RENINE Annual Report 2015

T. Hoekstra, M.H. Hemmelder, F.J. van Ittersum

Nefrovisie
Richtlijnen · Registratie · Visitatie

Nederlandse Federatie voor Nefrologie

In cooperation with the sectie Registratie (Registration division) of the Nederlandse Federatie voor Nefrologie (NfN; Dutch federation for Nephrology):

prof.dr. F.J. van Ittersum, internist-nephrologist, epidemiologist – chair sectie Registratie NfN
dr. H. van Hamersvelt, internist-nephrologist , representative Guidelines division NfN
dr. B. van Dam, internist-nephrologist , representative Guidelines division NfN
dr. M.H. Hemmelder, internist-nephrologist , director Nefrovisie
prof.dr. A. Hoitsma, emeritus internist-nephrologist, representative NOTR/NTS
dr. V.S. Stel, epidemiologist, ERA-EDTA registry
prof.dr. F.W. Dekker, epidemiologist
dr. G. Laverman, internist-nephrologist
dr. M. van Buren, internist-nephrologist
dr. K. Cransberg, pediatric nephrologist
P. v.d. Vlist, representative V&VN
drs. H. Bart, director Nierpatiëntenvereniging Nederland (Dutch Association of Kidney Patients)
drs. K. Prantl, Nierpatiënten Vereniging Nederland (Dutch Association of Kidney Patients)

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INTRODUCTION

The Nefrovisie foundation collects data from patients on renal replacement treatment in a national database (RENINE) since 1986. All Dutch dialysis centres[1]. collaborate with this data collection to provide a nationwide overview of indicators of renal replacement treatment in the Netherlands.

RENINE data are available on the webportal Nefrodata, both aggregated yearly data for the general public as well as actual centre specific data for the participating centres (http://www.nefrovisie.nl/nefrodata). Nefrovisie has published annual reports since 2014. The annual report 2015 which we now present contains additional analyses in comparison to the 2014 report.

The 2015 report has additional information on a number of clinical indicators, such as vascular access and PTH, as well as a more detailed analysis of mortality and causes of death. Dialysis centres provided data on clinical indicators in 2015 on a voluntary basis. Since 2016 the clinical indicators are an obligatory component of the RENINE data collection. We therefore expect to perform more complete analyses in future reports. In addition to general results for most topics, information is provided for different age categories as well as categories for primary renal disease. In addition to the 2014 report, data of children on renal replacement treatment are also included (age category 0-19 years). To enable international comparisons we use the same age and primary renal disease categories as the ERA-EDTA. We firstly present the 2015 report in English to enable international comparisons with registries of other countries. We also will provide a RENINE report 2015 in Dutch language which is suitable for patients.

This report provides the main figures. Additional results will be provided on the website of Nefrovisie (http://www.nefrovisie.nl). This will be indicated in the report if applicable. It should be noted that the numbers presented in this annual report might differ from the numbers on Nefrodata due to different definitions.

[1] In Appendix D. an overview of the dialysis centres is given.

1. PREVALENCE AND INCIDENCE OF RENAL REPLACEMENT THERAPY

Renal replacement therapy (RRT) includes both renal transplantation as well as dialysis. At the end of 2015, 16,724 patients were on RRT in the Netherlands. The number of prevalent RRT patients shows a steady increase over the years (Figure 1.1). However, the number of patients starting RRT in a year, i.e. the incidence, has remained quite stable during the last seven years. In 2015, 1,996 patients started for the first time with renal replacement therapy with either renal transplantation or dialysis. The same pattern is observed when the prevalence and incidence are expressed as patients per million of the population (ppm) (Figure 1.2): in 2015, about 119 patients per million population started renal replacement therapy.

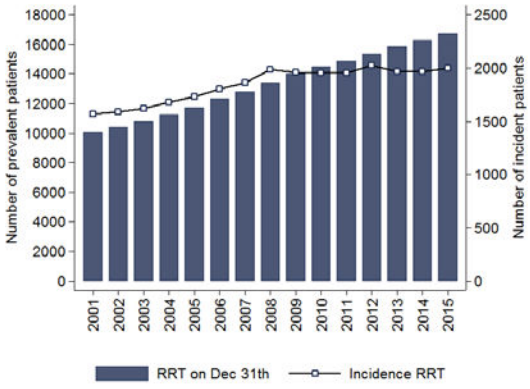


Figure 1.1. Prevalence and incidence of renal replacement therapy

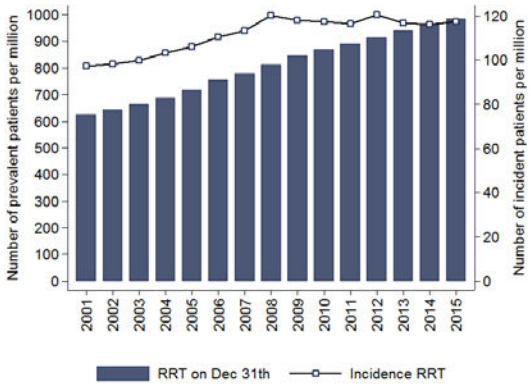


Figure 1.2. Prevalence and incidence of renal replacement therapy expressed per million population.

Age categories

The patients were categorized into five age categories[2]. Figure 1.3 shows age specific prevalences and incidences of renal replacement therapy per million age related population (pmarp).[3] These figures indicate that the overall rise in prevalence of RRT is caused by steady increases in the older age categories. In 2015, the prevalence per million population was with 2,354 patients per million the highest in the age category of 75 years and older. Incidence was also the highest in this age category (393 patients per million population). However, the prevalence in patients over 75 years seems to stabilize during the last years and the incidence is showing a decrease during the last years.

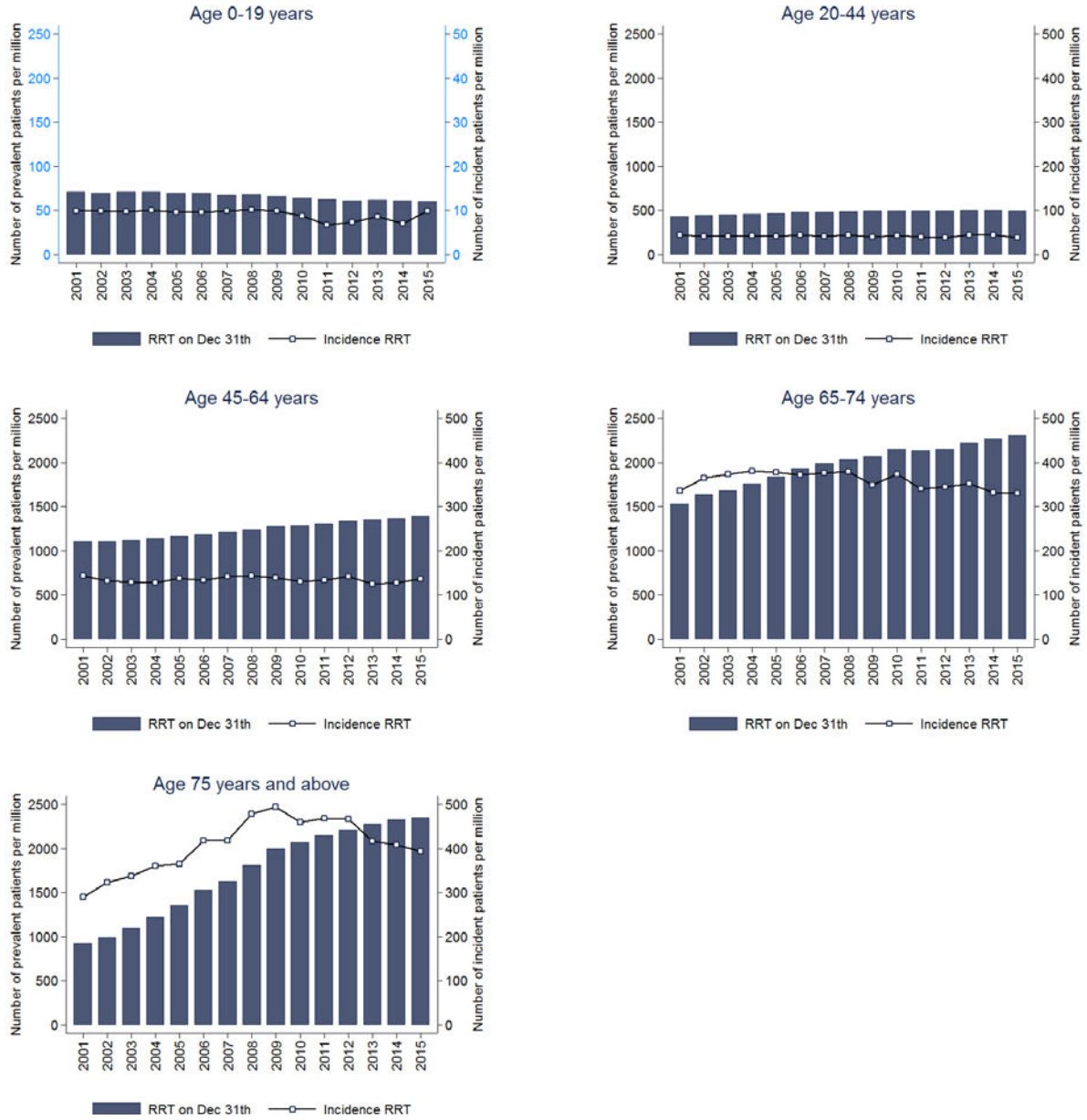
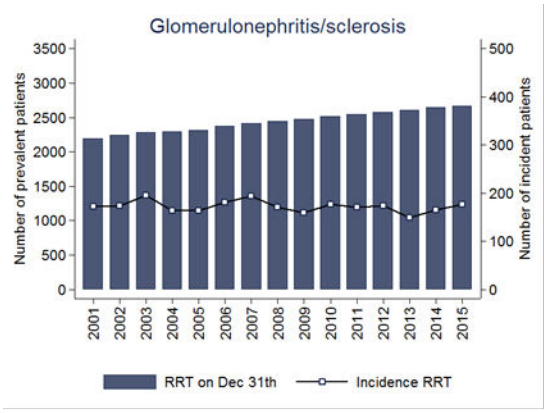


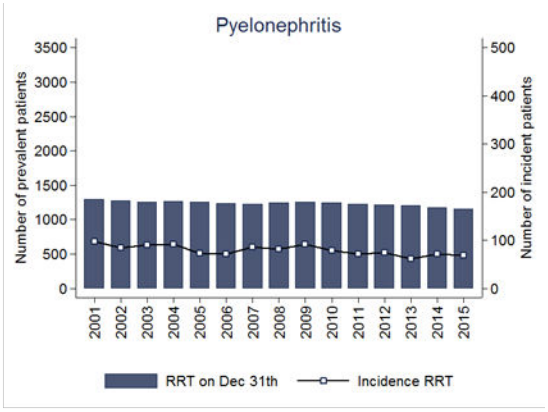
Figure 1.3. Prevalence and incidence of renal replacement therapy in age categories expressed per million age related population. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

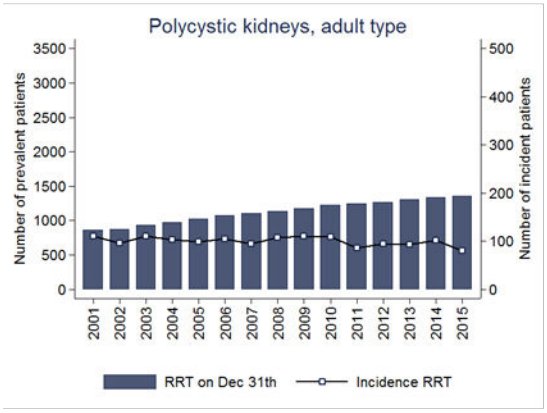
[2] Age categories are in accordance to the age categories used by the ERA-EDTA registry
[3] Figures with overall numbers per age category are shown in the online appendix.

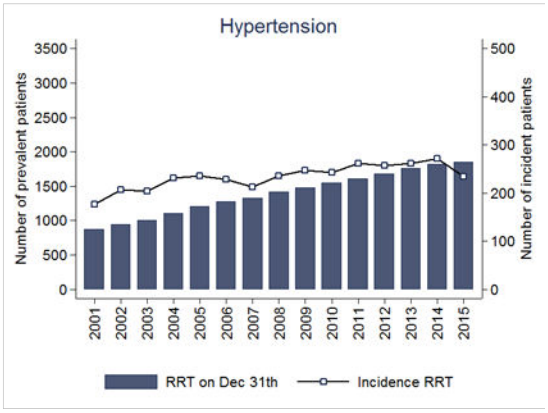
Primary kidney disease and renal replacement therapy

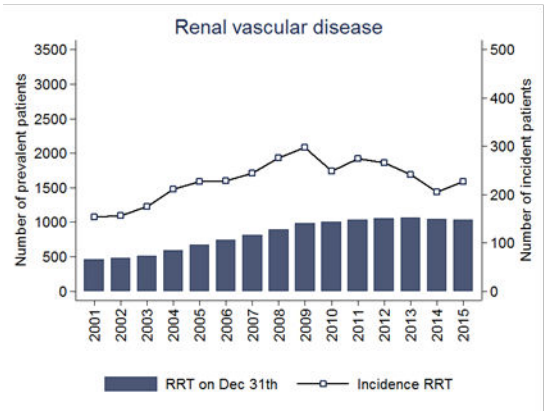
Primary kidney diseases were categorized in nine categories according to the ERA-EDTA categorization (see Appendix B). Figure 1.4 shows prevalences and incidences in the different categories. The primary kidney disease categories with the largest contribution to the prevalence of RRT are the categories “miscellaneous” and “unknown”. Prevalences of hypertension, diabetes type 2 and miscellaneous categories are all rising, although the incidence in these categories is rather stable. There is a remarkable rise in the category with unknown primary kidney disease. This is the only category with not only an increase over the years in the number of prevalent patients but also with a clear increase in incidence.

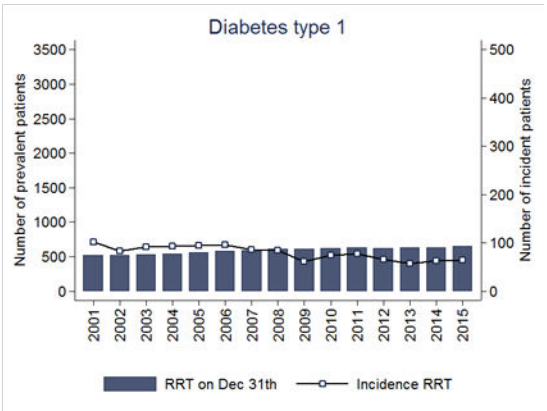












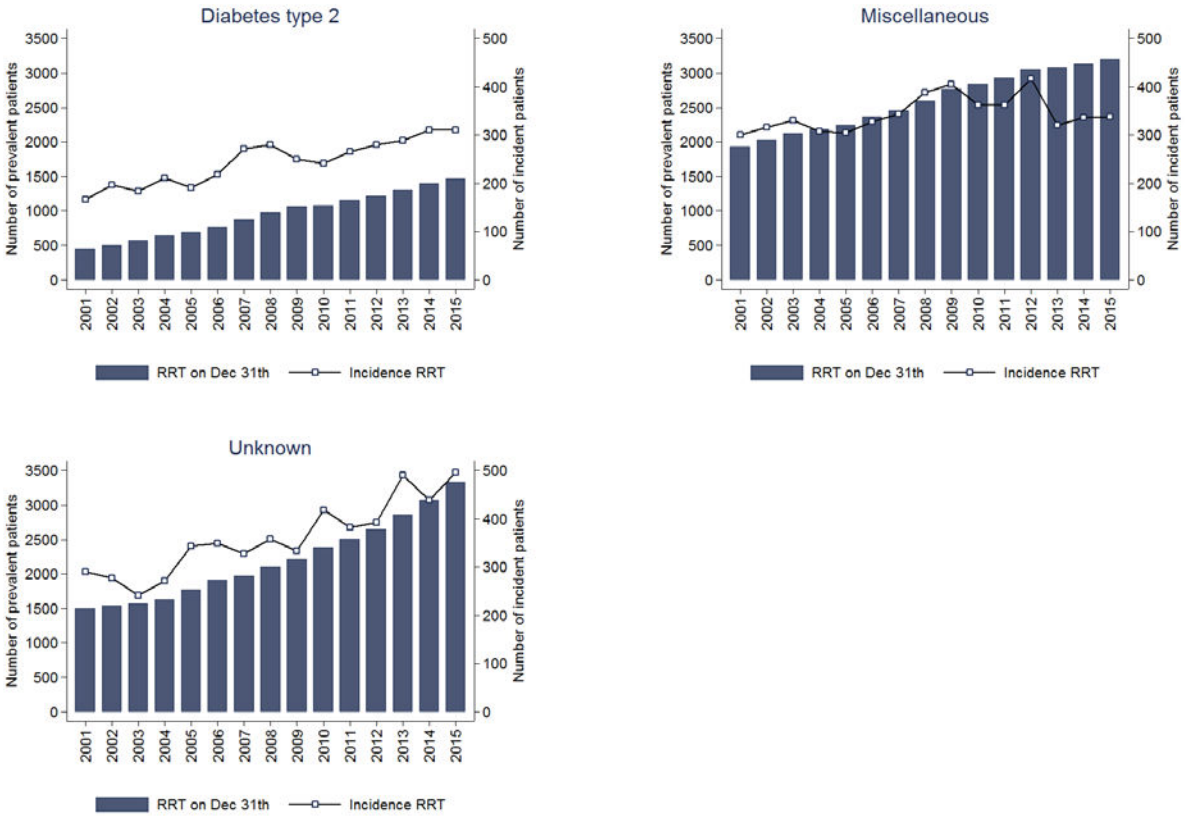


Figure 1.4. Prevalence and incidence of renal replacement therapy in primary kidney disease categories.

