.0	0	0.0	4	7.4	0	0.0	4	5.1	0	0.0	0	0.0
	Total	253	100.0	293	100.0	397	100.0	426	100.0	484	100.0	54	100.0	53	100.0	78	100.0	67	100.0	79	100.0

Based on UNOS OPTN/Scientific Registry data as of July 4, 1998.
Data subject to change based on futu[redacted] submission or correction.

United Network for Organ Sharing

Racial Distribution of Waiting List vs. Cadaveric Transplants
Patients 21 Years of Age or Younger: 1993-1997

Organ	Racial Category	Registrations Ever Waiting 1995-1997										Cadaveric Transplants 1995-1997									
		1993		1994		1995		1996		1997		1993		1994		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Heart-Lung	White	71	85.5	77	77.0	71	76.3	64	71.1	63	70.0	19	100.0	14	82.4	17	81.0	9	81.8	5	45.5
	Black	5	6.0	9	9.0	10	10.8	10	11.1	12	13.3	0	0.0	0	0.0	2	9.5	1	9.1	2	18.2
	Hispanic	3	3.6	10	10.0	9	9.7	12	13.3	10	11.1	0	0.0	2	11.7	1	4.8	1	9.1	2	18.2
	Asian	4	4.8	4	4.0	3	3.2	4	4.4	4	4.5	0	0.0	1	5.9	1	4.8	0	0.0	2	18.2
	Other	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Total	83	100.0	100	100.0	93	100.0	90	100.0	90	100.0	19	100.0	17	100.0	21	100.0	11	100.0	11	100.0
Pancreas	White	15	88.2	18	90.0	15	75.0	16	80.0	21	72.4	6	100.0	1	50.0	0	0.0	5	100.0	4	44.4
	Black	1	5.9	1	5.0	1	5.0	2	10.0	4	13.8	0	0.0	0	0.0	0	0.0	0	0.0	4	44.4
	Hispanic	0	0.0	0	0.0	3	15.0	2	10.0	3	10.3	0	0.0	1	50.0	0	0.0	0	0.0	1	11.2
	Asian	1	5.9	1	5.0	1	5.0	0	0.0	1	3.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Total	17	100.0	20	100.0	20	100.0	20	100.0	29	100.0	6	100.0	2	100.0	1	100.0	5	100.0	9	100.0

Based on UNOS OPTN/Scientific Registry data as of July 4, 1998.
Data subject to change based on fi e data submission or correction.

United Network for Organ Sharing

Racial Distribution of Waiting List vs. Cadaveric Transplants
Patients 22 Years of Age or Older: 1993-1997

Organ	Racial Category	Registrations Ever Waiting 1995-1997										Cadaveric Transplants 1995-1997									
		1993		1994		1995		1996		1997		1993		1994		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kidney	White	18836	53.6	19835	51.8	21579	50.8	23195	50.1	24926	49.2	4340	61.8	4116	58.4	4167	58.2	4229	58.4	4225	57.5
	Black	10581	30.1	11817	30.8	13193	31.1	14779	31.9	16253	32.1	1675	23.9	1852	26.3	1819	25.4	1884	26.0	1994	27.1
	Hispanic	3831	10.9	4575	11.9	5319	12.5	5629	12.2	6387	12.6	653	9.3	664	9.4	810	11.3	723	10.0	702	9.6
	Asian	1539	4.4	1710	4.5	1895	4.5	2162	4.7	2491	4.9	246	3.5	275	3.9	255	3.6	286	4.0	322	4.4
	Other	330	0.9	392	1.0	479	1.1	548	1.1	601	1.2	108	1.5	138	1.9	109	1.5	120	1.6	110	1.5
	Total	35117	100.0	38329	100.0	42465	100.0	46313	100.0	50658	100.0	7022	100.0	7045	100.0	7160	100.0	7242	100.0	7353	100.0
Kidney-Pancreas	White	1562	88.8	1697	83.0	1940	81.7	2075	82.4	2272	81.6	598	91.2	654	88.1	755	83.1	702	83.3	692	82.3
	Black	137	7.8	182	8.9	238	10.0	272	10.8	309	11.1	39	6.0	53	7.1	85	9.4	87	10.3	86	10.2
	Hispanic	50	2.8	149	7.3	172	7.2	146	5.8	174	6.3	12	1.8	28	3.8	62	6.8	41	4.9	45	5.4
	Asian	7	0.4	15	0.7	23	1.0	20	0.8	23	0.8	2	0.3	5	0.7	3	0.3	9	1.1	10	1.2
	Other	3	0.2	2	0.1	3	0.1	6	0.2	7	0.2	5	0.7	2	0.2	4	0.4	4	0.4	8	0.9
	Total	1759	100.0	2045	100.0	2376	100.0	2519	100.0	2785	100.0	656	100.0	742	100.0	909	100.0	843	100.0	841	100.0
Liver	White	4970	78.9	5855	76.8	7452	76.4	9251	77.2	10868	76.8	2274	79.7	2418	79.7	2574	76.6	2751	78.5	2769	78.0
	Black	364	5.8	505	6.6	585	6.0	789	6.6	899	6.4	174	6.1	186	6.1	193	5.7	250	7.1	242	6.8
	Hispanic	586	9.3	880	11.6	1274	13.1	1379	11.5	1702	12.0	248	8.7	260	8.6	429	12.8	326	9.3	311	8.8
	Asian	323	5.1	319	4.2	375	3.8	486	4.1	585	4.1	71	2.5	74	2.4	92	2.7	112	3.2	130	3.7
	Other	56	0.9	62	0.8	67	0.7	80	0.7	99	0.7	87	3.1	95	3.1	73	2.2	65	1.9	99	2.8
	Total	6299	100.0	7621	83.7	9753	100.0	11985	100.0	14153	100.0	2854	100.0	3033	100.0	3361	100.0	3504	100.0	3551	100.0
Heart	White	4821	83.4	4796	81.5	5214	81.2	5358	81.6	5415	81.3	1647	83.4	1677	82.1	1681	81.6	1660	81.7	1621	81.9
	Black	645	11.2	702	11.9	753	11.7	794	12.1	801	12.0	194	9.8	230	11.3	212	10.3	243	12.0	203	10.3
	Hispanic	189	3.3	269	4.6	336	5.2	308	4.7	346	5.2	72	3.6	72	3.5	118	5.7	84	4.1	86	4.4
	Asian	97	1.7	90	1.5	85	1.3	64	1.0	70	1.1	25	1.3	21	1.0	23	1.1	27	1.3	30	1.5
	Other	31	0.5	28	0.5	32	0.5	40	0.6	27	0.4	38	1.9	42	2.1	25	1.2	17	0.8	39	1.9
	Total	5783	100.0	5885	100.0	6420	100.0	6564	100.0	6659	100.0	1976	100.0	2042	100.0	2059	100.0	2031	100.0	1979	100.0
Lung	White	1798	89.9	2157	87.7	2566	87.0	2858	86.9	3273	87.6	567	93.6	593	90.5	674	87.5	643	88.9	742	89.3
	Black	107	5.4	152	6.2	222	7.5	264	8.0	292	7.8	22	3.6	27	4.1	50	6.5	48	6.6	61	7.3
	Hispanic	47	2.4	104	4.2	127	4.3	131	4.0	136	3.6	9	1.5	19	2.9	34	4.4	25	3.5	20	2.4
	Asian	44	2.2	37	1.5	24	0.8	25	0.8	24	0.6	6	1.0	4	0.6	5	0.7	4	0.6	2	0.2
	Other	3	0.1	10	0.4	12	0.4	10	0.3	13	0.4	2	0.3	12	1.8	7	0.9	3	0.4	6	0.7
	Total	1999	100.0	2460	100.0	2951	100.0	3288	100.0	3738	100.0	606	100.0	655	100.0	770	100.0	723	100.0	831	100.0

Based on UNOS OPTN/Scientific R[illegible]ry data as of July 4, 1998.
Data subject to change based on futu[illegible]a submission or correction.

United Network for Organ Sharing

Racial Distribution of Waiting List vs. Cadaveric Transplants
Patients 22 Years of Age or Older: 1993-1997

Organ	Racial Category	Registrations Ever Waiting 1995-1997										Cadaveric Transplants 1995-1997									
		1993		1994		1995		1996		1997		1993		1994		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Heart-Lung	White	216	84.7	203	81.5	209	84.6	221	83.1	241	82.8	34	82.9	44	83.0	40	81.6	25	89.3	40	78.4
	Black	16	6.3	13	5.2	10	4.1	19	7.1	18	6.2	5	12.2	2	3.8	2	4.1	3	10.7	4	7.8
	Hispanic	14	5.5	21	8.4	19	7.7	22	8.3	28	9.6	1	2.4	1	1.9	3	6.1	0	0.0	4	7.8
	Asian	8	3.1	10	4.0	7	2.8	3	1.1	2	0.7	0	0.0	3	5.7	4	8.2	0	0.0	2	3.9
	Other	1	0.4	2	0.8	2	0.8	1	0.4	2	0.7	1	2.4	3	5.7	0	0.0	0	0.0	1	2.0
	Total	255	100.0	249	100.0	247	100.0	266	100.0	291	100.0	41	100.0	53	100.0	49	100.0	28	100.0	51	100.0
Pancreas	White	305	93.9	352	90.7	432	91.4	524	90.5	607	92.7	101	96.2	88	95.7	98	91.6	151	95.0	180	91.4
	Black	15	4.6	21	5.4	29	6.1	35	6.0	35	5.3	0	0.0	2	2.2	4	3.7	5	3.1	9	4.6
	Hispanic	3	0.9	13	3.4	10	2.1	16	2.8	9	1.4	1	1.0	0	0.0	4	3.7	2	1.3	1	0.5
	Asian	1	0.3	1	0.3	1	0.2	2	0.4	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5
	Other	1	0.3	1	0.3	1	0.2	2	0.4	3	0.5	3	2.8	2	2.2	1	1.0	1	0.6	6	3.0
	Total	325	100.0	388	100.0	473	100.0	579	100.0	655	100.0	105	100.0	92	100.0	107	100.0	159	100.0	197	100.0

Based on UNOS OPTN/Scientific Registry data as of July 4, 1998.
Data subject to change based on fu[illegible] data submission or correction.

United Network for Organ Sharing

Education Distribution of Waiting List vs. Cadaveric Transplants

Patients 22 Years of Age or Older: 1994-1997

* Education Information Was Not Collected Prior to April 1, 1994

Organ	Education Category	Registrations Ever Waiting 1995-1997								Cadaveric Transplants 1995-1997							
		1994*		1995		1996		1997		1994*		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kidney	Less Than 8 Years of Education	597	7.2	1533	8.1	2172	8.2	2516	8.0	66	6.7	239	7.6	357	8.5	356	7.6
	9-12 Years of Education	3977	48.2	8941	47.3	12586	47.8	15083	47.9	481	48.8	1537	49.1	2007	48.0	2294	48.7
	Some College/College Degree	3223	39.0	7370	39.0	10182	38.6	12138	38.5	382	38.8	1191	38.1	1615	38.6	1790	38.0
	Post-College/Graduate Degree	458	5.5	1046	5.5	1411	5.4	1751	5.6	56	5.7	161	5.1	206	4.9	267	5.7
	Unknown	30074		23575		19962		19170		6060		4032		3057		2646	
	Total	38329	100.0	42465	100.0	46313	100.0	50658	100.0	7045	100.0	7160	100.0	7242	100.0	7353	100.0
Kidney-Pancreas	Less Than 8 Years of Education	6	0.9	20	1.4	33	1.9	23	1.2	1	0.6	9	1.6	15	2.5	10	1.7
	9-12 Years of Education	276	40.7	591	40.2	689	40.2	747	40.4	68	37.8	224	40.5	227	38.4	246	41.6
	Some College/College Degree	340	50.1	764	52.0	900	52.4	962	52.0	91	50.6	277	50.1	327	55.3	304	51.4
	Post-College/Graduate Degree	56	8.3	94	6.4	94	5.5	118	6.4	20	11.1	43	7.8	22	3.7	31	5.2
	Unknown	1367		907		803		935		562		356		252		250	
	Total	2045	100.0	2376	100.0	2519	100.0	2785	100.0	742	100.0	909	100.0	843	100.0	841	100.0
Liver	Less Than 8 Years of Education	146	6.0	268	5.3	344	5.0	371	4.8	54	5.7	92	4.7	122	5.6	86	4.2
	9-12 Years of Education	1133	46.5	2415	47.3	3320	48.7	3723	47.7	416	44.0	899	46.3	1071	49.3	980	48.0
	Some College/College Degree	966	39.7	2125	41.6	2723	40.0	3155	40.5	392	41.5	842	43.3	850	39.1	823	40.3
	Post-College/Graduate Degree	189	7.8	295	5.8	428	6.3	549	7.0	83	8.8	110	5.7	129	5.9	152	7.4
	Unknown	5187		4650		5170		6355		2088		1418		1332		1510	
	Total	7621	100.0	9753	100.0	11985	100.0	14153	100.0	3033	100.0	3361	100.0	3504	100.0	3551	100.0
Heart	Less Than 8 Years of Education	85	4.9	197	5.6	208	5.4	203	5.2	26	4.2	79	6.1	63	4.7	70	5.7
	9-12 Years of Education	862	49.8	1693	48.1	1853	47.8	1849	47.7	305	48.8	620	47.6	644	48.1	586	47.5
	Some College/College Degree	648	37.4	1374	39.0	1563	40.3	1552	40.1	239	38.2	512	39.3	543	40.5	496	40.2
	Post-College/Graduate Degree	137	7.9	256	7.3	253	6.5	271	7.0	55	8.8	92	7.1	90	6.7	81	6.6
	Unknown	4153		2900		2687		2784		1417		756		691		746	
	Total	5885	100.0	6420	100.0	6564	100.0	6659	100.0	2042	100.0	2059	100.0	2031	100.0	1979	100.0
Lung	Less Than 8 Years of Education	17	2.1	45	2.6	89	4.1	105	4.2	7	4.8	10	2.5	14	2.9	26	4.7
	9-12 Years of Education	388	48.0	776	45.7	973	44.9	1160	46.5	78	53.4	176	44.3	204	42.3	245	44.0
	Some College/College Degree	354	43.8	780	45.9	967	44.6	1065	42.7	54	37.0	193	48.6	228	47.3	253	45.4
	Post-College/Graduate Degree	49	6.1	98	5.8	138	6.4	162	6.5	7	4.8	18	4.5	36	7.5	33	5.9
	Unknown	1652		1252		1121		1246		509		373		241		274	
	Total	2460	100.0	2951	100.0	3288	100.0	3738	100.0	655	100.0	770	100.0	723	100.0	831	100.0

Based on UNOS OPTN/Scientific Registry data as of July 4, 1998.

Data subject to change based on future submission or correction.

United Network for Organ Sharing

Education Distribution of Waiting List vs. Cadaveric Transplants

Patients 22 Years of Age or Older: 1994-1997

* Education Information Was Not Collected Prior to April 1, 1994

Organ	Education Category	Registrations Ever Waiting 1995-1997								Cadaveric Transplants 1995-1997							
		1994*		1995		1996		1997		1994*		1995		1996		1997	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Heart-Lung	Less Than 8 Years of Education	1	1.8	2	1.7	4	2.4	6	3.4	1	14.3	0	0.0	0	00	3	7.9
	9-12 Years of Education	33	60.0	55	47.4	80	47.6	82	46.3	6	85.7	9	47.4	8	38.1	19	50.0
	Some College/College Degree	17	30.9	53	45.7	76	45.2	77	43.5	0	0.0	10	52.6	12	57.1	14	36.8
	Post-College/Graduate Degree	4	7.3	6	5.2	8	4.8	12	6.8	0	0.0	0	0.0	1	4.8	2	5.3
	Unknown	194		131		98		114		46		30		7		13	
	Total	249	100.0	247	100.0	266	100.0	291	100.0	53	100.0	49	100.0	28	100.0	51	100.0
Pancreas	Less Than 8 Years of Education	1	1.1	3	0.6	2	0.7	1	0.3	1	12.5	1	2.2	2	2.1	0	0.0
	9-12 Years of Education	39	44.8	87	18.4	135	44.1	122	38.1	2	25.0	23	50.0	45	46.4	37	40.2
	Some College/College Degree	39	44.8	100	21.1	155	50.7	175	54.7	3	37.5	20	43.5	46	47.4	48	52.2
	Post-College/Graduate Degree	8	9.2	13	2.7	14	4.6	22	6.9	2	25.0	2	4.3	4	4.1	7	7.6
	Unknown	301		270		273		335		84		61		62		105	
	Total	388	100.0	473	100.0	579	100.0	655	100.0	92	100.0	107	100.0	159	100.0	197	100.0

Based on UNOS OPTN/Scientifi gistry data as of July 4, 1998.

Data subject to change based on future data submission or correction.

ATTACHMENT B

United Network for Organ Sharing
Government Data Requests: January 1995 – June 16, 1998

Summary

- 189 government data requests
- All requested data were provided
- 1 request completed late
- All other data provided within time frame suitable to requester
- 105 (56%) requests provided within 1 day
- 50 additional requests within 1 week, for a total of 82% within 1 week

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

ata uest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
95-1	1/4/95	1/13/95	Remy Aronoff (DOT)	What percent of Liver status 1 waiting list patients remain in status 1 during a year. What percent of status 2 patients not transplanted during a year remain in status 2, improved to status 1. Analyze for U.S. and UPMC alone.	Yes		Yes	
95-11	1/25/95	3/30/95	Judy Braslow (DOT)	For each OPO: # of actual donors, # of kidneys procured, # of kidneys transplanted, # of extra-renal organs procured, by organ, # of extra-renal organs transplanted, by organ	Yes		Yes	
795-2	1/27/95	2/08/95	Remy Aronoff	Names of patients on waiting list for all NJ transplant centers and all NJ residents listed in other states on 12/31/94 to include patient-specific info. Utilization data to include certain data elements	Yes		Yes	
395-3	2/3/95	2/08/95	Gwen Mayes (DOT)	For 1991-1994 for all organs, source of payment data for waiting list patients. Source of payment data for thoracic transplants	Yes		Yes	
795-3	2/7/95	2/08/95	Steve Smolinski (D.O.T.)	Data to include: CASU, CAUC, AZUA, and ALUA for 1994 lung patients: # of lung patients on the waiting list, # of patients added and transplanted, # of deaths on the waiting list	Yes		Yes	
595-1	2/15/95	2/24/95	Remy Aronoff	Top 25 donor hospitals for 1994	Yes		Yes	
495-7	2/24/95	3/08/95	Roy Hogberg (GAO)	For kidney waiting list patients during 1991-1993: MWT by OPO, # of Registrations, # on Waiting List, # Removed for transplant, # Deaths on Waiting List. Variables to include: Race, Gender, ABO, Age, and PRA Level	Yes		Yes	
2795-4	2/27/95	3/01/95	Gwen Mayes	Number of Hearts offered for transplant in 1994 (to include dates). Number and reasons for refusal for the calendar year 1994.	Yes		Yes	
1395-1	3/13/95	3/13/95	Remy Aronoff	Number of heart offers and refusal reasons for 1992-1995 for KSUK	Yes		Yes	
1495-3	3/14/95	3/20/95	Gwen Mayes	# and % of multiple listed patients on 12/31/94 by organ, gender, age, first vs. repeat transplants, state, # of registrations (2,3,4,...)	Yes		Yes	
1495-8	3/14/95	3/14/95	Mary Ganikos (DOT)	Number of Donors, Cadaveric vs. Living: 1993-1994	Yes		Yes	
1595-3	3/15/95	3/27/95	Remy Aronoff	Number of donors by race for each year, by region and state.	Yes		Yes	
1595-7	3/15/95	3/15/95	Gwen Mayes	Number of data requests that were done for a fee. Summary of data request hours by year. Number of programmed vs. non-programmed data requests. Source of data requests received by source of request.	Yes		Yes	
2295-1	3/22/95	4/21/95	Judy Braslow	Assess relationship between liver center volume and liver survival rates for older donors (50+ or 55+). Determine whether the percent of liver transplants involving older donor organs is related to center size.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data quest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
)495-1	4/4/95	4/10/95	Remy Aronoff	Number and percent of transplants by organ with source of payment recorded on TRR as being paid for by Medicare, Medicaid, Other Government Funds, All Other Sources of Payment	Yes		Yes	
)595-2	4/5/95	4/07/95	Roy Hogberg (GAO)	For 1991-1993, the number of kidneys procured by OPO and race, by OPO and ABO, and by OPO and race and ABO	Yes		Yes	
)595-3	4/5/95	4/18/95	Remy Aronoff	For liver patients, MWT by status, number of patients on the waiting list in 1994, number of patients removed from the waiting list in 1994, by reason, number of transplants by status in 1994, number of deaths on the waiting list in 1994 by status	Yes		Yes	
0695-3	4/6/95	4/07/95	Judy Braslow	For 1998-1994 liver and lung transplants, number of lung transplants for Barnes Hospital and for PAPT and PACH (92-94). Total number of liver transplants Pittsburgh has done. One year survival rates for liver transplants at Pittsburgh, live and cadaveric donors separately and together.	Yes		Yes	
1095-1	4/10/95	4/10/95	Remy Aronoff	Number of registrations added to the waiting list by year.	Yes		Yes	
1195-1	4/11/95	4/26/95	Gwen Mayes	Total number of transplants by region for 1993-1994. Total number on waiting list at year end of 1994 and 1994 by region. Total number of organs donated in 1993 and 1994 by region. Number of institutional members by region on 12/31/93 and 12/31/94-OPOs, Histo Labs, and Transplant Centers	Yes		Yes	
11895-5	4/18/95	4/18/95	Remy Aronoff	For liver transplants form 1989-1994. Number of transplants for U.S. and Pittsburgh hospitals. Number of registrations added to waiting list. Number of deaths on the waiting list vs. the number of patients waiting on 12/31. The number of transplants by center for 1994.	Yes		Yes	
42095-1	4/20/95	5/19/95	Remy Aronoff	For each OPO provide: Name, Address, ID number, number of patients on waiting list for cadaveric kidney at year end for 1987-1994, number of kidney transplant centers which contribute to the OPO waiting list, number of kidney transplants done at transplant centers for that OPO, number of procured cadaveric kidneys pers 100,000 population in the OPO, an indicator noting whether the OPO was a net importer or net exporter of kidneys during the year.	Yes		Yes	
42595-3	4/25/95	4/26/95	Judy Braslow	Number of liver transplants by center and status at transplant. Center volume by ages 0-10, 10-35, 35+. Status at transplant.	Yes		Yes	
50495-1	5/04/95	5/10/95	Philomena Greene (DOT)	Number of 1994 cadaveric donors by donor hospitals and sorted by OPO	Yes		Yes	
50895-1	5/08/95	5/09/95	Remy Aronoff	For 1994, number on the waiting list 12/31/94 by organ, by race. Number of donors by organ, by race. Number of transplants by	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data quest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
				organ, by race. MWT by organ, by race.				
195	6/1/95	6/1/95	Remy Aronoff	The median waiting times in days for liver patients by status for 1993.	Yes		Yes	
)895	6/8/95	6/9/95	Roy Hogberg (GAO)	Median waiting times for heart and liver by OPO and for the U.S. by race, gender, blood type, and age. Median waiting times for heart and liver patients by status at registration. The report should include median waiting times, the number of registrants, the number still waiting, the number of patients removed for transplant, and the number of waiting list deaths, for patients registered on the UNOS heart and liver waiting list during 1991-1993.	Yes		Yes	
1295	6/12/95	6/15/95	Remy Aronoff	Number of transplants by center, by organ and citizenship for 1994. Rank top five transplant centers with highest number of foreign nationals for 1994, by organ.	Yes		Yes	
1395	6/13/95	6/29/95	Remy Aronoff	For southern California kidney centers, a listing of all renal transplants, including patient names, during 1994. Also a list of those who were on the waiting list as of 12/31/94.	Yes		Yes	
2195	6/21/95	6/22/95	Vera Lake (DOT)	Number on waiting list who died waiting for an organ in 1994. What was the percentage increase in the number of people waiting for a kidney, heart, and liver transplant from December 1988 to December 1994.	Yes		Yes	
62195	6/21/95	6/22/95	Roy Hogberg	The number of hearts and livers procured by OPO and race, OPO and ABO, and OPO and race and ABO	Yes		Yes	
71295	071295	071395	Gwen Mayes	Number of days to transplant from change in status by status for liver patients entered in 1993 and 1994.	Yes		Yes	
71295	7/12/95	7/17/95	Gwen Mayes	By transplant center and year, the number of living donor kidney transplants broken out by recipient age and relation of donor to recipient	Yes		Yes	
71395	7/13/95	7/13/95	Judy Braslow	1994 donors by age group.	Yes		Yes	
71795	7/17/95	7/17/95	Gwen Mayes	Total number of transplants by organ performed in Georgia during 1994.	Yes		Yes	
71795	7/17/95	7/18/95	Gwen Mayes	For the following celebrities: Joe Moakley, David Crosby, Jim Nabors, John Phillips, David Woodley, how long did they wait, what was their status at transplant, and how long were they in their status. Also, is Erma Bombeck on the kidney waiting list, and how long has she been waiting.	Yes		Yes	
72495	7/24/95	8/7/95	Remy Aronoff	Number of cadaveric donors greater than 50 and greater than 60. 1 and 3-year survival rates for transplants with donors greater than	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data :quest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
				50 and greater than 60.				
1095-1	8/10/95	8/15/95	Gwen Mayes	Graft and patient survival for kidney and kidney-pancreas. Graft and patient survival for pancreas, pancreas-kidney, pancreas after kidney. Provide a copy of the abstract presented in Japan 1994 on pancreas volume effect.	Yes		Yes	
1095-4	8/10/95	8/30/95	Jenny Kitsen (HCFA)	To be done quarterly, number of kidney transplants by state by center, by year. Number of cadaveric donors by state by OPO.	Yes		Yes	
2595-3	8/25/95	9/11/95	Remy Aronoff	Total population in HCFA service area, U.S. census 1991 estimates population. Total population by race for 1991 census. For 1994, number of donors, number of organs recovered, number transplanted, number kidneys recovered, number of kidneys transplanted, number of organs per donor, number of donors by race.	Yes		Yes	
2895-6	8/28/95	9/08/95	Remy Aronoff	Graft and patient survival rates by diagnosis codes (use those categories that are included in the current annual report in progress)	Yes		Yes	
3095-1	8/30/95	9/11/95	Remy Aronoff	The number and percent of organs in the U.S. that have been transplanted into foreign nationals. The number of organs from the U.S. that have been exported to other countries, by country.	Yes		Yes	
1495-7	9/14/95	9/28/95	Remy Aronoff	Current waiting list-all patients, identifiers encrypted, by age, by ABO, by sex, by race, transplant center ID. Put in flat file with program appropriate for converting data to PC SAS files on diskettes	Yes		Yes	
10295-9	10/02/95	10/04/95	Remy Aronoff	How many small intestinal transplants have been done. Total for 1994 and 1995. Which centers did them and how many. Which centers have done a combination pediatric liver-intestine transplant.	Yes		Yes	
10495-2	10/04/95	10/04/95	Gwen Mayes	Number of donors for 1994.	Yes		Yes	
12795-1	10/27/95	10/27/95	Remy Aronoff	1995 (to date), number of transplants, number of cadaveric donors.	Yes		Yes	
13095-3	10/30/95	10/31/95	Remy Aronoff	Latest 1994 number of cadaveric donors by race.	Yes		Yes	
11595-1	11/15/95	11/20/95	Judy Braslow	MWT by OPO for heart and livers in 1991-1993.	Yes		Yes	
12295-7	11/22/95	11/29/95	Remy Aronoff	A listing of all patients registered in each of the areas of the programs listed (VA hospitals).	Yes		Yes	
20495	12/4/95	12/4/95	Gwen Mayes	A dataset of living kidney donor information for Dr. Carolyn Sparks, Department of Health Care Sciences	Yes		Yes	
21595-3	12/15/95	12/20/95	Judy Braslow	Kidney-Pancreas graft survival rates by center for 1988-1994.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data Request #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
895-10	12/18/95	01/05/96	Gwen Mayes	For a given transplant cohort (1993), the number of transplants by status at transplant, number that died within 3 months by status at transplant, of those that survived 3 months, what is their 1 year survival.	Yes		Yes	
095-3	12/20/95	12/20/95	Remy Aronoff	One year survival rates for liver transplants stratified by waiting list status at the time of transplant and transplant center volume.	Yes		Yes	
:296-5	1/22/96	5/14/96	Judy Braslow	'93-'95 By OPO: donors by: race,per million,per thousand, age, organs recovered per million, transplanted per million. # of organs imported and exported.	Yes		Yes	
:696-6	1/26/96	1/29/96	Gwen Mayes	The # of North Carolina residents that were tx'd at North Carolina liver programs. # of N. Carolinians tx'd outside of North Carolina.	Yes		Yes	
2996-10	1/29/96	1/29/96	Gwen Mayes	1,2,3,4 year graft and patient survival rates for liver,heart and lung transplants.	Yes		Yes	
0596-6	2/05/96	2/07/97	Philomena Green (DOT)	Total # of black and hispanic donors for '94 and Jan. thru Oct. '95. Cadaveric hospital donor data for Jan. thru Oct. '95.	Yes		Yes	
0596-10	2/05/96	2/13/96	Remy Aronoff	Total # and % of cadaveric donors by race for 1995. # of cadaveric donors by month from Jan. 1994 to Dec. 1995.	Yes		Yes	
2696-2	2/26/96	2/27/96	Remy Aronoff	The # of organs procurred and transplanted by organ, by OPO for 1995.	Yes		Yes	
:2696-3	2/26/96	2/27/96	Remy Aronoff	For 1995: # of transplants, # of deaths on the wait List, # of patients on the wait list at year end by race.	Yes		Yes	
:2796	2/27/96	2/27/96	Remy Aronoff	Offer/refusal informations and the number of transplants for William Beumon Hospital and the U.S. overall	Yes		Yes	
:2896-3	2/28/96	2/29/96	Remy Aronoff	Create a table showing what extra-renal programs are within each OPO area.	Yes		Yes	
30196-1	3/01/96	3/04/96	Remy Aronoff	For 1995: # and % of transplants by race. # of hearts recovered in the 1st 6 months vs. the last 6 months.	Yes		Yes	
30596-10	3/05/96	3/18/96	Remy Aronoff	The # of refusals for hearts by hospital for Jun. thru Dec. '94. MWT for kidney,liver & heart. Range in mwt for kidney across OPO's.	Yes		Yes	
30896-1	3/08/96	3/14/96	Remy Aronoff	Of the trauma patients listed, how many became donors. # of	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data Request #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
				donors at VTMC with NY state home addresses. Of the patients in #1, how many renal vs. non-renal were tx'd.				
31896-7	3/18/96	3/18/96	Remy Aronoff	The # of American Indian/Alaskan Native Donors in 1995.	Yes		Yes	
41096-3	4/10/96	4/15/96	Remy Aronoff	Policies 1,3.1 and 5, PGDS-20% and the "Nebraska/Home OPO" proposal over '92 thru '94 using historical data.	Yes		Yes	
41196-5	4/11/96	4/11/96	Venus Walker (DOT)	The # of transplants by race for 1995.	Yes		Yes	
41296-3	4/12/96	4/18/96	Remy Aronoff For Battelle	For the provided list of centers: listing of patients on the kidney wait list for 6mos. For kidney offers during '95 to these centers: list patient information. For kidney patients tx'd at these centers in '95: list patient information.	Yes		Yes	
41296-5	4/12/96	4/19/96	Claude Moen (HCFA)	The # of donors, organs recovered and organs transplanted by OPO for 1995.	Yes		Yes	
42296-3	4/22/96	4/23/96	Mark Horney (HCFA)	Names of OPO's and the transplant centers they serve.	Yes		Yes	
42696-4	4/26/96	4/29/96	Remy Aronoff	Listing of hospitals with donors and # of donors by OPO and region as provided in data request #020596-6. List of the top 50 donor hospitals and number of donors in each.	Yes		Yes	
050896-3	5/08/96	5/09/96	Remy Aronoff	Total # of data requests for 1995 to present by source of requestor. Copy of the requests completed in the last 30 days.	Yes		Yes	
051496-1	5/14/96	5/17/96	Mark Horney	MWT by OPO by organ. MWT by OPO, by organ, by transplant center.	Yes		Yes	
051896-1	5/18/96	5/30/96	Gwen Mayes	Re-run data request #012696-6, stratifying by county of residence.	Yes		Yes	
052296-1	5/22/96	5/22/96	Mary Ganikos	MWT by state for all organs.	Yes		Yes	
060796-2	6/07/96	6/11/96	Remy Aronoff	For '91-'95 in NC,SC & VA liver patients: for blacks and whites: provide # and % on the wait list and # and % transplanted.	Yes		Yes	
061196-7	6/11/96	6/11/96	Remy Aronoff	The # of cadaveric liver transplants by center in 1995.	Yes		Yes	
061296-2	6/12/96	6/18/96	Remy Aronoff	Re-run request #060796-2 for the U.S. for all organs, by year, by race.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data equest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
'0196-1	7/01/96	7/15/96	Remy Aronoff	The # of peds tx'd. Tx's by primary vs. secondary source of pymt. The # of pts identified as HIV+ after tx. The # of pts who have contracted HIV through transplanted organs.	Yes		Yes	
70996-2	7/09/96	7/11/96	Remy Aronoff	The # of non-heart beating donors by organ for '94 - '95.	Yes		Yes	
70996-3	7/09/96	11/97	Remy Aronoff	The # of local offers accepted or refused at each transplant center Jan '95 to Mar '96.	Yes		No	The data were requested for purpose of releasing to media. The data in question had not been collected for center-specific analysis and, for public release, required the development of both an appropriate analysis and modification of UNOS data release policies.
'71696-1	7/16/96	7/16/96	Remy Aronoff	The # of liver patients on the wait list at year end in the U.S. and at the University of Pittsburgh for '90 to '95.	Yes		Yes	
180296-1	8/02/96	8/06/96	Remy Aronoff	The # and % of liver transplants that were local, regional or national in 1995.	Yes		Yes	
080896-1	8/08/96	8/21/96	Remy Aronoff	The # of transplanted patients, donors and total patients on the wait list at year end in '94 and '95 for the attached zip codes.	Yes		Yes	
080996-2	8/09/96	8/16/96	Remy Aronoff	The # of donors in 1995 that tested positive for hepatitisC.	Yes		Yes	
081396-1	8/13/96	8/23/96	Gwen Mayes	For '93-'95 by transplant center for kidney: # of living donor tx's, related vs. unrelated.	Yes		Yes	
082096-5	8/20/96	9/04/96	Lorah Tidwell (HRSA)	List of the top 10 donor hospitals for 1995. If Orlando Regional Medical Center is not in the top 10, what is their rank.	Yes		Yes	
082396-1	8/23/96	9/04/96	Judy Braslow	ULAM run of UPMC liver policy proposal '96-'98. Compare with current policy and liver allocation advisory and Board proposals. Include pre-tx life years.	Yes		Yes	
090496-3	9/04/96	9/12/96	Remy Aronoff	Donors per million by OPO for 1995.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data Request #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
)0596-6	9/05/96	9/12/96	Judy Braslow	Liver graft and patient survival rates for MACH & PACP. The # of transplants at each center for '94 & '95.	Yes		Yes	
)1396-1	9/13/96	9/13/96	Gwen Mayes	The # of liver transplants by center in descending order.	Yes		Yes	
)1396-2	9/13/96	9/16/96	Remy Aronoff	Most recent information on comparisons of simultaneous KI/PA transplants and pancreas after kidney transplants.	Yes		Yes	
91696-1	9/16/96	9/20/96	Remy Aronoff	The # of donor organs coming into the U.S. from Canada & Mexico vs. # of organs going out of the U.S. to Canada & Mexico.	Yes		Yes	
93096-1	9/30/96	10/01/96	Remy Aronoff	One year survival rates for liver transplants done 11/87 to 12/93 by the following: female to female, female to male, male to male, male to female.	Yes		Yes	
01196-2	10/11/96	10/1196	Remy Aronoff	Data on centers doing 30-50 tx's per year. Revised spreadsheets with current modeling results. Modeling results of mwt by region & status. Modelled data on the effects of the "Inpatient First" liver allocation system. Pecent of deaths on the waitlist.	Yes		Yes	
01796-2	10/17/96	10/18/96	Judy Braslow	Donors per million for '94 & '95 for WRTC,CORE,VANO & the U.S.	Yes		Yes	
02196-1	10/21/96	10/21/96	Remy Aronoff	Liver primary and secondary sources of payment by center for 4/94 to 12/95.	Yes		Yes	
02296-1	10/22/96	10/22/96	Gwen Mayes	Comparison of 1995 and 1996 cadaveric donors.	Yes		Yes	
02496-2	10/24/96	10/31/96	Remy Aronoff	Total # of living donors related or unrelated for '88-'95.	Yes		Yes	
02896-2	10/28/96	10/28/96	Remy Aronoff	The # of people that died on the kidney waiting list in '95.	Yes		Yes	
02896-4	10/28/96	10/29/96	Gwen Mayes	Total # of cadaveric donors recovered at transplant centers for '94 to '95 by center.	Yes		Yes	
10796-3	11/07/96	11/07/96	Remy Aronoff	Data provided to Louise Jacobbi. By Region: population, donor hospitals and transplant centers.	Yes		Yes	
11896-9	11/18/96	12/19/96	Remy Aronoff	The # of foreign nationals transplanted by center by organ.	Yes		Yes	
12596-5	11/25/96	11/25/96	Remy Aronoff					

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data equest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
				Revision of the information sent to Louise Jacobbi for status 1 and 2 patients on the liver wait list snapshot.	Yes		Yes	
:1796-1	12/17/96	12/18/96	Remy Aronoff	The % and # of transplants where medicaid was the primary payer vs. seconday payer for 1995.	Yes		Yes	
:1996-1	12/19/96	12/19/96	Remy Aronoff	Revisions to dr#111896-9 broken out by transplant center for '90-'95	Yes		Yes	
21996-2	12/19/96	12/19/96	Judy Braslow	Survival rates on patients with hepatitis B and/or hepatitis C.	Yes		Yes	
10997-2	1/09/97	1/09/97	Remy Aronoff	Information on HIV+ donors and recipients.	Yes		Yes	
11597-3	1/15/97	1/17/97	Remy Aronoff	The # of abo type O donors that are transplanted into patients that are not abo type O for heart .	Yes		Yes	
11597-9	1/15/97	1/20/97	Gwen Mayes	By OPO and Transplant Center: HCFA designated population base. Kidney transplant centers affiliated with each OPO. The # of living donor kidney transplants done.	Yes		Yes	
21097-14	2/10/97	2/18/97	Remy Aronoff	Retrospective outcome information on patienst tx'd as status 1 and 2 as defined by the revised liver allocation policy. Any information we can provide about local discard rates vs. the shared discard rate--why the local rate is higher.	Yes		Yes	
032697-1	3/26/97	3/26/97	Remy Aronoff	Total # of cadaveric donors, transplants and deaths on the waiting list for 1996.	Yes		Yes	
032897-2	3/28/97	3/28/97	Remy Aronoff	Comparison of the "Inpatient First" policy to the current policy	Yes		Yes	
040797-4	4/7/97	4/9/97	Claude Moen (HCFA)	For 1996, By OPO, number of organs recovered, number of donors, number of organs transplanted.	Yes		Yes	
040797-11	4/7/97	4/21/97	Remy Aronoff	For the past 12 months, a listing of all data requests for DOT to include: what the request was for, was requested data sent, if no why, was data provided in the time frame requested, if not why.	Yes		Yes	
040797-13	4/7/97	4/7/97	Remy Aronoff	Total number of non-heartbeating donors for the years 92-95 to include names of the hospitals and OPOs where the organs were recovered	Yes		Yes	
041097-2	4/10/97	4/10/97	Remy Aronoff	1996 Donor Volumes by hospital	Yes		Yes	
041597-2	4/15/97	4/16/97	Remy Aronoff	Number of transplant centers that did not recover cadaveric donors	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data quest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
				in 1995-1996				
797-1	4/17/97	4/17/97	Remy Aronoff	Number of cadaveric donors by donor hospital for 1996	Yes		Yes	
:397-2	4/23/97	4/23/97	Remy Aronoff	Number of living donor liver segment transplants by age. Survival rates for ages 5 and under.	Yes		Yes	
'497-21	4/24/97	4/29/97	Remy Aronoff	For foreign nationals, number of patients listed in 1994-1996, number of patients transplanted 94-96, by the name of the country of residency.	Yes		Yes	
:997-11	4/29/97	4/29/97	Remy Aronoff	Employment status at 1 year for heart patients from 4/94-3/95 by age group.	Yes		Yes	
3097-2	4/30/97	5/7/97	Gwen Mayes	Frequency distribution of employment status variables submitted on the three year follow-up forms for all kidney patients 18 years old and up who had functioning grafts 3 years after receiving their transplants in 1991, 1992, and the first half of 1993.	Yes		Yes	
3097-13	4/30/97	5/5/97	Remy Aronoff	Source of payment, by organ with totals for transplants during 1994-1996, primary vs. secondary.	Yes		Yes	
0197-5	5/1/97	5/2/97	Remy Aronoff	Percent and number of American Indian donors, recipients, waiting list patients, and survival rates.	Yes		Yes	
1297-10	5/12/97	5/15/97	Remy Aronoff	Number of kidney and liver patients who lost a graft due to non-compliance or the inability to pay for medications.	Yes		Yes	
1597-1	5/15/97	5/15/97	Remy Aronoff	Tabulation of reasons for discarded organs that were not transplanted for cadaveric donors recovered 4/94-12/95	Yes		Yes	
1597-10	5/15/97	5/19/97	Remy Aronoff	Number of cadaveric donors recovered during April 1997 compared to April, 1996. Total number of cadaveric donors recovered 1/97-4/97. Preliminary results of the OPO fax survey regarding the 60 Minutes story.	Yes		Yes	
1697-10	5/16/97	5/16/97	Remy Aronoff	All donors hospitals that recovered non-heartbeating donors from 1992-1996	Yes		Yes	
2397-3	5/23/97	5/27/97	Remy Aronoff	Donor per million by OPO for 1996	Yes		Yes	
2997-3	5/29/97	5/30/97	Gwen Mayes	For liver, number of transplants by status for 1991-1996, center volume by year (1-7, 8-22, 23-45, 46+), center volume by year (1-10, 11-20, 21-50, 51-99, 100+), number of patients mulitply listed at year end 1994-1996, number of new registrations by region 1991-1996.	Yes		Yes	
0397-10	6/3/97	6/3/97	Mary Ganikos	Number of donors by OPO for 1996.	Yes		Yes	
1997-1	6/19/97	6/19/97	Remy Aronoff	Number of low, medium, and high volume transplant centers with volume ranges for liver, heart, and cadaveric kidney transplants.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data equest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
2797-1	6/27/97	6/27/97	Jennifer Grant (DOT)	Average number of organs per donor and the average number of organs transplanted per donor for 1988-1996.	Yes		Yes	
3097-1	6/30/97	6/30/97	Remy Aronoff	1996 Donors per million per OPO.	Yes		Yes	
0197-1	7/1/97	7/7/97	Remy Aronoff	For pediatrics less than 1 year old, the number currently on the waiting list, the number transplanted in 1996, and the number that died on the waiting list during 1996.	Yes		Yes	
0297-1	7/2/97	7/2/97	Jackie Sheridan (HCFA)	Liver survival rates by diagnosis for patients diagnosed with hepatitis B	Yes		Yes	
70797-1	7/7/97	7/7/97	Remy Aronoff	Donors per million population by OPO, 1992-1996, and the national average.	Yes		Yes	
71197-5	7/11/97	7/22/97	Roy Hogberg (GAO)	By OPO: 1994-1995 number and percent of donors by home city and state.	Yes		Yes	
71597-2	7/15/97	7/18/97	Remy Aronoff	Overall deaths on the waiting list for 1996. Number and percent of donors and transplants by race. 12/31/96 snapshot by race. Number and percent of deaths on the waiting list by race in 1996.	Yes		Yes	
71897-1	7/18/97	7/18/97	Remy Aronoff	Names of the liver transplant centers for previous data request where the names were encrypted.	Yes		Yes	
72297-7	7/22/97	7/22/97	Remy Aronoff	Number and percent of cadaveric donors discarded in 1996.	Yes		Yes	
72497-1	7/24/97	7/28/97	Remy Aronoff	1996 cadaveric donors by age.	Yes		Yes	
72897-1	7/28/97	7/29/97	Roy Hogberg (GAO)	Number of donors 75 and older.	Yes		Yes	
72897-2	7/28/97	7/30/97	Hal Davis (FDA)	Number of patients added to the waiting list for diagnosis codes 4100 and 4108. For diagnosis code 4100, list by drug.	Yes		Yes	
73197-3	7/31/97	8/6/97	Hal Davis	Number of patients added to the waiting list during 1995 and 1996 with acute hepatic necrosis (4100). Number of transplants by diagnosis.	Yes		Yes	
81297-5	8/12/97	8/14/97	Remy Aronoff	MWT for kidney patients by region for latest year available. For heart and kidney, after 1993, MWT by ABO and overall.	Yes		Yes	
90897-5	9/8/97	9/8/97	Remy Aronoff	Number of pediatric heart transplants by center and age group for 1995-1996. MWT for pediatric heart patients by age group and OPO for 1993-1996. Current waiting list for pediatric heart patients by age and OPO.	Yes		Yes	
90897-6	9/8/97	9/8/97	Remy Aronoff	Cadaveric donors in 1996 by OPO and donor hospital.	Yes		Yes	
91597-1	9/15/97	9/15/97	Mary Ganikos	Number on the waiting list and MWT by state of residence.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data Request #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
091797-1	9/17/97	9/17/97	Barbara Dombeck (DOT)	Number of Maryland residents on the waiting list as of August 31, 1997.	Yes		Yes	
092297-2	9/22/97	9/22/97	Mary Ganikos	Number and percent of blacks on the waiting list by organ.	Yes		Yes	
092997-4	9/29/97	9/29/97	Sarah Silverman (HRSA)	Number of transplants cadaveric vs. living. Number of deaths on the waiting list. Donors by race.	Yes		Yes	
093097-1	9/30/97	10/1/97	Sarah Silverman	Number of living donors by race. Number on the waiting list at year end.	Yes		Yes	
100297-4	10/2/97	10/2/97	Roy Hogberg (GAO)	Number on the waiting list at year end in 1996. Number of donors, number of transplants, and number of donors by race.	Yes		Yes	
101497-7	10/14/97	10/15/97	Rich Laeng (DOT)	By OPO and ABO for Georgia, Alabama, and Florida: the number of active kidney registrations waiting on 12/31/93. Number of additions to the kidney waiting list 1994-1996. Number of removals by removal code, 1994-1996. Number of kidney transplants by center, 1994-1996.	Yes		Yes	
102497-1	10/24/97	10/24/97	Sarah Silverman	1995 1-year survival rates.	Yes		Yes	
102797-3	10/27/97	10/28/97	Sarah Silverman	Donors and organs by race. Number of patients on the waiting list by race and organ.	Yes		Yes	
102997-3	10/29/97	10/30/97	Sarah Silverman	Number of transplants by race.	Yes		Yes	
110697	11/6/97	11/6/97	Judy Braslow	Number of registrations on U.S. waiting list as of 10/31/97 by state.	Yes		Yes	
111097-1	11/10/97	11/10/97	Gwen Mayes	Donors per million for 1994-1995.	Yes		Yes	
111397-4	11/13/97	11/14/97	Roy Hogberg (GAO)	Number of cadaveric donors by age group for 1996.	Yes		Yes	
120997-1	12/09/97	12/9/97	Gwen Mayes	Number of donors by state for 1993 and 1996, mainly for Illinois	Yes		Yes	
121897	12/18/97	12/18/97	Judy Braslow	Number of transplants during 1996 by organ and race. Number waiting on 12/31/96 by organ and race. Number waiting on 11/30/97 by organ and race.	Yes		Yes	
121897-9	12/18/97	12/18/97	Jennifer Grant (DOT)	Number of donors by race.	Yes		Yes	
010898-1	1/8/98	1/9/98	Sarah Silverman	Average age of cadaveric donors for 1994-1996. Donor cause of death and circumstances of death.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

