Erişkinde Pnömokok Hastalık Yükü

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Erişkinde Pnömokok Hastalık **Yükü**

Herkesin hastalık ve sakatlık olmadan yaşadığı ideal bir durum ile mevcut sağlık durumu arasındaki boşluk

Sağlık, Ekonomik, Sosyal

Epidemiyolojik

(İnsidans, prevelans, hastane yatış oranı, fatalite oranı…)

Ekonomik

(Direk ve indirek maliyetler…)

Sosyal-toplumsal

Quality of life year-QALY

Disability Adjusted Life Years-DALY

Search: **(Streptococcus pneumoniae Infections OR Pneumococcal Diseases OR Pneumococcal Infection OR Pneumococcal pneumonia OR Pneumococcal meningitis OR Pneumococcal bacteremia OR Pneumococcal septicemia AND (Turkey)AND (y_5[Filter]))** Filters: **in the last 5 years**

83 Makale

HUMAN VACCINES & IMMUNOTHERAPEUTICS
2020, VOL. 16, NO. 8, 1923–1936
https://doi.org/10.1080/21645515.2019.1708668

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RESEARCH PAPER

OPEN ACCESS Check for updates

Indirect costs of adult pneumococcal disease and the productivity-based rate of return to the 13-valent pneumococcal conjugate vaccine for adults in Turkey

J. P. Sevilla [a], Andrew Stawasz [a*], Daria Burnes[a], Anubhav Agarwal[a#], Basak Hacibedel[b], Kerem Helvacioglu[b], Reiko Sato[c], and David E. Bloom[a]

Olasılık teorisi: **Markov modeli yapısı**

Popülasyon

-Büyüklük
-Yaşam beklentisi
-Risk/alt grupları
-Aşı uygulaması
-Aşı kapsayıcılığı

İnfeksiyon

- İnsidans
- Hastane yatış oranı
-Fatalite oranı
-Sekel oranı

Etkinlik

-Aşı etkililiği
-Serotip dağılımı-değişimi
-Çocukluk aşılamasının etkisi

Ekonomik

-Aşı ve uygulama
-Tedavi maliyeti
-Verimlilik
-İş gücü kaybı

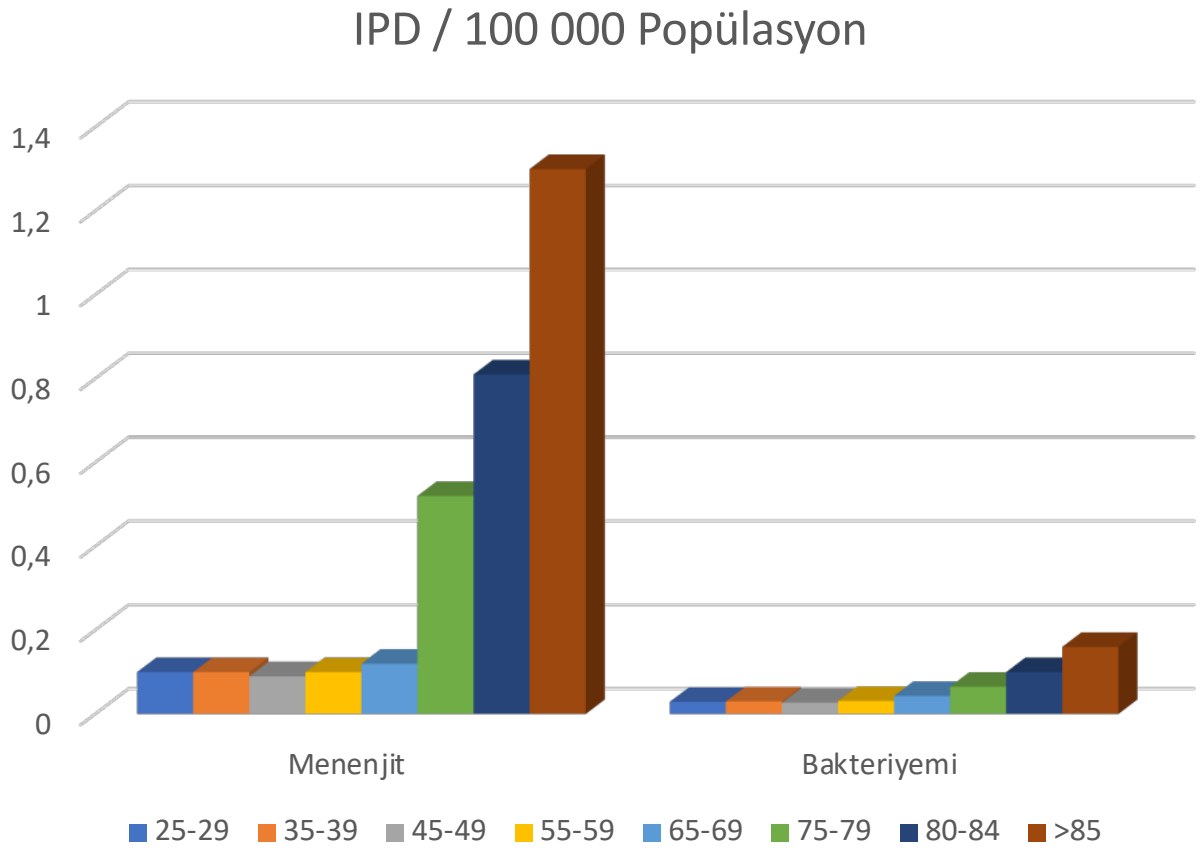
Kısıtlılık: Türkiye'de verilerin sınırlı olması birçok varsayım kullanılmasını yol açmıştır.

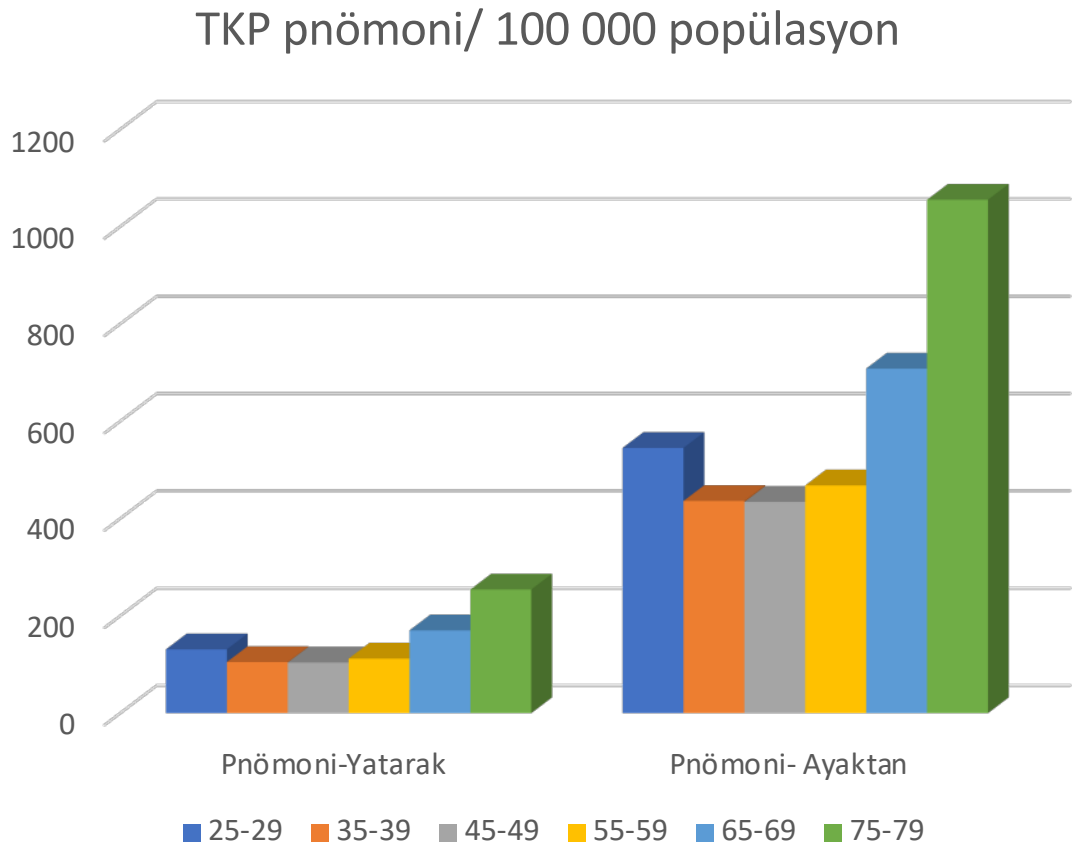
Kwame Owusu-Edusei et al., Infect Dis Ther, 2022

J. P. Sevılla et Al. Human Vaccınes & Immunotherapeutıcs 2020

Parameter	18–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85	Source
Epidemiological parameters, elderly population																
Vaccine-type incidence per 100,000 of																
Inpatient CAP	209.72	144.25	131.20	118.17	105.15	100.65	104.64	108.70	112.75	133.47	170.64	216.29	254.08	313.78	390.76	*
Outpatient CAP	871.31	599.32	545.10	490.94	436.88	418.18	434.74	451.60	468.44	554.53	708.96	898.63	1,055.60	1,303.64	1,623.47	*
Bacteremia	0.14	0.10	0.10	0.09	0.10	0.09	0.09	0.09	0.10	0.12	0.35	0.43	0.52	0.81	1.30	*
Meningitis	0.044	0.032	0.029	0.029	0.030	0.029	0.027	0.028	0.031	0.036	0.043	0.053	0.065	0.10	0.16	*
Case fatality rate																
Inpatient CAP	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	[43]
Outpatient CAP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[43]
Bacteremia	0.05	0.05	0.17	0.17	0.17	0.17	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	*
Meningitis	0.02	0.02	0.07	0.07	0.07	0.07	0.11	0.11	0.11	0.11	0.29	0.29	0.29	0.29	0.29	*
Probability of meningitis causing																
Persistent vegetative state	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	[44]
Severe disability	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	[44]
Moderate disability	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	[44]
Temporary disability	0.78	0.78	0.73	0.73	0.73	0.73	0.69	0.69	0.69	0.69	0.51	0.51	0.51	0.51	0.51	*

J. P. Sevilla et Al. Human Vaccines & Immunotherapeutics 2020





J. P. Sevılla et al.Human Vaccınes & Immunotherapeutıcs 2020

(Kaynaktan alınan veriler grafikleştirilmiştir)

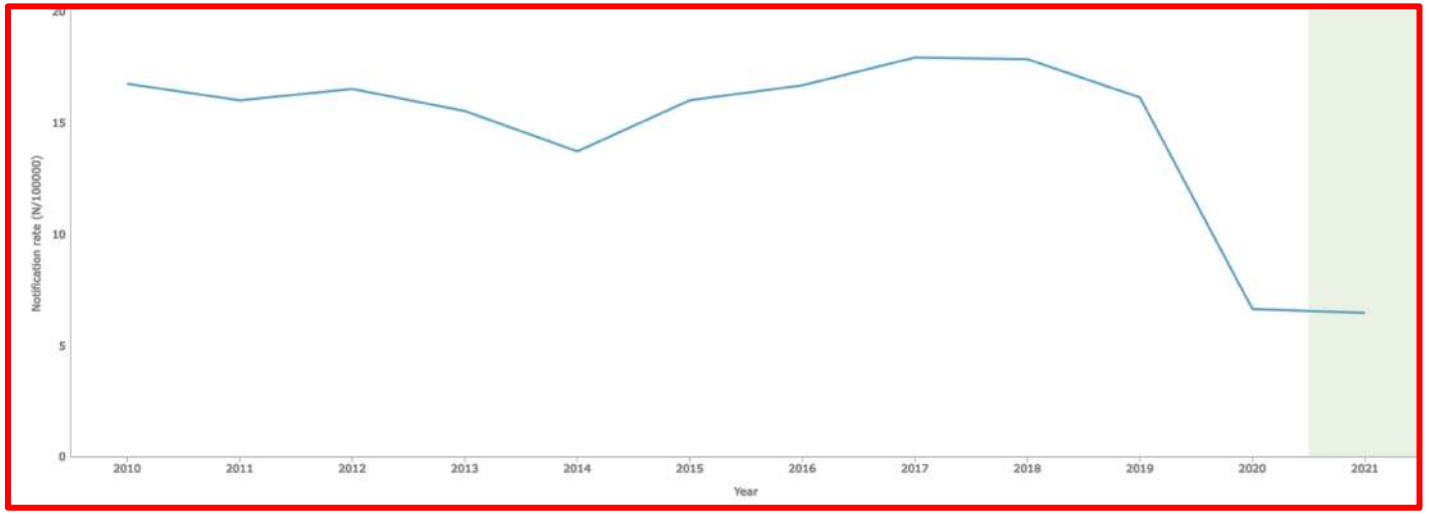
Türkiye'de IPD insidansı, 2017

Bakteriyemi: 0.14-1.30/ 100 000 popülasyon

Menenjit: 0.043-0.16/ 100 000 popülasyon

Türkiye'ye yakın, GSMH benzer, sosyo-demografik index benzer ve verisi olan 6 ülke

