HEALTH PSYCHOLOGY BULLETIN

EDITORIAL HISTORY

Mothers' Perceptions of their Daughters' Susceptibility to HPV-related Risk Factors: an Experimental Pretest Comparing Narrative and Statistical Risk Information

Pot, M., van Keulen, H. M., Paulussen, T. W. G. M., Otten, W.,
van Steenbergen, J. E., & Ruiter, R. A. C.

This document contains the editorial history, organized into three sections. This first section, section 0, provides background information about the paper and the review procedure. Section 1 is organized chronologically and contains the editorial communication and peer review history. Section 2 contains the successive preprints and is organized anti-chronologically.

DOI of article:	10.5334/hpb.7
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Article submitted:	2017-05-09
Revision submitted:	2018-02-13
Article accepted:	2018-07-29
Executive editor:	Lena Fleig
Senior editor:	Alexander Rothman
Peer reviewer A:	Suellen Hopfer
Peer reviewer B:	Marleena Vornanen

Cite this document as:

Pot, M., van Keulen, H. M., Paulussen, T. W. G. M., Otten, W., van Steenbergen, J. E., & Ruiter, R. A. C. (authors); Hopfer, S., & Vornanen, M. (reviewers); Rothman, A., & Fleig, L. (editors) (2019) Editorial history for 'Mothers' Perceptions of their Daughters' Susceptibility to HPV-related Risk Factors: an Experimental Pretest Comparing Narrative and Statistical Risk Information'. *Health Psychology Bulletin*, 3(1). DOI: <http://doi.org/10.5334/hpb.7.pr1>

Paper abstract

Background: In order to promote HPV-vaccination acceptability among mothers of invited girls, we developed a web-based, tailored intervention. This study reports on an experimental pretest for the component of this intervention targeting mothers' perceptions of their daughters' susceptibility towards HPV-related risk factors. Statistical versus narrative risk information was pretested as research results remain to be mixed on the surplus value of one type over the other in influencing mothers' perceptions of their daughters' susceptibility.

Methods: We used data from 375 mothers of girls-to-be invited to the HPV-vaccination round 2014, who were derived from the Dutch National Immunization Register. They were randomly assigned to one of four conditions in a 2 (statistical information: yes or no) x 2 (narrative information: yes or no) between-subjects factorial design.

Findings: Mothers who received statistical information felt their daughters were more susceptible towards HPV than mothers who received no statistical information. No main or interaction effects with narrative information were found. The effect of statistical information on mothers' perceptions of their daughters' susceptibility towards HPV was not moderated by perceived comprehensibility, credibility or novelty of the risk information, nor mediated by message-induced imaginability, elaboration, personal relevance, or defensive reactions. However, in secondary analyses, in which we only included the statistical and narrative condition, we found personal relevance to mediate the effect of statistical information (independent variable) on mothers' perceptions of their daughters' susceptibility towards HPV (dependent variable).

Discussion: Statistical risk information appeared most effective in increasing mothers' perceptions of their daughters' susceptibility towards HPV and was therefore included in the web-based, tailored intervention promoting HPV-vaccination acceptability.

Background

This peer review history is published under Health Psychology Bulletin's peer review policy. Peer review at Health Psychology Bulletin (HPB) is blind, but upon acceptance of an article, the entire peer review history is made public. This policy has two aims. First, it makes the reviews citable, rewarding reviewers for their reviews, incentivizing thorough, thoughtful reviews, and stimulating constructive, considerate reviews and responses. Second, to yield the best of both worlds in terms of design of the review procedure. The common procedure of shielding authors' and peer reviewers' identities aims to prevent undue harshness or leniency. However, this anonymity also protects reviewers who make unreasonable requests or statements that are inconsistent with the literature, and authors who refuse to respond adequately to reviewers' requests. These risks are ameliorated by unblinding and publishing the peer review procedure upon paper acceptance.

Health Psychology Bulletin

Health Psychology Bulletin (HPB) is an official journal of the European Health Psychology Society (EHPS). It implements a number of innovative practices such as this peer review procedure, a strong full disclosure policy, a two-tiered review procedure, and explicitly welcoming null findings, replications, and reports of lessons learned such as failed manipulations or measurement instruments, as well as regular articles.

Section 1: editorial correspondence

This section is comprised of the editor–author correspondence followed by the review reports in chronological order.

09/05/2017

Dear Dr. Peters,

We wish to submit an original research article entitled "Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks" for consideration by Health Psychology Bulletin.

This study reports on an online experimental pretest of materials developed for an intervention promoting HPV-vaccination acceptability targeting mothers of invited girls. Specifically, this study pretested two types of risk information (i.e., statistical and narrative risk information) for an intervention component targeting perceived susceptibility towards HPV-related risks. As research remains to be mixed on the surplus value of one type over the other in influencing perceived susceptibility, pretesting was considered necessary. We believe that this manuscript is appropriate for publication by Health Psychology Bulletin because it significantly contributes to the development in the field of health psychology, that is, in the field of HPV-vaccination. In addition, by complying to the full disclosure policy, this manuscript adds to the plea of improving publication practices to accelerate scientific progress.

It should be noted that, although we aimed to be concise, the article turned out to be somewhat longer than we strived for (i.e., 4,204 words instead of the suggested 4,000). However, we were worried that shortening the article (more than we already did), may preclude accurate replication. Hopefully, this serves as a justification.

This manuscript has not been and will not be published in this or a similar form (in print or electronically, including on a web site), nor accepted for publication elsewhere, nor is it under consideration by another publication. The authors do not have any conflict of interest and have contributed significantly to the manuscript. All authors have confirmed that they have read and approved the paper and believe that the paper represents honest work. They are able to verify the validity of the results reported.

We hope that this manuscript can contribute to the contents of Health Psychology Bulletin.

Kind regards,

Also on behalf of the co-authors, Hilde van Keulen, Theo Paulussen, Wilma Otten, Jim van Steenbergen and Robert Ruiter,

Mirjam Pot, MSc.
TNO, Child Health

Editor/Author Correspondence

Section Editor
2017-09-09 04:48 PM

Subject: [HPB] Editor Decision - "Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks"

Dear Mirjam Pot,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks". Our decision is to request revisions of the manuscript. These revisions (together with your full manuscript, including results/discussion section) may then undergo further peer review prior to acceptance.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly:

I have also read your work and the the following Editorial Revision Requests:

Major revisions:

- Provide a more detailed overall (theoretical) framework (you mention the ELM, consider making reference to other theories of decision making/intention formation/behaviour change, ideally as a Figure (with independent variables, dependent variables, mediators, moderators, etc.)
- Please highlight why this study was needed and what it adds to previous research/what is the novel aspect of your study?

Minor revisions:

- Please provide references for all of your measures
- Page 3, line 55: caN mediate

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by October 9th, 2017. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Prof Lena Fleig
Freie Universität Berlin
lena.fleig@fu-berlin.de

Reviewer B:

The article appears to fit within the scope of the journal. Communicating effectively about HPV vaccination is an important topic.

Intro: Sufficient literature review on impact of narratives and statistics. Just an fyi, Hopfer narrative intervention included narratives and statistics. It seems that testing narratives OR statistics is a bit of an old debate....really what would advance science of this is how to use both togetherwhat kind of narratives and what kinds or ways of presenting statistics....a bit of a missed opportunity here

I do like your investigation into moderators and mediators.

I would say that while focusing on the importance of mother communication, this is not the only factor. In fact, it's quite a complex message environment with the practitioners' role equally as important. This is not recognized. Furthermore, to the aspect of what impacts HPV vaccine attitudes, intent to vaccinate....perceived susceptibility does not always play a role (so this ratl is a bit flawed)....

Recruitment: Methods section describes recruitment of 3680 mothers however, it's not clear from where these mothers are being recruited. This should be made clear in the Procedure section.

Power calculations: Line 105, please use anticipated "attrition rate" for 30% rather than drop-out percentage. As for 5% response rate (that is extremely low, not acceptable for many journals).

Is "Operationalisations" a word? (not sure if this is British English? but this is not a word in American-English)

Measures: Vaccine intent (2 items) one item should have included a time element to "intent to vaccinate" in the next 2 months?

Manipulation checks: good to see you did this!!

Single item measures a limitation

Word count of statistical and narrative messages should be provided. If not similar, this may account for differences.

Reviewer F:

The manuscript concerns an experimental pretesting of statistical and narrative risk communication materials, targeting mothers' perceived susceptibility of their daughter getting an HPV infection or cervical cancer. The aim is to formulate an intervention promoting uptake of HPV vaccination among teenage girls. Strengths of the study include a register-based sample, and an experimental design comparing effects of two types of risk information, and their combination, to effects of general information on HPV, cervical cancer, and HPV vaccination only.

The article fits well within the scope of the journal. The manuscript is well written in good English, logically structured and easy to follow. The chosen approach is appropriately described and justified. The abstract concisely summarizes the aims and methods of the study, and the authors adhere to journal formatting guidelines. However, there are certain aspects that could be expressed more clearly, or discussed/justified more thoroughly.

Comment 1: I suggest the authors specify in the title that the study concerns not one's own, but one's daughter's susceptibility. Also in the abstract and throughout the manuscript the authors could more accurately refer to 'perceived daughter's susceptibility' or similar, to avoid confusing the reader.

Introduction:

The aims and scope of the study are concisely presented.

Comment 2: In the first paragraph, the authors cite evidence that perceived susceptibility is linked to HPV vaccination acceptability. Please specify whether this refers to perceived own susceptibility, or perceived daughter's susceptibility, or both. Please discuss also potential differences in effects between the two. I suggest the authors also show more explicitly that HPV vaccination acceptability promotes uptake of HPV vaccination. Is acceptability the main barrier for uptake, or are there others as well?

Comment 3: The authors say (line 22) that 'research findings are mixed about the surplus value of either using statistical or narrative risk information in affecting perceived susceptibility'. Please address which studies this conclusion refers to, specifically. In the next section the previous studies are discussed more. I suggest the authors describe more accurately what types of control groups (line 42) were used in previous studies that are cited, so that the reader can follow the argument more easily. Does the present study take into account some methodological aspects that were not considered in previous studies, or is the aim to replicate previous studies?

Comment 4: The authors describe (lines 49–54) that comprehensibility, credibility, and novelty are theorized to

mediate the effects of risk communication, yet a moderation analysis was chosen. Is there a reason for this mismatch?

Methods:

Altogether, study procedure and used measures are clearly described.

Comment 5: I suggest the authors discuss how well the contents of the two types of risk information match. To what extent can possible differences in effects of statistical risk information and narrative risk information be attributed to the type and not the content of the information? Some elements that are implicitly linked to susceptibility in the narrative (e.g. number of sex partners, use of condoms) were not present in the statistical risk information. How was the narrative formulated, i.e. which were the reasons for choosing this type of a narrative over other possibilities? Some more information on the process of formulating the different texts would be useful (lines 159–161). In addition, there is a logical error in the statistical risk information: 'Of every 100 women, 80 get infected with the HPV-virus. This means that 80% of all women get infected with HPV once.' The first sentence means that 80 % get infected at least once, and 20 % never get it. The latter sentence suggests that 80 % get infected once, and some percentage more than once, and less than 20 % never get it. Might this have confused the participants?

Comment 6: The authors state (line 162) that 'All participants received general information about HPV, cervical cancer, and the HPV-vaccination, to ensure their background knowledge was similar'. Could the authors discuss in which ways participants' background knowledge or beliefs might differ even after receiving the general information?

Comment 7: In the article (line 170) the authors describe that the narrative used was 'derived from an internet health forum', but the name of the person was fictitious. In the Debriefing file, however, the narrative is said to be fictitious: 'The story of Anne, however, has been generated by the researchers; she is a fictitious person.' Please clarify this confusion. Was the story indeed real, but the participants were told otherwise, and why so?