Data equest #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
2398-3	1/23/98	1/23/98	Remy Aronoff	Number of deaths on the waiting list during 1997. Number and percent that were Black.	Yes		Yes	
2398-4	1/23/98	1/23/98	Marcia Newton (HCFA)	Definition of donor when collecting data on cadaveric donors.	Yes		Yes	
2998-9	1/29/98	1/29/98	Chris Haggar (HRSA)	Number and percent of cadaveric kidneys that are accepted for one patient and ultimately transplanted into a different patient at the same center.	Yes		Yes	
12998-10	1/29/98	2/19/98	Lindsey Bramwell (HRSA)	Enlarged chart of Center Specific Data liver transplant volumes vs. differences in actual and expected survival rates. 1-year survival rates for centers performing more than 12 transplants.	Yes		Yes	
20498-3	2/4/98	2/5/98	Remy Aronoff	Cadaveric donors by OPO for 1996. Percent of donors less than 55 by OPO.	Yes		Yes	
21998-7	2/19/98	2/19/98	Remy Aronoff	Number of patients on the waiting list by state of residency	Yes		Yes	
30398-8	3/3/98	3/3/98	Shana Olshan (HCFA)	Unstratified liver, heart, and lung, 1 and 2 year survival rates by center.	Yes		Yes	
32098-9	3/20/98	3/20/98	Mary Ganikos	Monthly snapshot of the waiting list on 2/28/98	Yes		Yes	
33198-6	3/31/98	4/8/98	Marcia Newton (HCFA)	Number of patients removed/added on the waiting list daily. Number on the waiting list at year end 1997. Number of cadaveric transplants in 1997.	Yes		Yes	
040298-8	4/2/98	4/8/98	Rich Laeng	By OPO: Number of organs recovered, used and exported. Local vs. shared.	Yes		Yes	
041098-9	4/10/98	4/10/98	Rich Laeng	For Liver: Number of deaths on the waiting list by center, by status (initial vs. final status).	Yes		Yes	
042498-1	4/24/98	4/24/98	Mary Ganikos	Number of patients on the waiting list by age group.	Yes		Yes	
043098-5	4/30/98	4/30/98	Marcia Newton (HRSA)	Number of cadaveric vs. living donors in 1997.	Yes		Yes	
050498-2	5/4/98	5/4/98	Rich Laeng	Number of donors and transplants done in 1997. 4/30/98 snapshot of the waiting list by race.	Yes		Yes	
050598-1	5/5/98	5/5/98	Mary Ganikos	Number of registrations on the waiting list on 12/31/97 by race.	Yes		Yes	
051198-10	5/11/98	5/12/98	Rich Laeng	By state: Net number of transplants done when organs were recovered in state and used out of state.	Yes		Yes	
051298-9	5/12/98	5/13/98	Rich Laeng	By OPO: Net number of zero mismatched kidney transplants done when kidneys were recovered by the opo and mandatorily shared outside the OPO.	Yes		Yes	

United Network for Organ Sharing
Government Data Requests: 1995-May,1998

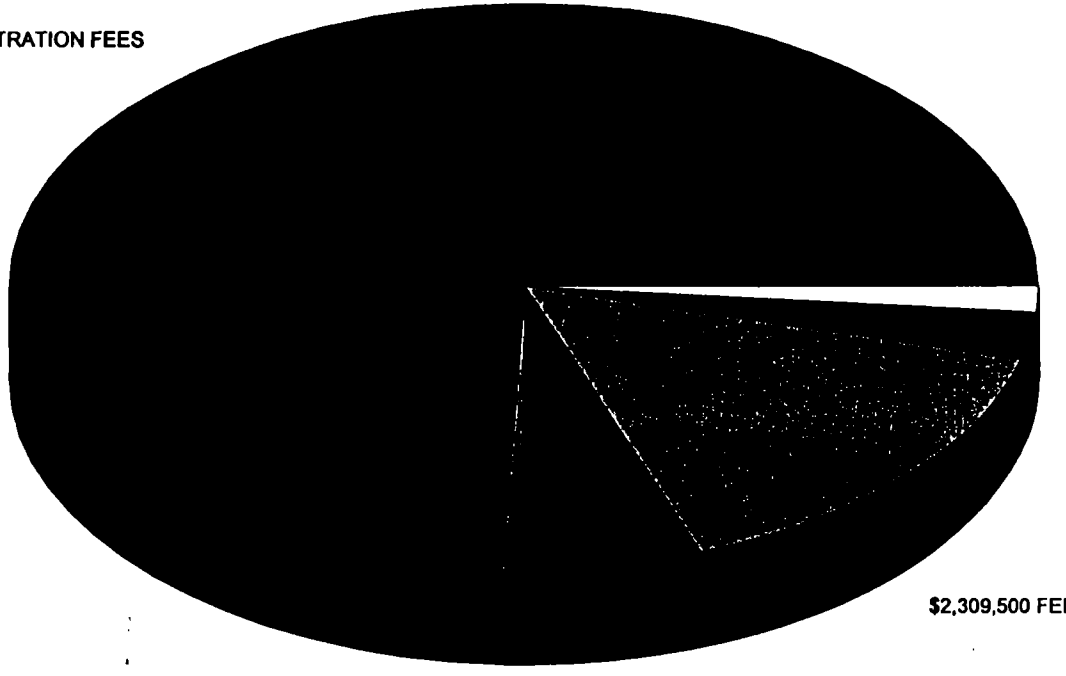
Data Request #	Date Requested	Date Request Completed	Name of Requestor	Data Requested	Was Requested Data Provided? Yes or No	If not, why	Was requested data provided within time frame suitable to requester? Yes or No	If not, why?
051498-4	5/14/98	5/18/98	Sarah Silverman	Number of cadaveric donors age 15-34, by race and gender.	Yes		Yes	
052698-1	5/26/98	5/27/98	Rich Laeng	State specific data (by organ): Number of transplants for in state residents vs. out of state residents shown seperately.	Yes		Yes	
052798-1	5/27/98	5/28/98	Nancy Layton (HCFA, Iowa Medicaid Agency	Number of transplants by source of payment. Number of secondary source of payment transplants for medicaid.	Yes		Yes	
061298	6/12/98	6/12/98	Mary Ganikos	Number and percentage of cadaveric donors by race in 1997	Yes		Yes	
061598-1	6/15/98	6/16/98	Jon Nelson Lynn Wegman	Names of transplant programs, by organ type, with more than 5% non-resident alien transplants in 1997, Waiting list registrations by citizenship on 12/31/97, Number of organs imported into U.S. and number exported, by year from 1988-1997, Information regarding UNOS rationale for transplanting foreign nationals and limiting foreign national transplants in U.S.	Yes		Yes	

ATTACHMENT C

Attachment C

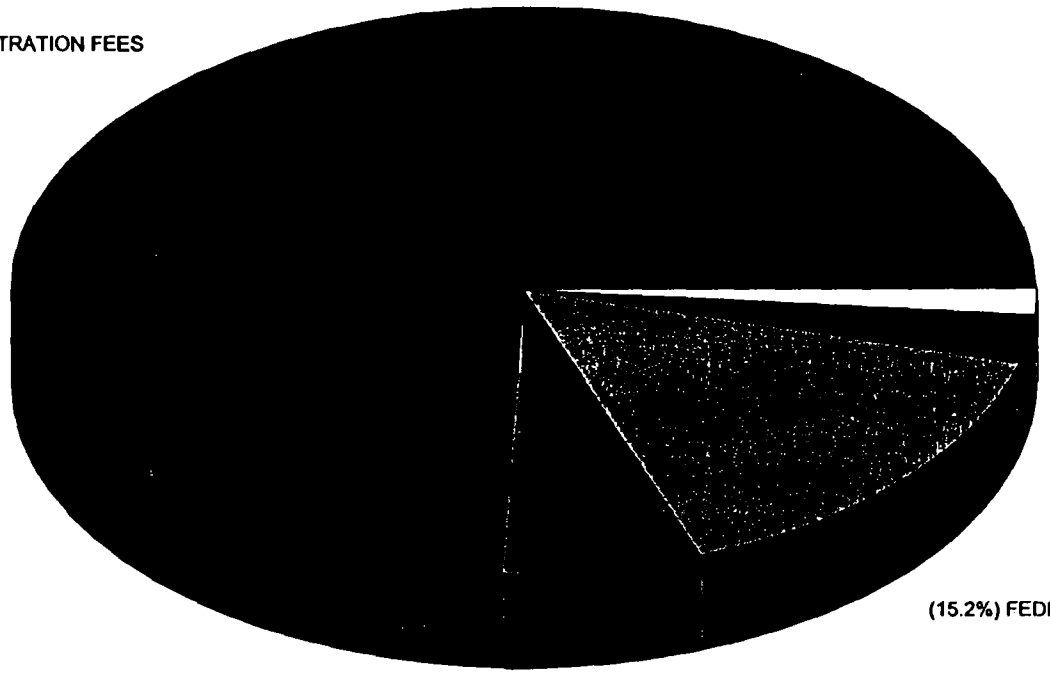
UNOS OPERATING REVENUES - 1997

GROSS REVENUES - $15,207,000



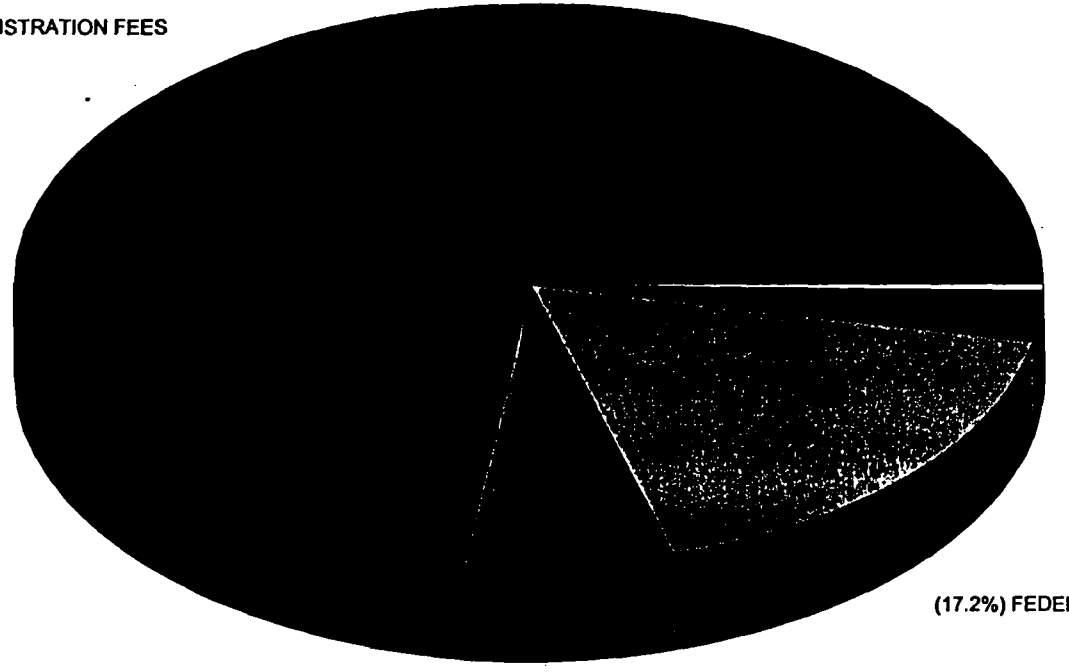
UNOS OPERATING REVENUES - 1997

GROSS REVENUES - $15,207,000



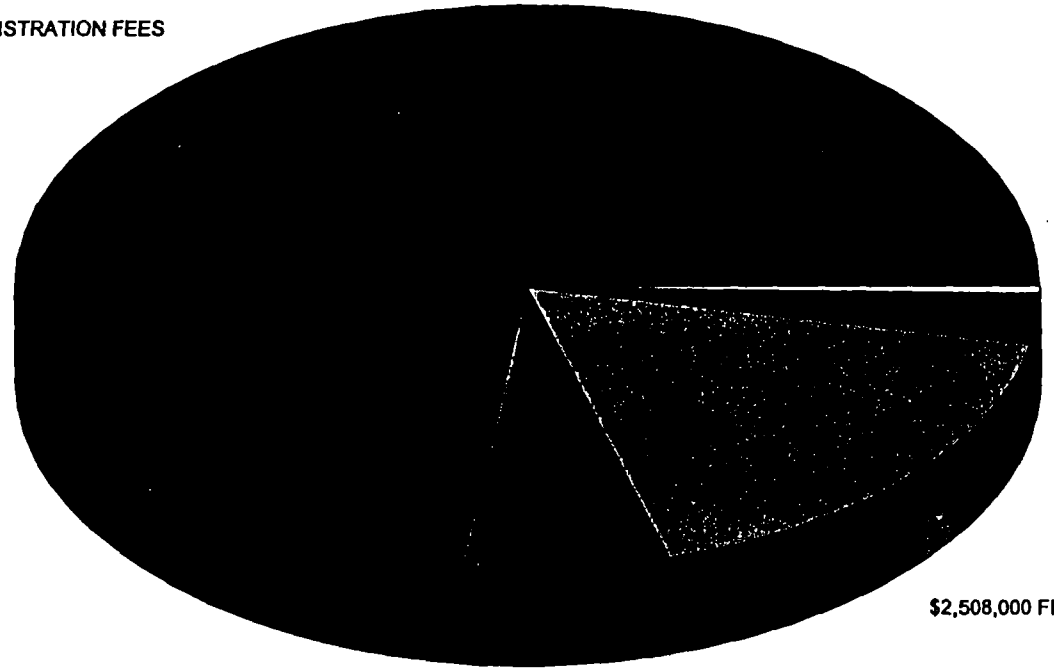
UNOS OPERATING REVENUES - 1996

GROSS REVENUES - $14,578,000



UNOS OPERATING REVENUES - 1996

GROSS REVENUES - $14,578,000



ARTHUR ANDERSEN LLP

United Network for Organ Sharing

Financial Statements
As of December 31, 1997 and 1996
Together With Auditors' Report

ARTHUR ANDERSEN LLP

Report of Independent Public Accountants

To the Board of Directors of
United Network for Organ Sharing:

We have audited the accompanying statement of financial position of the United Network for Organ Sharing ("UNOS"), a Virginia not-for-profit corporation, as of December 31, 1997, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of UNOS' management. Our responsibility is to express an opinion on these financial statements based on our audit. The financial statements of UNOS as of December 31, 1996, were audited by other auditors whose report dated April 7, 1997, expressed an unqualified opinion on these statements.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of UNOS as of December 31, 1997, and the changes in its net assets and its cash flows for the year then ended in conformity with generally accepted accounting principles.

Arthur Andersen LLP

Richmond, Virginia
April 22, 1998

United Network for Organ Sharing

Statements of Financial Position
As of December 31, 1997 and 1996

Assets

	1997	1996
Cash and cash equivalents	$ 842,603	$ 58,649
Investments	228,799	749,000
Accounts receivable:		
Registration fees	1,799,453	1,900,320
Government contracts	464,322	849,152
Other	389,843	380,427
Total accounts receivable	2,653,618	3,129,899
Prepaid expenses	196,525	121,362
Total current assets	3,921,545	4,058,910
Furniture and equipment, net	2,004,890	1,762,840
Capitalized software costs, net	226,273	813,782
Long-term investments	400,000	235,000
Other assets, net	166,048	351,358
Total assets	$6,718,756	$7,221,890

Liabilities and Net Assets

Current maturities of long-term obligations	$ 323,910	$ 475,031
Accounts payable:		
Trade	349,340	614,004
Subcontractors	331,302	403,795
Other	753,555	740,247
Total accounts payable	1,434,197	1,758,046
Accrued pension expense	53,321	423,149
Accrued compensated absences	323,656	287,026
Total current liabilities	2,135,084	2,943,252
Long-term obligations, less current maturities	103,625	22,998
Other liabilities	350,009	419,429
Total liabilities	2,588,718	3,385,679
Net assets:		
Unrestricted - undesignated	3,446,976	3,202,364
Unrestricted - board designated-		
Funded depreciation	536,760	460,636
Council on Organ Availability	49,655	104,011
Total unrestricted net assets	4,033,391	3,767,011
Temporarily restricted	96,647	69,200
Total net assets	4,130,038	3,836,211
Total liabilities and net assets	$6,718,756	$7,221,890

The accompanying notes are an integral part of these statements.

Network and Member Services	Management and General	Fund-raising	1997 Total
$11,302,188	$ -	$ -	$11,302,188
-	-	-	610,463
-	-	-	1,698,805
424,525	-	-	424,525
5,292	-	-	5,292
80,604	-	-	80,604
869,539	-	-	869,539
188,309	-	-	188,309
12,870,457	-	-	15,179,725
1,796,084	1,104,667	51,559	6,267,895
423,020	268,175	12,635	1,507,087
49,280	30,487	-	119,656
535,101	224,156	-	1,349,575
-	-	-	407,369
47,596	29,445	-	116,765
483,767	431,550	20,308	1,168,314
-	-	-	5,597
59,195	16,068	-	380,778
59,857	37,031	-	102,083
119,805	74,116	-	280,303
47,166	29,179	-	550,653
23,033	13,443	-	148,328
801,425	495,800	-	1,326,770
312,660	-	-	312,660
424,525	-	-	424,525
167,102	80,504	14,365	444,987
5,349,616	2,834,621	98,867	14,913,345
$ 7,520,841	$(2,834,621)	$(98,867)	266,380
			215,756
			(188,309)
			27,447
			293,827
			3,836,211
			$ 4,130,038

Network and Member Services	Management and General	Fund-raising	1996 Total
$10,630,290	$ -	$ -	$10,630,290
-	-	-	800,942
-	-	-	1,707,404
4,764	-	-	4,764
81,405	-	-	81,405
431,050	-	-	431,050
876,516	-	-	876,516
88,996	-	-	88,996
12,113,021	-	-	14,621,367
1,460,725	785,897	16,891	5,998,430
384,952	206,990	4,447	1,581,404
50,357	27,091	-	99,441
1,141,759	38,353	1,084	1,795,544
-	-	-	559,871
125,703	67,626	-	224,261
444,895	381,523	16,998	1,139,181
65,150	10,061	-	435,058
-	-	-	117,342
48,529	5,236	-	90,205
127,386	68,532	-	285,541
23,605	12,700	-	517,518
12,634	6,797	-	159,654
54,377	29,255	-	565,369
325,135	-	-	325,135
431,050	-	-	431,050
70,929	23,843	7,096	409,528
4,767,186	1,663,904	46,516	14,734,532
$ 7,345,835	$(1,663,904)	$(46,516)	(113,165)
			46,000
			(88,996)
			(42,996)
			(156,161)
			3,992,372
			$ 3,836,211

United Network for Organ Sharing

Statements of Cash Flows
For the Years Ended December 31, 1997 and 1996

	1997	1996
Cash flows from operating activities:		
Change in net assets	$ 293,827	$ (156,161)
Adjustments to reconcile change in net assets to net cash provided by operating activities-		
Depreciation and amortization	1,326,770	565,369
Loss on disposal of furniture and equipment	22,264	3,379
Change in:		
Accounts receivable	476,281	416,554
Prepaid expenses	(75,163)	(30,698)
Other assets	(17,192)	(223,493)
Unearned contract revenues	-	(760,051)
Accounts payable, accrued expenses, and other liabilities	(726,467)	307,964
Net cash provided by operating activities	1,300,320	122,863
Cash flows from investing activities:		
Additions to furniture and equipment	(822,598)	(634,380)
Proceeds from sale of furniture and equipment	21,525	4,031
Additions to capitalized software costs	-	(490,698)
Purchases of investments	(493,799)	(335,000)
Proceeds from sale of investments	849,000	489,536
Net cash used in investing activities	(445,872)	(966,511)
Cash flows from financing activities:		
Proceeds from long-term obligations	331,869	413,238
Repayments of long-term obligations	(402,363)	(251,158)
Net cash (used in) provided by financing activities	(70,494)	162,080
Increase (decrease) in cash and cash equivalents	783,954	(681,568)
Cash and cash equivalents, beginning of year	58,649	740,217
Cash and cash equivalents, end of year	$ 842,603	$ 58,649

The accompanying notes are an integral part of these statements.

ATTACHMENT D

United Network for Organ Sharing

OPO Key

OPO Code	OPO Name	OPO Location
ALOB	ALABAMA ORGAN CENTER	BIRMINGHAM AL
AROR	ARKANSAS REG ORGAN REC AGENCY	LITTLE ROCK AR
AZOB	DONOR NETWORK OF ARIZONA	PHOENIX AZ
CADN	CALIFORNIA TRANSP DONOR NETWK	SAN FRANCISCO CA
CAGS	GOLDEN STATE TRANSPLANT SERV.	SACRAMENTO CA
CAOP	SOUTHERN CALIFORNIA ORGAN PROCUREMENT	LOS ANGELES CA
CARO	R OPA OF SOUTHERN CALIFORNIA	LOS ANGELES CA
CASD	UCSD-ORGAN & TISSUE ACQ. CTR.	SAN DIEGO CA
CORS	DONOR ALLIANCE	DENVER CO
CTHH	NORTHEAST OPO & TISSUE BANK	HARTFORD CT
DCTC	WASHINGTON REG TRANSPLANT CNST	FALLS CHURCH VA
FLFH	FLORIDA HOSPITAL - TRANSLIFE	ORLANDO FL
FLMP	UNIVERSITY OF MIAMI OPO	MIAMI FL
FLSW	LIFELINK OF SOUTHWEST FLORIDA	FORT MYERS FL
FLUF	SHANDS HOSPITAL - U OF FL. OPO	GAINESVILLE FL
FLWC	LIFELINK OF FLORIDA	TAMPA FL
GALL	LIFELINK OF GEORGIA	ATLANTA GA
[redacted]AMC	MEDICAL COLLEGE OF GEORGIA HOS	AUGUSTA GA
[redacted]OP	ORGAN DONOR CENTER OF HAWAII	HONOLULU HI
IAOP	IOWA STATEWIDE OPO	IOWA CITY IA
ILIP	REGIONAL ORGAN BANK - ILLINOIS	CHICAGO IL
INOP	INDIANA ORGAN PROCUREMENT ORG	INDIANAPOLIS IN
KYDA	KENTUCKY ORGAN DONOR AFFIL	LEXINGTON KY
LAOP	LOUISIANA ORGAN PROC AGENCY	METAIRIE LA
MAOB	NEW ENGLAND ORGAN BANK	NEWTON MA
MDPC	TRANSPLANT RESOURCE OF MD	BALTIMORE MD
MIOP	TRANSPLANTATION SOCIETY OF MICHIGAN	ANN ARBOR MI
MNOP	LIFESOURCE/UPPER MIDWEST OPO	MINNEAPOLIS MN
MOMA	MID-AMERICA TRANSPLANT SERVICES	ST. LOUIS MO
MSUM	UNIV. OF MISSISSIPPI OPO	JACKSON MS
MWOB	MIDWEST ORGAN BANK OPA	WESTWOOD KS
NCBG	CAROLINA LIFECARE	WINSTON-SALEM NC
NCCM	LIFESHARE OF THE CAROLINAS	CHARLOTTE NC
NCNC	CAROLINA ORGAN PROC AGENCY	GREENVILLE NC
NEOR	NEBRASKA ORGAN RETRIEVAL SYS.	OMAHA NE
NJTO	NEW JERSEY ORGAN & TIS SHARING	SPRINGFIELD NJ
NMOP	NEW MEXICO DONOR PROGRAM	ALBUQUERQUE NM
NVLV	NEVADA DONOR ORGAN REF SERVICE	LAS VEGAS NV
[redacted]YAP	CENTER FOR DONATION AND TRANSPLANT	ALBANY NY
[redacted]YFL	FINGER LAKES DONOR RECOVERY NETWORK	ROCHESTER NY
NYRT	NEW YORK ORGAN DONOR NETWORK	NEW YORK NY

United Network for Organ Sharing

OPO Key

OPO Code	OPO Name	OPO Location
NYSB	SUNY AT STONY BROOK OPO	STONY BROOK NY
NYWN	UPSTATE NEW YORK TRNSPLT SERVS	BUFFALO NY
OHLB	LIFEBANC OF OHIO	CLEVELAND OH
OHLC	LIFE CONNECTION OF OHIO	MAUMEE OH
OHLP	LIFELINE OF OHIO ORGAN PROC	COLUMBUS OH
OHOV	OHIO VALLEY LIFECENTER	CINCINNATI OH
OKOP	OKLAHOMA ORGAN SHARING NETWORK	OKLAHOMA CITY OK
ORUO	OREGON HEALTH SCIENCES UNIV HO	PORTLAND OR
PADV	DELAWARE VALLEY TRANSP PROG	PHILADELPHIA PA
PATF	CENTER FOR ORGAN RECOVERY	PITTSBURGH PA
PRLL	LIFELINK OF PUERTO RICO	GUAYNABO PR
SCOP	SOUTH CAROLINA OPA	CHARLESTON SC
TNDS	TENNESSEE DONOR SVCS NASHVILLE	NASHVILLE TN
TNET	LIFE RESOURCES REG DONOR CNTR	JOHNSON CITY TN
TNMS	MID-SOUTH TRANSPLANT FNDN	MEMPHIS TN
TXAD	BRACKENRIDGE HOSPITAL	AUSTIN TX
TXGC	LIFEGIFT ORGAN DONATION CENTER	HOUSTON TX
TXSA	SOUTH TEXAS ORGAN BANK	SAN ANTONIO TX
TXSB	SOUTHWEST TRANSPLANT ALLIANCE	DALLAS TX
UTOP	INTERMOUNTAIN ORGAN RECOVERY	SALT LAKE CITY UT
VAOP	VIRGINIAS' ORGAN PROC. AGENCY	MIDLOTHIAN VA
VATB	LIFENET	VIRGINIA BEACH VA
WALC	LIFECENTER NORTHWEST	MERCER ISLAND WA
WANW	NORTHWEST KIDNEY CENTER	SEATTLE WA
WASH	SACRED HEART MEDICAL CENTER	SPOKANE WA
WISE	FROEDTERT MEM. HOSPITAL - OPO	MILWAUKEE WI
WIUW	UNIVERSITY OF WISCONSIN OPO	MADISON WI

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Heart-Lung

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	2	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	4	2	50.0	2	0	0.0	0	0	0.0	1	0	0.0
AZOB	1	1	100.0	4	0	0.0	1	0	0.0	1	0	0.0	7	0	0.0	5	2	40.0	3	1	33.3	3	0	0.0
CADN	10	0	0.0	9	0	0.0	3	0	0.0	3	0	0.0	11	2	18.2	15	0	0.0	5	0	0.0	9	0	0.0
CAGS	2	2	100.0	1	1	100.0	0	0	0.0	1	1	100	3	3	100.0	0	0	0.0	0	0	0.0	1	1	100.0
CAOP	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	2	2	100.0	0	0	0.0	1	0	0.0	0	0	0.0
CARO	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100	0	0	0.0	2	1	50.0	0	0	0.0	1	1	100.0
CASD	1	0	0.0	1	0	0.0	2	0	0.0	4	1	25.0	3	0	0.0	2	1	50.0	3	1	33.3	2	0	0.0
CORS	3	2	66.7	1	0	0.0	0	0	0.0	1	1	100.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
CTHH	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0
DCTC	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0
FLFH	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
FLMP	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	1	1	100.0	1	1	100.0
FLUF	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
FLWC	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	0	0	0.0
GALL	0	0	0.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
IAOP	0	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	2	1	50.0	1	1	100.0	0	0	0.0	0	0	0.0
ILIP	0	0	0.0	3	0	0.0	2	1	50.0	5	1	20.0	4	1	25.0	3	0	0.0	3	2	66.7	1	0	0.0
INOP	1	0	0.0	0	0	0.0	2	1	50.0	1	0	0.0	0	0	0.0	3	1	33.3	0	0	0.0	1	0	0.0
KYDA	0	0	0.0	0	0	0.0	0	0	0.0	3	0	0.0	2	0	0.0	2	0	0.0	1	0	0.0	1	0	0.0
LAOP	1	0	0.0	2	2	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
MAOB	5	1	20.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
MDPC	3	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0
MIOP	0	0	0.0	1	0	0.0	2	0	0.0	1	0	0.0	3	1	33.3	2	1	50.0	1	0	0.0	3	2	66.7
MNOP	7	0	0.0	4	1	25.0	1	0	0.0	3	1	33.3	7	1	14.3	1	0	0.0	3	1	33.3	6	1	16.7
MOMA	1	1	100.0	0	0	0.0	1	0	0.0	6	1	16.7	1	0	0.0	2	0	0.0	1	1	100.0	3	0	0.0
MSUM	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
MWOB	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
NCNC	0	0	0.0	1	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	4	0	0.0	0	0	0.0	2	0	0.0
NEOR	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
NJTO	1	1	100.0	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0
NMOP	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
NVLV	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
NYAP	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	2	2	100.0	0	0	0.0	0	0	0.0	4	4	100.0
NYFL	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0
NYRT	2	0	0.0	2	0	0.0	4	2	50.0	2	0	0.0	1	0	0.0	1	1	100.0	1	0	0.0	0	0	0.0
NYSB	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
NYWN	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Heart-Lung

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
OHLB	0	0	0.0	0	0	0.0	1	0	0.0	2	1	50.0	0	0	0.0	0	0	0.0	1	0	0.0	2	2	100.0
OHLC	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
OHLP	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0
ORUO	1	1	100.0	1	1	100.0	1	1	100.0	3	1	33.3	1	1	100.0	2	2	100.0	1	0	0.0	0	0	0.0
PADV	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0	1	0	0.0	2	0	0.0	5	0	0.0
PATF	1	0	0.0	2	0	0.0	11	0	0.0	7	0	0.0	1	0	0.0	3	0	0.0	3	1	33.3	1	0	0.0
SCOP	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0	2	1	50.0	0	0	0.0	0	0	0.0	0	0	0.0
TNDS	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	4	1	25.0	1	0	0.0	3	3	100.0
TNET	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
TNMS	0	0	0.0	2	1	50.0	0	0	0.0	1	0	0.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	1	50.0	0	0	0.0	0	0	0.0
TXSA	0	0	0.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	0	0	0.0
TXSB	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	2	0	0.0	1	1	100.0	0	0	0.0	5	3	60.0
UTOP	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
VAOP	0	0	0.0	4	2	50.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
VATB	2	0	0.0	1	0	0.0	0	0	0.0	3	1	33.3	3	1	33.3	1	0	0.0	1	0	0.0	0	0	0.0
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0
WANW	1	1	100.0	1	1	100.0	2	2	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
WASH	2	2	100.0	2	0	0.0	3	0	0.0	1	0	0.0	0	0	0.0	2	0	0.0	1	0	0.0	0	0	0.0
WISE	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
WIUW	0	0	0.0	0	0	0.0	2	0	0.0	0	0	0.0	1	0	0.0	1	1	100.0	1	0	0.0	2	1	50.0
TOTAL	52	15	28.8	51	15	29.4	48	13	27.1	60	18	30.0	70	19	27.1	70	21	30.0	39	12	30.8	62	22	35.5

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on late data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Kidney-Pancreas

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	5	0	0.0	0	0	0.0	8	0	0.0	10	1	10.0	13	0	0.0	2	1	50.0	7	0	0.0	6	0	0.0
AROR	0	0	0.0	6	0	0.0	5	0	0.0	12	2	16.7	10	0	0.0	10	0	0.0	8	0	0.0	7	1	14.3
AZOB	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	2	2	100.0	8	7	87.5	6	4	66.7	10	10	100.0
CADN	24	2	8.3	12	0	0.0	20	3	15.0	35	0	0.0	28	1	3.6	48	0	0.0	39	0	0.0	28	1	3.6
CAGS	5	3	60.0	3	1	33.3	5	1	20.0	7	1	14.3	9	0	0.0	9	1	11.1	7	0	0.0	9	0	0.0
CAOP	2	2	100.0	1	1	100.0	0	0	0.0	9	9	100.0	13	7	53.8	29	0	0.0	20	0	0.0	31	7	22.6
CARO	2	1	50.0	0	0	0.0	1	1	100.0	2	0	0.0	12	0	0.0	11	1	9.1	17	17	100.0	16	12	75.0
CASD	3	3	100.0	4	4	100.0	7	2	28.6	6	4	66.7	8	1	12.5	6	1	16.7	3	0	0.0	3	1	33.3
CORS	17	12	70.6	13	13	100.0	8	7	87.5	24	11	45.8	17	2	11.8	32	2	6.3	26	0	0.0	21	1	4.8
CTHH	2	1	50.0	4	1	25.0	3	0	0.0	3	0	0.0	4	1	25.0	4	0	0.0	0	0	0.0	1	0	0.0
DCTC	22	0	0.0	13	0	0.0	25	0	0.0	22	0	0.0	28	1	3.6	30	6	20.0	27	5	18.5	19	2	10.5
FLFH	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	3	3	100.0	1	1	100.0
FLMP	2	1	50.0	5	1	20.0	5	2	40.0	7	1	14.3	22	2	9.1	25	6	24.0	16	2	12.5	28	1	3.6
FLUF	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	3	2	66.7	8	2	25.0	5	3	60.0
FLWC	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	2	2	100.0	0	0	0.0	1	1	100.0	0	0	0.0
GALL	6	0	0.0	6	0	0.0	6	0	0.0	11	1	9.1	10	0	0.0	12	0	0.0	14	0	0.0	17	1	5.9
GAMC	3	3	100.0	1	1	100.0	2	2	100.0	5	3	60.0	4	3	75.0	0	0	0.0	0	0	0.0	0	0	0.0
HIOP	0	0	0.0	0	0	0.0	1	1	100.0	1	0	0.0	2	0	0.0	0	0	0.0	2	0	0.0	2	0	0.0
IAOP	6	1	16.7	15	5	33.3	16	5	31.3	11	2	18.2	16	7	43.8	10	2	20.0	13	5	38.5	14	2	14.3
ILIP	15	0	0.0	19	1	5.3	4	0	0.0	15	0	0.0	40	0	0.0	47	0	0.0	46	0	0.0	75	0	0.0
INOP	8	0	0.0	5	0	0.0	6	1	16.7	6	1	16.7	9	1	11.1	6	1	16.7	11	1	9.1	4	0	0.0
KYDA	11	4	36.4	9	7	77.8	4	3	75.0	5	2	40.0	16	4	25.0	16	6	37.5	22	3	13.6	20	9	45.0
LAOP	3	0	0.0	6	1	16.7	3	0	0.0	4	0	0.0	16	0	0.0	26	0	0.0	18	0	0.0	13	0	0.0
MAOB	19	0	0.0	6	0	0.0	10	0	0.0	11	0	0.0	10	0	0.0	10	1	10.0	9	1	11.1	8	1	12.5
MDPC	0	0	0.0	8	0	0.0	15	1	6.7	22	1	4.5	15	0	0.0	30	0	0.0	15	0	0.0	18	0	0.0
MIOP	3	1	33.3	6	6	100.0	12	2	16.7	32	7	21.9	44	11	25.0	30	2	6.7	26	0	0.0	18	0	0.0
MNOP	30	1	3.3	19	0	0.0	40	1	2.5	40	1	2.5	55	3	5.5	47	2	4.3	36	1	2.8	37	6	16.2
MOMA	14	1	7.1	11	0	0.0	12	1	8.3	14	0	0.0	9	0	0.0	13	0	0.0	7	1	14.3	6	0	0.0
MSUM	1	1	100.0	0	0	0.0	0	0	0.0	2	2	100.0	1	1	100.0	2	2	100.0	1	1	100.0	1	1	100.0
MWOB	5	1	20.0	1	0	0.0	3	0	0.0	1	0	0.0	2	1	50.0	6	4	66.7	0	0	0.0	2	1	50.0
NCBG	9	9	100.0	3	3	100.0	4	3	75.0	0	0	0.0	4	4	100.0	4	4	100.0	0	0	0.0	2	2	100.0
NCCM	0	0	0.0	1	1	100.0	4	4	100.0	5	5	100.0	6	5	83.3	5	1	20.0	8	0	0.0	11	5	45.5
NCNC	6	2	33.3	12	4	33.3	7	5	71.4	14	4	28.6	13	1	7.7	26	9	34.6	25	7	28.0	11	1	9.1
NEOR	12	0	0.0	22	0	0.0	12	1	8.3	9	0	0.0	14	1	7.1	15	0	0.0	12	0	0.0	12	1	8.3
NJTO	1	1	100.0	0	0	0.0	6	2	33.3	3	3	100.0	4	4	100.0	20	6	30.0	21	7	33.3	18	3	16.7
NVLV	1	1	100.0	5	5	100.0	1	1	100.0	2	1	50.0	0	0	0.0	0	0	0.0	0	0	0.0	5	0	0.0
NYAP	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	8	2	25.0	2	0	0.0	3	0	0.0	4	0	0.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Kidney-Pancreas

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYFL	0	0	0.0	0	0	0.0	3	1	33.3	5	0	0.0	6	1	16.7	14	0	0.0	14	2	14.3	10	0	0.0
NYRT	0	0	0.0	1	0	0.0	3	0	0.0	4	0	0.0	6	0	0.0	9	0	0.0	10	0	0.0	25	1	4.0
NYWN	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	0	0.0	1	0	0.0
OHLB	12	0	0.0	9	0	0.0	9	0	0.0	12	1	8.3	13	0	0.0	16	0	0.0	17	0	0.0	13	0	0.0
OHLC	1	1	100.0	5	5	100.0	6	6	100.0	3	3	100.0	1	1	100.0	5	5	100.0	1	1	100.0	3	3	100.0
OHLP	39	0	0.0	37	3	8.1	33	0	0.0	44	0	0.0	49	6	12.2	37	0	0.0	42	0	0.0	31	1	3.2
OHOV	11	6	54.5	7	1	14.3	16	7	43.8	18	1	5.6	11	0	0.0	15	1	6.7	9	0	0.0	6	0	0.0
OKOP	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	1	50.0	6	0	0.0	4	0	0.0
ORUO	9	3	33.3	5	3	60.0	17	17	100.0	13	7	53.8	20	12	60.0	18	14	77.8	10	4	40.0	9	4	44.4
PADV	29	1	3.4	26	2	7.7	36	1	2.8	29	3	10.3	12	0	0.0	26	4	15.4	37	16	43.2	41	7	17.1
PATF	2	0	0.0	6	5	83.3	0	0	0.0	8	2	25.0	26	5	19.2	46	3	6.5	42	0	0.0	34	0	0.0
PRLL	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
SCOP	1	1	100.0	7	0	0.0	4	1	25.0	3	0	0.0	3	0	0.0	5	0	0.0	11	0	0.0	10	0	0.0
TNDS	4	1	25.0	6	3	50.0	4	2	50.0	11	9	81.8	4	4	100.0	9	9	100.0	10	10	100.0	20	20	100.0
TNET	2	2	100.0	2	2	100.0	1	1	100.0	4	4	100.0	3	3	100.0	2	1	50.0	4	2	50.0	2	2	100.0
TNMS	12	4	33.3	4	1	25.0	4	0	0.0	5	3	60.0	4	1	25.0	6	1	16.7	7	1	14.3	9	1	11.1
TXAD	3	3	100.0	4	4	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	4	0	0.0	7	1	14.3	4	1	25.0	6	0	0.0	3	1	33.3	6	2	33.3	4	2	50.0	6	1	16.7
TXSA	3	0	0.0	5	2	40.0	4	1	25.0	4	0	0.0	3	0	0.0	6	1	16.7	5	0	0.0	5	2	40.0
TXSB	20	2	10.0	25	2	8.0	17	0	0.0	28	0	0.0	20	0	0.0	29	1	3.4	22	0	0.0	27	2	7.4
UTOP	10	0	0.0	10	0	0.0	7	1	14.3	3	0	0.0	9	1	11.1	9	0	0.0	11	0	0.0	5	0	0.0
VAOP	1	0	0.0	2	1	50.0	0	0	0.0	4	2	50.0	8	2	25.0	3	1	33.3	5	0	0.0	4	0	0.0
VATB	5	5	100.0	3	3	100.0	3	3	100.0	3	2	66.7	7	0	0.0	9	2	22.2	9	2	22.2	5	0	0.0
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	19	2	10.5
WANW	6	0	0.0	8	1	12.5	15	2	13.3	22	1	4.5	15	1	6.7	19	0	0.0	22	2	9.1	0	0	0.0
WASH	2	2	100.0	3	3	100.0	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
WISE	9	0	0.0	11	0	0.0	12	1	8.3	12	0	0.0	7	0	0.0	19	0	0.0	16	1	6.3	16	2	12.5
WIUW	37	1	2.7	42	1	2.4	37	0	0.0	67	0	0.0	47	0	0.0	55	0	0.0	56	0	0.0	58	0	0.0
TOTAL	459	83	18.1	452	99	21.9	493	97	19.7	661	103	15.6	745	107	14.4	912	116	12.7	849	104	12.2	847	121	14.3

