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kidney FOUNDATION

Health Economic Impact of Improving Chronic Kidney Disease Management in Canada

November 2025

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APPENDICES

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Preface

The Kidney Foundation of Canada engaged Deloitte to evaluate the current landscape of chronic kidney disease in Canada and assess the health economic impact of enhancing its management.

The objective of this report is to assess the overall burden of CKD in Canada and evaluate the potential benefits of improved disease management. This includes estimating the total direct and indirect costs associated with CKD, analyzing the economic impact of enhanced management strategies, and reviewing evidence on the cost-effectiveness of prevention and treatment programs — particularly for high-risk populations. The report also aims to inform policy and advocacy efforts by demonstrating the significant health and economic burden of CKD, and to support the recognition of CKD as a major chronic disease requiring coordinated long-term management.

The layout of the report is as follows:

Section 1 provides an introduction to chronic kidney disease (CKD), defining the disease, its various stages, and the underlying causes and risk factors. It provides a background on how CKD develops and progresses, as well as its clinical implications. The section also discusses why CKD is an important public health issue, highlighting its impact on individuals' health and quality of life. By establishing the foundational knowledge this section provides the context for the subsequent analysis.

Section 2 presents current data on how widespread CKD is within the Canadian population, including demographic trends and risk groups. It examines both the direct and indirect costs associated with CKD, such as healthcare spending on treatment, hospitalizations, and kidney replacement therapies, as well as broader economic impacts like lost productivity. The section draws on national and provincial data to illustrate the scale of the problem and the growing strain CKD places on Canada's healthcare system and economy. By quantifying the burden, this section highlights the urgency of addressing CKD more effectively.

This is followed by Section 3, which explores how better management of CKD could reduce the overall cost burden of the disease, and benefit patients, healthcare providers, and society at large. It reviews evidence on interventions that can slow disease progression, reduce complications, and improve patient outcomes, such as early detection, guideline-based care, and multidisciplinary management. The section the presents the potential economic benefits of improved CKD management, including cost savings and more efficient use of healthcare resources.

The conclusion is presented in Section 4, followed by an Appendix on the methodology of the report's computations.

Executive Summary

Chronic Kidney Disease (CKD) is an underrecognized but rapidly growing public health challenge in Canada, with profound implications for affected individuals and their support networks, the healthcare system, and the broader economy. This report provides an in-depth analysis of the current CKD landscape, quantifies its health and economic burden, and evaluates the impact and cost-effectiveness of enhanced management strategies.

Background and Scope

CKD is characterized by a gradual and often asymptomatic decline in kidney function, leading to increased morbidity, mortality, and healthcare costs as the disease progresses. The condition is often triggered by chronic conditions such as diabetes and hypertension, and therefore is particularly prevalent in older adults. CKD is classified into five stages, with the risk and cost of complications rising sharply in advanced stages, particularly end-stage kidney disease (ESKD), which requires dialysis or kidney transplantation for survival. The objectives of this report are to assess the prevalence and burden of CKD in Canada, quantify the direct and indirect costs associated with CKD and its management, and evaluate the potential benefits and economic impact of enhanced CKD management strategies, including early detection, optimized treatment, and increased access to transplantation and novel therapies.

Key Findings

CKD currently affects over 4 million Canadians, making it one of the most prevalent chronic diseases in the country. It is the 11th leading cause of death in Canada, directly responsible for close to 8,000 deaths in 2021. ESKD cases are also increasing, with over 49,000 Canadians living with ESKD in 2023, marking a 40% increase in cases since 2014. The prevalence of CKD is highest among older populations and is expected to rise as Canada's population ages and as risk factors such as diabetes — now affecting nearly 10% of adults — and hypertension — affecting 25% — become more common. By 2050, the number of Canadians with CKD is projected to exceed 6.2 million, with nearly half of these cases in moderate to severe stages (Stage 3 or higher).

The economic burden of CKD is substantial. The annual direct cost of CKD management in Canada is estimated at $7.6 billion in 2024, with the majority of expenses incurred in the later stages of the disease, particularly for dialysis and transplantation. Indirect costs — including lost productivity (e.g., loss of earnings), informal caregiving, transportation, and donor expenses — add an additional $4.1 billion annually. Collectively, the total annual economic burden (combining direct and indirect costs) now exceeds $11.7 billion and is projected to increase by 1.5 times by 2050, driven by demographic trends and the rising prevalence of risk factors.

Despite the scale of the problem, there are significant gaps in CKD management in Canada. More than 90% of early-stage CKD cases remain undiagnosed, limiting opportunities for early intervention. Screening is inconsistent, particularly among high-risk groups such as those with diabetes, hypertension, or in remote Indigenous communities. Adherence to best-practice guidelines in primary care is variable; for example, only 18% of patients receive recommended urine albumin testing within six months of diagnosis. Access to new, more effective therapies — such as SGLT2 inhibitors, MRAs, and GLP-1 receptor agonists — remains limited. Kidney transplantation, the gold standard for ESKD management, is constrained by long wait times, with a median wait of 3.5 years, despite accounting for 58% of all organ transplants in 2023.

Analysis of cost-effectiveness reveals that broad population-based CKD screening is not economically justified. However, targeted screening in high-risk populations, such as individuals with diabetes or Indigenous communities, is highly cost-effective and can significantly reduce progression to ESKD. Multidisciplinary care models and improved medication adherence have demonstrated reductions in hospitalizations, slower disease progression, and improved quality of life. New therapies can reduce the risk of CKD progression by 20 to 40 percent, yet uptake remains low due to systemic barriers, cost, and lack of awareness.

Modelling indicates that moderate improvements — such as a 10% increase in early detection, medication use, and transplant capacity — could reduce the number of ESKD cases by 7% and lower total cost by $1.1 billion (direct costs by $0.7 billion and indirect cost by $0.4 billion) annually by 2050. High-level improvements, such as a 20% increase in key management areas, could prevent 13% of ESKD cases and reduce total cost by $2.1 billion (direct costs by $1.3 billion and indirect costs by $0.8 billion) annually. Improving access to new drug treatments for CKD has a significant impact, substantially reducing the burden associated with end-stage CKD. If these high-level improvements are combined with broad access to new therapies, up to 32% of ESKD cases could be prevented, saving $4.1 billion ($2.3 billion in direct costs and $1.9 billion in indirect costs) each year by 2050. These interventions would also reduce CKD-related deaths, workforce disruption, and informal caregiving hours, yielding significant productivity gains and quality of life improvements.

Conclusions and Recommendations

CKD is a major and growing health and economic burden in Canada, with significant opportunities for improvement. Despite its increasing burden, Canada lacks comprehensive national surveillance data on the prevalence of CKD. Enhancing surveillance and data collection will enable better monitoring of CKD prevalence, outcomes, and disparities across Canada. The evidence of this report indicates that early identification and intervention, especially among high-risk groups, are critical for reducing disease progression and costs. Expanding access to new therapies and multidisciplinary care can further improve outcomes and reduce the need for costly late-stage interventions. Increasing kidney transplant capacity would improve survival, quality of life, and reduce long-term costs. By prioritizing these strategies, Canada can achieve substantial improvements in CKD outcomes, reduce the long-term economic burden, and support healthier, more productive communities.

1.0 Introduction

This section provides an overview of chronic kidney disease, including an outline of its five stages, and the progression to end stage kidney disease.

Overview of Chronic Kidney Disease

Chronic kidney disease (CKD) is an underrecognized but rapidly growing public health challenge in Canada, with profound implications for affected individuals and their support networks, the healthcare system, and the broader economy.

Kidney disease describes a variety of conditions and disorders that affect the kidneys. The kidneys contain tiny blood vessels called glomeruli, which serve as essential filters to remove waste and excess fluids from the bloodstream. Most kidney disease affect the filtering units of the kidneys—the nephrons—and damage their ability to eliminate wastes and excess fluids. CKD is a progressive condition characterized by a gradual decline in kidney function, resulting in the kidneys' reduced ability to filter wastes, balance electrolytes, and regulate fluid levels in the body.

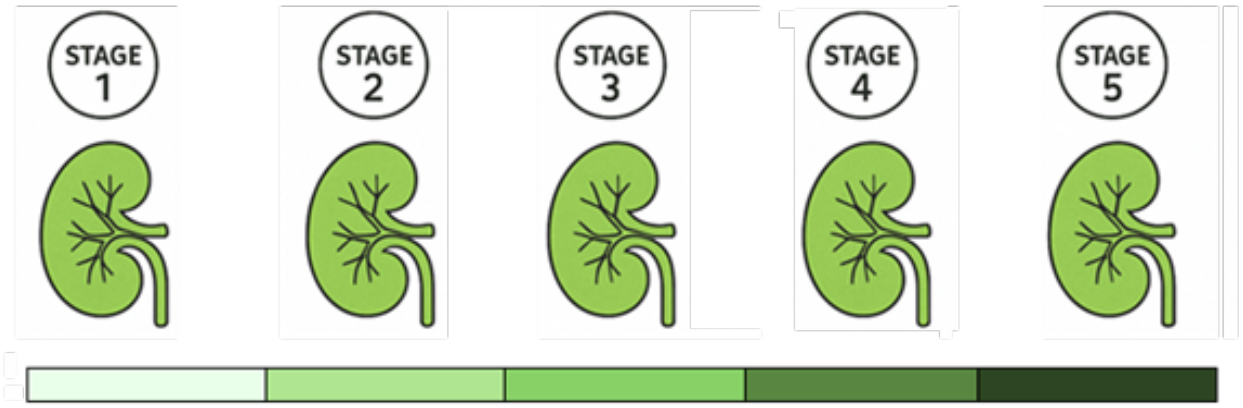
CKD typically develops due to underlying health issues such as diabetes, high blood pressure (hypertension), chronic inflammation (e.g., glomerulonephritis), or inherited disorders (e.g., polycystic kidney disease), and other causes. Over time, these conditions damage the nephrons, the kidney's filtering units, leading to progressive loss of kidney function.

Kidney disease can vary in severity, ranging from mild impairment to kidney failure—also known as end-stage kidney disease (ESKD). CKD develops gradually and without obvious symptoms, and therefore often goes undiagnosed until kidney function has significantly declined.

The Five Stages of Chronic Kidney Disease

Chronic kidney disease can progress over time without intervention. CKD is classified into five stages, each reflecting the level of kidney function and extent of kidney damage. As the disease advances through the stages, both its severity and the cost of treatment significantly increase.

Table 1. The Five Stages of CKD [1]



Stages	NORMAL	MILD	MODERATE	SEVERE	KIDNEY FAILURE
Kidney function	**> 60%***	**45% - 59%**	**30% - 44%**	**15% - 29%**	**< 15%**
Symptoms	No symptoms observed	No symptoms observed	In some people, early symptoms may occur and could include tiredness, poor appetite, and itching	In some people, tiredness, poor appetite and itching	Symptoms may include fatigue, nausea, swelling, difficulty breathing and itchiness
Treatment options	Identify cause and try to reverse it Monitor urine albumin-creatinine ratio (ACR) and estimated Glomerular Filtration Rate (eGFR)	Monitor urine ACR and eGFR**, blood pressure, general health and well-being Try to stop or slow down the worsening of kidney function	Monitor urine ACR, and eGFR, and continue to try to stop or slow the worsening of kidney function Learn more about CKD and treatment options	Monitor urine ACR, eGFR, and blood pressure, and continue to try to stop or slow the worsening of kidney function Discuss and plan for treatment choice: dialysis access, assessment for transplant, or information about conservative kidney management	Monitor eGFR and blood pressure, and continue to try to stop or slow the worsening of kidney function Plan for dialysis or kidney transplant or continue conservative kidney management (depending on symptoms) ***

* Normal unless there is an underlying issue, kidney damage or albumin in the urine.
** eGFR is based on sex at birth and not on gender
*** The timing of starting dialysis treatment depends on a large number of factors. This should be discussed with your doctors and healthcare team.

Source: The Kidney Foundation of Canada

CKD stages are tested primarily based on the Estimated Glomerular Filtration Rate (eGFR) and albuminuria. In early stages, CKD is diagnosed using an eGFR, with higher eGFR indicating better kidney function and lower eGFR signifying more advanced CKD. In advanced CKD, conditions are tested with eGFR along with a urine ACR. In stages 3 through 5, eGFR alone is usually sufficient for diagnosis.

For eGFR testing, estimation results are calculated using a blood test for creatinine, along with factors such as age, sex. The eGFR is a critical tool for detecting CKD and determining its stage, even before symptoms appear.

Early-stage treatment of CKD and preventive testing offer significant advantages by slowing disease progression, reducing the risk of complications (such as cardiovascular disease and kidney failure), and improving overall patient outcomes. Early detection through preventive testing enables timely interventions — such as lifestyle modifications, blood pressure and glucose control, and medication — which can help preserve kidney function, lower healthcare costs, and enhance quality of life for patients. While the cost of early-stage testing can vary across jurisdictions, however, early testing provides critical benefits in that an eGFR is automatically calculated and reported in standard bloodwork, and uACR is a readily available and inexpensive.

Table 2. CKD Stages by eGFR Categories[2]

Stages	eGFR (mL/min/1.73m^2)	Kidney Function
1	> = 90	Normal or high function
2	60-89	Mildly decreased function
3a	45-59	Mildly to moderately decreased function
3b	30-44	Moderately to severely decreased function
4	15-29	Severely decreased function
5	<15	Kidney failure

Source: Interdisciplinary Chronic Disease Collaboration, CKD Clinical Pathway.

End Stage Kidney Disease

End-stage kidney disease occurs when the kidneys can no longer effectively filter waste and fluids from the blood. At this point, treatment options include various forms of dialysis, kidney transplantation, or supportive care without dialysis, depending on the patient's condition and preferences. These treatments require significant ongoing effort and come with significant financial costs, placing a substantial burden on both patients and their families.

The financial burden of ESKD is much higher compared to earlier stages of CKD. CIHI (2016) reported that the annual cost to care for a patient on dialysis treatment is estimated at $60,000 to $100,000, depending on the modality[3]. A study by Koto et al. (2022) found that Nova Scotia, the health care costs in the year of a kidney transplant is over $100,000, encompassing surgery, hospitalization, and post-operative care[4]. Annual costs in subsequent years tapers to approximately$25,000, primarily due to the

[2] The Chronic Kidney Disease (CKD) Clinical Pathway. (2025). Classification of CKD.

[3] Canadian Institute for Health Information. High Risk and High Cost: Focus on Opportunities to Reduce Hospitalizations of Dialysis Patients in Canada. Ottawa, ON: CIHI; 2016. (The study relied on the Canadian Organ Replacement Register (CORR) to identify dialysis-dependent ESKD patients, as well as their demographic and dialysis-related information.)

need for immunosuppressive medications and routine follow-up care. Beyond direct medical expenses, ESKD also imposes considerable indirect costs due to lost productivity, reduced employment capacity, and the need for informal caregiving by family members.

