

Cost-effectiveness of HIV Testing: Frequency and Target Groups

HepHIV 2017, Malta

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Tuesday 31st January, 2017

“Whatever the next hottest, scientifically proven HIV treatment or prevention strategies are :

- PreP
- TasP

they will share a common denominator for implementation: **the HIV test.**

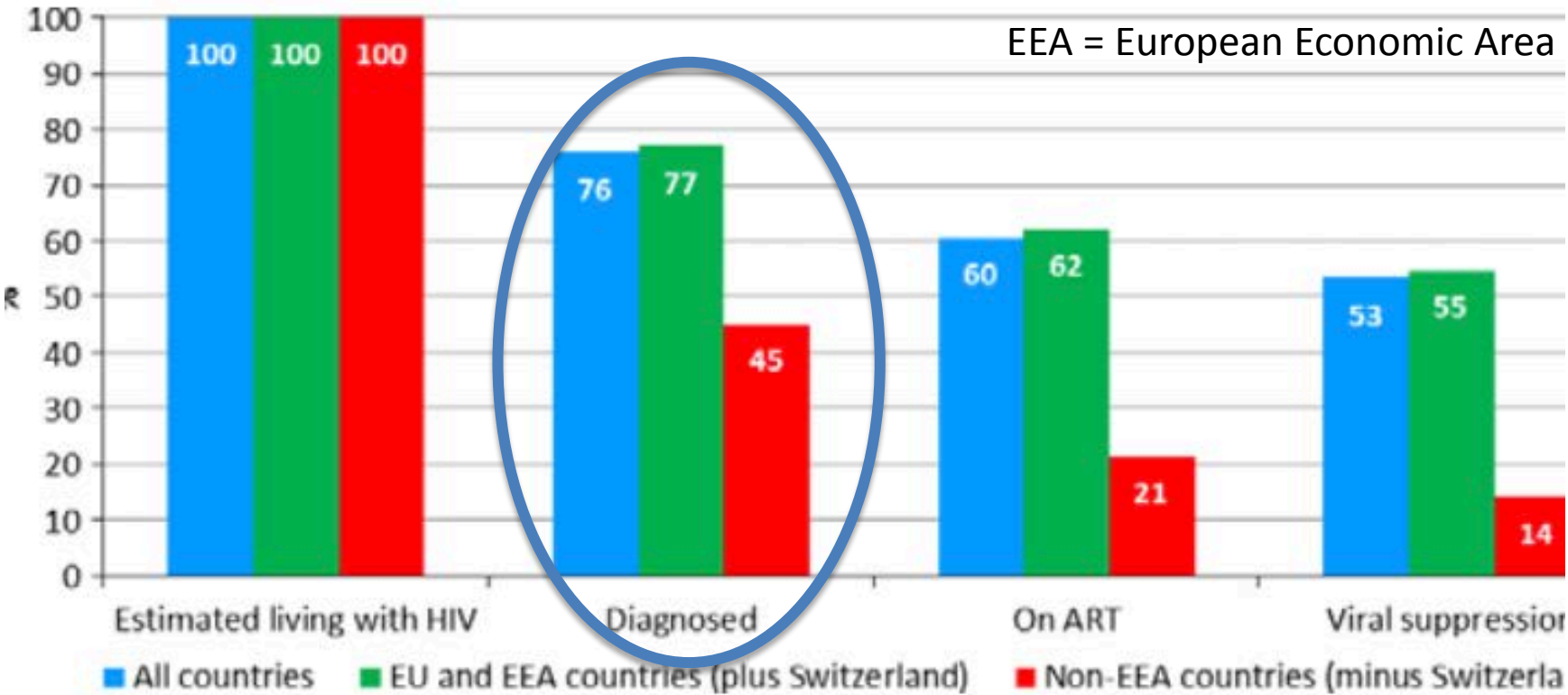
They all begin with learning one’s HIV status.”

Walensky et al. Plos Med 2011

ORIGINAL RESEARCH

HIV continuum of care in Europe and Central Asia

RS Drew,¹ B Rice,² K Rüütel,³ V Delpech,⁴ KA Attawell,⁵ DK Hales,⁶ C Velasco,⁷ AJ Amato-Gauci,⁸ A Pharris,⁸ L Tavošči⁸ and T Noori⁸



The OptTEST Project

- **OptTEST:** “*Optimising testing and linkage to care for HIV across Europe*” is a 3-year project co-funded by the Consumers, Health and Food Executive Agency (CHAFEA) under the European Union Public Health Programme.
- **Objective:** to reduce the number of undiagnosed people with HIV infection and newly diagnosed late presenters in the European regions and to promote timely treatment and care.

OptTEST Work Package 6

The cost-effectiveness of HIV testing strategies in priority groups and regions.

