Supplementary File 6 – Characteristics of included studies (summary and details)

Table S6.1 – Characteristics of all included studies (n=22) - summary by income group

Characteristics	Total N (%)	HIC N (%)	LMIC N (%)
Total	22 (100)	12 (100)	10 (100)
Publication dates			
< 2010	1 (5)	1 (8)	0 (0)
2010-2014	6 (27)	5 (42)	1 (10)
2015-02/2020	15 (68)	6 (50)	9 (90)
Study design			
Parallel-group RCT	19 (86)	11 (92)	8 (80)
Cluster RCT	3 (14)	1 (8)	2 (20)
Study type^			
Pilot RCT	7 (32)	5 (42)	2 (20)
Efficacy/ effectiveness RCT	14 (64)	6 (50)	8 (80)
No. of trial arms			
2 arms	19 (86)	11 (92)	8 (80)
>2 arms	3 (14)	1 (8)	2 (20)
World region			
Africa	7 (32)	0 (0)	7 (70)
Americas	6 (27)	6 (50)	0 (0)
South-East Asia	1 (5)	0 (0)	1 (10)
Europe	3 (14)	3 (25)	0 (0)
Eastern-Mediterranean	0 (0)	0 (0)	0 (0)
Western Pacific	5 (23)	3 (25)	2 (20)
Target population			
General population	12 (55)	8 (67)	4 (40)
Key population and other specific populations	10 (45)	4 (33)	6 (60)
Study size (n)			
≤ 300	10 (45)	8 (67)	2 (20)
301-1000	6 (27)	3 (25)	3 (30)
1001-5000	5 (23)	0 (0)	5 (50)
> 5000	1 (5)	1 (8)	0 (0)
Population age~			
Adolescents/youth#	8 (36)	7 (58)	1 (10)
Adolescents/youth & adults	5 (23)	3 (25)	2 (20)
Adults	8 (36)	2 (17)	6 (60)
Not specified	1 (5)	0 (0)	1 (10)
Type of sexually transmitted infection:			
Curable STIs	7 (32)	6 (50)	1 (10)
HIV	11 (50)	3 (25)	8 (80)
Both/ not specified	4 (18)	3 (25)	1 (10)
Behavioural theory use			
Yes	13 (59)	9 (75)	4 (40)
No/ Not reported	9 (41)	3 (25)	6 (60)

User involvement during intervention development			
Yes	12 (55)	7 (58)	5 (50)
No/ not reported	10 (45)	5 (42)	5 (50)
Intervention aim/behaviour targeted ~			
Diagnosis-related behaviour only	7 (32)	1 (8)	6 (60)
Preventive behaviour only	6 (27)	4 (33)	2 (20)
Preventive and diagnosis-related behaviour	7 (32)	5 (42)	2 (20)
Preventive, diagnosis-, and treatment-related behaviour	2 (9)	2 (17)	0 (0)
Intervention purpose * ‖			
Inform/Educate	17 (77)	11 (92)	6 (60)
Remind/Recall	22 (100)	12 (100)	10 (100)
Teach skills	8 (36)	5 (42)	3 (30)
Provide support	8 (36)	6 (50)	2 (20)
Facilitate decision making	3 (14)	2 (17)	1 (10)
Duration of intervention receipt			
< 1 week	1 (5)	1 (8)	0 (0)
1 -4 weeks	4 (18)	0 (0)	4 (40)
1- 6 months	14 (64)	9 (75)	5 (50)
> 6 months	3 (14)	2 (17)	1 (10)
Message direction*			
Unidirectional only	13 (59)	5 (42)	8 (80)
Unidirectional and bidirectional	11 (50)	8 (67)	3 (30)
Tailored? ##			
Yes	8 (36)	5 (42)	3 (30)
No/ not reported	14 (64)	6 (50)	8 (80)
Main intervention mode			
SMS/text messages ~~	16 (73)	9 (75)	7 (70)
SMS/text messages blended with face-to-face sessions	2 (9)	1 (8)	1 (10)
Other interventions with 'push' component	4 (18)	2 (17)	2 (20)
Type of inactive comparison~			
No intervention	4 (18)	3 (25)	1 (10)
Standard of care **	9 (41)	3 (25)	6 (60)
Placebo intervention ^^	5 (23)	4 (33)	1 (10)
Waiting list control	1 (5)	0 (0)	1 (10)
Timing of intervention(s)/assessment(s)*			
One-time intervention, immediately followed by assessment	2 (9)	1 (8)	1 (10)
Repeated/continuous intervention, immediately followed by assessment	18 (82)	10 (83)	8 (80)
Repeated/continuous intervention followed by (potential) wash-out period prior to assessment	5 (23)	4 (33)	1 (10)
Other/not applicable/ unclear	4 (18)	1 (8)	3 (30)
Length of follow-up ~			
Short/moderate term (<12 months)	18 (82)	10 (83)	8 (80)
Long-term (≥12 months)	4 (18)	2 (17)	2 (20)
Type of primary and secondary review outcomes assessed*			
HIV/STI occurrence (objectively confirmed)	2 (9)	2 (17)	0 (0)
Adverse events (actively assessed)	1 (5)	1 (8)	0 (0)

HIV/STI occurrence (self-reported)	1 (5)	1 (8)	0 (0)
Condom use	15 (68)	10 (83)	5 (50)
STI/HIV (self-)testing	14 (64)	7 (58)	7 (70)
Compliance with treatment instructions	2 (9)	2 (17)	0 (0)
Partner notification	3 (14)	2 (17)	1 (10)
Cognitive outcomes	7 (32)	4 (33)	3 (30)
Costs	4 (18)	1 (8)	3 (30)

Footnote:
World regions defined according to WHO[1]; HIC= High income country, LMIC= low-and-middle income countries (defined according to The World Bank Group 2020[2])
MSM=Men having sex with men
* multiple selection possible, therefore figures do not add up to 100%
| Key populations and other specific target populations, including men having sex with men, female sex workers, people who inject drugs and truck drivers
~ groups/definitions as pre-specified in protocol
# We consider the trial to report on adolescents/youth if at least 70% of randomized persons (for whom results are reported separately) fall within the age range of 10-24 years
(WHO definition of adolescents: 10-19 years; UN definition of youth: 15-24 years[3])
^ RCT, randomized controlled trials, as defined in the Cochrane handbook (excluding quasi-randomized controlled trials)[4]; we define a study as 'pilot'-RCT, if the study is clearly identified as such in the article/report itself or cited as such in another relevant source, e.g. later publication by same research team; if not identified as pilot study, we have classified the study as efficacy/effectiveness study
~~ Two trials included SMS interventions as *main* mode, plus other components at lower dose or under certain circumstances, e.g. emails or phone calls in case of non-response
Defined as in TIDieR checklist[5] (Tailoring:## "If the intervention was planned to be personalised, titrated or adapted")
|| Defined as in Kaufman 2017[6]; listed are those classified 'yes' versus 'no/not reported/ unclear'
** Standard of care as defined in protocol, i.e. usual care given to participants in the given setting at the time an eligible study was done) - two trials already included an active SMS component with sexual health related content at lower dose
^^ placebos as defined in protocol, to determine the effect of the sexual health component of the intervention, such as text messages with sexual health content versus text messages with content that is not directly related to sexual health (e.g. sun safety or malaria prevention)

Table S6.2 – Characteristics of all included studies (n=22) - details by study

de Tolly (2012)[7]

Aim*	The aim of this study was to investigate the effectiveness of using SMSs to facilitate uptake of HCT in South Africa, and study the impact of using two forms of SMS content and varying the dosage levels (the number of SMSs) on the efficacy of the SMS-based intervention.	
Methods	*Design (study name):*	Five-arm parallel-group RCT
	Trial dates/ duration:	Not reported
	Trial registration:	Not reported
Setting	*Country:*	South Africa
	Location:	Not specified
	Recruitment setting:	Recruited from mobile phone database to increase facility-based testing
Participants	*Participants:*	People listed in mobile phone database, South Africa (N=2553)
	Inclusion criteria:	People from a mobile database who have not been tested for HIV in the last year
	Exclusion criteria:	n/a
	Age:	Not reported
	Sex:	Not reported
	Sexuality:	Not reported
	Ethnicity:	Not reported
Intervention	*Summary:*	Four SMS intervention arms (3 or 10 motivational vs 3 or 10 informational SMSs) vs no intervention
	Theory/ techniques:	Information-motivation-behavioral skills model of AIDS risk reduction[8]; The theory used hypothesizes that behavioral skills, information (knowledge), and motivation (attitudes and beliefs) are critical in influencing behavioral changes.
	User involvement? [/] (Other?)	No/not reported (A brief literature search of published barriers to uptake of HCT was incorporated in the drafting of the SMSs.)
	Targeted behaviour:	Diagnosis-related (HIV testing)
	Intervention purpose:[//]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	Informational-style SMS, e.g.: "In SA 1,400 people get HIV every day. Test for HIV so you know if you're one (so then u can look after yourself) or if you're negative make sure u stay that way."; Motivational-style SMS, e.g.: "If you test and you're HIV + you can go on free drugs when you need to. HIV is no longer a death sentence. You can live a long, normal life with HIV. Plz test!" (only few example SMS given in table 1 of article)
	Procedures/ MOD:	The SMSs were sent using Mobilisr, a Web-based system that allows for prescheduling and sending of SMSs in bulk.
	Timing/ frequency:	The messages were sent 3 days apart; hence, the groups that got three SMSs received them over 9 days. A week after completion of each SMS intervention, an SMS reminding the recipient to go for HCT was sent.
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS sent to participants, who were not required to respond (only for assessment participants were asked to send 'please-call me'/PCM text to one of two lines to indicate if they had gone for HCT).
	Other components & co-interventions:	No/ not reported (All participants who responded with PCMs were compensated with R10 (approximately $1.40) worth of airtime)
	Tailoring:[##]	No/ not reported
	Adaptation/ Fidelity:	No information provided
	Comparator:	The control group did not receive any intervention SMSs

	Other groups~ :	n/a
Outcomes^	*Outcomes^*	[HIV testing, Costs (1m3w)] #
Other	*Funding:*	Right To Care, cooperative agreement CA 674A 0008 0000 700.
	Conflict of interest:	None declared

Delamere (2006)[9]

Aim*	In response to an increasing number of adolescents presenting with STIs it was decided to look at an innovative intervention to try and improve condom usage.	
Methods	*Design (study name):*	Two-arm parallel-group RCT
	Trial dates/ duration:	Not reported
	Trial registration:	Not reported
Setting	*Country:*	Ireland
	Location:	Dublin
	Recruitment setting:	Young persons clinic
Participants	*Participants:*	Young persons clinic clients, Ireland (N=60)
	Inclusion criteria:	People attending young persons clinic, aged 17 and 18 years
	Exclusion criteria:	n/a
	Age:	17 and 18 years old
	Sex:	Not reported
	Sexuality:	Not reported
	Ethnicity:	Not reported
Intervention	*Summary:*	SMS intervention vs no intervention
	Theory/ techniques:	Not reported
	User involvement?[/] (Other?)	No/ not reported (SMS 'were made up by the author')
	Targeted behaviour:	Preventive (condom use)
	Intervention purpose:[//]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	Weekly text messages for three months; 'The text messages, for example ''avoid infection, use protection. Use a condom'', were made up by the authors and a different message was sent out each week.' (only one example SMS given)
	Procedures/ MOD:	Thirty participants received weekly text messages for 3 months
	Timing/ frequency:	Weekly text messages for 3 months
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	No details provided, but probably unidirectional SMS only
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	No information provided
	Comparator:	No intervention
	Other groups:	n/a
Outcomes^		Condom use (3m)
Other	*Funding:*	Not reported
	Conflict of interest:	Not reported

Downing (2013)[10]

Aim*	To assess the effectiveness of using SMS reminders with and without a financial incentive to increase re-testing rates in clients diagnosed with chlamydia	
Methods	*Design (study name):*	Three-arm parallel-group RCT
	Trial dates/ duration:	Jan/10-Mar/11
	Trial registration:	Not reported
Setting	*Country:*	Australia
	Location:	Not specified
	Recruitment setting:	Cairns Sexual Health Service (CSHS)
Participants	*Participants:*	SH service clients, Australia (N=94)
	Inclusion criteria:	Clients attending the CSHS for treatment of chlamydia or who presented with genital symptoms or who were a contact of someone diagnosed with chlamydia and who were aged at least 16 years, and were residing in Cairns for the next 6 months, had access to a mobile telephone
	Exclusion criteria:	HIV-positive clients were excluded as their regular HIV clinic appointments could influence re-testing patterns.
	Age:	16 to 24 years: 62.8%, ≥ 25 years: 37.2%
	Sex:	51.5% female
	Sexuality:	Not reported
	Ethnicity:	28.7% ATSI [Aboriginal and/or Torres Strait Islander]
Intervention	*Summary:*	SMS reminder at 10-12 weeks vs SOC
	Theory/ techniques:	Not reported
	User involvement? [I] (Other?)	No/ not reported
	Targeted behaviour:	Diagnosis-related (chlamydia re-testing)
	Intervention purpose:[II]	Remind/recall
	Intervention content: (reported examples/ complete content?)	SOC plus one SMS reminder ["A clinic mobile telephone was set up with the SMS reminder templates '3 mths r up, drop in 4 a checkup or call 40506205 for an appointment' and '3 mths r up, drop in 4 a check-up or call 40506205 for an appt & get $10'. SMS reminders were manually sent on Mondays, or Tuesdays if Monday was a public holiday"] (Complete content provided – one reminder message only)
	Procedures/ MOD:	A clinic mobile telephone was set up with the SMS reminder templates and SMS reminders were manually sent on Mondays, or Tuesdays if Monday was a public holiday.
	Timing/ frequency:	One text message sent at 10-12 weeks post-treatment
	Intervention provider:	Researchers organised for messages to be sent manually
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS sent to participants, who were not required to respond, but encouraged to return to clinic for re-testing (phone the clinic to make appointment or drop in for 'walk-in appointment')
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	SMS undelivered for n=7 of 32 participants in the intervention group
	Comparator:	SOC; standard advice from clinician to return for re-testing in 3-4 months
	Other groups:	Group 3 received the standard advice and the SMS reminder, which also offered an incentive payment of 10$ on clinic attendance.
Outcomes^		STI testing (3-4m)
Other	*Funding:*	The Queensland Nursing Council
	Conflict of interest:	None declared
Free (2016)[11] [Linked reports: McCarthy 2016[12]; Free 2017[13]]		

