



Winter School



La Malattia Renale in Medicina: Epidemiologia e Peso Sociale

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Bologna

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Diapositiva preparata da GABRIELLA GRUDEN e ceduta alla Società Italiana di Diabetologia.
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CONFLITTI DI INTERESSE

Gabriella Gruden dichiara di aver ricevuto negli ultimi due anni compensi o finanziamenti dalle seguenti Aziende Farmaceutiche e/o Diagnostiche:

- Novo Nordisk
- Boheringer Ingelheim

Dichiara altresì il proprio impegno ad astenersi, nell'ambito dell'evento, dal nominare, in qualsivoglia modo o forma, aziende farmaceutiche e/o denominazione commerciale e di non fare pubblicità di qualsiasi tipo relativamente a specifici prodotti di interesse sanitario (farmaci, strumenti, dispositivi medico-chirurgici, ecc.).

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OUTLINE

CKD problema

- **Sottostimato**
- Grave e ingravescente
- Sommerso
- Ad elevato impatto sociale



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Malattia Renale

Dati epidemiologici:

- Pianificazione programmazione
- Efficacia
- Sensibilizzare



A single number for advocacy and communication—worldwide more than 850 million individuals have kidney diseases

Kidney International (2019) 96, 1048–1050; <https://doi.org/10.1016/j.kint.2019.07.012>

KEYWORDS: chronic kidney disease; kidney development

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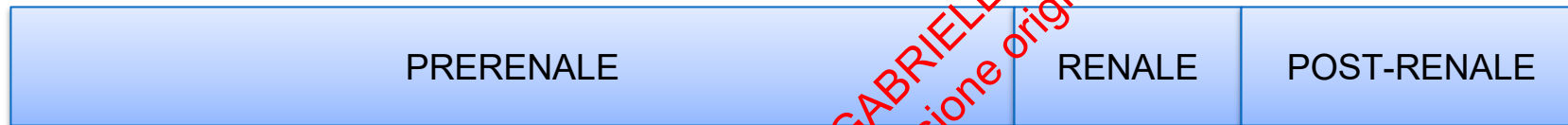
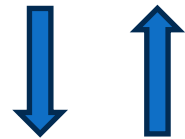
Table 1 | The global dimension of kidney diseases in 2017

CKD stages 1–5	843.6 million
Individuals with AKI	13.3 million
Individuals on RRT	3.9 million
Total	860.8 million

AKI, acute kidney injury; CKD, chronic kidney disease; RRT, renal replacement therapy.

Malattia Renale e Nefrologi

Malattia Renale Cronica



Danno Renale Acuto

- Medici di Base
- Internisti
- Medici PS
- Diabetologi
- Ipertensivologi
- Cardiologi
- Urologo

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Problemi in Epidemiologia della CKD

Registri

- RRT
- CKD (G4-G5)
- AKI

Eterogeneità

Definizione CKD

- eGFR (3-5)
- eGFR e ACR/PCR (1-5)
- Test di conferma

↳ Aggregazione dati

Definizione ESRD

- RRT
- eGFR <15 ml/min

Demografici

Comorbidità

Income

Country	CKD	Dialysis	Transplant	AKI	Conservative care
Andorra					
Austria		X	X		
Belgium		X	X		
Denmark		X	X		
Finland		X	X		
France	X	X	X		
Germany		X	X		
Greece		X	X		
Iceland	X	X	X		X
Ireland		X	X		
Israel		X	X		
Italy		X	X		
Liechtenstein					
Luxembourg	X	X	X		
Malta		X	X		
Netherlands		X	X		
Norway	X	X	X		
Portugal		X	X		
Spain		X	X		
Sweden	X	X	X	X	X
Switzerland		X	X		
United Kingdom	X	X	X	X	

X : Yes

Neglected CKD

World Bank country group for chronic kidney disease gaps.

CKD care	Low-income countries (%)	Lower-middle-income countries (%)	Upper-middle-income countries (%)	High-income countries (%)
Governmental recognition of CKD as a health priority	59	50	17	29
Government funds all aspects of CKD care	13	21	40	53
Availability of CKD management and referral guidelines (international, national, or regional)	46	73	83	97
Existence of current CKD detection programs	6	24	24	32



EU non-communicable diseases (NCDs) initiative

5 focus:

- CVD
- DM
- Malattie respiratorie croniche
- Malattia mentale
- Disturbi neurologici

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CONSAPEVOLEZZA

- Popolazione generale: 7%
- Pazienti con CKD 1-3: 10%

CKD awareness among US adults by future risk of kidney failure

Setting & Participants	Study Design	Results										
 NHANES 1999-2016  3,713 adult participants  CKD stages 3-4  Not pregnant	Cross-sectional Study  CKD-EPI eGFR  Urine albumin-creatinine ratio  5-year risk of ESKD from Kidney Failure Risk Equation (KFRE)  Surveyed on awareness of CKD diagnosis	 NHANES 2011-2016 <table><tr><th>5-Year Risk of ESKD</th><th>Aware of CKD</th></tr><tr><td>Minimal: <2%</td><td>9.6%</td></tr><tr><td>Low: 2 to <5%</td><td>22.6%</td></tr><tr><td>Intermediate: 5 to <15%</td><td>44.7%</td></tr><tr><td>High: ≥15%</td><td>49.0%</td></tr></table> No change in proportions 1999-2016	5-Year Risk of ESKD	Aware of CKD	Minimal: <2%	9.6%	Low: 2 to <5%	22.6%	Intermediate: 5 to <15%	44.7%	High: ≥15%	49.0%
5-Year Risk of ESKD	Aware of CKD											
Minimal: <2%	9.6%											
Low: 2 to <5%	22.6%											
Intermediate: 5 to <15%	44.7%											
High: ≥15%	49.0%											
CONCLUSION: Approximately half of patients with CKD stages 3-4 who are intermediate or high risk for progression to ESKD are unaware of their kidney disease												

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Epidemiologia della CKD

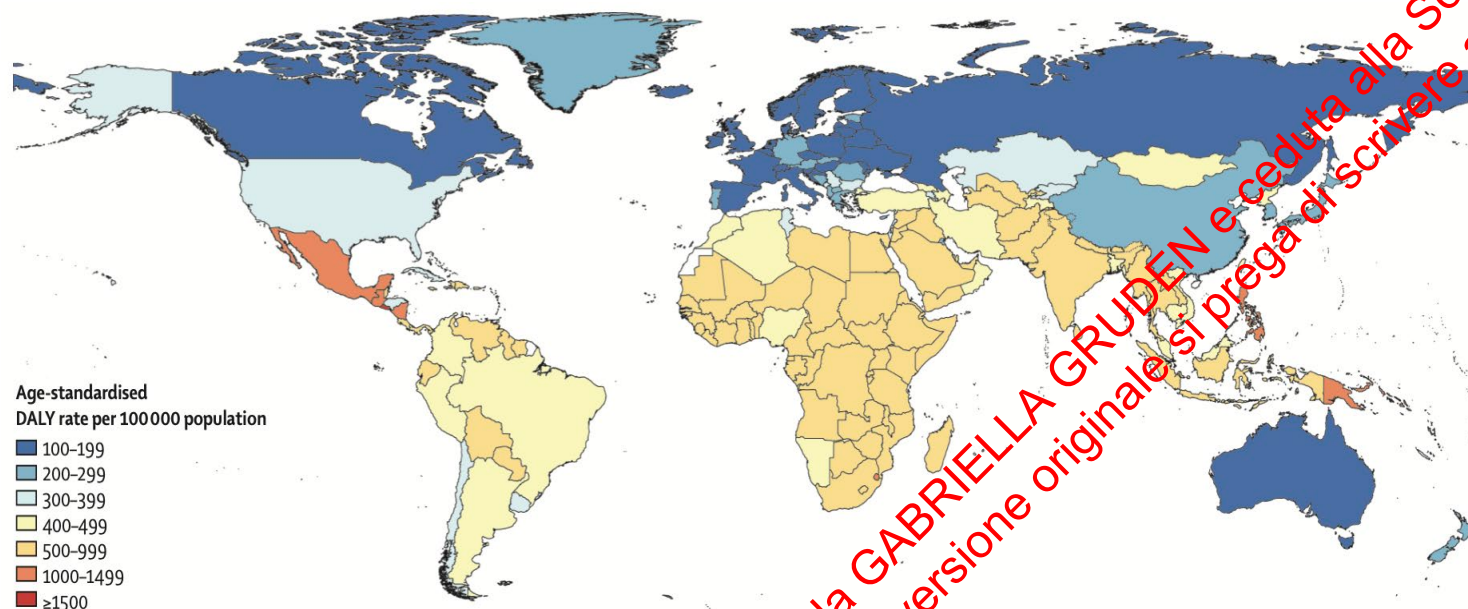
Epidemiology of chronic kidney disease: an update 2022



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Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017

GBD Chronic Kidney Disease Collaboration*



CKD Prevalenza

Aumento dal 1990: 29.3%

RRT Prevalenza: 0,1% (1:1000)

RTT Incidenza aumento dal 1990: 43.1%

Mortalità

Aumento dal 1990: 41.5%

Trainata da America Latina ed Asia

CKD e MORTALITA'

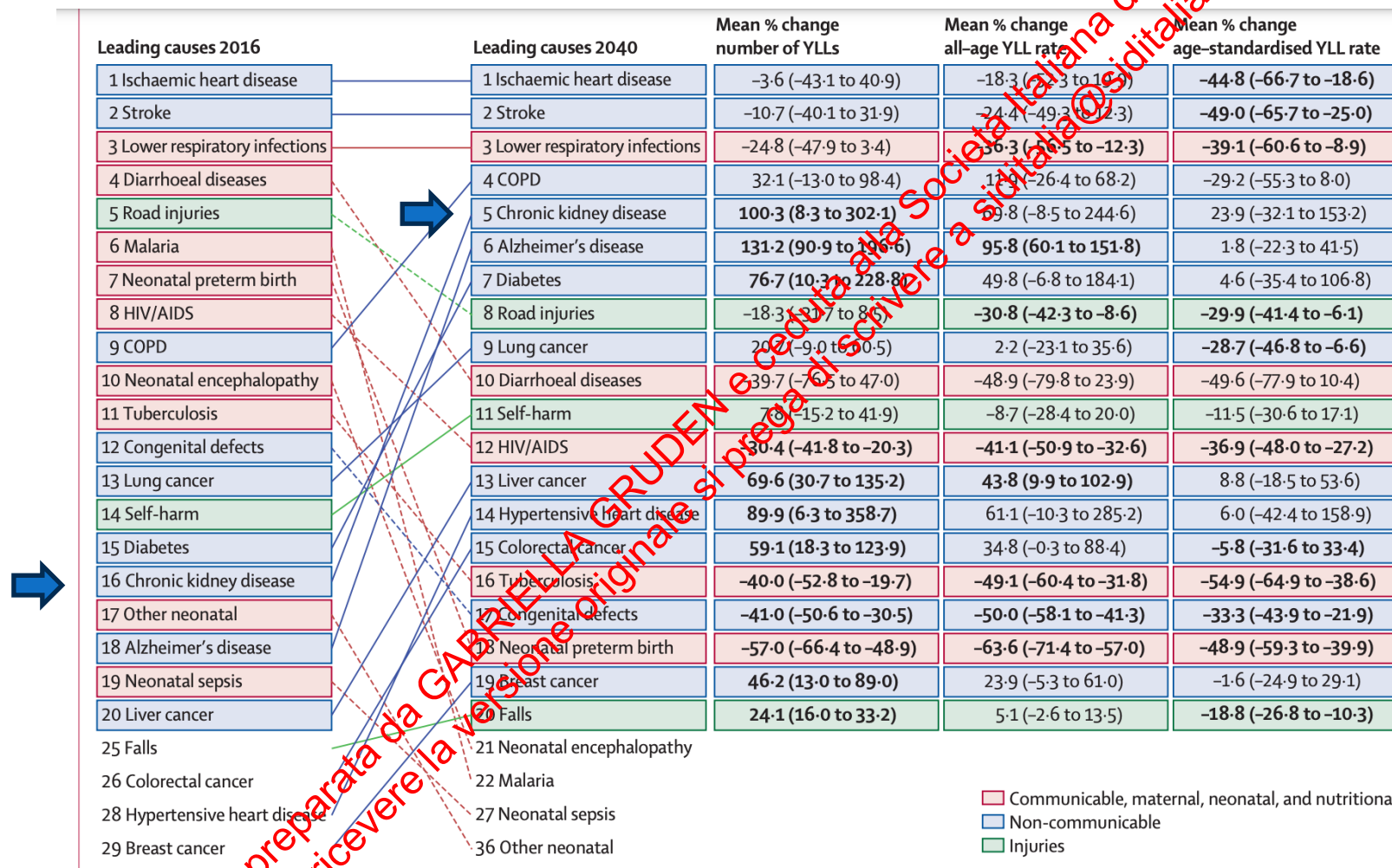


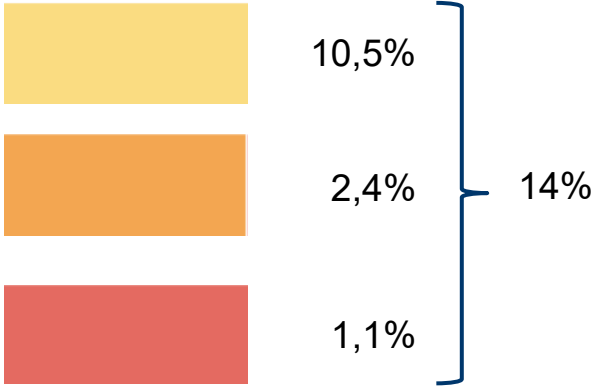
Figure 4: Leading 20 Level 3 causes of YLLs globally in 2016 and 2040 by rank order

USRDS

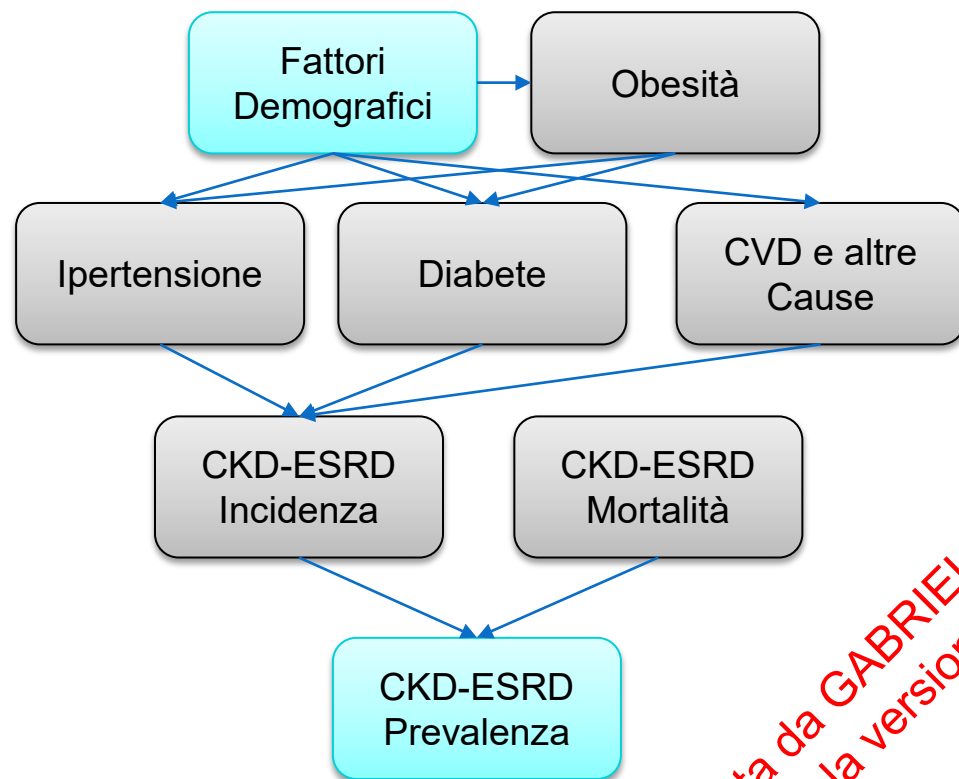
2017-2020: 14% (1:7 soggetti)

Prognosis of CKD by GFR and albuminuria categories: KDIGO 2012

GFR categories (ml/min/1.73 m ²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased < 30 mg/g < 3 mg/mmol	Moderately increased 30-300 mg/g 3-30 mg/mmol	Severely increased > 300 mg/g > 30 mg/mmol
eGFR < 60 ml/min	G1	Normal or high	≥ 90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	< 15			



Fattori Demografici - USA 2017-2020

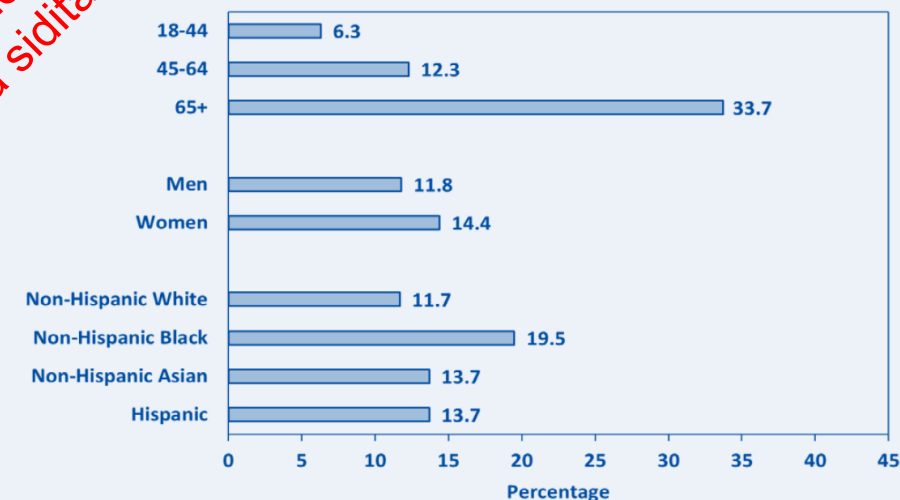


Età
CKD 1:7
⇒ > 65 aa 1:3

Sesso F

Etnia

Percentage of US Adults Aged 18 Years and Older With CKD,[†] by Age, Sex, and Race/Ethnicity



[†]CKD stages 1–4 using data from the 2017–March 2020 National Health and Nutrition Examination Survey based on 2021 CKD Epidemiology Collaboration GFR estimating equation, including serum creatinine, age, and sex. For more details on methods, see “How Estimates Were Calculated.”

ESRD

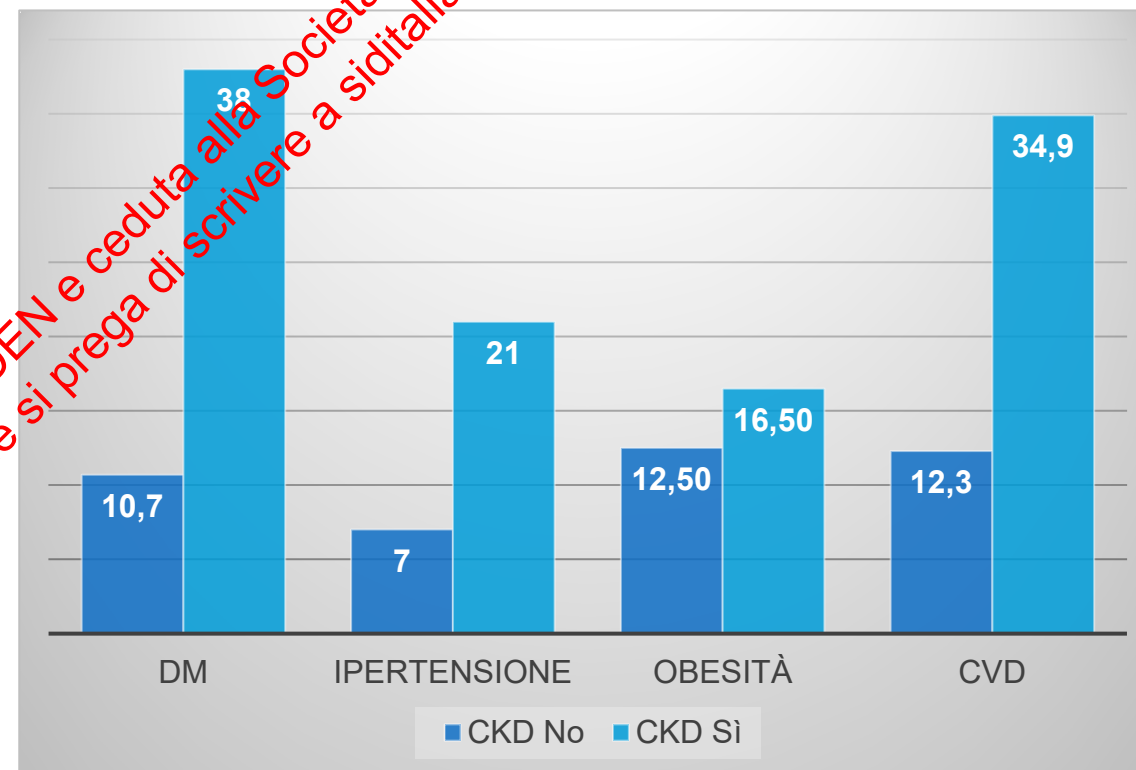
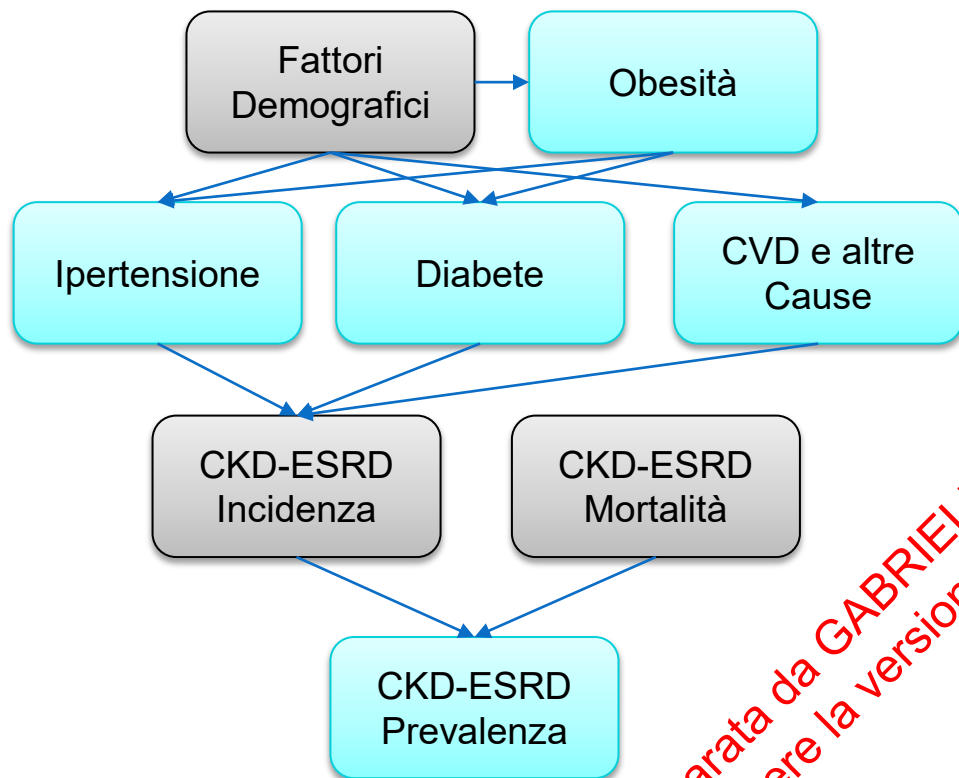
Black or African Americans are more than 3 times as likely and Hispanics or Latinos are 1.3 times more likely to have kidney failure compared to White Americans.



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

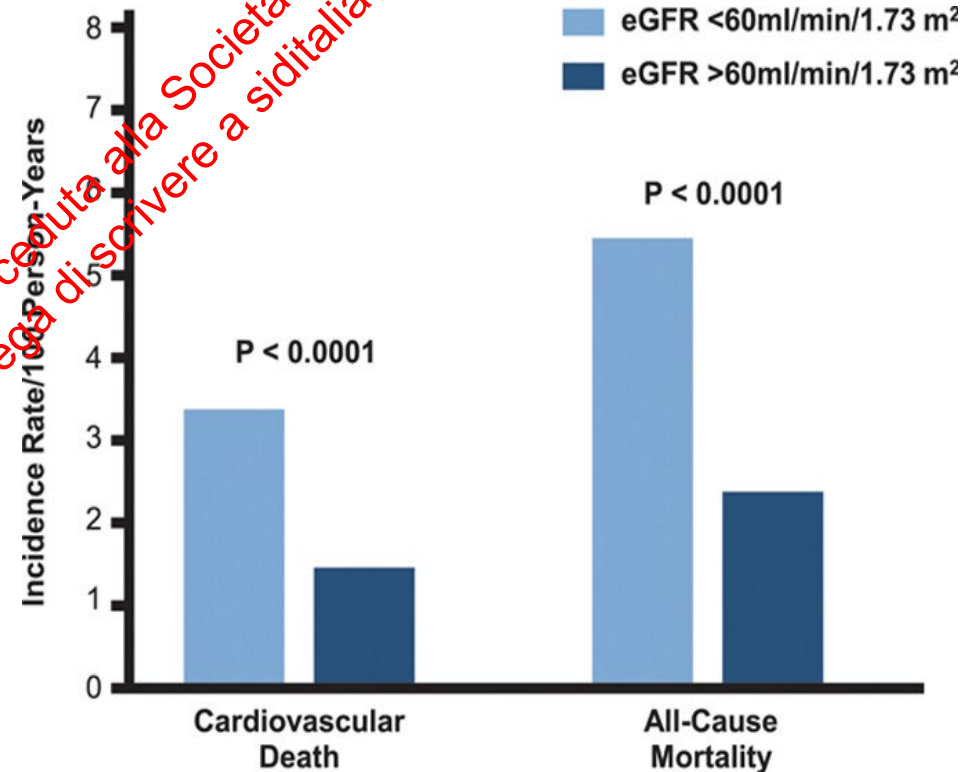
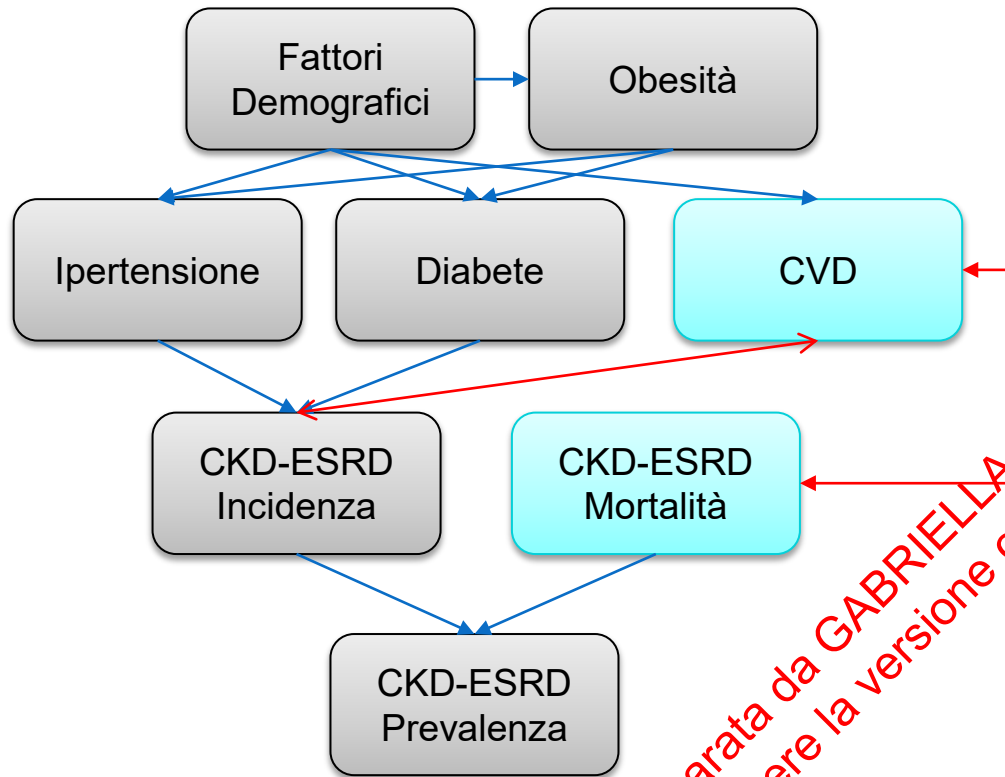
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Comorbidità - USA 2017-2020



- Familiarità per CKD
- Patologie renali ereditarie
- Pregressi AKI

MORBILITA' - MORTALITA' - USA 2017-2020



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Cause di Morte

Table 4. Cause of death for NHANES 1999-2006 participants, N=3,424^{a,b}

Cause of death, n (%; 95% CI)	eGFR ^c ≥ 60, no proteinuria ^d	eGFR ≥ 60, proteinuria	eGFR 45-60	eGFR 30-44	eGFR < 30
n	1,911	591	570	247	105
Cardiovascular disease	375 (16.8, 14.8-18.8)	173 (26.5, 22.0-31.0)	150 (26.7, 22.4-31.1)	66 (26.3, 19.7-32.8)	29 (27.8, 17.5-38.0)
Malignancy	497 (27.7, 25.1-30.2)	98 (16.1, 12.5-19.8)	92 (16.0, 12.4-19.6)	29 (10.9, 6.5-15.3)	11 (12.2, 3.9-20.5)
Dementia/Alzheimer ^e	57 (3.2, 2.3-4.1)	23 (3.2, 1.6-4.8)	29 (5.3, 3.2-7.5)	8 (3.7, 0.9-6.6)	0
Other	982 (52.3, 49.5-55.1)	297 (54.2, 49.0-59.3)	299 (51.9, 47.0-56.8)	144 (59.1, 51.8-66.3)	65 (60.1, 48.5-71.7)

Abbreviations: ACR, albumin-creatinine ratio; CI, confidence interval; NHANES, National Health and Nutrition Examination Survey.

