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Studying possible outcomes in a model of sexually transmitted virus (HPV) causing cervical cancer for Poland

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BCC, Kraków, 10-12.05.2013

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Agenda

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- **Problem: STI (sexual transmitted infections)**
- **Data**
- **Epidemiology of HPV and cervical cancer**
- **Model and simulations**
- **Possible future scenarios**

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STI

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Pathogens

- **viruses: HPV, HSV, HIV, HB(C)V;**
- **bacteria: Chlamydia, Gonorrhea, Spirochetes;**
- **fungi: Saccharomycetes;**
- **other microorganisms: Trichomonasinne**

Paths of infection

- **the main heterosexual population,**
- **sex workers,**
- **men who have sex with men**

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Data

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- **The main goal is the authoritative analysis of the costs and losses of potential epidemiological control strategies and identifies potential problems that health care will have to face in the future,**

- **Very little data about sexual contacts (sensitive data),**

- **There was no verified so far, working model of STI sexually transmitted infections dedicated to the Polish community.**

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Epidemiology of HPV

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- **Human papillomavirus, or HPV, is a sexually transmittable virus infection, which is not only the main, but also necessary risk factor for developing cervical cancer - second most common type of cancer in women.**
- **The infection is transmittable via sexual contact.**
- **The time between getting infected by HPV and developing a cancer can be twenty years or more, therefore a dynamic model of human behavior would be very useful, so that simulations can be made and different scenarios compared.**

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Epidemiology of HPV

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- **Among the oncogenic HPVs, the most severe one is type 16, present in about half of all cervical cancer cases.**
- **Recent studies have shown that the main safety precaution with respect to cervical cancer is going to be a combination of vaccination and screening - since only type specific vaccines are available and there are as many as 15 high risk HPVs.**

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Model and simulations

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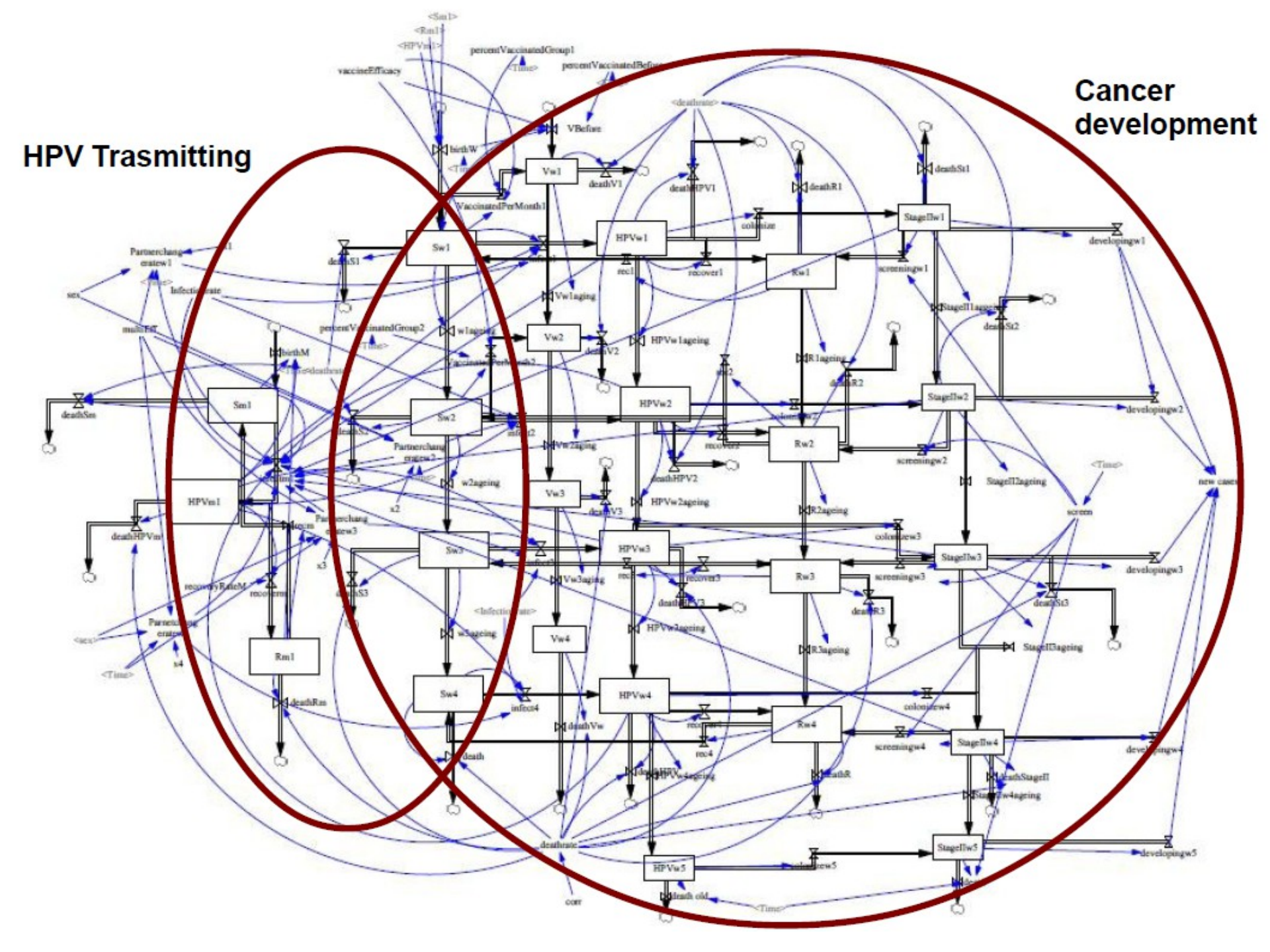
1) 15-19 (initiation of sexual live)
2) 20-24 (most active sexual group)
3) 25-34 (stabilization of sexual live)
4) 35-64 (sexual stagnation and stronger susceptibility to cancer)
5) <65 (no sexuality and cancer development)