2. PREVALENCE AND INCIDENCE OF DIALYSIS AND RENAL TRANSPLANTS

The prevalence of patients with dialysis has been quite stable since 2009, whilst the number of patients living with a functioning renal transplant has shown a steady increase over time (Figure 2.1) Figure 2.1 also shows the incidence of both treatment modalities. Incidence has been defined by patients who received a renal transplant or started dialysis as their first renal replacement therapy. Figure 2.2 shows prevalences and incidences expressed per million of the population. In 2015, 1,749 patients started dialysis as the first renal replacement therapy and 247 patients received a renal transplant as first therapy (i.e. first pre-emptive transplant).

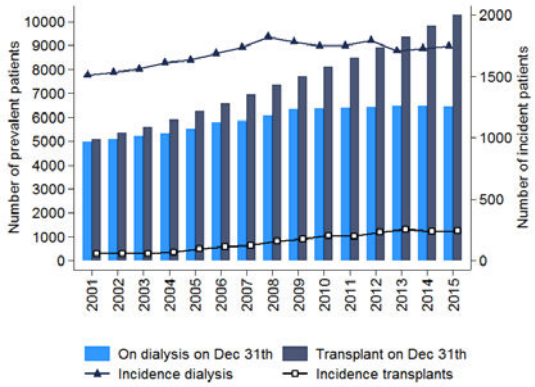


Figure 2.1. Prevalence and incidence of dialysis and renal transplants. Incidence only includes patients without previous renal replacement therapy.

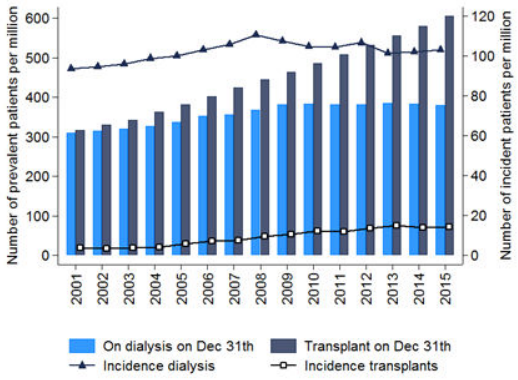


Figure 2.2. Prevalence and incidence of dialysis and renal transplants expressed per million population. Incidence only includes patients without previous renal replacement therapy.

When we change the definition of incidence to all patients who start with dialysis or receive a renal transplant, irrespective of earlier RRT treatment, 980 patients had a renal transplant and 1,998 patients started with dialysis in 2015 (Figure 2.3 and 2.4 (ppm)).

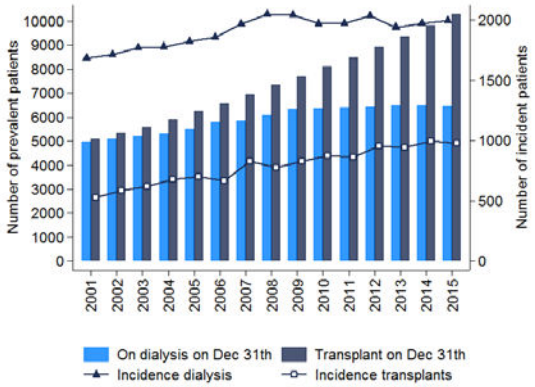


Figure 2.3. Prevalence and incidence of dialysis and renal transplants. Incidence includes all patients starting dialysis or receiving a renal transplant irrespective of previous renal replacement therapy.

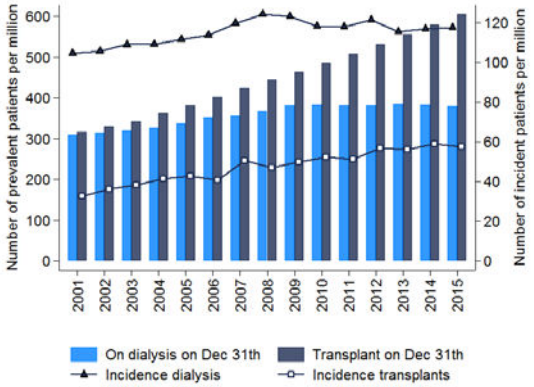


Figure 2.4. Prevalence and incidence of dialysis and renal transplants expressed per million population. Incidence includes all patients starting dialysis or receiving a renal transplant irrespective of previous renal replacement therapy.

Figure 2.5 shows the prevalences and incidences of dialysis and renal transplants in different age categories. The numbers are shown per million age related population. Incidences includes only patients starting therapy as first RRT treatment[4]. In young prevalent patients renal transplantation is the dominant therapy. In the age category 65-74 years more patients were treated with dialysis than with renal transplantation until 2010. From 2011 more patients are living with a functioning renal transplant than being treated with dialysis in this age category. In the patients over 75 years of age dialysis remains the prevailing therapy.

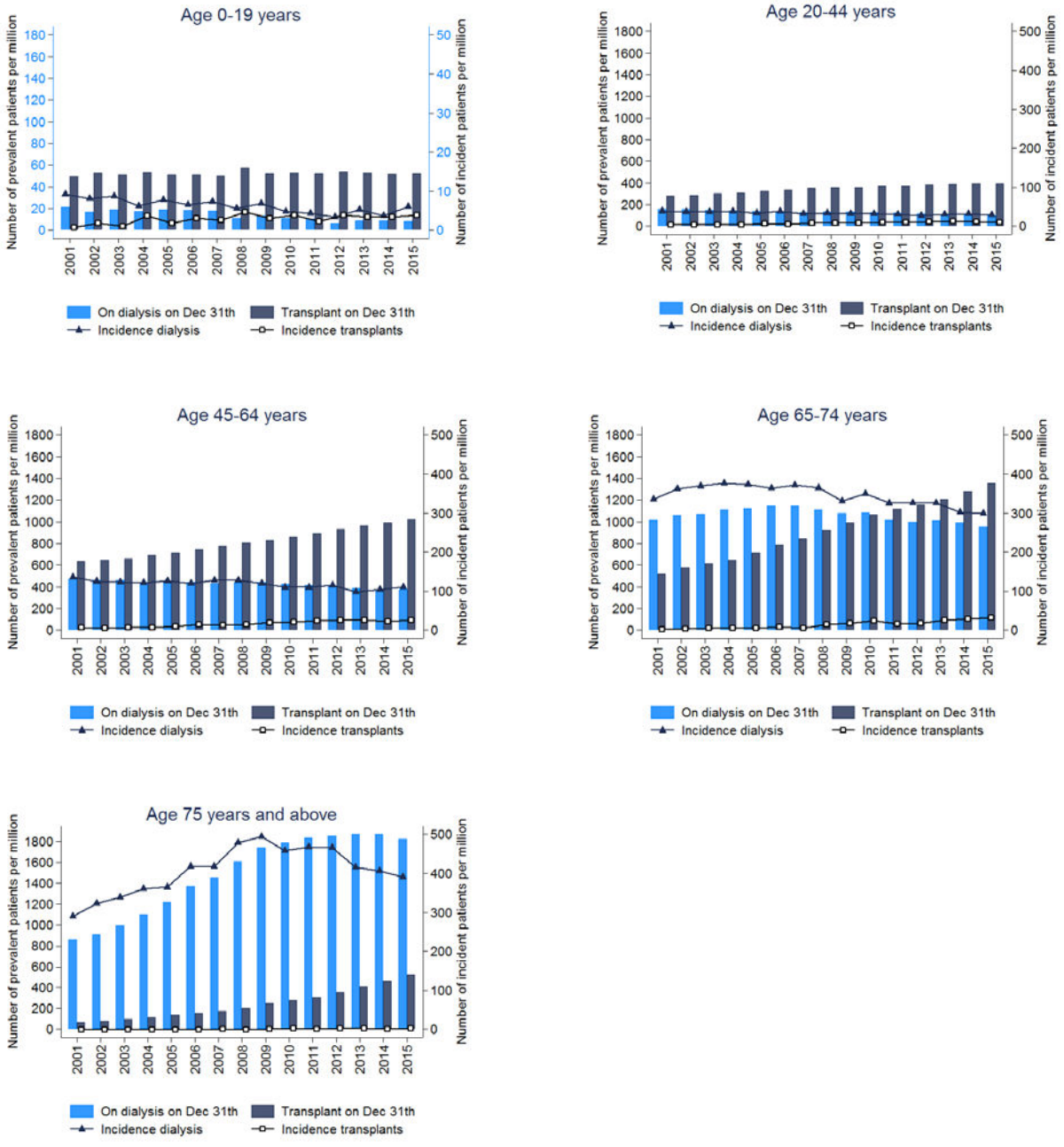
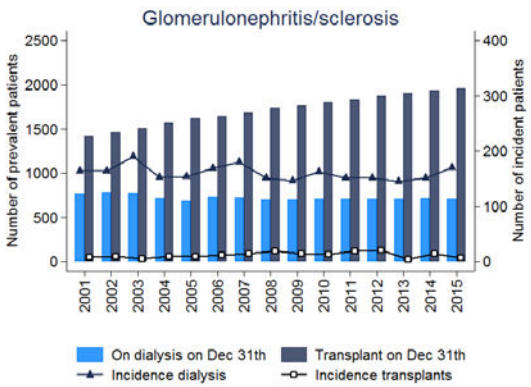
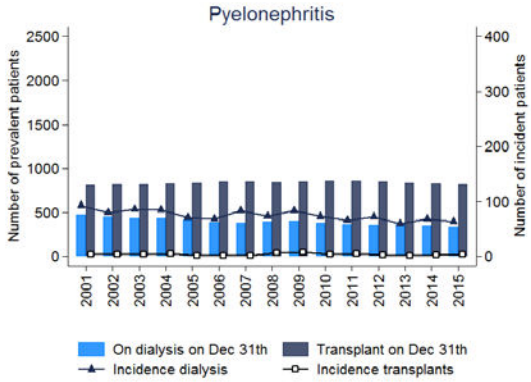


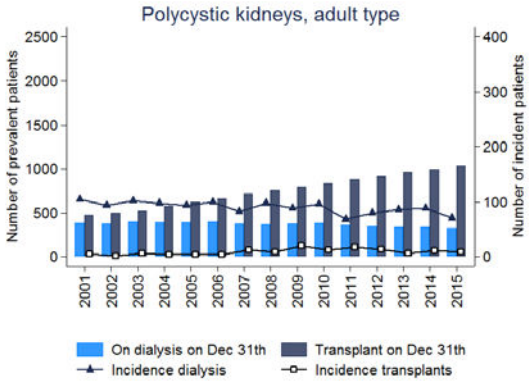
Figure 2.5. Prevalence and incidence of dialysis and renal transplants in age categories expressed per million age related population. Incidence includes only patients without previous renal replacement therapy. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

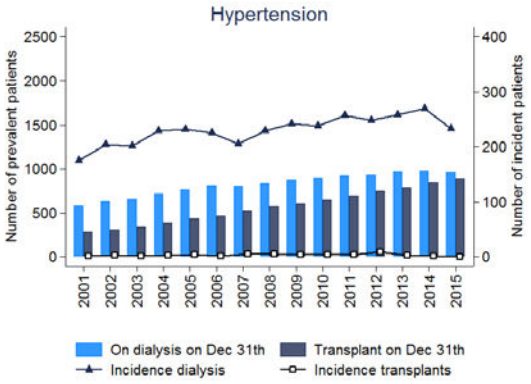
[4] Figures showing incidence irrespective of previous renal replacement therapy for the age categories are presented in the online appendix.

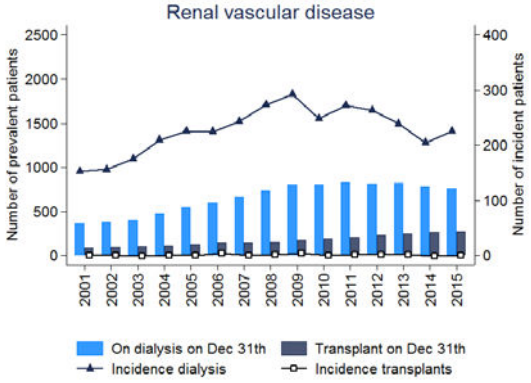
Figure 2.6 shows prevalences and incidences for primary kidney disease categories[5]. Noteworthy is the steep increase in both the prevalence and incidence of patients with renal transplantation in the category with unknown primary disease. A gradual increase of prevalence and incidence of patients with type 2 diabetes mellitus and dialysis persists, just as a gradual decrease of patients with pyelonephritis and dialysis.

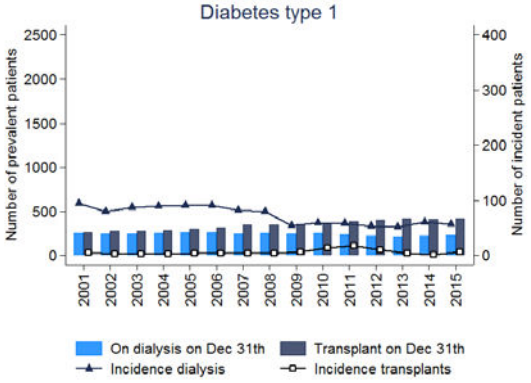












[5] Figures showing incidence irrespective of previous renal replacement therapy for the primary kidney disease categories are presented in the online appendix.