- Objectives
 - To determine the survival benefits, cost and **cost-effectiveness** of different **HIV testing strategies** in different **settings, regions** and **priority groups** in Europe.

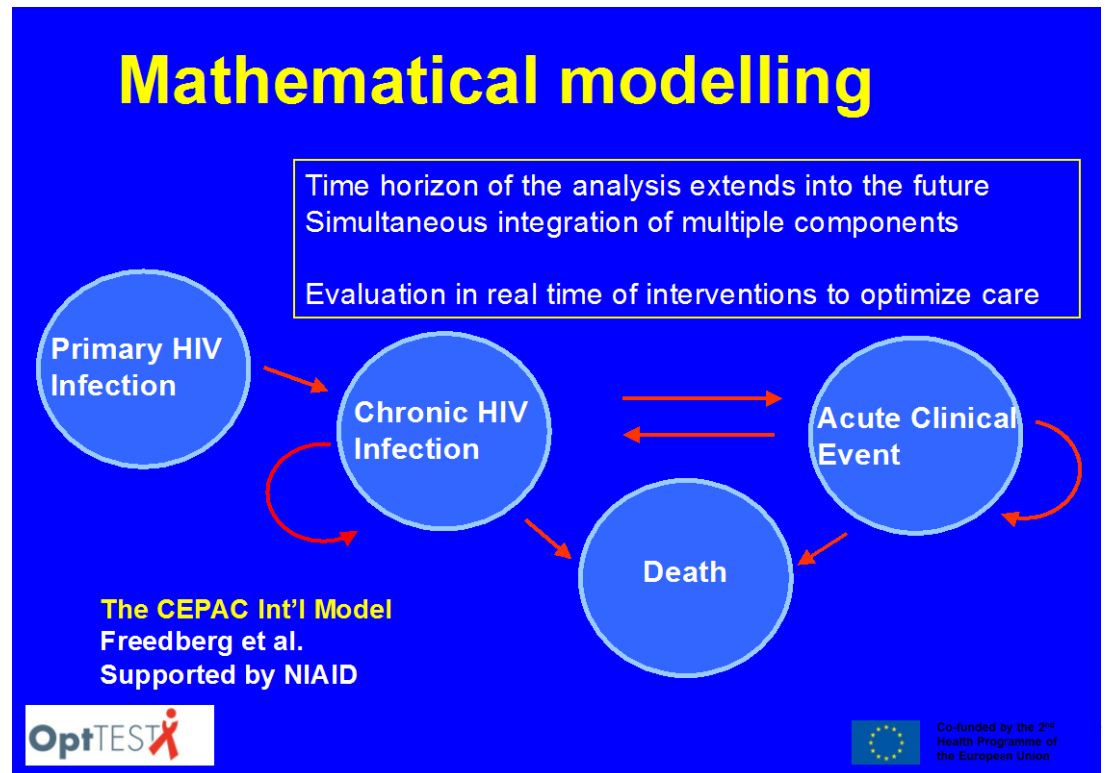
WP6 analysis

- Focus of analysis France, Spain, and Estonia.
- Findings are to be extrapolated to other European countries to produce country- and region-specific guidance for choosing cost-effective testing strategies



Study design

- Mathematical modelling : Cost-Effectiveness of Preventing AIDS Complications (CEPAC), a widely published Monte Carlo simulation model of the detection, natural history and treatment of HIV disease.



SPECIAL ARTICLE

Expanded Screening for HIV in the United States — An Analysis of Cost-Effectiveness

A. David Paltiel, Ph.D., Milton C. Weinstein, Ph.D., April D. Kimmel, M.Sc.,
George R. Seage III, Sc.D., M.P.H., Elena Losina, Ph.D., Hong Zhang, S.M.,
Kenneth A. Freedberg, M.D., and Rochelle P. Walensky, M.D., M.P.H.

- At a 1% prevalence of undiagnosed HIV infection, routine testing every 5 years had a cost-effectiveness ratio of \$71,000/QALY gained



MMWR™

Morbidity and Mortality Weekly Report

Recommendations and Reports

September 22, 2006 / Vol. 55 / No. RR-14

Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health-Care Settings

Screening for HIV Infection : 2006

- In all health-care settings, screening for HIV infection should be performed routinely for all patients aged 13–64 years. Health-care providers should initiate screening unless prevalence of undiagnosed HIV infection in their patients has been documented to be $<0.1\%$.