HPV Trasmitting
Cancer development
percentVaccinatedGroup1
vaccineEfficacy
VBefore
birthW
Vw1
deathV1
deathHPV1
deathR1
deathSt1
VaccinatedPerMonth1
HPVw1
Sw1
StageIIw1
developingw1
screeningw1
Rw1
colonize
Vw1aging
deathS1
recover1
rec1
Partnerchangerratew1
Infectionrate
sex
multiFld
percentVaccinatedGroup2
w1aging
Vw2
deathV2
HPVw1ageing
R1ageing
StageII1ageing
deathSt2
birthM
deathRm
HPVw2
StageIIw2
developingw2
Sm1
deathSm
Sw2
infect2
Vw2aging
recover2
Rw2
screeningw2
Partnerchangerratew2
deathHPV2
StageII2ageing
Time
new cases
HPVm1
Vw3
deathV3
HPVw2ageing
R2ageing
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x2
Partnerchangerratew3
deathHPVm
Sw3
HPVw3
colonizew3
StageIIw3
developingw3
x3
Vw3aging
recover3
Rw3
screeningw3
recoveryRatioM
recoverm
deathS3
deathV3
deathR3
deathSt3
Infectionrate
HPVw3ageing
Vw4
R3ageing
StageII3ageing
w3ageing
Parnerchangerratew4
x4
Rm1
Sw4
HPVw4
colonizew4
deathRm
infect4
deathVw
Rw4
screeningw4
StageIIw4
developingw4
rec4
death
deathR
deathStageII
HPVw4ageing
StageIIw4ageing
deathrate
StageIIw5
developingw5
HPVw5
colonizew5
corr
fresh old
Time

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Model and simulations

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Model and simulations

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Age (years)	Highest activity	Moderately high activity	Moderate activity	Lowest activity
15 – 19	0.015	0.03	0.135	0.82
20 – 24	0.015	0.025	0.34	0.62
25 – 34	0.01	0.02	0.21	0.76
35 – 64	0.005	0.01	0.09	0.895

