# Chronic Kidney Disease

## The case for early diagnosis and treatment

September 2026

Health Innovation Manchester

CF Experts in health

# About this report

**Background and purpose**

- This report was developed jointly by **Greater Manchester Integrated Care Board and Carnall Farrar** to quantify the burden of chronic kidney disease (CKD) across Greater Manchester, with particular focus on health inequalities and the role of socioeconomic deprivation.
- The analysis was led by CF in close collaboration with **clinical leadership from Dr Smeeta Sinha, Consultant Nephrologist and Honorary Professor,** and **Dr Gavin Dreyer, Consultant Nephrologist**, whose expertise shaped the clinical framing and interpretation throughout.

**What makes this analysis unique**

- For the first time, this work **links primary care, secondary care, prescribing and laboratory data** at patient-level across Greater Manchester, enabling insights into disease burden, comorbidities and health inequalities that are not visible in any single dataset.
- The analysis uniquely shines a spotlight on **stage 1 and stage 2 CKD** – conditions that historically have lower levels of clinical coding and data capture – providing a fuller picture of the true population burden than has previously been available.
- Together, these data sources provide **granular population-level evidence on prevalence, diagnosis gaps, comorbidity burden, treatment rates and inequalities by deprivation** to inform system-level prioritisation and commissioning decisions.

# Executive summary

- Chronic kidney disease (CKD) affects **over 200,000 people in Greater Manchester** (GM), of whom **115,000 are diagnosed** and another **94,000 (43%) remain undiagnosed**.
- In GM, people with CKD are over **six times more likely than general adult population to suffer a cardiovascular event**, especially as the disease progresses. **CKD can cut life expectancy by up to 21 years**, with almost 50-60% of stage 4 and 5 CKD patients dying from CVD.
- People in the **most deprived areas are twice as likely to have CKD**, face a two-year delay from clinical evidence to diagnosis, have higher CKD-related mortality, and, importantly, make up 50% of all patients on dialysis.
- **21,000 diagnosed CKD patients are admitted to a hospital annually**. People with CKD require more care as the disease progresses - **stage 5 CKD patients are admitted to hospital on average 36 times a year, costing over £20,000 per person**.
- The highest cost per admitted CKD patient is at stage 5 due to the cost of dialysis, reaching **£54,000 annually**, with over 50% of total admission costs coming from the larger number of stage 3 patients. **Dialysis costs over £60M annually**, with nearly half of dialysis and transplant patients at stages 3 or 4. People with CKD are much more likely to be hospitalised for non-CKD related issues, with CVD being the leading cause.
- Despite the simplicity and efficiency of the uACR test, **only about 50% of diagnosed CKD patients in GM have had this test** in the last 12 months, though, the eGFR test is more widely used. **Only 70% of high-risk individuals are tested for ACR**.
- There are critical gaps in managing diabetes and hypertension, key drivers of CKD progression - **over 70% of people in GM with CKD are hypertensive and 33% are diabetic, with less than 50% diabetic CKD patients being prescribed SGLT2 inhibitors.**
- SGLT2i treatment can delay end-stage kidney disease by up to 15 years, yet only 25% of eligible CKD patients in GM are prescribed it. Wider use could **save over 250 lives and prevent more than 2,100 major cardiovascular events annually**.
- Earlier intervention with SGLT2i therapies, at an annual cost of £23m, would slow CKD progression and reduce hospitalisations, dialysis, transplants, and CVD costs, saving £45.7m per year. **Net savings of ~£23m could be achieved if stage 2–5 patients are identified early and treated promptly.**



Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# Chronic kidney disease is a progressive long-term condition where kidney function declines over time

Chronic kidney disease (CKD) is defined as abnormalities in kidney function or structure present for more than 3 months, diagnosed based on:

- Estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73m$^2$
- Urinary albumin-to-creatinine ration (ACR) > 3 mg/mmol

| State of CKD | STAGE 1 | STAGE 2 | STAGE 3A | STAGE 3B | STAGE 4 | STAGE 5 |
|---|---|---|---|---|---|---|
| eGFR | 90 or greater | Between 60 and 89 | Between 45 and 59 | Between 30 and 44 | Between 15 and 29 | Less than 15 |
| Level of kidney damage |  Mild kidney damage |  Mild kidney damage |  Mild to moderate kidney damage |  Mild to moderate kidney damage |  Mild to severe kidney damage |  Kidneys are close to failure or have completely failed. You will need to start dialysis or have a kidney transplant. |
| Symptoms | **Asymptomatic** | | **Swollen feet; shortness of breath; fatigue; loss of appetite; blood in urine** | | | **Kidney failure** |

CKD is a **progressive disease**— without intervention, it worsens over time, leading to serious complications

Early identification of CKD is challenging due to a **lack of symptoms at early stages**

Health Innovation Manchester

CF Experts in health

Chronic Kidney Disease in Greater Manchester: The case for early diagnosis and treatment

Source: Campbell et al. BMC Nephrol 22, 152 (2021); Healthcare reporting LLC, 2025, Renal dialysis cost containment. Available at: https://healthcarereporting.com/renal-dialysis-cost-containment/ (accessed March 2025) ; NICE, Sept 2024, Health Topics: Chronic Kidney Disease

# CKD progression drives cost, hospital use, and cardiovascular risk

| | | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 |
|---|---|---|---|---|---|---|
| Current | Avg. time to next stage (in <20% who progress) | 5.6 years | 3.2 years | 2.5 years | 2.8 years | |
| | Bed days per year per person | 7.7 | 8.0 | 12.8 | 15.4 | 18.0 |
| | Annual healthcare cost per person | £352 | £448 | £1,586 | £5,216 | £21,794 |
| | MI events per 1000 people | 33 | 43 | 117 | 233 | 156 |
| | Tested for ACR in the last 12 months | 43% | 42% | 57% | 58% | 36% |
| | Annual healthcare savings (Early Intervention) | £30 | £310 | £1,461 | £3,490 | £1,246 |

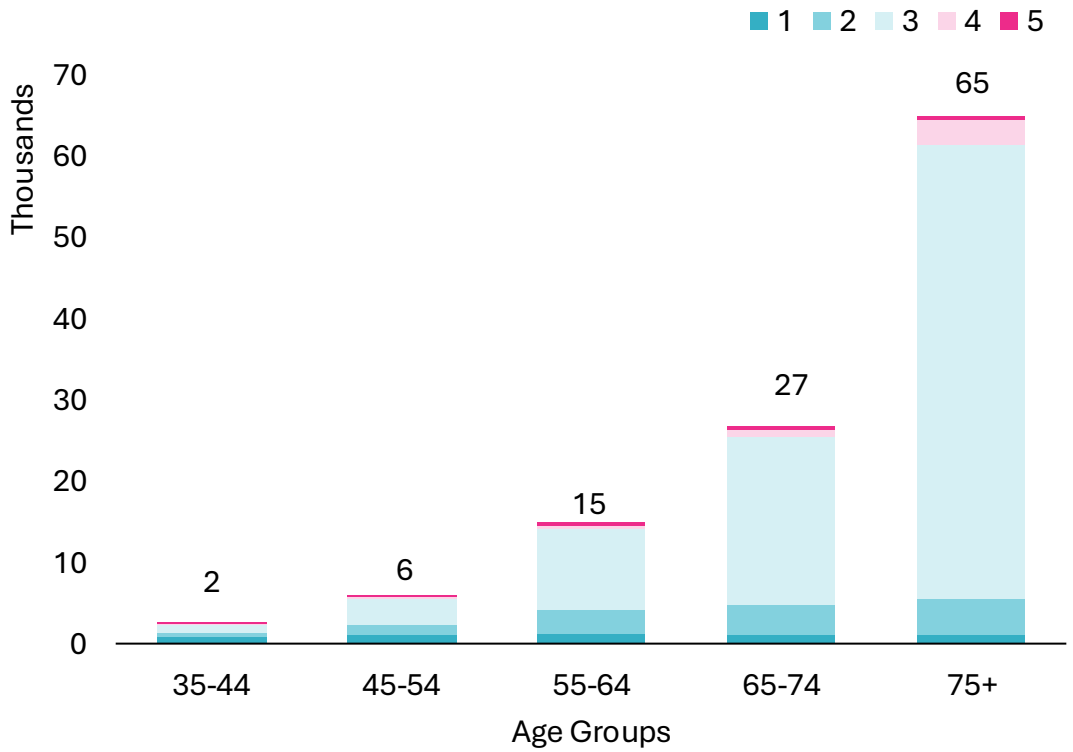


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# In Greater Manchester, 115,000 patients, 7% of adult population, are diagnosed with CKD

## Patients with CKD at each stage

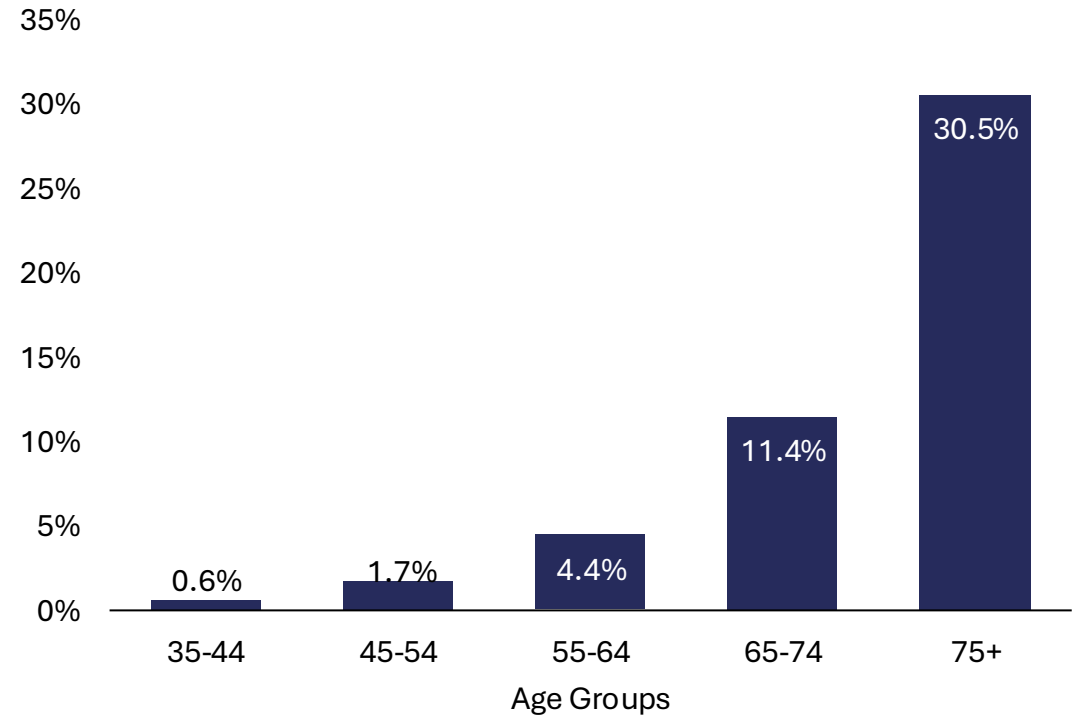
*Thousands, diagnosed patients, by age group*




115,000 in GM have CKD diagnosis, with 65,000 (56%) of them 75+ year old.

## CKD prevalence

*Diagnosed patients, by age group*




CKD prevalence increases with age, jumping from 0.6% in 35-44 year olds to over 30.5% in 75-year olds.

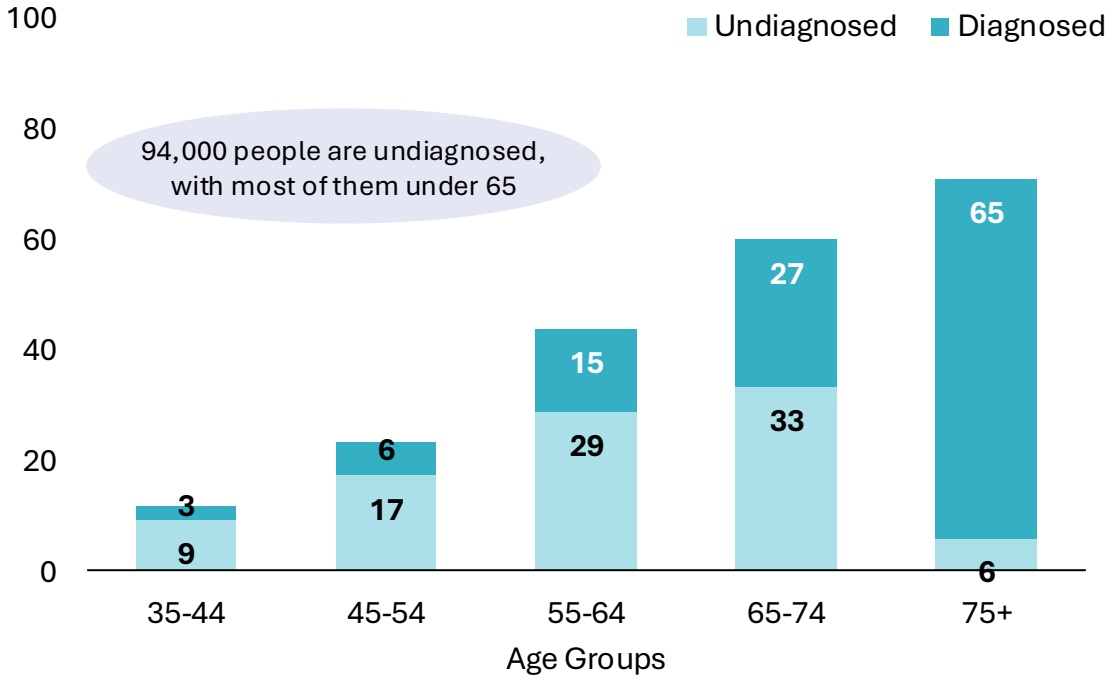


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# However, around 43% of people who have CKD are undiagnosed, most of whom are younger and in early stages of the disease