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Section Editor
2017-10-19 02:04 PM

Subject: [HPB] Editor Decision - "Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks"

Dear Mirjam Pot and colleagues,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks". Our decision is to request revisions of the manuscript prior to acceptance for publication.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly:

Editorial Revision Requests:

Major revisions:

[XXXX EDITOR TO INSERT LIST OF MAJOR REVISIONS HERE, IF ANY XXXX]

Minor revisions:

[XXXX EDITOR TO INSERT LIST OF MINOR REVISIONS HERE, IF ANY XXXX]

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- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by [GIVE 2 WEEK DEADLINE]. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Prof Lena Fleig
Freie Universität Berlin
lena.fleig@fu-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Subject: [HPB] Editor Decsion - Extension of Deadline for Revision

Dear Hilde, dear co-authors,

I am sorry to hear about the illness of your leading author. I have extended the due date of your revision to January 31st 2018.

If you have any questions or difficulties during this process, please do contact us.

Kind regards & get-well-wishes to Mirjam,

Lena Fleig

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschooll-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Subject: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Submission to: Health Psychology Bulletin

Title of paper: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Date revision: 13 February 2018

Dear Editor,

On behalf of my co-authors, I would like to resubmit the enclosed manuscript for consideration by Health Psychology Bulletin. In the revised manuscript we have tried to incorporate all your comments concerning review tier 1. The changes to the introduction and method section are highlighted (track changes). We also attached a list of responses to the comments (see "HPB_ResponseToReviewTier1_final"). Furthermore, we have added the result and discussion section to the manuscript (review tier 2). Finally, the analysis package can be found as a zip file.

As was stated in the first submission, this manuscript has not been and will not be published in this or a similar form (in print or electronically, including on a web site), nor accepted for publication elsewhere, nor is it under consideration by another publication. The authors do not have any conflict of interest. All authors have confirmed that they have read and approved the revised paper, believe that the paper represents honest work, and are able to verify the validity of the results reported.

We would like to thank you for the opportunity to engage with the comments of the reviewers and improve our manuscript. Hopefully the revisions are to mutual satisfaction. Thanks for your patience.

We hope that this manuscript can contribute to the contents of Health Psychology Bulletin.

Kind regards,

Also on behalf of the co-authors, Hilde van Keulen, Theo Paulussen, Wilma Otten, Jim van Steenberg and Robert Ruiter,

Mirjam Pot, MSc.
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Health Psychology Bulletin
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Section Editor
2017-10-19 05:56 PM

Author
2018-02-13 01:47 PM

Author
2018-02-13 01:52 PM

Subject: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Section Editor
2018-02-21 07:36 PM

Subject: [HPB] Editor Decision – "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks"

Dear Mirjam Pot,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks". Our decision is to request revisions of the manuscript. These revisions may then undergo further peer review prior to acceptance.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly:

Editorial Revision Requests:

Major revisions:

[XXXX EDITOR TO INSERT LIST OF MAJOR REVISIONS HERE, IF ANY XXXX]

Minor revisions:

[XXXX EDITOR TO INSERT LIST OF MINOR REVISIONS HERE, IF ANY XXXX]

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If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by [GIVE 2 WEEK DEADLINE]. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschooll-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Section Editor
2018-04-25 08:27 AM

Subject: [HPB] Editor Decision - "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks"

Dear Mirjam Pot,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks". Our decision is to request revisions of the manuscript prior to acceptance for publication.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly.

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If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by May 17th 2018. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschooll-berlin.de

Reviewer A:

Section 1a, Full Disclosure: Replication Package: Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.:

- Includes protocols for recruitment of participants and guiding participants through the study
- Includes templates for communications with participants (if applicable)
- Includes operationalisations of measurements (e.g. questionnaires, source code)
- Includes operationalisations of manipulations (e.g. intervention manuals, stimuli, etc)
- Includes analysis plan
- Includes proposal for ethical approval

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format.:

Section 1b, Full Disclosure: Analysis Package: Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.:

- Includes raw data
- Includes analysis scripts used to clean/preprocess/wrangle/munge the data
- Includes cleaned data
- Includes analysis scripts used to conduct statistical analyses

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format.:

Section 2a, Reviewer comments: Here, please type or paste your review. Please make sure to adhere to the editorial policy for reviewers.:

The schematic overview (Figure 1) is helpful as are the details in methods section on background about recruitment, etc. as are the details on the stimulus.

Discussion section: Please add or revise a more pointed discussion of ruling out alternative explanations/hypotheses to build confidence about results or discuss what we can learn about why or why not and under what conditions statistical and narrative messages may be effective. The authors point out as I thought of when reading, that the narrative stimulus used in this study...that mothers' may not identify with or link the story of a 30 y.o who gets cervical cancer with their adolescent daughter...also, that the 30 y.o. main character had sex at age 14. This may be play an important reason why the narrative did not play a role in mothers' perceptions of their daughters. And the authors point out that they did not measure identification (this also plays a key role with identifying "effective" narratives). Also pointed out was that perceived susceptibility does not always play a key role in behavior adoption intention.

For Significant moderators and mediators, please add on what outcome (line 467). Authors mention personal relevance mediator impacts perceived susceptibility (469). It could be that statistical and narratives that are presented in such a way that evoke imaginability, personal relevance and comprehensibility will increase

behavioral intention outcomes...Perhaps we learn from this that either it is the way statistical information is presented (there are different ways, e.g., more proximally relevant for a target audience) or in a normalized way. In addition, perhaps the mediators indicate key ways in which either statistical or narratives messages need to be designed...to evoke imaginability, personal relevance and render the information more comprehensible. Main thing in discussion -perhaps if authors could elaborate what we learn from this study about how to present and or what kind of statistical information may be effective.

Limitations: Réponse rate is very low. Authors might want to conduct an analysis to see how responders are different from non-responders.

Also, please include limitation that you did not include identification as a mediator...this could have helped in disentangling why narratives and or statistical information is or is not effective.

Minor revision: This may be British English but in English one does not "attract" cancer or a virus, one either acquires it or contracts it. That needs to be changed on lines 422, 424, 427

Future Research: I wouldn't say this work needs to be extended to other viruses....Speak more about how, what kind ...speak to anything we learn about the presentation of statistical and narratives messages...that is the point of this study. Please speak to what kinds of statistical information need to be further investigated for how to present statistical information.

Reviewer B:

Section 1a, Full Disclosure: Replication Package:Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.:

Includes protocols for recruitment of participants and guiding participants through the study

Includes templates for communications with participants (if applicable)

Includes operationalisations of measurements (e.g. questionnaires, source code)

Includes operationalisations of manipulations (e.g. intervention manuals, stimuli, etc)

Includes analysis plan

Includes proposal for ethical approval

Includes confirmation of ethics approval/Institutional Review Board (IRB) approval

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format::

Section 1b, Full Disclosure: Analysis Package:Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.:

Includes raw data

Includes analysis scripts used to clean/preprocess/wrangle/munge the data

Includes cleaned data

Includes analysis scripts used to conduct statistical analyses

Includes textual output

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format::

Section 2a, Reviewer comments:Here, please type or paste your review. Please make sure to adhere to the editorial policy for reviewers.:

General comments:

The authors have clarified several parts of their study procedure, altogether the paper is coherent. Yet, the authors still need to be more accurate when describing earlier studies. Results need to report statistical tests of differences between means for different groups.

Introduction:

Line 31: Please be specific, whose intention Pot et al.'s and Hofman et al.'s studies examined, mothers' or daughters' own? I am still missing some theoretical discussion on whether perceived susceptibility, intention, and other determinants might work similarly or differently when the issue concerns one's own risk versus someone else's (=daughter's). Also in the 'Statistical versus Narrative Risk Information' section it is not always clear to the reader whether the referred studies concern perceived own risk or daughters' risk (lines 68–75).

Line 79: Please describe expected direction of moderation.

Results:

Line 292: Mean scores are not very high for defensive avoidance or perceived manipulation on scale 1–7, do the authors mean are they higher than expected based on previous studies?

Structure and argument:

The text is fluent and structured, but I encourage use of less statistical language throughout the manuscript to enhance readability, for example line 326 'In this study no effects were found for narrative risk information', to for example 'In this study, narrative risk information had no effect on how mothers perceived their daughters' risk for HPV or cervical cancer.' In particular, the paragraph in the discussion lines 341–363 is a bit hard to follow.

Figures/tables:

Figure 1 clarifies the study nicely, but I wonder why 'defensive avoidance' and 'perceived manipulation' are not included there?

I suggest the authors add the possible range for susceptibility and intention scores to tables 1–3. Did the authors statistically test differences between means (Tables 1–4)?

Health Psychology Bulletin

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Subject: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Submission to: Health Psychology Bulletin

Title of paper: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Date revision: 17 May 2018

Dear Alexander Rothman and Prof. Lena Feig,

On behalf of my co-authors, I would like to resubmit the enclosed manuscript for consideration by Health Psychology Bulletin. In the revised manuscript we have tried to incorporate all your comments concerning review tier 2. The changes to the manuscript are highlighted (track changes). We also attached a list of responses to the comments (see "HPB_ResponseToReviewTier2_final").

It should be noted that, although we aimed to be concise, the article turned out to be somewhat longer than we strived for (i.e., 4,677 words instead of the suggested 4,000). However, we were worried that shortening the article (more than we already did), may preclude accurate replication. Also, we have extended some parts of the manuscript in order to (a) enhance both comprehensibility and readability and (b) provide a more pointed discussion of ruling out alternative explanations/hypotheses to build confidence about the study's results (both were suggested by the Reviewers). Hopefully, the above serves as a justification.

We have uploaded the tracked manuscript. In addition, you can find the untracked version as an attachment.

As was stated in the first submission, this manuscript has not been and will not be published in this or a similar form (in print or electronically, including on a web site), nor accepted for publication elsewhere, nor is it under consideration by another publication. The authors do not have any conflict of interest. All authors have confirmed that they have read and approved the revised paper, believe that the paper represents honest work, and are able to verify the validity of the results reported.

We would like to thank you for the opportunity to engage with the comments of the reviewers and improve our manuscript. Hopefully the revisions are to mutual satisfaction. Thanks for your patience.

We hope that this manuscript can contribute to the contents of Health Psychology Bulletin.

Kind regards,

Also on behalf of the co-authors, Hilde van Keulen, Theo Paulussen, Wilma Otten, Jim van Steenberghe and Robert Ruiter,

Mirjam Pot, MSc.

TNO, Child Health

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E-mail address: mirjampot90@hotmail.com (M. Pot)

Health Psychology Bulletin

<http://healthpsychologybulletin.com>

Subject: [HPB] Editor Decision - "Experimental Pretesting..."

Dear Mirjam Pot,

After reviewing your extensive revisions, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks". Our decision is to request minor revisions of the manuscript prior to acceptance for publication.

Author
2018-05-17 10:18 AM

Section Editor
2018-07-04 10:49 AM

From my own reading of the manuscript, I very much agree with the reviewers' assessments that the paper has many strengths and you have convincingly addressed the reviewers concerns. However, there remain some minor points. Prior to accepting the paper for publication please consider these more minor issues and make appropriate changes to your manuscript and highlight exactly where you have made them.

A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly:

Editorial Revision Requests/Minor revisions:

Abstract

Page 1, line 14: The effect of statistical information ON mothers' INTENTION/Susceptibility? – state the dependent variable (DV) here

- Avoid starting sentences with But (also see discussion) and “and” (page 18, line 378)

Page 1, line 16-17: please state here IV and DV (otherwise this confuses the reader as it is not clear why you run secondary analyses)

Discussion

Page 17, line 350: avoid causal language, consider rephrasing into: may also have been associated with.... (Check throughout the manuscript)

Page 17, ff.: Avoid using “statistical” language: “Identification has been shown to be an important effect condition for narratives”, try to rephrase, e.g. : Statistical risk information may be particularly effective for persons who perceive a high personal relevance....

