A counter-balanced randomised trial of YouthCHAT screening either before or after face-to-face HEEADSSS assessment was undertaken with 129 New Zealand 13-year old high school students of predominantly Māori and Pacific Island ethnicity.

**METHODS**

### CONSORT: Description of trial design (such as parallel, factorial) including allocation ratio

A randomised trial using a counterbalanced design was employed to deliver YouthCHAT screening either before or after face-to-face HEEADSSS assessment.

### CONSORT: Eligibility criteria for participants

All Year 9 (13-14 year old) students at a low decile high school in Auckland, New Zealand were invited to participate following the provision of written information about the study at the start of the school year and the completion of paired informed parental consent (using an opt-out process) and individual participant assent (as all students were under 16 years of age). No students were excluded from the study.

### CONSORT: Settings and locations where the data were collected

YouthCHAT data were collected electronically (completed on an iPad by students) and encrypted results were securely stored on a central database.

### CONSORT: Important changes to methods after trial commencement (such as eligibility criteria), with reasons

N/A

### CONSORT: Reporting of outcomes of all groups (including non-participants and dropouts)

N/A

### CONSORT: Description of patient recruitment

All Year 9 (13-14 year old) students at a low decile high school in Auckland, New Zealand were invited to participate following the provision of written information about the study at the start of the school year and the completion of paired informed parental consent (using an opt-out process) and individual participant assent (as all students were under 16 years of age). No students were excluded from the study.

### CONSORT: Open vs. closed, web-based vs. face-to-face assessments

N/A

### CONSORT: Computer / Internet literacy

N/A

### CONSORT: Information giving during recruitment

All Year 9 (13-14 year old) students at a low decile high school in Auckland, New Zealand were invited to participate following the provision of written information about the study at the start of the school year and the completion of paired informed parental consent (using an opt-out process) and individual participant assent (as all students were under 16 years of age).

### CONSORT: Settings and locations where the data were collected

YouthCHAT data were collected electronically (completed on an iPad by students) and encrypted results were securely stored on a central database.

### CONSORT: Report if outcomes were (self-)assessed through online questionnaires

N/A

### CONSORT: Report how institutional affiliations are displayed

N/A

### CONSORT: Description of the interventions for each group with sufficient details to allow replication, including how and when they were actually administered

A counter-balanced randomised trial of YouthCHAT screening either before or after face-to-face HEEADSSS assessment was undertaken with 129 New Zealand 13-year old high school students of predominantly Māori and Pacific Island ethnicity.

### CONSORT: Comparison of the Electronic Composite Psychosocial Screener YouthCHAT with a Clinician-Interview Assessment for Young People: A Randomised Trial

The Youth version of the electronic Case-Finding and Help Assessment Tool (YouthCHAT) [13, 14] is a self-report, electronic screener that covers the following domains: smoking, drinking, recreational drug use (based on the Substances and Choices Scale, SACS)[15] problematic gambling, depression (based on the Patient Health Questionnaire – Adolescent Version, PHQ-A) [16, 17], anxiety (based on the Generalized Anxiety Disorder scale GAD-7), sexual health, general stresses, exposure to abuse, behaviour problems, anger management problems, eating problems and physical activity (https://yachat.org/psychic/youthchat/home).

### CONSORT: Digital preservation

The Youth version of the electronic Case-Finding and Help Assessment Tool (YouthCHAT) [13, 14] is a self-report, electronic screener that covers the following domains: smoking, drinking, recreational drug use (based on the Substances and Choices Scale, SACS)[15] problematic gambling, depression (based on the Patient Health Questionnaire – Adolescent Version, PHQ-A) [16, 17], anxiety (based on the Generalized Anxiety Disorder scale GAD-7), sexual health, general stresses, exposure to abuse, behaviour problems, anger management problems, eating problems and physical activity (https://yachat.org/psychic/youthchat/home).

### CONSORT: Access

All Year 9 (13-14 year old) students at a low decile high school in Auckland, New Zealand were invited to participate following the provision of written information about the study at the start of the school year and the completion of paired informed parental consent (using an opt-out process) and individual participant assent (as all students were under 16 years of age). No students were excluded from the study.