Age (years)	Highest activity	Moderately high activity	Moderate activity	Lowest activity
15 – 19	15	3.50	1.34	0.48
20 – 24	17.5	0.96	0.38	0.14
25 – 34	15	0.67	0.21	0.08
35 – 64*	7.5	0.45	0.08	0.04

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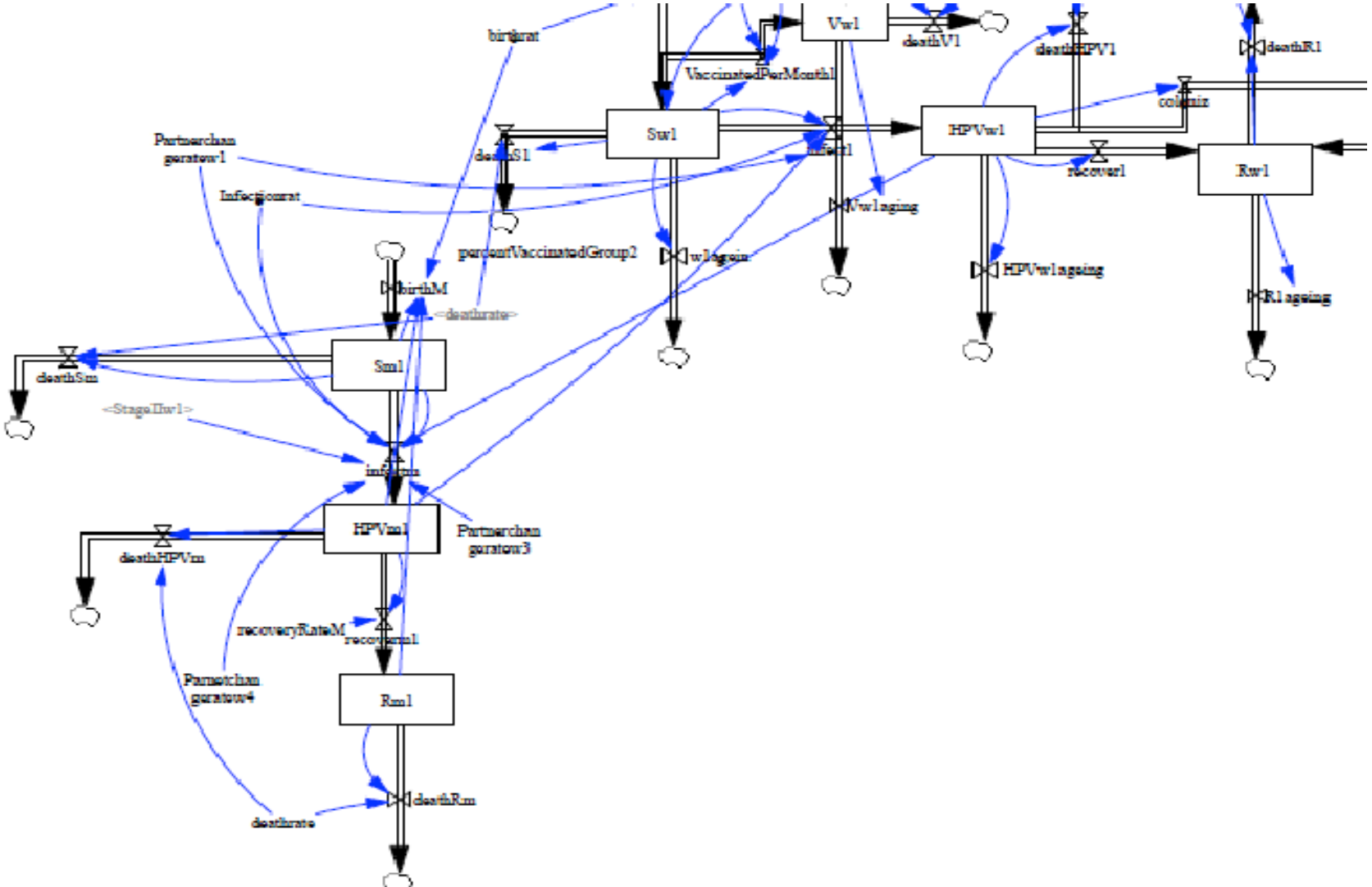

