

# Organ and Tissue Donation and Transplantation

System Progress Report 2018



**Organs & Tissues  
for Life**



**Canadian  
Blood  
Services**

BLOOD  
PLASMA  
STEM CELLS  
ORGANS  
& TISSUES

# Organ and Tissue Donation and Transplantation

System Progress Report 2018

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Production of this report has been made possible through financial contributions from Health Canada and the provincial and territorial governments. The views expressed herein do not necessarily represent those of the federal, provincial or territorial governments. The people portrayed in the images are donors, recipients, staff or partners and to them we offer our special thanks.

**Front Cover:** Shak Pawar & Gurjit Cheema

Shak Pawar is a living kidney donor and Gurjit Cheema is a kidney transplant recipient. As Shak was not a direct match for Gurjit, the transplant was facilitated through the Kidney Paired Donation program. Shak and Gurjit are married and since their donation and transplant, they have grown their family and now have a young son named Kasen. The family is actively involved in raising awareness for organ donation.

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**Canadian Blood Services** sincerely acknowledges the generosity of the organ and tissue donors, and their families and loved ones, who gave so selflessly to provide hope to transplant candidates across the country.

## Table of contents

Foreword .....	5
Highlights .....	7
Deceased donation in Canada .....	10
Performance among provinces .....	12
Living donation in Canada.....	13-14
Transplantation in Canada.....	15-16
Eye and tissue performance in Canada .....	20-21
Acknowledgements.....	22
Appendices A-E .....	23-28



Foreword from Canadian Blood Services  
**CEO, Dr. Graham D. Sher**

Each year we are reminded of the remarkable collaborative effort that underpins the organ and tissue donation and transplantation (OTDT) system in Canada. On behalf of that collaborative network, I am pleased to introduce this 2018 update on OTDT system progress.

The results reflected within this report represent the individual and collective work of both the provincial programs and the national efforts led by Canadian Blood Services. Most importantly, through this report we sincerely acknowledge the generosity of the 1,317 organ donors and 4,824 tissue donors and their families who gave so selflessly in 2018. We also recognize the heartfelt appreciation of the recipients whose lives were saved or changed through the generous act of donation.

Canada's performance in terms of deceased organ donation and transplantation remains stable, experiencing only a minor decline when compared to the previous year's results. Inversely, living donation rates nationally have improved slightly. In 2018, a total of 223 Canadians died while waiting for a suitable transplant opportunity. For every patient in Canada who receives a lifesaving organ transplant, there are two on a waitlist. As such, there remains much work yet to be done.

Given our experience as the national coordinating body for OTDT in Canada and our knowledge of the components required for success, we believe that national priorities in this realm must continue to focus on strategies that will advance interprovincial organ sharing, improve living donation rates, assist jurisdictions as they implement leading practices, and enhance system performance measurements and accountability mechanisms. As a nation, we have the recipe for system improvement: when the key elements are implemented, marked improvement is achieved. By working together to ensure these key elements are in place, we will continue to save lives.

Canada's OTDT system has demonstrated that patients with the greatest need, and those whose clinical profiles are most difficult to match, benefit when organs are shared across provincial boundaries. This work includes three national patient registries that serve to maximize transplant access for patients most in need. These programs operate on a sophisticated technology platform called the Canadian Transplant Registry (CTR), which is currently used by more than 400 health professionals coast-to-coast. By maintaining these interprovincial organ sharing programs, we are proud to help coordinate national collaborative efforts to improve transplant opportunities for Canadians.

Another key focus area of our collective work is toward system development and improvement. In 2018, we made great strides in enhancing our effectiveness and our collaboration. We rely on the generosity of the clinical and professional community and our partner organizations to continue to effect the positive change and evolve in the areas of leading practice development, professional education, public education and awareness and data analysis and reporting.

We thank you for your continued support and engagement as we work together to continue to improve the national OTDT system on behalf of donors and patients.

**Dr. Graham D. Sher**  
Chief Executive Officer  
Canadian Blood Services

## A year of renewed investment and increased collaboration

In 2018, the Organ Donation and Transplantation Collaborative (ODTC) was formed. This Collaborative, co-led by Health Canada, Canadian Blood Services and the provincial and territorial ministries of health as equal partners, brings together key stakeholders and is aimed at bringing further alignment to the organ donation and transplantation systems across the country. The Collaborative benefits Canadians by navigating complex historical challenges related to the governance of the OTDT system.

Also in 2018, Health Canada invested an additional \$3.4 million over two years to help enhance national collaboration and momentum toward developing a higher-performing organ donation and transplantation system for all Canadians. The investment focused on four priority areas: public education and awareness; professional education; development and implementation of best practices; and system improvements to promote effective and timely access to care. Increased focus in these areas serves to build a more solid foundation from which to advance all aspects of the OTDT system more effectively and more equitably for transplant patients, regardless of where they live in Canada. This enhanced federal investment will help support further improvement on behalf of Canadian patients waiting for transplant today, and in the future.

## Key elements of a high performing deceased donation system

Through experience gained provincially, nationally and internationally it is generally accepted that fundamental key components to a high performing deceased donation system exist, and when implemented, lead to improved performance. These foundational elements include: adequate resources and infrastructure, availability of highly trained front-line specialists, leading practice guidelines and professional education, data and analytics to inform system and performance improvement including death audits and the identification of missed donation opportunities, adequate legislation (including mandatory referral), and the presence of appropriate accountability tools and structures. A comprehensive description of each element is provided in Appendix D.

## The Logan Boulet Effect

Logan Boulet made the decision to be an organ and tissue donor just weeks before his passing in the tragic Humboldt Broncos bus crash in April 2018. Logan was inspired to register his decision to donate by his coach and mentor, Ric Suggit, who had died in 2017 and became an organ donor. The act of registering his choice and sharing that decision with his loved ones helped prepare his family to make the heart-wrenching decision to allow Logan's organs and tissues to be donated for transplantation following his death on April 7, 2018.

In 2018, what became known as the "The Logan Boulet Effect" inspired more than 150,000 Canadians to become registered organ donors in the days and weeks that followed.

Logan's family continues to share their story, making an essential and unprecedented contribution to nationwide public awareness of organ and tissue donation.

Another fundamental component of a high-performing system is adequate **public education and awareness**. Organ donation and transplantation is complex and not well understood. There are many misconceptions that contribute to barriers to registering intent to donate. Increasing awareness for organ and tissue donation and transplantation, and increasing the number of registered organ donors, is part of a comprehensive system-wide approach to increasing donation rates.

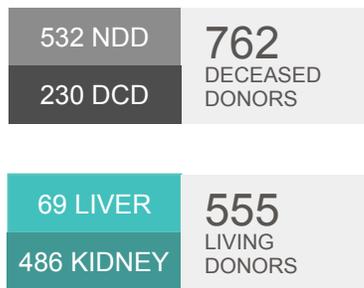


## In summary

In 2018, we saw the first decline in deceased donation in Canada in eight years, resulting in a 6% drop in the national transplant rate from 2017.

- **2,829** Canadians received life changing transplants from **762** deceased donors and **555** living donors
- **223** Canadians died while on the national waitlist
- **4,351** Canadians were waiting for a solid organ transplant at the end of 2018

To what extent this recent decline in deceased donation rates is correlated with the subsidence of opioid related overdoses is not clear. Canadian Blood Services is working with donation clinicians across Canada to assess the impact the opioid crisis has had on organ and tissue donation rates.



**2,829**

Transplants, including multi-organ transplants

### RATES PER MILLION POPULATION

Transplants	76.3	▲	23%
Deceased Donation	20.6	▲	42%
Living Donation	15.0	▼	2%

Change in the last 10 years (since 2009)

**4,351**

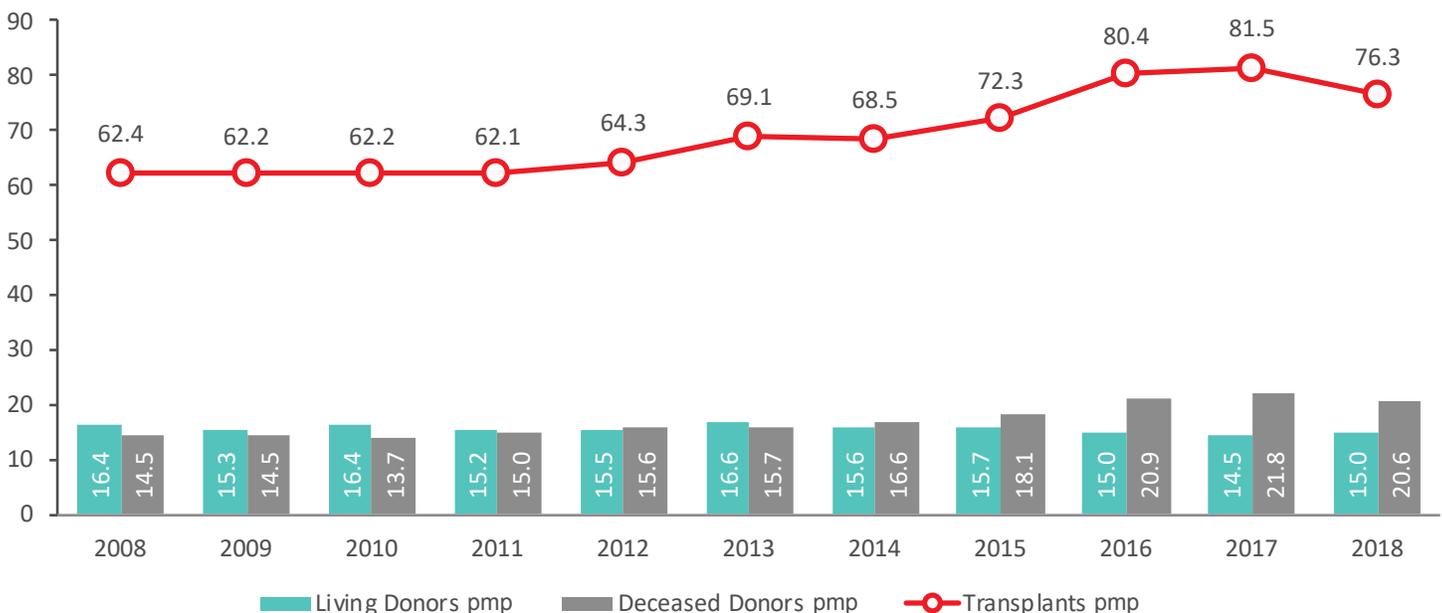
Patients on Canada's Organ Transplant Waitlists at Year-End

**223**

Patients Died while on Waitlists

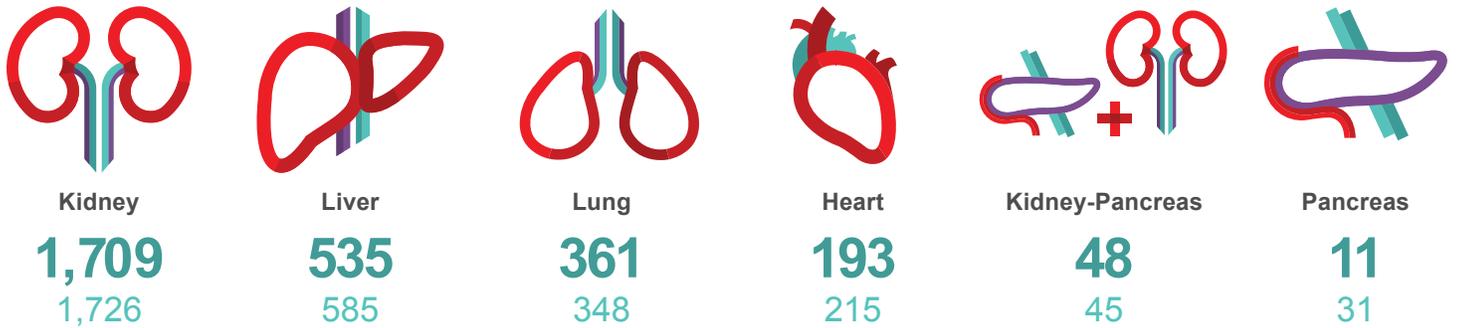
DCD: donation after circulatory death  
NDD: neurological determination of death

