Savings associated with an intervention aimed at reducing unnecessary antibiotic prescriptions in general practices – an upscaling analysis at the European level

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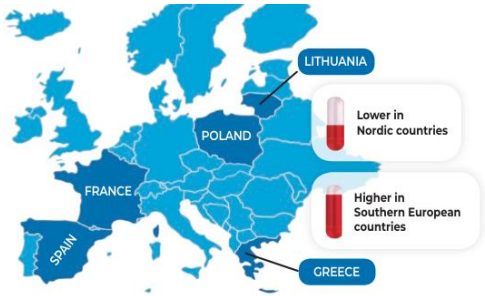
26 June 2024

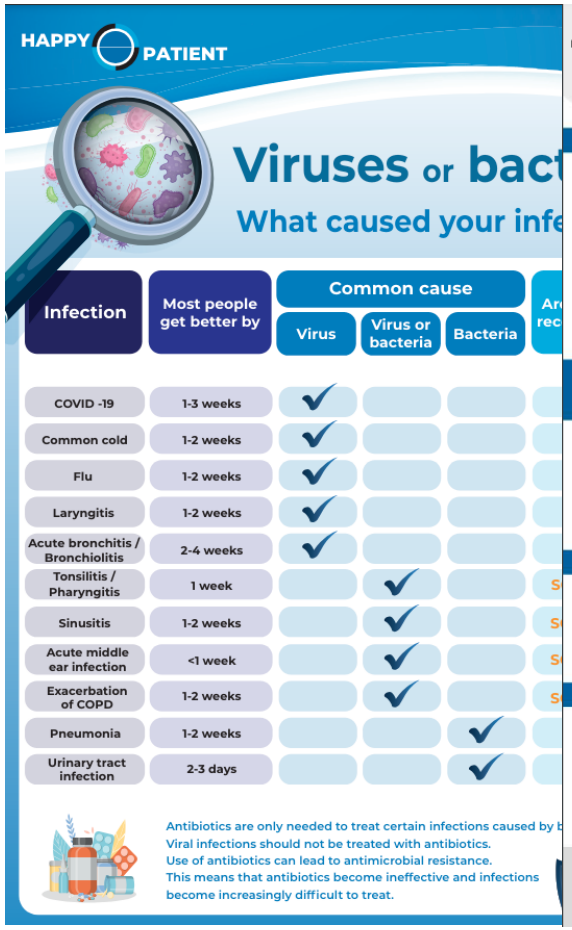
Co-funded by
the Health Programme
of the European Union