(Çek cumhuriyeti, Slovenya, Slovakya, Polanya, Macaristan) verisi



http://atlas.ecdc.europa.eu/public/index.aspx

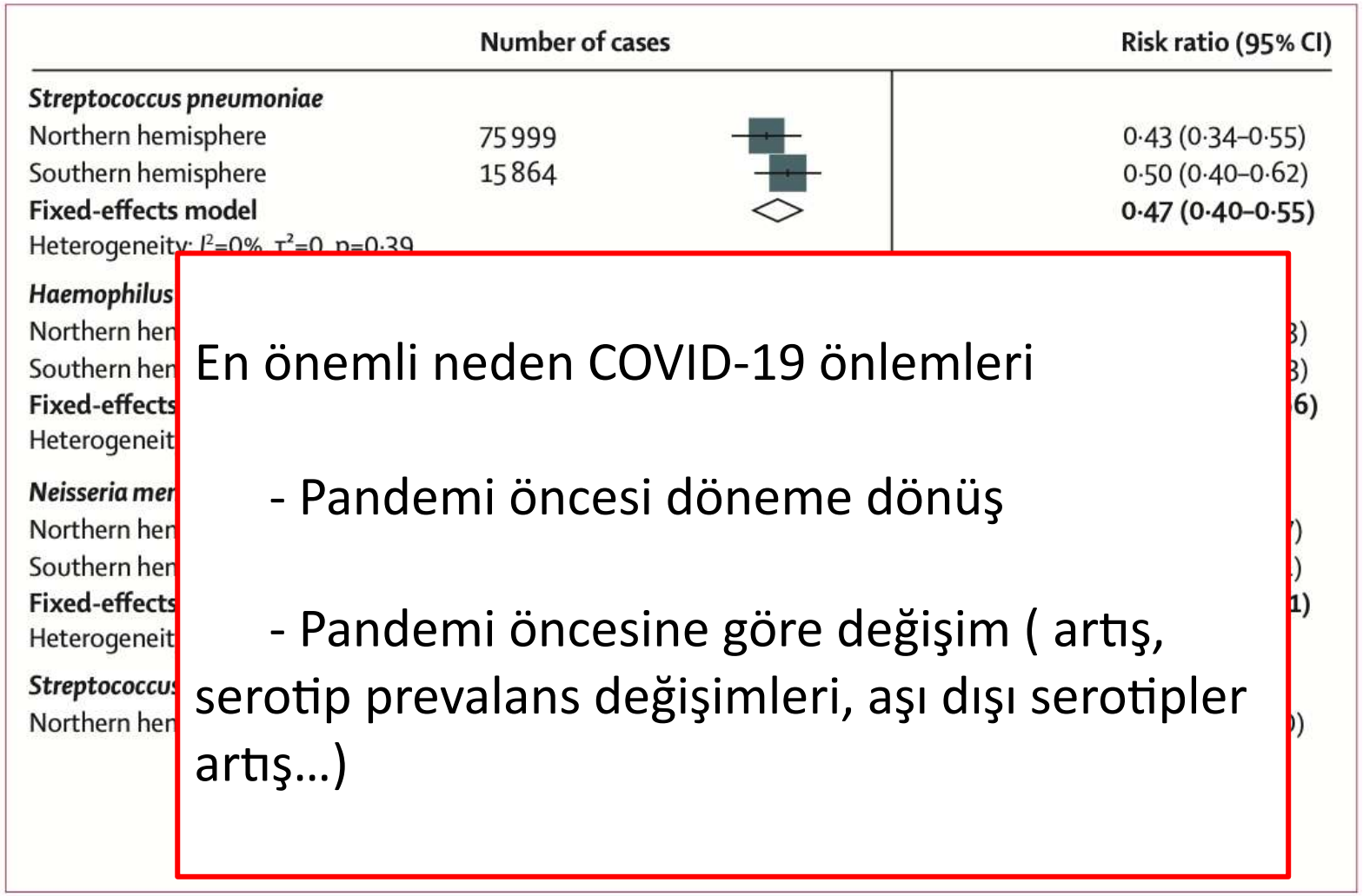
COVİD-19'un IPD epidemiyolojisine etkisi

2018-2019 ile

2020-2021 arasında

invaziv bakteriyel

hastalık değişimi



En önemli neden COVID-19 önlemleri

- Pandemi öncesi döneme dönüş

- Pandemi öncesine göre değişim (artış, serotip prevalans değişimleri, aşı dışı serotipler artış…)

David Shaw et al. Lancet Digit Health 2023

Almanya’da yaş gruplarına göre 2020-2021 IPD insidans değişimi

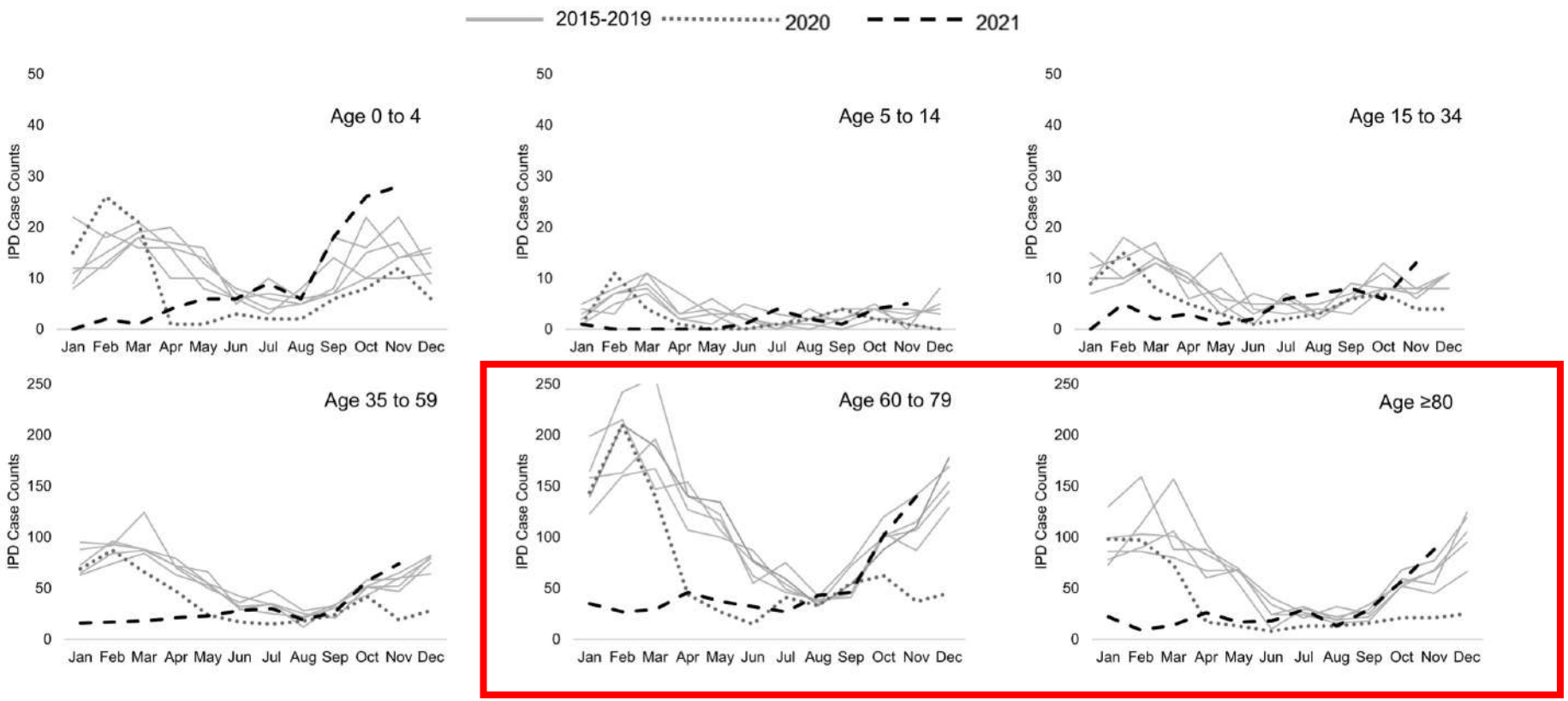
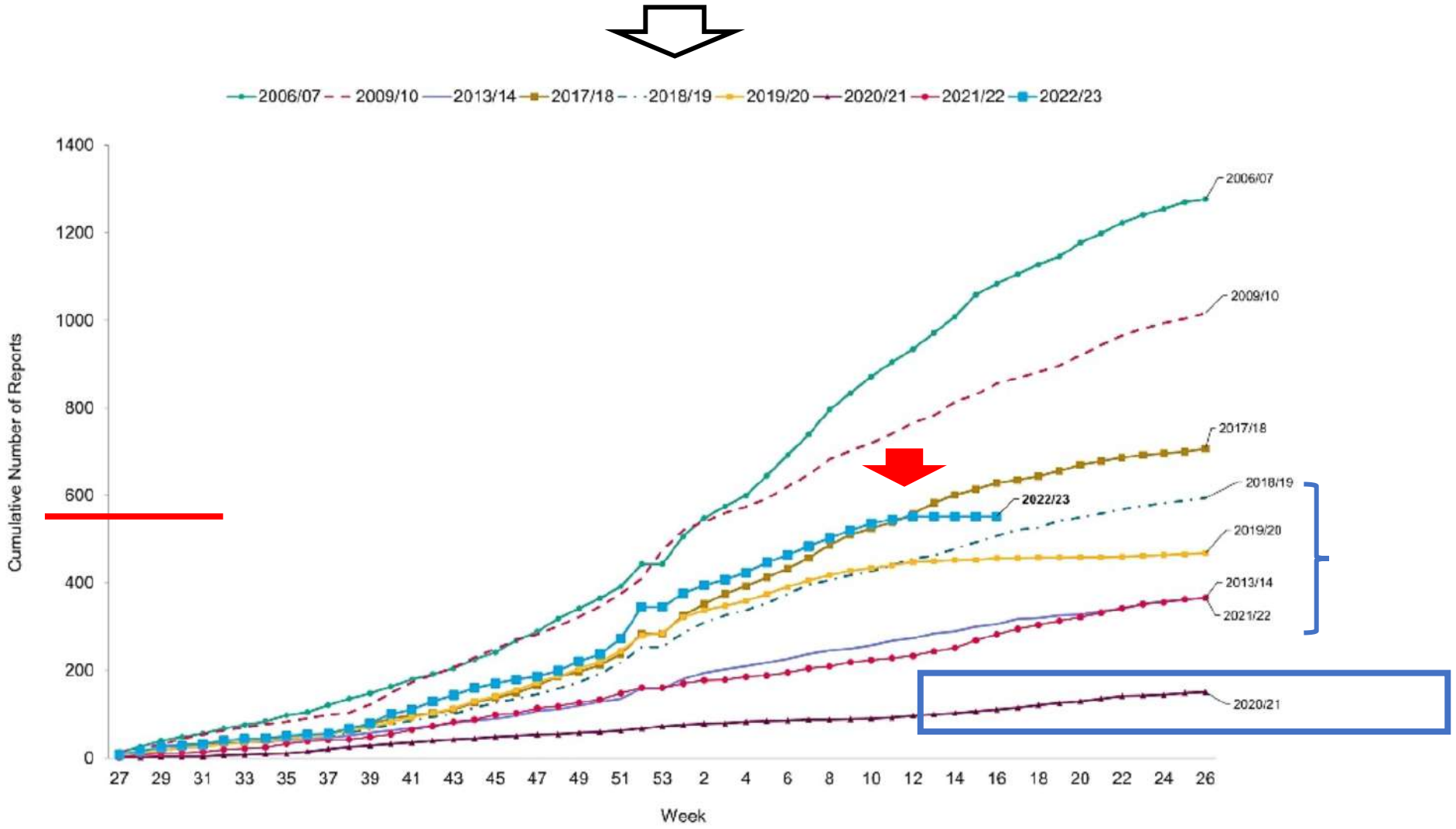


Figure 1. Invasive pneumococcal disease (IPD) case count by age group, from January 2015 to November 2021. Gray lines represent cases counts in the years before 2020 (2015–2019); orange line, 2020; and green line, 2021.