## Donors and transplants per million population (pmp) in Canada, 2008–2018



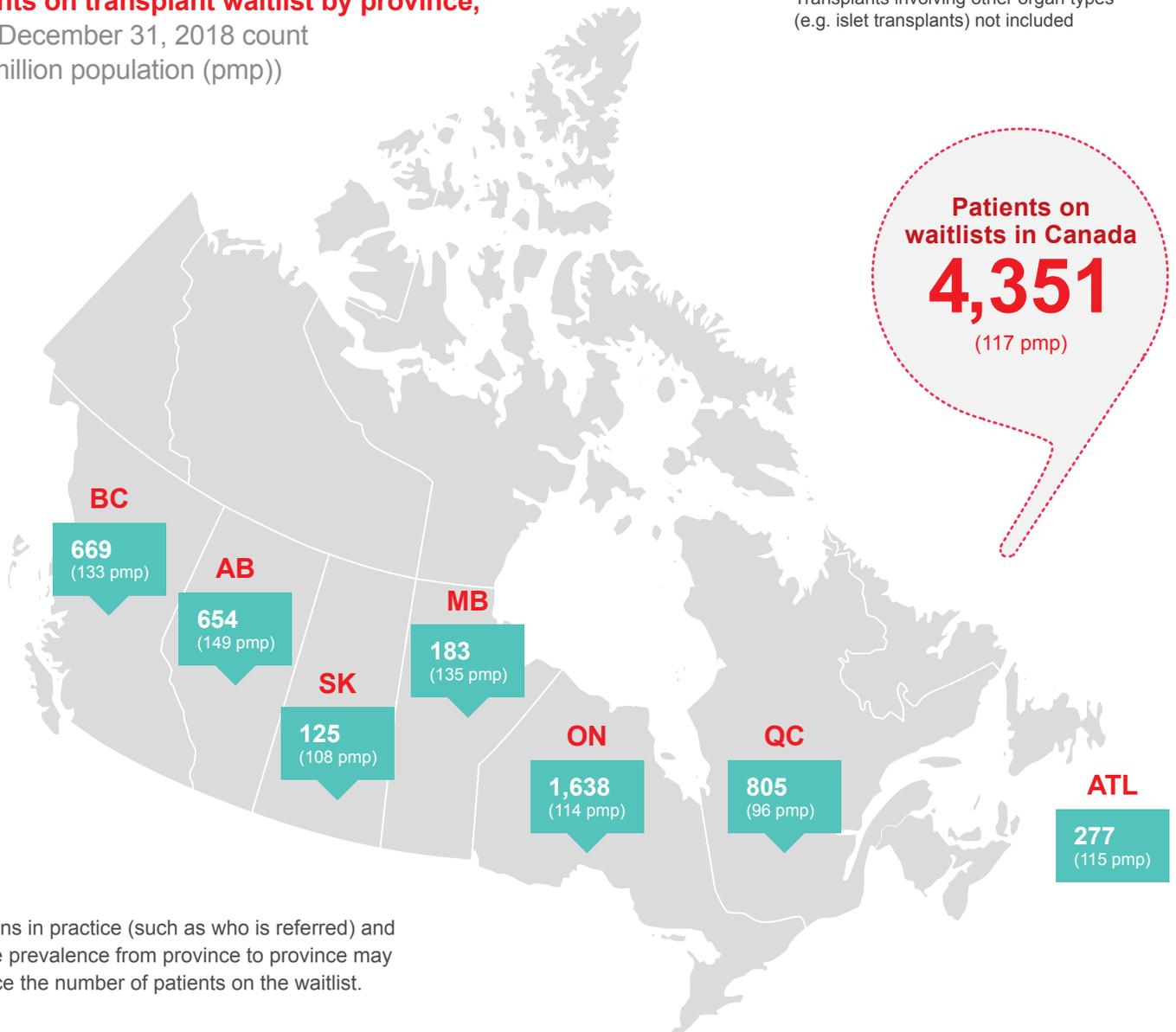
# Transplants by organ type, 2018

● 2018 ● 2017



## Patients on transplant waitlist by province, as of December 31, 2018 count (per million population (pmp))

Transplants involving other organ types (e.g. islet transplants) not included

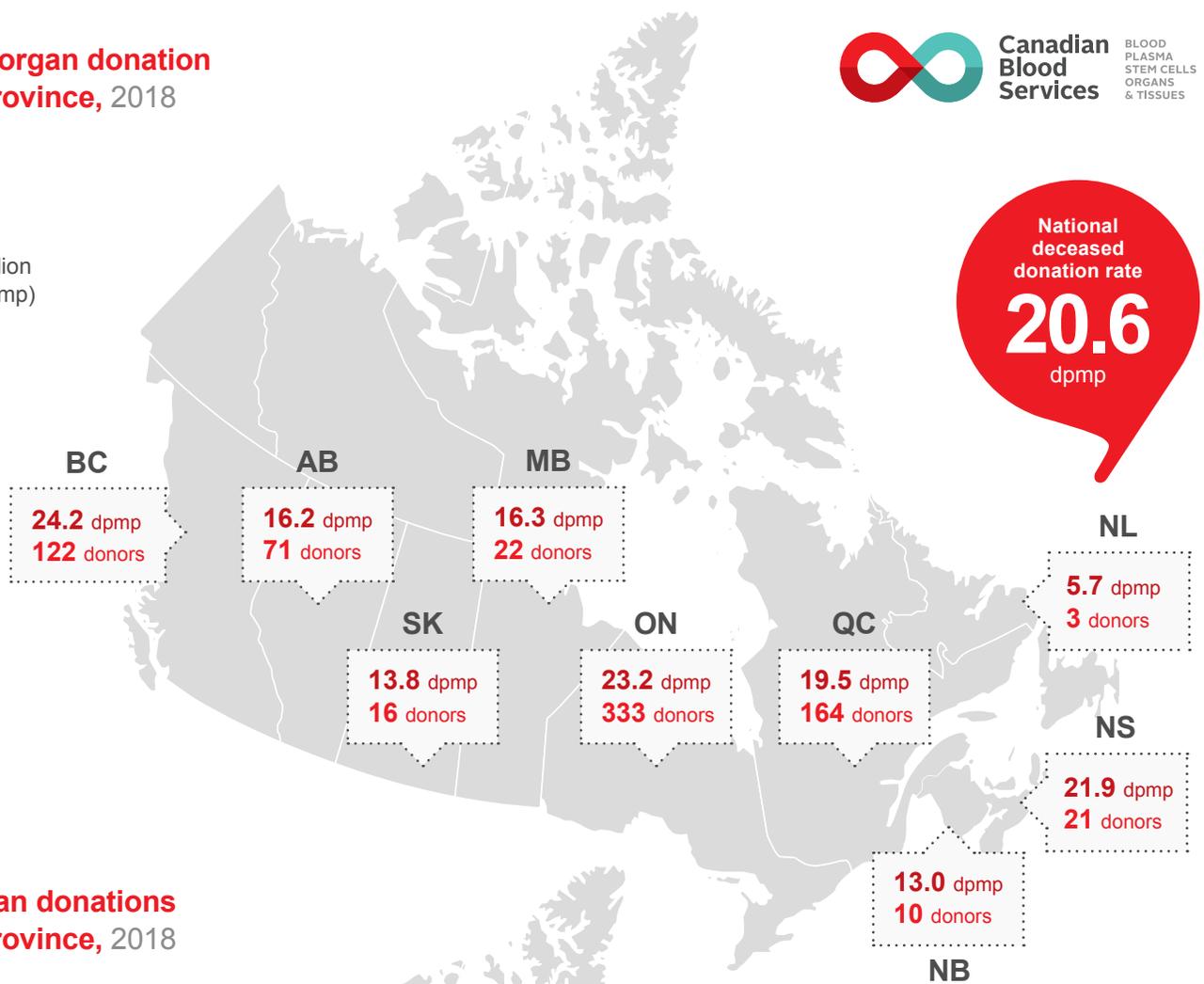


Variations in practice (such as who is referred) and disease prevalence from province to province may influence the number of patients on the waitlist.

## Deceased organ donation rates by province, 2018

- dpmp
- donors

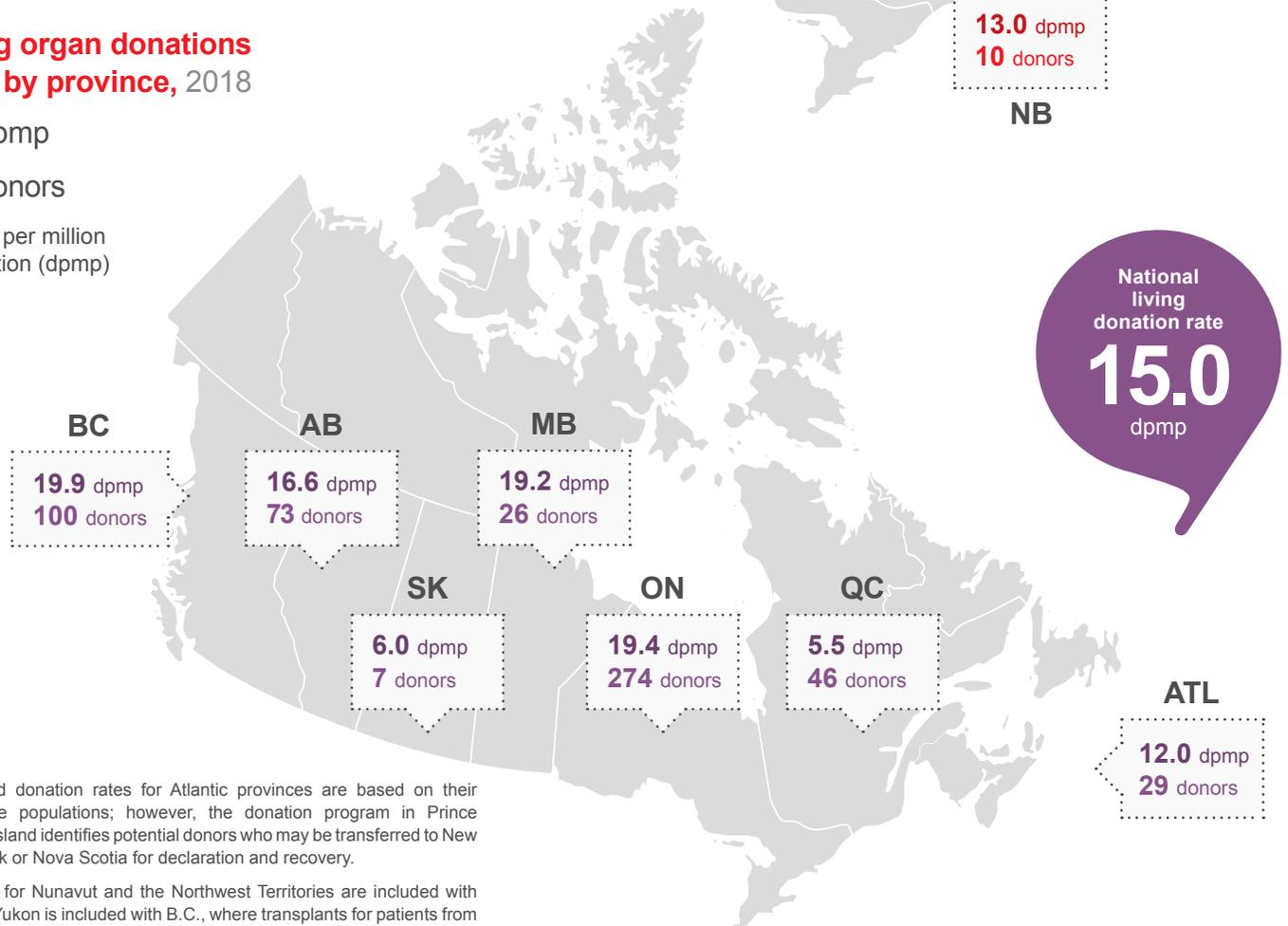
donors per million population (dpmp)



## Living organ donations rates by province, 2018

- dpmp
- donors

donors per million population (dpmp)



Deceased donation rates for Atlantic provinces are based on their respective populations; however, the donation program in Prince Edward Island identifies potential donors who may be transferred to New Brunswick or Nova Scotia for declaration and recovery.

Statistics for Nunavut and the Northwest Territories are included with Alberta; Yukon is included with B.C., where transplants for patients from those territories take place.