## Diagnosed and undiagnosed people (GM)

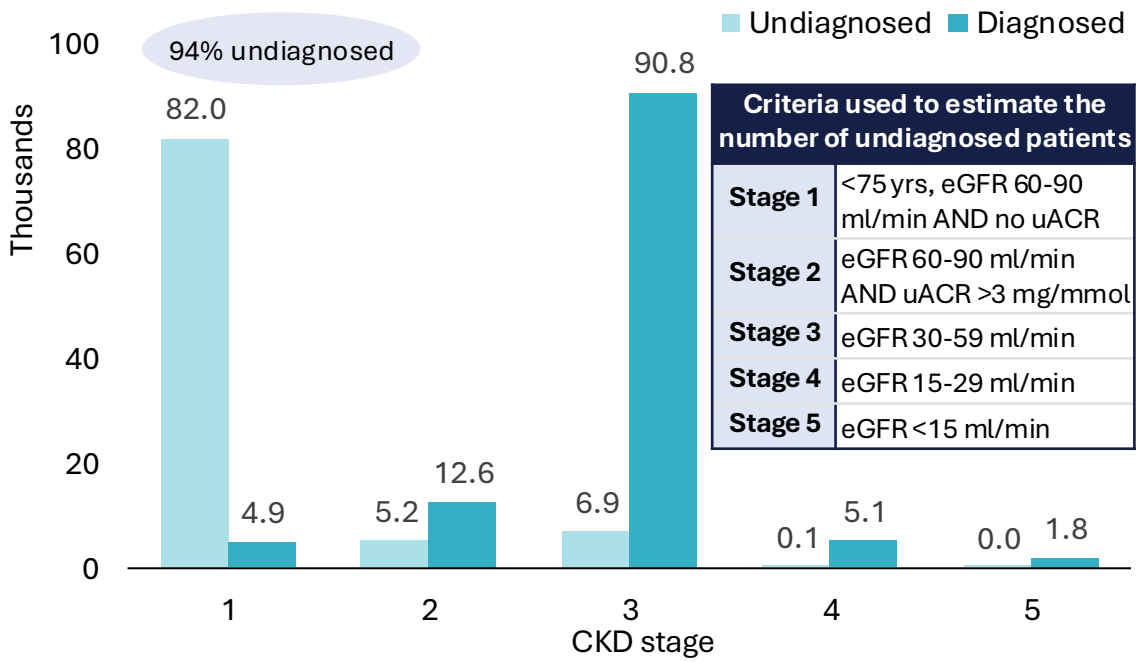
*Thousands, number of patients at each age band*




Most people who are undiagnosed are of working age (aged under 65), whilst almost all of patients over the age of 75 are diagnosed. In GM, this means that over 50, 000 people under the age of 65 with CKD are undiagnosed.

## People with CKD at each stage (GM)

*Thousands, diagnosed and undiagnosed patients at each CKD stage*




Around 82,000 (94%) people in GM with Stage 1 CKD are undiagnosed whilst most patients with CKD at stages 3-5 (93%) have a diagnosis.

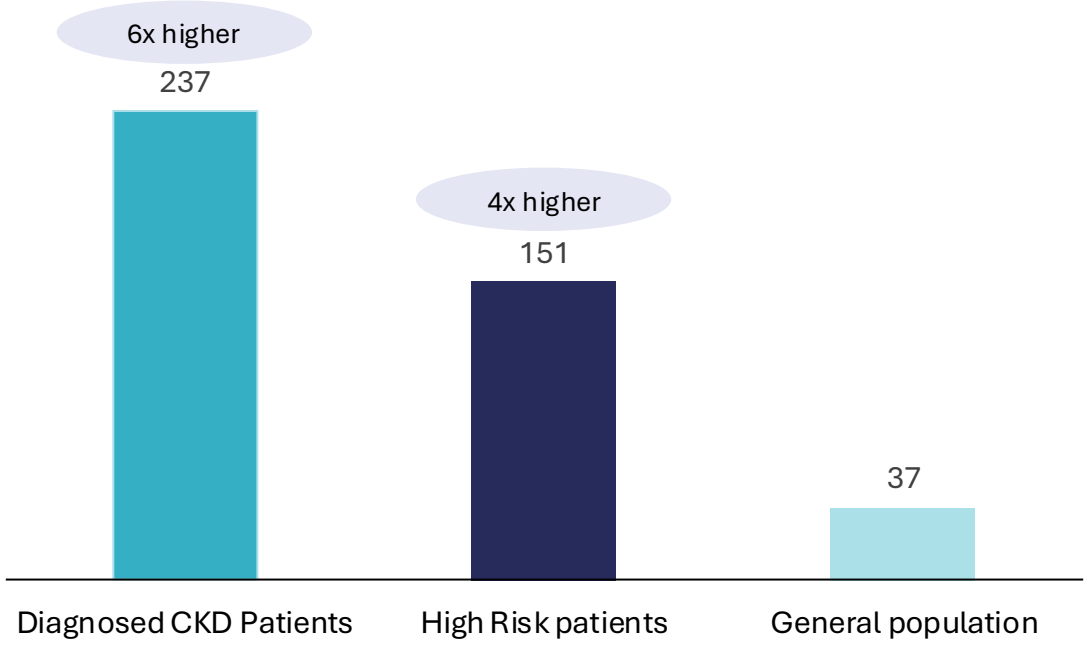


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# People with CKD are over six times more likely to suffer a cardiovascular event, with risk increasing as the disease progresses

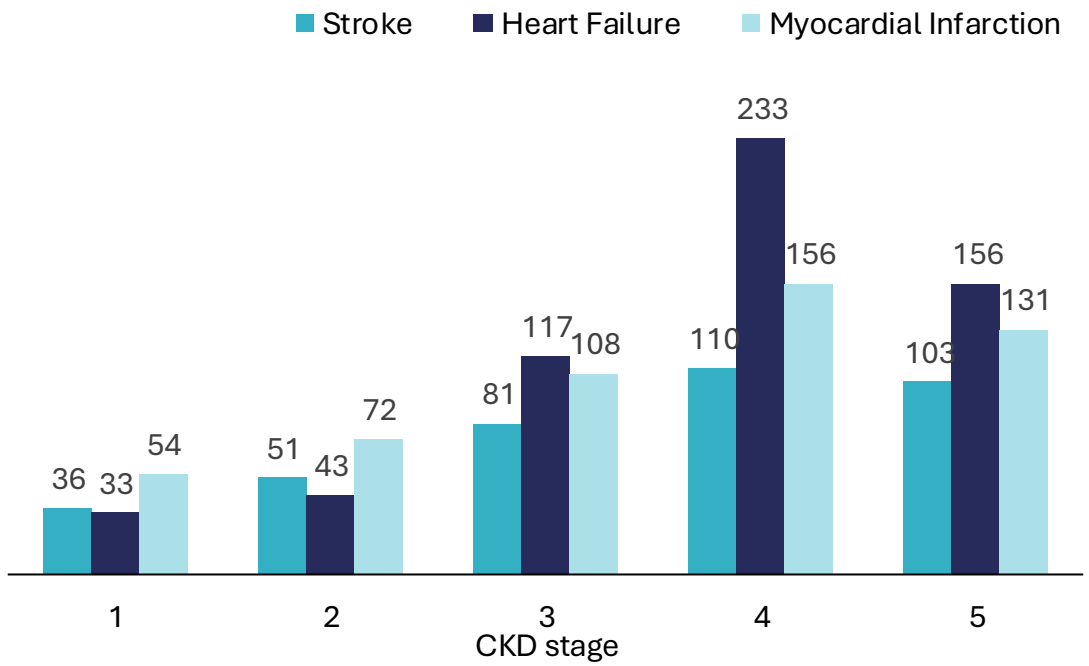
## Stroke, myocardial infarction and heart failure events (GM)

*Events per 1,000 in diagnosed CKD patients, high-risk patients and general population*




## Cardiovascular disease events per CKD stage (GM)

*Events per 1,000 patients diagnosed with CKD*




In GM, people with CKD are over 6 times more likely to have a stroke, myocardial-infarction or heart failure event compared to the general population.

People in the more advanced stages of CKD are more likely to have cardiovascular events, with 306 CVD events per 1,000 people with a stage 3 diagnosis.

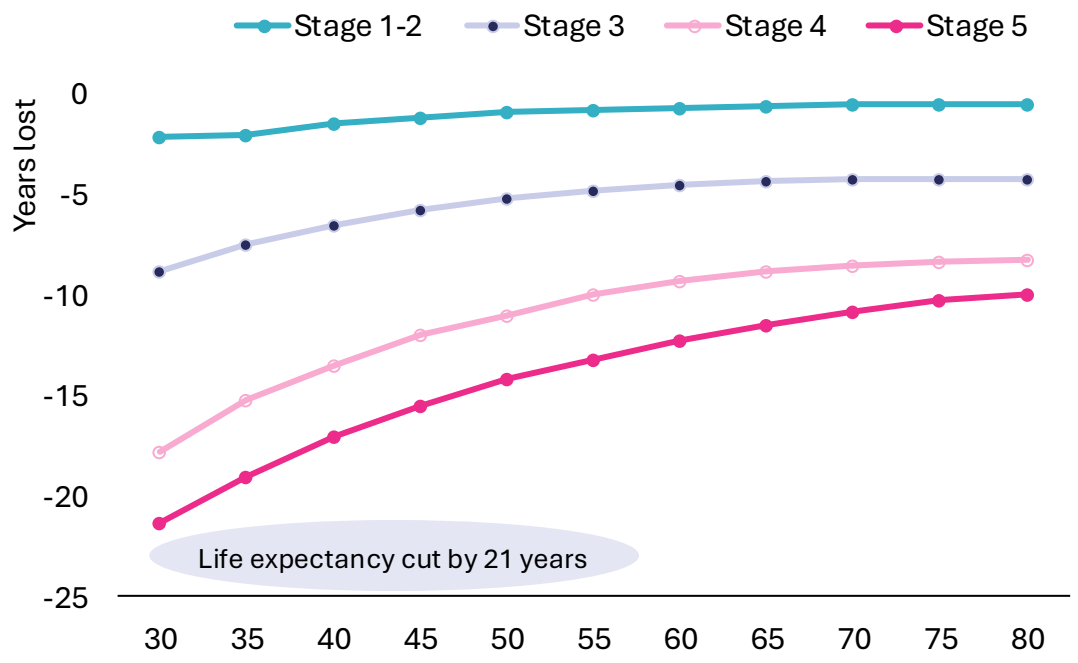


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# CKD can cut life expectancy by up to 21 years, with the majority of deaths caused by CVD, especially at the later stages

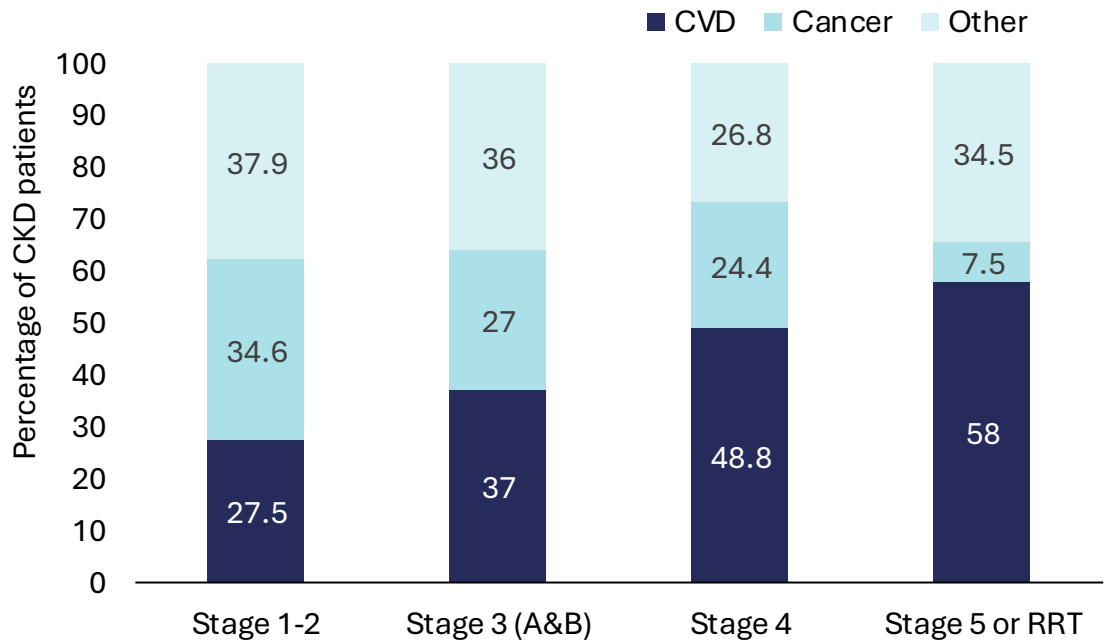
## Loss in life expectancy due to CVD

*Years, by CKD stage, by age*




## Causes of death per CKD stage

*% of CKD patients dying from CVD, cancer or other disease*




CKD has a significant impact on life expectancy - someone aged 30 with Stage 3 CKD would have a reduced life expectancy of ~9 years (21 years if they have stage 5 CKD).

Cardiovascular disease is a major killer for people with CKD and the majority of CKD patients die prematurely from CVD, not kidney failure.