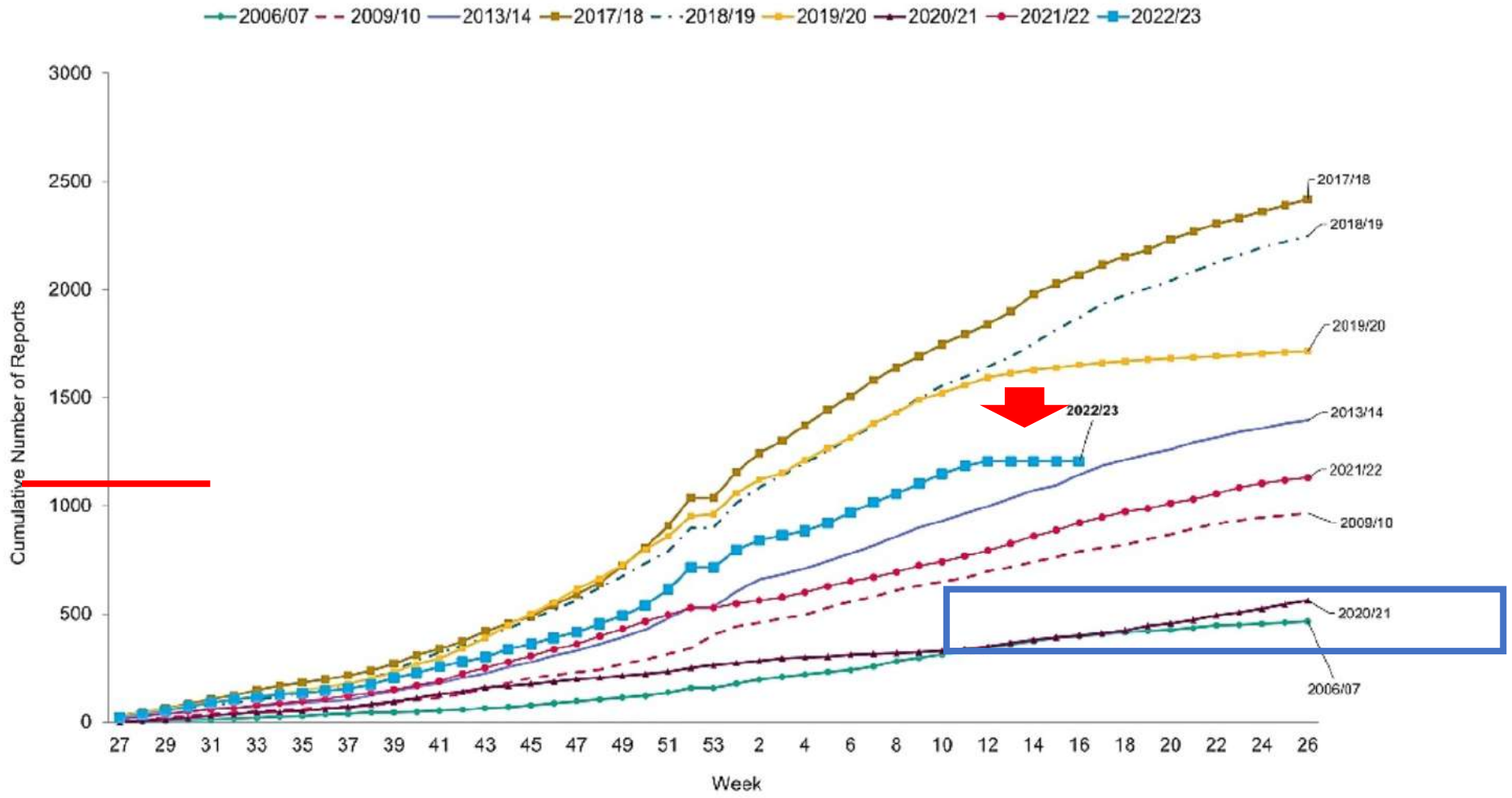
Stephanie Perniciaro et al. CID,2023

65 yaş ve üzeri: PCV 13'ün kapsadığı serotipler ile gelişen IPD



https://www.gov.uk/government/publications/pneumococcal-disease-cases-caused-by-strains-covered-by-prevenar-13-vaccine

65 yaş ve üzeri : PCV 13'ün kapsamadığı serotipler ile gelişen IPD



https://www.gov.uk/government/publications/pneumococcal-disease-caused-by-strains-not-covered-by-prevenar-13-vaccine

Türkiye’de TKP insidansı(65-69 yaş grubu)

Hastanede takip edilen:

170.6-390.7/ 100 000 popülasyon

Ayaktan takip edilen:

708.9- 1623.4/100 000 popülasyon

Türkiye'ye özgü 2017 Küresel Hastalık Yükü (GBD) tahminlerininde ASYE insidansı, pnömokokal pnömoniye bağlı ASYE'nin oranı

Lokal verilerin kullanımı

J. P. Sevılla et Al. Human Vaccınes & Immunotherapeutıcs 2020

Clinical Infectious Diseases
MAJOR ARTICLE

Burden of Lower Respiratory Tract Infections Preventable by Adult Immunization With 15- and 20-Valent Pneumococcal Conjugate Vaccines in the United States

Joseph A. Lewnard,[1,2,3] Vennis Hong,[4] Katia J. Bruxvoort,[5] Lindsay R. Grant,[6] Luis Jódar,[6] Alejandro Cané,[6] Adriano Arguedas,[6] Magdalena E. Pomichowski,[4] Bradford D. Gessner,[6] and Sara Y. Tartof[4,7]

ABD

Tüm hastalar: 1430 (1330-1530)/100 000 popülasyon

Hastanede takip edilen: 330 (320-350) /100 000 popülasyon

Epidemiology and Infection

cambridge.org/hyg

Original Paper

Cite this article: Deb A *et al* (2022). Clinical and economic burden of pneumococcal disease among individuals aged 16 years and older in Germany. *Epidemiology and Infection* **150**, e204, 1–11. https://doi.org/10.1017/S0950268822001182

Clinical and economic burden of pneumococcal disease among individuals aged 16 years and older in Germany

Arijita Deb[1], Bélène Podmore[2,3], Rosemarie Barnett[2,4], Dominik Beier[5], Wolfgang Galetzka[5], Nawab Qizilbash[2,3], Dennis Haeckl[6], Sarah Mihm[7], Kelly D. Johnson[1] and Thomas Weiss[1]

[1]Merck & Co., Inc., Rahway, NJ, USA; [2]OXON Epidemiology, London, UK; [3]London School of Hygiene & Tropical Medicine, London, UK; [4]University of Bath, Bath, UK; [5]InGef – Institute for Applied Health Research Berlin GmbH, Berlin, Germany; [6]WIG2 GmbH, Leipzig, Germany and [7]MSD Sharp & Dohme GmbH, Munich, Germany

Almanya

Tüm hastalar: 512-4286 /100 000 popülasyon
(Farklı yaş ve risk)

Turk Thorac J 2021; 22(4): 339-345 DOI: 10.5152/TurkThoracJ.2021.20223

Original Article

The Role of Pneumococcal Pneumonia among Community-Acquired Pneumonia in Adult Turkish Population: TurkCAP Study

Esin Şenol[1], Aykut Çilli[2], Hakan Günen[3], Alper Şener[4], Rıdvan Dumlu[4], Ayşe Ödemiş[2],

Pnömokokal pnömoni: % 12.7

% 85 Üriner antijen test ile tanı, test duyarlılığı % 63 (45-81)

Pönomokokal pnömoni: % 22.8

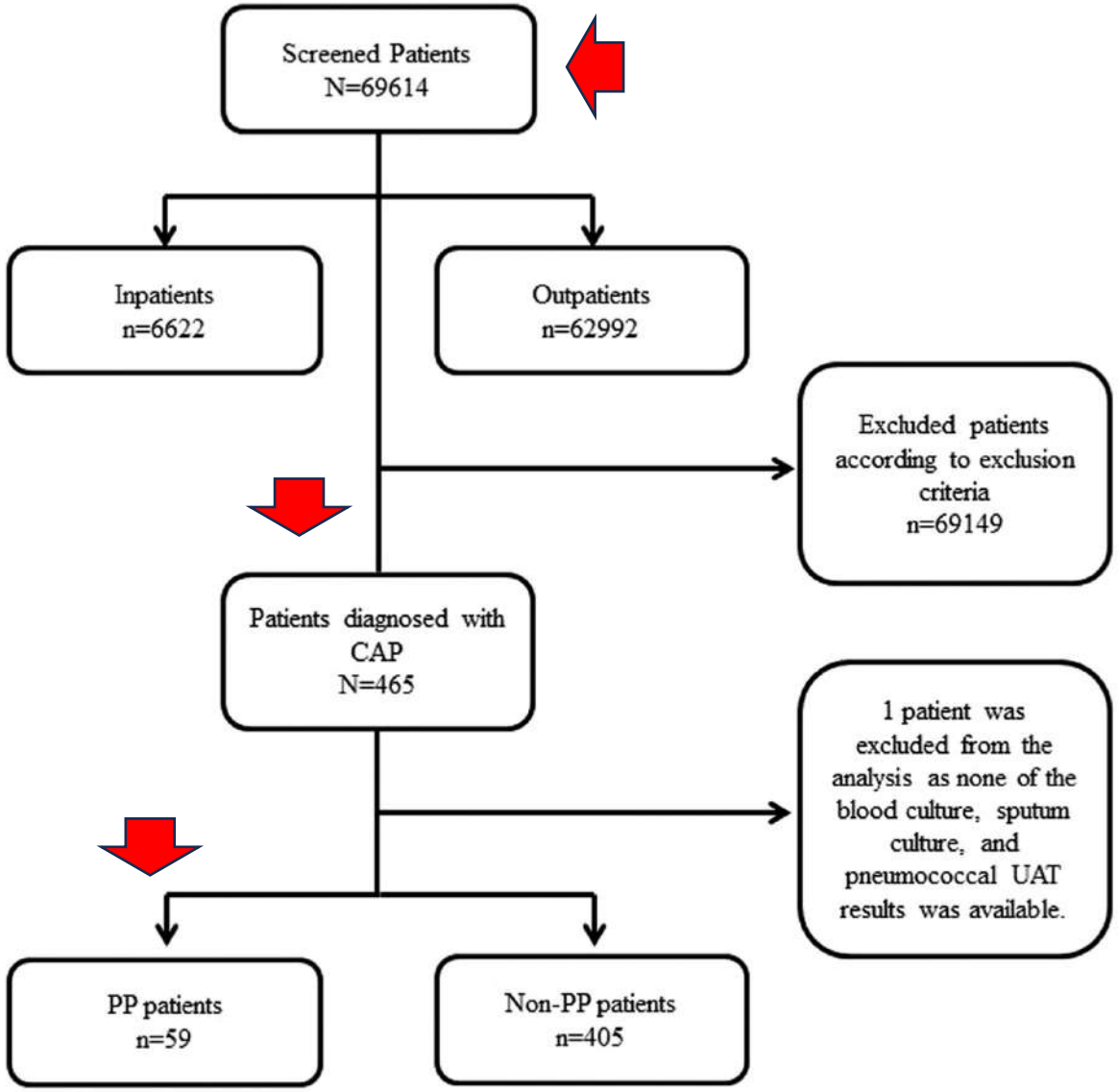


Table 2. Summary values for prevalence of pneumococcal disease in Southern European countries*.

Pneumoccocal disease type	Country	Number of records	Prevalence	95%CI
Bacteremia	Overall	31	6%	4%-8%
	Spain	29	6%	4%-8%
	Italy	2	5%	0%-24%
	Portugal	0	-	-
	Greece	0	-	-
Pneumonia	Overall	182	16%	15%-18%
	Spain	140	19%	17%-20%
	Italy	26	8%	7%-9%
	Portugal	12	11%	5%-18%
	Greece	4	5%	2%-10%
Noninvasive pneumonia	Overall	31	64%	56%-71%
	Spain	28	64%	55%-71%
	Italy	2	77%	53%-95%
	Portugal	1	40%	21%-60%
Meningitis	Overall	18	25%	17%-35%
	Spain	11	21%	9%-35%
	Italy	6	33%	23%-42%
	Portugal	1	35%	29%-42%
	Greece	0	-	-

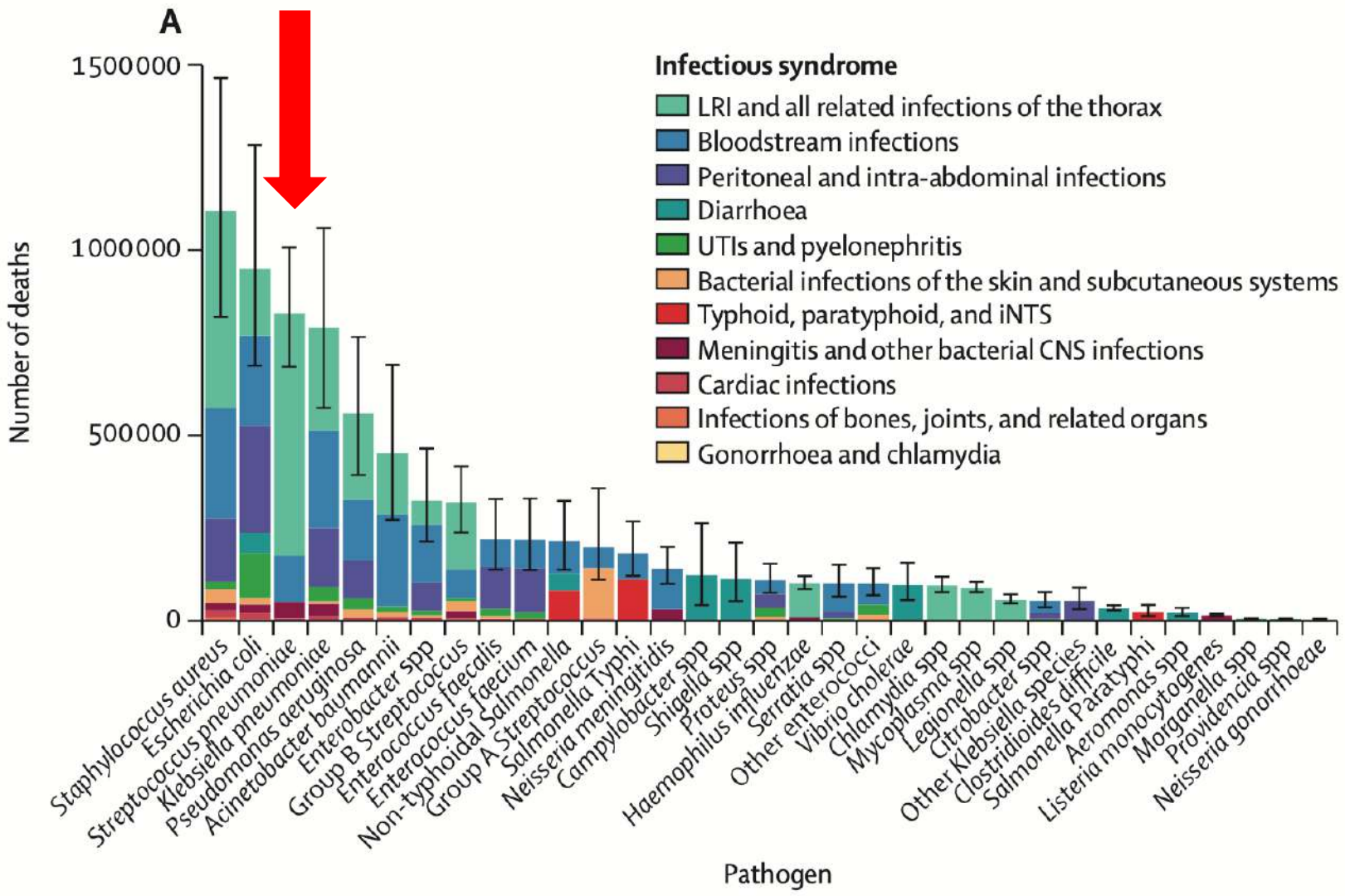
Adoración Navarro-Torné et al. Human Vaccines & Immunotherapeutics,2021

