

Performance of a tool to identify different types of self-reported sexual risk among women attending a contraception and sexual health clinic: results of a cross-sectional survey

Article (Published Version)

Edelman, Natalie, Whetham, Jennifer, Cassell, Jackie, de Visser, Richard, Mercer, Catherine, Jones, Christopher, Gersten, Abbey and Bremner, Stephen (2020) Performance of a tool to identify different types of self-reported sexual risk among women attending a contraception and sexual health clinic: results of a cross-sectional survey. *BMJ Sexual & Reproductive Health*. pp. 1-12. ISSN 2515-1991

This version is available from Sussex Research Online: <http://sro.sussex.ac.uk/id/eprint/92121/>

This document is made available in accordance with publisher policies and may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the URL above for details on accessing the published version.

Copyright and reuse:

Sussex Research Online is a digital repository of the research output of the University.



Copyright and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable, the material made available in SRO has been checked for eligibility before being made available.

Copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.



OPEN ACCESS

Performance of a tool to identify different types of self-reported sexual risk among women attending a contraception and sexual health clinic: results of a cross-sectional survey

Natalie Edelman ,^{1,2} Jennifer Whetham,³ Jackie Cassell,² Richard de Visser,⁴ Catherine Mercer,⁵ Christopher Jones ,² Abbey Gersten,⁶ Stephen Bremner²

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bmjshr-2019-200482>).

For numbered affiliations see end of article.

Correspondence to

Dr Natalie Edelman, Westlain House, School of Health Sciences, University of Brighton, Falmer BN1 9PH, UK; N.Edelman@brighton.ac.uk

Received 23 September 2019

Revised 29 April 2020

Accepted 1 May 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Edelman N, Whetham J, Cassell J, *et al.* *BMJ Sex Reprod Health* Published Online First: [please include Day Month Year]. doi:10.1136/bmjshr-2019-200482

ABSTRACT

Introduction A clinical prediction rule (CPR) using psychosocial questions was previously derived to target sexual healthcare in general practice by identifying women at risk of unintended pregnancy (UIP) and sexually transmitted infections (STIs). This psychosocial CPR may help target resources within contraception and sexual health (CASH) services. This study investigated how well it predicted recent self-reported risk of UIP and STI acquisition among women attending a CASH clinic.

Methods Female patients aged 16–44 years attending a CASH clinic in South-East England were offered a questionnaire on arrival. This comprised psychosocial questions, and others addressing three sexual risks: (1) two or more male sexual partners in the last year (2+P), (2) risk of STI acquisition through most recent partner and (3) risk of UIP in the last 6 months. A CPR score was calculated for each participant and cross-tabulated against self-report of each sexual risk to estimate CPR sensitivity and specificity.

Results The psychosocial questions predicting 2+P had sensitivity 83.2% (95% CI 79.3% to 86.5%) and specificity 56.1% (95% CI 51.3%–60.6%). Those predicting combined 2+P and/or risk of STI acquisition through most recent partner had a sensitivity of 89.1% (95% CI 85.7%–91.8%) and specificity of 43.7% (95% CI 39.0%–48.5%). Questions predicting risk of UIP in the last 6 months had a sensitivity of 82.5% (95% CI 78.6%–86.0%) and specificity of 48.3% (95% CI 43.4%–53.1%).

Key messages

- Clinical prediction rules (CPRs) may help to identify intervention needs and target resources within sexual health services.
- Psychosocial questions can be used in CPRs to identify recent sexual risk experiences in women of reproductive age.
- A psychosocial CPR to identify sexual risk among women of reproductive age has higher sensitivity but lower specificity in contraception and sexual health than in general practice.

Conclusions The CPR demonstrated good sensitivity but low specificity, so may be suited to triaging or stratifying which interventions to offer CASH patients and by which mode (eg, online vs face-to-face). Further investigation of causal links between psychosocial factors and sexual risk is warranted to support development of psychosocial interventions for this patient group.

INTRODUCTION

Clinical prediction rules (CPRs) identify risk of adverse outcomes in individuals using patient characteristics data, and can inform decisions about clinical intervention. Most sexual health CPRs comprise sexual behavioural and sociodemographic factors and focus on sexually transmitted infection (STI) risk.^{1 2} Previously we developed a CPR to identify

women at risk of STIs and/or unintended pregnancy (UIP) attending general practice (GP),³ using psychosocial questions identified from preliminary studies.^{4,5} Psychosocial factors are increasingly explored in sexual health research, reflecting the need to address social determinants of sexual health,⁶ and may prove more acceptable than sexual behaviour questions in GP^{7,8} for which the CPR was originally developed.

The CPR was generated for women only as psychosocial determinants of sexual risk and morbidity may vary considerably between the sexes,⁹ for example, alcohol use predicts number of sexual partners among female STI clinic attenders but not male.¹⁰ The nature of contraception also indicates the benefit of a sex-specific CPR, while sexual healthcare engagement and delivery preferences also vary by sex and/or gender.^{11,12}

CPRs may offer opportunities for efficiency amid cuts to specialist sexual healthcare of up to 20% in Britain¹³ and elsewhere.¹⁴ As an example, previous research has investigated a digitally-delivered CPR to triage STI testing in specialist sexual health settings for high-risk subpopulations.¹⁵ In Britain, specialist contraceptive advice and supply, and STI testing, treatment and partner notification, are increasingly co-delivered in contraception and sexual health (CASH) clinics.⁶ Although women attending specialist sexual health services experience higher rates of sexual risk than those attending GP for sexual healthcare,^{16,17} this may not be true for those women attending CASH clinics only for contraceptive advice and supply. We hypothesised that our psychosocial CPR may support differential targeting of women attending CASH clinics who may not require both contraception and STI testing, and set out to assess its performance using an existing dataset, before investigating digital delivery.