^a3,436 adult NHANES participants died, of whom 3,424 had an available cause of death.

^bNHANES participants' weights utilized to calculate the percentages. As a result, percentages in NHANES columns are not uniformly equal to the n of participants divided by the column n × 100%.

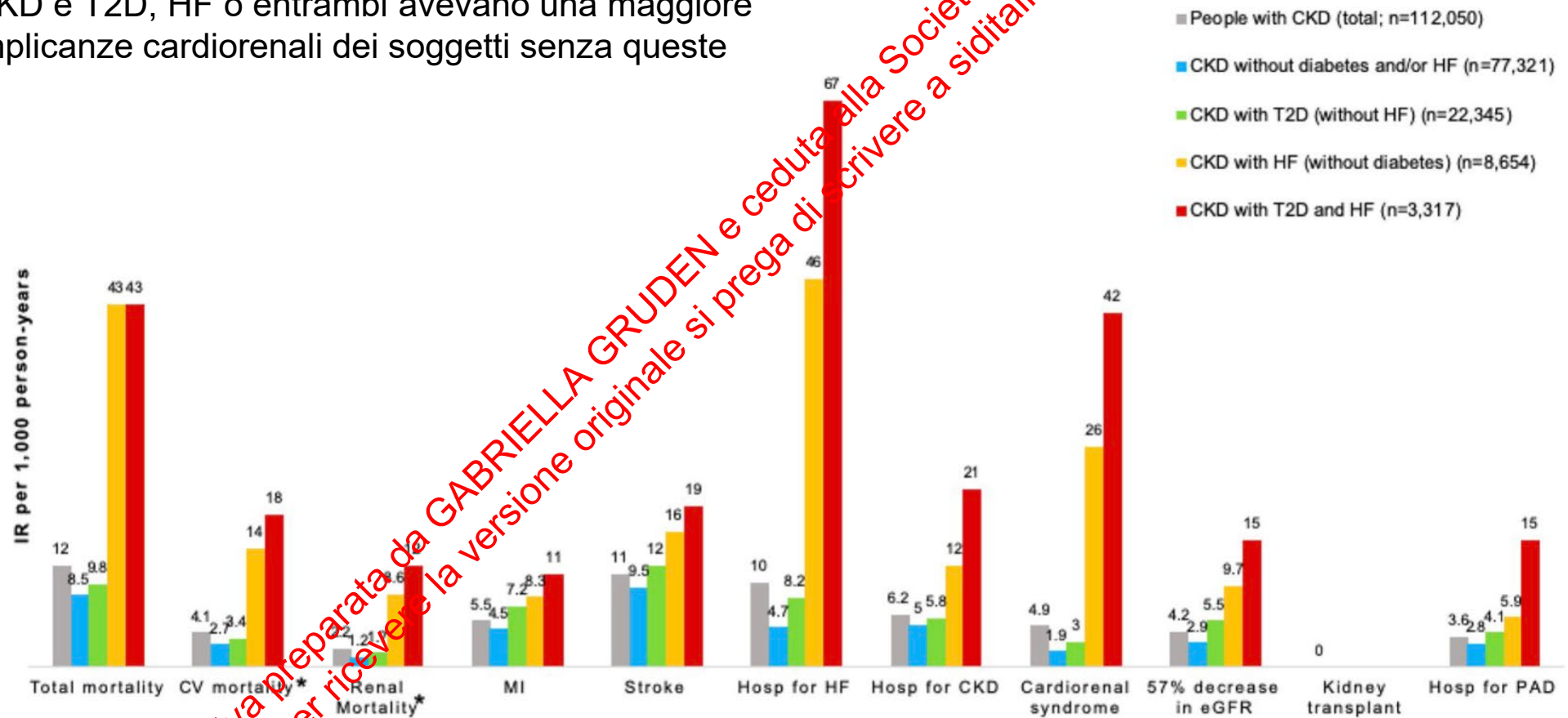
^ceGFR: estimated glomerular filtration rate, measured in mL/min/1.73 m², calculated by the 2021 CKD-EPI equation.¹²

^dProteinuria defined in NHANES by ACR at the time of examination and considered present if ≥ 30 mg/g.

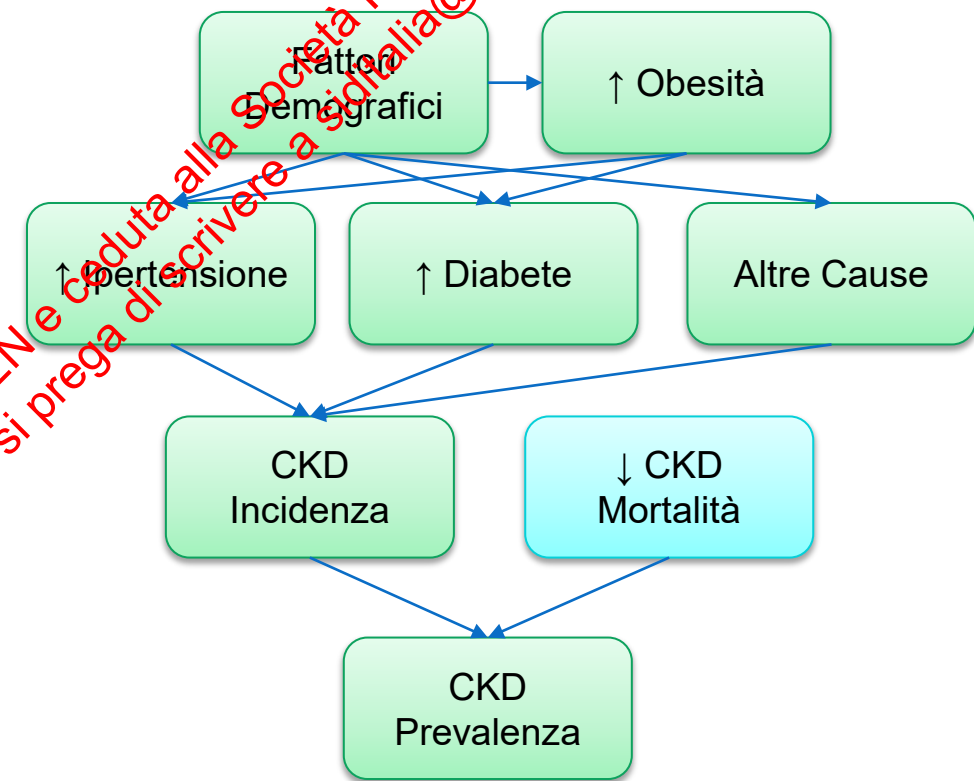
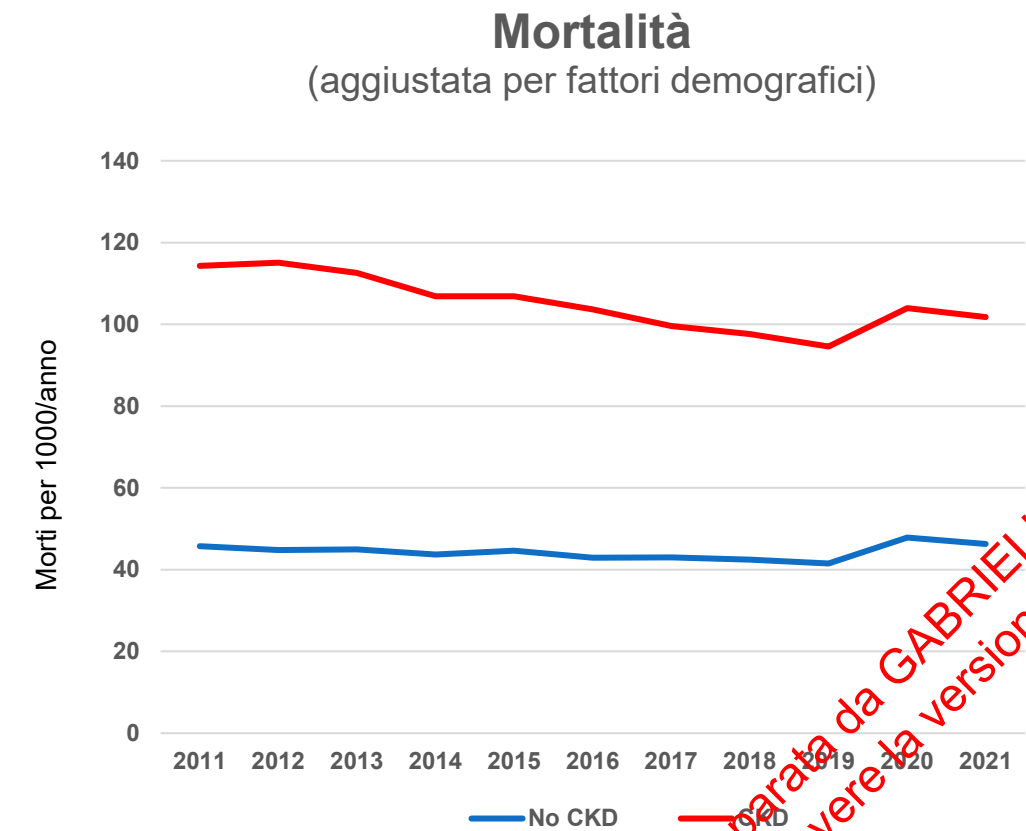
^eFor NHANES, Dementia/Alzheimer only includes Alzheimer disease.

EVENTI CARDIORENALI

- 2.187.962 individui Paesi Bassi
- Prevalenza CKD 8.9% (19.9% T2D, 7.7% HF 3.0% entrambi)
- Soggetti con CKD e T2D, HF o entrambi avevano una maggiore mortalità e complicanze cardiorenali dei soggetti senza queste comorbidità



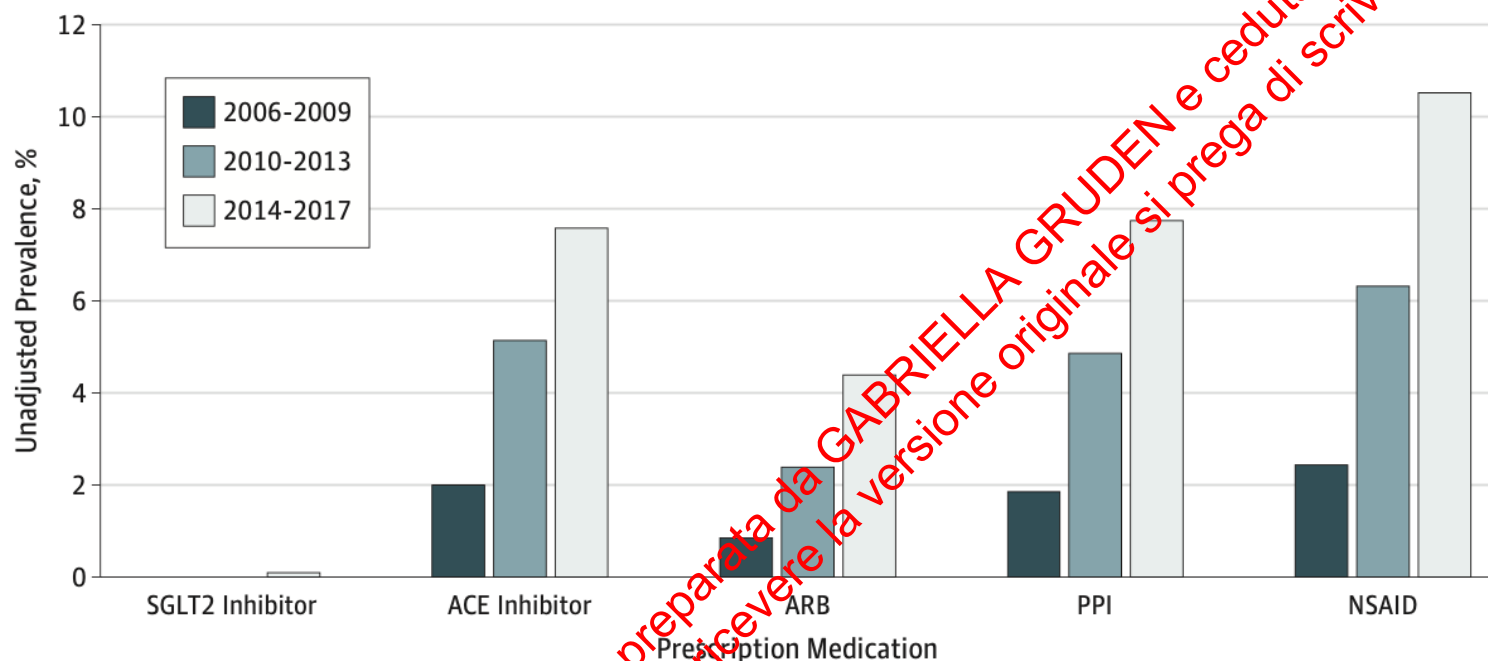
Mortalità da Tutte le Cause



CURE-CKD Registry

- Electronic health record-based registry: 2 large US health care systems
- 2.625.963 adults and children CKD or at risk of CKD

Figure 2. Prevalence of Prescription Medication Use in Chronic Kidney Disease Categories 3a to 5 in 2006 to 2009, 2010 to 2013, 2014 to 2017



RAS-i prescritto 20.6%
FANS o PPI prescritti 33.7%

INCIDENZA ESRD 2000-2019 US

TABLE. Number of reported incident and prevalent cases of end-stage kidney disease, by selected characteristics — United States, 2000 and 2019*

Characteristic	Incident cases			Prevalent cases		
	2000	2019	Percentage change	2000	2019	Percentage change
	No. (%) [†]	No. (%) [†]		No. (%) [†]	No. (%) [†]	
Total	92,660 (100.0)	131,422 (100.0)	41.8	358,247 (100.0)	783,594 (100.0)	118.7
Age group, yrs						
<45	14,194 (15.3)	16,230 (12.3)	14.3	87,769 (24.5)	118,208 (15.1)	34.7
45–64	32,370 (34.9)	48,874 (37.2)	51.0	144,703 (40.4)	331,220 (42.3)	128.9
65–74	23,494 (25.4)	35,744 (27.2)	52.1	71,825 (20.0)	199,005 (25.4)	177.1
≥75	22,602 (24.4)	30,574 (23.3)	35.3	52,950 (14.7)	135,161 (17.2)	150.5
Sex						
Men	49,500 (53.4)	76,631 (58.3)	54.8	195,216 (54.5)	456,821 (58.3)	134.0
Women	43,160 (46.6)	54,791 (41.7)	26.9	163,031 (45.5)	326,773 (41.7)	100.4
Race and Ethnicity						
White	51,156 (55.2)	67,919 (51.7)	32.8	180,636 (50.4)	349,596 (44.7)	93.5
Black	25,917 (28.0)	33,700 (25.6)	30.0	116,376 (32.5)	234,399 (29.9)	101.4
Hispanic	11,297 (12.2)	20,790 (15.8)	84.6	42,129 (11.8)	140,961 (18.0)	234.6
Asian	2,507 (2.7)	6,256 (4.8)	149.5	11,839 (3.3)	41,393 (5.3)	249.6
American Indian or Alaska Native	1,041 (1.1)	1,299 (1.0)	24.8	4,538 (1.3)	7,949 (1.0)	75.2
Native Hawaiian or other Pacific Islander	742 (0.8)	1,458 (1.1)	96.5	2,729 (0.8)	9,296 (1.2)	240.6
Primary cause						
Diabetes	41,458 (44.7)	61,522 (46.8)	48.4	129,699 (36.2)	307,385 (39.2)	137.0
Hypertension	23,384 (25.2)	33,339 (25.3)	60.5	83,553 (23.3)	209,437 (26.7)	150.7
Other cause	27,818 (30.0)	32,361 (24.6)	16.3	144,995 (40.5)	266,772 (34.0)	84.0

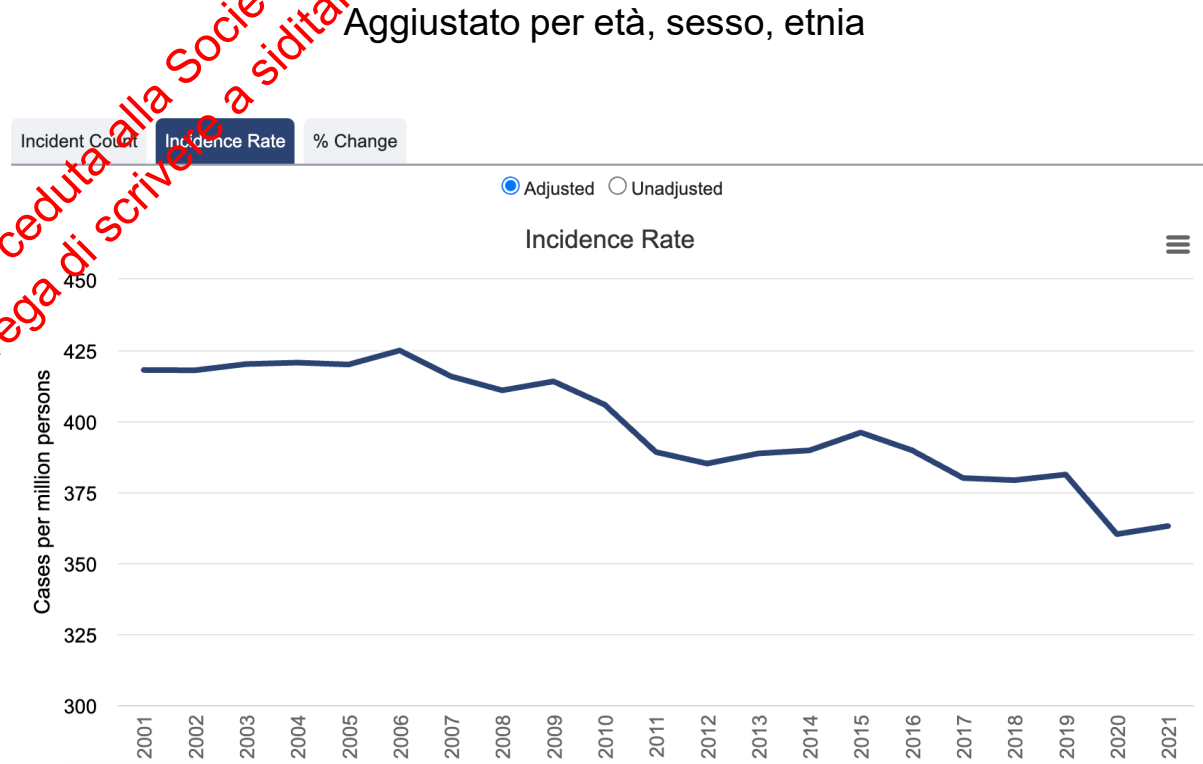
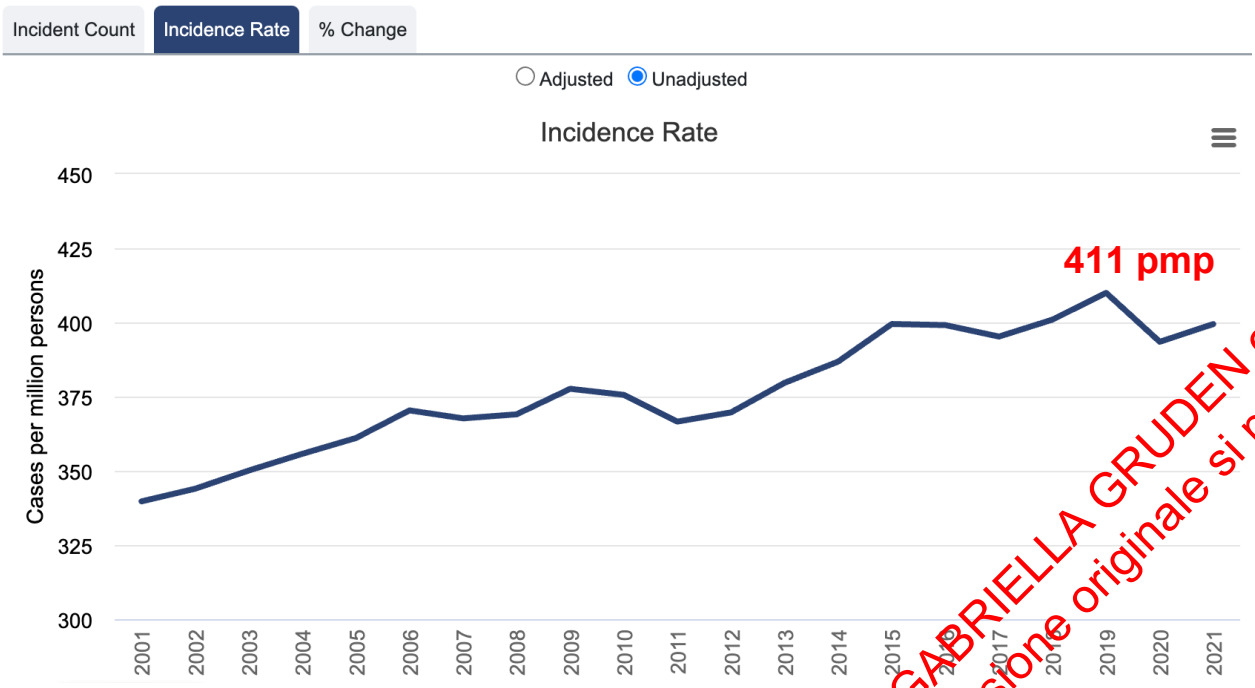
* Data from United States Renal Data System, 2021 Annual Data Report, Reference Tables. <https://adr.usrds.org/2021/reference-tables>

† Percentages might not sum to 100% because of rounding.

La maggior parte dei casi incidenti/prevalenti è costituita da maschi, >45–anni, con DM.

Tuttavia il maggior aumento di casi si è osservato nelle minoranze etniche e nei soggetti con ipertensione

Incidenza ESRD Cruda e Aggiustata 2001-2021



EUROPA 145 pmp

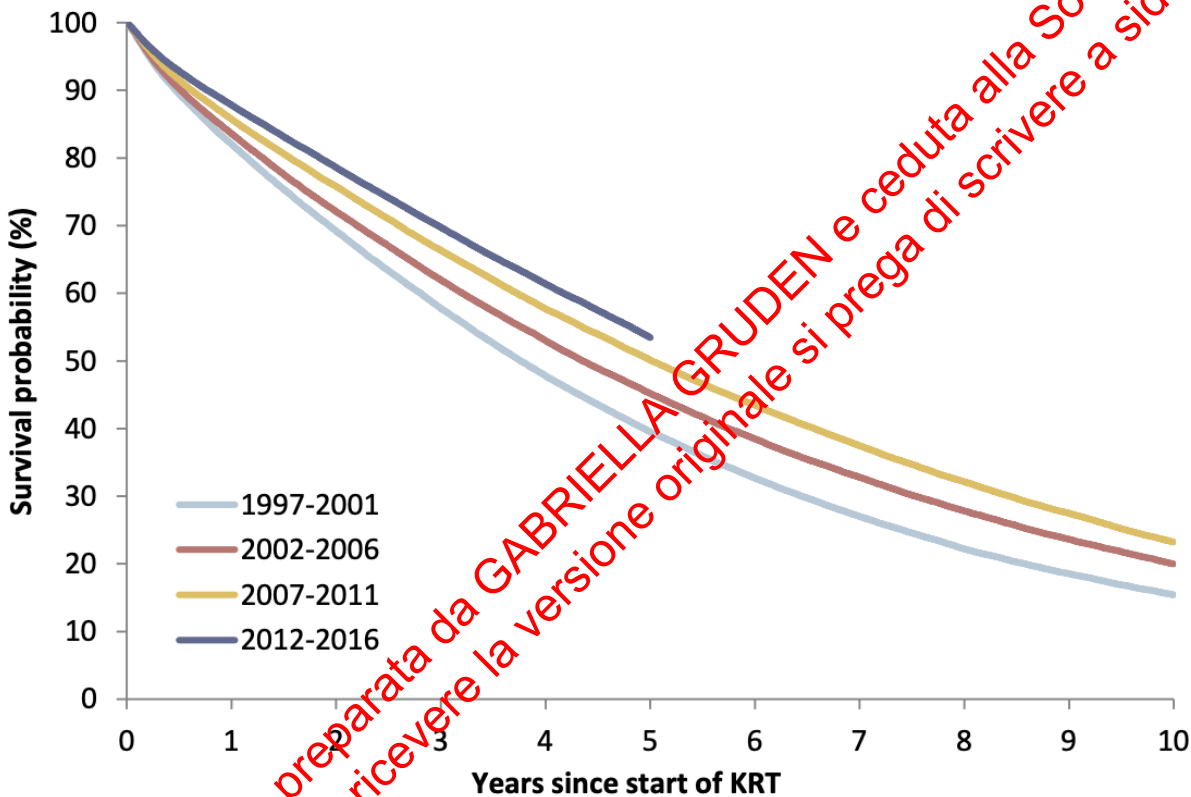
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Mortalità e ESRD



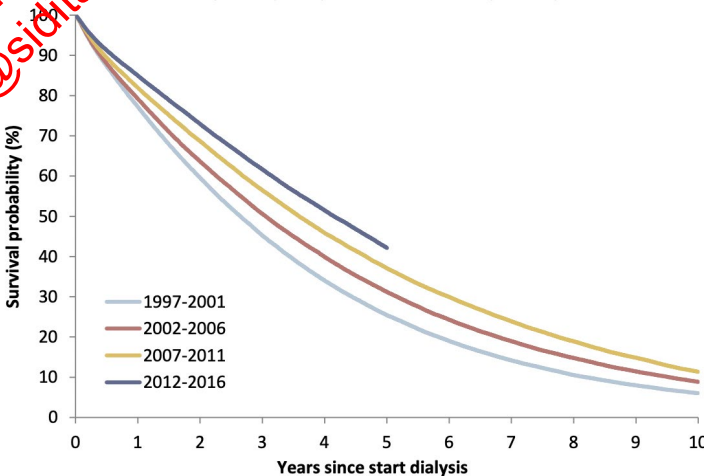
Patient survival incident KRT patients

adjusted for age, sex and cause of renal failure



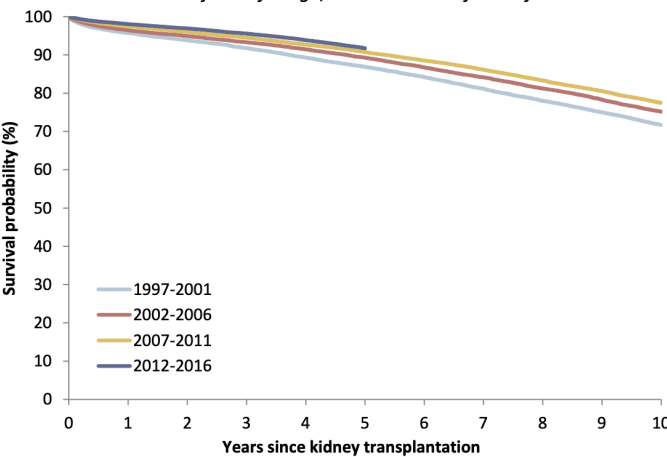
Patient survival incident dialysis patients

adjusted for age, sex and cause of renal failure



Patient survival after first kidney transplantation

adjusted for age, sex and cause of renal failure

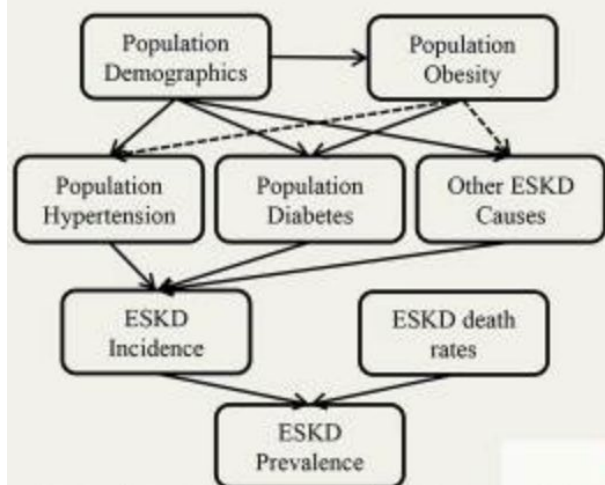


ESRD PROIEZIONI 2030

Projecting end-stage kidney disease (ESKD) incidence and prevalence in the United States through 2030

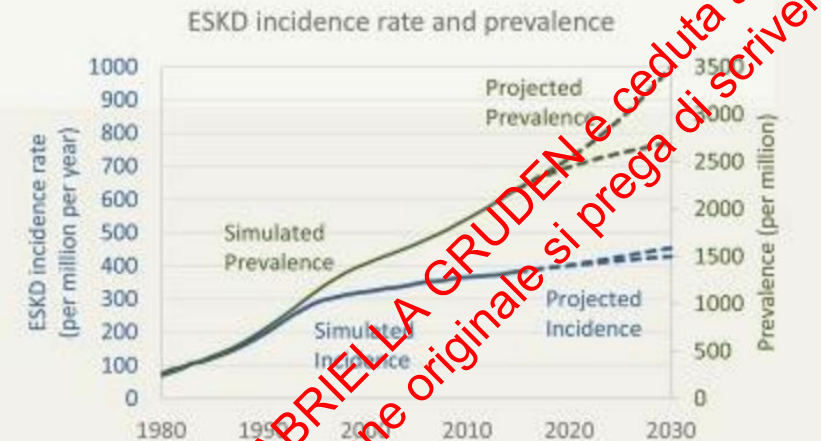
METHODS

Schematic diagram of factors influencing ESKD prevalence and incidence



OUTCOME

Population trends will lead to an increase in the ESKD incidence rate



CONCLUSION The ESKD incidence rate is projected to rise between 11-18% between 2015 and 2030, and the number of prevalent patients is projected to rise from 690,000 to 971,000-1,259,000 patients over the same period.