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Model and simulations

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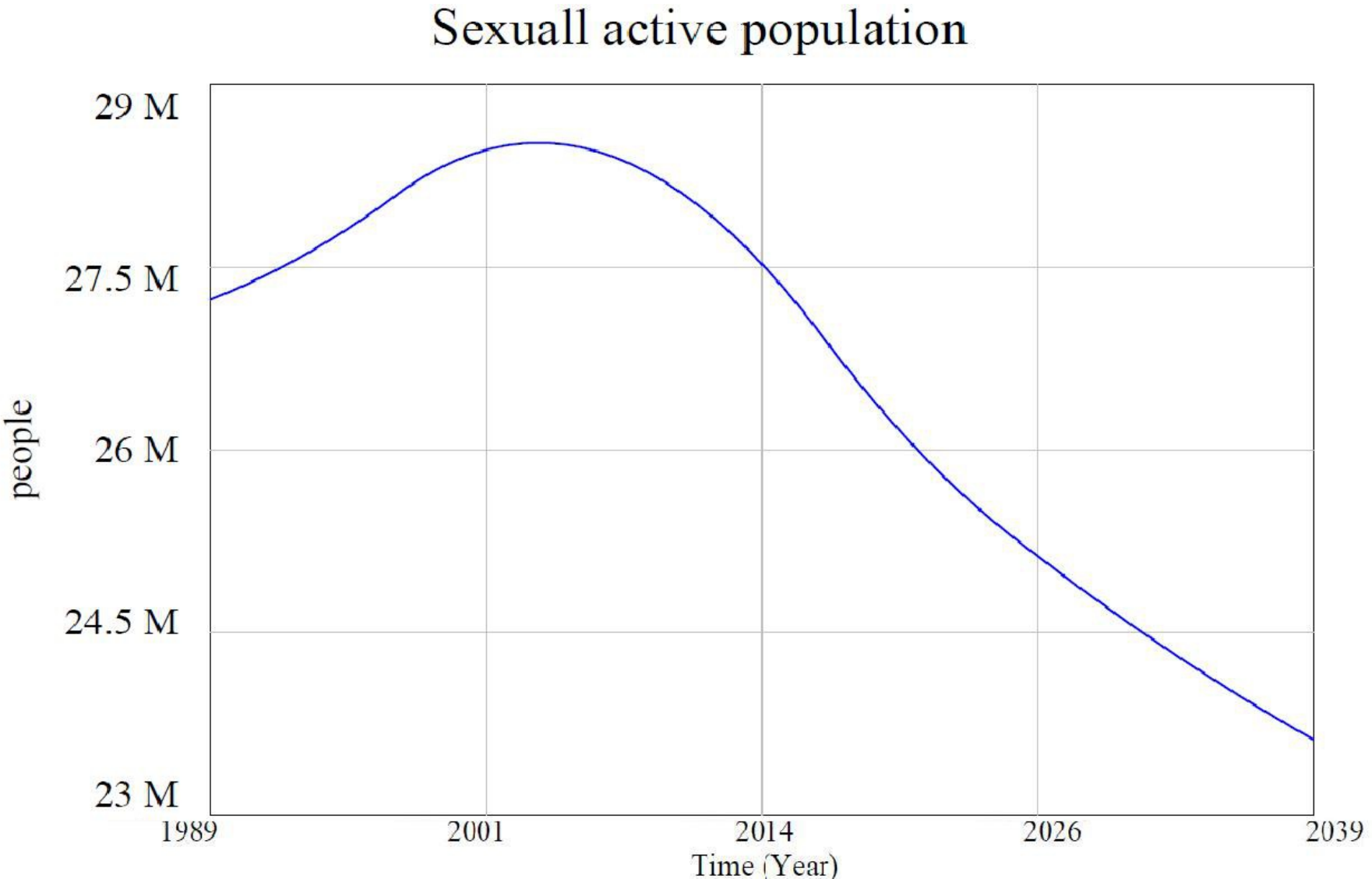

