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Cost-effectiveness of internet and telephone treatment for smoking cessation: an economic evaluation of The iQUITTT Study

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Abstract

Background—Internet and telephone treatments for smoking cessation can reach large numbers of smokers. There is little research on their costs and the impact of adherence on costs and effects.

Objective—To conduct an economic evaluation of The iQUITTT Study, a randomised trial comparing Basic Internet, Enhanced Internet and Enhanced Internet plus telephone counselling ('Phone') at 3, 6, 12 and 18 months.

Methods—We used a payer perspective to evaluate the average and incremental cost per quitter of the three interventions using intention-to-treat analysis of 30-day single-point prevalence and multiple-point prevalence (MPP) abstinence rates. We also examined results based on adherence. Costs included commercial charges for each intervention. Discounting was not included given the short time horizon.

Results—Basic Internet had the lowest cost per quitter at all time points. In the analysis of incremental costs per additional quitter, Enhanced Internet+Phone was the most cost-effective using both single and MPP abstinence metrics. As adherence increased, the cost per quitter dropped across all arms. Costs per quitter were lowest among participants who used the 'optimal'

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Competing interests Cobb is a consultant to Healthways Inc, which operates QuitNet, a web-based smoking cessation application using social networks. Tinkelman is medical director of the National Jewish Health QuitLine, and vice president of Health Initiatives for National Jewish which owns the QuitLine.

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level of each intervention, with an average cost per quitter at 3 months of US\$7 for Basic Internet, US\$164 for Enhanced Internet and US\$346 for Enhanced Internet +Phone.

Conclusions—‘Optimal’ adherence to internet and combined internet and telephone interventions yields the highest number of quitters at the lowest cost. Cost-effective means of ensuring adherence to such evidence-based programmes could maximise their population-level impact on smoking prevalence.

INTRODUCTION

Cigarette smoking remains the leading cause of preventable death in the USA, claiming 443,000 lives and costing approximately US\$193 billion annually (all \$ values given are US \$).¹ Despite effective behavioural and pharmacological treatments,² about 44 million Americans continue to smoke, and the decline in smoking prevalence has stalled, with smoking rates hovering around 20% since 2004.³ Accelerating the reduction in the prevalence of smoking will require innovative approaches to deliver cost-effective cessation interventions at the population level.^{4–6}

Internet and telephone interventions have great potential to impact smoking prevalence given their broad reach and accessibility.² More than 80% of US adults are internet users,⁷ and over 10 million adults search for cessation information annually.^{8,9} A growing number of randomised trials and meta-analyses of internet interventions provide evidence of effectiveness,^{10–12} but there are only a few studies of their cost-effectiveness.¹³ Telephone counselling is effective² and cost-effective,^{14,15} and ‘quitline’ services are available throughout the USA. Adding proactive telephone counselling to internet interventions (or vice versa) may further improve population impact at reasonable cost. Most US quitlines offer internet services,^{16,17} but there is limited evidence about the effectiveness and cost-effectiveness of combined treatment.^{18–21}

A critical parameter to consider in cost-effectiveness analyses is adherence,²² though it remains inconsistently evaluated and reported.²³ The importance of adherence to treatment outcome is well documented.^{24,25} Adherence is traditionally defined as ‘the extent to which a person’s behaviour corresponds with agreed recommendations from a healthcare provider’.²⁵ Since internet and telephone interventions have no specified prescriptions for use, adherence, in this context, may best be defined as ‘the extent to which individuals experience the content of the intervention’.²⁶ Adherence is low across internet studies, with a majority of participants using interventions minimally or not at all.^{27,28} Telephone counselling adherence is also lower in real-world practice.^{29,30}

Poor adherence in internet and telephone trials may have significant implications for cost-effectiveness because there is a well documented dose-response relationship between cessation treatments and abstinence, with greater treatment intensity associated with higher quit rates.² Including participants who use an intervention minimally or not at all in cost-effectiveness analyses, may result in incomplete and/or misleading interpretations of cost-effectiveness results. We are aware of no cost-effectiveness studies that have addressed adherence in trials of internet and telephone cessation interventions.

