Supplemental Material

Supplemental Material 1: Questionnaire

Supplemental Table 1: Comparison of demographic and socio-professional characteristics between membranous nephropathy patients and the general population of French workers

Supplemental Figure 1: Comparison of the main job categories between primary membranous nephropathy patients and the general population of French workers

Supplemental Table 2: Estimated risk of membranous nephropathy for each occupation compared to the referent occupation (service sector), adjusted for age and sex

Supplemental Table 3: Comparison of baseline characteristics and occupational exposure between membranous nephropathy patients with kidney failure and those without kidney failure

Supplemental Material 1: Questionnaire

The hetero-questionnaire, developed by the occupational medicine department in collaboration with the nephrology and immunology departments, was completed during semi-guided individual interviews by an occupational health physician. It collected details of the patient current and past occupational activities, possible occupational toxic exposures, and occupational nephrotoxic prevention measures implemented by their employer's occupational medicine. The questionnaire was translated into English for publication, but all patients in the study were French-speaking and completed it in French.

Supplemental Table 1: Comparison of demographic and socio-professional characteristics between membranous nephropathy patients and the general population of French workers

		French workers	Membranous nephropathy patients	p-value
All participants		**n=26,734,000 (100%)**	**n=94 (100%)**	
	Male (%)	15,773,060 (59%)	63 (63%)	0.48
	Age 15-29	5,346,800 (20%)	9 (10%)	<0.01
	Age 30-49	13,367,000 (50%)	32 (34%)	<0.01
	Age ≥50	8,020,200 (30%)	53 (56%)	<0.01
Service workers		**n=20,585,180 (77%)**	**n=43 (46%)**	<0.01
	Male (%)	10,910,145 (53%)	16 (37%)	0.05
	Age 15-29	3,911,184 (19%)	6 (14%)	0.56
	Age 30-49	10,498,442 (51%)	13 (30%)	<0.01
	Age ≥50	6,175,554 (30%)	24 (56%)	<0.01
Industry workers		**n=3,742,760 (14%)**	**n=14 (15%)**	0.81
	Male (%)	2,881,925 (77%)	8 (57%)	0.06
	Age 15-29	935,690 (25%)	2 (14%)	0.01
	Age 30-49	1,871,380 (50%)	5 (36%)	0.43
	Age ≥50	935,690 (25%)	7 (50%)	0.06
Construction workers		**n=1,871,380 (7%)**	**n=31 (33%)**	<0.01
	Male (%)	1,478,390 (79%)	31 (100%)	<0.01
	Age 15-29	374,276 (20%)	1 (3%)	0.01
	Age 30-49	954,404 (51%)	11 (36%)	0.11
	Age ≥50	542,700 (29%)	19 (61%)	<0.01
Agricultural workers		**n=668,350 (3%)**	**n=6 (6%)**	0.04
	Male (%)	487,896 (73%)	5 (83%)	>0.99
	Age 15-29	113,620 (17%)	0	0.60
	Age 30-49	267,340 (40%)	3 (50%)	0.69
	Age ≥50	287,391 (43%)	3 (50%)	>0.99

The data source for French workers is the French National Institute of Statistics and Economic Studies 2018 which provides the occupational activity of the French general population. After excluding unemployed individuals, this information is available for 26,734,000 participants. Statistical significance was determined by a Chi-square test or Fisher's exact test according to patient sample size.

