COST-EFFECTIVENESS OF CERVICAL CANCER SCREENING IN THE NETHERLANDS: COMPARISON OF DIFFERENT SCREENING SCENARIOS AND POLICIES

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Background

- The introduction of the HPV DNA test has provided new cervical cancer screening opportunities.
- Recent longitudinal data on the sensitivity available from POBASCAM trial (Bulkmans et al., Lancet 2007)
- Not yet clear whether primary cytological testing or primary HPV testing is most cost-effective in the Netherlands.
- Research question: how should the current Dutch screening program (cytological screening 7 times per lifetime) be adapted, to account for the introduction of the HPV DNA test?

Methods: micro-simulation modeling

- MISCAN micro-simulation model (Van den Akker-van Marle et al., JNCI 2002 and De Kok et al., JNCI, 2009) to represent natural history of cervical cancer and determine cost-effectiveness of screening.
- Model inputs and assumptions for costs and effects based on De Kok et al., JNCI (2009).
- Population model that includes 8 million unvaccinated women born between 1939 and 1992
- 3% annual discounting of costs and effects

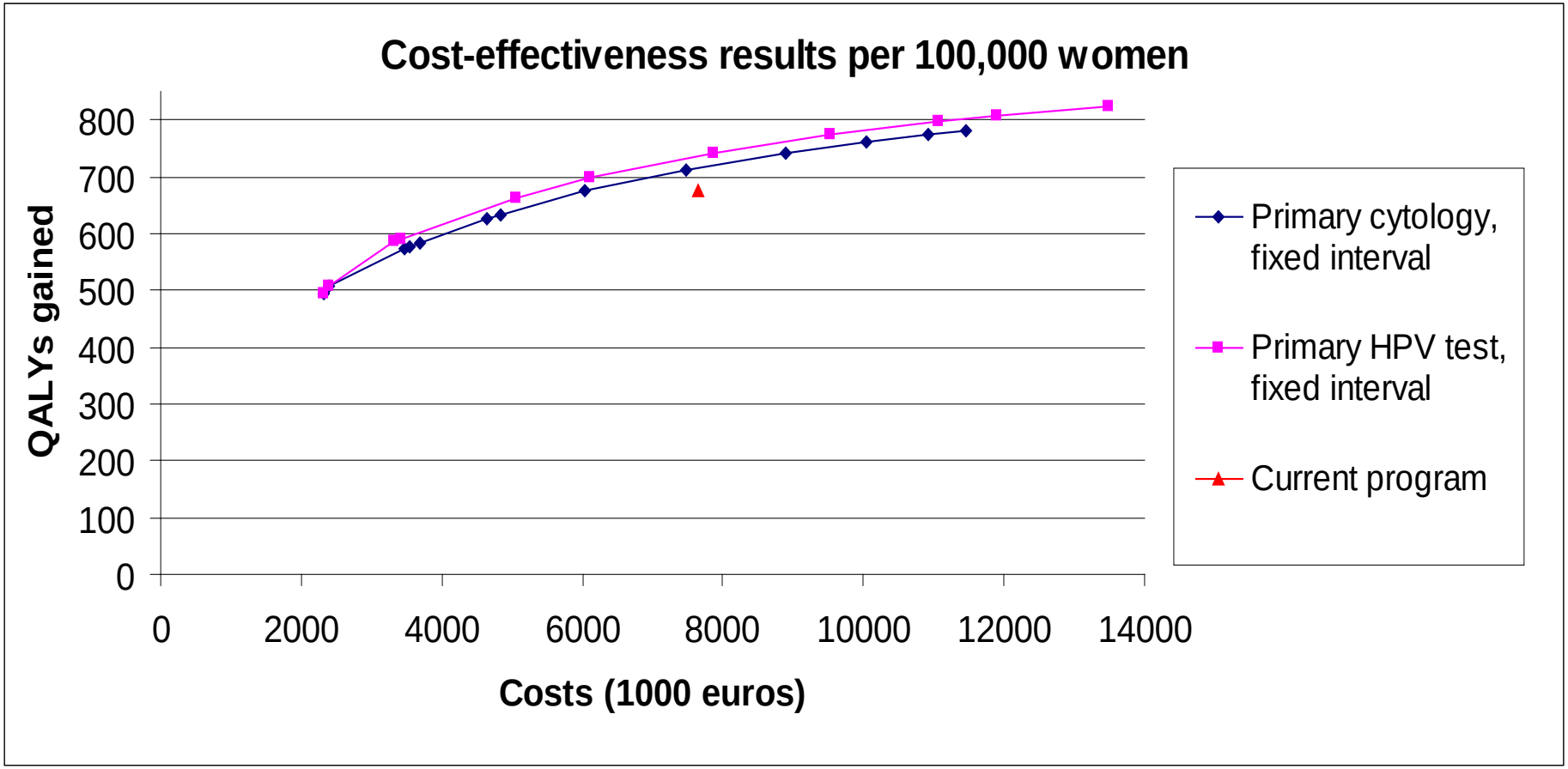
Methods: base-case assumptions

- Sensitivity of cytology: 40% for CIN I, 50% for CIN II, 75% for CIN III+
- Sensitivity of HPV-test: 94% positive if a high-risk HPV infection is present
- Laboratory costs of HPV test: €33; lab. costs cytology: €21