In contrast, earlier-stage CKD management costs—such as monitoring, lifestyle modifications, and medication—are significantly less. Preventing the progression of CKD to ESKD and avoiding the need for dialysis or transplantation can lead to major cost savings for the healthcare system and reduce the emotional and financial strain on patients and caregivers.

Kidney Replacement Therapies

Kidney Replacement Therapies (KRTs) are medical treatments that substitute the normal blood-filtering functions of the kidneys in patients with renal failure. The primary KRTs include:

- Hemodialysis (HD): Blood is filtered through a machine called a dialyzer to remove waste and excess fluids. This can be performed in a dialysis center (in-center hemodialysis) or at home (home hemodialysis).
- Peritoneal Dialysis (PD): The lining of the abdomen, known as the peritoneum, is used to filter blood by introducing a cleansing fluid that removes wast and excess fuids, which is then drained. This method is typically performed at home.
- Kidney Transplantation: This surgical procedure involves implanting a healthy kidney from a living or deceased donor into a patient with kidney failure. The transplanted kidney takes over the filtration functions, eliminating the need for dialysis. Post-transplant, patients require lifelong immunosuppressive medications to prevent organ rejection.

[4] Koto, Prosper, Tennankore, Karthik, Vinson, Amanda, Krmpotic, Kristina, Weiss, Matthew J, Theriault, Chris, Beed, Stephen. What are the short-term annual cost savings associated with kidney transplantation? Cost Effectiveness and Resource Allocation. 2022 May 3;20:20

2. Prevalence and Cost Burden of CKD in Canada

This section provides an overview of the prevalence of chronic kidney disease in Canada and the level of projected cases through to 2050. It examines both the direct disease management costs and the indirect costs to highlight the growing burden that CKD places on Canada's healthcare system and the economy.

Over 4 million Canadians are living with CKD

Kidney disease is the 11th leading cause of death in Canada

2.1 Prevalence of Chronic Kidney Disease in Canada

Chronic kidney disease is a significant public health concern in Canada and around the world. CKD affects around 10-15% of the global adult population.[5] According to a study by Arora et al. (2013) estimated approximately 12.5% of Canadian adults were living with CKD[6]. Kidney disease was the 11th leading cause of death in Canada, directly responsible close to 8,000 deaths in 2021[7,8,9].

In 2024, more than 4 million Canadian adults aged 18 and older were living with CKD. Approximately 60% (2.8 million) Canadians are estimated to be living with Stage 1 and 2 CKD. Of the total CKD population, about 40% (1.8 million) have moderate to severe CKD, classified as Stage 3 and above.

Most CKD cases in Canada are in the early stages, when kidney damage is present, but function is still normal or only mildly impaired (See Figure 1). Because early-stage CKD is typically asymptomatic, many individuals remain undiagnosed and untreated until the disease advances to Stage 3 or beyond, when clinical symptoms become more noticeable, and management becomes more complex.

CKD prevalence rises significantly with age, with a large proportion of mid to advanced stage cases occurring in older adults (See Figure 2). Notably, 80% of individuals with Stage 4 or 5 CKD are over the age of 60. This trend reflects both the natural decline in kidney function associated with aging and the higher prevalence of comorbid conditions such as hypertension and diabetes in older populations.

Despite its increasing burden, Canada lacks comprehensive national surveillance data on the

[5] GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2020 Feb 29;395(10225):709-733. doi: 10.1016/S0140-6736(20)30045-3. Epub 2020 Feb 13. PMID: 32061315; PMCID: PMC7049905.

[6] Arora P, Vasa P, Brenner D, Iglar K, McFarlane P, Morrison H, Badawi A. Prevalence estimates of chronic kidney disease in Canada: results of a nationally representative survey. CMAJ. 2013 Jun 11;185(9):E417-23. doi: 10.1503/cmaj.120833. Epub 2013 May 6. PMID: 23649413; PMCID: PMC3680588.

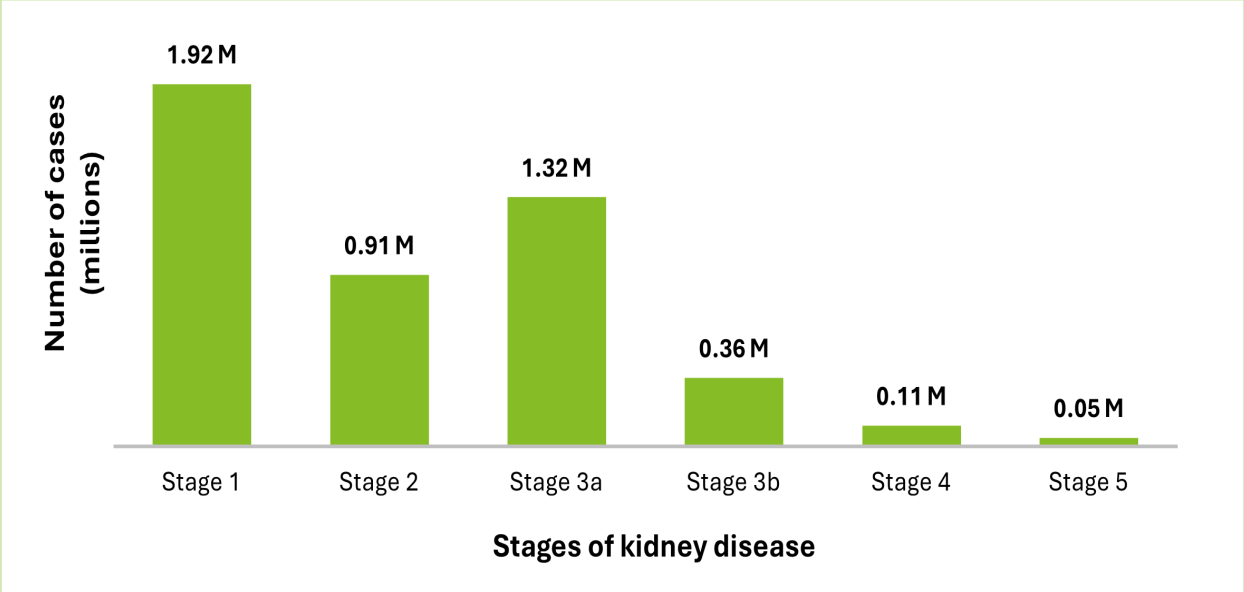
[7] Kitzler TM, Chun J. Understanding the Current Landscape of Kidney Disease in Canada to Advance Precision Medicine Guided Personalized Care. Can J Kidney Health Dis. 2023 Feb 13;10:20543581231154185. doi: 10.1177/20543581231154185. PMID: 36798634; PMCID: PMC9926383.

[8] https://kidney.ca/KFOC/media/images/PDFs/Facing-the-Facts-2023-HIghlights-from-the-Annual-Statistics-on-Organ-Donation.pdf

[9] Global Burden of Disease Study 2021 (GBD 2021) Causes of Death and Nonfatal Causes Mapped to ICD Codes: https://ghdx.healthdata.org/record/ihme-data/gbd-2021-cause-icd-code-mappings.

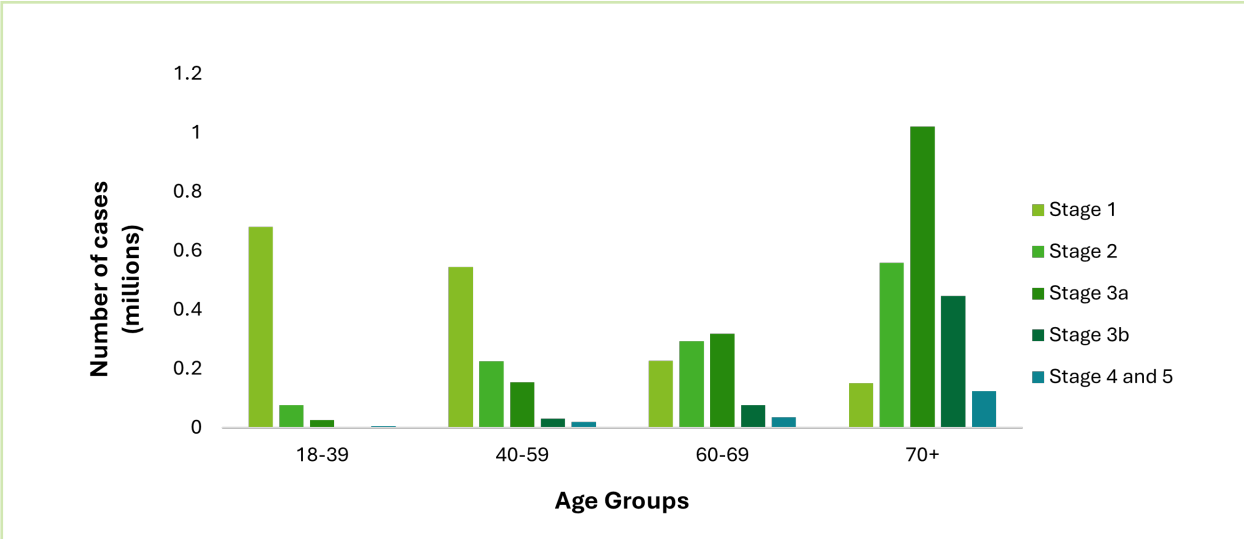
prevalence of CKD by stage. To estimate the prevalence of CKD by stage in Canada, data from the U.S. Kidney Disease Surveillance System is utilized as a reference. Any estimation must also consider the demographic and healthcare differences between the two countries. This approach allows for a more informed estimation of CKD prevalence across different stages within Canada.

Figure 1. Estimated Chronic Kidney Disease Cases in Canada in 2024, by stage



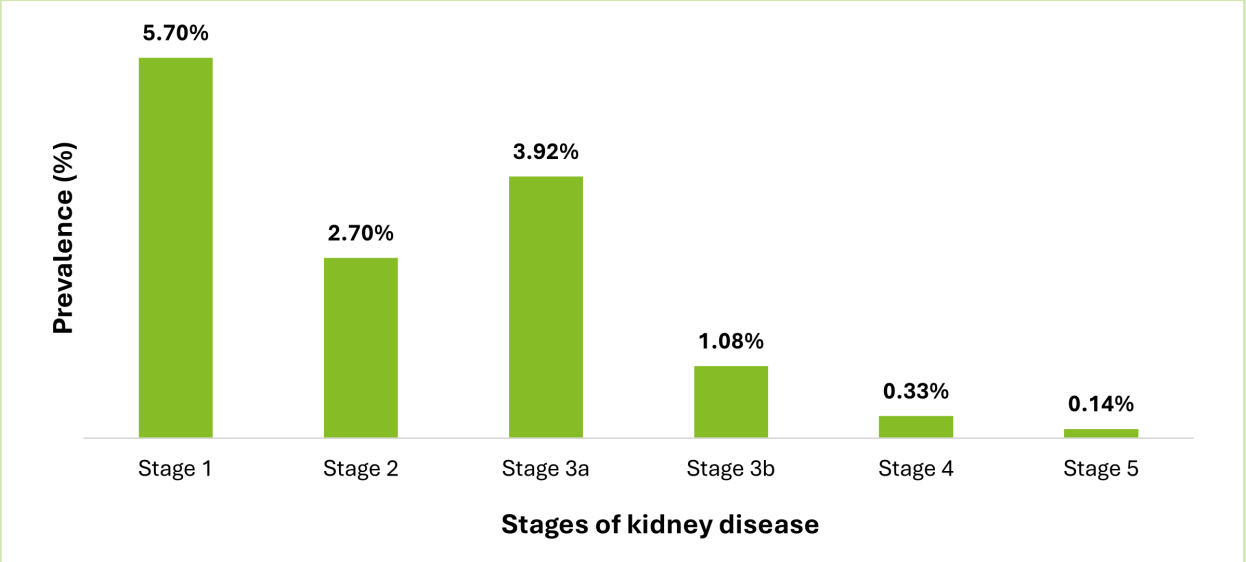
Source: Statistics Canada, CDC, Deloitte Analysis.
Note: Prevalence by stage and age groups was estimated using CDC's Kidney Surveillance System - Trends in Prevalence of CKD among U.S. Adults.

Figure 2. Estimated Chronic Kidney Disease Cases in Canada in 2024, by stage and age group



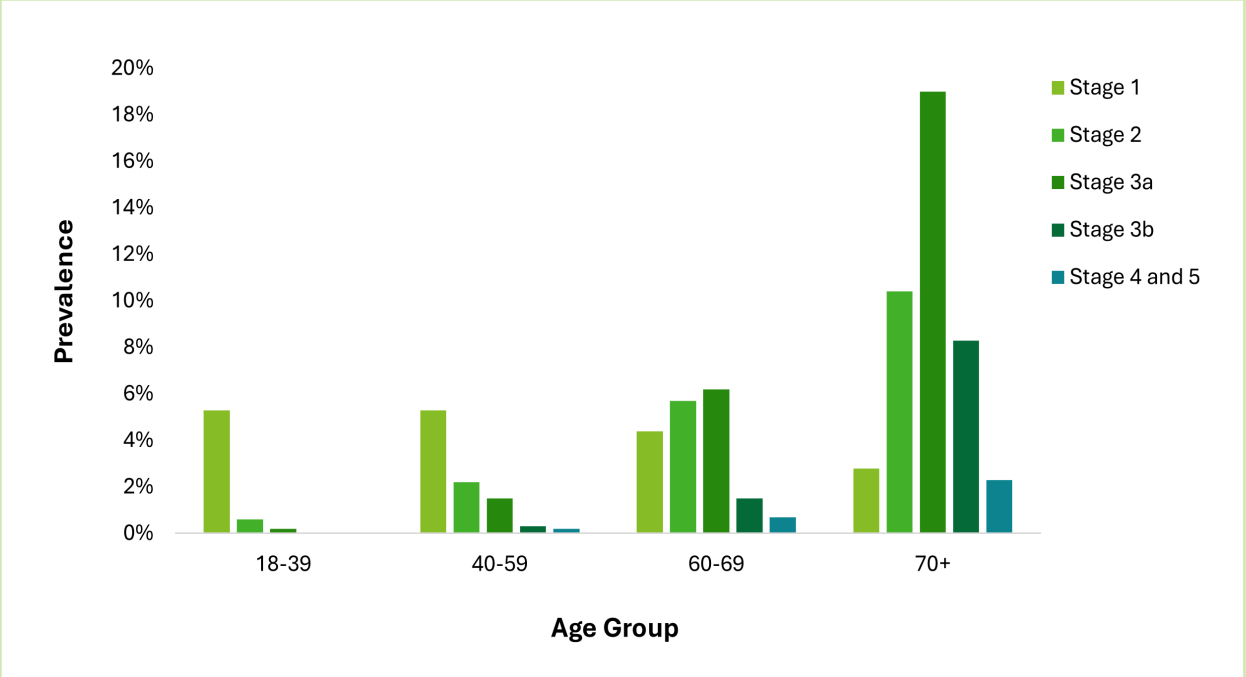
Source: Statistics Canada, CDC, Deloitte Analysis.
Note: Prevalence by stage and age groups was estimated using CDC's Kidney Surveillance System - Trends in Prevalence of CKD among U.S. Adults.