The increase in ESRD incidence rates within age and race groups has leveled off and/or declined in recent years, but our model indicates that population changes in age and race distribution, obesity and diabetes prevalence, and ESRD survival will result in a **11-18% increase in the crude incidence rate from 2015 to 2030.**

This incidence trend along with reductions in ESRD mortality will increase **the number of patients with ESRD by 29-68%** during the same period to between **971,000 and 1,259,000 in 2030.**

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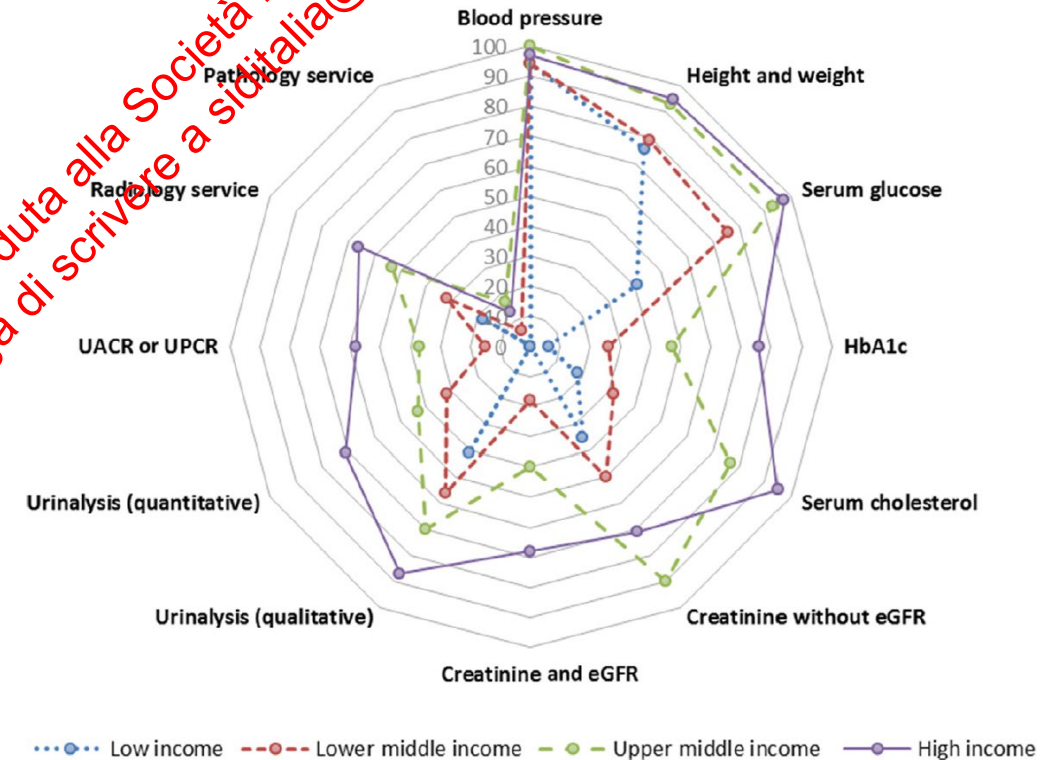


G1-G3a
asintomatici
↳ screening
riconosciuta

Albuminuria Screening

- Albuminuria testing in persons with diabetes
 - 41.8% of Medicare
 - 49% of Optum Clinformatics™
- Albuminuria testing – HTN alone
 - 6.6% of Medicare
 - 7.1% of Optum Clinformatics™

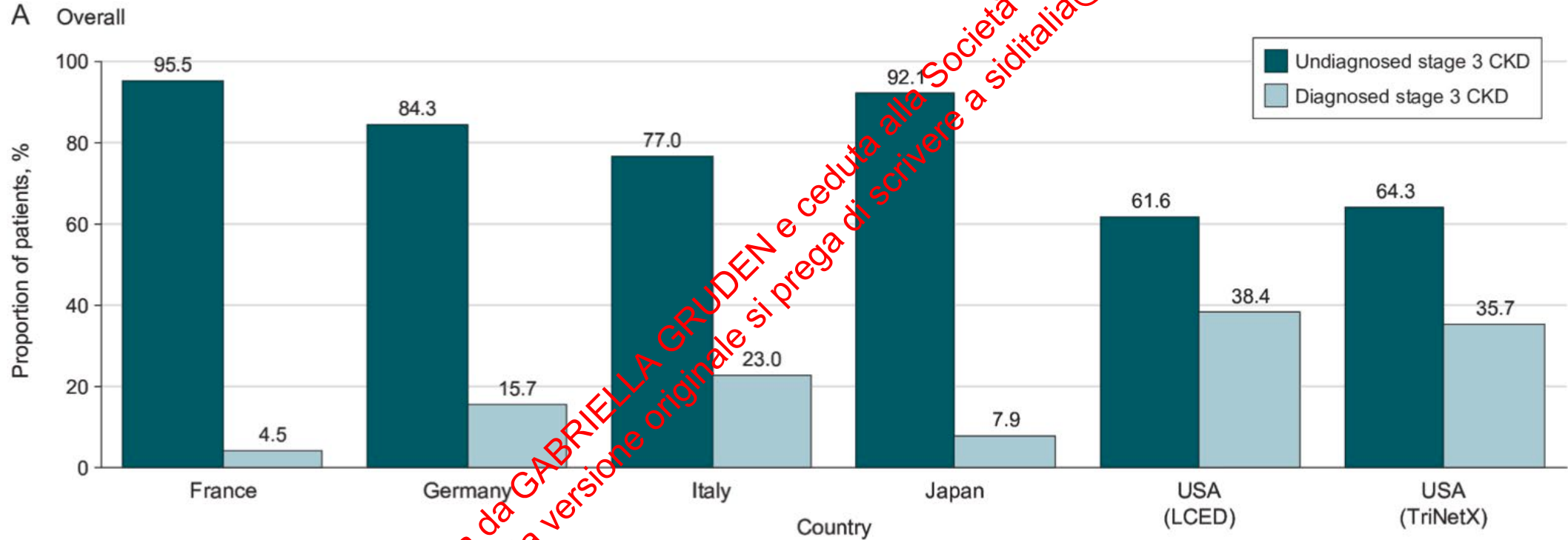
2018 USRDS Annual Data Report: NIDDK, 2018



Capacities of primary health care services for CKD (by income groups):

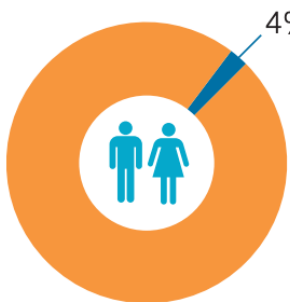
Qualitative urinalysis using test strips for albumin or protein or both was available in 41% of low-income countries, 58% of high-income countries in primary care. Only one-third of low-income countries were able to measure serum creatinine in primary care, and none was able to access eGFR.

REVEAL-CKD CKD Stadio 3 Non-Diagnostici

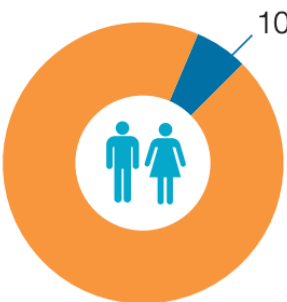


ESRD SOMMERSA

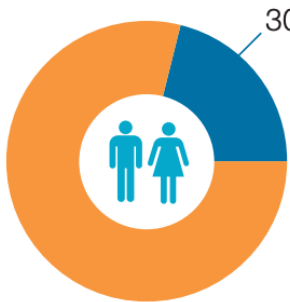
■ Access to KRT ■ No access to KRT



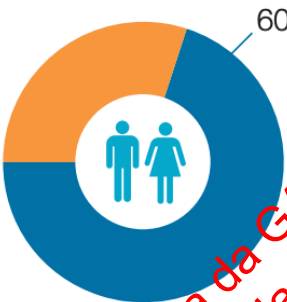
Low income countries



Lower-middle income countries

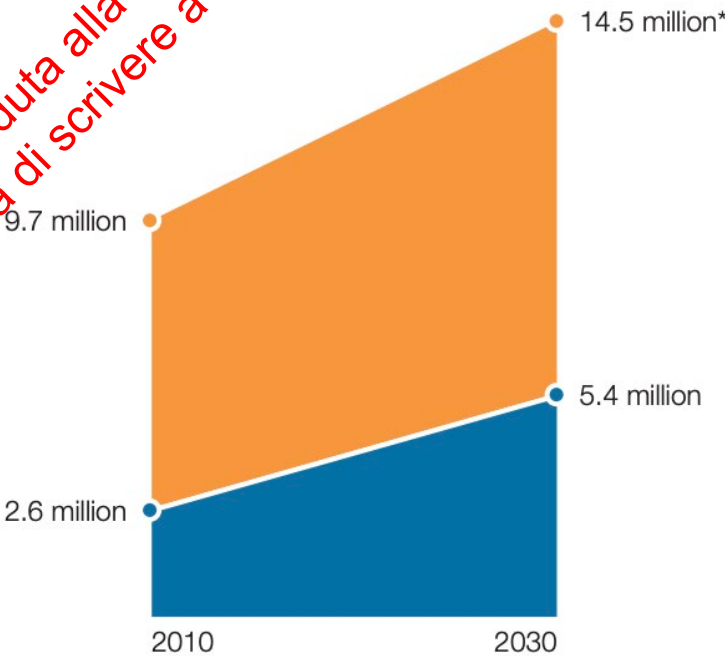


Upper-middle income countries



High income countries

■ Number of people needing KRT
■ Number of people receiving KRT



OUTLINE

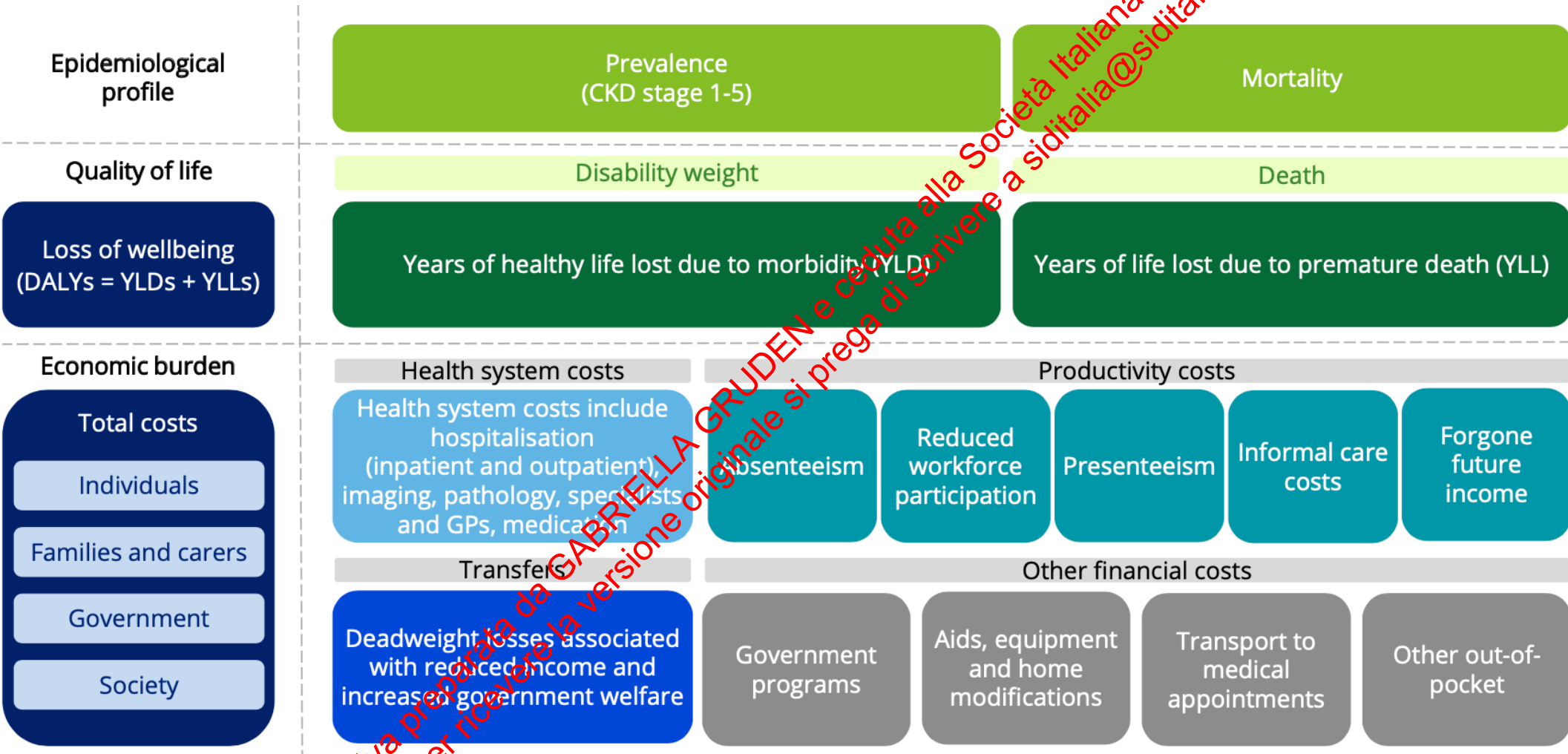
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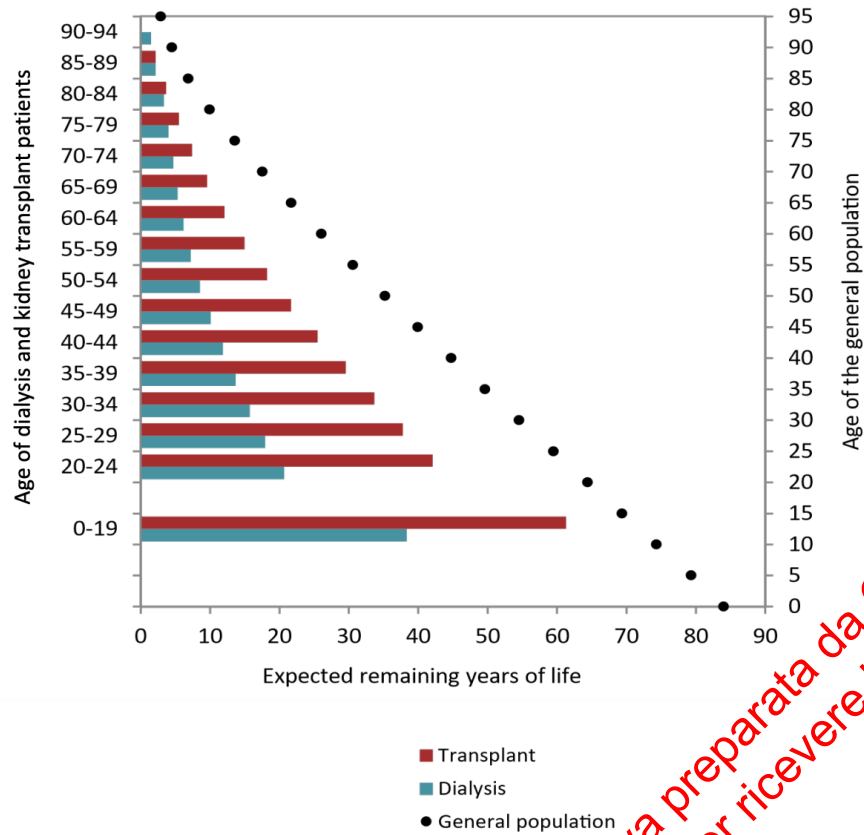
Peso Sociale



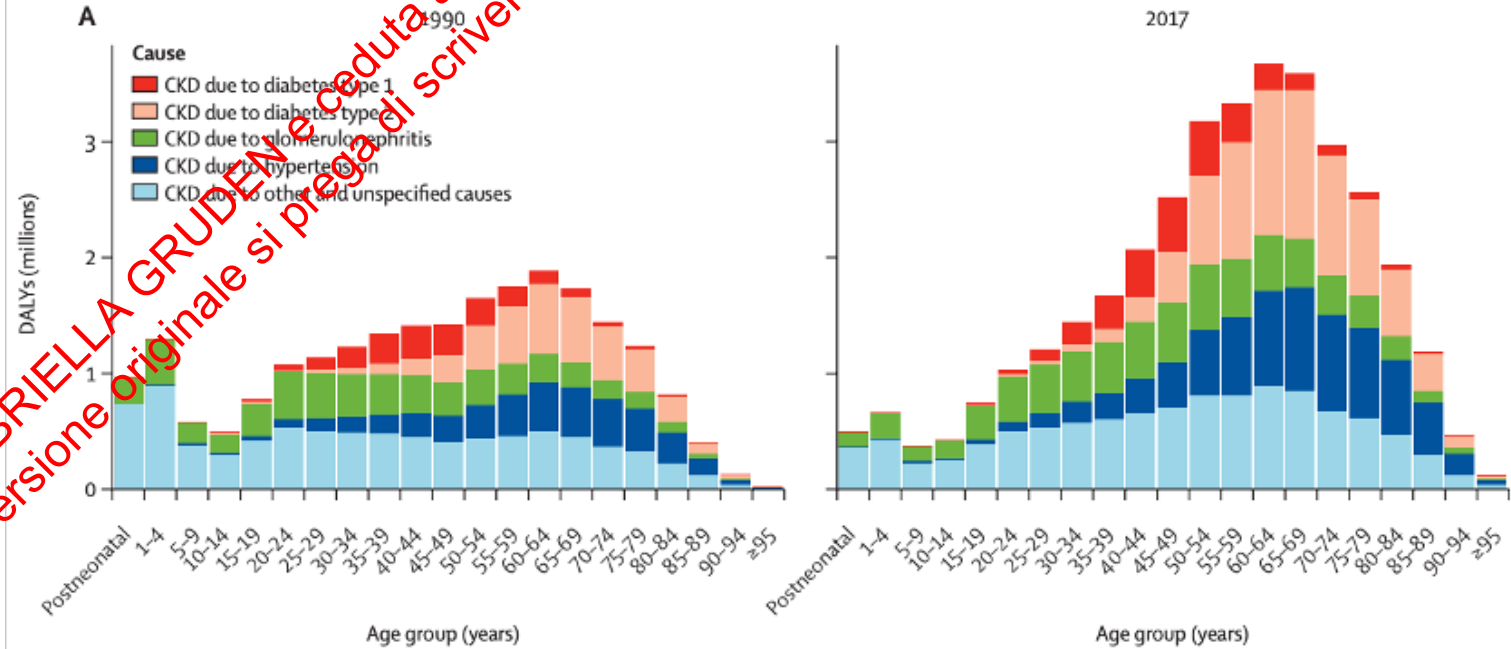
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YLLs e DALYs - CKD

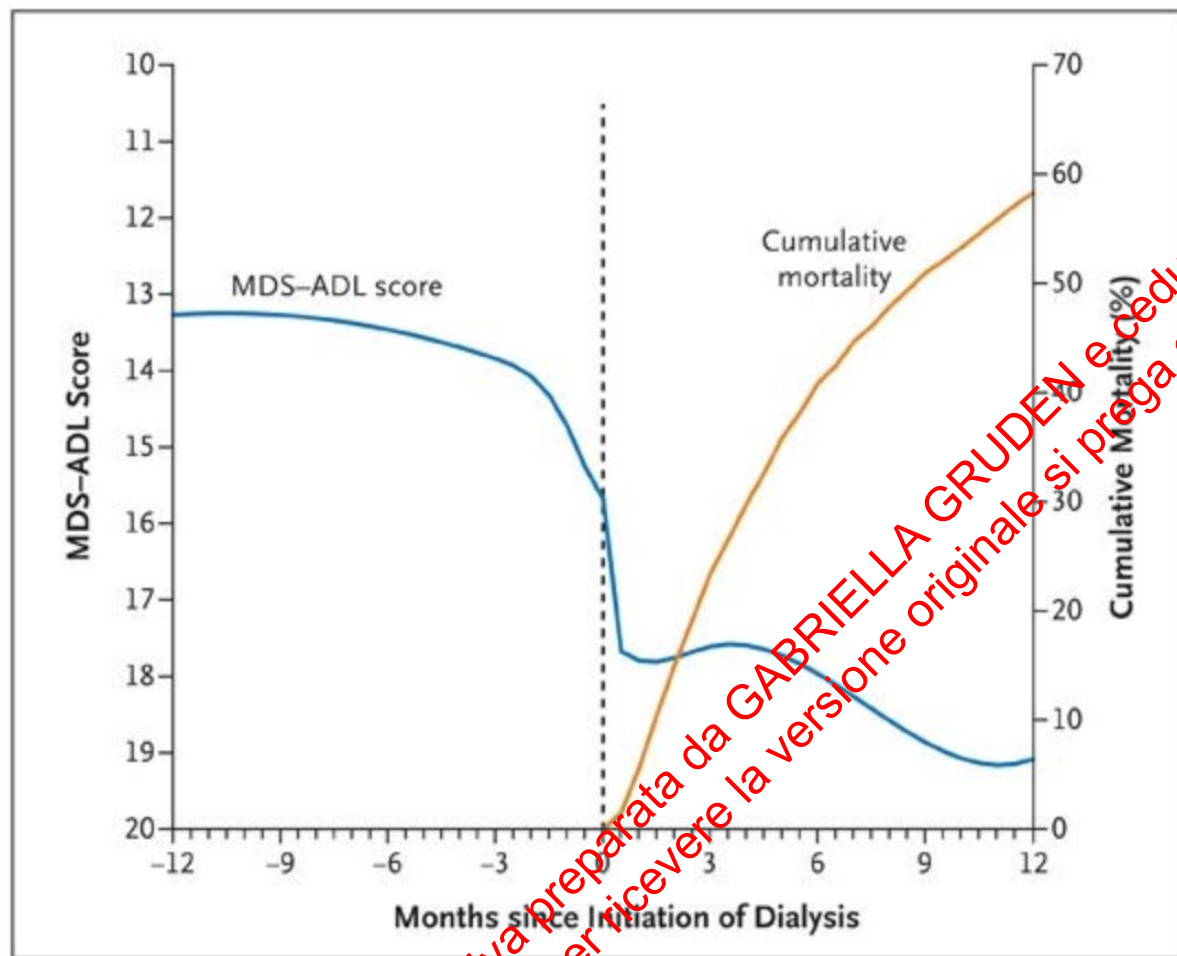
Expected remaining years of life of the general population and of prevalent dialysis and kidney transplant patients



Anno 2017 globale: 7.3 milioni di anni vissuti con disabilità (YLD) + 28,5 milioni di anni di vita persi (YLL) per un totale di 35,8 milioni di anni di vita persi aggiustata per disabilità