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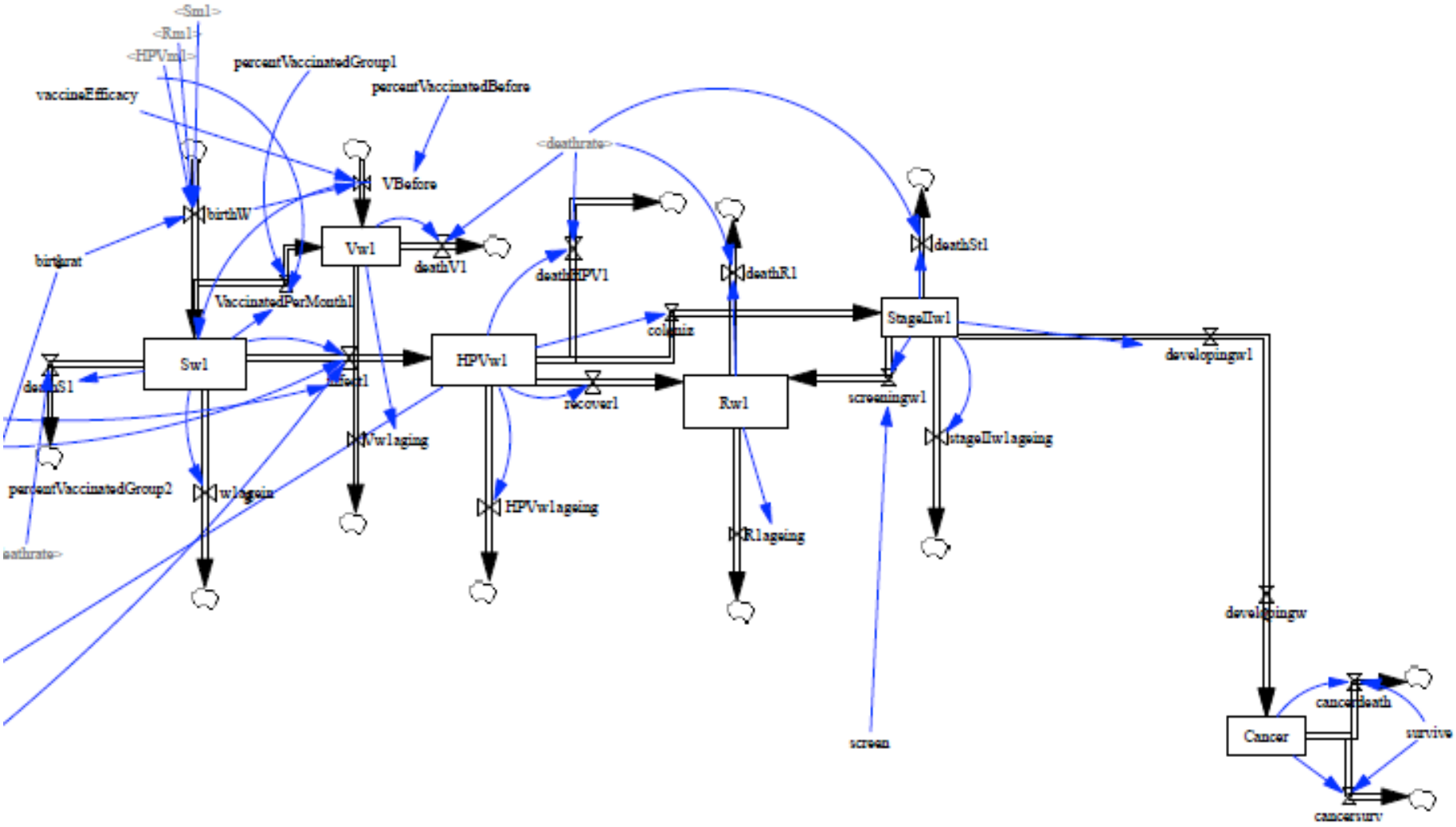