Figure 3. Prevalence of CKD by Stage in the United States (2017-2020)



Source: CDC Kidney Disease Surveillance System

Figure 4. Prevalence of CKD by Stage by Age Group in the United States (2003-2020)



Source: CDC Kidney Disease Surveillance System

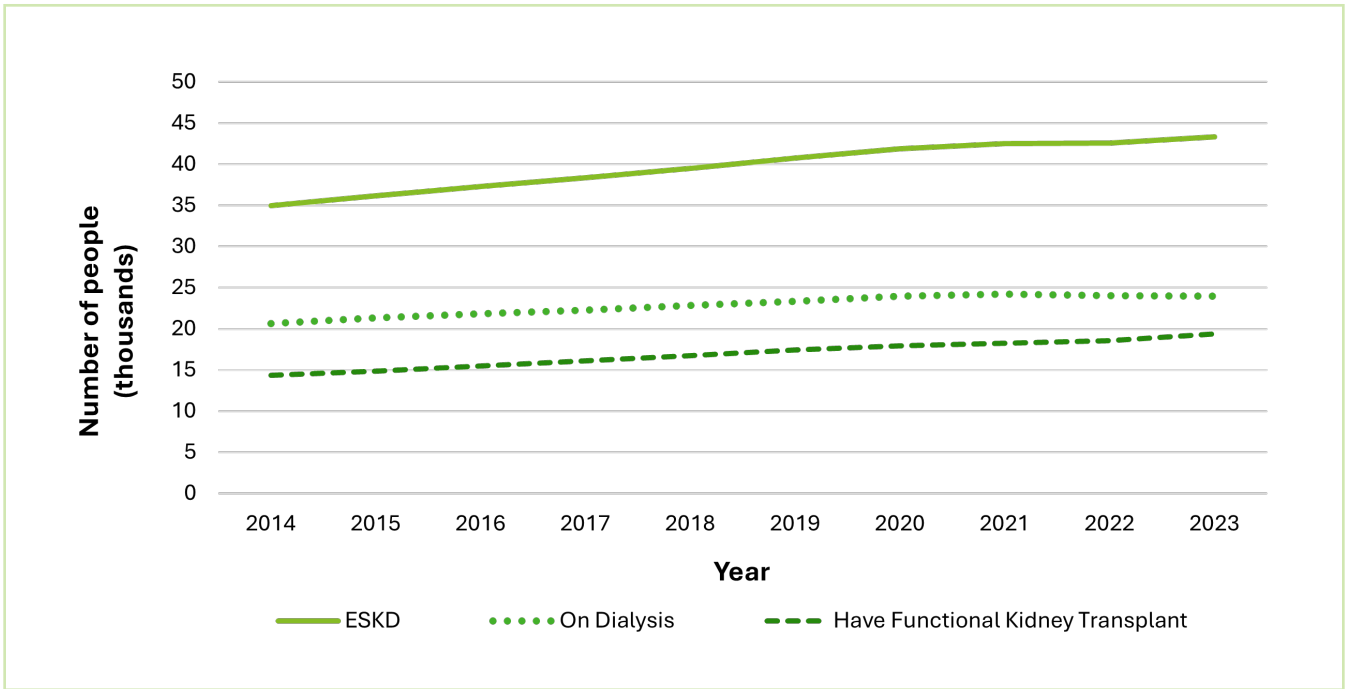
End-Stage Kidney Disease

The number of ESKD cases in Canada has been increasing over the past decades. According to the most recent CIHI data from 2023, more than 49,000 Canadians (excluding Quebec) were living with ESKD, representing 40% increase since 2014 which experienced approximately 35,000 cases. Among these individuals, in 2023, 29,906 Canadians were undergoing dialysis, and another 19,356 were living with a functioning kidney transplant[10].

According to the Canadian Organ Replacement Register, there were 1,929 kidney transplants performed in Canada in 2024, representing 58% of all organ transplants. Moreover, this also marks a 23% increase compared to the 1,627 kidney transplants conducted in 2018[11].

There were 1,929 kidney transplants performed in 2024, accounting for 58% of all organ transplants in Canada.

Figure 5. Number of People Living with ESKD and Treatment Modalities in Canada, 2013 to 2024



Source: CIHI. Deloitte Analysis.
Note: Numbers excludes Québec. Québec data not available.

[10] Canadian Institute for Health Information. (2024). Organ replacement in Canada: CORR annual statistics.
[11] Canadian Institute for Health Information. (2024). Summary statistics on organ transplants, wait-lists and donors.

2.2 Projection of CKD Cases in Canada

The projection of CKD cases can be determined by the product of the projections of CKD prevalence by age and the population by age. Even if prevalences should remain stable, Canada's growing and aging population will ensure a growing number of CKD cases in Canada and provide challenges for healthcare planning and resource allocation in managing this disease.

Over 6.2 million Canadians are projected to have CKD by 2050, with nearly half being moderate to severe cases.

CKD Trends in Canada

The prevalence of CKD by age can be expected to be relatively stable in the future, with the possibility of slight increase over time. This supposition is supported by data from the U.S. CKD Surveillance System, which reported a crude CKD prevalence of 12.9% during 2001–2004 and a slight increase to 13.9% between 2017 and March 2020, indicating a relatively stable trend over time[12]. A study by Bello et al. (2019) on the prevalence of stage 3 to 5 CKD in a primary care setting suggests that the overall prevalence of CKD in Canada remained relatively stable during the study period from 2011 to 2014[13]. As such, for our prevalence projection, we assume that CDK prevalence by age group will remain stable in the future.

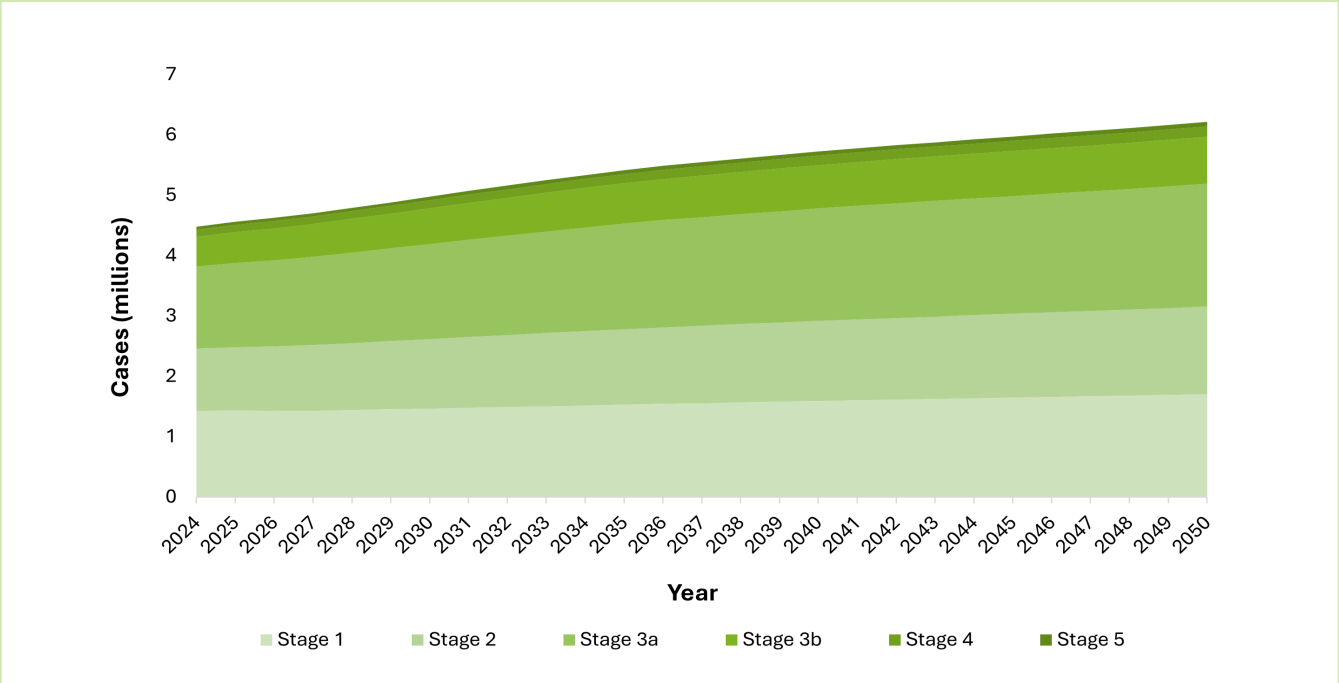
While prevalence of CKD by age can be expected to remain stable in the future, the total number of cases in Canada is projected to increase significantly due merely to population growth and aging demographics. An aging population will generally increase the total number of CKD cases in the population as prevalence are much higher in older age groups compared younger age groups.

Based on Statistics Canada's population projections (2024–2050) Canada's population is expected to grow by 3% from 2024 to 2030 and by 20% from 2024 to 2050. The 70+ year old cohort is expected to experience the most significant growth in population, growing by 24% from 2024 to 2030 and by 68% from 2024 to 2050[14].

Even with stable prevalence rates, the growth in CKD cases is expected to be large (See Figure 6). As a result of population growth and aging demographics, the number of Canadians living with CKD is expected to grow and reach 4.98 million by 2030, 5.72 million by 2040 and 6.22 million by 2050. By 2030, 47% of all CKD cases are projected to be in stage 3 or higher. This percentage will grow to nearly half (49%) by 2050[15], indicating a significant shift towards a higher prevalence of mid-to-late-stage CKD among patients.

[12] CDC. (2024). Kidney Disease Surveillance System.
[13] Bello AK, Ronksley PE, Tangri N, Kurzawa J, Osman MA, Singer A, Grill A, Nitsch D, Queenan JA, Wick J, Lindeman C, Soos B, Tuot DS, Shojai S, Brimble S, Mangin D, Drummond N. Prevalence and Demographics of CKD in Canadian Primary Care Practices: A Cross-sectional Study. Kidney Int Rep. 2019 Jan 21;4(4):561-570. doi: 10.1016/j.ekir.2019.01.005. PMID: 30993231; PMCID: PMC6451150.
[14] Statistics Canada. (2025). Population Projections for Canada (2024 to 2074).
[15] Chertow GM, Correa-Rotter R, Eckardt KU, Kanda E, Karasik A, Li G, Christiansen CF, Stafylas P, Holt SG, Hagen EC, Garcia Sanchez JJ, Barone S, Cabrera C, Nolan S, Coker T, Webber L, Retat L. Projecting the clinical burden of chronic kidney disease at the patient level (Inside CKD): a microsimulation modelling study. EClinicalMedicine. 2024 May 2;72:102614. doi: 10.1016/j.eclinm.2024.102614. PMID: 39010981; PMCID: PMC11247147.

Figure 6. Forecasted Chronic Kidney Disease Cases by Stage in Canada: 2024-2050



Source: Statistics Canada, Inside CKD, Deloitte Analysis

Table 3. Forecasted Chronic Kidney Disease Cases by Stage in Canada, 2030, 2040, 2050

CKD Stages	2030	2040	2050
Stage 1	1.47 M	1.59 M	1.71 M
Stage 2	1.15 M	1.32 M	1.45 M
Stage 3a	1.57 M	1.86 M	2.04 M
Stage 3b	0.59 M	0.72 M	0.78 M
Stage 4	0.14 M	0.16 M	0.17 M
Stage 5	0.06 M	0.07 M	0.07 M
Total	**4.98 M**	**5.72 M**	**6.22 M**

While our projections assume that the prevalence of CKD would remain stable throughout the projection period, this assumption is relatively conservative, as it does not account for potential small increases in prevalence over time. Diabetes, a major risk factor for CKD, is on the rise, and while not accounted for in projection, its increasing prevalence will further contribute to the rising number of CKD in the coming years.

Critical Risk Factors

Although CKD prevalence has remained relatively stable in the past, its major risk factors —diabetes, and hypertension — are all on the rise. As these risk factors continue to increase, they are expected to impact prevalence and drive the growing number of CKD cases.

Ultimately, the overall projection in the number of CKD cases in Canada is expected to rise even further, driven by the increasing prevalence of major risk factors such as diabetes and hypertension.