Alt solunum yolu infeksiyonları

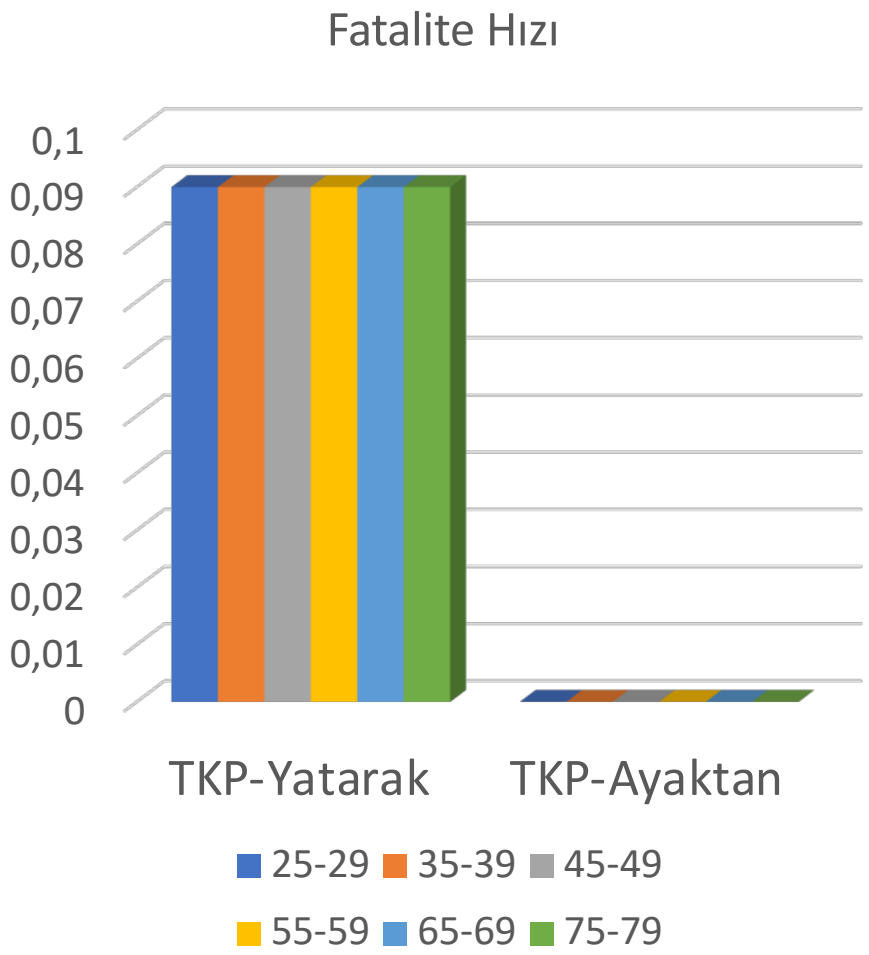
2019 yılında 13·7 milyon (95% 10·9–17·1) **infeksiyon ilişkili ölüm**

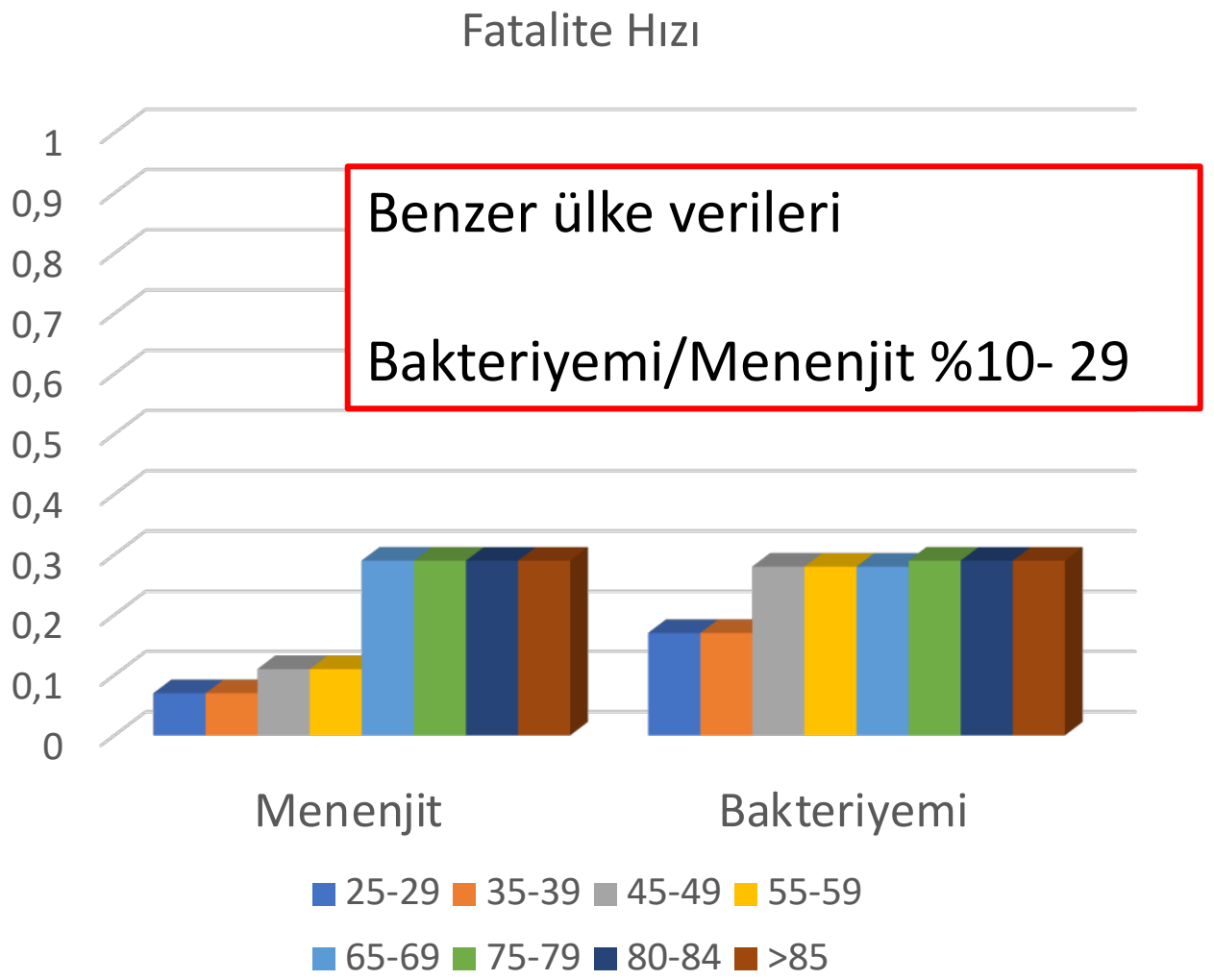
7·7milyon (5·7–10·2) ölüm

33 bakteri ile ilişkili



*GBD 2019 Antimicrobial Resistance Collaborators ,**Lancet** 2022*





J. P. Sevılla et Al. Human Vaccınes & Immunotherapeutıcs 2020

2011-2013 yılları ,retrospektif, çok merkezli çalışma (Türk toraks derneği veri tabanı)

Örneklem büyülüğü; 735

Sonlanımlar: Kısa ve uzun dönem mortalite

Mikrobiyolojik değerlendirme yok

Table 2 All-cause mortality of all patients ($N = 785$).

	N	%
30-Day	72	9.2
90-Day	132	16.8
1-Year	235	29.9
2-Year	296	37.7
3-Year	336	42.8
4-Year	453	57.7
5-Year	587	74.8

J. P. Sevılla Et Al. Human Vaccınes & Immunotherapeutıcs 2020

F.Tokgoz Akyil et al. Pulmonology.,2018

Pnömokokal hastalık ve yaşa göre fatalite hızı

İşveç, erişkin popülasyon, 2015-2019 Pnömoni, menenjit, septisemi (n=10391 epizod)

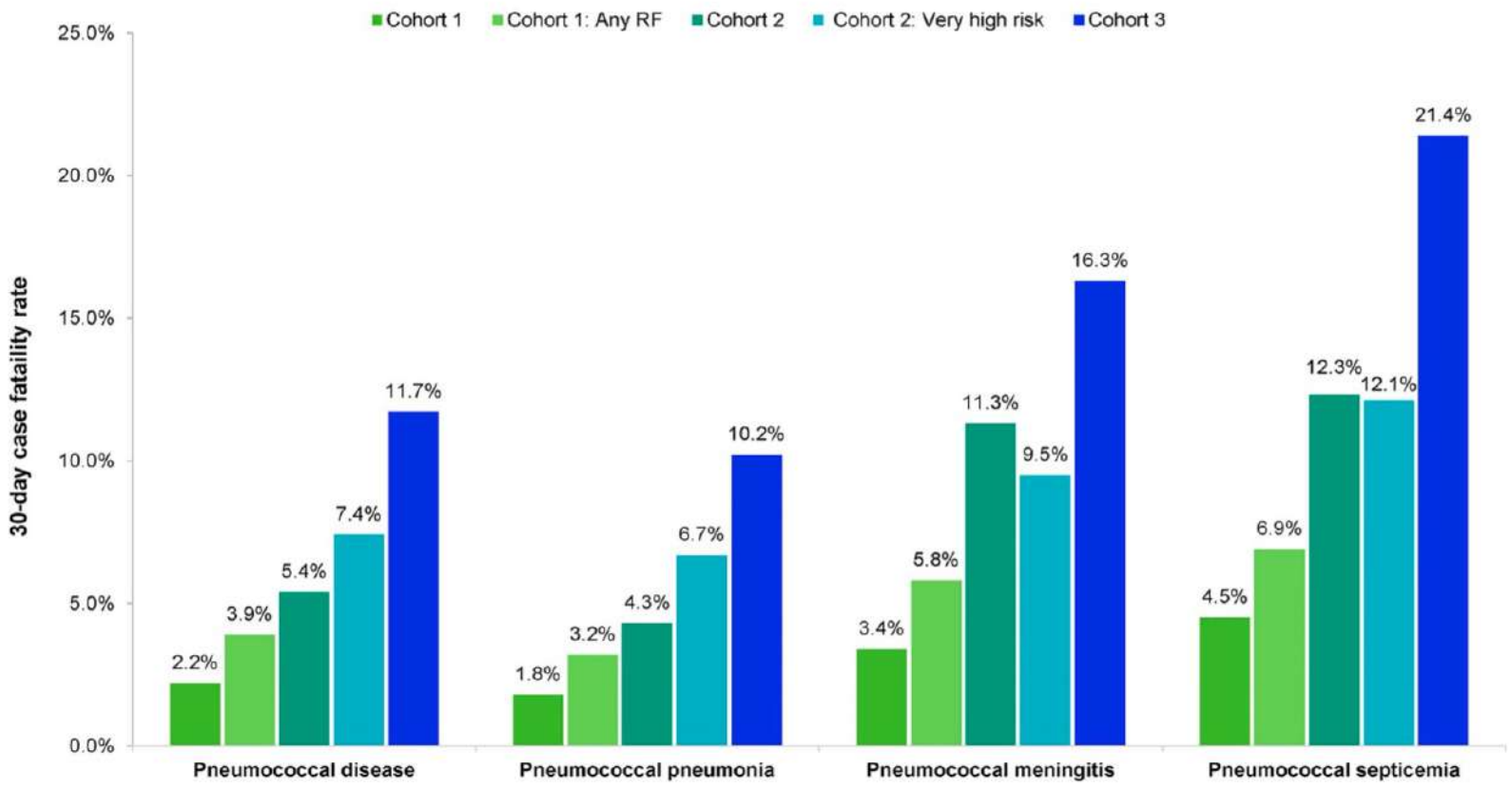


Fig 2. Average (all-cause) 30-day case fatality rate in 2015–2019, by clinical presentation and age cohort.