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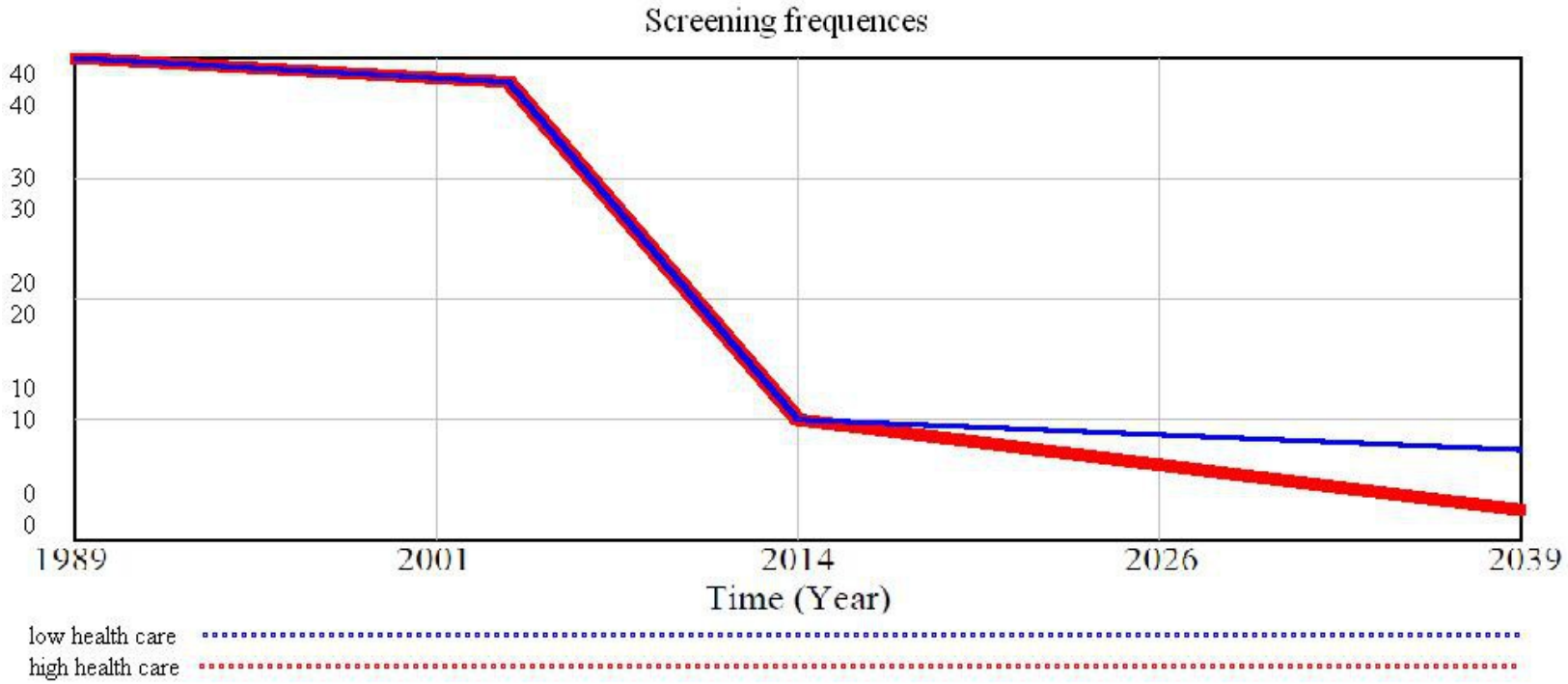