Dipendenza e Mortalità



3702 pazienti

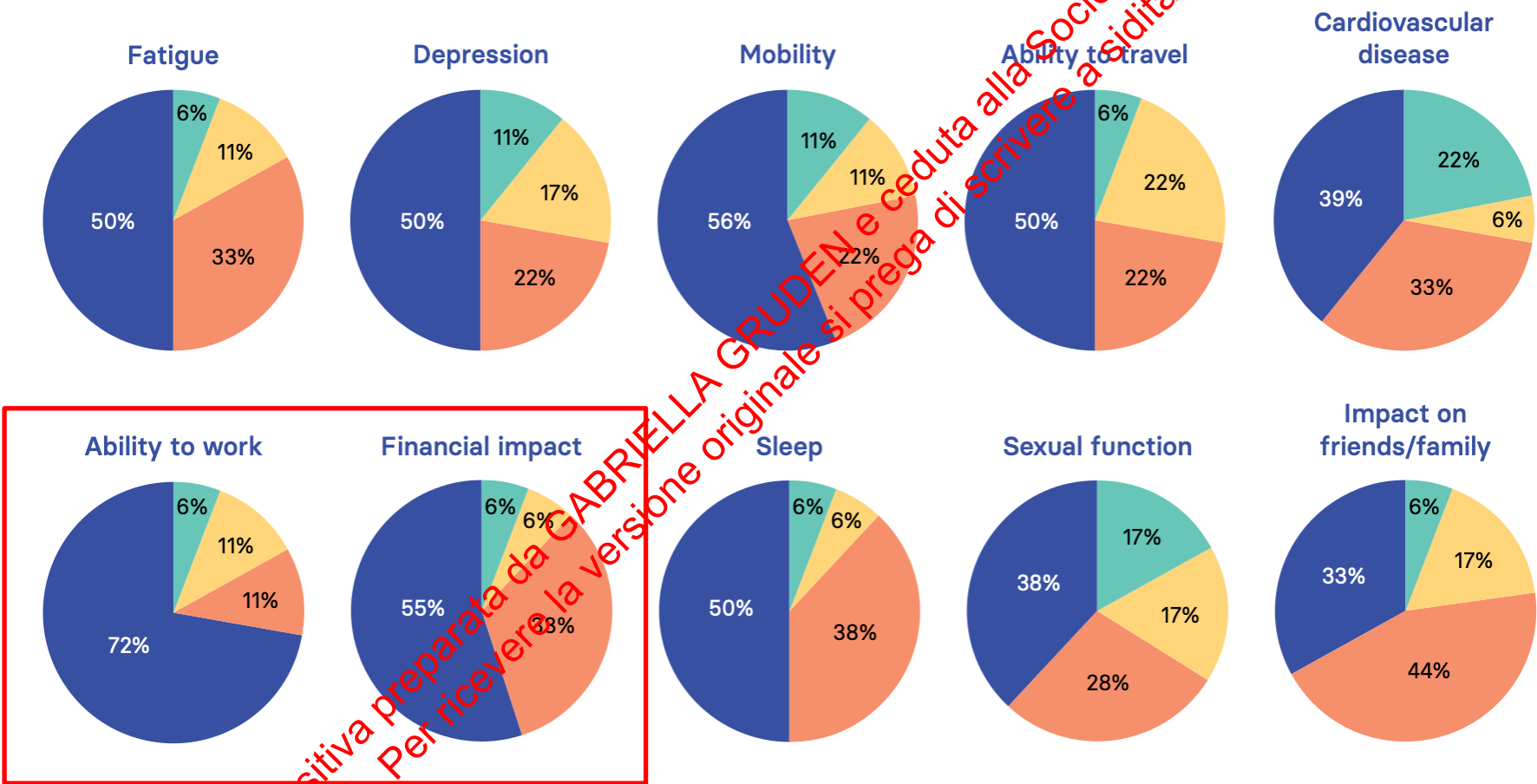
Pre e post dialisi

- MDS-ADL (Minimum Data Set-Activities of Daily Living) dipendenza in 7 attività della vita quotidiana
- Mortalità

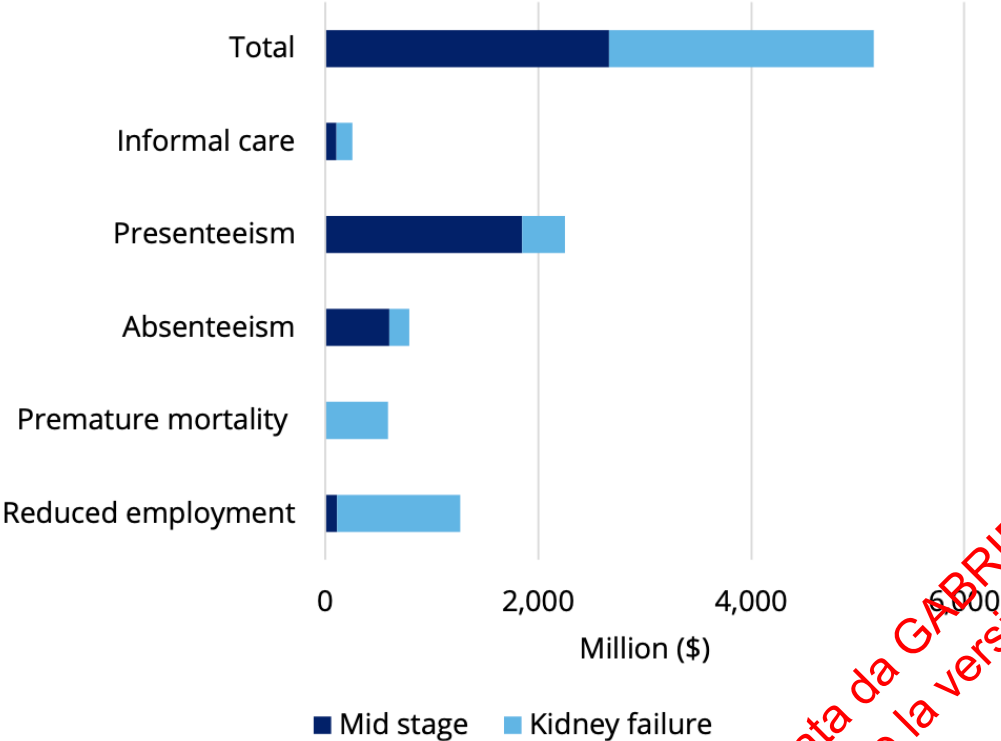
La Prospettiva del Paziente

Figure 9.7 | Perspectives of people living with kidney disease on its effects on wellbeing

Not at all important Fairly important Important Extremely important



CKD e Produttività



U.S. Bureau of Labor Statistics

Americani (età 16-64):
72.2% lavoratori attivi
↳ 26.9% lavoratori attivi con disabilità
Solo 16% pazienti in dialisi lavorano full o part-time



CDC National Health Interview Survey 2015

Adulti > 18 anni, self-reported CKD

Selected Characteristic	Number Told They Have Weak or Failing Kidneys
Total (18 and older)	4,850,000 (100%)
18 and older, includes retired/age:	
Employed (full or part-time)	1,086,000 (22.4%)
Not employed, worked before	3,526,000 (72.7%)
Not employed, never worked	237,000 (4.9%)

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Effetti sul Pianeta

THE ECOLOGIC BURDEN OF KIDNEY REPLACEMENT

- Water consumption:
 - Per dialysis session: 400-500 L
 - Per day and dialysis unit (30 patients): 12,000-15,000 L
 - Per week: 84,000-105,000 L
 - Per year: 4,368,000-5,460,000 L
- Energy waste: individual power need doubled per patient
 - CO2 production
- Plastic waste



Emissioni CO2

Dati UK: paziente in dialisi
↑ 7 volte

Consumo acqua:

75.000 litri paziente/anno

Materiale plastico

>900.000/aa tonnellate di
materiale plastico

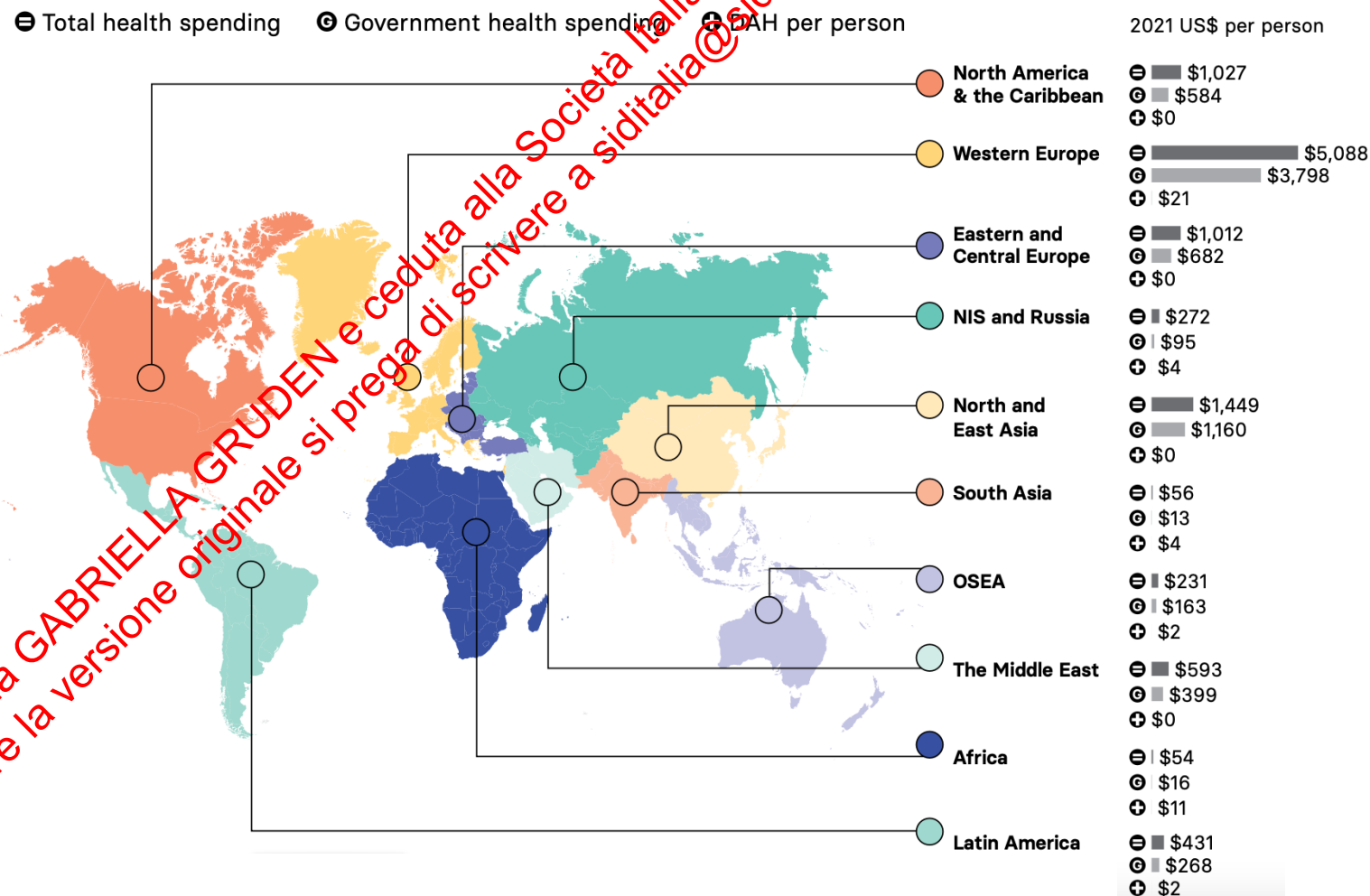
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Spesa Sanitaria

CKD

- Visite mediche
- Farmaci
- Diagnostica
- Test di laboratorio
- Ospedalizzazione
- Degenze prolungate e ripetute
- Eventi acuti: IMA, PVD, HF, IRA...

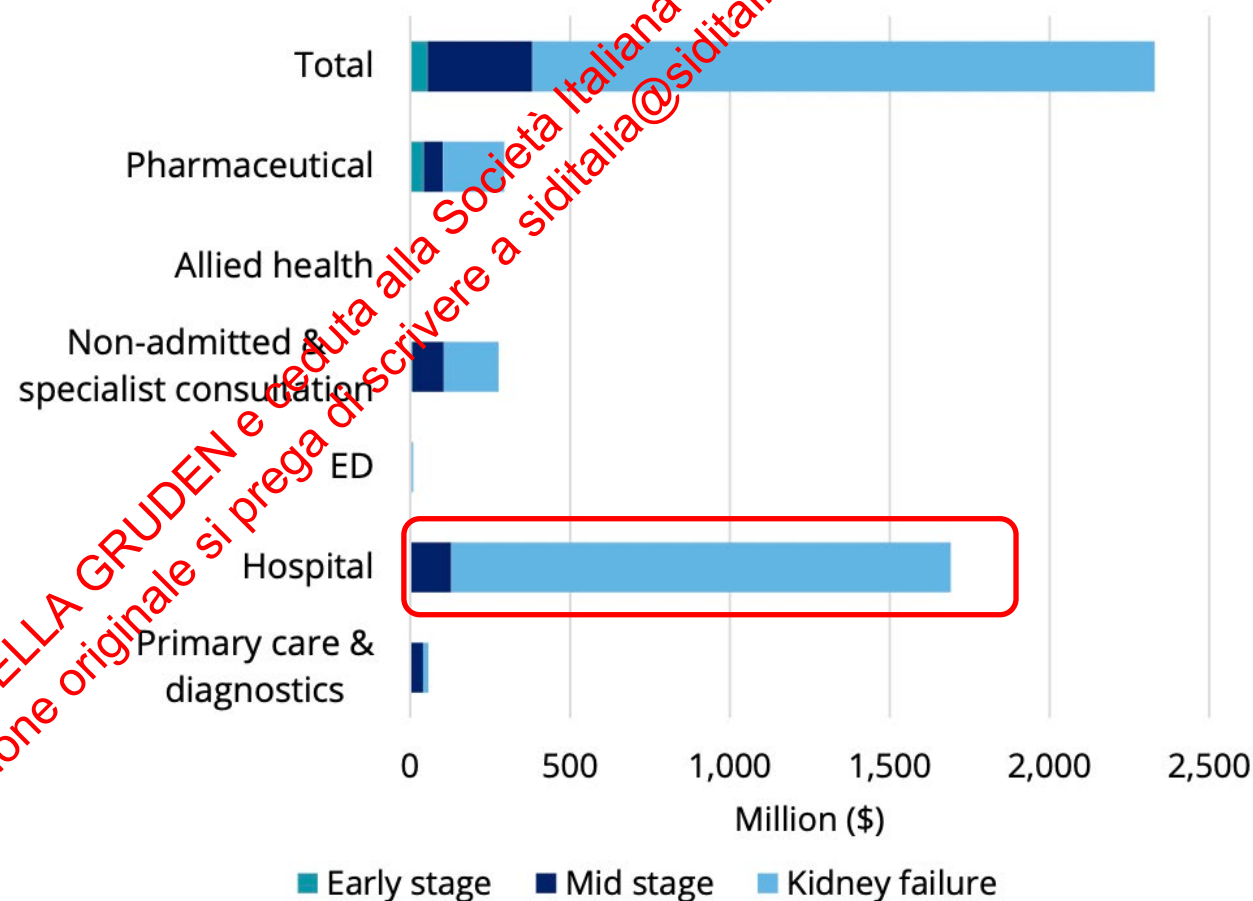
Map 3.3 | Health spending



Ospedalizzazione e ESRD

RRT

- Dialisi
- Trapianto
- Trasporto per dialisi
- Materiali, manutenzione ed ammortamento attrezzature
- Centri di dialisi e trapianto: nefrologo, nefrologo pediatra, infermiere dialisi, chirurgo trapianto, chirurgo per accesso, dietista, psicologo, palliativista, coordinatori

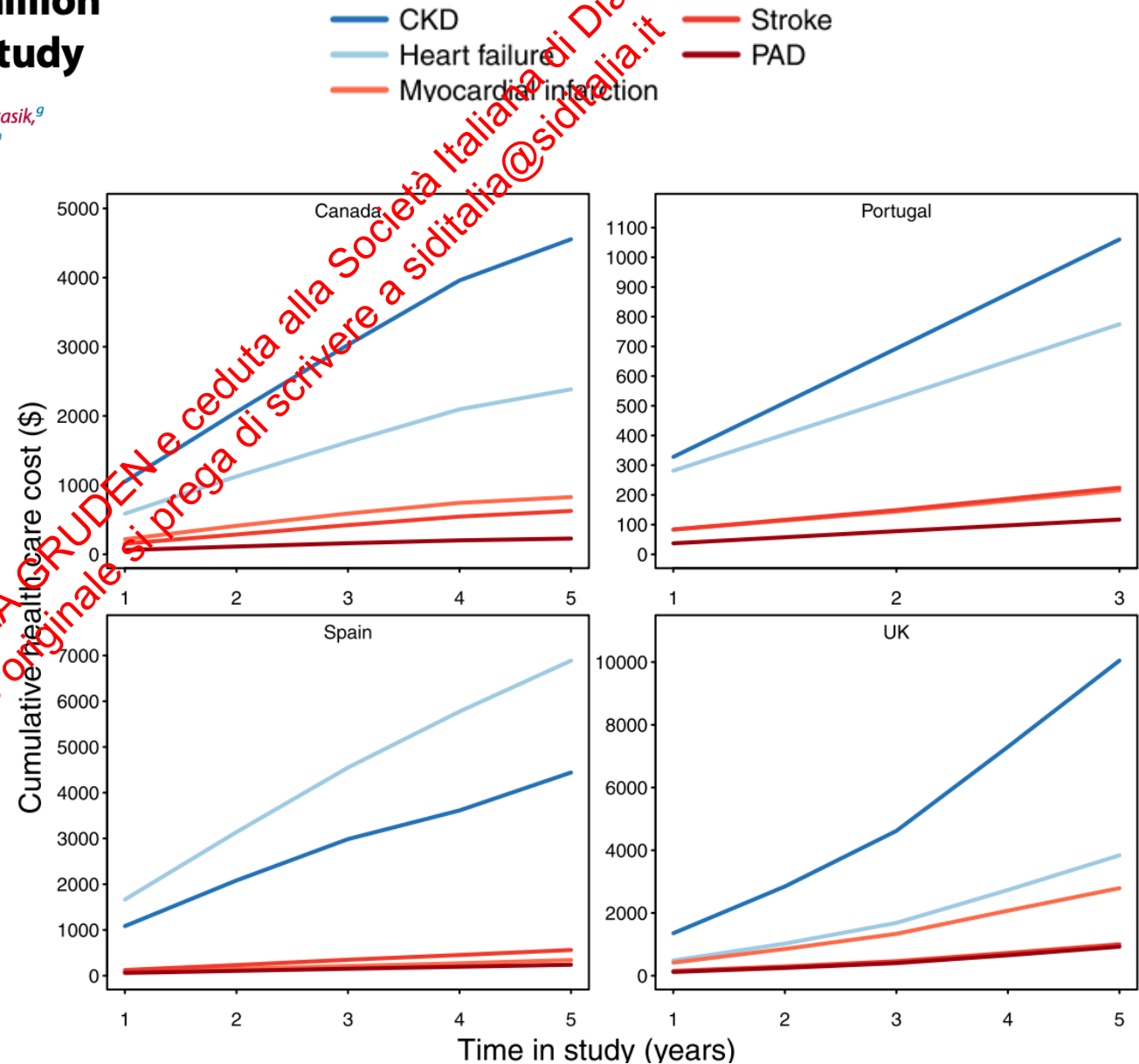


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Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

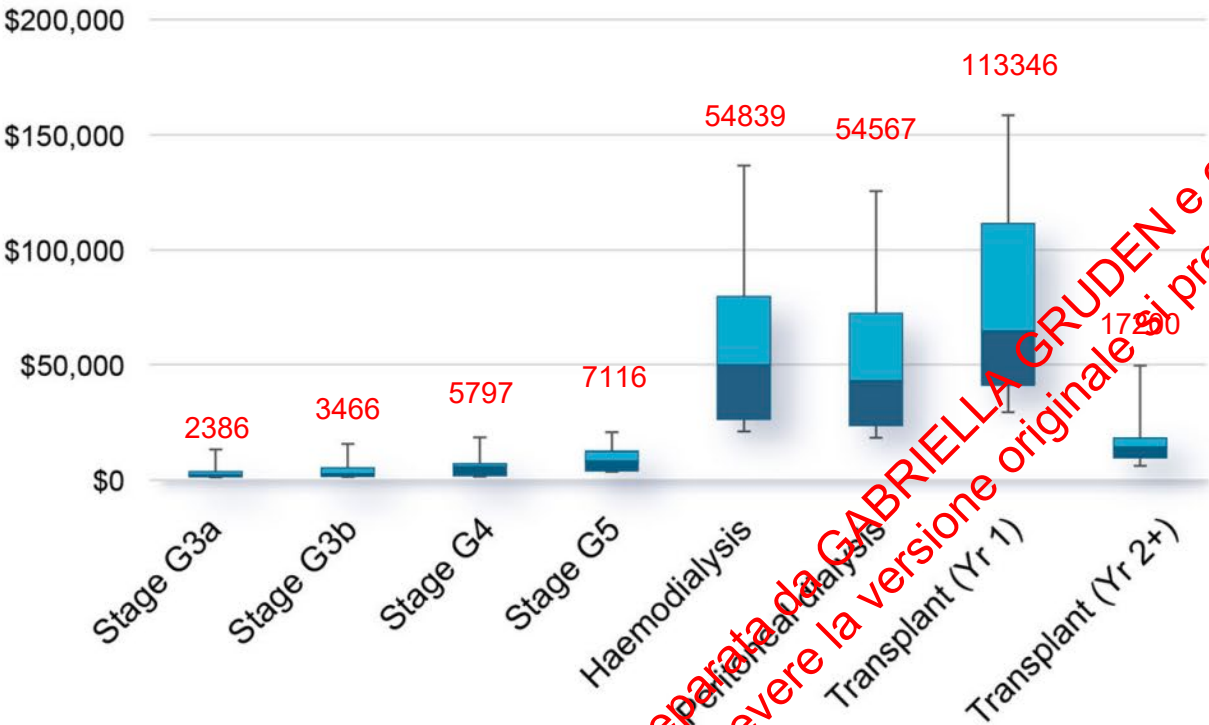
Prevalence, outcomes, and cost of chronic kidney disease in a contemporary population of 2.4 million patients from 11 countries: The CaReMe CKD study

Johan Sundström,^{a,b,*} Johan Bodegard,^c Andreas Bollmann,^d Marc G. Vervloet,^e Patrick B. Mark,^f Avraham Karasik,^g Tiago Taveira-Gomes,^h Manuel Botana,ⁱ Kåre I. Birkeland,^{j,k} Marcus Thuresson,^l Levy Jäger,^m Manish M. Sood,ⁿ Gijs VanPottelbergh,^o and Navdeep Tangri,^p on behalf of the CaReMe CKD Investigators

- 1.695.704 pazienti
- Costi ospedalieri al baseline e cumulativi (5 anni)
- Costi per eventi cardiorenali (CKD e HF) erano > dei costi per gli eventi aterosclerotici (IMA, ictus, PAD)



COSTI DIRETTI



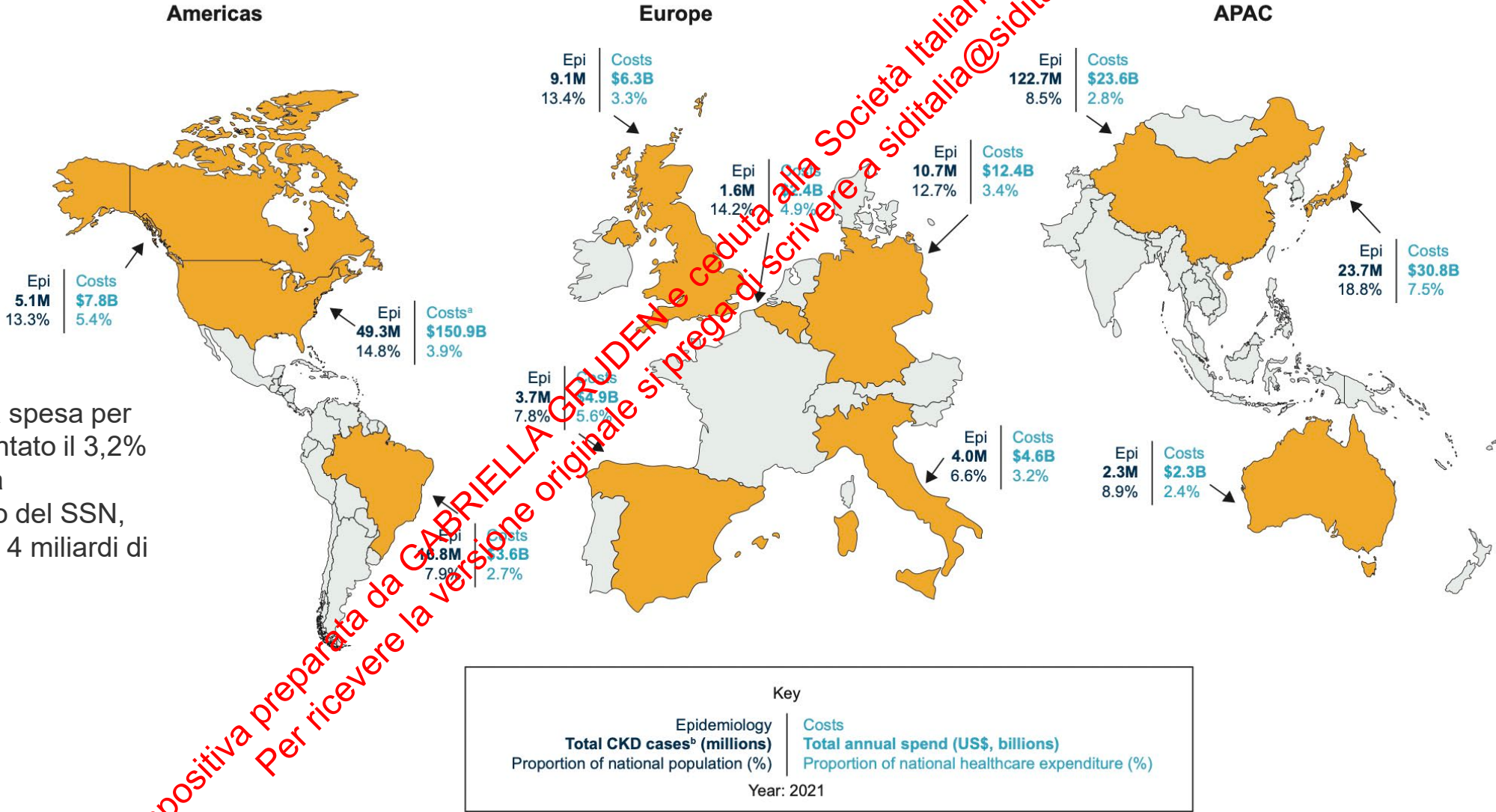
Costi in Italia



Diapositiva preparata da GABRIELLA GRUDEN e ceduta alla Società Italiana di Diabetologia.
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INSIDE-CKD

Figure 2. Epidemiological and economic burden of CKD, including RRTs, in 2021.



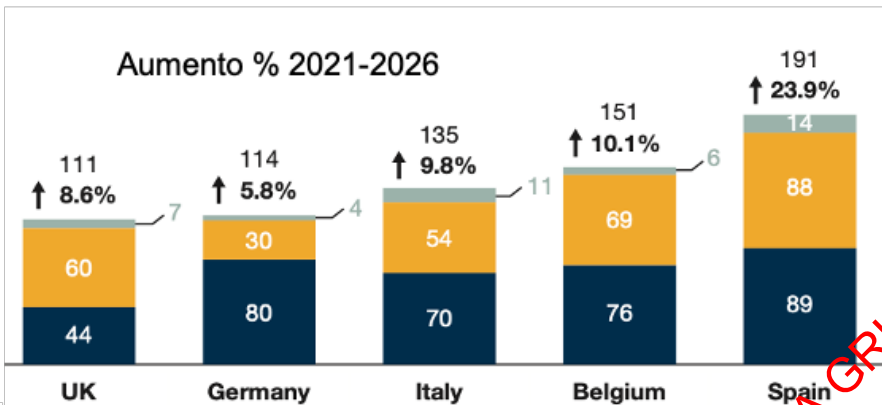
Nel 2021, in Italia, la spesa per la CKD ha rappresentato il 3,2% della spesa sanitaria complessiva a carico del SSN, per un totale di circa 4 miliardi di euro

Diapositiva preparata da GABRIELLA GRUDEN e ceduta alla Società Italiana di Diabetologia. Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

INSIDE-CKD

Projected burden of RRT by modality in 2026.