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Lung

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	3	1	33.3	9	6	66.7	6	4	66.7	17	9	52.9	28	12	42.9	28	9	32.1	25	3	12.0	23	1	4.3
AROR	1	1	100.0	3	3	100.0	1	1	100.0	3	3	100.0	1	1	100.0	7	7	100.0	7	7	100.0	9	9	100.0
AZOB	2	0	0.0	1	1	100.0	10	6	60.0	7	4	57.1	7	4	57.1	12	6	50.0	5	2	40.0	7	1	14.3
CADN	6	2	33.3	7	2	28.6	5	0	0.0	12	0	0.0	10	2	20.0	23	9	39.1	29	8	27.6	45	14	31.1
CAGS	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	3	2	66.7	6	0	0.0	14	1	7.1	14	4	28.6
CAOP	9	9	100.0	9	9	100.0	4	4	100.0	15	10	66.7	11	8	72.7	13	5	38.5	14	5	35.7	19	13	68.4
CARO	7	1	14.3	5	3	60.0	11	5	45.5	8	3	37.5	18	2	11.1	16	3	18.8	11	11	100.0	8	5	62.5
CASD	2	0	0.0	8	2	25.0	8	2	25.0	18	1	5.6	20	2	10.0	15	2	13.3	10	1	10.0	9	1	11.1
CORS	4	2	50.0	2	1	50.0	10	4	40.0	15	6	40.0	14	4	28.6	18	4	22.2	13	1	7.7	14	1	7.1
CTHH	1	1	100.0	4	4	100.0	3	3	100.0	2	2	100.0	1	1	100.0	4	4	100.0	2	2	100.0	6	6	100.0
DCTC	1	1	100.0	2	1	50.0	3	3	100.0	6	4	66.7	7	1	14.3	5	3	60.0	14	10	71.4	4	2	50.0
FLFH	2	2	100.0	8	8	100.0	2	2	100.0	5	5	100.0	9	9	100.0	12	12	100.0	4	4	100.0	11	11	100.0
FLMP	0	0	0.0	2	2	100.0	5	5	100.0	4	4	100.0	15	15	100.0	14	14	100.0	18	15	83.3	23	23	100.0
FLSW	1	1	100.0	5	5	100.0	6	6	100.0	4	4	100.0	5	5	100.0	5	5	100.0	3	3	100.0	3	3	100.0
FLUF	3	3	100.0	2	2	100.0	11	11	100.0	3	3	100.0	7	5	71.4	15	9	60.0	17	11	64.7	7	3	42.9
FLWC	5	5	100.0	10	10	100.0	10	10	100.0	21	21	100.0	12	12	100.0	13	13	100.0	12	12	100.0	17	17	100.0
GALL	0	0	0.0	11	11	100.0	5	5	100.0	16	13	81.3	13	8	61.5	14	11	78.6	16	11	68.8	42	32	76.2
GAMC	0	0	0.0	3	3	100.0	6	6	100.0	7	7	100.0	4	4	100.0	4	4	100.0	5	5	100.0	0	0	0.0
IAOP	0	0	0.0	7	3	42.9	6	1	16.7	7	2	28.6	9	5	55.6	5	4	80.0	12	11	91.7	11	11	100.0
ILIP	8	5	62.5	18	10	55.6	30	4	13.3	49	4	8.2	45	11	24.4	44	7	15.9	47	6	12.8	44	7	15.9
INOP	5	2	40.0	22	4	18.2	12	3	25.0	12	0	0.0	23	7	30.4	11	6	54.5	12	2	16.7	23	10	43.5
KYDA	1	1	100.0	8	6	75.0	4	1	25.0	18	8	44.4	30	9	30.0	36	1	2.8	21	3	14.3	22	10	45.5
LAOP	1	1	100.0	6	6	100.0	27	22	81.5	14	10	71.4	23	14	60.9	19	14	73.7	18	5	27.8	27	12	44.4
MAOB	11	0	0.0	20	2	10.0	19	2	10.5	18	1	5.6	15	0	0.0	22	2	9.1	30	5	16.7	29	5	17.2
MDPC	0	0	0.0	3	3	100.0	3	2	66.7	11	9	81.8	11	8	72.7	24	9	37.5	22	3	13.6	14	3	21.4
MIOP	6	3	50.0	23	5	21.7	24	7	29.2	14	6	42.9	16	1	6.3	35	10	28.6	34	7	20.6	30	5	16.7
MNOP	7	0	0.0	10	0	0.0	39	7	17.9	23	3	13.0	31	5	16.1	30	2	6.7	28	5	17.9	33	2	6.1
MOMA	6	0	0.0	14	1	7.1	24	0	0.0	15	1	6.7	29	1	3.4	15	1	6.7	16	0	0.0	14	1	7.1
MSUM	0	0	0.0	1	1	100.0	5	5	100.0	3	3	100.0	1	1	100.0	5	5	100.0	6	6	100.0	4	4	100.0
MWOB	8	8	100.0	7	7	100.0	10	10	100.0	16	16	100.0	11	11	100.0	12	12	100.0	14	14	100.0	9	9	100.0
NCBG	7	7	100.0	5	5	100.0	4	4	100.0	5	5	100.0	4	4	100.0	1	1	100.0	0	0	0.0	8	8	100.0
NCCM	0	0	0.0	2	2	100.0	7	7	100.0	5	5	100.0	5	5	100.0	5	5	100.0	5	5	100.0	11	11	100.0
NCNC	8	2	25.0	11	1	9.1	6	1	16.7	15	3	20.0	11	0	0.0	23	1	4.3	19	0	0.0	16	2	12.5
NEOR	1	1	100.0	3	3	100.0	4	2	50.0	3	0	0.0	6	4	66.7	2	1	50.0	7	2	28.6	5	1	20.0
NJTO	1	1	100.0	4	4	100.0	6	3	50.0	10	2	20.0	5	2	40.0	15	8	53.3	8	2	25.0	14	11	78.6
NMOP	0	0	0.0	2	2	100.0	7	7	100.0	2	2	100.0	3	3	100.0	1	1	100.0	1	1	100.0	0	0	0.0
NVLV	0	0	0.0	1	1	100.0	3	3	100.0	0	0	0.0	2	2	100.0	4	4	100.0	3	3	100.0	3	3	100.0

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United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Lung

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYAP	6	6	100.0	2	2	100.0	3	3	100.0	4	4	100.0	2	2	100.0	2	2	100.0	2	2	100.0	3	3	100.0
NYFL	2	2	100.0	4	4	100.0	4	4	100.0	4	4	100.0	2	2	100.0	3	3	100.0	1	1	100.0	4	4	100.0
NYRT	6	2	33.3	11	1	9.1	13	2	15.4	13	1	7.7	14	2	14.3	11	2	18.2	18	6	33.3	16	6	37.5
NYSB	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	3	3	100.0	0	0	0.0
NYWN	2	2	100.0	0	0	0.0	1	1	100.0	3	3	100.0	2	2	100.0	0	0	0.0	4	2	50.0	2	2	100.0
OHLB	4	2	50.0	4	1	25.0	7	0	0.0	12	1	8.3	6	1	16.7	4	0	0.0	4	2	50.0	6	2	33.3
OHLC	1	1	100.0	4	4	100.0	3	3	100.0	6	6	100.0	6	6	100.0	8	8	100.0	3	3	100.0	4	4	100.0
OHLP	3	3	100.0	7	7	100.0	7	7	100.0	17	17	100.0	10	10	100.0	5	5	100.0	3	3	100.0	1	1	100.0
OHOV	1	1	100.0	4	4	100.0	10	10	100.0	4	4	100.0	3	3	100.0	14	14	100.0	4	4	100.0	3	3	100.0
OKOP	2	2	100.0	2	2	100.0	5	5	100.0	4	3	75.0	6	2	33.3	9	8	88.9	7	3	42.9	8	7	87.5
ORUO	1	1	100.0	6	6	100.0	5	3	60.0	5	2	40.0	9	7	77.8	10	7	70.0	3	3	100.0	5	3	60.0
PADV	4	4	100.0	15	12	80.0	25	12	48.0	30	7	23.3	42	0	0.0	51	6	11.8	33	2	6.1	41	4	9.8
PATF	5	2	40.0	8	2	25.0	12	1	8.3	19	2	10.5	12	0	0.0	20	3	15.0	9	2	22.2	22	2	9.1
SCOP	1	1	100.0	6	6	100.0	3	3	100.0	5	5	100.0	7	4	57.1	10	4	40.0	10	5	50.0	7	7	100.0
TNDS	3	0	0.0	11	3	27.3	17	11	64.7	12	7	58.3	9	2	22.2	13	6	46.2	21	8	38.1	24	11	45.8
TNET	1	1	100.0	0	0	0.0	0	0	0.0	5	5	100.0	3	3	100.0	6	6	100.0	1	1	100.0	2	2	100.0
TNMS	0	0	0.0	4	3	75.0	0	0	0.0	2	2	100.0	1	1	100.0	1	1	100.0	1	0	0.0	7	5	71.4
TXAD	5	5	100.0	3	3	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	9	6	66.7	14	7	50.0	19	7	36.8	23	9	39.1	19	4	21.1	22	8	36.4	17	6	35.3	31	14	45.2
TXSA	4	1	25.0	4	0	0.0	2	0	0.0	6	1	16.7	0	0	0.0	12	5	41.7	6	1	16.7	9	6	66.7
TXSB	15	13	86.7	6	4	66.7	9	6	66.7	15	11	73.3	30	13	43.3	30	13	43.3	26	6	23.1	57	10	17.5
UTOP	3	3	100.0	1	1	100.0	1	0	0.0	3	0	0.0	6	6	100.0	7	0	0.0	7	3	42.9	8	0	0.0
VAOP	2	0	0.0	8	0	0.0	11	1	9.1	9	1	11.1	13	1	7.7	13	1	7.7	9	0	0.0	10	0	0.0
VATB	1	1	100.0	0	0	0.0	7	2	28.6	10	3	30.0	4	2	50.0	11	4	36.4	22	8	36.4	11	6	54.5
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	16	5	31.3
WANW	2	2	100.0	7	7	100.0	15	3	20.0	20	7	35.0	12	2	16.7	15	2	13.3	12	2	16.7	0	0	0.0
WASH	0	0	0.0	3	0	0.0	1	0	0.0	3	0	0.0	0	0	0.0	0	0	0.0	2	1	50.0	0	0	0.0
WISE	1	1	100.0	3	1	33.3	6	2	33.3	7	3	42.9	8	2	25.0	12	4	33.3	12	4	33.3	12	1	8.3
WIUW	0	0	0.0	1	0	0.0	1	1	100.0	10	2	20.0	14	0	0.0	24	0	0.0	23	1	4.3	20	0	0.0
TOTAL	201	122	60.7	396	219	55.3	533	255	47.8	654	289	44.2	706	268	38.0	846	326	38.5	785	274	34.9	907	369	40.7

Based on UNOS OPTN/Scie[illegible] Registry data as of July 11, 1998.
Data subject to change based [illegible]re data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Heart

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	37	10	27.0	34	13	38.2	26	7	26.9	42	5	11.9	44	8	18.2	39	6	15.4	49	7	14.3	43	4	9.3
AROR	21	15	71.4	16	11	68.8	21	9	42.9	21	6	28.6	21	6	28.6	16	5	31.3	22	8	36.4	23	6	26.1
AZOB	31	8	25.8	28	6	21.4	28	4	14.3	35	2	5.7	39	6	15.4	29	8	27.6	37	15	40.5	28	6	21.4
CADN	92	18	19.6	92	19	20.7	83	17	20.5	78	16	20.5	71	18	25.4	83	18	21.7	80	21	26.3	85	28	32.9
CAGS	22	18	81.8	18	10	55.6	15	4	26.7	15	6	40.0	12	5	41.7	13	5	38.5	14	7	50.0	18	10	55.6
CAOP	59	52	88.1	57	55	96.5	51	48	94.1	52	48	92.3	70	52	74.3	61	8	13.1	59	2	3.4	71	40	56.3
CARO	50	7	14.0	52	6	11.5	67	7	10.4	70	10	14.3	62	5	8.1	49	8	16.3	54	54	100.0	54	25	46.3
CASD	38	18	47.4	40	17	42.5	34	10	29.4	31	5	16.1	36	11	30.6	30	9	30.0	32	3	9.4	26	9	34.6
CORS	42	20	47.6	31	18	58.1	34	9	26.5	58	12	20.7	43	11	25.6	46	18	39.1	44	15	34.1	35	7	20.0
CTHH	9	2	22.2	10	2	20.0	10	0	0.0	14	2	14.3	11	0	0.0	21	0	0.0	19	4	21.1	21	3	14.3
DCTC	28	7	25.0	29	2	6.9	22	5	22.7	33	7	21.2	33	3	9.1	31	6	19.4	39	10	25.6	27	8	29.6
FLFH	21	21	100.0	27	27	100.0	26	26	100.0	19	19	100.0	35	35	100.0	26	26	100.0	23	23	100.0	28	28	100.0
FLMP	24	15	62.5	22	15	68.2	19	13	68.4	30	24	80.0	30	23	76.7	44	40	90.9	32	19	59.4	41	34	82.9
FLSW	11	11	100.0	9	9	100.0	15	15	100.0	4	4	100.0	8	8	100.0	14	14	100.0	8	8	100.0	6	6	100.0
FLUF	28	12	42.9	23	13	56.5	30	24	80.0	21	13	61.9	23	12	52.2	20	13	65.0	27	18	66.7	27	19	70.4
FLWC	42	21	50.0	43	27	62.8	42	29	69.0	53	27	50.9	31	26	83.9	39	31	79.5	38	33	86.8	43	30	69.8
GALL	45	9	20.0	34	12	35.3	30	3	10.0	44	13	29.5	52	13	25.0	48	7	14.6	55	14	25.5	76	22	28.9
GAMC	13	13	100.0	13	13	100.0	20	20	100.0	19	19	100.0	7	7	100.0	10	10	100.0	12	12	100.0	0	0	0.0
HIOP	3	0	0.0	3	0	0.0	6	0	0.0	1	0	0.0	4	0	0.0	1	1	100.0	1	0	0.0	4	0	0.0
IAOP	14	4	28.6	20	6	30.0	23	2	8.7	23	7	30.4	28	15	53.6	10	1	10.0	19	3	15.8	24	8	33.3
ILIP	60	12	20.0	70	12	17.1	67	10	14.9	65	18	27.7	74	11	14.9	93	12	12.9	93	8	8.6	82	21	25.6
INOP	47	3	6.4	43	4	9.3	49	8	16.3	52	13	25.0	61	13	21.3	57	14	24.6	59	8	13.6	51	5	9.8
KYDA	25	7	28.0	47	13	27.7	32	7	21.9	40	5	12.5	41	6	14.6	35	4	11.4	44	11	25.0	42	17	40.5
LAOP	44	15	34.1	56	9	16.1	74	11	14.9	60	5	8.3	64	2	3.1	57	7	12.3	55	5	9.1	51	8	15.7
MAOB	68	11	16.2	79	6	7.6	79	11	13.9	72	2	2.8	68	6	8.8	79	5	6.3	86	10	11.6	83	11	13.3
MDPC	18	6	33.3	27	8	29.6	30	10	33.3	31	8	25.8	18	5	27.8	40	8	20.0	29	4	13.8	24	8	33.3
MIOP	56	9	16.1	47	13	27.7	47	13	27.7	61	19	31.1	64	26	40.6	66	22	33.3	60	16	26.7	61	16	26.2
MNOP	41	5	12.2	46	3	6.5	70	12	17.1	66	19	28.8	71	17	23.9	65	18	27.7	58	9	15.5	54	12	22.2
MOMA	25	3	12.0	37	2	5.4	42	2	4.8	46	4	8.7	49	5	10.2	51	8	15.7	42	4	9.5	35	3	8.6
MSUM	13	8	61.5	11	9	81.8	8	5	62.5	14	6	42.9	17	3	17.6	17	10	58.8	20	7	35.0	15	9	60.0
MWOB	51	20	39.2	61	14	23.0	42	10	23.8	43	5	11.6	55	15	27.3	54	14	25.9	50	16	32.0	38	7	18.4
NCBG	14	14	100.0	12	12	100.0	9	9	100.0	14	12	85.7	19	12	63.2	13	8	61.5	13	2	15.4	16	7	43.8
NCCM	18	2	11.1	12	0	0.0	22	4	18.2	17	2	11.8	28	7	25.0	18	6	33.3	16	7	43.8	29	7	24.1
NCNC	19	4	21.1	24	11	45.8	27	9	33.3	35	11	31.4	28	5	17.9	34	7	20.6	44	9	20.5	32	14	43.8
NEOR	17	7	41.2	22	14	63.6	14	4	28.6	17	6	35.3	16	2	12.5	15	5	33.3	12	5	41.7	12	2	16.7
NJTO	21	10	47.6	26	10	38.5	41	16	39.0	36	16	44.4	36	17	47.2	40	23	57.5	47	29	61.7	45	28	62.2
NMOP	23	7	30.4	28	14	50.0	25	17	68.0	21	10	47.6	21	12	57.1	20	10	50.0	19	10	52.6	3	1	33.3
NVLV	8	8	100.0	14	14	100.0	12	12	100.0	14	14	100.0	11	11	100.0	10	10	100.0	13	13	100.0	13	13	100.0
NYAP	13	13	100.0	11	11	100.0	13	13	100.0	13	13	100.0	10	10	100.0	9	9	100.0	12	12	100.0	13	13	100.0
NYFL	19	19	100.0	20	20	100.0	17	17	100.0	14	14	100.0	15	15	100.0	15	15	100.0	9	9	100.0	11	11	100.0
NYRT	73	9	12.3	76	13	17.1	73	9	12.3	64	18	28.1	83	17	20.5	65	9	13.8	66	10	15.2	63	18	28.6
NYSB	10	10	100.0	5	5	100.0	1	1	100.0	6	6	100.0	9	9	100.0	4	4	100.0	2	2	100.0	0	0	0.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Heart

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYWN	6	4	66.7	3	2	66.7	9	5	55.6	5	4	80.0	3	2	66.7	16	12	75.0	12	10	83.3	9	8	88.9
OHLB	33	7	21.2	21	4	19.0	36	1	2.8	26	1	3.8	32	6	18.8	26	3	11.5	25	3	12.0	27	3	11.1
OHLC	18	15	83.3	16	16	100.0	22	22	100.0	20	18	90.0	21	20	95.2	26	19	73.1	20	14	70.0	28	22	78.6
OHLP	33	17	51.5	36	22	61.1	28	13	46.4	36	19	52.8	27	18	66.7	25	17	68.0	21	15	71.4	22	16	72.7
OHOV	12	7	58.3	17	3	17.6	25	11	44.0	19	9	47.4	11	5	45.5	21	13	61.9	16	12	75.0	12	6	50.0
OKOP	25	9	36.0	23	7	30.4	27	6	22.2	28	8	28.6	42	2	4.8	45	11	24.4	35	4	11.4	25	6	24.0
ORUO	42	9	21.4	36	10	27.8	35	6	17.1	35	7	20.0	39	15	38.5	43	24	55.8	20	11	55.0	30	16	53.3
PADV	90	7	7.8	83	17	20.5	101	10	9.9	105	12	11.4	113	3	2.7	111	9	8.1	117	7	6.0	130	15	11.5
PATF	32	5	15.6	34	4	11.8	39	9	23.1	47	7	14.9	41	7	17.1	53	10	18.9	49	9	18.4	47	5	10.6
PRLL	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	4	4	100.0	2	2	100.0
SCOP	20	6	30.0	24	13	54.2	20	11	55.0	24	6	25.0	26	8	30.8	22	10	45.5	33	12	36.4	27	7	25.9
TNDS	37	8	21.6	34	5	14.7	39	12	30.8	52	23	44.2	37	14	37.8	52	17	32.7	55	20	36.4	42	15	35.7
TNET	3	3	100.0	9	9	100.0	6	6	100.0	11	11	100.0	9	9	100.0	7	7	100.0	12	12	100.0	10	10	100.0
TNMS	17	6	35.3	15	4	26.7	11	3	27.3	13	6	46.2	15	9	60.0	13	6	46.2	15	8	53.3	16	7	43.8
TXAD	9	9	100.0	20	20	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	75	10	13.3	80	17	21.3	80	13	16.3	77	12	15.6	76	12	15.8	84	19	22.6	72	18	25.0	86	29	33.7
TXSA	29	9	31.0	22	4	18.2	37	5	13.5	48	11	22.9	37	11	29.7	41	5	12.2	37	6	16.2	43	8	18.6
TXSB	79	26	32.9	73	15	20.5	69	13	18.8	84	18	21.4	71	20	28.2	75	17	22.7	78	18	23.1	101	16	15.8
UTOP	34	5	14.7	29	4	13.8	39	6	15.4	31	2	6.5	20	1	5.0	35	5	14.3	28	5	17.9	19	0	0.0
VAOP	23	5	21.7	21	6	28.6	11	1	9.1	14	0	0.0	25	3	12.0	19	1	5.3	19	3	15.8	17	2	11.8
VATB	38	1	2.6	35	9	25.7	34	6	17.6	29	5	17.2	35	7	20.0	25	6	24.0	31	6	19.4	44	10	22.7
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	34	7	20.6
WANW	48	30	62.5	39	18	46.2	41	21	51.2	42	23	54.8	34	20	58.8	32	6	18.8	33	10	30.3	0	0	0.0
WASH	14	5	35.7	13	7	53.8	6	2	33.3	6	0	0.0	13	4	30.8	10	3	30.0	10	3	30.0	0	0	0.0
WISE	29	7	24.1	25	8	32.0	25	9	36.0	22	7	31.8	29	6	20.7	31	3	9.7	34	2	5.9	29	5	17.2
WIUW	24	15	62.5	28	16	57.1	22	12	54.5	49	13	26.5	56	4	7.1	51	6	11.8	44	3	6.8	34	1	2.9
TOTAL	2083	708	34.0	2111	738	35.0	2158	665	30.8	2287	693	30.3	2330	696	29.9	2352	693	29.5	2333	697	29.9	2287	740	32.4

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Kidney

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	171	15	8.8	170	26	15.3	121	23	19.0	174	27	15.5	168	26	15.5	187	37	19.8	163	35	21.5	158	38	24.1
AROR	59	18	30.5	51	16	31.4	51	9	17.6	74	22	29.7	48	9	18.8	55	16	29.1	57	21	36.8	72	26	36.1
AZOB	89	29	32.6	101	23	22.8	80	16	20.0	109	21	19.3	120	27	22.5	118	52	44.1	130	49	37.7	102	38	37.3
CADN	363	48	13.2	296	45	15.2	294	53	18.0	251	49	19.5	249	44	17.7	291	65	22.3	302	70	23.2	288	53	18.4
CAGS	70	34	48.6	65	33	50.8	61	24	39.3	58	18	31.0	60	9	15.0	48	13	27.1	60	25	41.7	72	13	18.1
CAOP	169	89	52.7	170	106	62.4	144	110	76.4	161	113	70.2	170	95	55.9	163	44	27.0	147	45	30.6	223	142	63.7
CARO	240	35	14.6	262	83	31.7	208	61	29.3	233	33	14.2	197	32	16.2	208	51	24.5	181	128	70.7	149	83	55.7
CASD	105	22	21.0	114	24	21.1	106	23	21.7	103	26	25.2	103	22	21.4	87	22	25.3	124	35	28.2	100	28	28.0
CORS	123	42	34.1	85	28	32.9	93	27	29.0	132	30	22.7	102	40	39.2	112	39	34.8	100	41	41.0	107	44	41.1
CTHH	41	7	17.1	39	6	15.4	25	3	12.0	48	3	6.3	45	11	24.4	68	15	22.1	69	20	29.0	73	17	23.3
DCTC	86	17	19.8	111	26	23.4	110	19	17.3	98	26	26.5	125	23	18.4	102	20	19.6	112	29	25.9	91	23	25.3
FLFH	109	38	34.9	111	70	63.1	110	76	69.1	98	70	71.4	106	75	70.8	106	80	75.5	116	80	69.0	99	67	67.7
FLMP	139	91	65.5	128	90	70.3	119	80	67.2	138	97	70.3	149	108	72.5	166	101	60.8	122	55	45.1	151	60	39.7
FLSW	46	42	91.3	39	32	82.1	53	39	73.6	27	25	92.6	36	29	80.6	68	55	80.9	28	23	82.1	40	21	52.5
FLUF	112	49	43.8	90	47	52.2	94	67	71.3	98	55	56.1	95	67	70.5	117	71	60.7	113	76	67.3	129	71	55.0
FLWC	124	49	39.5	138	67	48.6	149	88	59.1	154	88	57.1	122	81	66.4	119	81	68.1	153	93	60.8	128	39	30.5
GALL	168	21	12.5	118	43	36.4	120	25	20.8	142	30	21.1	148	39	26.4	159	48	30.2	173	71	41.0	239	72	30.1
GAMC	46	28	60.9	39	20	51.3	69	32	46.4	46	11	23.9	37	21	56.8	37	22	59.5	39	29	74.4	0	0	0.0
HIOP	19	0	0.0	23	4	17.4	43	12	27.9	21	6	28.6	20	6	30.0	16	9	56.3	24	5	20.8	30	11	36.7
IAOP	62	17	27.4	60	31	51.7	51	13	25.5	67	23	34.3	103	24	23.3	49	16	32.7	65	22	33.8	69	20	29.0
ILIF	251	44	17.5	278	53	19.1	278	44	15.8	284	51	18.0	292	46	15.8	340	70	20.6	361	73	20.2	295	59	20.0
INOP	151	54	35.8	120	36	30.0	134	27	20.1	137	44	32.1	151	36	23.8	145	47	32.4	139	54	38.8	134	60	44.8
KYDA	87	36	41.4	121	52	43.0	108	33	30.6	151	49	32.5	131	61	46.6	120	47	39.2	131	52	39.7	144	63	43.8
LAOP	125	28	22.4	132	33	25.0	177	62	35.0	145	36	24.8	154	27	17.5	157	46	29.3	130	40	30.8	126	34	27.0
MAOB	307	30	9.8	308	59	19.2	275	43	15.6	284	44	15.5	282	51	18.1	235	80	34.0	274	102	37.2	297	73	24.6
MDPC	90	39	43.3	103	32	31.1	93	26	28.0	96	25	26.0	87	28	32.2	97	42	43.3	93	44	47.3	72	41	56.9
MIOP	248	48	19.4	295	67	22.7	280	47	16.8	245	36	14.7	269	55	20.4	256	71	27.7	241	85	35.3	243	63	25.9
MNOP	172	38	22.1	189	56	29.6	209	46	22.0	184	49	26.6	199	47	23.6	217	74	34.1	209	60	28.7	207	51	24.6
MOMA	88	24	27.3	117	48	41.0	124	45	36.3	141	44	31.2	171	45	26.3	127	48	37.8	137	42	30.7	149	38	25.5
MSUM	42	26	61.9	34	21	61.8	24	17	70.8	41	19	46.3	50	17	34.0	45	24	53.3	53	26	49.1	33	23	69.7
MWOB	174	53	30.5	162	53	32.7	138	48	34.8	156	53	34.0	154	45	29.2	171	71	41.5	142	52	36.6	167	52	31.1
NCBG	37	24	64.9	35	20	57.1	27	13	48.1	52	13	25.0	47	21	44.7	30	17	56.7	45	28	62.2	49	32	65.3
NCCM	41	14	34.1	28	7	25.0	46	13	28.3	39	9	23.1	71	26	36.6	42	27	64.3	46	28	60.9	68	39	57.4
NCNC	72	45	62.5	83	40	48.2	84	35	41.7	62	25	40.3	92	45	48.9	91	54	59.3	97	52	53.6	83	51	61.4
NEOR	33	11	33.3	52	21	40.4	44	21	47.7	39	15	38.5	44	15	34.1	34	13	38.2	38	8	21.1	39	19	48.7
NJTO	119	30	25.2	125	36	28.8	148	40	27.0	172	38	22.1	179	37	20.7	169	53	31.4	170	43	25.3	180	45	25.0
NMOP	51	6	11.8	68	11	16.2	54	11	20.4	58	21	36.2	62	9	14.5	66	18	27.3	64	16	25.0	33	8	24.2
NVLV	27	8	29.6	40	16	40.0	24	4	16.7	55	20	36.4	41	20	48.8	32	20	62.5	40	14	35.0	52	11	21.2
NYAP	48	8	16.7	57	15	26.3	61	9	14.8	60	19	31.7	49	12	24.5	50	12	24.0	54	15	27.8	64	19	29.7
NYFL	77	12	15.6	73	15	20.5	76	16	21.1	73	16	21.9	77	23	29.9	75	17	22.7	64	14	21.9	68	21	30.9
NYRT	239	26	10.9	234	35	15.0	238	42	17.6	260	44	16.9	283	42	14.8	250	42	16.8	241	60	24.9	259	90	34.7
NYSB	37	8	21.6	28	11	39.3	38	11	28.9	31	9	29.0	33	14	42.4	31	12	38.7	31	12	38.7	0	0	0.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Kidney

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYWN	34	5	14.7	38	16	42.1	37	8	21.6	32	3	9.4	30	4	13.3	54	18	33.3	46	16	34.8	42	8	19.0
OHLB	124	20	16.1	98	44	44.9	155	35	22.6	118	35	29.7	118	32	27.1	112	46	41.1	117	37	31.6	108	30	27.8
OHLC	74	26	35.1	77	27	35.1	61	29	47.5	81	20	24.7	70	26	37.1	88	46	52.3	64	29	45.3	87	45	51.7
OHLP	86	15	17.4	92	26	28.3	76	23	30.3	77	18	23.4	76	22	28.9	78	32	41.0	92	24	26.1	85	23	27.1
OHOV	54	18	33.3	56	19	33.9	69	14	20.3	46	11	23.9	45	14	31.1	62	24	38.7	58	15	25.9	61	18	29.5
OKOP	88	22	25.0	78	30	38.5	98	35	35.7	106	26	24.5	119	20	16.8	139	58	41.7	90	26	28.9	72	30	41.7
ORUO	110	49	44.5	116	49	42.2	95	24	25.3	110	33	30.0	119	36	30.3	119	59	49.6	101	41	40.6	117	53	45.3
PADV	289	66	22.8	331	62	18.7	323	50	15.5	283	41	14.5	287	39	13.6	326	81	24.8	380	69	18.2	402	67	16.7
PATF	146	32	21.9	154	31	20.1	235	29	12.3	232	35	15.1	194	24	12.4	208	59	28.4	186	41	22.0	199	52	26.1
PRLL	8	2	25.0	6	3	50.0	4	1	25.0	14	2	14.3	9	2	22.2	17	11	64.7	12	8	66.7	22	12	54.5
SCOP	81	9	11.1	76	16	21.1	87	19	21.8	89	16	18.0	94	14	14.9	89	30	33.7	108	23	21.3	90	24	26.7
TNDS	139	65	46.8	104	58	55.8	97	44	45.4	119	52	43.7	101	53	52.5	140	80	57.1	138	72	52.2	122	75	61.5
TNET	20	17	85.0	32	25	78.1	28	17	60.7	27	24	88.9	19	15	78.9	20	18	90.0	17	15	88.2	19	12	63.2
TNMS	56	19	33.9	48	17	35.4	43	13	30.2	47	22	46.8	49	31	63.3	43	26	60.5	42	19	45.2	47	30	63.8
TXAD	18	5	27.8	33	15	45.5	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	181	36	19.9	188	31	16.5	217	29	13.4	199	23	11.6	252	55	21.8	256	75	29.3	291	65	22.3	284	98	34.5
TXSA	78	4	5.1	64	15	23.4	119	22	18.5	123	10	8.1	94	12	12.8	97	23	23.7	109	22	20.2	112	32	28.6
TXSB	216	40	18.5	214	41	19.2	215	46	21.4	240	57	23.8	280	45	16.1	263	59	22.4	237	69	29.1	251	70	27.9
UTOP	90	21	23.3	94	25	26.6	82	28	34.1	85	19	22.4	69	23	33.3	95	26	27.4	74	27	36.5	66	14	21.2
VAOP	61	31	50.8	52	25	48.1	30	8	26.7	42	17	40.5	49	26	53.1	38	13	34.2	43	15	34.9	52	13	25.0
VATB	115	26	22.6	95	25	26.3	96	28	29.2	95	21	22.1	91	15	16.5	68	26	38.2	85	28	32.9	107	28	26.2
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	138	45	32.6
WANW	168	54	32.1	127	34	26.8	107	44	41.1	128	36	28.1	118	27	22.9	100	38	38.0	129	42	32.6	0	0	0.0
WASH	47	25	53.2	34	19	55.9	27	10	37.0	29	14	48.3	33	13	39.4	35	11	31.4	46	26	56.5	0	0	0.0
WISE	94	6	6.4	88	13	14.8	50	7	14.0	72	9	12.5	88	14	15.9	83	19	22.9	85	23	27.1	88	13	14.8
WIUW	81	17	21.0	90	26	28.9	66	19	28.8	113	24	21.2	100	17	17.0	103	23	22.3	93	18	19.4	101	26	25.7
TOTAL	7315	1933	26.4	7277	2249	30.9	7198	2035	28.3	7504	2020	26.9	7625	2089	27.4	7689	2663	34.6	7721	2642	34.2	7753	2576	33.2

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Liver

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	49	38	77.6	45	39	86.7	39	22	56.4	61	36	59.0	73	25	34.2	68	9	13.2	73	10	13.7	70	5	7.1
AROR	24	24	100.0	21	21	100.0	19	19	100.0	24	24	100.0	20	20	100.0	29	29	100.0	24	24	100.0	32	32	100.0
AZOB	28	20	71.4	41	32	78.0	39	32	82.1	53	24	45.3	57	35	61.4	64	45	70.3	77	52	67.5	60	42	70.0
CADN	137	42	30.7	140	30	21.4	155	22	14.2	140	21	15.0	147	22	15.0	155	23	14.8	164	16	9.8	153	8	5.2
CAGS	20	20	100.0	25	25	100.0	25	25	100.0	29	29	100.0	31	25	80.6	30	22	73.3	28	21	75.0	35	12	34.3
CAOP	55	55	100.0	55	55	100.0	68	68	100.0	70	70	100.0	96	96	100.0	86	17	19.8	96	4	4.2	139	92	66.2
CARO	69	17	24.6	97	8	8.2	101	2	2.0	115	3	2.6	106	1	0.9	122	3	2.5	119	119	100.0	95	29	30.5
CASD	37	31	83.8	50	39	78.0	49	39	79.6	49	26	53.1	54	25	46.3	51	18	35.3	57	19	33.3	49	13	26.5
CORS	54	24	44.4	43	8	18.6	46	11	23.9	73	18	24.7	58	19	32.8	80	24	30.0	69	14	20.3	73	16	21.9
CTHH	12	8	66.7	13	5	38.5	9	4	44.4	16	8	50.0	11	6	54.5	21	16	76.2	24	15	62.5	25	17	68.0
DCTC	34	34	100.0	35	34	97.1	50	40	80.0	51	33	64.7	57	30	52.6	54	18	33.3	65	7	10.8	44	8	18.2
FLFH	35	35	100.0	38	38	100.0	34	34	100.0	35	35	100.0	47	47	100.0	46	46	100.0	47	47	100.0	59	59	100.0
FLMP	45	39	86.7	43	33	76.7	47	37	78.7	48	32	66.7	74	31	41.9	99	24	24.2	86	22	25.6	103	19	18.4
FLSW	14	14	100.0	12	12	100.0	20	20	100.0	10	10	100.0	12	12	100.0	27	27	100.0	16	16	100.0	16	16	100.0
FLUF	39	34	87.2	32	26	81.3	38	34	89.5	38	31	81.6	40	30	75.0	48	26	54.2	56	30	53.6	59	24	40.7
FLWC	46	46	100.0	49	49	100.0	51	50	98.0	65	65	100.0	55	55	100.0	61	61	100.0	80	80	100.0	63	44	69.8
GALL	53	41	77.4	45	30	66.7	42	34	81.0	76	42	55.3	71	37	52.1	76	25	32.9	77	33	42.9	122	44	36.1
GAMC	17	17	100.0	14	14	100.0	26	26	100.0	22	22	100.0	13	13	100.0	14	14	100.0	16	16	100.0	0	0	0.0
HIOP	2	2	100.0	1	1	100.0	17	17	100.0	10	7	70.0	12	10	83.3	9	8	88.9	7	3	42.9	15	8	53.3
IAOP	16	12	75.0	29	19	65.5	29	20	69.0	37	11	29.7	58	23	39.7	24	6	25.0	42	10	23.8	41	8	19.5
ILIP	96	29	30.2	116	42	36.2	113	27	23.9	111	24	21.6	131	18	13.7	172	21	12.2	182	22	12.1	166	11	6.6
INOP	55	20	36.4	54	14	25.9	57	15	26.3	62	16	25.8	73	18	24.7	69	20	29.0	69	14	20.3	63	20	31.7
KYDA	32	27	84.4	46	38	82.6	36	26	72.2	61	48	78.7	69	48	69.6	59	28	47.5	63	23	35.4	66	24	36.4
LAOP	46	34	73.9	56	38	67.9	85	63	74.1	74	57	77.0	82	43	52.4	86	54	62.8	73	36	49.3	74	38	51.4
MAOB	104	18	17.3	110	11	10.0	100	10	10.0	102	9	8.8	115	11	9.6	116	21	18.1	136	19	14.0	129	28	21.7
MDPC	30	12	40.0	41	13	31.7	33	5	15.2	42	9	21.4	36	3	8.3	51	8	15.7	43	4	9.3	33	3	9.1
MIOP	91	38	41.8	104	33	31.7	89	26	29.2	106	38	35.8	122	38	31.1	107	12	11.2	103	14	13.6	103	25	24.3
MNOP	70	16	22.9	89	23	25.8	114	21	18.4	98	13	13.3	104	10	9.6	125	14	11.2	127	17	13.4	131	9	6.9
MOMA	38	11	28.9	46	14	30.4	59	13	22.0	73	17	23.3	89	9	10.1	75	5	6.7	92	14	15.2	87	7	8.0
MSUM	15	15	100.0	13	13	100.0	7	7	100.0	16	16	100.0	15	15	100.0	18	18	100.0	21	21	100.0	19	19	100.0
MWOB	62	52	83.9	82	62	75.6	66	42	63.6	70	56	80.0	74	48	64.9	85	58	68.2	73	37	50.7	82	51	62.2
NCBG	17	17	100.0	13	13	100.0	16	16	100.0	19	19	100.0	19	19	100.0	18	18	100.0	20	20	100.0	24	24	100.0
NCCM	8	8	100.0	9	9	100.0	15	15	100.0	20	20	100.0	24	20	83.3	22	19	86.4	23	18	78.3	32	25	78.1
NCNC	23	18	78.3	33	19	57.6	35	21	60.0	30	16	53.3	41	6	14.6	58	17	29.3	55	18	32.7	43	18	41.9
NEOR	19	1	5.3	37	3	8.1	21	2	9.5	22	5	22.7	28	1	3.6	27	0	0.0	28	3	10.7	24	0	0.0
NJTO	35	25	71.4	37	19	51.4	45	23	51.1	60	33	55.0	60	25	41.7	73	39	53.4	73	29	39.7	84	36	42.9
NMOP	21	21	100.0	31	31	100.0	25	25	100.0	24	24	100.0	27	27	100.0	29	20	69.0	32	22	68.8	15	5	33.3
NVLV	6	6	100.0	15	15	100.0	10	10	100.0	21	21	100.0	15	15	100.0	13	13	100.0	18	18	100.0	25	25	100.0
NYAP	13	13	100.0	22	22	100.0	21	21	100.0	28	28	100.0	24	24	100.0	29	29	100.0	38	38	100.0	37	37	100.0
NYFL	27	27	100.0	30	30	100.0	26	22	84.6	26	24	92.3	33	31	93.9	40	20	50.0	38	15	39.5	40	12	30.0
NYRT	83	32	38.6	94	17	18.1	108	10	9.3	125	19	15.2	120	19	15.8	155	12	7.7	135	9	6.7	161	17	10.6
NYSB	11	11	100.0	3	3	100.0	7	7	100.0	9	9	100.0	17	17	100.0	13	13	100.0	15	15	100.0	0	0	0.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Liver

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYWN	8	8	100.0	6	6	100.0	11	11	100.0	13	13	100.0	9	9	100.0	27	27	100.0	20	20	100.0	22	22	100.0
OHLB	35	14	40.0	36	14	38.9	47	14	29.8	39	10	25.6	57	18	31.6	56	22	39.3	64	20	31.3	63	16	25.4
OHLC	22	22	100.0	28	28	100.0	28	28	100.0	28	28	100.0	31	31	100.0	41	41	100.0	32	32	100.0	37	37	100.0
OHLP	53	38	71.7	55	31	56.4	46	19	41.3	48	21	43.8	60	37	61.7	48	24	50.0	52	32	61.5	56	37	66.1
OHOV	22	19	86.4	23	14	60.9	36	17	47.2	23	10	43.5	25	15	60.0	25	11	44.0	34	17	50.0	25	18	72.0
OKOP	29	29	100.0	31	30	96.8	34	24	70.6	47	17	36.2	55	21	38.2	61	20	32.8	49	14	28.6	36	6	16.7
ORUO	43	29	67.4	48	40	83.3	52	20	38.5	58	12	20.7	66	13	19.7	71	17	23.9	57	10	17.5	67	15	22.4
PADV	116	66	56.9	127	56	44.1	131	55	42.0	137	67	48.9	128	50	39.1	142	34	23.9	166	12	7.2	215	42	19.5
PATF	60	7	11.7	80	2	2.5	113	2	1.8	118	1	0.8	110	3	2.7	115	1	0.9	113	1	0.9	108	1	0.9
PRLL	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	9	9	100.0	7	7	100.0	8	8	100.0
SCOP	24	23	95.8	26	16	61.5	25	11	44.0	33	15	45.5	39	13	33.3	39	14	35.9	48	14	29.2	39	14	35.9
TNDS	41	41	100.0	45	42	93.3	42	33	78.6	55	42	76.4	47	36	76.6	65	46	70.8	69	44	63.8	71	43	60.6
TNET	3	3	100.0	7	7	100.0	9	9	100.0	12	12	100.0	11	11	100.0	9	9	100.0	11	11	100.0	13	13	100.0
TNMS	25	19	76.0	13	7	53.8	11	6	54.5	24	14	58.3	18	13	72.2	14	5	35.7	20	14	70.0	28	16	57.1
TXAD	11	11	100.0	18	18	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
TXGC	69	60	87.0	80	56	70.0	78	36	46.2	74	32	43.2	87	46	52.9	88	45	51.1	96	46	47.9	124	58	46.8
TXSA	37	33	89.2	20	15	75.0	34	24	70.6	58	38	65.5	36	10	27.8	51	10	19.6	55	4	7.3	65	16	24.6
TXSB	96	34	35.4	107	22	20.6	104	8	7.7	128	14	10.9	129	19	14.7	134	23	17.2	131	30	22.9	129	29	22.5
UTOP	35	23	65.7	42	26	61.9	41	29	70.7	42	26	61.9	38	15	39.5	45	8	17.8	40	9	22.5	39	7	17.9
VAOP	27	11	40.7	23	7	30.4	16	8	50.0	18	6	33.3	28	7	25.0	19	1	5.3	18	2	11.1	22	4	18.2
VATB	43	33	76.7	33	23	69.7	37	24	64.9	37	21	56.8	35	16	45.7	32	4	12.5	49	6	12.2	46	7	15.2
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	73	16	21.9
WANW	71	50	70.4	53	21	39.6	51	14	27.5	64	17	26.6	61	15	24.6	53	13	24.5	69	11	15.9	0	0	0.0
WASH	13	13	100.0	14	14	100.0	13	13	100.0	13	13	100.0	15	15	100.0	18	18	100.0	21	21	100.0	0	0	0.0
WISE	36	17	47.2	28	12	42.9	26	4	15.4	31	8	25.8	30	14	46.7	34	13	38.2	44	18	40.9	46	9	19.6
WIUW	46	13	28.3	47	10	21.3	39	4	10.3	66	6	9.1	56	2	3.6	69	7	10.1	61	2	3.3	69	1	1.4
TOTAL	2653	1620	61.1	2899	1517	52.3	3016	1396	46.3	3387	1511	44.6	3583	1458	40.7	3869	1342	34.7	4008	1381	34.5	4094	1366	33.4

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on late data submission or correction.