Aim*	To assess the acceptability and feasibility of a randomised controlled trial of a safer sex intervention delivered by text message for young people aged 16–24 years.	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT (Safetxt)
	Trial dates/ duration:	Sep/13-Nov/13 (randomization); Oct/13-Feb/15 (FU period, 12 months)
	Trial registration:	Current Controlled Trials ISRCTN02304709
Setting	*Country:*	United Kingdom
	Location:	London, Cambridgeshire (rural &urban), Manchester, East Anglia, Kent, Hull
	Recruitment setting:	Sexual health services in six geographical locations in the UK: London, Cambridgeshire (rural and urban), Manchester, East Anglia, Kent and Hull
Participants	*Participants:*	Young people attending SH services, UK (N=200)
	Inclusion criteria:	People aged 16–24 years with a positive chlamydia test result or who had had unsafe sex in the last year (defined as >1 partner and at least one occasion of sex without a condom) and who owned a mobile phone
	Exclusion criteria:	Non-English-language speakers or unable to provide informed consent (e.g. people with severe learning difficulties)
	Age:	16- 24 years; Mean (SD)- Intervention: 20.39 (2.42), Control: 20.60 (2.39)
	Sex:	Intervention.: 70.71% female; Control: 69.31% female
	Sexuality:	Intervention: 88.89% heterosexual, 3.03% gay/lesbian, 5.05% bisexual; Control: 82.18% heterosexual, 4.95% gay/lesbian, 9.90% bisexual
	Ethnicity:	Interv.: 59.60% white, 21.21% black; Contr.: 54.46% white, 31.68% black
Intervention	*Summary:*	SMS messages over 12 months vs monthly SMS checking contact details
	Theory/ techniques:	The intervention was informed by the capability, opportunity and motivation model of behaviour (COM-B)[14]; Use of 12 behaviour change techniques, including problem-solving, action planning, social support (emotional), instruction on how to perform behaviour, information about health consequences, anticipated regret, demonstrating behaviour, social reward, non-specific incentive, and adding objects to the environment; (plus further techniques as listed in table 6 of the main article)
	User involvement? [I] (Other?)	Yes, intervention content (pre-)tested and adapted by involving users via focus group discussion, telephone interviews and survey. (Intervention development also informed by systematic review of literature, involvement of sexual health counsellor and experts in sexual and reproductive health service delivery)
	Targeted behaviour:	Preventive (condom use, STI testing prior to sex with new partner), diagnosis-related (STI testing, PN) and treatment-related (adherence to treatment instructions)
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (e.g. instructing/demonstrating how to use condoms or examples how to notify partner about STI or negotiate condom use), provide support, facilitate decision-making
	Intervention content: (reported examples/ complete content?)	Messages were designed to reduce STI in young people by supporting them in using condoms, telling a partner about an infection and testing before unprotected sex with a new partner. The message content included the following topics/ target behaviours: Engagement with the trial, telling partner about an infection, linking with services (partner notification, concerns about violence and pregnancy), engage with intervention, condom use, contraception, testing for STI, communication about sex. (Table 6 provides summary of no. of messages targeting each behaviour, employing each intervention function and behaviour change technique; Appendix 3 includes list of 19 sample SMS that users had been asked to rate for relevance)
	Procedures/ MOD:	The bespoke texting software delivered the intervention messages automatically, directly to the mobile phone number given by each participant at enrolment.

	Timing/ frequency:	"For men and women testing positive for chlamydia the intervention included four messages per day for the first 3 days, reducing to one to two messages per day for the first 2 weeks. The number of messages was then reduced to one per day for the first month followed by between one and nine per month until 12 months. For men and women who tested negative for chlamydia the intervention included one to two messages per day for 1 month and then one to three messages per week for up to 12 months."
	Intervention provider:	Researchers organised for messages to be automatically sent
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, who were not required to respond, but sometimes had option to text a number back to obtain additional information; some SMS also had links to websites and services
	Other components & co-interventions:	No/ not reported (STI test kits sent to all participants as part of assessment)
	Tailoring:##	The messages were tailored according to sex and infection status at enrolment. Additional tailoring enabled participants to choose a daily time period when they did not want the messages delivered ('embargoed time'). Some messages contained web links or gave participants, who were particularly interested in the specific topic, the option to text a number back to hear more, e.g. "'I just couldn't tell some partners so the clinic offered to do it for me. They gave me the option of keeping my name out of it'. Text 7 to hear more."
	Adaptation/ Fidelity:	"We fully recruited within 3 months and 97% of messages were successfully delivered"; "Of the 99 participants receiving the intervention, 15 participants (15%) requested that the messages stop; two of these also withdrew from the study (both stopped the messages 1 day after enrolment)."
	Comparator:	The control messages contained no information regarding sexual health. The messages were intended to help keep participants engaged in the study and to remind them of their participation, for example 'Young people can experience health inequalities. Taking part in the texting study can help things to be equal. Thanks for taking part'. The messages expressed our appreciation of their involvement in the study and suggested that participation in research can be personally beneficial: 'Taking part in the texting study is a way to help you be actively involved in things that affect your life. Thank you for taking part'
	Other groups:	n/a
Outcomes^		STI occurrence (3, 12m), AE (12m), Condom use, STI testing (1, 12m), treatment compliance, PN (1m)
Other	*Funding:*	National Institute for Health Research (NIHR) Health Technology Assessment programme
	Conflict of interest:	None declared

Gold (2011)[15]

Aim*	To both pilot the use of mobile advertising as a means to reach individuals for health promotion and to evaluate the effectiveness of SMS to increase knowledge and promote beneficial behaviour change related to safer sex and sun safety among young people.	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT (S5 project, SMS for safer sex and sun safety)
	Trial dates/ duration:	Dec/08 (baseline)-May/09(FU survey), 6 months
	Trial registration:	Not reported
Setting	*Country:*	Australia
	Location:	State of Victoria (> 80% from Metropolitan Melbourne, < 20% Regional Victoria)
	Recruitment setting:	People subscribed to a mobile advertising service offered by one of the largest mobile telecommunications providers
Participants	*Participants:*	Mobile advertising service subscribers, Australia (N=7606)
	Inclusion criteria:	Females and males aged 16-29 years residing in the state of Victoria who subscribed to a mobile advertising service
	Exclusion criteria:	n/a
	Age:	16-29 years; (Intervention: 53.2% 25-29 years; Contr.: 58% 25-29 years; note: only 8.2% completed baseline survey)
	Sex:	Intervention: 39.2% female; control: 40.5% female (note: only 8.2% completed baseline survey)
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	Safer sex SMS intervention vs sun safety SMS placebo control
	Theory/ techniques:	Weinstein's Precaution Adoption Process model[16] and incorporated elements from Ajzen's Theory of Planned Behaviour[17] and Bandura's concept of self-efficacy[18]
	User involvement? | (Other?)	Yes, user involvement for testing of SMS and focus group discussions (but two multi-media messages developed/designed by authors and telecommunications provider's technicians without user involvement; SMS developed based on factors shown to increase acceptability/ impact in an earlier study by the authors that used SMS for sexual health promotion)
	Targeted behaviour:	Preventive (condom use) and diagnosis-related (STI testing)
	Intervention purpose:[11]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	The messages aimed to increase sexual health knowledge, reinforce protective behaviours, change attitudes and increase perceived behavioural control. To maximise appeal, messages were humorous, short, used informal language and were linked to particular annual events (such as Valentine's Day) where possible, e.g. on 1st Jan 2009: "Make a resolution! Get a test when changing partners. Chlamydia can cause infertility." and on Valentines day: "Roses are red, daises are white, use a condom if you get lucky tonight. Happy Valentines Day!" (Table I seems to include all content/ all messages and broadcast dates)
	Procedures/ MOD:	Messages were designed to be sent out approximately fortnightly over the summer period, to maximise relevance to the sun safety group. (Message broadcast schedule displayed in Table I of the article.) Messages included an 'opt out' message (supplied by the telecommunications provider) informing subscribers how they could cease receiving mobile advertising messages. Messages were broadcast in the afternoon on the same day and time to each group (with the exception of the broadcast of the first safer sex message, which was delayed by the telecommunications provider). During the intervention period, subscribers may have been receiving

		advertising messages from other advertisers, in addition to our intervention messages."
	Timing/ frequency:	SMS sent about approximately fortnightly over the summer period (afternoon), plus 8 scheduled messages as listed in table III of the article
	Intervention provider:	Researchers organised for messages to be automatically sent
	'Push' component (unidirectional/ bidirectional?):	SMS (and 2 multi-media messages) sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported (During the intervention period, subscribers may also have been receiving advertising messages from other advertisers)
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	"some of the safer sex messages were censored by the provider [...] we were unable to fully implement our brief intervention as intended due to restrictions imposed by the telecommunications company and technical difficulties. This may have altered intervention effectiveness" (p.791); "The original message intended for these dates were not broadcast; these messages include changes insisted on by the telecommunications provider." (footnote, table I)
	Comparator:	Placebo control (Sun safety SMS intervention)
	Other groups:	n/a (but participants might have received other advertisements as subscribers with the telecommunication company)
Outcomes^		Condom use, STI testing, SH knowledge (5-6m)
Other	*Funding:*	VicHealth Discovery Grant (grant number 2008-0099) and in-kind support from the telecommunications provider.
	Conflict of interest:	None declared

Govender (2019)[19]

Aim*	To test the effectiveness of a SMS intervention in reducing HIV risk behaviours and improving HIV testing behaviours among truck drivers, sex workers and community residents located near Roadside Wellness Clinics (RWCs) in three southern African countries. (There is a paucity of literature on the impact of SMS interventions in key populations and populations located in difficult-to-reach' and high HIV risk settings in sub-Saharan Africa.)	
Methods	*Design (study name):*	Two-arm parallel-group RCT
	Trial dates/ duration:	Jul/16-Mar/18, 6 months (FU period), trial duration approx. 25 months
	Trial registration:	Not reported
Setting	*Country:*	South Africa, Zimbabwe, and Mozambiqu
	Location:	Forbes/Mutare (Zimbabwe), Inchope, (Mozambique) and Bloemfontein (South Africa)
	Recruitment setting:	Catchment area (5 km radius) of three Roadside Wellness Clinics (RWCs) located along major trucking routes. The RWs are run by the North Star Alliance (NSA), an organisation providing health services to mobile populations located in remote areas across Africa.
Participants	*Participants:*	Transient/resident populations near roadside clinics, South Africa, Zimbabwe, Mozambique (N=1783)
	Inclusion criteria:	(1) > 18 years old, (2) self-identification as long distance truck driver including driver's assistant or a sex worker, or a community resident, (3) had to have one cell phone that is solely their phone, (4) expected to utilise the truck stop within 4–8 months after the baseline study, so that a follow-up interview could be conducted, (5) speak English or Portuguese, (6) able to read and sign a consent form, (7) able to receive a payment fee in the form of an air time voucher
	Exclusion criteria:	n/a
	Age:	≥ 18 years old [10.7% = 18–24 years; 37.6% = 25–35 years; 40.8% = 36–49 years; 10.9% = 50–69 years]
	Sex:	76.7% male (intervention: 78.5% male, control: 74.7% male)
	Sexuality:	Not reported
	Ethnicity:	Not reported
Intervention	*Summary:*	SMS intervention vs SOC
	Theory/ techniques:	Not reported
	User involvement? | (Other?)	Yes, acceptability of SMS content was tested through two focus groups among study populations at each site.
	Targeted behaviour:	Preventive (condom use, HIV testing if partner with unknown status, reducing number of partners) and diagnosis-related (STI and HIV testing)
	Intervention purpose:[11]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	The SMS content was short and focused on promoting consistent condom use, reducing the number of sex partners and advocating for regular HIV testing, e.g. "Be respectful and responsible. Talk with your partner about condoms.", "Get FREE condoms at your nearest clinic or public hospital", "Always have condoms on you.", "Remember: No Condoms No Sex!", "Are you scared to test for HIV? Speak confidentially to a counsellor at your nearest clinic.", "HIV and STIs can be treated and managed - Get tested as soon as possible.", "Do you know your partner's HIV status? Get tested together at a clinic near you.", "Unsafe sex with multiple partners increases your chance of contracting HIV. Always use condoms.", "Don't be reckless with your health and future! Reduce the number of your sexual partners.", "Be aware! Alcohol and drug use can lead to risky sex", "Please remember to attend your follow-up clinic visit." (Online appendix 1 includes content of all 35 SMS sent)

	Procedures/ MOD:	One-way messages were sent out daily in the first week following recruitment and once weekly thereafter. The intervention consisted of 35 messages over a 29-week period (approximately 6 months)
	Timing/ frequency:	Daily SMS during first week, then weekly; total of 35 SMS over 29 weeks
	Intervention provider:	Researchers organised for messages to be automatically sent
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	More than two-thirds (68%) of all the messages sent out were successfully delivered to the respondent's handset. Nearly a quarter (24%) of all the messages sent out expired before reaching the respondent's handset. This is caused by the handset being off or the handset being out of network reach. A small proportion (6%) of all the messages sent out remained undelivered. This is caused by the handset or subscriber identification module card being inactive. Two percent of participants had the wrong number recorded. Only one attempt was made by the service provider to deliver the message over a 48-h period. If the message was not delivered within this period, the SMS expired. According to the network operating companies, the mean number of messages received by the participants in the SMS arm was 17.9 (SD 10.1) and the median was 16.
	Comparator:	SOC; Participants randomised to the control arm received basic HIV prevention information, verbally from the recruiters, (read from an information sheet) indicating importance of regular HIV testing and practicing safe sex.
	Other groups:	n/a
Outcomes^		Condom use, HIV testing, self- efficacy, knowledge, & risk perception (6m)
Other	*Funding:*	SADC HIV and AIDS Special Fund Round 111.
	Conflict of interest:	None declared

Kelvin (2019a)[20] [linked report: George 2018[21]]

Aim*	To assess whether alerting truckers via text message about the availability of HIV self-testing at clinics located at major transit hubs in Kenya would increase HIV testing rates.	
Methods	*Design (study name):*	Three-arm parallel-group RCT
	Trial dates/ duration:	Dec/16-Feb/17, 2 months
	Trial registration:	https://clinicaltrials.gov/ct2/show/NCT03662165
Setting	*Country:*	Kenya
	Location:	Burnt Forest, Emali, Jomvu, Maai Mahiu, Mlolongo, Mombasa, Namanga, Salagaa
	Recruitment setting:	Eight road side wellness clinics in Kenya run by the North Star Alliance (NSA, an organization providing primary and secondary health services to hard-to-reach populations across Africa). Information on clinic clients stored in electronic health record system (EHRS).
Participants	*Participants:*	Male truckers registered in EHRS, Kenya (N=2262)
	Inclusion criteria:	(a) no indication of being HIV-positive, (b) Kenya resident, (c) valid mobile phone number listed, (d) had fewer than four HIV tests in the past year (suggesting that they were not testing every three months as recommended for those at high risk [16]), (e) no indication of an HIV test in the past three months, (f) had not participated in our previous study on self-administered HIV testing [3, 9, 17], (g) were male, and (h) worked as truckers, including drivers and assistants (turn boys).
	Exclusion criteria:	n/a
	Age:	All three groups [years]: Mean 35.3 (SD 9.7), Median 34.0 (range 18.0-76.0) Enhanced SOC group: Mean 35.5 (SD 8.6), Median 34.5 (range 18.0-76.0) SOC group: Mean 35.2 (SD 8.5), Median 34.0 (range 18.0-68.0)
	Sex:	100% male
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	Enhanced SOC (3 SMS reminders) vs SOC (1 SMS reminder)
	Theory/ techniques:	No/ not reported
	User involvement? | (Other?)	No/ not reported
	Targeted behaviour:	Diagnosis-related (HIV testing)
	Intervention purpose:‖	Remind/recall
	Intervention content: (reported examples/ complete content?)	Enhanced SOC, in which the SOC text "North Star Alliance East Africa would wish to kindly remind you to visit any of our roadside wellness centers for HIV testing. Your health, our priority" was sent three times, alternating in English or Kiswahili. (Complete content/ one reminder message only)
	Procedures/ MOD:	After randomization, participants in the Enhanced SOC group were sent the SOC text message (reminding them to get tested for HIV) three times, alternating in English or Kiswahili. Participants were offered the standard HIV test when seeking clinic services and the electronic health records system (EHRS) was updated accordingly.
	Timing/ frequency:	Same reminder message sent three times, alternating in English and Kiswahili
	Intervention provider:	Researchers organised for messages to be sent; clinic staff performed standard HIV testing.
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported