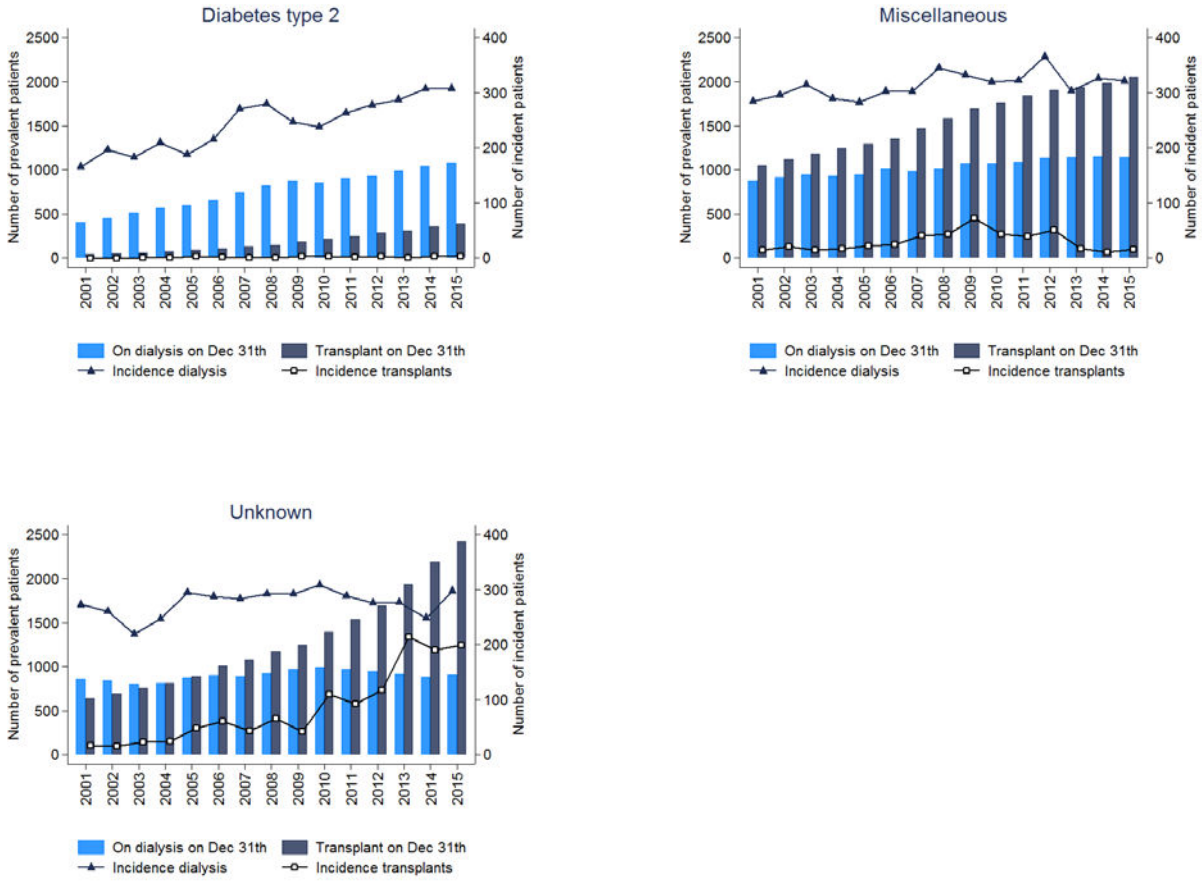


Figure 2.6. Prevalence and incidence of dialysis and renal transplants in primary kidney disease categories. Incidence includes only patients without previous renal replacement therapy.

The mean age of prevalent dialysis and renal transplant patients has increased over time. In 2015 the mean age of dialysis patients was 67.4 years compared to 55.6 years for patients living with a renal transplant. In addition, the age at which patients started renal replacement therapy with either a transplantation or with dialysis has increased over time (Figure 2.7 and 2.8).

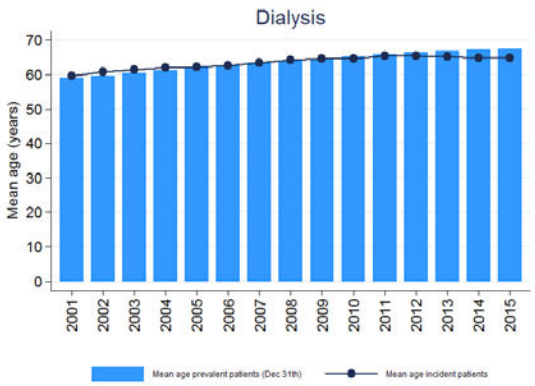


Figure 2.7. Mean age of incident and prevalent dialysis patients. Incident dialysis patients are patients starting dialysis as first RRT.

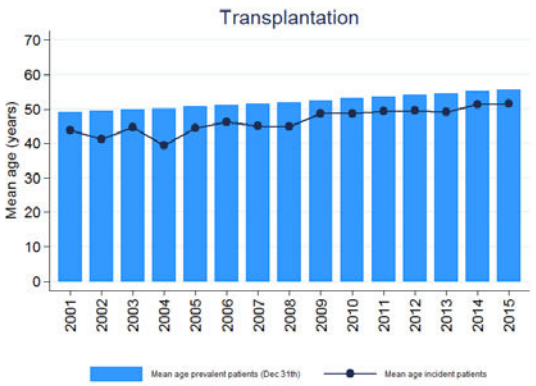


Figure 2.8. Mean age of incident and prevalent patients with renal transplant. Incident transplant patients are the patients that received a renal transplant as first RRT.

3. PREVALENCE AND INCIDENCE OF DIALYSIS MODALITIES

The majority of patients on dialysis has been treated with haemodialysis. The number of patients treated with peritoneal dialysis shows a steady decrease over the years (Figure 3.1). However, the incidence of peritoneal dialysis is not further decreasing.

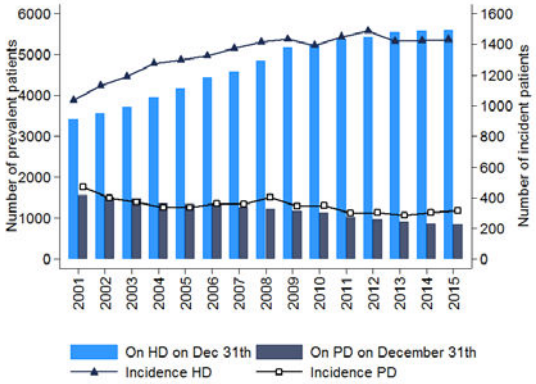


Figure 3.1. Prevalence and incidence of haemodialysis and peritoneal dialysis. Incidence of dialysis only includes patients without previous renal replacement therapy.

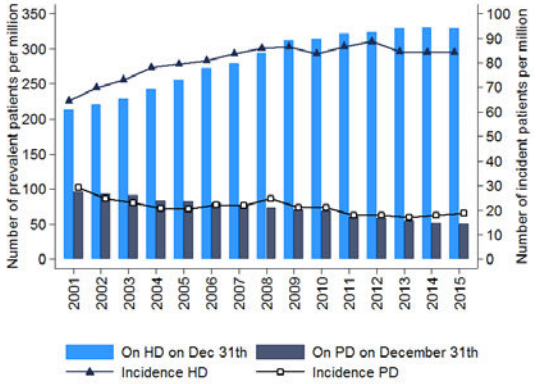


Figure 3.2. Prevalence and incidence of haemodialysis and peritoneal dialysis per million population. Incidence of dialysis only includes patients without previous renal replacement therapy.

The number of patients in the different age categories (per million age related population) and primary kidney disease categories are shown in Figure 3.3. and 3.4. The increase in prevalence of HD is primarily seen in the category of patients 75 years and older. However, since 2010 the incidence in this age category has been decreasing again and the number of prevalent patients seems to stabilize. The decrease in number of prevalent PD patients is most apparent in the age category 45-64 years, even though the incidence is rather stable in this age category.

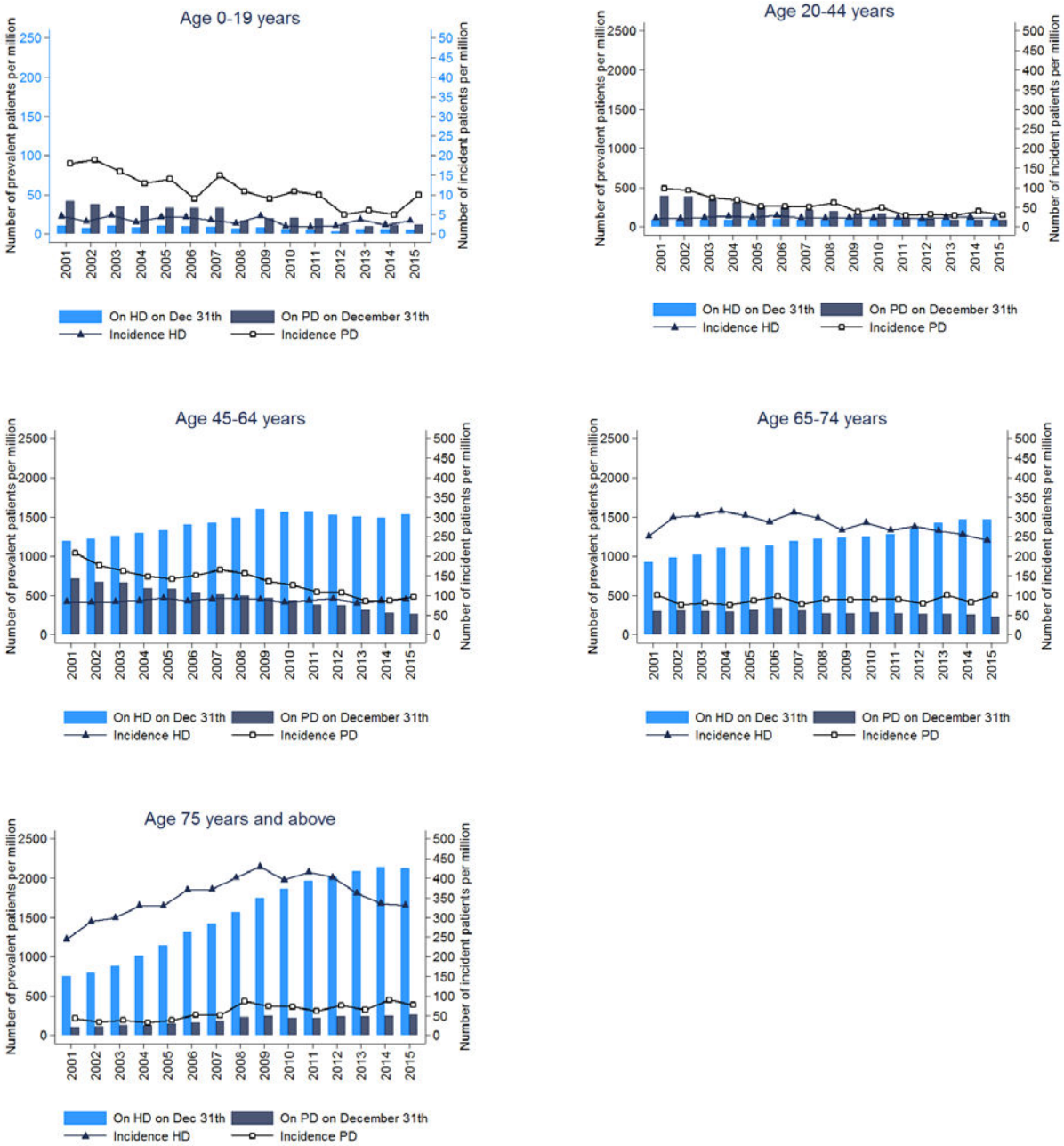
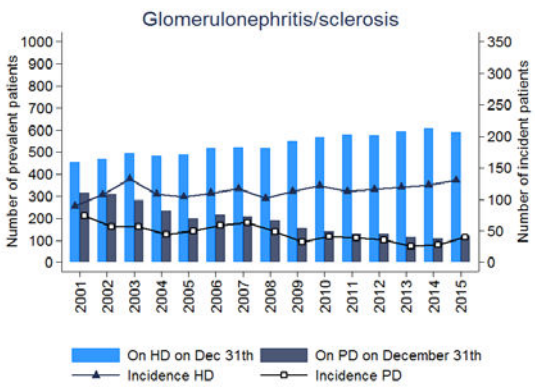
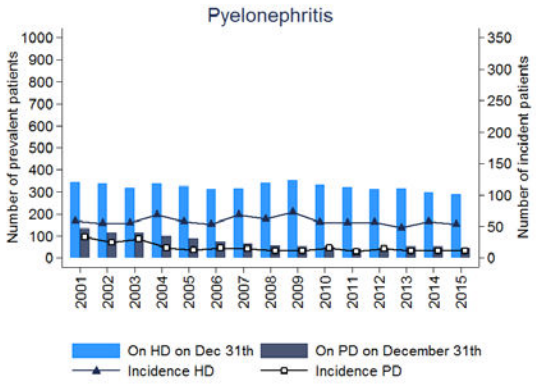
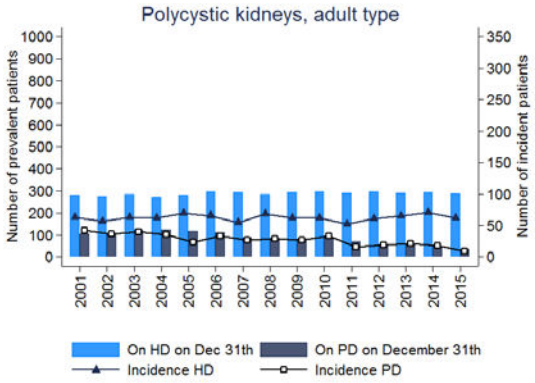
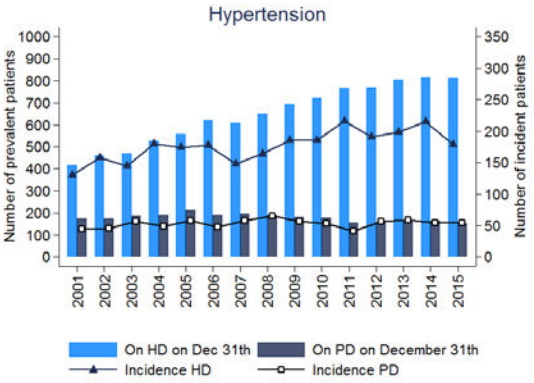


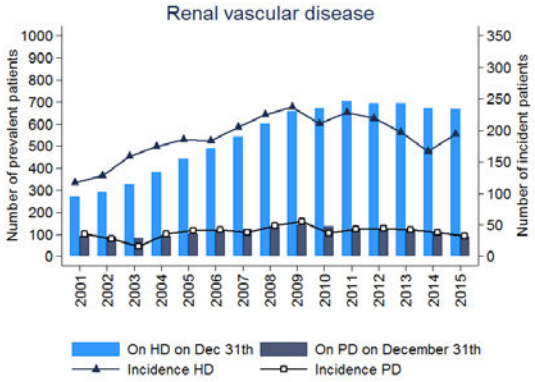
Figure 3.3. Prevalence and incidence of haemodialysis and peritoneal dialysis in age categories expressed per million age related population. Incidence includes only patients without previous renal replacement therapy. Incidence only includes patients without previous renal replacement therapy. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

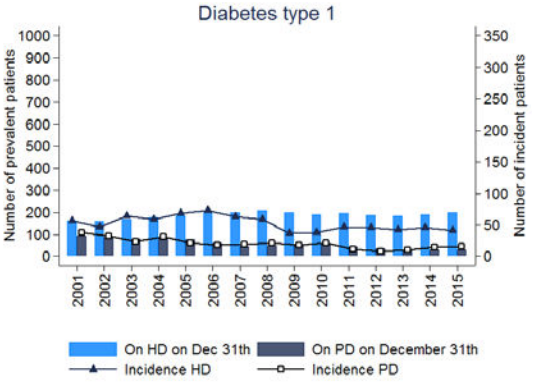

Glomerulonephritis/sclerosis
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD


Pyelonephritis
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD


Polycystic kidneys, adult type
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD


Hypertension
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD


Renal vascular disease
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD


Diabetes type 1
Number of prevalent patients
Number of incident patients
On HD on Dec 31th
On PD on December 31th
Incidence HD
Incidence PD

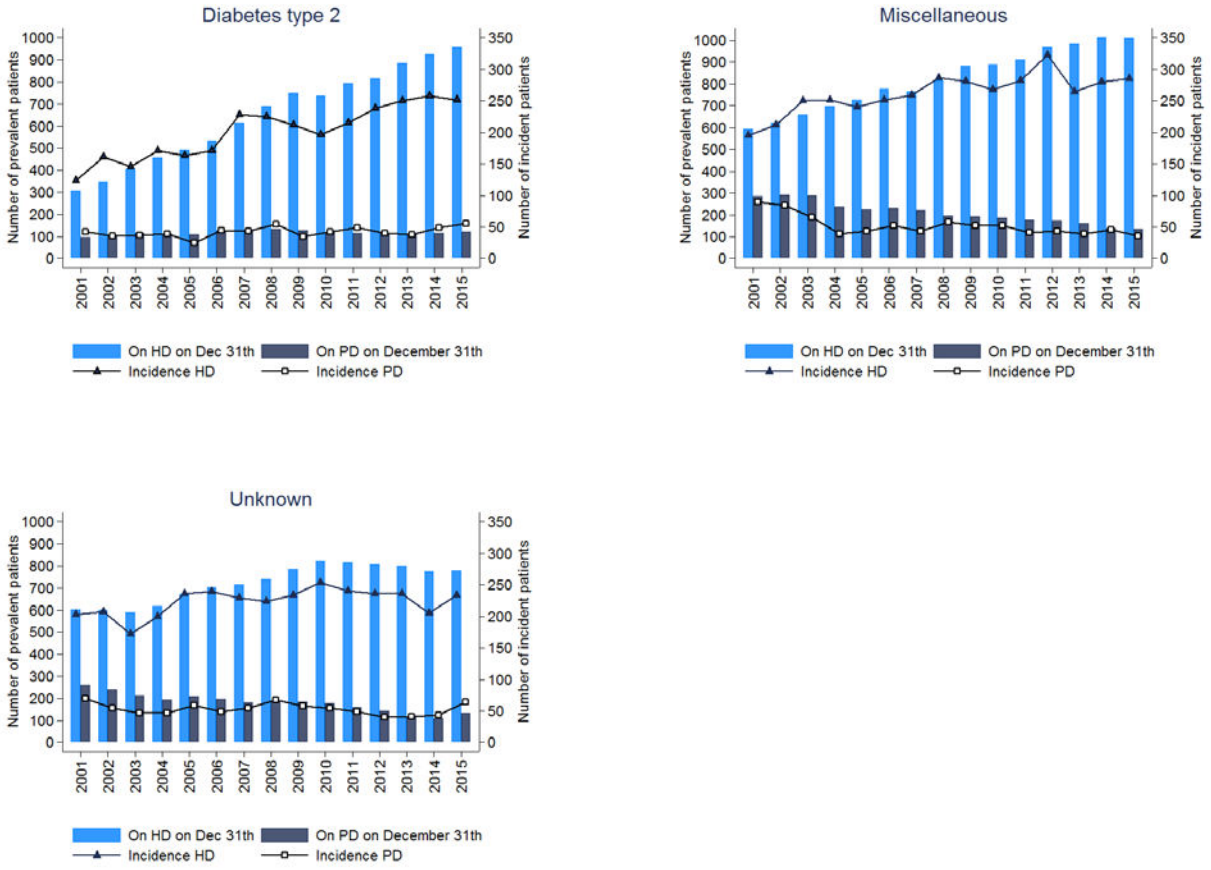


Figure 3.4. Prevalence and incidence of haemodialysis and peritoneal dialysis in primary kidney disease categories. Incidence only includes patients without previous renal replacement therapy.

