

# Contextual factors related to fine-scale geographic variations of renal replacement therapy incidence in north-eastern France

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## Introduction

- The incidence of renal replacement therapy (RRT) vary considerably between and within countries, particularly at the local level.
- According to Caskey et al. [1, Figure 1], incidence of RRT could be the result of chronic diseases burden in the population, the accessibility to primary and secondary care, and the medical practices.

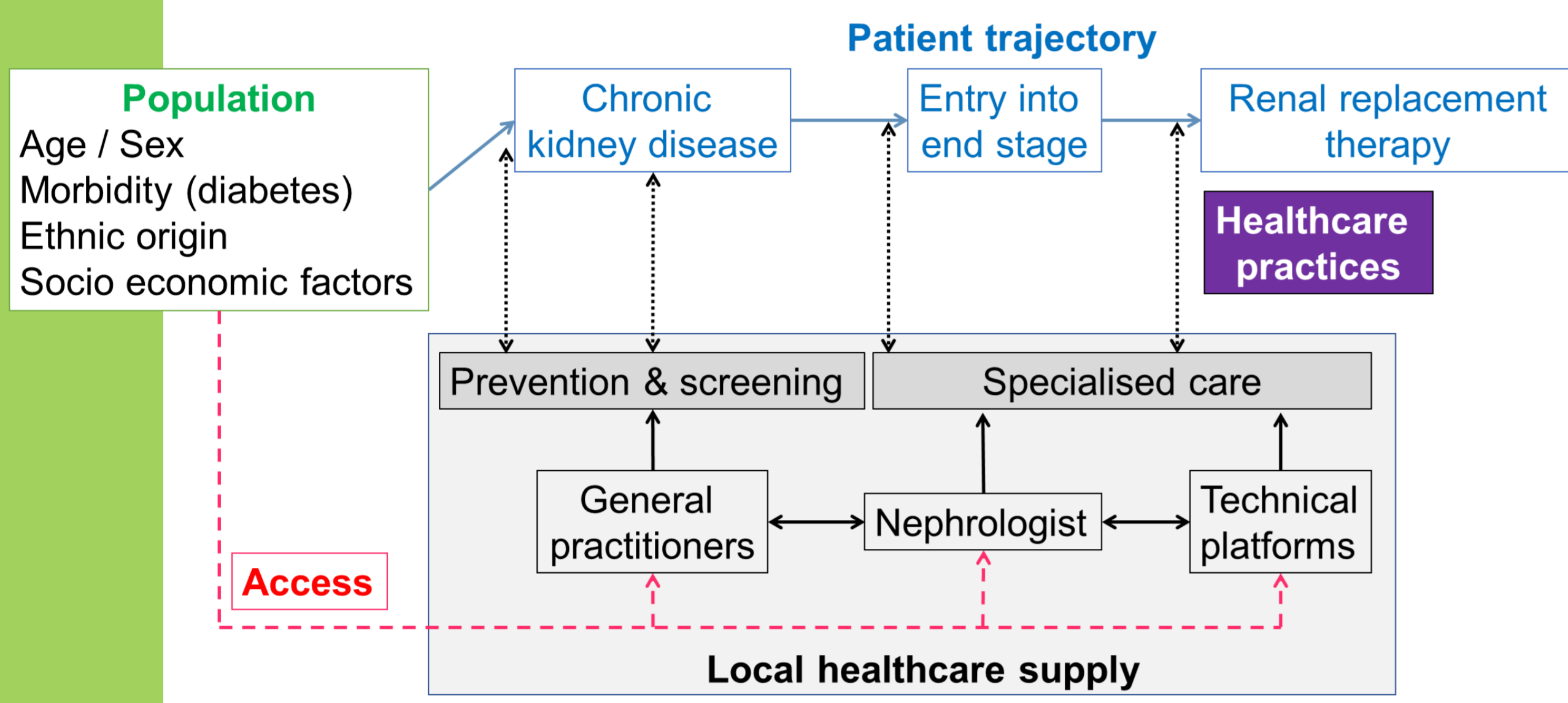


Figure 1. Underlying theoretical epidemiologic model adapted from Caskey FJ et al. [1]

## Objectives

To analyse the relationship between **RRT incidence disparities** and **socio-economic environment, geographic accessibility** to primary and secondary care, and **medical practice patterns**, after adjusting for morbidity and mortality rates.