	Adaptation/ Fidelity:	No details provided, apart from: "all models were based on intent-to-treat; even if someone did not receive the text messages we sent, they were included in the arm to which they were randomized."
	Comparator:	SOC in which the SOC text "North Star Alliance East Africa would wish to kindly remind you to visit any of our roadside wellness centers for HIV testing. Your health, our priority" was sent one time in both Kiswahili and English concurrently
	Other groups:	Intervention group - 3 SMS telling participants about the availability of oral HIV self-test kits at all eight roadside wellness centers
Outcomes^		HIV testing, SMS costs (2m)
Other	*Funding:*	International Initiative for Impact Evaluation (3IE # TW2.2.06 supplement; Elizabeth Kelvin was also supported by the Einstein-Rockefeller-CUNY Center for AIDS Research [P30-AI124414] which is supported by the following National Institutes of Health (NIH) Co-Funding and Participating Institutes and Centers: NIAID, NCI, NICHD, NHBL, NIDA, NIMH, NIA, FIC and OAR. Support for Joanne Mantell also came from a center grant from the National Institute of Mental Health (NIMH) to the HIV Center for Clinical and Behavioral Studies at the New York State Psychiatric Institute and Columbia University [P30 MH43520, PI: Robert H. Remien.]
	Conflict of interest:	None declared

Kelvin (2019b)[22] [linked report: George 2018[21]]

Aim*	To assess whether informing female sex workers about the availability of HIV self-testing at clinics in Kenya using text messages would increase HIV testing rates	
Methods	*Design (study name):*	Three-arm parallel-group RCT
	Trial dates/ duration:	Mar/17-May/17, 2 months
	Trial registration:	https://ridie.3ieimpact.org/index.php?r=search/detailView&id=492
Setting	*Country:*	Kenya
	Location:	Burnt Forest, Emali, Jomvu, Maai Mahiu, Mlolongo, Mombasa, Namanga, Salagaa
	Recruitment setting:	Eight road side wellness clinics in Kenya run by the North Star Alliance (NSA, an organization providing primary and secondary health services to hard-to-reach populations across Africa). Information on clinic clients stored in electronic health record system (EHRS).
Participants	*Participants:*	FSW registered in EHRS, Kenya (N=2196)
	Inclusion criteria:	Female sex workers registered in the North Star Alliance electronic health record system who: (1) had no indication that they were HIV-positive, (2) resided in Kenya, (3) had a valid mobile phone number listed, (4) had fewer than four HIV tests recorded in the system in the past 12 months (indicating that they were not following the recommendation to test every 3 months for four tests per year [11]), and (5) had not had an HIV test in the past 3 months.
	Exclusion criteria:	n/a
	Age:	All three groups [years]: Mean 28.6 (SD 5.9), Median 28.0 (range 18.0-61.0) Enhanced SOC group: Mean 28.7 (SD 6.0), Median 28.0 (range 18.0-52.0) SOC group: Mean 28.6 (SD 5.9), Median 28.0 (range 18.0-53.0)
	Sex:	100% female
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	Enhanced SOC (3 SMS reminders) vs SOC (1 SMS reminder)
	Theory/ techniques:	n/a

	*User involvement?	(Other?)*	No/ not reported
	Targeted behaviour:	Diagnosis-related (HIV testing)
	Intervention purpose:[11]	Remind/recall
	Intervention content: (reported examples/ complete content?)	Enhanced SOC, in which the SOC text "North Star Alliance East Africa would wish to kindly remind you to visit any of our roadside wellness centers for HIV testing. Your health, our priority" was sent three times, alternating in English or Kiswahili.
	Procedures/ MOD:	After randomization, participants in the Enhanced SOC group were sent the SOC text message (reminding them to get tested for HIV) three times, one week apart, alternating in English or Kiswahili. Participants were offered the standard HIV test when seeking clinic services and the electronic health records system (EHRS) was updated accordingly.
	Timing/ frequency:	Same reminder message sent three times, one week apart, alternating in English and Kiswahili
	Intervention provider:	Researchers organised for messages to be sent; clinic staff performed standard HIV testing.
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	No details provided.
	Comparator:	SOC in which the SOC text "North Star Alliance East Africa would wish to kindly remind you to visit any of our roadside wellness centers for HIV testing. Your health, our priority" was sent one time in both Kiswahili and English concurrently
	Other groups:	Intervention group - 3 SMS telling participants about the availability of oral HIV self-test kits at all eight roadside wellness centers
Outcomes^		HIV testing, SMS costs (2m)
Other	*Funding:*	International Initiative for Impact Evaluation (3IE # TW2.2.06 supplement; Elizabeth Kelvin was also supported by the Einstein-Rockefeller-CUNY Center for AIDS Research [P30-AI124414] which is supported by the following National Institutes of Health (NIH) Co-Funding and Participating Institutes and Centers: NIAID, NCI, NICHD, NHBL, NIDA, NIMH, NIA, FIC and OAR. Support for Joanne Mantell also came from a center grant from the National Institute of Mental Health (NIMH) to the HIV Center for Clinical and Behavioral Studies at the New York State Psychiatric Institute and Columbia University [P30 MH43520, PI: Robert H. Remien.]
	Conflict of interest:	None declared

Lim (2012)[23] [linked report: Lim 2007[24]]

Aim*	To determine the impact on young people of sending regular email and SMS on condom use, knowledge of STIs and STI testing behaviour.	
Methods	*Design (study name):*	Two-arm parallel-group RCT
	Trial dates/ duration:	Jan/06 (baseline) - Mar/07 (FU closure), 1 day of recruitment plus 12 m FU
	Trial registration:	Australian Clinical Trials Registry - ACTRN12605000760673 -
Setting	*Country:*	Australia
	Location:	Melbourne
	Recruitment setting:	A market stall within the festival grounds of Big Day Out musical festival
Participants	*Participants:*	Music festival attendees, Australia (N=994)
	Inclusion criteria:	People aged between 16 and 29, current residents of Victoria or Tasmania, sufficient English skills, having a working email address and mobile phone
	Exclusion criteria:	n/a
	Age:	age 16-19 yrs: 56%; age 20-29 yrs: 44%; median age 19
	Sex:	58% female
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	SMS and emails over 12 months vs no intervention
	Theory/ techniques:	Not reported
	User involvement? | (Other?)	Yes, SMS messages were tested in a focus group for understanding, relevance and amusement
	Targeted behaviour:	Preventive (condom use) and diagnosis-related (STI testing)
	Intervention purpose:[ll]	Inform/educate, Remind/recall
	Intervention content: (reported examples/ complete content?)	'The SMS were short and catchy pieces of advice or information about STI or safe sex for example, "Chlamydia: hard to spell, easy to catch. Use a condom". The emails were longer and contained two to five short paragraphs about a different safe sex or STI topic each month and links to other sexual health websites.' (Only one example SMS given)
	Procedures/ MOD:	The intervention group received regular email and SMS messages. Participants who completed all three follow-up questionnaires were given a CD voucher valued at approximately $A25.
	Timing/ frequency:	SMS messages were sent every 3-4 weeks (a total of 14 over 12 months), while emails were sent less than monthly (a total of eight over 12 months). Messages were sent at various times and on different days, with the SMS concentrated on Friday and Saturday evenings and the emails usually sent during weekday working hours.
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	Unidirectional SMS (and emails) sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported

	Adaptation/ Fidelity:	High numbers of non-responders to FU survey. "There was also no way to determine if email addresses and mobile phone numbers were active or belonged to the enrolled participant. Participants may have changed their mobile number or email address, or provided incorrect or illegible information at recruitment. It was not possible to determine whether the SMS we sent were received, but our software enabled us to determine that only 35-50% of each round of emails were opened. Possibly, many participants never received any contact from us but this could not be confirmed"
	Comparator:	No intervention
	Other groups:	n/a
Outcomes^		Condom use, STI testing, STI knowledge (6, 12m)
Other	*Funding:*	Australian Health Ministers Advisory Council Priority Driven Research Program, 2005.
	Conflict of interest:	None declared

Mimiaga (2017)[25]

Aim*	Overall research goal to develop and test a culturally relevant, theory-based HIV risk reduction intervention using mobile phone technology for male sex workers in Chennai, India. This pilot study aims to assess feasibility, acceptability and preliminary efficacy for reducing condomless anal sex (CAS) acts among participants.	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT
	Trial dates/ duration:	Not reported
	Trial registration:	Not reported
Setting	*Country:*	India
	Location:	Chennai
	Recruitment setting:	Recruitment by local NGO (info obtained from author); All study visits were conducted at the National Institute for Research on Tuberculosis (NIRT) in Chennai, India.
Participants	*Participants:*	MSM engaging in sex work, India (N=100)
	Inclusion criteria:	Inclusion criteria included being 18 years or older, identifying as male, and having engaged in anal sex (insertive or receptive) with another man in exchange (i.e., someone gave them) for money, goods, favors or gifts, as a way to generate income in the 3 months prior to screening.
	Exclusion criteria:	Individuals were excluded if they were unwilling to complete the written informed consent procedures, had participated in an HIV prevention intervention in the past year or identified as a hijra/transgender.
	Age:	≥18 years; mean age 27.7 (SD 9.1)
	Sex:	100% male
	Sexuality:	MSM; The Majority (overall 77.0%; Intervention: 82%, Control: 72%) identified as *kothi* ("often with a desire to be the penetrated member in sexual intercourse")
	Ethnicity:	Not reported
Intervention	*Summary:*	Blended in-person and SMS intervention vs SOC
	Theory/ techniques:	Guided by empowerment theory and using motivational interviewing techniques, the intervention was designed to facilitate personal strategies and problem-solving skills for sexual risk reduction[26 27]
	User involvement? / (Other?)	Yes, the intervention was informed by in-depth qualitative feedback from potential users and key informants; peer-community advisory board; tested in open pilot trial with exit interviews

	Targeted behaviour:	Preventive (condom use)
	Intervention purpose:[ll]	Inform/educate, Remind/recall, teach skills (how to use condoms and lubricants, negotiate condom use, and manage triggers of condomless sex), provide support, facilitate decision-making
	Intervention content: (reported examples/ complete content?)	In-person and mobile phone sessions used motivational interviewing techniques and discussed among other things how to use condoms and lubricants, problems with condoms, alternative sexual activities, communicating with clients about condoms and sexual limits; sessions also included review of HIV/STI transmission behaviours, 'triggers' of condomless anal sex, and practicing strategies to manage these triggers, and condom use negotiation skills; during first session participants could choose from a list of text messages/voice-messages intended to remind them about their personal goals for sexual safety and dispute maladaptive thoughts as potential barriers to HIV risk reduction. (No examples given)
	Procedures/ MOD:	In addition to standard of care, participants received 2 in-person sessions (in weeks 1 and 3, lasting 30-60min) and 2-4 mobile phone sessions (in weeks 2 and 4, lasting 15-20min) plus 2 'booster' mobile phone sessions (in weeks 8 and 12); During first in-person session, participants chose 7 text or voice-messages from a list of 16 to remind them of their personal goals; Daily messages were sent for a 12-week period (post-randomization) daily during a time previously reported as 'period of possible higher risk'.
	Timing/ frequency:	Two in-person sessions (in weeks 1 and 3, lasting 30-60min) and 2-4 mobile phone sessions (in weeks 2 and 4, lasting 15-20min) plus 2 'booster' mobile phone sessions (in weeks 8 and 12); Daily messages sent for a 12-week (post randomization) period.
	Intervention provider:	Trained, Masters-level (e.g., social work, psychology) counsellors conducted in-person and mobile phone sessions; Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	Tailored text messages and voice messages sent to participants, who were not required to respond (but linked to in-person components of the intervention)
	Other components & co-interventions:	In-person and mobile phone motivational interviewing sessions linked to text/voice messages, as mentioned above
	Tailoring:##	During first in-person session, participants chose 7 text or voice-messages from a list of 16 to remind them of their personal goals; Daily messages were sent during a time previously reported as 'period of possible higher risk'. Participants had the option of receiving Tamil-script text messages or pre-recorded voice messages in Tamil.
	Adaptation/ Fidelity:	48 instead of 50 participants received mobile phone sessions; all 50 received 1st in-person session, 48 received second in-person session.
	Comparator:	SOC HIV counselling and testing
	Other groups:	n/a
Outcomes^	*Outcomes^*	Condom use (3m)
Other	*Funding:*	Indo-U.S. Joint Working Group on Prevention of STD and HIV/AIDS through U.S. National Institute of Drug Abuse Grant #R21DA033720 (Matthew Mimiaga, PI) and Indian Council of Medical Research Grant #Indo-U.S/72/9/2010-ECDII (Beena Thomas, PI).
	Conflict of interest:	None declared

Mugo (2016a)[28] [linked report: Mugo 2016b[29]]

Aim*	To determine the effect of SMS, phone-call and in-person reminders on uptake of repeat HIV testing among outpatients evaluated for acute HIV infection (AHI) in Coastal Kenya	
Methods	*Design (study name):*	Two-arm parallel-group RCT
	Trial dates/ duration:	Apr/13 (randomization start)
	Trial registration:	ClinicalTrials.gov NCT01876199
Setting	*Country:*	Kenya
	Location:	Not specified
	Recruitment setting:	Five health facilities and five community pharmacies in Coastal Kenya
Participants	*Participants:*	Health facility/ pharmacy clients, Kenya (N=410)
	Inclusion criteria:	From protocol: Any adult patient aged 18-29 years, who scores 2 or higher at a 'Symptom Screening Tool & study eligibility score list' in annex. Patients should be a resident in Mtwapa or Shanzu, or planning to stay in Mtwapa for approximately 4 weeks duration, willing to give locator information (including mobile phone number) and willing to undergo free evaluation for acute HIV infection.
	Exclusion criteria:	n/a
	Age:	Mean age 23 years, [18-24 years: 66%, 25-29 years: 34%]
	Sex:	64% female
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	SMS and phone call (or in-person) reminders vs SOC appointment card
	Theory/ techniques:	Not reported
	User involvement? [I] (Other?)	No/ not reported
	Targeted behaviour:	Diagnosis-related (HIV re-testing)
	Intervention purpose:[II]	Remind/recall
	Intervention content: (reported examples/ complete content?)	Enhanced appointment: Apart from standard appointment, participants received a pre-appointment SMS the day before the scheduled appointment date plus missed-appointment reminders; The first SMS read: "Please remember to go for your clinic appointment tomorrow. Call this number if you need more information", and the second SMS read: "You missed your clinic appointment yesterday. Please report to the clinic as soon as possible." (Complete content, two reminder messages only)
	Procedures/ MOD:	Apart from standard appointment by clinician at baseline, participants received a pre-appointment SMS the day before the scheduled appointment date plus missed-appointment reminders
	Timing/ frequency:	Standard care at baseline, plus text messages before 14-day appointment and then another text after missed appointments, then a phone call, then an in-person visit
	Intervention provider:	Researcher organized for messages to be sent, home visit by community counsellor, and HIV counselling and testing by trained health facility staff.
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, who were not required to respond
	Other components & co-interventions:	In-person visits for those without phone and phone call for people who did not attend after first mobile phone reminders
	Tailoring:##	In-person visits for those without phone or who did not attend after first mobile phone reminders