Table 4. Trends of Major Risk Factors of CKD

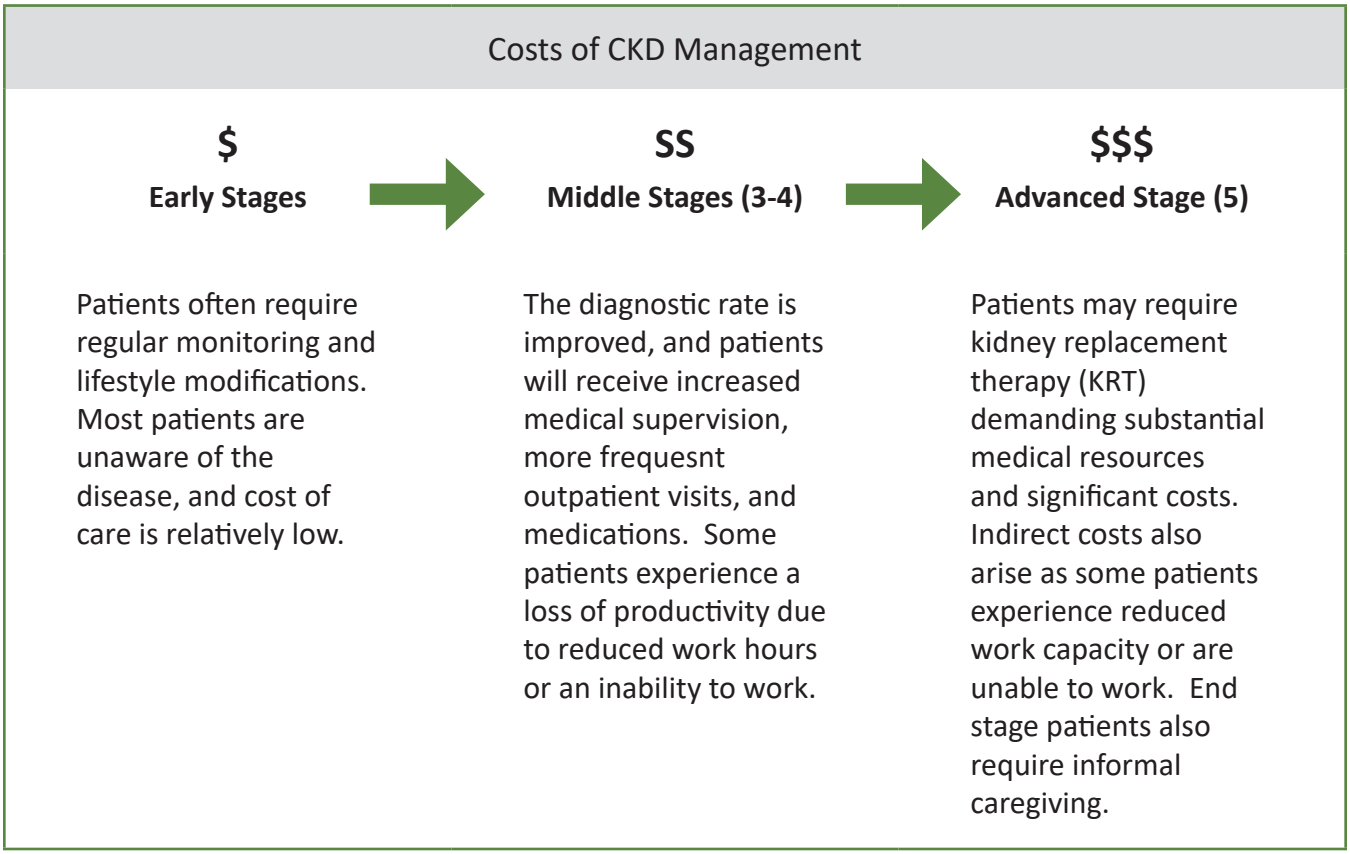
Trends of Major Risk Factors of CKD	
Aging Natural decline in kidney function associated with older age, increasing vulnerability to CKD	Canada's population is aging steadily, with a growing proportion of adults aged 65 and older. This trend is expected to continue, with the share of the population aged 65 and over projected to rise from 19% in 2024 to 26% by 2070.
Diabetes A metabolic disorder that can damage kidney blood vessels over time	Diabetes prevalence is increasing due to rising obesity rates and lifestyle factors; more Canadians are affected. The prevalence of diabetes raised from 8.2% in 2014 to 9.6% in 2023.
Hypertension High blood pressure damages kidney blood vessels and accelerates CKD progression	Hypertension affects 25% of Canadian adults. Hypertension prevalence remains high; lifestyle and dietary factors contribute to its ongoing burden in Canada.

2.3 Cost Burden of CKD Management in Canada

While the number of CKD cases is a key driver of the overall cost burden of the disease, the cost of managing each case is equally important in determining the total economic costs.

Disease management costs of CKD vary widely depending on the severity of the disease, ranging from relatively low costs in its early, milder stages to significantly higher expenses as the disease progresses (Figure 7). In the early stages of CKD, treatment often involves regular monitoring, lifestyle modifications, and the use of medications. However, as CKD advances to its later stages, particularly to ESKD, the financial burden increases dramatically. Treatment for ESKD typically requires dialysis or kidney transplantation, both of which entail substantial medical expenses and ongoing maintenance. These elevated costs highlight the importance of early detection and management to slow disease progression and mitigate the financial impact on patients, their families, and the healthcare system.

Figure 7. Cost Burden of CKD Management



The economic burden of CKD includes both direct and indirect costs. Direct costs refer to the medical expenses associated with managing the disease, including hospitalizations, physician consultations, outpatient services, prescription medications, dialysis treatments, and kidney transplants. Indirect costs encompass the broader economic impacts of CKD, such as lost productivity (e.g., loss of earnings) due to illness, reduced quality of life, and expenses related to informal caregiving — often involving time and effort from family members. These financial pressures are shared among public health systems, private insurance providers, and patients themselves, highlighting the importance of early intervention and effective management strategies to curb the growing economic impact of CKD. While direct medical costs are substantial, indirect costs also represent a significant portion of the overall economic burden to society, further underscoring the urgency of comprehensive prevention and management efforts for CKD.

Direct Costs

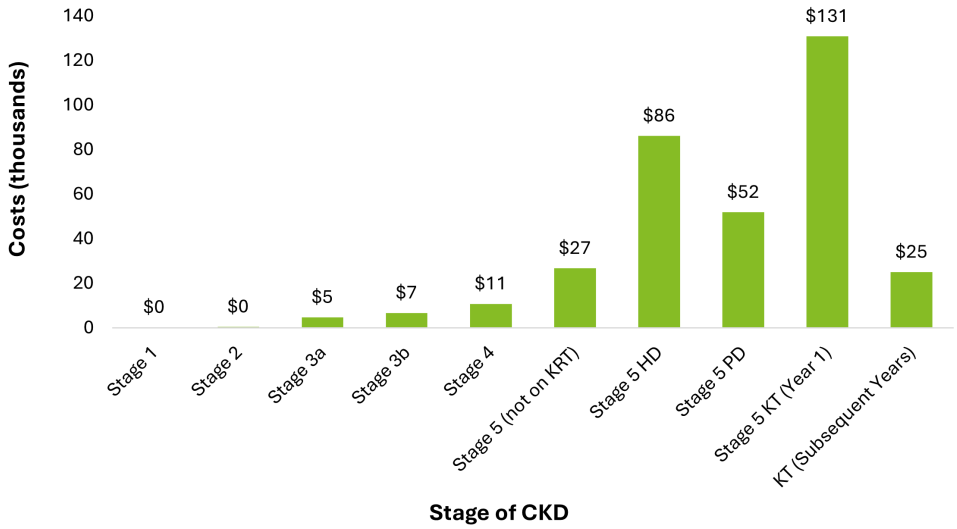
Studies estimating the direct costs of CKD in Canada vary greatly depending on methodology. A study by Manns et al. (2017) estimated that the annual healthcare cost to treat of patients living with CKD was approximately $14,634 per patient. However, this estimate includes expenses related to other comorbidities. As a result this can be viewed as an upper bound estimate of costs. Aggregating across all patients, the total health care costs, based on this study, for Canadians with CKD exceeded $40 billion in 2017[17].

To provide a more precise assessment of the cost burden of CKD, it is important to examine direct costs specifically associated with CKD care. These direct costs include routine management and treatment expenses for patients in the early and mid-stages of the disease, as well as the significantly higher costs for advanced-stage treatments such as dialysis and kidney transplantation. These expenditures represent a substantial burden on both the healthcare system and patients.

A valuable tool that can be used to obtain estimates of direct costs of CKD management in Canada is the Inside CKD model. This modelling tool, developed in collaboration with health economists and clinical experts, supports policy makers, healthcare providers, and stakeholders in evaluating the current and future economic burden of CKD.

According to economic burden estimates from the Inside CKD model, per-patient disease management costs increase rapidly as patients progress through the disease stages, with dialysis and kidney transplantation imposing the most significant financial burden on the healthcare system (See Figure 8)[18]. The direct management cost of diagnosed CKD patients in 2024 ranged from around $5,000 to $7,000 per year for stage 3 patient to over $ 50,000 per year for stage 5 patient on dialysis. The cost of first year of kidney transplant can exceed $100,000, with reduced management cost in subsequent years at around $25,000. This underscores the importance of early intervention and effective management strategies to reduce or halt the progression to late-stage CKD and mitigate its economic impact.

Figure 8. Disease Management Costs of Diagnosed Patients by CKD Stage and KRTs in Canada



Source: Inside CKD, Deloitte Analysis.
HD: Hemodialysis; PD: Peritoneal Dialysis; KRT: Kidney Replacement Therapy; KT: Kidney Transplantation
a. All costs were converted to 2024 CAD dollars, updated using PPP factor and CPI.
b. Estimated cost of regular follow-ups.

[16] Manns B, Hemmelgarn B, Tonelli M, Au F, So H, Weaver R, Quinn AE, Klarenbach S; for Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease. The Cost of Care for People With Chronic Kidney Disease. Can J Kidney Health Dis. 2019 Apr 4;6:2054358119835521.
[17] Manns B, Hemmelgarn B, Tonelli M, Au F, So H, Weaver R, Quinn AE, Klarenbach S; for Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease. The Cost of Care for People With Chronic Kidney Disease. Can J Kidney Health Dis. 2019 Apr 4;6:2054358119835521.
[18] Jha V, Al-Ghamdi SMG, Li G, Wu MS, Stafylas P, Retat L, Card-Gowers J, Barone S, Cabrera C, Garcia Sanchez JJ. Global Economic Burden Associated with Chronic Kidney Disease: A Pragmatic Review of Medical Costs for the Inside CKD Research Programme. Adv Ther. 2023 Oct;40(10):4405-4420.

Indirect Costs

A large portion of patients with severe chronic kidney disease are unable to work due to their condition.

End-stage CKD patients require informal care, placing additional demand on patients and their families.

Indirect costs refer to the broader economic impacts of CKD that extend beyond direct medical expenses. These costs include lost productivity due to reduced work capacity or early retirement, informal caregiving expenses such as the time spent by family members providing unpaid care, transportation costs, and other out-of-pocket expenses incurred while managing the condition. CKD can lead to productivity loss as patients experience declining health, fatigue, and frequent medical appointments, reducing their ability to work. In the end stages of CKD, many patients require intensive caregiving, often relying on family members or informal caregivers for daily assistance.

Globally, there are a variety of studies assessing these indirect costs associated with CKD. However, these studies often involve differing methodologies and definitions, leading to variations in reported estimates. In Canada, data on indirect costs related to CKD care are limited. A study by Zelmer JL (2007) estimated that the indirect cost associated with ESKD in Canada was $0.6 billion in 2007[19].

While estimates for indirect costs are available, many of these studies do not account for a variety of indirect health burdens on both patients and caregivers. To provide a more comprehensive evaluation of indirect costs, our computation includes four major categories of indirect costs with available evidence. These include indirect costs from productivity loss due to morbidity and mortality, informal caregiving costs, transportation costs, and expenses incurred by living donors:

> Productivity loss due to CKD is significant, especially in later stages, as many patients cannot continue working because of their illness. A study by Manns et al. (2017) found that for those with kidney failure and on dialysis, 80% were unable to work. Furthermore, it was estimated that Canadians with advanced kidney failure are receiving disability benefit payments of at least $217 million annually[20]. Patient with kidney transplant had a slightly higher employment rate, however, 66% were still unable to work due to their health[21].

> Informal Care Cost: A significant portion of caregivers reported making job-related decisions due to caregiving responsibilities, including retiring early, reducing work hours, or quitting their job. A study by Michalopoulos et al. (2022) in the US found most patients reported receiving paid or unpaid care because of their health condition, with an overall average of 14.2 and 11.3 hours per week among the anemia and no anemia patients (anemia is a common complication in patients with CKD), respectively[22].

[19] Zelmer JL. The economic burden of end-stage renal disease in Canada. Kidney Int. 2007 Nov;72(9):1122-9. doi: 10.1038/sj.ki.5002459. Epub 2007 Aug 15. PMID: 17700643.

[20] Manns B, McKenzie SQ, Au F, Gignac PM, Geller LI. The financial impact of advanced kidney disease on Canada pension plan and private disability insurance costs. Can J Kidney Health Dis. 2017;4:2054358117703986. doi: 10.1177/2054358117703986.

[21] Kirkeskov L, Carlsen RK, Lund T, Buus NH. Employment of patients with kidney failure treated with dialysis or kidney transplantation-a systematic review and meta-analysis. BMC Nephrol. 2021 Oct 22;22(1):348. doi: 10.1186/s12882-021-02552-2. PMID: 34686138; PMCID: PMC8532382.

[22] Michalopoulos SN, Gauthier-Loiselle M, Aigbogun MS, Serra E, Bungay R, Clynes D, Cloutier M, Kahle E, Guérin A, Farag YMK, Wish JB. Patient and Care Partner Burden in CKD Patients With and Without Anemia: A US-Based Survey. Kidney Med. 2022 Mar 7;4(4):100439. doi: 10.1016/j.xkme.2022.100439. PMID: 35402892; PMCID: PMC8988003.

> Transportation costs are a significant burden for dialysis patients, particularly those undergoing in-centre hemodialysis. A report by The Kidney Foundation of Canada in 2017 estimated that patients paid an average of $684 per year specifically on travel and parking[23].

> Kidney donations incur costs for living kidney donors. A study by Klarenbach et al. (2014) found that the average out-of-pocket costs borne by kidney donors in Canada was $3,268, covering direct expenses such as travel, accommodation, medication, and other medical costs related to the donation process[24].

These indirect cost elements were incorporated to provide a more comprehensive estimate of the overall indirect burden of CKD in Canada. The analysis focuses primarily on productivity losses experienced by both patients and their caregivers, along with other major components such as transportation costs and costs associated with living kidney donation, where data were available. It is important to note, however, that additional indirect costs — such as the psychological impact of living with a chronic illness, including stress, anxiety, and depression experienced by patients and their families, or financial loss incurred by kidney donors[25] — were not captured in this analysis.

2.4 Projection of CKD Cost Burden in Canada

The estimates of the direct and indirect costs per case, coupled with the projection of the number CKD cases over time, allows us to estimate the current and future cost burden of CKD in Canada. The projected cost burden of CKD is calculated by multiplying the per-patient costs by the projected number of individuals in each stage of CKD across the forecast period. Together, these calculations provide a comprehensive view of how CKD will impact Canada's healthcare system and economy through to 2050.