Page 18, 363: I wonder why authors reference the health belief model and then citing Schwarzer, 2001; I understand that the authors refer to the HBM as it has a strong focus on explaining what motivates people to take preventive action; however, it also has many shortcomings as the model does not include any efficacy beliefs (e.g., self-efficacy, behavioral control; which have been shown to be relevant when predicting individuals' intention to take up vaccinations; e.g.: Self-efficacy, outcome expectancies: Ernsting, Gellert, Schneider, Lippke , 2012; <https://www.tandfonline.com/doi/abs/10.1080/08870446.2012.753072>) or volitional variables (e.g., planning, social support; Ernsting, Knoll, Schneider, Schwarzer, 2015; <https://www.tandfonline.com/doi/abs/10.1080/13548506.2014.920957>), consider referring to a health behaviour change model that includes motivational and volitional variables (e.g., the integrated behaviour change model or the Health Action Process approach)

Reviewer B has a valid point asking for a discussion on the difference between information re one's own risk versus someone else's risks (=daughter's), authors may consider adding 1 sentence to the discussion (e.g., would the effects be even stronger, when the daughters themselves received messages ...future studies could include mother(or even father)-daughter dyads)

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by [20.07.2018]. If you cannot make this deadline, please let us know as early as possible.

I look Forward to your revised manuscript version.

Kind regards from Berlin,

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschooll-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Author
2018-07-13 09:22 AM

Subject: Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks

Date revision: 13 July 2018

Dear Editor,

On behalf of my co-authors, I would like to resubmit the enclosed manuscript for consideration by Health Psychology Bulletin. In the revised manuscript we have tried to incorporate all your comments (i.e., the minor revisions). The changes to the manuscript are highlighted (track changes). We also attached a list of responses to the comments (see "HPB_RespondstoReview_MinorRevisions").

It should be noted that, although we aimed to be concise, the article turned out to be somewhat longer than we strived for (i.e., a 100 words longer than the previous version of the manuscript). However, we were worried that shortening the article (more than we already did), may preclude accurate replication. Also, we wanted to meet all of the suggested minor revisions. Hopefully, the above serves as a justification.

As was stated in the first submission, this manuscript has not been and will not be published in this or a similar form (in print or electronically, including on a web site), nor accepted for publication elsewhere, nor is it under consideration by another publication. The authors do not have any conflict of interest. All authors have confirmed that they have read and approved the revised paper, believe that the paper represents honest work, and are able to verify the validity of the results reported.

We would like to thank you for the opportunity to engage with the comments of the reviewers and improve our manuscript. Hopefully the revisions are to mutual satisfaction. Thanks for your patience.

We hope that this manuscript can contribute to the contents of Health Psychology Bulletin.

Kind regards,

Also on behalf of the co-authors, Hilde van Keulen, Theo Paulussen, Wilma Otten, Jim van Steenberghe and Robert Ruiter,

Mirjam Pot, MSc.
TNO, Child Health
PO Box 3005, 2316 ZL, Leiden, The Netherlands
E-mail address: mirjampot90@hotmail.com (M. Pot)

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Section Editor
2018-07-29 07:16 AM

Subject: [HPB] Editor Decision - "Experimental Pretesting..."

Dear Mirjam Pot,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Experimental Pretesting of Statistical and Narrative Risk Information on Mothers' Perceived Daughters' Susceptibility towards HPV-related Risks", and are happy to accept your submission for publication, pending the completion of copyediting and formatting processes.

As there are no further reviewer revisions to make, you do not have to complete any tasks at this point. The accepted submission will now undergo final copyediting. You will be contacted once this is complete to answer any queries that may have arisen during copyediting and to allow a final chance to edit the files prior to typesetting. If you wish to view your submission during this time, you can log in via the journal website.

Kind regards,

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschooll-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Section Editor
2018-07-29 07:17 AM

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Kind regards,

Prof Lena Fleig
Medical School Berlin
lena.fleig@medicalschoo-berlin.de

Health Psychology Bulletin
<http://healthpsychologybulletin.com>

Subject

Mothers' Perceptions of their Daughters' Susceptibilit

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Review

Reviewer A 2017-08-28 06:42 PM	Subject: Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks
For author and editor	<p>The article appears to fit within the scope of the journal. Communicating effectively about HPV vaccination is an important topic.</p> <p>Intro: Sufficient literature review on impact of narratives and statistics. Just an fyi, Hopfer narrative intervention included narratives and statistics. It seems that testing narratives OR statistics is a bit of an old debate....really what would advance science of this is how to use both togetherwhat kind of narratives and what kinds or ways of presenting statistics....a bit of a missed opportunity here</p> <p>I do like your investigation into moderators and mediators. I would say that while focusing on the importance of mother communication, this is not the only factor. In fact, it's quite a complex message environment with the practitioners' role equally as important. This is not recognized. Furthermore, to the aspect of what impacts HPV vaccine attitudes, intent to vaccinate....perceived susceptibility does not always play a role (so this ratl is a bit flawed)....</p> <p>Recruitment: Methods section describes recruitment of 3680 mothers however, it's not clear from where these mothers are being recruited. This should be made clear in the Procedure section.</p> <p>Power calculations: Line 105, please use anticipated "attrition rate" for 30% rather than drop-out percentage. As for 5% response rate (that is extremely low, not acceptable for many journals).</p> <p>Is "Operationalisations" a word? (not sure if this is British English? but this is not a word in American-English)</p> <p>Measures: Vaccine intent (2 items) one item should have included a time element to "intent to vaccinate" in the next 2 months?</p> <p>Manipulation checks: good to see you did this!!</p> <p>Single item measures a limitation</p> <p>Word count of statistical and narrative messages should be provided. If not similar, this may account for differences.</p>
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Manipulation checks: good to see you did this!!

Single item measures a limitation

Word count of statistical and narrative messages should be provided. If not similar, this may account for differences.

Close

Review

Reviewer A
2017-08-23 10:27 AM

For author and editor

Subject: Experimental Pretesting of the Impact of Statistical and Narrative Risk Information on Perceived Susceptibility towards HPV-related Risks

The manuscript concerns an experimental pretesting of statistical and narrative risk communication materials, targeting mothers' perceived susceptibility of their daughter getting an HPV infection or cervical cancer. The aim is to formulate an intervention promoting uptake of HPV vaccination among teenage girls. Strengths of the study include a register-based sample, and an experimental design comparing effects of two types of risk information, and their combination, to effects of general information on HPV, cervical cancer, and HPV vaccination only. The article fits well within the scope of the journal. The manuscript is well written in good English, logically structured and easy to follow. The chosen approach is appropriately described and justified. The abstract concisely summarizes the aims and methods of the study, and the authors adhere to journal formatting guidelines. However, there are certain aspects that could be expressed more clearly, or discussed/justified more thoroughly. Comment 1: I suggest the authors specify in the title that the study concerns not one's own, but one's daughter's susceptibility. Also in the abstract and throughout the manuscript the authors could more accurately refer to 'perceived daughter's susceptibility' or similar, to avoid confusing the reader.

Introduction:

The aims and scope of the study are concisely presented.

Comment 2: In the first paragraph, the authors cite evidence that perceived susceptibility is linked to HPV vaccination acceptability. Please specify whether this refers to perceived own susceptibility, or perceived daughter's susceptibility, or both. Please discuss also potential differences in effects between the two. I suggest the authors also show more explicitly that HPV vaccination acceptability promotes uptake of HPV vaccination. Is acceptability the main barrier for uptake, or are there others as well?

Comment 3: The authors say (line 22) that 'research findings are mixed about the surplus value of either using statistical or narrative risk information in affecting perceived susceptibility'. Please address which studies this conclusion refers to, specifically. In the next section the previous studies are discussed more. I suggest the authors describe more accurately what types of control groups (line 42) were used in previous studies that are cited, so that the reader can follow the argument more easily. Does the present study take into account some methodological aspects that were not considered in previous studies, or is the aim to replicate previous studies?

Comment 4: The authors describe (lines 49–54) that comprehensibility, credibility, and novelty are theorized to mediate the effects of risk communication, yet a moderation analysis was chosen. Is there a reason for this mismatch?

Methods:

Altogether, study procedure and used measures are clearly described.

Comment 5: I suggest the authors discuss how well the contents of the two types of risk information match. To what extent can possible differences in effects of statistical risk information and narrative risk information be attributed to the type and not the content of the information? Some elements that are implicitly linked to susceptibility in the narrative (e.g. number of sex partners, use of condoms) were not present in the statistical risk information. How was the narrative formulated, i.e. which were the reasons for choosing this type of a narrative over other possibilities? Some more information on the process of formulating the different texts would be useful (lines 159–161). In addition, there is a logical error in the statistical risk information:

'Of every 100 women, 80 get infected with the HPV-virus. This means that 80% of all women get infected with HPV once.' The first sentence means that 80 % get infected at least once, and 20 % never get it. The latter sentence suggests that 80 % get infected once, and some percentage more than once, and less than 20 % never get it. Might this have confused the participants?

Comment 6: The authors state (line 162) that 'All participants received general information about HPV, cervical cancer , and the HPV-vaccination, to ensure their background knowledge was similar'. Could the authors discuss in which ways participants' background knowledge or beliefs might differ even after receiving the general information?

Comment 7: In the article (line 170) the authors describe that the narrative used was 'derived from an internet health forum', but the name of the person was fictitious. In the Debriefing file, however, the narrative is said to be fictitious: 'The story of Anne, however, has been generated by the researchers; she is a fictitious person.' Please clarify this confusion. Was the story indeed real, but the participants were told otherwise, and why so?

Close

Review Form Response

Empirical Paper

This review form consists of two sections. This first section is intended as a tool to quickly inspect the required and optional components of this submission. The second section contains the actual review.

Section 1a, Full Disclosure: Replication Package:

Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.

☒ Includes protocols for recruitment of participants and guiding participants through the study

☒ Includes templates for communications with participants (if applicable)

☒ Includes operationalisations of measurements (e.g. questionnaires, source code)

☒ Includes operationalisations of manipulations (e.g. intervention manuals, stimuli, etc)

☒ Includes analysis plan

☒ Includes proposal for ethical approval

☐ Includes confirmation of ethics approval/Institutional Review Board (IRB) approval

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format:

Section 1b, Full Disclosure: Analysis Package:

Note that for any of these elements, an explanation by the authors as to why this element is omitted, also serves, that is, if the explanation is acceptable. After all, one of HPB's goals is to help emptying the file drawers, and older studies may no longer have all these resources available.

☒ Includes raw data

☒ Includes analysis scripts used to clean/preprocess/wrangle/munge the data

☒ Includes cleaned data

☒ Includes analysis scripts used to conduct statistical analyses

☐ Includes textual output

☐ Includes graphical output

If applicable, please indicate here to the authors what exactly was omitted, or which resources were not provided in an open format:

Section 2a, Reviewer comments:

Here, please type or paste your review. Please make sure to adhere to the [editorial policy for reviewers](#).

The schematic overview (Figure 1) is helpful as are the details in methods section on background about recruitment, etc. as are the details on the stimulus.

Discussion section: Please add or revise a more pointed discussion of ruling out alternative explanations/hypotheses to build confidence about results or discuss what we can learn about why or why not and under what conditions statistical and narrative messages may be effective. The authors point out as I thought of when reading, that the narrative stimulus used in this study...that mothers' may not identify with or link the story of a 30 y.o who gets cervical cancer with their adolescent daughter...also, that the 30 y.o. main character had sex at age 14. This may be play an important reason why the narrative did not play a role in mothers' perceptions of their daughters. And the authors point out that they did not measure identification (this also plays a key role with identifying "effective" narratives). Also pointed out was that perceived susceptibility does not always play a key role in behavior adoption intention.

For Significant moderators and mediators, please add on what outcome (line467). Authors mention personal relevance mediator impacts perceived susceptibility (469). It could be that statistical and narratives that are presented in such a way that evoke imaginability, personal relevance and comprehensibility will increase behavioral intention outcomes...Perhaps we learn from this that either it is the way statistical information is presented (there are different ways, e.g., more proximally relevant for a target audience) or in a normalized way. In addition, perhaps the mediators indicate key ways in which either statistical or narratives messages need to be designed...to evoke imaginability, personal relevance and render the information more comprehensible. Main thing in discussion -perhaps if authors could elaborate what we learn from this study about how to present and or what kind of statistical information may be effective.