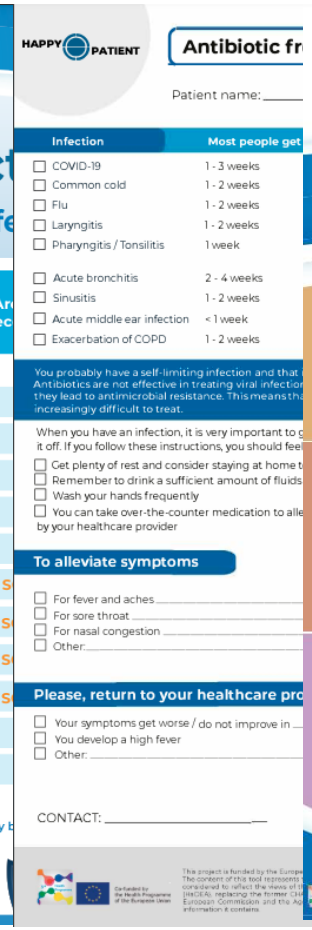
HAPPY PATIENT is…

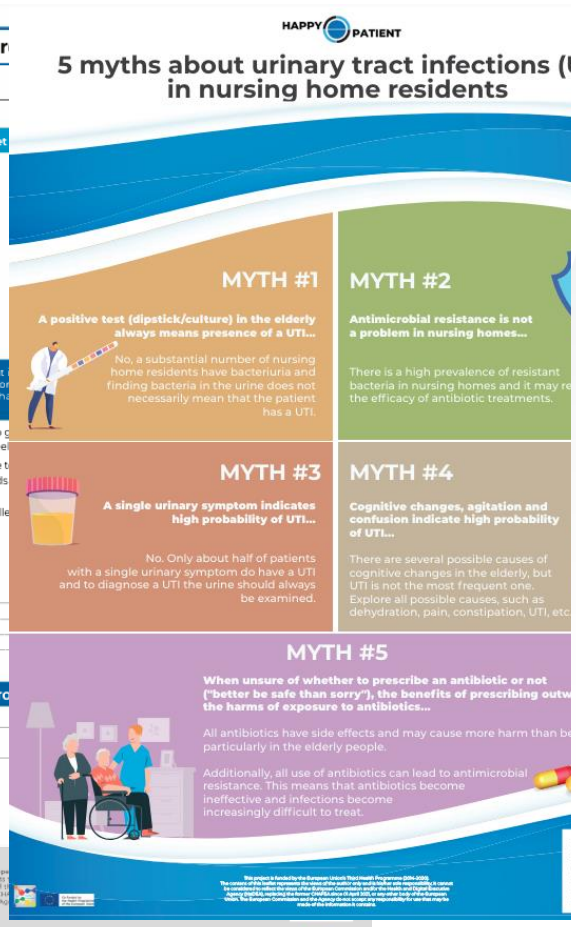
- EU-funded project
- Aimed at **improving antibiotic (ATB) prescribing** and dispensing
- Using a **before-and-after study** to analyse and implement
- A **multifaceted intervention** on healthcare professionals
  - Reviewing and discussing feedback on the first registration's results, enhancing communication skills, and providing communication tools
- In 4 primary care settings:
  - **General practices (GP)**, out-of-hours (OOH), nursing homes (NH) and pharmacies (CP)
- In **five countries:**
  - France, Greece, Lithuania, Poland and Spain