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Model and simulations

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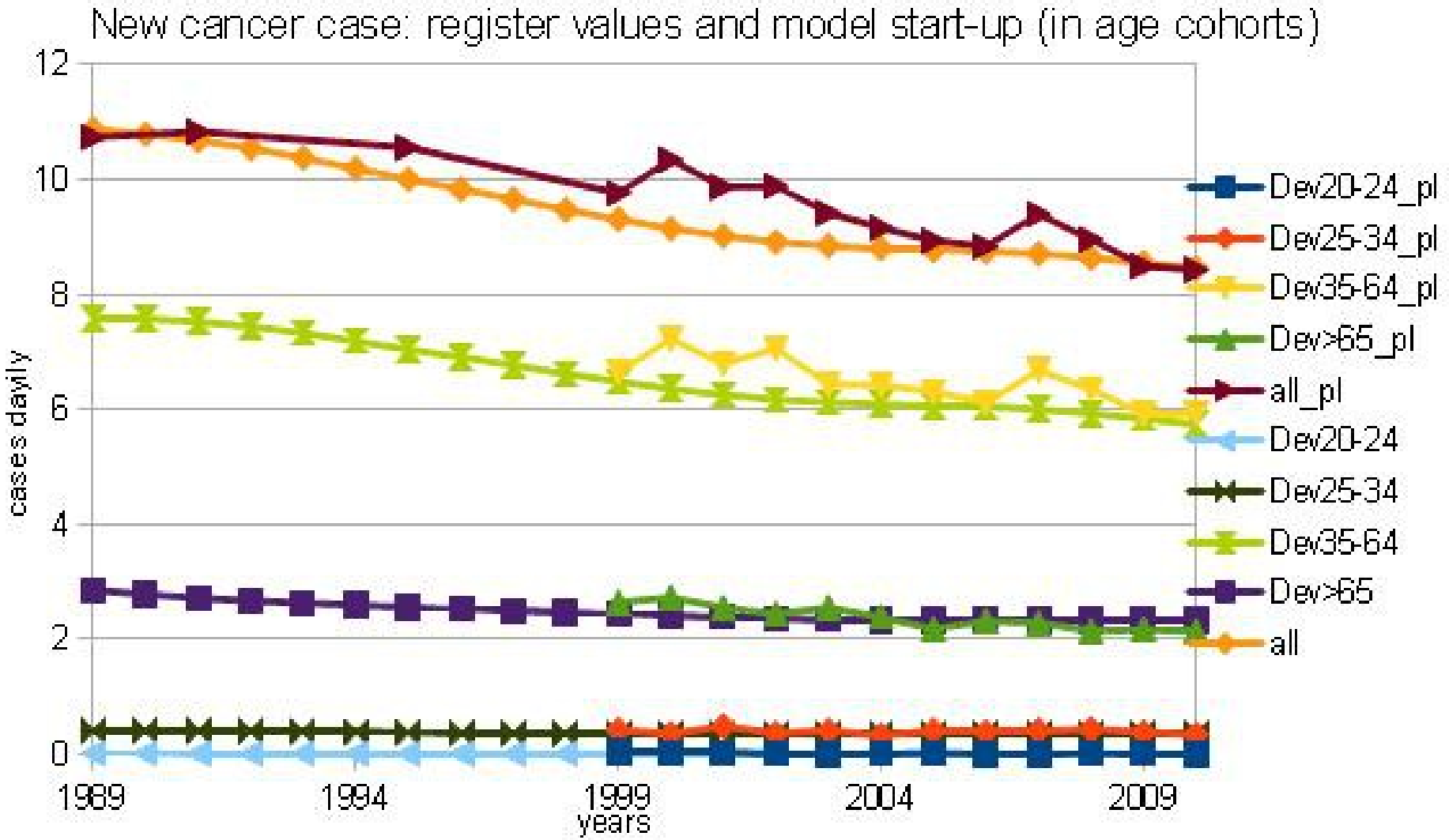