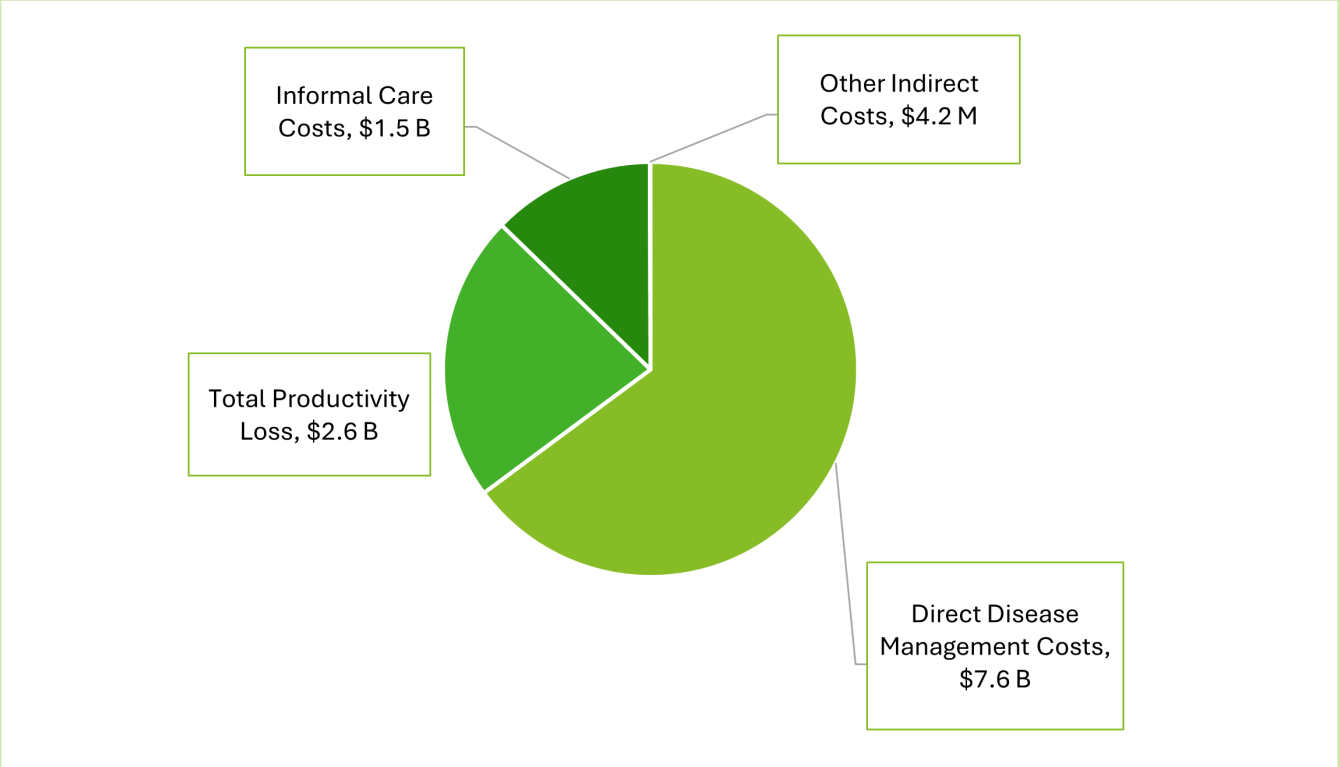
Direct costs are linked to the medical expenses associated with managing CKD – and include hospitalizations, outpatient visits, physician services, medications, dialysis, and kidney transplantation – and they increase significantly with disease severity, particularly for patients in stage 5, when kidney replacement therapies are required. For each stage, per-patient direct costs are applied to the projected number of patients (as outlined in Section 2.2) to estimate annual and cumulative healthcare system costs.

Indirect costs that capture the broader economic impact of CKD – including lost productivity due to morbidity and premature mortality, time spent by informal caregivers, and associated out-of-pocket expenses such as transportation, also vary by CKD stage, with higher burdens observed in advanced stages where patients experience greater disability and care needs. Similar to direct costs, per-patient indirect costs are multiplied by the projected number of patients in each stage to estimate the full societal burden.

[23] The Kidney Foundation of Canada. (2017). Burden of Out-of-Pocket Costs.
[24] Klarenbach S, Gill JS, Knoll G, Caulfield T, Boudville N, Prasad GV, Karpinski M, Storsley L, Treleaven D, Arnold J, Cuerden M, Jacobs P, Garg AX; Donor Nephrectomy Outcomes Research (DONOR) Network. Economic consequences incurred by living kidney donors: a Canadian multi-center prospective study. Am J Transplant. 2014 Apr;14(4):916-22. doi: 10.1111/ajt.12662. Epub 2014 Mar 5. PMID: 24597854; PMCID: PMC4285205.
[25] Fu , Rui, Sekercioglu Nigar , Hishida Manabu, Coyte Peter C; Economic Consequences of Adult Living Kidney Donation: A Systematic Review. April 2021, Pages 592-601, Volume 24, Issue 4

In 2024, the total cost burden of CKD management in Canada amounted to $11.7 billion. This includes an estimated $7.6 billion of direct disease management costs of diagnosed CKD patients, with the majority of expenses attributable to interventions for ESKD, including dialysis and kidney transplantation (See Figure 9). In addition to direct medical costs, indirect costs impose a significant economic burden, with a total estimate $4.1 billion in 2024. Of this amount, the costs from productivity losses due to morbidity and mortality are estimated to be $2.6 billion, representing a 64% share of total indirect costs. This includes $2.0 billion from patients unable to work, $195 million due to reduced work capacity, and $421 million from premature deaths. Informal caregiving is the second-largest contributor to indirect costs, with an estimated $1.5 billion in economic burden due to the time spent caring for CKD patients. Additional indirect costs include transportation expenses, with dialysis patients incurring an estimated $4.2 million. Living kidney donors facing $2.1 million in transportation expenses.

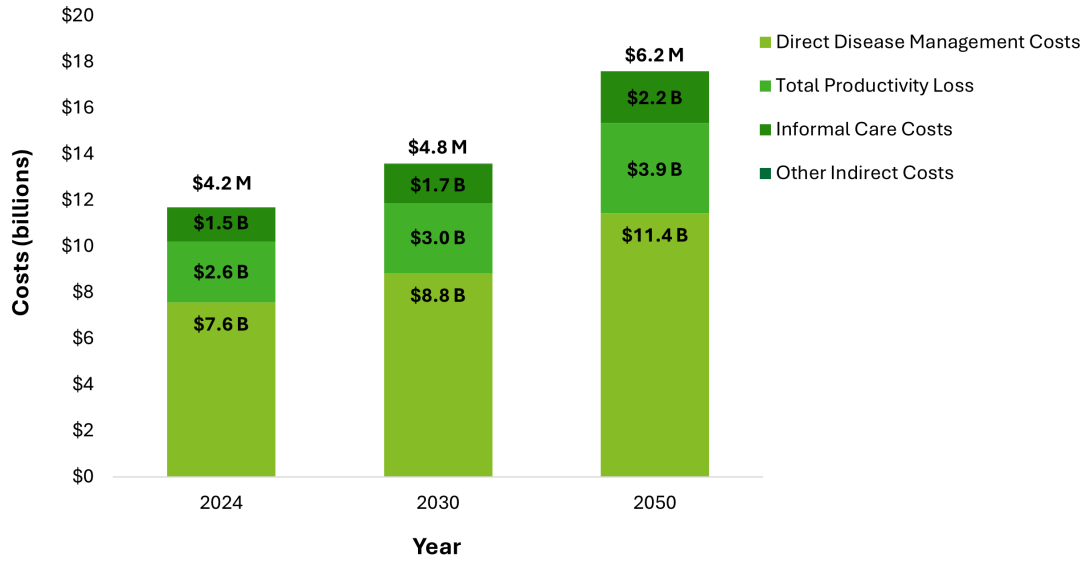
Figure 9. Estimated Economic Burden of CKD, 2024



Source: Inside CKD, Deloitte Analysis.

Projecting ahead, economic burdens associated with CKD are expected to increase by 1.5 times by 2050 due to the rising number of cases. The direct cost of CKD management is projected to rise from $7.6 billion in 2024 to $8.8 billion by 2030 and $11.4 billion by 2050 (all figures in 2024 Canadian dollars). Meanwhile, indirect costs are expected to grow from $4.1 billion in 2024 to $4.8 billion by 2030 and $6.2 billion in 2050. The increasing trend in direct and indirect costs will resulting in a total cost burden of $13.6 billion by 2030 and $17.6 billion by 2050 (Figure 10).

Figure 10. Direct and Indirect Disease Management Costs of CKD 2024, 2030, 2050



Source: Inside CKD, Deloitte Analysis.
Note: All values in 2024 Canadian dollars.

In summary, under current trends, the prevalence and economic burden of CKD in Canada are both substantial and projected to grow significantly in the coming decades. With over 4 million Canadians currently affected and the number expected to exceed 6.2 million cases by 2050, CKD represents a major public health challenge, particularly as the population ages and risk factors such as diabetes and hypertension become more prevalent. The total cost burden of CKD is projected to increase from $11.7 billion in 2024 to $13.6 billion by 2030 and $17.6 billion by 2050. The direct healthcare costs for CKD management are estimated at $7.6 billion in 2024 and are projected to reach $11.4 billion by 2050, while indirect costs — including productivity losses and informal caregiving — are expected to rise from $4.1 billion to $6.2 billion over the same period. These trends underscore the urgent need for comprehensive prevention, early detection, and effective management strategies to mitigate the rising health and economic burden of CKD on individuals, families, and the Canadian healthcare system.

It should be noted that these estimates represent a conservative evaluation of the burden of illness. They do not include costs that may be difficult to measure, such as the burden of mental anguish from patients or caregivers, or other out-of-pocket expenses tied to caregiving which could represent a considerable portion of expenses. They also do not include the comorbidity costs associated with CKD. As identified in the Manns et al. (2017) study, the total costs of CKD including comorbidities was estimated to reach $40 billion in 2017. The current analysis is designed to isolate and measure the economic and health impact attributable specifically to CKD. Including the costs associated with comorbidities can obscure the specific burden of illness, as these costs may overlap with other conditions. Moreover, accurately attributing healthcare utilization and costs to one specific illness becomes complex when multiple conditions coexist, making it difficult to distinguish which costs that are directly related to CKD. To maintain clarity and methodological rigor, this study excluded comorbidity costs from the analysis. Nevertheless, these additional costs which were not included in the analysis can be significant. As such, the evaluated costs can be viewed as the lower bound estimate of costs.

3. Impact of Improving CKD Management

While the cost burden of CKD in Canada is projected to increase significantly, there are opportunities to lower the impact of these cost burden increases through improved CKD management. This section provides alternative cost burden projection estimates based on different CKD management improvement scenarios.

Over 90% of early-stage CKD is undiagnosed in Canada.

Targeted screening could have a high (19%) detection rate in high-risk groups.

3.1. Cost-effectiveness of CKD Management

There are various gaps in CKD management which if addressed can help reduce the burden costs of CKD in Canada. These include ensuring early detection, improving patient care, address access and uptake in new treatment drugs for CKD, and enhancing timely access to kidney replacement therapies.

Addressing Gaps in CKD Management

Gaps in CKD management remain significant across the continuum of care in Canada. Early detection is critical to identify CKD in its initial stages through routine screenings such as blood and urine tests. Yet, most early-stage patients remain undiagnosed due to inconsistent screening practices and limited awareness of CKD risk factors. Implementing targeted screening for high-risk groups, such as those with diabetes or hypertension, is a cost-effective strategy that can facilitate earlier interventions. Patient care strategies that can slow CKD progression — such as diet and lifestyle counselling, regular monitoring and ensuring medication adherence — are not consistently implemented. Disparities in care and inconsistent adherence to guidelines further exacerbate this challenge. Enhancing patient education and strengthening system-level interventions can improve outcomes and reduce healthcare costs. Optimal kidney replacement therapy (KRT) for ESKD is essential but often delayed due to high costs and limited resources. Addressing these gaps is vital to improve patient outcomes and alleviate the growing economic burden of CKD in Canada.

Figure 11. Gaps in CKD Management

Early Detection

A significant percentage of CKD patients remain undiagnosed in the early stages. Undiagnosed CKD leads to accelerated disease progression, resulting in more patients reaching advanced stages faster. In Canada, awareness of CKD remains low, leading to late diagnoses and missed opportunities for early intervention. For instance, the REVEAL-CKD study by Peach, E. et al. (2023) utilizing the CPCSSN database found that, among patients with stage 3 CKD and hypertension, 30,523 (94.8%) did not have a recorded CKD diagnosis within six months after their initial assessment[26]. In another study by Yeo SC et al. (2023), the prevalence of unrecognized CKD (Stage 3 and above) in a targeted screening program (18.8%) was higher than the prevalence based on population-based screening (7%)[27].

Early detection of CKD is crucial for improving patient outcomes and reducing healthcare costs. Identifying CKD in its initial stages allows for timely interventions, such as lifestyle modifications and medical treatments, which can slow disease progression and prevent complications, ultimately leading to a reduction in healthcare costs. Economic evaluations of CKD screening programs have been conducted in various countries, yielding insights into their cost-effectiveness[28]. Broad population-based CKD screening is found not to be cost-effective in Canada[29]. However, targeted screening for high-risk groups (e.g., individuals with diabetes, Indigenous populations in remote areas) is a viable and cost-effective strategy based on Canadian studies[30]. Furthermore, there is evidence to indicate that remote Indigenous communities can benefit the most from CKD screening due to limited healthcare access and high disease prevalence. (See Table 5)

[26] Galbraith LE, Ronksley PE, Barnieh LJ, Kappel J, Manns BJ, Samuel SM, Jun M, Weaver R, Valk N, Hemmelgarn BR. The See Kidney Disease Targeted Screening Program for CKD. Clin J Am Soc Nephrol. 2016 Jun 6;11(6):964-972. doi: 10.2215/CJN.11961115. Epub 2016 May 19. PMID: 27197905; PMCID: PMC4891759.

[27] Peach, E., Wittbrodt, E., Barone, S., Chen, H., Järbrink, K., & Tangri, N. (2023). REVEAL-CKD: PREVALENCE OF UNDIAGNOSED STAGE 3 CHRONIC KIDNEY DISEASE IN PATIENTS WITH DIAGNOSED HYPERTENSION IN CANADA. Journal of Hypertension, 41(Suppl 3), e264.

[28] Yeo SC, Wang H, Ang YG, Lim CK, Ooi XY. Cost-effectiveness of screening for chronic kidney disease in the general adult population: a systematic review. Clin Kidney J. 2023 Jun 12;17(1):sfad137. doi: 10.1093/ckj/sfad137. PMID: 38186904; PMCID: PMC10765095.

[29] Manns B, Hemmelgarn B, Tonelli M, Au F, Chiasson TC, Dong J, Klarenbach S; Alberta Kidney Disease Network. Population based screening for chronic kidney disease: cost effectiveness study. BMJ. 2010 Nov 8;341:c5869. doi: 10.1136/bmj.c5869. PMID: 21059726; PMCID: PMC2975430.

[30] Ferguson TW, Tangri N, Tan Z, James MT, Lavallee BDA, Chartrand CD, McLeod LL, Dart AB, Rigatto C, Komenda PVJ. Screening for chronic kidney disease in Canadian indigenous peoples is cost-effective. Kidney Int. 2017 Jul;92(1):192-200. doi: 10.1016/j.kint.2017.02.022. Epub 2017 Apr 20. PMID: 28433383.