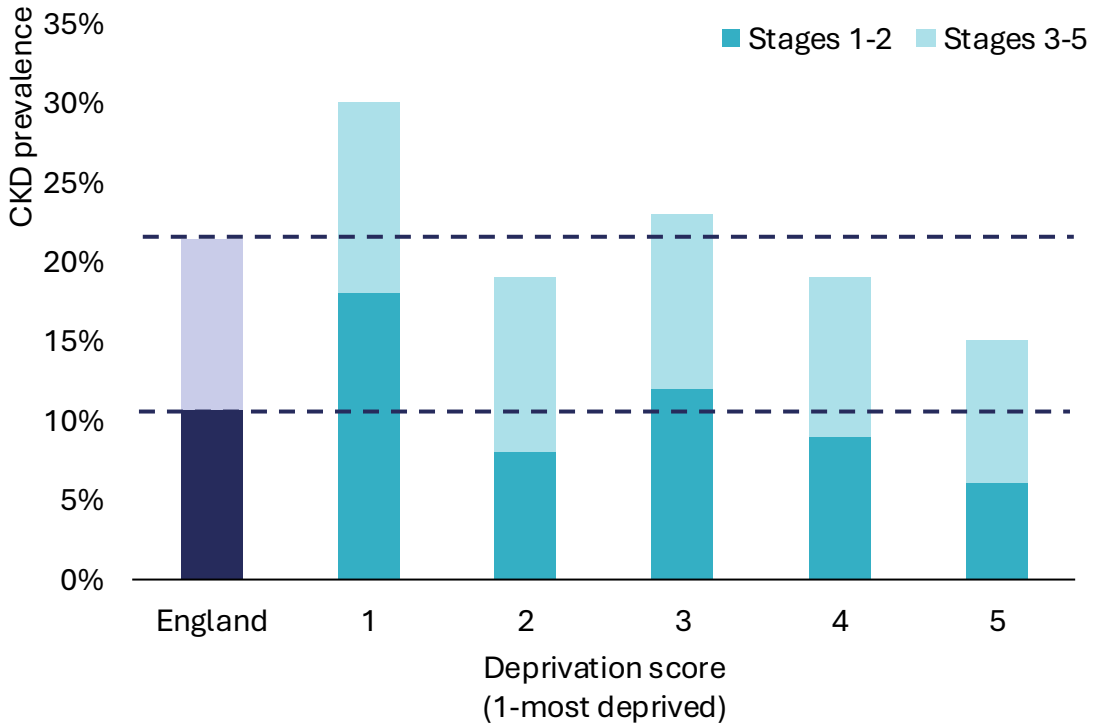


Source: NHS health survey for England, 2022; Gansevoort R, et al. The Lancet, Volume 382, Issue 9889, 339-352

# People living in areas of deprivation are twice as likely to have CKD compared to those in the least deprived areas

## Prevalence of CKD in England by deprivation score

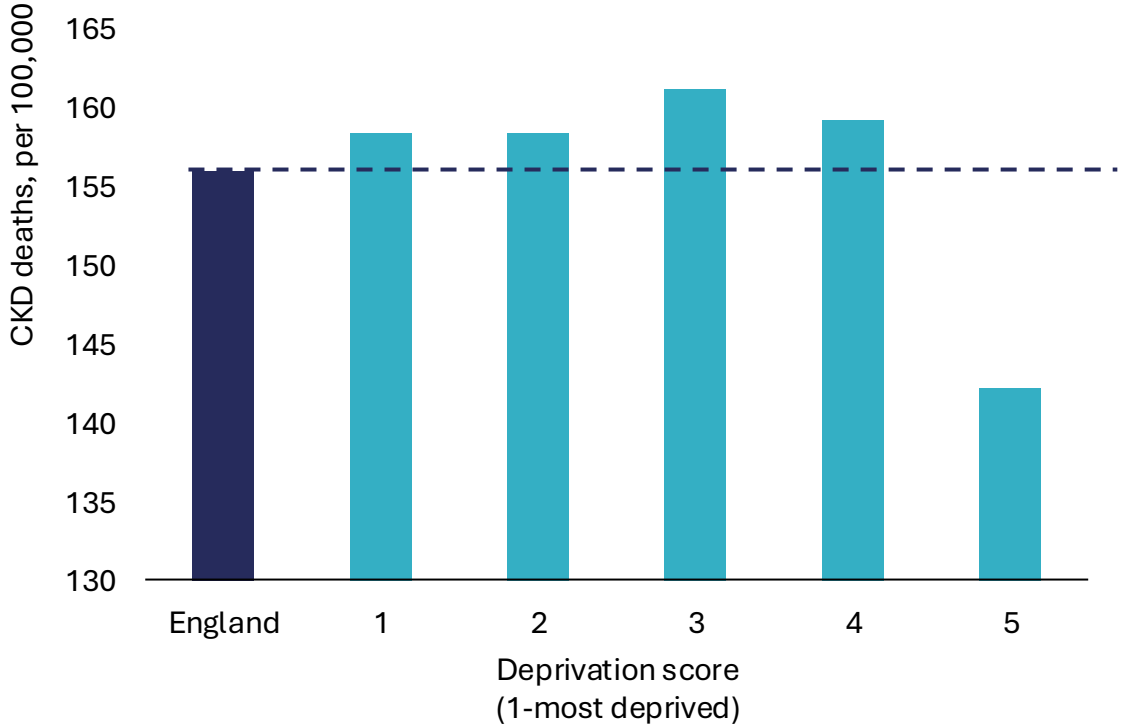
*2022, by deprivation score*




The prevalence of CKD is highest in amongst people living in areas of greater deprivation.

## Mortality from CKD in England by deprivation score

*2021-2022, by deprivation score*




CKD-related deaths are significantly lower in people living in areas of lower deprivation.

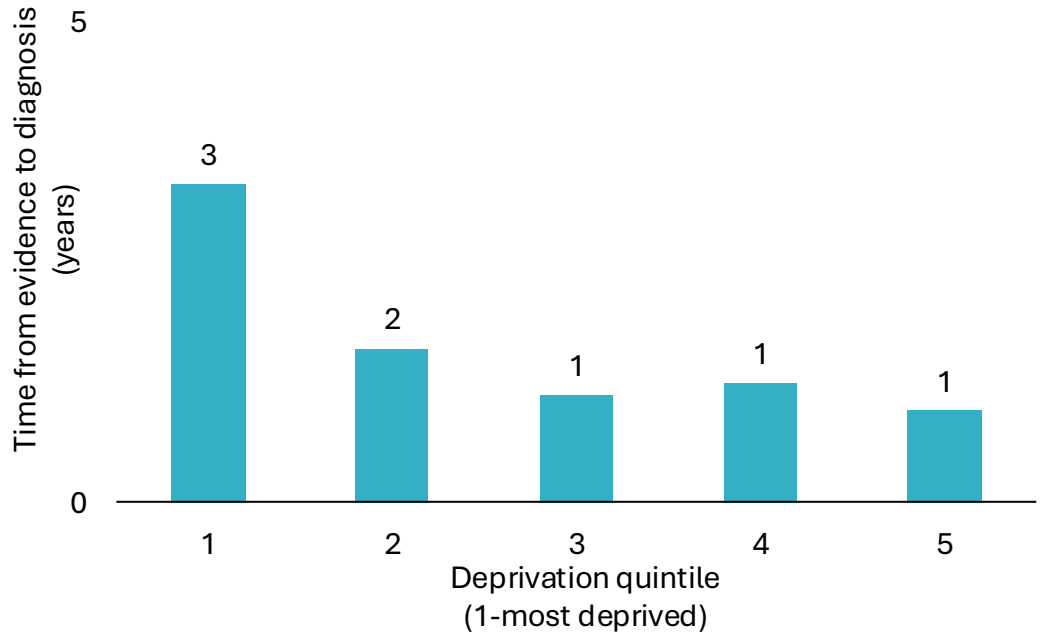


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# People with CKD living in areas of deprivation in GM take two years longer to be diagnosed and comprise 50% of patient receiving dialysis

## Average time from evidence to diagnosis (GM)

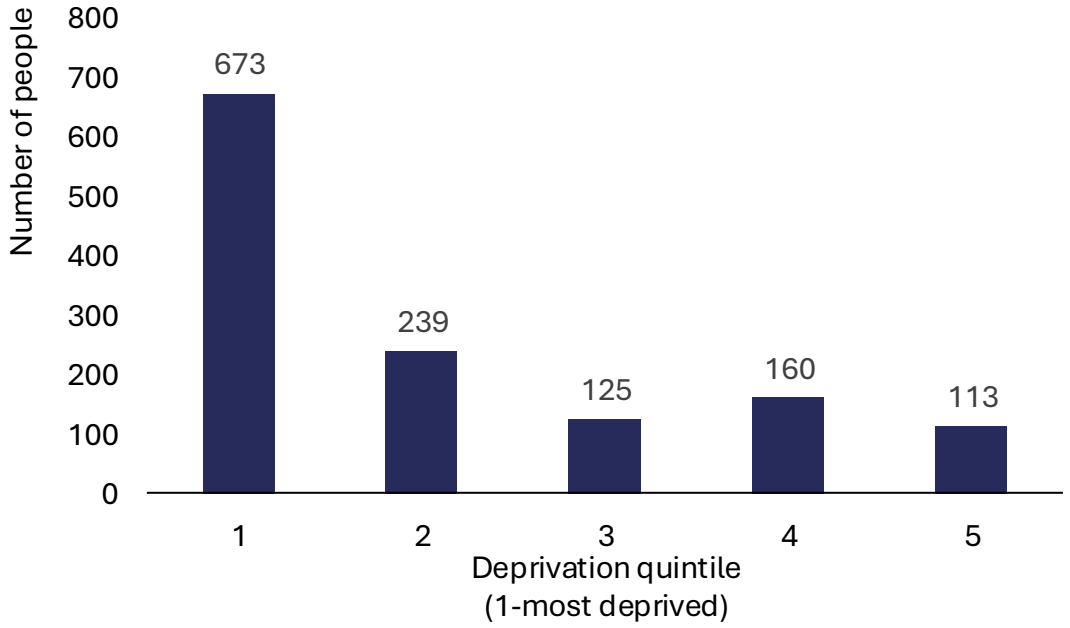
*2022, by deprivation quintile*




It takes almost 3 years for a person living in the greatest areas of deprivation in GM to be diagnosed with CKD compared to 1 year for the top quintile.

## Number of patients on dialysis (GM)

*2022, by deprivation quintile*




Over 50% of the people having dialysis in GM live in the bottom 20% areas of deprivation.

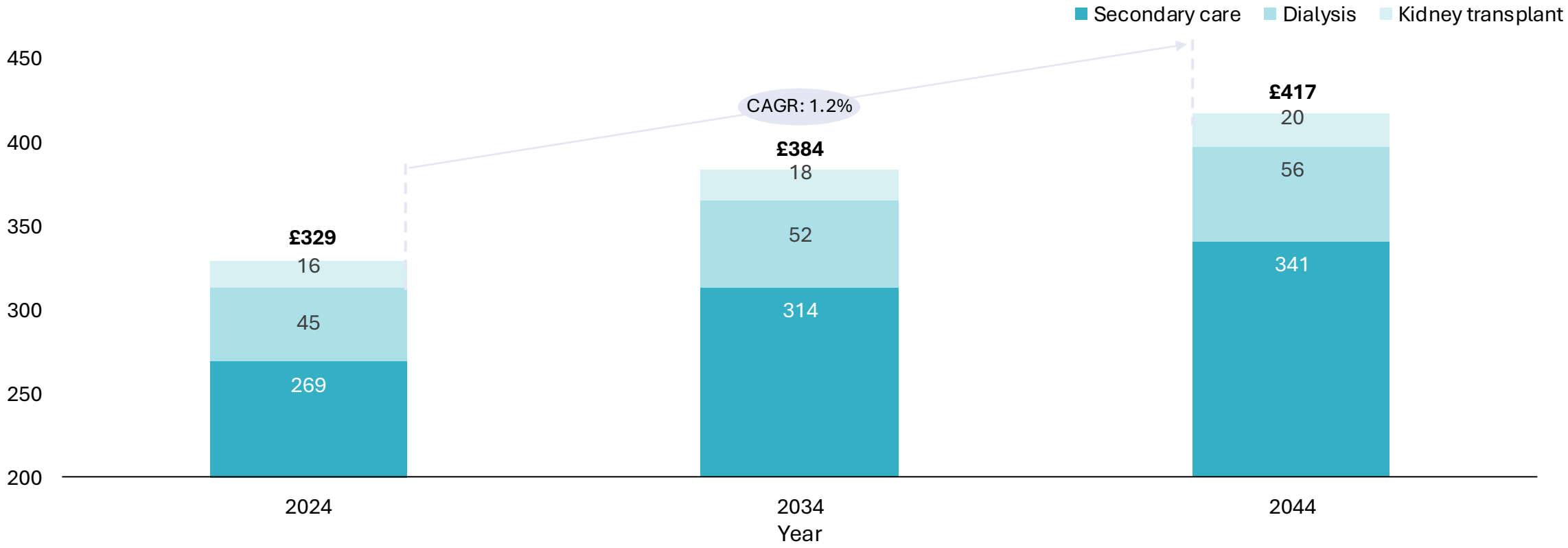


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# The cost of diagnosed patients with CKD in Greater Manchester in 2024 was £329m, projected to rise to £381m over the next 10 years

## Annual healthcare costs for diagnosed CKD patients

*£Millions, current vs projected**




The cost of CKD in diagnosed people was £329m in GM in 2023 and is projected to increase by £52m to £381m by 2033 and by £85m to £414m by 2043, illustrating the cost of the disease increasing by 1.2% year on year.