Switches between modalities

RENINE documents changes between dialysis modalities. For the current analyses only switches between dialysis modalities lasting longer than 30 days were included. In 2015, 175 switches of HD to PD were recorded and 239 switches of PD to HD. In Figure 3.5 and Figure 3.6. trends over time in modality changes are shown. For completeness transplantations are also reported. To make comparisons between the calendar years easier, the number of switches are expressed as percentage of the prevalent number of patients on either HD and PD at the beginning of the calendar year. Over time switches from PD to HD became more common. In addition, the time a patient is being treated by PD before switching to HD became shorter over time (See Figure 3.7.). In contrast, switching from HD to PD has happened less often in recent years.

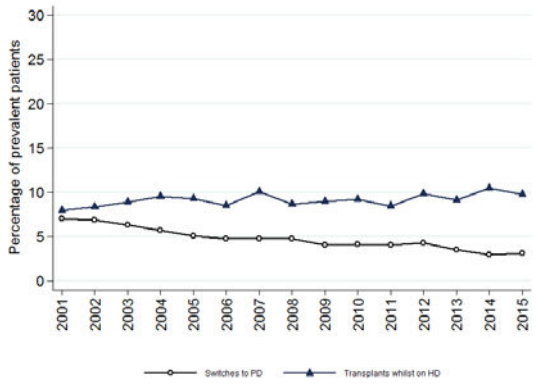


Figure 3.5. Modality changes in haemodialysis patients expressed as percentage of prevalent haemodialysis patients at the start of the calendar year.

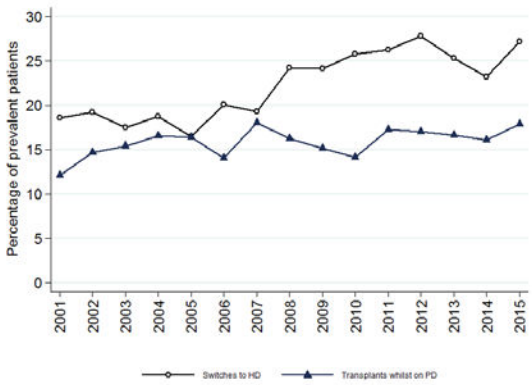


Figure 3.6. Modality changes in peritoneal dialysis patients expressed as percentage of prevalent peritoneal dialysis patients at the start of the calendar year.

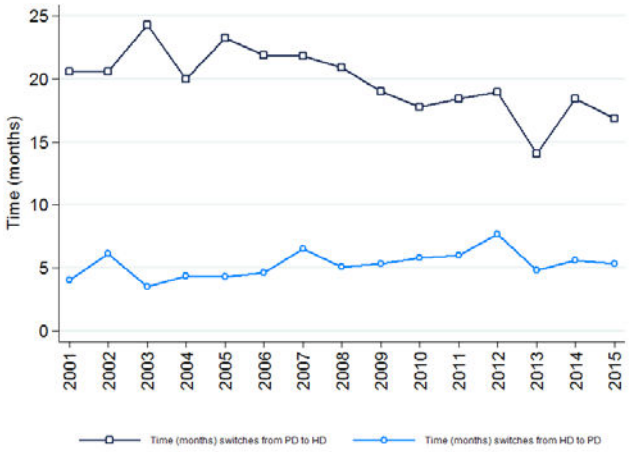


Figure 3.7. Time on dialysis modality at the moment of a switch to another dialysis modality

4. PREVALENCE AND INCIDENCE OF HOME DIALYSIS

Home dialysis includes home haemodialysis and peritoneal dialysis. The number of prevalent patients treated with home dialysis is decreasing over the years (Figure 4.1 and 4.2). On December 31th 2015 1,140 patients were treated with home dialysis, which is 18% of the total patient population on dialysis. The incidence of home dialysis tends to rise. It should be noted that the incidence of home dialysis almost exclusively consists of peritoneal dialysis, because home haemodialysis is generally being performed after a start with in-centre haemodialysis.

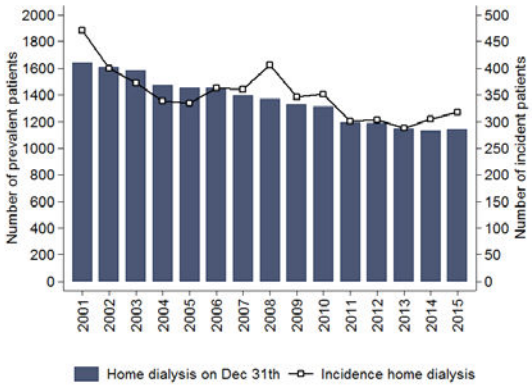


Figure 4.1. Prevalence and incidence of home dialysis (home haemodialysis and peritoneal dialysis). Incidence only includes patients without previous renal replacement therapy.

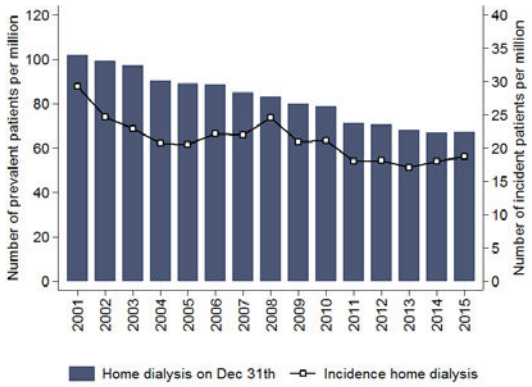


Figure 4.2. Prevalence and incidence per million population of home dialysis (home haemodialysis and peritoneal dialysis). Incidence only includes patients without previous renal replacement therapy.

The prevalences and incidences in different age categories (per million age related population) and primary kidney disease categories are shown in Figure 4.3 and 4.4, respectively. The age category “75 years and above” is the only age category in which the number of patients on home dialysis is increasing.

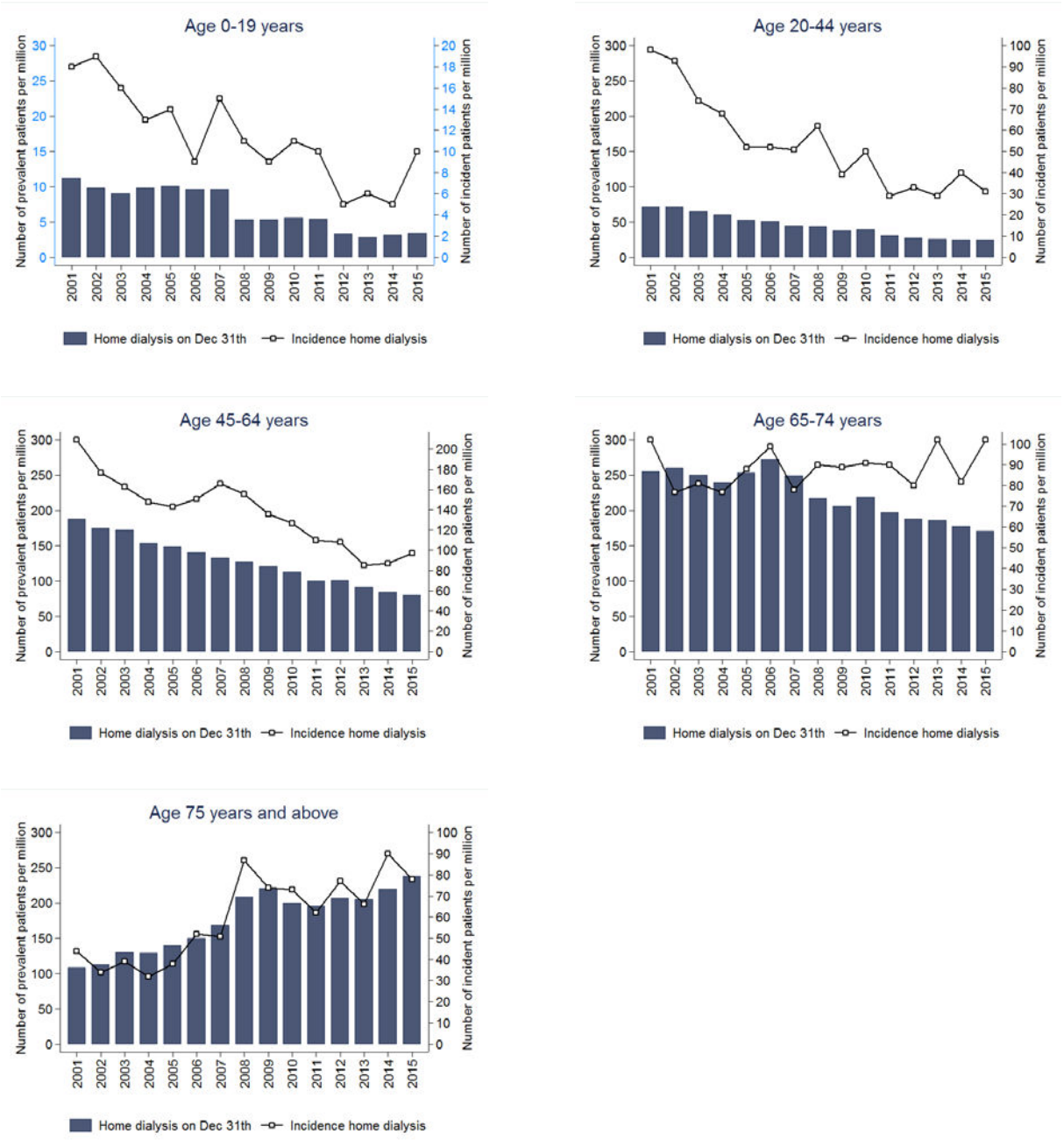
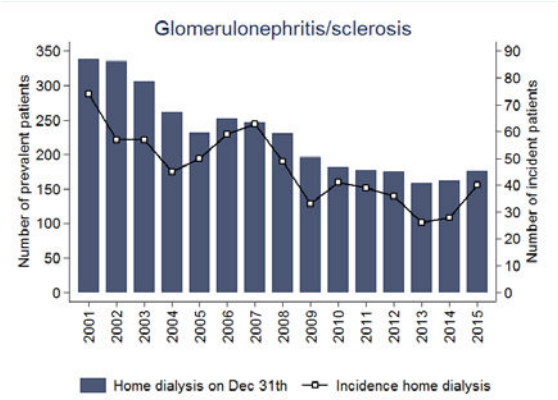
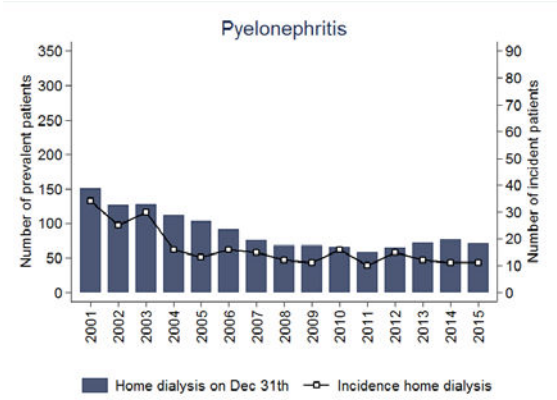
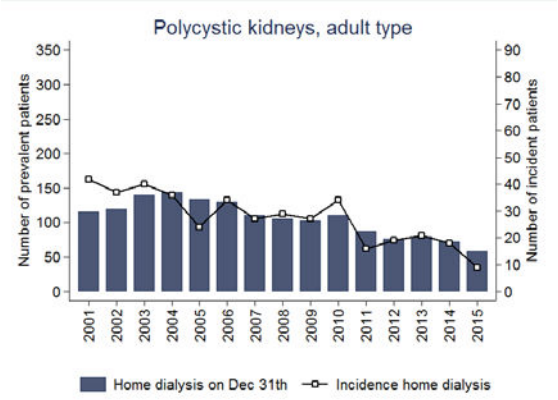
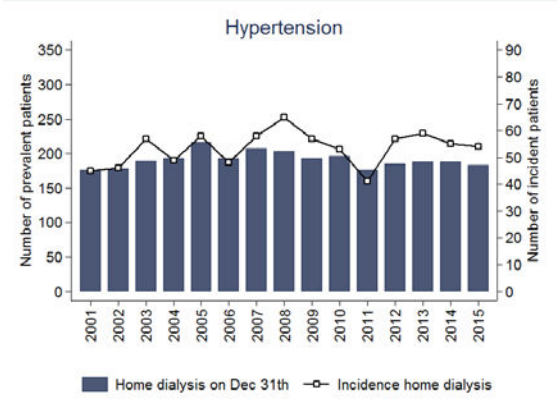


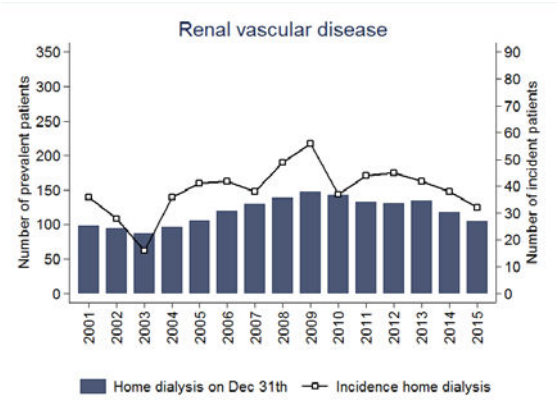
Figure 4.3. Prevalence and incidence of home dialysis (home haemodialysis and peritoneal dialysis) in age categories expressed per million age related population. Incidence only includes patients without previous renal replacement therapy. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

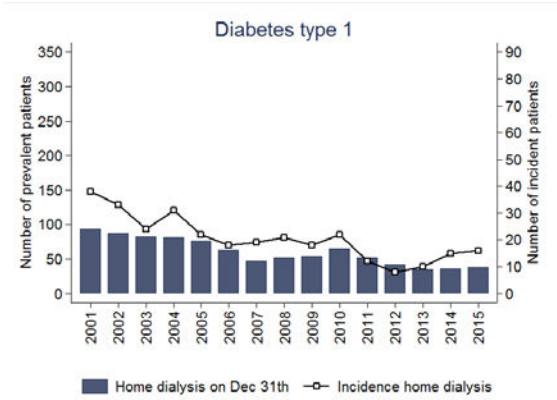

Glomerulonephritis/sclerosis
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis


Pyelonephritis
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis


Polycystic kidneys, adult type
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis