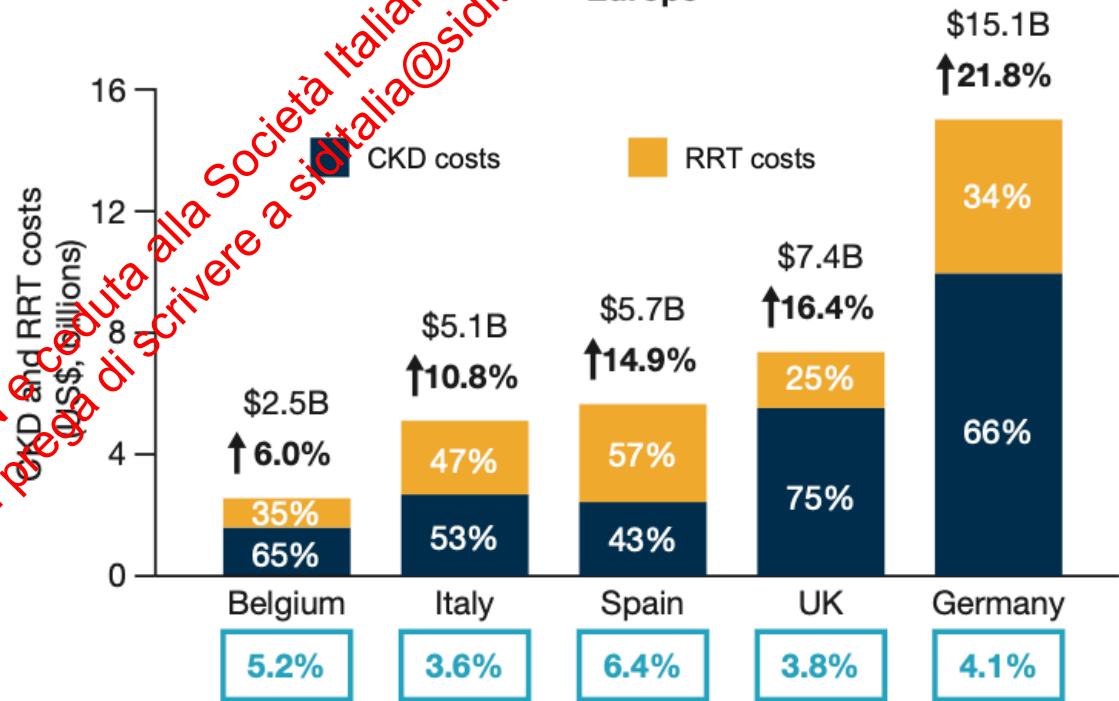
Haemodialysis Kidney transplant Peritoneal dialysis



Modality	Projected number of cases				
	UK	Germany	Italy	Belgium	Spain
CKD pre-RRT ^a	9 455 885	11 005 610	4 428 313	1 673 656	3 968 277
Haemodialysis	30 881	66 849	42 089	8876	11 202
Kidney transplant	41 548	25 358	32 157	8053	40 731
Peritoneal dialysis	4719	3447	6317	698	6626
Total CKD cases ^b	9 533 032	11 101 263	4 508 876	1 691 263	4 056 836
Prevalence ^c	13.6%	13.2%	7.4%	14.9%	8.6%

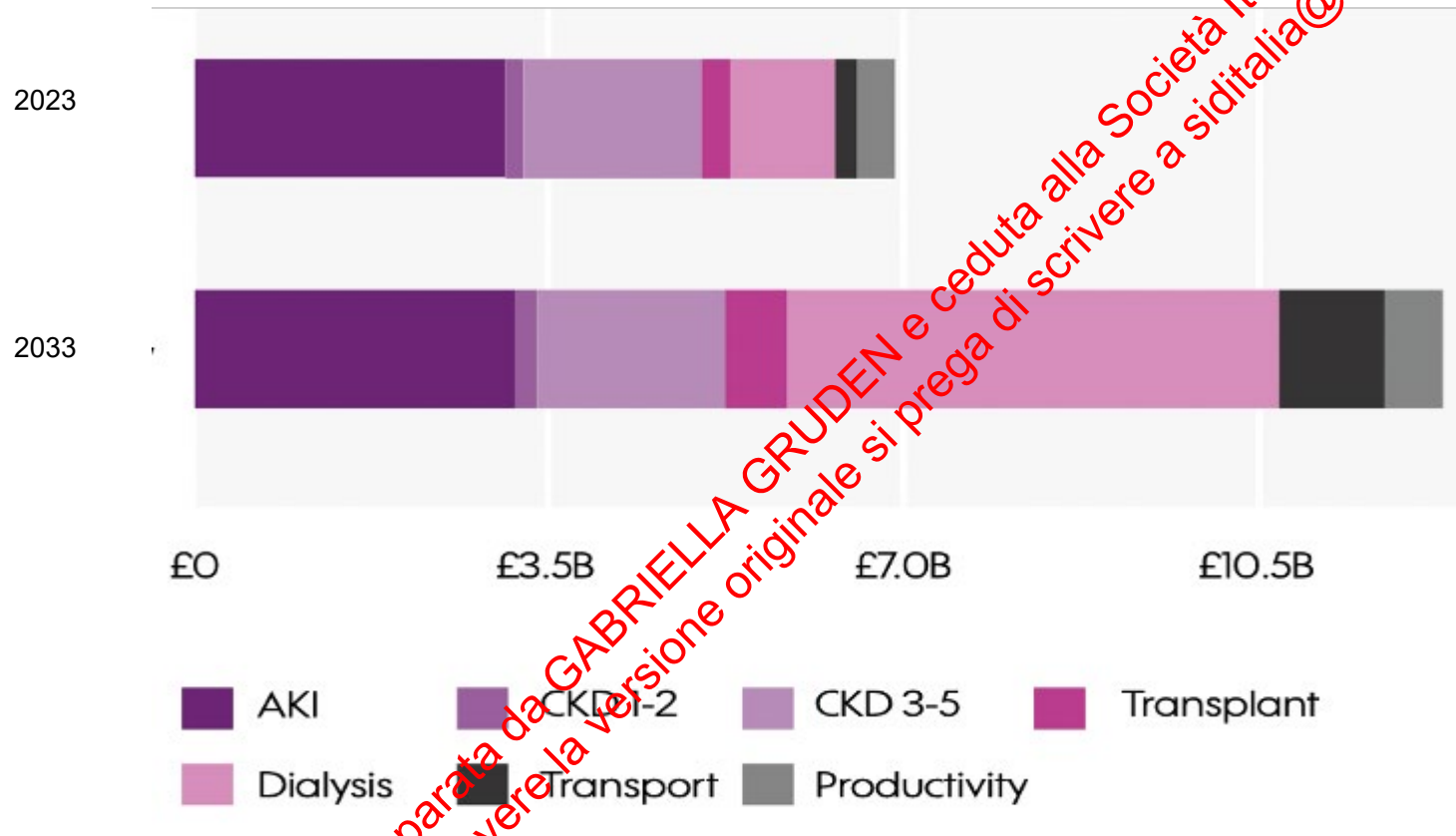
Percentage cost increase projected from 2021 to 2026

Europe



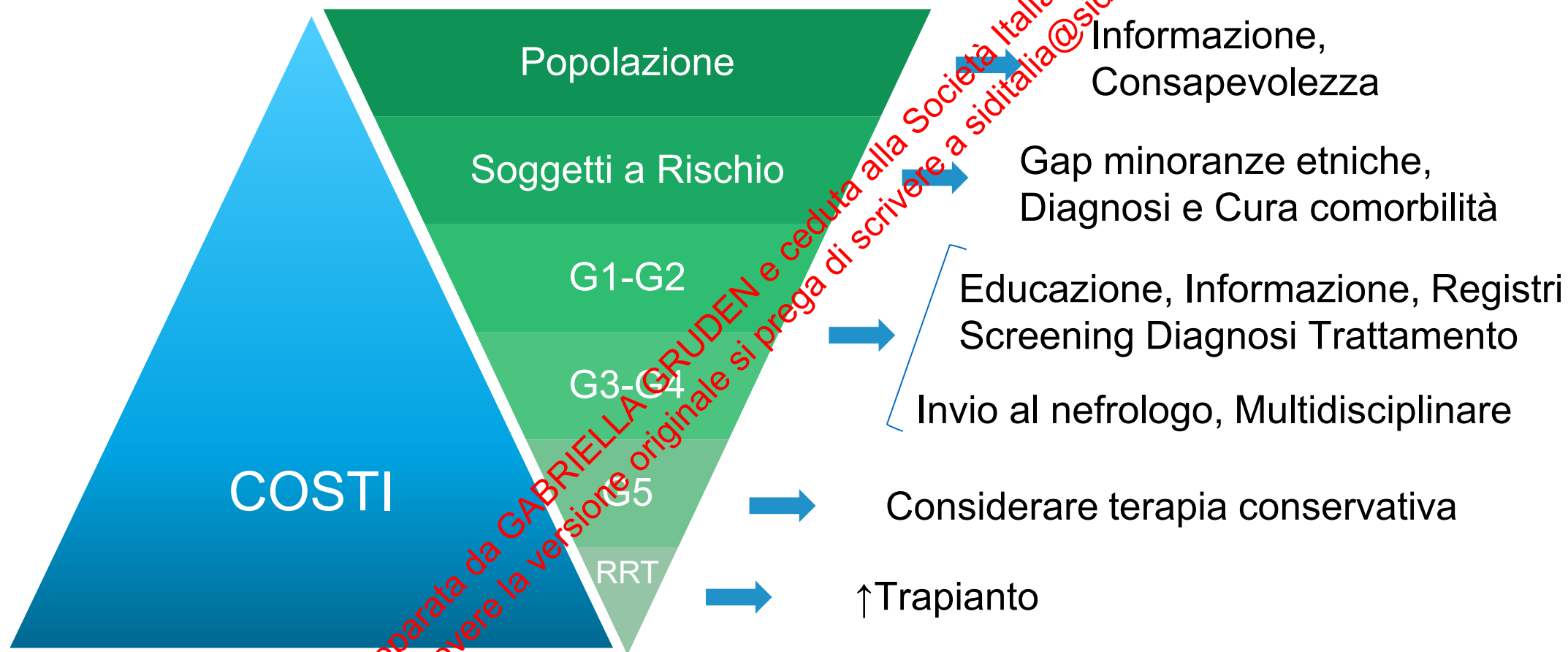
Sulla base dei risultati dello Studio INSIDE CKD, entro il 2026 è stato stimato un aumento dei costi annuali per questa patologia del 10,8% dei quali il 53% imputabile alla terapia renale sostitutiva.

UK Costs



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GOVERNANCE

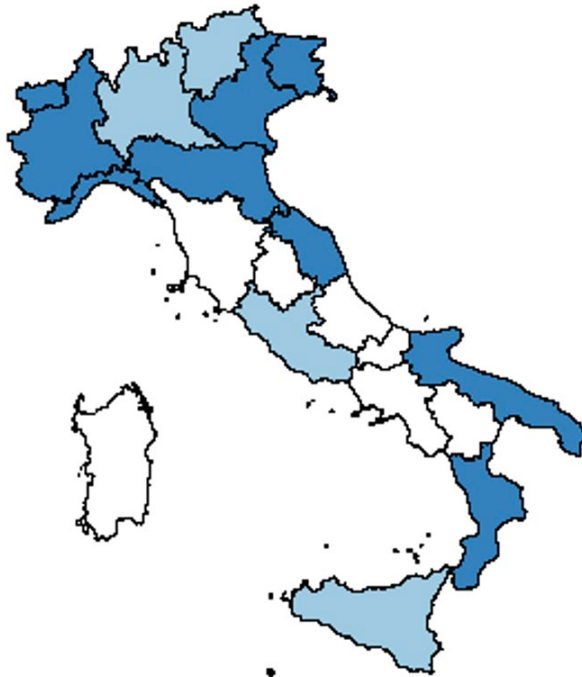


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*Vi ringrazio per
l'attenzione*

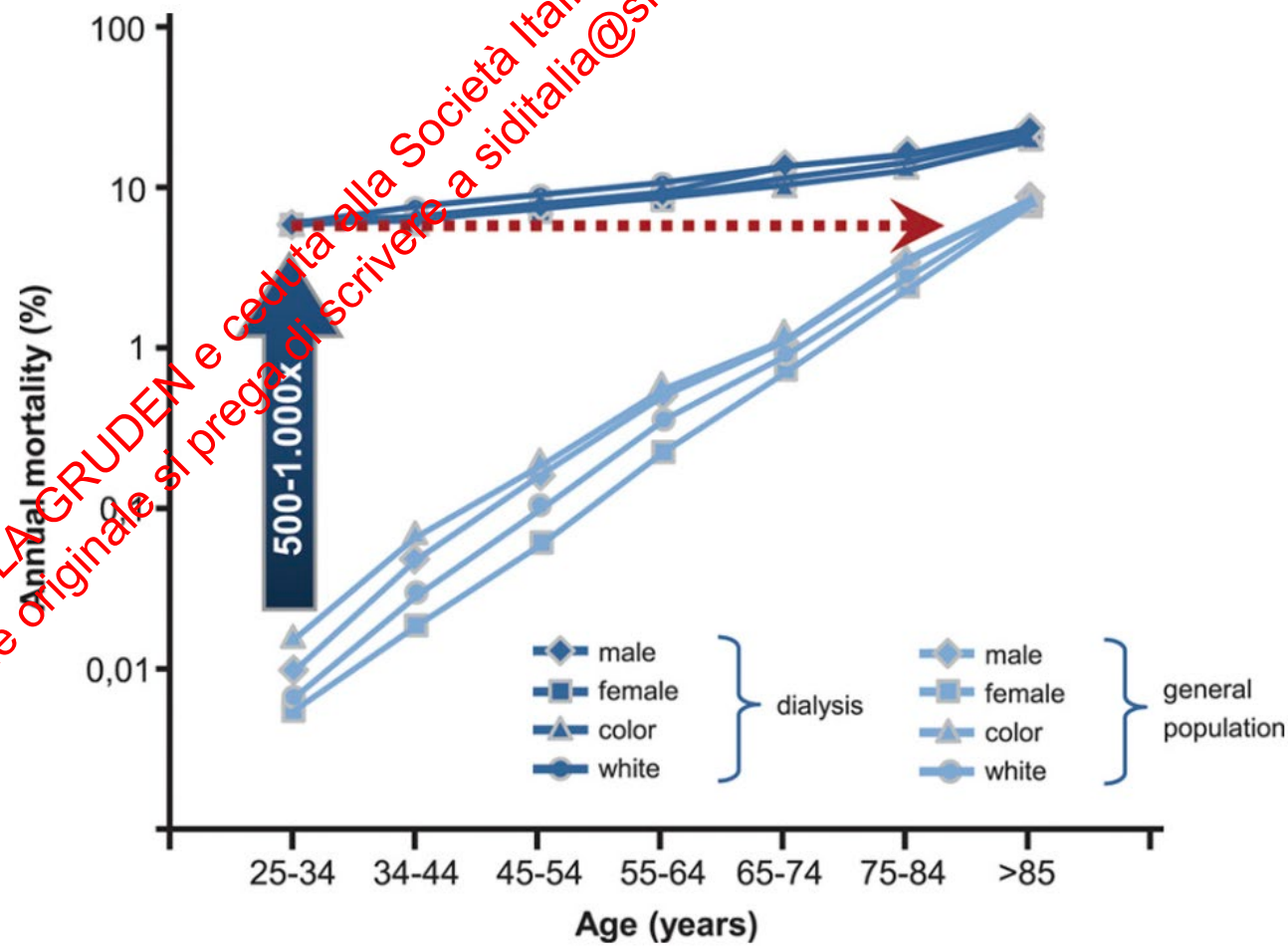
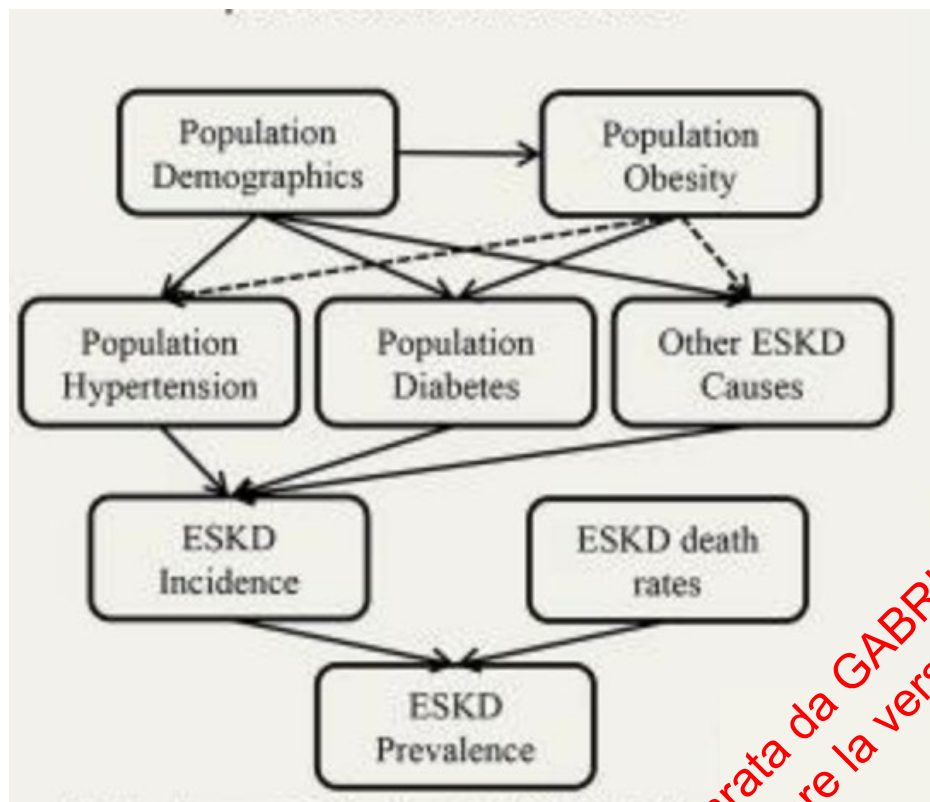


Italia



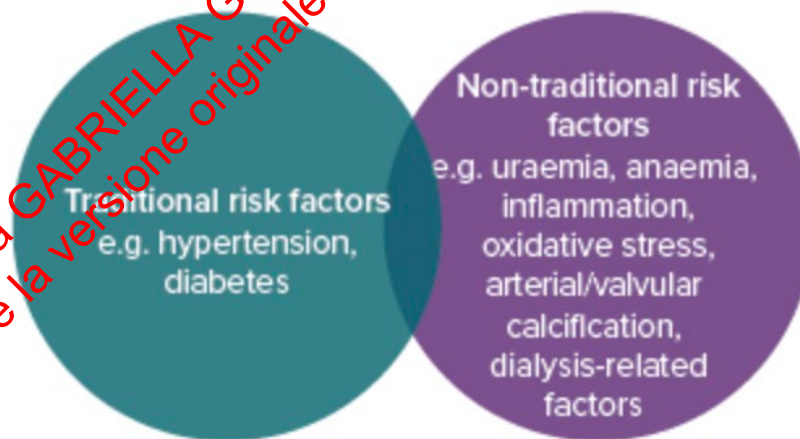
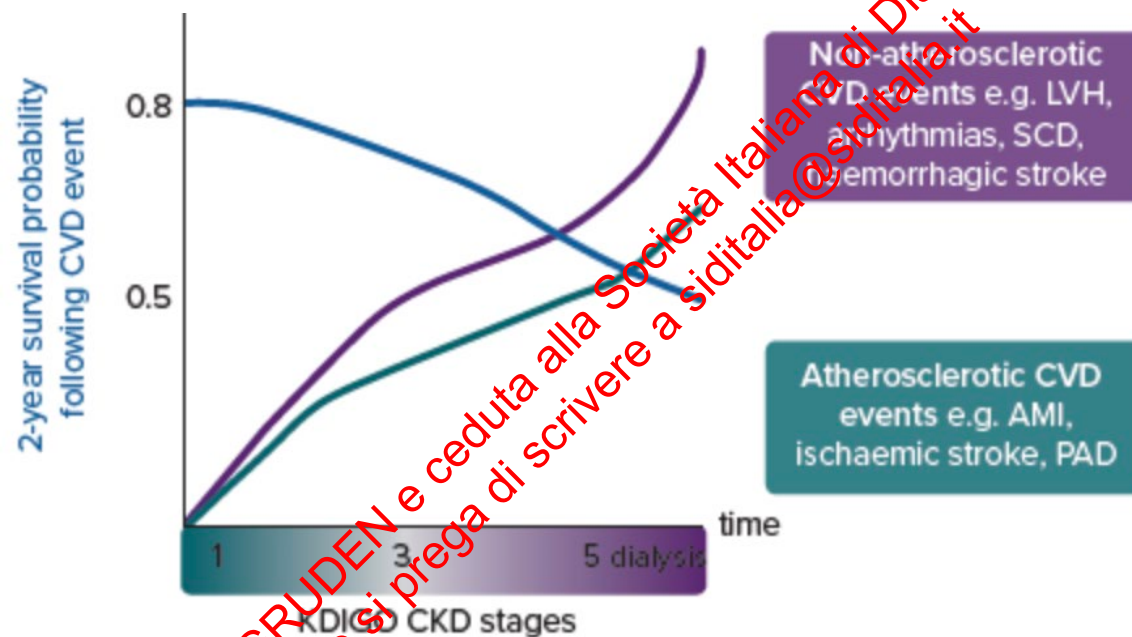
Country	KRT		HD	PD	TX
	Incidence pmp	Prevalence pmp	Prevalence	Prevalence	Prevalence
Austria	135	1044	495.8	40.4	507.1
Belgium	197	1337	706.85	57.5	569.65
Denmark	108	952	346.8	87.2	517.7
Finland	94	95	306.8	54.2	601
France	170	376	700.7	45.8	622.3
Germany	-	1214	768.1	38.8	-
Greece	263	1413	1100.5	63.9	248.9
Iceland	108	810	196.9	44.4	565.8
Ireland	88	979	401.39	39.16	533
Italy	165	1276	701.8	89.32	476
Luxembourg	-	522	596.7	4.7	-
Netherlands	106	1034	322.7	56.3	695.2
Norway	100	1014.5	252.2	65.1	686.4
Portugal	260	2008	871.3	48.1	707
Spain	152	1368	531.4	68.2	751.2
Sweden	113	996	316.1	85.1	594.7
Switzerland	99	968	408.5	39.3	519.2
United Kingdom	151	1293	489	69	735

MORTALITA'



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Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

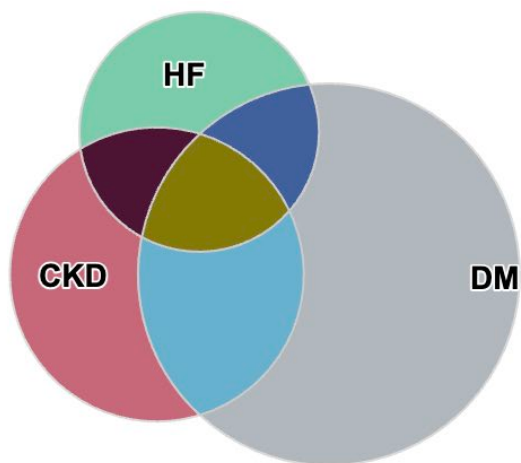
CKD e Morte CV



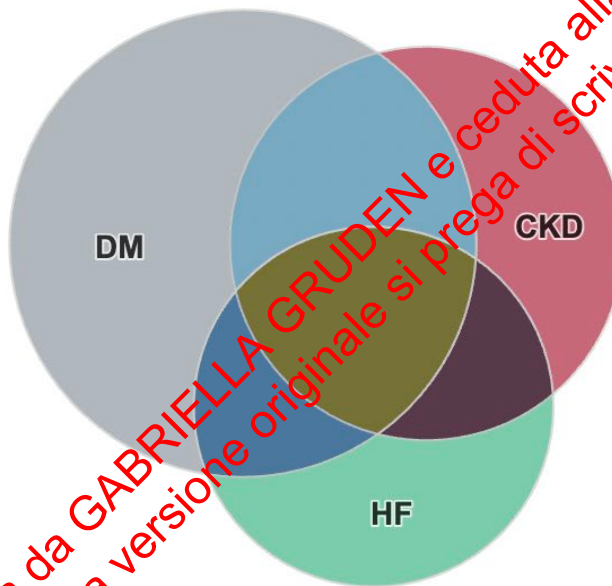
Diapositiva preparata da GABRIELLA GRUDEN e ceduta alla Società Italiana di Diabetologia.
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LA TRIADE

Percentage of population (n=23.87M)



Percentage of costs (total \$318.81B)

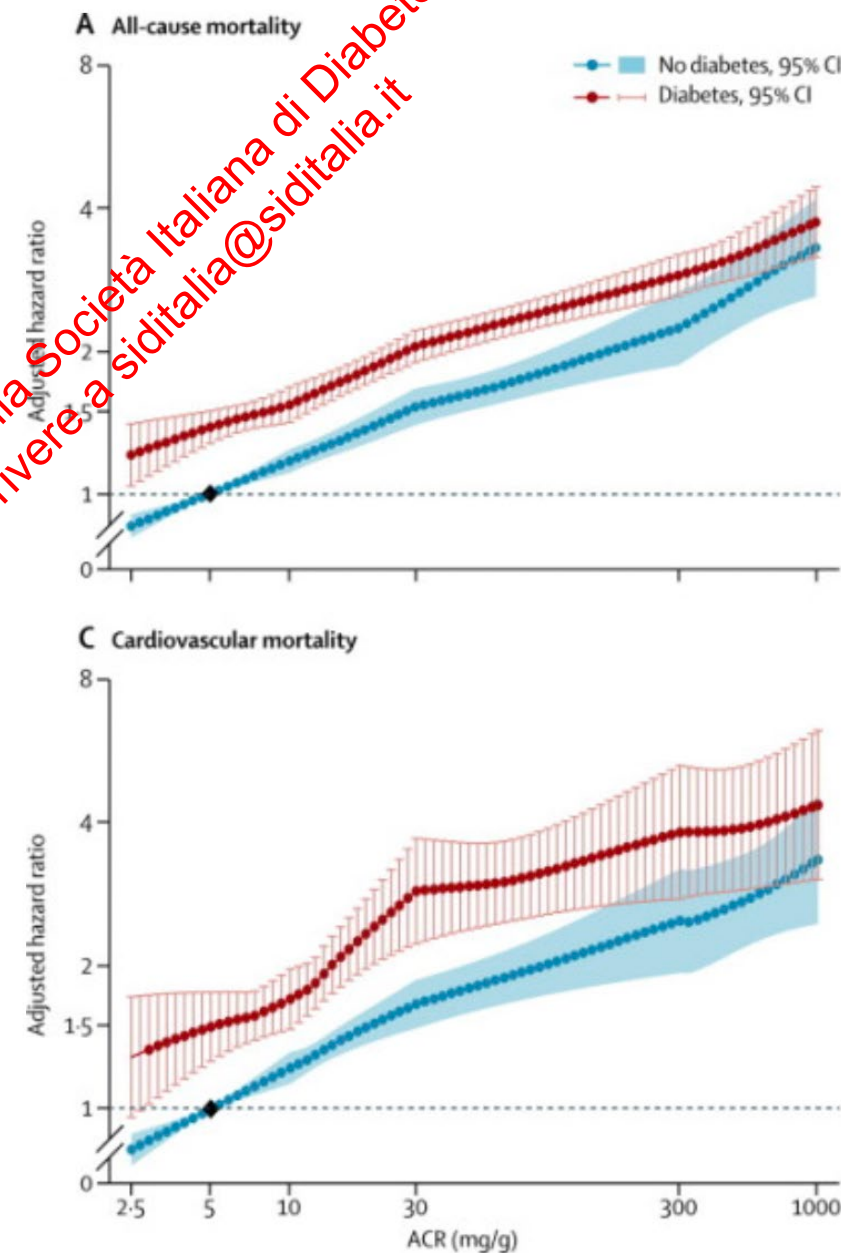
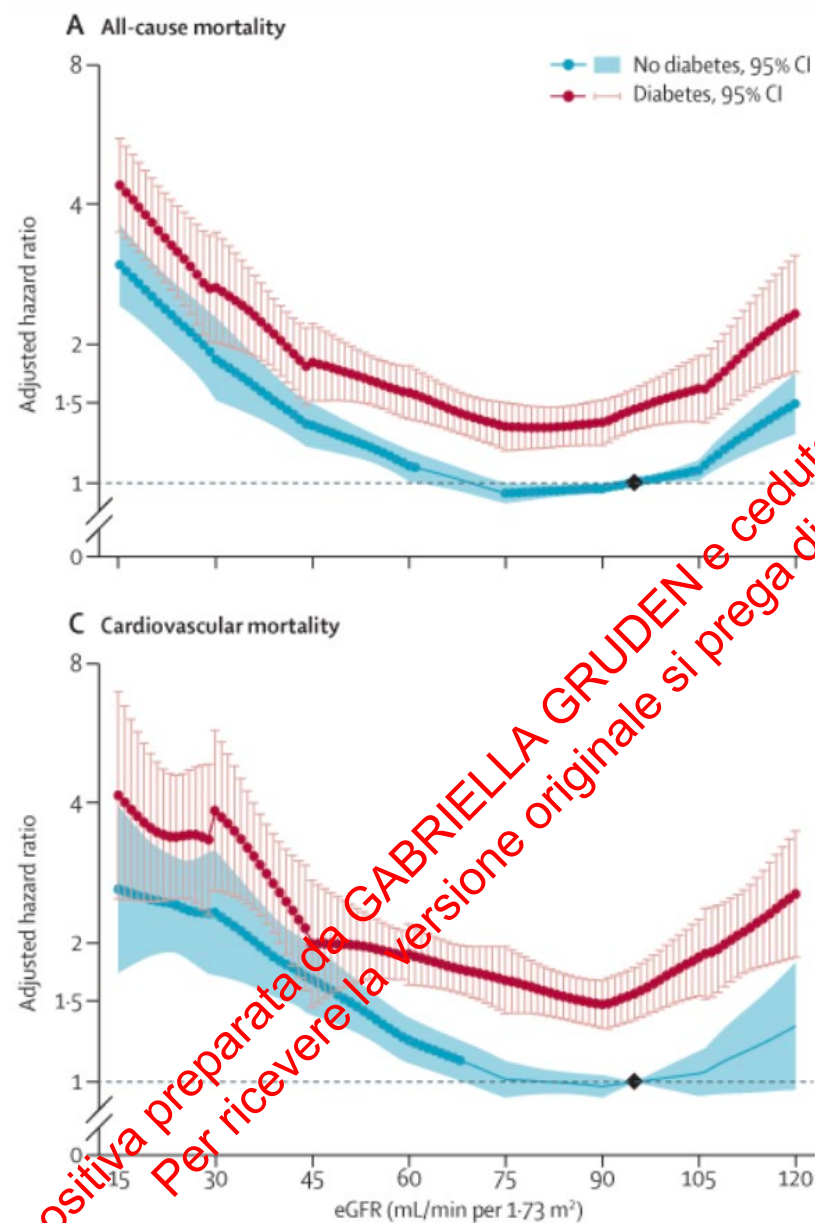