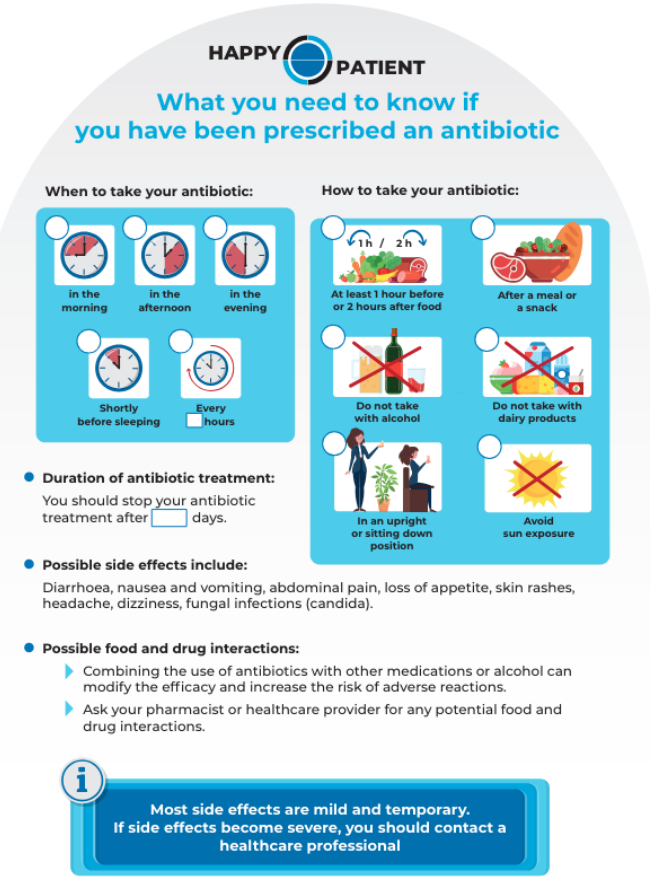


Examples of communication tools





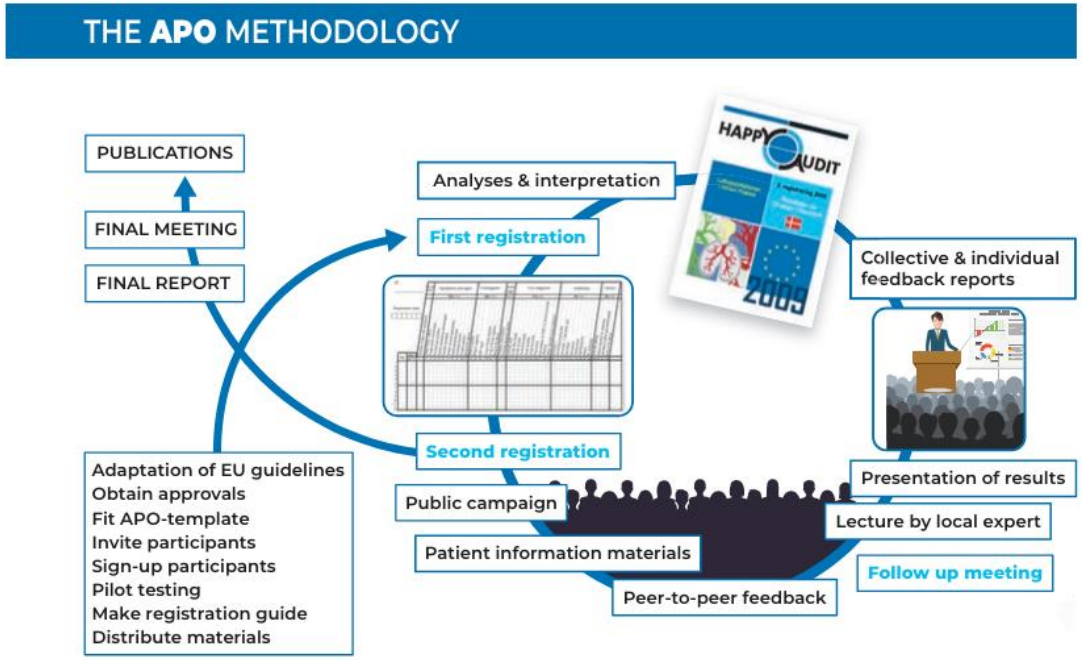


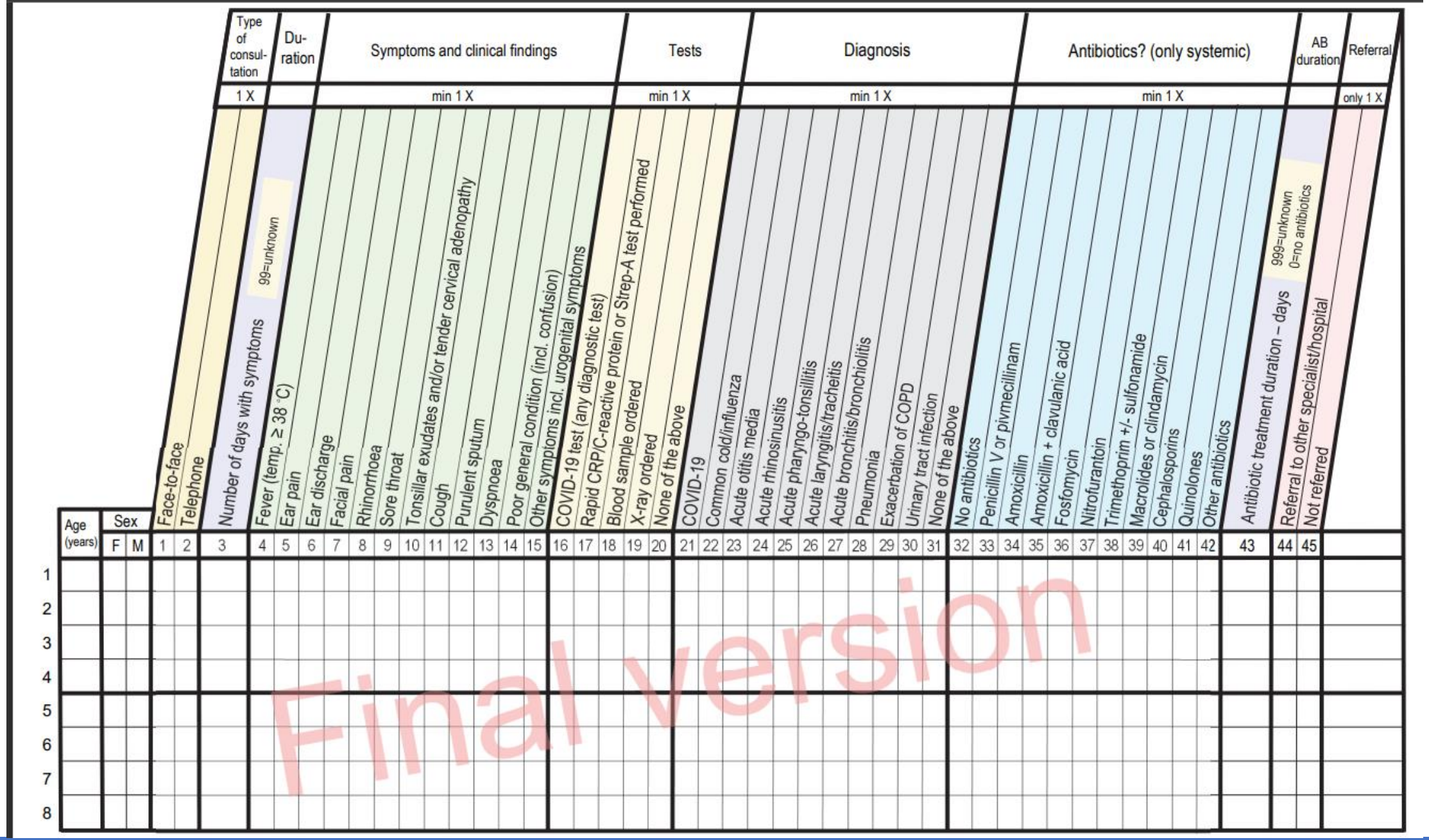


https://happypatient.eu/outcomes/happy-patient-communication-tools/

APO methodology

- First audit from February to April 2022 (1st registration)
- Second audit from February to April 2023 (2nd registration).
- At each audit, HCPs were instructed to register, in each specific APO chart, all contacts for suspected infections in the case of GP and OoH, and all ATB prescribed or dispensed, respectively, in NH and CP.





ANTIBIOTIC APROPRIATENESS IN GENERAL PRACTICE

AB PRESCRIPTION

UTI

NATIONAL 1st-LINE AB

Spain: Fosfomycin / Nitrofurantoin

France: Fosfomycin /

Greece: Nitrofurantoin / Fosfomycin / Trimethoprim+ sulfamethoxazole

Poland: Nitrofurantoin / Fosfomycin / Trimethoprim+ sulfamethoxazole

Lithuania: Nitrofurantoin / Fosfomycin

AB INAPPROPRIATE

If the above are not fulfilled

PNEUMONIA

(Cough OR Dyspnoea) AND (Fever OR Poor general condition)

NATIONAL 1st-LINE AB

Spain: Amoxicillin (<65 yr.) / Amoxicillin+clavulanic (≥65 yr.)

France: Amoxicillin (<65 yr.) / Amoxicillin+clavulanic (≥65 yr.)