Hypertension
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis


Renal vascular disease
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis


Diabetes type 1
Number of prevalent patients
Number of incident patients
Home dialysis on Dec 31th
Incidence home dialysis

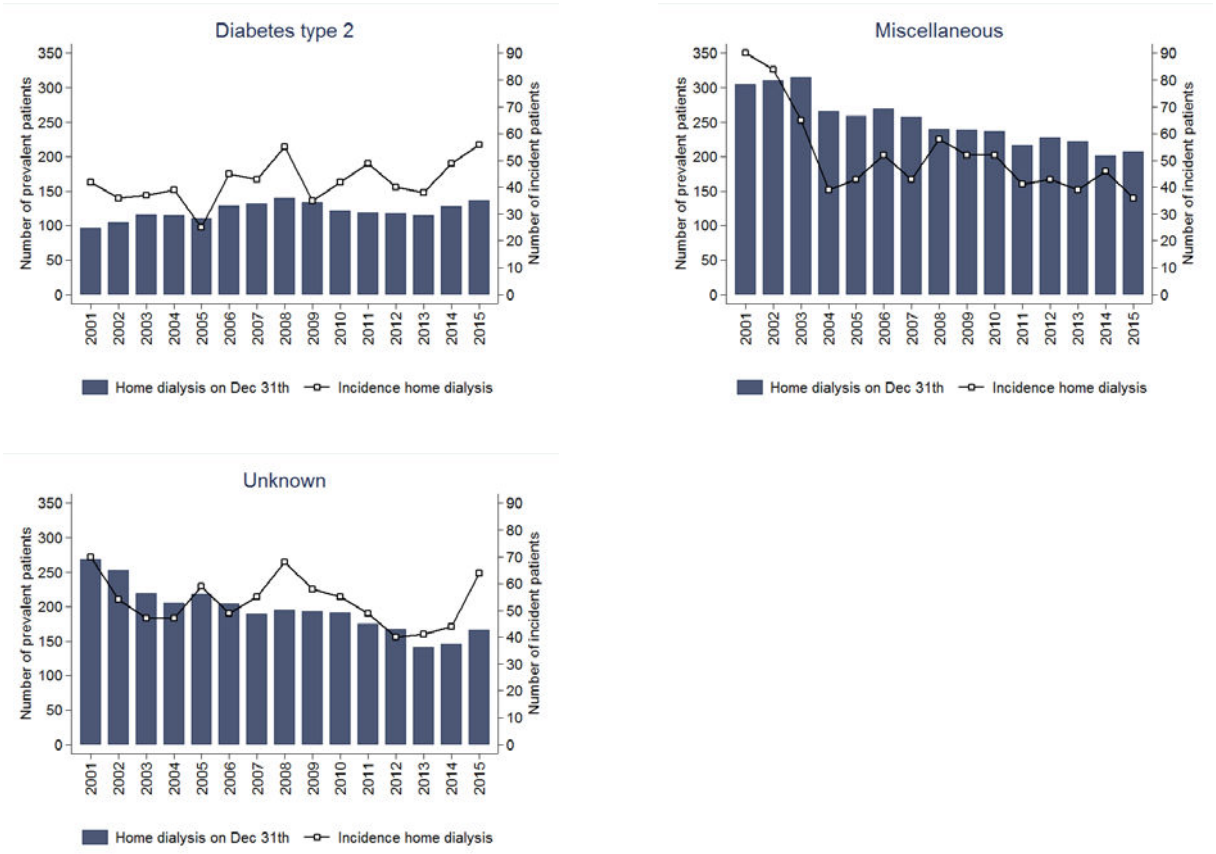


Figure 4.4. Prevalence and incidence of home dialysis (home haemodialysis and peritoneal dialysis) in categories of primary kidney disease. Incidence only includes patients without previous renal replacement therapy. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

Peritoneal dialysis remains the primary modality in home dialysis as shown in Figure 4.5. In this figure home dialysis is presented as percentage of total dialysis. The fraction home haemodialysis has been slightly increased in 2015. In the online Appendix similar figures are shown for age and primary kidney disease categories.

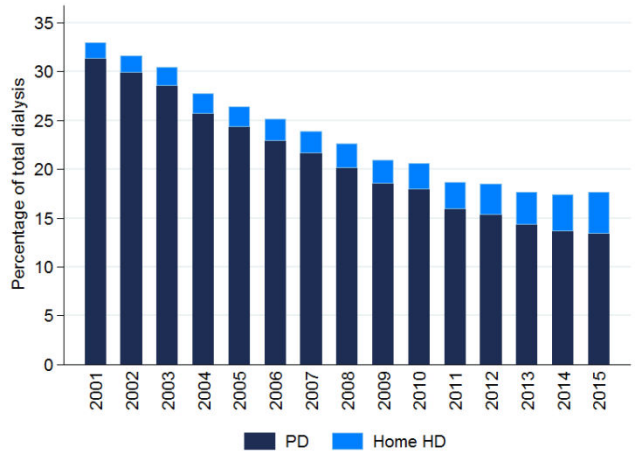


Figure 4.5. Prevalence of peritoneal dialysis and home haemodialysis on December 31th. Prevalence is expressed as percentage of total dialysis.

The proportion of patients that is being treated with home dialysis shows a substantial variation among centres. A funnel plot analysis shows the percentage of home dialysis of the total patients on dialysis against the total number of dialysis patients (Figure 4.6). It should be noted that some centres only offer in-centre haemodialysis, but may refer patients for home haemodialysis to other centres. Therefore, it would be more informative to also include information on the number of patients that are being referred to another centre for home dialysis. More detailed analyses on this issue are planned for future reports.

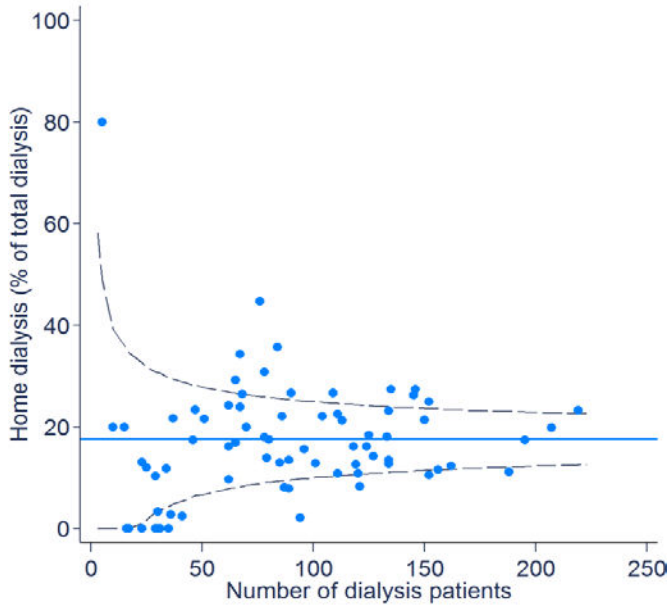


Figure 4.6. Funnel plot of the variation in home dialysis over centres. The percentage home dialysis is calculated based on the number of prevalent patients on December 2015. Dashed lines show the 95% confidence limits.

5. PREVALENCE AND INCIDENCE OF RENAL TRANSPLANTATIONS

PRE-EMPTIVE RENAL TRANSPLANTATIONS AND TRANSPLANTATION AFTER DIALYSIS

Prevalence and incidence of renal transplantation, separately for pre-emptive and transplants after dialysis are shown in Figure 5.1. and 5.2. Both types of renal transplantation are increasing over time. However, the incidence of renal transplantation after dialysis decreased in 2015 compared to 2014.

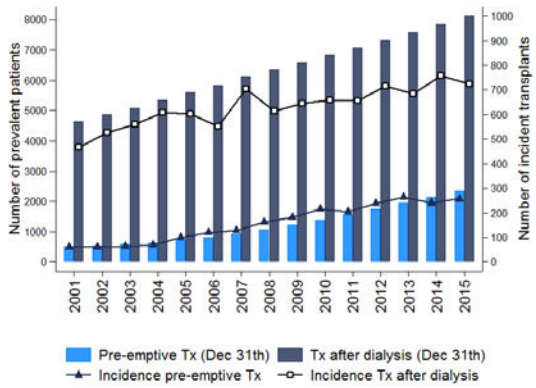


Figure 5.1. Prevalence and incidence of pre-emptive transplantations and transplantations after dialysis.

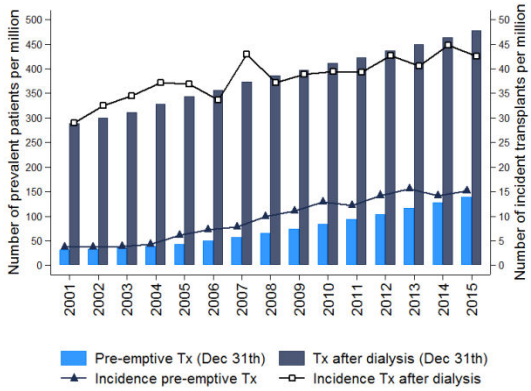


Figure 5.2. Prevalence and incidence per million population of pre-emptive transplantations and transplantations after dialysis.

Prevalences and incidences of renal transplantation for age categories and categories of primary kidney disease are shown in Figure 5.3 and 5.4. Prevalence and incidence per million population is highest in the age category 65-74 years. Pre-emptive renal transplantations are overrepresented in the category unknown primary kidney disease.

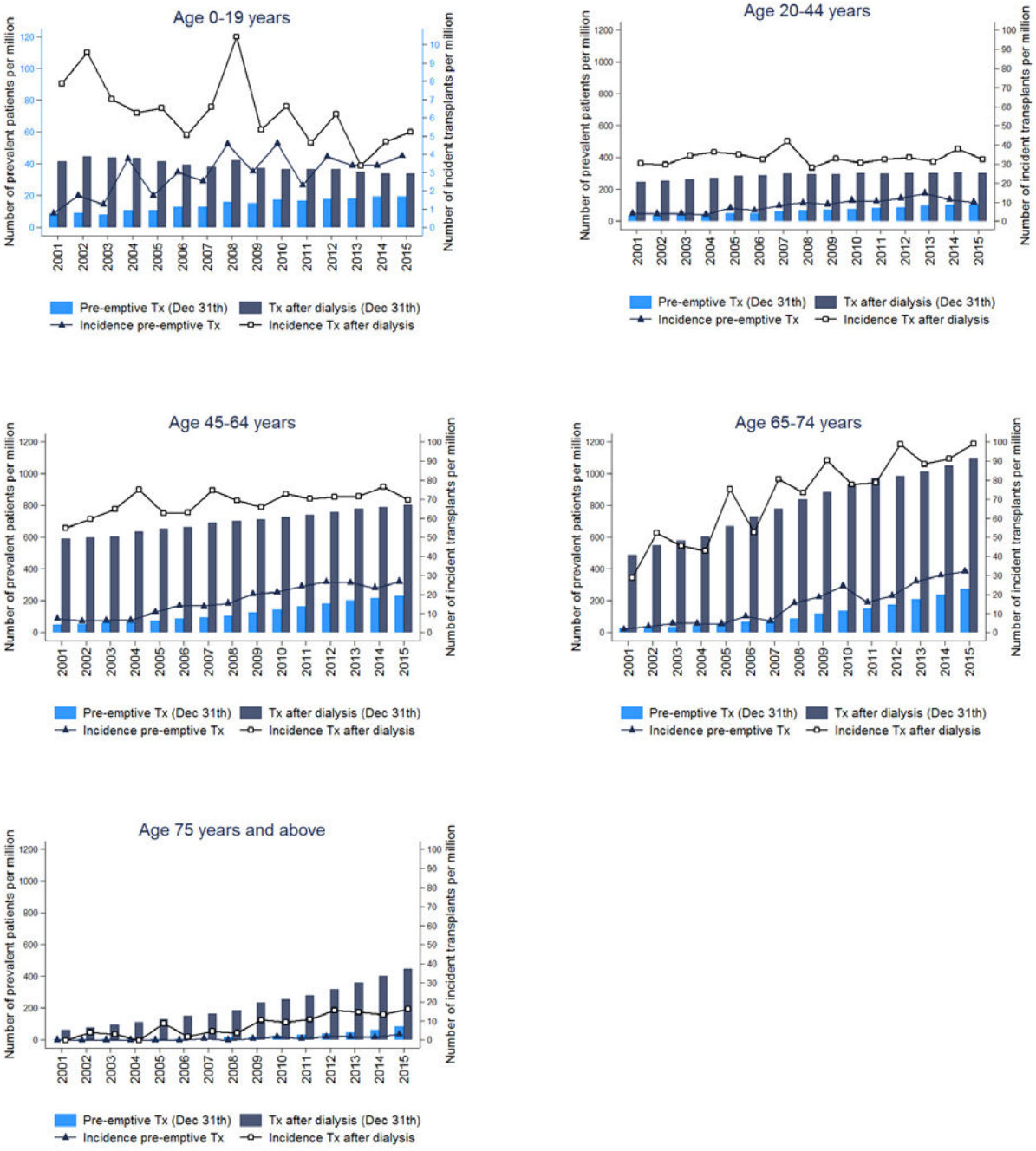
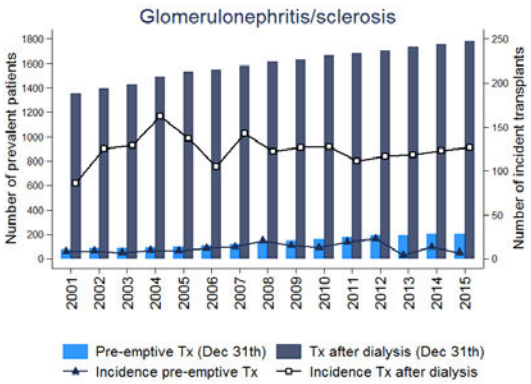
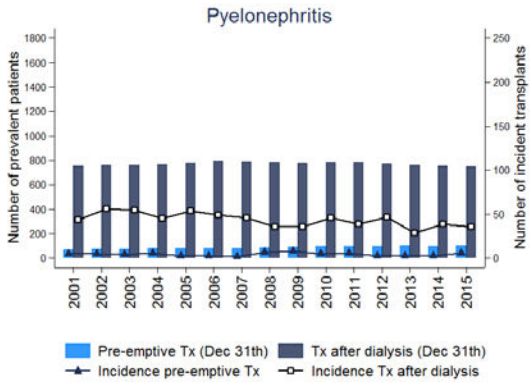
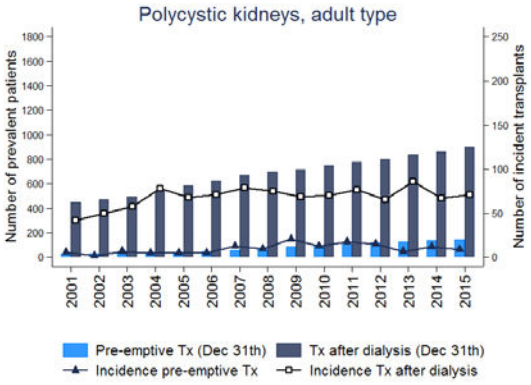
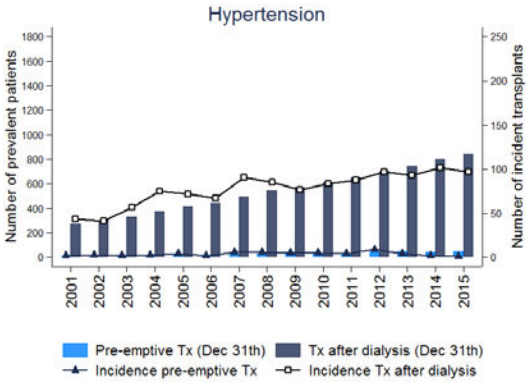


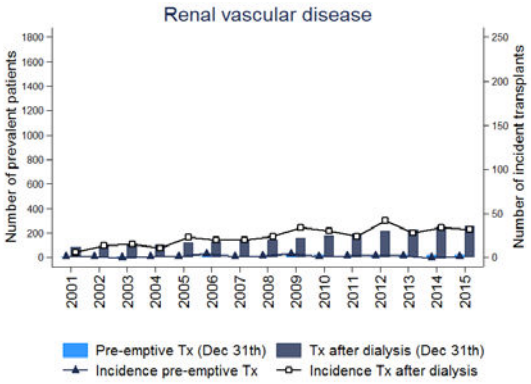
Figure 5.3. Prevalence and incidence of pre-emptive transplantations and transplantations after dialysis per million age related population in age categories. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