Limitations: Réponse rate is very low. Authors might want to conduct an analysis to see how responders are different from non-responders.

Also, please include limitation that you did not include identification as a mediator...this could have helped in disentangling why narratives and or statistical information is or is not effective.

Minor revision: This may be British English but in English one does not "attract" cancer or a virus, one either acquires it or contracts it. That needs to be changed on lines 422, 424, 427

Future Research: I wouldn't say this work needs to be extended to other viruses....Speak more about how, what kind ...speak to anything we learn about the presentation of statistical and narratives messages...that is the point of this study. Please speak to what kinds of statistical information need to be further investigated for how to present statistical information.

Section 2b, Guidelines and unblinding and publishing of reviews:

Note that this is not a regular reviewing procedure. As you'll see in the [editorial policy for reviewers](#), there should normally be only one reason to reject a paper, and that is if the authors refuse to revise the paper (on the basis of review comments) such that the conclusions are consistent with those that can be drawn based on the data.

In other words, HPB does not reject 'failed' or even 'flawed' research, as long as the failures and flaws are explicitly discussed, and the authors refrain from drawing conclusions not permitted by the data. As a reviewer, therefore, your goal is to scrutinize the paper for transparency and integrity, and help the authors improve their manuscript to achieve that. In addition, the journal has a strong Full Disclosure policy, so where authors do not provide their materials, data, or analysis scripts, they should clearly justify this. We explain the rationale underlying these policies in the [initial editorial](#).

Note also that although the review procedure is double blind, the review history will be made public once a paper has been accepted. The blinding and unblinding is implemented to combine the best of both worlds: blind peer reviews are designed to prevent unreasonably mild or harsh reviews based on author identity, while unblinding upon acceptance prevents the opposite (using the cover of anonymity to be unreasonable) and encourages a civil tone. The review history will also become citable, which is a way of rewarding reviewers for their reviews, but also enables continuing the scientific debate. *

☒ I understand that reviews and editorial communication will be mandatorily unblinded and published upon an accepted article's publication.

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Review Form Response

Empirical Paper

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Section 1b, Full Disclosure: Analysis Package:

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- ☐ Includes graphical output

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Section 2a, Reviewer comments:

Here, please type or paste your review. Please make sure to adhere to the [editorial policy for reviewers](#).

General comments:

The authors have clarified several parts of their study procedure, altogether the paper is coherent. Yet, the authors still need to be more accurate when describing earlier studies. Results need to report statistical tests of differences between means for different groups.

Introduction:

Line 31: Please be specific, whose intention Pot et al.'s and Hofman et al.'s studies examined, mothers' or daughters' own? I am still missing some theoretical discussion on whether perceived susceptibility, intention, and other determinants might work similarly or differently when the issue concerns one's own risk versus someone else's (=daughter's). Also in the 'Statistical versus Narrative Risk Information' section it is not always clear to the reader whether the referred studies concern perceived own risk or daughters' risk (lines 68–75).

Line 79: Please describe expected direction of moderation.

Results:

Line 292: Mean scores are not very high for defensive avoidance or perceived manipulation on scale 1–7, do the authors mean are they higher than expected based on previous studies?

Structure and argument:

The text is fluent and structured, but I encourage use of less statistical language throughout the manuscript to enhance readability, for example line 326 'In this study no effects were found for narrative risk information', to for example 'In this study, narrative risk information had no effect on how mothers perceived their daughters' risk for HPV or cervical cancer.' In particular, the paragraph in the discussion lines 341–363 is a bit hard to follow.

Figures/tables:

Figure 1 clarifies the study nicely, but I wonder why 'defensive avoidance' and 'perceived manipulation' are not included there?

I suggest the authors add the possible range for susceptibility and intention scores to tables 1–3. Did the authors statistically test differences between means (Tables 1–4)?

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Section 2: manuscript iterations

This section is comprised of the manuscript preprints in anti-chronological order (i.e. the originally submitted manuscript is placed last, preceded by the revisions, with the penultimate version directly following this title page).

Abstract

Background: In order to promote HPV-vaccination acceptability among mothers of invited girls, we developed a ~~Web-based~~ Web-based, tailored intervention. This study reports on an experimental pretest for the component of this intervention targeting mothers' perceived daughters' susceptibility ~~of~~ ~~their daughter~~ towards HPV-related risks. Two types of risk information (i.e., statistical and narrative risk information) were pretested as research remains to be mixed on the surplus value of one type over the other in influencing mothers' perceived daughters' susceptibility.

Methods: We used data from 375 mothers of girls-to-be invited to the HPV-vaccination round 2014, who were derived from the Dutch National Immunization Register. They were randomly assigned to one of four conditions in a 2 (statistical information: yes or no) x 2 (narrative information: yes or no) between-subjects factorial design.

Findings: Mothers who received statistical information felt their daughters were more susceptible towards HPV than mothers who received no statistical information. No main or interaction effects with narrative information were found. The effect of statistical information was not moderated by perceived comprehensibility, credibility or novelty of the risk information, nor was it mediated by message-induced imaginability, elaboration, personal relevance, or defensive reactions.

Discussion: Statistical risk information appeared most effective in increasing mothers' perceived daughters' susceptibility towards HPV and was therefore included in the Web-based, tailored intervention promoting HPV-vaccination acceptability.

Key words: experimental pretesting, risk communication, narratives, perceived susceptibility, HPV, cervical cancer

Introduction

In the Netherlands, HPV-vaccination uptake remains to be lower (61%) than expected (75%) (Van Lier et al., 2016). ~~Hence, a need exists for evidence-based interventions aimed at increasing HPV-vaccination uptake. This low uptake led to s~~Several studies ~~have provided~~ing insight in factors constituting HPV-vaccination acceptability (e.g., Pot et al., 2017, Van Keulen et al., 2013; Alberts et al., 2017; Hofman et al., 2014). Results from ~~two~~a Dutch studiesy among mothers ~~and of~~ girls to-be-invited showed that ‘modifiable’ social-psychological determinants (~~e.g., such as~~ perceived daughters’ susceptibility ~~towards HPV-related risks~~ -and attitude) accounted for large proportions of variance in HPV-vaccination intention ~~-vaccination acceptability~~ (Van Keulen et al., 2013; Pot et al., 2017; ~~Alberts et al., 2017~~). Intention, in turn, was found to be the main and stable predictor of actual uptake (Pot et al., 2017; Hofman et al., 2014), which is in line with social cognitive models such as the Reasoned Action Approach (Fishbein & Ajzen, 2010). Furthermore, mothers appeared most important in the process of decision-making about their daughters’ HPV-vaccination (Van Keulen et al., 2013). These insights, ~~in turn,~~ led to the development of an innovative, interactive, ~~web-based~~Web-based, tailored intervention promoting HPV-vaccination acceptability among mothers of invited girls.

~~The intervention was developed using Intervention Mapping (IM), a protocol for developing theory and evidence-based health promotion interventions (Bartholomew Eldredge et al., 2016). According to IM, an important element of intervention development is pretesting of components of the intervention, preferably by using an experimental design (Whittingham et al., 2008a; Whittingham et al., 2008b). Experimental pretesting enables researchers to draw reliable conclusions about the feasibility and effectiveness of developed materials in influencing predetermined objectives (Whittingham, 2008a; Whittingham, 2008b).~~

~~One of the determinants to be targeted in the intervention was perceived daughters’ susceptibility towards HPV-related risks because this appeared an important determinant of~~ mothers’ HPV-vaccination intention (Van Keulen et al., 2017; Pot et al., 2017). Besides, perceived susceptibility has been shown to be an important factor of preventive behavior according to health

theory (e.g. the Health Belief Model; e.g., Schwarzer, 2001) and research (e.g., Brewer & Fazekas, 2007). However, research findings are mixed about the surplus value of either using statistical or narrative risk information in affecting perceived susceptibility (for a review, see Winterbottom et al., 2008).

Therefore, this study is an online experimental pretest in which the effects of statistical and narrative risk information on mothers' perceived daughters' susceptibility towards HPV-related risks will be tested among mothers. Experimental pretesting enables researchers to draw reliable conclusions about the feasibility and effectiveness of developed materials in influencing predetermined objectives (Whittingham, 2008a; Whittingham, 2008b). Hence, this experimental pretest enables (a) drawing a reliable conclusion about which type of risk information is preferred when promoting perceived susceptibility, and (b) making an evidence-based decision on which type of risk information to include in the intervention promoting HPV-vaccination acceptability.

~~This study is an online experimental pretest of the interventions materials specifically targeting perceived HPV related risks in mothers of girls to be invited for the HPV vaccination. This was planned because perceived susceptibility appeared an important determinant of HPV vaccination acceptability (Pot et al., 2017; Van Keulen et al., 2013; Brewer & Fazekas, 2007; Brewer et al., 2007), and because research findings are mixed about the surplus value of either using statistical or narrative risk information in affecting perceived susceptibility.~~

Statistical versus Narrative Risk Information

Statistical risk information includes abstracts of numerical data and factual assertions (e.g., prevalence rates) about the probability of attracting a certain health-related outcome (De Wit et al., 2008). It is assumed that confrontation with the likelihood of attracting a risk people are willing to take preventive actions. For instance, Cox and colleagues (2010) found that parents who received statistical information reported significantly stronger intentions to have their daughter vaccinated against HPV compared with to parents who did not receive statistical information. But there is also

evidence for the impact of narratives. A narrative consists of a personal experience of an event, such as somebody getting a disease (Hinyard & Kreuter, 2007; ~~Winterbottom et al., 2008~~). Narrative information is suggested to trigger the simulation heuristic (Kahnemann & Tyversky, 1982). According to this heuristic, the perceived likelihood of an event is based on the ease to picture the event mentally (Gregory, Cialdini, & Carpenter, 1982; Kahnemann & Tyversky, 1982). Narratives are suggested to increase this ease ~~of imagination~~ and, therefore, are likely to increase likelihood estimates (Tversky & Kahneman, 1974). De Wit and colleagues (2008) showed that narrative risk information resulted in higher intentions to get the ~~hepatitis B-HBV~~-vaccination than information that only mentioned an increased risk of infection. Finally, Hopfer (2012) found that compared to non-narrative controls (i.e., messages lacking personal decision narratives), a hybrid message (i.e., a message containing both statistical and narrative information) nearly doubled HPV-vaccination uptake (12% versus 22%, respectively). Nan and colleagues (2015) found a hybrid message to result in higher levels of perceived susceptibility towards HPV compared to narrative-only and statistics-only messages. Hopfer (2012) found that narrative information nearly doubled HPV-vaccination uptake compared to non-narrative controls. And Nan and colleagues (2015) found that a message containing both statistical and narrative information resulted in higher levels of perceived susceptibility towards HPV than messages containing just one of the two.

Despite the lack of consensus about the surplus value of statistical versus narrative risk communication, research has also pointed at certain conditions for effectiveness of (risk) communication (e.g., Breakwell, 2000; Priester & Petty, 2003). Eagly and Chaiken (1993) pointed at factors moderating or mediating the effectiveness of persuasive (risk) communication. Mediators Moderators are *comprehensibility* (Eagly & Chaiken, 1993, p. 263) and *credibility* (Eagly & Chaiken, 1993, p. 352). Also information that is perceived as more *novel*, is suggested to increase the likelihood of attitude change (Wyer, 1974, p. 223). Therefore, we ~~also~~ explored whether the effectiveness of ~~the type of different modes of~~ risk communication is moderated by comprehensibility, credibility, and novelty of the message.