Greece: Amoxicillin / macrolide

Poland: Amoxicillin / Amoxicillin+ clavulanic

Lithuania: Amoxicillin / Penicillin V

AB INAPPROPRIATE

If the above are not fulfilled

ACUTE PHARYNGO-TONSILLITIS

Sore throat AND

(AT LEAST TWO OF Fever, NO Cough, Tonsillar exudates and/or tender cervical adenopathy) OR

ONLY Tonsillar exudates and/or tender cervical adenopathy OR Poor general condition)

STREP A PERFORMED IF AVAILABLE (in Lithuania usage is only for children at specific age in other countries the participant may have informed to have Strep A available)

NATIONAL 1st-LINE AB

Spain: Penicillin V

France: Amoxicillin

Greece: Penicillin V

Poland: Penicillin V

Lithuania: Penicillin V

AB INAPPROPRIATE

If the above are not fulfilled

ACUTE RHINOSINUSITIS

Facial pain AND Fever AND (Number of days with symptoms >=10 OR Poor general condition)

NATIONAL 1st-LINE AB

Spain: Amoxicillin

France: Amoxicillin / Amoxicillin+clavulanic

Greece: Amoxicillin / Amoxicillin+clavulanic

Poland: Amoxicillin

Lithuania: Penicillin V

AB INAPPROPRIATE

If the above are not fulfilled

COPD EXACERBATION

Purulent sputum

NATIONAL 1st-LINE AB

Spain: Amoxicillin+clavulanic acid

France: Amoxicillin / Amoxicillin+clavulanic / Other ATB

Greece: Amoxicillin+clavulanic / Macrolide / Cephalosporin

Poland: Macrolides / Amoxicillin+clavulanic

Lithuania: Amoxicillin / amoxicillin+clavulanic

AB INAPPROPRIATE

If the above are not fulfilled

ACUTE OTITIS MEDIA

FOR CHILDREN < 2 YEARS:

Ear pain AND ((Fever OR Ear discharge) AND Number of days with symptoms >=3) OR Poor general condition

FOR PATIENTS >= 2 YEARS:

Ear pain AND (Fever OR Ear discharge) AND (Number of days with symptoms > =3)

NATIONAL 1st-LINE AB

Spain: Amoxicillin

France: Amoxicillin

Greece: Amoxicillin / amoxicillin+clavulanic

Poland: Amoxicillin

Lithuania: Penicillin V / Amoxicillin

AB INAPPROPRIATE

If the above are not fulfilled

AB INAPPROPRIATE if

COVID-19

COMMON COLD/INFLUENZA

ACUTE BRONCHITIS

ACUTE TRACHEITIS

HAPPY PATIENT

Effectiveness of interventions

Country	Potentially unecessary ATB prescribing (QI 1)**					
	Before		After		IE***	p-value*
	n	%	n	%	%	
France	117	65.8	152	55.3	-16.0%	0.080
Greece	189	70.4	254	71.3	1.3%	0.839
Lithuania	204	75.0	268	60.1	-19.9%*	0.001
Poland	361	75.9	344	72.1	-5.0%	0.249
Spain	203	68.5	277	61.4	-10.4%	0.109
Total	1,074	72.2	1,295	65.2	-9.7%*	0.000

*Chi-square p value statistically significant (p value <0.05)

**Excluding UTIs

Upscaling

- What would be the **impact** of implementing HAPPY PATIENT interventions at the EU level?
  - How much would it cost?
  - How many potentially unnecessary ATB prescriptions would be avoided?
  - How much would it save?

Upscaling at the EU - Methods

- We estimate the **impact at the country level** for **each target country (TC)** and **for each EU-27 country** (except Cyprus and Malta due to lack of data)
    1. How much would it cost to implement HP interventions in GPs at the country-level?
    2. How many potentially unnecessary ATB would be avoided at the country-level?
    3. How much could be saved due to reductions in potentially unnecessary ATB at the country-level?