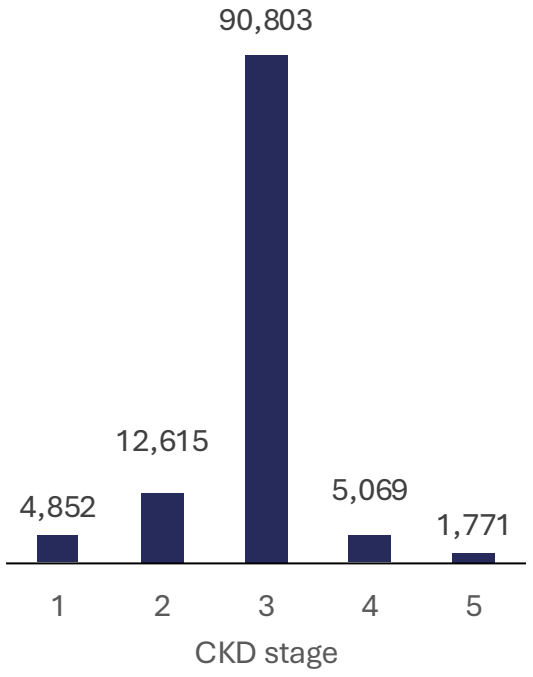


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data
*These projections are based solely on population growth and do not account for potential inflation or changes in treatment prices

# People with CKD require more care as the disease progresses - stage 5 CKD patients are admitted to hospital on average 36 times a year, costing over £20,000 per person

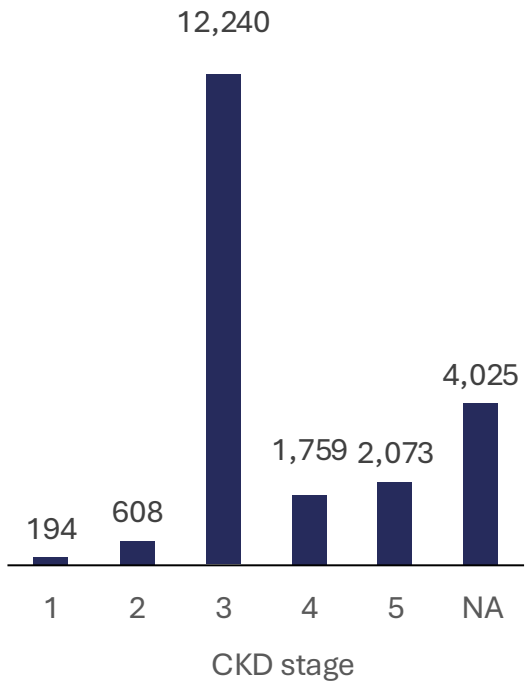
### Estimated diagnosed people with CKD (GM)

*2024, by stage*



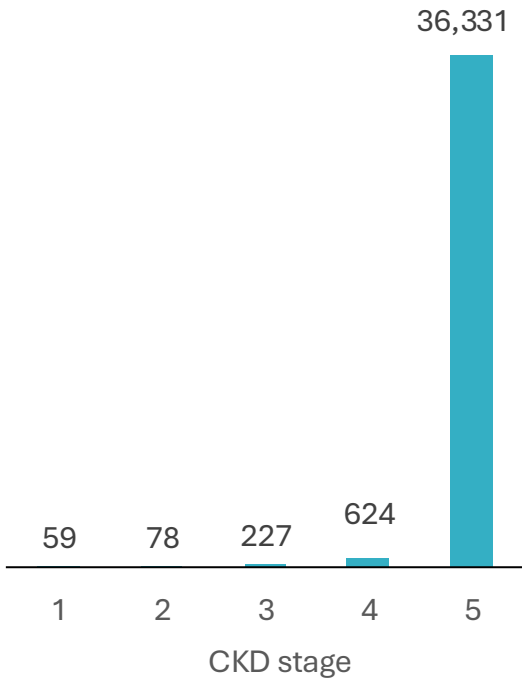

### CKD diagnosed with hospital admissions recorded (GM)

*2024, by stage*



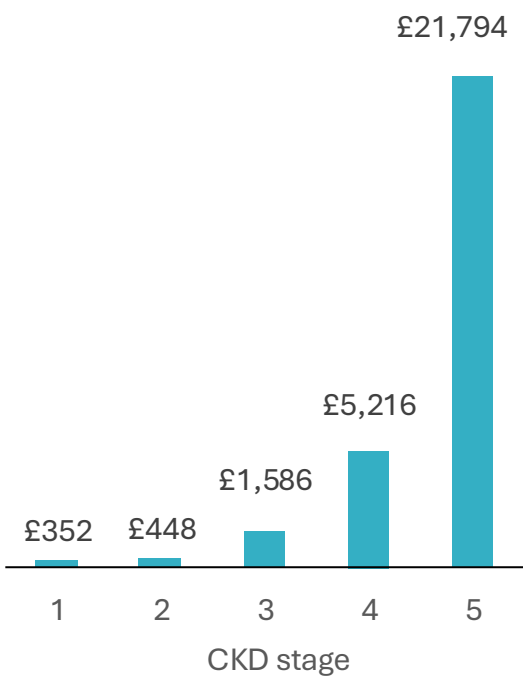

### Hospital admissions in those with diagnosed CKD (GM)

*2024, by stage, per 1,000*




### Annual secondary care costs per diagnosed CKD (GM)

*2024, by stage*




Of the ~115,000 people diagnosed with CKD in GM, ~21,000 are admitted to hospital each year.

An average patient with stage 5 CKD is admitted to hospital 36 a year, costing over £20,000.

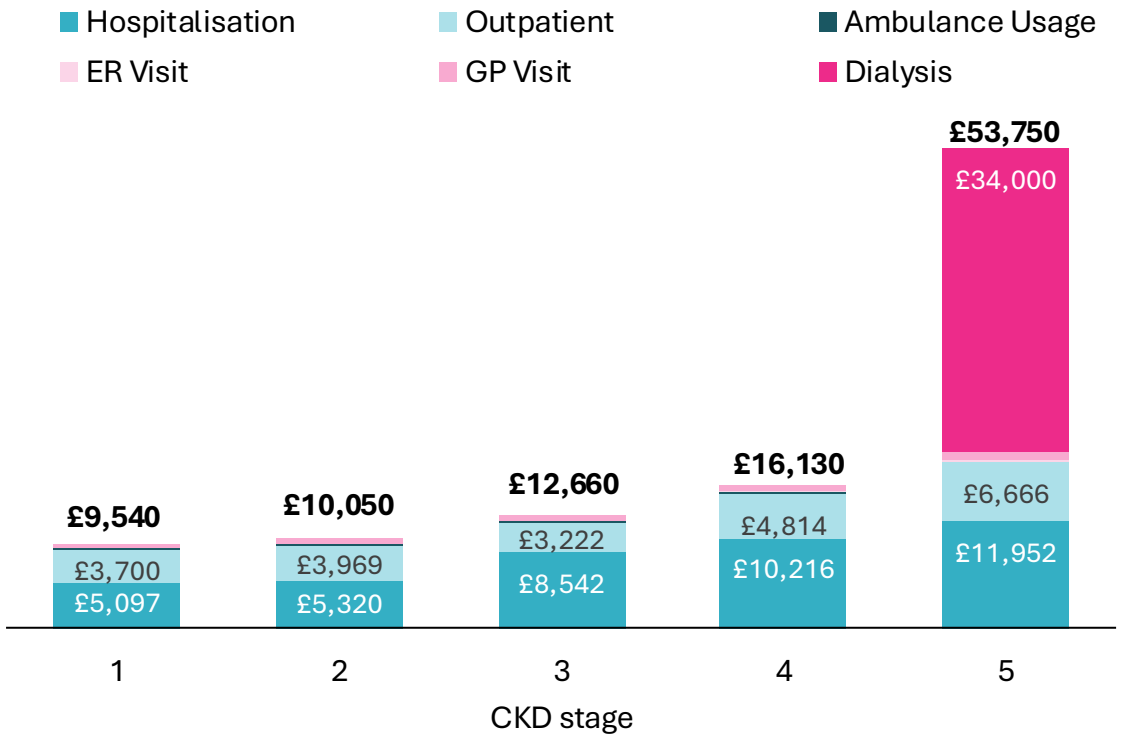


Source: Hospital Episode Statistics (HES) – Carnall Farrar analysis. Greater Manchester data – Carnall Farrar analysis. Peng, Ke et al. Medicine 101(48) Dec 2022

# The highest cost per admitted CKD patient is at stage 5 due to the cost of dialysis, with over 50% of total admission costs come from the larger number of stage 3 patients

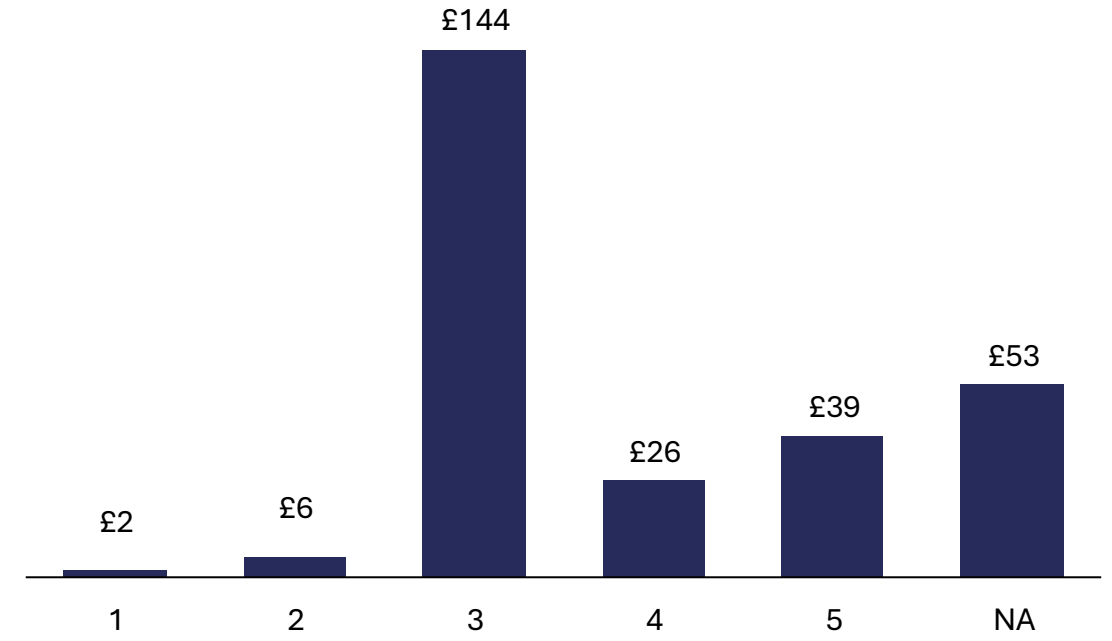
## Annual healthcare cost per admitted patient with CKD (GM)

*By CKD stage*




## Total annual secondary care cost for admitted CKD patients (GM)

*£Millions, by CKD stage*




Healthcare costs per admitted patient with CKD are £9.5k-£16k per year for stages 1-4 and ~£54k at stage 5.

Stage 3 patients contribute the most, £144M (50% of total secondary care costs) towards secondary care admission costs for CKD patients.

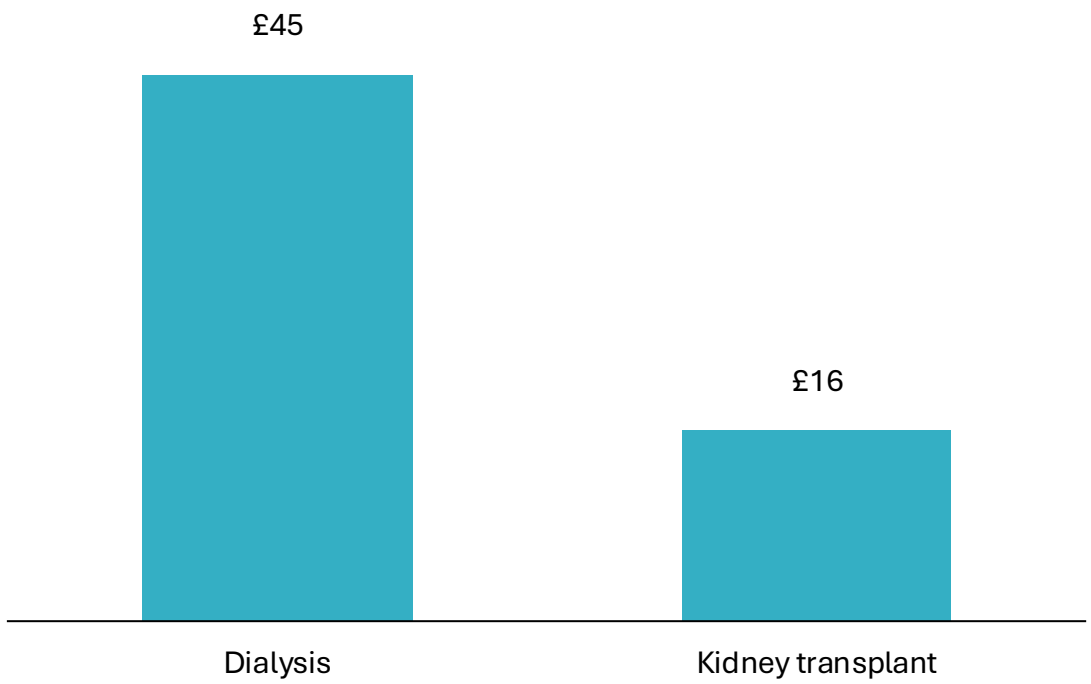


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data
NA = data not available