Routine HIV Screening in France: Clinical Impact and Cost-Effectiveness

Yazdan Yazdanpanah^{1,2,3*}, Caroline E. Sloan⁴, Cécile Charlois-Ou⁶, Stéphane Le Vu⁷, Caroline Semaille^{3,7}, Dominique Costagliola^{8,9,10,11}, Josiane Pillonel⁷, Anne-Isabelle Poullié¹², Olivier Scemama¹², Sylvie Deuffic-Burban¹³, Elena Losina^{4,14,15}, Rochelle P. Walensky^{4,5,16,17}, Kenneth A. Freedberg^{4,5,14,17}, A. David Paltiel¹⁸

RECOMMANDATIONS EN SANTÉ PUBLIQUE

Dépistage de l'infection par le VIH
en France

Stratégies et dispositif de dépistage

SYNTHÈSE ET RECOMMANDATIONS

Octobre 2009

Document non soumis à relecture orthographique

Avec la participation de



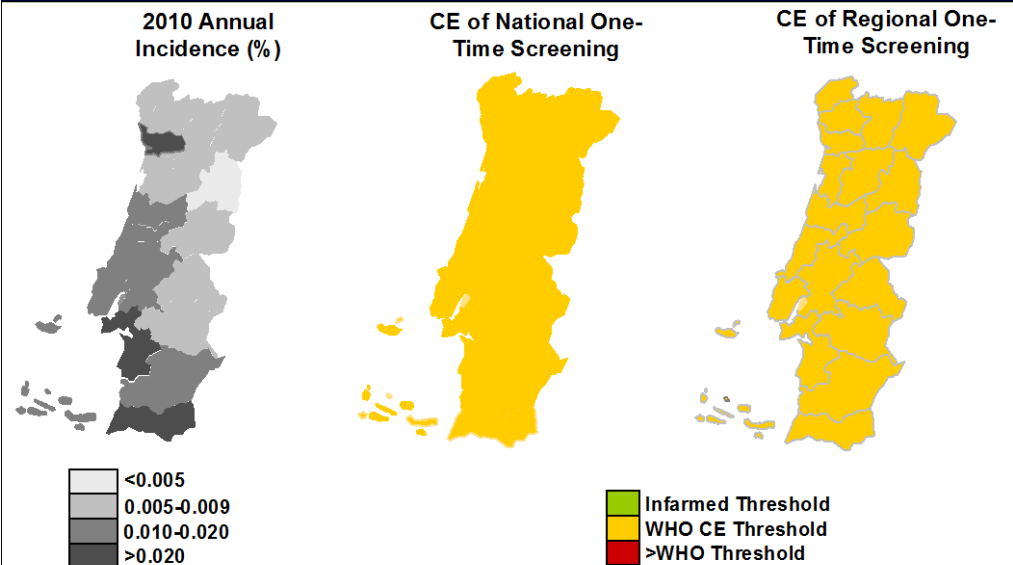
« **Des stratégies nouvelles à mettre en oeuvre et à évaluer : proposition de dépistage en population générale et dépistage ciblé** »

- La proposition de test de dépistage à la population générale hors notion d'exposition à un risque de contamination par le VIH,
- En parallèle le maintien et le renforcement d'un dépistage ciblé et régulier pour les populations à risque »

Routine HIV Screening in Portugal: Clinical Impact and Cost-Effectiveness

Yazdan Yazdanpanah^{1,2*}, Julian Perelman³, Madeline A. DiLorenzo^{8,9}, Joana Alves³, Henrique Barros⁴, Céu Mateus³, João Pereira³, Kamal Mansinho⁵, Marion Robine^{8,9}, Ji-Eun Park^{8,9}, Eric L. Ross^{8,9}, Elena Losina^{7,8,9,10,11,13}, Rochelle P. Walensky^{6,7,8,9,10,11}, Farzad Noubary^{14,15}, Kenneth A. Freedberg^{6,7,8,9,11,12}, A. David Paltiel¹⁶