Upscaling at the EU - Methods

1. How much would it cost to implement HP interventions in GPs at the country-level?

- Types of costs considered:
  - **Fixed costs** – costs of developing/adapting the interventions

  → Independent of the number of professionals
  - **Fixed by blocks costs** – costs of delivering the interventions to GPs

  → Depends on the size of the groups of GPs receiving the interventions
  - **Variable costs** – costs of performing the interventions

  → GP-specific costs, e.g., filling in the APO chart
- We estimate the **intervention cost per GP**, and based on the **number of GPs** in each country, the **intervention cost at the country-level**
- Several **assumptions** required. Some:
  - Size of the groups (e.g., intervention meetings organised for up to 75 GPs)
  - % of GPs receiving and performing interventions (70%)
  - Missing data: use mean value across countries with available data

Upscaling at the EU - Methods

2. How many potentially unnecessary ATB would be avoided at the country-level?

- Steps:
  - **Number of ATB prescribed** by GPs annually in each country – Data from ESAC-Net
  - **% potentially unnecessary** – Mean data from first APO in 5 TC
  - **% reduction** in potentially unnecessary prescription. Two scenarios:
    - **Realistic scenario**: using the mean result across the 5 TCs in HP (~10% reduction)
    - **Optimistic scenario**: using the best result from a TC in HP (~20% reduction in Lithuania)

Upscaling at the EU - Methods

3. How much could be saved due to reductions in potentially unnecessary ATB at the country-level?

- Assigned a mean cost per ATB prescription including:
  - Costs associated with **ATB consumption**
  - Costs associated with **adverse events (AE)** due to ATB
  - Costs associated with **AMR**
- Total net savings calculated based on:

(Country population ∗ ATB_prescription rate ∗ % potentially unnecessary ∗ % reduction in potentially unnecessary prescriptions ∗ mean cost per ATB prescription) – (Mean intervention cost per GP * number of GPs)

Upscaling at the EU - Results

1. **How much would it cost to implement HP interventions in GPs at the country-level?**
   - Intervention cost per GP
     - ~400€ per GP (most are variable/fixed by blocks costs)
   - Number of GPs
     - ~4 doctors per 1000 people
     - ~21% are GPs

Country	Intervention cost
France	29,085,411 €
Greece	1,377,262 €
Lithuania	1,083,726 €
Poland	3,942,087 €
Spain	17,509,709 €
TOTAL HP	**52,998,195 €**
Austria	2,679,086 €
Belgium	5,695,008 €
Bulgaria	1,577,797 €
Croatia	921,220 €
Czechia	3,060,019 €
Denmark	1,883,234 €
Estonia	380,737 €
Finland	3,078,987 €
Germany	24,145,972 €
Hungary	1,549,059 €
Ireland	1,718,051 €
Italy	16,086,255 €
Latvia	584,763 €
Luxembourg	232,573 €
Netherlands	6,482,586 €
Portugal	11,304,003 €
Romania	4,936,873 €
Slovakia	1,688,328 €
Slovenia	517,866 €
Sweden	2,537,405 €
TOTAL EU	**144,058,017 €**

Upscaling at the EU - Results

2. How many potentially unnecessary ATB would be avoided at the country-level?

- ATB prescription at community
  - Mean of ~14 DDD per 1000 people per day
  - Mean ATB treatment duration ~7 days (based on HP)
- % prescribed at GPs
  - ~96,4% (based on literature)
- % potentially unnecessary
  - ~72% (based on 1st APO of HP)
- % reduction
  - ~10% in realistic scenario
  - ~20% in optimistic scenario