United Network for Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Pancreas

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
ALOB	1	0	0.0	1	1	100.0	1	1	100.0	5	5	100.0	4	4	100.0	4	4	100.0	2	2	100.0	7	7	100.0
AROR	2	2	100.0	0	0	0.0	0	0	0.0	1	1	100.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
AZOB	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0	3	3	100.0
CADN	1	1	100.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	2	2	100.0	2	1	50.0
CAGS	0	0	0.0	0	0	0.0	1	1	100.0	3	2	66.7	0	0	0.0	0	0	0.0	1	0	0.0	1	0	0.0
CAOP	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	2	0	0.0	2	0	0.0	0	0	0.0
CARO	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	3	3	100.0
CASD	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	2	2	100.0	3	3	100.0	1	1	100.0	0	0	0.0
CORS	3	3	100.0	4	4	100.0	2	1	50.0	4	4	100.0	4	4	100.0	1	1	100.0	1	1	100.0	3	3	100.0
DCTC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	7	5	71.4	2	2	100.0
FLFH	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0
FLMP	2	2	100.0	1	1	100.0	1	1	100.0	1	1	100.0	1	0	0.0	2	1	50.0	1	0	0.0	7	1	14.3
FLSW	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	4	4	100.0	3	3	100.0	1	1	100.0
FLUF	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	6	6	100.0	6	5	83.3
FLWC	0	0	0.0	0	0	0.0	1	1	100.0	3	3	100.0	6	6	100.0	5	5	100.0	10	10	100.0	1	1	100.0
GALL	1	1	100.0	1	1	100.0	1	1	100.0	2	2	100.0	1	1	100.0	0	0	0.0	3	3	100.0	16	15	93.8
GAMC	0	0	0.0	0	0	0.0	2	2	100.0	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0
IAOP	5	3	60.0	2	2	100.0	2	2	100.0	0	0	0.0	5	4	80.0	0	0	0.0	4	3	75.0	0	0	0.0
ILIP	3	2	66.7	4	3	75.0	0	0	0.0	2	1	50.0	0	0	0.0	0	0	0.0	2	2	100.0	4	0	0.0
INOP	3	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	1	0	0.0	2	1	50.0	0	0	0.0	1	0	0.0
KYDA	3	1	33.3	0	0	0.0	0	0	0.0	2	1	50.0	6	5	83.3	0	0	0.0	2	2	100.0	3	3	100.0
LAOP	2	2	100.0	5	3	60.0	7	6	85.7	7	7	100.0	1	0	0.0	2	1	50.0	3	2	66.7	0	0	0.0
MAOB	2	1	50.0	4	0	0.0	1	0	0.0	1	0	0.0	4	2	50.0	7	5	71.4	12	1	8.3	11	5	45.5
MDPC	0	0	0.0	0	0	0.0	3	0	0.0	2	1	50.0	2	0	0.0	1	0	0.0	4	0	0.0	1	1	100.0
MIOP	2	1	50.0	0	0	0.0	3	1	33.3	12	7	58.3	5	2	40.0	6	1	16.7	10	5	50.0	6	2	33.3
MNOP	10	0	0.0	13	2	15.4	12	1	8.3	21	5	23.8	12	0	0.0	16	0	0.0	25	4	16.0	24	4	16.7
MOMA	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	2	2	100.0	0	0	0.0	7	7	100.0
MSUM	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
MWOB	0	0	0.0	7	7	100.0	1	1	100.0	4	4	100.0	7	7	100.0	9	9	100.0	10	10	100.0	12	12	100.0
NCBG	0	0	0.0	2	2	100.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	5	5	100.0	8	8	100.0
NCCM	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	2	2	100.0	0	0	0.0	0	0	0.0	0	0	0.0
NEOR	1	1	100.0	2	0	0.0	3	0	0.0	6	1	16.7	1	1	100.0	0	0	0.0	2	1	50.0	0	0	0.0
NJTO	0	0	0.0	0	0	0.0	0	0	0.0	3	3	100.0	0	0	0.0	0	0	0.0	3	3	100.0	1	0	0.0
NMOP	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	3	3	100.0	0	0	0.0
NVLV	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	1	1	100.0	0	0	0.0
NYAP	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	1	1	100.0	4	4	100.0	2	2	100.0	1	1	100.0
NYFL	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

United Networ Organ Sharing
Cadaveric Transplants From Organs Recovered By Each OPO: 1990-1997
Number and Percent Shared
Organ: Pancreas

OPO	1990			1991			1992			1993			1994			1995			1996			1997		
	All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared		All	Shared	
	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%	No.	No.	%
NYRT	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0
NYWN	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0
OHLB	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
OHLC	2	2	100.0	3	3	100.0	0	0	0.0	4	4	100.0	1	1	100.0	2	2	100.0	0	0	0.0	2	2	100.0
OHLP	1	0	0.0	1	1	100.0	2	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	3	0	0.0
OHOV	0	0	0.0	2	0	0.0	1	1	100.0	1	1	100.0	0	0	0.0	0	0	0.0	1	0	0.0	2	2	100.0
OKOP	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	1	0	0.0
ORUO	0	0	0.0	1	1	100.0	2	2	100.0	4	4	100.0	6	5	83.3	8	8	100.0	6	6	100.0	6	6	100.0
PADV	4	1	25.0	1	0	0.0	1	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	2	1	50.0	7	4	57.1
PATF	1	0	0.0	2	0	0.0	3	0	0.0	7	2	28.6	3	3	100.0	5	0	0.0	6	0	0.0	15	0	0.0
PRLL	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0
SCOP	0	0	0.0	1	1	100.0	2	1	50.0	0	0	0.0	1	1	100.0	1	0	0.0	2	2	100.0	1	1	100.0
TNDS	0	0	0.0	2	2	100.0	1	1	100.0	3	3	100.0	2	1	50.0	2	2	100.0	5	5	100.0	2	2	100.0
TNET	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0
TNMS	1	0	0.0	1	0	0.0	1	0	0.0	0	0	0.0	1	0	0.0	1	0	0.0	2	0	0.0	0	0	0.0
TXGC	0	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	1	1	100.0	11	5	45.5
TXSA	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	0	0.0	0	0	0.0	1	1	100.0
TXSB	2	1	50.0	2	0	0.0	0	0	0.0	1	0	0.0	1	0	0.0	4	0	0.0	2	2	100.0	4	4	100.0
UTOP	2	1	50.0	3	0	0.0	0	0	0.0	0	0	0.0	1	1	100.0	1	1	100.0	1	1	100.0	5	4	80.0
VAOP	1	0	0.0	2	1	50.0	0	0	0.0	0	0	0.0	2	2	100.0	2	1	50.0	1	0	0.0	1	1	100.0
VATB	1	1	100.0	1	1	100.0	1	1	100.0	1	1	100.0	2	2	100.0	0	0	0.0	0	0	0.0	0	0	0.0
WALC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	6	3	50.0
WANW	7	6	85.7	5	3	60.0	3	1	33.3	3	0	0.0	2	0	0.0	2	0	0.0	2	0	0.0	0	0	0.0
WASH	0	0	0.0	2	2	100.0	0	0	0.0	0	0	0.0	1	1	100.0	0	0	0.0	0	0	0.0	0	0	0.0
WISE	0	0	0.0	1	1	100.0	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	2	2	100.0	0	0	0.0
WIUW	1	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	4	0	0.0
TOTAL	66	34	51.5	77	43	55.8	61	27	44.3	111	71	64.0	94	63	67.0	108	62	57.4	165	100	60.6	206	123	59.7

Based on UNOS OPTN/Scientific Registry data as of July 11, 1998.
Data subject to change based on future data submission or correction.

ATTACHMENT E

Department of Health and Human Services
Health Resources and Services Administration

1997 Report of Center Specific Graft and Patient Survival Rates

Executive Summary

United Network for Organ Sharing

1997 REPORT

OF

CENTER SPECIFIC

GRAFT AND PATIENT

SURVIVAL RATES

EXECUTIVE SUMMARY

This report was prepared by the United Network for Organ Sharing (UNOS)
and was funded in part by the U.S. Department of Health and Human Services,
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and the U.S. Scientific Registry of Transplant Recipients

Explore the UNOS Home Page on the world wide web

www.unos.org

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and 1-886651-16-7 (Executive Summary)
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PREFACE

The United Network for Organ Sharing (UNOS) operates the national Organ Procurement and Transplantation Network (OPTN) and the national Scientific Registry of Transplant Recipients. In this role, UNOS functions as both a contractor for the Federal Government and as a private, non-profit corporation. Under contract with the Health Resources and Services Administration, UNOS has operated the OPTN since September 30, 1986, and the Scientific Registry since September 30, 1987.

Under the terms of the Transplant Amendment Act of 1990, UNOS is required to determine center specific transplant survival rates for all solid organ transplants performed within the United States and provide this information to the Division of Transplantation. This *1997 Report of Center Specific Graft and Patient Survival Rates* represents the third biennial report, based largely on scientific Registry data, compiled and analyzed from January 1, 1988, through April 30, 1994.

There are 7 volumes in this report: 6 Organ Specific Volumes and 1 Executive Summary. The *organ specific volumes* contain a summary of the national graft and patient survival outcomes for each organ, as well as a description and distribution of the donor and recipient characteristics among programs. Also included in each organ specific volume is an *User's Guide* which provides guidance on how to read the data and use the report. The *Executive Summary* condenses the primary results from each organ specific volume and describes the technical methods used in creating this report.

SUGGESTED CITATION FOR THIS REPORT

1997 Report of Center Specific Graft and Patient Survival Rates, UNOS, Richmond, VA, and the Division of Transplantation, Office of Special Programs, Health Resources and Services Administration, U.S. Department of Health and Human Services, Rockville, MD.

Suggested Abbreviated Citation

1997 Center Specific Report. UNOS; DOT/HRSA/DHHS.

Publications based upon UNOS data in this report or supplied upon request must include the above citation as well as the following statement:

The data and analyses in the *1997 Report of Center Specific Graft and Patient Survival Rates* have been supplied by UNOS. The authors alone are responsible for the reporting and interpretation of these data.

ACKNOWLEDGMENTS

The data in this report were provided on a voluntary basis by transplant programs, histocompatibility laboratories and organ procurement organizations throughout the United States. The United Network for Organ Sharing (UNOS) gratefully acknowledges the efforts of program directors, administrators, data coordinators, and other transplant professionals, whose efforts have made it possible to compile and analyze transplantation data collected across the nation.

This report has been compiled through the collective efforts of many individuals. For their assistance, UNOS thanks Judith Braslow, Gwen Mayes, and Remy Aronoff of the Division of Transplantation, Office of Special Programs, Health Resources and Services Administration, U.S. Department of Health and Human Services.

UNOS also appreciates the guidance and advice provided by the Technical Oversight Subcommittee of the Scientific Advisory Committee, in particular, Steve Belle, Ph.D., Dennis E. Daniels, Ph.D., David Gjertson, Ph.D., Lawrence G. Hunsicker, M.D., Jeffrey D. Hosenpud, M.D., Charles F. Shield, III, M.D., and David E.R. Sutherland, M.D., Ph.D. For their suggestions and critical review of this report, we also wish to thank Barbara Bernhard, Steve Bynon, M.D., John M. Holman, Jr., M.D., Ph.D., Anne Carothers Kay, George B. Mallory, Jr., M.D., Lawrence F. McManus, M.D., Paul Oldam, Kevin Stump, R.N., B.S.N., Deborah C. Surlas, R.N.

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Finally, UNOS gratefully acknowledges donor families and transplant recipients, whose courage has made advances in organ transplantation possible.

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I. OVERVIEW

A. INTRODUCTION

The 1997 Report of Center Specific Graft and Patient Survival Rates (hereafter referred to as the Report) is produced by the United Network for Organ Sharing (UNOS), Richmond, Virginia. UNOS operates the national Organ Procurement and Transplantation Network (OPTN) and the national Scientific Registry for Transplant Recipients under contracts with the Division of Transplantation, Office of Special Programs, Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services.

Under the terms of the Transplant Amendment Act of 1990, UNOS is required to determine program specific transplant survival rates for all solid organ transplants performed within the United States. This report is the third center specific transplant survival study performed to fulfill this contractual arrangement. In addition, this report is intended to provide updated information on national and program specific survival outcomes, and to enhance the awareness of transplant program performance in the United States. Such awareness is vital to promote the continued improvement in transplant outcomes.

The *1991 Report of Center Specific Graft and Patient Survival Rates* was based on all solid organ transplants between October 1, 1987, and December 31, 1989. The 1994 report was based on solid organ transplants between October 1, 1987, and December 31, 1991. The current Report includes U.S. transplant data from January 1, 1988, through April 30, 1994. This cohort was chosen to capture the maximum number of transplants with sufficient follow-up data. Specifically, the Report:

- Presents data for 97,587 transplant procedures performed on 92,966 patients at 742 separate transplant programs during the study period.
- Considers patient and donor characteristics for each organ specific risk model (see organ specific chapters for list of characteristics).
- Emphasizes short term as well as long term survival. Short term survival is defined at two time points -- 3 months (1 month for thoracic organs) and 1 year following transplant. Long term survival is defined in two ways: (1) survival at 3 years post-transplant, and (2) survival at 3 years post-transplant for those patients (grafts) who were living (still functioning) at 1 year post-transplant. Throughout this report, the second definition will be referred to as **conditional 3 year survival**. *The conditional 3 year survival analysis assesses characteristics independent of those limited to the first year (e.g., the risk of surgical procedures and early acute rejection events).*

  Note that the *conditional* 3 year survival rate often may be greater than the 1 year survival rate. This does not mean that the unconditional 3 year survival rate is also greater than the one year survival rate. In fact, the latter cannot exceed the 1 year survival rate.
- Presents both **actual** and **expected** graft and patient survival rates.
- Shows survival rates for two eras. Era 1 is from January 1, 1988, to April 30, 1992. Era 2 is from May 1, 1992, to April 30, 1994. *Era-specific survival rates allow the assessment of the improvement in a program's performance over time. The 3 year survival analysis is possible only for Era 1, due to insufficient follow-up on patients who received transplants in Era 2.*

Due to small numbers of these types of transplants, the following were excluded from the analyses:

- data on multi-organ transplants other than kidney-pancreas and heart-lung transplants,
- heterotopic heart transplants, and
- living donor transplants other than living donor kidney transplants.

As with previous editions, this report contains:

- Organ Specific Volumes -- Kidney, Liver, Pancreas, Heart, Lung, and Heart-Lung
- Executive Summary

The organ specific volumes contain (1) a User's Guide, which provides guidance on how to use the

report and interpret the data tables, (2) a summary of the national graft and patient survival outcomes for each organ, and (3) transplant program specific data: a table of survival rates, a chart describing the distribution of characteristics for the transplant program and the nation, and an optional narrative for every authorized transplant program in the United States. *The Executive Summary* condenses the primary results from each organ specific volume and describes the technical methods used in creating this report. It is organized as follows:

1. Overview -- Covers the development and scope of this report.

2. Data Highlights -- Provides a brief summary of the results and conclusions across all organs.

3. Organ Specific Results -- Presents in six chapters the summarized results from the organ specific analyses. By design, the contents and language of each chapter are similar. Each chapter includes a synopsis of the completeness of the data, the numbers of transplants and outcomes studied, overall survival rates, the distribution of survival rates among programs, a description and distribution of the characteristics among programs, and a summary section.

4. Technical Methods -- Describes in detail the statistical methods used to report graft and patient survival rates.

Glossary of Terms

The general terms and definitions used throughout this report can be found in the User's Guide (Chapter 1) in each organ specific volume.

B. PROJECT DEVELOPMENT

The UNOS Scientific Advisory Committee (SAC) developed the project plan for this report. An Ad Hoc Technical Oversight Subcommittee of the UNOS SAC, including HRSA staff, was established to provide guidance for the project design and subsequent data analysis. (The Technical Methods Chapter provides a list of the members of this Subcommittee.) Then, UNOS research staff conducted the study.

The project plan consisted of the following elements:

1. Outcomes from all organ kidney, liver, pancreas, heart, lung, and heart-lung transplants performed from January 1, 1988, through April 30, 1994, were analyzed. Because there were not enough multi-organ transplants to draw significant statistical findings by themselves, all but kidney-pancreas and heart-lung were excluded from this analysis. For similar reasons, heterotopic heart transplants and living donor heart, liver, and pancreas transplants were also excluded.

2. Logistic regression, a statistical method used for risk modeling, was applied to calculate each transplant program's expected graft and patient survival rates. A set of organ specific donor and recipient characteristics recommended by the Ad Hoc Technical Oversight Subcommittee was initially included in the mathematical modeling procedure. Then using backward elimination, the final models would contain those that had the strongest impact on survival outcomes (see the Technical Methods Chapter).

3. Actual and expected graft and patient survival rates were determined for each transplant program at:

   - 1 month for heart, lung, and heart-lung transplants, 3 months for kidney, liver, and pancreas transplants -- to assess mortality risk from the surgical procedure, or to assess early graft failure or rejection.

   - 1 year for all organs -- to assess short term survival and rejection or graft failure.

   - 3 years for all organs -- to assess long term survival and rejection or graft failure. Three year survival rates are presented in two ways: (1) as survival at 3 years after transplantation, and (2) *conditional 3 year survival*, or survival at 3 years post-transplant for those patients (grafts) who were living (still functioning) at 1 year post-transplant.

4. Each transplant program received a copy of their data and preliminary survival results for validation. If a transplant program agreed that the results reflected its performance during the study period, the transplant program had the option not to validate its data. Otherwise, the data were validated by the transplant program in order to assure that accurate and complete data

were used in the study. If the transplant program made corrections on the cadaveric donor or histocompatibility data, Organ Procurement Organizations and Tissue Typing Laboratories were asked to re-verify these corrections.

5. Each transplant program's final survival results in this report are based on the validated data. Each transplant program was given the opportunity to write a one-page narrative to provide additional information that they felt might have had an impact on their survival rates. These narratives were published unedited, alongside the program's graft and patient survival rates, in each organ specific volume.

6. Two separate national kidney long term survival models are presented in the Kidney Chapter of the Executive Summary and the Summary Chapter of the Kidney Volume. In addition to the variables selected for the first model, the second model included two post-transplant variables: delayed graft function (defined as whether a patient needed dialysis in the first week after transplant), and presence of rejection events (defined as whether a patient experienced rejection episodes within the first six months following transplant). This is because these two variables have been demonstrated in the past to play important roles in long term survival. However, these variables also may be highly related to practices at individual transplant programs. Therefore, in calculating expected survival rates for a given transplant program, the first model was applied instead of the second, which might adjust for a possible center effect expressed within these two variables.

C. USES OF THE REPORT

Potential transplant candidates and their family members commonly use this report to learn about transplantation and assess transplant programs. The data contained in the report are particularly helpful in combination with other resource information available from UNOS, such as patient brochures and general statistics on organ donation and transplantation.

Outcome data in this report also are valuable to researchers in a variety of settings, including academic research departments, hospital planning and development, and managed care organizations. Such information can help researchers analyze transplant services.

The report also has been used as a resource by journalists preparing news stories on transplant topics. *However, it must be noted that the report is not intended to rank transplant programs based on outcome, nor to compare the actual performance of programs relative to one another.* The most appropriate comparison is of an individual program's *actual* survival outcomes relative to its *expected* outcomes.

UNOS and the transplant community also have used the report data as a continuous quality improvement tool. This began in 1992 when the UNOS Membership and Professional Standards Committee, in conjunction with UNOS staff, developed an objective method for determining which programs should be investigated due to poor (lower than expected) performance. Specifically, the method uses this report to identify potential "poor performance" programs, and then re- evaluates these programs *using more recent data.* Both statistical and clinical significance are important components of this method, which set for *actual* program survival rates a threshold deviation from their *expected* rates. Specifically:

- *-10% for deviations which are highly statistically significant (p-value close to zero), or*
- *-35% for deviations which are not statistically significant (p-values close to one) but are considered to be clinically significant.*

Using this standard through a continuous quality improvement process is not intended to be punitive, but rather allows UNOS to identify, in a reasonable way, what is fair across a wide variety of programs and to determine those for which further review is indicated.

D. WHAT TO REMEMBER WHEN USING THE REPORT

In this report, each transplant program's data are summarized in three ways:

1. Graft and patient survival rates table -- presents both the actual and expected graft and patient

survival rates at 1 month (thoracic organs) or 3 months, 1 year, and 3 years.

2. Donor and recipient characteristics table -- displays a comparison of the transplant program's patient and donor characteristics with the national overall data.

3. Optional written narrative from transplant program -- describes the transplant program's understanding of their graft and patient survival rate data.

When using the report, you should remember that:

- Caution should be exercised in comparing one program to another because each program may reflect a special patient and donor pool. Conclusions should be based not only on the survival rate tables but also on the patient and donor characteristics tables and the optional narrative provided by the transplant program.

- By themselves, the **actual** survival rates may be misleading because the actual survival rates are reflective of both the quality of the services at a program and the characteristics of the patients being treated by that program.

- The **expected** survival rates show what survival rates are to be expected at a program if its patient and donor characteristics are taken into account. However, not all of the characteristics affecting graft and patient survival were included in the analysis. *There may be other characteristics which have an impact on survival rates that were not included in this report.*

- For the large majority of transplant programs, the difference between the actual and expected survival rates was not statistically significant.

- The number of transplants performed at a program is an important characteristic to consider when evaluating survival rates. In general, the more transplants a program has performed, the more closely the survival rates reflect the quality of the program.

Patients and their families also should consider the following characteristics in selecting a transplant program:

- The experience, training, and education of the transplant team and the medical and nursing c available throughout the process, from candida evaluation through transplantation and follow-up care.

- The costs of the transplant procedure, physician services, hospitalization, and medications.

- The proximity of the transplant program to home and how easily it can be reached.

- The friends and family available for assistance before, during, and after the transplant.

- The quality and availability of post-transplant services.

E. ADDITIONAL RESOURCES

Personal Physician -- One of the most valuable resources for interpreting the data in the *1997 Report of Center Specific Graft and Patient Survival Rates* is a personal physician. Even if the physician does not have a copy of the report, he or she should be able to explain the differences between the types of data reported for the specific transplant programs of interest.

The Transplant Program -- Information about a transplant program's graft and patient survival rates should be available upon request of the transplant program. You might seek assistance from the transplant surgeon or physician, transplant coordinator, or social worker.

National Organ Procurement and Transplantation Network (OPTN) and the Scientific Registry of Transplant Recipients -- UNOS maintains the OPTN and the Scientific Registry and can be contacted for information about the report and for assistance with data interpretation. Please contact:

All ***Patient*** inquiries:	(888)TXINFO-1
Research inquiries:	UNOS Data Request Line -- 804/330-8576 or 804/323-3794 (fax)
Media inquiries:	(804) 327-1432

UNOS also maintains a **Web site** on the Internet from which visitors can retrieve the latest UNOS statistics, patient information, press releases, policie

and by-laws, and other information pertinent to transplant professionals, the media, and the general public. The address is: **www.unos.org.**

UNOS also is producing the *1997 Report of the OPTN: Waiting List Activity and Donor Procurement*. The purpose of this report is to provide information relating to donor procurement and waiting list activity, including median waiting times to transplant and percentage transplanted for the U.S. as well as each UNOS region and every OPO. Used in conjunction with the *1997 Report of Center Specific Graft and Patient Survival Rates*, patients and their families will have information on donor procurement rates and estimated waiting time to transplant given various patient clinical or demographic characteristics for each OPO and waiting list activity data for transplant centers within each OPO.

UNOS also has resource packets available for transplant patients or family members. These packets include brochures on the organ allocation process and questions patients should ask a transplant program, information on financial issues for transplant patients, summary transplant statistics and details on obtaining more specific information from UNOS.

Beginning in 1998, transplant centers will provide a resource packet to every patient accepted for transplantation. In addition, UNOS maintains a toll-free request line (1-888-TXINFO-1) for anyone wishing to receive this information separately.

The Federal Government -- The *1997 Report of Center Specific Graft and Patient Survival Rates* was prepared by UNOS under contract with the U.S. Department of Health and Human Services, Health Resources and Services Administration, Office of Special Programs, Division of Transplantation. For information on how to obtain a copy of the report, or additional information regarding transplantation, contact:

Health Resources and Services Administration
Office of Special Programs
Division of Transplantation
5600 Fishers Lane
Parklawn Building., Room 7-29
Rockville, Maryland 20857 USA
(301) 443-7577

II. DATA HIGHLIGHTS

Numbers of Transplants, Patients, and Programs
Completeness of Follow-up Data
National Graft and Patient Survival Rates
Differences in Actual and Expected Survival Rates
Overall Donor and Recipient Characteristics
Characteristics Affecting Survival Outcomes
Conclusions

II. DATA HIGHLIGHTS

A. NUMBERS OF TRANSPLANTS, PATIENTS, AND PROGRAMS

There were 97,587 transplants performed for 92,966 patients at 742 programs between January 1, 1988, and April 30, 1994 (see Table II-1). The entire transplant cohort was used to determine graft and patient survival rates at 3 months (1 month for thoracic organs) and 1 year. A subset of this cohort (i.e., transplants performed between January 1, 1988, and April 30, 1992) was used to calculate survival rates at 3 years. Three year survival rates were determined in two ways:

1. Unconditional survival at 3 years post-transplant.
2. **Conditional 3 year survival**, defined as survival at 3 years for those who survived at least 1 year post-transplant.

The emphasis on long term survival in this report is on the conditional 3 year survival rates because the conditional analysis assesses characteristics independent of those limited to the first year, such as the risk of surgical procedures.

B. COMPLETENESS OF FOLLOW-UP DATA

Completeness of graft and patient follow-up data for 1 year and conditional 3 year survival is shown in Table II-2. If the status of a patient (graft) was known at the end of a specified time interval, then that observation was said to have complete follow-up data at the end of that interval. For example, the time interval for the conditional 3 year analysis is from 1 year to 3 years after transplantation. Thus, complete follow-up data would indicate a known status, either that the patient was still alive (graft was still functioning) at 3 years post-transplant, or that the patient died (graft failed) between 1 and 3 years post-transplant.

As Table II-2 shows, more than 98% of 1 year graft follow-up data and more than 96% of 1 year patient follow-up data were complete. For conditional 3 year survival, more than 91% of both graft and patient follow-up data were complete. Abdominal organ recipients had lower levels of complete 1 year follow-up data. This may be due to higher retransplantation rates for these organs. Additionally, with kidney or pancreas failure, patients might survived by being returned to dialysis or exogenous insulin administration and thus could be subsequently lost to follow-up.

Table II-1. Number of Transplants, Patients, and Transplant Programs

Organ	Number of Transplants	Number of Patients	Number of Programs
KI	62,572	60,340	249
LI	16,658	14,607	103
PA	3,222	3,142	96
HR	12,627	12,428	161
LU	2,135	2,079	75
HL	373	370	58
Total	97,587	92,966	742

Table II-2. Completeness of Graft and Patient Follow-up Data

Organ	1 Yr FU[1] (%)		Cond. 3 Yr FU[2] (%)	
	Graft	Patient	Graft	Patient
KI	98.3	96.5	91.7	91.9
LI	99.1	98.5	96.8	96.5
PA	99.3	96.5	93.9	94.4
HR	98.9	98.9	98.0	97.9
LU	98.7	98.6	95.4	95.2
HL	98.1	98.1	96.7	96.7

[1] Based on transplants from 1/1/88 to 4/30/94.
[2] Based on transplants from 1/1/88 to 4/30/92.

C. NATIONAL GRAFT AND PATIENT SURVIVAL RATES

The national graft and patient survival rates for each organ are displayed in Table II-3. For kidney, liver, and pancreas transplants, patient survival rates are higher than graft survival rates. This may be due to (a) re-transplantation (kidney and liver re-transplantation rates were 13%), (b) returning to dialysis for kidney patients, and (c) insulin administration for pancreas patients. At conditional 3 years post-transplant, graft and patient survival rates are comparable, indicating that re-transplantation, returning to dialysis, and insulin treatment are usually early events following transplantation.

For heart, lung and heart-lung transplants, graft and patient survival rates are comparable at all time points because, for these organ types, graft failure usually leads to patient death.

Conditional 3 year graft and patient survival rates were approximately 90% for all organs, with the exception of lung and heart-lung. Conditional 3 year rates are better than 1 year survival rates for all organ types, indicating that the most critical period of time is the first year post-transplant. Those who survive the first year are very likely to survive 3 years post-transplant.

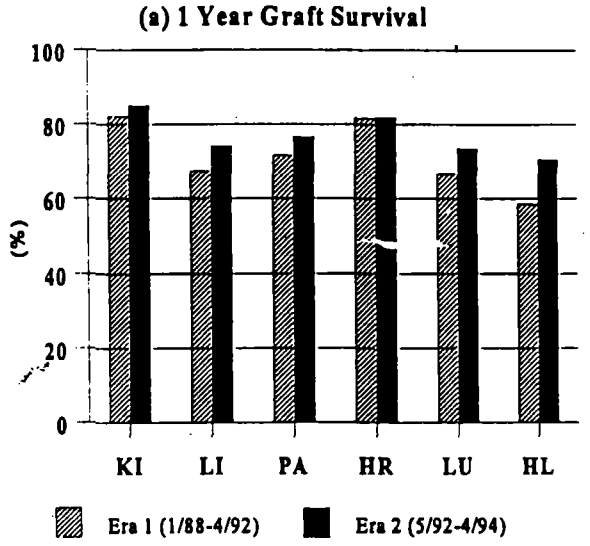
Survival Rates by Era

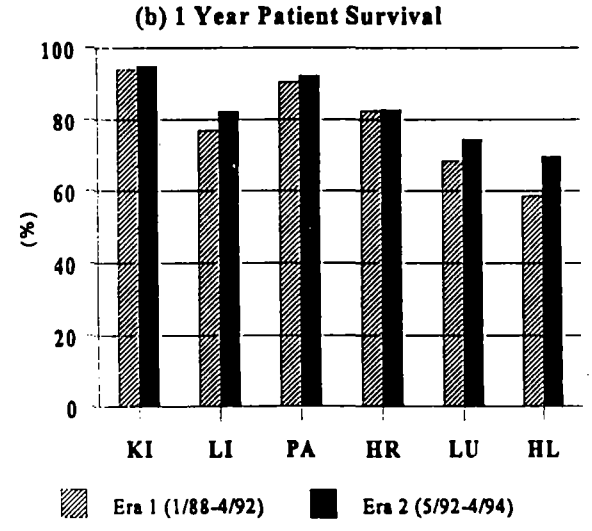
Figure II-1 on the following page presents the 1 year graft and patient survival rates for two different eras -- Era 1, from January 1, 1988, to April 30, 1992; and Era 2, from May 1, 1992, to April 30, 1994. The figure shows a substantial improvement in graft and patient survival rates over time for nearly all organs. The only exception was heart transplants, for which survival rates remained virtually unchanged in the two eras. The greatest changes in survival were seen for heart-lung, lung, and liver with 1 year graft survival rate increases of 12, 7, and 7 percentage points, respectively. These results support the evidence that transplantation outcomes are improving as more effective surgical techniques, medical care, and immunosuppression drugs are developed. Ultimately, patients benefit from these improvements.

Table II-3. Overall Graft and Patient Survival Rates by Organ

Organ	Graft Survival (%)				Patient Survival (%)			
	1 or 3 Months	1 Year	3 Years	Cond. 3 Years	1 or 3 Months	1 Year	3 Years	Cond. 3 Years
KI	88.8	83.4	75.7	90.8	97.2	94.3	89.1	94.5
LI	77.7	69.9	62.2	89.0	85.3	79.0	71.4	90.4
PA	83.6	73.5	67.1	91.3	96.1	91.1	84.1	92.3
HR	91.6	81.7	73.7	90.2	92.1	82.5	74.8	90.7
LU	86.8	70.4	52.6	74.7	87.7	71.9	54.6	75.9
HL	81.9	61.9	49.6	80.1	82.2	61.9	50.3	81.2

Figure II-1. One Year (a) Graft and (b) Patient Survival Rates by Era





D. PROGRAMS WITH ACTUAL SURVIVAL RATES SIGNIFICANTLY ABOVE OR BELOW EXPECTED SURVIVAL RATES

After accounting for both donor and recipient characteristics, some transplant programs had either significantly more or fewer patient deaths (graft failures) than were expected statistically. Figure II-2 on the following page illustrates the percentage of programs with actual graft survival rates either significantly below, equal to, or significantly above their expected survival rates, both at 1 year and conditional 3 years. Note that programs with actual survival rates that were *not statistically different* from expected rates are shown in the "equal to" group. The patterns for patient survival rates by program are similar to those shown for graft survival.

For the majority of transplant programs, the difference in actual and expected graft and patient survival was not statistically significant, regardless of organ type. As depicted in Figure II-2, the "center effects" (i.e., the practices or quality of a transplant program) were most noticeable among liver programs, followed by heart and kidney programs. For example, at 1 year post-transplant, approximately 35% of liver programs had actual survival rates which were significantly different from expected rates. Of these, about 24% of the liver programs had actual survival rates less than expected and 11% of the programs had better than expected survival rates. Fewer significant differences were found among lung and heart-lung programs, probably due to the small number of transplants performed by these programs. The "center effect" diminished considerably for the conditional 3 year survival rates. These data appear to indicate that center effects are most likely to be observed within the first year post-transplant; these effects are less influential on long term survival outcomes. This is supported by the overall conditional 3 year survival rates which were approximately 90% for most organ types and 90% for most of the transplant programs.

Program Comparisons -- 1994 and 1997 Reports

Compared to the results from the 1994 Report, the 1997 Report had a greater percentage of programs with actual survival rates which were significantly different from their expected rates. In part, this is due to the fact that the number of transplants per

program increased considerably between the 1994 Report and this study. In other words, because of the greater the number of transplants, the power to detect differences between actual and expected survival rates was greater.

Figure II-2. Percentages of Programs with Actual Graft Survival Rates Above, Below, or Equal to Expected Survival Rates

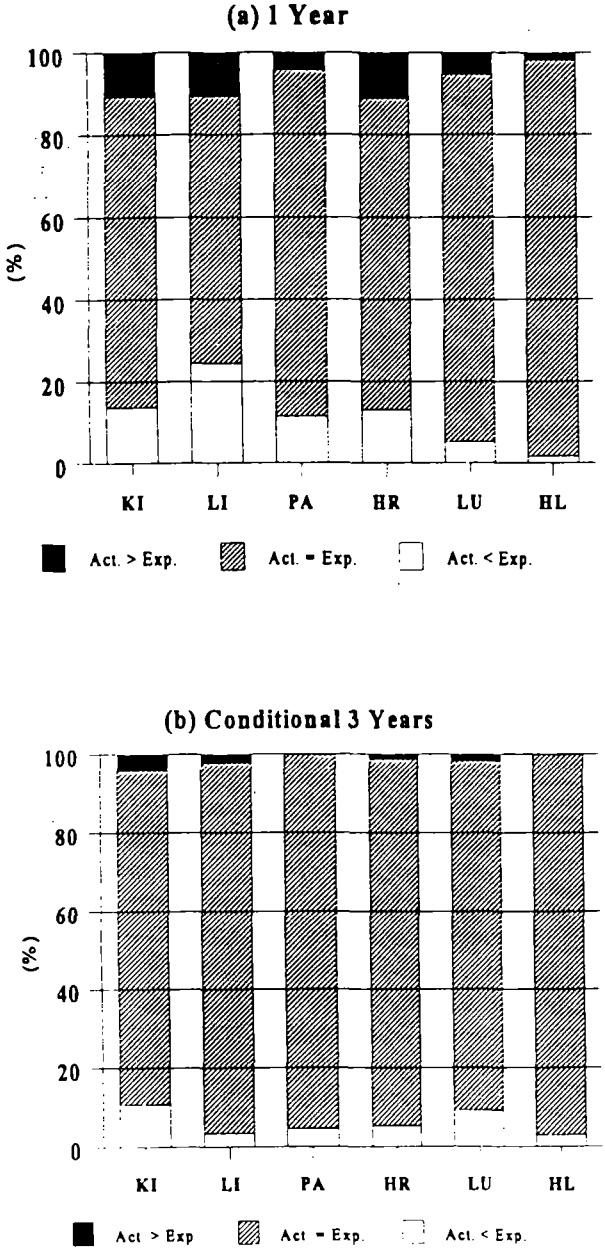


Table II-4 on the following page compares the numbers of (a) kidney, (b) liver, and (c) heart transplant programs with actual 1 year graft survival rates below, equal to, or above their expected survival rates, for the 1994 and 1997 Reports. For example, in the kidney table, 21 programs had less than expected graft survival rates in the 1994 Report. In the 1997 Report, the classification for 15 of these 21 programs remained the same (i.e., their actual survival outcomes were still less than expected) but six programs had actual survival rates which were equal to their expected rates.

There were 13 kidney, 15 liver, and 10 heart programs which began doing transplants after the 1994 Report was produced. Of these new programs, 92% had actual graft survival rates which were equal to or above their expected rates.

The larger differences in actual and expected rates were nearly always seen in programs that reported relatively few transplants during the study period. For example, when looking at 1 year graft survival for kidney, heart, and liver transplant programs, nearly all differences greater than 10% (either above or below expected rates) were found among programs performing fewer than 25 transplants per year (see Figure 2 in each organ specific chapter). Therefore, it is important to consider transplant volume when evaluating the performance of a transplant program.

The UNOS Membership and Professional Standards Committee, in conjunction with UNOS staff, have developed an objective method by which to determine which programs should be investigated due to poor performance. Specifically, the method uses this report to identify potential "poor performance" programs, and then re- evaluates these programs *using more recent data*. Both statistical and clinical significance are important components of this method. Details are described in the Uses of the Report Section of the Overview Chapter.

Table II-4. Numbers of Programs with Actual 1 Year Graft Survival Rates Below (<), Equal to (=), or Above (>) Expected Survival Rates; 1997 and 1994 Reports Compared.

(a) Kidney

Programs	N	1997 Report <	1997 Report =	1997 Report >
1994 Report				
<	21	15	6	0
=	193	19	163	11
>	22	0	7	15
New[1]	13	0	12	1
Total	249	34	188	27

(b) Liver

Programs	N	1997 Report <	1997 Report =	1997 Report >
1994 Report				
<	13	13	0	0
=	68	10	54	4
>	7	0	0	7
New[1]	15	2	13	0
Total	103	25	67	11

(c) Heart

Programs	N	1997 Report <	1997 Report =	1997 Report >
1994 Report				
<	16	15	1	0
=	123	5	110	8
>	12	0	2	10
New[1]	10	1	9	0
Total	161	21	122	18

[1] New programs started after the 1994 Report.

E. OVERALL DONOR AND RECIPIENT CHARACTERISTICS

The distribution of all donor and recipient characteristics, overall and by era, can be found in each organ specific chapter. Described below are some of the donor and recipient trends seen when comparing Era 1 (1/88-4/92) and Era 2 (5/92-4/94) data.

Donor Trends

The majority of organs transplanted were recovered from white male donors between the ages of 18 and 45. Among cadaveric donors, motor vehicle accidents as a cause of death decreased, while cerebrovascular deaths increased. Donors age 50 and older, minority donors, and living donors all increased between Era 1 and Era 2. (In this report, living donors were included only in the analysis for kidney transplants.)

Kidney Recipient Trends

Over time, the percentage of minority recipients increased. Simultaneous kidney-pancreas transplants and patients with diabetes or systemic diseases also increased slightly. Recipients with a PRA of 20% or more prior to transplant and those with an HLA mismatch level greater than 3 decreased between Era 1 and Era 2. The incidences of post-transplant delayed graft function and rejection episodes also decreased in Era 2.

Liver Recipient Trends

More recipients were older with a diagnosis of cirrhosis in Era 2. The percentage of recipients in the intensive care unit (ICU) just prior to transplant decreased substantially. While the re-transplantation rate remained high in both eras, it did decrease slightly over time.

Pancreas Recipient Trends

Similar to the kidney recipient trends, the percentage of minority recipients increased between Era 1 and Era 2. There was also a slight increase in the number of simultaneous kidney-pancreas transplants.

Heart Recipient Trends

More recipients were older and in the ICU just prior

to transplant in Era 2 than in Era 1. There also were more minority recipients over time. The number of recipients with cardiomyopathy increased during the study period as did the average length of cold ischemic time.

Lung Recipient Trends

Transplant recipients were older and yet fewer were in the ICU at the time of transplant in the second era. The percentage of recipients with emphysema increased while the percentages of recipients with Alpha-1-Antitrypsin deficiency and primary pulmonary hypertension decreased over time. Also, the mean cold ischemic time increased from Era 1 to Era 2.

Heart-Lung Recipient Trends

In Era 2, the percentage of recipients less than 18 years increased substantially compared to Era 1. The percentage of minority recipients also increased during the second era. Congenital diagnoses, including Eisenmengers syndrome, were the main indication for transplant in Era 2. The mean cold ischemic time increased in the second era also.

F. CHARACTERISTICS AFFECTING SURVIVAL OUTCOMES

To identify the donor and recipient characteristics affecting graft and patient survival outcomes, separate analyses were performed for each organ and time point of interest. These analyses then were used to calculate each program's expected survival rate. The difference between a program's expected and actual survival rates may provide some indication of the "center effect," or quality of a program.

Of all the donor and recipient characteristics that were initially included in the analyses, some turned out to be exceptionally strong predictors of graft or patient short and long term survival outcomes. Some of the characteristics affecting transplant outcomes for each organ are listed below. Details/further information about the impact of these and other characteristics on short and long term survival can be found in each organ specific chapter.

Kidney

The characteristics with the strongest **positive** impact on **short term** outcomes were:

- Recipient received a living donor transplant
- Recipient was Asian or Hispanic
- Recipient was female
- Year of transplant was 1993 or 1994

The characteristics with the strongest **negative** impact on **short term** outcomes were:

- Recipient received a previous kidney transplant
- Recipient HLA was poorly matched with the donor
- Recipient was in the ICU or hospitalized at the time of transplant
- Recipient was less than 2 years old
- Recipient had diabetes
- Donor was Black or Hispanic

The characteristics with the strongest **positive** impact on **long term** outcomes were:

- Recipient received a living donor transplant
- Recipient was female

The characteristics with the strongest **negative** impact on **long term** outcomes were:

- Recipient received a previous kidney transplant
- Recipient HLA was poorly matched with the donor
- Recipient had diabetes or a systemic disease
- Recipient was Black
- Recipient needed dialysis within the first week post-transplant
- Recipient experienced rejection episodes within 6 months post-transplant
- Donor was Black

Liver

The characteristics with the strongest **positive** impact on **short term** outcomes were:

- Recipient had cholestatic disease/biliary cirrhosis
- Year of transplant was 1993 or 1994

The characteristics with the strongest **negative** impact on **short term** outcomes were:

- Recipient received a previous liver transpl
- Recipient received a reduced or split liver transplant

- Recipient was on life support or in the ICU at the time of transplant
- Recipient's most recent serum creatinine prior to transplant was >2 mg/dl
- Donor was Black or Hispanic
- Donor and recipient blood type were incompatible

The characteristics with the strongest **positive** impact on **long term** outcomes were:

- Recipient was female
- Recipient had acute hepatic necrosis, cholestatic disease/biliary cirrhosis, or a disease from the miscellaneous disease group

The characteristics with the strongest **negative** impact on **long term** outcomes were:

- Recipient received a previous liver transplant
- Recipient received a reduced or split liver transplant
- Recipient was less than 2 years old
- Recipient had malignant neoplasms
- Donor was female

Pancreas

The characteristics with the strongest **negative** impact on **short term** outcomes were:

- Recipient received a previous pancreas transplant
- Recipient received a pancreas alone or a pancreas subsequent to a kidney transplant
- Year of transplant was prior to 1991

The characteristics with the strongest **negative** impact on **long term** outcomes were:

- Recipient age was older
- Recipient received a pancreas alone or a pancreas subsequent to a kidney transplant
- Donor was Black
- Donor age was older

Heart

The characteristics with the strongest **negative** impact on **short term** outcomes were:

- Recipient received a previous heart transplant
- Recipient had a congenital heart disease
- Recipient was in the ICU and/or on a ventilator/VAD at the time of transplant
- Year of transplant was prior to 1993

The characteristics with the strongest **negative** impact on **long term** outcomes were:

- Recipient received a previous heart transplant
- Recipient was Black or Hispanic
- Donor was Hispanic

Lung

The characteristics with the strongest **negative** impact on **short term** outcomes were:

- Recipient received a previous lung transplant
- Transplant type was double lung transplant
- Recipient had fibrosis, primary pulmonary hypertension, or a congenital lung disease
- Recipient was on a ventilator at the time of transplant
- Transplant year was prior to 1993

The characteristics with the strongest **negative** impact on **long term** survival was:

- Recipient race was non-White

Heart-Lung

The characteristic with the strongest **negative** impact on **short term** outcomes was:

- Recipient received a previous heart-lung transplant
- Recipient was on a ventilator at the time of transplant
- Year of transplant was prior to 1990

The characteristic with the strongest **negative** impact on **long term** outcomes was:

- Recipient was hospitalized or in ICU at transplant
- Recipient had primary pulmonary hypertension

G. CONCLUSIONS

The number of transplant programs and transplant procedures performed in the United States continue to grow at a rapid pace. A total of 97,587 transplants for 92,966 recipients performed at 742 transplant programs are included in this report. Since the 1994 Report, the largest increases in the number of

transplant procedures occurred for lung transplants (189% increase), pancreas transplants (88% increase), and liver transplants (73% increase). The number of transplant programs in the 1997 Report is 16% greater than the number of programs in the 1994 Report (640) and 40% greater than those in the 1991 Report (531). *Program growth* between 1991 and 1997 was most notable for lung (213% increase), pancreas (92% increase), and liver (47% increase) programs.