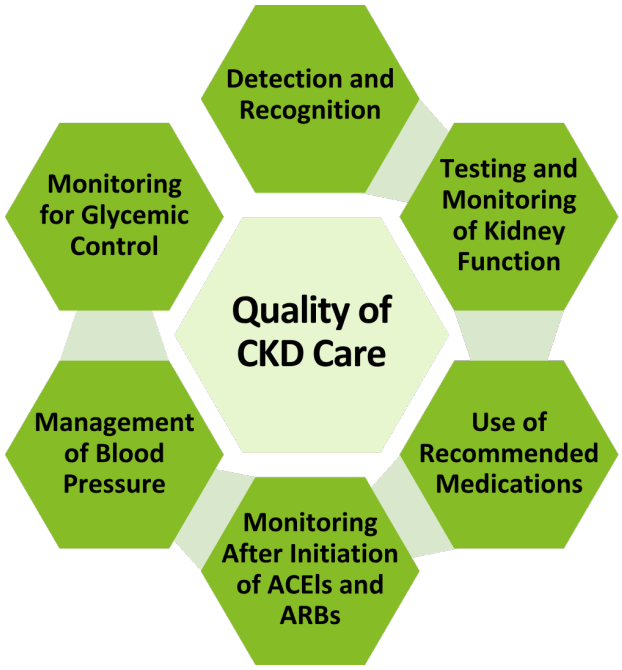
Table 5. Evidence of Population-Based and Targeted Screening in Canada

Cost-Effectiveness of Population-Based CKD Screening in Canada	Targeted CKD Screening in Indigenous Communities
• Incremental Cost: $463 (Canadian dollars in 2009) • QALY gained: 0.0044 • Reduction of ESRD over lifetime, patients with diabetes: 1741-1796 (per 100,000 screened) A cost-effectiveness study by Manns et al. (2010) evaluated whether nationwide CKD screening is economically viable. The findings indicated that population-wide CKD screening was not cost-effective, including in subgroups such as individuals with hypertension or older adults. However, targeted screening of individuals with diabetes was found to be cost-effective, with an ICER comparable to other publicly funded health interventions in Canada. The study suggested that rather than broad population screening, a more focused approach targeting high-risk individuals—particularly those with diabetes—would be a more economically sound strategy.	• Air-access-only community ICER: $7,790 per QALY • Road-accessible community ICER: $52,480 per QALY A study by Ferguson et al. (2017) assessed the cost-utility of CKD screening and treatment in rural Indigenous populations, using a decision-analytic Markov model. The results showed that targeted screening was cost-effective, particularly in remote air-access-only communities, where the incremental cost-effectiveness ratio (ICER) was $7,790 per quality-adjusted life year (QALY). In road-accessible communities, where CKD prevalence was lower, the ICER was higher at $52,480 per QALY. The study concluded that CKD screening in high-risk Indigenous populations can be a cost-effective strategy, particularly in geographically isolated regions with limited healthcare access.

Improving Patient Care

While most patients receive with CKD high-quality care, there are notable gaps in treatment. A study by Bello et al. (2019) examined the quality of CKD management in Canadian primary care settings, revealing that while certain aspects of CKD care were adequately managed, significant deficiencies were identified, particularly in albuminuria testing and appropriate medication use[31]. Out of 12 evaluated quality indicators for CKD management, only 4 were met by 75% or more of the patient cohort. A mere 18.4% of patients received a urine albumin test within six months of CKD diagnosis, and only 39.4% underwent a follow-up test after an abnormal initial result. Patients aged 18 to 49 were less commonly prescribed recommended medications (7.7%), compared to those aged 75 to 84 (44.2%).

Figure 12. Key Indicators of Quality of CKD Care



A better model of care for CKD, incorporating multidisciplinary management, patient education, and early intervention, can improve patient outcomes by slowing disease progression, reducing hospitalizations, and enhancing quality of life. There are limited studies related to the cost-effectiveness of CKD intervention. However, a study by Hopkins RB et al. (2011) illustrated that comprehensive CKD management involving collaborative approach with nephrologists and nurses for mild to moderate CKD patients are cost-effective to the healthcare system (Table 6).[32] Furthermore, evidence presented by Lin E et al. (2018) showcases that multidisciplinary care approach for stage 3-4 CKD patients led to fewer hospitalizations, improved quality of life, and reduced healthcare costs.[33]

Thus, taken altogether, addressing the gaps in patient care is a critical factor that will be fruitful in reducing the burden costs of CKD.

[31] Bello AK, Ronksley PE, Tangri N, Kurzawa J, Osman MA, Singer A, Grill AK, Nitsch D, Queenan JA, Wick J, Lindeman C, Soos B, Tuot DS, Shojai S, Brimble KS, Mangin D, Drummond N. Quality of Chronic Kidney Disease Management in Canadian Primary Care. JAMA Netw Open. 2019 Sep 4;2(9):e1910704. doi: 10.1001/jamanetworkopen.2019.10704. PMID: 31483474; PMCID: PMC6727682.

Table 6. Evidence of CKD Care in Canada

Cost-effectiveness of the Canadian Prevention of Renal and Cardiovascular Endpoints Trial (CanPREVENT)	Cost-effectiveness of a multidisciplinary care in mild to moderate CKD in the United States
• Total program cost per patient per year: Nursing: $293 + Nephrologist: $172.58 • $1515 saved in hospitalization cost per patient for 2 years • $476 saved in societal cost per patient for 2 years • 0.046 QALYs gained per patient The Canadian Prevention of Renal and Cardiovascular Endpoints Trial (CanPREVENT) was a multicenter, randomized controlled trial that evaluated the effectiveness of a multifaceted intervention for patients with stage 3 to 4 (CKD). The intervention involved a collaborative approach between nephrologists and nurses, focusing on managing risk factors associated with the progression of kidney and cardiovascular diseases. Over a two-year period, the study found that patients receiving the intervention had fewer hospital days compared to those receiving standard care, leading to reduced healthcare costs. Additionally, the intervention group reported a higher quality of life.	• MDC added 0.23 over usual care • $51,285 per QALY gained • MDC could yield greater improvements in health in younger than older patients. A study by Lin et al. (2018) conducted in the US assessed the cost-effectiveness of multidisciplinary care for patients with mild to moderate (stage 3 and 4) CKD. The study simulated a theoretical Medicare-funded program involving a team of healthcare providers, including nephrologists, advanced practitioners, educators, dietitians, and social workers. Such multidisciplinary care could reduce the progression to end-stage renal disease, extend life expectancy, and be cost-effective, especially for middle-aged to elderly patients. The program remained cost-effective even under varying assumptions of effectiveness and cost, supporting the implementation of multidisciplinary care programs for CKD patients.

[32] Hopkins RB, Garg AX, Levin A, Molzahn A, Rigatto C, Singer J, Soltys G, Soroka S, Parfrey PS, Barrett BJ, Goeree R. Cost-effectiveness analysis of a randomized trial comparing care models for chronic kidney disease. Clin J Am Soc Nephrol. 2011 Jun;6(6):1248-57. doi: 10.2215/CJN.07180810. Epub 2011 May 26. PMID: 21617091; PMCID: PMC3109919.

[33] Lin E, Chertow GM, Yan B, Malcolm E, Goldhaber-Fiebert JD. Cost-effectiveness of multidisciplinary care in mild to moderate chronic kidney disease in the United States: A modeling study. PLoS Med. 2018 Mar 27;15(3):e1002532. doi: 10.1371/journal.pmed.1002532. PMID: 29584720; PMCID: PMC5870947.

Address Access and Uptake in New Treatment Drugs for CKD

New treatments for chronic kidney disease are highly effective in slowing disease progression; however, their utilization remains critically low.

Traditionally, the management of CKD has relied heavily on medications that target the renin-angiotensin-aldosterone system (RAAS), particularly Angiotensin-Converting Enzyme Inhibitors (ACE inhibitors) and Angiotensin II Receptor Blockers (ARBs). These drugs have been foundational in controlling blood pressure and reducing proteinuria, thereby slowing CKD progression.

In recent years, the therapeutic landscape for CKD has expanded with the introduction of novel agents that offer additional benefits beyond those provided by ACE inhibitors and ARBs. These include the SGLT2 Inhibitors, Mineralocorticoid Receptor Antagonists and GLP-1 Receptor Agonists. Recent clinical trials have evaluated the efficacy of new pharmacological agents in treating CKD, particularly focusing on their significant ability to prevent the disease progression to end-stage kidney disease. Most trials followed CKD patients for approximately two years and found that the risk of kidney disease progression was reduced by 20% to 40%. (See Table 8)

Despite these significant benefits, gaps in treatment,access and uptake remains a critical issue. A recent Alberta study by Lau D et al. (2023) revealed that in 2019, just 7.1% of adults with diabetes and chronic kidney disease who were eligible for SGLT2 inhibitors actually received them, while usage among CKD patients without diabetes was nearly zero[34]. Factors associated with underuse included older age, lower hemoglobin A_1c levels, females, lower neighborhood income, rural residence, and recent hospital admissions. These findings highlight a significant treatment gap that underscores the need to improve access and uptake of better medication in CKD care.

Table 7. Treatment Drugs for CKD

Drug Class	Generic Name	Brand Name	Health Canada Approval
ACE Inhibitors (ACEi)	Enalapril Ramipril Lisinopril	Vasotec Altace Prinivil, Zestril	Prior to 2000 Prior to 2000 Prior to 2000
Angiotensin II Receptor Blockers (ARB)	Losartan Irbesartan Valsartan	Cozaar Avapro Diovan	Prior to 2000 Prior to 2000 Prior to 2000
SGLT2 Inhibitors	Dapagliflozin Empagliflozin	Forxiga Jardiance	August 2021 January 2024
Mineralocorticoid Receptor Antagonists	Finerenone	Kerendia	October 2022
GLP-1 Receptor Agonists*	Semaglutide	Ozempic Wegovy	January 2018 November 2021

Source: Health Canada, FDA

*In Jan 2025, GLP-1 Receptor Agonists were approved in the U.S. for CKD. In Canada, GLP-1 Receptor Agonists were approved for weight management and gycemic control for diabetes.

[34] Lau D, Pannu N, Yeung RO, Scott-Douglas N, Klarenbach S. Use of sodium-glucose cotransporter 2 inhibitors in Alberta adults with chronic kidney disease: a cross-sectional study identifying care gaps to inform knowledge translation. CMAJ Open. 2023 Jan 31;11(1):E101-E109. doi: 10.9778/cmajo.20210281. PMID: 36720493; PMCID: PMC9894653.

Table 8. Effectiveness of New Drugs for CKD

Drug	Clinical Effectiveness on CKD Progression
Empagliflozin – SGLT2i	In the EMPA-KIDNEY trial, over a median of 2 years of follow-up, progression of kidney disease or death from cardiovascular causes occurred in 432 patients (13.1%) in the empagliflozin group and in 558 patients (16.9%) in the placebo group[35].
Dapagliflozin – SGLT2i	The DAPA-CKD trial demonstrated that dapagliflozin reduced the risk of a sustained decline in eGFR, ESKD, or death from renal or cardiovascular causes by compared to placebo in patients with CKD, Over a median of 2.4 years, a primary outcome event occurred in 197 of 2152 participants (9.2%) in the dapagliflozin group and 312 of 2152 participants (14.5%) in the placebo group[36].
Finerenone – MRA	In the FIDELIO-DKD trial, finerenone reduced the risk of kidney failure. During a median follow-up of 2.6 years, a primary outcome event occurred in 504 of 2833 patients (17.8%) in the finerenone group and 600 of 2841 patients (21.1%) in the placebo group[37].
Semaglutide (Ozempic) – GLP-1	A recent clinical trial of Semaglutide showed among the 3533 participants who underwent randomization (1767 in the semaglutide group and 1766 in the placebo group), median follow-up was 3.4 years, after early trial cessation was recommended at a prespecified interim analysis. The risk of a primary-outcome event was 24% lower in the semaglutide group than in the placebo group (331 vs. 410 first events). Major kidney disease events decreased from 23.2% in placebo group to 18.7% of Semaglutide group[38].

[35] The EMPA-KIDNEY Collaborative Group; Herrington WG, Staplin N, Wanner C, Green JB, Hauske SJ, Emberson JR, Preiss D, Judge P, Mayne KJ, Ng SYA, Sammons E, Zhu D, Hill M, Stevens W, Wallendszus K, Brenner S, Cheung AK, Liu ZH, Li J, Hooi LS, Liu W, Kadowaki T, Nangaku M, Levin A, Cherney D, Maggioni AP, Pontremoli R, Deo R, Goto S, Rossello X, Tuttle KR, Steubl D, Petrini M, Massey D, Eilbracht J, Brueckmann M, Landray MJ, Baigent C, Haynes R. Empagliflozin in Patients with Chronic Kidney Disease. N Engl J Med. 2023 Jan 12;388(2):117-127. doi: 10.1056/NEJMoa2204233. Epub 2022 Nov 4. PMID: 36331190; PMCID: PMC7614055.

[36] Svensson MK, Tangri N, Bodegård J, Adamsson Eryd S, Thuresson M, Sofue T. Dapagliflozin treatment of patients with chronic kidney disease without diabetes across different albuminuria levels (OPTIMISE-CKD). Clin Kidney J. 2024 Apr 4;17(8):sfae100. doi: 10.1093/ckj/sfae100. PMID: 39165293; PMCID: PMC11333959.

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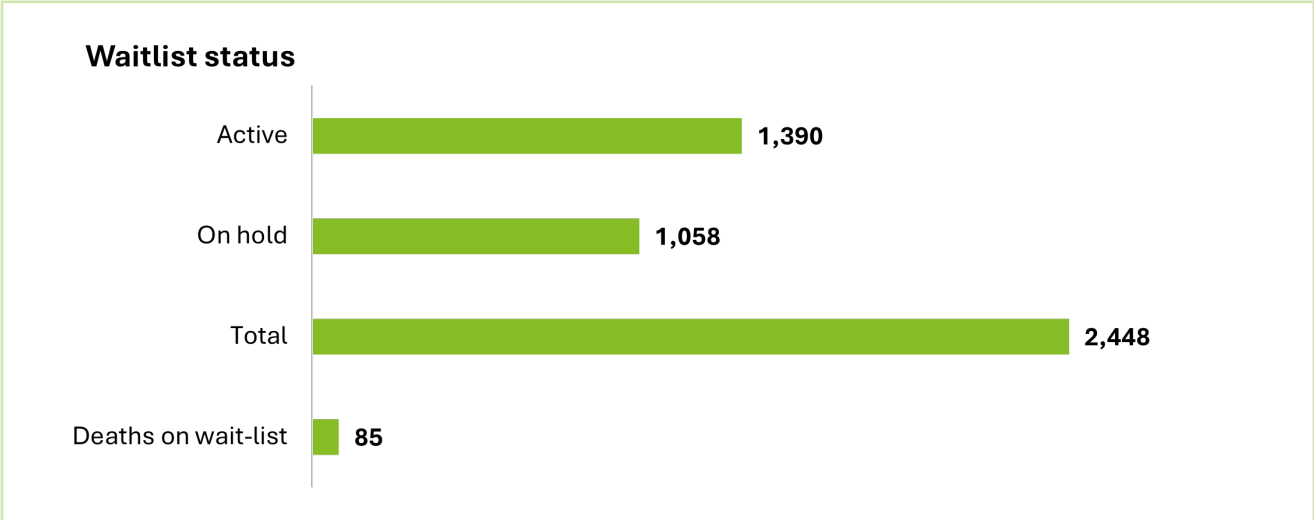
[38] Perkovic V, Tuttle KR, Rossing P, Mahaffey KW, Mann JFE, Bakris G, Baeres FMM, Idorn T, Bosch-Traberg H, Lausvig NL, Pratley R; FLOW Trial Committees and Investigators. Effects of Semaglutide on Chronic Kidney Disease in Patients with Type 2 Diabetes. N Engl J Med. 2024 Jul 11;391(2):109-121. doi: 10.1056/NEJMoa2403347. Epub 2024 May 24. PMID: 38785209.