Country	Intervention cost	Potentially unnecessary ATB prescriptions	Reduction in potentially unnecessary ATB prescriptions	
			Realistic scenario	Optimistic scenario
France	29,085,411 €	54,464,032	5,283,011	10,838,342
Greece	1,377,262 €	6,365,680	617,471	1,266,770
Lithuania	1,083,726 €	1,127,064	109,325	224,286
Poland	3,942,087 €	25,690,992	2,492,026	5,112,507
Spain	17,509,709 €	31,397,863	3,045,593	6,248,175
TOTAL HP	**52,998,195 €**	**119,045,631**	**11,547,426**	**23,690,081**
Austria	2,679,086 €	2,219,384	215,280	441,657
Belgium	5,695,008 €	6,381,351	618,991	1,269,889
Bulgaria	1,577,797 €	5,259,107	510,133	1,046,562
Croatia	921,220 €	2,148,013	208,357	427,455
Czechia	3,060,019 €	4,151,958	402,740	826,240
Denmark	1,883,234 €	2,540,604	246,439	505,580
Estonia	380,737 €	397,770	38,584	79,156
Finland	3,078,987 €	1,790,435	173,672	356,297
Germany	24,145,972 €	23,146,081	2,245,170	4,606,070
Hungary	1,549,059 €	3,592,349	348,458	714,877
Ireland	1,718,051 €	2,831,482	274,654	563,465
Italy	16,086,255 €	32,424,189	3,145,146	6,452,414
Latvia	584,763 €	656,829	63,712	130,709
Luxembourg	232,573 €	323,486	31,378	64,374
Netherlands	6,482,586 €	4,589,564	445,188	913,323
Portugal	11,304,003 €	4,868,800	472,274	968,891
Romania	4,936,873 €	15,885,635	1,540,907	3,161,241
Slovakia	1,688,328 €	2,705,328	262,417	538,360
Slovenia	517,866 €	629,356	61,048	125,242
Sweden	2,537,405 €	3,121,818	302,816	621,242
TOTAL EU	**144,058,017 €**	**238,709,170**	**23,154,790**	**47,503,125**

Upscaling at the EU - Results

3. How much could be saved due to reductions in potentially unnecessary ATB at the country-level?

- Mean cost per ATB prescription
  - ~12€ per ATB prescription (approx. 80% ATB, 20% AMR, 1% AE)