The purpose of this study was to conduct an economic evaluation of The iQUITTT Study,³¹ a randomised trial of internet and telephone treatment for smoking cessation, and to examine the impact of treatment adherence on cost-effectiveness. These data can be used to inform decisions about intervention delivery, and to highlight the importance of adherence as an important consideration for future research.

METHODS

Overview of The iQUITT study

The iQUITT Study was a three-group randomised trial (clinicaltrials.gov NCT00282009) that compared the effectiveness of an Enhanced Internet smoking cessation programme—alone and in combination with integrated, proactive, telephone counselling—with a Basic Internet comparison condition. The study has been described elsewhere.^{31,32} Briefly, US smokers were recruited between 2005 and 2007 using active user interception sampling. Consistent with recommendations for reporting standardised cessation outcomes,³³ and to allow for comparisons with other published studies, the primary outcomes were self-reported 30-day single-point prevalence (SPP) abstinence, and 30-day multiple-point prevalence (MPP) abstinence (abstinence at a particular follow-up and all prior time points) measured at 3, 6, 12 and 18 months post-randomisation. Abstinence rates were calculated using intention-to-treat analysis which counted participants lost to follow-up as smoking. Biochemical verification of abstinence was not feasible or recommended since this was a national sample enrolled through the internet.³⁴ All participants provided informed consent, and the study was approved by the Georgetown University Institutional Review Board (protocol #2006-409).

Interventions

Participants randomised to Enhanced Internet were provided 6 months of free access to QuitNet.com, a widely used and longstanding commercial smoking cessation internet programme.^{31,35,36} QuitNet provides advice and assistance in accordance with evidence-based guidelines, and includes interactive features and a large online social network. Participants randomised to Enhanced Internet plus proactive telephone counselling (Enhanced Internet+Phone) received 6 months free access to QuitNet and proactive telephone counselling provided by trained cessation counsellors at National Jewish Health. Telephone counselling was seamlessly integrated with QuitNet; counsellors delivered the standard National Jewish five-call protocol and reinforced and encouraged use of QuitNet. In the Basic Internet condition, participants were provided 6 months of free access to static content extracted from QuitNet, including quitting and medication guides, a national directory of cessation programmes, and responses to 'Frequently Asked Questions'. The Basic Internet site was created for this trial as a minimal intervention comparison condition; it had no interactive features and no online social network.

The study was designed largely as a pragmatic randomised trial³⁷ to maximise generalisability and real-world relevance while preserving internal validity. We evaluated each intervention as used in the real world, with the goal of bridging the gap between tightly controlled clinical research and the applicability of research in practice. There were no incentives or other strategies to boost adherence.

Data collection

At each follow-up, research staff contacted participants by telephone to assess abstinence and other outcomes. Individuals not reached via telephone were emailed a link to an online survey. Participants were paid only for completing follow-up surveys (\$25 online, \$15 telephone).

Website utilisation metrics common to Basic and Enhanced Internet (logins, page views, minutes on the website, content used) were extracted from host servers; participation in the online social network (eg, number of QuitNet members to whom the participant sent messages) was extracted for those in Enhanced Internet. Telephone counsellors used a web-based tool to record the number, duration and content of calls.

Cost-effectiveness

The economic analysis followed published guidelines.^{38,39} Since smoking cessation results in improved survival and quality-adjusted life years compared with continued smoking,² we did not use life years saved as an outcome metric. Instead, we used conventions in comparable tobacco control studies^{19,40} to evaluate the average cost per quitter. We also calculated the incremental cost per additional quitter using a payer perspective since our goal was to inform decisions about widespread intervention delivery to large populations by insurers and other payers. The time horizon of the analysis was limited to the study period of 18 months post-randomisation, so we did not discount costs or effects. Costs were the commercial charges for each intervention. We did not include pharmacotherapy costs since medication was not provided to the study participants, its use was equally distributed across arms at baseline and at 3 months, use was not related to 3-month abstinence ($p=0.2778$), and there were no differential effects of pharmacotherapy use on abstinence by treatment arm ($p=0.5406$).