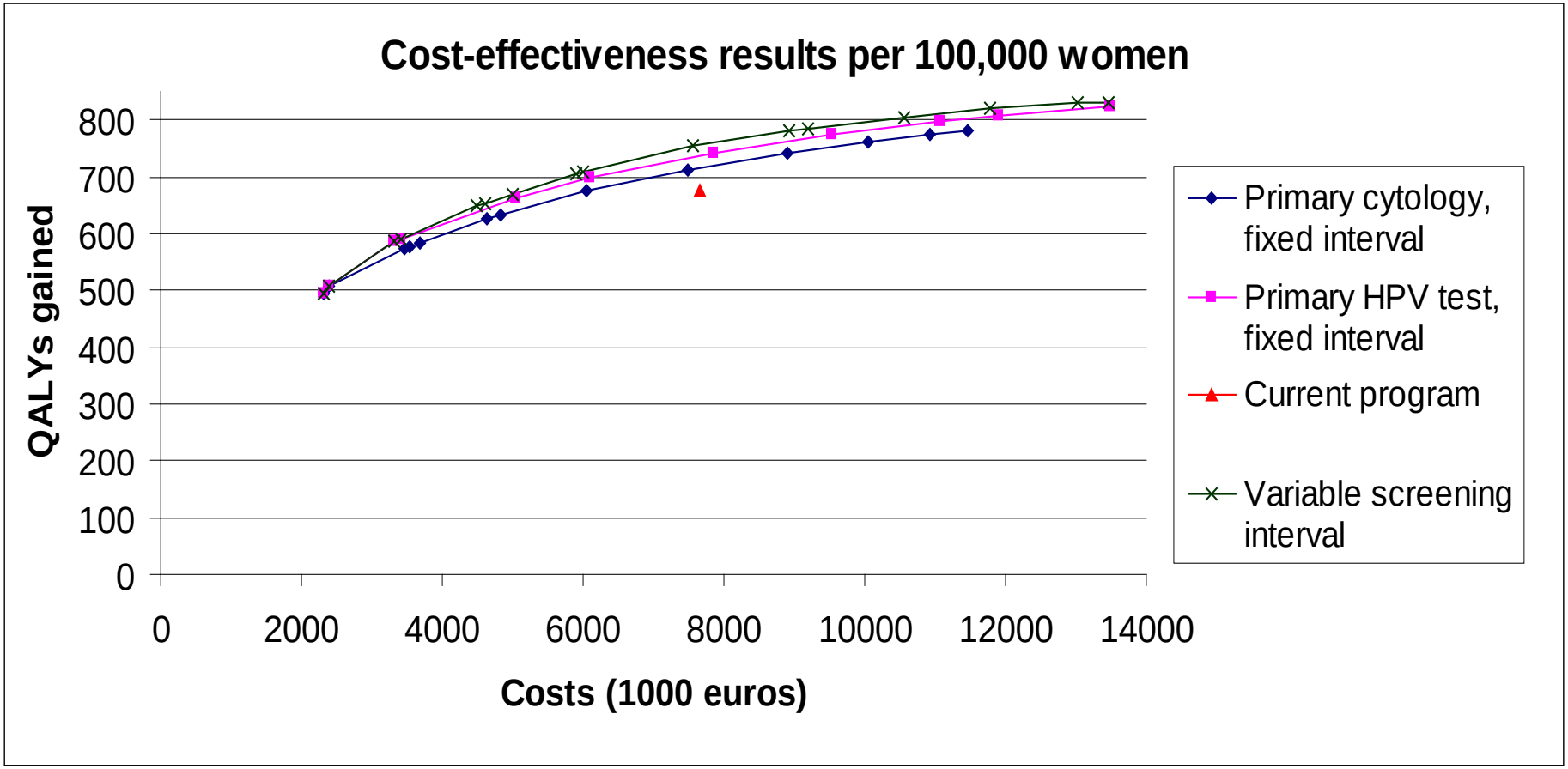
Methods: simulated programs

- Optimization of:
  a) type of primary test (cytology or HPV test)
  b) which triage tests are applied and when
  c) the screening policy (the ages at which women are screened)
- Both conventional and liquid-based cytology considered.
- Simulated screening policies:
  a) At least 3 and at most 10 screening rounds
  b) Starting age at least 25 and at most 32 years old.
  c) Interval of at least 3 and at most 10 years.
- Interval between screenings can change once per lifetime.

Results: cost-effectiveness frontiers



Results: cost-effectiveness frontiers



Results: efficient screening programs, fixed interval

Strategy	Primary test	Triage test	Screenings	Age range	QALYs gained	Net costs (1000€)	Incremental costs per QALY gained (€)
I	Conv. cyt.	HPV	3	32-42	494	2,327	4,707
I	Conv. cyt.	HPV	3	32-44	508	2,392	4,736
C	HPV	Conv. cyt.	3	32-46	585	3,328	12,802
C	HPV	Conv. cyt.	3	32-48	591	3,410	13,758
E	HPV	Conv. cyt./HPV	4	30-54	662	5,049	23,379
D	HPV	Conv. cyt.	5	30-54	697	6,107	31,186
D	HPV	Conv. cyt.	6	30-60	740	7,859	40,847
D	HPV	Conv. cyt.	7	30-66	773	9,531	51,413
D	HPV	Conv. cyt.	8	30-65	797	11,074	65,630
D	HPV	Conv. cyt.	9	25-65	806	11,899	87,058
D	HPV	Conv. cyt.	10	25-70	824	13,484	90,021

Results: efficient screening programs, variable time interval

Strategy	Primary test	Triage test	Screening ages	Incremental costs per QALY gained (€)
I	Conv. cyt.	HPV	25, 32, 39, 43	5,748
I	Conv. cyt.	HPV	30, 35, 40, 48	8,380
I	Conv. cyt.	HPV	32, 36, 40, 48	8,412
D	HPV	Conv. cyt.	30, 36, 42, 52	14,720