Consistent with the literature, we found a male predominance and a higher age in membranous nephropathy patients than in the general population. The proportion and sex ratio of patients working in industry are similar to those of the general population. On the other hand, we found a higher proportion with a male predominance of patients working in the construction sector, in contrast to the service sector where the opposite proportions were found.
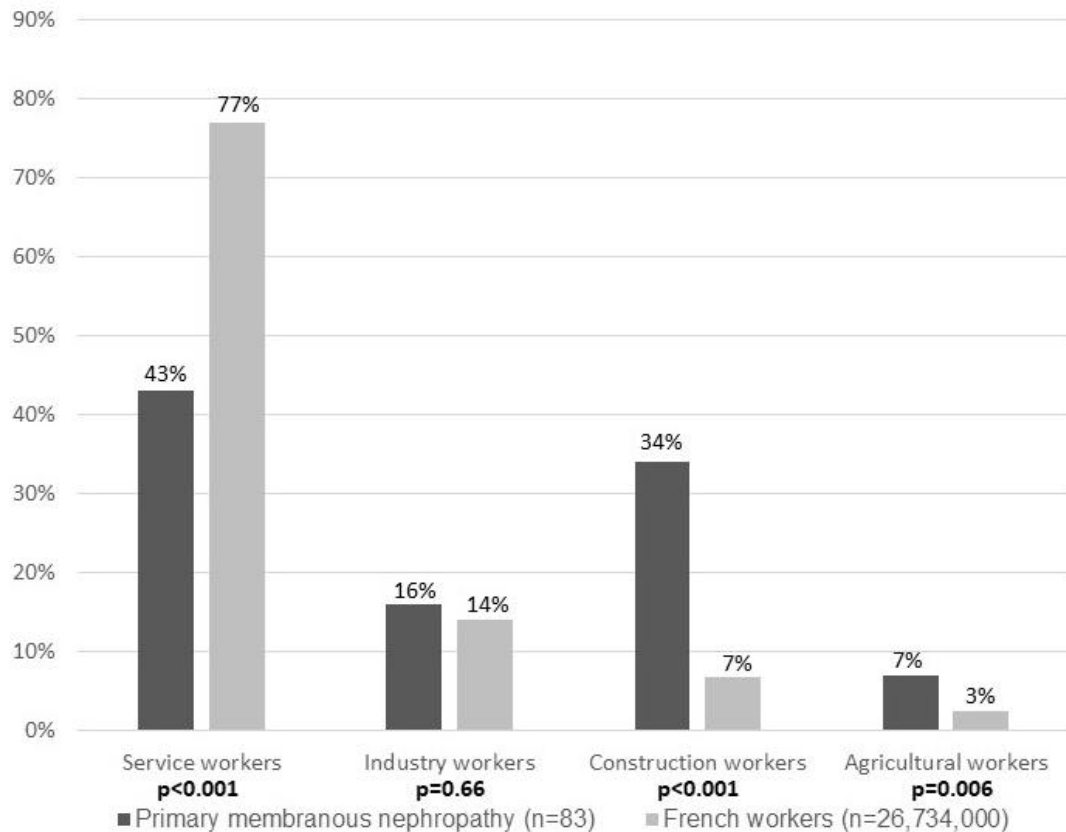
Supplemental Figure 1: Comparison of the main job categories between primary membranous nephropathy patients and the general population of French workers.

The data source for French workers is the French National Institute of Statistics and Economic Studies 2018 and covers 26,734,000 individuals. Individuals who have never worked were not included in the analysis. Primary membranous nephropathy patients worked significantly more in the construction ($p<0.001$) and agricultural sectors ($p=0.006$), and less in the service sector ($p<0.001$), than the general population of French workers. Statistical significance was determined by a Chi-square test or Fisher's exact test according to patient sample size. There was no missing data.

Supplemental Table 2: Estimated risk of membranous nephropathy for each occupation compared to the referent occupation (service sector), adjusted for age and sex

		Service workers	Industry workers	Agricultural workers	Construction workers
Male	Age <50	1.00	1.80	2.56	8.23*
	Age ≥50	0.98*	1.79	4.03	7.89*
Female	Age <50	1.00	2.37	4.61	7.91*
	Age ≥50	1.02	1.86	3.52	7.46*

By convention, we considered the lowest risk of membranous nephropathy to be 1.00 and corresponded to service workers younger than 50 years. We calculated the ratios of the proportion of observed cases to the proportion of expected cases in each age, sex, and occupational category and then applied the correction factor that had been obtained on the reference population. With this approach, we showed that the risk of having a membranous nephropathy when working in construction is multiplied by a factor of 8 compared to the reference occupation, regardless of age and sex.

*, p < 0.05

Supplemental Table 3: Comparison of baseline characteristics and occupational exposure between membranous nephropathy patients with kidney failure and those without kidney failure

	No kidney failure n=76	Kidney failure n=24	p-value
Baseline characteristics			
Male	49 (64%)	13 (54%)	0.47
Sex ratio M/F	1.8	1.2	
Age at MN diagnostic, yr	51 (15)	53 (16)	0.48
Smoking	49 (64%)	13 (54%)	0.47
Occupational exposure			
Asbestos	15 (20%)	5 (21%)	>0.99
Lead	10 (13%)	3 (13%)	>0.99
Organic solvents	44 (58%)	10 (42%)	0.24
Duration of exposure (years)	16.0 [7.3-30.0]	18.5 [10.0-32.3]	0.54

Categorial (number and percentage) and continuous variables (mean and standard deviation or median and interquartile range according to the data distribution) are shown for membranous nephropathy patients with or without kidney failure. Baseline characteristics and occupational exposures were compared using Chi-square test or Fisher's exact test and unpaired t-test or Mann-Whitney test for categorial and continuous variables, respectively. There was no missing data.