	Adaptation/ Fidelity:	Fig. 2 footnote: "Due to delays in communication from study sites, follow-up reminders were not sent for five participants after the first SMS and for six participants after the second SMS. Twelve participants who had provided a valid mobile at enrolment were subsequently unreachable at the follow-up visit, perhaps due to lost mobile phone or changed numbers. Three participants could not be found at the address they had given on the locator form, but we could not determine if they had given incorrect information or had moved."
	Comparator:	SOC; Standard appointment consisted of instructions to come back to the clinic on a specific date two weeks after the enrolment visit, plus an appointment card with the appointment date and participant number written on.
	Other groups:	n/a
Outcomes^		HIV testing (2w)
Other	*Funding:*	International AIDS Vaccine Initiative (IAVI, support from various donors, www.iavi.org); University of Washington Center for AIDS Research, an NIH funded program (P30 AI027757) supported by the following NIH Institutes and Centers (NIAID, NCI, NIMH, NIDA, NICHD, NHLBI, NIA, NIGMS, NIDDK); The Centre for Geographic Medicine Research-Coast, supported by core funding from the Wellcome Trust (#077092). SMG was supported by NIH grant 1R34MH099946-01; United States Agency for International Development (USAID).
	Conflict of interest:	None declared

Nielsen (2019)[30] [linked report: Nielson 2018[31]; cited in main article: Nielson 2020[32]]

Aim*	To evaluate in a randomised controlled trial, the effectiveness of this smartphone application to improve condom use among youth in Stockholm, Sweden.	
Methods	*Design (study name):*	Two-arm parallel-group RCT (MOSEXY trial - 'Skyddslaget'/'protection team')
	Trial dates/ duration:	Oct/17-Apr/18 (recruitment period), 6 months (FU period)
	Trial registration:	ISRCTN13212899
Setting	*Country:*	Sweden
	Location:	Stockholm County
	Recruitment setting:	Eight Youth Health Clinics that provide contraceptive counselling and sexual health services
Participants	*Participants:*	Young people attending Youth Health Clinics, Sweden (N=433)
	Inclusion criteria:	(A) age 18–23 years; (B) smartphone owner; and (C) >2 sexual partners during the previous 6 months.
	Exclusion criteria:	Women who exclusively had sex with women were excluded
	Age:	Mean age 20.0 years (range 18-23)
	Sex:	67.4% female
	Sexuality:	95.2% heterosexual
	Ethnicity:	Not reported
Intervention	*Summary:*	Interactive smartphone app, incl. info sent over 6 m vs 'dummy' app with questionnaires
	Theory/ techniques:	Transtheoretical Model of Change[33] and the Integrated Behavioural Model[34]; The intervention considered behaviour change methods/models aimed to normalise condom use, provide practical information and build the necessary trust and confidence to negotiate condom use
	User involvement? [I] (Other?)	Yes, the app was developed based on individual interviews and focus group discussions with youth.
	Targeted behaviour:	Preventive (condom use) and diagnosis-related (STI testing)
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (examples of condom use negotiation)
	Intervention content: (reported examples/ complete content?)	Interactive smartphone app plus standard of care at the Youth Health Centre. The app delivered youth friendly 'safe-sex and STI' relevant snippets of information to participants on their phones. In addition, it had an interactive element that included weekly games and quizzes, related to safer sex, condom usage and STIs. There were also personal stories related to sexual risk-taking narrated by peers. Activities/information snippets were changed periodically over the 6-month intervention period. (No examples given in main article, but cited previous report[32] provides examples of content in the different stages of change according to the transtheoretical model.)
	Procedures/ MOD:	After randomization, participants downloaded the app (with assistance of research staff) and used the app for 6 months.
	Timing/ frequency:	Participants in the interventions arm received between two to five new activities/information snippets per day for the 6 months study period
	Intervention provider:	Research staff at the site were available to assist in the download and train participants in the use of the app.
	'Push' component (unidirectional/ bidirectional?):	The app delivered 'safe-sex and STI' relevant snippets of information to participants' phones; From linked paper: "In addition, push notifications were used to inform users that new content had been added into the app. Every Friday evening, a condom reminder push notification was sent out to participants." (In addition, also bidirectional communication, e.g. quizzes)

	Other components & co-interventions:	No/ not reported, apart from the interactive elements of the app described above.
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	Fidelity of the intervention: participants received the app exactly as per allocation. This was assured as login details were linked to randomisation number, and the app was downloaded in the clinic in the presence of the study midwife. Available data on engagement with the app in the intervention arm indicate that on average, a participant interacted with the app 43 times over the 6-month intervention period, that is, a little under twice a week
	Comparator:	Placebo control ('dummy' application containing only questionnaires) plus SOC at Youth Health Centre.
	Other groups:	n/a
Outcomes^		STI occurrence, Condom use, STI testing (6m)
Other	*Funding:*	FORTE – Swedish Research Council for Health, Working life and Welfare.
	Conflict of interest:	None declared

Parkes-Ratanshi (2018, 2020)[35 36] ; [Cited in text: Manabe 2015[37]]

Aim*	To compare the proportion of partners who reported to the clinic for syphilis testing (and treatment) when syphilis-positive pregnant women were given only PN slips (SOC), compared with SOC plus SMS reminders or SOC plus telephone call reminders.	
Methods	*Design (study name):*	Three-arm parallel-group RCT (STOP)
	Trial dates/ duration:	Jan/15-Feb/16, 13 months
	Trial registration:	https://clinicaltrials.gov/ct2/show/NCT02262390
Setting	*Country:*	Uganda
	Location:	Kampala
	Recruitment setting:	Antenatal care clinics (ANC) at Mulago Hospital and Kasangati Health Centre IV (public) and the IDI Adult Infectious Disease Clinic (private, not-for-profit)
Participants	*Participants:*	Pregnant women with positive syphilis test, Uganda (N=442)
	Inclusion criteria:	Women with a positive pregnancy test and treponemal antibody rapid POC test (POCT), age >18 years or age 14–17 years and being a mature and emancipated minor, having a known sexual partner, having access to a mobile phone and being willing and able to use and receive SMS or telephone calls
	Exclusion criteria:	Illiteracy, inability to use a mobile phone and confirmed neurosyphilis.
	Age:	≥ 14 years; median 25 years (IQR 22–28 years)
	Sex:	100% female
	Sexuality:	not reported
	Ethnicity:	not reported
Intervention	*Summary:*	SMS reminders vs SOC partner notification slips
	Theory/ techniques:	Not reported
	User involvement? | (Other?)	No/ not reported ("the approach was based on experience gained in PN at IDI [Infectious Disease Institute] with targeted counselling and standard of care (SOC; 58% informed their partner)[37] , as well as from other African studies on index case PN…")
	Targeted behaviour:	Diagnosis-related (PN, partner's syphilis testing)

	Intervention purpose:[11]	Remind/recall
	Intervention content: (reported examples/ complete content?)	In addition to SOC, participants received weekly SMS reminders to encourage their partners to attend the STI clinic for syphilis testing for up to 8 weeks after the woman's initial positive syphilis test. The participant ID code number was written on the notification slip, which partners were asked to bring to the clinic, and in the SMS reminders. Script of SMS: "Hello, please remember to pass on your notification slip from the antenatal clinic to your partner. Thank you." (Complete content, one message only)
	Procedures/ MOD:	Participants received SOC notification slip when leaving the clinic, and then received weekly SMS reminders to encourage their partners to attend the STI clinic for syphilis testing for up to 8 weeks. The participant ID code number was written on the notification slip, which partners were asked to bring to the clinic, and in the SMS reminders.
	Timing/ frequency:	Weekly SMS reminders for up to 8 weeks
	Intervention provider:	Researchers organised for messages to be sent; clinic staff recorded partner attendance
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, who were not required to respond
	Other components & co-interventions:	No/ not reported
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	No details provided
	Comparator:	The PN slip was given to the pregnant female participant on the day she received her syphilis test results. The woman was asked to give the slip to her sexual partner(s) and encourage them to attend the STI clinic for syphilis management. The PN slip contained only a code number and no identifiable features
	Other groups:	SOC & nurse telephone call reminders
Outcomes^	*Outcomes^*	PN/ Partner attendance (median 20 days)
Other	*Funding:*	Foundation for the National Institutes of Health (5U54EB007958 to Charlotte Gaydos).
	Conflict of interest:	None declared, apart from: Rosalind Parkes-Ratanshi receives grant funding through the IDI from Janssen, the pharmaceutical company of Johnson and Johnson

Reback (2019a)[38] [Linked reports: Reback 2019b[39], 2017[40], 2015a[41],cited in main article: Reback 2010[42], 2015b[43]]

Aim*	To test three methods of text message delivery designed to reduce methamphetamine use and HIV sexual risk behaviors among out-of-treatment MSM	
Methods	*Design (study name):*	Three-arm parallel-group RCT (Project Tech Support 2)
	Trial dates/ duration:	Mar/14-Jan/16 (enrolment period)
	Trial registration:	Provided by author via email: clinicaltrials.gov ID# NCT02008526
Setting	*Country:*	United States
	Location:	Hollywood area of Los Angeles County, California
	Recruitment setting:	Community-wide recruitment (street- and venue-based outreach) and online recruitment (social media, dating apps). Research activities at community research center that had worked with methamphetamine-using MSM for over two decades
Participants	*Participants:*	MSM who use methamphetamine, US (N=286)
	Inclusion criteria:	Self-identified Men having Sex with Men (MSM), between the ages of 18-65 years, used methamphetamine within the previous three months, reported CAI (includes insertive and receptive behaviors) with a non-primary male partner in the previous 6 months, not currently in treatment or seeking methamphetamine abuse treatment, has a personal cell phone with unlimited texting service and the capacity to charge the phone daily, able and willing to provide informed consent and comply with study requirements
	Exclusion criteria:	Unable to understand the Informed Consent Form (unable to pass a consent quiz), or determined to have a more serious psychiatric condition (Structured Clinical Interview for the DSM-V-MINI [SCID-MINI] verified) that was beyond the safe enrollment of the study procedures.
	Age:	18-65 years, mean age: 41.5 years (SD 10.9)
	Sex:	100% male
	Sexuality:	MSM; 67.1% gay identified, 32.9% non gay identified
	Ethnicity:	Participants predominantly self-identified as African American/Black (44%) or Hispanic/Latino (25%)
Intervention	*Summary:*	SMS conversation with PHE, automated SMS and self-monitoring assessment (SMA) vs automated SMS and SMA vs SMA only
	Theory/ techniques:	Social Support Theory, Social Cognitive Theory, and Health Belief Model[43 44]
	User involvement? [/] (Other?)	Yes, SMS written 'in collaboration with community/peer focus groups." - article also refers to prior text-messaging research, including formative research with focus group discussions, community partners meetings and pre-testing of text messages (Reback 2010[42])
	Targeted behaviour:	Preventive (condom use and reducing illegal drug use)
	Intervention purpose:[/]	Inform/educate, remind/recall, provide support

	Intervention content: (reported examples/ complete content?)	TXT-Auto: Theory-Based, Gay-Specific, Text Messages Transmitted by Automation, Plus Weekly Self-Monitoring Text-Based Assessments; design. All scripted text messages were gayspecific, i.e., used gay cultural references and/or language such as the following Social Support Theory (Informational Support) message scripted for a participant who is HIV positive, "Poz N using? Not a good cocktail. You deserve to be healthy." Or the following Social Cognitive Theory message scripted for a participant who is an injection drug user, "You have a choice, don't trade your rig for sex." Or the following Health Belief Model message scripted for a participant who is the insertive partner in condomless anal sex, "Using? Tops get STDs, too." TXT-PHE: Interactive Text-Messaging Conversations with Peer Health Educators, Plus Theory-Based, Gay-Specific Text Messages Transmitted by Automation, Plus Weekly Self-Monitoring Text-Based Assessments; *Interactive messages*: PHEs initiated text messages to participants and also responded to participant-initiated queries and participant responses to the PHE messages. To allow the text message conversation to flow, the PHE also transmitted extemporaneous HIV prevention text messages; *Automated messages*: All scripted text messages as above for the TXT-Auto arm. (Only a few examples given of the total of 616 scripted SMS)
	Procedures/ MOD & Timing/ frequency:	During the 8-week intervention period, each participant in the TXT-PHE and TXT-Auto conditions received a total of 280 scripted theory-based, gay-specific text messages (5 messages/ day × 7 days/week × 8 weeks = 280 messages). Text messages were transmitted and responded to in real time, at the peak hours of high risk activities, which were determined in the pilot study [35] to be: Monday and Tuesday 12:00PM to 8:00PM, Wednesday and Thursday 12:00PM to 1:00AM, Friday 12:00PM to 2:00AM, Saturday 3:30PM to 2:00AM, and Sunday 3:30PM to 12:00AM.
	Intervention provider:	Researchers organised for messages to be sent, plus peer health educator for PHE arm
	'Push' component (unidirectional/ bidirectional?):	TXT-Auto arm: SMS sent to participants, who were not required to respond TXT-PHE arm: SMS sent to participants, who were not required to respond plus bidirectional messages/ communication with peer health educator
	Other components & co-interventions:	No/ not reported
	Tailoring:##	Text messages based on risk profiles plus interactive messages
	Adaptation/ Fidelity:	Not reported
	Comparator:	Weekly Self-Monitoring Text-Based Assessments
	Other groups:	n/a
Outcomes^	*Outcomes^*	Condom use (9 m), costs
Other	*Funding:*	National Institute on Drug Abuse, Grant #R01DA035092; additional support from the National Institute of Mental Health (P30MH58107).
	Conflict of interest:	None declared

Rinehart (2019)[45]