Cost-Effectiveness of One-Time HIV Screening in Different Regions



Methods overview

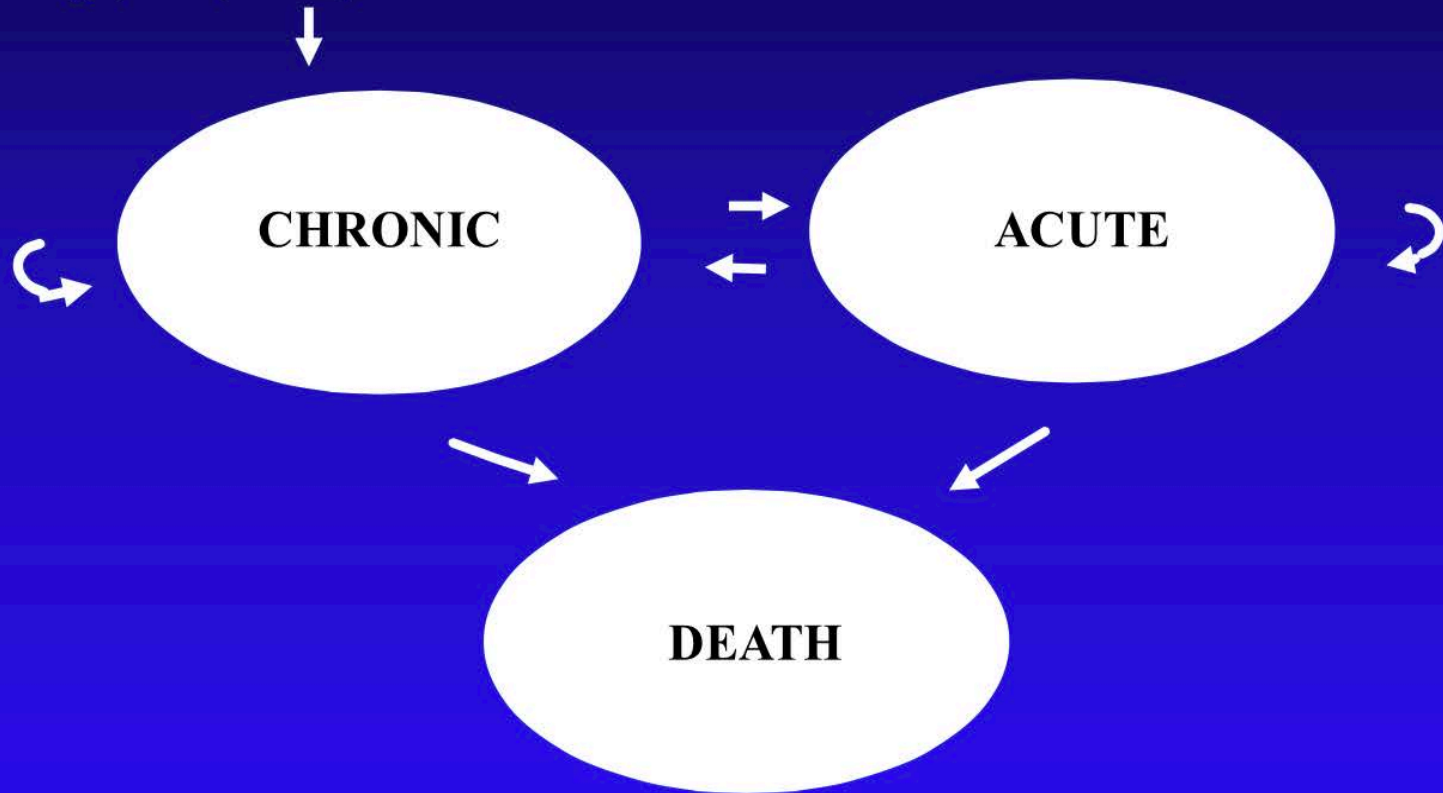
- **Disease Model.** A simulation model of the natural history and treatment of HIV disease
- **Screening Model.** A new simulation model of « Counselling, Testing and Referral » (CTR) in an at-risk population.
- To evaluate alternative HIV CTR strategies based on:
 - Prevalence and incidence of HIV infection
 - Testing protocols (Se, Sp, cost)
 - Test / retest frequency
 - Follow-up and linkage to care

The Disease Model (CEPAC)

- Computer simulation model of HIV disease
- Captures effects of CD4, HIV-RNA, OI incidence, and the impact of ART and other therapies
- Data from observational cohorts, clinical trials, cost surveys, and other published sources
- Outcomes: life expectancy, quality-adjusted life-expectancy, cost, cost-effectiveness

The Disease Model (CEPAC)