The study aimed to investigate how well our psychosocial CPR – developed for use in GP – performed in predicting self-reported recent risk of UIP and STI acquisition among women of reproductive age attending a specialist sexual health service.

METHODS

Patient and public involvement

We conducted patient and public involvement (PPI) at a women's centre to explore the purposes, format and acceptability of a psychosocial CPR. Opportunistic PPI consultation took place in GP waiting rooms to explore the feasibility and acceptability of the recruitment and data collection plans described below. We also held consultations at a youth forum with women aged 16–17 years. As participation was anonymous, we distributed lay summary leaflets of findings to all recruitment sites instead of to individual participants.

Study sample

We undertook a cross-sectional survey of women attending an urban specialist sexual health and contraception clinic in a hospital outpatient setting in

South-East England (referred to as 'SHAC' as it was a genitourinary medicine clinic expanded to include contraception services). We aimed to recruit a convenience sample of $n=500$ women between April and August 2016, sufficient to enable multivariable statistical modelling.¹⁸ Using a nomogram for sensitivity and specificity sample size calculations, a sample size of $n=500$ would be adequate to estimate a sensitivity of 80% with a 95% CI to within $\pm 5\%$ given a prevalence of 50%.¹⁹ The sample comprised female attenders aged 16–44 years regardless of attendance reason, recruited as part of a larger study to develop a CPR to target sexual healthcare to women attending GPs, but eventually not needed for that derivation.³

Recruitment and data collection

Recruitment took place two mornings per week, when women were attending for walk-in and booked appointments for dedicated contraception services, STI testing and treatment. Women were offered an envelope by reception staff, or by a researcher immediately after they booked in, with the exception of visibly distressed women, those known to have insufficient English language skills, or those clearly outside the eligible age range. Due to resource limitations, it was not possible to record the numbers of women not offered or refusing a questionnaire, or the reasons why. Each envelope contained a pen, participant information sheet (PIS) and a questionnaire, comprising potential CPR items and the outcomes of interest. The questionnaire was designed to take 5 min to complete, while awaiting an appointment. To maintain brevity we did not capture additional demographic data. Participants were instructed to complete the questionnaire anonymously, sitting alone in the waiting area if possible. Consent was implied by questionnaire completion. Three initial questionnaire items were used to screen out those not identifying as female, outside the eligible age range and/or who had completed the questionnaire previously. The questionnaire text instructed these patients to seal and return their questionnaire without completing it further. The questionnaire and PIS instructed participants to seal their questionnaire in the envelope before returning to staff to be securely passed to the researchers.

Data management and storage

Data were stored at Brighton and Sussex Medical School for the study duration. Data were double-entered into a statistical package by an external company and transferred to Stata 13²⁰ for analysis. Accuracy checks were performed on a random 10% sample and anomalies checked and addressed individually by researchers.

Measurement of sexual risk and psychosocial predictors

Three sets of CPR psychosocial questions were investigated, each set having been previously derived using

Table 1 Psychosocial questions and response options, indicating which clinical prediction rule set each contributed to

Item wording	CPR for 2+P* Response options (score)	CPR for combined risk† Response options (score)	CPR for risk of UIP‡ Response options (score)
Q2. How old are you?	15 years or less (excluded) Between 16 and 24 years (2) Between 25 and 34 years (0) Between 35 and 44 years (0) 45 years or older (excluded)	15 years or less (excluded) Between 16 and 24 years (1) Between 25 and 34 years (0) Between 35 and 44 years (0) 45 years or older (excluded)	Item not part of this CPR
Q4. Thinking about where you are living now, which statement best describes your circumstances?	I am renting or living rent-free (including living with parents or staying with friends) (2) I own my own home (including mortgage, shared ownership or bought outright) (0)	I am renting or living rent-free (including living with parents or staying with friends) (1) I own my own home (including mortgage, shared ownership or bought outright) (0)	Item not part of this CPR
Q6. How often is each of the following kinds of support available to you if you need it? Someone to prepare your meals if you're unable to do it yourself.	Item not part of this CPR	None of the time (1) A little of the time (1) Some of the time (0) Most of the time (0) All of the time (0)	Item not part of this CPR
Q6. How often is each of the following kinds of support available to you if you need it? Someone to help with daily chores if you're sick.	None of the time (1) A little of the time (1) Some of the time (0) Most of the time (0) All of the time (0)	Item not part of this CPR	Item not part of this CPR
Q7. To what extent is the statement 'I have high self-esteem' true for you?	Not very true of me (0) Somewhat untrue of me (0) Neither untrue nor true of me (0) Somewhat true of me (2) Very true of me (2)	Item not part of this CPR	Item not part of this CPR
Q8. In the last 12 months have you received treatment from a health professional for depression?	Item not part of this CPR	Yes (1) No (0) Prefer not to answer (0)	Yes (2) No (0) Prefer not to answer (0)
Q9. How strongly do you agree with the statement 'Having a partner at all times is important to me'?	Strongly agree (0) Agree (0) Disagree (1) Strongly disagree (1)	Strongly agree (0) Agree (0) Disagree (2) Strongly disagree (2)	Item not part of this CPR
Q10. How often do you have six or more units of alcohol on one occasion?	Daily or almost daily (2) Weekly or almost weekly (2) Monthly (0) Less than monthly (0) Never (0) Prefer not to answer (0)	Item not part of this CPR	Item not part of this CPR
Q11. Do you smoke cigarettes at all nowadays?	Yes I smoke cigarettes or roll-ups (1) Yes I smoke e-cigarettes (0) No (0) Prefer not to answer (0)	Yes I smoke cigarettes or roll-ups (2) Yes I smoke e-cigarettes (0) No (0) Prefer not to answer (0)	Item not part of this CPR
Q12. Have you ever taken any non-prescribed, illicit or illegal drugs, including legal highs?	Yes (1) No (0) Don't know (0) Prefer not to answer (0)	Yes (1) No (0) Don't know (0) Prefer not to answer (0)	Item not part of this CPR
Q13. At present are you...?	Living as a couple with a partner or spouse (0) In a steady relationship but not living together (0) In a casual relationship (4) Single (4) Prefer not to answer (0)	Living as a couple with a partner or spouse (0) In a steady relationship but not living together (0) In a casual relationship (4) Single (4) Prefer not to answer (0)	Item not part of this CPR
Q14. Please rate how emotionally satisfying your current relationship is, or how emotionally satisfying your most recent relationship was if you are currently single.	Item not part of this CPR	Item not part of this CPR	Extremely satisfying (0) Very satisfying (0) Moderately satisfying (1) Slightly satisfying (1) Not at all satisfying (1)

