



Modelling the impact of using a DNA compared to mRNA HPV assay as part of the cervical screening programmes in Sweden and Denmark

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INTRODUCTION

- Nearly all cases of cervical cancer are caused by 14 high-risk human papillomavirus (HR-HPV) genotypes (1).
- Denmark and Sweden are assessing the structure of their cervical cancer screening programmes and implementing HR-HPV screening in certain populations.
- While both DNA and mRNA assays have similar sensitivity, mRNA assays have been shown to have higher specificity resulting in fewer false positive results (2).
- This study will investigate how the type of assay used to detect HR HPV infections in a screening programme may impact costs, patient follow-up, and resource use.

AIM

To compare the impact of using an mRNA versus DNA assay to detect HR-HPV within the national cervical screening programmes of Denmark and Sweden, using a modelling approach.

RESULTS

Country	Screened population	Cost savings	Colposcopies averted
Sweden	546,615	39.0 million (SEK)	12,621
Denmark	224,680	7.5 million (DKK)	5,427

Table 2: Model outputs with the use of mRNA compared to DNA testing in the screening algorithm

- For both countries, there are cost savings and colposcopies averted under the mRNA testing arm (Table 2, Table 3).
- In scenario analyses, cost savings were seen with the mRNA assay at low and high levels of HPV positivity and increased percentage of HR-HPV assay uptake in the algorithm (Figure 3).