Kohort 3 : > 75 yaş

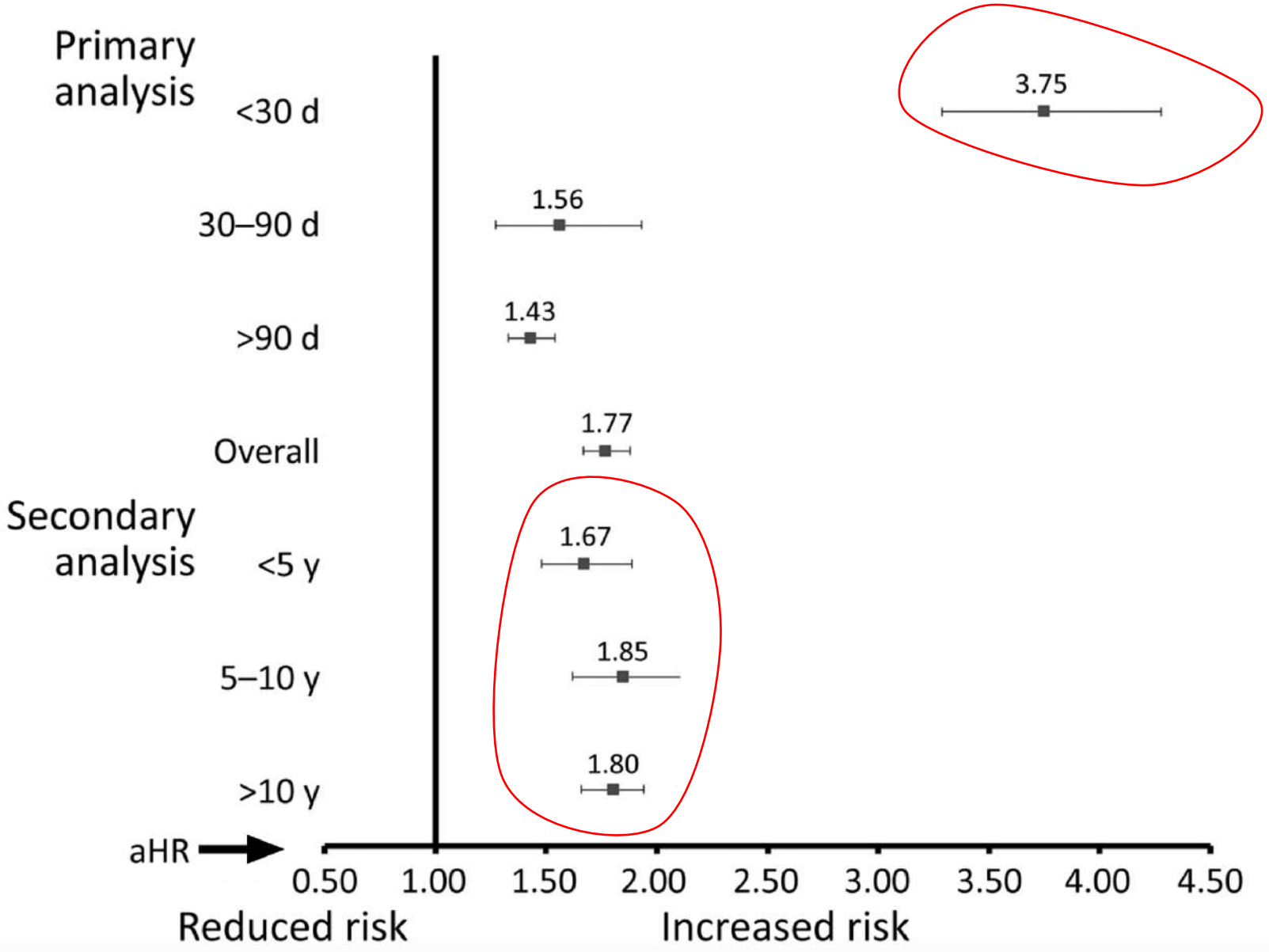
Kohort 2: 65-74 yaş

Kohort 1: 18-64 yaş

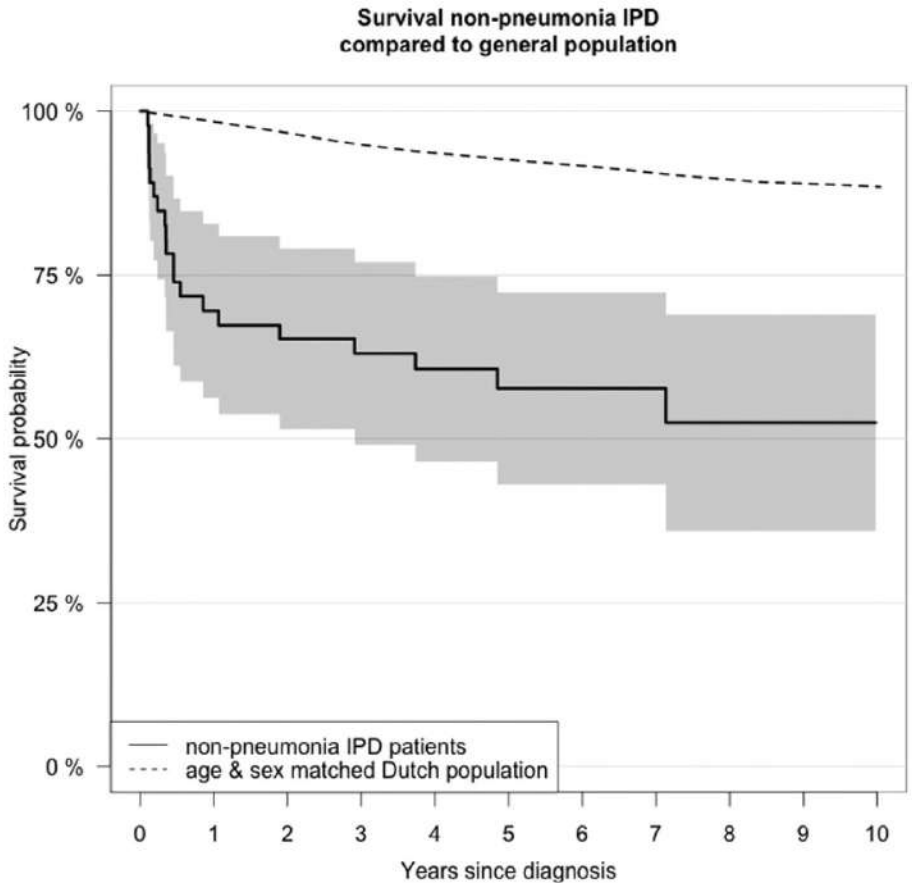
Natalie Zarab et al., PLOS ONE,2023

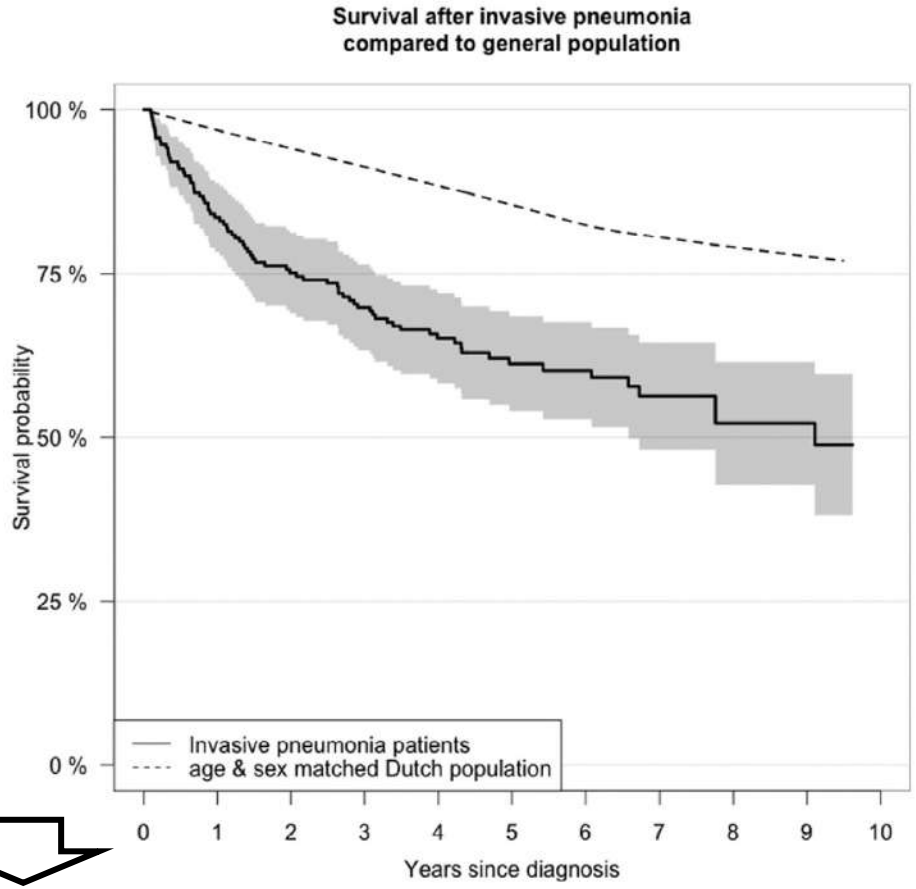
IPD sonrası erken ve geç dönem mortalite risk

Mortalite risk faktörleri açısından eşleştirme çabası



Kristen A. Versluys et al. Emerging Infectious Diseases,2022





Nedensellik ilişkisi ?