Transplant volume differed greatly among programs. The majority of transplants were performed by a small number of transplant programs. For example, nearly 75% of all liver transplants were performed by only 27% of the 103 liver programs during the period between January 1, 1988 and April 30, 1994. Approximately 20% of the 249 kidney programs performed over 50% of all kidney transplants during the same period. Similarly, about 20% of the 161 heart programs performed over 50% of all heart transplants. Issues relating to transplant program volume may become increasingly important in the future, some studies have already demonstrated a relationship between transplant center volume and outcome.[1,2]

It is encouraging to note that overall graft and patient survival rates have improved for all organs over time (see Figure II-1). For example, the 1 year graft survival rate for lung transplants increased 7 percentage points from Era 1 (1/88-4/92) to Era 2 (5/92-4/94), while the 1 year patient survival rate increased 6 percentage points. The 1 year graft survival rate for heart-lung transplants increased over 12 percentage points, and for lung transplants, it increased over 7 percentage points. Survival rates for liver transplants also increased; at 1 year, graft survival rates increased 7 percentage points and patient survival rates increased 5 percentage points from Era 1 to Era 2. It is unlikely that these observed increases were due entirely to differences in donor and recipient characteristics or to chance alone. Based on the survival analyses performed for each organ, transplants in more recent years were always associated with a statistically significant increase in the odds of survival.

Recipient functional status (i.e., the degree of medical urgency), donor and recipient race, whether the procedure was a first or repeat transplant, and the year of transplant were among the strongest predictors of recipient outcomes. *In general*, characteristics associated with a significantly increased odds of graft failure and/or patient death were (a) being hospitalized just prior to transplant, (b) being a non-White recipient, (c) receiving an organ from a non-White donor, and (d) having a repeat transplant. Heart transplant recipients whose reason for transplant was a congenital disease and liver recipients with a malignancy had poorer outcomes than heart and liver recipients with other diseases.

Despite the statistical adjustment for numerous donor and recipient characteristics, much of the variation in the program specific survival rates remained unexplained by this analysis. Clearly, other factors, some of which may not be easily obtained or quantified, may account for some of the unexplained variation. It also should be noted that in a study of this size, it is possible that statistically significant positive or negative results for some programs may have occurred simply by chance. Nevertheless, in this report, measurable differences in program specific outcomes were determined. The reader is reminded and cautioned that the clinical importance of these differences must be evaluated on a program specific basis.

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1 Hosenpud J.D., Breen T.J., Edwards E.B., et al., 1994 The effect of transplant center volume on cardiac transplant outcome. *JAMA* 271: 1844-1849

2 Hunsicker L.G., Edwards E.B., Breen T.J. and Daily O.P. 1993. *Transplant Proceedings* 25:1318-1320.

III. KIDNEY CHAPTER

Introduction
Completeness of Follow-Up Data and Survival Rates
Percentages of Actual and Expected Graft Survival Rates
Percentages of Actual and Expected Patient Survival Rates
Donor and Recipient Characteristics
Impact of Characteristics on Short Term Survival
Impact of Characteristics on Long Term Survival
Comparison Between Short and Long Term Characteristics
Statistical Methods and Models
Summary
Final Words

III. KIDNEY TRANSPLANT SURVIVAL RATES

For the Summary of this chapter, see page 42. For definitions of any terms used here, please refer to the User's Guide in the Kidney volume.

A. INTRODUCTION

This report of kidney transplant survival rates is based upon verified Scientific Registry data for 62,572 transplants involving 60,340 patients from 249 kidney transplant programs in the United States. Each program reporting at least one kidney or combined kidney-pancreas transplant between January 1, 1988, and April 30, 1994, was included. Multi-organ transplants other than combined kidney-pancreas procedures were excluded.

Short term survival is defined as survival at 3 months and 1 year post-transplant. Short term survival rates are based on all transplants in the study for which there are follow-up data.

Long term survival is defined in two ways:

- unconditional survival at 3 years post-transplant, and
- survival at 3 years post-transplant for those who survived at least 1 year, referred to as **conditional 3 year survival**.

The long term survival rates are based on all transplants between January 1, 1988, and April 30, 1992, for which there are follow-up data. This cohort was chosen to ensure that the maximum number of transplants with follow-up data was used to determine long term survival rates. Please note that the emphasis on long term survival in this report is on the *conditional* 3-year survival rates. This is because the conditional 3-year analysis provides an assessment of characteristics independent of those limited to the first year (e.g., surgical complications and early acute rejection events).

B. COMPLETENESS OF FOLLOW-UP DATA AND OVERALL GRAFT AND PATIENT SURVIVAL RATES

For graft survival, completeness of follow-up data and overall actual survival rates at each time point are shown in Table III-1; patient survival data are shown in Table III-2.

Patient (graft) follow-up data were considered complete when:

- the patient was alive (kidney was functioning) and the duration of survival (function) was equal to or exceeded the specified time after transplant (i.e., 3 months, 1 or 3 years), or
- the patient died (kidney failed) and a valid date of death (failure) was reported.

The percentages of complete follow-up data ranged from a low of 91.7% for the conditional 3 year time point to a high of 99.5% for the 3 month time point.

Overall survival rates also are presented in the tables. Patient survival rates are better than graft survival rates at all time points because patients may survive on dialysis even if their grafts fail. If a graft had incomplete follow-up data, the observation was weighted to account for the time during which the graft was known to be functioning. Therefore, the actual graft survival rate reflects the weighted proportion of grafts functioning at the specified time interval. Patient survival rates were computed in a similar way (see the *Technical Methods* chapter of the *Executive Summary*).

In the calculation of graft survival rates, death with a functioning graft was treated differently depending upon the time interval. For short term survival (3 months, 1 year), grafts were considered to have failed at the time of death because it is reasonable to assume that deaths occurring shortly after a transplant are likely to be related to graft dysfunction. For long term survival, because it is more likely that death might not be related to graft failure, if a patient died with a functioning graft more than 1 year after a transplant, the graft was treated as a censored observation at the time of death. In other words, it was treated as if the graft still functioned but further follow-up data were unavailable. The graft then was weighted for the proportion of time in the period that the graft was functioning (see the *Technical Methods* chapter of the *Executive Summary* for a complete description of weighting.)

In the cohort of transplants (1/1/88 - 4/30/92) used to compute conditional 3 year survival rates, patients (grafts) who did not survive to 1 year after transplant were excluded from the analyses. Therefore, the total number of patients (grafts) for the conditional 3 year analysis was less than that for the 3 month and 1 year analyses. Further, the number of patients is greater than the number of grafts because more grafts failed than patients died within the first year post-transplant.

Please note that the conditional 3 year graft and patient survival rates in Tables III-1 and III-2 may be higher than the 1 year graft survival rates. This is possible because the conditional 3 year survival rates should be interpreted as the 3 year survival rate for patients (grafts) who (which) survived at least 1 year post-transplant.

For example: Program A performed a total of five transplants between 1/1/88 and 4/30/92. Two of the kidneys failed prior to 1 year post-transplant and the remaining three kidneys survived to 3 years after transplant. In this example, Program A has a 1 year graft survival rate of 60% (3 out of 5 kidneys were functioning at 1 year post-transplant). However, the conditional 3 year survival rate for Program A is 100% because all three kidneys that were functioning at 1 year after transplant also were functioning at 3 years post-transplant. The same calculations are used for patient survival. See the *Technical Methods* chapter of the *Executive Summary* for more specific definitions of follow-up data and the calculations for actual graft and patient survival.

Overall Graft and Patient Survival Rates by Era

In this report, short term survival also is reported by era. Separate eras were used to determine whether there were any improvements over time in the short term survival rates. Era 1 is defined as all transplants occurring between January 1, 1988, and April 30, 1992; Era 2 includes all transplants occurring between May 1, 1992, and April 30, 1994. The overall graft and patient survival rates by era are presented in the last two columns of Table III-1 and Table III-2, respectively. The results demonstrate improvement in both graft and patient survival rates over time.

Table III-1. Completeness of Graft Follow-Up Data and Actual Survival Rates for Kidney Transplants

Time	Cohort	Number of Transplants	Percent with Follow-Up Data	Graft Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	62,572	99.5	88.8	87.9	90.6
1 Year	1/1/88 - 4/30/94	62,572	98.3	83.4	82.3	85.6
Cond. 3 Years	1/1/88 - 4/30/92	33,192	91.7	90.8*	90.8*	N/A*

Table III-2. Completeness of Patient Follow-Up Data and Actual Survival Rates for Kidney Transplants

Time	Cohort	Number of Patients	Percent with Follow-Up Data	Patient Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	60,340	98.9	97.2	96.9	97.6
1 Year	1/1/88 - 4/30/94	60,340	96.5	94.3	94.0	94.9
Cond. 3 Years	1/1/88 - 4/30/92	36,394	91.9	94.5*	94.5*	N/A*

* The cohort used to determine the overall conditional 3 year survival rate is the same as the Era 1 cohort. Therefore, the overall conditional 3 year survival rates are identical to the conditional 3 year survival rates for Era 1. There is no conditional 3 year survival rate calculated for Era 2 due to insufficient follow-up data on patients who received transplants in Era 2

C. GRAFT SURVIVAL -- PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

For each transplant program, actual and expected survival rates were calculated at 3 months, 1 year, and 3 years conditional on survival at 1 year. Survival rates at each time point were determined using a specific cohort of transplants (shown in Tables III-1 and III-2 on the previous page). Expected survival rates were determined for each transplant program based on its specific patient and donor characteristics. These expected outcomes were statistically adjusted for many important prognostic variables, or covariates, that were used in the survival analysis. In other words, they take into account the many different characteristics that affect survival. For example: *if Program A transplanted many more "high risk" recipients than Program B, then Program A would have a lower expected survival rate than Program B.*

If a program's *actual* survival rate was *greater* than its expected survival rate, this means that the program's actual results were higher than the national results for transplants *with the same donor and recipient characteristics.* If a program's *actual* survival rate was *less than* its expected survival rate, this means that the program's actual results were lower than the national results for transplants *with the same donor and recipient characteristics. The difference between the actual and expected rate may have occurred by chance and, therefore, may not be statistically significant.* Furthermore, even a statistically significant difference, one that most likely did not occur by chance, may not be clinically significant (i.e., medically important). A formal description of the methods used to determine actual and expected survival rates appears in the *Technical Methods* chapter of the *Executive Summary*.

Table III-3 shows the percentages of kidney transplant programs by graft survival rates, both for actual and expected survival. The majority of the transplant programs had actual survival rates greater than 80% at all time points. The 1 year survival rates showed a greater variation among programs than the 3 month and conditional 3 year survival rates. At 3 months, 38% of programs had actual survival rates greater than 90%. At 1 year, this fell to 12%. However, the percentage increased to 61% for the conditional 3 year survival rates. The distribution of the expected survival rates shows a similar trend. The results indicate that there are more programs with high survival rates (>90%) at the conditional 3 year time point than there are at the 1 year time point. *This is because the most critical period of time for graft survival is the first year post-transplant.* Those who survive the first year are very likely to survive 3 years post-transplant.

The percentages of programs by short term graft survival rates and eras, both for actual and expected survival, are summarized in Table III-4. The results demonstrate a substantial improvement in graft survival over time because a greater percentage of programs had actual survival rates higher than 90% in Era 2. Expected survival rates in Era 2 also were higher than in Era 1.

Table III-3. Percentages of Kidney Transplant Programs by Graft Survival Rates

Graft Survival Rate (%)	Actual			Expected		
	3 Months (n= 249)	1 Year (n=249)	Cond. 3 Yrs (n=236)	3 Months (n=249)	1 Year (n=249)	Cond. 3 Yrs (n=236)
0-40	0.0	0.0	0.4	0.0	0.0	0.0
>40-60	0.0	0.8	0.0	0.0	0.0	0.0
>60-80	4.8	22.9	5.5	0.0	6.0	0.0
>80-90	57.0	63.9	33.5	71.5	92.8	31.4
>90-100	38.2	12.4	60.6	28.5	1.2	68.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Table III-4. Percentages of Kidney Transplant Programs by Graft Survival Rates and Era

Graft Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)
0-40	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
>40-60	0.9	0.4	2.1	0.4	0.0	0.0	0.0	0.0
>60-80	9.3	5.0	30.5	17.1	0.0	0.0	13.6	2.9
>80-90	54.2	36.7	55.5	56.3	86.9	27.1	86.0	92.1
>90-100	35.6	57.9	11.9	25.8	13.1	72.9	0.4	5.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

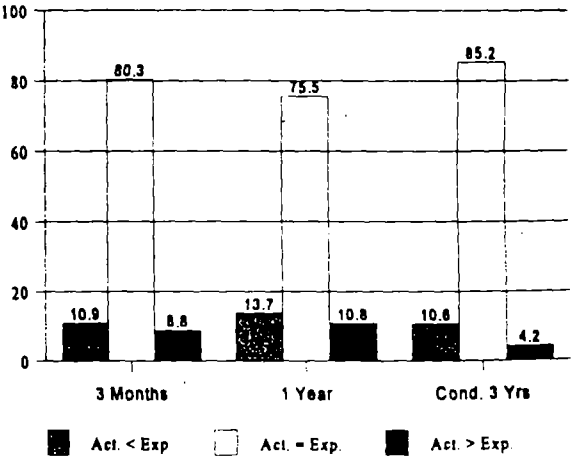
Differences in Actual and Expected Survival Rates

For most programs, the difference between the actual survival rate and the expected survival rate was not statistically significant. Figure III-1 shows the percentages of programs whose actual graft survival rates were either above, equal to, or below expected graft survival rates at three time points. Programs with actual survival rates that were not significantly different from expected rates are shown in the actual survival equals expected survival group. Actual survival rates shown in the figure to be either greater than or less than expected survival rates were statistically significant. Overall, there were more programs that fell significantly below expected results than above expected results. However, for the majority of the transplant programs, the difference in actual and expected graft survival was not statistically significant and varied little over time.

At all time points, the larger differences in actual and expected rates were nearly always seen in programs that reported relatively few transplants during the period. This occurs because programs that do not perform many transplants tend to have highly variable outcomes. To illustrate this, Figure III-2 shows a scatter plot of the average number of transplants per year (transplant volume) versus the difference in 1 year actual and expected graft survival. Nearly all differences greater than 10% (either positive or negative) are found among transplant programs performing fewer than 25 kidney transplants per year.

Please note that actual survival rates which differ from expected survival rates are not always statistically significant and even statistically significant differences may not be clinically significant.

Figure III-1. Percentages of Kidney Transplant Programs with Actual Graft Survival Rates Above, Below, or Equal to Expected Rates.*



* Actual survival rates above or below expected survival rates are statistically significant.

D. PATIENT SURVIVAL -- PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

The percentages of programs by patient survival rates for both actual and expected survival are shown in Table III-5; the percentages of programs by survival rates and eras are shown in Table III-6. Note that both actual and expected patient survival rates were higher and less variable at each time point than were actual and expected graft survival rates. As with graft survival, the outcomes in Era 2 were better than in Era 1.

Differences in Actual and Expected Survival Rates

The percentage of programs with actual patient survival rates significantly above their expected rates was greater at 1 year and conditional 3 years than at 3 months (see Figure III-3). Overall, there were more programs that fell significantly below expected results than above expected results. However, for the majority of transplant programs, the difference in actual and expected patient survival was not statistically significant and varied little over time.

Figure III-2. Kidney Transplant Volume vs Difference in Actual and Expected 1 Year Graft Survival Rates.

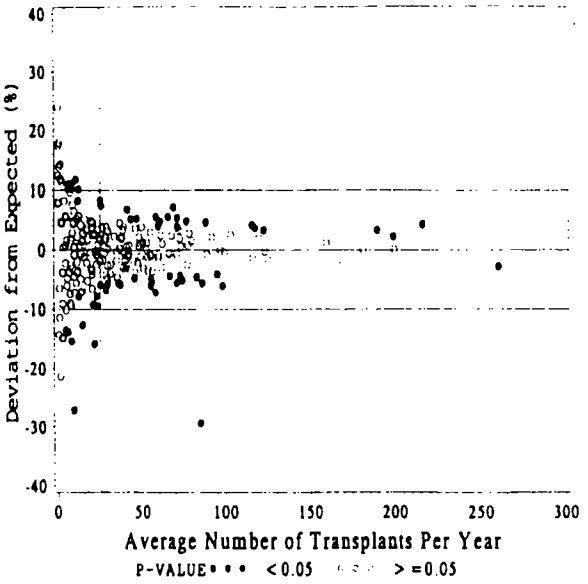


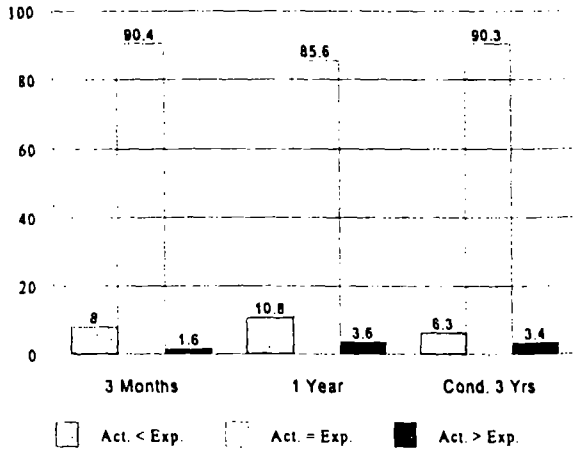
Table III-5. Percentages of Kidney Transplant Programs by Patient Survival Rates

Patient Survival Rate (%)	Actual			Expected		
	3 Months (n= 249)	1 Year (n=249)	Cond. 3 Yrs (n=236)	3 Months (n=249)	1 Year (n=249)	Cond. 3 Yrs (n=236)
0-70	0.0	0.0	0.0	0.0	0.0	0.0
>70-80	0.0	0.8	0.8	0.0	0.0	0.0
>80-90	2.4	7.6	11.5	0.4	0.8	0.4
>90-95	9.6	50.6	43.6	0.8	67.5	64.9
>95-100	88.0	41.0	44.1	98.8	31.7	34.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Table III-6. Percentages of Kidney Transplant Programs by Patient Survival Rates and Era

Patient Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)	Era 1 (n=236)	Era 2 (n=240)
0-70	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0
>70-80	0.0	0.4	0.8	0.8	0.0	0.0	0.0	0.0
>80-90	2.6	2.5	11.9	10.4	0.4	0.0	0.8	0.0
>90-95	13.1	11.3	48.3	32.1	1.3	0.0	75.0	47.5
>95-100	83.9	85.8	38.6	56.7	98.3	100.0	24.2	52.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figure III-3. Percentages of Kidney Transplant Programs with Actual Patient Survival Rates Above, Below or Equal to Expected Rates.*



* Actual survival rates above or below expected survival rates are statistically significant.

E. NATIONAL DISTRIBUTION OF DONOR AND RECIPIENT CHARACTERISTICS

The national distribution of donor and recipient characteristics for kidney transplants, presented in percentages, is shown in Table III-7. Each of these donor and recipient characteristics was included in the analyses for graft or patient survival, and used to determine an expected survival rate for each transplant.

The majority of kidneys transplanted were recovered from white male donors between the ages of 18 and 30 and the most frequent causes of death were cerebrovascular accidents (CVAs) and motor vehicle accidents (MVAs). The most common total HLA mismatch level between donor and recipient was 3 mismatches. Nearly 18% of living donor kidneys had a cold ischemic time of less than two hours. More than 35% of cadaveric kidney donors had a cold ischemic time of less than 22 hours.

The majority of kidney recipients were white males between the ages of 18 and 35. Most recipients were not hospitalized prior to transplant, and nearly 65% of the recipients showed some level of sensitization (peak PRA > 0) at the time of transplant. Of the 62,572 transplants, 13% were repeat kidney transplants. In addition, 21% (=9.1%+11.6%) of the recipients required dialysis within first week after transplant, and 41% (=21.7%+19.6%) had rejection episodes within the first 6 months following transplant.

Donor Trends

National donor characteristics changed between Era 1 and Era 2. The percentage of living donors increased 3.5%. Among cadaveric donors, there were fewer donors who died from motor vehicle accidents and more who died from cerebrovascular accidents. The

percentage of donors over age 45 increased by nearly 5% between Era 1 and Era 2, from 20.5% to 25%. The percentage of minority donors also increased, from 19% to 23%. The percentage of zero antigen mismatched kidney donors also increased slightly, which could be due to the national policy of mandatory sharing of well matched kidney during that period.

Recipient Trends

Transplant recipients were older in the second era; those over age 45 comprised 38% of recipients in Era 2 as compared to 33% in Era 1. Simultaneous kidney-pancreas transplants also increased slightly. Recipients with peak PRAs under 20% increased from 73% in Era 1 to 79% in Era 2. The percentage of transplants for patients with some type of glomerular disease decreased while transplants for patients with systemic and diabetic diseases increased slightly. The incidence of delayed graft function post surgery (requiring dialysis within first week after transplant) decreased by 3% between Era 1 and Era 2, from 22% (=13.9%+7.7%) to 19.1%. Also, the incidence of rejection episodes within six months following transplant dropped from 43% (=33%+10%) to 38%.

Despite more older donors and older recipients in Era 2, the national survival rates improved from Era 1 to Era 2 (See Tables III-1 and III-2).

Table III-7. National Donor and Recipient Characteristics in Kidney Transplants: Percentages by Era and Overall.

Characteristics by Category		ERA 1 1/88-4/92 N=41126	ERA 2 5/92-4/94 N=21446	OVERALL 1/88-4/94 N=62572
Donor Type and Donor Cause of Death	Living	22.0	25.5	23.2
	Cadaveric: CVA	24.3	26.3	25.0
	Cadaveric: MVA	23.2	17.6	21.3
	Cadaveric: Other	30.4	30.4	30.4
	Not Reported	0.1	0.2	0.1
Donor Age	0-17	17.6	16.3	17.2
	18-30	32.4	28.6	31.1
	31-45	29.4	30.0	29.6
	46-60	17.3	19.9	18.2
	61+	3.2	5.1	3.8
	Not Reported	0.0	0.1	0.1
Donor Race	White	80.8	76.5	79.4
	Black	9.5	11.9	10.3
	Hispanic	7.4	8.9	7.9
	Asian	1.2	1.5	1.3
	Other	1.0	1.0	1.0
	Not Reported	0.1	0.2	0.1

		ERA 1	ERA 2	OVERALL
Donor Gender	Female	40.8	42.1	41.2
	Male	59.2	57.9	58.8
	Not Reported	0.0	0.0	0.0
Cold Ischemic Time (Hours) by Donor Type	Living: 0-2	17.9	16.8	17.5
	Living: 3-5	0.8	1.4	1.0
	Living: 6+	0.6	1.4	0.9
	Cadaveric: 0-11	9.3	9.6	9.4
	Cadaveric: 12-21	25.3	26.6	25.8
	Cadaveric: 22-31	24.0	20.7	22.8
	Cadaveric: 32-41	13.6	9.7	12.3
	Cadaveric: 42+	4.7	2.8	4.0
	Not Reported	3.8	11.0	6.3
Level of HLA Mismatch	0	8.9	10.6	9.5
	1	5.4	5.9	5.6
	2	15.1	16.1	15.4
	3	25.3	26.1	25.6
	4	22.8	21.6	22.4
	5	15.0	13.1	14.3
	6	5.0	4.4	4.8
	Not Reported	2.5	2.4	2.4
Recipient Age	0-17	6.7	5.6	6.3
	18-35	33.7	30.5	32.6
	36-45	26.4	25.9	26.2
	46-60	26.6	29.0	27.4
	61+	6.6	9.0	7.4
	Not Reported	0.0	0.0	0.0
Recipient Race	White	66.4	64.7	65.9
	Black	20.0	20.8	20.3
	Hispanic	8.7	9.6	9.0
	Asian	2.6	3.2	2.8
	Other	2.2	1.5	2.0
	Not Reported	0.1	0.2	0.1
Recipient Gender	Female	39.9	40.4	40.1
	Male	60.1	59.6	59.9
	Not Reported	0.0	0.0	0.0

		ERA 1	ERA 2	OVERALL
Procedure Type	Kidney Alone	96.2	94.3	95.5
	Kidney and Pancreas	3.8	5.7	4.5
Previous Kidney Transplant	No	85.8	87.9	86.5
	Yes	13.9	11.8	13.2
	Not Reported	0.3	0.3	0.3
Pretransplant Transfusions	0	35.3	24.1	31.4
	1-5	38.5	34.4	37.1
	6-10	11.0	5.7	9.2
	11+	10.8	3.9	8.4
	Not Reported	4.5	31.9	13.9
Peak PRA Prior to Transplant	0	30.8	36.3	32.7
	1-19	42.6	42.5	42.6
	20-79	17.1	13.6	15.9
	80-100	7.5	5.5	6.8
	Not Reported	1.8	2.1	1.9
Body Mass Index (kg/m^2)	0-20	20.5	15.4	18.7
	21-25	40.7	33.0	38.1
	26-30	20.4	18.9	19.9
	31+	8.8	10.0	9.2
	Not Reported	9.6	22.7	14.1
Primary Kidney Disease	Glomerular	28.3	24.7	27.0
	Cystic/Congenital	12.0	11.2	11.7
	Systemic	18.4	19.6	18.8
	Tubulointerstitial	7.2	6.0	6.8
	Diabetes	22.0	23.3	22.5
	Other Diagnosis	7.8	9.5	8.4
	Not Reported	4.3	5.7	4.8
Recipient Description at Transplant	Not Hospitalized	94.2	95.8	94.7
	Hospitalized	3.6	2.0	3.1
	ICU/Life Support	1.0	0.2	0.7
	Not Reported	1.2	2.0	1.4

		ERA 1	ERA 2	OVERALL
Year of Transplant	1988	21.9	0.0	14.4
	1989	21.8	0.0	14.3
	1990	23.9	0.0	15.7
	1991	24.5	0.0	16.1
	1992	7.9	32.2	16.2
	1993-1994	0.0	67.8	23.2
Dialysis in First Week After Transplant*	Yes	13.9	0.0	9.1
	No	64.5	0.0	42.4
	Not Reported	2.3	0.0	1.5
	N.A.*: Yes	7.7	19.1	11.6
	N.A.*: No	10.7	79.7	34.4
	N.A.*: Not Reported	0.9	1.2	1.0
Rejection in First 6 Months After Transplant*	Yes	33.0	0.0	21.7
	No	47.7	0.0	31.4
	N.A.*: Yes	10.0	38.0	19.6
	N.A.*: No	9.3	62.0	27.3

* The data shown for dialysis and rejection, used to model the conditional 3 year survival outcomes, were based on all transplants from 1/88 through 4/94. Note that the numbers in the N.A. categories were not used in the conditional analysis due to either graft failure or a transplant after 4/92.

F. SHORT TERM SURVIVAL -- IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

To determine the expected survival for each transplant or patient, separate analyses were performed for graft and patient survival at three time points. (The analyses were performed using logistic regression, see the *Technical Methods* chapter in the *Executive Summary.*) The analyses also identified donor and recipient characteristics that had a significant impact on survival outcomes. For each *characteristic* (e.g., race, gender) considered in the analyses, a *reference group* was chosen (e.g., White, male) with which the other groups were compared. As a general rule, the largest group or the mean of the characteristic (e.g., mean recipient age=40) is often used as the reference group.

The following served as the characteristics and reference groups for ***short term graft*** survival:

- Donor Type -- cadaveric donors
- Donor Cause of Death -- cerebral vascular accident (CVA)
- Mean Donor Age -- 32 years
- Donor Race -- non-Black, non-Hispanic
- Donor Gender -- male
- Mean Cold Ischemic Time -- 23 hours (cadaveric donors), 1 hour (living donors)
- HLA Mismatch Level -- zero
- Previous kidney transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- White

Table III-8. Kidney Primary Disease Diagnoses at Time of Transplant

Diabetes Type I Insulin Dependent Type II Insulin Dependent Type I Non-Insulin Dependent Type II Non-Insulin Dependent	**Cystic/Congenital Diseases (CC)** Cystinosis Polycystic Kidneys Oxalosis Fabry's Disease Hypoplasia Medullary Cystic Disease Alport's Syndrome Prune Belly Syndrome
Glomerular Diseases (GN) Idiopathic and post-infectious crescentic glomerulonephritis Membranous glomerulonephritis Mesangio-capillary (Type 1) glomerulonephritis Mesangio-capillary (Type 2) glomerulonephritis IgA nephropathy Anti-GBM Focal glomerulosclerosis Goodpasture's Syndrome Chronic Glomerulonephritis -- unspecified Membranous Nephropathy	**Systemic Diseases (SD)** Amyloidosis Systemic lupus erythematosus Progressive Systemic Sclerosis Wilms' tumor Renal Cell Carcinoma Incidental Carcinoma Myeloma Hemolytic Uremic Syndrome Cortical Necrosis Acute Tubular Necrosis Sickle Cell Anemia Familial Nephropathy Malignant Hypertension Henoch-Schonlein Purpura Hypertensive Nephrosclerosis (kidney disease caused by hypertension) Renal Artery Thrombosis Chronic Nephrosclerosis -- unspecified Scleroderma Wegener's Granulomatosis Polyarteritis Rheumatoid Arthritis Sarcoidosis Lymphoma
Tubulointerstitial Diseases (TI) Chronic Pyelonephritis (Reflux Nephropathy) Interstitial Nephritis Gout Obstructive Uropathy Analgesic Nephropathy Radiation Nephritis Antibiotic - induced nephritis Cancer -- Chemotherapy induced nephritis Cyclosporin Nephrotoxicity Heroin Nephrotoxicity Congenital Obstructive Uropathy Nephrolithiasis	

- Recipient Gender -- male
- Transplant Procedure Type -- kidney alone
- Primary Kidney Disease -- recipient had non-diabetes, non-systemic (SD), and non-tubulointerstitial (TI) diseases at transplant (see Table III-8 for a complete list of primary disease diagnoses)
- Mean Body Mass Index -- 24 kg/m^2
- Mean Peak PRA -- 16%
- Pre-transplant Transfusions -- none
- Medical Status -- not hospitalized prior to transplant
- Year of Transplant -- 1988

The following served as the characteristics and reference groups for ***short term patient*** survival:

- Donor Type -- cadaveric donors
- Donor Cause of Death -- cerebral vascular accident (CVA)
- Mean Donor Age -- 32 years
- Donor Race -- non-Black
- Donor Gender -- male
- Mean Cold Ischemic Time -- 23 hours (cadaveric donors), 1 hour (living donors)
- HLA Mismatch Level -- zero
- Previous kidney transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- non-Black or non-Hispanic
- Recipient Gender -- male
- Transplant Procedure Type -- kidney alone
- Primary Kidney Disease -- recipient had either glomerular (GM) or tubulointerstitial (TI) disease at transplant (see Table III-8 for complete list of primary disease diagnoses)
- Mean Body Mass Index -- 24
- Mean Peak PRA -- 16%
- Pre-transplant Transfusions -- none
- Medical Status -- not hospitalized prior to transplant
- Year of Transplant -- 1988

The relative impact of each donor and recipient characteristic on short term graft and patient survival outcomes is listed in Table III-9. For each characteristic, the ***odds ratio*** is the odds of patient death (graft failure) as compared to the reference group, after adjusting for the effects of all other donor and recipient characteristics. An *odds ratio of less than 1* indicates that the characteristic was associated with a *reduced odds* of patient death or graft failure relative to the reference group. An odds ratio of *greater than 1* indicates that the characteristic was associated with an *increased odds* of death relative to the reference group. The corresponding p-value measures the significance of the odds ratio. A p-value less than 0.05 indicates statistical significance and means that there is less than a 5% probability that such difference is due to chance alone. The smaller the p-value, the greater the statistical significance and the less likely the difference is due to chance alone.

Examples

In Table III-9, the odds ratio of graft failure within 3 months after a repeat transplant versus a first, or primary, transplant was 1.43. This means that, after adjusting for all of the other donor and recipient characteristics, the odds of graft failure within 3 months was 43% greater for repeat transplants than for primary transplants ((1.43-1)×100%=43%). As another example, the odds ratio of graft failure within 3 months post-transplant for a recipient who was in the intensive care unit (ICU) or on life support prior to transplant versus a recipient who was not hospitalized was 2.16. After adjusting for the effects of both donor and recipient characteristics, the odds of graft failure within 3 months for a patient who was in the ICU or on life support prior to transplant was 116% higher ((2.16-1)×100%=116%) than that for a patient who was not hospitalized prior to transplant.

The estimated odds ratios for continuous variables (i.e., variables with many possible values) such as cold ischemic time, donor and recipient ages, peak PRA, and body mass indices are less easily interpreted. For these variables, the estimated odds is determined for every 5 or 10 unit increase or decrease from the mean (reference group) of the variable. For example, in Table III-9, the estimated odds of 3 month graft failure for 33 hours of cold ischemic time compared to the mean of 23 hours is 1.07. This means that, after adjusting for the effects of all other characteristics, the odds of graft failure was estimated to increase by 7% for the first 10 hour increase from the mean cold ischemic time.

An increase of 25 hours from the mean (i.e., the cold ischemic time is 23+25=48) would result in an 18% increase in the odds of graft failure. Mathematically, this 18% was calculated as follows:

$$\text{Odds ratio} = \exp^{\left(\frac{25}{10} \times 0.0661\right)} = 1.18$$

Table III-9. Impact of Donor and Recipient Characteristics on Short Term Graft and Patient Survival--Kidney Transplants

Short Term Characteristics	Graft Survival [1]				Patient Survival [1]			
	3 Months		1 Year		3 Months		1 Year	
	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]
Living vs Cadaveric Donor	0.482	<0.001	0.476	<0.001	0.508	<0.001	0.568	<0.001
Donor Cause of Death MVA vs CVA	0.770	<0.001	0.804	<0.001	---	n.d.	---	n.d.
Donor Cause of Death Other vs CVA	0.830	<0.001	0.854	<0.001	---	n.d.	---	n.d.
Donor Age 42 vs 32 [3]	1.066	<0.001	1.096	<0.001	1.067	<0.001	1.090	<0.001
Donor Black vs White, Asian, Other	1.267	<0.001	1.303	<0.001	---	n.d.	---	n.d.
Donor Hispanic vs White, Asian, and Other	1.187	<0.001	1.128	<0.001	---	n.d.	---	n.d.
Donor Black vs Non-Black	---	n.d.	---	n.d.	1.243	0.008	1.340	<0.001
Donor Female vs Male	1.131	<0.001	1.154	<0.001	---	n.d.	---	n.d.
Cold Ischemic Time (hours) 33 vs 23 for Cadaveric Donors, 11 vs 1 for Living Donors [3]	1.068	<0.001	1.062	<0.001	---	n.d.	---	n.d.
1 vs 0 HLA Mismatch	1.599	<0.001	1.563	<0.001	1.373	0.035	1.264	0.031
2 vs 0 HLA Mismatches	1.589	<0.001	1.630	<0.001	1.212	0.124	1.236	0.016
3 vs 0 HLA Mismatches	1.856	<0.001	1.786	<0.001	1.318	0.017	1.247	0.007
4 vs 0 HLA Mismatches	2.081	<0.001	2.040	<0.001	1.342	0.013	1.359	<0.001
5 vs 0 HLA Mismatches	2.293	<0.001	2.206	<0.001	1.459	0.002	1.425	<0.001
6 vs 0 HLA Mismatches	2.561	<0.001	2.360	<0.001	1.421	0.019	1.440	<0.001
Previous Transplant -- Yes vs No	1.426	<0.001	1.334	<0.001	1.300	0.001	1.232	<0.001
Recipient Age 50 vs 40 [3]	1.024	0.028	1.058	<0.001	1.437	<0.001	1.452	<0.001
Recipient Age <2 vs Age ≥ 2	1.924	<0.001	1.728	<0.001	5.404	<0.001	6.492	<0.001
Recipient Black vs White	0.966	0.327	1.097	0.002	---	n.d.	---	n.d.
Recipient Hispanic vs White	0.702	<0.001	0.763	<0.001	---	n.d.	---	n.d.
Recipient Asian vs White	0.711	<0.001	0.745	<0.001	---	n.d.	---	n.d.
Recipient Other Race vs White	0.743	0.003	0.785	<0.001	---	n.d.	---	n.d.
Recipient Black vs White, Asian, & Other	---	n.d.	---	n.d.	0.905	0.144	0.876	0.008
Recipient Hispanic vs White, Asian, & Other	---	n.d.	---	n.d.	0.649	<0.001	0.710	<0.001
Recipient Female vs Male	---	n.d.	---	n.d.	0.875	0.012	0.882	0.001
Kidney-Pancreas vs Kidney Alone	0.810	0.005	0.989	0.867	1.436	0.002	1.468	<0.001

Short Term Characteristics	Graft Survival [1]				Patient Survival [1]			
	3 Months		1 Year		3 Months		1 Year	
	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]
Diabetes vs GM [4], CC [4], & Other [4]	1.213	<0.001	1.231	<0.001	---	n.d.	---	n.d.
SD [4] vs GM, CC, & Other	1.050	0.185	1.066	0.039	---	n.d.	---	n.d.
TI [4] vs GM, CC, & Other	0.880	0.024	0.890	0.015	---	n.d.	---	n.d.
Diabetes vs GM and TI	---	n.d.	---	n.d.	1.734	<0.001	1.866	<0.001
CC vs GM and TI	---	n.d.	---	n.d.	0.784	0.010	0.883	0.065
SD vs GM and TI	---	n.d.	---	n.d.	1.120	0.136	1.170	0.005
Other vs GM and TI	---	n.d.	---	n.d.	1.091	0.319	1.205	0.003
Body Mass Index 29 vs 24 [3]	1.101	<0.001	1.097	<0.001	1.072	0.012	1.011	0.563
Peak PRA 26% vs 16% [3]	1.080	<0.001	1.072	<0.001	1.030	0.125	1.025	0.079
Pre-transplant Transfusions--Yes vs No	0.881	<0.001	0.904	<0.001	---	n.d.	---	n.d.
Hospitalized vs Not Hospitalized	1.133	0.065	1.166	<0.001	1.121	0.389	1.233	0.026
In ICU/on Life Support vs Not Hospitalized	2.162	<0.001	2.293	<0.001	4.021	<0.001	2.820	<0.001
TX Year 1989 vs 1988	0.861	<0.001	0.838	<0.001	0.875	0.107	0.881	0.041
TX Year 1990 vs 1988	0.809	<0.001	0.802	<0.001	0.838	0.033	0.859	0.014
TX Year 1991 vs 1988	0.629	<0.001	0.608	<0.001	0.554	<0.001	0.608	<0.001
TX Year 1992 vs 1988	0.611	<0.001	0.615	<0.001	0.670	<0.001	0.712	<0.001
TX Year 1993-1994 vs 1988	0.614	<0.001	0.615	<0.001	0.537	<0.001	0.623	<0.001

Notes:

[1] In the short term survival analysis, if a patient died with a functioning graft (DWFG), the kidney was considered to have failed at the time of death.

[2] n.d. denotes p-value not determined due to either (a) using a different reference group, or (b) results not statistically significant, and therefore factor is not included in the analysis.

[3] Odds ratios for continuous covariates (donor age, cold ischemic time, recipient age, peak PRA, and body mass index) do not have a linear relationship. The odds ratios presented in this table correspond to 5 or 10 unit increases from the mean of each covariate. The mean donor age was 32. The mean cold ischemic times for living and cadaveric donors were 1 and 23 hours, respectively. The mean recipient age was 40, the mean peak PRA was 16%, and the mean body mass index was 24.

[4] Glomerular Diseases (GM), Tubulointerstitial Diseases (TI), Cystic, Congenital, Hereditary Diseases (CC), Systemic Diseases (SD), Other disease diagnoses.

where the 25 hour increase is equivalent to 2.5 per 10 hour difference, and 0.0661 corresponds to the coefficient of cold ischemic time per 10 hour difference (see Table III-12 for coefficients). Therefore, the increase in the odds of graft failure is (1.18-1)×100%=18%. For some variables such as recipient age and recipient body mass index, it is necessary to add a quadratic term. For more details on calculating odds ratios for continuous variables, refer to the section on *Odds Ratios* in the *Technical Methods* chapter of the *Executive Summary.*

Graft Survival

The donor characteristics with the strongest impact on short term graft survival were donor type, donor cause of death, donor race, and level of HLA mismatch between the donor and the recipient. The odds of 1 year graft failure was 52% lower in transplants from living donors than in those from cadaveric donors, and 30% higher in transplants from Black donors than those from non-Black and non-Hispanic donors. The odds of graft failure for 4 to 6 antigen mismatch transplants was more than twice that for zero antigen mismatch transplants.

The recipient characteristics that had the strongest impact on short term graft survival were whether recipient had any previous kidney transplant, recipient under age 2, race, disease diagnosis at transplant, pre-transplant transfusions, medical condition at transplant, and year of transplant. The 3 month odds ratio of graft failure for a recipient under 2 years of age was almost twice that of recipients age 2 and older. Repeat transplants had a 43% greater odds of failing within 3 months than did first transplants. Hispanic and Asian recipients had a 30% lower odds of graft failure at 3 months post-transplant than did White recipients. Transplants performed during 1993 and the first four months of 1994 had an almost 40% reduced odds of failure compared to transplants performed in 1988.

Patient Survival

As seen with graft survival, the donor characteristics with the strongest impact on short term patient survival were donor type, donor race, and HLA mismatch level. The odds of mortality for living donor transplant recipients was nearly half that for cadaveric donor transplant recipients. The odds of mortality for recipients of Black donor kidneys was greater than that for recipients of non-Black donors. Recipients of poorly matched kidneys (6 antigen mismatch) had approximately a 40% increased odds of mortality relative to recipients of well matched kidneys (zero antigen mismatch). However, HLA antigen mismatch levels overall had less impact on patient survival than on graft survival. Donor cause of death, donor gender, and cold ischemic time had no significant effect on patient survival. In this analysis, Asian and "other" (not Black, White, Hispanic, or Asian) races were grouped with White as the reference group because these factors did not have a statistically significant impact on patient survival.

Recipient age younger than 2 years, previous transplant, disease diagnosis at transplant, medical condition at transplant, and year of transplant were found to influence strongly patient mortality. When compared to those of other ages, recipients under 2 years old had the greatest odds of short term mortality. Specifically, compared to the odds of patient death among recipients age 2 and older, the odds of patient death among recipients under 2 was 5.40 times greater at 3 months post-transplant and 6.49 times greater at 1 year post-transplant. Also at an increased odds of mortality were recipients of repeat transplants, whose odds of death was 30% greater at 3 months than that for recipients of primary transplants. The odds of death within 3 months after transplant for recipients in the ICU or on life support at transplant was more than four times that of recipients who were not hospitalized just prior to transplant. This increased odds of death dropped to 2.82 for these recipients at 1 year post-transplant. Recipients of transplants in 1992, 1993, and 1994 had a 29% to 38% reduction in the odds of death at 1 year post-transplant relative to recipients of transplants in 1988. This finding is consistent with the improved kidney patient survival rates over time. Having a pre-transplant transfusion was significant for short term graft survival but had no significant effect on short term patient survival.