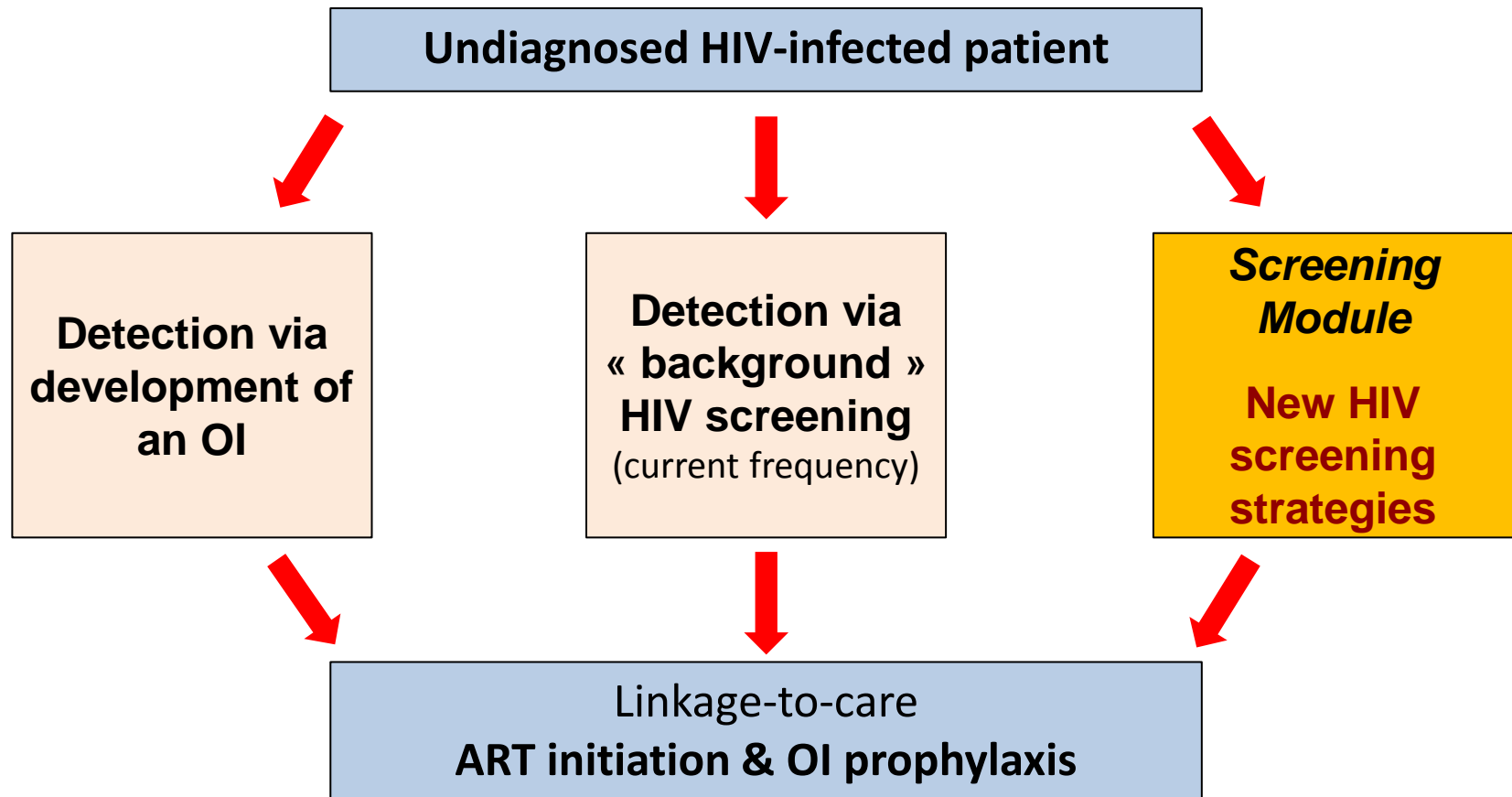
Enter:
Age, Sex, CD4, RNA



Screening Model

- Manages entry into the Disease Model
 - time of infection
 - time of detection
 - time of “eligibility” for therapy
- Measures testing program performance
 - total tests performed;
 - disease progression at the time of detection
 - mechanism of detection

Three Mechanisms of Detection



Cost-Effectiveness analysis

- **Societal** perspective (without indirect costs)
- **Lifetime** horizon (until death)
- **Costs** : Costs of HIV testing strategies, related to HIV care, treatment and death (AIDS or non-AIDS)
- **Effectiveness** : Life expectancy in months / Quality-adjusted life expectancy (QALE)
- **Discount rate** : 3% per annum (Costs & Effectiveness)
- **Cost-Effectiveness** : Incremental cost-effectiveness ratio (ICER) in €/years of life saved (YLS), and €/QALY:

$$ICER = \frac{\textit{Additional costs}}{\textit{Additional effectiveness}}$$

Strategies to be tested

Main criterias

- **Populations**

- **High-risk** populations : Men who have Sex with Men (MSM), People Who Inject Drugs (PWID)

- **General** Population

- **Testing frequency**

- One additional test lifetime

- Every 10, 5, 3 and 1 year(s)

- Every 6, 3 and 1 month(s) (high-risk groups)

Key-parameters

Parameter	Estonia	France	Spain
Population size (18-69)	895,020	41,732,130	31,868,050
HIV prevalence (%)			
<i>Overall Population</i>	1.3	0.37	0.4
<i>MSM</i>	3.0	17.0	6.2
<i>PWID</i>	55.0	17.5	28.7
<i>Migrants</i>	--	1.3	0.7
Undiagnosed prevalence (%)			
<i>Overall Population</i>	0.4	0.07	0.10
<i>MSM</i>	2.0	2.95	0.62-1.24
<i>PWID</i>	6.0	0.62	3.31-6.62
<i>Migrants</i>	--	0.36	0.17
Incidence /100PY			
<i>Overall Population</i>	0.03	0.02	0.007
<i>MSM</i>	0.08	1.0	0.28-1.0
<i>PWID</i>	6.0	0.13	1.9-3.0
<i>Migrants</i>	--	0.06	0.03
Mean CD4 count at initiation			
<i>Overall Population</i>		419	414
<i>MSM</i>		465	450
<i>PWID</i>	289.0	316	275
<i>Migrants</i>		334	386