### CONSORT: Mode of delivery, features/functionality/components of the intervention and comparator, and the theoretical framework

YouthCHAT modules described in Table 1
The Youth version of the electronic Case-Finding and Help Assessment Tool (YouthCHAT)[13, 14] is a self-report, electronic screener that covers the following domains: smoking, drinking, recreational drug use (based on the Substances and Choices Scale, SACS).[15] problematic gambling, depression (based on the Patient Health Questionnaire – Adolescent Version, PHQ-A) [16, 17], anxiety (based on the Generalized Anxiety Disorder scale GAD-7), sexual health, general stresses, eating problems and physical activity (https://chat.org/projects/youthchat/home). For each positive domain screened, there is a ‘help’ question that asks participants if they would like help either today or later. Responses to the ‘help’ question support conversations between young people and their health providers about the issues they would like addressed, which facilitates shared decision-making, with increased likelihood that real sustained changes will be made.

5-a) Describe use parameters
Only completed once per participant

5-b) Specify whether humans were involved

5-c) Clarify the level of human involvement
Participants were randomised to receive either HEEADSSS assessment by a school nurse followed by YouthCHAT on an iPad (condition 1) or YouthCHAT followed by HEEADSSS assessment (condition 2) during a planned break from class time when students would usually have been receiving their HEEADSSS assessment. Review of results and any necessary follow-up was arranged by the school nurse immediately following the completion of YouthCHAT screening and HEEADSSS assessment.

5-d) Report any prompts/reminders used
N/A, one off use supported by school nurse

5-e) Describe any co-interventions (incl. training/support)
N/A

6-a) CONSORT: Completely defined: Defined primary and secondary outcome measures, including how and when they were assessed
Primary outcome measures were 1) the time taken to complete YouthCHAT and HEEADSSS, 2) comparative detection rates for YouthCHAT and HEEADSSS for each issue, and 3) acceptability of YouthCHAT to students and staff.

6-i) Online questionnaires: describe if they were validated for online use and apply CHERRIES items to describe how the questionnaires were designed/employed
No online questionnaires used

6-a-ii) Describe whether and how “use” (including intensity of use/dosage) was defined/measured/monitored
Single use only

6-a-iii) Describe whether, how, and when qualitative feedback from participants was obtained
A subset of students completed paper-based acceptability questionnaires and the three school nurses were interviewed individually.

6-b) CONSORT: Changes to trial outcomes after the trial commenced, with reasons
A subset of students completed paper-based acceptability questionnaires and the school nurses were interviewed individually.

6-b-i) Changes to trial outcomes after the trial commenced, with reasons

7-a) CONSORT: How sample size was determined
HEEADSSS for each issue, and 3) acceptability of YouthCHAT to students and staff.

7-b) CONSORT: Details of any interim analyses and stopping guidelines
Primary outcome measures were 1) the time taken to complete YouthCHAT and HEEADSSS, 2) comparative detection rates for YouthCHAT and HEEADSSS for each issue, and 3) acceptability of YouthCHAT to students and staff.

7-c) CONSORT: How sample size was determined

8-a) CONSORT: Method used to generate the random allocation sequence
Computer-generated randomisation described in study protocol (ref 30)

8-b) CONSORT: Type of randomisation; details of any restriction (such as blocking and block size)
Computer-generated randomisation described in study protocol (ref 30)

9) CONSORT: Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned
Primary outcome measures were 1) the time taken to complete YouthCHAT and HEEADSSS, 2) comparative detection rates for YouthCHAT and HEEADSSS for each issue, and 3) acceptability of YouthCHAT to students and staff.