Continued

Table 1 Continued

Item wording	CPR for 2+P* Response options (score)	CPR for combined risk† Response options (score)	CPR for risk of UIP‡ Response options (score)
Q16. During your current or most recent relationship did your partner ever have sexual intercourse with anyone besides you?	Item not part of this CPR	Item not part of this CPR	No definitely not (0) I don't think so (0) It's quite likely (2) Yes, definitely (2) Prefer not to answer (0)
Q17. Have you ever been in a relationship with a partner who...? Insulted or talked down to you often.	Yes (1) No (0) Prefer not to answer (0)	Item not part of this CPR	Item not part of this CPR
Q18. How old were you when you first had sexual intercourse with someone of the opposite sex (including experiences you may not have wanted or that happened at an early age)?	Item not part of this CPR	Under 16 years old (2) 16 years or older (0) I've never had sexual intercourse with someone of the opposite sex (excluded) Prefer not to answer (0)	Under 16 years old (1) 16 years or older (0) I've never had sexual intercourse with someone of the opposite sex (excluded) Prefer not to answer (0)
Q20. The man I most recently had sex with is five or more years older than me.	Item not part of this CPR	True (1) Probably true (1) I have no idea (0) Probably not true (0) Not true (0)	Item not part of this CPR
Q25. In the last 6 months have you used emergency contraception at all?	Item not part of this CPR	Item not part of this CPR	Yes (5) No (0) Prefer not to answer (0)
Q28. In the last 6 months have you taken a pregnancy test because you thought you might be pregnant?	Yes (1) No (0) Prefer not to answer (0)	Yes (1) No (0) Prefer not to answer (0)	Item not part of this CPR

Q1 and Q3 are excluded as they were used only to remove ineligible respondents.

*2+Pdenotes two or more male sexual partners.

†Two or more male sexual partners in the last year and/or most recent partner hadnot used condoms with previous partners in last year.

‡Unintendedpregnancy risk in the last 6 months.

CPR, clinical prediction rule; UIP, unintended pregnancy.

clinical prediction modelling³ to predict one of the following outcomes:

1. Self-report of 2+ male sexual partners in the last year (hereafter '2+P')
2. Self-report of 2+P and/or risk of STI through most recent partner (abbreviated hereafter as 'combined risk')
3. Self-report of risk of UIP in the last 6 months (abbreviated hereafter as 'risk of UIP').

The first outcome was chosen as indicative of possible need for sexual health advice and STI testing, and measured using the item 'In the last year, how many men have you had sexual intercourse with (by sexual intercourse, we mean a man's penis in a woman's vagina, mouth or anus)?'.

The second outcome was chosen as experiences such as multiple partnerships and condom use only partly predict poor sexual health outcomes.²¹ This was measured using a composite variable comprising positive responses to the items 'The man I most recently had sex with didn't always use condoms for vaginal sex with previous partners', and 'The man I most recently had sex with had at least one sexual partner in the last year before me' and 'Thinking about condom use with your most recent male sexual partner ... condoms were sometimes used for vaginal sex OR condoms were never used for vaginal sex'.

The third outcome was chosen as indicative of possible ongoing need for contraceptive advice and supply. This was measured by combining responses to an item about contraception use ('Thinking about your contraception use in the last 6 months, please tick one statement which most applies to you') with another about pregnancy intention ('Overall, in the last 6 months how much have you wanted to avoid getting pregnant?'), each adapted from previous studies.^{22 23} Women responding 'Contraception was used but the method failed' or 'Contraception was never used' or 'Contraception was used, but not on every occasion' and that they had wanted to avoid getting pregnant 'very much' or 'quite a lot' were categorised as having been at risk of UIP in the last 6 months.