Enhancing Timely Access to Kidney Replacement Therapies

Kidney transplantation offers substantial benefits compared to dialysis, including improved survival rates, enhanced quality of life, and freedom from the time-consuming nature of dialysis treatments. In 2024, kidney transplants accounted for 58% of all organ transplants in Canada, highlighting the critical role of transplantation in managing ESKD.[39] Despite recent improvements in wait times, many patients continue to experience extended delays in receiving a suitable donor organ. The median wait time for a kidney transplant in Canada currently stands at approximately 3.5 years. Enhancing timely access to kidney transplantation for ESKD patients would not only improve patient outcomes and quality of life but also significantly reduce the overall economic burden on the healthcare system.

Table 13. Number of ESKD Patient and Death on Waitlist for Kidney Transplant, 2023



Source: CIHI, Annual statistics on organ replacement in Canada 2023

3.2. Developing Alternative Scenarios for Cost Burden Estimates

In developing alternative scenarios for estimating potential improvements in cost burdens, we focus on three key areas that would impact improvements in CKD management: enhancing early diagnosis, optimizing medication use, and expanding kidney transplant capacity. Based on these key areas, we modelled three improvement scenarios and compared them with the status quo estimates of the CKD cases and economic burden costs defined in Section 2. These improvement scenarios include: (1) moderate-level improvement, (2) high-level improvement, and (3) high-level improvement with access to new drugs. The moderate-level improvement scenario represents a moderate improvement assumption across the three key areas, while the high-level improvement scenario reflects a higher improvement assumption, and high-level improvement with new drug treatments exams the additional benefits of new treatment drugs.

The impact of these improvements was evaluated by analyzing the changes in the number of CKD patients from the medical interventions and the associated reduction in the total direct and indirect costs. The difference between the cost burden estimates from the scenarios relative to the status quo demonstrates the potential economic benefits of enhanced CKD management.

[39] CIHI. (2025). Summary statistics on organ transplants, wait-lists and donors.

Assumptions for the Three Key Areas of CKD Management Improvement

Assumptions were adapted from a validated model developed by Manns et al., which assessed the impact of improved CKD management on reducing the likelihood of patients progressing to late-stage chronic kidney disease.[40] Improvement of adapting new drugs were generated from literature review on the effectiveness of new drugs.

1. Enhancing early CKD diagnosis rates

   Identifying CKD in its early stages enables timely interventions such as blood pressure control, glycemic management, lifestyle modifications, and appropriate pharmacologic treatment. Early interventions have been shown to slow disease progression, reduce the risk of developing late-stage CKD, and delay the onset of kidney failure. Assumptions on the effectiveness of early CKD diagnosis were adapted from Manns et al. (2023), whose findings suggest that improved early-stage management significantly lowers the likelihood of patients progressing to end-stage kidney disease. The assumptions under the different scenarios are as follows:

   - Moderate-level Improvement: A 10% increase in the identification of high-risk patients would lead to a 1% cumulative reduction in the number of stage 3-5 CKDs cases in five years compared to status quo.
   - High-level Improvement: A 20% increase in the identification of high-risk patients would lead to a 2% cumulative reduction in the number of stage 3-5 CKDs cases in five years compared to status quo.
   - High-level Improvement with New Drugs: A 20% increase in the identification of high-risk patients would lead to a 2% cumulative reduction in the number of stage 3-5 CKDs in five years compared to status quo.

2. Optimizing medication use

   Ensuring that patients receive and adhere to evidence-based medications such as ACE inhibitors, ARBs, and newer agents like SGLT2 inhibitors can significantly slow CKD progression. Clinical trials have shown these therapies reduce proteinuria, preserve kidney function, and lower the risk of ESKD, yet underutilization remains a challenge. Improving access to and uptake of effective CKD treatments is both a clinical priority and an opportunity for substantial economic savings. Our model incorporates assumptions and effectiveness data for early CKD diagnosis from Manns et al. (2023) and further examines the added benefit of increasing accessibility to new treatments like SGLT2 inhibitors (see Section 3.1). The assumptions under the different scenarios are as follows:

   - Moderate-level Improvement: A 10% increase in optimal medication use would lead to a 0.5% reduction in the number of stage 4-5 CKDs cases in five years compared to status quo.
   - High-level Improvement: A 20% increase in optimal medication use would lead to a 1% reduction in the number of stage 4-5 CKDs cases in five years compared to status quo.
   - High-level Improvement with New Drugs: A 20% increase in optimal medication use will lead to a 1% reduction in the number of stage 4-5 CKDs per year. Access to new treatment drugs would lead to an additional 30% reduction in the risk of stage 4-5 CKDs per year.

[40] Manns B, McKenzie SQ, Au F, Gignac PM, Geller LI; Canadians Seeking Solutions and Innovations to Overcome Chronic Kidney Disease (Can-SOLVE CKD) Network. The Financial Impact of Advanced Kidney Disease on Canada Pension Plan and Private Disability Insurance Costs. Can J Kidney Health Dis. 2017 Apr 17;4:2054358117703986. doi: 10.1177/2054358117703986. PMID: 28491340; PMCID: PMC5406196.

3. Expanding kidney transplant capacity

Many patients face long wait times for kidney transplants, even though annual healthcare costs after transplantation are significantly lower than for dialysis. Expanding access to transplants not only reduces the number of patients needing dialysis but also improves productivity for patients and caregivers by lessening the burden of informal care. Our analysis also examines how increasing transplant capacity can lower both direct and indirect costs. The assumptions under the different scenarios are as follows:

- Moderate-level Improvement: A 10% increase in the proportion of patients undergoing kidney transplants, leading to an equivalent reduction in dialysis patients.
- High-level Improvement: A 20% increase in the proportion of patients undergoing kidney transplant, leading to an equivalent reduction in dialysis patients.
- High-level Improvement with New Drugs: A 20% increase in the proportion of patients undergoing kidney transplant, leading to an equivalent reduction in dialysis patients.

3.3. Impacts of Improving CKD Management

Reduction in ESKD Cases and Death

Improved care for CKD leads to slower progression to ESKD and reduction in CKD-related deaths, as interventions take effect and generate long-term benefits.

Under the moderate improvement scenario, 7% fewer people are projected to develop ESKD by 2050 compared to the status quo scenario (See Figure 14). Under the high improvement scenario, 13% fewer people are projected to develop ESKD by 2050. The impact is even more substantial under the high improvement scenario with new treatment drugs. With improved access to these new drugs, an additional 19% reduction in ESKD cases could be achieved by 2050.

CKD-related mortality is projected to decline with enhanced disease management (See Figure 15). By 2050, under a moderate improvement scenario, an estimated 918 deaths could be prevented. In a high improvement scenario, approximately 1,800 deaths could be avoided. Furthermore, if access to new drug therapies is incorporated into the high improvement scenario, up to 4,409 deaths could be prevented compared to the status quo.

From 2025 to 2050, utilizing new treatment drugs for CKD would result in a cumulative reduction of 207,300 person-years with ESKD.

Figure 14. Number of ESKD by Levels of Improvements in CKD Management, 2050

Source: Deloitte Analysis

Figure 15. Number of Death by Levels of Improvements in CKD Management, 2050

Source: Deloitte Analysis

Productivity Gains

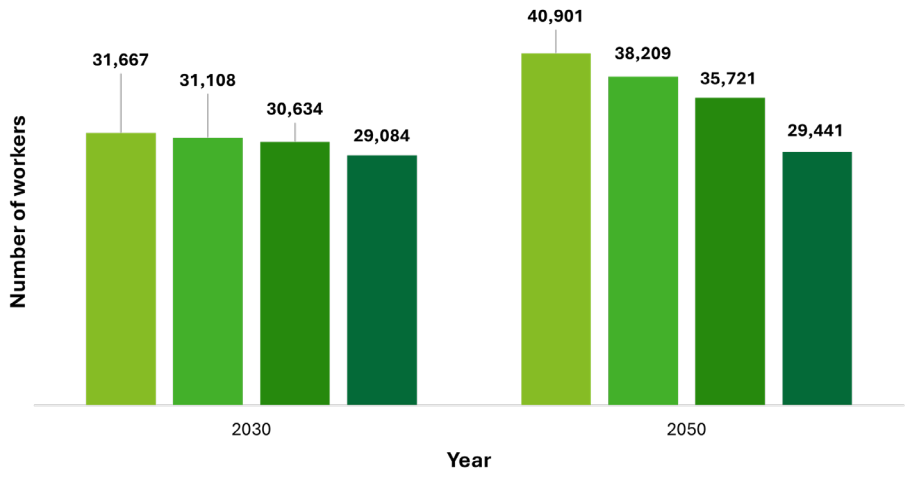
End-stage CKD places a significant economic burden, particularly through loss of productivity and the need for informal care. The two main sources of indirect cost savings come from increased productivity and reduced hours of informal caregiving due to fewer patients progressing to stage 4 and 5 CKD compared to the status quo.

Under the moderate improvement scenario, the number of workers affected by CKD (those unable to work or experiencing reduced work capacity) is projected to decrease by 559 individuals (2%) by 2030 and by 2,692 individuals (7%) by 2050, compared to the status quo scenario (Figure 16). In the high improvement scenario, the reduction is even greater, with 1,033 individuals (3%) by 2030 and 5,179

individuals (13%) by 2050 spared from workforce disruption. With the addition of access to new CKD treatments, a further 2,548 individuals (8%) by 2030 and 11,460 individuals (28%) by 2050 could avoid workforce disruption due to CKD.

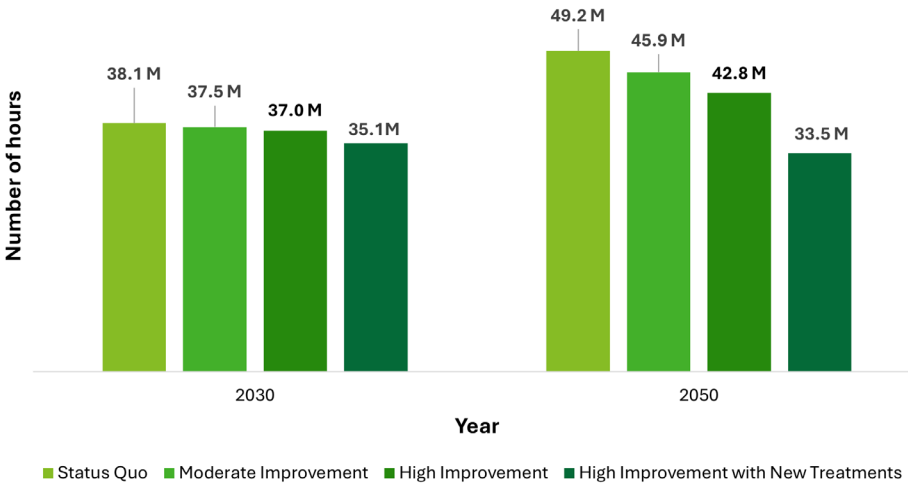
Improved CKD management also reduces the need for informal caregiving, freeing up time for other productive activities. Under the moderate improvement scenario, 0.6 million hours of informal care could be saved by 2030, and 3.3 million hours could be saved by 2050 (Figure 17). Under the high improvement scenario, 1.14 million hours could be saved by 2030, and 6.4 million hours by 2050. With access to new CKD treatments, an additional 9.33 million hours of imformal care could be saved by 2030, and 15.74 million hours by 2050.

Figure 16. Total Workforce Affected by CKD by Levels of Improvements in CKD Management



Source: Deloitte Analysis

Figure 17. Informal CKD Care Hours by Levels of Improvements in CKD Management



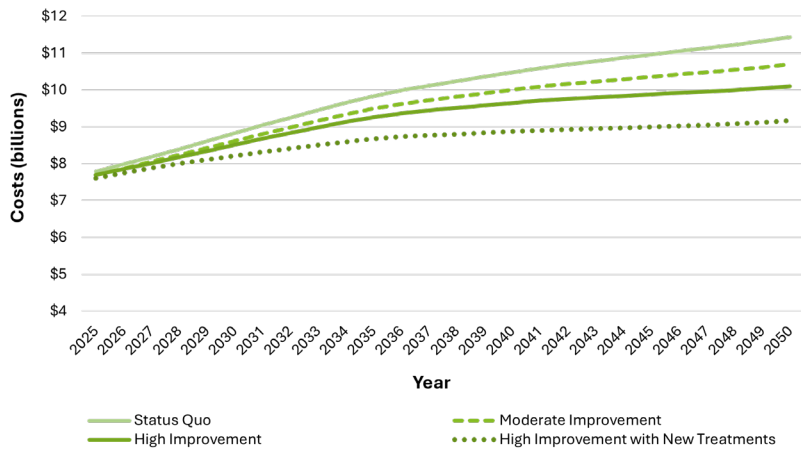
Source: Deloitte Analysis

Impact on Direct Costs

In both the moderate and high improvement scenarios, the impact widens over time due to delays in progression to late-stage CKD (See Figure 18). Moderate improvements in CKD management could reduce annual direct care costs by $0.2 billion (2%) in 2030 and $0.7 billion (6%) in 2050 compared to the status quo (Figure 19). High-level improvements are projected to yield greater savings, with reductions of $0.3 billion (4%) by 2030 and $1.3 billion (12%) by 2050. If high-level improvements are combined with increased access to new CKD treatments, the economic benefits could be even more substantial, resulting in projected savings of $0.6 billion (7%) by 2030 and $2.3 billion (20%) by 2050.

It is important to note that the costs of implementing interventions — including prevention education, screening programs, and medication costs — were not included in this analysis, due to the variability in intervention types and cost structures.