## Methods

### Patients

- French national ESRD registry “REIN”
- Study conducted in 2 administrative regions (Grand Est + Bourgogne Franche-Comté, ~8.3 M inhabitants) → 18 « départements » [districts] and 282 « cantons » [townships]
- All **adult** patients **beginning** RRT between January 2010 and December 2014.

### Statistical analysis

- Age and sex adjusted incidence rates + standardised incidence ratios (SIR)
- Spatial analysis : Bayesian hierarchical random-effect Poisson regression models [2] to account for population size heterogeneity + spatial autocorrelation (R + WinBUGS) → Smoothed SIRs → Relative risks (RR) and 95% credible intervals (95% CI) associated with different contextual factors (included in the model as standardised continuous variables)
- Mapping of rates and smoothed SIRs (QGIS)

## References

- Caskey FJ, *Nephrol Dial Transplant* 2011; 26(8): 2604
- Besag J, *Ann Inst Statist Math* 1991; 43(1): 1
- Rey G, *BMC Public Health* 2009; 9(1): 33

## Results

Table 1. Patients

	n (%) or median (IQR)
<b>N</b>	6 835 (100)
<b>Age</b>	71.7 (60.5 – 80.0)
<b>Male sex</b>	4 231 (61.9)
<b>Diabetes</b> (n=6791)	3 059 (45.0)
Type II (n=3030)	2 905 (95.8)
<b>Nephropathy</b> (n=6823)	
Diabetic	1 517 (22.2)
Vascular	1 384 (20.3)
Unknown*	1 376 (20.3)
Other	2 546 (37.3)
<b>Initial treatment method</b>	
Transplantation	152 (2.2)
Peritoneal dialysis	1 189 (17.4)
Haemodialysis	5 494 (80.3)

\*inconclusive renal biopsy

Overall RRT incidence :  
190 per million inhabitants; 95% confidence interval [130 – 272]