2021 soggetti >66 anni

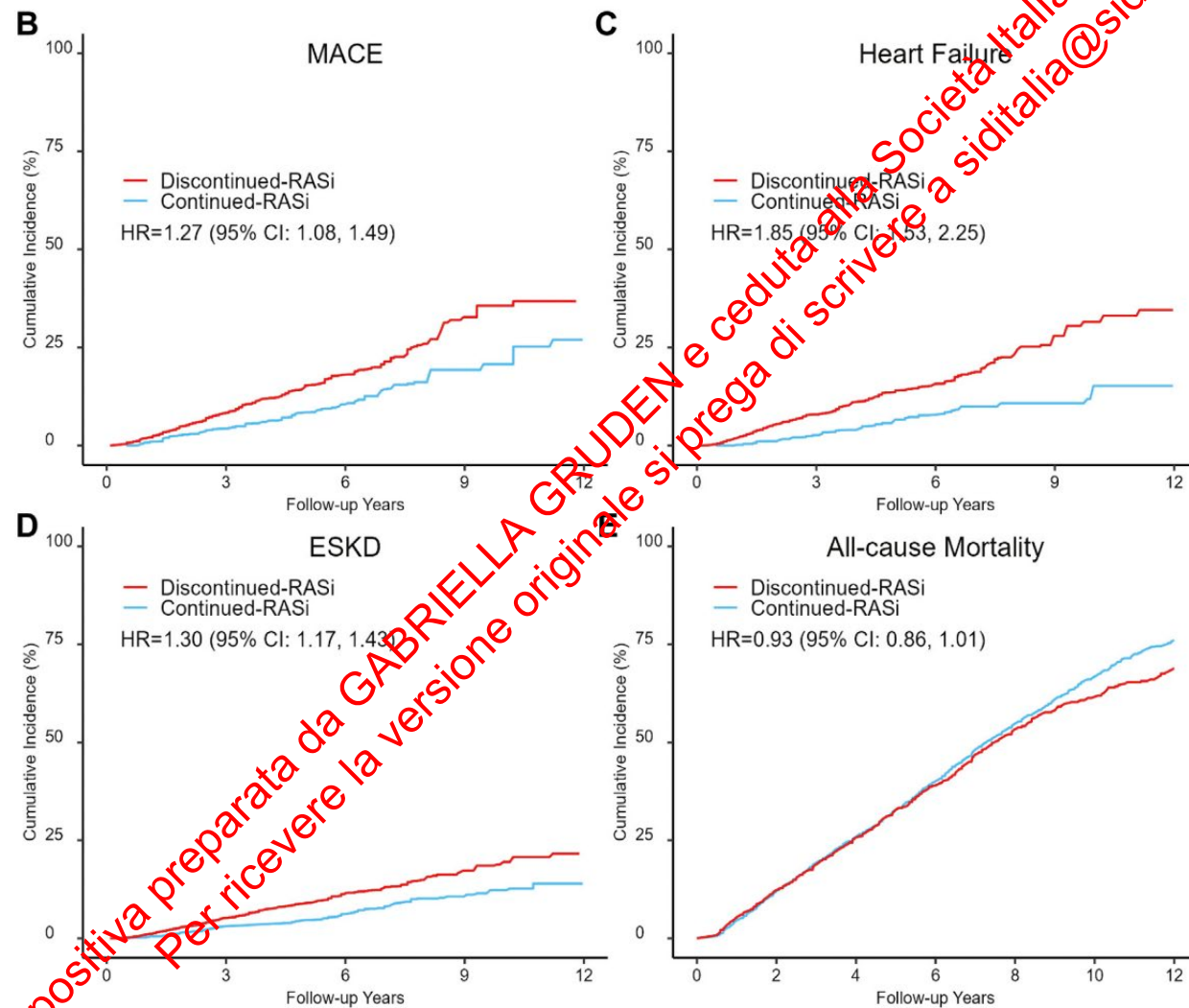
- 13.5% CKD
 - ↳ assorbono 24% spesa sanitaria globale
- 61.3% con CKD hanno anche HF e/o DM
 - ↳ 71.3% spesa dei soggetti con CKD

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Rischio CVD



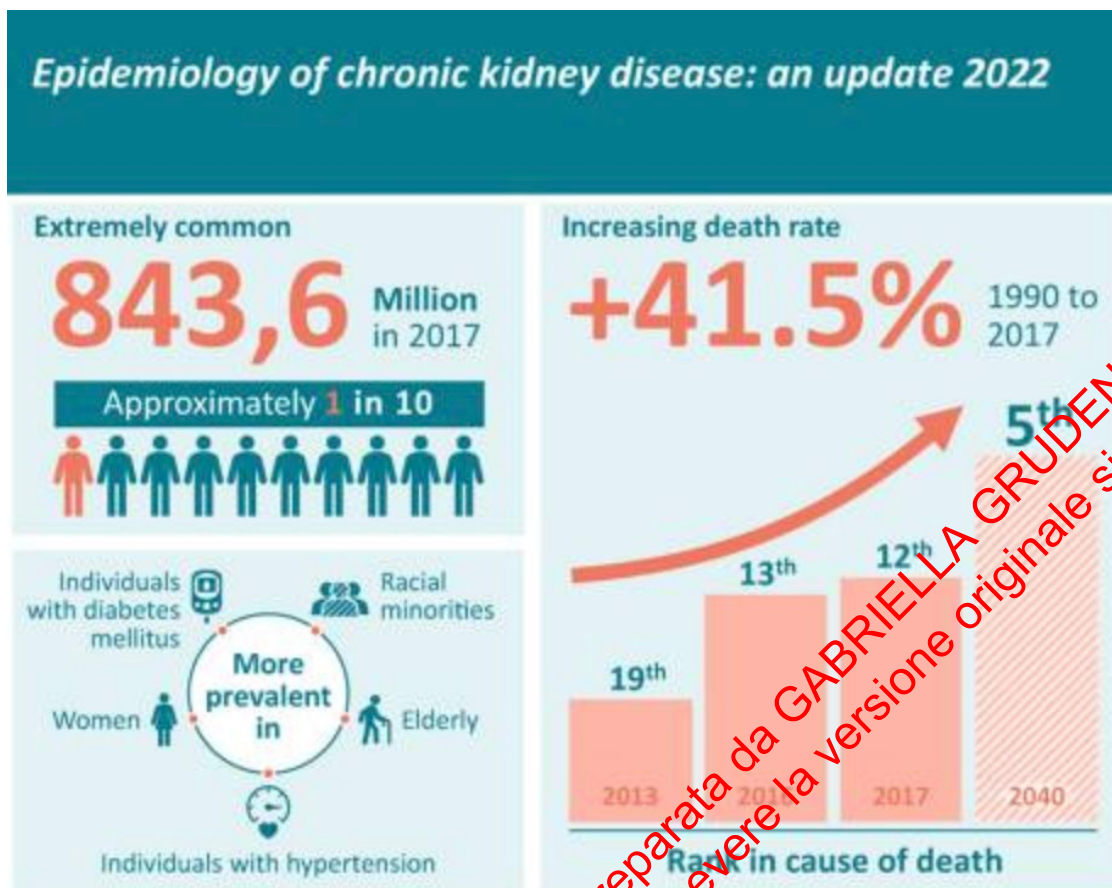
Outcomes Interruzione RAS-i eGFR<30 ml/min DM2



eClinicalMedicine Vol. 55 Published: Nov 2020

•Aimin Yang

Epidemiologia della CKD



Pool di 33 studi di popolazione
Prevalenza (adulti >20 aa) standardizzata per età

CKD 1-5

- M:10.4%, F: 11.8%

CKD 3-5

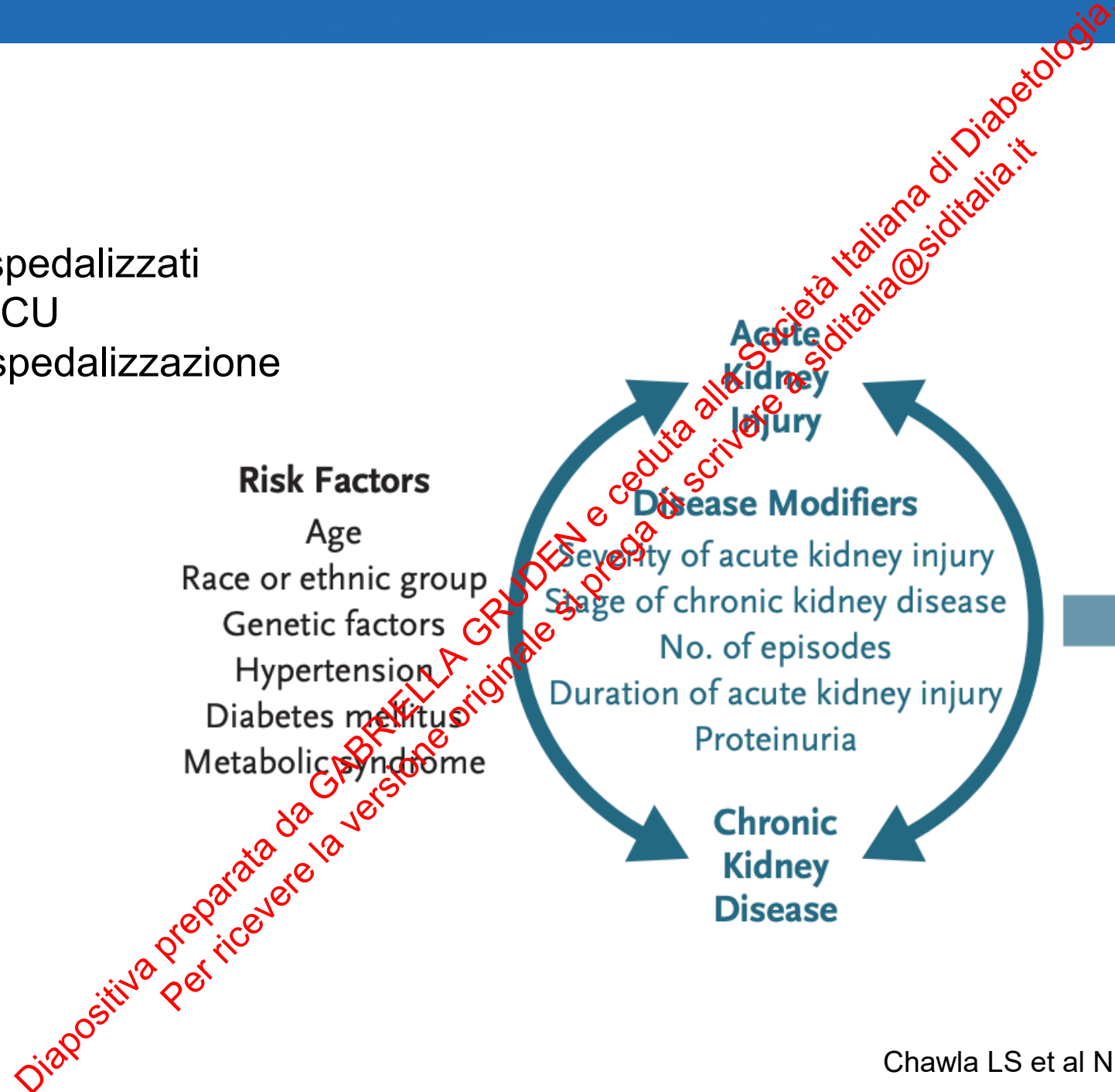
- M:4.7%, F: 5.8%

Mortalità globale 1990-2017: aumento
Aggiustata per età: 2.8% aumento (America Latina, Asia)

AKI

Pazienti critici e ospedalizzati

- 40% ammessi ICU
- 60% durante ospedalizzazione



AKI e CKD

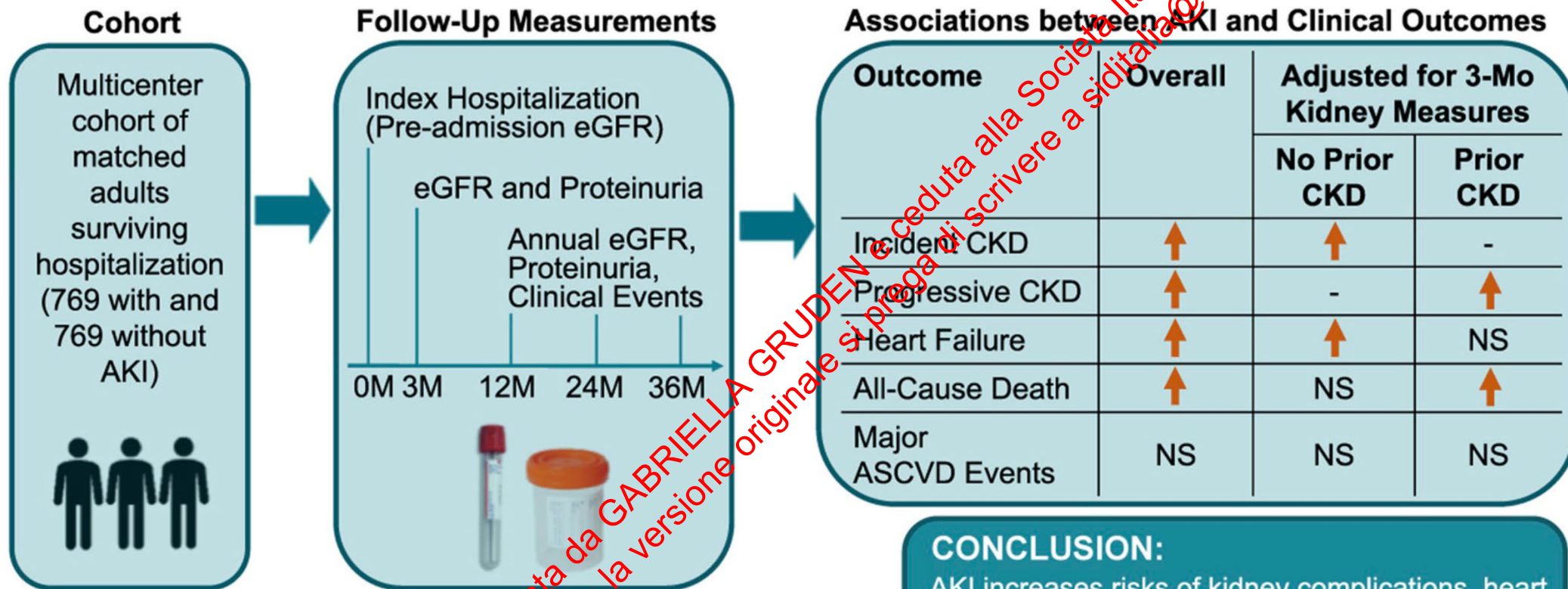
Table 2. Development of CKD Stage 3 and Higher and Stage 5 or ESRD by 1 Year Following Index Hospitalization Discharge, Stratified by AKI Stage and Recovery Pattern

	No. of Patients	Stage ≥ 3 CKD by 1 y ^a	Stage 5 CKD/ESRD by 1 y ^b
Overall total	104,764	19,044 (18.2)	1,271 (1.2)
No AKI	87,715	13,625 (15.5)	1,044 (1.2)
Any AKI	17,049	5,419 (31.8)	227 (1.3)
AKI by severity ^c			
Stage 1	15,566	4,774 (30.7)	192 (1.2)
Stage 2	561	206 (26.7)	7 (1.3)
Stage 3	922	439 (47.6)	29 (3.2)
AKI by recovery pattern ^c			
≤ 2 d	12,072	3,341 (27.7)	127 (1.1)
3-10 d	2,072	823 (39.7)	36 (1.7)
Still elevated after 10 d	1,854	997 (53.2)	48 (2.6)
No Scr measure in 10-d postpeak period	2,031	258 (25.0)	16 (1.6)

104.764 pazienti del Veterans Health Administration ospedalizzati nel 2011 con normale funzione renale e 2 misurazioni intraospedaliere di creatinina

Casi di CKD dopo 1 anno

A prospective cohort study of acute kidney injury and kidney outcomes, cardiovascular events, and death



CONCLUSION:

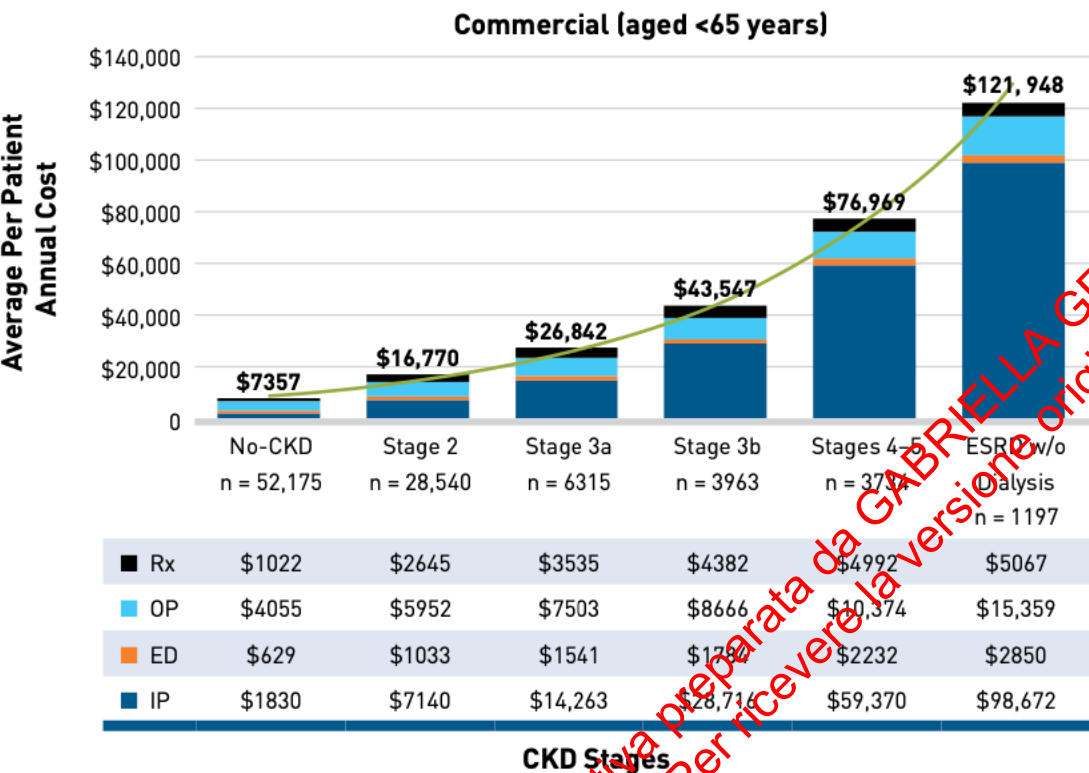
AKI increases risks of kidney complications, heart failure and death. Assessing kidney function and proteinuria 3 months after AKI provides important prognostic information for long-term outcomes.

Ikizler TA et al., 2020

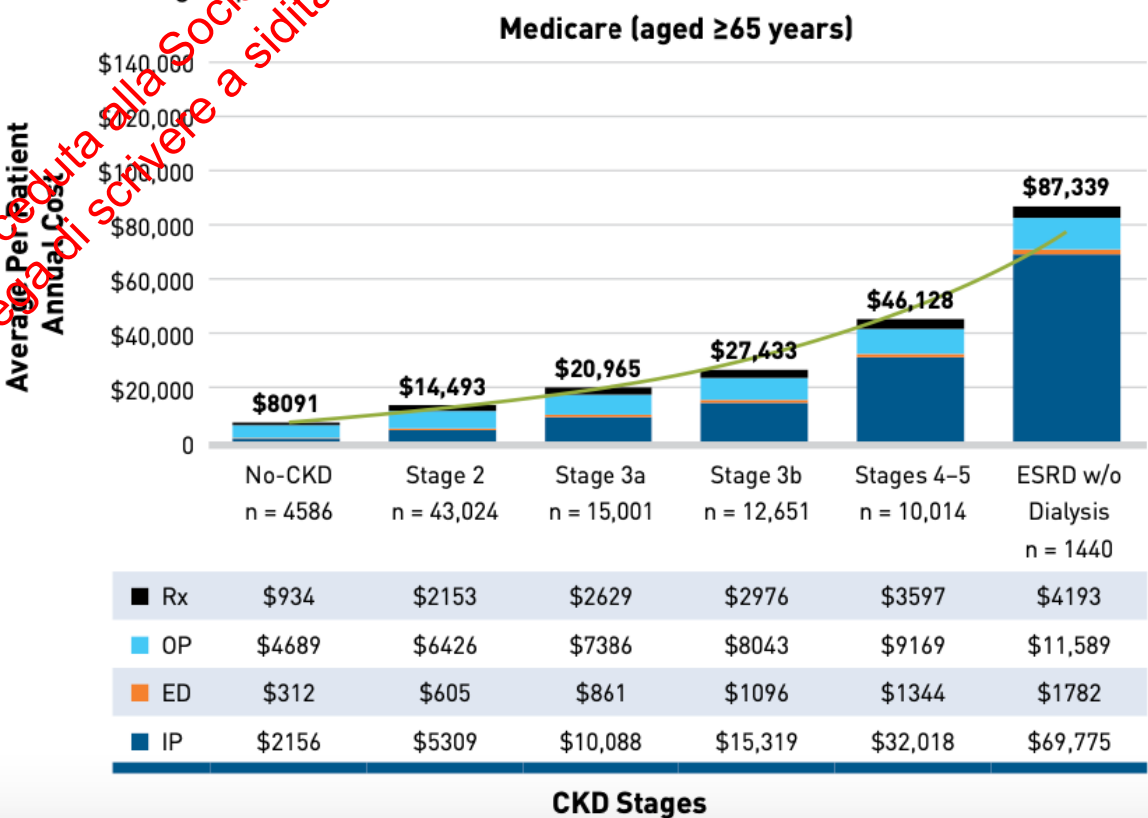
COSTI SANITARI

FIGURE 1. Mean Annualized Costs by Medical Service Category and CKD Stage by Commercial Group (A) and Medicare Group (B).