G. LONG TERM SURVIVAL -- IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

In this report, long term survival analyses were developed separately from the short term survival analyses. Because this narrative focuses on conditional 3 year survival (survival at 3 years for grafts or patients surviving at least 1 year post-transplant), only conditional 3 year survival data are presented in this text. Both conditional and

unconditional 3 year survival rates are provided in the tables for each transplant program presented in each organ specific volume.

The conditional 3 year survival analyses provide an assessment of the donor and recipient characteristics that are independent of those limited to the first year (e.g., surgical complications). Furthermore, for the long term survival analysis, if a patient died with a functioning graft, the graft was not considered to have failed as it was with short term survival. *This was done because deaths occurring some years after a transplant are less likely to be related to the transplant.*

The impact of each donor and recipient characteristic on graft and patient long term survival is listed in Table III-10. Notice that two models were used for graft and patient survival rates. Model II includes two post-transplant covariates not found in Model I:

1. Delayed graft function--defined as the need for dialysis in the first week after transplant.
2. Rejection--defined as whether a patient experienced rejection episodes in the first six months following transplant.

Using the post-transplant covariates found in Model II allows for an assessment of the effects of early post-transplant events (e.g., onset of acute tubular necrosis and early rejections) on long term survival. However, while these two covariates may be related to long term survival outcomes, they also may be highly related to practices at individual transplant programs. Therefore, in assessing the quality of a program (i.e., the "center effect"), each program's expected survival rates were calculated based on Model I, the model without these two covariates.

The following characteristics and reference groups were used for ***long term graft*** survival:

- Donor Type -- cadaveric donors
- Donor Cause of Death -- non-Motor Vehicle Accident (MVA)
- Mean Donor Age -- 32 years
- Donor Race -- non-Black
- Donor Gender -- male
- Mean Cold Ischemic Time -- 23 hours (cadaveric donors), 1 hour (living donors)
- HLA Mismatch Level -- zero
- Previous kidney transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- non-Black or non-Hispanic
- Recipient Gender -- male
- Transplant Procedure Type -- kidney alone
- Primary Disease Diagnosis -- non-systemic (SD), non-cystic/congenital (CC), or non-tubulointerstitial (TI) disease at transplant (see Table III-8 for a complete list of primary disease diagnoses)
- Mean Body Mass Index -- 24 kg/m^2
- Mean Peak PRA -- 16%
- Pre-transplant Transfusions -- none
- Medical Status -- not in ICU or on life support prior to transplant
- Year of Transplant -- 1988

The following characteristics and reference groups were used for ***long term patient*** survival:

- Donor Type -- cadaveric donors
- Donor Cause of Death -- non-Motor Vehicle Accident (MVA)
- Mean Donor Age -- 32 years
- Donor Race -- non-Black
- Donor Gender -- male
- Mean Cold Ischemic Time -- 23 hours (cadaveric donors), 1 hour (living donors)
- HLA Mismatch Level -- zero
- Previous kidney transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- non-Hispanic
- Recipient Gender -- male
- Transplant Procedure Type -- kidney alone
- Primary Disease Diagnosis -- recipient had glomerular (GM) or cystic/congenital (CC) or tubulointerstitial (TI) disease at transplant (see Table III-9 for a complete list of primary disease diagnoses)
- Mean Body Mass Index -- 24 kg/m^2
- Mean Peak PRA -- 16%
- Pre-transplant Transfusions -- none
- Medical Status -- not in ICU or on life support prior to transplant
- Year of Transplant -- 1988
- Delayed Graft Function -- no
- Rejection Episodes -- no

Table III-10. Impact of Donor and Recipient Characteristics on Long Term Graft and Patient Survival -- Kidney Transplants

Long Term Characteristics	Graft [1]				Patient [1]			
	Model I [2]		Model II [2]		Model I [2]		Model II [2]	
	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]
Living vs Cadaveric Donor	0.531	<0.001	0.563	<0.001	0.612	<0.001	0.667	<0.001
Donor Cause of Death MVA vs Other	0.897	0.034	0.901	0.044	---	n.d.	---	n.d.
Donor Age 42 vs 32 [4]	1.158	<0.001	1.143	<0.001	1.082	<0.001	1.064	<0.001
Donor Black vs Non-Black	1.183	0.009	1.180	0.010	1.231	0.009	1.217	0.014
Donor Female vs Male	---	n.d.	---	n.d.	1.242	<0.001	1.236	<0.001
Cold Ischemic Time (hours) 33 vs 23 for Cadaveric Donors, 11 vs 1 for Living Donors [4]	---	n.d.	---	n.d.	---	n.d.	---	n.d.
1 vs 0 HLA Mismatch	1.557	<0.001	1.525	0.001	1.467	0.009	1.439	0.013
2 vs 0 HLA Mismatches	1.700	<0.001	1.617	<0.001	1.434	0.003	1.380	0.008
3 vs 0 HLA Mismatches	1.744	<0.001	1.648	<0.001	1.448	0.001	1.374	0.005
4 vs 0 HLA Mismatches	1.853	<0.001	1.749	<0.001	1.472	<0.001	1.392	0.005
5 vs 0 HLA Mismatches	1.733	<0.001	1.595	<0.001	1.520	<0.001	1.426	0.003
6 vs 0 HLA Mismatches	1.990	<0.001	1.826	<0.001	1.799	<0.001	1.674	<0.001
Previous Transplant -- Yes vs No	1.132	0.037	1.106	0.094	1.193	0.022	1.157	0.061
Recipient Age 50 vs 40 [4]	0.772	<0.001	0.782	<0.001	1.440	<0.001	1.455	<0.001
Recipient Age <2 vs Age ≥2	---	n.d.	---	n.d.	---	n.d.	---	n.d.
Recipient Black vs White, Asian & Other	2.232	<0.001	2.209	<0.001	---	n.d.	---	n.d.
Recipient Hispanic vs White, Asian & Other	1.215	0.006	1.244	0.002	---	n.d.	---	n.d.
Recipient Hispanic vs non-Hispanic	---	n.d.	---	n.d.	0.761	0.005	0.770	0.007
Recipient Female vs Male	---	n.d.	---	n.d.	0.808	<0.001	0.814	<0.001
Kidney-Pancreas vs Kidney Alone	0.756	0.021	0.715	0.006	---	n.d.	---	n.d.
CC [5] vs GM [5], Diabetes and Other [5]	0.695	<0.001	0.699	<0.001	---	n.d.	---	n.d.
SD [5] vs GM, Diabetes and Other	1.260	<0.001	1.274	<0.001	---	n.d.	---	n.d.
TI [5] vs GM, Diabetes and Other	0.837	0.032	0.842	0.040	---	n.d.	---	n.d.
Diabetes vs GM, CC and TI	---	n.d.	---	n.d.	2.775	<0.001	2.787	<0.001
SD vs GM, CC and TI	---	n.d.	---	n.d.	1.504	<0.001	1.500	<0.001
Other vs GM, CC and TI	---	n.d.	---	n.d.	1.304	0.002	1.317	0.001
Body Mass Index 29 vs 24 [4]	1.097	<0.001	1.090	<0.001	0.937	0.013	0.925	0.003

Long Term Characteristics	Graft [1]				Patient [1]			
	Model I [2]		Model II [2]		Model I [2]		Model II [2]	
	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]	Odds Ratio	P-value [3]
Peak PRA 26% vs 16% [4]	1.019	0.012	1.014	0.064	1.049	<0.001	1.040	<0.001
Pre-transplant Transfusions--Yes vs No	---	n.d.	---	n.d.	---	n.d.	---	n.d.
Medical Condition at Transplant	---	n.d.	---	n.d.	---	n.d.	---	n.d.
TX Year 1989 vs 1988	0.907	0.087	0.904	0.078	0.848	0.016	0.850	0.018
TX Year 1990 vs 1988	0.786	<0.001	0.787	<0.001	0.749	<0.001	0.735	<0.001
TX Year 1991- 1992 vs 1988	0.646	<0.001	0.659	<0.001	0.723	<0.001	0.741	<0.001
Dialysis within 1st Week After TX	---	n.d.	1.206	<0.001	---	n.d.	1.427	<0.001
Rejection within 6 months After TX	---	n.d.	1.488	<0.001	---	n.d.	1.288	<0.001

Notes:

[1] In the long term survival analysis, if a patient died with a functioning graft (DWFG), the kidney was not considered to have failed at the time of death.

[2] Model I does not include the two post-transplant covariates (the last two items in the table); Model II does include them.

[3] n.d. denotes p-value not determined due to either (a) using a different reference group, or (b) results not statistically significant, and therefore factor is not included in the analysis.

[4] Odds ratio for continuous covariates (donor age, cold ischemic time, recipient age, peak PRA, and body mass index) do not have a linear relationship. The odds ratios presented in this table correspond to 5 or 10 unit increases from the mean of each covariate. The mean donor age was 32. The means cold ischemic time for living and cadaveric donors were 1 and 23 hours, respectively. The mean recipient age was 40, the mean peak PRA was 16%, and the mean body mass index was 24.

[5] Glomerular Diseases (GM), Tubulointerstitial Diseases (TI), Cystic, Congenital Diseases (CC), Systemic Diseases (SD), Other Disease Diagnosis.

Graft Survival

The results using Models I and II, without and with the two post-transplant covariates, respectively, were very similar (see Table III-10). In Model I, the donor characteristics with the strongest impact on long term graft survival were donor type (living or cadaveric), donor race, and HLA mismatch level. Based on the conditional 3 year analysis, the odds of graft failure was at least 47% lower in living donor transplants than in cadaveric donor transplants ((.531-1) ×100%=-47%); and 18% higher in Black donor transplants than in non-Black donor transplants. HLA mismatch level still played an important role in long term survival. The odds of graft failure for 6 antigen mismatch transplants was nearly twice that of zero antigen mismatch transplants. Donor gender and cold ischemic time had no significant effect on graft survival and were not included in the analysis.

The recipient characteristics that had the strongest impact on graft survival were age, race, transplant procedure type (kidney-pancreas or kidney alone), diagnosis at transplant, and year of transplant. Black recipients had an approximately 120% greater odds of graft failure than did non-Black and non-Hispanic recipients. Recipients of a simultaneous kidney-pancreas had a 24% lower odds of graft failure than did recipients of a kidney alone. When compared to the glomerular (GM), diabetes, and "other" disease

groups, the systemic disease (SD) group had the highest odds of graft failure. Patients who had cystic, congenital (CC), or tubulointerstitial (TI) diseases, however, had a 16% to 30% lower odds of graft failure. Finally, in Model II, the results demonstrated that delayed graft function (i.e., requiring dialysis within the first week post-transplant) and rejection episodes within 6 months post-transplant had a significant impact on long term survival outcomes, with the odds of graft failure increased by 20% for recipients requiring dialysis, and 49% for recipients having rejection episodes after transplant.

Patient Survival

As was seen with graft survival, the donor characteristics with the strongest impact on patient survival were donor type (living or cadaveric), donor race, and HLA mismatch level. Unlike the graft survival analysis, donor gender had a strong impact on patient survival. The Model I analysis shows that living donor transplants had a 39% lower odds of patient mortality than did cadaveric transplants. The odds of mortality for recipients of kidneys from Black donors was about 23% greater than that for recipients of kidneys from non-Black donors. Recipients of poorly matched kidneys (6 antigen mismatch) had an approximately 80% increased odds of mortality relative to recipients of well matched kidneys (zero antigen mismatch). Overall, the various HLA antigen mismatch levels had less impact on patient survival than on graft survival. As with graft survival, cold ischemic time had no significant effect on patient survival and was not included in the analysis.

Black recipients had worse long term graft survival but similar patient survival as compared to White and Asian recipients. Although Hispanic recipients had a higher chance of graft failure relative to White, Asian, and "Other" races, they had lower patient mortality. Recipient gender was found to affect patient mortality -- the odds of death was 19% lower for women than for men. Though transplant procedure type (simultaneous kidney-pancreas or pancreas alone), pre-transplant transfusions, and medical condition were important predictors of short term patient survival, they were not statistically significant in the long term analysis. Disease diagnosis and the year of transplant were found to be important predictors of long term patient mortality. In particular, diabetes had a nearly 180% higher odds of patient mortality than the reference group of glomerular (GM), cystic/congenital (CC), and tubulointerstitial (TI) disease groups. The systemic disease (SD) group had a 50% increased odds of patient mortality compared to the reference group. The "other" disease group (i.e., non-diabetes, non-SD, non-GM, non-CC, and non-TI) also showed an increased odds of mortality. Diabetes, SD, and "other" disease groups had a greater negative impact on patient survival than on graft survival. In general, recipients of transplants in more recent years had a decreased odds of mortality.

H. COMPARISON BETWEEN SHORT TERM AND LONG TERM CHARACTERISTICS

The majority of the donor and recipient characteristics that had a strong impact on short term graft survival appeared to have a strong impact on long term graft survival as well. Some exceptions were donor and recipient gender, recipient age less than 2 years, cold ischemic time, pre-transplant transfusions, and medical condition prior to transplant. Donor cause of death was significant for short and long term graft survival but not for short or long term patient survival. Donor gender did not have a significant impact on short term patient survival but was significant in the long term. The impact of some characteristics (e.g., cold ischemic time, pre-transplant transfusions) simply diminished over time.

Medical condition at the time of transplant was significant for short term graft and patient survival but was not significant for long term survival. In addition, the effect of recipient age less than 2 years was highly significant in the short term analysis but not significant in the long term analysis. However, for recipients who were less than 2 years old or who were in critical condition prior to transplant, the risk of graft failure or mortality was usually so high that the patients did not survive long enough (i.e., at least 1 year), to be included in the conditional 3 year analysis. This might explain why these two factors were not significant in the long term analysis.

For some characteristics, their negative effect on graft survival increased over time. For instance, the odds of graft failure at 3 months for Black recipients compared to White recipients was 0.97, then increased to 1.10 at 1 year, and was 2.23 in the conditional 3 years analysis. Similarly, the odds of failure at 3 months for Hispanic recipients compared to White recipients was 0.70, which increased to 0.76

at 1 year, and 1.22 in the conditional 3 years analysis. In the short term, patients who had systemic diseases (SD) showed a marginal difference in the odds of graft failure compared to patients with glomerular diseases (GM). In the long term, patients with SD had a 50% increased odds of graft failure compared to patients with GM, CC, or TI diseases.

I. STATISTICAL METHODS AND MODELS

This section provides a brief summary of the statistical methods used to determine survival rates for kidney transplants, both nationally and at each transplant program. It is not necessary to read this section in order to utilize the rest of the report. For additional statistical details, please see the Technical Methods chapter in the Executive Summary.

Model Significance -- R^2

The conclusion that there is a "center effect" in kidney transplantation often is based on the observation that actual survival rates vary considerably among kidney transplant programs. However, in reality, only part of the variability can be attributed to the quality of the program (the so called "center effect"); the rest can be attributed to the differences in donor and recipient characteristics among transplant programs. The degree to which the variability in actual survival rates can be attributed to the specific donor and recipient characteristics in each analysis appears in Table III-11.

Table III-11. Kidney Model R^2: Comparison of the 1994 and 1997 Reports

Outcome	Time Point	Report Year	Number of Covariates	R^2
Graft Model R^2	3 Months	1997 1994	37 31	19.1 17.6
	1 Year	1997 1994	37 31	22.4 25.1
	Cond. 3 Years *	1997 1994	24 N.A.	29.1 N.A.
Patient Model R^2	3 Months	1997 1994	34 29	3.7 6.3
	1 Year	1997 1994	34 29	3.9 5.6
	Cond. 3 Years *	1997 1994	25 N.A.	23.9 N.A.

* Conditional 3 year analysis was not performed in the 1994 report.

In the table, the values in the column labeled R^2 estimate the percentage of variability in the actual survival rates that can be attributed to the covariates in each analysis. *The higher the percentage, the better the analysis explained the individual program outcomes, based on the characteristics examined.* Theoretically, if an analysis contained every covariate that affected survival outcomes, and there were no differences in quality among programs (i.e., no "center effect"), then R^2 would equal 100%. In practice, we can never capture every factor that affects outcomes, and it is likely that real differences among programs do exist. This means that any unexplained variation can probably be attributed to a combination of true center effect and covariates not considered in this study. (For details on the R^2 calculation, refer to the *Model Significance* section in the *Technical Methods* chapter of the *Executive Summary*.)

The value of R^2 estimated from analyses in the 1994 Report was compared to the value of the R^2 analyses in the 1997 Report. Note that these analyses are not *directly* comparable since each was used with a different cohort of transplants. Nevertheless, the extensive characteristics considered in the 1997 Report appear to explain similar amount of the variability in the actual survival rates. Despite the refinements in the 1997 Report, as compared to the 1994 Report, much of the variation in actual survival rates among the 249 transplant programs in the study remains unexplained by the analyses. This suggests that much of the risk involved in transplantation is due to characteristics not described in this report.

Estimated Coefficients and Standard Errors from the Logistic Regression Models

Tables III-12 and III-13 list the coefficients and the standard errors of the coefficients at each time point for all of the donor and recipient characteristics used in the logistic regression models. Each coefficient is reported on the logistic scale and represents the $\log_e$ odds of graft failure or the $\log_e$ odds of patient mortality for the corresponding characteristic at the specified time after transplant. The adjusted odds ratio on the probability scale may be obtained by applying the exponential function to the coefficient. For further details, see the *Odds Ratios* section in the *Technical Methods* chapter of the *Executive Summary*.

Expected Kidney Transplant Survival Rates

Table III-14 shows the 1 year *expected graft* survival rates for kidney transplants and kidney-pancreas transplants for a given set of donor and recipient characteristics; Table III-15 shows the 1 year *expected patient* survival rates. These rates were determined using the following characteristics: recipient age, disease diagnosis, type of donor, and primary or repeat transplant. For these analyses, all other characteristics were set to the values for the reference groups, with the exception of the year of transplant (1993-1994), and the HLA mismatch level (3). The complete list of reference groups is shown on page 24.

For example, in Table III-14, the expected 1 year *graft* survival rate for a 65 year old diabetic recipient of a primary cadaveric kidney transplant was almost the same as that for a diabetic kidney-pancreas recipient of the same age (81.1% vs 81.3%). In contrast, the expected 1 year *patient* survival rates for a diabetic kidney recipient was nearly 6% higher than that for a diabetic kidney-pancreas recipient (85.3% vs 79.8%).

Table III-12. Model Coefficients and Standard Errors for Donor and Recipient Characteristics in Short Term Kidney Transplant Survival

Short Term Characteristics [2]	Graft Survival [1]				Patient Survival [1]			
	3 Months		1 Year		3 Months		1 Year	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Intercept	-2.485	0.077	-2.090	0.065	-3.881	0.136	-3.276	0.098
Living vs Cadaveric Donor	-0.729	0.047	-0.743	0.040	-0.677	0.090	-0.565	0.062
Donor Cause of Death MVA vs CVA	-0.261	0.042	-0.219	0.036	---	---	---	---
Donor Cause of Death Other vs CVA	-0.186	0.037	-0.158	0.032	---	---	---	---
Donor Age -Linear (per 10 years) [3,4]	0.007	0.010	0.029	0.008	0.048	0.016	0.057	0.012
-Quadratic (per 10 years) [3,4]	0.057	0.004	0.063	0.004	0.017	0.009	0.029	0.006
Donor Black vs White, Asian, Other	0.237	0.043	0.265	0.037	---	---	---	---
Donor Hispanic vs White, Asian, and Other	0.172	0.052	0.121	0.045	---	---	---	---
Donor Black vs Non-Black	---	---	---	---	0.217	0.082	0.293	0.059
Donor Female vs Male	0.123	0.028	0.143	0.024	---	---	---	---
Cold Ischemic Time (per 10 hours) [4]	0.066	0.013	0.063	0.011	---	---	---	---
1 vs 0 HLA Mismatch	0.470	0.082	0.447	0.070	0.317	0.150	0.234	0.108
2 vs 0 HLA Mismatches	0.463	0.068	0.488	0.057	0.192	0.125	0.211	0.088
3 vs 0 HLA Mismatches	0.618	0.064	0.580	0.053	0.276	0.116	0.221	0.082
4 vs 0 HLA Mismatches	0.733	0.065	0.713	0.055	0.295	0.118	0.307	0.084
5 vs 0 HLA Mismatches	0.830	0.067	0.791	0.057	0.378	0.123	0.354	0.087
6 vs 0 HLA Mismatches	0.941	0.079	0.859	0.068	0.351	0.149	0.365	0.106
Previous Transplant -- Yes vs No	0.355	0.037	0.288	0.033	0.262	0.081	0.209	0.060
Recipient Age - Linear (per 10 years) [3,4]	-0.019	0.010	0.006	0.008	0.298	0.022	0.318	0.016
- Quadratic (per 10 years) [3,4]	0.043	0.005	0.050	0.005	0.065	0.011	0.057	0.008
Recipient Age <2 vs Age ≥ 2	0.654	0.191	0.547	0.176	1.687	0.372	1.871	0.254
Recipient Black vs White	-0.034	0.035	0.093	0.030	---	---	---	---
Recipient Hispanic vs White	-0.355	0.053	-0.270	0.045	---	---	---	---
Recipient Asian vs White	-0.342	0.089	-0.294	0.075	---	---	---	---
Recipient Other Race vs White	-0.297	0.099	-0.242	0.086	---	---	---	---
Recipient Black vs White, Asian, & Other	---	---	---	---	-0.100	0.068	-0.133	0.050
Recipient Hispanic vs White, Asian & Other	---	---	---	---	-0.432	0.107	-0.342	0.075
Recipient Female vs Male	---	---	---	---	-0.134	0.053	-0.125	0.038
Kidney-Pancreas vs Kidney Alone	-0.210	0.074	-0.011	0.060	0.362	0.114	0.384	0.081

Short Term Characteristics [2]	Graft Survival [1]				Patient Survival [1]			
	3 Months		1 Year		3 Months		1 Year	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Diabetes vs GM [5], CC [5], & Other [5]	0.193	0.035	0.208	0.030	---	---	---	---
SD [5] vs GM, CC, & Other	0.049	0.036	0.064	0.031	---	---	---	---
TI [5] vs GM, CC, & Other	-0.128	0.056	-0.116	0.048	---	---	---	---
Diabetes vs GM and TI	---	---	---	---	0.551	0.070	0.624	0.051
CC vs GM and TI	---	---	---	---	-0.244	0.095	-0.124	0.067
SD vs GM and TI	---	---	---	---	0.113	0.076	0.157	0.056
Other vs GM and TI	---	---	---	---	0.087	0.088	0.187	0.063
Body Mass Index - Linear (per 5 kg/m^2) [3,4]	0.096	0.014	0.092	0.012	0.047	0.034	-0.030	0.024
-Quadratic(per 5 kg/m^2) [3,4]	---	---	---	---	0.022	0.013	0.042	0.009
Peak PRA - Linear (per 10%) [3,4]	0.077	0.005	0.069	0.004	0.025	0.022	0.020	0.016
- Quadratic (per 10%) [3,4]	---	---	---	---	0.004	0.004	0.004	0.003
Pre-transplant Transfusions--Yes vs No	-0.128	0.027	-0.101	0.023	---	---	---	---
Hospitalized vs Not Hospitalized	0.125	0.068	0.154	0.059	0.115	0.133	0.209	0.094
In ICU/on Life Support vs Not Hospitalized	0.771	0.113	0.830	0.102	1.391	0.158	1.037	0.137
TX Year 1989 vs 1988	-0.150	0.044	-0.176	0.038	-0.134	0.083	-0.127	0.062
TX Year 1990 vs 1988	-0.212	0.044	-0.220	0.038	-0.177	0.083	-0.152	0.062
TX Year 1991 vs 1988	-0.464	0.046	-0.497	0.040	-0.591	0.092	-0.498	0.066
TX Year 1992 vs 1988	-0.493	0.047	-0.486	0.040	-0.400	0.087	-0.340	0.064
TX Year 1993-1994 vs 1988	-0.488	0.044	-0.485	0.037	-0.622	0.084	-0.472	0.060

Notes:

1 In the short term survival analysis, if a patient died with a functioning graft (DWFG), the kidney was considered to have failed at the time of death.

2 Not all characteristics were included in the graft and patient analyses. This is denoted by "---" due to either (a) using a different reference group, or (b) results not statistically significant.

3 In the analysis, the continuous covariates (donor age, cold ischemic time, recipient age, peak PRA, and body mass index) were centered at their mean. The mean donor age was 32. The mean cold ischemic times for living and cadaveric donors were 1 and 23 hours, respectively. The mean recipient age was 40, the mean peak PRA was 16%, and the mean body mass index was 24.

4 Modeling the continuous covariates with a linear and a quadratic term (the square of the linear term) is necessary due to the relationship between the covariate and the odds of graft failure or patient death.

5 Glomerular Diseases (GM), Tubulointerstitial Diseases (TI), Cystic, Congenital Diseases (CC), Systemic Diseases (SD), Other Disease Diagnosis.

Table III-13. Model Coefficients and Standard Errors for Donor and Recipient Characteristics in Long Term Kidney Transplant Survival

Long Term Characteristics [3]	Graft [1]				Patient [1]			
	Model I [2]		Model II [2]		Model I [2]		Model II [2]	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Intercept	-2.888	0.107	-3.059	0.108	-3.612	0.127	-3.782	0.129
Living vs Cadaveric Donor	-0.633	0.064	-0.574	0.065	-0.491	0.080	-0.405	0.081
Donor Cause of Death MVA vs Other	-0.109	0.052	-0.105	0.052	---	---	---	---
Donor Age - Linear (per 10 years) [4,5]	0.092	0.014	0.083	0.014	0.048	0.016	0.035	0.016
-Quadratic (per 10 years) [4,5]	0.054	0.007	0.051	0.007	0.031	0.009	0.027	0.009
Donor Black vs Non-Black	0.168	0.065	0.166	0.065	0.208	0.080	0.197	0.080
Donor Female vs Male	---	---	---	---	0.217	0.049	0.217	0.049
Cold Ischemic Time (per 10 hours) [4]	---	---	---	---	---	---	---	---
1 vs 0 HLA Mismatch	0.443	0.128	0.422	0.128	0.383	0.146	0.364	0.146
2 vs 0 HLA Mismatches	0.531	0.105	0.480	0.105	0.360	0.121	0.322	0.121
3 vs 0 HLA Mismatches	0.556	0.100	0.499	0.100	0.370	0.114	0.318	0.114
4 vs 0 HLA Mismatches	0.617	0.103	0.559	0.103	0.387	0.116	0.331	0.116
5 vs 0 HLA Mismatches	0.550	0.107	0.467	0.108	0.419	0.121	0.355	0.121
6 vs 0 HLA Mismatches	0.688	0.126	0.602	0.126	0.587	0.141	0.515	0.142
Previous Transplant -- Yes vs No	0.124	0.060	0.101	0.060	0.176	0.077	0.146	0.078
Recipient Age - Linear (per 10 years) [4,5]	-0.259	0.016	-0.247	0.016	0.335	0.021	0.346	0.021
- Quadratic (per 10 years) [4,5]	---	---	---	---	0.030	0.011	0.029	0.011
Recipient Age <2 vs Age ≥2	---	---	---	---	---	---	---	---
Recipient Black vs White, Asian & Other	0.803	0.049	0.793	0.049	---	---	---	---
Recipient Hispanic vs White, Asian & Other	0.195	0.071	0.218	0.071	---	---	---	---
Recipient Hispanic vs non-Hispanic	---	---	---	---	-0.273	0.097	-0.261	0.097
Recipient Female vs Male	---	---	---	---	-0.213	0.051	-0.206	0.051
Kidney-Pancreas vs Kidney Alone	-0.280	0.121	-0.335	0.122	---	---	---	---
CC [6] vs GM [6], Diabetes and Other [6]	-0.364	0.074	-0.358	0.074	---	---	---	---
SD [6] vs GM, Diabetes and Other	0.231	0.050	0.242	0.050	---	---	---	---
TI [6] vs GM, Diabetes and Other	-0.179	0.083	-0.172	0.083	---	---	---	---
Diabetes vs GM, CC and TI	---	---	---	---	1.021	0.059	1.025	0.059
SD vs GM, CC and TI	---	---	---	---	0.408	0.067	0.405	0.067

Long Term Characteristics [3]	Graft [1]				Patient [1]			
	Model I [2]		Model II [2]		Model I [2]		Model II [2]	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Other vs GM, CC and TI	---	---	---	---	0.265	0.086	0.275	0.086
Body Mass Index -Linear (per 5 kg/m^2) [4,5]	0.093	0.021	0.086	0.021	-0.119	0.031	-0.134	0.031
-Quadratic(per 5 kg/m^2) [4,5]	---	---	---	---	0.054	0.012	0.057	0.012
Peak PRA - Linear (per 10%) [4]	0.019	0.008	0.014	0.008	0.048	0.009	0.039	0.009
Pre-transplant Transfusions--Yes vs No	---	---	---	---	---	---	---	---
Medical Condition at Transplant	---	---	---	---	---	---	---	---
TX Year 1989 vs 1988	-0.098	0.057	-0.101	0.057	-0.165	0.069	-0.162	0.069
TX Year 1990 vs 1988	-0.241	0.058	-0.240	0.058	-0.289	0.069	-0.283	0.069
TX Year 1991- 1992 vs 1988	-0.437	0.055	-0.417	0.056	-0.325	0.065	-0.300	0.065
Dialysis within 1st Week After TX	---	---	0.187	0.049	---	---	0.356	0.055
Rejection within 6 months After TX	---	---	0.398	0.041	---	---	0.253	0.049

Notes:

[1] In the long term survival analysis, if a patient died with a functioning graft (DWFG), the kidney was considered to be lost to follow-up at the time of death.

[2] Model I is forced *not* to include the post-transplant covariates (the last two items in the above table). Model II is forced to include them.

[3] Not all characteristics were included in the graft and patient analyses. This is denoted by "---" due to either (a) using a different reference group, or (b) results not statistically significant.

[4] In the analysis, the continuous covariates (donor age, cold ischemic time, recipient age, peak PRA, and body mass index) were centered at their mean. The mean donor age was 32. The mean cold ischemic times for living and cadaveric donors were 1 and 23 hours, respectively. The mean recipient age was 40, the mean peak PRA was 16%, and the mean body mass index was 24.

[5] Modeling the continuous covariates with a linear and a quadratic term (the square of the linear term) is necessary due to the relationship between the covariate and the odds graft failure or patient death.

[6] Glomerular Diseases (GM), Tubulointerstitial Diseases (TI), Cystic, Congenital Diseases (CC), Systemic Diseases (SD), Other Disease Diagnosis.

Table III-14. Expected U.S. 1 Year Graft Survival Rates -- Kidney and Kidney-Pancreas Transplants Stratified by Recipient Age, Disease Diagnosis, Type of Donor, and Primary or Repeat Transplant

Age	Diagnosis	Kidney Alone				Kidney-Pancreas			
		Cadaveric		Living		Cadaveric		Living	
		Primary	Repeat	Primary	Repeat	Primary	Repeat	Primary	Repeat
5	Glomerular	80.3	75.3	89.5	86.5	80.4	75.5	89.6	86.6
	Diabetic	76.8	71.3	87.4	83.9	77.0	71.5	87.5	84.0
	Systemic	79.2	74.1	88.9	85.7	79.4	74.3	89.0	85.9
	Tubulointerstitial	82.0	77.4	90.6	87.8	82.2	77.6	90.7	87.9
	Cystic/Congenital	80.3	75.3	89.5	86.5	80.4	75.5	89.6	86.6
	Other	80.3	75.3	89.5	86.5	80.4	75.5	89.6	86.6
25	Glomerular	86.9	83.3	93.3	91.3	87.0	83.4	93.4	91.4
	Diabetic	84.3	80.2	91.9	89.5	84.5	80.3	92.0	89.6
	Systemic	86.2	82.4	92.9	90.7	86.3	82.5	93.0	90.8
	Tubulointerstitial	88.2	84.8	94.0	92.1	88.3	85.0	94.1	92.2
	Cystic/Congenital	86.9	83.3	93.3	91.3	87.0	83.4	93.4	91.4
	Other	86.9	83.3	93.3	91.3	87.0	83.4	93.4	91.4
40	Glomerular	88.0	84.7	93.9	92.1	88.2	84.8	94.0	92.1
	Diabetic	85.7	81.8	92.6	90.4	85.8	81.9	92.7	90.5
	Systemic	87.3	83.8	93.5	91.6	87.5	84.0	93.6	91.7
	Tubulointerstitial	89.2	86.1	94.6	92.9	89.3	86.2	94.6	92.9
	Cystic/Congenital	88.0	84.7	93.9	92.1	88.2	84.8	94.0	92.1
	Other	88.0	84.7	93.9	92.1	88.2	84.8	94.0	92.1
50	Glomerular	87.4	83.9	93.6	91.6	87.6	84.1	93.7	91.7
	Diabetic	85.0	80.9	92.2	89.9	85.1	81.1	92.3	90.0
	Systemic	86.7	83.0	93.2	91.1	86.8	83.2	93.3	91.2
	Tubulointerstitial	88.6	85.4	94.3	92.5	88.8	85.6	94.3	92.6
	Cystic/Congenital	87.4	83.9	93.6	91.6	87.6	84.1	93.7	91.7
	Other	87.4	83.9	93.6	91.6	87.6	84.1	93.7	91.7
65	Glomerular	84.1	79.9	91.7	89.3	84.3	80.1	91.8	89.4
	Diabetic	81.1	76.3	90.0	87.1	81.3	76.5	90.1	87.3
	Systemic	83.2	78.8	91.3	88.7	83.4	79.0	91.3	88.8
	Tubulointerstitial	85.6	81.7	92.6	90.4	85.7	81.8	92.7	90.4
	Cystic/Congenital	84.1	79.9	91.7	89.3	84.3	80.1	91.8	89.4
	Other	84.1	79.9	91.7	89.3	84.3	80.1	91.8	89.4

Table III-15. Expected U.S. 1 Year Patient Survival Rates -- Kidney and Kidney-Pancreas Transplants Stratified by Recipient Age, Disease Diagnosis, Type of Donor, and Primary or Repeat Transplant

Age	Diagnosis	Kidney Alone				Kidney-Pancreas			
		Cadaveric		Living		Cadaveric		Living	
		Primary	Repeat	Primary	Repeat	Primary	Repeat	Primary	Repeat
5	Glomerular	98.1	97.7	98.9	98.7	97.2	96.6	98.4	98.1
	Diabetic	96.5	95.7	98.0	97.5	95.0	93.9	97.1	96.4
	Systemic	97.8	97.3	98.7	98.4	96.8	96.1	98.1	97.7
	Tubulointerstitial	98.1	97.7	98.9	98.7	97.2	96.6	98.4	98.1
	Cystic/Congenital	98.3	97.9	99.0	98.8	97.6	97.0	98.6	98.3
	Other	97.7	97.2	98.7	98.4	96.7	96.0	98.1	97.7
25	Glomerular	98.0	97.5	98.8	98.6	97.0	96.4	98.3	97.9
	Diabetic	96.3	95.5	97.8	97.4	94.6	93.5	96.9	96.2
	Systemic	97.6	97.1	98.6	98.3	96.6	95.8	98.0	97.6
	Tubulointerstitial	98.0	97.5	98.8	98.6	97.0	96.4	98.3	97.9
	Cystic/Congenital	98.2	97.8	99.0	98.7	97.4	96.8	98.3	98.2
	Other	97.6	97.0	98.6	98.3	96.5	95.7	98.5	97.5
40	Glomerular	97.1	96.5	98.4	98.0	95.9	95.0	97.6	97.1
	Diabetic	94.8	93.7	97.0	96.3	92.5	91.0	95.6	94.7
	Systemic	96.7	95.9	98.1	97.6	95.2	94.1	97.2	96.6
	Tubulointerstitial	97.1	96.5	98.4	98.0	95.9	95.0	97.6	97.1
	Cystic/Congenital	97.5	96.9	98.5	98.2	96.3	95.5	97.9	97.4
	Other	96.6	95.8	98.0	97.6	95.1	94.0	97.1	96.5
50	Glomerular	95.9	95.0	97.6	97.1	94.1	92.8	96.6	95.8
	Diabetic	92.6	91.1	95.7	94.7	89.5	87.4	93.8	92.4
	Systemic	95.2	94.2	97.2	96.6	93.2	91.7	96.0	95.1
	Tubulointerstitial	95.9	95.0	97.6	97.1	94.1	92.8	96.6	95.8
	Cystic/Congenital	96.4	95.6	97.9	97.4	94.7	93.6	96.9	96.3
	Other	95.1	94.0	97.2	96.5	93.0	91.5	95.9	95.0
65	Glomerular	91.5	89.8	95.0	93.9	88.0	85.7	92.8	91.3
	Diabetic	85.3	82.4	91.1	89.2	79.8	76.2	87.4	84.9
	Systemic	90.2	88.2	94.2	92.9	86.3	83.6	91.7	90.0
	Tubulointerstitial	91.5	89.8	95.0	93.9	88.0	85.7	92.8	91.3
	Cystic/Congenital	92.4	90.8	95.6	94.6	89.3	87.1	93.6	92.2
	Other	90.0	87.9	94.0	92.8	85.9	83.2	91.5	89.7

J. SUMMARY

Study Period

The 1997 Report was based on 62,572 kidney transplants performed in 60,340 patients between January 1, 1988, and April 30, 1994, from 249 transplant programs in the United States. In order to assess changes within transplant programs over time, the data were divided into 2 eras. The first era included transplants performed from January 1, 1988, through April 30, 1992; the second era covered the two year time period from May 1, 1992, through April 30, 1994.

Survival Rates

Survival rates were computed at 3 months, 1 year, and 3 years, both nationally and for each transplant program. Three year survival was determined in two ways: (1) conditional 3 year survival (i.e., survival at 3 years for those who survived at least 1 year post-transplant), and (2) unconditional 3 year survival. The emphasis on long term survival in this chapter is on the conditional 3-year survival rates because the conditional 3-year analysis provides an assessment of characteristics independent of those limited to the first year (e.g., surgical complications and early acute rejection events).

The national graft and patient survival rates and completeness of follow-up at 3 months, 1 year, and conditional 3 years are shown in Tables III-1 and III-2. The percent of programs with graft and patient follow-up data at 1 year was more than 96%; at conditional 3 years the percent of programs with follow-up data was 92%.

There was a marked increase in both the number of kidney transplants and in the actual graft and patient survival rates from Era 1 to Era 2. As demonstrated in Table III-16, graft survival rates increased 2.7% at 3 months and 3.3% at 1 year in Era 2 from Era 1. Patient survival rates increased 0.7% at 3 months and 0.9% at 1 year during the study period.

For the majority of transplant programs, the difference between actual and expected survival rates was not statistically significant (See Figures III-1 and III-3). In general, large differences (either higher or lower) were nearly always found among programs that reported relatively few transplants (see Figure III-2). Therefore, when evaluating survival rates for a program, it is also important to consider the number of transplants performed there.

Table III-16. Comparison of 3 Month and 1 Year Actual Survival Rates Between Eras

	3 Months		1 Year	
	Era 1	Era 2	Era 1	Era 2
Graft Survival (%)	87.9%	90.6%	82.3%	85.6%
Average No. of Transplants/Month	791	894	791	894
Patient Survival (%)	96.9%	97.6%	94.0%	94.9%
Average No. of Patients/Month	769	887	769	887

Differences Between Short Term and Long Term Characteristics

The 1997 Report includes an extensive list of characteristics that have a significant impact on both short and long term graft and patient survival.

Characteristics with the strongest *positive* impact on *short term survival* were:

- Recipient received a living donor transplant
- Recipient was Asian or Hispanic
- Recipient was female

- Year of transplant was 1993 or 1994

Characteristics with the strongest *negative* impact on *short term survival* were:

- Recipient received one or more previous transplants
- Recipient's HLA was poorly matched with donor
- Recipient was in ICU or hospitalized at time of transplant
- Recipient was less than 2 years old
- Recipient had diabetes
- Donor was Black or Hispanic

Characteristics with the strongest *positive* impact on *long term survival* were:

- Recipient received a living donor transplant
- Recipient was female
- Year of Transplant was 1992

Characteristics with the strongest *negative* impact on *long term survival* were:

- Recipient received one or more previous transplants
- Recipient HLA was poorly matched with donor
- Recipient was Black
- Recipient had diabetes or a systemic disease
- Recipient needed dialysis within the first week post-transplant
- Recipient had rejection episodes within the first six months after transplant
- Donor was Black

K. FINAL WORDS

The purpose of this report is to provide updated information on survival outcomes both nationally and at specific transplant programs, and to enhance the awareness of program performance in the U.S. However, the assessment of a transplant program should not be based solely on the survival rates provided in this report. Some of the other important factors to consider are the experience of the transplant team, support personnel, the cost of the procedure, and the quality and location of post-transplant services.

IV. LIVER CHAPTER

Introduction
Completeness of Follow-Up Data and Survival Rates
Percentages of Actual and Expected Graft Survival Rates
Percentages of Actual and Expected Patient Survival Rates
Donor and Recipient Characteristics
Impact of Characteristics on Short Term Survival
Impact of Characteristics on Long Term Survival
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Statistical Methods and Models
Summary
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IV. LIVER TRANSPLANT SURVIVAL RATES

For the Summary of this chapter, see page 66. For definitions of any terms used here, please refer to the User's Guide in the Liver volume.

A. INTRODUCTION

This report of liver transplant survival rates is based upon verified Scientific Registry data for 16,658 transplants involving 14,607 patients from 103 liver transplant programs in the United States. Each program reporting at least one liver transplant between January 1, 1988, and April 30, 1994, was included. Multi-organ and living donor transplants were excluded.

Short term survival is defined as survival at 3 months and 1 year post-transplant. Short term survival rates are based on all transplants in the study for which there are follow-up data.

Long term survival is defined in two ways:

- unconditional survival at 3 years post-transplant, and
- survival at 3 years post-transplant for those who survived at least 1 year, referred to as **conditional 3 year survival.**

The long term survival rates are based on all transplants between January 1, 1988, and April 30, 1992, for which there are follow-up data. This cohort was chosen to ensure that the maximum number of transplants with follow-up data was used to determine long term survival rates. Please note that the emphasis on long term survival in this report is on the *conditional* 3-year survival rates. This is because the conditional 3-year analysis provides an assessment of characteristics independent of those limited to the first year (e.g., surgical complications and early acute rejection events).

B. COMPLETENESS OF FOLLOW-UP DATA AND OVERALL GRAFT AND PATIENT SURVIVAL RATES

For graft survival, completeness of follow-up data and overall actual survival rates at each time point are shown in Table IV-1; patient survival data are shown in Table IV-2.

Patient (graft) follow-up data were considered complete when:

- the patient was alive (liver was functioning) and the duration of survival (function) was equal to or exceeded the specified time after transplant (i.e., 3 months, 1 or 3 years), or
- the patient died (liver failed) and a valid date of death (failure) was reported.

The percentages of complete follow-up data ranged from a low of 96.5% for the conditional 3 year time point to a high of 99.9% for the 3 month time point.

Overall survival rates also are presented in the tables. Patient survival rates are better than graft survival rates at all time points because patients may be retransplanted and remain alive following graft failure. If a graft had incomplete follow-up data, the observation was weighted to account for the time during which the graft was known to be functioning. Therefore, the actual graft survival rate reflects the weighted proportion of grafts functioning at the specified time interval. Patient survival rates were computed in a similar way (see the *Technical Methods* chapter of the *Executive Summary*).

In the cohort of transplants (1/1/88 - 4/30/92) used to compute conditional 3 year survival rates, patients (grafts) who did not survive to 1 year after transplant were excluded from the analyses. Therefore, the total number of patients (grafts) for the conditional 3 year analysis was less than that for the 3 month and 1 year analyses. Further, the number of patients is greater than the number of grafts because more grafts failed than patients died within the first year post-transplant.

Please note that the conditional 3 year graft and patient survival rates in Tables IV-1 and IV-2 may be higher than the 1 year graft survival rates. This is possible because the conditional 3 year survival rates should be interpreted as the 3 year survival rate for patients (grafts) who (which) survived at least 1 year post-transplant.