We also examined the impact of adherence on cost-effectiveness by considering the number of quitters in each arm by actual use of the interventions. We focused on participants who did not use the intervention at all, and participants whose level of treatment utilisation exceeded a certain threshold which we designated as 'optimal'. We examined 3-month utilisation and follow-up data since adherence was highest during the initial months of the study. We defined adherence based on three utilisation metrics: (1) treatment intensity (all three arms); (2) online community involvement (Enhanced Internet and Enhanced Internet +Phone arms only) and (3) telephone counselling use (Enhanced Internet+Phone). We used empirical data to identify thresholds where a significant dose-response relationship has been reported. For treatment intensity, 'optimal' adherence was defined as use of the assigned internet intervention for 30 min or more based on a meta-analysis demonstrating that the odds of cessation increase more than threefold when intervention contact time exceeds 30 min.² For online community involvement, 'optimal' adherence was defined as sending messages to one or more QuitNet members based on our previous research³⁵ which showed that communication with other QuitNet members differentiated quitters from current smokers. Finally, 'optimal' adherence for telephone counselling was defined as completing five or more calls since this is standard protocol,⁴¹ and there is a dose-response relation between sessions and treatment effectiveness.²

Effects

The primary effectiveness measure was the number of quitters at each follow-up, with abstinence defined as 30-day SPP and MPP abstinence based on intention to treat. Since the arms were balanced with respect to demographics, smoking profiles and use of pharmacotherapy, we used unadjusted effects for all analyses. Adherence analyses only consider 30-day SPP and MPP abstinence at 3 months since treatment utilisation was highest during the initial months of the study and tailed off significantly after 3 months.

Assignment of costs for intervention arms

The Basic Internet condition was designed to mirror the majority of publicly available (free) cessation websites, most of which contain static information.⁴² The challenge in estimating the costs per user for Basic Internet is that while many of the elements may be 'known' (eg, fixed development costs, hosting fees), the number of users is unknown. Were we to calculate the cost of Basic Internet as the known costs to develop and maintain the trial site divided by the number of Basic Internet study participants ($n=679$), the results would be inappropriately high. On the other hand, were we to assume the existence of a large-scale public health campaign driving people to the site (eg, up to 1 000 000 visitors/year in the BecomeAnEX campaign⁴³), the cost would approach pennies per individual (excluding

campaign costs). Thus, we assigned an estimated \$1 per user as a reasonable real-world cost to a payer to provide static web pages at scale.

The cost for Enhanced Internet was the \$40 subscription fee for QuitNet's premium service. This fee reflects the actual per-person cost to commercial payers for a longstanding, fully developed and maintained website with a large social network and evidence-based cessation content. The cost of Enhanced Internet+Phone was \$145 per participant, which reflects the charge from an established call centre working with a seamlessly integrated internet programme, and reflects 'at-scale' charges to deliver services to large numbers of individuals (eg, 100 000–200 000 users/year). Research costs were considered 'sunk costs' and were excluded from analyses.⁴⁴

Analysis

We assessed the average cost per quitter and incremental net cost of each intervention arm per additional quitter for our base case. We repeated the average cost per quitter analysis using actual intervention adherence. For incremental analyses, we ordered intervention arms by their total costs, from least to most costly (Basic Internet, Enhanced Internet, Enhanced Internet+Phone, respectively). We used the following formula to estimate incremental cost-effectiveness ratios:

$$(TC_x - TC_y) / (TQ_x - TQ_y)$$

where TC_x is the total cost of the intervention, TC_y is the total cost of the next least expensive intervention, TQ_x is the number of quitters in the intervention, and TQ_y is the number of quitters in the next least expensive intervention. If an intervention is more costly and less effective than the next least expensive comparator, it is labelled 'dominated' and would not be considered.