Figure 18. Impact of CKD Management Improvements on Direct Costs



Source: Deloitte Analysis

Figure 19. Impact of CKD Management Improvements on Direct Costs, 2030 and 2050

Source: Deloitte Analysis

Note:

- Status Quo: current trend.
- Moderate Improvement:
  10% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement:
  20% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement with New Treatments:
  20% improvement in early detection, medication use and kidney transplant capacity + access to new treatment drugs for CKD

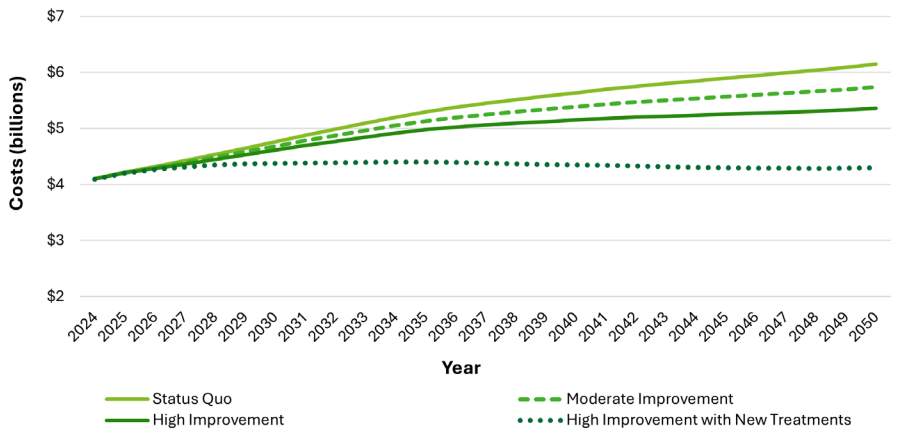
Impact on Indirect Costs

In all scenarios, the impact widens over time due to the cumulative benefits of delaying progression to late-stage CKD (Figure 20). Since the majority of indirect costs come from lost productivity and time spent on informal caregiving for late-stage CKD patients, improvements in disease management — and particularly delays in the onset of ESKD can significantly reduce indirect costs.

The introduction of new drugs for CKD with greater clinical effectiveness in slowing disease progression further amplifies these benefits, leading to a greater reduction in the indirect cost burden.

Moderate improvements in CKD management could reduce annual indirect costs by $0.1 billion (2%) in 2030 and $0.4 billion (7%) in 2050 compared to the status quo (Figure 21). High-level improvements are projected to save $0.2 billion (3%) by 2030 and $0.8 billion (13%) by 2050. With high-level improvements and access to new CKD treatments, the economic benefits could be even greater — resulting in projected indirect cost savings of $0.4 billion (8%) by 2030 and $1.9 billion (30%) by 2050.

Figure 20. Impact of CKD Management Improvements on Indirect Costs



Source: Deloitte Analysis

Figure 21. Impact of CKD Management Improvements on Indirect Costs, 2030 and 2050

Source: Deloitte Analysis

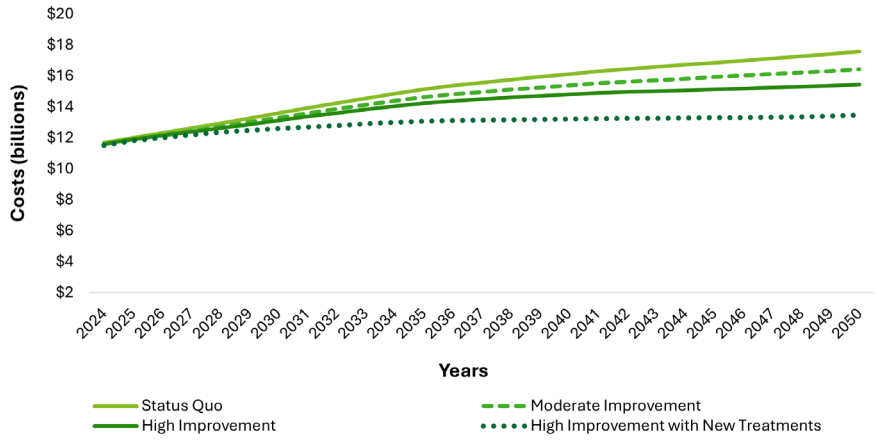
Note:

- Status Quo: current trend.
- Moderate Improvement:
  10% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement:
  20% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement with New Treatments:
  20% improvement in early detection, medication use and kidney transplant capacity + access to new treatment drugs for CKD

Impact on Total Costs

Combining the direct and indirect costs, the total cost burden of CKD could be significantly reduced by improving CKD management in Canada. With moderate improvement, total costs associated with CKD are projected to be reduced by $0.3 billion (2%) in 2030, and $1.1 billion (7%) in 2050 compared with status quo. In the high improvement scenario, total costs are projected to be even lower, reaching a reduction of $0.5 billion (3%) in 2030 and $2.1 billion (12%) in 2050. If high improvement is combined with access to new CKD treatments, total costs could be further reduced by $1.0 billion (7%) in 2030 and $4.1 billion (23%) in 2050.

Figure 22. Impact of CKD Management Improvements on Total Costs of CKD



Source: Deloitte Analysis

Figure 23. Impact of CKD Management Improvements on Total Costs of CKD, 2030 and 2050

Source: Deloitte Analysis

Note:

- Status Quo: current trend.
- Moderate Improvement:
  10% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement:
  20% improvement in early detection, medication use and kidney transplant capacity.
- High Improvement with New Treatments:
  20% improvement in early detection, medication use and kidney transplant capacity + access to new treatment drugs for CKD

Enhancing CKD management through earlier diagnosis, improved medication use, and expanded transplant capacity can substantially reduce both the clinical and economic burden of the disease. Our modelling indicates that, compared to the status quo scenario, moderate and high-level improvements — particularly with access to newer treatments — could significantly lower the number of advanced CKD cases and related deaths, while generating considerable direct and indirect cost savings in long-term. More importantly, the impact of improvement grows over time, as the cumulative benefits of delayed disease progression compound, highlighting the long-term value of investing in comprehensive CKD care to achieve better health and economic outcomes.

4. Conclusion

Chronic kidney disease poses a significant and escalating health and economic challenge in Canada, currently affecting more than 4 million Canadians. The total annual economic burden of CKD exceeds $11.7 billion, encompassing both direct medical costs and indirect costs such as lost productivity and informal caregiving. Without effective intervention, this burden is projected to grow substantially. By 2050, the number of Canadians living with CKD is expected to exceed 6.2 million, with nearly half of these individuals in moderate to severe stages of the disease.

Despite the scale of the issue, critical gaps remain in the prevention, early detection, management, and treatment of chronic kidney disease. Most early-stage CKD cases go undiagnosed, and access to recommended screening, innovative therapies, and kidney transplantation remains limited for many patients. Strong evidence supports the cost-effectiveness of interventions such as early detection, preventive strategies, and optimal patient care. Targeted screening of high-risk populations — such as individuals with diabetes or hypertension — can enable earlier diagnosis and intervention. Multidisciplinary care and improved medication adherence have been shown to reduce hospitalizations, slow progression to end-stage kidney disease. Kidney transplantation can enhance patients' quality of life and significantly reduce the costly dialysis.

Modeling projections indicate that addressing current gaps in chronic kidney disease care could lead to significant reductions in both the health and economic burden of the disease in Canada. Under a moderate improvement scenario, total costs (combining the direct and indirect costs) associated with CKD could be reduced by 7% by 2050. In a high improvement scenario — including broader access to newly available and more effective treatments — total cost reductions could reach 23% by 2050. Across all scenarios, the benefits grow over time, reflecting the cumulative impact of slowing progression to late-stage CKD.

Realizing these improvements will require stronger national CKD surveillance — currently a critical gap — earlier identification of at-risk individuals and expanded access to optimal management and treatment. Prioritizing these strategies will enable Canada to improve chronic kidney disease outcomes, reduce long-term economic burden of illness, and foster healthier, more productive communities.

APPENDICES

Methodology

Study Design and Approach

The analysis of this report employs a mixed-methods approach, combining quantitative analysis of epidemiological and economic data with a targeted literature review. The analysis is structured around three core areas: disease prevalence, cost burden (direct and indirect), and scenario modeling of management improvements.

In undertaking research for background information on CKD in Canada, including its definition, causes, stages, clinical implications, and treatment options, a comprehensive literature review was conducted to summarize the epidemiology, progression, and economic burden of CKD. The review also includes an overview of kidney replacement therapies and the financial impact of end-stage kidney disease. Information was synthesized to establish a foundational understanding for the remainder of the report and to clarify the purpose and scope of the analysis.

Prevalence of CKD was estimated by analyzing the demographic distribution and trends of CKD and ESKD in Canada. A quantitative approach was used to calculate the number of Canadians affected at different stages of CKD, as well as trends in ESKD and kidney transplantation. Prevalence rates were derived from epidemiological studies, national population projection data, and the CDC surveillance systems. The analysis included age-specific trends and the proportion of undiagnosed early-stage CKD. Where direct Canadian data was unavailable, prevalence estimates were adapted from international datasets, with adjustments for demographic and healthcare differences.

The number of CKD cases in Canada in 2024 was estimated by multiplying the population of Canadian adults aged 18 and above by the overall CKD prevalence reported by Arora et al. (2013). Estimates of CKD cases by stage and by age group were calculated by applying stage-specific and age-specific prevalence rates from the U.S. CDC's Kidney Disease Surveillance System to the Canadian adult population, due to the absence of detailed Canadian data. The results were validated with ESKD (Stage 5 CKD) data from CIHI.

Future trends in the number of CKD cases in Canada were projected by applying the projected prevalence rate to projected adult population figures from 2024 to 2050. The analysis assumes the prevalence of CKD by age group remains relatively stable over time, based on historical trends observed in both Canadian and U.S. data. The projected number of CKD cases by stage was estimated by multiplying the projected population in each year by stage-specific prevalence rates.

The cost burden of CKD management in Canada in 2024 was assessed by estimating both direct and indirect costs associated with the disease. An in-depth review of available research papers, reports, and data sources was conducted to obtain inputs for each type of cost estimate. Direct costs were defined as medical expenses related to CKD care, including hospitalizations, physician visits, outpatient services, prescription medications, dialysis, and kidney transplantation. Indirect costs were defined as the broader economic impacts beyond medical expenses, such as lost productivity due to illness, informal caregiving, transportation, and costs associated with living kidney donation. Direct cost estimates were primarily sourced from published studies and economic models by Inside CKD focused on per-patient and aggregate costs by CKD stage and treatment modality. Indirect cost estimates were obtained from studies and surveys covering productivity loss, caregiving, transportation, and living donor expenses. Where Canadian data was limited, estimates were supplemented by international studies and adjusted for the Canadian context.

To summarize the cost-effectiveness of CKD management strategies in Canada, an in-depth review of published research studies, economic evaluations, clinical trials, and national health reports was conducted. The analysis focused on three key domains: early detection and screening, patient care and intervention models, and pharmacological as well as kidney replacement therapies. The cost-effectiveness of these interventions including incremental cost-effectiveness ratios (ICERs), quality-adjusted life years (QALYs) gained, and direct healthcare cost savings were summarized. For pharmacological interventions, recent randomized controlled trials and meta-analyses were reviewed to determine the clinical and economic impact of new drug classes, including SGLT2 inhibitors, MRAs, and GLP-1 receptor agonists, on CKD progression. Kidney replacement therapy data, including transplantation rates and wait times, were obtained from national organ replacement registries and health system reports.

To assess the impact of improved chronic kidney disease (CKD) management on case numbers and economic burden in Canada, we developed a scenario analysis using a stock-flow model that traces the number of cases in each period, and the movement from. This approach simulated the progression of CKD across different stages (from early to late) and estimated how targeted improvements in early diagnosis, medication optimization, and transplant capacity would alter disease trajectories and associated costs.

For each annual cycle, the number of cases in a given CKD stage was calculated based on the inflow probability from the previous stage (in the prior year), the outflow probability to the next stage, and stage-specific mortality. Scenario-specific improvements were modeled as changes to the inflow and outflow probabilities, reflecting reduced disease progression and improved survival. For example, enhanced early diagnosis reduced the risk of progression to advanced CKD, while optimized medication uses further slowed progression and improved outcomes. Expanded transplant capacity reduced the number of patients requiring dialysis and improved productivity. The impact of new drug access was incorporated as an additional reduction in progression rates for advanced CKD. For each scenario, the model estimated annual and cumulative CKD case counts by stage, ESKD incidence, mortality, and associated direct and indirect costs. The difference between each improvement scenario and the status quo quantified the potential clinical and economic benefits of enhanced CKD management.

Three alternative improvement scenarios were modeled — moderate-level, high-level, and high-level with access to new drugs — each defined by specific assumptions on the degree of improvement in the three key management areas. The status quo scenario, reflecting current trends, served as the baseline for comparison. Scenario assumptions were adapted from validated literature, including Manns et al. (2023) and published clinical trial data on new CKD treatments. The impact of each scenario was evaluated over the forecast period (2025–2050).

Data Sources

Data and information were reviewed and summarized from a range of sources, including:

- The Kidney Foundation of Canada
- CKD Pathway Canada
- Canadian Institute for Health Information (CIHI)
- Canadian Organ Replacement Register
- U.S. Centers for Disease Control and Prevention Kidney Disease Surveillance System
- Statistics Canada population projections (2024–2050)
- Inside CKD (2022)

- Historical prevalence trends of the U.S. CKD Surveillance System
- Health Canada
- Published clinical guidelines and peer-reviewed literature

Limitations

Key limitations of the study include the reliance on extrapolated data due to significant gaps in Canadian CKD surveillance, which may affect the accuracy of the projections. The study assumes a stable prevalence of CKD over time, potentially overlooking fluctuations that could arise from demographic changes or shifts in risk factors. Additionally, the exclusion of implementation costs for new interventions presents a limitation, as it does not account for the financial and logistical resources required to introduce and sustain these improvements in CKD management. Furthermore, the study acknowledges potential variability in future healthcare delivery and treatment uptake, which could influence the effectiveness and reach of the proposed interventions. This variability may stem from differences in healthcare infrastructure, patient adherence, and policy changes that are not accounted for in the current analysis. These limitations suggest that while the study provides valuable insights, the results should be interpreted with caution, considering these potential constraints.

Glossary

Abbreviation	Full Term / Definition
ACEi	Angiotensin-Converting Enzyme Inhibitor
ARB	Angiotensin II Receptor Blocker
CAD	Canadian Dollar
CanPREVENT	Canadian Prevention of Renal and Cardiovascular Endpoints Trial
CDC	Centers for Disease Control and Prevention
CIHI	Canadian Institute for Health Information
CKD	Chronic Kidney Disease
CPI	Consumer Price Index
eGFR	Estimated Glomerular Filtration Rate
ESKD	End-Stage Kidney Disease
GFR	Glomerular Filtration Rate
GLP - 1 RA	Glucagon-Like Peptide-1 Receptor Agonist
HD	Hemodialysis
ICER	Incremental Cost-Effectiveness Ratio
KT	Kidney Transplantation
KRT	Kidney Replacement Therapy
MRA	Mineralocorticoid Receptor Antagonist
PD	Peritoneal Dialysis
PPP	Purchasing Power Parity
QALY	Quality-Adjusted Life Year
SGLT2i	Sodium-Glucose Cotransporter-2 Inhibitor
uACR	Urine albumin-creatinine ratio
US	United States

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