G.H.J. Wagenvoort et al. , Vaccine, 2017

Pnömokokal hastalıklarda hastane yatış yükü

Ortalama yatış sayısı:1.13-1.31

Ortalama yatış günü: 6.46-8.78 gün

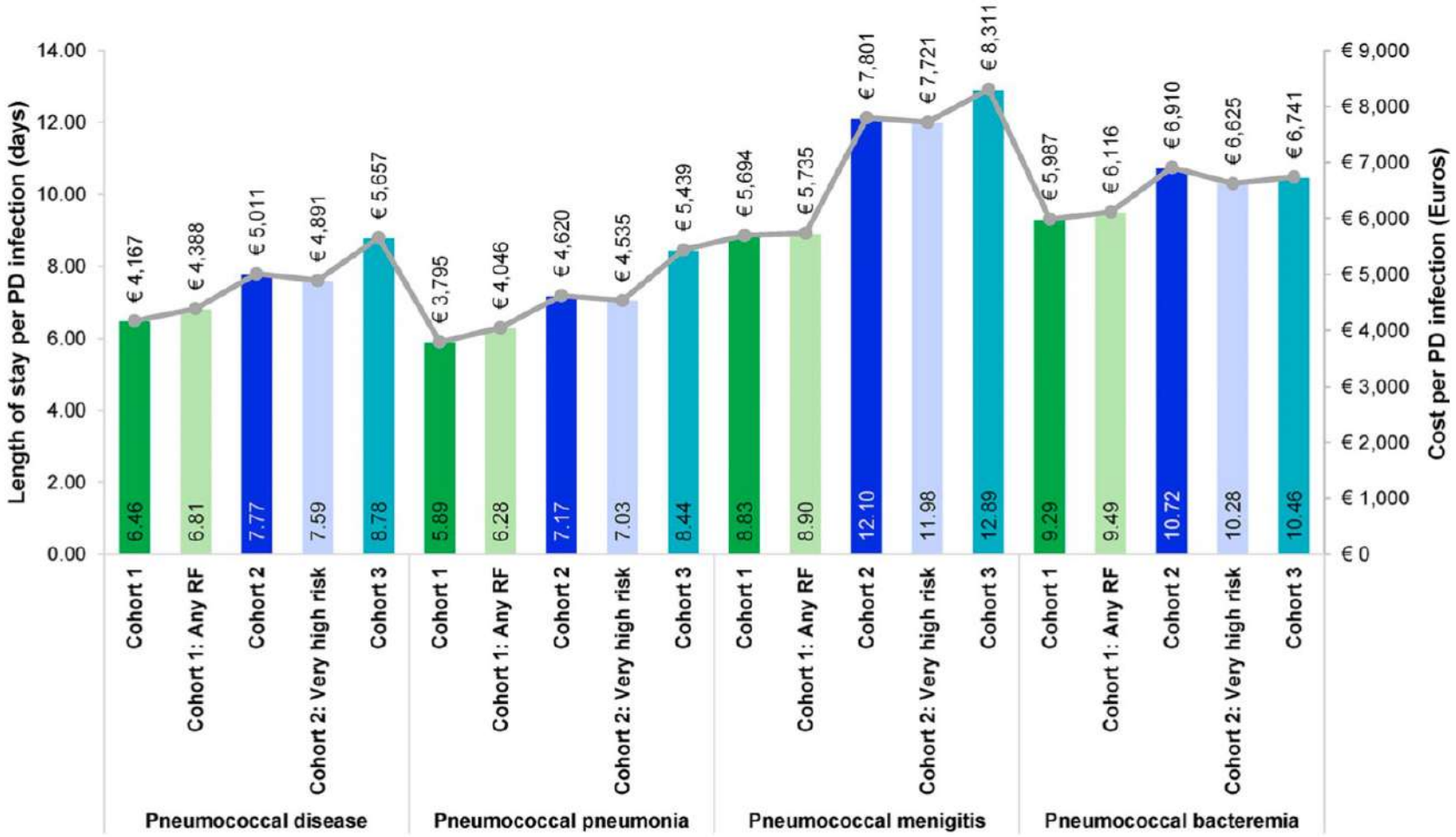
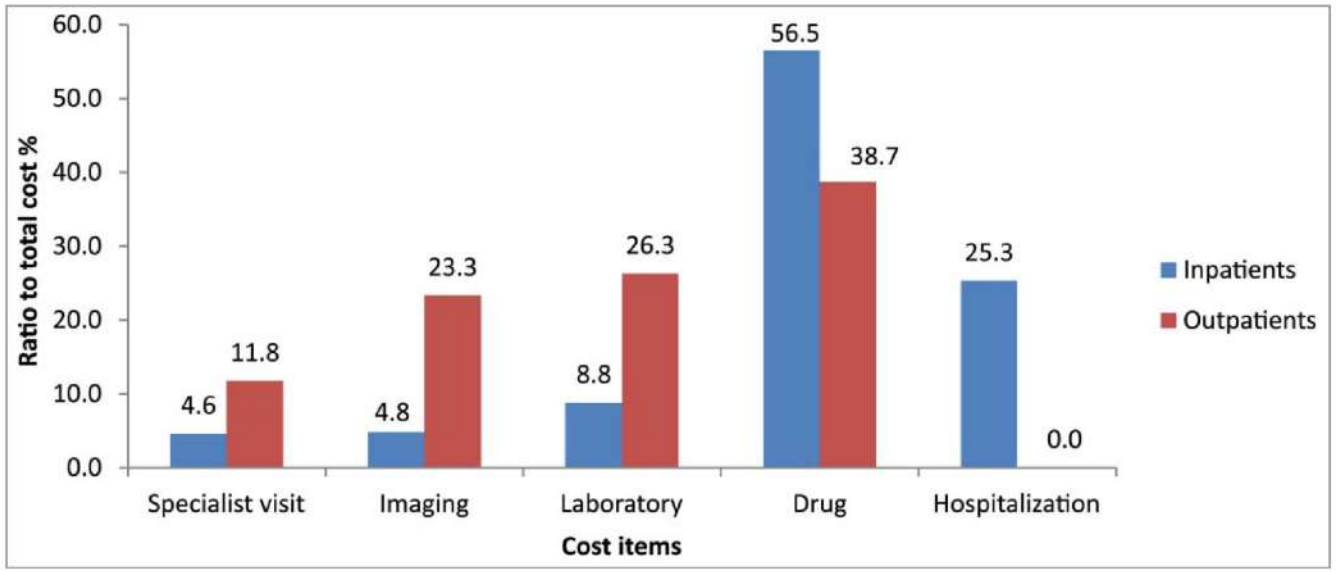


Fig 3. Average 30-day all-cause HCRU and costs per PD infection.

Natalie Zarab et al., PLOS ONE,2023

İstanbul 2 merkez, retrospektif çalışma, Yatarak (n=211) ve ayaktan (n=208) TKP olgularında maliyet karşılaştırılması

Aşı endikasyonu olan (<65 yaş üstü: %28.9-48.6, komorbidite: % 71.6-80.8), Aşısız hasta grubu (her grupta bir hasta aşılı)



Yatan hasta € 556.09 ± 1,004.77

Ayaktan hasta € 51.16 ± 40.92

Yaş, komorbidite, Hastane yatış (YB yatış, yatış süresi)

F. KOSAR ET AL. Human Vaccınes & Immunotherapeutıcs 2017

Pnömokokal pnömoni - Hastane yatış yükü

	PP	**Non-PP**	
CURB-65	2 (1-3)	1 (1-2)	0.002
Ayaktan takip	14 (23.7%)	118 (29.1%)	0.390
Yatarak takip	**45 (76.3)**	**287 (70.9%)**	
Klinik takip	34 (75.6%)	255 (89.8%)	0.007
YB takibi	**11 (24.4 %)**	**29 (10.2%)**	

E. Senol et al., Turk Thorac J 2021

Türkiye Çok merkezli, prospektif - kohort çalışma, Aşı sonrası 12 ay takip

Aşı sonrası **yoğun bakım dışı hospitalizasyon** (Pnömoni, COPD, Astım, malignite) ve **maliyet** (**Aşılı (n=400) ve Aşısız (n=400) yatan hasta (2018-2020 PCV-13)**

Her iki grup karşılaştırması komorbidite, COPD ve Kalp hastalığı aşılı grupta daha sık (p<0.001)

Table 2. Vaccination Status vs. Length of Stay and Cost

	Total (n = 800)		Unvaccinated (n = 400)		Vaccinated (n = 400)		*P*
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Cost	3781.8454	5673.1697	4231.6153	6805.4092	3332.0756	4210.8405	0.025
Length of stay	10.76	12.67	12.41	15.71	9.11	8.34	<0.001

Pnömokok aşılaması ile hastane yatış gününde 41.7 % ve maliyet 27.8% bir azalma

Veske S.N et al.Thorac Res Pract. 2023

Clinical Infectious Diseases

MAJOR ARTICLE

Impact of the 13-Valent Pneumococcal Conjugate Vaccine Among Adults: A Systematic Review and Meta-analysis

Nirma Khatri Vadlamudi, Anna Chen, and Fawziah Marra

Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, Canada

Meta-analiz, n=2 033 961

Çocukluk dönemi PVC13 uygulanması IPD, non-invaziv PD, hastane yatış ve meortalite üzerine etkisi

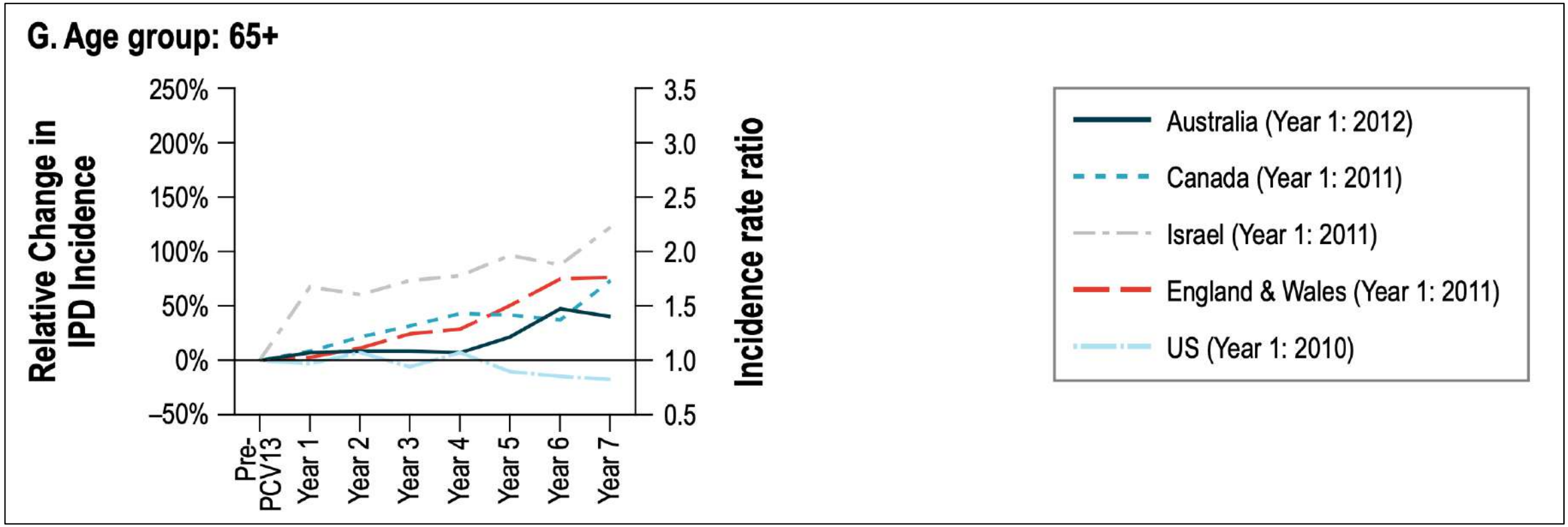
<65 yaş, ≥65 yaş

	<65 yaş, IRR	**≥65 yaş, IRR**
IPD	0.78 (0.72–0.85)	0.86 (0.81–0.91)
IPD, PCV7 serotipleri	0.49 (0.39-0.63)	0.39 (0.29-0.51)
IPD, PCV13 serotipleri	0.59 (0.49-0.69)	0.61 (0.52-0.71)
IPD, Aşı dışı serotipler	**1.04 (0.95-1.14)**	**1.20 (1.21-1.29)**
Mortalite	0.68 (0.56-0.83)	0.71 (0.54-0.93)

Australya, US, İngiltere, İsrail, Kanada

Çoçukluk çağı aşılama programına 2010-2018 yılları arasında PCV13

Farklı yaş gruplarında IPD insidans değişimleri



Pertrizet et al.Infect Dis Ther (2023)

Aşı serotip dağılımları

	Pneumococcal Serotype																							
Vaccine	**1**	**3**	**4**	**5**	**6A**	**6B**	**7F**	**9V**	**14**	**18C**	**19A**	**19F**	**23F**	**22F**	**33F**	**8**	**10A**	**11A**	**12F**	**15B**	**2**	**9N**	**17F**	**20**	**15C**	**6C**
PCV13	●	●	●	●	●	●	●	●	●	●	●	●	●													●
PCV15	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											●
PCV20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						●
PPV23	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		

Moore et al. *Lancet Infect Dis* 2017

Oligbu et al. *Clin Infect Dis* 2017

Hausdorff & Hanage. *Hum Vacc Immunother* 2016

Andrews N et al. *Vaccine.* 2019;37(32):4491-4498.