Data analysis

For each CPR set, a score was generated for each participant using their psychosocial question responses (table 1). Each participant's score was cross-tabulated against their self-report of that outcome to assess the sensitivity and specificity of that item set in predicting 2+P, combined risk and risk of UIP. Sensitivity and specificity were calculated for a range of CPR scores, using the original cut-off value specified from the GP sample³ and an alternative cut-off value that better

Table 2 Distribution of responses to clinical prediction rule psychosocial items by outcome

CPR psychosocial item	2+ male partners in last year			Combined STI risk			UIP risk in last 6 months								
	Yes	No	Missing	Yes	No	Missing	Yes	No	Missing						
Age group (years)															
16–24	169	63	5	237	44.5	189	39	9	237	44.5	88	139	10	237	45
25–44	155	133	7	295	55.5	198	79	18	295	55.5	85	186	24	295	56
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Housing tenure															
Renting or living rent-free	287	155	10	452	85	343	91	18	452	85	158	269	25	452	85
Owner	35	41	2	78	14.7	42	27	9	78	14.7	15	55	8	78	15
Missing data	2	0	0	2	0.4	2	0	0	2	0.4	0	1	1	2	0.4
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Lived with both natural parents to age 14 years															
Yes	230	144	7	381	71.6	271	91	19	381	71.6	117	242	22	381	72
No	91	47	5	143	26.9	111	25	7	143	26.9	53	80	10	143	27
Missing data	3	5	0	8	1.5	5	2	1	8	1.5	3	3	2	8	1.5
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
How often do you have someone to prepare your meals if you're unable to do it yourself?															
Has help sometimes, a little or not at all	157	73	7	237	44.5	189	36	12	237	44.5	82	146	9	237	45
Mostly or always has help	158	121	4	283	53.2	188	81	14	283	53.2	88	171	24	283	53
Missing data	9	2	1	12	2.3	10	1	1	12	2.3	3	8	1	12	2.3
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
How often do you have someone to help with daily chores if you're sick?															
Mostly or always has help	156	112	4	272	51.1	182	76	14	272	51.1	87	164	21	272	51
Has help sometimes, a little or not at all	161	82	7	250	47	197	41	12	250	47	83	155	12	250	47
Missing data	7	2	1	10	1.9	8	1	1	10	1.9	3	6	1	10	1.9
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Degree of agreement with the statement 'I have high self-esteem'															
Not very true of me	46	23	1	70	13.2	55	11	4	70	13.2	28	40	2	70	13
Somewhat untrue of me	54	34	3	91	17.1	68	20	3	91	17.1	31	55	5	91	17
Neither true nor untrue of me	50	36	2	88	16.5	65	18	5	88	16.5	28	53	7	88	17
Somewhat true of me	134	80	2	216	40.6	154	54	8	216	40.6	65	139	12	216	41

Continued

Table 2 Continued

CPR psychosocial item	2+ male partners in last year			Combined STI risk			UIP risk in last 6 months								
	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%
Very true of me	33	21	3	57	10.7	37	15	5	57	10.7	20	34	3	57	11
Missing data	7	2	1	10	1.9	8	0	2	10	1.9	1	4	5	10	1.9
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Treatment for depression in last 12 months															
Yes	88	36	1	125	23.5	100	23	2	125	23.5	43	76	6	125	24
No	234	159	11	404	75.9	284	95	25	404	75.9	130	247	27	404	76
Missing data	2	1	0	3	0.6	3	0	0	3	0.6	0	2	1	3	0.6
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Degree of agreement with statement 'Having a partner at all times is important to me'															
Strongly agree	14	19	0	33	6.2	18	12	3	33	6.2	8	22	3	33	6.2
Agree	48	54	5	107	20.1	65	35	7	107	20.1	32	67	8	107	20
Disagree	199	99	6	304	57.1	232	59	13	304	57.1	106	183	15	304	57
Strongly disagree	58	18	1	77	14.5	65	9	3	77	14.5	26	47	4	77	15
Missing data	5	6	0	11	2.1	7	3	1	11	2.1	1	6	4	11	2.1
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Frequency of 6+ units of alcohol on one occasion															
Daily, or almost daily	17	2	0	19	3.6	18	1	0	19	3.6	8	11	0	19	3.6
Weekly, or almost weekly	143	57	5	205	38.5	164	33	8	205	38.5	71	123	11	205	39
Monthly	86	46	1	133	25	99	27	7	133	25	44	80	9	133	25
Less than monthly	56	59	3	118	22.2	74	35	9	118	22.2	37	72	9	118	22
Never	21	32	3	56	10.5	31	22	3	56	10.5	13	39	4	56	11
Missing data	1	0	0	1	0.2	1	0	0	1	0.2	0	0	1	1	0.2
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Current cigarette smoking or roll-ups															
Yes	140	53	2	195	36.7	159	30	6	195	36.7	70	109	16	195	37
No	182	140	10	332	62.4	225	86	21	332	62.4	101	213	18	332	62
Missing data	2	3	0	5	1	3	2	0	5	1	2	3	0	5	1
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Ever taken drugs including legal highs															