# Deceased donation in Canada

Canada’s performance in terms of deceased organ donation remains stable, experiencing only a minor decline in 2018 when compared to the previous year’s results. The results reflected within this report represent the individual and collective work of the provincial programs and the national efforts led by Canadian Blood Services. Most importantly, we must acknowledge the generosity of the **762 deceased organ donors** and their families who gave so selflessly in 2018.

## Deceased Donor Organ Utilization

# 3.0

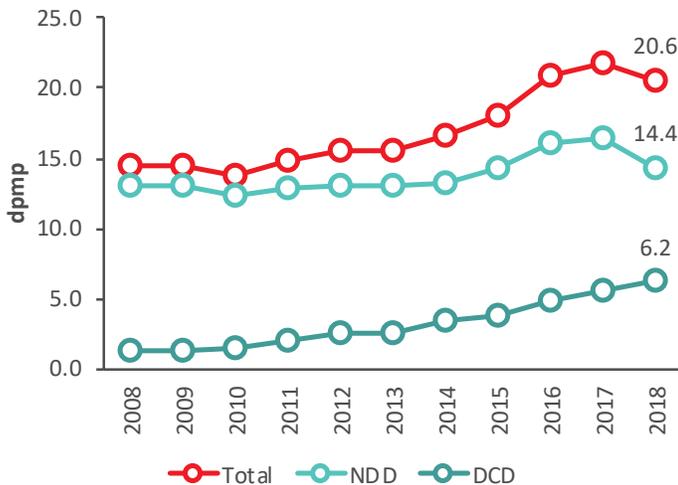
Organ transplants per donor in 2018



While the number of deceased donors is an important metric, equally important is the degree to which the system utilizes each donor’s gift. A single donor has the potential to provide as many as eight organs for transplant (heart, liver, kidneys, pancreas, lungs and small bowel).

The deceased donor organ utilization rate in Canada, measured by the number of organ transplants from deceased donors divided by the number of deceased donors, exceeds that of other nations such as Australia, Spain, and the United Kingdom; it is equivalent with that of the United States.

## Deceased donor rate by donor type, 2008–2018 (donors per million population (dpmp))



Canada’s national deceased donation rate has decreased by 6% since 2017, from 21.8 dpmp to 20.6 dpmp in 2018. This is marked by a 12% decrease in the rate of NDD donors between 2017 and 2018 (from 16.4 dpmp to 14.4 dpmp), but also a 13% increase in the DCD donor rate between 2017 and 2018 (from 5.5 dpmp to 6.2 dpmp).



*Organ donation is a gift of life. The donation and transplant system in Canada is deeply grateful to the increasing number of Canadians who have donated organs to save other Canadians.*

*While there has been a slight decrease in donors and transplants over a single year from 2017 to 2018, the system has performed extremely well over the past decade.*

*Over the past 10 years, there has been 57% increase in the number of Canadians who have donated organs after their tragic death. This has led to a 35% increase in the number of life-saving or life-preserving transplants performed and a decrease in the number of patients on the waiting list.*

**Dr. Sam Shemie, Medical Advisor, Deceased Donation, Canadian Blood Services**



## Leading Practice and Professional Education:

In 2018, we saw change in the realm of deceased donation as Canada’s medical assistance in dying laws presented a unique ethical challenge for the health care system. Following patient-initiated requests, Canadian Blood Services worked with medical, legal and ethics experts, as well as patient partners, to develop recommendations to support organ and tissue donation in patients who choose medical assistance in dying or who choose to withdraw life-sustaining measures.

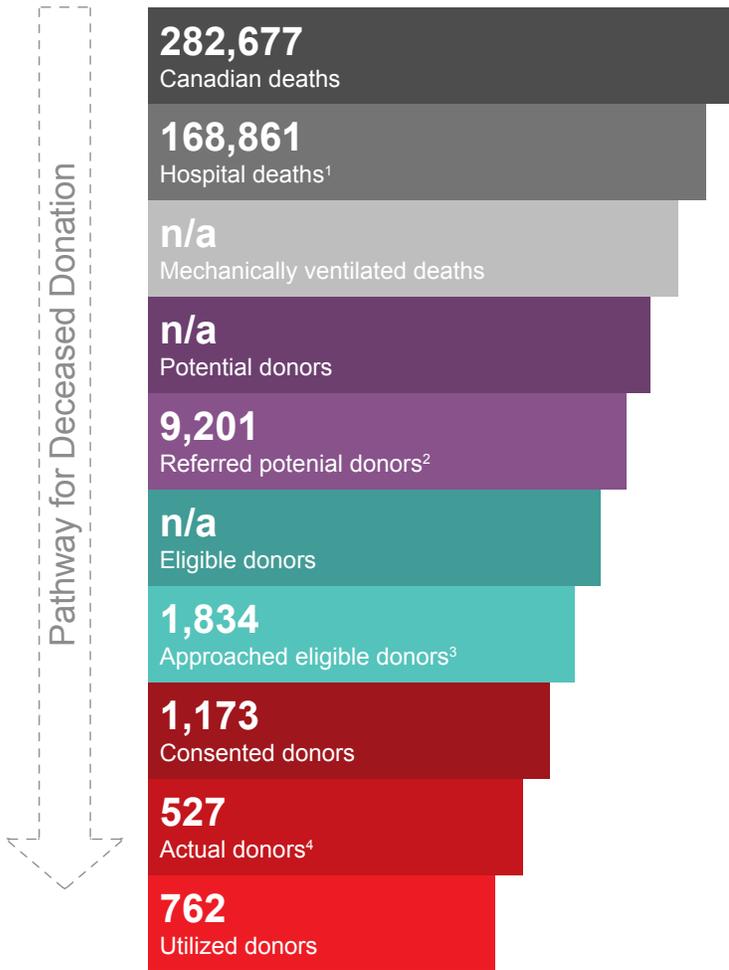
The resulting guidance for policy, now published in the Canadian Medical Association Journal (CMAJ), supports health care teams so they can ensure quality end-of-life care for patients, navigate medical, legal and ethical concerns, and honour the patient’s wish to become an organ donor.

Today, implementation of this important work is through knowledge translation, educational curriculum development, and the creation and dissemination of the documentary *Her Last Project*.

# Pathway to deceased donation

For someone to become a deceased donor, he or she has to die in very specific circumstances. The opportunities for deceased donation remain limited as only about 1%-2% of deaths in hospital are eligible to donate. The deceased donation clinical pathway shows the key steps in the chain of care that can lead to actual transplants and each step along the path must be optimized to minimize missed donation opportunities. Each step along the pathway represents an opportunity for maximizing organ utilization.

Collection of data along this pathway is critical for effective assessment of the national donation system. (More detailed descriptions of each step along this pathway can be found in Appendix C.)



### Sources

1. Statistics Canada. Table 13-10-0715-01 Deaths, by place of death (hospital or non-hospital)
2. The number of in-province referrals reported.
3. Quebec does not provide Approached Eligible Donor numbers
4. Not all provinces report actual donors - this is the total number reported (Actual Donors Type A - A consented eligible donor in whom an operative incision was made with the intent of organ recovery for the purpose of transplantation)

## Deceased donation after circulatory death

### Donation after circulatory death - a key contributor to system improvement

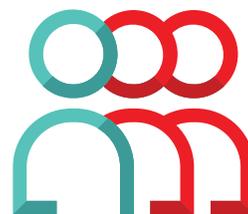
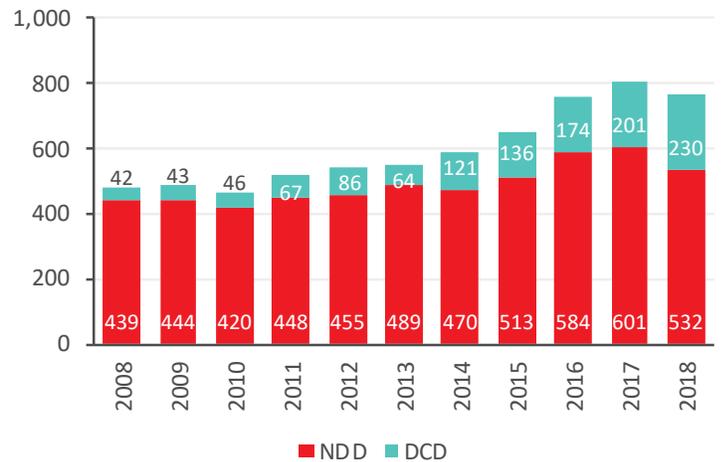
DCD accounts for the largest increase in deceased donation over time and, next to ensuring consistent donor identification and referral, constitutes the greatest opportunity to continue to increase donation potential. Nine provincial organ donation organizations have implemented DCD within their jurisdiction, in addition to their neurological determination of death (NDD) programs.

Improving Canada's deceased donation rate will require a continued focus on implementation and evaluation of donation after circulatory death (DCD) programs. In 2018, 30% of all deceased donors were realized through DCD. Refer to pages 15 and 18 for additional information about DCD.



Of the total transplants in 2018 in Canada, 80% were from deceased donors, while 20% were from living donors.

### Deceased donation by donor type, 2008–2018



1 in 3

DONATIONS ARE MADE THROUGH DCD

## Performance among provinces varies

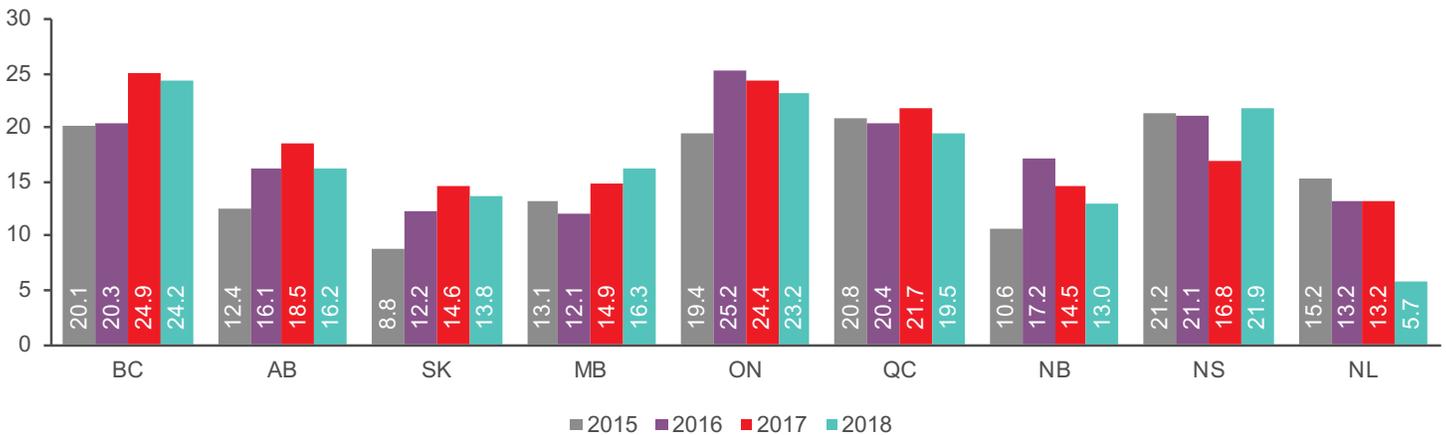
The degree to which provincial variability in performance affects variability in national performance trends is an important consideration. In 2012, as part of the Call to Action and in conjunction with the OTDT community, a deceased donation target of 22 dpmp was set. In 2018, the national donation rate was 20.6 dpmp. Canadian Blood Services and its provincial partners are working to determine an appropriate national target for deceased donation. Although the deceased donation rate is relatively flat over the past four years, it has seen an increase over the past decade.

### Canada

Target: 22 dpmp

2018: 20.6 dpmp

### Deceased donor rate by province, 2015–2018 (dpmp)



### Factors contributing to higher donation rates

The table below highlights some of the key factors that contribute to a high-performing deceased donation program and shows how each province is progressing in terms of implementation of these practices. The factors included here do not constitute a complete list of all contributory factors and should not be interpreted as an assessment of provincial performance.