Key-parameters

Parameter	Estonia	France	Spain
Screening performance			
Test acceptance rate	95.0%	79.0%	96.0%
Linkage to care rate	50.0%	75.0%	83.1%
Sensibility (ELISA test)		100%	
Specificity (ELISA test)		99.5%	
Cost of HIV test	€8.00	€41.77	€18.45
Cost of ART (annually)			
1 st line	€2,920	€11,810	€8,640
2 nd to 4 th line	€1,750	€13,960	€10,210
5 th line	€7,720	€19,740	€14,450
GDP per capita	€20,000	€29,000	€24,300

Results for the base case analysis

MSM

Testing strategies: ¹	Estonia			France			Spain		
	GDP=€20,000			GDP=€29,000			GDP=€24,300		
	LE	Costs (€)	ICER (€YLS) ²	LE	Costs (€)	ICER (€YLS) ²	LE	Costs (€)	ICER (€YLS) ²
Current frequency	359.7	€1,736	--	280.9	€45,276	--	332.2	€12,640	--
One additional lifetime test	360.1	€2,057	dominated	281.1	€45,615	dominated	332.3	€12,645	1,400
Every 10 years	360.2	€2,110	dominated	281.8	€46,390	17,400	332.7	€13,233	13,700
Every 5 years	360.2	€2,186	dominated	281.9	€46,555	dominated	332.8	€13,432	dominated
Every 3 years	360.4	€2,277	8,900	282.2	€47,011	dominated	332.9	€13,595	25,300
Every year	360.6	€2,589	16,200	282.9	€48,135	23,900	333.2	€14,218	31,200
Every 6 months	360.8	€2,918	30,000	283.4	€49,366	33,100	333.4	€14,899	32,500
Every 3 months	360.9	€3,458	49,700	283.9	€51,014	45,900	333.5	€15,940	133,600
Every month	361.0	€5,420	230,200	280.9	€45,276	165,900	333.6	€19,853	439,200

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Testing strategies:¹									
Current frequency	267.5	€36,010	--	332.9	€6,761	--	320.4	€36,163	--
One additional lifetime test	271.0	€38,695	dominated	333.1	€7,311	dominated	323.1	€40,758	dominated
Every 10 years	273.4	€39,795	dominated	333.4	€7,640	16,500	325.7	€43,875	dominated
Every 5 years	276.5	€41,283	dominated	333.6	€7,845	19,500	326.8	€45,170	dominated
Every 3 years	279.5	€42,748	dominated	333.7	€8,133	27,700	327.8	€46,129	dominated
Every year	286.4	€46,384	dominated	334.1	€9,035	39,000	329.4	€48,111	15,900
Every 6 months	289.7	€48,054	6,500	334.2	€10,070	97,000	330.2	€49,299	18,300
Every 3 months	292.3	€49,536	7,000	334.4	€12,002	208,700	330.5	€50,530	47,900
Every month	294.3	€51,418	11,000	334.4	€19,329	1,138,300	331.0	€54,535	101,700

Results for the base case analysis

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Results for the base case analysis

Overall Populations

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One additional lifetime test	356.7	€617	9,800	319.6	€1,020	37,100	350.4	€434	28,100
Every 10 years	356.7	€653	dominated	319.7	€1,116	49,100	350.4	€505	44,900
Every 5 years	356.7	€699	dominated	319.7	€1,214	dominated	350.4	€562	dominated
Every 3 years	356.8	€756	13,000	319.7	€1,344	124,100	350.5	€638	dominated
Every year	356.9	€969	32,500	319.7	€1,954	419,000	350.5	€1,001	316,200
Every 6 months	356.9	€1,232	60,700	319.7	€2,855	dominated	350.5	€1,531	614,600
Every 3 months	357.0	€1,728	126,200	319.7	€4,637	1,150,400	350.5	€2,587	dominated

Results for the base case analysis

Overall Populations

Estonia

France

Spain

GDP=€20,000

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Every 5 years	356.7	€699	dominated	319.7	€1,214	dominated	350.4	€562	dominated
Every 3 years	356.8	€756	13,000	319.7	€1,344	124,100	350.5	€638	dominated
Every year	356.9	€969	32,500	319.7	€1,954	419,000	350.5	€1,001	316,200
Every 6 months	356.9	€1,232	60,700	319.7	€2,855	dominated	350.5	€1,531	614,600
Every 3 months	357.0	€1,728	126,200	319.7	€4,637	1,150,400	350.5	€2,587	dominated