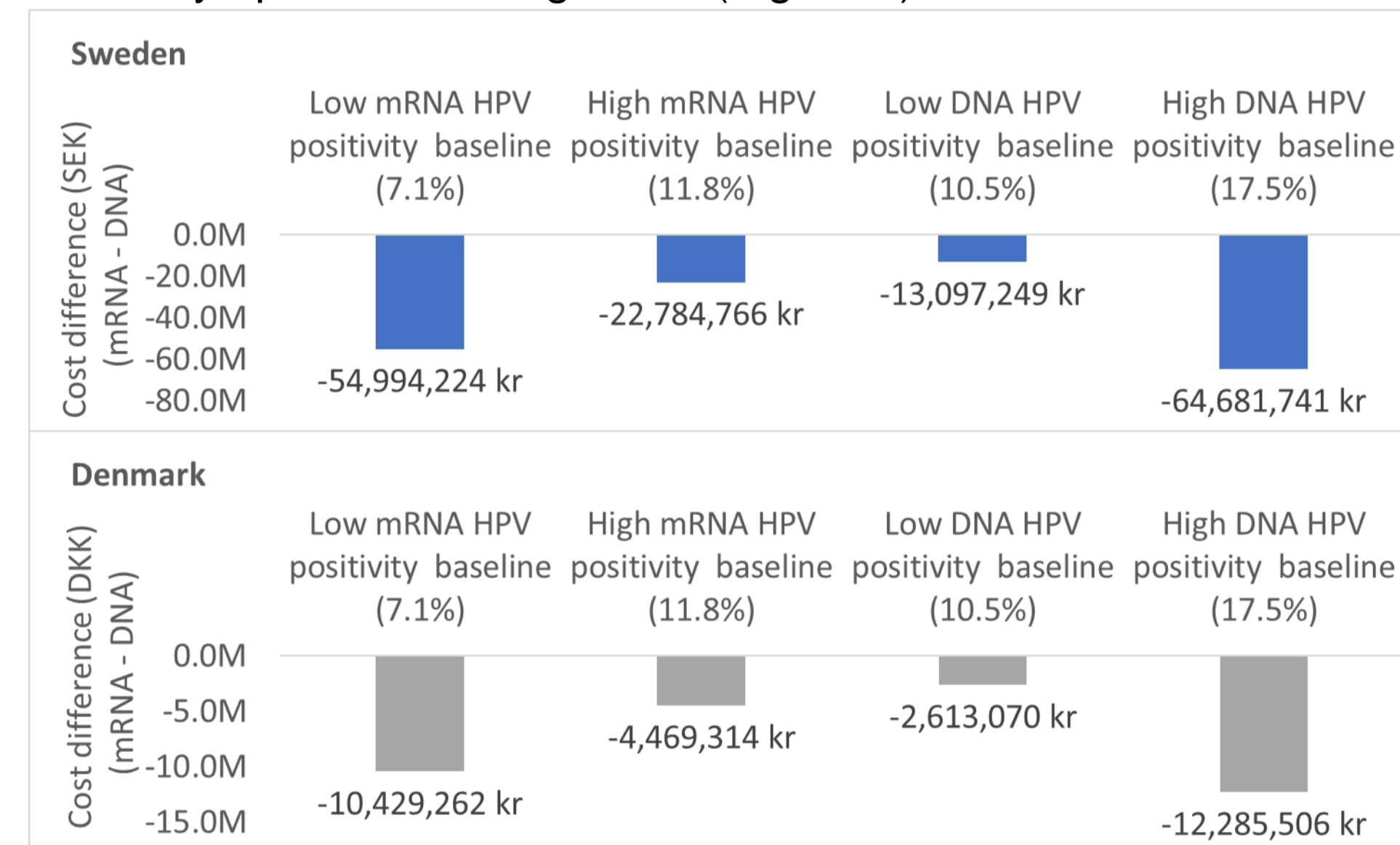


Figure 3. Scenario analysis: Cost savings are seen in the mRNA HR-HPV assay arm at low and high relative HR-HPV positivity levels at initial screen compared to the DNA HR-HPV assay. Cost are reported in local currencies: Swedish costs (SEK), Danish costs (DKK).