A. Commercial group.



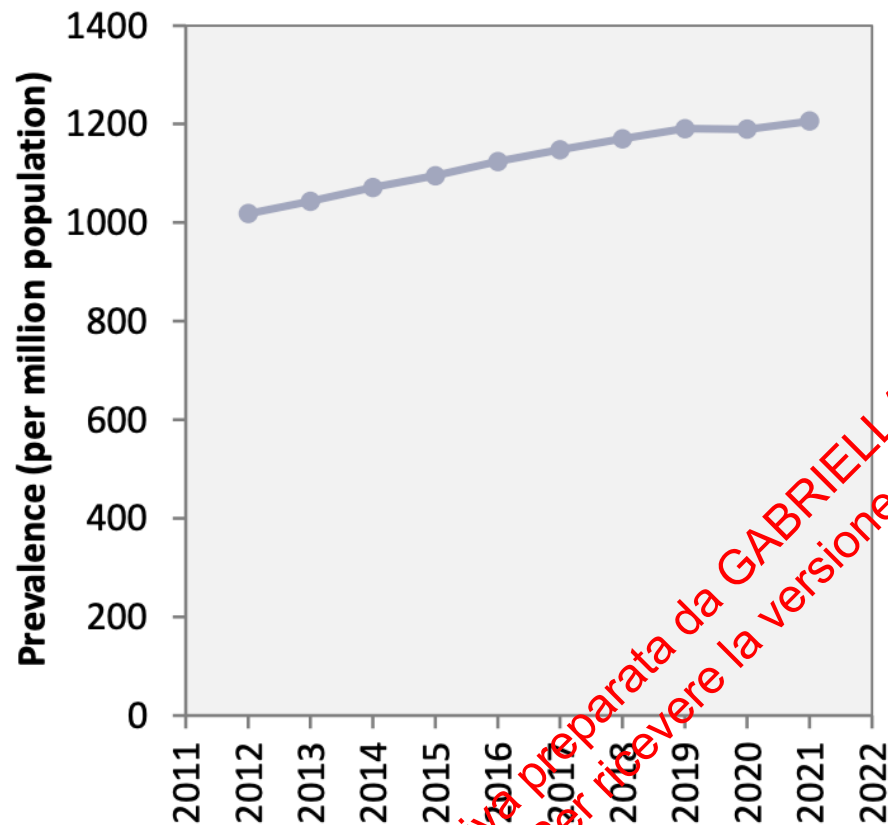
B. Medicare group



PREVALENZA RRT 2011-2022

Unadjusted prevalence over time

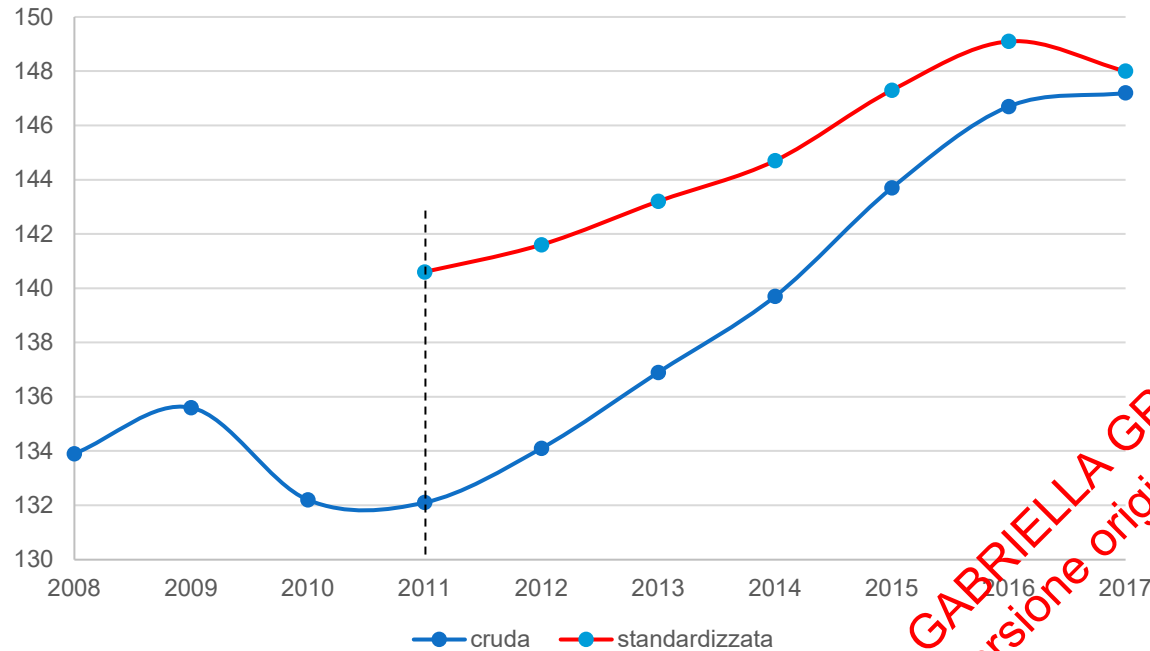
all patients on KRT



- Dati non completi
- Eterogeneità
- Soglia eGFR per RRT
- Proporzione Dialisi/Trapianto

INCIDENZA RRT 2008-2017

Incidenza RTT 2008-2017



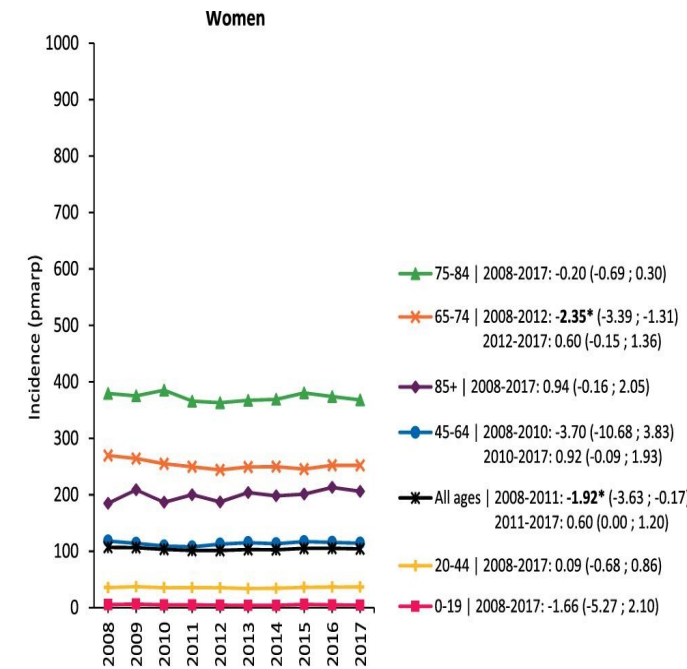
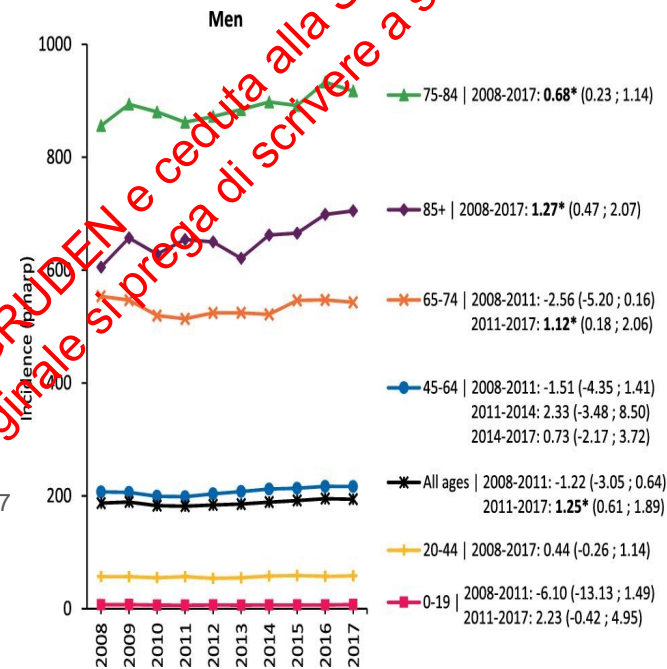
Incidenza (crudo)

- 2008-2011: **stabile** (133.9 -> 132.1 pmp [APC: -0.1 (-0.37; 0.98)])
- 2011-2017: **aumento** (132.1 -> 147.2 [APC: 1.98 (1.40; 2.56)])

Incidenza standardizzata età e sesso

- 2008-2011: **stabile** (146.0 -> 140.6 pmp [APC: -1.48 (-3.15; 0.21)]),
- 2011-2017: **aumento** (140.6 -> 148.1 [APC: 1.01 (0.43; 1.60)])

Aumento uomini anziani >75 DM o ipertesi

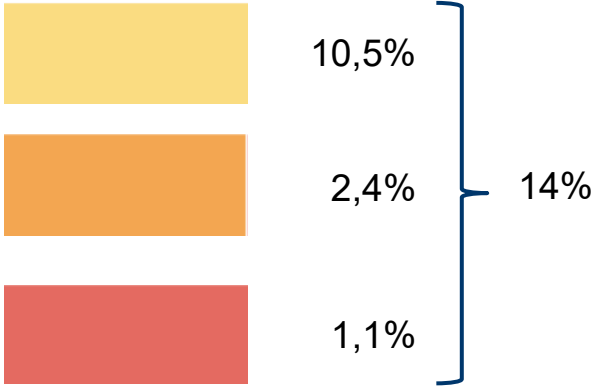


USRDS

2017-2020: 14% (1:7 soggetti)

Prognosis of CKD by GFR and albuminuria categories: KDIGO 2012

GFR categories (ml/min/1.73 m ²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased < 30 mg/g < 3 mg/mmol	Moderately increased 30-300 mg/g 3-30 mg/mmol	Severely increased > 300 mg/g > 30 mg/mmol
eGFR < 60 ml/min	G1	Normal or high	≥ 90			
	G2	Mildly decreased	60-89			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	< 15			





KIDNEY DISEASE
SURVEILLANCE SYSTEM

TRACKING KIDNEY DISEASE IN THE UNITED STATES

USA 1:7 CKD 1-4

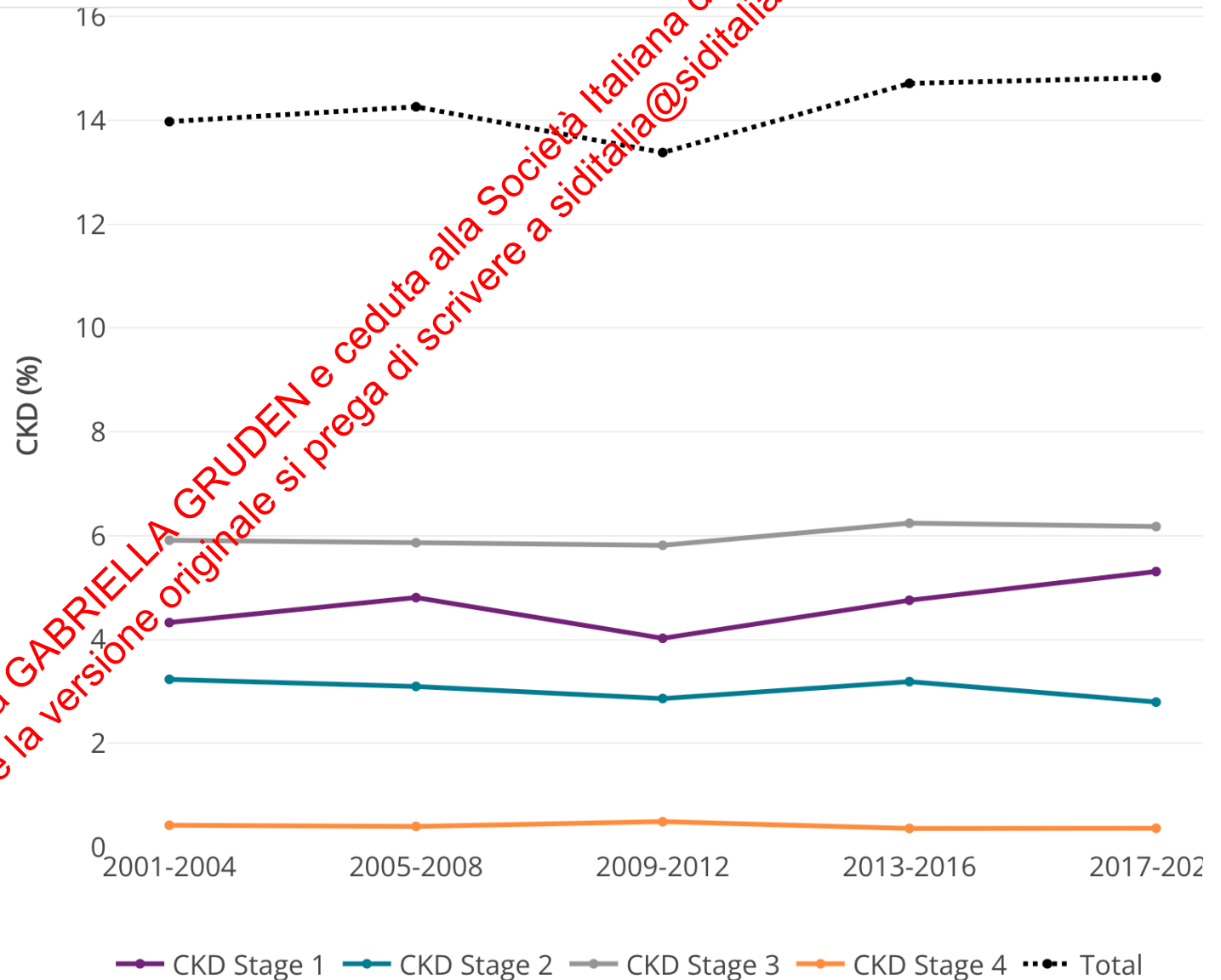
Prevalenza non aggiustata

- 2001–2004: 14.0%
- 2017–March 2020: 14.8%

Piccole variazioni nel tempo
ad eccezione dello stadio

CKD-1

Prevalence of CKD Among U.S. Adults, by Stage
National Health and Nutrition Examination Survey



GAPS in Kidney Care

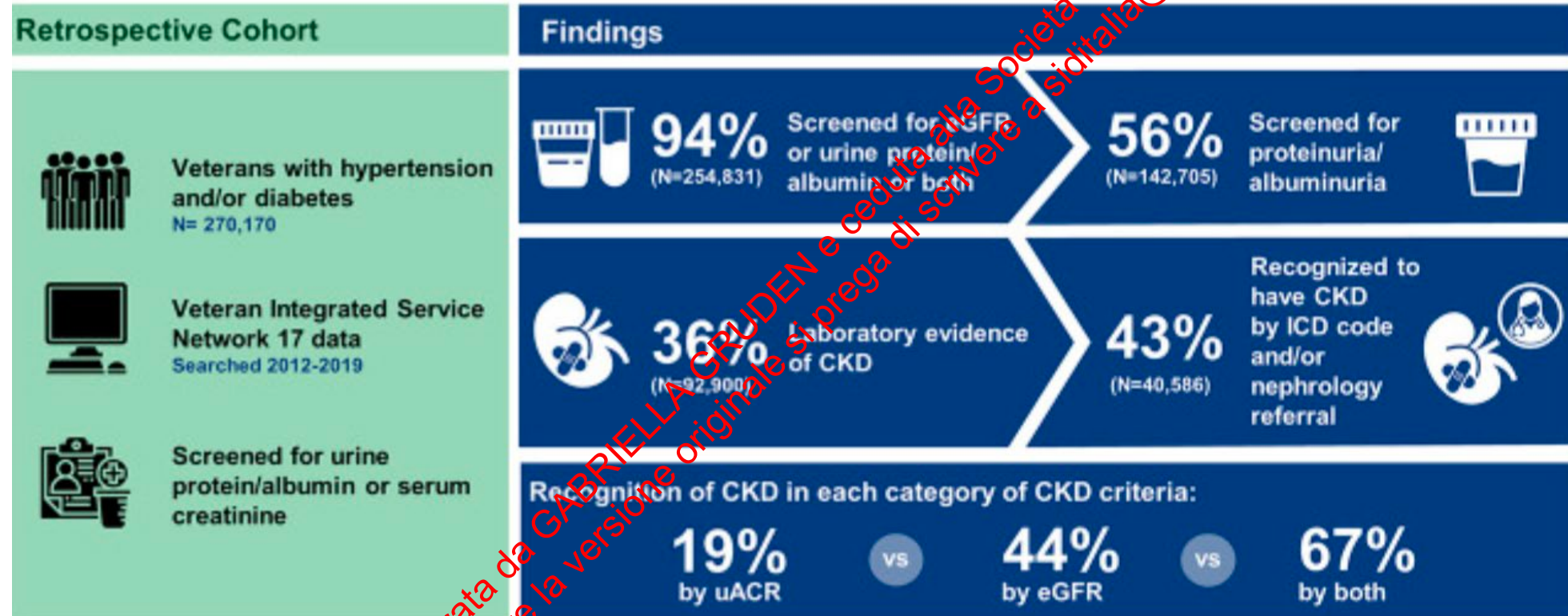
World Bank country group for chronic kidney disease gaps.

CKD care	Low-income countries (%)	Lower-middle income countries (%)	Upper-middle-income countries (%)	High-income countries (%)
Governmental recognition of CKD as a health priority	59	40	17	29
Government funds all aspects of CKD care	13	21	40	53
Availability of CKD management and referral guidelines (international, national, or regional)	46	73	83	97
Existence of current CKD detection programs	6	24	24	32
Availability of dialysis registries	24	48	72	89
Availability of academic centers for renal clinical trial management	12	34	62	63

CKD: chronic kidney disease. Data from Bello et al. [4](#).

Screening and recognition of chronic kidney disease (CKD): how are we doing?

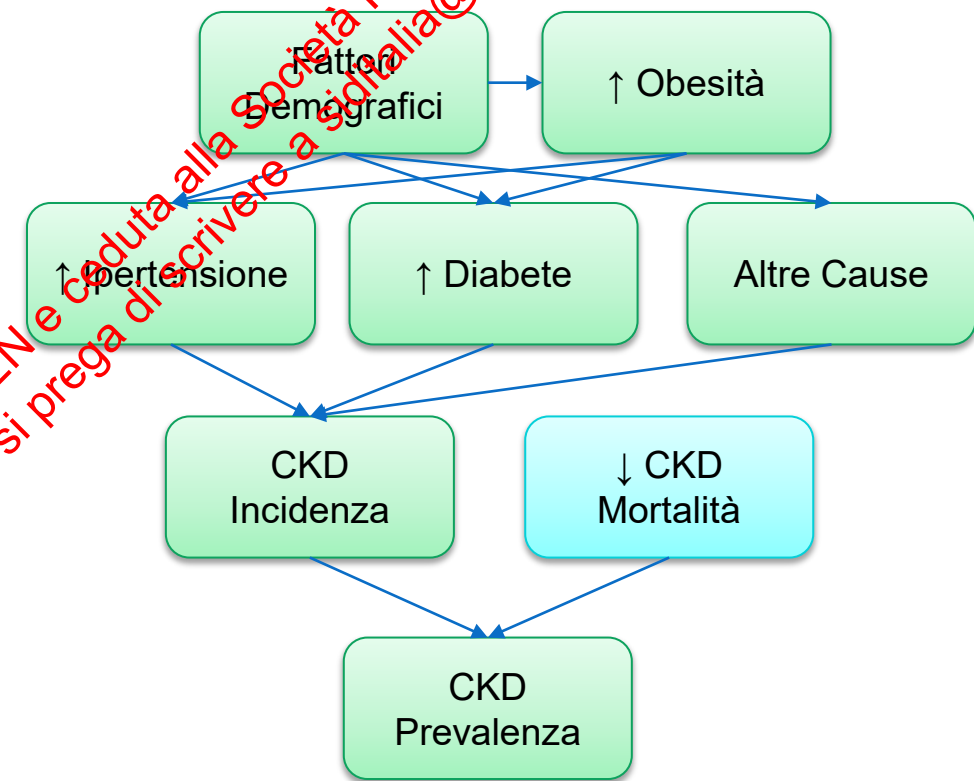
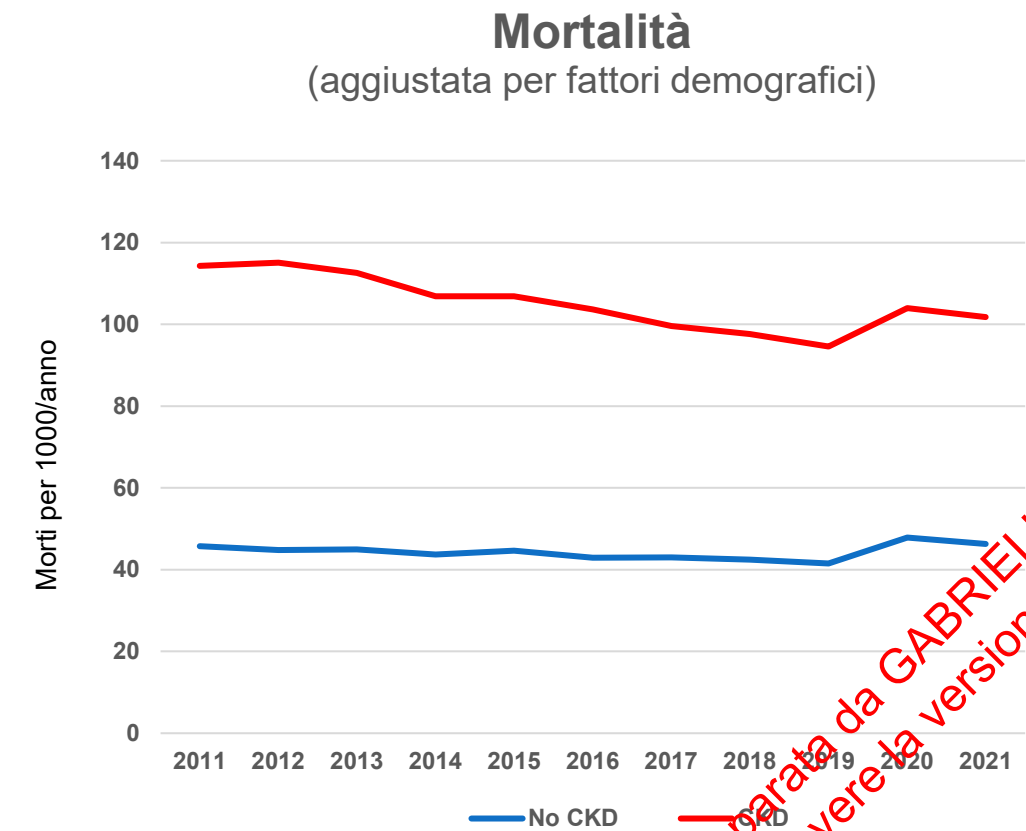
Kidney360



Conclusions While overall CKD screening rate was high, screening of protein/albuminuria and overall recognition of CKD was low in at-risk Veterans.

Shweta Bansal, Michael Mader, Jacqueline A. Pugh. *Screening and Recognition of Chronic Kidney Disease in VA Health Care System Primary Care Clinics.* Kidney360 doi: 10.34067/KID.0000532020
Visual Abstract by Dominique Tomacruz, MD

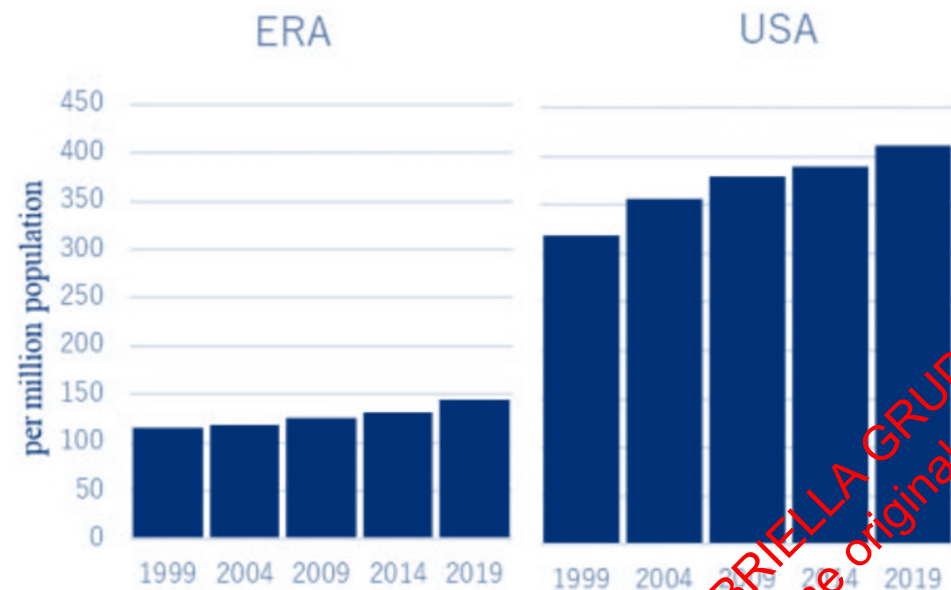
Mortalità da Tutte le Cause



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INCIDENZA RRT 1999-2019

Five-year trends in the incidence of RRT per million population.



Incidenza RRT 2019

- **USA 411.7 pmp**
- **Europa 145 pmp**

USA vs. Europa

- Etnia
- Aspettativa di vita da altre cause
- Copertura spese RRT
- Adesione a RRT

Incidenza (crudo)

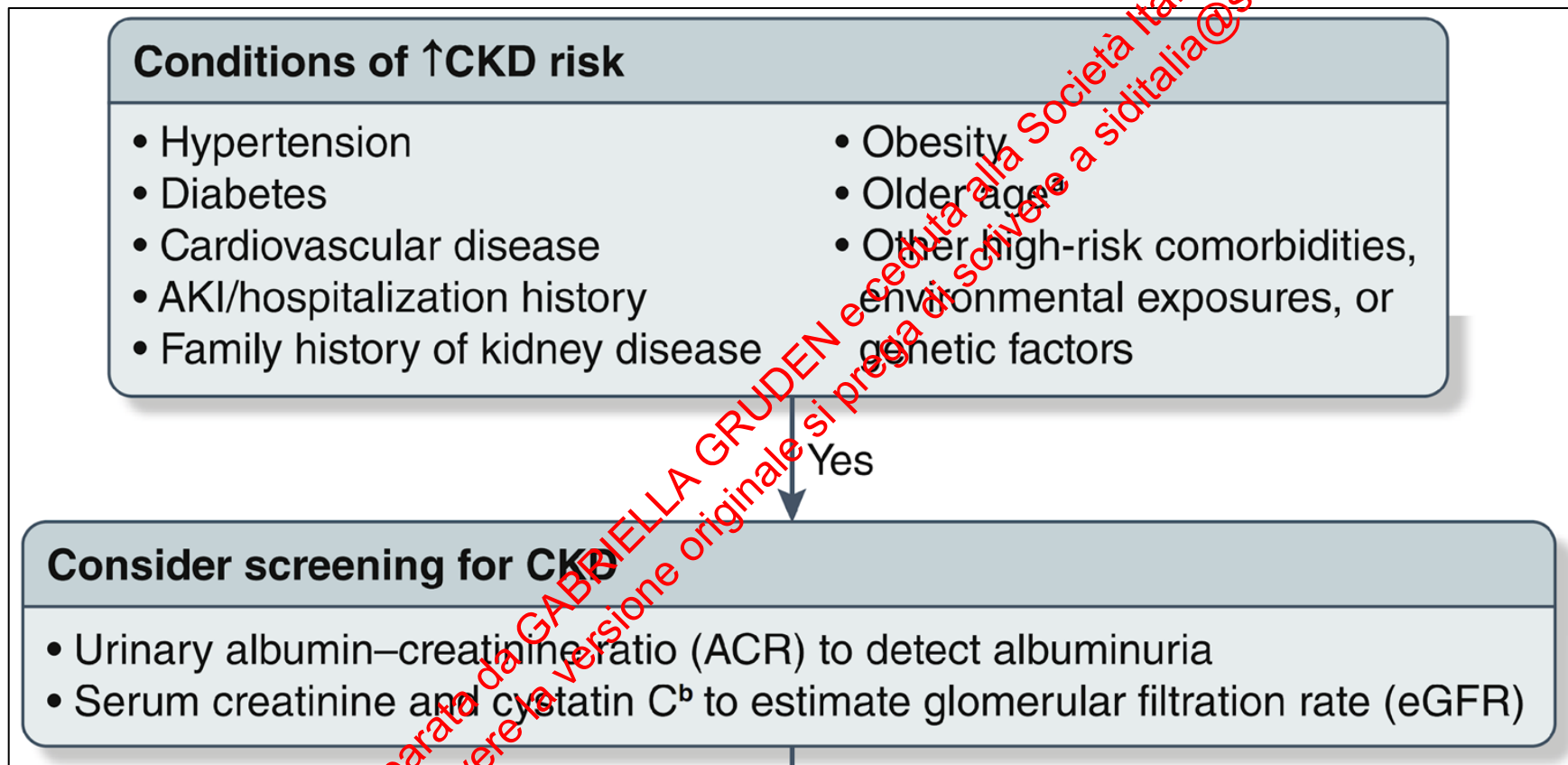
- 2008-2011: **stabile** (133.9 -> 132.1 pmp [APC: -0.71 (-2.37; 0.98)])
- 2011-2017: **aumento** (132.1 -> 147.2 [APC: 1.98 (0.40; 2.56)])

Incidenza standardizzata età e sesso

- 2008-2011 **stabile** (146.0 -> 140.6 pmp [APC: -1.48 (-3.15; 0.21)]),
- 2011-2017: **aumento** (140.6 -> 148.0 [APC: 1.01 (0.43; 1.60)])

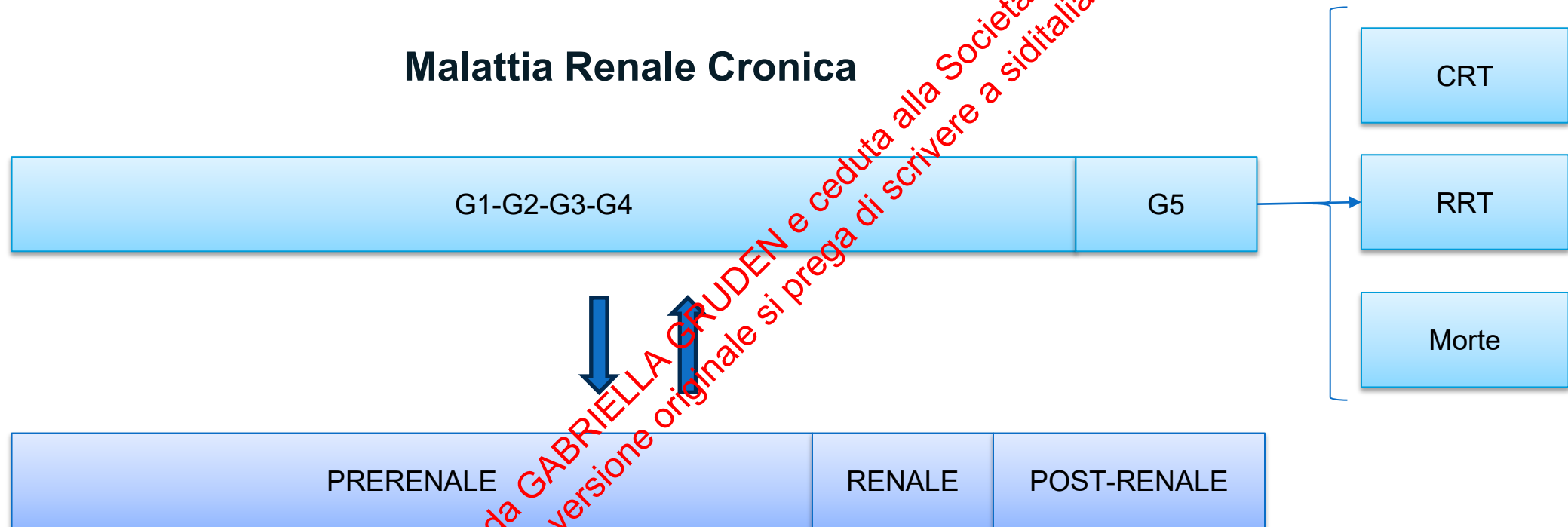
Aumento uomini anziani >75 DM o ipertesi