For example: Program A performed a total of five transplants between 1/1/88 and 4/30/92. Two of the livers failed prior to 1 year post-transplant and the remaining three livers survived to 3 years after transplant. In this example, Program A has a 1 year graft survival rate of 60% (3 out of 5 livers were functioning at 1 year post-transplant). However, the conditional 3 year survival rate for Program A is 100% because all three livers that were functioning at 1 year after transplant also were functioning at 3 years post-transplant. The same calculations are used for patient survival. See the *Technical Methods* chapter of the *Executive Summary* for more specific definitions of follow-up data and the calculations for actual graft and patient survival.

Overall Graft and Patient Survival Rates by Era

In this report, short term survival also is reported by era. Separate eras were used to determine whether there were any improvements over time in the short term survival rates. Era 1 is defined as all transplants occurring between January 1, 1988, and April 30, 1992; Era 2 includes all transplants occurring between May 1, 1992, and April 30, 1994. The overall graft and patient survival rates by era are presented in the last two columns of Table IV-1 and Table IV-2, respectively. The results demonstrate a substantial improvement in both graft and patient survival rates over time.

Table IV-1. Completeness of Graft Follow-Up Data and Actual Survival Rates for Liver Transplants

Time	Cohort	Number of Transplants	Percent with Follow-Up Data	Graft Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	16,658	99.9	77.7	75.5	81.1
1 Year	1/1/88 - 4/30/94	16,658	99.1	69.9	67.3	74.1
Cond. 3 Years	1/1/88 - 4/30/92	6,859	96.8	89.0	89.0	N/A*

Table IV-2. Completeness of Patient Follow-Up Data and Actual Survival Rates for Liver Transplants

Time	Cohort	Number of Patients	Percent with Follow-Up Data	Patient Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	14,607	99.7	85.3	83.7	87.8
1 Year	1/1/88 - 4/30/94	14,607	98.5	98.5	76.9	82.2
Cond. 3 Years	1/1/88 - 4/30/92	6,861	96.5	90.4	90.4	N/A*

* The cohort used to determine the overall conditional 3 year survival rate is the same as the Era 1 cohort. Therefore, the overall conditional 3 year survival rates are identical to the conditional 3 year survival rates for Era 1. There is no conditional 3 year survival rate calculated for Era 2 due to insufficient follow-up data on patients who received transplants in Era 2.

C. GRAFT SURVIVAL -- PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

For each transplant program, actual and expected survival rates were calculated at 3 months; 1 year, and 3 years conditional on survival at 1 year. Survival rates at each time point were determined using a specific cohort of transplants (shown in Tables IV-1 and IV-2 on the previous page). Expected survival rates were determined for each transplant program based on its specific patient and donor characteristics. These expected outcomes were statistically adjusted for many important prognostic variables, or covariates, that were used in the survival analysis. In other words, they take into account the many different characteristics that affect survival. *For example: if Program A transplanted many more "high risk" recipients than Program B, then Program A would have a lower expected survival rate than Program B.*

If a program's *actual* survival rate was *greater* than its expected survival rate, this means that the program's actual results were higher than the national results for transplants *with the same donor and recipient characteristics.* If a program's *actual* survival rate was *less than* its expected survival rate, this means that the program's actual results were lower than the national results for transplants *with the same donor and recipient characteristics. The difference between the actual and expected rate may have occurred by chance and, therefore, may not be statistically significant.* Furthermore, even a statistically significant difference, one that most likely did not occur by chance, may not be clinically significant (i.e., medically important). A formal description of the methods used to determine actual and expected survival rates appears in the *Technical Methods* chapter of the *Executive Summary.*

Table IV-3 shows the percentages of liver transplant programs by graft survival rates, both for actual and expected survival. The majority of the transplant programs had actual survival rates greater than 60% at all time points. At 3 months, 39% of programs had actual survival rates greater than 80%. At 1 year, this fell to 16%. However, the percentage increased to 89% for the conditional 3 year survival rates. The distribution of the expected survival rates shows a similar trend. The results indicate that there are more programs with high survival rates (>80%) at the conditional 3 year time point than there are at the 3 month and 1 year time point. *This is because the most critical period of time for graft survival is the first year post-transplant.* Those who survive the first year are very likely to survive 3 years post-transplant.

The percentages of programs by short term graft survival rates and eras, both for actual and expected survival, are summarized in Table IV-4. The results demonstrate a substantial improvement in graft survival over time because a greater percentage of programs had actual survival rates higher than 80% in Era 2. Expected survival rates in Era 2 also were higher than in Era 1.

Table IV-3. Percentages of Liver Transplant Programs by Graft Survival Rates

Graft Survival Rates (%)	Actual			Expected		
	3 Months (n= 103)	1 Year (n=103)	Cond. 3 Yrs (n=85)	3 Months (n=103)	1 Year (n=103)	Cond. 3 Yrs (n=85)
0-40	4.9	8.7	1.2	0.0	0.0	0.0
>40-60	7.8	20.4	0.0	0.0	0.0	1.2
>60-80	48.5	55.3	9.4	49.5	96.1	1.2
>80-90	30.1	12.6	37.6	50.5	3.9	60.0
>90-100	8.7	3.0	51.8	0.0	0.0	37.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Table IV-4. Percentages of Liver Transplant Programs by Graft Survival Rates and Era

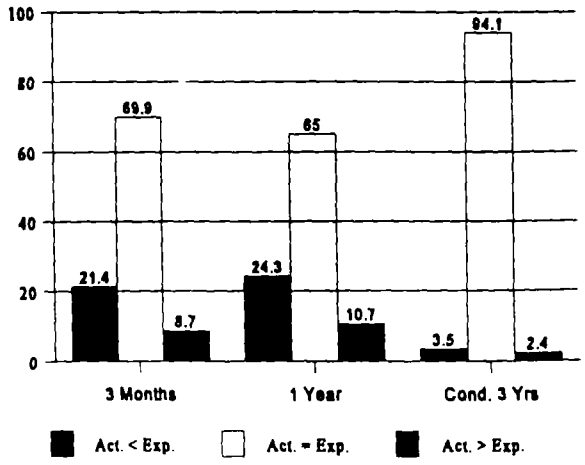
Graft Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)
0-40	4.4	6.0	6.7	12.1	0.0	0.0	0.0	0.0
>40-60	15.6	9.1	22.2	8.1	0.0	0.0	1.1	0.0
>60-80	52.2	29.3	62.2	47.5	71.1	31.3	95.6	87.9
>80-90	22.2	37.4	5.6	26.3	28.9	68.7	3.3	12.1
>90-100	5.6	18.2	3.3	6.0	0.0	0.0	0.0	0.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Differences in Actual and Expected Survival Rates

For most programs, the difference between the actual survival rate and the expected survival rate was not statistically significant. Figure IV-1 shows the percentages of programs whose actual graft survival rates were either above, equal to, or below expected graft survival rates at three time points. Programs with actual survival rates that were not significantly different from expected rates are shown in the actual survival equals expected survival group. Actual survival rates shown in the figure to be either greater than or less than expected survival rates were statistically significant. Overall, there were more programs that fell significantly below expected results than above expected results. However, for the majority of the transplant programs, the difference in actual and expected graft survival was not statistically significant. This was especially true at the conditional 3 year time point where less than 6% of programs were either significantly greater than or significantly less than expected.

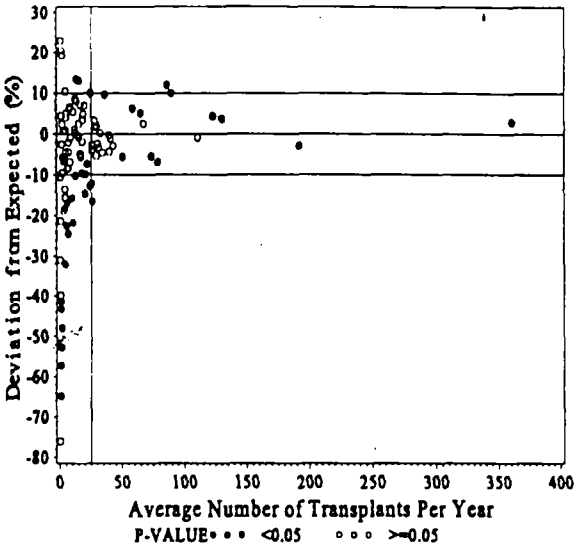
At all time points, the larger differences in actual and expected rates were nearly always seen in programs that reported relatively few transplants during the period. This occurs because programs that do not perform many transplants tend to have highly variable outcomes. To illustrate this, Figure IV-2 shows a scatter plot of the average number of transplants per year (transplant volume) versus the difference in 1 year actual and expected graft survival. Nearly all differences greater than 10% (either positive or negative) are found among transplant programs performing fewer than 25 liver transplants per year. Please note that actual survival rates which differ from expected survival rates are not always statistically significant and even statistically significant differences may not be clinically significant.

Figure IV-1. Percentages of Liver Transplant Programs with Actual Graft Survival Rates Above, Below, or Equal to Expected Survival Rates. *



*Actual survival rates above or below expected survival rates are statistically significant.

Figure IV-2. Liver Transplant Volume vs Difference in Actual and Expected 1 Year Graft Survival



D. PATIENT SURVIVAL – PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

The percentages of programs by patient survival rates for both actual and expected survival are shown in Table IV-5; the percentages of programs by survival rates and eras are shown in Table IV-6. Note that both actual and expected patient survival rates were higher at each time point than were actual and expected graft survival rates. As with graft survival, the outcomes in Era 2 were better than in Era 1.

Table IV-5. Percentages of Liver Transplant Programs by Patient Survival Rates

Patient Survival Rates (%)	Actual			Expected		
	3 Months (n= 103)	1 Year (n=103)	Cond. 3 Yrs (n=85)	3 Months (n=103)	1 Year (n=103)	Cond. 3 Yrs (n=85)
0-40	1.9	5.8	0.0	0.0	0.0	0.0
>40-60	6.8	8.7	0.0	0.0	0.0	1.2
>60-80	22.3	47.6	4.7	1.9	27.2	0.0
>80-90	49.6	30.1	29.4	87.4	72.8	23.5
>90-100	19.4	7.8	65.9	10.7	0.0	75.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Table IV-6. Percentages of Liver Transplant Programs by Patient Survival Rates and Era

Patient Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)	Era 1 (n=90)	Era 2 (n=99)
0-40	3.3	4.0	6.7	5.1	0.0	0.0	0.0	0.0
>40-60	11.1	7.1	12.2	8.1	0.0	0.0	0.0	0.0
>60-80	31.1	9.1	48.9	30.3	7.7	0.0	53.3	18.2
>80-90	35.6	43.4	25.5	39.3	85.6	72.7	45.6	81.8
>90-100	18.9	36.4	6.7	17.2	6.7	27.3	1.1	0.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Differences in Actual and Expected Survival Rates

The percentage of programs with actual patient survival rates significantly above their expected rates was greater at 3 months and 1 year than at conditional 3 years (see Figure IV-3). Overall, there were more programs that fell significantly below expected results than above expected results. However, for the majority of transplant programs, the difference in actual and expected patient survival was not statistically significant. This was especially true at the conditional 3 year time point where less than 5% of programs were either significantly greater than or significantly less than expected.

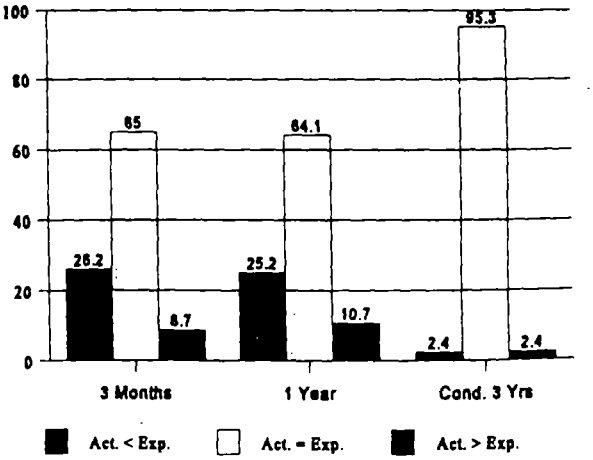
E. NATIONAL DISTRIBUTION OF DONOR AND RECIPIENT CHARACTERISTICS

The national distribution of donor and recipient characteristics for liver transplants, presented in percentages, is shown in Table IV-7. Each of these donor and recipient characteristics was included in the analyses for graft or patient survival, and used to determine an expected survival rate for each transplant.

The majority of livers transplanted were recovered from white male donors between the ages of 18 and 44 and the most frequent causes of death were due to cerebrovascular accidents (CVAs) and head trauma. Nearly 47% of liver donors had cold ischemic times of 10 hours or less.

The majority of liver recipients were white males between the ages of 45 and 64. Nearly 51% of recipients were not hospitalized prior to transplant and 87% of the recipients received an ABO identical transplant; in other words, both the donor and recipient had the same blood type. Of the 16,658 transplants, 13% were repeat liver transplants.

Figure IV-3. Percentages of Liver Transplant Programs with Actual Patient Survival Rates Above, Below, or Equal to Expected Survival Rates. *



*Actual survival rates above or below expected survival rates are statistically significant.

Table IV-7. National Donor and Recipient Characteristics in Liver Transplants: Percentages by Era and Overall

Characteristics by Category		ERA 1 1/88-4/92 N=10,241	ERA 2 5/92-4/94 N=6,417	OVERALL 1/88-4/94 N=16,658
Donor Age	< 1	3.6	1.7	2.9
	1-5	7.1	4.6	6.1
	6-17	20.5	19.8	20.2
	18-44	54.2	49.5	52.4
	45-64	13.8	21.1	16.6
	65+	0.5	3.2	1.5
	Not Reported	0.3	0.2	0.2
Donor Race	White	81.9	77.4	80.2
	Black	9.5	11.7	10.4
	Hispanic	6.6	8.4	7.3
	Asian	0.9	1.4	1.1
	Other	0.7	0.8	0.7
	Not Reported	0.4	0.3	0.4
Donor Gender	Female	35.9	36.9	36.3
	Male	64.0	63.1	63.7
	Not Reported	0.1	0.0	0.1
Cold Ischemic Time (Hours)	0-5	11.1	9.1	10.3
	6-10	34.4	40.0	36.6
	11-15	31.6	32.5	31.9
	16-20	11.5	7.5	10.0
	21 +	5.0	3.7	4.5
	Not Reported	6.4	7.1	6.7
Donor Cause of Death	CVA	28.5	34.1	30.7
	Head Trauma	32.8	15.9	26.3
	Other	38.8	49.9	43.1

		ERA 1	ERA 2	OVERALL
Blood Group Compatibility	Identical	85.7	89.0	87.0
	Compatible	10.4	8.6	9.7
	Incompatible	3.4	2.2	3.0
	Unknown	0.4	0.2	0.3
Recipient Age	< 1	5.1	3.3	4.4
	1-5	7.6	5.8	6.9
	6-17	6.3	5.2	5.9
	18-44	34.5	30.9	33.1
	45-64	43.1	49.5	45.5
	65+	3.4	5.3	4.2
Recipient Race	White	78.2	76.3	77.5
	Black	8.2	7.7	8.0
	Hispanic	7.7	9.7	8.4
	Asian	2.8	3.1	2.9
	Other	3.1	3.2	3.1
	Not Reported	0.1	0.0	0.1
Recipient Gender	Female	46.6	44.5	45.8
	Male	53.4	55.5	54.2
Procedure Type	Whole Liver	98.1	98.1	98.1
	Reduced/Split Liver	1.9	1.9	1.9
Previous Liver Tx	No	85.8	88.4	86.8
	Yes	14.2	11.6	13.2
Liver Disease	Acute Hepatic Necrosis	7.7	6.7	7.4
	Cholestatic/Biliary Cirrhosis	18.5	17.2	18.0
	Cirrhosis	49.2	57.2	52.3
	Malignant Neoplasms	4.9	3.5	4.4
	Metabolic Disease	5.5	4.7	5.2
	Miscellaneous Disease	14.2	10.5	12.7
	Not Reported	0.0	0.2	0.1

		ERA 1	ERA 2	OVERALL
Recipient Description at Transplant	Intensive Care	31.0	22.4	27.7
	Hospitalized	22.2	19.8	21.3
	Not Hospitalized	46.8	57.4	50.9
	Not Reported	0.0	0.3	0.2
Recipient on Life Support	No	79.6	85.2	81.8
	Yes	20.4	14.4	18.1
	Not Reported	0.0	0.3	0.1
Serum Creatinine Prior to Transplant	0 - 2	85.8	86.8	86.2
	> 2	13.1	12.7	13.0
	Not Reported	1.0	0.5	0.8
Year of Transplant	1988	16.4	0.0	10.1
	1989	21.0	0.0	12.9
	1990	25.5	0.0	15.7
	1991	28.0	0.0	17.2
	1992	9.1	31.5	17.8
	1993	0.0	52.0	20.0
	1994	0.0	16.5	6.4

Donor Trends

National donor characteristics changed between Era 1 and Era 2. The percentage of donors age 45 and older increased by 10% between Era 1 and Era 2, from 14% to 24%. The percentage of minority donors also increased, from 18% to 23%. There were fewer donors who died from head trauma and more who died from cerebrovascular accidents (CVAs).

Recipient Trends

Transplant recipients were older in the second era; those over age 45 comprised 55% of recipients in Era 2 as compared to 47% in Era 1. The percentage of transplants for patients in the miscellaneous liver disease group decreased, while those with cirrhosis increased in Era 2 (see Table IV-8 for a complete list of primary disease diagnoses). More recipients were not hospitalized prior to their transplants in Era 2; the percentage of recipients who were hospitalized decreased by 2% from Era 1 and the percentage of patients in the intensive care unit decreased by 9% from Era 1.

Despite more older donors and older recipients in Era 2, the national survival rates improved from Era 1 to Era 2 (See Tables IV-1 and IV-2).

Table IV-8. Liver Primary Disease Diagnoses at Time of Transplant

Cholestatic Liver Disease/Biliary Cirrhosis	Cirrhosis
Cholestatic Liver Disease Primary Biliary Cirrhosis (PBC) Secondary Biliary Cirrhosis (SBC) --Caroli's disease --Choledochal Cyst --Bile Duct Strictures Primary Sclerosing Cholangitis (PSC) --with Crohn's GI tract disease --with Ulcerative Colitis	Cirrhosis: --Laennec's --Postnecrotic Cirrhosis (A, B, C, D) --Postnecrotic Cirrhosis (Non A, Non B) --Cryptogenic, Idiopathic, no obvious source --Chronic Active Hepatitis (A, B, C, D) --Chronic Active Hepatitis: etiology unknown --Autoimmune, Lupoid, Banti's --Drug or industrial exposure
Acute Hepatic Necrosis (AHN)	**Metabolic Disease**
Due to a drug, chemicals, toxins Hepatitis (A, B, C, D) Non A, Non B Hepatitis Acute non-hepatic viral infection Unspecified fulminant hepatitis, submassive hepatic necrosis	Alpha-1-antitrypsin deficiency (A-1-A) Wilson's Disease, Other copper metabolism disorder Hemochromatosis, hemosiderosis, other iron storage disease Glycogen Storage Disease Type I, Type II Hyperlipidemia-II, Homozygous Hypercholesterolemia Tyrosinemia Primary Oxalosis/Oxaluria, Hyperoxaluria Other Metabolic Disease
Miscellaneous (Other) Liver Disease	**Malignant Neoplasms**
Familial Cholestasis: Byler's Disease, Other Neonatal Hepatitis Biliary Atresia --Extrahepatic, Hypoplasia, Alagille's Syndrome Congenital Hepatic Fibrosis Cystic Fibrosis Budd-Chiari Syndrome Benign Tumor: Hepatic Adenoma, Polycystic liver disease, other Total Parenteral Nutrition (TPN)/Hyperalimentation induced liver disease Graft vs Host Disease secondary to non-liver transplant Trauma	Primary Liver Malignancy --Hepatoma, hepatocellular carcinoma (HCC) --Fibrolamellar (FL-HC) --Cholangiocarcinoma (CH-CA) --Hepatoblastoma (HBL) --Hemangioendothelioma, Hemangiosarcoma, Angiosarcoma --Klatskin tumor, Leimyosarcoma Bile duct cancer --Cholangioma, Biliary Tract Carcinoma Secondary Hepatic Malignancy --Non-liver Adenocarcinoma, Cystadenocarcinoma, VIPoma, Gastrinoma, Insulinoma, Islet cell tumor, Neuroendocrine tumor

F. SHORT TERM SURVIVAL -- IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

To determine the expected survival for each transplant or patient, separate analyses were performed for graft and patient survival at three time points. (The analyses were performed using logistic regression, see the *Technical Methods* chapter in the *Executive Summary.*) The analyses also identified donor and recipient characteristics that had a significant impact on survival outcomes. For each *characteristic* (e.g., race, gender) considered in the analyses, a *reference group* was chosen (e.g., White, male) with which the other groups were compared. As a general rule, the largest group or the mean of

the characteristic (e.g., mean recipient age=40) was used as the reference group.

The following served as the characteristics and reference groups for ***short term graft and patient*** survival:

- Mean Donor Age -- 28 years
- Donor Race -- non-Black, non-Hispanic
- Donor Gender -- male
- Mean Cold Ischemic Time -- 11 hours
- Donor Cause of Death -- not cerebrovascular accident (CVA)
- Blood Type Compatibility -- identical
- Previous Liver Transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- non-Black, non-Asian
- Transplant Procedure Type -- whole liver
- Primary Liver Disease -- recipient had cirrhosis or metabolic disease (see Table IV-8 for a complete list of primary disease diagnoses)
- Medical Status -- not hospitalized prior to transplant
- Life Support Status -- none
- Serum Creatinine prior to transplant -- ≤ 2 mg/dl
- Year of Transplant -- 1988 or 1989

The relative impact of each donor and recipient characteristic on short term graft and patient survival outcomes is listed in Table IV-9. For each characteristic, the ***odds ratio*** is the odds of patient death (graft failure) as compared to the reference group, after adjusting for the effects of all other donor and recipient characteristics. An *odds ratio of less than 1* indicates that the characteristic was associated with a *reduced odds* of patient death or graft failure relative to the reference group. An odds ratio of *greater than 1* indicates that the characteristic was associated with an *increased odds* of patient death or graft failure relative to the reference group. The corresponding p-value measures the significance of the odds ratio. A p-value less than 0.05 indicates statistical significance and means that there is less than a 5% probability that such difference is due to chance alone. The smaller the p-value, the greater the statistical significance and the less likely the difference is due to chance alone.

Examples

In Table IV-9, the odds ratio of graft failure within 3 months after a repeat transplant versus a first, or primary, transplant was 1.59. This means that, after adjusting for all of the other donor and recipient characteristics, the odds of graft failure within 3 months was 59% greater for repeat transplants than for primary transplants ((1.59-1)×100%=59%). As another example, the odds ratio of graft failure within 3 months post-transplant for a recipient who was on life support prior to transplant versus a recipient who was not on life support was 1.71. After adjusting for the effects of both donor and recipient characteristics, the odds of graft failure within 3 months for a patient who was on life support prior to transplant was 71% higher ((1.71-1)×100%=71%) than that for a patient who was not on life support prior to transplant.

The estimated odds ratios for continuous variables (i.e., variables with many possible values) such as cold ischemic time and donor and recipient ages are less easily interpreted. For these variables, the estimated odds is determined for every 1 or 10 unit increase or decrease from the mean (reference group) of the variable. For example, in Table IV-9, the estimated odds of 3 month graft failure for 12 hours of cold ischemic time compared to the mean of 11 hours is 1.02. This means that, after adjusting for the effects of all other characteristics, the odds of graft failure was estimated to increase by 2% for the first one hour increase from the mean cold ischemic time.

An increase of 5 hours from the mean (i.e., the cold ischemic time is 11+5=16 hours) would result in an 8% increase in the odds of graft failure. Mathematically, this 8% was calculated as follows:

$$\text{Odds ratio} = \exp^{\left(\frac{5}{1}\times 0.015\right)} = 1.08$$

where 1 represents the unit of increase and 0.015 corresponds to the coefficient of cold ischemic time per one hour difference (see Table IV-12 for coefficients). Therefore, the increase in the odds of graft failure is (1.08-1)×100%=8%. For some variables such as donor and recipient age, it is necessary to add a quadratic term. For more details on calculating odds ratios for continuous variables, refer to the section on *Odds Ratios* in the *Technical Methods* chapter of the *Executive Summary*.

Table IV-9. Impact of Donor and Recipient Characteristics on Short Term Graft and Patient Survival--Liver Transplants

Short Term Characteristics	Graft Survival				Patient Survival			
	3 Months		1 Year		3 Months		1 Year	
	Odds Ratio	P-value	Odds Ratio	P-value	Odds Ratio	P-value	Odds Ratio	P-value
Donor Age 38 vs 28 [1]	1.106	<0.001	1.131	<0.001	1.060	0.006	1.081	0.012
Donor Black vs White, Asian, Other	1.507	<0.001	1.609	<0.001	1.373	<0.001	1.405	<0.001
Donor Hisp vs White, Asian, Other	1.225	0.007	1.146	0.048	1.168	0.097	1.147	0.097
Donor Female vs Male	1.136	0.003	1.089	0.027	1.181	0.002	1.125	0.012
Cold Ischemic Time - 12 vs 11 hours	1.015	<0.001	1.011	<0.001	1.005	0.274	1.004	0.284
Cause of Death: Cerebrovascular Accident vs Other	1.223	<0.001	1.135	0.007	1.108	0.111	1.049	0.400
ABO Compatible vs Identical	1.246	<0.001	1.210	0.001	1.267	0.002	1.271	<0.001
ABO Incompatible vs Identical	1.619	<0.001	1.481	<0.001	1.406	0.008	1.306	0.027
Previous Transplant - Yes vs No	1.586	<0.001	1.647	<0.001	1.955	<0.001	1.983	<0.001
Recipient Age - 50 vs 40 [1]	1.104	<0.001	1.112	<0.001	1.207	<0.001	1.234	0.001
Recipient Age < 1 vs Age ≥1	1.339	0.006	1.313	0.007	1.615	<0.001	1.440	0.003
Recipient Black vs White, Hisp, Other	1.157	0.038	1.172	0.015	1.349	<0.001	1.349	<0.001
Recipient Asian vs White, Hisp, Other	1.023	0.843	1.539	<0.001	1.147	0.313	1.767	<0.001
Reduced or Split Liver vs Whole Tx	1.429	0.008	1.569	<0.001	1.274	0.168	1.487	0.012
Acute Hepatic Necrosis vs Cirrhosis, Metabolic Disease	1.277	<0.001	1.139	0.072	1.291	0.005	1.151	0.100
Cholestatic Disease/Biliary Cirrhosis vs Cirrhosis, Metabolic Disease	0.833	0.001	0.808	<0.001	0.689	<0.001	0.667	<0.001
Malignant Neoplasms vs Cirrhosis, Metabolic Disease	1.016	0.867	1.653	<0.001	1.021	0.862	1.989	<0.001
Miscellaneous Disease vs Cirrhosis, Metabolic Disease	1.293	0.002	1.152	0.066	1.278	0.020	1.120	0.235
Hospitalized vs Not Hospitalized	1.223	<0.001	1.212	<0.001	1.346	<0.001	1.295	<0.001
ICU vs Not Hospitalized	1.476	<0.001	1.409	<0.001	1.646	<0.001	1.558	<0.001
On Life Support vs No Life Support	1.706	<0.001	1.602	<0.001	1.837	<0.001	1.697	<0.001
Most Recent Serum Creatinine Prior to Transplant >2 mg/dl	1.459	<0.001	1.501	<0.001	1.672	<0.001	1.660	<0.001

Short Term Characteristics	Graft Survival				Patient Survival			
	3 Months		1 Year		3 Months		1 Year	
	Odds Ratio	P-value	Odds Ratio	P-value	Odds Ratio	P-value	Odds Ratio	P-value
Tx Year 1990 vs 1988-89	0.844	0.006	0.822	<0.001	0.789	0.003	0.815	0.003
Tx Year 1991 vs 1988-89	0.778	<0.001	0.762	<0.001	0.836	0.019	0.827	0.005
Tx Year 1992 vs 1988-89	0.683	<0.001	0.664	<0.001	0.698	<0.001	0.707	<0.001
Tx Year 1993-94 vs 1988-89	0.614	<0.001	0.591	<0.001	0.632	<0.001	0.617	<0.001

Notes:

Odds ratios for donor and recipient age do not have a linear relationship. The odds ratios presented in this table represent 1 (cold ischemic time) or 10 unit (donor and recipient age) increases from the mean of each covariate. The mean donor age was 28. The mean cold ischemic time was 11 hours. The mean recipient age was 40.

Graft Survival

The donor characteristics with the strongest impact on short term graft survival were donor race, donor cause of death, and blood type compatibility between the donor and the recipient. The odds of 1 year graft failure was 61% higher in transplants from Black donors than those from non-Black and non-Hispanic donors. The odds of 1 year graft failure for ABO incompatible grafts was nearly 50% greater than for ABO identical grafts.

The recipient characteristics that had the strongest impact on short term graft survival were previous transplant, race, procedure type (whole or reduced/split liver), disease diagnosis at transplant, medical condition at transplant, serum creatinine prior to transplant and year of transplant. Repeat transplants had a 59% greater odds of failing within 3 months than did first transplants. Although not statistically significant at 3 months, Asian recipients had an increased odds of graft failure at 1 year of 54% as compared to non-Asian and non-Black recipients. Recipients who were in the ICU prior to transplant had a 41% greater odds of graft failure at 1 year than patients who were not hospitalized prior to transplant. Transplants performed during 1993 and the first four months of 1994 had an almost 40% reduced odds of failure compared to transplants performed in 1988.

Patient Survival

As seen with graft survival, the donor characteristics with the strongest impact on short term patient survival were donor race and ABO compatibility between the donor and recipient. Donor cause of death did not have a significant effect on short term patient survival in liver recipients ($p > 0.05$). The odds of mortality for recipients of Black donor livers was greater than that for recipients of non-Black and non-Hispanic donor livers. The odds of 1 year mortality for recipients of ABO incompatible livers was 31% greater than for recipients of ABO identical livers. Additionally, recipients of female donor livers had a slightly increased odds of mortality at 3 months and 1 year.

The recipient characteristics with the strongest impact on short term patient survival are similar to those seen with graft survival. Previous transplant, race, disease diagnosis at transplant, medical condition at transplant, and year of transplant were found to influence strongly patient mortality. When compared to those receiving primary transplants, recipients of repeat transplants had an increased odds of mortality of more than 95% at 3 months and 1 year. Although not statistically significant at 3 months, Asian recipients had an increased odds of mortality at 1 year of 77% as compared to non-Asian and non-Black recipients. A similar trend was observed for recipients with a diagnosis of malignant neoplasms; these patients had an increased odds of mortality at 1 year of 99% as compared to recipients

with cirrhosis or metabolic diseases. Recipients of transplants in 1992, 1993, and 1994 had a 29% to 38% reduction in the odds of death at 1 year post-transplant relative to recipients of transplants in 1988. This finding is consistent with the improved liver patient survival rates over time.

G. LONG TERM SURVIVAL -- IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

In this report, long term survival analyses were developed separately from the short term survival analyses. Because this narrative focuses on conditional 3 year survival (survival at 3 years for grafts or patients surviving at least 1 year post-transplant), only conditional 3 year survival data are presented in this text. Both conditional and unconditional 3 year survival rates are provided in the tables for each transplant program presented in each organ specific volume.

The conditional 3 year survival analyses provide an assessment of the donor and recipient characteristics that are independent of those limited to the first year (e.g., surgical complications).

The impact of each donor and recipient characteristic on graft and patient long term survival is listed in Table IV-10.

Table IV-10. Impact of Donor and Recipient Characteristics on Long Term Graft and Patient Survival -- Liver Transplants

Long Term Characteristics	Graft Survival		Patient Survival	
	Odds Ratio	P-value	Odds Ratio	P-value
Donor Age 38 vs 28 [1]	1.162	0.002	1.155	<0.001
Donor Female vs Male	1.229	0.020	1.303	0.005
Donor Cause of Death CVA vs Other	0.795	0.032	0.797	0.046
Previous Transplant Yes vs No	1.741	<0.001	1.644	0.003
Recipient Age 50 vs 40 [1]	1.004	0.913	1.101	0.006
Recipient Age < 1 vs Age ≥ 1	2.047	0.003	2.507	<0.001
Recipient Black vs White, Asian, Hispanic, Other	1.647	<0.001	1.643	0.002
Recipient Female vs Male	0.806	0.011	0.781	0.006
Reduced or Split Liver vs Whole Tx	2.369	0.003	3.052	<0.001
Acute Hepatic Necrosis vs Cirrhosis	0.628	0.016	0.511	0.004
Cholestatic Disease/Biliary Cirrhosis vs Cirrhosis	0.576	<0.001	0.567	<0.001
Metabolic Disease vs Cirrhosis	0.672	0.050	0.617	0.038
Malignant Neoplasms vs Cirrhosis	5.848	<0.001	6.483	<0.001
Miscellaneous Disease vs Cirrhosis	0.404	<0.001	0.386	<0.001

Notes:

[1] Odds ratios for donor and recipient age do not have a linear relationship. The odds ratios presented in this table represent 1 (cold ischemic time) or 10 unit (donor and recipient age) increases from the mean of each covariate. The mean donor age was 28. The mean cold ischemic time was 11 hours. The mean recipient age was 40.

The following characteristics and reference groups were used for *long term graft and patient* survival:

- Mean Donor Age -- 28
- Donor Gender -- male
- Donor Cause of Death -- not CVA
- Previous Liver Transplant -- no
- Mean Recipient Age -- 40 years
- Recipient Race -- non-Black
- Recipient Gender -- male
- Transplant Procedure Type -- whole liver
- Primary Liver Disease --recipient had cirrhosis (see Table IV-8 for a complete list of primary disease diagnoses)

Graft Survival

The donor characteristics with the strongest impact on long term graft survival were donor gender and donor cause of death. Based on the conditional 3 year analysis, the odds of graft failure was 20% lower in recipients of livers from donors with cause of death due to CVA than recipients of donors with all other causes of death ((0.8-1) ×100%=-20%); and 23% higher in female donor transplants than in male donor transplants. Donor race and cold ischemic time had no significant effect on long term survival and were not included in the analysis.

The recipient characteristics that had the strongest impact on graft survival were transplant number (primary or repeat), age, race, gender, transplant procedure type (whole or reduced/split liver), and disease diagnosis at transplant. Black recipients had an approximately 65% greater odds of graft failure than did non-Black recipients, while female recipients had a 19% lower odds of graft failure than did male recipients. When compared to the cirrhosis disease group, patients diagnosed with malignant neoplasms had nearly 6 times the odds of graft failure. In contrast, recipients with acute hepatic necrosis, cholestatic disease/biliary cirrhosis, metabolic disease, or miscellaneous diseases had a 33% to 60% lower odds of graft failure when compared to the cirrhosis group.

Patient Survival

As was seen with graft survival, the donor characteristics with the strongest impact on long term patient survival were donor gender and donor cause of death. Based on the conditional 3 year analysis, the odds of mortality was 30% higher in female donor transplants than in male donor transplants; and 20% lower in recipients of livers from donors with cause of death due to CVA than recipients of donors with all other causes of death.

The recipient characteristics that had the strongest impact on long term patient survival were transplant number (primary or repeat) age, race, gender, transplant procedure type (whole vs reduced or split liver), and disease diagnosis at transplant. Recipients under age 1 had a 151% greater odds of graft failure than recipients of all other ages, and Black recipients had an approximately 65% greater odds of mortality than did non-Black recipients. Similar results were also found with respect to recipient diagnosis. When compared to the cirrhosis disease group, patients diagnosed with malignant neoplasms had nearly 6.5 times the odds of mortality. In contrast, recipients with acute hepatic necrosis, cholestatic disease/biliary cirrhosis, metabolic disease, or miscellaneous diseases had significantly lower odds of death when compared to recipients with cirrhosis.

H. COMPARISON BETWEEN SHORT TERM AND LONG TERM CHARACTERISTICS

Many of the donor and recipient characteristics that had a strong impact on short term graft survival appeared to have a strong impact on long term graft survival as well. Some exceptions were donor race, blood type compatibility between donor and recipient and medical condition prior to transplant. Recipient gender did not have a significant impact on short term patient survival but female recipients had a significantly decreased odds of graft failure and patient mortality in the long term.

For some characteristics, their negative effect on graft and/or patient survival increased over time. For instance, the odds of graft failure at 3 months for recipients with previous transplants was 1.59, then increased to 1.65 at 1 year, and was 1.74 in the conditional 3 years analysis. Similarly, the odds of patient mortality at 3 months for recipients of reduced or split livers compared to recipients of whole livers was 1.27, which increased to 1.49 at 1 year, and 3.05 in the conditional 3 years analysis. In the short term, recipients with a diagnosis of malignant neoplasms showed a moderate increase in

the odds of graft failure compared to patients with cirrhosis or metabolic diseases. In the long term, however, recipients with malignancies had a nearly 484% increased odds of graft failure compared to patients with cirrhosis. Interestingly, while patients with acute hepatic necrosis or miscellaneous diseases had an increased risk of graft failure and patient mortality in the short term, for those grafts (patients) which (who) survived the first year, there was a significantly decreased risk of graft failure and mortality at 3 years.

I. STATISTICAL METHODS AND MODELS

This section provides a brief summary of the statistical methods used to determine survival rates for liver transplants, both nationally and at each transplant program. It is <u>not</u> necessary to read this section in order to utilize the rest of the report. For additional statistical details, please see the Technical Methods chapter in the Executive Summary.

<u>Model Significance -- R^2</u>

The conclusion that there is a "center effect" in liver transplantation often is based on the observation that actual survival rates vary considerably among liver transplant programs. However, in reality, only part of the variability can be attributed to the quality of the program (the so called "center effect"); the rest can be attributed to the differences in donor and recipient characteristics among transplant programs. The degree to which the variability in actual survival rates can be attributed to the specific donor and recipient characteristics in each analysis appears in Table IV-11.

In the table, the values in the column labeled R^2 estimate the percentage of variability in the actual survival rates that can be attributed to the covariates in each analysis. *The higher the percentage, the better the analysis explained the individual program outcomes, based on the characteristics examined.* Theoretically, if an analysis contained every covariate that affected survival outcomes, and there were no differences in quality among programs (i.e., no "center effect"), then R^2 would equal 100%. In practice, we can never capture every factor that affects outcomes, and it is likely that real differences among programs do exist. This means that any unexplained variation can probably be attributed to a combination of true center effect and covariates not considered in this study. (For details on the R^2 calculation, refer to the *Model Significance* section in the *Technical Methods* chapter of the *Executive Summary*.)

The value of R^2 estimated from analyses in the 1994 Report was compared to the value of the R^2 analyses in the 1997 Report. Note that these analyses are not *directly* comparable since each was used with a different cohort of transplants. Despite the refinements in the 1997 Report, as compared to the 1994 Report, much of the variation in actual survival rates among the 103 transplant programs in the study remains unexplained by the analyses. This suggests that much of the risk involved in liver transplantation is due to characteristics not described in this report.

<u>Estimated Coefficients and Standard Errors from the Logistic Regression Models</u>

Tables IV-12 and IV-13 list the coefficients and the standard errors of the coefficients at each time point for all of the donor and recipient characteristics used in the logistic regression models. Each coefficient is reported on the logistic scale and represents the $\log_e$ odds of graft failure or the $\log_e$ odds of patient mortality for the corresponding characteristic at the specified time after transplant. The adjusted odds ratio on the probability scale may be obtained by applying the exponential function to the coefficient. For further details, see the *Odds Ratios* section in the *Technical Methods* chapter of the *Executive Summary*.

Table IV-11. Liver Model R^2: Comparison of the 1994 and 1997 Reports

Outcome	Time Point	Report Year	Number of Covariates	R^2
Graft Model R^2	3 Months	1997 1994	28 23	34.1 40.0
	1 Year	1997 1994	28 23	38.2 34.0
	Cond. 3 Years	1997 1994	14 N.A.*	28.3 N.A.*
Patient Model R^2	3 Months	1997 1994	28 23	36.2 45.0
	1 Year	1997 1994	28 23	39.9 43.0
	Cond. 3 Years	1997 1994	14 N.A.*	42.2 N.A.*

* Not applicable, conditional 3 year survival not calculated in the 1994 Report.

Table IV-12. Model Coefficients and Standard Errors for Donor and Recipient Characteristics in Short Term Liver Transplant Survival

Short Term Characteristics	Graft Survival				Patient Survival			
	3 Months		1 Year		3 Months		1 Year	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Intercept	-1.859	0.059	-1.329	0.053	-2.439	0.075	-1.920	0.065
Donor Age - Linear (per 10 years) [1,2]	0.083	0.019	0.101	0.018	0.044	0.024	0.066	0.022
- Quadratic	0.018	0.007	0.015	0.007	0.014	0.009	0.013	0.008
Donor Black vs White, Asian, Other	0.410	0.061	0.476	0.057	0.317	0.078	0.340	0.069
Donor Hisp vs White, Asian, Other	0.203	0.075	0.136	0.069	0.155	0.094	0.137	0.082
Donor Female vs Male	0.127	0.042	0.086	0.039	0.166	0.053	0.118	0.047
Cold Ischemic Time (per hour)	0.015	0.004	0.011	0.003	0.005	0.005	0.004	0.004
Cause of Death: Cerebrovascular/ Stroke vs Other	0.201	0.051	0.127	0.047	0.103	0.064	0.048	0.057
ABO Compatible vs Identical	0.220	0.062	0.190	0.058	0.237	0.077	0.239	0.070
ABO Incompatible vs Identical	0.482	0.101	0.393	0.099	0.341	0.128	0.267	0.121
Previous Transplant Yes vs No	0.461	0.057	0.499	0.054	0.671	0.079	0.685	0.074

Short Term Characteristics	Graft Survival				Patient Survival			
	3 Months		1 Year		3 Months		1 Year	
	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error	Model Coeff.	Std. Error
Recipient Age - Linear (per 10 years) [1,2]	0.071	0.015	0.077	0.014	0.154	0.019	0.168	0.017
- Quadratic	0.028	0.007	0.030	0.006	0.035	0.009	0.042	0.008
Recipient Age < 1 vs Age ≥1	0.292	0.107	0.272	0.101	0.479	0.134	0.365	0.124
Recipient Black vs White, Hisp, Other	0.146	0.070	0.159	0.065	0.299	0.086	0.299	0.078
Recipient Asian vs White, Hisp, Other	0.023	0.115	0.431	0.099	0.137	0.136	0.569	0.111
Reduced or Split Liver vs Whole Tx	0.357	0.135	0.451	0.129	0.242	0.175	0.397	0.158
Acute Hepatic Necrosis vs Cirrhosis, Metabolic Disease	0.244	0.076	0.130	0.073	0.255	0.092	0.141	0.086
Cholestatic Disease/Biliary Cirrhosis vs Cirrhosis, Metabolic Disease	-0.183	0.057	-0.213	0.051	-0.372	0.075	-0.405	0.065
Malignant Neoplasms vs Cirrhosis, Metabolic Disease	0.016	0.098	0.503	0.083	0.021	0.119	0.688	0.091
Miscellaneous Disease vs Cirrhosis, Metabolic Disease	0.257	0.082	0.142	0.077	0.245	0.105	0.113	0.095
Hospitalized vs Not Hospitalized	0.201	0.053	0.193	0.047	0.298	0.067	0.259	0.057
ICU vs Not Hospitalized	0.390	0.068	0.343	0.062	0.499	0.085	0.443	0.075
On Life Support vs No Life Support	0.534	0.071	0.471	0.067	0.608	0.088	0.529	0.080
Most Recent Serum Creatinine Prior to Transplant >2 mg/dl	0.378	0.057	0.406	0.054	0.514	0.069	0.507	0.063
Tx Year 1990 vs 1988-89	-0.169	0.062	-0.196	0.057	-0.237	0.079	-0.204	0.069
Tx Year 1991 vs 1988-89	-0.251	0.062	-0.272	0.056	-0.179	0.077	-0.190	0.067
Tx Year 1992 vs 1988-89	-0.381	0.063	-0.409	0.057	-0.360	0.079	-0.347	0.069
Tx Year 1993-94 vs 1988-89	-0.488	0.058	-0.527	0.053	-0.459	0.073	-0.483	0.064

Notes:

1 In the analysis, the continuous covariates (donor age, cold ischemic time, recipient age) were centered at their mean. The mean donor age was 28. The mean cold ischemic time was 11 hours. The mean recipient age was 40.