Continued

Table 2 Continued

CPR psychosocial item	2+ male partners in last year			Combined STI risk			UIP risk in last 6 months								
	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%
Yes	225	96	2	323	60.7	257	60	6	323	60.7	113	192	18	323	61
No	87	93	8	188	35.3	115	54	19	188	35.3	49	123	16	188	35
Don't know	1	1	0	2	0.4	1	1	0	2	0.4	1	1	0	2	0.4
Missing data	11	6	2	19	3.6	14	3	2	19	3.6	10	9	0	19	3.6
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Current relationship status															
Living as a couple with a partner or a spouse	21	85	4	110	20.7	40	57	13	110	20.7	21	81	8	110	21
In a steady relationship but not living together	66	46	1	113	21.2	79	28	6	113	21.2	38	66	9	113	21
In a casual relationship	59	8	4	71	13.3	62	5	4	71	13.3	28	39	4	71	13
Single	175	53	2	230	43.2	199	27	4	230	43.2	85	132	13	230	43
Missing data	3	4	1	8	1.5	7	1	0	8	1.5	1	7	0	8	1.5
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
Emotional satisfaction from current or most recent relationship															
Extremely satisfying	39	60	1	100	18.8	50	41	9	100	18.8	23	69	8	100	19
Very satisfying	84	67	2	153	28.8	106	39	8	153	28.8	51	94	8	153	29
Moderately satisfying	89	26	3	118	22.2	101	14	3	118	22.2	46	66	6	118	22
Slightly satisfying	60	17	2	79	14.8	67	10	2	79	14.8	28	45	6	79	15
Not at all satisfying	29	16	2	47	8.8	34	10	3	47	8.8	14	29	4	47	8.8
N/A*	12	2	0	14	2.6	13	1	0	14	2.6	5	9	0	14	2.6
Missing data	11	8	2	21	3.9	16	3	2	21	3.9	6	13	2	21	3.9
Total	324	196	12	532	100	387	118	27	532	100	173	325	34	532	100
During your current or most recent relationship did your partner ever have sexual intercourse with anyone besides you?															
No, definitely not	141	119	4	264	49.6	168	79	17	264	49.6	75	174	15	264	50
I don't think so	108	42	5	155	29.1	126	24	5	155	29.1	54	89	12	155	29
It's quite likely	24	12	2	38	7.1	29	6	3	38	7.1	18	17	3	38	7.1
Yes, definitely	33	17	0	50	9.4	42	7	1	50	9.4	17	30	3	50	9.4
N/A*	10	2	0	12	2.3	11	1	0	12	2.3	6	6	0	12	2.3
Missing data	8	4	1	13	2.5	11	1	1	13	2.5	3	9	1	13	2.5

Continued

Table 2 Continued

CPR psychosocial item	2+ male partners in last year			Combined STI risk			UIP risk in last 6 months		
	Yes	No	Missing	Yes	No	Missing	Yes	No	Missing
Total	324	196	12	387	118	27	173	325	34
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				532	532	532	532	532	532
Have you ever had a partner who insulted or talked down to you often?									
Yes	154	85	4	183	52	8	81	147	15
No	166	102	6	197	62	15	90	167	17
Missing data	4	9	2	7	4	4	2	11	2
Total	324	196	12	387	118	27	173	325	34
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				532	532	532	532	532	532
Age of first sexual intercourse with someone of the opposite sex									
Under 16 years	138	60	2	157	38	5	74	112	14
16 years or older	186	128	8	229	75	18	99	205	18
N/A†	0	2	0	0	2	0	0	2	0
Missing data	0	6	2	1	3	4	0	6	2
Total	324	196	12	387	118	27	173	325	34
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				532	532	532	532	532	532
Man last had sex with 5+ years older									
True	78	47	2	98	24	5	43	75	9
Probably true	6	1	0	7	0	0	2	5	0
I have no idea	3	0	0	3	0	0	0	2	1
Probably not true	1	0	0	1	0	0	0	1	0
Not true	232	126	5	274	76	13	124	223	16
N/A‡	0	18	0	0	18	0	0	17	1
Missing data	4	4	5	4	0	9	4	2	7
Total	324	196	12	387	118	27	173	325	34
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				532	532	532	532	532	532
Use of emergency contraception in the last 6 months									
Yes	87	27	1	95	19	1	79	34	2
No	229	140	7	283	77	16	94	266	16
N/A\$	2	23	0	3	21	1	0	25	0
Missing data	6	6	4	6	1	9	0	0	16
Total	324	196	12	387	118	27	173	325	34
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				532	532	532	532	532	532
Pregnancy test used in last 6 months as thought pregnant									
Yes	126	59	1	148	33	5	89	89	8
				%			%		%
				100	100	100	100	100	100
				Total	Total	Total	Total	Total	Total
				186	186	186	186	186	186

Continued

Table 2 Continued

CPR psychosocial item	2+ male partners in last year			Combined STI risk			UIP risk in last 6 months								
	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%	Yes	No	Missing	Total	%
No	192	114	8	314	59.1	232	68	14	314	59.1	83	217	14	314	59.1
N/A§	1	18	0	19	3.5	2	16	1	19	3.5	0	19	0	19	3.5
Missing data	5	5	3	13	2.4	5	1	7	13	2.4	1	0	12	13	2.4
Total	324	196	12	532	100	387	118	27	531	100	173	325	34	532	100

*Never been in a relationship.

†Never had sexual intercourse with someone of the opposite sex.

‡No male partners ever/no male partners in last year.

§No male partners ever/no male partners in last year/no vaginal sex in last year/pregnant throughout last 6 months.

¶CPR, clinical prediction rule; N/A, not applicable; STI, sexually transmitted infection; UIP, unintended pregnancy.

balanced sensitivity and specificity. Participants were excluded if there were missing data for either the outcome of interest or any of the exposures comprising that CPR item set (on the basis that this would constitute an incomplete and therefore invalid CPR score). Positive and negative predictive values for each CPR set were also calculated on this basis using the same cross-tabulation.