8-a) CONSORT: Method used to generate the random allocation sequence

10) CONSORT: Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions
Computer-generated randomisation described in study protocol (ref 30) - list provided to school nurses

11) CONSORT: Blinding - If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how
N/A

11a) CONSORT: Specify who was blinded, and who wasn’t

11ii) CONSORT: Discuss e.g., whether participants knew which intervention was the “intervention of interest” and which one was the “comparator”

12-a) CONSORT: For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome

12b) CONSORT: If relevant, description of the similarity of interventions
Both interventions described in methods section

12c) CONSORT: Statistical methods used to compare groups for primary and secondary outcomes
Quantitative data was analysed using Microsoft Excel and SPSS (Statistical Software Package). Analyses included basic descriptive statistics, between-intervention analyses undertaken with paired t-tests (for numeric variables) or McNemar’s tests (for categorical variables) and between-condition non-parametric analyses undertaken with Mann-Whitney U tests. Distributions were checked for normality throughout.

12-a) CONSORT: Statistical methods used to compare groups for primary and secondary outcomes

12-a-i) Imputation techniques to deal with attrition / missing values
N/A

12-b) CONSORT: Methods for additional analyses, such as subgroup analyses and adjusted analyses
N/A

RESULTS

13-a) CONSORT: For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome
From the 139 eligible students, 129 attended. Electronic screening and face to face assessments were carried out between March and November 2017. Incomplete or missing data for 16 students provided a total sample size of N =113 for analysis (81%) - see Figure 1. Demographics are shown in Table 2. Nearly two thirds were of Pacific and one third of Māori ethnicity, with roughly equal males and females. From the 32 students invited to participate in a focus group (eight each term), 21 (66%) attended, with three groups of five and one group of six.

13-b) CONSORT: Describe the periods of recruitment and follow-up

13c) CONSORT: Dates defining the periods of recruitment and follow-up
Electronic screening and face to face assessments were carried out between March and November 2017.

13-a-i) CONSORT: For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome

14-a) CONSORT: Dates defining the periods of recruitment and follow-up

14-a-i) CONSORT: For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome

14-b) CONSORT: Why the trial ended or was stopped (early)
N/A

15-a) CONSORT: A table showing baseline demographic and clinical characteristics for each group
Demographics are shown in Table 2. Nearly two thirds were of Pacific and one third of Māori ethnicity, with roughly equal males and females. From the 32 students invited to participate in a focus group (eight each term), 21 (66%) attended, with three groups of five and one group of six.

15-b) CONSORT: Report demographics associated with digital divide issues
All participants of the same age

16-a) CONSORT: For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups

16-a-i) CONSORT: For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups

16-b) CONSORT: For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups

16-i) CONSORT: For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups

16-i) Report multiple “denominators” and provide definitions
N/A

16-ii) Primary analysis should be intent-to-treat
N/A

17-a) CONSORT: For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)
Paired samples t-tests found that YouthCHAT took significantly less time (505 seconds faster on average, 95% CI: 380 to 670, P=0.001) to complete than HEEADSSS assessment.

17-a) CONSORT: For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)