# Dialysis costs over £60M annually, with nearly half of dialysis and transplant patients originally at stages 3 or 4

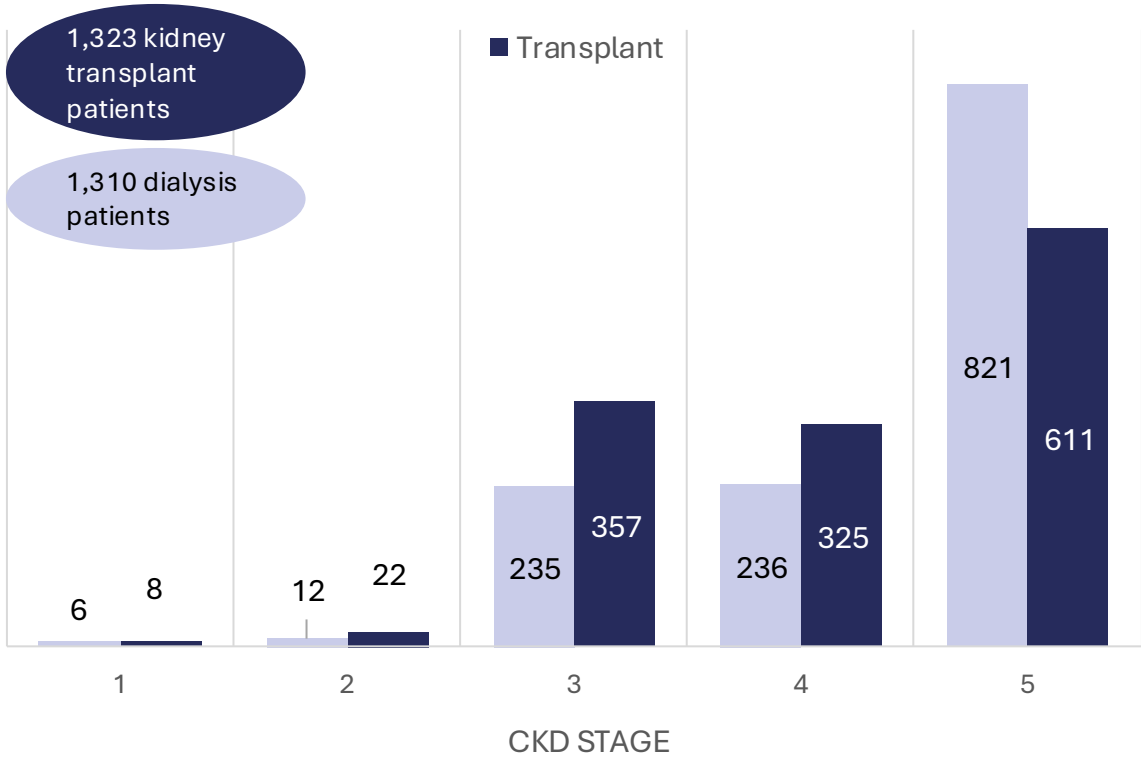
## Total annual cost of dialysis and transplant (GM)

*£Millions, 2023*




## Patients with kidney transplant or on dialysis (GM)

*By CKD stage*




Dialysis (£45m) and transplant (£16m) cost over £60m per year in GM. Unexpectedly, almost half of all patients on dialysis or with kidney transplant are in CKD stages 1-4.

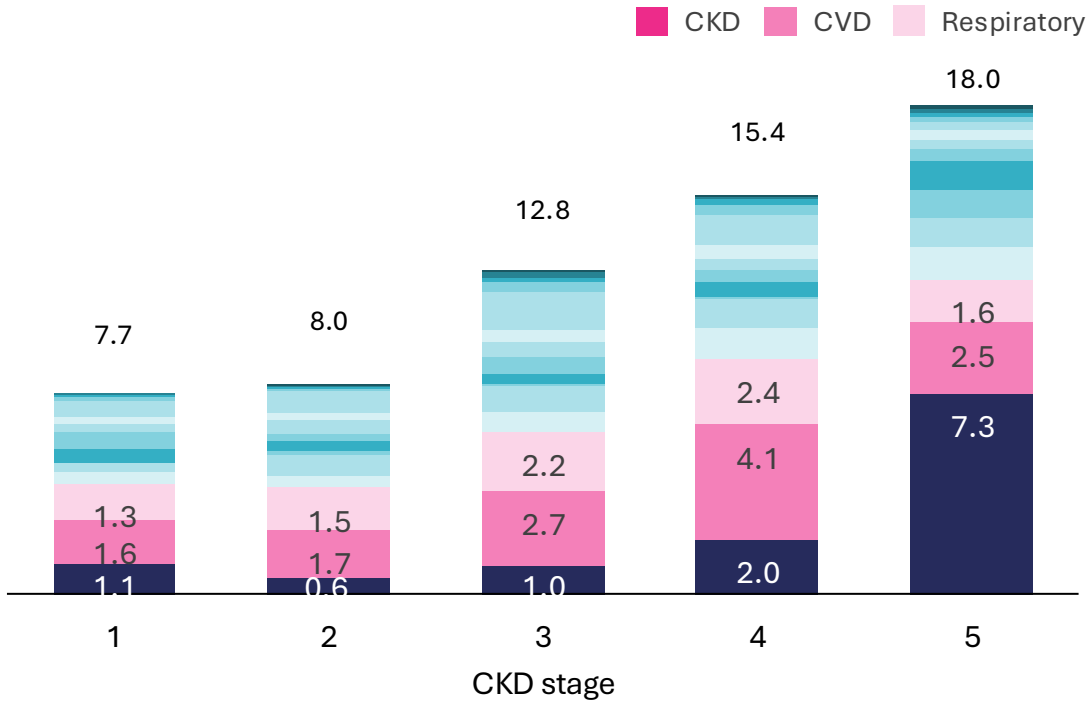


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# People with CKD are much more likely to be hospitalised for non-CKD related issues, with CVD leading

## Average bed days per admitted patient with CKD per year (GM)

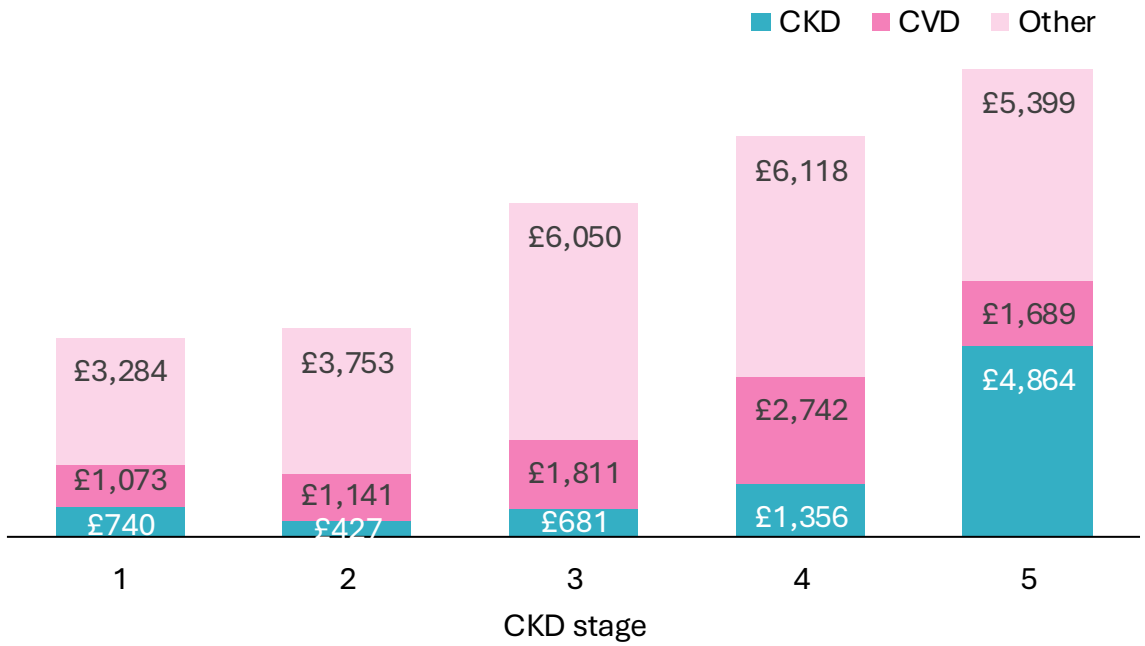
*2023-2024, by diagnosis, by CKD stage*




CKD accounts for up to **16%** of CKD secondary care health care resource use – but CVD, a major complication, drives **22%.**

## Average hospitalisation cost per admitted patient with CKD per year (GM)

*2023-2024, by diagnosis, by CKD stage*




In CKD patients, hospital costs for CVD far exceed those for CKD. Only in stage 5 CKD do kidney-related costs become higher, largely because many of these patients die from CVD complications.

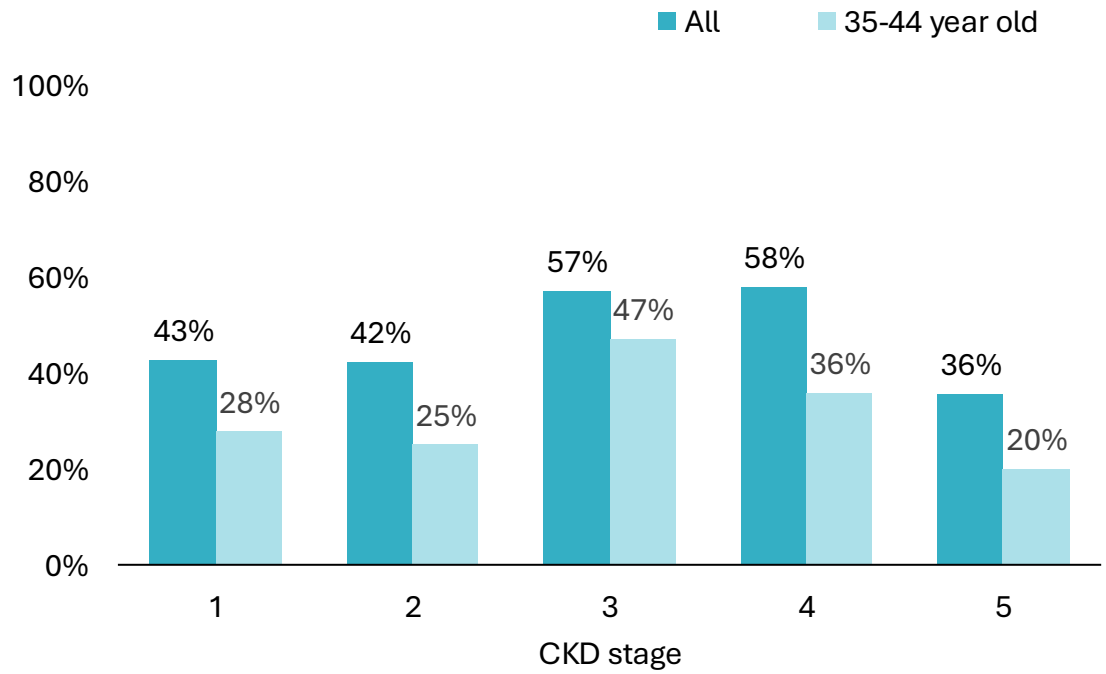


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# Few people in GM are taking advantage of the 'cheap and efficient' uACR test that can identify people with CKD early, although there is higher take up of the eGFR test

## People with CKD tested for uACR (GM)

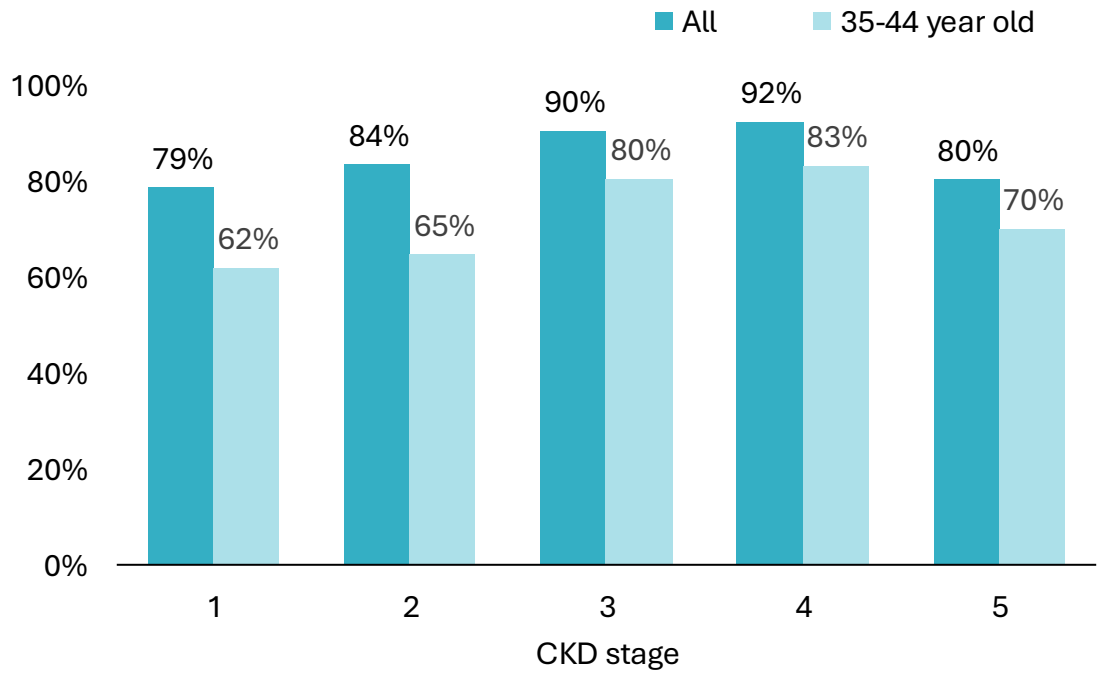
*% tested in the last 12 months*




**There are low rates of uACR testing (less than half of patients in stages 1 and 2)**, particularly in younger patients (aged 35-44), representing a significant **missed opportunity to manage CKD at earlier stages.**