Besides, factors constituting the processing of information can mediate the effects of risk communication, that is imaginability, elaboration, relevance, and defensive reactions. For instance, Janssen, Van Osch, De Vries, and Lechner (2013) reported that sunbed users who were exposed to narrative information could better imagine themselves attracting skin cancer. Information processing models of attitude change, such as the Elaboration Likelihood Model (Petty & Cacioppo, 1986; see also Kreuter & Wray, 2003), state that message *relevance* increases active processing of information, which in turn enhances message effects. But, a growing body of literature also suggests that messages about health risks may evoke *defensive reactions* such as message derogation (i.e., denying the relevance of the message or preventing it from reaching consciousness), denial of one's susceptibility (i.e., defensive avoidance), and/or perceived manipulation (Van't Riet & Ruiter, 2011; Block & Williams, 2002; Liberman & Chaiken, 1992; Ruiter, Verplanken, de Cremer, & Kok, 2004; ~~Witte, Berkowitz, Cameron, & McKeon, 1998~~). Defensive reactions will reduce message effects because it distracts the recipient's attention to the message (cf. Kessels, Harris, Ruiter, & Klein, 2016). Therefore, the present study also explores whether the effects of risk information are mediated by imaginability, elaboration, relevance, and defensive reactions. See Figure 1 for an overview of the theoretical framework.

a) direct effect

b) moderated effects

c) mediated effects

Figure 1. A schematic overview of the theoretical framework of perceived susceptibility in which the explorative direct, moderation and mediation effects are depicted.

Notes. The focus of this study can be found within the bold square (direct effects); $\forall$ variables within this study: X = predictor variable; Y = outcome variable; Z = moderator; M = mediator.

To summarize, this study is an online experimental pretest of materials developed for an intervention promoting HPV-vaccination acceptability targeting mothers of invited girls. Specifically, we aim to assess the effectiveness of statistical versus narrative risk information in influencing mothers' perceived daughters' susceptibility towards HPV and cervical cancer of their daughter. To our knowledge, the effects of risk information on the latter remain to be unexplored. In addition, Another novel aspect of the this present study is that it explores the underlying conditions and mechanisms.

Methods

Recruitment

~~Participants were mothers of girls born in 2001 (i.e., girls to be invited for the HPV vaccination round of 2014). A random sample of mothers was drawn from the Dutch vaccination register (Praeventis). Participants were recruited by postal mail via Praeventis, the Dutch vaccination register. Praeventis has the name, sex, address and birth date of all Dutch children up till 18 years. A computer program was used to draw a random sample of mothers of girls born in 2001 from Praeventis (i.e., girls to be invited for the HPV-vaccination round of 2014).~~

Design

Mothers were randomly assigned by the computer to one of four conditions in a 2 (statistical information: yes vs no) x 2 (narrative information: yes vs no) between-subjects factorial design.

Procedure

An invitational letter was sent to selected participants' home addresses. This included information about the study, contact details of the researchers, a link to the website, and a personal entrance code. As a reimbursement, a subscription to a magazine was raffled among all eligible participants ~~that met the inclusion criteria~~. When participants logged in to the online experiment, they were first informed about the study purpose, followed by instructions for completing the experiment. After having provided informed consent, participants were randomly assigned to one of the four conditions. All participants received the same general information about HPV, cervical cancer, and the HPV-vaccination. Next, only mothers in the experimental conditions additionally received risk information (See 'manipulations'). After this, participants proceeded with self-report questionnaires that accounted for the dependent variables, the proposed mediators and moderators, and their socio-

demographics. Finally, mothers were debriefed and thanked for their participation. On average, mothers needed 15 minutes to complete the experiment.

Required Sample Size

Based on the literature (e.g., Mevissen et al., 2009; De Wit et al., 2008), we expected a medium effect size on the primary outcomes ($\eta^2 = .06$; Cohen, 1988). In our design with 2 means per factor, this effect size value corresponds to a d-value of 0.50, and an f-value of 0.25. Power analysis showed that a minimal sample size of 32 participants per condition was needed (with power = 0.80, and two-sided $\alpha = 0.05$; Hintze, 2004). We took into account an attrition rate of 30% and a response rate of 5%, based on previous experiences (Van Keulen et al., 2013). Consequently, 3,680 mothers were invited.

Data Collection Period

The experimental pretest was conducted between September and October 2013.

Operationalisations

Measurements

Socio-demographics included the participants' age, gender, educational level, country of birth, and religion. Level of education accounted for the mothers' highest level of education they had completed. This was classified as low (less than secondary or vocational education), intermediate (secondary through pre-university education), or high (professional or university education) (Van Keulen et al., 2013). Mothers were asked about their religious conviction (Protestant, Roman Catholic, Muslim, Jewish, Buddhist, Hindu, other, or no religion) (Van Keulen et al., 2013). Research has

179 shown that more Dutch Protestants refrain from vaccination compared to the other (non) religious
180 groups (Van Keulen et al., 2013). This was confirmed in our sample, ~~and hence therefore~~ religion was
181 dichotomized into ‘Protestant’ versus ‘not Protestant’. Country of birth was dichotomized into
182 ‘Netherlands’ versus ‘other’ as in our sample only 6% participants were born in a country other than
183 the Netherlands.

184 Criteria for effectiveness. The outcome criteria were perceived susceptibility and HPV-
185 vaccination intention. Perceived susceptibility towards HPV and towards cervical cancer was
186 measured by 7-point scaled item, each: -‘Without the HPV-vaccination, the chances of my daughter
187 for getting infected with HPV (getting cervical cancer) are ‘(1 = very small; to 7 = very big) (Pot
188 et al., 2017; Van Keulen et al., 2013). HPV-vaccination intention was measured as a composite of two
189 items: ‘Are you planning to have your daughter vaccinated against HPV?’ and ‘What are the chances
190 that you will get your daughter vaccinated against HPV?’ (Pot et al., 2017; Van Keulen et al., 2013).
191 Responses were given on a 7-point scale ranging from (1) certainly not / very small / to (7) certainly /
192 very big (Pearson’s $r = .95$).

193 Items measuring the moderating and mediating factors (except for ‘defensive avoidance, see
194 below) referred to the specific type(s) of information the mothers had received (i.e., general and/or
195 statistical and/or narrative risk information). ~~For mothers in the three experimental conditions, a mean~~
196 ~~score per moderating and mediating factor was calculated.~~ Thus, mothers evaluated each specific type
197 of information separately. ~~For mothers in the experimental conditions, a mean score per moderating~~
198 ~~and mediating factor had to be calculated.~~ This means that, for instance, credibility for mothers in the
199 statistical information condition represents the mean score of perceived credibility of the general and
200 the statistical information.

201 Moderating factors. Comprehensibility was assessed by a composite of three items accounting
202 for the extent to which mothers ~~had~~ understood the ~~presented~~ information, and whether they
203 considered the text to be clear and readable (Mevisen et al., 2009). Responses were given on a seven-
204 point scale ranging from (1) not at all understandable / very unclear / very readable to (7) fully

understandable / very clear / very readable (Cronbach's alpha = .87). Credibility was measured with the single-item: 'To what extent do you believe the content of the text is credible?' (1 = very incredible; to 7 = very credible) (Mevisen et al., 2009). Novelty was measured with a single-item: 'To what extent does the text contain new information for you?' (1 = much new information; to 7 = much known information) (Mevisen et al., 2009).

Mediating factors. Imaginability was measured with one item for HPV and one item for cervical cancer: 'Because of the text, I could imagine my daughter getting HPV / cervical cancer' (1 = totally disagree; to 7 = totally agree) (Broemer, 2004; Jaanssen et al., 2013; Mevisen et al., 2010). Elaboration was assessed by a single item 'How well did you read the information?' (1 = not carefully at all; to 7 = very carefully) (Chaiken, 1980). Personal relevance was measured with the item 'I considered the text to be personally relevant' (1 = totally disagree; to 7 = totally agree) (Mevisen et al., 2009). Defensive avoidance was accounted for by two 7-point scaled items (one referring to HPV and the other to for cervical cancer): 'I'd rather not think about my daughter getting infected with HPV/developing cervical cancer' (1 = totally disagree; to 7 = totally agree); (Van't Riet & Ruiter, 2013). Perceived manipulation of the information was measured by the item 'I considered the text to manipulate my beliefs' (1 = totally disagree; to 7 = totally agree) (Mevisen et al., 2009; Van't Riet et al., 2010).

Manipulations

The text messages were pretested among a sample of mothers (N = 10) to assure comprehensibility, and, for the narrative text message, to assure that mothers were able to imagine the situation. ~~All text messages that were finally used can be found in the Appendices.~~

General information (see Appendix A). All participants received general information about HPV, cervical cancer, and the HPV-vaccination, to ensure their background knowledge was similar.

229 *Statistical risk information* (see Appendix B). The statistical message ~~presented factual~~
230 ~~epidemiological information about the prevalence of HPV and cervical cancer among women and~~
231 ~~information about the reduction in cases of cervical cancer to be expected when all girls would obtain~~
232 ~~the HPV vaccination. This message~~ was based on data from the Dutch National Institute for Public
233 Health and Environment and data released by the Health Council of The Netherlands
234 (Gezondheidsraad, 2008). It presented factual epidemiological information about the prevalence of
235 HPV and cervical cancer among women and information about the reduction in cases of cervical
236 cancer to be expected when all girls would obtain the HPV-vaccination. The latter was based on a
237 study by Cox and colleagues (2010): “when no girl gets the HPV-vaccination, 600 women per year
238 will get cervical cancer. But when all girls get the HPV-vaccination, 300 women per year (half of
239 600) will be saved from getting cervical cancer”.

240 *Narrative risk information* (see Appendix C). The narrative message ~~included~~ was based on a personal
241 story derived from an ~~I~~Internet health forum of a woman who had found out she had cervical cancer,
242 which was caused years ago by an HPV-infection. ~~The name of the woman was fictitious. It was~~
243 reported in the first person, because research has shown this to be more effective in influencing
244 perceived susceptibility than the third person (Nan et al., 2015). We changed the name of the woman
245 into ‘Anne’, because it is relatively common in The Netherlands, and not specific to individuals with
246 certain backgrounds. She was 30 years old, as it typically takes 10-20 years for an initial HPV-
247 infection to develop into cancer (Weinberg, 1999). It was emphasized that she got infected with HPV,
248 despite having had an overall safe sex life (Manhart & Koutsky, 2002; Moschicki, 2005). To ensure
249 mothers that the message concerns the HPV-vaccination of their daughter, Anne ended her story by
250 noting: “With the HPV-vaccination that is available now, I sometimes can’t help but wonder: ‘what if
251 I had gotten myself vaccinated against HPV 18 years ago...”

252 The statistical and narrative information were approximately of the same length (i.e., $\pm$ 300 words).

254 *Analysis Plan*

A two-way analysis of variance (ANOVA) was conducted to examine the impact of the different types of risk information on perceived susceptibility and intention. Mediation and moderation analyses were examined using SPSS PROCESS macro (2.12.1 release), a widely used regression-based approach (Hayes, 2013).

For the moderation analysis, the independent variable and the proposed moderator were entered in the model in the first step, followed by the interaction between the independent variable and the moderator in Step 2. The interaction (i.e., moderation) was assumed significant when $p < .05$. For the mediation analyses, the PROCESS macro first conducted the following hierarchical regressions: the mediators (M) were regressed onto the independent variable (X) and the dependent variable (Y) was regressed onto both the independent variable and the mediator. We assumed mediation when the following conditions were met: (1) X has an effect on the mediator variable M, (2) M has an effect on Y when controlling for X, and (3) the effect of X on Y becomes significantly smaller or non-significant when controlling for M. Then, in order to test the indirect effect for significance, the bootstrapping method was utilized by the PROCESS macro. The indirect effect represents the influence of the mediating variable on the original relation between X and Y. A value of 0 indicates no impact. A bias-corrected 95% bootstrap model with confidence intervals resampled 5,000 times for each analysis was used to judge significance of the indirect effect (Shrout & Bolger, 2002); if the bootstrap confidence interval did not include zero, mediation was supported. This method was chosen as it is generally considered to maximize power and is robust against non-normality (Hayes, 2013).