	BC	AB	SK	MB	ON	QC	NB	NS	NL
Mandatory Referral	●	● <sup>1</sup>	●	●	●	●	● <sup>2</sup>	●	●
Donation Physicians (Number of Donation Physicians)	● (8)	● (2)	● (4)	● (6)	● (61)	● (12)	● (2)	● (1)	● (1)
NDD Leading Practices	●	●	●	●	●	●	●	●	●
DCD Programs (% DCD donors)	● (35%)	● (30%)	● (19%)	● (18%)	● (35%)	● (23%)	● (0%)	● (14%)	● (0%)
Donor Management Leading Practice	●	●	●	●	●	●	●	●	●
Deceased Donors (dpmp) (Number of Donors)	24.2 (122)	16.2 (71)	13.8 (16)	16.3 (22)	23.3 (333)	19.5 (164)	13.0 (10)	21.9 (21)	5.7 (3)
% change in dpmp, 2017-2018	↓ 3%	↓ 13%	↓ 6%	↑ 9%	↓ 5%	↓ 10%	↓ 11%	↑ 30%	↓ 57%

- Implementation complete or near completion
- Implementation in progress
- Implementation not started

1. Alberta uses a mandatory consideration model, rather than mandatory referral
2. Mandatory referral in NB has been implemented for tissue donation only

# Living donation performance in Canada

Canada's living donation rate in 2018 was 15.0 dpmp, which is a 3% increase from 2017, returning the rate to that seen in 2016; despite this increase, the living donation rate is still 2% lower than what was seen in 2009.

In 2018, there were 555 living donor transplants, representing a 4% increase from 2017. The Kidney Paired Donation (KPD) program has facilitated 633 transplants as of the end of 2018, with 73 transplants being performed in 2018 alone.

**2%**

DECREASE IN LIVING DONATION SINCE 2009

The national KPD program is an interprovincial program operated by Canadian Blood Services in collaboration with Canada's living kidney donation and kidney transplant programs. The KPD program gives individuals an opportunity to become a living donor and donate a kidney to someone in need, and in doing so, provide transplant candidates an increased opportunity to receive a transplant.

More information about KPD can be found at [blood.ca/organs-tissues](http://blood.ca/organs-tissues)

While opportunities for deceased donation are limited (only about 1%-2% of deaths in hospital continue through to donation), living donation is a controllable process, providing a potential growth opportunity for transplantation.

Every patient who receives a kidney transplant from a living donor comes off the wait-list for an organ from a deceased donor. This shortens the wait-time for other patients on the transplant waitlist.



*We seem to have hit a new plateau in living donation rates, which means as a country we have to drill down on how to get system performance to the next level. To be on par with countries like the United States, where rates are far ahead of ours, we need to make improving practice in jurisdictions with low rates a key focus.*

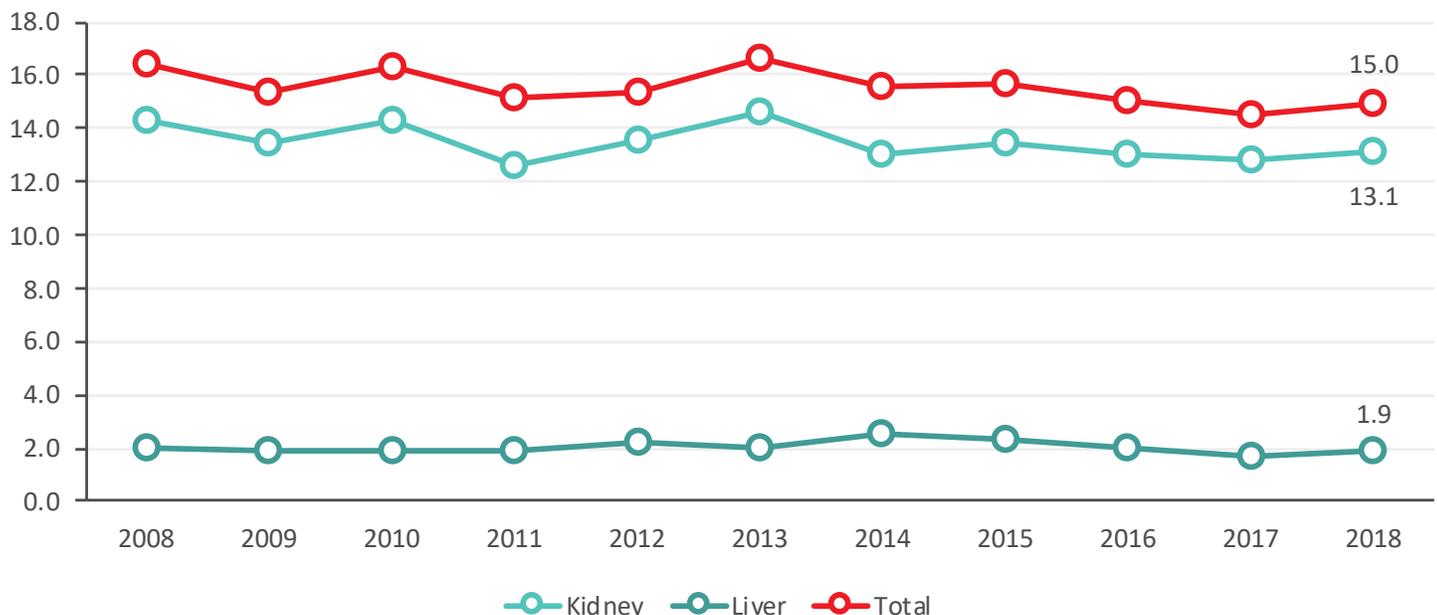
*Given the wide variation in practice across Canada today, I believe we have a huge opportunity to improve living kidney donation rates."*

**Dr. Peter Nickerson, Medical Advisor, System Performance, Data and Transplantation, Canadian Blood Services**



Although living lung donation does exist, it is very rare and has seen a decrease in activity in recent years. In the past 10 years there have been only two living lung transplants nationally and none in the past four years.

## Transplant rate from living donors in Canada, 2008–2018 (tpmp)

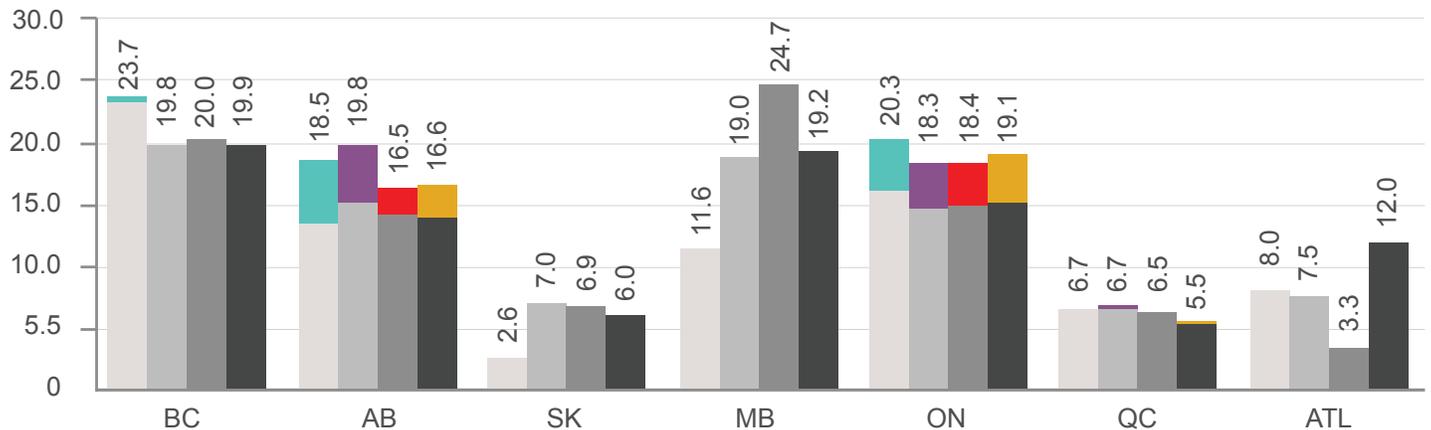
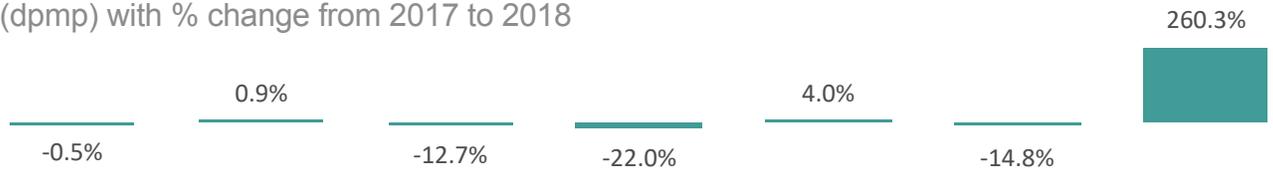


# Living donation performance in Canada (cont'd)

## Living donor rates by province, 2015–2018 (dpmp) with % change from 2017 to 2018

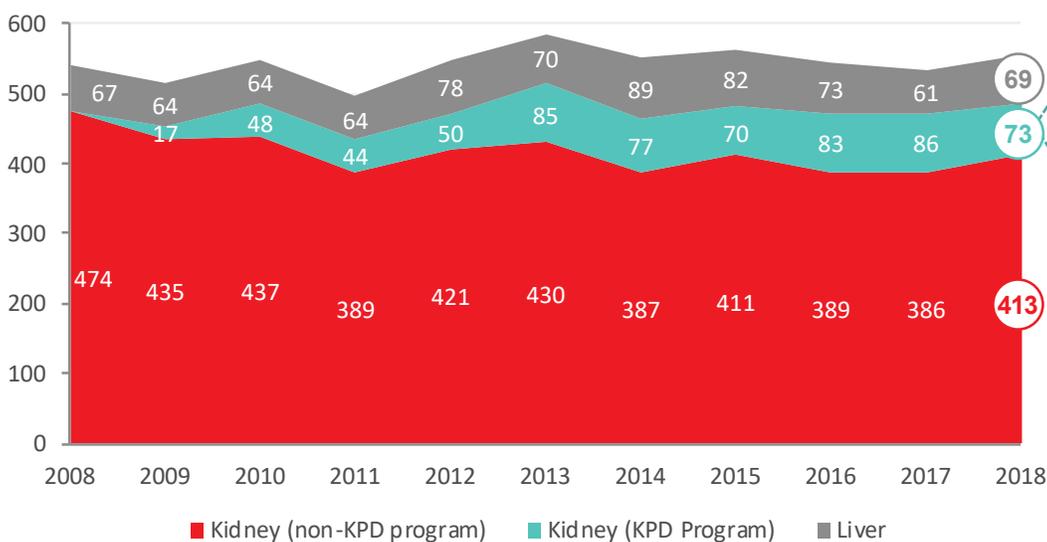
2015–2018 (dpmp) with % change from 2017 to 2018

% change in total living donor rates



■ 2015 (Liver)    ■ 2016 (Liver)    ■ 2017 (Liver)    ■ 2018 (Liver)  
■ 2015 (Kidney)    ■ 2016 (Kidney)    ■ 2017 (Kidney)    ■ 2018 (Kidney)

## Number of transplants from living donors in Canada, 2008–2018



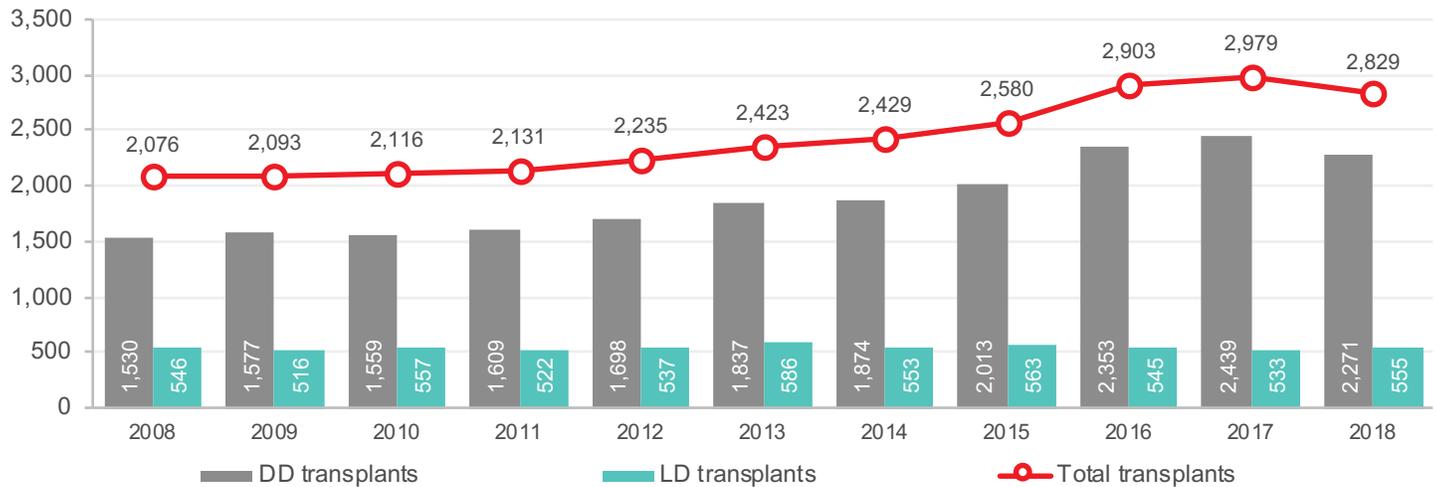
**The Kidney Paired Donation program** has facilitated an average of three transplants every two weeks from 2010 to 2018, transplants that would not have been possible without this interprovincial organ sharing program.