PCV10-13 aşılaması ile IPD insidansında % 22-49 düşüş

IPD insidansında % 17-19 artış

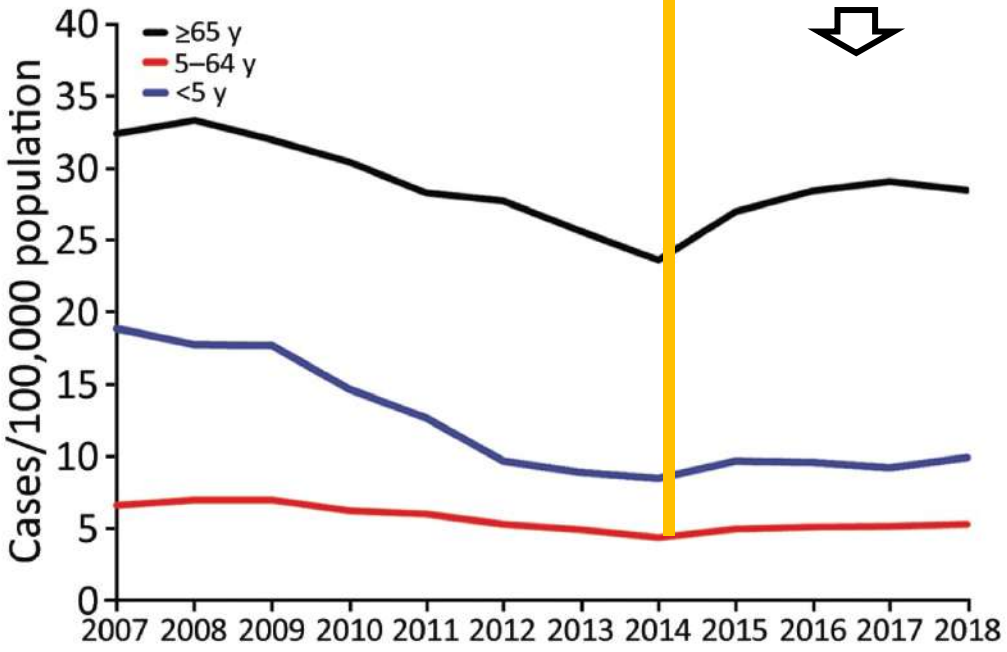
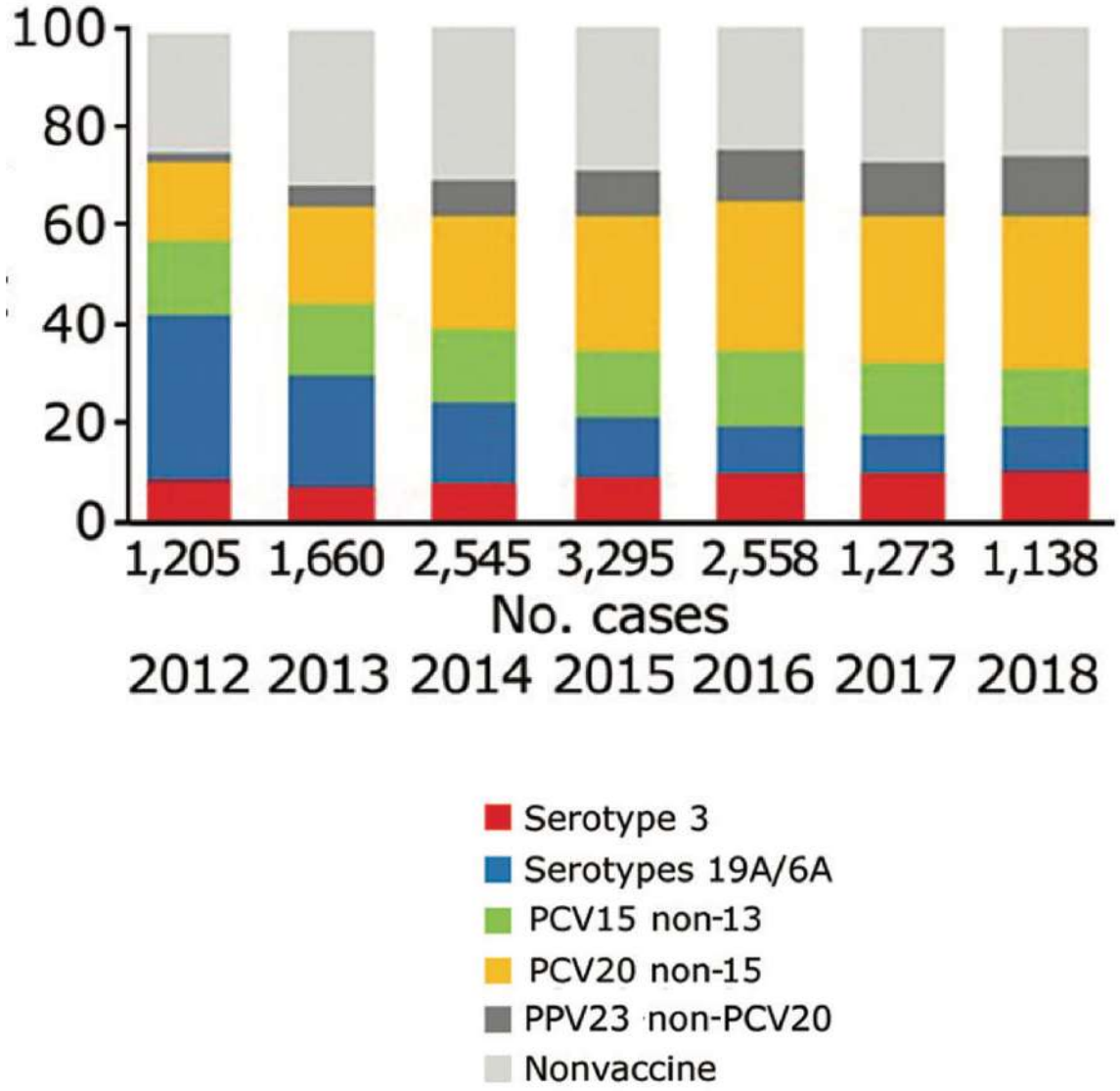


Figure 1. Overall incidence rates of invasive pneumococcal disease (pooled) per year, by age group in 13 SpIDnet (*Streptococcus pneumoniae* Invasive Disease network) sites, Europe.



Germaine Hanquet, Pavla Krizova et al.Emerging Infectious Diseases,2022

microorganisms

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Review

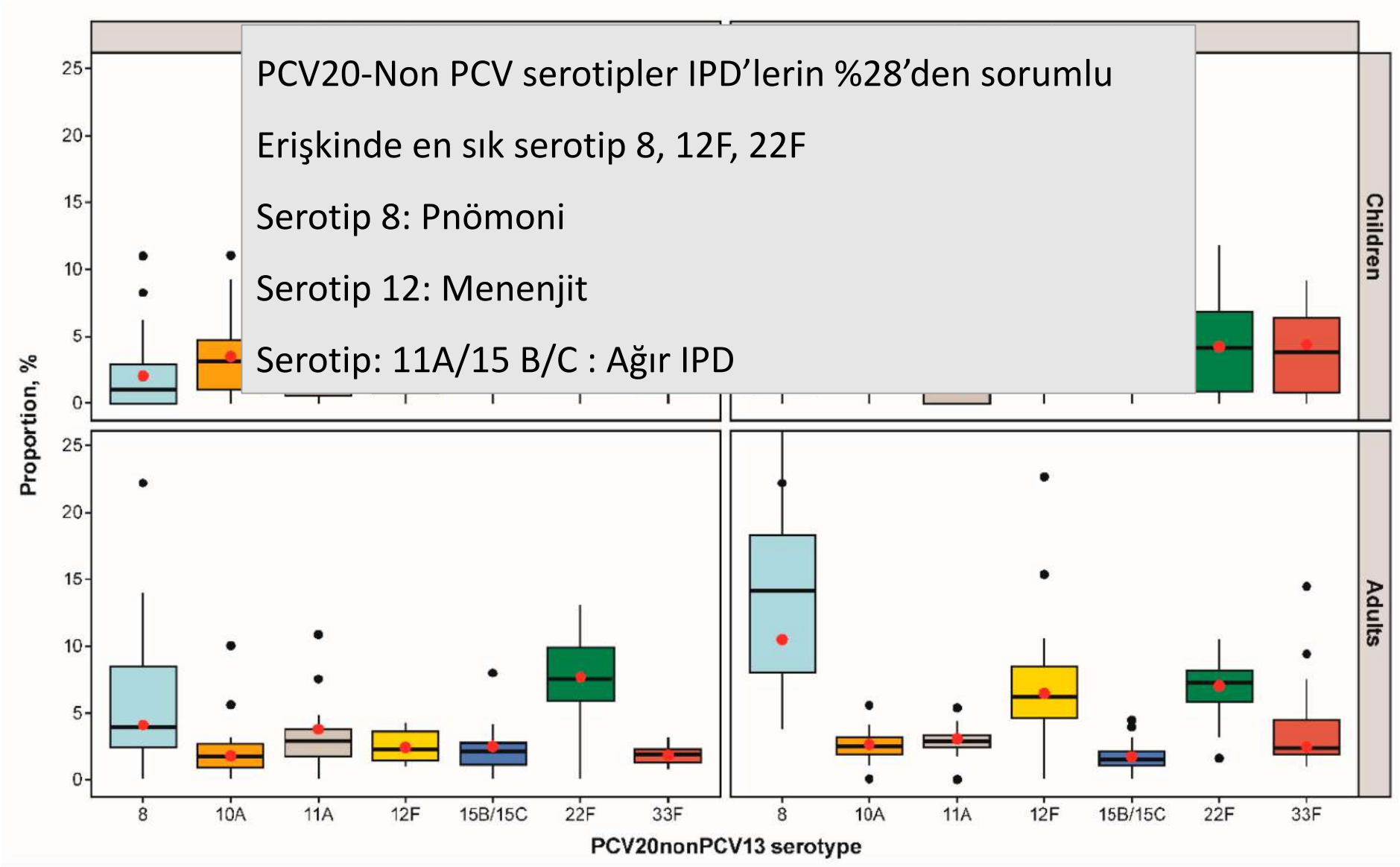
Systematic Literature Review of the Epidemiological Characteristics of Pneumococcal Disease Caused by the Additional Serotypes Covered by the 20-Valent Pneumococcal Conjugate Vaccine

Estelle Méroc [1], Mark A. Fletcher [2], Germaine Hanquet [1], Mary P. E. Slack [3], Marc Baay [1], Kyla Hayford [4], Bradford D. Gessner [4] and Lindsay R. Grant [4,*]

Meta analiz-127 çalışmanın meta-analizi

2010-2020

Age Group	Sampling Site and Clinical Presentation	Proportion All PCV20nonPCV13 [1]		Proportion All PCV20nonPCV15 [1]	
		n, Studies (Isolates)	Mean (Min–Max)	n, Studies (Isolates)	Mean (Min–Max)
Adults		20 (44,349)		23 (49,699)	
	Sterile site: IPD overall	16 (42,323)	27.5 (8.9–55.4)	18 (47,505)	19.7 (8.0–37.3)
	IPD, presentation specified:				
	Pneumococcal bacteremia	1 (101)	26.7	1 (101)	22.7
	Pneumococcal meningitis	1 (98)	27.5	2 (375)	25.7 (20.4–31.0)
	Bacteremic pneumococcal pneumonia	3 (1071)	23.1 (19.9–28.1)	4 (5976)	17.1 (14.6–23.3)
	Other IPD [2]	1 (51)	25.5	1 (51)	23.5
	IPD, presentation unspecified [3]	13 (41,002)	28.6 (8.9–55.4)	13 (41,002)	19.6 (8.0–37.3)
	Non-sterile site: Non-IPD overall	2 (312)	15.8 (9.5–22.0)	2 (312)	10.8 (5.7–15.8)
	Non-IPD, presentation specified	2 (312)	15.8 (9.5–22.0)	2 (312)	10.8 (5.7–15.8)
	Undifferentiated site	3 (1714)	14.6 (8.7–23.9)	4 (1882)	8.0 (4.8–17.5)
	All pneumococcal pneumonia	3 (1714)	14.6 (8.7–23.9)	4 (1882)	8.0 (4.8–17.5)



Estelle Méroc et al. *Microorganisms* 2023

Fatalite oranları: +: ≤ 2 %, ++: 3-5 %, +++ 6-8 %, ++++: > 8%

Population	Epidemiological Characteristic (Cause of)	Serotype						
		8	10A	11A	12F	15B/C	22F	33F
Children	IPD [1,2]	++	++	+	++	+++	++	++
	Pneumococcal meningitis [2,3]	+++	++	+	++	++++	+++	++
	Bacteremic pneumococcal pneumonia [2,3]	++	++	+	++	++	+	++
	Non-IPD [2,3]	+	+++	+	+	++++	nr	+
	Pneumococcal AOM [2,3]	+	+++	+++	+	++++	++	+
Adults	IPD [1]	++++	+	+	+++	+	+++	+
	Pneumococcal meningitis [3]	+++	++	++	++++	+	++	+
	Bacteremic pneumococcal pneumonia [3]	++++	+	+	+++	+	++	+
	Non-IPD [3]	+	+	+	+	+	+	+
Children	Death due to IPD [4]	+	++++	++	++	++++	+++	++
Adults	Death due to IPD [5]	++	+++	++++	++	++++	++	+++
All Ages	Penicillin non-susceptible IPD or Non-IPD [6]	+	+	+	+	++	+	+
	Macrolide non-susceptible IPD or Non-IPD [6]	++	+++	+++	nr	++++	+++	++++

Estelle Méroc et al. *Microorganisms* 2023

Türkiye'de < 5 yaş altı çocuklarda (PVC 13 ile aşılı) (N=580 Sağlıklı)

Pnömokok taşıyıcılık: 17.8 %

72.8 % aşı dışı seroptipler

En sık saptanan serotipler;

Serotip 15B (9.7%)

Serotip 23F (8.7%),

Serotip 23A (8.7%)

Serotip 11A (6.7%)

Serotip 19F (4.8%)

Serotip 15F (4.8%)