RESULTS

The final sample comprised $n=532$ respondents of which 44.5% were aged 16–24 years. Logistically it was not possible to assess what proportion of eligible women attending the clinic during recruitment this figure represents. However, of 589 questionnaires handed out, 553 (94%) were returned, of which $n=537$ (97%) were eligible. A further five participants were excluded from analysis because sexual risk items were not completed.

Among the final sample, 62.3% (95% CI 58.0% to 66.5%) ($n=324$) self-reported multiple male sexual partners in the last year ($n=12$ missing data); 76.6% (95% CI 72.7% to 80.3%) ($n=387$) self-reported combined risk of multiple male sexual partners and/or risk of STI through most recent partner ($n=27$ missing data); and 34.7% (95% CI 30.6% to 39.1%) ($n=173$) self-reported risk of UIP in the last 6 months ($n=34$ missing data). Table 2 presents the distribution of item responses.

Table 3 comprises a cross-tabulation of CPR scores against participants' self-report of each outcome, displaying the sensitivity and specificity offered by using each score as a cut-off value categorising a participant as 'at risk' or 'not'.

For 2+P, excluding participants with missing outcome data or CPR items gave a sample size of $n=445$, of which 66.7% (297/445) reported multiple partnerships in the last year. For combined risk, excluding participants with missing outcome data or CPR items gave a sample size of $n=437$, of which 80.0% (350/437) reported combined risk in the last year. For UIP risk, excluding participants with missing outcome data or CPR items gave a sample size of $n=429$, of which 37.3% (160/429) reported unintended pregnancy risk in the last 6 months. Thus, missing exposure data was greatest for items contributing to the CPR for unintended pregnancy risk, but sample sizes for all CPRs were compromised by missing data.

Using the original cut-off score of 9 (on a scale of 0–18), the CPR for '2+ sexual partners in the last year' had a positive predictive value (PPV) of 79.2% (247/312) and negative predictive value (NPV) of 62.4% (83/133). Alternatively, a cut-off score of 10+ had a PPV of 82.9% (228/275) and NPV of 59.4% (101/170). The CPR for 'combined risk from multiple partnerships or most recent partner', using the original cut-off score of 6+ (on a scale of 0–17), had a PPV of 86.4% (312/361) and NPV of 50.0% (38/76).

Table 3 Sensitivity and specificity of the clinical prediction rule in identifying different sexual risk experiences

Outcome	CPR score	Participants self-reporting as at risk (n)	Sensitivity (95% CI)	Participants self-reporting as not at risk (n)	Specificity (95% CI)
2+ male sexual partners in last year					
	≤8	50	Not calculated	83	Not calculated
	9	19	83.2 (79.3 to 86.5)	18	56.1 (51.3 to 60.6)
	10	38	76.8 (72.7 to 80.7)	11	68.2 (63.7 to 72.5)
	11	27	64.0 (59.4 to 68.4)	13	75.7 (71.5 to 80.0)
	12	34	54.9 (50.2 to 59.6)	9	84.5 (80.8 to 87.7)
	≥13	129	Not calculated	14	Not calculated
Total		297		148	
Combined 2+ partners or risk from partner					
	≤4	20	Not calculated	22	Not calculated
	5	18	94.2 (91.7 to 96.3)	16	25.3 (21.4 to 29.8)
	6	16	89.1 (85.7 to 91.8)	8	43.7 (39.0 to 48.5)
	7	22	84.6 (80.9 to 87.9)	8	52.9 (48.1 to 57.6)
	8	33	78.3 (74.1 to 82.0)	12	62.0 (57.3 to 66.6)
	9	30	69.0 (64.5 to 73.4)	5	75.9 (71.7 to 79.9)
	10	50	60.3 (55.7 to 65.0)	6	81.6 (77.7 to 85.2)
	≥11	161	Not calculated	10	Not calculated
Total		350		87	
Risk of unintended pregnancy in the last 6 months					
	≤2	28	Not calculated	130	Not calculated
	3	29	82.5 (78.6 to 86.0)	70	48.3 (43.4 to 53.1)
	4	15	64.4 (59.6 to 68.9)	20	74.3 (70.0 to 78.4)
	5	10	55.0 (50.2 to 59.8)	16	81.8 (77.8 to 85.4)
	6	19	48.8 (43.9 to 53.6)	6	87.7 (84.2 to 90.6)
	≥7	59	Not calculated	27	Not calculated
Total		160		269	

CPR, clinical prediction rule.

Alternatively, a cut-off score of 7+ gave a PPV of 87.8% (296/337) and NPV of 46.0% (46/100). Using the original cut-off score of 3+ (on a scale of 0–11), the CPR for ‘unintended pregnancy risk in the last 6 months’ had a PPV of 48.7% (132/271) and NPV of 82.3% (130/158). Alternatively, a cut-off score of 4+ gave a PPV of 59.9% (103/172) and NPV of 77.8% (200/257). For each outcome the c-statistic and Receiver Operating Curve is provided in the online supplementary file.

DISCUSSION

Findings indicate that the psychosocial variables demonstrated good sensitivity in identifying those at recent risk of UIP or of STI acquisition in our dataset, but that the CPR does not constitute a useful alternative to direct questions about recent sexual risk experiences in this setting.