Aim*	To evaluate the feasibility, acceptability, and initial efficacy of a pilot texting intervention ("t4she") in primary care designed to increase sexual health knowledge and promote dual protection strategies to reduce unintended pregnancies and sexually transmitted infections among adolescent females.	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT (t4she, Texts for Sexual Health Education and Empowerment)
	Trial dates/ duration:	Apr/15-Jan/17, 6 months
	Trial registration:	https://clinicaltrials.gov/ct2/show/NCT02419690
Setting	*Country:*	United States
	Location:	Denver, Colorado
	Recruitment setting:	Two federally qualified community health centres
Participants	*Participants:*	Community health centre patients, US (N=244)
	Inclusion criteria:	Assigned female at birth and aged 13 to 18, ability to send and receive text messages, not pregnant (verified through urinalysis), not trying to become pregnant in the next year, and able to participate in English
	Exclusion criteria:	n/a
	Age:	Mean [years] 15.9 (SD 1.6); Intervention: 15.7 (SD 1.6), Contr.: 15.9 (SD 1.7)
	Sex:	100% female
	Sexuality:	77.9% heterosexual, 0.8% lesbian, 15.7% bisexual, 4.5% dk, 1.2% other
	Ethnicity:	79.9% Hispanic/Latina, 10.3% White, 8.6% Black, 1.2% Asian
Intervention	*Summary:*	SMS intervention over 3 m vs SOC
	Theory/ techniques:	Health Belief Model (HBM)[44]
	User involvement? [I] (Other?)	Yes, key informant interviews (and existing texting and social media programs) informed intervention prototype development, plus input from focus groups on sample messages and intervention logistics.
	Targeted behaviour:	Preventive (dual protection to prevent unintended pregnancy and STIs)
	Intervention purpose:[II]	Inform/educate, remind/recall, provide support, facilitate decision-making (for birth control)
	Intervention content: (reported examples/ complete content?)	58 automated text messages designed to increase sexual health knowledge and promote dual protection strategies over 12 weeks plus standard of care (SOC); Messages covered a range of topics and targeted HBM constructs. Initial messages provided early coverage of basic facts regarding conception, STI contraction, and birth control methods and access (e.g., location and dispelling misconceptions about age restrictions); Weekly coverage of core content areas (birth control, condom use, and dual protection behaviors). Message format varied, it included fun facts (dispel myths), multiple choice quizzes, true/false messages - 38% were bidirectional and 33% included a link to a website or graphic to reinforce the message. Example messages: "t4she: Have a question about sexual health? Text ICYC to 57890, then text your questions."; "t4she: Birth control (BC) comes in all shapes and sizes. Some work better and are easier to use. Choose what works for you. http://bedsider.org/methods"; "t4she: Be prepared. Buy condoms at any drugstore or get them free at most clinics. Ask the Denver Health registration desk for a free bag."; "t4she: True or false: You need your parents' permission to start BC or purchase condoms. 1=True 2=False"; 't4she: What percentage of women will get pregnant when using only condoms during sex? Reply 1=10%; 2=15%; 3=20%; 4=25%' (only one example message for each HBM construct given in supplement)

	Procedures/ MOD:	In addition to SOC, participants randomized to the T4She intervention group received 58 automated messages sent over 12 weeks. Within 24 hours of completing the baseline survey, participants received a welcome text introducing the program, and the Saturday morning following their enrolment the intervention began.
	Timing/ frequency:	58 automated messages sent over 12 weeks; for bidirectional texts, the correct response was sent within 24 hours for non-responders; SMS were tied to certain days to illicit cues to action - Fridays: texts that act as cues to action (e.g. texts about using condoms), and Mondays: texts to initiate connection to resources (e.g., if have questions/needs based on events that occurred over the weekend).
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, 38% were bidirectional and 33% included a link to a website or graphic to reinforce the message
	Other components & co-interventions:	Some SMS linked to external services, e.g. in case of questions encouraged teens to connect to a texting program that provides rapid answers to questions about sexual health (In Case You're Curious: ICYC)
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	90% of participants reported receiving messages weekly (3 months survey data); 2% of participants reported receiving no texts, and 0.1% of texts were cancelled or undelivered according to data from texting platform system.
	Comparator:	SOC (access to on-site family planning services and free contraception)
	Other groups:	n/a
Outcomes^		Condom use, STI knowledge, self-efficacy (3, 6m)
Other	*Funding:*	Agency for Healthcare Research and Quality Developing Infrastructure for PCOR grant number R24HS022143. Supported by NIH/NCATS Colorado CTSA grant number UL1 TR002535 (use of REDCap).
	Conflict of interest:	None declared

Rokicki (2017)[46]

Aim*	To examine the potential of text messaging sexual-education programs to improve adolescent reproductive health, we conducted a randomized controlled trial in Ghana, investigating the effectiveness of both 1-way and 2-way text-messaging programs on knowledge and sexual behavior.	
Methods	*Design (study name):*	Three-arm Cluster RCT
	Trial dates/ duration:	Jan/14 -Feb/14 (recruitment period), 16 months (1 month of enrolment and 15 months of follow-up); 3 months intervention duration
	Trial registration:	ClinicalTrials.gov (NCT02031575)
Setting	*Country:*	Ghana
	Location:	Accra
	Recruitment setting:	Secondary schools (excluding boarding schools)
Participants	*Participants:*	Students at 38 secondary schools, Ghana (N=756)
	Inclusion criteria:	Female students aged 14 to 24 years attending the second year of participating senior secondary schools
	Exclusion criteria:	n/a
	Age:	14-24 years; mean (SD) in years - control arm: 17.8 (1.2); SMS unidirectional arm: 17.6 (1.4); SMS interactive quiz arm.: 17.6(1.5)
	Sex:	100% female
	Sexuality:	not reported
	Ethnicity:	Akan, Ga, Ewe and other (details in table 1)
Intervention	*Summary:*	Interactive quiz SMS vs unidirectional SMS intervention vs placebo control (malaria info)
	Theory/ techniques:	Not reported
	Targeted behaviour:	Preventive (contraception, condom use, abstinence)
	Intervention purpose:[I,I]	Inform/educate, remind/recall, teach skills (verbal instructions on how to use condom, option to phone nurse to discuss strategies to say no if doesn't want sex), provide support
	User involvement? [I] *(Other?)*	Yes, SMS content generated after focus groups with young adults (also guidance from Ghana Health Service Health Promotion Unit, who edited wording and approved appropriateness of content for this age group)
	Intervention content: (reported examples/ complete content?)	Unidirectional SMS messages focused on pregnancy prevention and contained information on topics of reproductive anatomy, pregnancy, STIs, and contraception including male condoms, female condoms, birth control pills, and emergency contraception. Example (App. Table A): "SMART fact: You can be a carrier of a sexually transmitted infection (STI) without having any symptoms or knowing you are a carrier. It can take months to see symptoms like sores, itches and problems urinating. A partner may have a STI and it may be impossible for him or you to know that he has it."; "SMART Tip: Great job! Remember, if you don't want to have sex, it's ok to say no. Call 0302208585 or 080028585 (Toll free- Vodafone only) to speak to a nurse about strategies for saying no. It is completely confidential. You could also call this number if you have any questions bothering you"; "SMART: When putting on a condom, a man should NOT unroll the entire condom first. Open the package, hold the tip of the condom with one hand and roll it down the penis with the other hand. Leave space at the tip to collect semen. If there is no space at the tip the condom will burst open during ejaculation." The interactive quiz SMS arm involved multiple choice quiz question via text message to which they were invited to respond free of charge. Upon responding, participants immediately received a confirmatory text message informing them whether they answered correctly along with additional information which corresponded to the information provided in the

		unidirectional intervention. Example (App. Table A): "SMART: Can you be a carrier of a Sexually Transmitted Infection (STI) and NOT be aware that you have it? Reply SMT1 for yes or SMT2 for no" - then detailed response SMS Both groups also received 4 extra tips about the effectiveness of condoms, the benefits of talking with their boyfriend about reproductive health, and the existence of a free public hotline number that they could call for reproductive health information (sent twice). (Complete content/ messages for each week provided in Appendix Table A)
	Procedures/ MOD:	As part of the unidirectional intervention, participants were sent 1 reproductive health message via text message once a week; As part of the interactive intervention, participants were not sent any information initially, but were instead sent 1 multiple choice quiz question via text message each week to which they were invited to respond free of charge. Upon responding, participants immediately received a confirmatory text message informing them whether they answered correctly along with the correct answer and additional information, which corresponded to the information provided in the unidirectional intervention
	Timing/ frequency:	Weekly text messages for 12 weeks
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	Unidirectional arm: SMS sent to participants, not required to respond Interactive quiz arm: SMS sent to participants, most of them were bidirectional, where participants were expected to respond
	Other components & co-interventions:	Some SMS provided toll free public hotline phone number to speak to a nurse in case of questions; After the 3-month follow-up, participants in both intervention and control arms were offered a 30- to 45-minute lecture about reproductive health by a nurse recruited by the Alliance for Reproductive Health Rights, a Ghanaian nongovernmental organization.
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	A total of 756 participants enrolled in the study, of which 716 (95%) were successfully followed up at 3 months and 721 (95%) were successfully followed up at 15 months. Of those participants followed up at 3 months, 99% had provided a phone number at baseline and 83% claimed to have received at least 1 text message. Participants who used a family member's phone were less likely to report receiving messages than those who owned a phone (71% compared with 86%, respectively). In the interactive group, weekly response rates to the quiz questions remained relatively stable, ranging from 64% to 70% over the 12-week intervention duration
	Comparator:	Placebo messages once a week with information about malaria; Example (Annex Table A): "SMART fact: The first symptoms of malaria are fever, headache, and chills. These occur 2-3 days after the mosquito bite. Other symptoms are body pain and nausea."
	Other groups:	n/a
Outcomes^		Condom use, age at sexual debut (15 m), knowledge (3, 15m)
Other	*Funding:*	Weiss Family Fund for Research in Development Economics, the Harvard Lab for Economic Applications and Policy, and the Harvard Institute for Quantitative Social Science
	Conflict of interest:	Not reported

Suffoletto (2013)[47]

Aim*	To pilot test a text message (SMS) sex risk reduction program among at-risk young adult female patients discharged from an emergency department	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT
	Trial dates/ duration:	Sep/11-Apr/12 (recruitment period), 3 months FU
	Trial registration:	The trial was registered with ClinicalTrials.gov (number NCT01548183)
Setting	*Country:*	United States
	Location:	Western Pennsylvania
	Recruitment setting:	a single urban level I trauma and tertiary care hospital emergency department
Participants	*Participants:*	Female emergency department patients, US (N=52)
	Inclusion criteria:	Female, age 18-25 years old, and not critically ill, with self-reported hazardous drinking behavior, based on a score >3 on the three item Alcohol Use Disorder Identification Test-Consumption, and with at least one of the following: more than 1 male sexual partner in the past 3 months, no condom use at last sexual intercourse, or alcohol/drug use concurrent with their last sexual intercourse
	Exclusion criteria:	Self-reported current substance abuse or psychiatric treatment, having a monogamous partner for >2 years or were planning pregnancy in next 3 months, not having a personal mobile phone with text messaging features
	Age:	18-25 years; Mean (SD) - Intervention: 22 (2), Control: 21 (2)
	Sex:	100% female
	Sexuality:	Not reported
	Ethnicity:	Intervention: 75% black, Control: 55% black
Intervention	*Summary:*	SMS intervention over 12 w vs SMS announcing time of FU questionnaire completion
	Theory/ techniques:	Health Belief Model[48] and Information Motivation Behavior model[8]
	User involvement? [I] (Other?)	No/ not reported
	Targeted behaviour:	Preventive (condom use, reduced alcohol/drug use before sex)
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (tools to increase self-efficacy for protected sex), provide support
	Intervention content: (reported examples/ complete content?)	Each Sunday at noon, intervention participants received a sequence of text messages that assessed risky encounters over the past week, were provided personalized feedback on risk behavior, and were prompted collaborative goal setting to not have a risky encounter for the coming week. Following precepts of the Health Belief Model, we incorporated messages to increase an individual's perceived susceptibility to getting an STD, perceived severity of health risk associated with an STD, and benefits of adopting protective behaviors (using condoms). According to the Information-Motivation-Behavioral Skills model constructs, we incorporated messages relaying effective health information about STDs specific to young adult women, increasing personal motivation to adopting healthy sexual behaviors and tools to increase self-efficacy for protected sexual encounters. (No SMS examples provided)
	Procedures/ MOD:	'Upon entering their phone number into our system, intervention participants received a series of welcome text messages describing the program. Each Sunday at noon, intervention participants received a sequence of text messages that assessed risky encounters over the past week, were provided personalized feedback on risk behavior, and were prompted collaborative goal setting to not have a risky encounter for the coming week. [...] If participants did not respond within 6 hours of a query, a second text message was sent out repeating the initial message. If no

		response was received within 12 hours, the data were considered lost and the participant was retexted the following week. If two consecutive weeks were missing, the participant was e-mailed regarding contact information.'
	Timing/ frequency:	Each Sunday at noon, intervention participants received a sequence of text messages. If participants did not respond within 6 hours of a query, a second text message was sent out repeating the initial message.
	Intervention provider:	No information provided
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, most of them were bidirectional, where participants were expected to respond
	Other components & co-interventions:	If intervention participants did not respond to SMS for two consecutive weeks, the participant was e-mailed regarding contact information.
	Tailoring:##	SMS feedback provided based on behavioral change theory tailored to a participants' reported engagement in risky encounters.
	Adaptation/ Fidelity:	In the intervention group, 70% (95% CI 64, 75) of weekly SMS assessments were completed. Noncompletion was 12% for week 1, peaked at 50% at week 8, and was 33% on week 12. A total of 39% of intervention participants completed all weekly assessments, 74% replied to at least half of assessments, and only one participant missed all 12 weeks. Compared with those who completed at least 50% of weekly SMS assessments, those who did not were more likely to be of black race (100% vs. 71%), have more frequent alcohol consumption (100% vs. 30% at least weekly drinkers), and were more likely to have more than one sexual partner in the past 3 months (67% vs. 35%).
	Comparator:	Each week for 12 weeks, control subjects received the following text message only, "Please look for our text in X weeks to complete your web-based follow-up," where [X] was the number of weeks until study completion.
	Other groups:	n/a
Outcomes^		Condom use, abstinence (3m)
Other	*Funding:*	B.S. is supported by an EMF-Century Council grant, A.A. is supported by the Robert Wood Johnson Foundation Harold Amos Medical Faculty Development Program, and D.B.C. is supported by R01AA016482 and P50DA05605.
	Conflict of interest:	None declared

Tang (2018)[49] [Linked reports: SESH 2017[50], Wu 2019[51]]