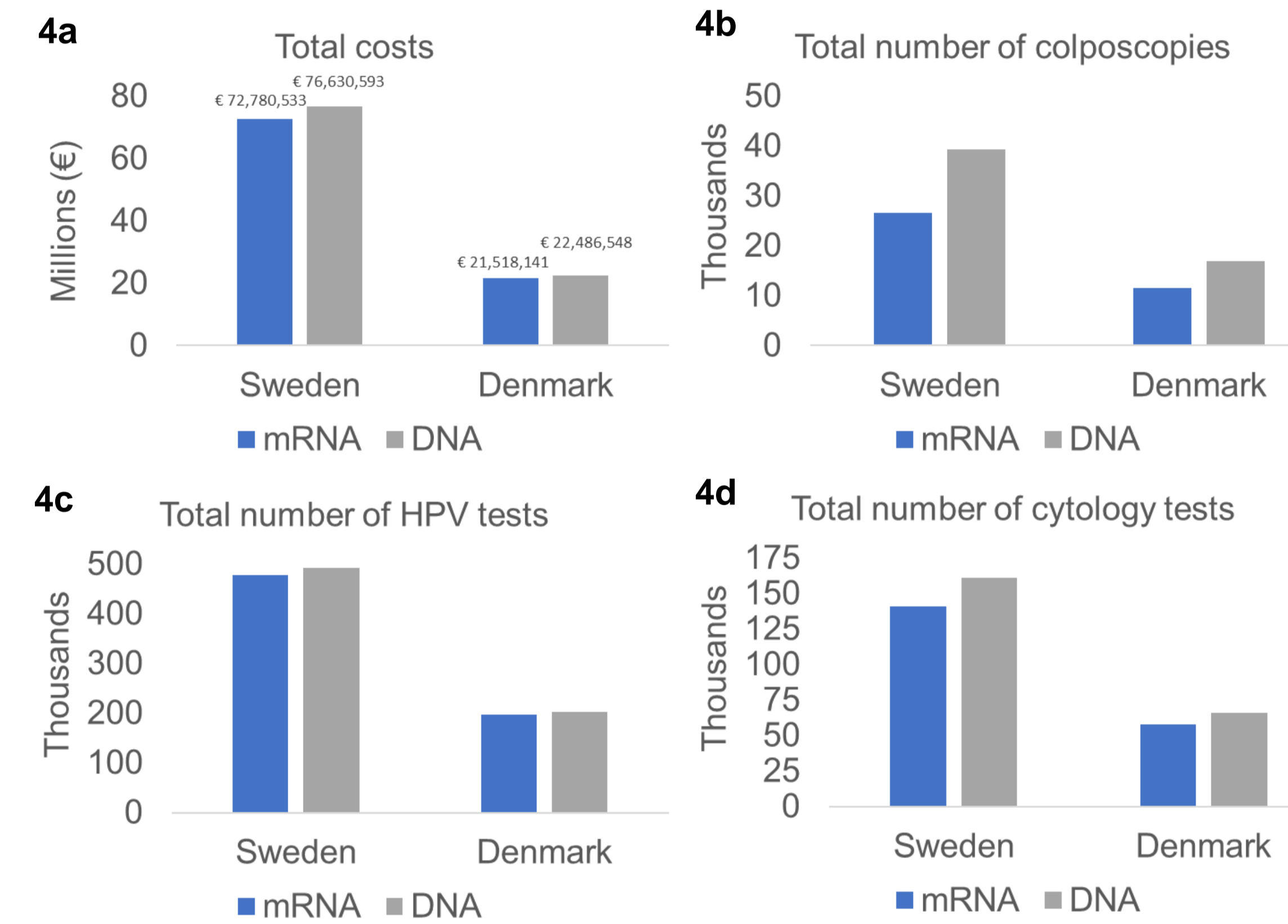


Figure 4. Results for one cohort of women participating in cervical screening over 2 years for Sweden and Denmark in the mRNA HR-HPV assay arm compared to the DNA HR-HPV assay arm. 4a: Total costs (converted to Euros) 4b: Total number of colposcopies. 4c: Total number of HPV tests. 4d: Total number of cytology tests.

Overall, there were reductions in the number of HPV and cytology tests, total costs and colposcopies; favouring the mRNA arm (Figure 4).

Country	Cost difference (mRNA – DNA)			
	Cost of colposcopies	Cost of HPV tests	Cost of cytology tests	Total cost
Sweden (SEK)	-18,266,153	-16,283,666	-4,339,676	-38,889,495
Denmark (DKK)	-3,016,177	-3,894,692	-538,420	-7,449,288

Table 3: Difference in costs in the mRNA HR-HPV assay arm compared to the DNA HR-HPV assay arm. Negative amounts indicate cost savings with mRNA (in local currencies: Swedish costs (SEK), Danish costs (DKK)).

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METHOD

- A decision tree model was adapted from a previously published study in England (3) to simulate cervical screening algorithms in Sweden and Denmark (Table 1).
- Trials of different algorithms for various age ranges are ongoing in Denmark. For this study, an HPV primary algorithm was modelled (Figure 1A Cytology Primary and Figure 1B HPV Primary).

Country	Age Range	Screening Algorithm
Sweden	23-29	Cytology Primary
	30-70	HPV Primary
Denmark	23-29	Cytology Primary
	30-60	HPV Primary

Table 1: Screening algorithm by age range in Sweden and Denmark

- The model estimated the total costs and number of colposcopies, HPV tests and cytology tests in one cohort screened and followed through the screening algorithm, using either a DNA or mRNA assay in Sweden or Denmark.
- Published data from Sweden and Denmark were used for the costs, demographic, and screening data. Probabilities of HR-HPV and cytology positivity were taken from the HORIZON study which compared mRNA and DNA testing for a screening population in Denmark (4,5).