Learn more about the KPD program at: <https://blood.ca/en/organs-issues/living-donation/kidney-paired-donation-program>

# Transplantation performance in Canada

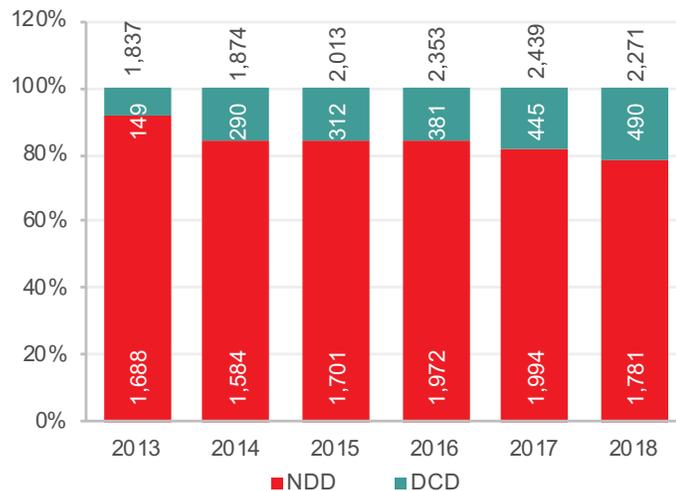
More than 4,000 Canadians are waiting for organ transplants at any given time, many of whom will never receive a transplant due to the limited number of and access to donated organs. Maximizing donor potential and ensuring equitable access for patients on Canada's waitlists is imperative to improving system performance.

## Transplants in Canada by donor type, 2008–2018

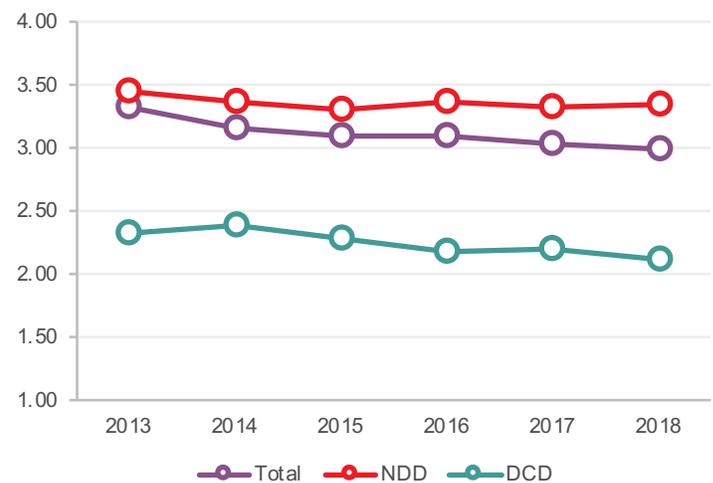


The number of transplants decreased by 5% between 2017 and 2018, lowering from 2,979 transplants to 2,829 transplants. The transplant rate has accordingly decreased to 76.3 transplants per million population (tpmp), which is 6% lower than the transplant rate in 2017 (81.5 tpmp) and 5% lower than the transplant rate in 2016 (80.4 tpmp).

## Deceased donor transplants by donor type, 2013–2018



## Deceased donor utilization by donor type, 2013–2018



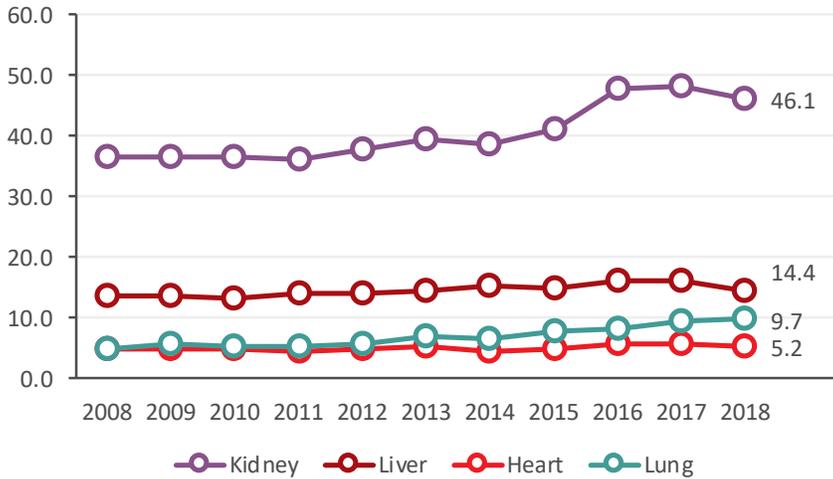
There were 11% fewer transplants from NDD donors in 2018 than 2017; meanwhile, there were 10% more transplants from DCD donors. Together, these changes resulted in a 7% decrease in the number of transplants from deceased donors in 2018 from 2017.

The proportion of deceased donor transplants from DCD donors has increased from 8% in 2013 to 22% in 2018. This is reflected in a 10% decrease in the deceased donor utilization rate between 2013 and 2018. The number of organs that can be donated is higher for NDD donors than DCD donors; as such, with an increased proportion of transplants from DCD donors, there is a decrease in deceased donor utilization, as well as a decrease in total transplants.

Refer to pages 11 and 18 for additional information about DCD.

# Transplantation performance in Canada (cont'd)

## Transplant rates (living and deceased donors) in Canada by organ type, 2008–2018 (tpmp)



A key priority for all provincial and national partners in transplantation is not merely to find any organ to give to a patient, but rather to ensure that donor management, tissue matching, peri-operative therapies, immunosuppression regimens, and long-term patient care are driving our system towards the goal of “one transplant for life”. This overarching goal of moving transplantation from being a time-limited therapy to more of a ‘cure’ is a stated goal of all national partners in Canada.

Retransplantation for patients who have lived a few years to several decades with a transplant is now being seen as a growing challenge to the system, as patients with failing transplants compete with those who are being listed for the first time.

The gap between transplants performed and persons on the waitlist has narrowed between 2008 and 2018, with 2017 representing the narrowest gap between transplants and persons on the waitlist. Compared to 2017, 2018 saw an increase in the number of persons on the waitlist at year’s end, as well as a decrease in the number of transplants, resulting in a wider gap comparable with that seen in 2016.

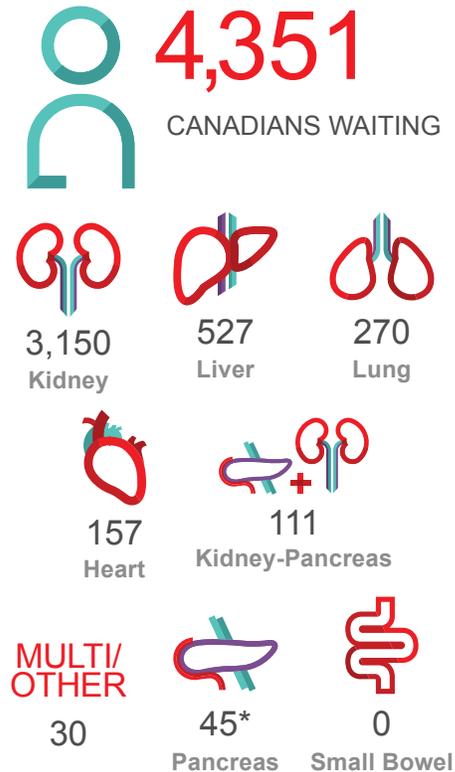
## Transplants and persons active or on hold on the waitlist, 2008–2018



Canadian Blood Services publishes individual reports for each of the national patient registries, specifically the National Organ Waitlist (NOW), the Kidney Paired Donation (KPD) program and the Highly Sensitized Patient (HSP) registries. These data reports offer insights into the growth of each program by reporting on long periods of collected data.

View the latest reports at: <https://professionaleducation.blood.ca/en/organs-and-tissues/reports-0>

## Patients waiting for transplants as of December 31, 2018



**223** PATIENTS DIED ON THE WAITLIST IN 2018

\* Does not include islet patients (61)

# Transplantation performance by organ type and by province

The living donor transplant and deceased donor transplant rate by province and nationally are broken down by organ type below. Target ranges represent an average of the top five international performers for each organ type as indicated in the 2018 IRODaT Newsletter\*.

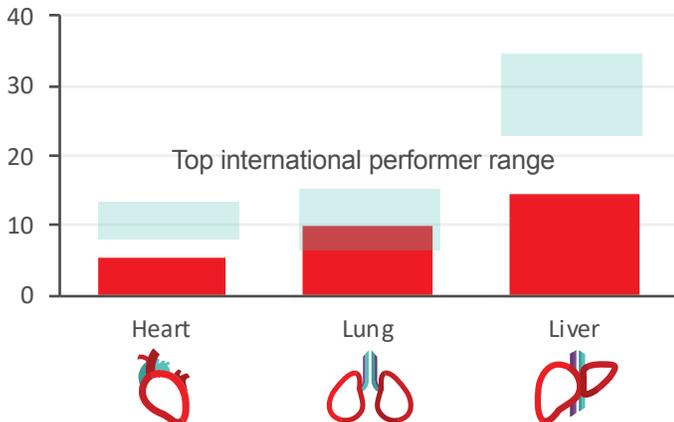
## Kidney transplants from deceased donors by province, 2018 (tpmp)



## Kidney transplants from living donors by province, 2018 (tpmp)



## Heart, lung, and liver transplants from deceased donors in Canada, 2018 (tpmp)



While most provinces have an organ donation program, only certain provinces perform transplants. A directory of organ and tissue donation registries by province and territory is available at: <https://organtissuedonation.ca>

\* Source: <http://www.irodat.org/img/database/pdf/IRODaT%20Newsletter%202019-March.pdf>

# Awareness and approval of organ and tissue donation in Canada

An “Organs and Tissues General Public Opinion Survey” is conducted by IPSOS on behalf of Canadian Blood Services every two years. According to the most recent survey, completed in March 2019, approval for deceased organ and tissue donation in Canada has remained stable at 89%.

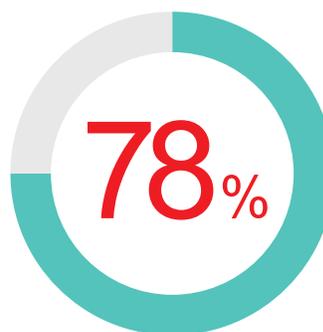
Those who are more likely to disapprove of deceased donation include those who also disapprove of living organ donation, those who have decided not to donate their organs/tissues at the time of their death, and those who are undecided whether they would accept an organ or tissue transplant if they needed one.



73%

of Canadians trust that the organ and tissue donation system in Canada is administered in the best interest of the public.

The proportion of people who agree that they trust that the organ and tissue donation system in Canada is administered in the best interest of the public has remained relatively stable (within 5%) over the past five years. Similarly, the proportion of people who trust that Canadian Blood Services does what is best for the Canadian organ and tissue system has stayed stable over the past five years (74% in 2014, 74% in 2019).



of Canadians approve of organ and tissue donation from a living donor



of Canadians approve of organ and tissue donation after death

Results from Organs and Tissues General Public Opinion Survey (IPSOS, March 2019).