Aim*	To evaluate a comprehensive crowdsourced intervention to increase HIV testing uptake among MSM in China	
Methods	*Design (study name):*	Closed cohort stepped wedge cluster RCT
	Trial dates/ duration:	Jul/16-Aug/16 (recruitment period); Aug/16-Aug/17 (FU period, 12 months)
	Trial registration:	ClinicalTrials.gov NCT02796963
Setting	*Country:*	China
	Location:	Eight Chinese cities, incl. Guangzhou, Shenzhen, Zhuhai, and Jiangmen in Guangdong province; Jinan, Qingdao, Yantai, & Jining in Shandong province
	Recruitment setting:	Recruitment through Blued, a social networking mobile application for MSM
Participants	*Participants:*	MSM recruited via social networking mobile app, China (N=1381)
	Inclusion criteria:	born biologically male, age 16 or older, currently living and planning to live in one of the eight cities for 12 months post-enrolment, HIV-negative or unknown HIV status, had not had HIV testing within the past 3 months, had anal sex with a man at least once during their lifetime, and were willing to provide their cell phone numbers for follow-up
	Exclusion criteria:	n/a
	Age:	16-20 years: 23%, 21-25 years: 34%, 26-30 years: 26%, >30 years: 18%
	Sex:	100% born male
	Sexuality:	100% MSM (71% gay, 29% bisexual)
	Ethnicity:	Not reported
Intervention	*Summary:*	Biweekly WeChat images/texts over 3 m and HIV self-testing platform vs wait list control
	Theory/ techniques:	Crowdsourcing (nationwide open contest and regional designathon)[52]
	User involvement?[I] *(Other?)*	Yes, intervention developed by experts and non-experts/ (potential) users through national image contest, a regional strategy dsignathon and local message contests
	Targeted behaviour:	diagnosis-related (HIV testing)
	Intervention purpose:[II]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	First part: Six HIV promotional images and messages, as well as HIV testing site information delivered biweekly via WeChat; Example texts in images: "Let's test for HIV together. Stop HIV from spreading in our community."; "HIV infected ≠AIDS patients. Don't be bound by fear. Get an HIV test for your sake and the sake of your loved one."; "Let HIV testing become a part of your life." Participants were encouraged to HIV test at local facilities; Second part: one WeChat message sent to the participants offering a free HIV oral self-testing kit. This WeChat message contained a link to an online form, open for one week, through which participants could provide their mailing addresses and apply for the testing kits. Third part: local CBO-led contests for HIV testing stories, with winning results shared with the community; CBOs sent at least eight online push notifications to the local community using their social media platforms (websites, Weibo, Blued, WeChat public account, or QQ). (Complete content/ all six images and messages given in Suppl. 2 and three stories selected from story contests in eight cities provided in Suppl. 3)

	Procedures/ MOD:	The exceptional images were disseminated by WeChat biweekly during the intervention period (S2 Text). The HIV self-testing platform was built in WeChat, and men who were interested could provide their address to receive one free oral HIV self-test kit in the mail. Men could also return a photo of the test results through WeChat. The local story contests were co-organized by respective local CDCs and MSM CBOs in the eight cities and aimed to promote continuing community engagement and HIV testing by soliciting stories of HIV testing from local individuals (S3 Text, three stories selected from the story contests). Exceptional stories from the story contests were disseminated through social media channels of local CBOs.
	Timing/ frequency:	WeChat images/messages sent biweekly for 3 months
	Intervention provider:	Researchers organised for images and messages to be sent via WeChat; local Centre for Disease Control (CDC) and MSM CBOs (community-based organisations) co-organized story contests.
	'Push' component (unidirectional/ bidirectional?):	Exceptional images sent via WeChat (unidirectional, but also bidirectional component, as participants had option to order free HIV self-test kit and return photo of test result through WeChat)
	Other components & co-interventions:	Intervention was developed via crowdsourcing, including a nationwide open contest and regional designathon, which in itself may be seen as an intervention; As mentioned above, intervention included HIV self-testing platform integrated into the app with option to receive one free oral HIV self-test kit in the mail; local story contest co-organised by local non-governmental organizations and CBOs with flexibility to design and conduct various offline promoting events -- displaying posters and distributing flyers at VCT clinics and common MSM gathering places, organizing entertainment activities, for example, a live show containing promoting messages; Additionally, routine promotional efforts by CDC and CBOs.
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	No information provided, apart form loss-to-follow up rates
	Comparator:	SOC (Routine promotional efforts by Centre for Disease Control, CDC and community-based organizations, CBO)
	Other groups:	n/a
Outcomes^		HIV testing, self-efficacy, stigma, social norms (3, 6, 9, 12m)
Other	*Funding:*	National Key Research and Development Program of China (2017YFE0103800), the National Institutes of Health (NIAID 1R01AI114310-01), UNC-South China STD Research Training Center (FIC 1D43TW009532-01), UNC Center for AIDS Research (NIAID 5P30AI050410), NIMH (R34MH109359), UJMT Fogarty Fellowship (FIC R25TW0093), the North Carolina Translational & Clinical Sciences Institute (1UL1TR001111), SMU Research Initiation Project (QD2017N030, C1034448), Youth Talent Grant of Guangdong Province (2017 WQNCX129), Social Science Young Teacher Supporting Project of Shenzhen University (18QNFC46), and SESH (Social Entrepreneurship to Spur Health) Global.
	Conflict of interest:	None declared, apart from: WT and JDT are advisors to SESH Global

Trent (2019)[53] [linked reports: Ha 2018[54], Trent 2017[55], Trent 2015[56]; cited in main report: Trent 2016[57]]		
Aim*	To examine the efficacy of a technology-enhanced community health nursing (TECH-N) intervention vs standard of care for improving PID self-management behaviors and 90-day longitudinal prevalence of N gonorrhoeae and C trachomatis infection.	
Methods	*Design (study name):*	Two-arm parallel-group RCT (TECH-N, Technology enhanced community health nursing)
	Trial dates/ duration:	Sep/16-Nov/18, 26 months
	Trial registration:	https://clinicaltrials.gov/ct2/show/NCT01640379
Setting	*Country:*	United States
	Location:	Baltimore, Maryland
	Recruitment setting:	Urban academic medical center located in a community with high STI prevalence (Johns Hopkins Hospital clinical sites, incl. Pediatric Emergency Department and the Harriet Lane General Pediatric and Adolescent Clinics)
Participants	*Participants:*	Patients with pelvic inflammatory disease (PID), US (N=292)
	Inclusion criteria:	13 to 25 years of age, diagnosis of mild to moderate PID, have a disposition plan for discharge to outpatient treatment at home instead of hospitalization, reside in the local metropolitan area
	Exclusion criteria:	Patients who were pregnant, hospitalized for PID, already enrolled in the study and had rediagnosed PID, receiving care for a sexual assault, or unable to communicate with staff because of cognitive, mental, or language difficulties
	Age:	13-25 years; mean [SD] age, 18.8 [2.5] years
	Sex:	100% female
	Sexuality:	Not reported
	Ethnicity:	268 (93.7%) African American
Intervention	*Summary:*	SMS support and community health nurse visit vs SOC
	Theory/ techniques:	Integrative model of behavioral prediction[58] "Capitalizing on the positive attitudes towards treatment, we are attempting to change behavior by 1) affirming positive outcome expectations, 2) enhancing sexual health skills e.g. condom use), and 3) removing environmental constraints (e.g. transportation). We employ comprehensive structured CHN care that includes: 1) standardized prevention case-management components, 2) an effective one-on-one intervention for STI behavior change and 3) PID-related health SMS messages as core components of the TECH-N intervention [Trent 2016]"
	User involvement? [I] (Other?)	No/ not reported
	Targeted behaviour:	Preventive (condom use), diagnosis-related and treatment-related
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (skills-based sexual risk reduction and condom negotiation counselling session), provide support

	Intervention content: (reported examples/ complete content?)	Intervention participants received text messaging support and a community health nurse visit within 5 days of diagnosis. The daily messages reminded patients to take their medications and prompted patients to provide data about how many scheduled doses they had consumed each day with a tailored automated message to affirm and encourage adherence to the treatment regimen based on their responses (eTable 1 in Supplement 2); Example messages: "*Condoms prevent STDs. Stop by the TECH-N Office if you need some. Call XXX-XXX-XXXX to let us know are coming by. TECH-N Team*"; "Good evening! How many doses did you take today? Text 0, 1, or 2. TECH-N Nurses." "One dose is good, but you need to take both doses to make sure your body heals properly." The community health nurse conducted a clinical re-assessment/ examination, and a 20-minute skills-based sexual risk reduction and condom negotiation counseling session using the Sister-to-Sister Teen Intervention. (Seven example SMS given in Suppl.2, eTable 1)
	Procedures/ MOD:	"Intervention participants received daily, automated text-message reminders for 2 weeks and then weekly booster messages provided through the Health Cloud SMS mobile communications platform (ReifyHealth LLC) for 1 month using their personal mobile phone or a prepaid, disposable mobile phone with text-messaging capacity provided by the study to patients without mobile phone access at the time of enrollment for use during the study. A community health nurse interventionist trained to deliver the PID-specific, short-term clinical follow-up visit that included a complete clinical assessment with abdominal examination and a 20-minute skills-based sexual risk reduction and condom negotiation counseling session using the Sister-to-Sister Teen Intervention[59 60] also visited intervention participants within 5 days of the enrollment visit to complete the CDC-recommended short-term clinical reassessment." It was also possible to have follow-up visits at alternative community sites (eg, local school-based health centers and health department clinical sites) if home visit not possible.
	Timing/ frequency:	Daily, automated text-message reminders for 2 weeks and then weekly booster messages for 1 month. Community health nurse visit within 5 days
	Intervention provider:	Researchers organised for messages to be sent; a community health nurse interventionist trained to deliver the PID-specific, short-term clinical follow-up visit
	'Push' component (unidirectional/ bidirectional?):	SMS sent to participants, some of them were bidirectional (asking how many treatment doses participant took)
	Other components & co-interventions:	Sister-to-Sister Teen Intervention[59 60] mentioned above
	Tailoring:##	Text message content depended on adherence response; community health nurse provided indvidual counseling session
	Adaptation/ Fidelity:	In intervention arm only 133 of 149 participants enrolled in intervention received the intervention, as 16 refused community health nurse visit; "The effective intervention delivery rate achieved was 89.6% (138 of 154 patients), and 90.9% (260 of 286 patients) of the effective sample was retained at 3 months"
	Comparator:	SOC, standard discharge instructions per institutional PID treatment guidelines, and asked to arrange a 72-hour visit with their primary care practitioner or with the Title X program offered through the institutional adolescent and young adult clinic.
	Other groups:	n/a
Outcomes^		STI occurrence, condom use (3 m), STI treatment compliance, PN (2 w)
Other	*Funding:*	Grant R01NR013507 from the National Institute of Nursing Research

	Conflict of interest:	Dr Trent reported receiving grants and research supplies from Hologic Inc, research supplies from SpeeDx LLC, and personal fees from Church and Dwight Inc outside the submitted work. Dr Perin reported receiving grants from the National Institute of Nursing Research during the conduct of the study. Dr Gaydos reported receiving grants from Hologic outside the submitted work. Dr Anders reported receiving grants from the National Institute of Nursing Research during the conduct of the study; receiving grants from the Health Resources and Services Administration Emergency Medical Services for Children; and receiving research supplies from the Maryland Institute for Emergency Medical Services Systems outside the submitted work. Dr Rothman reported receiving personal fees from Cepheid Diagnostics outside the submitted work. Dr Butz reported receiving grants from the National Institutes of Health during the conduct of the study. No other disclosures were reported.

Ybarra (2017)[61] [linked reports: Ybarra 2018, 2016a, 2015[62-64] and Prescott 2015[65], cited in text: Ybarra 2016b[66]]

Aim*	To assess a comprehensive HIV prevention program developed for sexual minority males as young as 14 years old, delivered nationally via text messaging.	
Methods	*Design (study name):*	Pilot three-arm parallel-group RCT (G2G, Guy2Guy)
	Trial dates/ duration:	Jun/14-Oct/14 (recruitment), Oct/14-Apr/15 (enrolment), ≥ 10 m duration
	Trial registration:	https://clinicaltrials.gov/ct2/show/NCT02113956
Setting	*Country:*	United States
	Location:	Nationally
	Recruitment setting:	Participants were recruited through online advertisements on Facebook
Participants	*Participants:*	Men identifying as gay, bisexual and/or queer, US (N=302)
	Inclusion criteria:	14 to 18 years old; cisgender male; identifying as gay, bisexual, and/or queer; English-speaker; US resident; sole owners of a cell phone with unlimited text messaging who intended to keep their current number for 6 months and had at least 6 months of text messaging experience
	Exclusion criteria:	knowing another person enrolled in the program and participating in a previous study activity (eg, focus groups)
	Age:	14-18 years; Intervention: 13.9% 18 years, Control: 29.5% 18 years (baseline imbalances statistically significant)
	Sex:	100% male
	Sexuality:	Not specified, but recruitment targeted men having sex with men and men having sex with men and women
	Ethnicity:	Intervention: 69.3% white; Control: 65.1% white
Intervention	*Summary:*	SMS intervention vs SMS placebo control (general health info)
	Theory/ techniques:	Information-Motivation-Behavior Model of HIV preventive behavior[67]
	User involvement? [I] (Other?)	Yes, formative development activities, including focus groups and content advisory teams, reported in Ybarra 2016a/b[64 66]
	Targeted behaviour:	Preventive (condom use, delay first sex/ abstinence) and diagnosis-related (HIV testing)
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (correct condom use), provide support
	Intervention content: (reported examples/ complete content?)	"Content included HIV information (eg, what it is, how to prevent it), motivation (eg, reasons why AGBM choose condoms), and behavioral skills (eg, correct condom use) (Table 1). Additional topics covered the importance of HIV testing, healthy and unhealthy relationships, coming out, and bullying. Although the same concepts were discussed for sexually experienced and inexperienced youth, the content was tailored by

		experience (eg, “When you’re in a healthy relationship and start having sex…” versus “When you have sex…”). The booster, delivered 6 weeks postintervention, reinforced this content." Gamelike features included quiz about info from last week plus opportunity to earn badges for buying condoms and carrying them (for sexually inexperienced youth) and for using them and getting tested for HIV (for sexually experienced youth); "Additionally, G2Genie was an on-demand feature that provided scripted “answers” to common questions that intervention youth could query (eg, how to break up with a boyfriend)." "Intervention participants were also paired to a text buddy. The goal was for paired intervention participants to practice program skills and provide mutual social support." Example info messages: “HIV is in 4 fluids: semen from the penis, blood, vaginal fluid, and breast milk. This includes “pre-cum” (fluid that comes out of the penis before ejaculation).” Example quiz level-up message: “You’re right! Frequent testing is the best way to stay healthy. Time it with something like your haircut so you won’t forget. Onward to Level 3!” Buddy suggestion text: “Some guys are worried that someone like their parents might find the condoms. Where can you keep them that feels safe to you? Text your buddy if you need advice.” (Ten example SMS provided in table 1)
	Procedures/ MOD:	SMS sent for 5 weeks (sexually inexperienced group: average of 8.5 messages daily; sexually experienced group: average of 9.6 messages daily); then a 1-week booster was delivered 6 weeks subsequently.; additional 'text buddy' scheme
	Timing/ frequency:	Intervention lasted 5 weeks and delivered 5 to 10 text messages daily (sexually inexperienced group: average of 8.5 messages daily; sexually experienced group: average of 9.6 messages daily) A 1-week booster was delivered 6 weeks subsequently.
	Intervention provider:	Researchers organised for messages to be sent; additional text buddy scheme
	‘Push’ component (unidirectional/ bidirectional?):	SMS sent to participants, including unidirectional information messages and bidirectional message with game-like features; additional interactive 'text buddy' scheme
	Other components & co-interventions:	No/ not reported, apart from different intervention components mentioned above
	Tailoring:##	SMS and types of badges received tailored depending on whether sexually experienced or not; ‘text buddy’ scheme
	Adaptation/ Fidelity:	All participants received allocated intervention; For lost to follow-up and withdrawal numbers 90 days postintervention see Fig.2
	Comparator:	Placebo control, text messages on general health topics (e.g. self-esteem, see table 1 in report)
	Other groups:	n/a
Outcomes^		Condom use, abstinence, HIV testing, knowledge, condom use skills (5w, 4m1w)
Other	*Funding:*	Award R01 MH096660 from the National Institute of Mental Health. Funded by the National Institutes of Health (NIH).
	Conflict of interest:	None declared