Software

The power calculation was conducted with PASS software (Hintze, 2004). The online experiment was developed using TailorBuilder © computer software. Main analyses and moderation and mediation analyses were conducted using SPSS version 22 (IBM Corp., 2013).

280

281 *Ethics*

282 This experiment was part of a larger study, for which ethical approval was obtained from the ethical
283 committee of the VU Medical Center in Amsterdam.

284

285 **Results**

286 *Sample Description*

287 Of the invited individuals ($n = 3,680$), 467 initiated the study (13%). Inclusion criteria were that
288 participants had to (1) provide informed consent online (excluded: $n = 1$), (2) fully complete the
289 questionnaire (excluded: $n = 72$), and (3) be female (excluded: $n = 19$). This resulted in a final sample
290 of 375 (11%) mothers.

291 The mean age of mothers was 43 years ($SD = 4.05$). A large percentage of the mothers was
292 born in the Netherlands (94%) and almost half of the mothers were high in education (42%). A
293 relatively small percentage of the mothers was Protestant (16%).

294

295 *Univariate Analyses*

296 ANOVA revealed a significant main effect of statistical information on mothers' perceived daughters'
297 susceptibility towards HPV ($F(1, 371) = 7.56, p < .01$). Mothers who received statistical risk
298 information had a higher perceived daughters' susceptibility towards HPV ($M = 4.11, SD = .10$) than
299 mothers who did not receive statistical risk information ($M = 3.73, SD = .09$). There was no main
300 effect of narrative risk information on perceived daughters' susceptibility towards HPV ($F(1, 371) =$
301 $.00, p = .97$), nor was there a significant interaction-effect between statistical and narrative risk
302 information on perceived susceptibility towards HPV ($F(1, 371) = 1.54, p = .22$). No significant main
303 or interaction effects were found on mothers' perceived daughters' susceptibility towards cervical

cancer (F 's < 2.10; p 's > .15) or on HPV-vaccination intention (F 's < .83; p 's > .36). See Tables 1-3 for the mean scores on the outcome measures per condition.

Table 1 Mean scores (SD) on susceptibility towards HPV (N = 375)

	Statistical risk information	No statistical risk information
Narrative information	4.02 (1.28)	3.82 (1.23)
No narrative information	4.19 (1.43)	3.65 (1.26)

Note. A higher score represents a higher perceived daughters' susceptibility towards HPV

Table 2 Mean scores (SD) on susceptibility towards cervical cancer (N = 375)

	Statistical risk information	No statistical risk information
Narrative information	3.65 (1.18)	3.81 (1.17)
No narrative information	3.79 (1.31)	3.60 (1.08)

Note. A higher score represents a higher perceived daughters' susceptibility towards cervical cancer

Table 3 Mean scores (SD) on HPV-vaccination intention (N = 375)

	Statistical risk information	No statistical risk information
Narrative information	6.01 (1.42)	5.92 (1.42)
No narrative information	5.76 (1.62)	5.88 (1.56)

Note. A higher score represents a higher HPV-vaccination intention

Moderation and Mediation Analyses

Moderation and mediation analyses were performed using statistical risk information (yes versus no) as the independent variable and mothers' perceived daughters' susceptibility towards HPV as the dependent variable. No significant interaction effect was found with any of the proposed moderators (comprehensibility, credibility and novelty; p 's > .05). Also, we didn't find any support for an indirect

impact of statistical risk information on perceived daughters' susceptibility towards HPV via the proposed mediators (i.e., imaginability, elaboration, perceived personal relevance, defensive avoidance and perceived manipulation). Mean scores on the moderators and mediators were high, and differences between the conditions were small and nonsignificant (See Table 4).

Table 4 Mean scores (SD) on moderators and mediators of those who did versus those who did not receive statistical risk information (N = 375)

	No Statistical Risk Information (n = 191)	Statistical Risk Information (n = 184)
<i>Proposed moderators*</i>		
Comprehensibility (1 – 7)	5.83 (.91)	5.80 (.86)
Credibility (1 – 7)	5.60 (1.11)	5.58 (.99)
Novelty (1 – 7)	4.70 (1.40)	4.92 (1.20)
<i>Proposed mediators*</i>		
Imaginability HPV (1 – 7)	5.76 (.91)	5.74 (.81)
Imaginability cervical cancer (1 – 7)	5.59 (1.04)	5.63 (.90)
Elaboration (1 – 7)	5.93 (.97)	5.86 (.84)
Perceived personal relevance (1 – 7)	5.24 (1.10)	5.42 (1.04)
Defensive avoidance HPV (1 – 7)	3.65 (2.02)	3.42 (2.00)
Defensive avoidance cervical cancer (1 – 7)	3.68 (2.06)	3.64 (2.10)
Perceived manipulation (1 – 7)	3.70 (1.64)	4.09 (1.50)

Note *A higher score represents a higher score on the moderator / mediator

Discussion

This study was an experimental pretest of materials targeting mothers of invited girls developed for a Web-based, tailored intervention promoting HPV-vaccination acceptability. We tested the effectiveness of statistical versus narrative risk information on affecting mothers' perceived daughters' susceptibility towards HPV and cervical cancer. Results showed that statistical risk information increased mothers' perceptions of their daughters' susceptibility towards HPV. Such a positive effect was also found by Mevissen and colleagues (2009), within the context of Chlamydia: participants felt more susceptible to a Chlamydia infection after they read statistical risk information compared to those exposed to narrative or no risk information. These results made us decide to include statistical information as the mode of communication about HPV-related risks in the Web-based intervention that was developed.

We did not find an effect of statistical risk information on mothers' perceived daughters' susceptibility towards getting cervical cancer. This might have been caused by the actual difference in the likelihood of attracting HPV (high probability), relative to attracting cervical cancer (low probability). In the present study, we found that mothers who received no risk information highly overestimated the probability of their daughter attracting cervical cancer when looking at the actual incidence in the Netherlands (Integraal Kankercentrum Nederland, 2013). It seems unlikely that exposure to statistical risk information –presenting the actual low probability rate– would increase mothers' perceptions of the daughters' susceptibility for attracting cervical cancer.

Mothers who received no risk information perceived the chance of their daughter attracting HPV or cervical cancer to be almost similar, while in fact, the chance of attracting HPV is much higher (Integraal Kankercentrum Nederland, 2013). So, it seemed that mothers *underestimated* the risk for HPV, and *overestimated* the risk for cervical cancer. The tendency to overestimate small frequencies and underestimate larger ones, is well known (Fischhoff, Bostrom & Quadrell, 1993; Lichtenstein et al., 1978). Correcting mothers' misperceptions about the risks of their daughter attracting HPV and cervical cancer, would provide a more realistic and bases for initiating processes of informed decision-making.

In this study no effects were found for narrative risk information. We hypothesized narratives to have an effect by increasing the ease of imagination (Kahnemann & Tyversky, 1982). But secondary analysis indicated that the narrative information was perceived as imaginable as was the statistical information. The absence of an effect of narrative information may also have been caused by the difficulty for the mothers to identify themselves with the character in the story. De Graaf, Hoeken, Sanders, and Beentjes (2012) showed this to be an important effect condition for narratives. Unfortunately, we did not assess the degree of identification with the story teller.

Although mothers who received statistical information felt their daughters were more susceptible towards HPV, this did not result in a higher HPV-vaccination intention. As indicated by social cognitive models of health behavior (e.g., the Health Belief Model; e.g., Schwarzer, 2001) and earlier research (Pot et al., 2017; Van Keulen et al. 2013), perceived daughters' susceptibility is not the sole determinant of mothers' intention to have their daughter vaccinated against HPV. Thus, to influence intention, communication should as well target other relevant determinants of HPV-vaccination uptake (e.g., attitudinal beliefs) (Pot et al., 2017; Van Keulen et al., 2013). In the Web-based intervention, other relevant determinants of HPV-vaccination uptake were also targeted.

The effect of statistical risk information on mothers' perceived daughters' susceptibility towards attracting HPV was not moderated by message characteristics (i.e., comprehensibility, credibility and novelty), nor was it mediated by imaginability, elaboration, perceived personal relevance, or defensive reactions. This absence effects may be due to the fact that we were forced to compute a mean for moderating and mediating factors when mothers received more than one type of information. Thus, for the combination condition, the evaluations of three pieces of risk information (i.e., the general, statistical *and* narrative information) were averaged. Moderation and mediation was tested between the subgroups 'statistical risk information' (i.e., statistical and combination condition) and 'no statistical risk information' (i.e., no risk information and narrative risk information condition). It could well be that actual differences between the statistical versus narrative information were diluted because of this averaging over the separate pieces of risk information. An indication for this comes from secondary analyses, in which we only compared the statistical information (n = 102) and

narrative information (n = 89) on the moderator and mediator evaluations of the experimental information only (i.e., not including the evaluations of the general information). Significant differences were found for the moderator comprehensibility (i.e., higher comprehensibility in the narrative condition) and on the mediators imaginability (i.e., higher imaginability towards both HPV and cervical cancer in the statistical condition) and personal relevance (i.e., higher personal relevance in the statistical condition). In addition, we found personal relevance to mediate the effect of statistical versus narrative information on perceived susceptibility towards HPV: statistical information was judged more personal relevant, which increased susceptibility towards HPV. This is in line with the Elaboration Likelihood Model (Petty & Cacioppo, 1986), which suggests that message relevance increases active processing of messages, which in turn enhances message effectiveness if persuasive arguments are perceived as strong.

Limitations

This study had several limitations worth mentioning. First, we only used specific formats of statistical and narrative information of HPV and cervical cancer, hence we cannot draw conclusions regarding the generalizability to other diseases. Second, we cannot exclude that the general information affected mothers' perceived daughters' susceptibility. However, general information is an essential element in communication about the HPV-vaccination, as sufficient knowledge is a prerequisite for an informed decision (Marteau, Dormandy & Michie 2001). Third, the use of single-item measures represents a limitation. These are suggested to be less stable, reliable, and precise compared to multi-item measures (Bowling, 2005). The questionnaire used for this experimental pretest included additional questions about design features of the intervention that was developed. In order to reduce the time burden for participants, single-items were used. Finally, response rate was low (11%). Although it was higher than found in a previous study which recruited mothers through Praeventis (Van Keulen et al., 2013), the low response rate could be explained by the use of a written invitation letter. Research has shown written invitations to result in lower response rates compared to e-mail invitations in

studies using online questionnaires (Manfreda et al., 2008). Due to the low response rate, caution is needed in generalizing the study results.

Recommendations for Future Research

We recommend future research to investigate the generalizability of the study results to other viruses that can be prevented by vaccination (e.g., influenza) (Lehmann et al., 2015). Furthermore, we recommend future research to investigate how to best present statistical risk information to maximize its effectiveness. For instance, Cox and colleagues (2010) found that parents who viewed a graphic presentation of statistical risk information had a higher HPV-vaccination intention compared to parents who viewed a nongraphic presentation. Finally, we recommend future research to investigate how to make narratives about HPV-related risks more effective, as we still believe narratives to be a promising method in communicating about HPV-related risks (e.g., De Wit et al. 2008; Janssen et al., 2013; Mevissen et al., 2012). To improve effectiveness, future research could use strategies such as multiple narrative risk messages (Mevissen et al., 2010), self-construed narratives (Mevissen et al., 2012), and tailoring the narrative to the recipients characteristics (Kreuter et al., 2007).

Take Home Messages

Statistical risk information was most effective in increasing mothers' perceived daughters' susceptibility towards HPV and was therefore implemented in the Web-based, tailored intervention promoting HPV-vaccination acceptability. Future research is needed on (a) how to best present statistical risk information and (b) how to make narratives about HPV-related risks more effective.

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Conflict of interest statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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594 **Appendix A**

595 *General information*

596 **HPV and cervical cancer**

597 Cervical cancer is a life-threatening disease among women. It is caused by the Human Pappilomavirus
598 (HPV). HPV is contagious and is spread through sex: through contact with infected genital skin,
599 mucous membranes, or bodily fluids. Both men and women can get infected with HPV. Not only the
600 penis and vagina are infected; HPV can infect skin not normally covered by a condom (such as hands
601 or mouth), so using a condom does not fully protect someone from the virus. Also, many people don't
602 realize they're infected with HPV and may have no symptoms. The virus can be cleared by one's
603 immune system, but sometimes, this does not happen. Then, the virus can lead to precursors of
604 cervical cancer –and eventually to cervical cancer.