Results for the base case analysis

Overall Populations

Estonia

France

Spain

GDP=€20,000

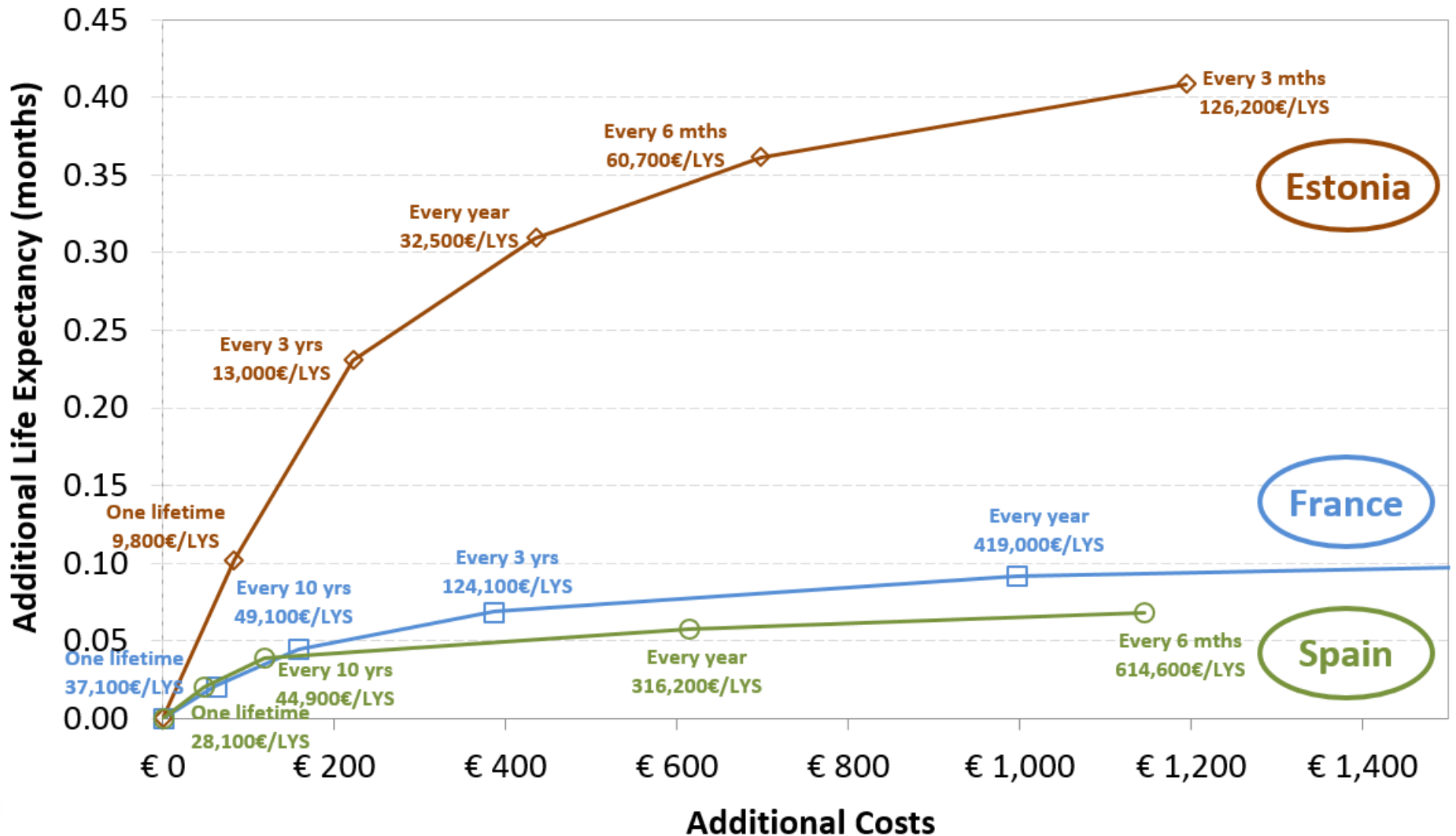
GDP=€29,000

GDP=€24,300

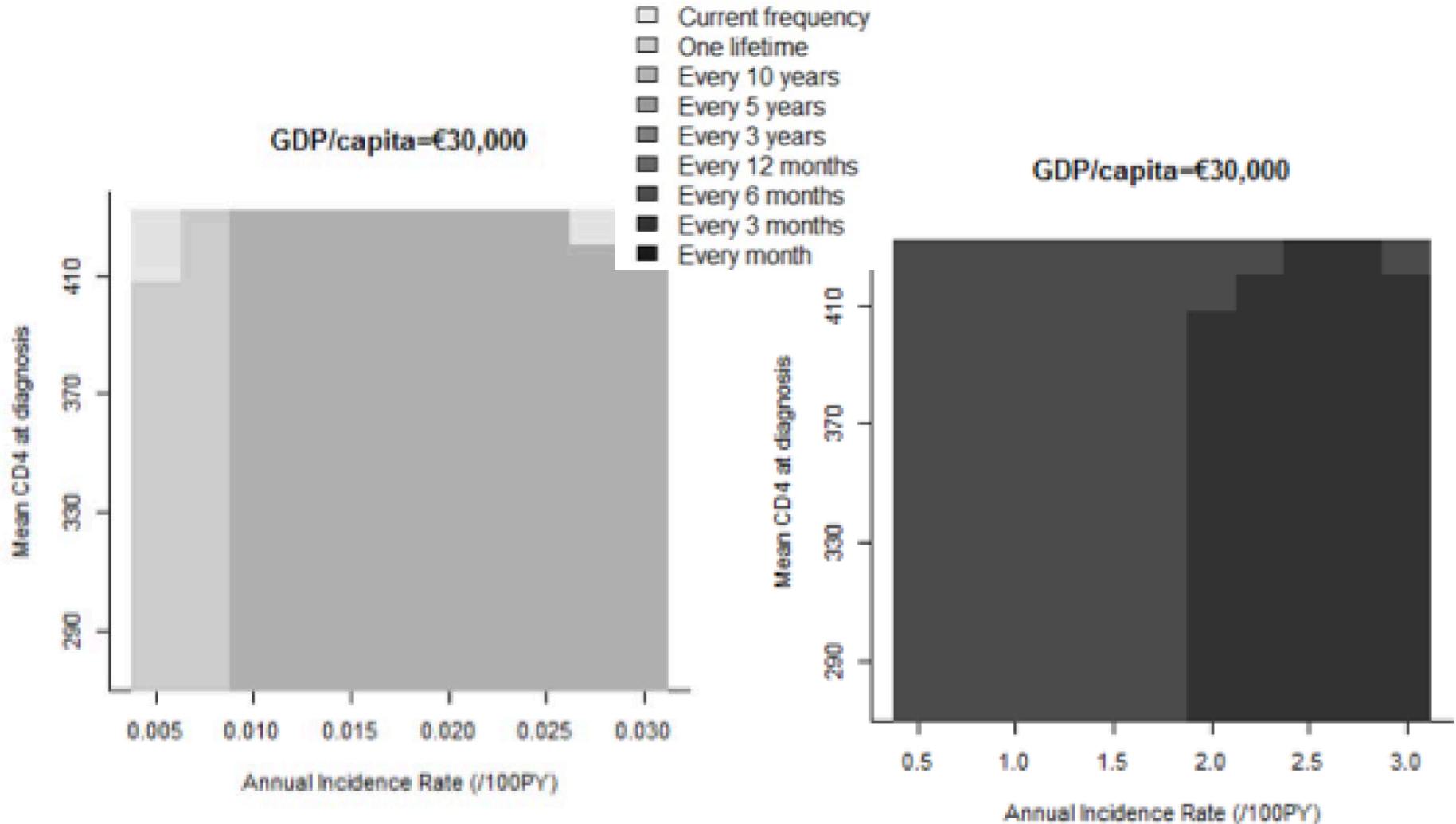
Testing strategies: ¹	Estonia			France			Spain		
	LE	Costs (€)	ICER (€/YLS) ²	LE	Costs (€)	ICER (€/YLS) ²	LE	Costs (€)	ICER (€/YLS) ²
Current frequency	356.6	€534	--	319.6	€958	--	350.4	€387	--
One additional lifetime test	356.7	€617	9,800	319.6	€1,020	37,100	350.4	€434	28,100
Every 10 years	356.7	€653	dominated	319.7	€1,116	49,100	350.4	€505	44,900
Every 5 years	356.7	€699	dominated	319.7	€1,214	dominated	350.4	€562	dominated
Every 3 years	356.8	€756	13,000	319.7	€1,344	124,100	350.5	€638	dominated
Every year	356.9	€969	32,500	319.7	€1,954	419,000	350.5	€1,001	316,200
Every 6 months	356.9	€1,232	60,700	319.7	€2,855	dominated	350.5	€1,531	614,600
Every 3 months	357.0	€1,728	126,200	319.7	€4,637	1,150,400	350.5	€2,587	dominated

Results for the base case analysis

General population - Efficiency frontiers (Additional Costs vs. Efficacy)



Heat maps considering the most cost-effective strategy when varying the GDP/capita; incidence rate; CD4 at diagnosis



Limitations

- A mathematical model with data from multiple sources
- Uncertainty in input data
- A decision should not be only based on cost-effectiveness data

Conclusion

- **MSM** should be tested every 6 to 12 months or yearly in France and Estonia, and every 6 to 36 months in Spain.
- **PWID** should be tested every 3 to 12 months in Spain, and every 12 to 36 months in France. In Estonia, PWID should be tested at least monthly, if not more frequently.
- Current HIV testing in the **general population** should be maintained in France and Spain, and increased in Estonia with an additional test every three years.
- For optimal value, HIV screening strategies in Europe should be **tailored** to each country's epidemic.

Thank you



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