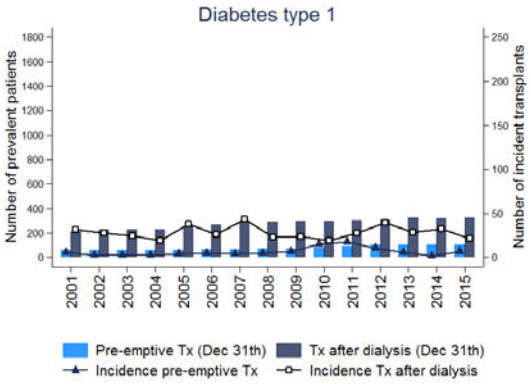

Glomerulonephritis/sclerosis
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis


Pyelonephritis
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis


Polycystic kidneys, adult type
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis


Hypertension
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis


Renal vascular disease
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis


Diabetes type 1
Number of prevalent patients
Number of incident transplants
Pre-emptive Tx (Dec 31th)
Tx after dialysis (Dec 31th)
Incidence pre-emptive Tx
Incidence Tx after dialysis

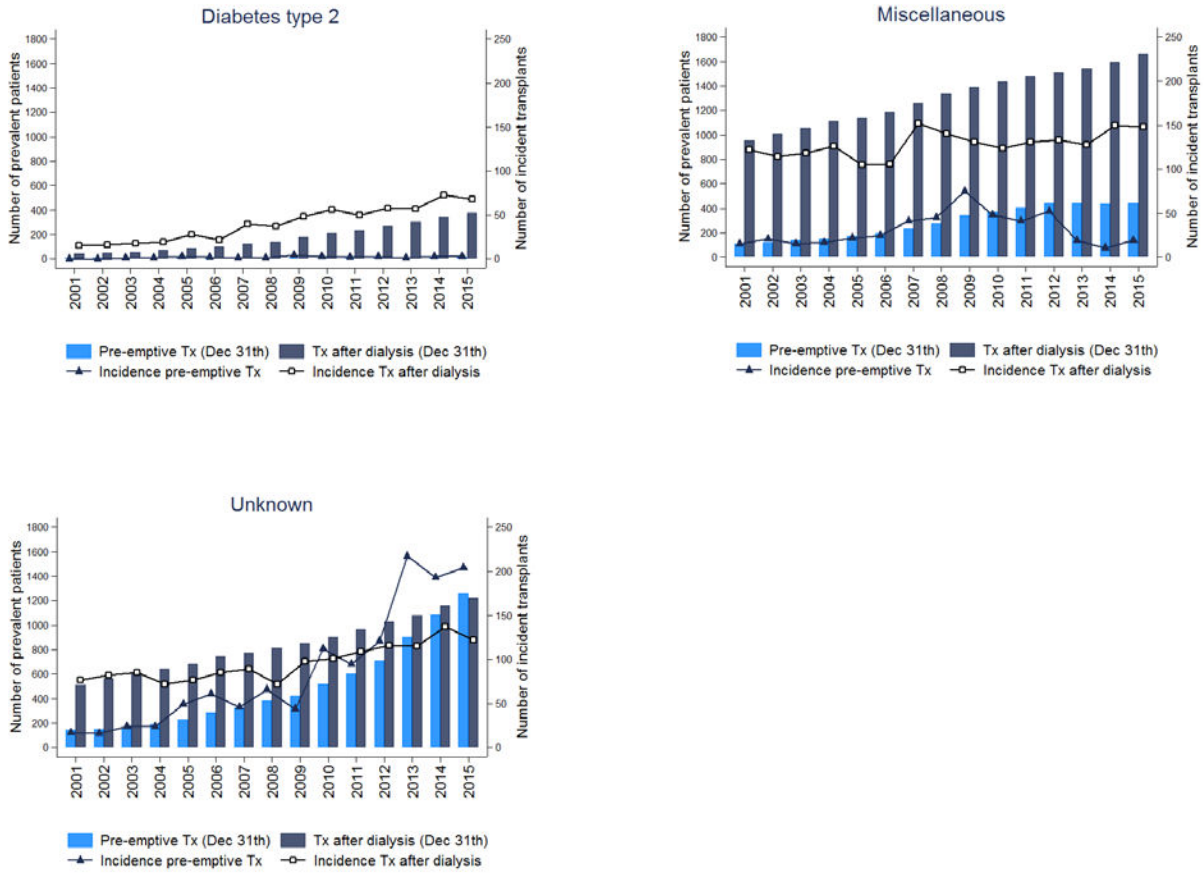


Figure 5.4. Prevalence and incidence of pre-emptive transplantations and transplantations after dialysis in primary kidney disease categories.

DECEASED DONOR AND LIVING DONOR RENAL TRANSPLANTATIONS

The number of renal transplantations performed with kidneys from deceased and living donors are shown in figure 5.5 and 5.6. A steep increase in living donor transplantations is being observed. In 2015, 515 living donor transplantations were performed which is 63% of the total number of renal transplantations.

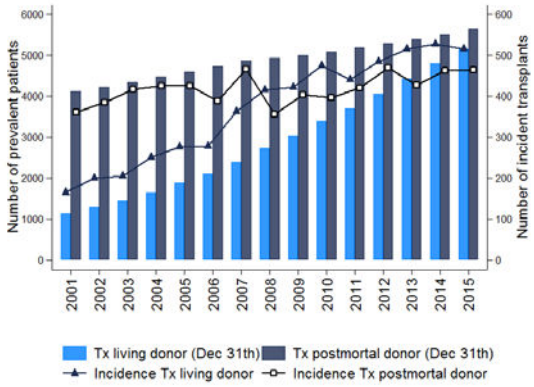


Figure 5.5. Prevalence and incidence of transplantations with living and deceased (post mortal) donors.

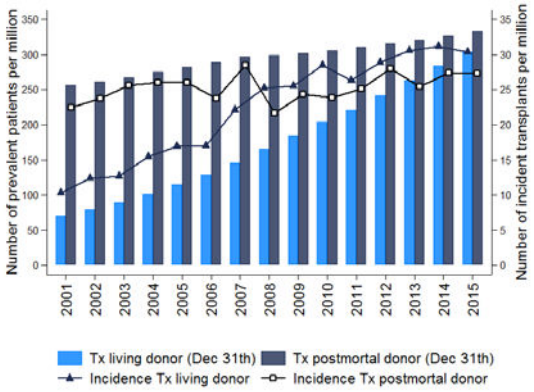


Figure 5.6. Prevalence and incidence of transplantations with living and deceased (post mortal) donors per million population.

The number of living donor and deceased donor transplantations for different age categories and primary kidney disease categories are shown in Figures 5.7 and 5.8.

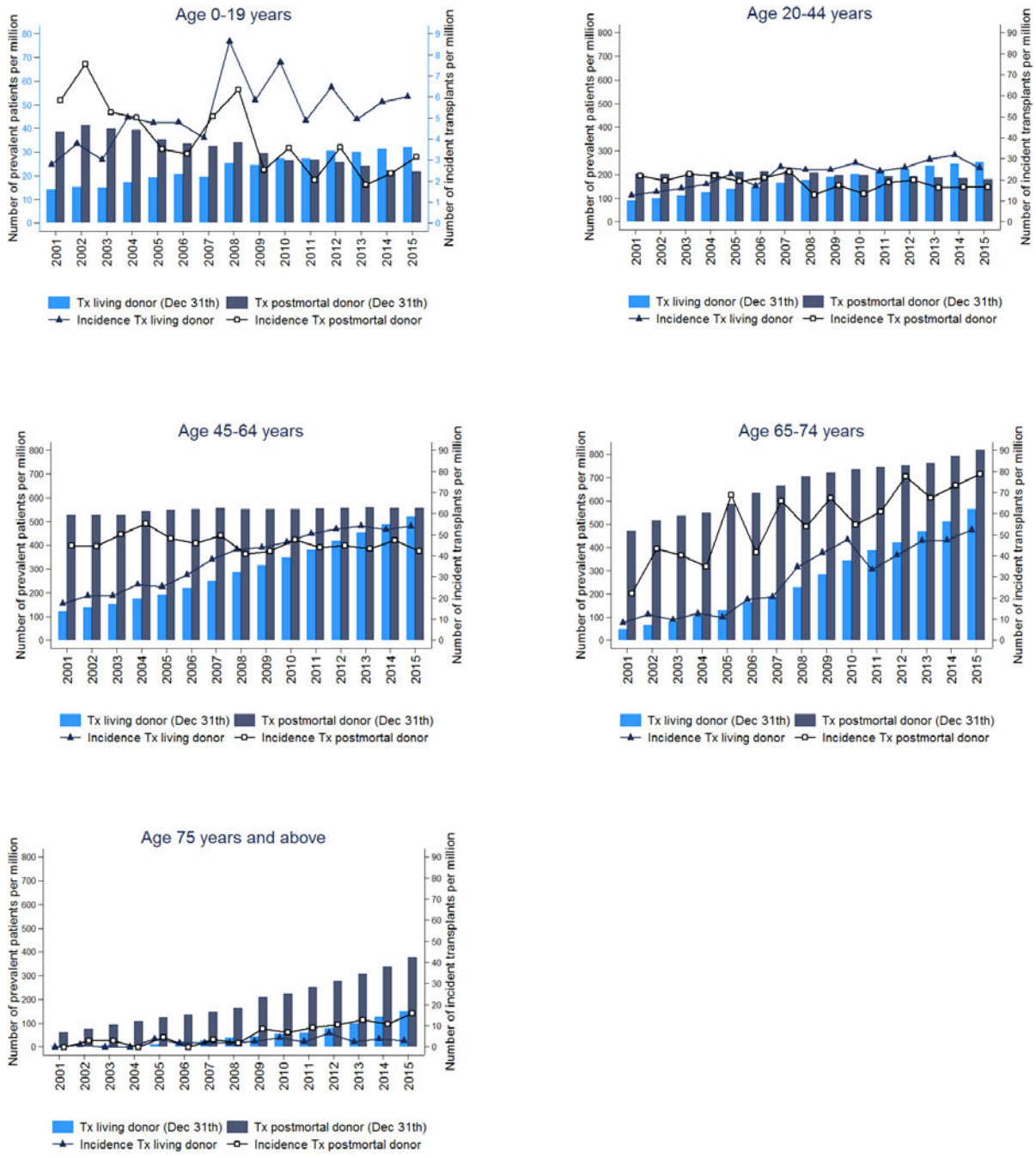
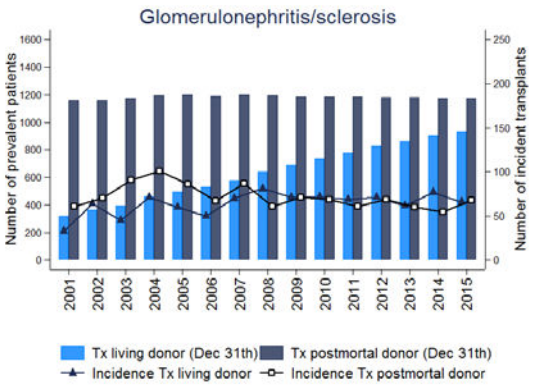
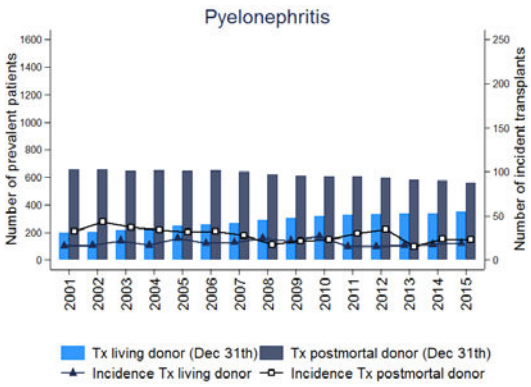
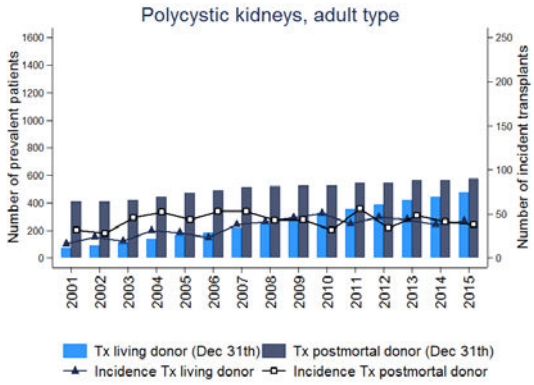
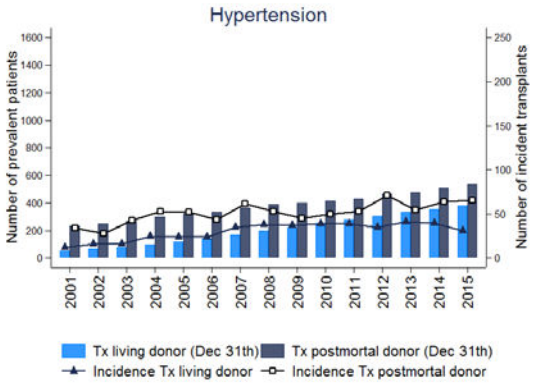


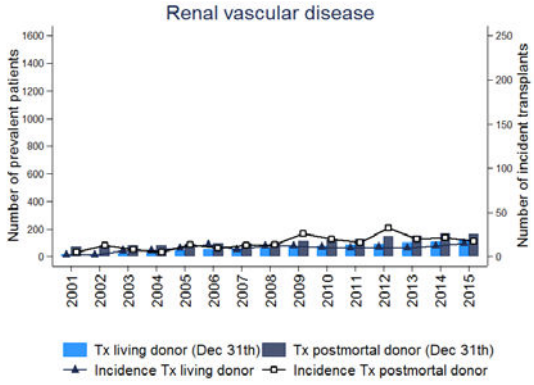
Figure 5.7. Prevalence and incidence of transplantations with living and deceased (post mortal) donors per million population in age categories. To improve readability of the graph the scale of the youngest age category was adjusted to 10% of the scale in the other categories.