605

606 **The HPV-vaccination**

607 Since 1976, there has been a cervical cancer screening program. Thanks to this program, precursors of
608 cervical cancer can be detected early, so that cervical cancer can be prevented or treated at an early
609 stage of the disease. In order to prevent (rather than detect) cervical cancer, the HPV-vaccination has
610 been available since 2010. Every year, 12 year old girls are invited via the National Immunization
611 Program. The HPV-vaccination consists of three injections*, given in a period of half a year. The
612 HPV-vaccination is offered on a voluntary basis and free of charge. The HPV-vaccination prevents
613 infection with the HPV-virus (2 types of the virus, that cause 70% of infections) and protects against
614 cervical cancer. The HPV-vaccination is also called 'the vaccination against cervical cancer'. The
615 HPV-vaccination has been approved for girls between 9 and 26 years old, but it is best to vaccinate
616 girls at an early age, before she gets sexually active and therefore is at risk for getting infected. The
617 HPV-vaccination has been tested and results showed it was safe. As with most vaccinations, the spot
618 of injection can be a bit painful, red and swollen for a while.

619 There is no treatment if you are infected with HPV. The HPV-vaccination is therefore the only
620 available and effective method to protect against an infection with HPV

621 Note: The original language of the narrative information was Dutch. *When the experiment was conducted, the
622 HPV-vaccination still consisted of three instead of two injections.

623

624 **Appendix B**

625 *Statistical risk information*

626 **The risk of getting HPV and cervical cancer**

627 In the Netherlands, every year, about 600 Dutch women are diagnosed with cervical cancer.

628 Approximately 200 of these women die of this disease per year. This means that almost every day, a
629 woman dies of cervical cancer. Cervical cancer is caused by infection with the HPV-virus. The HPV-
630 virus is highly prevalent. Almost everybody who is sexually active, is exposed to the virus. Of every
631 100 women, 80 get infected with the HPV-virus. This means that 80% of all women get infected with
632 HPV at least once. However, not all women get cervical cancer. It cannot be predicted who gets
633 cervical cancer and who doesn't, but it is always caused by being infected with HPV. Therefore, it is
634 important to prevent a HPV-infection.

635

636 **Protecting against HPV**

637 It is expected that, in the Netherlands, the HPV-vaccination will prevent half of the cervical cancer
638 cases. This means that the HPV-vaccination can decrease the amount of women getting cervical
639 cancer with 50%. So, when no girl gets the HPV-vaccination, 600 women per year will get cervical
640 cancer. But when all girls get the HPV-vaccination, 300 women per year (half of 600) will be saved
641 from getting cervical cancer.

642 In conclusion: girls who do get the HPV-vaccination, have a much smaller chance of getting cervical
643 cancer later in life than girls who don't get the HPV-vaccination.

644 Note: The original language of the statistical information was Dutch

645 **Appendix C**

646 *Narrative risk information*

647 By Anne, 30 years of age

648 Hi everybody. I found this forum via a friend and I would like to share my story with you all.

649 When I was 14 years old, I had my first boyfriend, with whom I had sex for the first time when I was

650 16. Since then, I have had two relationships: one when I was 21 (lasted 2 years) and my current

651 relationship with Robbert (already lasting 4 years now). I've only had a few casual sex partners in my

652 life; I never was that 'wild'. Aside from a drunk slip-up, I've always used a condom with casual

653 partners. I wouldn't want to get an STI!

654 Last year, we went skiing with a couple of friends. Just after our arrival, I noticed that I lost some

655 blood. Somewhat concerned, I called a family member who also is a doctor. 'Could it be that you're

656 pregnant?' he asked me. Robbert and I agreed that we were ready having a baby, so it was possible.

657 We got the advice to enjoy our vacation and that I should have it checked out when I was back home.

658 Once I was back home, I got my period and because we immediately were sucked into our busy but

659 carefree lives, I kind of already had forgotten about what happened during our vacation. Until, about a

660 month ago, I again had some blood loss while it wasn't the time to have my period. I arranged an

661 appointment with my doctor that afternoon. After a short examination, I was sent to the hospital for

662 further tests.

663 Turned out.. I have cervical cancer! The doctor told me that the cancer had been caused by the

664 HPV-virus. I've had heard of it, but didn't know much about it. But I had been so careful? Could it be

665 one of those very few times I have had unsafe sex? Could have been, but the doctor told me that I

666 could have gotten infected with HPV during safe sex as well. It therefore was quite difficult to find

667 out who got me infected. I'd never thought that I would get infected with HPV, let alone that it would

668 develop into cervical cancer..

669 With the HPV-vaccination that is available now, I sometimes can't help but wonder: 'what if I had
670 gotten myself vaccinated against HPV 18 years ago...'

671 Note: The original language of the narrative information was Dutch

672

Introduction

In the Netherlands, HPV-vaccination uptake remains to be lower (61%) than expected (70%) (Van Lier et al., 2016). This low uptake led to several studies providing insight in factors constituting HPV-vaccination acceptability (e.g., Pot et al., 2017, Van Keulen et al., 2013; Alberts et al., 2017; Hofman et al., 2014). Results from a Dutch study among mothers and girls to-be-invited showed that ‘modifiable’ social-psychological determinants such as perceived susceptibility and attitude accounted for large proportions of variance in HPV-vaccination acceptability (Van Keulen et al., 2013; Pot et al., 2017; Alberts et al., 2017). Furthermore, mothers appeared most important in the process of decision-making about their daughters’ HPV-vaccination. These insights, in turn, led to the development of an innovative, interactive, web-based, tailored intervention promoting HPV-vaccination acceptability among mothers of invited girls.

The intervention was developed using Intervention Mapping (IM), a protocol for developing theory-and evidence-based health promotion interventions (Bartholomew Eldredge et al., 2016). According to IM, an important element of intervention development is pretesting of components of the intervention, preferably by using an experimental design (Whittingham et al., 2008a; Whittingham et al., 2008b). Experimental pretesting enables researchers to draw reliable conclusions about the feasibility and effectiveness of developed materials in influencing predetermined objectives (Whittingham, 2008a; Whittingham, 2008b). This study is an online experimental pretest of the interventions materials specifically targeting perceived HPV-related risks in mothers of girls to-be-invited for the HPV vaccination. This was planned because perceived susceptibility appeared an important determinant of HPV-vaccination acceptability (Pot et al., 2017; Van Keulen et al., 2013; Brewer & Fazekas, 2007; Brewer et al., 2007), and because research findings are mixed about the surplus value of either using statistical or narrative risk information in affecting perceived susceptibility.

27 *Statistical versus Narrative Risk Information*

28 Statistical risk information includes abstracts of numerical data and factual assertions (e.g., prevalence
29 rates) about the probability of attracting a certain health-related outcome (De Wit et al., 2008). It is
30 assumed that confrontation with the likelihood of attracting a risk people are willing to take
31 preventive actions. For instance, Cox and colleagues (2010) found that parents who received
32 statistical information reported significantly stronger intentions to have their daughter vaccinated
33 against HPV compared with parents who did not receive statistical information. But there is also
34 evidence for the impact of narratives. A narrative consists of a personal experience of an event, such
35 as somebody getting a disease (Hinyard & Kreuter, 2007; Winterbottom et al., 2008). Narrative
36 information is suggested to trigger the simulation heuristic (Kahnemann & Tyversky, 1982).
37 According to this heuristic, the perceived likelihood of an event is based on the ease to picture the
38 event mentally (Gregory, Cialdini, & Carpenter, 1982; Kahnemann & Tyversky, 1982). Narratives are
39 suggested to increase this ease of imagination and, therefore, are likely to increase likelihood
40 estimates (Tversky & Kahneman, 1974). De Wit and colleagues (2008) showed that narrative risk
41 information resulted in higher intentions to get the hepatitis B vaccination than information that only
42 mentioned an increased risk of infection. Hopfer (2012) found that narrative information nearly
43 doubled HPV-vaccination uptake compared to non-narrative controls. And Nan and colleagues (2015)
44 found that a message containing *both* statistical and narrative information resulted in higher levels of
45 perceived susceptibility towards HPV than messages containing just one of the two.

46 Despite the lack of consensus about the surplus value of statistical versus narrative risk
47 communication, research has also pointed at certain conditions for effectiveness of (risk)
48 communication (e.g., Breakwell, 2000; Priester & Petty, 2003). Eagly and Chaiken (1993) pointed at
49 factors moderating or mediating the effectiveness of persuasive (risk) communication. Mediators are
50 *comprehensibility* (Eagly & Chaiken, 1993, p. 263) and *credibility* (Eagly & Chaiken, 1993, p. 352).
51 Also information that is perceived as more *novel*, is suggested to increase the likelihood of attitude
52 change (Wyer, 1974, p. 223). Therefore, we also explored whether the effectiveness of the different

modes of risk communication is moderated by comprehensibility, credibility, and novelty of the message.

Besides, factors constituting the processing of information can mediate the effects of risk communication, that is imaginability, elaboration, relevance, and defensive reactions. For instance, Janssen, Van Osch, De Vries, and Lechner (2013) reported that sunbed users who were exposed to narrative information could better imagine themselves attracting skin cancer. Information processing models of attitude change, such as the Elaboration Likelihood Model (Petty & Cacioppo, 1986; see also Kreuter & Wray, 2003), state that message *relevance* increases active processing of information, which in turn enhances message effects. But, a growing body of literature also suggests that messages about health risks may evoke *defensive reactions* such as message derogation (i.e., denying the relevance of the message or preventing it from reaching consciousness), denial of one's susceptibility (i.e., defensive avoidance), and/or perceived manipulation (Van't Riet & Ruiter, 2011; Block & Williams, 2002; Liberman & Chaiken, 1992; Ruiter, Verplanken, de Cremer, & Kok, 2004; Witte, Berkowitz, Cameron, & McKeon, 1998). Defensive reactions will reduce message effects because it distracts the recipient's attention to the message (cf. Kessels, Harris, Ruiter, & Klein, 2016). Therefore, the present study also explores whether the effects of risk information are mediated by imaginability, elaboration, relevance, and defensive reactions.

To summarize, this study is an online experimental pretest of materials developed for an intervention promoting HPV-vaccination acceptability targeting mothers of 12 year old girls. Specifically, we aim to assess the effectiveness of statistical versus narrative risk information in influencing mothers' perceived susceptibility towards HPV and cervical cancer of their daughter. In addition, the present study explores the underlying conditions and mechanisms.

Methods

Recruitment

Participants were mothers of girls born in 2001 (i.e., girls-to-be-invited for the HPV-vaccination round of 2014). A random sample of mothers was drawn from the Dutch vaccination register (Praeventis).

Design

Mothers were randomly assigned by the computer to one of four conditions in a 2 (statistical information: yes vs no) x 2 (narrative information: yes vs no) between-subjects factorial design.

Procedure

An invitational letter was sent to participants' home addresses. This included information about the study, contact details of the researchers, a link to the website, and a personal entrance code. As a reimbursement, a subscription to a magazine was raffled among all participants that met the inclusion criteria. When participants logged in to the online experiment, they were first informed about the study purpose, followed by instructions for completing the experiment. After having provided informed consent, participants were randomly assigned to one of the four conditions. All participants received the same general information about HPV, cervical cancer, and the HPV-vaccination. Next, only mothers in the experimental conditions additionally received risk information (See 'manipulations'). After this, participants proceeded with self-report questionnaires that accounted for the dependent variables, the proposed mediators and moderators, and their socio-demographics. Finally, mothers were debriefed and thanked for their participation. On average, mothers needed 15 minutes to complete the experiment.