## People with CKD tested for eGFR* (GM)

*% tested in the last 12 months*




Although eGFR testing is significantly higher than testing rates of uACR, there are still **gaps in early stage testing especially amongst younger patients.**

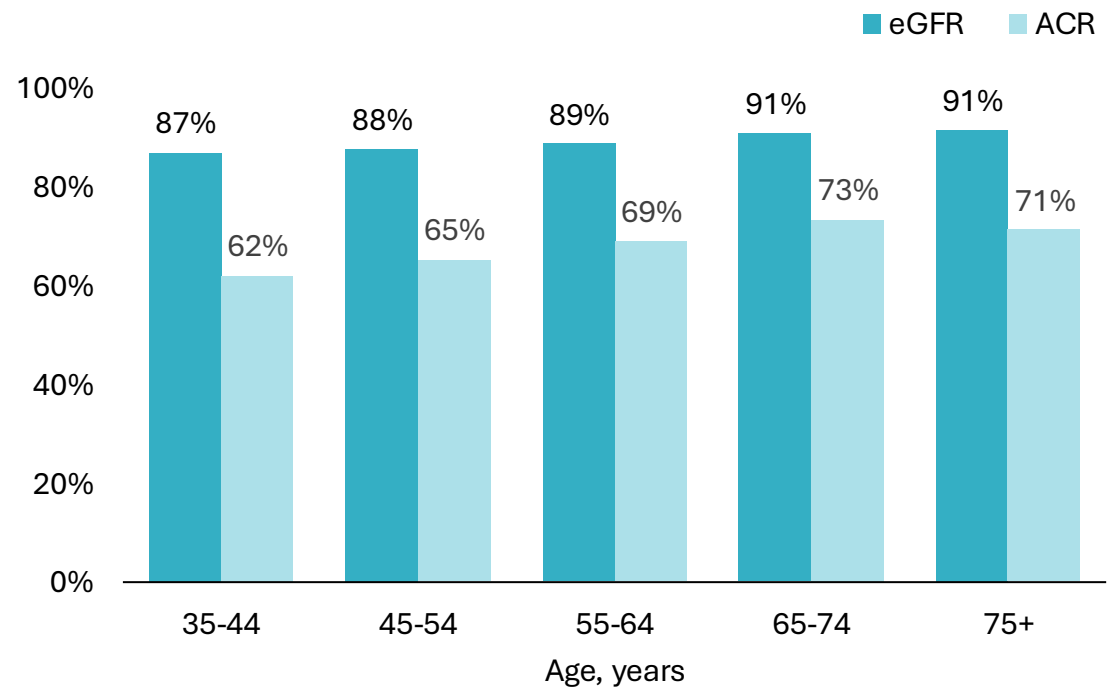


Source: Greater Manchester data – Carnall Farrar analysis. *Estimated glomerular filtration rate (eGFR) is a blood test that estimates how well the kidneys are filtering waste and excess fluid from the blood, and is used to assess kidney function and stage kidney disease

# Only 70% of people in GM at high risk of developing CKD are being tested for ACR, and only ~35% are being prescribed SGLT2 inhibitors

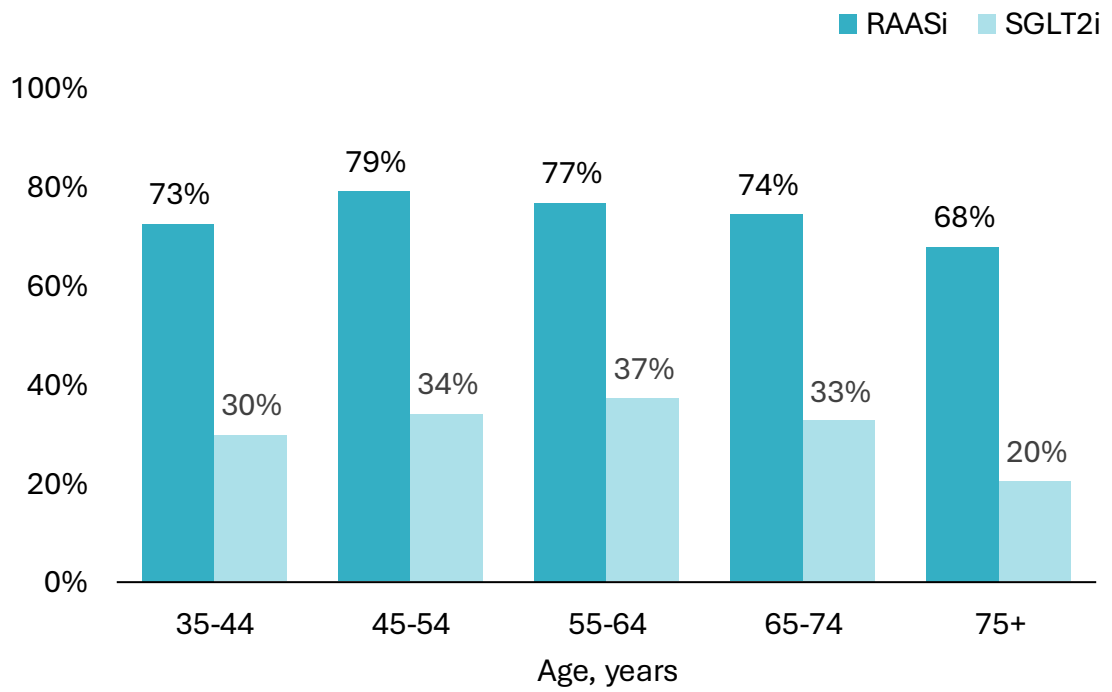
## High-risk* people tested for eGFR and ACR (GM)

*% tested in the last 12 months*




## High-risk* people prescribed RAASi or SGLT2i (GM)

*% prescribed*




**eGFR testing rates are consistently high** across all age groups, however, **uACR testing is low.**

Hypertension and diabetes, key risk factors for CKD, are often not managed effectively. Only about 70% of high-risk patients receive RAAS inhibitors, and just 30% are prescribed SGLT2 inhibitors.

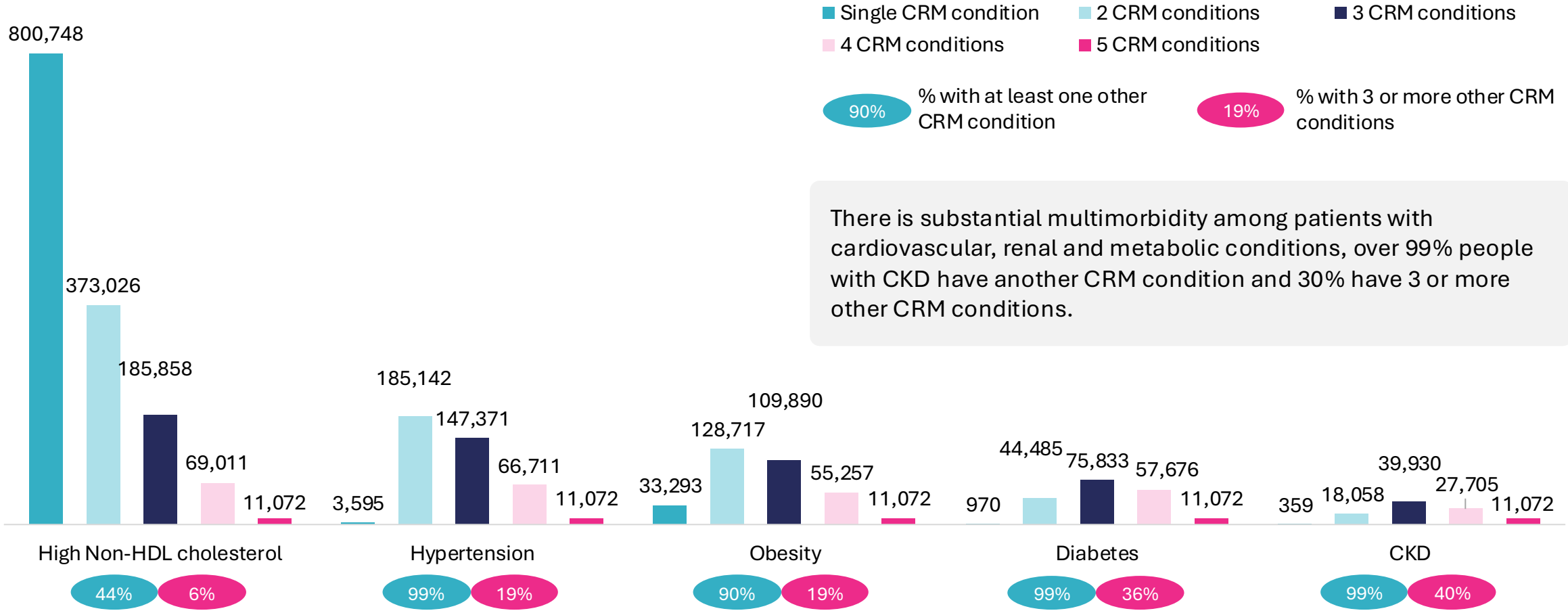


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data
*High-risk people are people with hypertension and type 2 diabetes

# Almost all the people in GM who have CKD also have one or more other cardiovascular, renal and/or metabolic conditions

## Recorded with cardiovascular, renal and metabolic (CRM) conditions in GM

*Recorded population with CRM conditions indicating the degree of multi-morbidity associated with each*




There is substantial multimorbidity among patients with cardiovascular, renal and metabolic conditions, over 99% people with CKD have another CRM condition and 30% have 3 or more other CRM conditions.

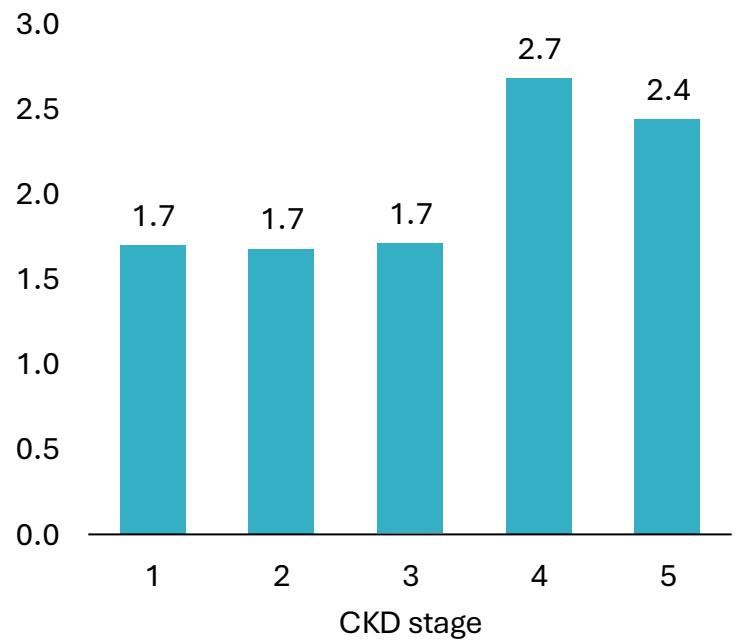


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# Diabetes and hypertension are key drivers of CKD progression - over 70% of people in GM with CKD are hypertensive and 33% are diabetic

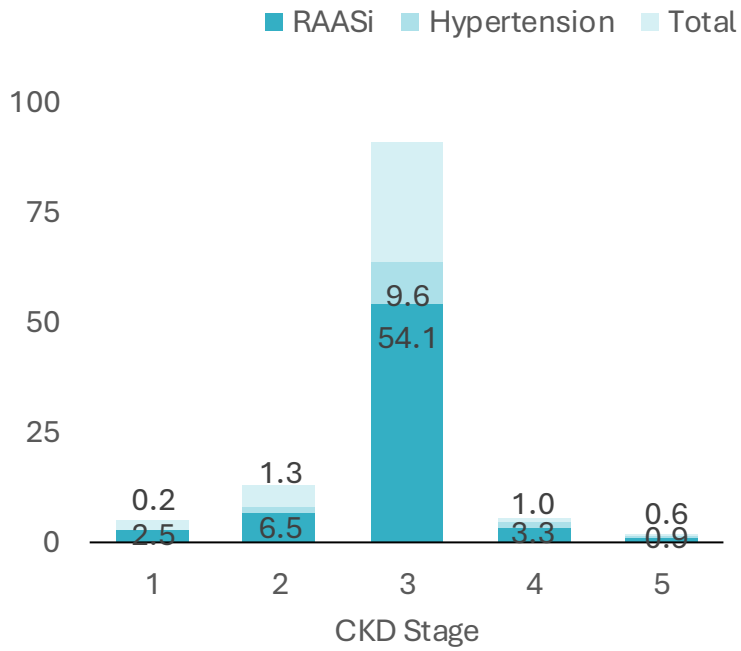
## Comorbidities per average CKD patient

*By CKD stage*



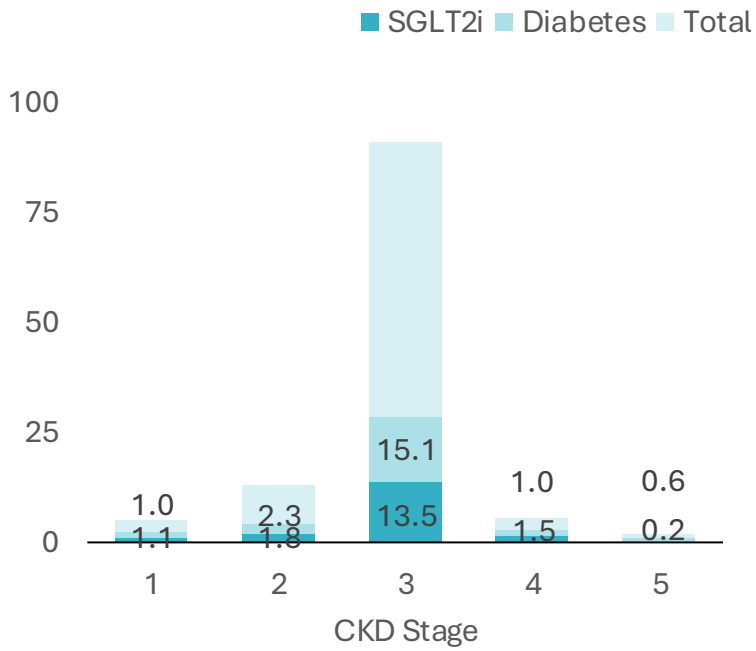

## CKD with HTN and treated with RAASi

*By CKD stage, thousands*




## CKD with diabetes and treated with SGLT2i

*By CKD stage, thousands*




Comorbidities **rise by almost 60%** from stages 3-4.