17-b) CONSORT: Presentation of process outcomes such as metrics of use and intensity of use
N/A
20-i) CONSORT: For binary outcomes, presentation of both absolute and relative effect sizes is recommended
N/A
20) CONSORT: Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory
Qualitative analyses presented in tables 6, 7
18-i) Subgroup analysis of comparing only users
N/A
19) CONSORT: All important harms or unintended effects in each group
For several students, the Wi-Fi connection was lost for YouthCHAT, which may be reflected in the outlier durations of 25 to 54 minutes, whereas the vast majority took 10 minutes or less.
19-i) Include privacy breaches, technical problems
N/A
19-ii) Include qualitative feedback from participants or observations from staff/researchers
Presented in tables 6, 7
DISCUSSION
19) CONSORT: Trial limitations, addressing sources of potential bias, imprecision, multiplicity of analyses
Presented in tables 6, 7
20-i) Typical limitations in ehealth trials
Strengths of this study include the comparison of YouthCHAT with an existing means of evaluating young people for psychosocial problems; the high response rate and collection of both student and staff perspectives on the use of electronic screening within a school environment. The restriction of participants to 13-14 year olds and three school nurses from a single high school limit the generalisability of our findings. Due to the variability in the time taken to complete both tests being considerably less than anticipated (i.e. smaller standard deviations for the time taken to complete YouthCHAT screening and HEEADSSS assessment than expected), our power to detect a difference between the two interventions was higher than anticipated. Furthermore, there is a clear statistical difference between the interventions based on this sample. Therefore our final sample size was sufficient to answer our primary research questions. The inclusion of predominantly Māori and Pacific Island participants is both a strength and weakness of this study. Māori and Pacific peoples comprise 20% and 11% respectively of New Zealanders aged 10-17 years, hence these ethnicities are over-sampled. However, Māori and Pacific Island youth have higher rates of emotional difficulties [44] including depression [45] and suicide [46], yet access specialist services at lower rates than other ethnicities [47], so early identification and intervention for these youth is key. Finally, the inability to directly map the YouthCHAT modules to the HEEADSSS assessment domains limited the scope of comparison.
21) CONSORT: Generalisability (external validity, applicability) of the trial findings
Strengths of this study include the comparison of YouthCHAT with an existing means of evaluating young people for psychosocial problems; the high response rate and collection of both student and staff perspectives on the use of electronic screening within a school environment. The restriction of participants to 13-14 year olds and three school nurses from a single high school limit the generalisability of our findings. Due to the variability in the time taken to complete both tests being considerably less than anticipated (i.e. smaller standard deviations for the time taken to complete YouthCHAT screening and HEEADSSS assessment than expected), our power to detect a difference between the two interventions was higher than anticipated. Furthermore, there is a clear statistical difference between the interventions based on this sample. Therefore our final sample size was sufficient to answer our primary research questions. The inclusion of predominantly Māori and Pacific Island participants is both a strength and weakness of this study. Māori and Pacific peoples comprise 20% and 11% respectively of New Zealanders aged 10-17 years, hence these ethnicities are over-sampled. However, Māori and Pacific Island youth have higher rates of emotional difficulties [44] including depression [45] and suicide [46], yet access specialist services at lower rates than other ethnicities [47], so early identification and intervention for these youth is key. Finally, the inability to directly map the YouthCHAT modules to the HEEADSSS assessment domains limited the scope of comparison.
21-ii) Discuss if there were elements in the RCT that would be different in a routine application setting
N/A
22) CONSORT: Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence
Our results indicate that YouthCHAT is a time-saving, effective and acceptable psychosocial screener for use in a high school setting, and in general had similar or significantly higher detection rates than HEEADSSS. While the detection rate for mental health problems or distress was higher with HEEADSSS, this reflects poor mapping of the two assessments for this issue. YouthCHAT 'mental health' consisted solely of positive scores for depression or anxiety on the PHQ-4 or GAD-7, whereas the HEEADSSS domain also included many non-specific issues such as low mood, distress, unresolved grief, sadness about a historical event, and difficulty sleeping. Rates of depression, anxiety and substance use problems identified via YouthCHAT were in line with expectations for this age group [32, 33].
22-ii) Highlight unanswered new questions, suggest future research
Other information
23) CONSORT: Registration number and name of trial registry
This study was registered with the Australian New Zealand Clinical Trials Network Registry ACTRN12616001243404p.
24) CONSORT: Where the full trial protocol can be accessed, if available
Reference 30 (JMR)
25) CONSORT: Sources of funding and other support (such as supply of drugs), role of funders
This study was generously funded by the Starship Foundation, New Zealand. The funder did not have any direct involvement in the design or conduct of the study, analysis of the data, or write-up of the results.
X26-i) Comment on ethics committee approval
The study was approved by the New Zealand Northern Region Ethics Committee (16/CEN/137/AM03).
X26-ii) Outline informed consent procedures
All Year 9 (13-14 year old) students at a low decile high school in Auckland, New Zealand were invited to participate following the provision of written information about the study at the start of the school year and the completion of paired informed parental consent (using an opt-out process) and individual participant assent (as all students were under 16 years of age).
X26-iii) Safety and security procedures
N/A
X27-i) State the relation of the study team towards the system being evaluated
HT, SD, MD, MG and JM do not have any conflicts of interest to declare. FGS is the primary developer of YouthCHAT. HT, MD and FGS were supported by the University of Auckland for the submitted work.