Required Sample Size

Based on the literature (e.g., Mevissen et al., 2009; De Wit et al., 2008), we expected a medium effect size on the primary outcomes ($\eta^2 = .06$; Cohen, 1988). In our design with 2 means per factor, this effect size value corresponds to a d-value of 0.50, and an f-value of 0.25. Power analysis showed that a minimal sample size of 32 participants per condition was needed (with power = 0.80, and two-sided $\alpha = 0.05$; Hintze, 2004). We took into account a drop-out percentage of 30% and a response rate of 5%, based on previous experiences (Van Keulen et al., 2013). Consequently, 3,680 mothers received the invitation for participation in the study.

Data Collection Period

The experimental pretest was conducted between September and October 2013.

Operationalisations

Measurements

Socio-demographics included the participants' age, gender, educational level, country of birth, and religion. Level of education accounted for the mothers' highest level of education they had completed. This was classified as low (less than secondary or vocational education), intermediate (secondary through pre-university education), or high (professional or university education). The mothers were asked about their religious conviction (Protestant, Roman Catholic, Muslim, Jewish, Buddhist, Hindu, other, or no religion). Research has shown that more Dutch Protestants refrain from vaccination compared to the other (non) religious groups (Van Keulen et al., 2013). This was confirmed in our sample, and therefore religion was dichotomized into 'Protestant' versus 'not Protestant'. Country of birth was dichotomized into 'Netherlands' versus 'other' as in our sample only 6% participants were born in a country other than the Netherlands.

Criteria for effectiveness. The outcome criteria were perceived susceptibility and HPV-vaccination intention. Perceived susceptibility towards HPV and towards cervical cancer was measured by 7-point scaled item, each: 'Without the HPV-vaccination, the chances of my daughter for getting infected with HPV (getting cervical cancer) are '(1 = very small; to 7 = very big). HPV-vaccination intention was measured as a composite of two items: 'Are you planning to have your daughter vaccinated against HPV?' and 'What are the chances that you will get your daughter vaccinated against HPV?' Responses were given on a 7-point scale ranging from (1) certainly not / very small / to (7) certainly / very big (Pearson's $r = .95$).

Items measuring the moderating and mediating factors (except for 'defensive avoidance, see below) referred to the specific type(s) of information the mothers had received (i.e., general and/or statistical and/or narrative risk information). For mothers in the three experimental conditions, a mean score per moderating and mediating factor was calculated. Thus, mothers evaluated each specific type of information separately. This means that, for instance, credibility for mothers in the statistical information condition represents the mean score of perceived credibility of the general and the statistical information.

Moderating factors. Comprehensibility was assessed by a composite of three items accounting for the extent to which mothers had understood the presented information, and whether they considered the text to be clear and readable. Responses were given on a seven-point scale ranging from (1) not at all understandable / very unclear / very readable to (7) fully understandable / very clear / very readable (Cronbach's $\alpha = .87$). Credibility was measured with the single-item: 'To what extent do you believe the content of the text is credible?' (1 = very incredible; to 7 = very credible). Novelty was measured with a single-item: 'To what extent does the text contain new information for you?' (1 = much new information; to 7 = much known information).

Mediating factors. Imaginability was measured with one item for HPV and one item for cervical cancer: 'Because of the text, I could imagine my daughter getting HPV / cervical cancer' (1 = totally disagree; to 7 = totally agree). Elaboration was assessed by a single item 'How well did you

read the information?’ (1 = not carefully at all; to 7 = very carefully). Personal relevance was measured with the item ‘I considered the text to be personally relevant’ (1 = totally disagree; to 7 = totally agree). Defensive avoidance was accounted for by two 7-point scaled items (one referring to HPV and the other to for cervical cancer): ‘I’d rather not think about my daughter getting infected with HPV/developing cervical cancer’ (1 = totally disagree; to 7 = totally agree). Perceived manipulation of the information was measured by the item ‘I considered the text to manipulate my beliefs’ (1 = totally disagree; to 7 = totally agree).

Manipulations

The text messages were pretested among a sample of mothers (N = 10) to assure comprehensibility, and, for the narrative text message, to assure that mothers were able to imagine the situation. All text messages that were finally used can be found in the Appendices.

General information (see Appendix A). All participants received general information about HPV, cervical cancer , and the HPV-vaccination, to ensure their background knowledge was similar.

Statistical risk information (see Appendix B). The statistical message presented factual epidemiological information about the prevalence of HPV and cervical cancer among women and information about the reduction in cases of cervical cancer to be expected when all girls would obtain the HPV-vaccination. This message was based on data from the Dutch National Institute for Public Health and Environment and data released by the Health Council of The Netherlands (Gezondheidsraad, 2008).

Narrative risk information (see Appendix C). The narrative message included a personal story derived from an internet health forum of a woman who had found out she had cervical cancer, which was caused years ago by an HPV-infection. The name of the woman was fictitious.

Analysis Plan

A two-way analysis of variance (ANOVA) was conducted to examine the impact of the different types of risk information on perceived susceptibility and intention. Mediation and moderation analyses were examined using SPSS PROCESS macro (2.12.1 release), a widely used regression-based approach (Hayes, 2013).

For the moderation analysis, the independent variable and the proposed moderator were entered in the model in the first step, followed by the interaction between the independent variable and the moderator in Step 2. The interaction (i.e., moderation) was assumed significant when $p < .05$. For the mediation analyses, the PROCESS macro first conducted the following hierarchical regressions: the mediators (M) were regressed onto the independent variable (X) and the dependent variable (Y) was regressed onto both the independent variable and the mediator. We assumed mediation when the following conditions were met: (1) X has an effect on the mediator variable M, (2) M has an effect on Y when controlling for X, and (3) the effect of X on Y becomes significantly smaller or non-significant when controlling for M. Then, in order to test the indirect effect for significance, the bootstrapping method was utilized by the PROCESS macro. The indirect effect represents the influence of the mediating variable on the original relation between X and Y. A value of 0 indicates no impact. A bias-corrected 95% bootstrap model with confidence intervals resampled 5,000 times for each analysis was used to judge significance of the indirect effect (Shrout & Bolger, 2002); if the bootstrap confidence interval did not include zero, mediation was supported. This method was chosen as it is generally considered to maximize power and is robust against non-normality (Hayes, 2013).

199 *Software*

200 The power calculation was conducted with PASS software (Hintze, 2004). The online experiment
201 was developed using TailorBuilder © computer software. Main analyses and moderation and
202 mediation analyses were conducted using SPSS version 22 (IBM Corp., 2013).

203

204 *Ethics*

205 This experiment was part of a larger study, for which ethical approval was obtained from the ethical
206 committee of the VU Medical Center in Amsterdam.

207

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320 **Appendix A**

321 *General information*

322 **HPV and cervical cancer**

323 Cervical cancer is a life-threatening disease among women. It is caused by the Human Pappilomavirus
324 (HPV). HPV is contagious and is spread through sex: through contact with infected genital skin,
325 mucous membranes, or bodily fluids. Both men and women can get infected with HPV. Not only the
326 penis and vagina are infected; HPV can infect skin not normally covered by a condom (such as hands
327 or mouth), so using a condom does not fully protect someone from the virus. Also, many people don't
328 realize they're infected with HPV and may have no symptoms. The virus can be cleared by one's
329 immune system, but sometimes, this does not happen. Then, the virus can lead to precursors of
330 cervical cancer –and eventually to cervical cancer.

331

332 **The HPV-vaccination**

333 Since 1976, there has been a cervical cancer screening program. Thanks to this program, precursors of
334 cervical cancer can be detected early, so that cervical cancer can be prevented or treated at an early
335 stage of the disease. In order to prevent (rather than detect) cervical cancer, the HPV-vaccination has
336 been available since 2010. Every year, 12 year old girls are invited via the National Immunization
337 Program. The HPV-vaccination consists of three injections*, given in a period of half a year. The
338 HPV-vaccination is offered on a voluntary basis and free of charge. The HPV-vaccination prevents
339 infection with the HPV-virus (2 types of the virus, that cause 70% of infections) and protects against
340 cervical cancer. The HPV-vaccination is also called 'the vaccination against cervical cancer'. The
341 HPV-vaccination has been approved for girls between 9 and 26 years old, but it is best to vaccinate
342 girls at an early age, before she gets sexually active and therefore is at risk for getting infected. The
343 HPV-vaccination has been tested and results showed it was safe. As with most vaccinations, the spot
344 of injection can be a bit painful, red and swollen for a while.

345 There is no treatment if you are infected with HPV. The HPV-vaccination is therefore the only
346 available and effective method to protect against an infection with HPV

347 Note: The original language of the narrative information was Dutch. *When the experiment was conducted, the
348 HPV-vaccination still consisted of three instead of two injections.

349

350 **Appendix B**

351 *Statistical risk information*

352 **The risk of getting HPV and cervical cancer**

353 In the Netherlands, every year, about 600 Dutch women are diagnosed with cervical cancer.
354 Approximately 200 of these women die of this disease per year. This means that almost every day, a
355 woman dies of cervical cancer. Cervical cancer is caused by infection with the HPV-virus. The HPV-
356 virus is highly prevalent. Almost everybody who is sexually active, is exposed to the virus. Of every
357 100 women, 80 get infected with the HPV-virus. This means that 80% of all women get infected with
358 HPV once. However, not all women get cervical cancer. It cannot be predicted who gets cervical
359 cancer and who doesn't, but it is always caused by being infected with HPV. Therefore, it is important
360 to prevent a HPV-infection.

361

362 **Protecting against HPV**

363 It is expected that, in the Netherlands, the HPV-vaccination will prevent half of the cervical cancer
364 cases. This means that the HPV-vaccination can decrease the amount of women getting cervical
365 cancer with 50%. So, when no girl gets the HPV-vaccination, 600 women per year will get cervical
366 cancer. But when all girls get the HPV-vaccination, 300 women per year (half of 600) will be saved
367 from getting cervical cancer.

368 In conclusion: girls who do get the HPV-vaccination, have a much smaller chance of getting cervical
369 cancer later in life than girls who don't get the HPV-vaccination.

370 Note: The original language of the statistical information was Dutch

371 **Appendix C**

372 *Narrative risk information*

373 By Anne, 30 years of age

374 Hi everybody. I found this forum via a friend and I would like to share my story with you all.

375 When I was 14 years old, I had my first boyfriend, with whom I had sex for the first time when I was
376 16. Since then, I have had two relationships: one when I was 21 (lasted 2 years) and my current
377 relationship with Robbert (already lasting 4 years now). I've only had a few casual sex partners in my
378 life; I never was that 'wild'. Aside from a drunk slip-up, I've always used a condom with casual
379 partners. I wouldn't want to get an STI!

380 Last year, we went skiing with a couple of friends. Just after our arrival, I noticed that I lost some
381 blood. Somewhat concerned, I called a family member who also is a doctor. 'Could it be that you're
382 pregnant?' he asked me. Robbert and I agreed that we were ready having a baby, so it was possible.
383 We got the advice to enjoy our vacation and that I should have it checked out when I was back home.
384 Once I was back home, I got my period and because we immediately were sucked into our busy but
385 carefree lives, I kind of already had forgotten about what happened during our vacation. Until, about a
386 month ago, I again had some blood loss while it wasn't the time to have my period. I arranged an
387 appointment with my doctor that afternoon. After a short examination, I was sent to the hospital for
388 further tests.

389 Turned out.. I have cervical cancer! The doctor told me that the cancer had been caused by the
390 HPV-virus. I've had heard of it, but didn't know much about it. But I had been so careful? Could it be
391 one of those very few times I have had unsafe sex? Could have been, but the doctor told me that I
392 could have gotten infected with HPV during safe sex as well. It therefore was quite difficult to find
393 out who got me infected. I'd never thought that I would get infected with HPV, let alone that it would
394 develop into cervical cancer..

395 With the HPV-vaccination that is available now, I sometimes can't help but wonder: 'what if I had
396 gotten myself vaccinated against HPV 18 years ago...'

397 Note: The original language of the narrative information was Dutch

398