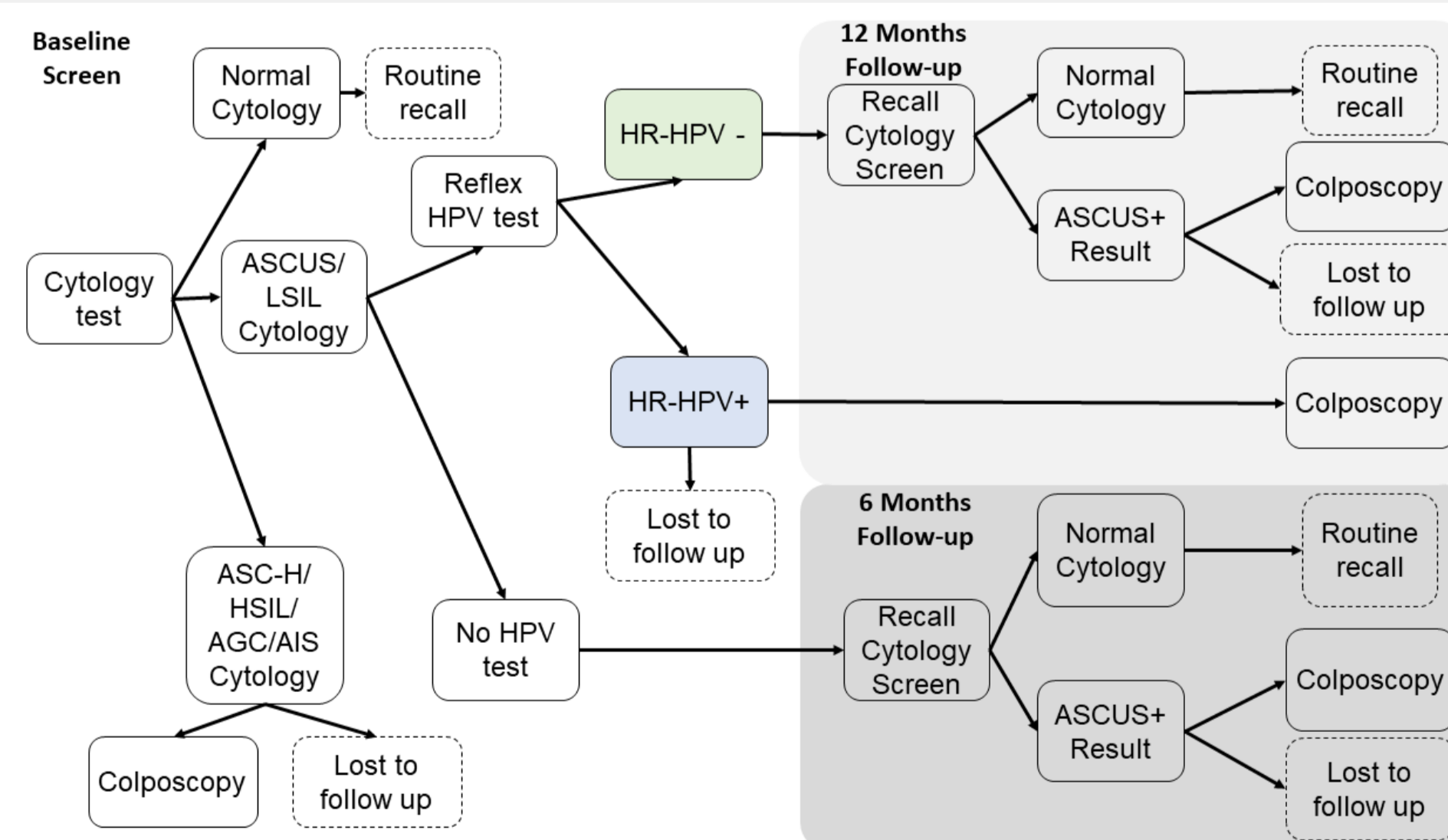


Figure 1A: Cytology Primary Screening Algorithm

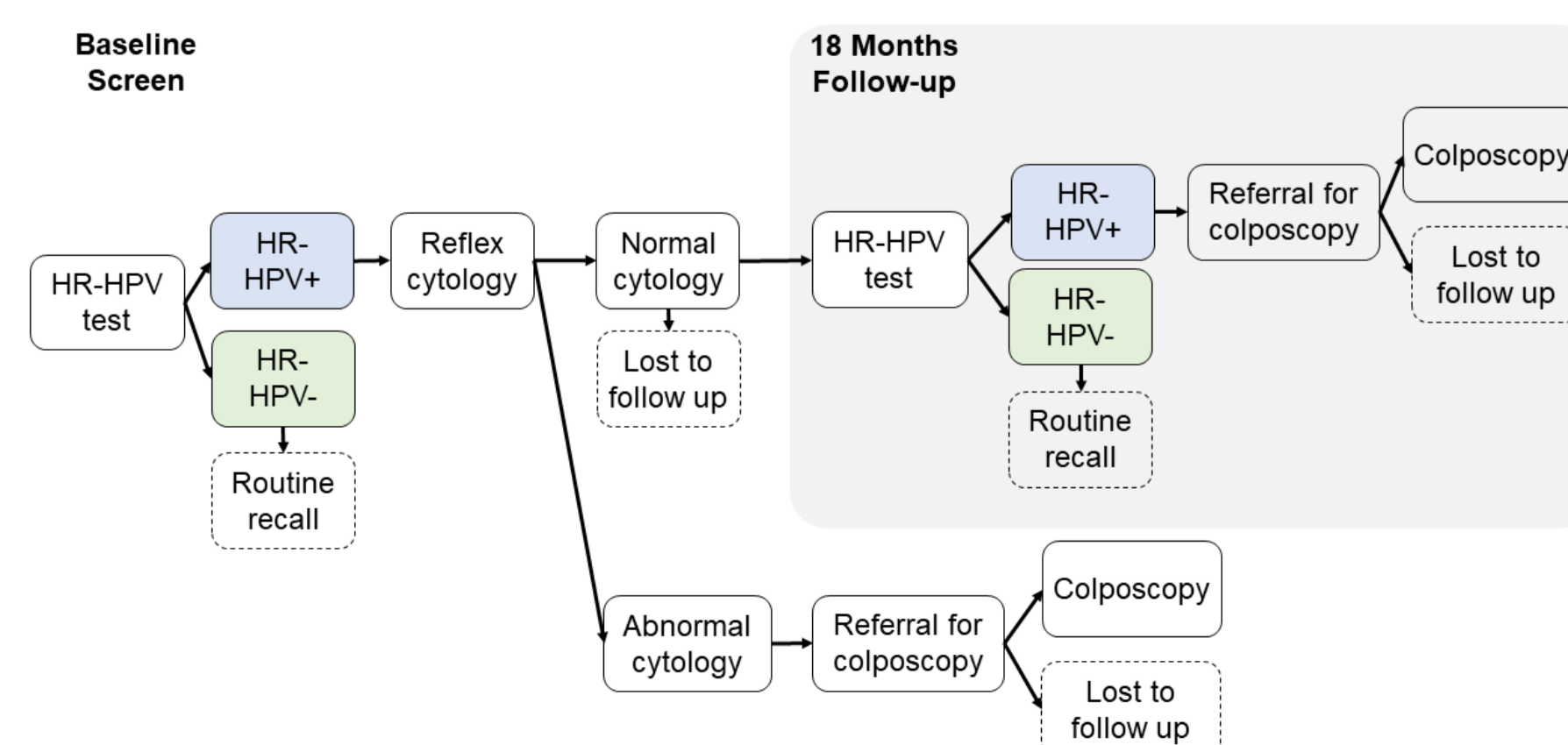


Figure 1B HPV Primary Screening Algorithm

DISCUSSION

- The use of mRNA tests in cervical screening for women in Sweden or Denmark instead of DNA testing would result in costs savings and a decrease in the number of unnecessary cytology tests, unnecessary recall HR-HPV tests and unnecessary colposcopies compared to HR-HPV DNA testing.
- The scope of cost savings and unnecessary tests avoided depends on the population, the algorithm chosen, the cost of different components of the pathway and HR-HPV prevalence. There may be higher HR-HPV prevalence in the population in the HORIZON study than throughout Denmark and Sweden. Therefore, the expected number of tests and cost savings may be lower than estimated in the model.
- These results can be used to inform the implementation of screening programmes with benefits for health services and women.
- Further studies could evaluate the impact of changes to the screening interval, alternative algorithm structures or including self-sampling or the addition of genotyping into the cervical screening algorithms.

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