Young (2013a)[68] [linked report: Young 2014[69], cited in main article: Young 2013b[70]]

Aim*	To test the feasibility, acceptability, and effectiveness of using social networking sites (specifically Facebook) to increase HIV prevention and testing among African American and Latino MSM.	
Methods	*Design (study name):*	Pilot cluster RCT (HOPE, Harnessing Online Peer Education)
	Trial dates/ duration:	Sep/10-Jan/11 (recruitment), Mar/11-Jun/11 (intervention, 12 weeks)
	Trial registration:	Paper incorrectly gives registration number of main trial ClinicalTrials.gov: NCT01701206; author response via email: "This is the future main trial: NCT02944877 The results of the pilot had not been reported in NCT01701206 Here's a paper describing the pilot training protocol from the earlier pilot including: https://journals.sagepub.com/doi/full/10.1177/0017896912440768 "
Setting	*Country:*	United States
	Location:	Online, mostly men born in Western United States
	Recruitment setting:	Participants were recruited from online venues (n=104), community venues (n=6) frequented by African American and Latino MSM (for example, restaurants, clubs, schools, and universities), and direct referrals from participants (n=12).
Participants	*Participants:*	Mostly African American and Latino MSM, US (N=122)
	Inclusion criteria:	African American or Latino man, age 18 years or older, has a Facebook account, self-reported living in the Los Angeles area, and had sex with a man in the past 12 months. [A "Facebook Connect" technology application was created to verify each participant's unique Facebook user status. Because this application reduced the anticipated speed of enrolment of African American and Latino MSM, we first recruited 70% of the sample from these populations and then opened enrolment to a small number of participants who were not African American or Latino to prevent study delays.]
	Exclusion criteria:	n/a
	Age:	> 18 years; Mean age 31.5 years (SD 10.2)
	Sex:	100% male
	Sexuality:	100% MSM (75.9% gay, 18.8% bisexual)
	Ethnicity:	59.8% Latino, 27.7% African American
Intervention	*Summary:*	Peer-delivered Facebook intervention vs placebo control (general health info)
	Theory/ techniques:	Diffusion theory (mentioned in linked paper)
	User involvement? [I] (Other?)	No/ not reported, but intervention delivered by peer leaders
	Targeted behaviour:	Preventive (HIV prevention) and diagnosis-related (HIV testing)
	Intervention purpose:[II]	Inform/educate, remind/recall
	Intervention content: (reported examples/ complete content?)	During each week of the 12-week study from March through June 2011, peer leaders attempted to communicate with their assigned participants on Facebook by sending messages, chats, and wall posts. In addition to general conversation, peer leaders in the intervention group were instructed to communicate about HIV prevention and testing. (No example messages provided)
	Procedures/ MOD:	During each week of the 12-week study from March through June 2011, peer leaders attempted to communicate with their assigned participants on Facebook by sending messages, chats, and wall posts. Participants were instructed to use Facebook as they normally would, with no obligation to respond to or engage with peer leaders or other participants or to remain a member of the Facebook group; Every 4 weeks, participants in both groups were told that they could request a free, home-based testing kit (Home Access HIV-1 Test System, Home Access Health, Hoffman Estates, Illinois).

	Timing/ frequency:	Facebook interaction for 12 weeks; HIV test kit offered every 4 weeks (one free kit during 12 week study period)
	Intervention provider:	Peer-leaders: Training sessions provided lessons on the epidemiology of HIV [...] subjects and ways of using Facebook to discuss health and stigmatizing topics. Peer leaders were given baseline and final questionnaires to ensure that they had gained necessary skills. Additional information about peer leaders and training is available online[70].
	'Push' component (unidirectional/ bidirectional?):	Messages sent via facebook, participant were not required to respond, but could, if they wanted to
	Other components & co-interventions:	No/not reported (in addition to facebook messages, facebook wall posts and chat function were used)
	Tailoring:##	Peer educators could respond to individual participants; peer leaders were advised to tailor messages each week on the basis of participant responses and engagement
	Adaptation/ Fidelity:	Two peer leaders (1 in each group) did not finish the training, leaving 16 leaders who were trained and qualified to conduct the intervention. Table 2 provides figures for participation/engagement by type of communication and arm – for messages in intervention arm: 94.7% in period 1, 91.2% in period 2, and 77.2% in period 3
	Comparator:	Placebo Facebook control groups, with peer leaders communicating the importance of exercising, healthy eating, and maintaining a low-stress lifestyle
	Other groups:	n/a
Outcomes^	*Outcomes^*	HIV testing (3 m)
Other	*Funding:*	National Institute of Mental Health (NIMH; Young K01 MH 090884), UCLA CHIPTS, and the UCLA AIDS Institute.
	Conflict of interest:	Disclosures can be viewed at www. acponline.org/authors/icmje/ ConflictOfInterestForms.do?msNumM13-0422.

Zhu (2019)[71] [cited in text: Zhao 2018[72]]

Aim*	This study tested a mobile health (mHealth) intervention program entitled WeTest, delivered via the WeChat mobile app, to promote oral HIV self-testing (HIVST) among MSM in Hefei, China.	
Methods	*Design (study name):*	Pilot two-arm parallel-group RCT (WeTest)
	Trial dates/ duration:	Sep/17-Jun/18 (study period, 9 months), 6 months intervention duration
	Trial registration:	ClinicalTrials.gov NCT03569462
Setting	*Country:*	China
	Location:	Hefei, the capital city of Anhui Province
	Recruitment setting:	Community, commercial and online venues frequented by MSM
Participants	*Participants:*	MSM, China (N=100)
	Inclusion criteria:	Age 18 or older; Chinese; cis-gender male; a history of unprotected anal sex with another man in the past 6 months; currently residing in Hefei with no intention to leave Hefei during the study period; HIV-negative or status unknown; willing to undergo HIVST; and in possession of a mobile smart-phone with capability to download and use WeChat.
	Exclusion criteria:	Individuals who previously participated in the open pilot
	Age:	> 18 years; 18-29 years: 68%; ≥ 30 years: 32%
	Sex:	100% male
	Sexuality:	100% MSM (78% gay or homosexual, 22% bisexual/heterosexual/other)

	Ethnicity:	Not reported
Intervention	*Summary:*	Smartphone App-based info and weekly messages plus HIVST kits vs HIVST kits only
	Theory/ techniques:	IMB [Information-Motivation-Behavioral] model of HIV behavior change[8]
	User involvement? [I] (Other?)	Yes, formative study, including indepth interviews, reported in Zhao 2018[72] and subsequent (pre-)testing with user involvement (Interdisciplinary research team worked in collaboration with CBO staff.)
	Targeted behaviour:	Preventive (condom use) and diagnosis-related (HIV testing)
	Intervention purpose:[II]	Inform/educate, remind/recall, teach skills (HIVST kit use)
	Intervention content: (reported examples/ complete content?)	App-based information to MSM users regarding the use of and interpretation of HIVST kits, as well as other messages about HIV transmission, risk for other STIs, behavioral risk reduction, and the importance of regular HIV testing; plus two oral HIVST kits. WeTest messages included brief informational articles about HIV, STIs, and HIV testing; first-person stories about people diagnosed and living with HIV; local data about HIV and STI infections among MSM; news about national policies related to HIV; and stories about general health concerns of MSM. In addition to new content, a video and information text about using the oral HIVST kit were permanently available on the WeTest account. The account also included a two-way communication feature in which users could send a text message to a member of the WeTest team and receive a reply within 24 h. At the conclusion of the baseline session, all participants were provided two additional oral HIVST kits and received standard information about the need for sexually active HIV negative or status-unknown MSM to test for HIV every 3 to 6 months. (No example messages provided)
	Procedures/ MOD:	Participants in the intervention group (n = 50) downloaded the WeTest mobile app in the presence of the research assistant, who provided an overview of the WeTest account features including how to browse messages, videos, and news items on the account. They were instructed to maintain the WeTest account for 6 months, during which two new additional messages would be added to the account weekly.
	Timing/ frequency:	WeTest account maintained for 6 months, during which two new additional messages added weekly
	Intervention provider:	Researchers organised for messages to be sent
	'Push' component (unidirectional/ bidirectional?):	Messages sent via WeChat, including both unidirectional and bidirectional messages
	Other components & co-interventions:	In the case of an emergency, all participants were informed that a member of the project team was "on call" 24-h via the customer service account to provide immediate response, assistance, and referrals to any participant.
	Tailoring:##	No/ not reported
	Adaptation/ Fidelity:	A library of 79 messages were created and delivered to participants via WeChat during the intervention period. Based on software diagnostics, approximately 80% of these messages (63 of 79 messages) were read by > 20% of participants and 15% of the messages (12 of 79 messages) were read by > 50% of participants; 5 intervention group participants "unfollowed" the WeTest account; these participants discontinued active participation between three to five months following enrollment
	Comparator:	No app-based information; general baseline procedures, two oral HIVST kits and SOC only
	Other groups:	n/a
Outcomes^		Condom use, HIV testing (6 m)

Other	*Funding:*	This research was supported by NIH-NIMH grant R34MH106349.
	Conflict of interest:	None declared

Footnote

* Aim(s) and rationale as stated in the report; [|]User involvement during intervention development? ^ Outcome categories (and assessment time points) included in review, for specific outcomes see Supplementary File 8; ~ Other groups not included in this review; [#] De Tolly: data unextractable due to figures not adding up and failed attempts to obtain response from authors; [||] Defined as in Kaufman 2017[6]; listed are those classified 'yes' versus 'no/not reported/ unclear'; [##] Defined as in TIDieR checklist[5] (Tailoring:## "If the intervention was planned to be personalised, titrated or adapted")

Acronyms: AE, adverse events; CBO, Community-based organisation; EHRS, electronic health record system; FU, follow-up; HCT, HIV counselling and testing; HIVST, HIV self-testing; MSM, men having sex with men; MOD, mode of delivery; PN, partner notification; RCT, randomized controlled trial; SH, sexual health; SMS, short message service (mobile phone text messaging); SOC, standard of care (in the given setting at the given time); STI, sexually transmitted infection;

Abbreviations: App, application; behav., behaviour; compl., compliance with STI treatment instructions (drug adherence and abstinence till infection has cleared); m, month(s); n/a, not applicable; vs, versus; w, week(s)

References

1. World Health Organization. World Health Statistics 2017, ANNEX C: WHO regional groupings. Geneva: WHO, 2017.
2. World Bank. Data - World Bank Country and Lending Groups Washington DC2020 [cited 2020 24th Sep]. Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups accessed 24th Sep 2020.
3. World Health Organization. Recognizing adolescence Geneva: WHO; 2020 [Available from: https://apps.who.int/adolescent/second-decade/section2/page1/recognizing-adolescence.html accessed 24th Sep 2020.
4. Higgins JPT, Thomas J, Chandler J, et al. Cochrane Handbook for Systematic Reviews of Interventions. 2nd ed. Chichester (UK): John Wiley & Sons 2019.
5. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ : British Medical Journal* 2014;348:g1687. doi: 10.1136/bmj.g1687
6. Kaufman J, Ames H, Bosch-Capblanch X, et al. The comprehensive 'Communicate to Vaccinate' taxonomy of communication interventions for childhood vaccination in routine and campaign contexts. *BMC public health* 2017;17(1):423. doi: 10.1186/s12889-017-4320-x [published Online First: 2017/05/11]
7. de Tolly K, Skinner D, Nembaware V, et al. Investigation into the use of short message services to expand uptake of human immunodeficiency virus testing, and whether content and dosage have impact. *Telemedicine Journal & E-Health* 2012;18(1):18-23. doi: https://dx.doi.org/10.1089/tmj.2011.0058
8. Fisher JD, Fisher WA. Changing AIDS-risk behavior. *Psychol Bull* 1992;111(3):455-74. doi: 10.1037/0033-2909.111.3.455 [published Online First: 1992/05/01]
9. Delamere S, Dooley S, Harrington L, et al. P92 - Safer sex text messages: Evaluating a health education intervention in an adolescent population. *Sexually transmitted infections* 2006;82:A27.

10. Downing SG, Cashman C, McNamee H, et al. Increasing chlamydia test of re-infection rates using SMS reminders and incentives. *Sexually transmitted infections* 2013;89(1):16-9. doi: https://dx.doi.org/10.1136/sextrans-2011-050454
11. Free C, McCarthy O, French RS, et al. Can text messages increase safer sex behaviours in young people? Intervention development and pilot randomised controlled trial. *Health Technology Assessment (Winchester, England)* 2016;20(57):1-82. doi: https://dx.doi.org/10.3310/hta20570
12. McCarthy OL, French RS, Baraitser P, et al. Safetxt: a pilot randomised controlled trial of an intervention delivered by mobile phone to increase safer sex behaviours in young people. *BMJ Open* 2016;6(12):e013045. doi: https://dx.doi.org/10.1136/bmjopen-2016-013045
13. Free C, Swinson R, Potter K, et al. Safetxt: A randomised controlled trial of an intervention delivered by mobile phone messaging designed to reduce infection with chlamydia and gonorrhoea-recruitment methods. *Sexually transmitted infections* 2017;93 (Supplement 1):A88. doi: http://dx.doi.org/10.1136/sextrans-2017-053232.260
14. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42. doi: 10.1186/1748-5908-6-42 [published Online First: 2011/04/26]
15. Gold J, Aitken CK, Dixon HG, et al. A randomised controlled trial using mobile advertising to promote safer sex and sun safety to young people. *Health Education Research* 2011;26(5):782-94. doi: https://dx.doi.org/10.1093/her/cyr020
16. Weinstein ND. The precaution adoption process. *Health Psychol* 1988;7(4):355-86. doi: 10.1037//0278-6133.7.4.355 [published Online First: 1988/01/01]
17. Ajzen I. From Intentions to Actions: A Theory of Planned Behavior. In: Kuhl J., J. B, eds. Action Control SSSP Springer Series in Social Psychology. Berlin, Heidelberg: Springer 1985.
18. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy* 1978;1(4):139-61. doi: https://doi.org/10.1016/0146-6402(78)90002-4
19. Govender K, Beckett S, Masebo W, et al. Effects of a Short Message Service (SMS) Intervention on Reduction of HIV Risk Behaviours and Improving HIV Testing Rates Among Populations located near Roadside Wellness Clinics: A Cluster Randomised Controlled Trial in South Africa, Zimbabwe and Mozambique. *AIDS & Behavior* 2019;23(11):3119-28. doi: https://dx.doi.org/10.1007/s10461-019-02427-6
20. Kelvin EA, George G, Kinyanjui S, et al. Announcing the availability of oral HIV self-test kits via text message to increase HIV testing among hard-to-reach truckers in Kenya: a randomized controlled trial. *BMC public health* 2019;19(1):7. doi: https://dx.doi.org/10.1186/s12889-018-6345-1
21. George G, Chetty T, Strauss M, et al. Costing analysis of an SMS-based intervention to promote HIV self-testing amongst truckers and sex workers in Kenya. *PLoS ONE [Electronic Resource]* 2018;13(7):e0197305. doi: https://dx.doi.org/10.1371/journal.pone.0197305
22. Kelvin EA, George G, Mwai E, et al. A Randomized Controlled Trial to Increase HIV Testing Demand Among Female Sex Workers in Kenya Through Announcing the Availability of HIV Self-testing Via Text Message. *AIDS & Behavior* 2019;23(1):116-25. doi: https://dx.doi.org/10.1007/s10461-018-2248-5
23. Lim MS, Hocking JS, Aitken CK, et al. Impact of text and email messaging on the sexual health of young people: a randomised controlled trial. *Journal of Epidemiology & Community Health* 2012;66(1):69-74. doi: https://dx.doi.org/10.1136/jech.2009.100396
24. Lim M, Hocking J, Aitken C, et al. A randomized controlled trial of the impact of email and text (SMS) messages on the sexual health of young people. *Sexual Health - SEX HEALTH* 2007;4 doi: 10.1071/SHv4n4Ab16
25. Mimiaga MJ, Thomas B, Biello K, et al. A Pilot Randomized Controlled Trial of an Integrated In-person and Mobile Phone Delivered Counseling and Text Messaging Intervention to Reduce HIV Transmission Risk among Male Sex Workers in Chennai, India. *AIDS & Behavior* 2017;21(11):3172-81. doi: https://dx.doi.org/10.1007/s10461-017-1884-5