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Possible future scenarios

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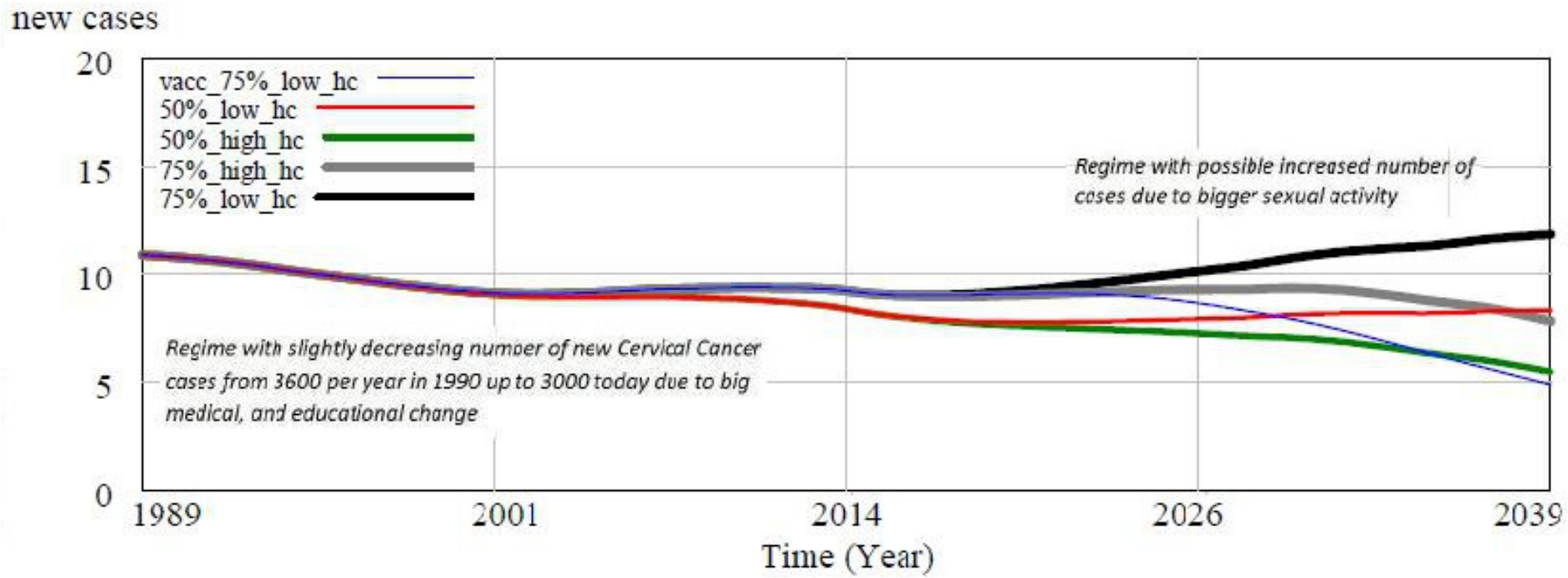

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Future?

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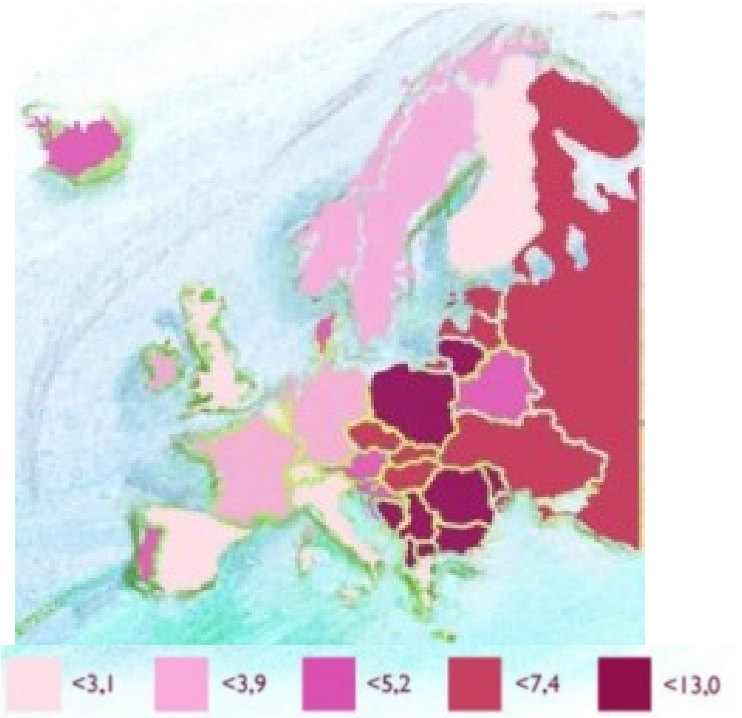
Thanks for attention



Mortality of cervical cancer