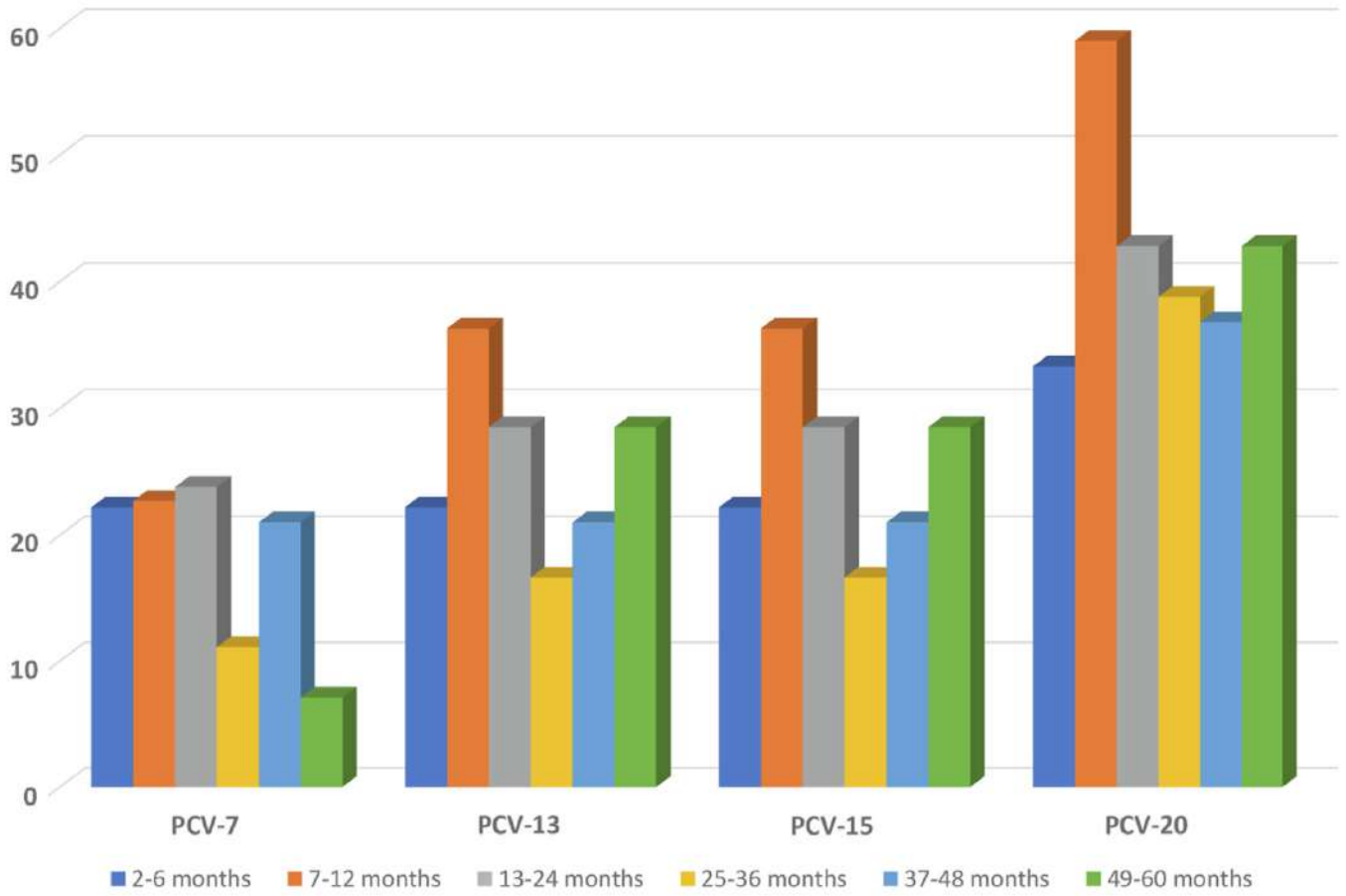
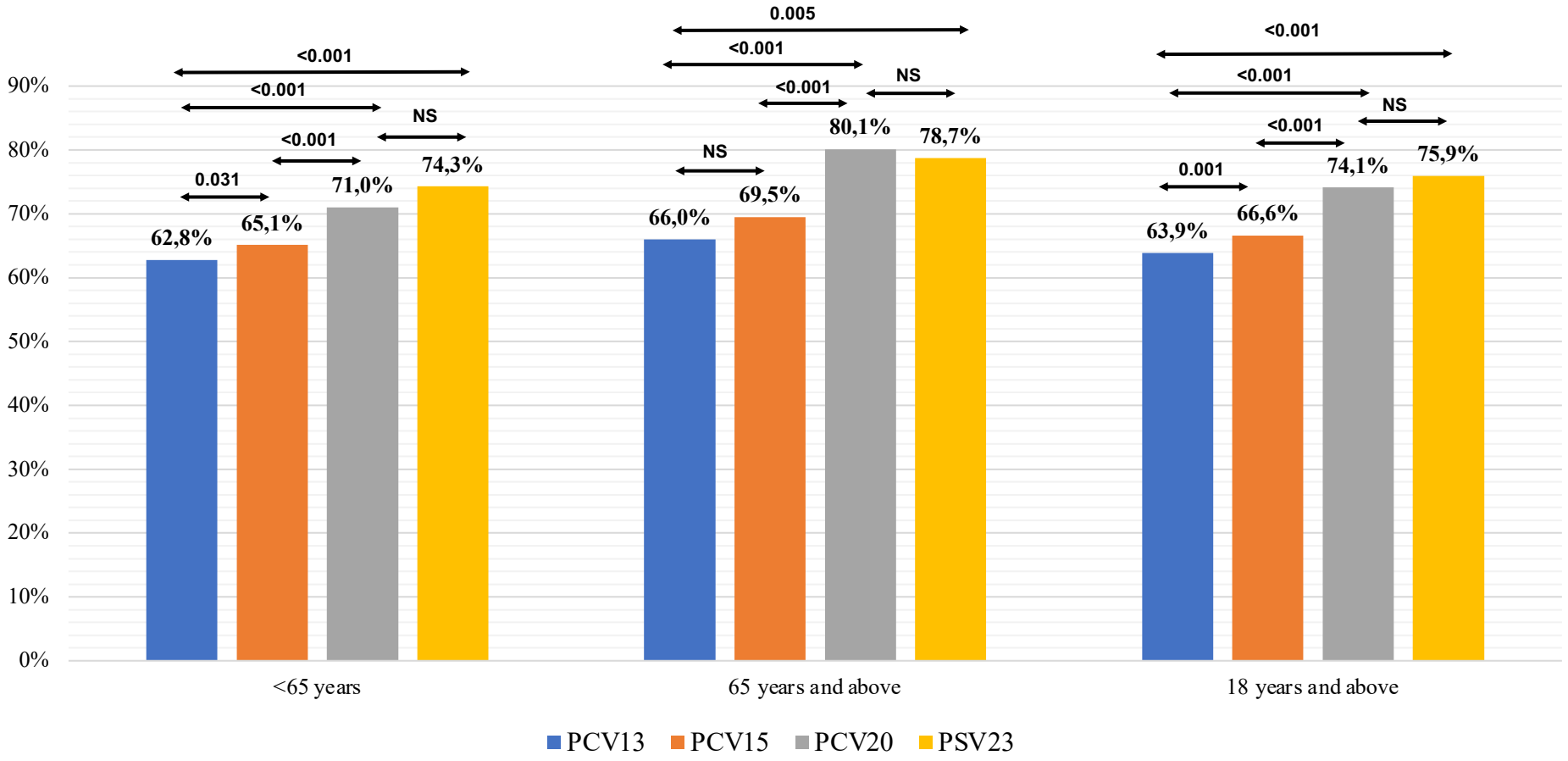


Fig. 1. Pneumococcal vaccine serotype coverage percentages according to age groups of the participants.

M. Ceyhan, E. Karadag-Oncel, G. Hascelik et al. ,Vaccine,2021

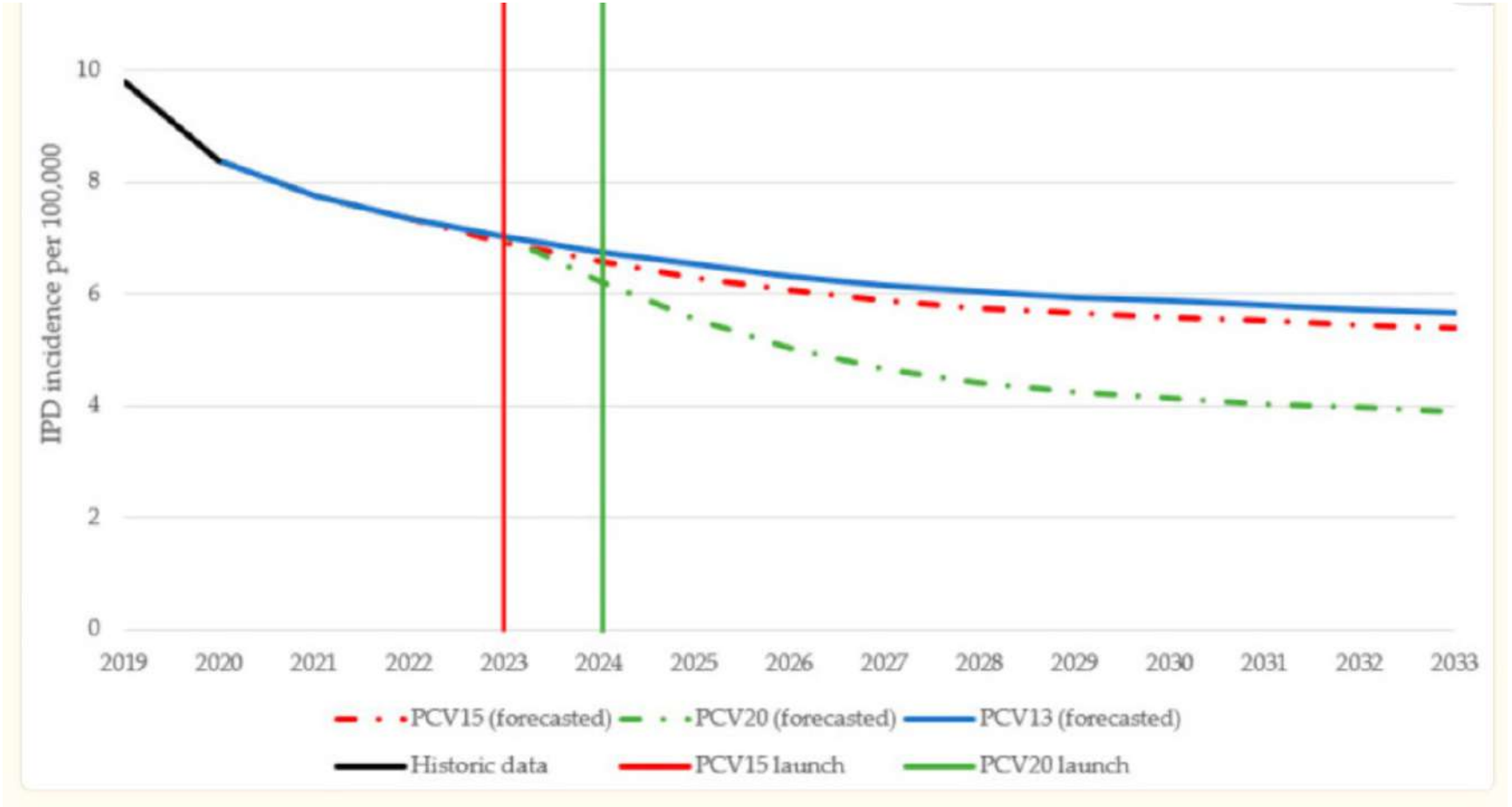
Pasif sürveyans çalışması, 2015-2018 yılları, Erişkin hastalar

Pnömoni, bakteriyemi, menenjit, plörit ve peritonitli hasta (≥ 18 yaş örneklerinden izole edilen *S. pneumoniae (n=410)*



G. Hascelık Et Al. Annals Of Medıcıne,2023

Yunanistan, Farklı pnökokok aşı stratejileri <2 yaş altı IPD insidansına olası etkisi



Sophie Warren et al. *Vaccines* 2023

Vaccine 41 (2023) 5342–5349

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Cost-utility analysis of the use of the 20-valent anti-pneumococcal vaccine (PCV20) in adults older than 60 years in Spain

David Cantarero [a], Daniel Ocaña [b], María Ángeles Onieva-García [c], Juan Rodríguez-García [d], Paulina Gálvez [e], Cristina Méndez [e], Carlos Crespo [f,g,*], Alejandra López-Ibáñez de Aldecoa [h]

Table 6
Base case analysis results (Cohort).

Strategy	Cost(€M)	QALYs (in thousands)	Δcost(€M)	ΔQALYs (in thousands)	ICER (€)
PCV20	4,775	63,951.6	−85.7	+5.9	Dominant (-14,605)
PCV15 + PPSV23	4,861	63,945.7	–	–	–

ICER: incremental cost-effectiveness ratio; LY: life years; QALY: quality-adjusted life years; PCV15: Pneumococcal conjugate vaccine 15-valent; PCV20: pneumococcal conjugate vaccine 20-valent; PPSV23: Pneumococcal polysaccharide vaccine 23-valent.

PCV20 aşılaması ile 2.161 IPD vakasını, 19.470 Non-bakteriyemik PP vakasını ve 3.396 ölümü önlecek

D. Cantarero et al. Vaccine , 2023

vaccines

MDPI

Article

Cost-Effectiveness of Vaccination with the 20-Valent Pneumococcal Conjugate Vaccine in the Italian Adult Population

Barbara Polistena [1], Giancarlo Icardi [2], Andrea Orsi [2], Federico Spandonaro [3,*], Roberto Di Virgilio [4] and Daniela d'Angela [1]

Vaccine	PCV13	PCV15	PCV20	PCV20 vs. PCV13	PCV20 vs. PCV15
		Disease cases			
Bacteraemia (excluding meningitis)	4982	4751	3811	−1171	−940
Meningitis	965	921	738	−227	−183
Hospitalised NBP cases	771,594	770,098	761,748	−9845	−8350
Non-hospitalised NBP cases	1,651,431	1,648,231	1,630,373	−21,058	−17,858
		Outcomes			
Deaths (from IPD and NBP)	99,715	99,516	98,506	−1208	−1009
Life years (LY) (×1000)	75,044.2	75,042.2	75,050.7	+6.6	+5.5
QALY (×1.000)	52,687.2	52,688.0	52,692.0	+4.7	+4.0
		Costs			
Vaccination costs (× EUR 1000)	EUR 448,495	EUR 448,495	EUR 489,063	EUR +40,568	EUR +40,568
Other health costs (× EUR 1000)	EUR 2,523,553	EUR 2,515,726	EUR 2,475,52	EUR −48,032	EUR −40,205
Total health costs (× EUR 1000)	EUR 2,972,047	EUR 2,964,220	EUR 2,964,58	EUR −7464	EUR −0.364

Barbara Polistena et al. *Vaccines* 2022