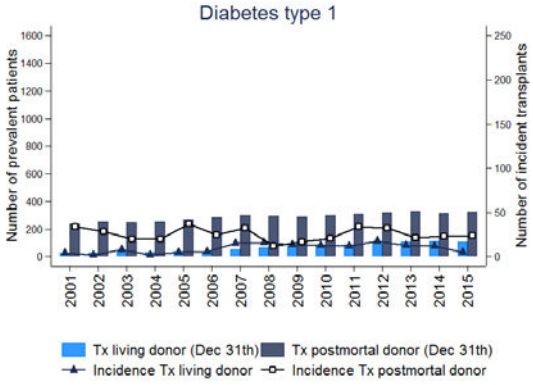

Glomerulonephritis/sclerosis
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor


Pyelonephritis
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor


Polycystic kidneys, adult type
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor


Hypertension
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor


Renal vascular disease
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor


Diabetes type 1
Number of prevalent patients
Number of incident transplants
Tx living donor (Dec 31th)
Tx postmortal donor (Dec 31th)
Incidence Tx living donor
Incidence Tx postmortal donor

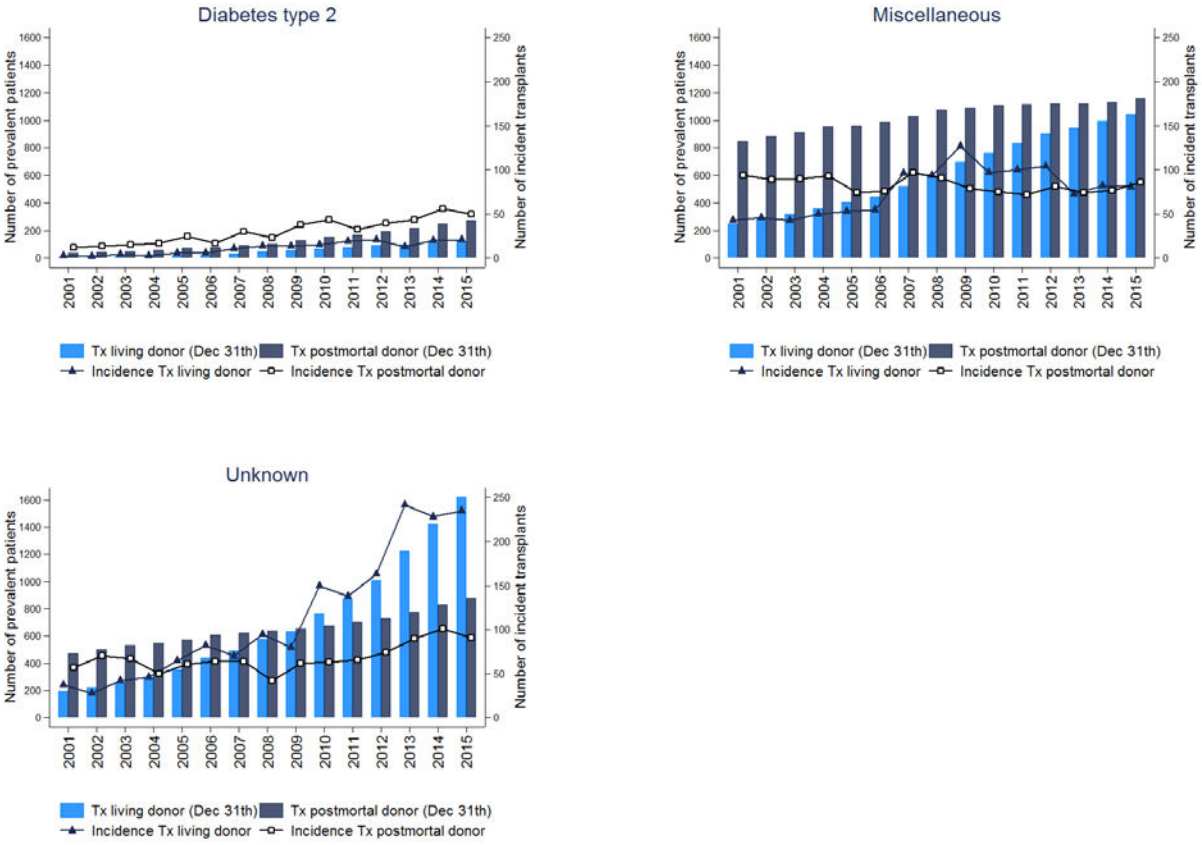


Figure 5.8. Prevalence and incidence of transplantations with living and post mortal donors in primary kidney disease categories.

6. MORTALITY

In 2015, 1426 patients died on renal replacement therapy. The majority (n=1,154; 81%) were patients on dialysis (Figure 6.1.).

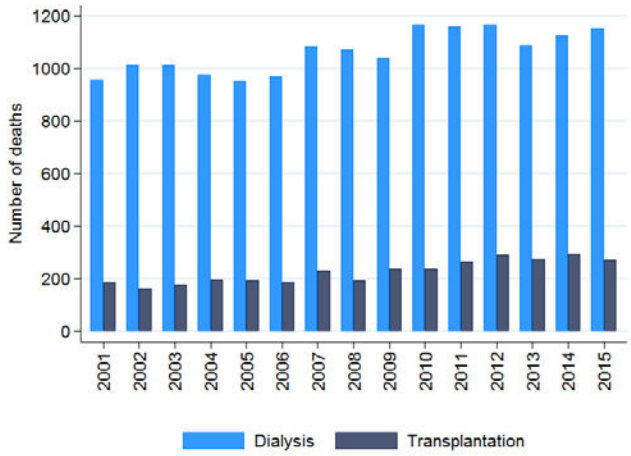


Figure 6.1. Number of patients who died on renal replacement therapy per calendar year.

Causes of death were categorized into seven categories in accordance with the categorization used by the UK Renal Registry (see Appendix C). The most common cause of death in dialysis patients was stopping with treatment. The category "Uncertain" is the dominant category in patients with renal transplantation with a gradual increase.

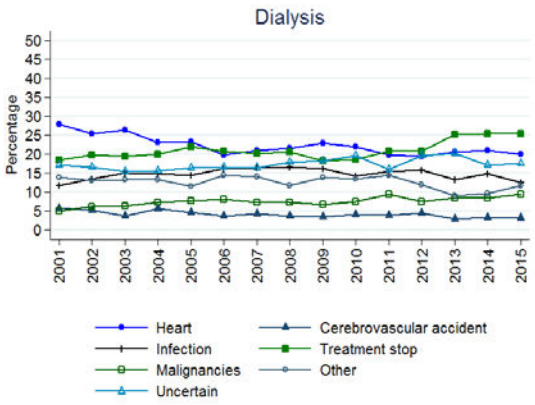


Figure 6.2. Causes of death in patients on dialysis

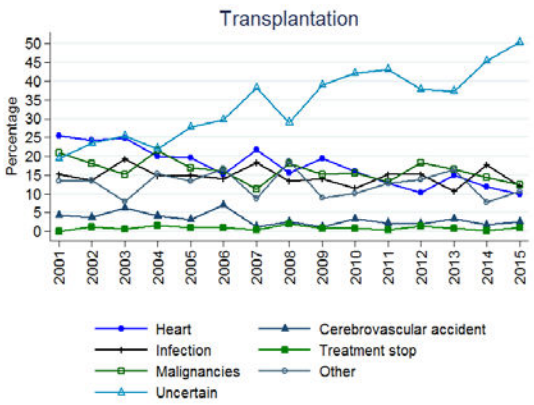


Figure 6.3. Causes of death in patients with a renal transplant

Survival of patients starting renal replacement therapy in different cohorts are shown in Figures 6.4 and 6.5. In the crude Kaplan-Meier curves it can be seen that survival improved over time (Figure 6.4). After adjustments for fixed values of age, gender and primary kidney disease the improvement of survival during time became more apparent.

Survival of patients starting dialysis is shown in Figure 6.6 and 6.7. In the crude Kaplan-Meier analysis, survival of the 2005-2009 and 2010-2014 cohorts overlap, but in the adjusted analysis, an improvement could be observed. It should be noted that firm conclusions cannot be drawn because we could not perform a complete case mix correction because important data on co-morbidity are not available.

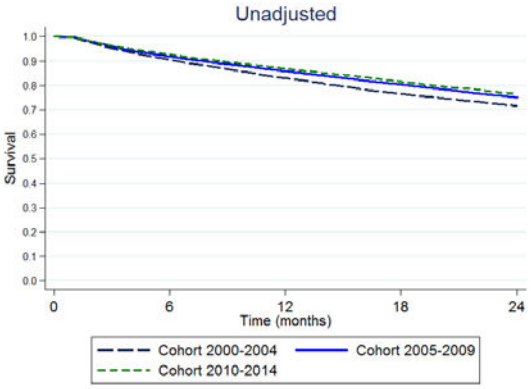


Figure 6.4. Unadjusted Kaplan- Meier survival curves for patients starting renal replacement therapy in different cohorts .

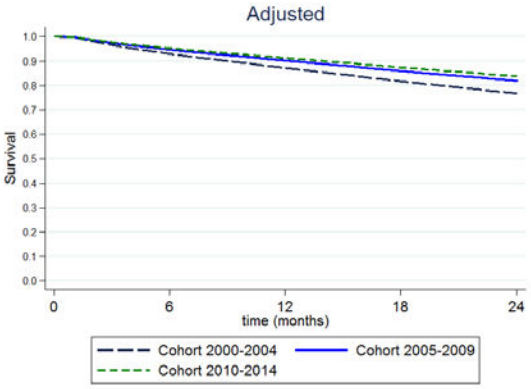


Figure 6.5. Survival curves for patients starting renal replacement therapy in different cohorts . Analyses were adjusted for age, gender and using fixed values (age 60, 60% men, primary kidney disease distribution: 20% diabetes, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other causes).

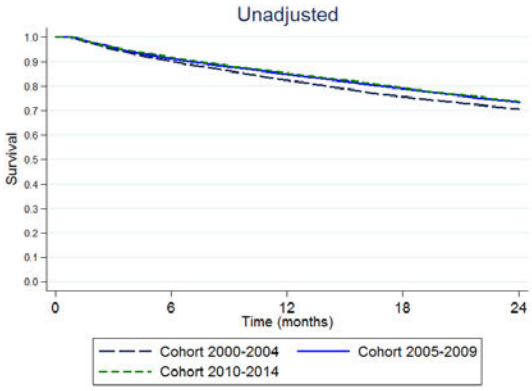


Figure 6.6. Unadjusted Kaplan-Meier survival curves for patients starting dialysis in different cohorts .Only patients starting dialysis as first renal replacement therapy are included.

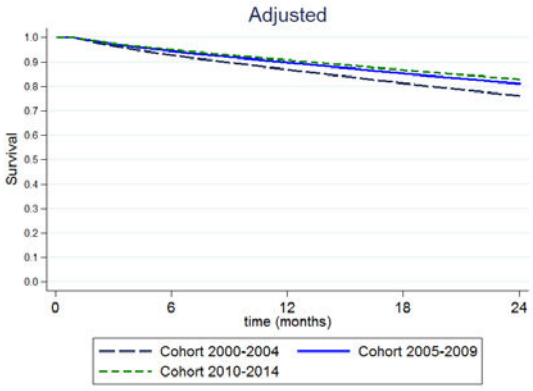


Figure 6.7. Survival curves for patients starting dialysis in different cohorts . Analyses were adjusted for age, gender and using fixed values (age 60, 60% men). Only patients starting dialysis as first renal replacement therapy are included. Analyses were adjusted for age, gender and using fixed values (age 60, 60% men, primary kidney disease distribution: 20% diabetes, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other causes).

Survival of patients starting peritoneal dialysis is higher than survival on haemodialysis in the crude Kaplan-Meier analysis (Figure 6.8.). After adjustment for fixed values of age, gender and primary kidney disease a much smaller difference between these two modalities was present (Figure 6.9.) More extensive adjustments are necessary to draw firm conclusions on differences in survival between these treatment modalities.

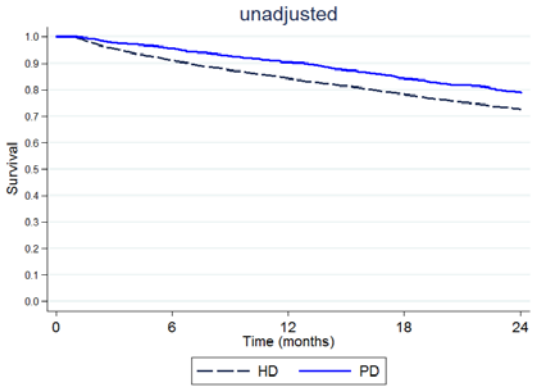


Figure 6.8. Unadjusted Kaplan-Meier survival curves for haemodialysis and peritoneal dialysis patients (cohort 2010-2014) .

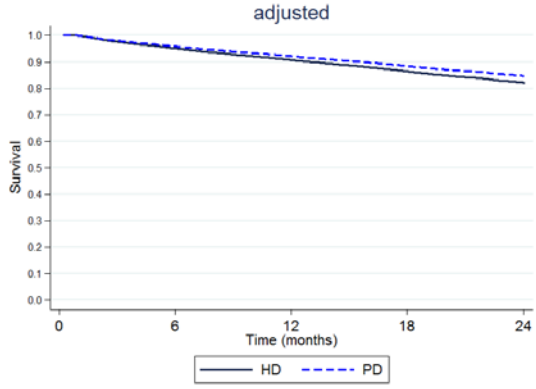


Figure6.9. Survival curves for haemodialysis and peritoneal dialysis patients (Cohort 2010-2014). Analyses were adjusted for age and gender using fixed values (age 60, 60% men, primary kidney disease distribution: 20% diabetes, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other causes).

7. CLINICAL DATA

A limited number of clinical indicators has been provided to RENINE on a voluntary basis. For the available data individual patient records are provided every three months. For this analyses only the first available measurement for a patient per calendar year was used.

The number of centres that provided data on PTH and phosphate levels decreased from 45 centres in 2012 to only 25 in 2015 (Figure 7.1). PTH and phosphate data were available for about one third of all dialysis patients In 2015. We report on these data in the next figures. It should be noted that the observations might be biased by the fact that different centres provided data over the years.

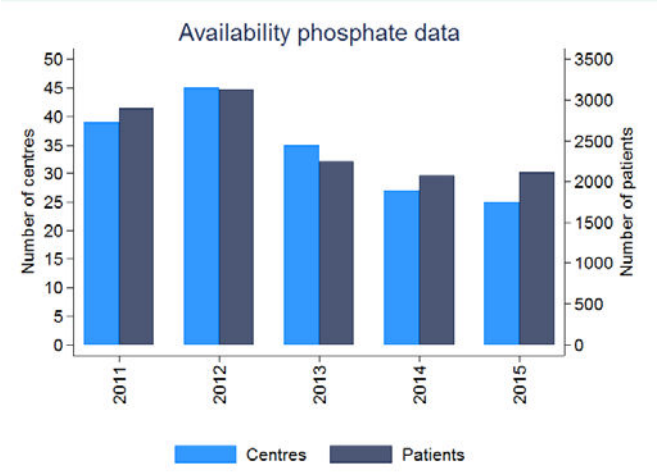


Figure 7.1. Number of centres that provided phosphate data and number of patients with at least one phosphate measurement available in a calendar year.

PHOSPHATE AND PARATHYROID HORMONE (PTH)

Mean phosphate levels decreased in 2015 compared to the previous years (Figure 7.2.) with a mean (SD) phosphate of 1.51(0.46) mmol/L. In addition, the percentage of patients with high phosphate levels also decreased over time (Figure 7.3). Mean parathyroid levels are reported in Figure 7.4.

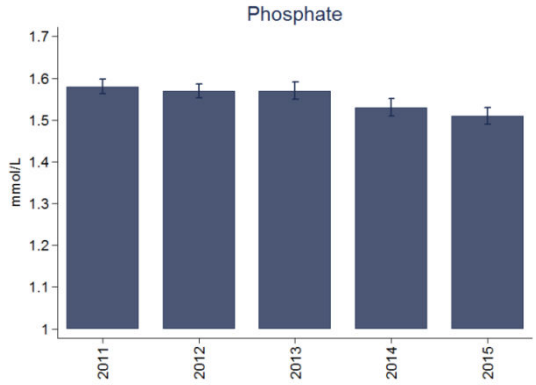


Figure 7.2. Mean phosphate levels with 95%-confidence intervals

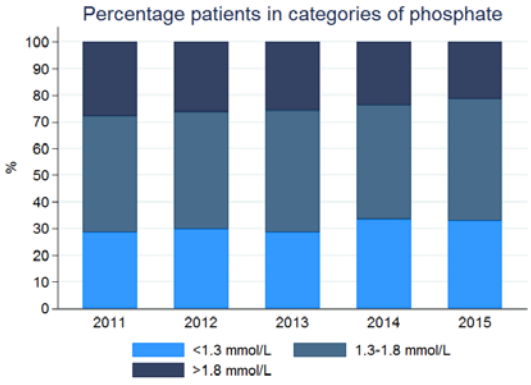


Figure 7.3. Percentage of patients in categories of phosphate levels.

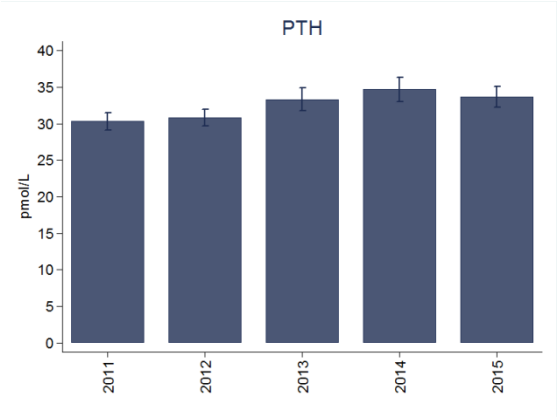


Figure 7.4. Mean PTH levels with 95% confidence intervals

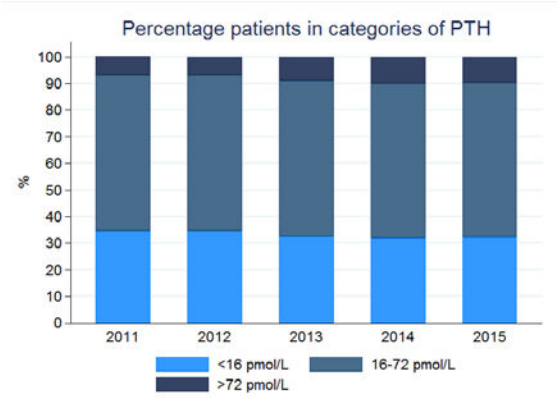


Figure 7.5. Percentage of patients in categories of PTH levels

Figure 7.6 shows the percentage patients with high serum phosphate (i.e. > 1.8 mmol/L) for each dialysis centre in a funnel plot. Considerable variation exists with one centre above and one centre below the 95-% confidence interval.