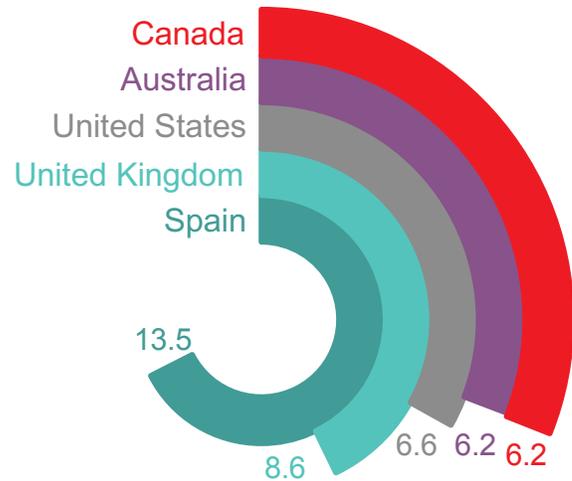
## International donation rates

To compare international donation rates, we use Spain, the United Kingdom, the United States, and Australia as benchmarks. Spain is considered to be an international leader in deceased donation, while the United States, United Kingdom, and Australia represent countries that most align with Canada either politically, socially, legislatively, and (or) geographically.

Canada has adopted a more conservative definition in tracking donation performance than is typically used by the international community. The deceased donation results in Canada report utilized donors, a metric that requires at least one organ from a donor to have been transplanted into a recipient. The donors per million population metric in most other countries counts a donor so long as an incision has been made for the purposes of organ recovery, regardless of whether or not an organ has been transplanted. These are called actual donors. Annual reports on organ donation and transplantation activity issued by the National Health Service in the United Kingdom (2012–2015) estimate differences of between 4%–8% when comparing actual donors and utilized donors.

Unless otherwise stated in the title, the graphics below show actual donor rates for countries other than Canada.

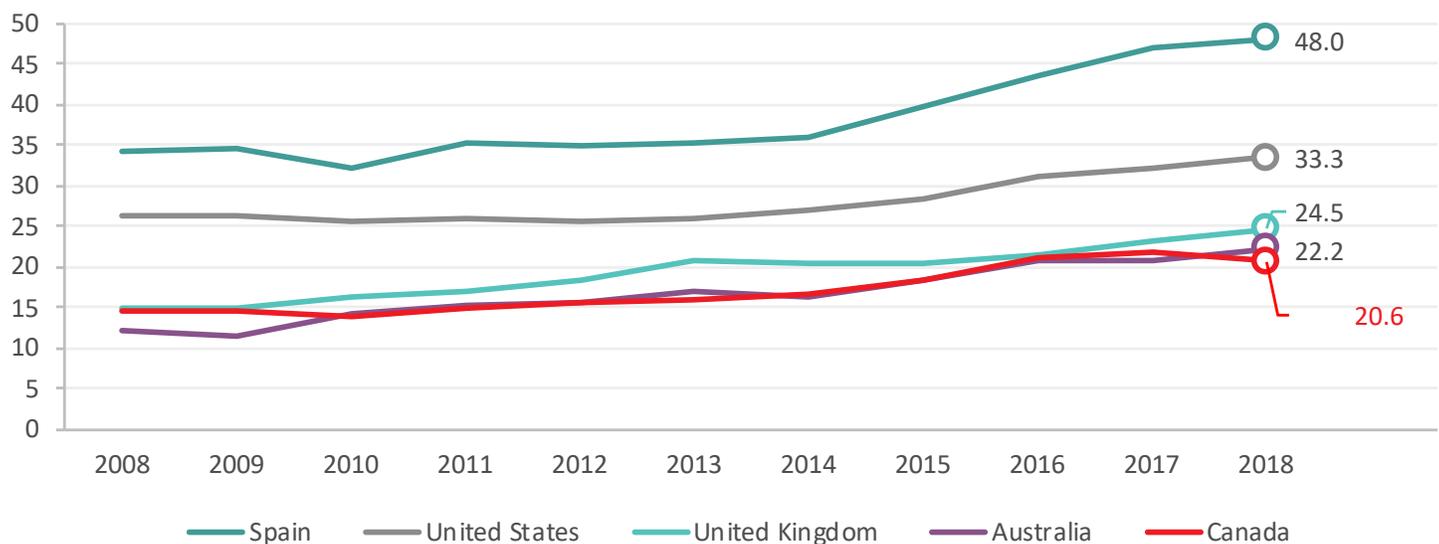
### DCD utilized donors per million population, 2018



The organ donation rate following DCD in Canada is similar to rates in Australia and the United States, however, based on DCD rates in the UK and Spain, there appears to be additional opportunities for improvement.

Refer to pages 11 and 15 for additional information about DCD.

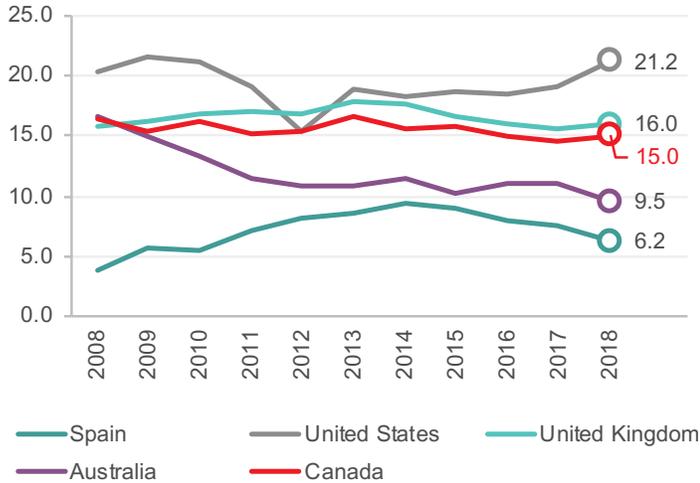
### International deceased donor rates, 2008–2018 (dpmp)



The deceased donation rate in Canada has decreased in 2018, which is off-trend of the benchmark countries, who all saw an increase in their respective deceased donation rate. In 2018 Canada had the lowest deceased donation rate of the benchmark countries.

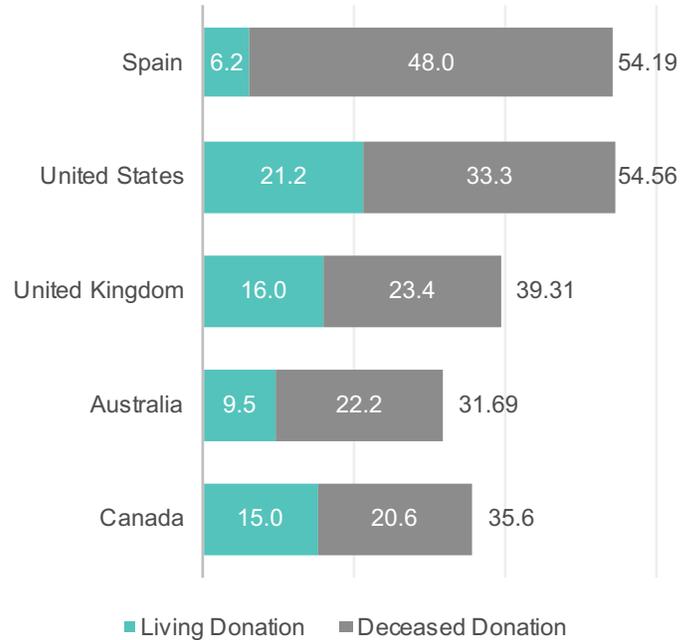
## International donation rates (cont'd)

**International living donor rates, 2008–2018 (dpmp)**

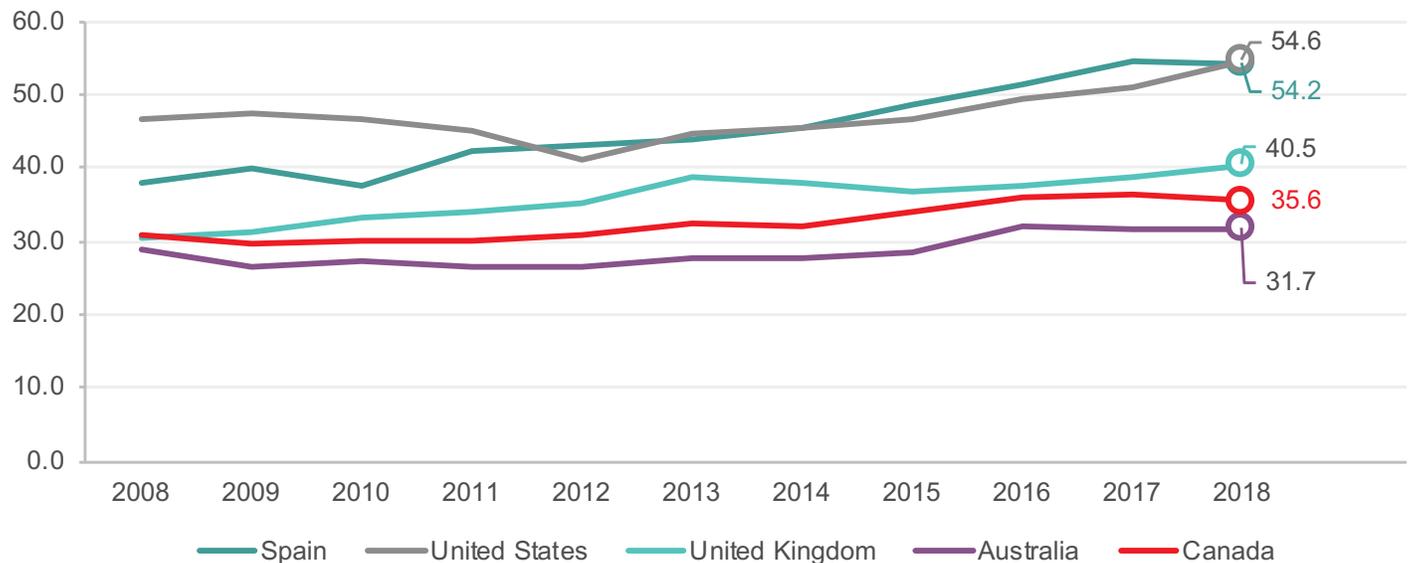


Living donation (kidney, liver) rates in the United States, the United Kingdom and Canada have increased between 2017 and 2018, while rates have decreased in Australia and Spain. Both Spain and Australia demonstrate a downwards trend of living donation rates, while the United States appears to have an increasing trend. Rates in the United Kingdom and Canada appear to be relatively stable over the past five years.

**Living and deceased utilized donation rates, 2018 (dpmp)**



**Combined living and deceased donor rates, 2008–2018 (dpmp)**

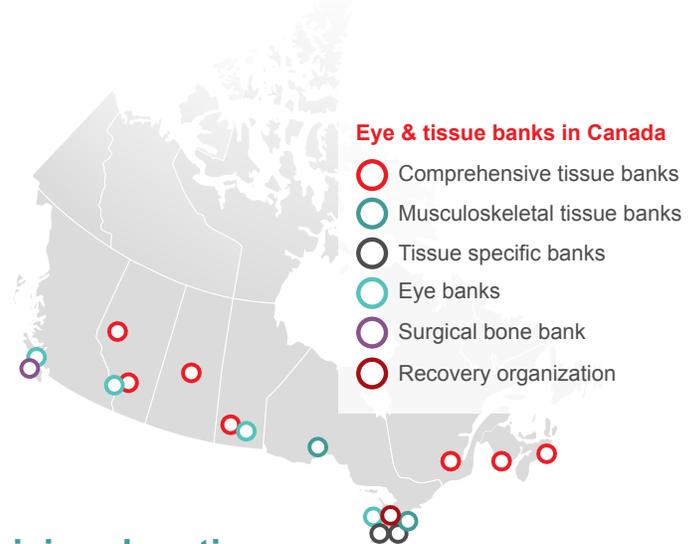


Both Canada and Australia demonstrated a slight decrease to their combined living and deceased donor rates in 2018, while the United States and the United Kingdom show an increase in their combined living and deceased donor rates in 2018. Spain's combined living and deceased donor rate remained stable in 2018.