70% of CKD patients are hypertensive, with 84% of them being prescribed RAASi and 33% of CKD patients are diabetic, with 47% being prescribed SGLT2i.

[1]Renin-angiotensin-aldosterone system inhibitors (RAASis) have been shown to reduce blood pressure and proteinuria, delay estimated glomerular filtration rate (eGFR) decline, and lower the risk of kidney failure, cardiovascular morbidity, and all-cause mortality in patients with chronic kidney disease (CKD)

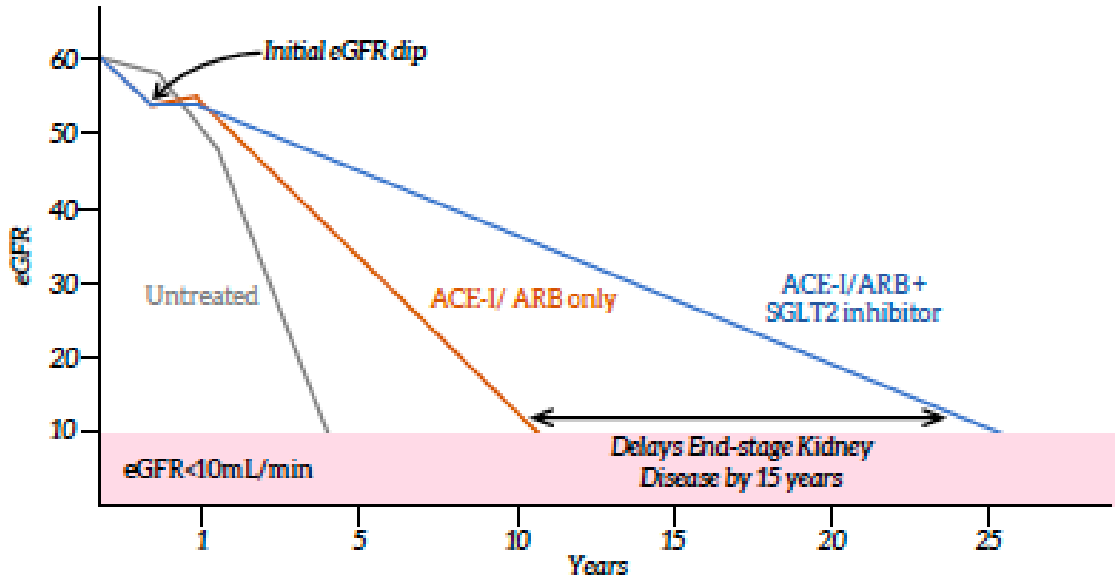
[2]SGLT2i is sodium-glucose cotransporter 2 inhibitor which lowers blood sugar by preventing the kidneys from reabsorbing glucose, leading to its excretion in urine and are used to manage type 2 diabetes



Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# Treatment with SGLT2i can delay end stage kidney disease by up to 15 years

## Potential impact of SGLT2i[3] on people with CKD




**Empagliflozin is recommended as an option for treating chronic kidney disease (CKD) in adults, only if:**

- It is an add-on to optimised standard care including the highest tolerated licensed dose of angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs), unless these are contraindicated, and
- People have an estimated glomerular filtration rate of:
  - 20 ml/min/1.73 $m^2$ to less than 45 ml/min/1.73 $m^2$ or
  - 45 ml/min/1.73 $m^2$ to 90 ml/min/1.73 $m^2$ and either:
    - a urine albumin-to-creatinine ratio of 22.6 mg/mmol or more, or
    - type 2 diabetes

The CREDENCE study trial suggests that SGLT2i[3] could delay end stage kidney disease by up to 15 years compared to treatment with RAASi alone.

*[1]Estimated glomerular filtration rate (eGFR) is a blood test that estimates how well the kidneys are filtering waste and excess fluid from the blood, and is used to assess kidney function and stage kidney disease*

*[2]Renin-angiotensin-aldosterone system inhibitors (RAASis) have been shown to reduce blood pressure and proteinuria, delay estimated glomerular filtration rate (eGFR) decline, and lower the risk of kidney failure, cardiovascular morbidity, and all-cause mortality in patients with chronic kidney disease (CKD)*

*[3]SGLT2i is sodium-glucose cotransporter 2 inhibitor which lowers blood sugar by preventing the kidneys from reabsorbing glucose, leading to its excretion in urine and are used to manage type 2 diabetes*

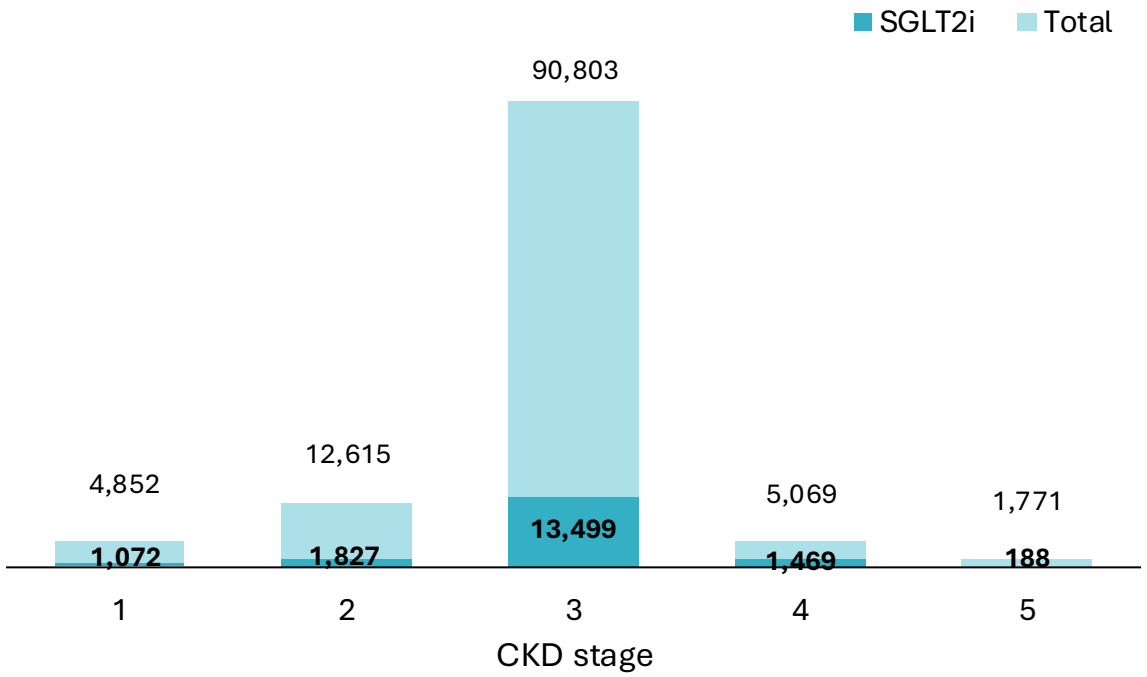


Source: Forbes et al. eClinicalMedicine, Volume 68, 102426; NICE Quality standard QS209, Type 2 diabetes in adults. March 2023.

# Only 25% of the eligible population of CKD patients in GM are currently being prescribed SGLT2i

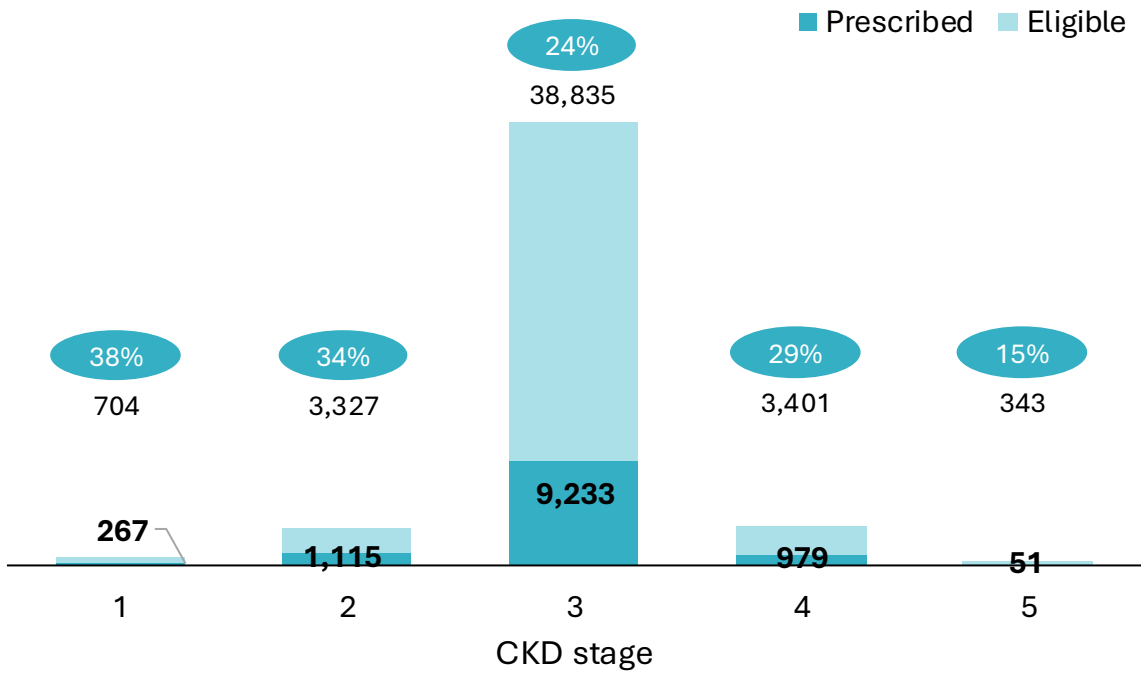
## Number of people receiving SGLT2i (GM)

*By CKD stage*




## Number of eligible people prescribed SGLT2i (GM)

*By CKD stage*




There is a significant under utilisation of SGLT2i in CKD management with only 16% of CKD diagnosed patients and c.25% of eligible patients receiving this treatment. This represents an opportunity to improve patient outcomes and reduce the healthcare burden on the system through the appropriate use of this category of medicine.

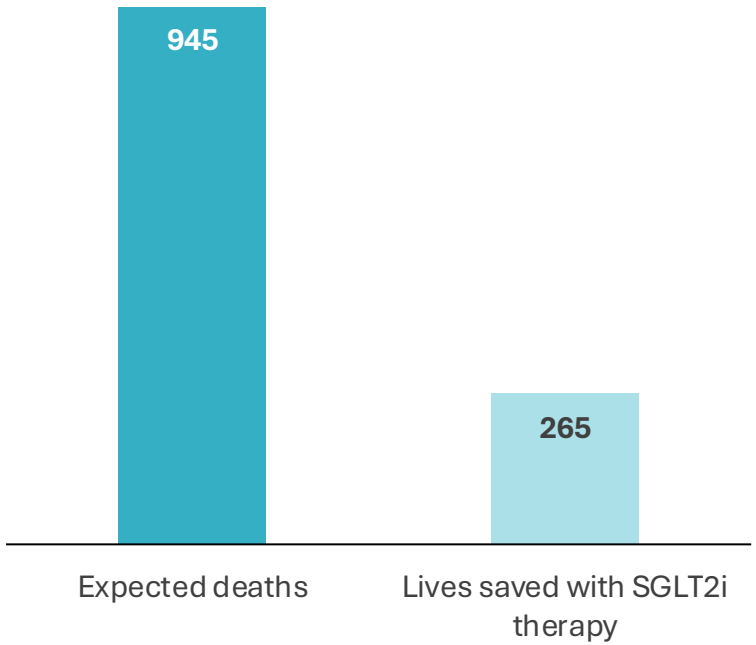


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# If SGLT2i therapies were more widely used, GM could expect to save over 250 lives per year and prevent over 2,100 major cardiovascular events

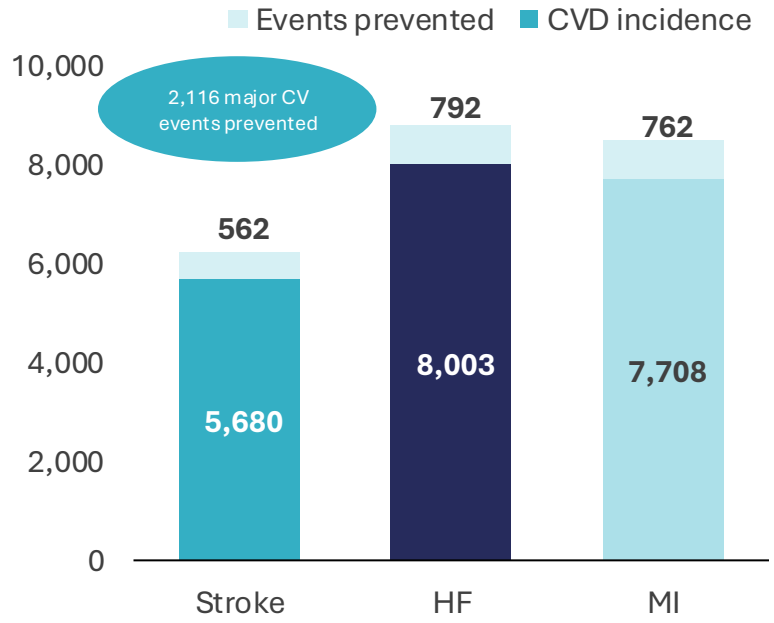
## Estimated number of deaths related to CKD