Country	Intervention cost	Potentially unnecessary ATB prescriptions	Reduction in potentially unnecessary ATB prescriptions		Potential savings		Net savings (potential savings - intervention costs)	
			Realistic scenario	Optimistic scenario	Realistic scenario	Optimistic scenario	Realistic scenario	Optimistic scenario
France	29,085,411 €	54,464,032	5,283,011	10,838,342	49,448,970 €	101,446,856 €	20,363,559 €	72,361,445 €
Greece	1,377,262 €	6,365,680	617,471	1,266,770	8,686,891 €	17,821,560 €	7,309,629 €	16,444,298 €
Lithuania	1,083,726 €	1,127,064	109,325	224,286	2,395,910 €	4,915,320 €	1,312,183 €	3,831,593 €
Poland	3,942,087 €	25,690,992	2,492,026	5,112,507	23,498,140 €	48,207,524 €	19,556,053 €	44,265,438 €
Spain	17,509,709 €	31,397,863	3,045,593	6,248,175	21,259,142 €	43,614,116 €	3,749,433 €	26,104,407 €
TOTAL HP	**52,998,195 €**	**119,045,631**	**11,547,426**	**23,690,081**	**105,289,053 €**	**216,005,376 €**	**52,290,858 €**	**163,007,181 €**
Austria	2,679,086 €	2,219,384	215,280	441,657	2,986,591 €	6,127,129 €	307,505 €	3,448,043 €
Belgium	5,695,008 €	6,381,351	618,991	1,269,889	7,479,073 €	15,343,665 €	1,784,064 €	9,648,656 €
Bulgaria	1,577,797 €	5,259,107	510,133	1,046,562	5,292,104 €	10,856,997 €	3,714,307 €	9,279,200 €
Croatia	921,220 €	2,148,013	208,357	427,455	2,388,307 €	4,899,722 €	1,467,086 €	3,978,502 €
Czechia	3,060,019 €	4,151,958	402,740	826,240	5,010,056 €	10,278,361 €	1,950,036 €	7,218,342 €
Denmark	1,883,234 €	2,540,604	246,439	505,580	2,703,579 €	5,546,517 €	820,344 €	3,663,283 €
Estonia	380,737 €	397,770	38,584	79,156	395,353 €	811,085 €	14,616 €	430,348 €
Finland	3,078,987 €	1,790,435	173,672	356,297	1,859,931 €	3,815,735 €	- 1,219,055 €	736,749 €
Germany	24,145,972 €	23,146,081	2,245,170	4,606,070	29,751,118 €	61,035,800 €	5,605,146 €	36,889,828 €
Hungary	1,549,059 €	3,592,349	348,458	714,877	4,401,506 €	9,029,894 €	2,852,447 €	7,480,835 €
Ireland	1,718,051 €	2,831,482	274,654	563,465	3,843,357 €	7,884,824 €	2,125,306 €	6,166,774 €
Italy	16,086,255 €	32,424,189	3,145,146	6,452,414	49,328,797 €	101,200,315 €	33,242,542 €	85,114,060 €
Latvia	584,763 €	656,829	63,712	130,709	664,413 €	1,363,074 €	79,649 €	778,310 €
Luxembourg	232,573 €	323,486	31,378	64,374	487,245 €	999,605 €	254,672 €	767,032 €
Netherlands	6,482,586 €	4,589,564	445,188	913,323	4,800,835 €	9,849,136 €	- 1,681,751 €	3,366,550 €
Portugal	11,304,003 €	4,868,800	472,274	968,891	7,078,403 €	14,521,671 €	- 4,225,600 €	3,217,669 €
Romania	4,936,873 €	15,885,635	1,540,907	3,161,241	16,474,202 €	33,797,589 €	11,537,329 €	28,860,717 €
Slovakia	1,688,328 €	2,705,328	262,417	538,360	3,461,556 €	7,101,542 €	1,773,227 €	5,413,213 €
Slovenia	517,866 €	629,356	61,048	125,242	822,725 €	1,687,858 €	304,858 €	1,169,991 €
Sweden	2,537,405 €	3,121,818	302,816	621,242	3,371,499 €	6,916,786 €	834,094 €	4,379,382 €
TOTAL EU	**144,058,017 €**	**238,709,170**	**23,154,790**	**47,503,125**	**257,889,700 €**	**529,072,683 €**	**113,831,683 €**	**385,014,666 €**

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3. How much could be saved due to reductions in potentially unnecessary ATB at the country-level?

- Mean cost per ATB prescription
  - ~12€ per ATB prescription (approx. 80% ATB, 20% AMR, 1% AE)

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Bulgaria	1,577,797 €	5,259,107	510,133	1,046,562	5,292,104 €	10,856,997 €	3,714,307 €	9,279,200 €
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Romania	4,936,873 €	15,885,635	1,540,907	3,161,241	16,474,202 €	33,797,589 €	11,537,329 €	28,860,717 €
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Upscaling at the EU – Summary of results

If the interventions were carried out in all EU countries*

- **Realistic scenario**:
  - A reduction in **23 million of ATB prescriptions** annually
  - A net cost saving of **114 million euros** annually

- **Optimistic scenario**:
  - A reduction of **48 million of ATB prescriptions** annually
  - A net cost saving of **385 million euros** annually

*EU-27 country, except Cyprus and Malta due to lack of data

Implementation at the EU - Discussion

Challenges

- Need to be run by European institution (e.g., WHO Regional Office for Europe?)
- Consider the pace at which EU countries should implement HP interventions
  - All at once?
  - Sequentially? In which order? Every how many years?
- Consider the resources needed to implement HP interventions
- Consider the professionals' willingness and motivation to take part

THANKS!