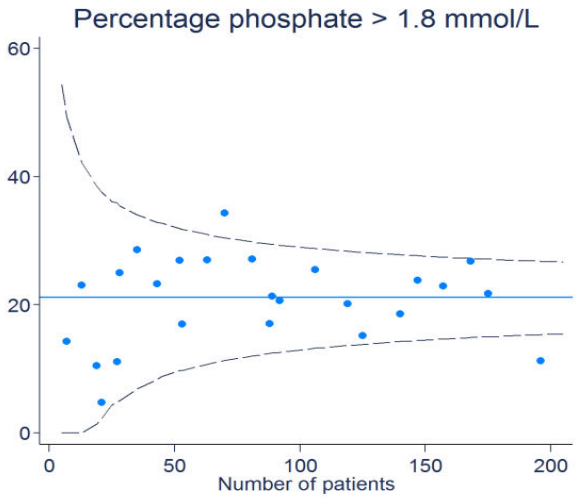


Figure 7.6. Funnel plot of the percentage patients with serum phosphate levels >1.8 mmol/L per centre. Dashed lines show the 95% confidence limits.

VASCULAR ACCESS

Data on vascular access have also been registered at 3 months intervals. Figure 7.7. and 7.8 report on patients that started with haemodialysis. Like for PTH and phosphate, data availability on vascular access decreased over time. Vascular access data were available in 246 incident haemodialysis patients (15%) in 2015. Most of these patients (42%) started with a central venous catheter. After inclusion of all available data after start of haemodialysis the distribution of the vascular access is very different with approximately 15% central venous catheters (Figure 7.9).

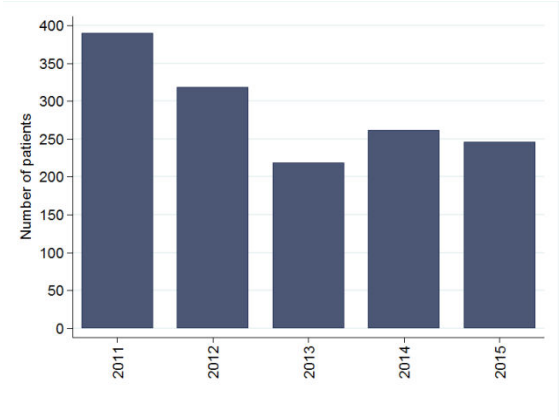


Figure 7.7. Number of patients that started haemodialysis and for whom data is available on vascular access

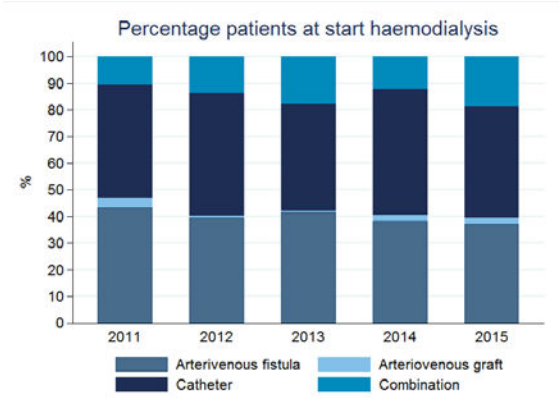


Figure 7.8. Distribution of vascular access at start of haemodialysis

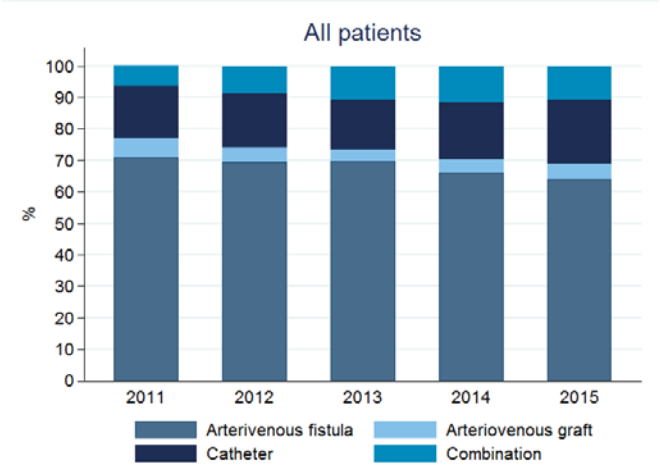


Figure 7.9. Overall distribution of vascular access categories.

8. DISCUSSION

In this RENINE 2015 annual report, Nefrovisie in collaboration with NfN provide more insight into a number of indicators of renal replacement therapy in the Netherlands. The information in this report is more extensive than in the previous RENINE 2014 annual report. We provide survival curves for patients on different renal replacement therapies and data on causes of death. These are the most important observations from the RENINE 2015 annual report:

- The incidence of patients seems to stabilize, although the number of prevalent renal replacement therapy patients is continuously growing. This trend is also observed in the primary kidney disease categories diabetes and hypertension. The cause of this development cannot be derived from our registry data. Possibly, the improvement of preventive renal care and the ensuing publication of new guidelines has gained effect over the last years.
- An already known decrease in incidence of home dialysis was confirmed, although there seems to be a trend to an increase of home dialysis in 2015. When we consider renal transplantation as a home treatment modality, the number of patients treated at home has increased tremendously over the last 15 years.
- There is a strong increase in the proportion of patients with unknown primary kidney disease. This trend was most apparent in renal transplantation patients. Similarly, in these patients, cause of death is more often unknown. Possibly, this is due to information bias in our database. We will investigate this issue in collaboration with the NOTR, .
- Survival analysis tends to show an improvement of survival in time, both for patients starting with renal replacement therapy as for patients starting with dialysis. I

In this report, we firstly present data on phosphate, PTH and vascular access that were registered voluntarily by a part of the dialysis centres. The mean phosphate levels decreased over time as well as the proportion of patients in the highest phosphate categories. About 42% of the patients start with haemodialysis using a central venous catheter. We don't know the proportion of these patients that were prepared in a predialysis program. It is impossible to draw conclusions because we cannot exclude selection bias over the years, whereas centres stopped and started providing non-obligatory data to RENINE. Since dialysis centres provide obligatory clinical data from 2016, we expect to be able to extend information in our next annual report. Furthermore, we intend to collect data of patients in the predialysis period and data on comorbidity. This is necessary to draw firm conclusions after appropriate case-mix analysis on the quality of renal replacement treatment in the Netherlands.

In conclusion, the incidence of patients on renal replacement therapy has been stabilized. The prevalence is still increasing, mainly due to patients with a functioning renal transplant. The next years Nefrovisie and NfN will continue to modify the information presented in the report to accommodate the needs of the different stake holders in a more optimal way.

APPENDIX A. DEFINITIONS AND METHODS

Prevalence
The number of people in a given population with a particular disease at a given time. In this report prevalence is the number of patients on a (specific) renal replacement therapy on December 31th of a calendar year.

Incidence
The number of new cases during a specific time period. In this report incidences per calendar years are reported. Throughout the report we use two definitions for incidence.

1. Incidence including only patients without previous renal replacement therapy. This means that patients who start dialysis after renal transplant failure are not included in the incidence number, as well as patients who have a second or third renal transplant after a previous transplant failure with or without a period with dialysis. Thus only patients who received a renal transplant or started dialysis as their first renal replacement therapy are counted.
2. Incidence including all patients who start with dialysis or receive a renal transplant, irrespective of earlier RRT. In this case, patients who start dialysis after renal transplant failure are thus included, as well as patients who have a second or third renal transplant after a previous transplant failure with or without a period with dialysis.

Throughout the report we explicitly state which definition for incidence was used for the various analyses.

Per million (age-related) population
The incidence or prevalence per million population (pmp) is the observed incident or prevalent count divided by the general population in that year and multiplied by one million.

The incidence or prevalence per age-related population (pmarp) is the observed incident or prevalent count for a specific age group divided by the general population of that age group and multiplied by one million.

Information on the (age-specific) population in the calendar years is provided by Statistics Netherlands (Centraal Bureau voor de Statistiek).

Survival analyses
Survival was analysed from start of renal replacement therapy. Survival time was censored in case of recovery of kidney function of at least 30 days or when patients were lost to follow-up. Crude survival curves are being presented using the Kaplan-Meier method. Cox regression analysis was used to calculate adjusted survival curves. Survival was adjusted to age 60 years, 60% men and primary kidney disease distribution of 20% diabetes, 17% hypertension/renal vascular disease, 15% glomerulonephritis and 48% other causes. These fixed values were are in accordance to the fixed values applies in the ERA-EDTA Annual Report 2014.

Funnel plots
Variation across centres is shown in funnel plots. In these plots centre specific data is plotted against the sample size of that centre. A horizontal line represents the group average. The 95%-confidence intervals were estimated using a binomial distribution.

APPENDIX B. CATEGORIZATION OF PRIMARY RENAL DISEASES

	ERA-EDTA code	Primary renal disease
Glomerulonephritis/sclerosis		
	10	Glomerulonephritis, histologically NOT examined
	11	Severe nephrotic syndrome with focal sclerosis (paediatric patients only)
	12	IgA nephropathy (proven by immunofluorescence, not code 85)
	13	Dense deposit disease membrano-proliferative GN, type II (proven by immunofluorescence and/or electron microscopy)
	14	Membranous nephropathy
	15	Membrano-proliferative GN, type I (proven by immunofluorescence and/orelectron microscopy - not code 84 or 89)
	16	Rapidly progressive GN without systemic disease (crescentic, histologically confirmed, not coded elsewhere)
	19	Glomerulonephritis, histologically examined
	17	Focal segmental glomerusclerosis with nephrotic syndrome in adults
Pyelonephritis		
	20	Pyelonephritis/Interstitial nephritis-cause not specified
	21	Pyelonephritis/Interstitial nephritis associated with neurogenic bladder
	22	Pyelonephritis/Interstitial nephritis due to congenital obstructive uropathy with or without vesico-ureteric reflux
	23	Pyelonephritis/Interstitial nephritis due to acquired obstructive uropathy
	24	Pyelonephritis/Interstitial nephritis due to vesico-ureteric reflux without obstruction
	25	Pyelonephritis/Interstitial nephritis due to urolithiasis
	29	Pyelonephritis/Interstitial nephritis due to other cause
Polycystic kidneys, adult type		
	41	Polycystic kidneys, adult type (dominant)
Hypertension		
	71	Renal vascular disease due to malignant hypertension (NO primary renal disease)
	72	Renal vascular disease due to hypertension (NO primary renal disease)

	ERA-EDTA code	Primary renal disease
Renal vascular disease		
	70	Renal vascular disease-type unspecified
	79	Renal vascular disease-classified
Diabetes, type 1		
	80	Diabetes glomerulosclerosis or diabetic nephropathy – Type 1
Diabetes, type 2		
	81	Diabetes glomerulosclerosis or diabetic nephropathy – Type II
Miscellaneous		
	30	Tubulo interstitial nephritis (not pyelonephritis)
	31	Nephropathy due to analgesic drugs
	32	Nephropathy due to cis-platinum
	33	Nephropathy due to cyclosporin A
	39	Nephropathy caused by other specific drug
	40	Cystic kidney disease-type unspecified
	42	Polycystic kidneys, infantile (recessive)
	43	Medullary cystic disease, including nephronophthisis
	49	Cystic kidney disease-other specified type
	50	Hereditary/Familial nephropathy-type unspecified
	51	Hereditary nephritis with nerve deafness (Alport's Syndrome)
	52	Cystinosis
	53	Primary oxalosis
	54	Fabry's disease
	59	Hereditary nephropathy-other
	60	Congenital renal hypoplasia-type unspecified
	61	Oligomeganephronic hypoplasia
	63	Congenital renal dysplasia with or without urinary tract malformation
	66	Syndrome of agenesis of abdominal muscles (Prune Belly Syndrome)
	73	Renal vascular disease due to polyarteritis
	74	Wegener's granulomatosis
	82	Myelomatosis/light chain deposit disease
	83	Amyloid
	84	Lupus erythematosus
	85	Henoch-Schoenlein purpura
	86	Goodpasture's Syndrome
	87	Systemic sclerosis (scleroderma)

	ERA-EDTA code	Primary renal disease
Miscellaneous		
	88	Haemolytic Uraemic Syndrome including Moschcowitz Syndrome
	89	Multi-system disease-other
	90	Cortical or tubular necrosis
	91	Tuberculosis
	92	Gout
	93	Nephrocalcinosis and hypercalcaemic nephropathy
	94	Balkan nephropathy
	95	Kidney tumour
	96	Traumatic or surgical loss of kidney
	99	Other identified renal disorders
	34	Lead induced interstitial nephropathy
	75	Ischaemic renal disease / cholesterol embolisation
	76	Glomerulonephritis related to liver cirrhosis
	78	Cryglobulinaemic glomerulonephritis
Unknown		
	0	Chronic renal failure, aetiology uncertain

APPENDIX C. CATEGORIZATION CAUSES OF DEATH

EDTA code	Cause	Category
0	Cause of death uncertain/not determined	Uncertain
11	Myocardial ischaemia and infarction	Heart
12	Hyperkalaemia	Other
13	Haemorrhagic pericarditis	Other
14	Other causes of cardiac failure	Heart
15	Cardiac arrest/sudden death; other cause or unknown	Heart
16	Hypertensive cardiac failure	Heart
17	Hypokalaemia	Other
18	Fluid overload/pulmonary oedema	Heart
21	Pulmonary embolus	Other
22	Cerebro-vascular accident, other cause or unspecified	CVA
23	Gastro-intestinal haemorrhage	Other
24	Haemorrhage from graft site	Other
25	Haemorrhage from vascular access or dialysis circuit	Other
26	Haemorrhage from ruptured vascular aneurysm (not code 22 or 23)	Other
27	Haemorrhage from surgery (not code 23, 24 or 26)	Other
28	Other haemorrhage (not codes 23-27)	Other
29	Mesenteric infarction	Other
30	Infection	Infection
31	Pulmonary infection (bacterial - not code 73)	Infection
32	Pulmonary infection (viral)	Infection
33	Pulmonary infection (fungal or protozoal)	Infection
34	Infections elsewhere (except viral hepatitis see codes 41-42)	Infection
35	Septicaemia	Infection
36	Tuberculosis (lung)	Infection
37	Tuberculosis (elsewhere)	Infection
38	Generalised viral infection	Infection
39	Peritonitis (all causes except for Peritoneal Dialysis)	Infection
41	Liver disease due to hepatitis B virus	Other
42	Liver disease due to other viral hepatitis	Other
43	Liver disease due to drug toxicity	Other
44	Cirrhosis - not viral	Other
45	Cystic liver disease	Other
46	Liver failure - cause unknown	Other
51	Patient refused further treatment	Treatment stop
52	Suicide	Other
53	ESRF treatment ceased for any other reason	Treatment stop
54	ESRF treatment ceased for medical reasons	Treatment stop
61	Uraemia caused by graft failure	Treatment stop
62	Pancreatitis	Other
63	Bone marrow depression	Other

EDTA code	Cause	Category
64	Cachexia	Other
66	Malignant disease possibly induced by immunosuppressive therapy	Malignancies
67	Malignant disease: solid tumors except those of 66	Malignancies
68	Malignant disease: lymphoproliferative disorders except those of 66	Malignancies
69	Dementia	Other
70	Peritonitis (sclerosing, with peritoneal dialysis)	Other
71	Perforation of peptic ulcer	Other
72	Perforation of colon	Other
73	Chronic obstructive airways (lung) disease	Other
80	Accident (all causes, specify)	Other
81	Accident related to ESRF treatment (not code 25)	Other
82	Accident unrelated to treatment	Other
90	Gastro-intestinal - other (specify)	Other
99	Other identified cause of death	Other
100	Peritonitis (bacterial, with peritoneal dialysis)	Infection
101	Peritonitis (fungal, with peritoneal dialysis)	Infection
102	Peritonitis (due to other cause, with peritoneal dialysis	Infection