RESULTS

Study sample

Mean age of the 2005 participants was 35.9 years (SD=10.8), 51.1% were women, and proportions of racial/ethnic minorities were similar to US smokers⁴⁵ except that proportions of Hispanics and African-American men were slightly lower in this study than the general smoking population (table 1). There were no significant between-group differences on any baseline demographic or smoking variables.

Cessation outcomes

Using intention-to-treat analysis, 30-day SPP abstinence rates increased over time (table 2). Significant between-group differences in SPP were observed at 3, 6 and 12 months, but not at 18 months. Post hoc comparisons showed Enhanced Internet +Phone outperforming the other two conditions at 3 and 6 months, and Enhanced Internet at 12 months ($p<0.003$). The difference between Enhanced Internet and Basic Internet for SPP abstinence was not statistically significant at any follow-up.

In contrast with SPP rates, 30-day MPP abstinence rates declined across groups over time (table 2) since, by definition, no subsequent MPP data point can ever exceed a prior data point. Significant between-group differences in MPP were observed at all follow-ups with Enhanced Internet+Phone outperforming the other conditions. The difference between Enhanced Internet and Basic Internet for MPP abstinence was not statistically significant at any time.

Average cost per quitter—base case analysis

The average cost per quitter at 3 months was \$11 for Basic Internet, \$383 for Enhanced Internet and \$765 for Enhanced Internet+Phone (table 2). Using 30-day SPP abstinence, the average cost per quitter decreased over time across treatment groups, dropping to \$5 for Basic Internet, \$230 for Enhanced Internet and \$741 for Enhanced Internet+Phone by 18 months. Using 30-day MPP abstinence, the cost per quitter increased over time, reaching \$28 for Basic Internet, \$898 for Enhanced Internet and \$1882 for Enhanced Internet+Phone by 18 months.

Incremental costs per additional quitter

In the analysis of incremental cost per additional quitter (table 3), Enhanced Internet+Phone was the most cost-effective intervention at all follow-ups using both SPP and MPP abstinence. Compared with Enhanced Internet (the next least costly intervention), the cost per additional quitter for Enhanced Internet+Phone ranged from \$1197 at 3 months to \$3781 (SPP) and \$3123 (MPP) at 18 months.

Average cost per quitter—adherence analysis

Participants with higher levels of utilisation of each intervention had higher abstinence rates than those with lower utilisation (table 4). For Basic Internet, participants who spent 30+ min on the site were twice as likely to be abstinent (13.9% vs 5.4%). For Enhanced Internet, quit rates increased from 4.9% among those who spent no time on the site, to 14.6% among those who spent 30+ min, to 24.4% among those who spent 30+ min and sent messages to one or more QuitNet members. For Enhanced Internet+Phone, spending 30+ min on the site, sending internal messages to one or more QuitNet members, and completing 5+ calls, increased abstinence to 41.9%.

Since there were intervention costs for all participants, regardless of utilisation as adherence increased, the cost per quitter dropped across all treatment arms. Cost-effectiveness was best among the subset of participants who used the 'optimal' level of all intervention components (Scenario 5, table 4). The average cost per quitter in Enhanced Internet +Phone dropped from \$765 in the base case to \$346 in the 'optimal' scenario. Likewise, the cost per quitter in Enhanced Internet dropped from \$383 in the base to \$164 in the 'optimal' scenario. Increasing time online made moderate contributions to cost-effectiveness across treatment arms (Scenario 2), but adding 'optimal' use of online social support/sending messages (Scenario 3) and telephone counselling (Scenario 4) to time online among those in the respective arms resulted in even greater cost-effectiveness compared with non-use (Scenario 2).