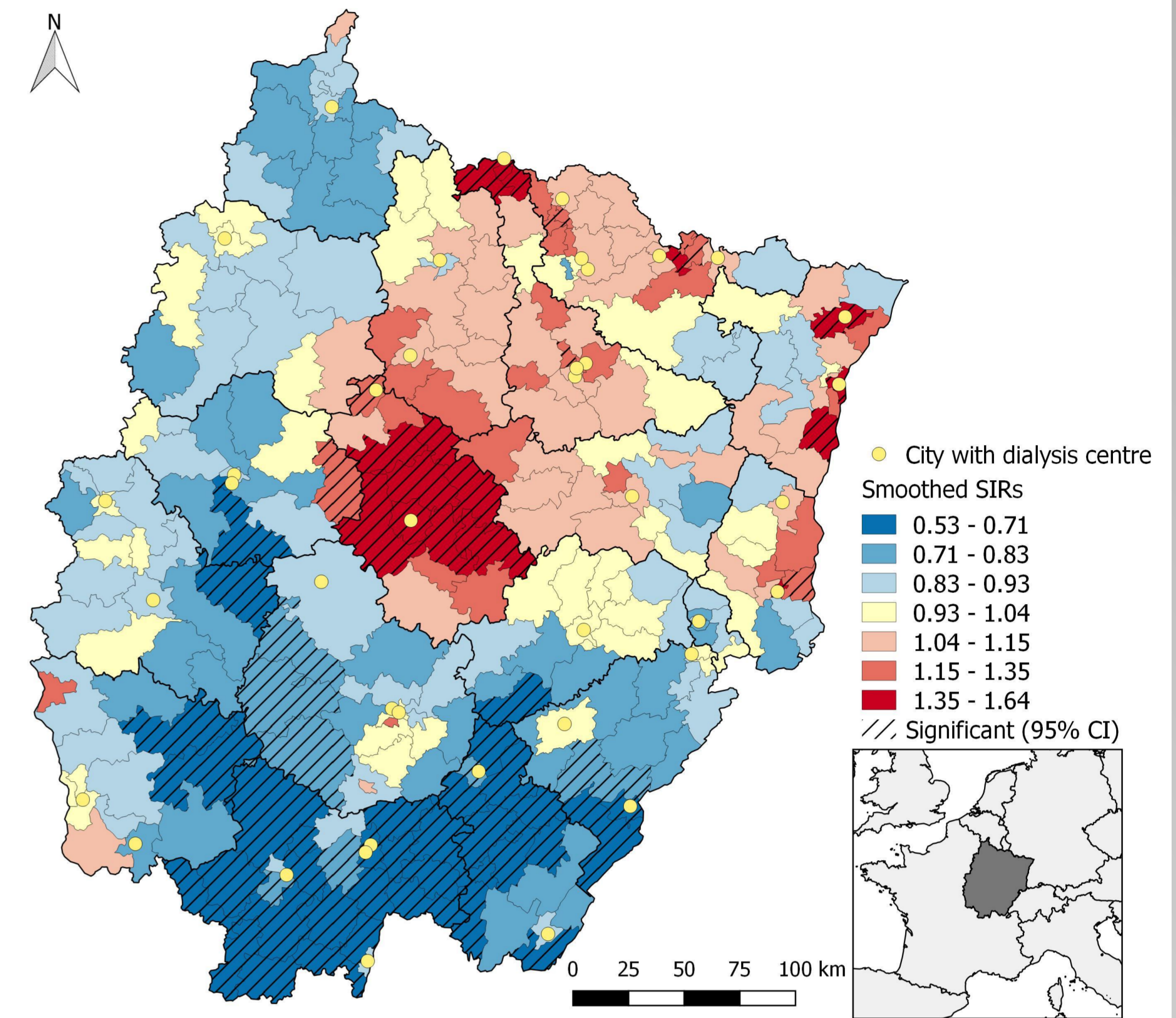


Figure 2. Smoothed Standardised Incidence Ratios of renal replacement therapy in the 282 townships of North-Eastern France 2010-2014.

Table 2. Relative risks of RRT incidence according to contextual factors

	Unadjusted RR* [95% CI]	RR* adjusted for other factors [95% CI]
<b>Morbidity, Mortality</b>		
Premature mortality <sup>a</sup>	1.02 [0.98 – 1.07]	
Cardiovascular mortality <sup>a</sup>	0.99 [0.95 – 1.03]	
Diabetes mortality <sup>a</sup>	0.99 [0.95 – 1.03]	
Prevalence of all treated chronic illnesses <sup>b</sup>	<b>1.08 [1.04 – 1.13]</b>	
<b>Prevalence of treated diabetes<sup>b</sup></b>	<b>1.09 [1.05 – 1.14]</b>	<b>1.08 [1.04 – 1.12]</b>
<b>Socio demographic</b>		
% people living in a rural area <sup>a</sup>	0.96 [0.92 – 1.00]	
<b>Deprivation index (FDEP)<sup>a,c</sup> [3]</b>	<b>1.05 [1.01 – 1.09]</b>	<b>1.04 [1.00 – 1.08]</b>
% unemployed in active population <sup>a</sup>	<b>1.07 [1.03 – 1.11]</b>	
% factory workers in active population <sup>a</sup>	1.03 [0.98 – 1.07]	
% adults without high school diploma	1.02 [0.98 – 1.06]	
<b>Healthcare resources and supply</b>		
<b>Travel time to dialysis center (min.)<sup>c</sup></b>	<b>0.94 [0.90 – 0.98]</b>	<b>0.92 [0.89 – 0.95]</b>
Accessibility to primary care <sup>a</sup>	<b>1.05 [1.01 – 1.09]</b>	
Accessibility to dialysis machine <sup>d</sup>	<b>1.07 [1.03 – 1.11]</b>	
<b>Clinical practices (district level measure)</b>		
<b>Median GFR (MDRD) at RRT initiation<sup>e</sup></b>	<b>1.17 [1.10 – 1.24]</b>	<b>1.13 [1.06 – 1.21]</b>
<b>% ESRD patients 85 and up<sup>e</sup></b>	<b>1.13 [1.07 – 1.19]</b>	<b>1.08 [1.02 – 1.14]</b>
% ESRD patients deceased within 3 months <sup>e</sup>	1.06 [0.99 – 1.12]	

All indicators measured at township level except where noted

\* Relative risk for a **change of 1 standard deviation**

Data sources: <sup>a</sup> Insee (National Institute of Statistics and Economic Studies); <sup>b</sup> ALD CNAM-TS (National Health Insurance Fund); <sup>c</sup> Observatoire Régional de la Santé Alsace; <sup>d</sup> Agence de la Biomédecine; <sup>e</sup> REIN

## Conclusions

- Both diabetes prevalence and deprivation (FDEP index) were associated with increased incidence of RRT.**
- Incidence of RRT was not related to accessibility to primary care but strongly related to nephrologists practices.**
- Incidence of RRT decreased as distance to dialysis centre increased and was lower in the most remote townships.**

- Strengths : fine scale study with multiple contextual factors taken into account.
- Limits : ecological bias may exist.