26. Biello KB, Thomas BE, Johnson BE, et al. Transactional sex and the challenges to safer sexual behaviors: a study among male sex workers in Chennai, India. *AIDS Care* 2017;29(2):231-38. doi: 10.1080/09540121.2016.1204421 [published Online First: 2016/07/12]
27. Thomas B, Closson EF, Biello K, et al. Development and Open Pilot Trial of an HIV-Prevention Intervention Integrating Mobile-Phone Technology for Male Sex Workers in Chennai, India. *Arch Sex Behav* 2017;46(4):1035-46. doi: 10.1007/s10508-015-0665-3 [published Online First: 2015/12/31]
28. Mugo PM, Wahome EW, Gichuru EN, et al. Effect of Text Message, Phone Call, and In-Person Appointment Reminders on Uptake of Repeat HIV Testing among Outpatients Screened for Acute HIV Infection in Kenya: A Randomized Controlled Trial. *PLoS ONE [Electronic Resource]* 2016;11(4):e0153612. doi: https://dx.doi.org/10.1371/journal.pone.0153612
29. Mugo PM, Wahome EW, Gichuru E, et al. Effect of SMS, phone-call, and in-person reminders on repeat HIV test uptake in Kenya. *Topics in Antiviral Medicine* 2016;24 (E-1):420.
30. Nielsen AM, De Costa A, Gemzell-Danielsson K, et al. The MOSEXY trial: Mobile phone intervention for sexual health in youth - A pragmatic randomised controlled trial to evaluate the effect of a smartphone application on sexual health in youth in Stockholm, Sweden. *Sexually Transmitted Infections* 2019 doi: http://dx.doi.org/10.1136/sextrans-2019-054027
31. Nielsen A, De Costa A, Bagenholm A, et al. Trial protocol: a parallel group, individually randomized clinical trial to evaluate the effect of a mobile phone application to improve sexual health among youth in Stockholm County. *BMC public health* 2018;18(1):216. doi: https://dx.doi.org/10.1186/s12889-018-5110-9
32. Nielsen A, Bågenholm A, De Costa A. Development of a Mobile Phone App to Promote Safe Sex Practice Among Youth in Stockholm, Sweden: Qualitative Study. *JMIR Form Res* 2020;4(1):e12917. doi: 10.2196/12917
33. Prochaska JO, Velicer WF. The Transtheoretical Model of Health Behavior Change. *American Journal of Health Promotion* 1997;12(1):38-48. doi: 10.4278/0890-1171-12.1.38
34. National Cancer Institute, Human Services, US Department of Health, et al. Theory at a Glance: A Guide for Health Promotion Practicee. . 2nd ed. Washington DC: NIH, 2005.
35. Parkes-Ratanshi R, Mbazira Kimeze J, Nakku-Joloba E, et al. Low male partner attendance after syphilis screening in pregnant women leads to worse birth outcomes: the Syphilis Treatment of Partners (STOP) randomised control trial. *Sex Health* 2020;17(3):214-22. doi: 10.1071/SH19092 [published Online First: 2020/06/13]
36. Parkes-Ratanshi R, Mbazira KJ, Nakku-Joloba E, et al. Congenital syphilis prevention in Uganda; a randomised trial of three different approaches to partner notification for pregnant women: OVERRIDE. *HIV Medicine* 2018;19 (Supplement 2):S132.
37. Manabe YC, Namale G, Nalintya E, et al. Integration of antenatal syphilis screening in an urban HIV clinic: a feasibility study. *BMC Infect Dis* 2015;15(1):15. doi: 10.1186/s12879-014-0739-1
38. Reback CJ, Fletcher JB, Swendeman DA, et al. Theory-Based Text-Messaging to Reduce Methamphetamine Use and HIV Sexual Risk Behaviors Among Men Who Have Sex with Men: Automated Unidirectional Delivery Outperforms Bidirectional Peer Interactive Delivery. *AIDS & Behavior* 2019;23(1):37-47. doi: https://dx.doi.org/10.1007/s10461-018-2225-z
39. Reback CJ, Fletcher JB, Leibowitz AA. Cost effectiveness of text messages to reduce methamphetamine use and HIV sexual risk behaviors among men who have sex with men. *Journal of Substance Abuse Treatment* 2019;100:59-63. doi: http://dx.doi.org/10.1016/j.jsat.2019.02.006
40. Reback CJ, Fletcher JB, Swendeman D. Theory-based text messages reduce methamphetamine use and HIV sexual risk behaviors among MSM. *Journal of Neuroimmune Pharmacology* 2017;12 (2 Supplement 1):S89. doi: http://dx.doi.org/10.1007/s11481-017-9751-8
41. Reback CJ, Fletcher JB. Theory-based text-messaging to reduce meth and sex risks among MSM. *Drug and Alcohol Dependence* 2015;156:e186-e87. doi: http://dx.doi.org/10.1016/j.drugalcdep.2015.07.502

42. Reback CJ, Ling D, Shoptaw S, et al. Developing a Text Messaging Risk Reduction Intervention for Methamphetamine-Using MSM: Research Note. *The open AIDS journal* 2010;4:116-22. doi: 10.2174/1874613601004030116
43. Reback CJ, Fletcher JB, Shoptaw S, et al. Exposure to Theory-Driven Text Messages is Associated with HIV Risk Reduction Among Methamphetamine-Using Men Who have Sex with Men. *AIDS and behavior* 2015;19 Suppl 2:130-41. doi: 10.1007/s10461-014-0985-7 [published Online First: 2015/01/08]
44. Rosenstock IM. Historical Origins of the Health Belief Model. *Health Education Monographs* 1974;2(4):328-35. doi: 10.1177/109019817400200403
45. Rinehart DJ, Leslie S, Durfee MJ, et al. Acceptability and Efficacy of a Sexual Health Texting Intervention Designed to Support Adolescent Females. *Academic Pediatrics* 2019 doi: http://dx.doi.org/10.1016/j.acap.2019.09.004
46. Rokicki S, Cohen J, Salomon JA, et al. Impact of a Text-Messaging Program on Adolescent Reproductive Health: A Cluster-Randomized Trial in Ghana. *American journal of public health* 2017;107(2):298-305. doi: 10.2105/AJPH.2016.303562 [published Online First: 2016/12/21]
47. Suffoletto B, Akers A, McGinnis KA, et al. A sex risk reduction text-message program for young adult females discharged from the emergency department. *Journal of Adolescent Health* 2013;53(3):387-93. doi: https://dx.doi.org/10.1016/j.jadohealth.2013.04.006
48. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the Health Belief Model. *Health Educ Q* 1988;15(2):175-83. doi: 10.1177/109019818801500203 [published Online First: 1988/01/01]
49. Tang W, Wei C, Cao B, et al. Crowdsourcing to expand HIV testing among men who have sex with men in China: A closed cohort stepped wedge cluster randomized controlled trial. *PLoS Medicine / Public Library of Science* 2018;15(8):e1002645. doi: https://dx.doi.org/10.1371/journal.pmed.1002645
50. Group SS, Tucker JD. Crowdsourcing to promote HIV testing among MSM in China: study protocol for a stepped wedge randomized controlled trial. *Trials [Electronic Resource]* 2017;18(1):447. doi: https://dx.doi.org/10.1186/s13063-017-2183-1
51. Wu D, Tang W, Lu H, et al. Leading by Example: Web-Based Sexual Health Influencers Among Men Who Have Sex With Men Have Higher HIV and Syphilis Testing Rates in China. *Journal of medical Internet research* 2019;21(1):e10171. doi: https://dx.doi.org/10.2196/10171
52. Tucker JD, Fenton KA. Innovation challenge contests to enhance HIV responses. *Lancet HIV* 2018;5(3):e113-e15. doi: 10.1016/S2352-3018(18)30027-4
53. Trent M, Perin J, Gaydos CA, et al. Efficacy of a Technology-Enhanced Community Health Nursing Intervention vs Standard of Care for Female Adolescents and Young Adults with Pelvic Inflammatory Disease: A Randomized Clinical Trial. *JAMA Network Open* 2019;2(8) doi: http://dx.doi.org/10.1001/jamanetworkopen.2019.8652
54. Ha M, Belcher H, Butz A, et al. Partner notification, treatment, and subse-quent condom use: Pelvic inflammatory disease: Implications for dyadic intervention. *Journal of Adolescent Health* 2018;62 (2 Supplement 1):S11.
55. Trent M, Gaydos C, Perin J, et al. Effectiveness of technology enhanced community health nursing (TECH-N) for adolescents and young adult women with pelvic inflammatory disease. *Journal of Adolescent Health* 2017;60 (2 Supplement 1):S10.
56. Trent ME, Chung SE, Gaydos C, et al. Urban minority youth participation in clinical research: Testing the design of the TECH-N trial. *Journal of Adolescent Health* 2015;56(2):S25-S26. doi: http://dx.doi.org/10.1016/j.jadohealth.2014.10.051
57. Trent M, Chung S-E, Gaydos C, et al. Recruitment of Minority Adolescents and Young Adults into Randomised Clinical Trials: Testing the Design of the Technology Enhanced Community Health Nursing (TECH-N) Pelvic Inflammatory Disease Trial. *Eur Med J Reprod Health* 2016;2(1):41-51.
58. Fishbein M. A reasoned action approach to health promotion. *Med Decis Making* 2008;28(6):834-44. doi: 10.1177/0272989X08326092 [published Online First: 2008/11/19]

59. Jemmott LS, Jemmott JB, Hutchinson MK, et al. Sexually transmitted infection/HIV risk reduction interventions in clinical practice settings. *J Obstet Gynecol Neonatal Nurs* 2008;37(2):137-45. doi: 10.1111/j.1552-6909.2008.00221.x [published Online First: 2008/03/14]
60. Jemmott LS, Jemmott JB, 3rd, O'Leary A. Effects on sexual risk behavior and STD rate of brief HIV/STD prevention interventions for African American women in primary care settings. *American journal of public health* 2007;97(6):1034-40. doi: 10.2105/AJPH.2003.020271 [published Online First: 2007/04/26]
61. Ybarra ML, Prescott TL, Phillips GL, 2nd, et al. Pilot RCT Results of an mHealth HIV Prevention Program for Sexual Minority Male Adolescents. *Pediatrics* 2017;140(1) doi: https://dx.doi.org/10.1542/peds.2016-2999
62. Ybarra M, Prescott TL, Phillips GL, et al. Intervention-end outcomes for Guy2Guy, a text messaging-based HIV prevention program for gay, bisexual, and queer adolescent men. *Journal of Sexual Medicine* 2015;12 (Supplement 5):321.
63. Ybarra ML, Liu W, Prescott TL, et al. The Effect of a Text Messaging Based HIV Prevention Program on Sexual Minority Male Youths: A National Evaluation of Information, Motivation and Behavioral Skills in a Randomized Controlled Trial of Guy2Guy. *AIDS & Behavior* 2018;22(10):3335-44. doi: https://dx.doi.org/10.1007/s10461-018-2118-1
64. Ybarra ML, Prescott TL, Phillips GL, 2nd, et al. Ethical Considerations in Recruiting Online and Implementing a Text Messaging-Based HIV Prevention Program With Gay, Bisexual, and Queer Adolescent Males. *Journal of Adolescent Health* 2016;59(1):44-9. doi: https://dx.doi.org/10.1016/j.jadohealth.2016.03.020
65. Prescottt T, Phillips GL, Bull SS, et al. Beta test results of Guy2Guy: An mHealth HIV prevention program for sexual minority adolescent males. *Journal of Sexual Medicine* 2015;12 (Supplement 5):326.
66. Ybarra ML, Prescott TL, Philips GL, 2nd, et al. Iteratively Developing an mHealth HIV Prevention Program for Sexual Minority Adolescent Men. *AIDS and behavior* 2016;20(6):1157-72. doi: 10.1007/s10461-015-1146-3
67. Fisher J.D., W.A. F. Theoretical Approaches to Individual-Level Change in HIV Risk Behavior. In: Peterson J.L., R.J. D, eds. Handbook of HIV Prevention Boston, MA: Springer 2000.
68. Young SD, Cumberland WG, Lee SJ, et al. Social networking technologies as an emerging tool for HIV prevention: a cluster randomized trial. *Ann Intern Med* 2013;159(5):318-24. doi: https://dx.doi.org/10.7326/0003-4819-159-5-201309030-00005
69. Young SD, Holloway I, Jaganath D, et al. Project HOPE: online social network changes in an HIV prevention randomized controlled trial for African American and Latino men who have sex with men. *American journal of public health* 2014;104(9):1707-12. doi: https://dx.doi.org/10.2105/AJPH.2014.301992
70. Young SD, Harrell L, Jaganath D, et al. Feasibility of recruiting peer educators for an online social networking-based health intervention. *Health Educ J* 2013;72(3):276-82. doi: 10.1177/0017896912440768
71. Zhu X, Zhang W, Operario D, et al. Effects of a Mobile Health Intervention to Promote HIV Self-testing with MSM in China: A Randomized Controlled Trial. *AIDS & Behavior* 2019;23(11):3129-39. doi: https://dx.doi.org/10.1007/s10461-019-02452-5
72. Zhao Y, Zhu X, Pérez AE, et al. MHealth approach to promote Oral HIV self-testing among men who have sex with men in China: a qualitative description. *BMC public health* 2018;18(1):1146. doi: 10.1186/s12889-018-6046-9 [published Online First: 2018/09/29]