DISCUSSION

This is one of the first studies to integrate a cost-effectiveness analysis within a clinical trial of internet and telephone treatment for smoking cessation. The results demonstrate that internet alone, and combined internet and telephone treatments, can be considered cost-effective tobacco dependence treatment modalities. Basic Internet had the lowest cost per quitter at all time points. In the analysis of incremental costs per additional quitter, Enhanced Internet+Phone was more costly than Enhanced Internet alone, but was also more effective, and thus, is considered the most cost-effective approach using both abstinence metrics. Overall, all three interventions are cost-effective and can be used to make a meaningful public health impact at the population level. Adherence to the 'optimal' level of the interventions was important to obtaining even better cost-efficiency for any option chosen to increase quit rates. Optimal use of the interactive features of the internet and telephone counselling yielded the most cost-effective choices. Increasing time spent on the

internet was not necessarily cost-effective without being supplemented by these interactive features.

Our results compare favourably with other cost-effectiveness studies of similar interventions. For instance, Tomson and colleagues¹⁵ reported telephone counselling costs of \$1052–\$1360 per quitter, defined as 7-day abstinence at 12 months (in 2004 US dollars). In our study, the cost per quit at 12 months using 30-day SPP abstinence was \$266 for Enhanced Internet and \$675 for Enhanced Internet+Phone. Even in the most conservative analyses using 30-day MPP, the cost per quit was \$840 and \$1529 for Enhanced Internet and Enhanced Internet+Phone, respectively. An and colleagues¹³ reported a cost per quit (defined as 30 days abstinence at 6 months) of \$291 for internet and \$1850 for telephone counselling, compared with our SPP results at the same time point of \$277 for Enhanced Internet and \$736 for Enhanced Internet+Phone. With a cost per quitter under \$2000 for all interventions even using the most conservative MPP abstinence metric at 18 months, our results suggest that internet and combined internet and telephone treatments are cost-effective approaches to tobacco dependence treatment.^{40, 46}

Analyses that stratified smokers according to differential utilisation of treatment services confirmed that treatment adherence is an important factor in determining treatment response (quitting) and cost-effectiveness. This finding is largely the consequence of the fact that there were increased quit rates observed with greater levels of adherence consistent with a dose-response relationship. These analyses may explain the equivalent performance of Basic Internet and Enhanced Internet in the parent trial,³¹ which is consistent with other studies that found no significant differences between static and interactive websites.^{47–49} We are currently exploring these results in more detail, but these findings are consistent with prior research demonstrating the importance of adherence.²⁴ Across all intervention arms, adherence to the ‘optimal’ level of the interventions was important to maximising cost-efficiency. Participation in the community and telephone counselling enhanced cost-effectiveness; increasing time spent on the internet was not necessarily cost-effective without being supplemented by these interactive features. The implication is that utilisation of the full range of intervention components in both internet and telephone interventions should be encouraged to realise maximal cost-efficiency.

Previous research suggests that the most effective cessation approaches combine treatment with supportive policies, media messages, and social and environmental supports.⁵⁰ Strategies to promote adherence could include incentives, self-monitoring systems that stimulate return visits, personal contacts,⁵¹ social network approaches³⁶ or systems-level interventions that leverage existing communication channels.⁵² None of the interventions in this trial had components or features specifically designed to maximise adherence. Indeed, like the majority of cessation treatments offered in the real world, the internet and telephone interventions in this study took a ‘buffet’ approach in that users self-selected which components they used. Overlaid on the intervention itself, strategies to increase adherence may incur their own costs. Thus, data are needed on the most effective and cost-efficient strategies to promote treatment adherence in the context of internet and telephone treatments.