# Eye and tissue performance in Canada

## Eye and tissue donation

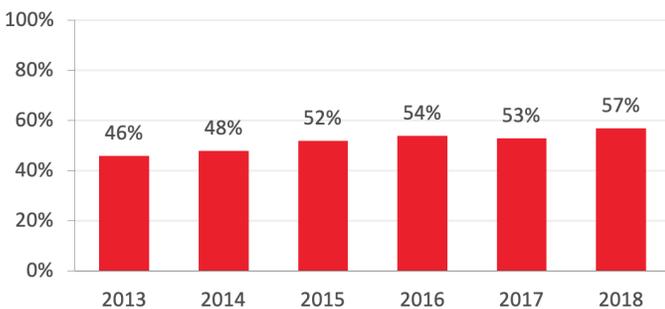
The utilization of tissue grafts to restore sight, to repair sports or trauma injuries, to treat severe burns, and to replace damaged heart valves has been long standing in Canada, with eye and tissue banks in eight provinces. Canadian Blood Services, in collaboration with all Canadian eye and tissue programs, maintains data related to tissue donation activity which helps to inform provincial strategies and national policy.



## Consent

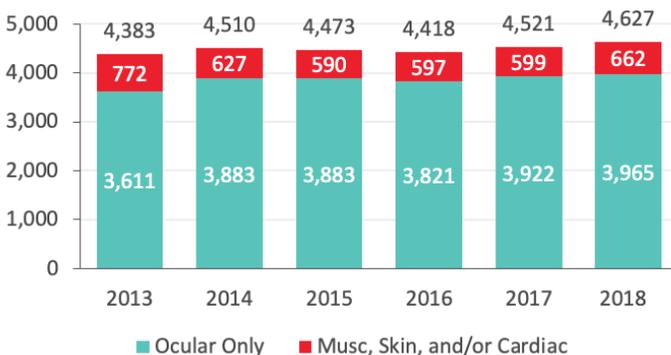
Based on 10,082 approaches for deceased tissue donation nationally in 2018, the consent rate of 57% was identified. This represents the first year that available results reflected a complete census of all Canadian eye and tissue programs.

### Deceased donors consent rate, 2013–2018



## Deceased donation

### Number of deceased tissue donors by year\*, 2013–2018



Results for Musculoskeletal/Skin/Cardiac donors include donors where ocular tissue was also recovered

\* This information reflects data provided by 11 of 17 programs.

In 2018, there were 4,627 deceased tissue donors and 197 living tissue donors. Of tissue donations, 86% are for ocular tissue only, while 14% of tissue donations are for musculoskeletal, cardiac and or skin tissue. In 2018, donation resulted in the distribution of 3,926 corneas grafts and 12,963 musculoskeletal, cardiac and skin tissue grafts.

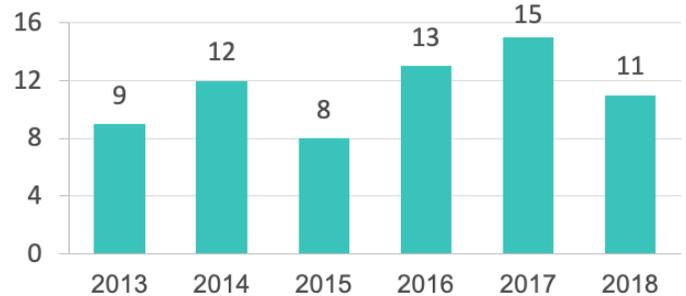
## Living donation

### Number of living tissue donors by year, 2013–2018

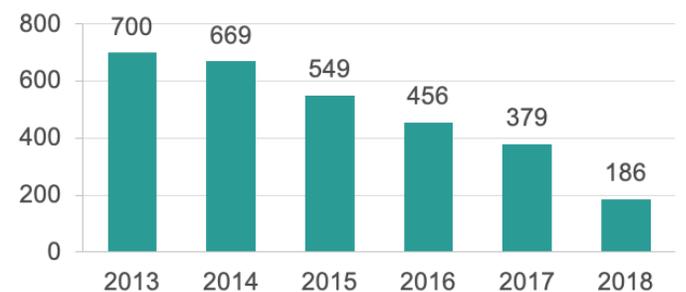
Living donors are a feature of the Canadian tissue system. In some hospitals, femoral heads are donated from patients having total hip replacements; this donated bone can be used in surgical repairs. Donation of surgical bone continues to decrease as hospitals demand shifts to more highly processed grafts.

In some centres, mothers donate their amniotic membrane, which can be used in eye surgery and in wound healing.

## Amnion

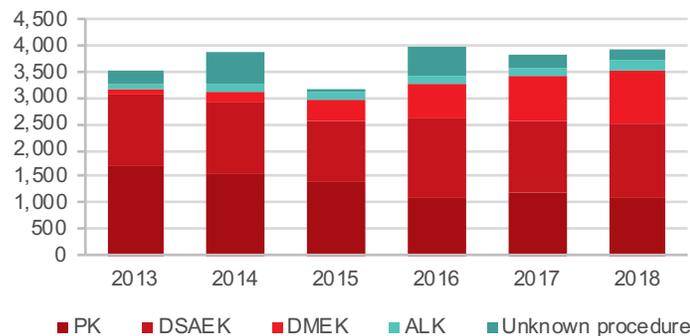


## Surgical bone



## Cornea

### Cornea transplants (keratoplasty) by type of procedure, 2013–2018

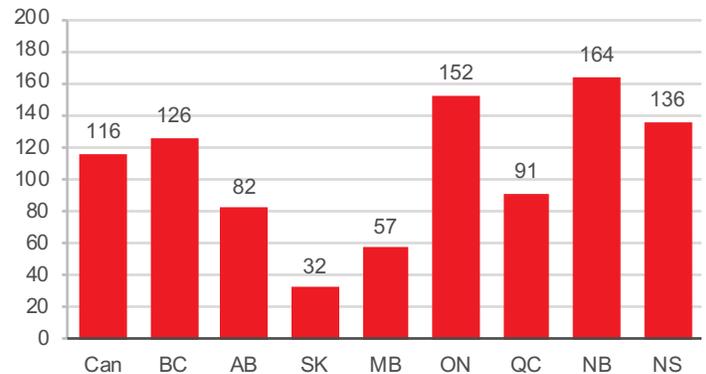


Canadian production and distribution of corneas are stable, with no significant growth over the past five years and 3,926 distributed to transplant in 2018.

Pre-transplant processing of corneas (Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK) and Descemet's Membrane Endothelial Keratoplasty (DMEK)) is continuing to improve outcomes and increase the demand for these procedures.

There is a significant variance in the corneal transplantation rate between provinces; there is a provincial range of 32 to 164 corneas distributed for transplant per million population. Some jurisdictions supplement their cornea production through importation; 2% of all cornea transplants performed in Canada utilize corneas from the United States.

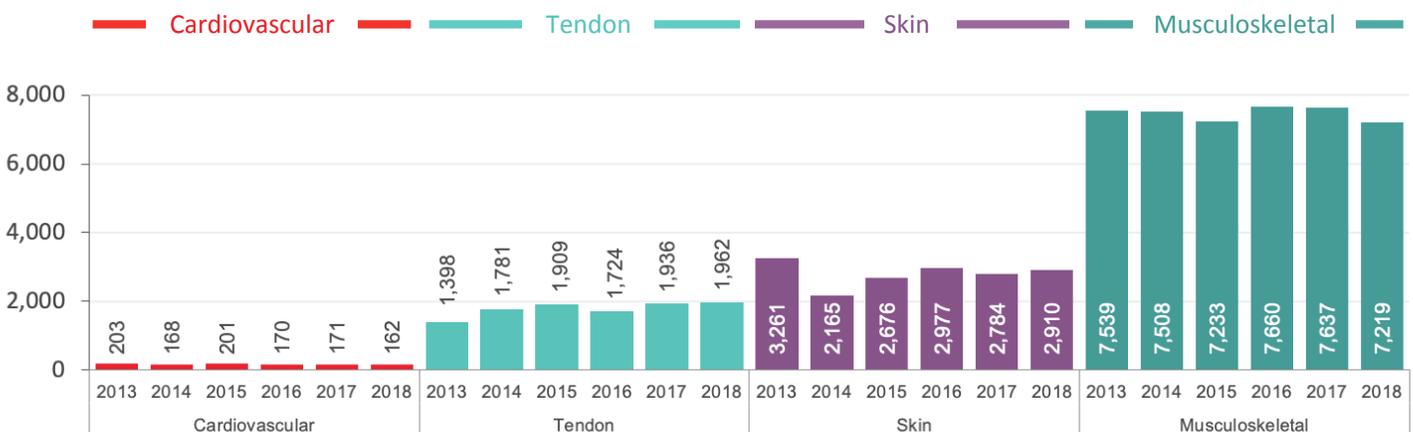
### Cornea transplants (keratoplasty) by province, 2018 (tpmp)



## Cardiovascular, tendon, skin and musculoskeletal

Canadian production and distribution of musculoskeletal (bone and tendons), cardiac and skin grafts is stable, with no significant growth over the past five years. In 2018, 12,963 musculoskeletal, cardiac and skin tissue grafts were distributed for transplant.

### Total non-ocular tissue grafts distribution from living and deceased donors, 2013–2018



Not represented in the graph, 710 transplants in Canada in 2018 consisting of various soft tissue, fresh osteoarticular, and other non-ocular tissue grafts from deceased donors.

Variance in the distribution of tissue grafts per province is related to tissue bank activity, population, and the number and type of surgical programs. Hospitals continue to import tissue grafts from the United States to supplement their needs. There is a significant demand for advanced tissue grafts not currently produced by any Canadian programs. These include demineralized bone products, powders and putties for orthopedic and dental surgery, bone dowels, screws and cages for spinal surgery and acellular dermal matrix for wound treatment. We estimate more bone grafts are imported annually than are produced in Canada.

Read more in the Annual Eye and Tissue Data :Committee reports: <https://profedu.blood.ca/en/organs-and-tissues/reports-0>

## Acknowledgements

This report acknowledges the generous gift made by organ and tissue donors, both living and deceased, and the families of those who have donated. The report further acknowledges the hopes of patients with end-stage organ failure and the dedication of healthcare teams and practitioners throughout the health care system who make it possible to fulfill and increase opportunities for organ and tissue donation and transplantation.

This report was made possible through the collective effort and input from members of Canadian Blood Services' Organ and Tissue Donation and Transplantation Committees, the Canadian Institute for Health Information, and the Information Management team with Canadian Blood Services' Organ and Tissue Donation and Transplantation department.

## Data sources

The Canadian data collected for this report was compiled from a number of sources and standardized and validated to the greatest degree possible by experts from Canadian Blood Services. Source material was derived from figures compiled from the Canadian Transplant Registry, and materials published by the Canadian Institute for Health Information and the Canadian Organ Replacement Register. Canadian Blood Services' personnel also collected and validated data from provincial organ donation organizations.

The international donation and transplantation data collected for this report was compiled from a number of sources and standardized and validated to the greatest degree possible by experts from Canadian Blood Services. Source material was derived from figures compiled from the International Registry on Organ Donation and Transplantation, the Organ Procurement and Transplantation Network in the United States, and the Organización Nacional de Trasplantes in Spain.

In accordance with Canadian Institute of Health Information (CIHI) standards, demographic data for estimates per million population (PMP) are based on *Statistics Canada Table 17-10-0134-01 Estimates of Population (2016 Census and administrative data), by age group and sex for July 1st, Canada, provinces, territories, health regions (2018 boundaries) and peer groups*. For the purpose of this calculation, PMP rates for British Columbia are based on the combined populations of British Columbia and Yukon, PMP rates for Alberta are based on the combined populations of Alberta, Northwest Territories and Nunavut, and Atlantic population includes New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.