Overall, the CPR scores and original cut-off values yielded higher sensitivity but lower specificity for

women attending this SHAC service when compared with women attending GP³ for whom the CPR was originally developed. This may indicate higher prevalence of psychosocial risk factors among SHAC-attending women compared with GP attenders. Certainly our previous comparative analysis between the GP and SHAC samples indicated that after adjusting for the younger age of the SHAC participants, 2+P in the last year was more strongly associated with current smoking in the GP cohort, but more strongly associated with illicit drug use ever in the SHAC cohort.²⁴ Similarly, it is important to note that the CPR was not designed to identify women needing contraceptive advice and supply for reasons other than inconsistent or failed use, such as switching methods due to side effects or lifestyle and/or attending for long-acting reversible contraception removal.²⁵

The CPR performance was broadly comparable with tools developed using specialist sexual health setting data, such as a chlamydia infection tool for heterosexual

women (sensitivity 70.0%, specificity 62.3%)²⁶ and an acute HIV infection tool for men who have sex with men (sensitivity 83.3%, specificity 52.5%).²⁷ Nonetheless, the low NPVs would not provide clinical confidence in using the CPR to gate-keep interventions without full sexual history-taking. This reflects the difficulty of applying a CPR developed in primary care in higher prevalence settings, suggesting that external CPR validation should consider the impact of setting prevalence of NPV and PPV when determining the best cut-off score.

To ensure the questionnaire was brief and suitable for self-completion, the only sociodemographic data captured were age and sex (inclusion criteria) and housing tenure (a proxy of socioeconomic status⁵). Capture of more sociodemographic data would have enabled assessment of the transferability of these findings to other settings; however, the study was not designed to generate generalizable findings, but rather to identify if validation of the CPR is worthy of pursuit.

Convenience sampling may have resulted in under- or over-sampling those reporting sexual risk experiences and/or adjunct psychosocial issues. Nonetheless, those who chose not to participate based on sexual risk and/or other covariates would also likely decline the CPR in practice so our findings may still anticipate CPR clinical performance. The CPR question sets are not yet validated in primary care; nonetheless, this study offers some validity by demonstrating their discriminatory potential in women of the same age attending a SHAC.

The validity of self-reported risk could not be evaluated because it was not logistically possible to link answers with clinic data. Oral and anal intercourse were not captured to ensure questionnaire brevity, therefore the combined variable for STI acquisition risk only captured risk from vaginal intercourse. Several psychosocial items were unvalidated (due to necessary adaptations to enable brief questionnaire self-completion). Recall bias may also have affected item responses.

The CPR was developed as a paper-and-pencil self-completion tool, meeting delivery preferences identified during public consultation, and addressing a recognised need for brief sexual health assessment using self-scoring.²⁸ However, digital delivery may enable more complete and accurate reporting. Limited resources meant that it was not possible to estimate response rates, investigate reasons for non-participation or capture the number of women who refused a questionnaire or were not offered one due to the exclusion criteria. Thus, it is not possible to deduce the acceptability of the CPR questions in this and other CASH settings, although PPI indicated all items were acceptable.

Increasing digital and/or shared delivery of contraception and STI interventions in CASH clinics opens the possibility for CPRs to triage patients to different

interventions. Self-completion CPRs such as this one can be incorporated into electronic or face-to-face book-in processes, or within specific care pathways, to identify if additional intervention is required.

Finally, our findings contribute to the broader study of association between social factors and sexual health, indicating the value of further research to investigate the role of psychosocial factors as causal factors in sexual risk, to inform psychosocial interventions aiming to reduce risk for women accessing sexual healthcare.

Author affiliations

¹School of Health Sciences, University of Brighton, Brighton & Hove, UK

²Department of Primary Care & Public Health, Brighton and Sussex Medical School, Brighton and Hove, UK

³Claude Nicol Centre, Brighton & Sussex University Hospitals Trust, Brighton and Hove, UK

⁴School of Psychology, University of Sussex, Brighton & Hove, UK

⁵Centre for Population Research in Sexual Health and HIV, University College London, London, UK

⁶Pavilion Practice, Brighton & Hove, UK

Twitter Natalie Edelman @natalieedelman

Acknowledgements The authors wish to acknowledge all those who have helped with and contributed to the study. This includes attenders at Brighton Women's Centre and at Newhaven Youth Forum, the NIHR Clinical Research Network Kent, Surrey and Sussex, the site Principal Investigators including Dr Paul Deffley, and the staff and patients of the participating site.

Contributors NE led the study conception, design, implementation, analysis and publication. JC, RV and CM contributed to conception, design and publication. JW and AG acted as Principal Investigators at study sites, contributing also to study planning and data acquisition, and consulting on the publication and cut-off score choices. CJ and SB advised on the sample size, plan of analysis and interpretation of findings, as well as this publication, and SB oversaw the analysis itself.

Funding This is a summary of independent research funded by the National Institute for Health Research (NIHR)'s Doctoral Research Fellowship programme (DRF-2013-06-004).

Disclaimer The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. The Methods section contains further details.

Patient consent for publication Not required.