*Deaths from CKD, Greater Manchester*



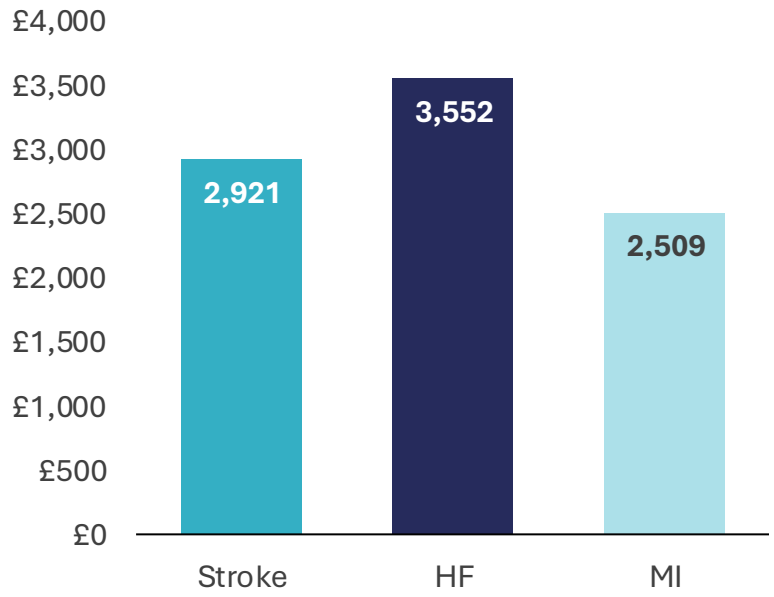

## Events prevented by using SGLT2 inhibitors

*CVD events prevented, Greater Manchester*




## Savings from CVD prevented events

*£, by CVD event, Greater Manchester*




SGLT2i therapies could **save 265 lives per year in GM**, however, SGLT2i therapies are not widely used within GM.

By using SGLT2i therapies, **major cardiovascular events could be reduced by 9%,** translating into over **2,100 events prevented** in GM alone.

SGLT2i is sodium-glucose cotransporter 2 inhibitor which lowers blood sugar by preventing the kidneys from reabsorbing glucose, leading to its excretion in urine and are used to manage type 2 diabetes

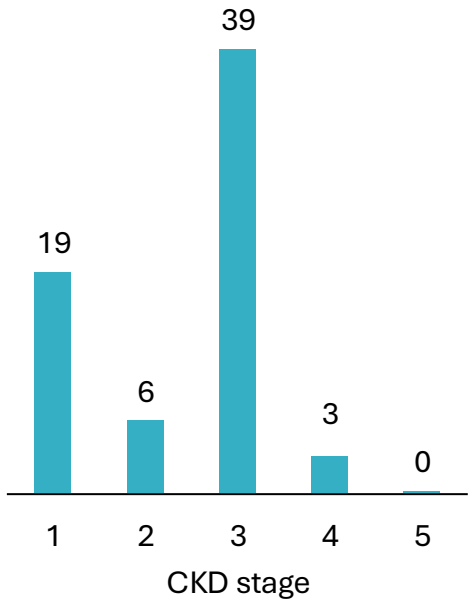


Source: Carnall Farrar analysis of patient level extract from Greater Manchester data
Patel S et al. Circulation, Volume 149, Number 23

# Earlier CKD intervention in GM with SGLT2i therapies would result in slower disease progression and a reduction in costs

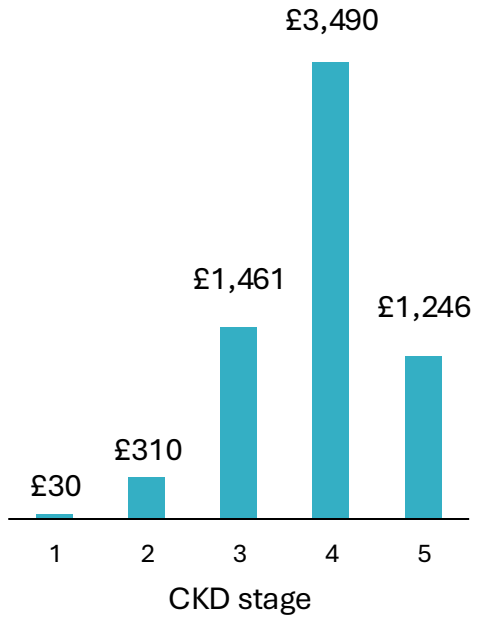
## Number of people to be treated

*Thousands, by stage*



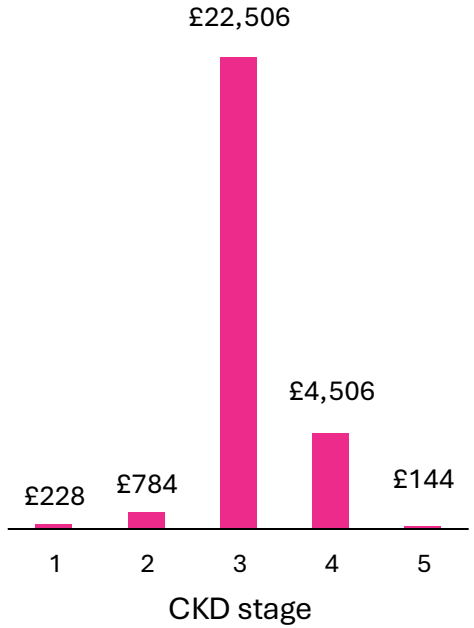

## Secondary care savings per person progressed next stage

*2024, by stage*




## Annual secondary care savings

*£Thousands, by stage*




## Annual dialysis and kidney transplant savings

*£Thousands, by stage*


67,000 people could be treated earlier, resulting in a savings of up to £3,490 per annum per person who is prevented from progressing to the next stage of the disease.

Earlier intervention would result in total annual savings of £36.7m (by 2033), £28m of secondary care costs and £8.7m of dialysis and kidney transplant costs.

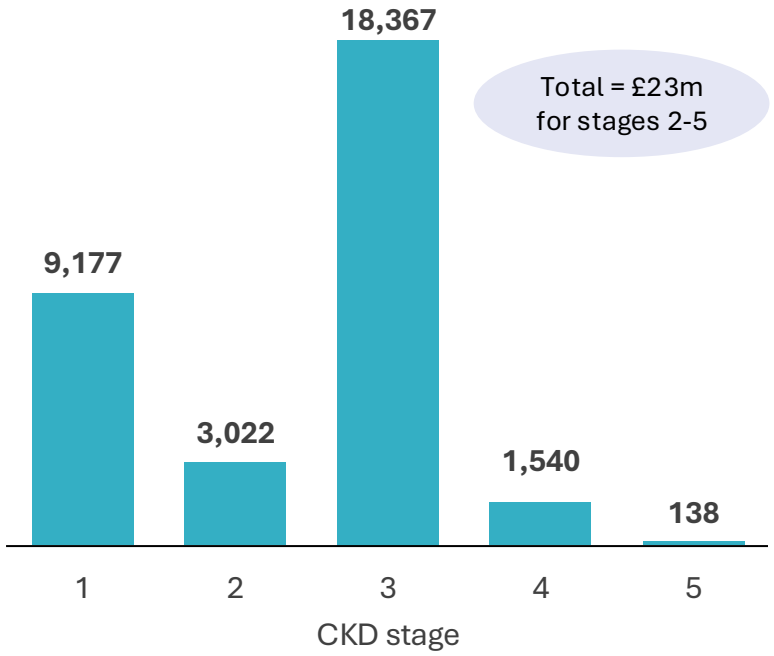


Source: Hospital Episode Statistics (HES) – Carnall Farrar analysis. Greater Manchester data – Carnall Farrar analysis. Peng, Ke et al. Medicine 101(48) Dec 2022

# Earlier intervention in CKD with SGLT2i therapies in GM costs £23m (stage 2-5) per year, however, early intervention will deliver savings of £45.7m annually

## Prescription costs

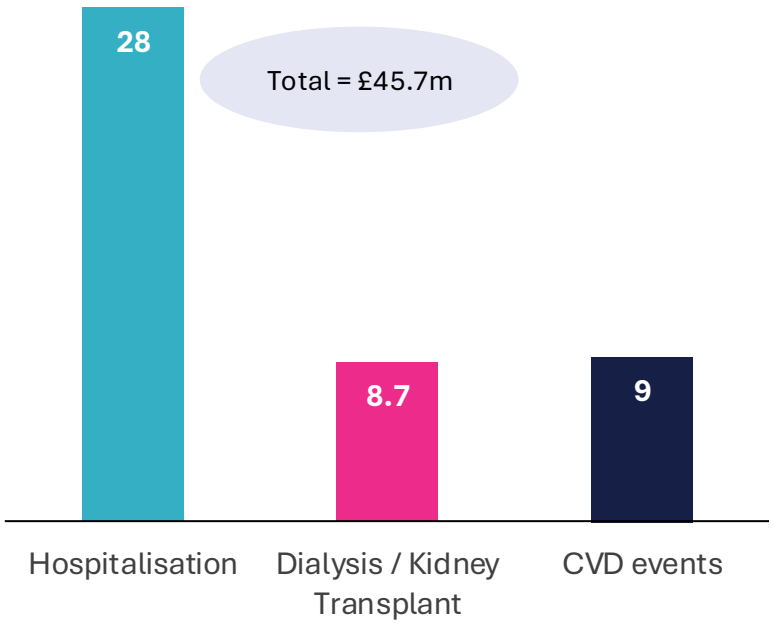
*£Millions, 2024, by stage, Greater Manchester*




Earlier intervention in GM with SGLT2 inhibitor therapies would cost £23M per year in additional drugs costs, when prescribed to stage 2-5 CKD patients.

## Savings as a result of earlier intervention

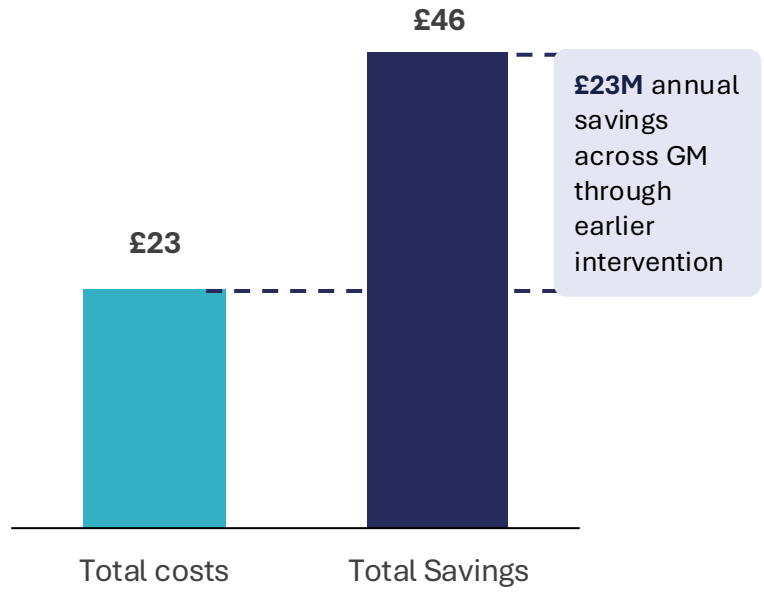
*£Millions, 2024, by stage, Greater Manchester*




Earlier intervention in GM with SGLT2i therapies would save £45.7m per year by reducing hospitalisations (£28m), dialysis and kidney transplant (£8.7m) and by reducing cardiovascular events (£9m).

## Net savings from earlier interventions

*£Millions, 2024, Greater Manchester*




Earlier intervention across all CKD stages can save £23m. when focusing on patients at stage 2+, who are more likely to progress and utilise the health system more.



Source: Carnall Farrar analysis of patient level extract from Greater Manchester data

# Conclusions

**What this analysis shows**

- CKD represents a **substantial and largely addressable burden** in Greater Manchester: over 200,000 people are affected, 43% remain undiagnosed, and only 25% of those eligible for SGLT2 inhibitor therapy are receiving it. The evidence base for intervention is clear and the tools to act are available.
- Health inequalities are stark and demand a targeted response: **people in the most deprived areas are twice as likely to have CKD**, face longer delays to diagnosis, and account for 50% of all patients on dialysis – an outcome that is expensive, burdensome, and preventable with earlier intervention.

**What this work in Greater Manchester concluded**

- GM ICB has agreed to **prioritise CKD as a system-level focus**, recognising that improving diagnosis rates – particularly through risk stratification using comorbidity data – is the most impactful near-term lever available to the system.
- Earlier intervention using SGLT2 inhibitor therapies could **save 265 lives, prevent over 2,100 major cardiovascular events, and deliver net savings of ~£23m annually** – a compelling case for commissioning a structured programme of diagnosis improvement and treatment optimisation.

**Wider implications**

- The challenge of **under-diagnosis and under-treatment of CKD is not unique to Greater Manchester**: it reflects a national and international pattern driven by fragmented data, asymptomatic early disease and insufficient clinical coding at primary care level.
- This work demonstrates the value of **building integrated datasets that link primary care, secondary care, prescribing and laboratory records**: without data integration of this kind, the true scale of the CKD burden – and the opportunity to address it – remains hidden.
- Addressing CKD at scale requires **a commissioned programme with dedicated resource**: this report provides the evidence base to make that case.

# Thank you


info@carnallfarrar.com

+ 44 (0)20 3770 7535


Health Innovation Manchester

CF Experts in health