2 Modeling the continuous covariates with a linear and a quadratic term (the square of the linear term) is necessary due to the relationship between the covariate and the odds of graft failure or patient death.

Table IV-13. Model Coefficients and Standard Errors for Donor and Recipient Characteristics in Long Term Liver Transplant Survival

Long Term Characteristics	Graft Survival		Patient Survival	
	Model Coefficient	Standard Error	Model Coefficient	Standard Error
Intercept	-2.137	0.081	-2.305	0.086
Donor Age -Linear (per 10 years) [1,2]	0.110	0.038	0.100	0.041
-Quadratic	0.040	0.017	0.044	0.018
Donor Female vs Male	0.207	0.088	0.264	0.094
Donor Cause of Death Cerebrovascular/Stroke vs Other	-0.230	0.107	-0.227	0.114
Previous Transplant - Yes vs No	0.554	0.117	0.497	0.165
Recipient Age (per 10 years)	0.004	0.032	0.096	0.035
Recipient Age < 1 vs Age ≥ 1	0.716	0.237	0.919	0.276
Recipient Black vs White, Asian, Hispanic, Other	0.499	0.144	0.496	0.159
Recipient Female vs Male	-0.216	0.846	-0.248	0.091
Reduced or Split Liver vs Whole Tx	0.862	0.287	1.116	0.311
Acute Hepatic Necrosis vs Cirrhosis	-0.465	0.194	-0.671	0.233
Cholestatic Disease/Biliary Cirrhosis vs Cirrhosis	-0.553	0.121	-0.567	0.128
Metabolic Disease vs Cirrhosis	-0.397	0.203	-0.483	0.233
Malignant Neoplasms vs Cirrhosis	1.766	0.134	1.869	0.135
Miscellaneous Disease vs Cirrhosis	-0.907	0.201	-0.953	0.234

Notes:

[1] In the analysis, the continuous covariates (donor age, cold ischemic time, recipient age) were centered at their mean. The mean donor age was 28. The mean cold ischemic time was 11 hours. The mean recipient age was 40.

[2] Modeling the continuous covariates with a linear and a quadratic term (the square of the linear term) is necessary due to the relationship between the covariate and the odds of graft failure or patient death.

Expected Liver Transplant Survival Rates

Table IV-14 shows the 1 year *expected graft* survival rates for liver transplants for a given set of donor and recipient characteristics; Table IV-15 shows the 1 year *expected patient* survival rates. These rates were determined using the following characteristics: recipient age, disease diagnosis, medical status prior to transplant, and transplant number. For these analyses, all other characteristics were set to the values for the reference groups, with the exception of the year of transplant (1993-94). The complete list of reference groups is shown on page 55.

For example, in Table IV-14, the expected 1 year graft survival for a 40 year old primary liver recipient with metabolic disease who was not hospitalized prior to transplant was 87%. In contrast, the expected 1 year graft survival for a primary liver recipient of the same age with metabolic disease who was in the ICU prior to transplant was 82%

Table IV-14. Expected U.S. 1 Year Graft Survival Rates -- Liver Transplants Stratified by Recipient Age, Diagnosis, Status at Time of Transplant, and Primary or Repeat Transplant

Age	Diagnosis	Not Hospitalized		Hospitalized		In ICU	
		Primary	Repeat	Primary	Repeat	Primary	Repeat
5	Acute Hepatic Necrosis	83.7	75.7	80.9	71.9	78.4	68.8
	Cholestatic/Biliary Cirrhosis	87.8	81.4	85.6	78.3	83.7	75.7
	Cirrhosis	85.4	78.0	82.8	74.5	80.5	71.5
	Malignancy	77.9	68.2	74.4	63.9	71.5	60.3
	Metabolic Disease	85.4	78.0	82.8	74.5	80.5	71.5
	Miscellaneous Disease	83.5	75.5	80.7	71.7	78.2	68.6
25	Acute Hepatic Necrosis	85.5	78.2	82.9	74.7	80.7	71.8
	Cholestatic/Biliary Cirrhosis	89.3	83.5	87.3	80.6	85.5	78.2
	Cirrhosis	87.0	80.3	84.7	77.1	82.7	74.3
	Malignancy	80.3	71.2	77.0	67.1	74.3	63.7
	Metabolic Disease	87.0	80.3	84.7	77.1	82.7	74.3
	Miscellaneous Disease	85.4	78.0	82.8	74.5	80.5	71.5
40	Acute Hepatic Necrosis	84.9	77.3	82.2	73.8	79.9	70.8
	Cholestatic/Biliary Cirrhosis	88.8	82.8	86.7	79.9	84.9	77.3
	Cirrhosis	86.5	79.5	84.1	76.2	81.9	73.4
	Malignancy	79.5	70.1	76.1	66.0	73.3	62.5
	Metabolic Disease	86.5	79.5	84.1	76.2	81.9	73.4
	Miscellaneous Disease	84.7	77.1	82.1	73.6	79.8	70.5
50	Acute Hepatic Necrosis	83.5	75.4	80.6	71.7	78.2	68.5
	Cholestatic/Biliary Cirrhosis	87.7	81.2	85.4	78.1	83.5	75.4
	Cirrhosis	85.2	77.7	82.6	74.2	80.3	71.2
	Malignancy	77.7	67.9	74.2	63.5	71.2	60.0
	Metabolic Disease	85.2	77.7	82.6	74.2	80.3	71.2
	Miscellaneous Disease	83.3	75.2	80.5	71.4	78.0	68.3
60	Acute Hepatic Necrosis	81.1	72.2	77.9	68.2	75.2	64.8
	Cholestatic/Biliary Cirrhosis	85.8	78.5	83.3	75.1	81.1	72.2
	Cirrhosis	83.0	74.7	80.1	70.9	77.6	67.7
	Malignancy	74.7	64.2	70.9	59.6	67.7	56.0
	Metabolic Disease	83.0	74.7	80.1	70.9	77.6	67.7
	Miscellaneous Disease	80.9	72.0	77.7	67.9	75.0	64.6

Table IV-15. Expected U.S. 1 Year Patient Survival Rates -- Liver Transplants Stratified by Recipient Age, Diagnosis, Status at Time of Transplant, and Primary or Repeat Transplant

Age	Diagnosis	Not Hospitalized		Hospitalized		In ICU	
		Primary	Repeat	Primary	Repeat	Primary	Repeat
5	Acute Hepatic Necrosis	91.2	83.9	88.9	80.1	86.9	77.0
	Cholestatic/Biliary Cirrhosis	94.7	90.0	93.2	87.4	92.0	85.3
	Cirrhosis	92.3	85.7	90.2	82.3	88.4	79.4
	Malignancy	85.7	75.1	82.2	70.0	79.4	66.0
	Metabolic Disease	92.3	85.7	90.2	82.3	88.4	79.4
	Miscellaneous Disease	91.4	84.3	89.2	80.6	87.2	77.5
25	Acute Hepatic Necrosis	91.8	85.0	89.7	81.4	87.8	78.5
	Cholestatic/Biliary Cirrhosis	95.1	90.7	93.7	88.3	92.6	86.3
	Cirrhosis	92.8	86.7	90.9	83.5	89.3	80.7
	Malignancy	86.7	76.7	83.4	71.7	80.7	67.8
	Metabolic Disease	92.8	86.7	90.9	83.5	89.3	80.7
	Miscellaneous Disease	92.0	85.4	89.9	81.8	88.1	78.9
40	Acute Hepatic Necrosis	90.6	82.9	88.1	78.9	86.0	75.7
	Cholestatic/Biliary Cirrhosis	94.3	89.3	92.8	86.6	91.4	84.3
	Cirrhosis	91.7	84.8	89.5	81.2	87.7	78.2
	Malignancy	84.8	73.7	81.1	68.4	78.1	64.3
	Metabolic Disease	91.7	84.8	89.5	81.2	87.7	78.2
	Miscellaneous Disease	90.8	83.3	88.4	79.4	86.4	76.2
50	Acute Hepatic Necrosis	88.6	79.7	85.7	75.2	83.3	71.6
	Cholestatic/Biliary Cirrhosis	93.1	87.1	91.2	84.0	89.6	81.3
	Cirrhosis	90.0	81.9	87.4	77.7	85.2	74.4
	Malignancy	81.8	69.4	77.7	63.7	74.3	59.3
	Metabolic Disease	90.0	81.9	87.4	77.7	85.2	74.4
	Miscellaneous Disease	88.9	80.1	86.1	75.7	83.7	72.2
60	Acute Hepatic Necrosis	85.3	74.5	81.8	69.3	78.8	65.3
	Cholestatic/Biliary Cirrhosis	90.9	83.5	88.5	79.6	86.5	76.4
	Cirrhosis	87.0	77.1	83.8	72.2	81.1	68.4
	Malignancy	77.1	62.9	72.2	56.7	68.3	52.1
	Metabolic Disease	87.0	77.1	83.8	72.2	81.1	68.4
	Miscellaneous Disease	85.6	75.1	82.2	69.9	79.3	65.9

J. SUMMARY

Study Period

The 1997 Report was based on 16,658 liver transplants performed in 14,607 patients between January 1, 1988, and April 30, 1994, from 103 transplant programs in the United States. In order to assess changes within transplant programs over time, the data were divided into 2 eras. The first era included transplants performed from January 1, 1988, through April 30, 1992; the second era covered the two year time period from May 1, 1992, through April 30, 1994.

Survival Rates

Survival rates were computed at 3 months, 1 year, and 3 years, both nationally and for each transplant program. Three year survival was determined in two ways: (1) conditional 3 year survival (i.e., survival at 3 years for those who survived at least 1 year post-transplant), and (2) unconditional 3 year survival. The emphasis on long term survival in this chapter is on the conditional 3-year survival rates because the conditional 3-year analysis provides an assessment of characteristics independent of those limited to the first year (e.g., surgical complications and early acute rejection events).

The national graft and patient survival rates and completeness of follow-up at 3 months, 1 year, and conditional 3 years are shown in Tables IV-1 and IV-2. The percent of programs with graft and patient follow-up data at 1 year was more than 98%; at conditional 3 years the percent of programs with follow-up data was greater than 96%.

There was a marked increase in both the number of liver transplants and in the actual graft and patient survival rates from Era 1 to Era 2. As demonstrated in Table IV-16, graft survival rates increased 6% at 3 months and 7% at 1 year in Era 2 from Era 1. Patient survival rates increased 4% at 3 months and 5% at 1 year during the study period.

For the majority of transplant programs, the difference between actual and expected survival rates was not statistically significant, especially in the long term (See Figures IV-1 and IV-3). In general, large differences (either higher or lower) were nearly always found among programs that reported relatively few transplants (see Figure IV-2). Therefore, when evaluating survival rates for a program, it is also important to consider the number of transplants performed there.

Differences Between Short Term and Long Term Characteristics

The 1997 Report includes an extensive list of characteristics that have a significant impact on both short and long term graft and patient survival.

Characteristics with the strongest *positive* impact on *short term survival* were:

- Recipient had cholestatic disease/biliary cirrhosis
- Year of transplant was after 1990

Characteristics with the strongest *negative* impact on *short term survival* were:

- Donor was Black or Hispanic
- Donor and recipient blood types were incompatible
- Recipient received one or more previous transplants
- Recipient was Asian
- Recipient received a reduced or split liver
- Recipient was on life support prior to transplant
- Recipient's most recent serum creatinine prior to transplant was >2 mg/dl

Characteristics with the strongest *positive* impact on *long term survival* were:

- Donor cause of death was cardiovascular accident (CVA)
- Recipient was female
- Recipient had acute hepatic necrosis, cholestatic disease/biliary cirrhosis, metabolic disease or miscellaneous disease

Characteristics with the strongest *negative* impact on *long term survival* were:

- Donor was female
- Recipient received one or more previous transplants
- Recipient was 1 year of age or younger
- Recipient received a reduced or split liver
- Recipient had malignant neoplasms

Table IV-16. Comparison of 3 Month and 1 Year Actual Survival Rates Between Eras

	3 Months		1 Year	
	Era 1	Era 2	Era 1	Era 2
Graft Survival (%)	75.5%	81.1%	67.3%	74.1%
Average No. Transplants/Month	197	267	197	267
Patient Survival (%)	83.7%	87.8%	76.9%	82.2%
Average No. Patients/Month	171	244	171	244

K. FINAL WORDS

The purpose of this report is to provide updated information on survival outcomes both nationally and at specific transplant programs, and to enhance the awareness of program performance in the U.S. However, the assessment of a transplant program should not be based solely on the survival rates provided in this report. Some of the other important factors to consider are the experience of the transplant team, support personnel, the cost of the procedure, and the quality and location of post-transplant services.

V. PANCREAS CHAPTER

V. PANCREAS TRANSPLANT SURVIVAL RATES

For the Summary of this chapter, see page 86. For definitions of any terms used here, please refer to the User's Guide in the Pancreas volume.

A. INTRODUCTION

This report of pancreas transplant survival rates is based upon verified Scientific Registry data for 3,222 transplants involving 3,142 patients from 96 pancreas transplant programs in the United States. Each program reporting at least one pancreas or combined kidney-pancreas transplant between January 1, 1988, and April 30, 1994, was included. Multi-organ transplants other than combined kidney-pancreas procedures were excluded.

Short term survival is defined as survival at 3 months and 1 year post-transplant. Short term survival rates are based on all transplants in the study for which there are follow-up data.

Long term survival is defined in two ways:

- unconditional survival at 3 years post-transplant, and
- survival at 3 years post-transplant for those who survived at least 1 year, referred to as **conditional 3 year survival.**

The long term survival rates are based on all transplants between January 1, 1988, and April 30, 1992, for which there are follow-up data. This cohort was chosen to ensure that the maximum number of transplants with follow-up data was used to determine long term survival rates. Please note that the emphasis on long term survival in this report is on the *conditional* 3-year survival rates. This is because the conditional 3-year analysis provides an assessment of characteristics independent of those limited to the first year (e.g., surgical complications and early acute rejection events).

B. COMPLETENESS OF FOLLOW-UP DATA AND OVERALL GRAFT AND PATIENT SURVIVAL RATES

For graft survival, completeness of follow-up data and overall actual survival rates at each time point are shown in Table V-1; patient survival data are shown in Table V-2.

Patient (graft) follow-up data were considered complete when:

- the patient was alive (pancreas was functioning) and the duration of survival (function) was equal to or exceeded the specified time after transplant (i.e., 3 months, 1 or 3 years), or
- the patient died (pancreas failed) and a valid date of death (failure) was reported.

The percentages of complete follow-up data ranged from a low of 93.9% for the conditional 3 year time point to a high of 99.9% for the 3 month time point. Patient survival rates are better than graft survival rates at all time points because other medical therapy is available for patients whose grafts fail.

Overall survival rates also are presented in the tables. If a graft had incomplete follow-up data, the observation was weighted to account for the time during which the graft was known to be functioning. Therefore, the actual graft survival rate reflects the weighted proportion of grafts functioning at the specified time interval. Patient survival rates were computed in a similar way (see the *Technical Methods* chapter of the *Executive Summary*).

In the calculation of graft survival rates, death with a functioning graft was treated differently depending upon the time interval. For short term survival (3 months, 1 year), grafts were considered to have failed at the time of death because it is reasonable to assume that deaths occurring shortly after a transplant are likely to be related to graft dysfunction. For long term survival, because it is more likely that death might not be related to graft failure, if a patient died with a functioning graft more than 1 year after a transplant, the graft was treated as a censored observation at the time of death. In other words, it was treated as if the graft still functioned but further follow-up data were unavailable. The graft then was weighted for the proportion of time in the period that the graft was functioning. (see the *Technical Methods* chapter of the *Executive Summary for a complete description of weighting.)*

In the cohort of transplants (1/1/88 - 4/30/92) used to compute conditional 3 year survival rates, patients (grafts) who did not survive to 1 year after transplant were excluded from the analyses. Therefore, the total number of patients (grafts) for the conditional 3 year analysis was less than that for the 3 month and 1 year analyses. Further, the number of patients is greater than the number of grafts because more grafts failed than patients died within the first year post-transplant.

Please note that the conditional 3 year graft and patient survival rates in Tables V-1 and V-2 may be higher than the 1 year graft survival rates. This is possible because the conditional 3 year survival rates should be interpreted as the 3 year survival rate for patients (grafts) who (which) survived at least 1 year post-transplant.

For example: Program A performed a total of five transplants between 1/1/88 and 4/30/92. Two of the pancreata failed prior to 1 year post-transplant and the remaining three pancreata survived to 3 years after transplant. In this example, Program A has a 1 year graft survival rate of 60% (3 out of 5 pancreata were functioning at 1 year post-transplant). However, the conditional 3 year survival rate for Program A is 100% because all three pancreata that were functioning at 1 year after transplant also were functioning at 3 years post-transplant. The same calculations are used for patient survival. See the *Technical Methods* chapter of the *Executive Summary* for more specific definitions of follow-up data and the calculations for actual graft and patient survival.

Overall Graft and Patient Survival Rates by Era

In this report, short term survival also is reported by era. Separate eras were used to determine whether there were any improvements over time in the short term survival rates. Era 1 is defined as all transplants occurring between January 1, 1988, and April 30, 1992; Era 2 includes all transplants occurring between May 1, 1992, and April 30, 1994. The overall graft and patient survival rates by era are presented in the last two columns of Table V-1 and Table V-2, respectively. The results demonstrate improvement in both graft and patient survival rates over time.

Table V-1. Completeness of Graft Follow-Up Data and Actual Survival Rates for Pancreas Transplants

Time	Cohort	Number of Transplants	Percent with Follow-Up Data	Graft Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	3,222	99.9	83.6	82.4	85.2
1 Year	1/1/88 - 4/30/94	3,222	99.3	73.5	71.9	75.7
Cond. 3 Years	1/1/88 - 4/30/92	1,310	93.9	91.3*	91.3*	N/A*

Table V-2. Completeness of Patient Follow-Up Data and Actual Survival Rates for Pancreas Transplants

Time	Cohort	Number of Patients	Percent with Follow-Up Data	Patient Survival (%)		
				Overall	Era 1	Era 2
3 Months	1/1/88 - 4/30/94	3,142	99.2	96.1	94.9	97.5
1 Year	1/1/88 - 4/30/94	3,142	96.5	91.1	90.4	92.2
Cond. 3 Years	1/1/88 - 4/30/92	1,595	94.4	92.3*	92.3*	N/A*

* The cohort used to determine the overall conditional 3 year survival rate is the same as the Era 1 cohort. Therefore, the overall conditional 3 year survival rates are identical to the conditional 3 year survival rates for Era 1. There is no conditional 3 year survival rate calculated for Era 2 due to insufficient follow-up data on patients who received transplants in Era 2.

C. GRAFT SURVIVAL -- PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

For each transplant program, actual and expected survival rates were calculated at 3 months, 1 year, and 3 years conditional on survival at 1 year. Survival rates at each time point were determined using a specific cohort of transplants (shown in Tables V-1 and V-2 on the previous page). Expected survival rates were determined for each transplant program based on its specific patient and donor characteristics. These expected outcomes were statistically adjusted for many important prognostic variables, or covariates, that were used in the survival analysis. In other words, they take into account the many different characteristics that affect survival. For example: *if Program A transplanted many more "high risk" recipients than Program B, then Program A would have a lower expected survival rate than Program B.*

If a program's *actual* survival rate was *greater* than its expected survival rate, this means that the program's actual results were higher than the national results for transplants *with the same donor and recipient characteristics*. If a program's *actual* survival rate was *less than* its expected survival rate, this means that the program's actual results were lower than the national results for transplants *with the same donor and recipient characteristics. The difference between the actual and expected rate may have occurred by chance and, therefore, may not be statistically significant.* Furthermore, even a statistically significant difference, one that most likely did not occur by chance, may not be clinically significant (i.e., medically important). A formal description of the methods used to determine actual and expected survival rates appears in the *Technical Methods* chapter of the *Executive Summary*.

Table V-3 shows the percentages of pancreas transplant programs by graft survival rates, both for actual and expected survival. The majority of the transplant programs had actual survival rates greater than 60% at all time points. The short term survival rates showed a greater variation among programs than the long term survival rates. At 3 months, 36.4% of programs had actual survival rates greater than 90% At 1 year, this fell to 18.8%. However, the percentage increased to 63.2% for the conditional 3 year survival rates. The distribution of the expected survival rates shows a similar trend. The results indicate that there are more programs with high survival rates (>90%) at the conditional 3 year time point than there are at the 1 year time point. *This is because the most critical period of time for graft survival is the first year post-transplant.* Those who survive the first year are very likely to survive 3 years post-transplant.

The percentages of programs by short term graft survival rates and eras, both for actual and expected survival, are summarized in Table V-4. The results demonstrate a substantial improvement in graft survival over time because a greater percentage of programs had actual survival rates higher than 90% in Era 2. Expected survival rates in Era 2 also were higher than in Era 1.

Table V-3. Percentages of Pancreas Transplant Programs by Graft Survival Rates

Graft Survival Rates (%)	Actual			Expected		
	3 Months (n= 96)	1 Year (n=96)	Cond. 3 Yrs (n=65)	3 Months (n=96)	1 Year (n=96)	Cond. 3 Yrs (n=65)
0-40	7.3	9.4	1.5	0.0	0.0	0.0
>40-60	6.3	14.6	1.5	0.0	1.0	0.0
>60-80	25.0	42.6	12.3	7.3	84.4	4.6
>80-90	25.0	14.6	21.5	92.7	14.6	12.3
>90-100	36.4	18.8	63.2	0.0	0.0	83.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Table V-4. Percentages of Pancreas Transplant Programs by Graft Survival Rates and Era

Graft Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)
0-40	10.0	4.7	14.3	9.3	0.0	0.0	0.0	0.0
>40-60	10.0	5.8	15.7	9.3	0.0	0.0	1.4	1.2
>60-80	28.6	22.1	45.7	36.0	14.3	1.2	87.1	67.4
>80-90	24.3	27.9	14.3	19.8	85.7	98.8	11.5	31.4
>90-100	27.1	39.5	10.0	25.6	0.0	0.0	0.0	0.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Differences in Actual and Expected Survival Rates

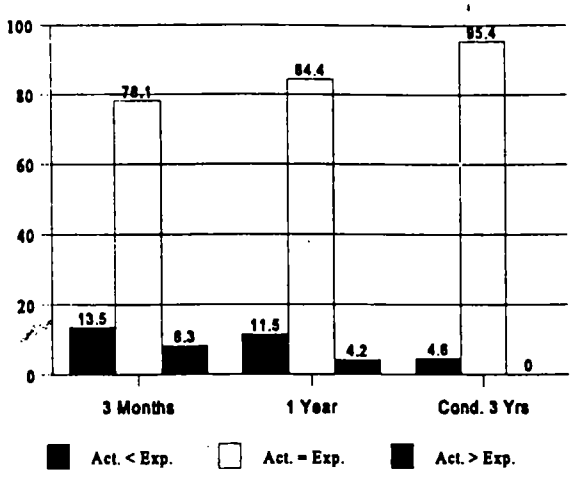
For most programs, the difference between the actual survival rate and the expected survival rate was not statistically significant. Figure V-1 shows the percentages of programs whose actual graft survival rates were either above, equal to, or below expected graft survival rates at three time points. Programs with actual survival rates that were not significantly different from expected rates are shown in the actual survival equals expected survival group. Actual survival rates shown in the figure to be greater than or less than expected survival rates were statistically significant. Overall, there were more programs that fell significantly below expected results than above expected results. However, for the majority of the transplant programs, the difference in actual and expected graft survival was not statistically significant.

At all time points, the larger differences in actual and expected rates were nearly always seen in programs that reported relatively few transplants during the period. This occurs because programs that do not perform many transplants tend to have highly variable outcomes. To illustrate this, Figure V-2 shows a scatter plot of the average number of transplants per year (transplant volume) versus the difference in 1 year actual and expected graft survival. Nearly all differences greater than 10% (either positive or negative) are found among transplant programs performing fewer than 12 pancreas transplants per year. Please note that actual survival rates which differ from expected survival rates are not always statistically significant and even statistically significant differences may not be clinically significant.

D. PATIENT SURVIVAL – PERCENTAGES OF ACTUAL AND EXPECTED SURVIVAL RATES

The percentages of programs by patient survival rates for both actual and expected survival are shown in Table V-5; the percentages of programs by survival rates and eras are shown in Table V-6. As with graft survival, the outcomes in Era 2 were better than in Era 1.

Figure V-1. Percentages of Pancreas Transplant Programs with Actual Graft Survival Rates Above, Below, or Equal to Expected Survival Rates. *



*Actual survival rates above or below expected survival rates are statistically significant.

Figure V-2. Pancreas Transplant Volume vs Difference in Actual and Expected 1 Year Graft Survival Rates.

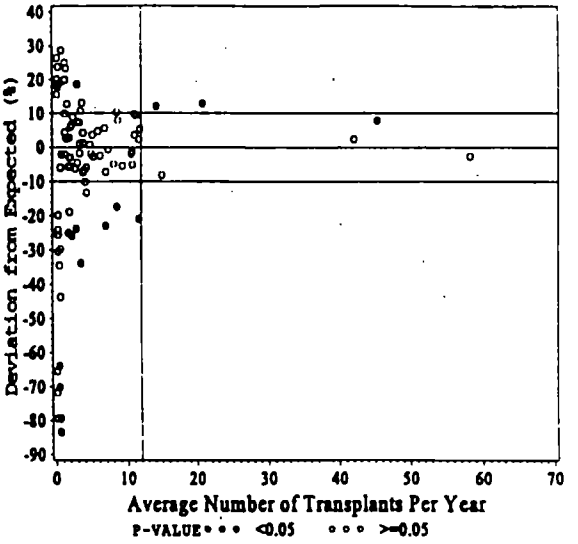


Table V-5. Percentages of Pancreas Transplant Programs by Patient Survival Rates

Patient Survival Rate (%)	Actual			Expected		
	3 Months (n= 96)	1 Year (n=96)	Cond. 3 Yrs (n=69)	3 Months (n=96)	1 Year (n=96)	Cond. 3 Yrs (n=69)
0-70	2.1	5.1	5.8	0.0	0.0	0.0
>70-80	3.1	6.3	1.4	0.0	0.0	0.0
>80-90	6.3	25.0	23.2	0.0	20.8	11.6
>90-95	13.5	16.7	29.0	18.8	79.2	84.1
>95-100	75.0	46.9	40.6	81.2	0.0	4.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

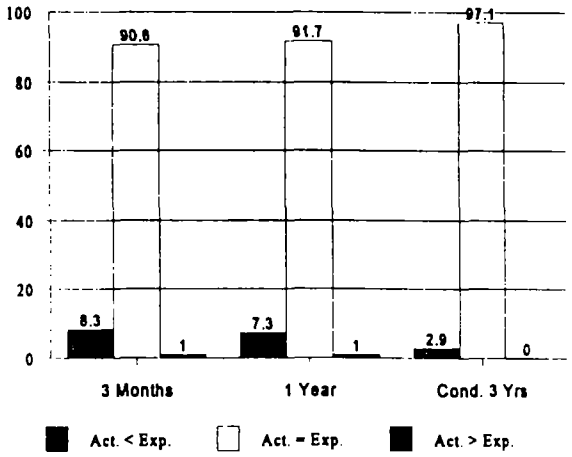
Table V-6. Percentages of Pancreas Transplant Programs by Patient Survival Rates and Era

Patient Survival Rates (%)	Actual				Expected			
	3 Months		1 Year		3 Months		1 Year	
	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)	Era 1 (n=70)	Era 2 (n=86)
0-70	8.6	0.0	11.4	3.5	0.0	0.0	0.0	0.0
>70-80	2.9	1.2	11.4	4.7	0.0	0.0	0.0	0.0
>80-90	14.3	5.8	22.9	18.6	0.0	0.0	41.4	8.1
>90-95	17.1	4.7	20.0	18.6	54.3	1.2	58.6	91.9
>95-100	57.1	88.3	34.3	54.6	45.7	98.8	0.0	0.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Differences in Actual and Expected Survival Rates

The percentage of programs with actual patient survival rates significantly above their expected rates was only 1% for short term survival, and no programs had actual rates significantly greater than expected for long term survival (see Figure V-3). As with graft survival, there were more programs that fell significantly below expected results than above expected results. However, for the majority of transplant programs, the difference in actual and expected patient survival was not statistically significant and varied little over time.

Figure V-3. Percentages of Pancreas Transplant Programs with Actual Patient Survival Rates Above, Below, or Equal to Expected Survival Rates. *



*Actual survival rates above or below expected survival rates are statistically significant.

E. NATIONAL DISTRIBUTION OF DONOR AND RECIPIENT CHARACTERISTICS

The national distribution of donor and recipient characteristics for pancreas transplants, presented in percentages, is shown in Table V-7. Each of these donor and recipient characteristics was included in the analyses for graft or patient survival, and those that proved to be significant were used to determine an expected survival rate for each transplant.

The majority of pancreata transplanted were recovered from white male donors under the age 30. Most recipients were under the age of 18 at the onset of their diabetes. Of the 3,222 transplants, 87% of the patients received a kidney at the same time, and less than 4% were repeat pancreas transplants.

Table V-7. National Donor and Recipient Characteristics in Pancreas Transplants: Percentages by Era and Overall

Characteristics		ERA 1 5/92-4/94 N=1,826	ERA 2 5/92-4/94 N=1,396	OVERALL 1/88-4/94 N=3,222
Donor Age	0-17	20.8	24.9	22.6
	18-29	40.6	37.5	39.3
	30-39	19.9	17.6	18.9
	40-49	13.9	14.0	14.0
	50+	4.8	6.0	5.3
Donor Race	White	88.7	83.9	86.6
	Black	7.0	9.7	8.2
	Hispanic	3.4	4.9	4.1
	Asian	0.5	1.0	0.7
	Other	0.4	0.4	0.4
Recipient Age	0-17	0.1	0.1	0.1
	18-29	21.7	16.1	19.3
	30-39	49.3	51.2	50.2
	40-49	25.8	28.7	27.1
	50+	3.0	3.8	3.3
Recipient Race	White	93.5	89.3	91.7
	Black	3.8	6.0	4.7
	Hispanic	1.8	2.2	2.0
	Asian	0.3	0.3	0.3
	Other	0.7	2.1	1.3
	Not Reported	0.0	0.1	0.0
Age at Diabetes Onset	0-9	35.0	30.1	32.9
	10-17	44.6	44.8	44.7
	18-30	18.1	20.1	19.0
	31+	2.0	1.6	1.8
	Not Reported	0.3	3.4	1.6

		ERA 1	ERA 2	OVERALL
Years Between Diabetes Onset and Transplant	1-9	1.1	1.1	1.1
	10-19	28.5	25.5	27.2
	20-29	54.1	52.9	53.5
	30-39	14.7	15.8	15.2
	40+	1.3	1.3	1.3
	Not Reported	0.3	3.4	1.6
Previous Pancreas Transplant	No	95.9	96.3	96.1
	Yes	4.1	3.7	3.9
Transplant Procedure*	SKP	86.1	88.2	87.0
	PAK	6.5	6.1	6.3
	PTA	7.3	5.7	6.6
Cold Ischemic Time (Hours)	0-8	24.4	14.0	19.9
	9-13	29.5	33.1	31.0
	14-18	24.9	29.6	26.9
	19-23	14.6	17.3	15.8
	24+	5.1	5.0	5.1
	Not Reported	1.5	1.0	1.3
Level of Mismatch	0	1.0	1.1	1.1
	1	2.0	2.7	2.3
	2	7.6	9.1	8.2
	3	18.4	20.2	19.2
	4	28.4	29.7	29.0
	5	28.5	24.3	26.7
	6	12.4	11.6	12.0
	Not Reported	1.8	1.2	1.5
Year of Transplant	1988	12.7	0.0	7.2
	1989	21.5	0.0	12.2
	1990	28.3	0.0	16.0
	1991	28.6	0.0	16.2
	1992	8.9	27.7	17.0
	1993-1994	0.0	72.3	31.3

* Procedure types: SKP-Simultaneous Kidney/Pancreas, PAK-Pancreas after Kidney, PTA-Pancreas transplanted alone.

Donor and Recipient Trends

National donor and recipient characteristics changed between Era 1 and Era 2. The percentage of minority donors and recipients increased from 11.3% to 16.1% and from 6.5% to 10.7% respectively. There was a slightly higher percentage of simultaneous kidney-pancreas transplants in Era 2. Also, more transplants had longer cold ischemic times (> 8 hours).

F. SHORT TERM SURVIVAL - IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

To determine the expected survival for each transplant or patient, separate analyses were performed for graft and patient survival at three time points. (The analyses were performed using logistic regression, see the *Technical Methods* chapter in the *Executive Summary.*) The analyses also identified donor and recipient characteristics that had a significant impact on survival outcomes. For each *characteristic* (e.g., race, gender) considered in the analyses, a *reference group* was chosen (e.g., White, male) with which the other groups were compared. As a general rule, the largest group or the mean of the characteristic (e.g., mean recipient age=36) is often used as the reference group.

The following served as the characteristics and reference groups for ***short term graft*** survival:

- Mean Donor Age -- 28 years
- Previous Pancreas Transplant -- no
- Mean Recipient Age -- 36 years
- Procedure Type -- simultaneous kidney-pancreas
- Transplant Year -- 1988

The following served as the characteristics and reference groups for ***short term patient*** survival:

- Mean Donor Age -- 28 years
- Mean Cold Ischemic Time -- 14 hours
- Mean Recipient Age -- 36 years
- Recipient Race -- non-Black
- Transplant Year -- 1988

The relative impact of each donor and recipient characteristic on short term graft and patient survival outcomes is listed in Table V-8. For each characteristic, the ***odds ratio*** is the odds of patient death (graft failure) as compared to the reference group, after adjusting for the effects of all other donor and recipient characteristics. An *odds ratio of less than 1* indicates that the characteristic was associated with a *reduced odds* of patient death or graft failure relative to the reference group. An odds ratio of *greater than 1* indicates that the characteristic was associated with an *increased odds* of death relative to the reference group. The corresponding p-value measures the significance of the odds ratio. A p-value less than 0.05 indicates statistical significance and means that there is less than a 5% probability that such difference is due to chance alone. The smaller the p-value, the greater the statistical significance and the less likely the difference is due to chance alone.

Examples

In Table V-8, the odds ratio of graft failure within 1 year after a repeat transplant versus a first, or primary, transplant was 1.85. This means that, after adjusting for all of the other donor and recipient characteristics, the odds of graft failure within 1 year was 85% greater for repeat transplants than for primary transplants ((1.85-1)x100%=85%). As another example, the odds ratio of graft failure within 1 year post-transplant for a recipient who received a pancreas alone versus a simultaneous kidney-pancreas was 2.91. After adjusting for the effects of both donor and recipient characteristics, the odds of graft failure within 1 year for a patient who received a pancreas alone was 191% higher than that for a patient who received a simultaneous kidney-pancreas ((2.91-1)x100%=191%).

The estimated odds ratios for continuous variables (i.e., variables with many possible values) such as cold ischemic time, and donor and recipient ages are less easily interpreted. For these variables, the estimated odds is determined for every 1 or 10 unit increase or decrease from the mean (reference group) of the variable. For example, in Table V-8, the estimated odds of 1 year graft failure for a pancreas from a 38 year old donor compared to the mean of 28 years is 1.22. This means that, after adjusting for the effects of all other characteristics, the odds of graft failure was estimated to increase by 22% for the first 10 year increase from the mean donor age.

An increase of 20 years from the mean (i.e., the donor age is 28+20=48) would result in a 48% increase in the odds of graft failure.
Mathematically, this 48% was calculated as follows:

$$\text{Odds ratio} = \exp^{\left(\frac{20}{10} \times 0.1957\right)} = 1.48$$

where the 20 year increase is equivalent to 2 per 10 year difference, and 0.1957 corresponds to the coefficient of donor age per 10 year difference (see Table V-11 for coefficients). Therefore, the increase in the odds of graft failure is (1.48-1)×100%=48%. For some variables such as recipient age, it is necessary to add a quadratic term. For more details on calculating odds ratios for continuous variables, refer to the section on *Odds Ratios* in the *Technical Methods* chapter of the *Executive Summary*.

Table V-8. Impact of Donor and Recipient Characteristics on Short Term Graft and Patient Survival--Pancreas Transplants

Short Term Characteristics	Graft Survival [1]				Patient Survival [1]			
	3 Months		1 Year		3 Months		1 Year	
	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]
Donor Age 38 vs 28 [3,5]	1.239	<0.001	1.216	<0.001	1.122	0.162	1.085	0.129
Cold Ischemic Time (hours) 15 vs 14 [3]	---	n.d.	---	n.d.	0.969	0.061	0.986	0.197
Previous Pancreas Transplant -- Yes vs No	1.118	0.645	1.851	0.004	---	n.d.	---	n.d.
Recipient Age 46 vs 36 [3,4]	1.022	0.808	1.147	0.066	1.026	0.846	1.360	0.001
Recipient Black vs non-Black	---	n.d.	---	n.d.	1.696	0.143	0.933	0.822
Pancreas After Kidney vs Simultaneous Kidney-Pancreas	2.115	<0.001	2.421	<0.001	---	n.d.	---	n.d.
Pancreas Alone vs Simultaneous Kidney-Pancreas	1.463	<0.001	2.906	<0.001	---	n.d.	---	n.d.
TX Year 1989 vs 1988	0.630	0.025	0.830	0.316	0.832	0.615	0.798	0.409
TX Year 1990 vs 1988	0.756	0.147	1.149	0.428	0.941	0.858	0.969	0.900
TX Year 1991 vs 1988	0.513	0.001	0.679	0.031	0.705	0.333	0.578	0.045
TX Year 1992 vs 1988	0.552	0.003	0.653	0.018	0.676	0.279	0.730	0.230
TX Year 1993-1994 vs 1988	0.545	0.001	0.725	0.050	0.347	0.003	0.589	0.032

Notes:

[1] In the short term survival analysis, if a patient died with a functioning graft (DWFG), the pancreas was considered to have failed at the time of death.

[2] n.d. denotes p-value not determined due to either (a) using a different reference group, or (b) results not statistically significant, and therefore factor is not included in the analysis.

[3] Odds ratios for continuous covariates (donor and recipient age, and cold ischemic time) do not always have a linear relationship in all models. The odds ratios presented in this table correspond to 1 or 10 unit increases from the mean of each covariate. The mean donor age was 28. The mean cold ischemic time was 14 hours. The mean recipient age was 36.

[4] Graft model contains a quadratic term.

[5] Patient model contains a quadratic term.

Graft Survival

The factors that had the strongest impact on short term graft survival were procedure type, previous pancreas transplant, donor age, and transplant year. The odds of 1 year graft failure was 191% higher for recipients of a pancreas alone, and 142% higher for a recipient of a pancreas after a kidney than for a recipient who received a simultaneous kidney-pancreas transplant. Patients who had a previous pancreas transplant had an 85% higher odds of 1 year graft failure than patients receiving their first pancreas. Recipients of a pancreas from a 38 year old donor had a 24% higher odds of 3 month graft failure than did a recipient of a pancreas from a 28 year old donor. Patients receiving their graft in 1993 or 1994 had a 45% lower odds of graft failure than did patients receiving their graft in 1988.

Patient Survival

The factors that had the strongest impact on short term patient survival were recipient race, donor age, and transplant year. Black recipients had a 70% higher odds of death at 3 months than did non-Blacks. A 46 year old recipient had a 36% higher odds of death at 1 year compared to a 36 year old recipient. A patient who receives a pancreas from a 38 year old donor has a 9% higher odds of death at 1 year than a patient who receives a pancreas from a 28 year old donor. A patient who received a pancreas in 1993 or 1994 had a 65% lower odds of mortality at 3 months than did a patient who received a pancreas in 1988.

G. LONG TERM SURVIVAL -- IMPACT OF DONOR AND RECIPIENT CHARACTERISTICS

In this report, long term survival analyses were developed separately from the short term survival analyses. Because this narrative focuses on conditional 3 year survival (survival at 3 years for grafts or patients surviving at least 1 year post-transplant), only conditional 3 year survival data are presented in this text. Both conditional and unconditional 3 year survival rates are provided in the tables for each transplant program presented in each organ specific volume.

The conditional 3 year survival analyses provide an assessment of the donor and recipient characteristics that are independent of those limited to the first year (e.g., surgical complications). Furthermore, for the long term survival analysis, if a patient died with a functioning graft, the graft was not considered to have failed as it was with short term survival. *This was done because deaths occurring some years after a transplant are less likely to be related to the transplant.*

The impact of each donor and recipient characteristic on graft and patient long term survival is listed in Table V-9.

The following characteristic and reference group was used for ***long term graft*** survival:

- Procedure Type -- simultaneous kidney-pancreas

The following characteristics and reference groups were used for ***long term patient*** survival:

- Mean Donor Age -- 28 years
- Donor Race -- non-Black
- Mean Cold Ischemic Time -- 14 hours
- Mean Years Between Diabetes Onset and Transplant -- 23 years
- Mean Recipient Age -- 36 years

Graft and Patient Survival

The only significant factor in the conditional 3 year graft survival model was procedure type. Patients who received a pancreas after a kidney had a 521% higher odds of graft failure, and patients who received a pancreas alone had a 630% higher odds of graft failure than did patients receiving a simultaneous kidney-pancreas transplant.

Factors that impacted long term patient survival were donor and recipient age, cold ischemic time, years between diabetes onset and transplant, and donor race. Patients who received a pancreas from a black donor had a 77% higher odds of death than a recipients of a non-Black donor pancreas. A 46 year old recipient had a 38% higher odds of death than did a 36 year old recipient. A patient who received a pancreas from a 38 year old donor had a 23% higher odds of death at 3 years than a recipient of a 28 year old donor pancreas.

Table V-9. Impact of Donor and Recipient Characteristics on Long Term Graft and Patient Survival -- Pancreas Transplants

Long Term Characteristics	Graft [1]		Patient [1]	
	Odds Ratio	P-value [2]	Odds Ratio	P-value [2]
Donor Age 38 vs 28 [3]	---	n.d.	1.232	0.008
Donor Black vs Non-Black	---	n.d.	1.773	0.072
Cold Ischemic Time (hours) 15 vs 14 [3,4]	---	n.d.	0.989	0.436
Recipient Age 46 vs 36 [3,4]	---	n.d.	1.376	0.065
Years Between Diabetes Onset and Transplant 24 vs 23 [3]	---	n.d.	1.026	0.120
Pancreas After Kidney vs Simultaneous Kidney-Pancreas	6.212	<0.001	---	n.d.
Pancreas Alone vs Simultaneous Kidney-Pancreas	7.298	<0.001	---	n.d.

Notes:

[1] In the long term survival analysis, if a patient died with a functioning graft (DWFG), the pancreas was not considered to have failed at the time of death.

[2] n.d. denotes p-value not determined due to either (a) using a different reference group, or (b) results not statistically significant, and therefore factor is not included in the analysis.

[3] Odds ratio for continuous covariates (donor age, cold ischemic time, recipient age, and years between diabetes onset and transplant) do not all have a linear relationship. The odds ratios presented in this table correspond to 1 or 10 unit increases from the mean of each covariate. The mean donor age was 28. The means cold ischemic time was 14 hours. The mean recipient age was 36, the mean number of years between diabetes onset and transplant was 23 years.

[4] Model contains a quadratic term.

H. COMPARISON BETWEEN SHORT TERM AND LONG TERM CHARACTERISTICS

The factor that had the greatest impact on short term graft survival, procedure type, had an even greater impact on long term graft survival. The odds of graft failure for receiving a pancreas after a kidney as opposed to a simultaneous kidney-pancreas transplant went from 115% at 3 months to 142% at 1 year to 521% in the conditional 3 year analysis. The odds of graft failure for a pancreas alone versus a simultaneous kidney-pancreas transplant increased from 46% at 3 months to 630% for long term conditional survival. The remaining factors that impacted short term graft survival did not significantly impact long term graft survival.

Most of the factors that impacted short term patient survival continued to impact long term patient survival. The odds of death for a 10 year increase from the mean for both donor and recipient age increased over time. While the number of years between diabetes onset and transplant did not have a significant impact on short term survival, it did have an impact on long term survival. Race played a factor in both short and long term patient survival. In the short term model Black recipients had a 70% higher odds of death at 3 months than did non-Blacks, and in the long term model a recipient of a pancreas from a Black donor had a 77% higher odds of death than that of a recipient of a non-Black donor pancreas.