Ethics approval Ethical approval for this study was granted by the National Research Ethics Service (Ref 16/LO/0206).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon request.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-

commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Natalie Edelman <http://orcid.org/0000-0001-6935-8877>

Christopher Jones <http://orcid.org/0000-0001-7065-1157>

REFERENCES

- Falasinu T, Gustafson P, Hottes TS, *et al*. A critical appraisal of risk models for predicting sexually transmitted infections. *Sex Transm Dis* 2014;41:321–30.
- Falasinu T, Gilbert M, Gustafson P, *et al*. Deriving and validating a risk estimation tool for screening asymptomatic chlamydia and gonorrhoea. *Sex Transm Dis* 2014;41:706–12.
- Edelman NL, Cassell JA, Mercer CH, *et al*. Deriving a clinical prediction rule to target sexual healthcare to women attending British general practices. *Prev Med* 2018;112:185–92.
- Edelman NL, de Visser RO, Mercer CH, *et al*. Targeting sexual health services in primary care: a systematic review of the psychosocial correlates of adverse sexual health outcomes reported in probability surveys of women of reproductive age. *Prev Med* 2015;81:345–56.
- Edelman N, Cassell JA, de Visser R, *et al*. Can psychosocial and socio-demographic questions help identify sexual risk among heterosexually-active women of reproductive age? Evidence from Britain's third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *BMC Public Health* 2017;17:5.
- Department of Health. *A framework for sexual health improvement in England (Report No: 18420)*. London, UK: Department of Health, 2013.
- Define Research & Insight Ltd. *Define Chlamydia screening and sexual health marketing - young people final report (Contract No: Define job number: 1649/COI reference: 285937)*. London, UK: Define Research & Insight Ltd for Department of Health, 2008.
- Edelman NL, Patel H, Glasper A, *et al*. Understanding barriers to sexual health service access among substance-misusing women on the South East coast of England. *J Fam Plann Reprod Health Care* 2013;39:258–63.
- Tannenbaum C, Greaves L, Graham ID. Why sex and gender matter in implementation research. *BMC Med Res Methodol* 2016;16:145.
- Carey KB, Senn TE, Walsh JL, *et al*. Alcohol use predicts number of sexual partners for female but not male STI clinic patients. *AIDS Behav* 2016;20:52–9.
- Green CA, Pope CR. Gender, psychosocial factors and the use of medical services: a longitudinal analysis. *Soc Sci Med* 1999;48:1363–72.
- Barnard S, Free C, Bakolis I, *et al*. Comparing the characteristics of users of an online service for STI self-sampling with clinic service users: a cross-sectional analysis. *Sex Transm Infect* 2018;94:377–83.
- Iacobucci G, Torjesen I. Cuts to sexual health services are putting patients at risk, says King's Fund. *BMJ* 2017;356:j1328.
- Leichliter JS, Heyer K, Peterman TA, *et al*. US public sexually transmitted disease clinical services in an era of declining public health funding: 2013–14. *Sex Transm Dis* 2017;44:505–9.
- King C, Hughes G, Furegato M, *et al*. Predicting STI diagnoses amongst MSM and young people attending sexual health clinics in England: triage algorithm development and validation using routine clinical data. *EClinicalMedicine* 2018;4-5:43–51.
- Scott Lamontagne D, Baster K, Emmett L, *et al*. Incidence and reinfection rates of genital chlamydial infection among women aged 16–24 years attending general practice, family planning and genitourinary medicine clinics in England: a prospective cohort study by the Chlamydia Recall Study Advisory Group. *Sex Transm Infect* 2007;83:292–303.
- Clifton S, Mercer CH, Woodhall SC, *et al*. Patterns of chlamydia testing in different settings and implications for wider STI diagnosis and care: a probability sample survey of the British population. *Sex Transm Infect* 2017;93:sextrans-2016-052719.
- Peduzzi P, Concato J, Kemper E, *et al*. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol* 1996;49:1373–9.
- Malhotra RK, Indrayan A. A simple nomogram for sample size for estimating sensitivity and specificity of medical tests. *Indian J Ophthalmol* 2010;58:519–22.
- StataCorp. *Stata statistical software: release 13*. College Station, TX, USA: StataCorp LP, 2013.
- Mittal M, Senn TE, Carey MP. Intimate partner violence and condom use among women: does the information–motivation–behavioral skills model explain sexual risk behavior? *AIDS Behav* 2012;16:1011–9.
- Barrett G, Smith SC, Wellings K. Conceptualisation, development, and evaluation of a measure of unplanned pregnancy. *J Epidemiol Community Health* 2004;58:426–33.
- Moreau C, Hall K, Trussell J, *et al*. Effect of prospectively measured pregnancy intentions on the consistency of contraceptive use among young women in Michigan. *Hum Reprod* 2013;28:642–50.
- Edelman N, Mercer CH, Cassell J, *et al*. Differences between women attending specialist sexual health clinics and those attending general practices: implications for targeting STI testing (P3.163). *Sex Transm Infect* 2017;93:A154.
- Faculty of Sexual & Reproductive Healthcare. *Clinical Guidance: Progesterone-only implants*. London, UK: Faculty of Sexual & Reproductive Healthcare, 2014.
- Wand H, Guy R, Donovan B, *et al*. Developing and validating a risk scoring tool for chlamydia infection among sexual health clinic attendees in Australia: a simple algorithm to identify those at high risk of chlamydia infection. *BMJ Open* 2011;1:e000005.
- Facente SN, Pilcher CD, Hartogensis WE, *et al*. Performance of risk-based criteria for targeting acute HIV screening in San Francisco. *PLoS One* 2011;6:e21813.
- Duke NN, Sieving RE, Pettingell SL, *et al*. Associations between health screening questions and sexual risk behaviors in adolescent female clinic patients: identifying a brief question format to yield critical information. *Clin Pediatr* 2008;47:564–72.