## Appendix A: Acronyms

### Acronyms

<b>ATL</b>	Atlantic provinces (includes New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador)	<b>HLA</b>	Human Leukocyte Antigen
<b>CDTRP</b>	Canadian Donation and Transplantation Research Program	<b>IRODaT</b>	International Registry in Organ Donation and Transplantation
<b>CIHI</b>	Canadian Institute of Health Information	<b>KPD</b>	Kidney Paired Donation program
<b>CIHR</b>	Canadian Institutes of Health Research	<b>NDD</b>	Neurological Determination of Death
<b>DALK</b>	Deep Anterior Lamellar Keratoplasty	<b>ODO</b>	Organ Donation Organization
<b>DCD</b>	Donation after Circulatory Death	<b>ODT</b>	Organ Donation and Transplantation
<b>DMEK</b>	Descemet's Membrane Endothelial Keratoplasty	<b>OTDT</b>	Organ and Tissue Donation and Transplantation
<b>DPMP</b>	Donors Per Million Population	<b>PK</b>	Penetrating Keratoplasty
<b>DSAEK</b>	Descemet's Stripping Automated Endothelial Keratoplasty	<b>PMP</b>	Per Million Population
<b>EK</b>	Endothelial Keratoplasty	<b>TPMP</b>	Transplants Per Million Population
<b>ETDC</b>	Eye and Tissue Data Committee		

# Appendix B: Definitions

## Key Terms

<b>Donation after Circulatory Death (DCD)</b>	A diagnosis and confirmation of death based on circulatory criteria.
<b>Deaths on waitlist</b>	Patients who died while waiting for a transplant. <i>Note: This does not include patients who die immediately after being removed from a transplant waitlist.</i>
<b>Deep Anterior Lamellar Keratoplasty (ALK/DALK)</b>	A partial thickness corneal transplant procedure used to treat disease or injury confined to anterior layers of the cornea: the epithelium, Bowman's layer and stroma. This procedure is most often used to treat keratoconus and corneal scarring.
<b>Descemet's Membrane Endothelial Keratoplasty (DMEK)</b>	The transplantation of only the Descemet's membrane and endothelial layer of the cornea. DMEK has been described as a more technically challenging surgical procedure than DSAEK but also has been reported to provide better, post-transplant patient visual acuity, lower rejection rates and faster visual recovery.
<b>Descemet's Stripping (Automated) Endothelial Keratoplasty (DSAEK)</b>	The vast majority of EK today is DSAEK where the eye bank precuts the corneal tissue, or the surgeon precuts the corneal tissue in the operating room. The prepared (cut) graft is comprised of the donor tissue endothelium, Descemet's membrane and a thin, partial layer of the donor tissue's stroma.
<b>Donation rate</b>	The number of donors relative to the population.
<b>Donor (organ)</b>	A consented eligible donor from whom at least one organ was transplanted. <i>Note: Non-Canadian results presented may reflect a different definition.</i>
<b>Donor (tissue)</b>	A consented donor from which at least one tissue was recovered.
<b>Donor utilization</b>	The mean number of organs used from each donor from whom at least one organ was transplanted.
<b>Endothelial Keratoplasty (EK)</b>	A corneal transplant procedure where only a patient's compromised posterior layers of the cornea are removed and replaced by similar posterior corneal layers of a donor cornea.
<b>Neurological Determination of Death (NDD)</b>	A diagnosis and confirmation of death based on neurological criteria.
<b>Non Ocular Tissue</b>	Musculoskeletal, tendons, soft tissue, cardiac and skin tissue.
<b>Ocular Grafts</b>	Grafts produced from the eye including cornea and scleral grafts.
<b>Organs transplanted</b>	The number of individual organs transplanted.
<b>Patients waiting for transplants/patients on waitlist</b>	Patients who are awaiting a transplant and (a) can receive a transplant at any time or (b) cannot receive a transplant for a medical or other reason for a short time. Results are based on a snapshot of patients as of Dec. 31, 2017.
<b>Penetrating Keratoplasty (PK)</b>	Corneal transplant with replacement of all layers of the cornea, but retaining the peripheral cornea.
<b>Transplant</b>	A completed transplant procedure. <i>Note: Multiple organs may be transplanted as part of the same transplant procedure.</i>
<b>Transplant rate</b>	The number of transplants relative to the population.

# Appendix C: Pathway to deceased donation

For someone to become a deceased donor, he or she has to die in very specific circumstances. The opportunities for deceased donation remain limited as only about 1%-2% of deaths in hospital are eligible to donate. The deceased donation pathway shows the key steps in the chain of care that can lead to actual transplants and each step along the path must be optimized to minimize missed donation opportunities. Each step along the pathway represents an opportunity for maximizing organ utilization.

## Definitions

<b>Total population</b>	The total population of Canada.
<b>Deaths</b>	All deaths that occurred in Canada. Death refers to the permanent disappearance of all evidence of life at any time after a live birth has taken place. Still births are excluded.
<b>Hospital deaths</b>	Deaths that were determined in hospital, which includes deaths in an acute care facility including emergency departments (ED), intensive care units (ICU), wards, special care units. Excludes long term care facilities, deaths on scene or during transport after failed cardiopulmonary resuscitation.
<b>Ventilated deaths</b>	Persons who died while on positive pressure ventilation (invasive or non-invasive) at any time during the hospital episode during which the patient died.
<b>Brain injured ventilated deaths</b>	Deaths of brain injured ventilated patients.
<b>Potential donors</b>	Persons with a brain injury leading to death, who received mechanical ventilation at or near the time of death.
<b>Referred potential donors</b>	A potential donor who was referred to an organ donation organization (ODO).
<b>Eligible donors</b>	A referred potential donor who is suitable for a consent discussion (to be approached for organ donation).
<b>Approached eligible donors</b>	An eligible donor who is approached for donation (a consent discussion is held).
<b>Consented donors</b>	A person for whom consent was obtained for organ donation.
<b>Actual donors</b>	A consented donor from whom at least one organ was recovered for the purpose of transplantation.
<b>Utilized donors</b>	A consented donor who had at least one organ transplanted.

# Appendix D: Elements of a high performing deceased donation system

Through experience gained provincially, nationally and internationally it is generally accepted that fundamental key elements of a high performing deceased donation system exist, and when implemented, lead to improved performance. These elements include: adequate resources and infrastructure, availability of highly trained front-line specialists, leading practice guidelines and professional education, availability of performance data to inform improvement, adequate legislation, and the presence of appropriate accountability tools and structures. A general description of each is provided in the chart below.

## Definitions of key elements

### Accountability tools and structure

There are many ways to ensure and demonstrate accountability within the OTDT system in Canada. Examples of tools and structures that have been implemented to varying degrees include: implementation of death audits to identify if a donation opportunity was lost, use of potential donor referral criteria checklists, integrating best practices into accreditation guidelines, and the development and reporting of hospital performance using benchmarks and scorecards.

### Legislation

A fundamental aspect of an interprovincial donation and transplantation system is ensuring appropriate legislation is in place that optimizes donation and transplantation, including provisions for mandatory referral to the ODO, sharing of donor and recipient personal information for purposes of facilitating organ donation and transplantation and mandatory outcome data reporting for system performance measurement. Presumed consent or opt-out legislation is also often debated in terms of relative impact on system performance, however it is generally accepted that these other legislative elements are fundamental, as is the case in other national systems.

### Data and system performance improvement

To ensure quality care, performance must be monitored, measured and reviewed systematically. Foundational to improvement is defining metrics at the hospital, provincial and national level and working towards achieving performance targets. Opportunities exist to continue to build on performance data that is currently collected and available to continue to improve outcomes for patients.

### Leading practices and professional education

Donation and transplantation are low frequency, high impact events. Development and implementation of leading practices and clinical practice guidelines is essential to guide current practice and aid in the management of complexities of the donation and transplantation process. Special attention must be applied to ensure staff leading these processes at the bedside are highly trained. Public education and awareness is another important driver of change but must be supported by knowledgeable health professionals.

### Specialization

An essential aspect of a high-performing donation system is the availability of highly trained specialized staff such as donation coordinators and donation physicians. These specialists are required to coordinate progression along the donation pathway, implement best practices, support donor care, improve quality, and provide education. Donation specialist models have been implemented in many provinces to differing degrees.

### Adequate front-line resources and infrastructure

Adequate resources and infrastructure are necessary to ensure that the clinical donation process is supported at every step in the pathway from donor identification and referral through to transplant and post-transplant care. For example, without adequate hospital capacity, support for donor assessment and management, and availability of surgical retrieval and transplant teams, organ donation and transplantation may not proceed.

# Appendix E: Contributing programs

## Canadian organ donation organizations

### British Columbia

BC Transplant

### Alberta

Human Organ Procurement and Exchange (HOPE) Program

Southern Alberta Organ and Tissue Donation Program (SAOTDP)

### Saskatchewan

Saskatchewan Transplant Program

### Manitoba

Transplant Manitoba

### Ontario

Trillium Gift of Life Network

### Québec

Transplant Québec

### New Brunswick

New Brunswick Organ and Tissue Program, Horizon Health Network

### Nova Scotia

Nova Scotia Health Authority

### Newfoundland & Labrador

Organ Procurement and Exchange of Newfoundland and Labrador (OPEN)

## Canadian transplant programs

### British Columbia

BC Children's Hospital, Vancouver\*

St. Paul's Hospital, Vancouver\*

Vancouver General Hospital, Vancouver\*

Fraser Valley Transplant Clinic, Surrey

Royal Inland Hospital, Kamloops

Kelowna General Hospital, Kelowna

Penticton Regional Hospital, Penticton

Prince George Regional Hospital, Prince George

Kootenay Boundary Regional Hospital, Trail

Royal Jubilee Hospital, Victoria

### Alberta

University of Alberta Hospital, Edmonton\*

Alberta Children's Hospital, Calgary

Foothills Medical Center, Calgary\*

### Saskatchewan

St. Paul's Hospital, Saskatoon\*

### Manitoba

Health Sciences Centre, Winnipeg\*

The Children's Hospital of Winnipeg, Winnipeg

### Ontario

Hospital for Sick Children, Toronto\*

Kingston General Hospital, Kingston\*

London Health Sciences Centre University Hospital and Children's

Hospital of Western Ontario, London\*

The Ottawa Hospital, Ottawa\*

University of Ottawa Heart Institute, Ottawa

St. Joseph's Healthcare, Hamilton\*

St. Michael's Hospital, Toronto\*

Toronto General

### Québec

CHU Ste-Justine, Montreal\*

Institut de cardiologie de Montréal, Montréal

Institut Universitaire De Cardiologie

Montreal Children's Hospital

McGill University Health Centre, Royal Victoria Hospital, Montréal\*

McGill University Health Centre, Montreal's Children Hospital,

Montréal\*

CHUM — Hôpital Notre-Dame, Montréal\*

CHUM — Hôpital Saint-Luc, Montréal\*

CHU de Québec-Université Laval, L'Hôtel-Dieu de Québec, Québec City\*

CIUSSS de l'Est-de-l'Île-de-Montréal, Montréal\*

CIUSS de l'Estrie-CHUS, Hôpital Fleurimont, Sherbrooke\*

Intitut universitaire de cardiologie et de pneumologie de Québec (IUCPQ), Québec

### Nova Scotia

Queen Elizabeth II, Halifax\*

IWK Health Centre, Halifax

*\*Operates a living donation program*

## Appendix E: Contributing programs

### Canadian eye and tissue programs

#### British Columbia

Eye Bank of BC, Vancouver  
Island Health Bone Bank, Victoria

#### Alberta

Comprehensive Tissue Centre (CTC), Edmonton  
Southern Alberta Tissue Program (SATP), Calgary  
Lions Eye Bank of Calgary, Calgary

#### Saskatchewan

Saskatchewan Transplant Program

#### Manitoba

Tissue Bank Manitoba, Winnipeg  
Misericordia Eye Bank, Winnipeg

#### Ontario

Trillium Gift of Life Network has oversight of tissue in Ontario.

#### Ontario eye and tissue banks include:

- Hospital for Sick Children's Tissue Laboratory, Toronto
- Eye Bank of Canada (Ontario Division), Toronto
- Rubinoff Bone and Tissue Bank, Toronto
- Lake Superior Centre for Regenerative Medicine (RegenMed), Thunder Bay
- Ontario Professional Firefighters Skin Bank

#### Québec

Héma-Québec, Québec City  
Banque d'yeux du Québec, Québec City  
Banque d'yeux du CUO, Montréal

#### New Brunswick

New Brunswick Organ and Tissue Program, Tissue Division,  
Moncton  
New Brunswick Organ and Tissue Program, Ocular Division,  
Saint John

#### Nova Scotia Health Authority

Regional Tissue Bank