D	HPV	Conv. cyt.	32, 37, 42, 52	23,340
C	HPV	Conv. cyt.	32, 39, 46, 56	25,283
D	HPV	Conv. cyt.	30, 35, 40, 45, 55	26,025
D	HPV	Conv. cyt.	30, 35, 40, 48, 56	27,881
D	HPV	Conv. cyt.	30, 35, 40, 45, 55, 65	32,972
D	HPV	Conv. cyt.	30, 34, 38, 42, 46, 56, 66	53,601
D	HPV	Conv. cyt.	30, 35, 40, 45, 53, 61, 69	56,606
D	HPV	Conv. cyt.	30, 34, 38, 42, 46, 54, 62, 70	71,506
D	HPV	Conv. cyt.	27, 31, 35, 39, 43, 47, 54, 61, 68	80,960
D	HPV	Conv. cyt.	27, 30, 33, 36, 39, 45, 51, 57, 63, 69	107,038
D	HPV	Conv. cyt.	30, 33, 36, 39, 42, 45, 48, 55, 62, 69	1,250,713

Results

- Optimal strategy: primary HPV test, cytology triage immediately and after 6 months for positive HPV tests. An abnormal result on a triage test leads to referral for colposcopy.
- Liquid-based cytology is not cost-effective

Results

- Screening can be less intensive at older ages
- Higher sensitivity of HPV test allows for longer interval between screening rounds.
- Compared to current Dutch program, an efficient program can yield 11% more QALYs gained, 8% fewer cervical cancer deaths at 1% lower costs.

Discussion

- Most cost-effective screening strategy: primary HPV testing with two times cytology triage.
- This result is sensitive to several model inputs, such as the price of the HPV test and the utility loss associated with time spent in triage.
- Results only valid for unvaccinated women.

Conclusion

- Adopting the HPV DNA test and increasing the interval between screening rounds for older women can improve the cost-effectiveness of cervical cancer screening in the Netherlands.