CKD Screening: Soggetti ad Alto Rischio



Diapositiva preparata da GABRIELLA GRUDEN e presentata alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

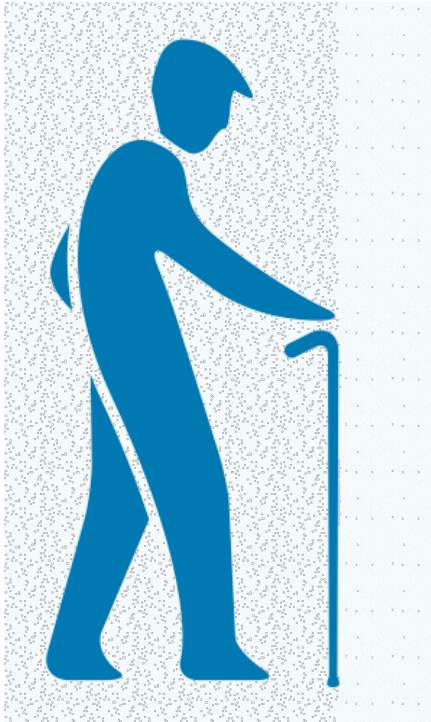
ESRD/RRT



Danno Renale Acuto

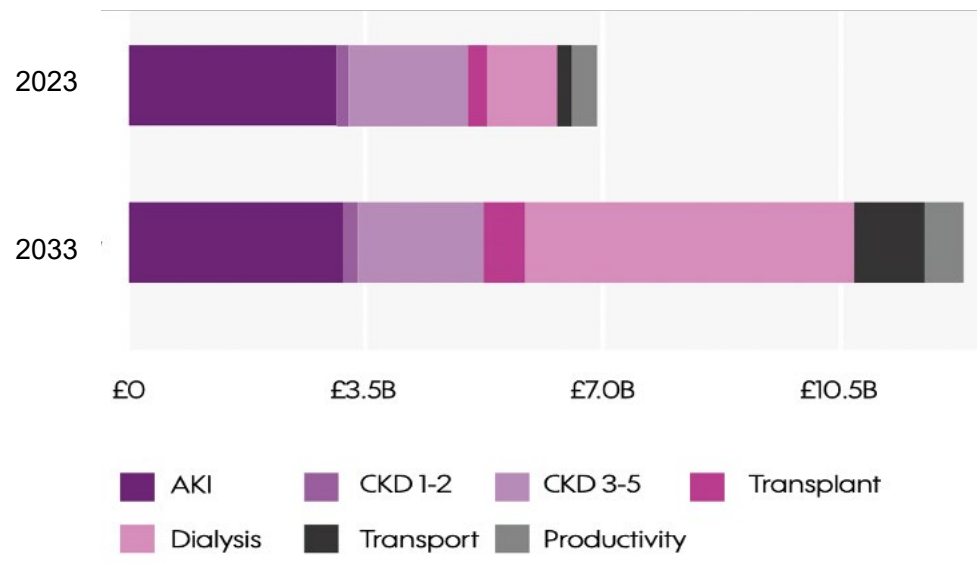
Diapositiva preparata da GABRIELLA CRUDEN e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Amplificatore di Fragilità

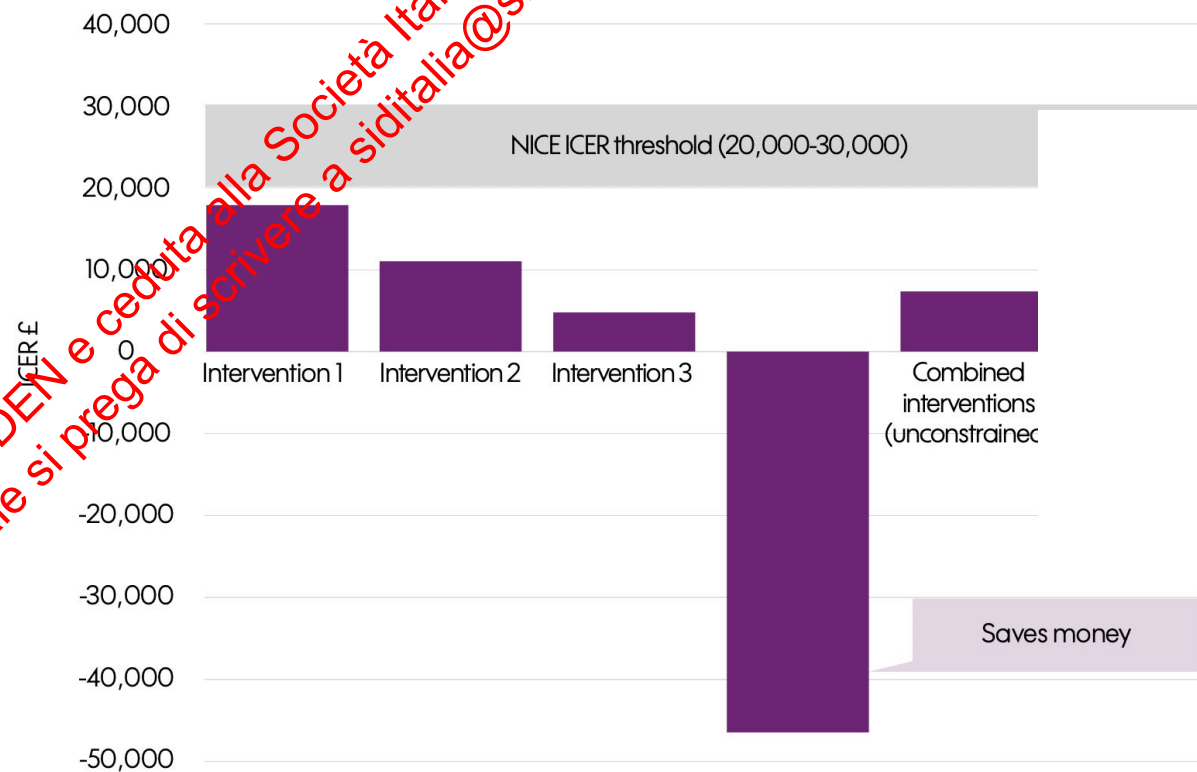


- Anemia → astenia, faticabilità
- Dispnea, edema declivi
- Perdita appetito, nausea, malnutrizione
- Patologia ossea → fratture cadute
- Neuropatia/Crampi/Disturbi del sonno
- Alterazioni neurologiche (confusione, perdita della memoria) → demenza
- Depressione
- Impatto della dialisi e trapianto

UK Costo

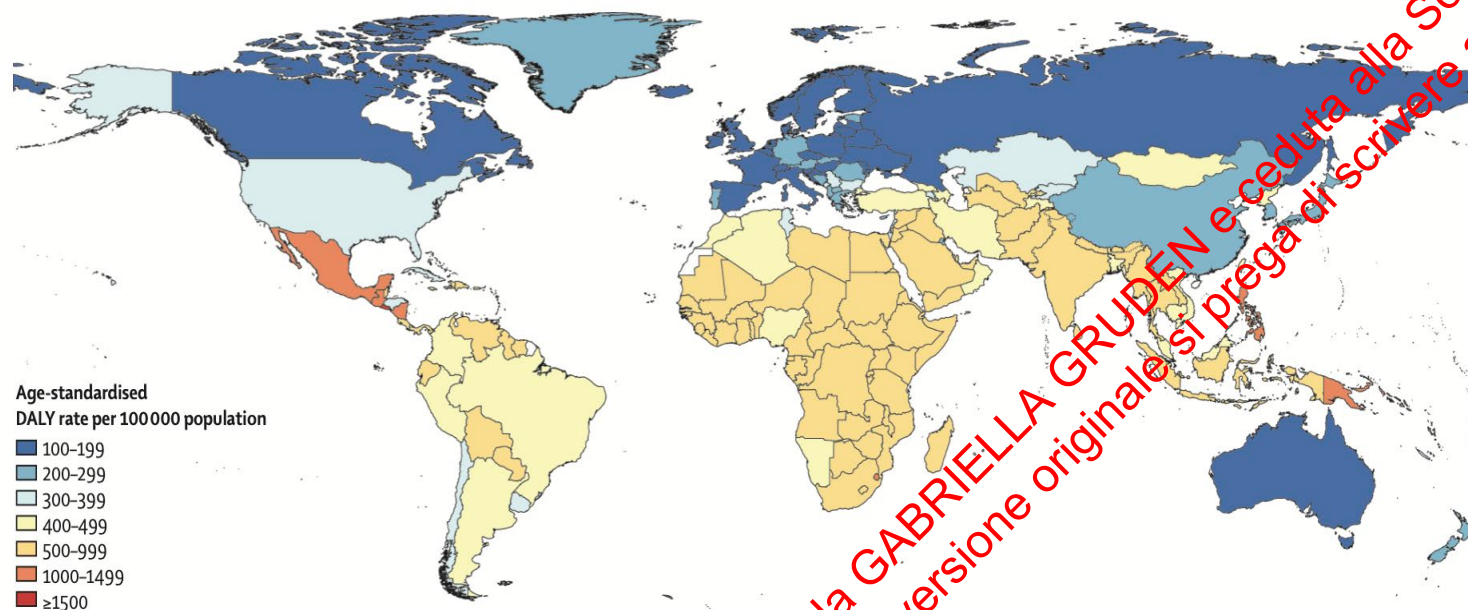


- **Early/improved diagnosis:** This intervention targets ethnic minority groups and other underserved populations through outreach programmes to improve screening opportunities and increase early diagnosis
- **Improved CKD management:** This intervention targets eligible patients with chronic kidney disease who are either untreated or not receiving standard care according to clinical guidelines (e.g. adequate blood pressure management)
- **Use of SGLT-2 inhibitors:** This intervention aims to increase uptake of new medications such as SGLT-2 inhibitors (e.g. dapagliflozin) to reduce CVD events and slow progression to ESKD
- **Increased rates of transplantation:** This intervention models the impact of increased outreach and awareness to increase pre-emptive live donor transplants. It is illustrative of the benefits of improving transplantation rates more generally.



Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017

GBD Chronic Kidney Disease Collaboration*



Prevalenza: 9.1% **700 milioni** (1:10)

Aumento dal 1990: **29.3%**

Aggiustata per età 1.2% (NS)

RRT

Prevalenza: 0,1% (1:1000)

Incidenza aumento dal 1900: **43.1%**

Mortalità

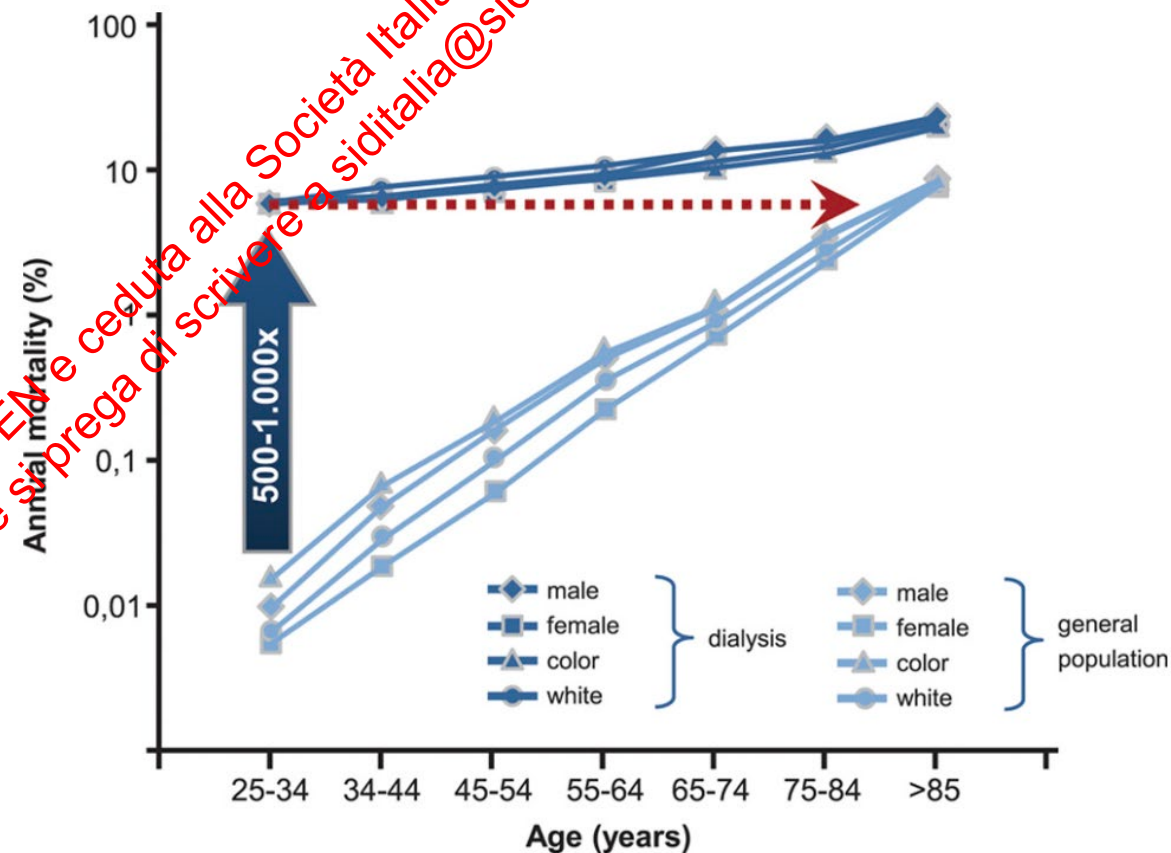
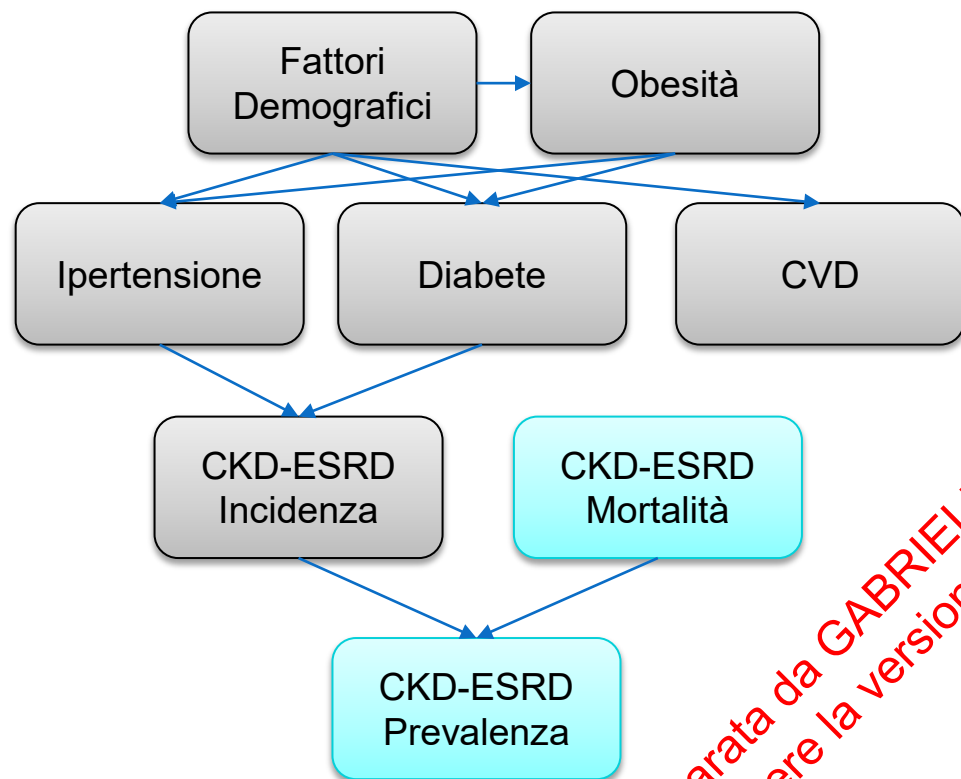
1.2 milioni/anno (1.43 milioni/anno 2019)

28 milioni anni vita perduti/anno

Aggiustata per età 2.8% (NS)

Trainata da America Latina, Asia

MORTALITA'



Diapositiva preparata da GABRIELLA GRUDEN e ceduta alla Società Italiana di Diabetologia.
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REVEAL-CKD Italia

Variabile	Totale (N)	CKD non diagnosticata (N)	Prevalenza CKD non diagnosticata (%) 95% CI
Totale	65.676	50.547	77.0% (76.6%, 77.3%)
Stadio			
3A	43.937	36.460	83.0% (82.6%, 83.3%)
3B	21.739	14.087	64.8% (64.2%, 65.4%)
Età (anni) al reclutamento			
<45	188	95	50.5% (43.2%, 57.9%)
45-64	3780	2.724	72.1% (70.6%, 73.5%)
65-74	14.264	10.976	77.0% (76.3%, 77.6%)
≥75	47.444	36.752	77.5% (77.1%, 77.8%)
Genere			
Donne	37.948	30.727	81.0% (80.6%, 81.4%)
Uomini	27.728	19.820	71.5% (70.9%, 72.0%)
Diabete			
No	44.376	34.762	78.3% (78.0%, 78.7%)
Sì	21.300	15.785	74.1% (73.5%, 74.7%)
Scompenso cardiaco			
No	59.298	46.298	78.1% (77.7%, 78.4%)
Sì	6.378	4.248	66.6% (65.4%, 67.8%)
Iipertensione			
No	14.352	11.698	81.5% (80.9%, 82.1%)
Sì	51.324	38.849	75.7% (75.3%, 76.1%)

Dati clinici estratti da cartelle cliniche elettroniche di 900 MMG (fonte IQVIA, Italia) e da database amministrativi

1.2 milioni di pazienti di età ≥18 anni, nel periodo 2015-2021

- CKD3a
- > 65 aa
- Donne

Diagnosi e Trattamento



01. BACKGROUND

Guidelines for the treatment of CKD recommend **early intervention and management** to slow disease progression



We investigated **changes in prescribing practices and eGFR decline following a CKD diagnosis** in patients in the USA with **stage 3 CKD**



02. METHODS

Data were extracted from **TriNetX**, a database of integrated electronic medical records and claims data from patients in the USA

Eligible patients:

- Age ≥ 18 years
- Two eGFR measurements indicative of stage 3 CKD (≥ 30 and < 60 mL/min/1.73 m²) recorded 91–730 days apart from 2015 to 2020
- Lack of ICD-9/10 code for CKD any time before and up to 6 months after second qualifying eGFR measurement
- CKD diagnosis ≥ 6 months after second qualifying eGFR measurement

03. RESULTS

26,851 patients

57.4% female

71.3 years mean age

The rate of prescribing of guideline-recommended drugs **increased significantly** in the 180 days after (versus the 180 days before) a CKD diagnosis

ACE inhibitors	↑ 87%
ARBs	↑ 91%
MRAs	↑ 123%
SGLT-2 inhibitors	↑ 62%

Median annual decline in eGFR (mL/min/1.73 m²) **significantly decreased** following a CKD diagnosis^a

Before	−3.20	95% CI: −3.38, −3.00
After	−0.74	95% CI: −0.96, −0.53

Delayed CKD diagnosis (by 1-year increments) was associated with **elevated risk** of:

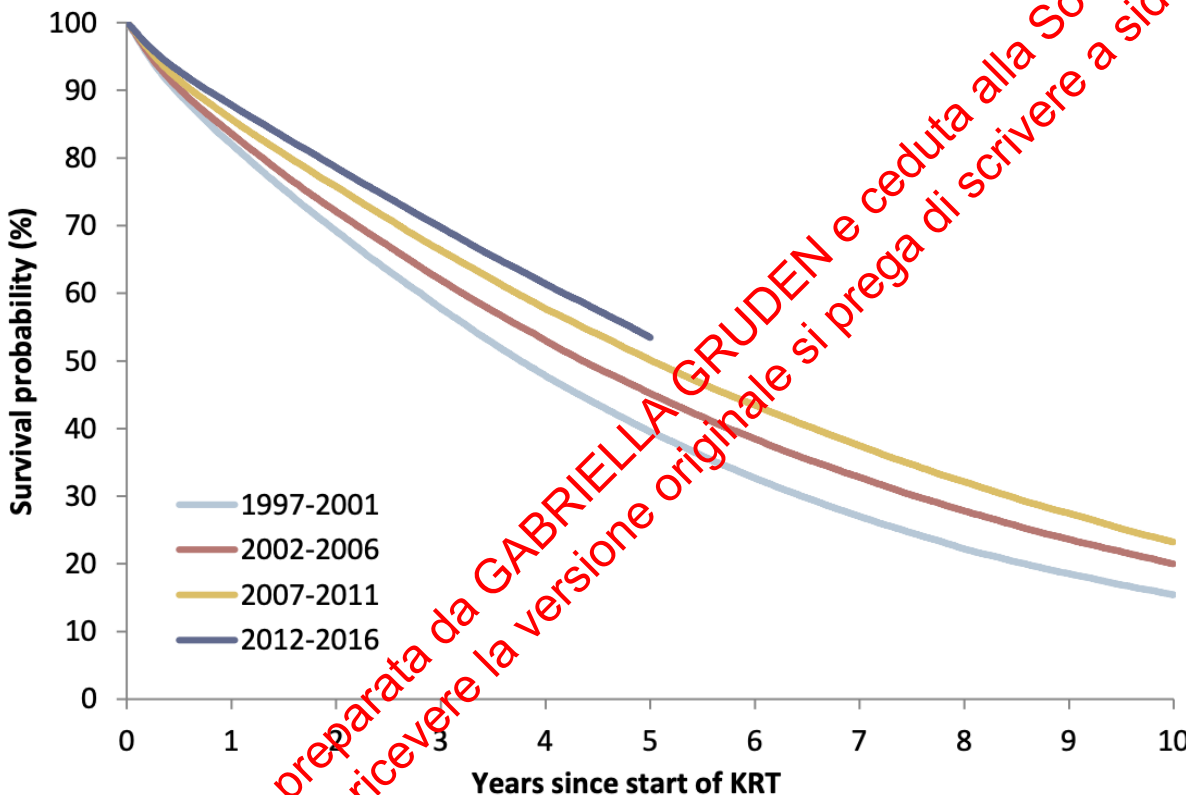
CKD progression (stage 4/5)	↑ 40%
Kidney failure (transplant or chronic dialysis)	↑ 63%
MACE+ (composite of MI, stroke and hHF)	↑ 8%

Mortalità e ESRD



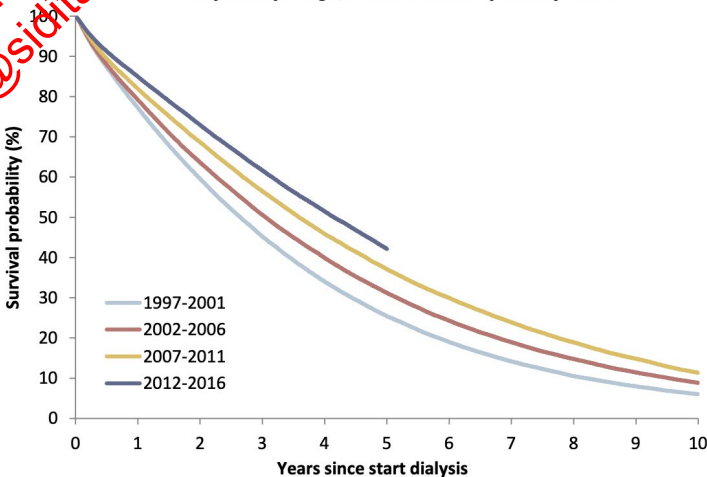
Patient survival incident KRT patients

adjusted for age, sex and cause of renal failure



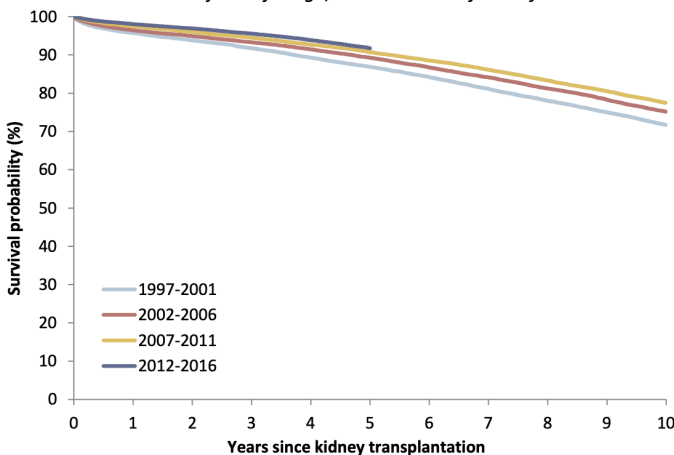
Patient survival incident dialysis patients

adjusted for age, sex and cause of renal failure



Patient survival after first kidney transplantation

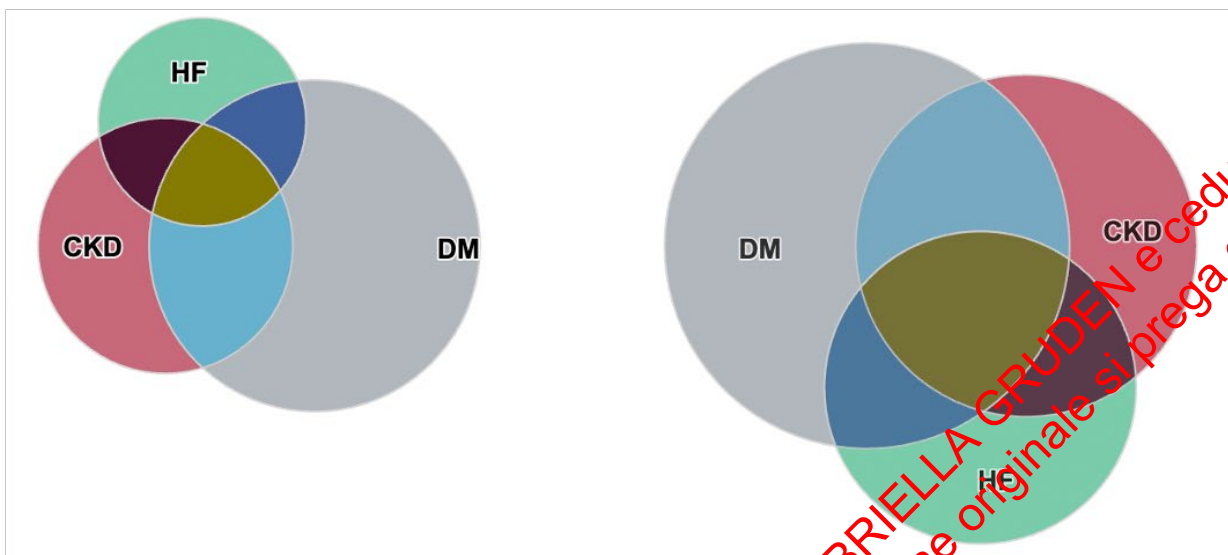
adjusted for age, sex and cause of renal failure



IL TERZETTO

Percentage of population (n=23.87M)

Percentage of costs (total \$318.81B)



13.5% CKD assorbono 24% spesa sanitaria globale

- 61.3% CKD + HF e/o DM
- Assorbono il 71.3% spesa dei soggetti con CKD