Several limitations of this study should be considered. First, while the thresholds we selected to define ‘optimal’ adherence are based on empirical data,^{2,35,41} they are somewhat arbitrary since this is a new area of inquiry. These thresholds do not imply recommendations for treatment utilisation, but were designed to illustrate the cost implications of adherence. Second, commercial charges for the two intervention conditions were used rather than actual costs. However, these are the most relevant charges since they reflect the price to a payer (eg, large health plan), and are calculated at scales based on high-volume delivery. Third, we

used known costs in a real-world commercial setting for Enhanced Internet, but developed an arbitrary estimate for Basic Internet. The cost per person to a payer to provide static web pages could be higher or lower depending on scale, institutional resources and the nature of the intervention. At public health scale (ie, hundreds of thousands of visitors every year), the costs of hosting static content would be in pennies per person, while the costs of creating a static site for a small business (<500 employees) might exceed several hundred dollars per person. Fourth, the cost per quitter using intention-to-treat analysis likely represents the most conservative estimate given that we included the intervention costs for participants assumed to be smoking. Finally, it is not clear to what degree our results obtained with a volunteer research sample generalise to the general population of smokers who use these treatments in other contexts.

Direct comparison of our results with published findings is challenging given the variability in the metrics of abstinence reported in other trials, the length of follow-up, the economic evaluation methods used and the study setting.^{40,53} Previous studies have used varying metrics for reporting costs, with some using average cost per quitter, and others (including ours) including both average cost per quitter and incremental cost-effectiveness.⁵⁴ Since there are few economic analyses of internet interventions,⁴⁴ we provide a range of cost results and abstinence metrics³³ to inform decision makers and researchers interested in comparing our results with other studies.

Overall, this study demonstrates that internet and combined internet and telephone treatments are cost-effective, with relatively modest costs per quitter. Increased adherence to each of the interventions—taking advantage of major interactive components—further improved cost-effectiveness. Different modes of intervention may appeal to different smokers and, therefore, it is difficult to recommend one modality over another based solely on moderate differences in cost per quit. However, the results support the inclusion of scalable smoking cessation interventions, similar to those used in this study, into the healthcare delivery system where broad access and adherence could save lives and unnecessary smoking-attributable costs.

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What this study adds

- This is one of the first studies to provide evidence regarding the cost-effectiveness of internet and combined internet and telephone interventions for smoking cessation. A static, information-only comparison website had the lowest cost per quitter at all time points.
- In analyses of the incremental costs per additional quitter, the most cost-effective intervention was an interactive website with a large social network combined with proactive telephone counselling.
- The unique contribution of this study is the focus of the critical role of adherence in cost-effectiveness studies. Payers wishing to optimise their investment in smoking cessation interventions delivered to large populations will need to address low rates of adherence in both internet and combined internet and telephone interventions.
- Future research will need to identify the most effective and cost-efficient strategies to promote treatment adherence to maximise cessation outcomes.

Table 1**Baseline characteristics of participants in The iQUITT Study**

Demographic variables	
Age, years, n (%)	35.9 (10.8)
Women, n (%)	1024 (51.1)
Education (highest grade completed), n (%)	
Grade 1–11	63 (3.14)
Grade 12 or GED	381 (19.00)
College 1–3 years	947 (47.24)
College 4 years or more	614 (30.62)
Race, n (%)	
Caucasian	1735 (86.53)
African–American	173 (8.63)
Asian	62 (3.09)
Native Hawaiian/other Pacific Islander	8 (0.40)
American–Indian/Alaska Native	27 (1.35)
Hispanic, n (%)	81 (4.0)
Income, * n (%)	
<\$30000	565 (28.33)
\$30000–\$50000	567 (28.44)
\$50000–\$75000	400 (20.06)
>\$75000	462 (23.17)
Marital status, * n (%)	
Married	814 (40.64)
Cohabiting	309 (15.43)
Single	405 (20.22)
Separated	74 (3.69)
Divorced	381 (19.02)
Widowed	20 (1.00)
Employment status, * n (%)	
Full-time	1430 (71.39)
Part-time	187 (9.34)
Unemployed	111 (5.54)
Homemaker	91 (4.54)
Retired	42 (2.10)
Student	142 (7.09)
US Region, ** n (%)	
Northeast	359 (17.9)
Midwest	558 (27.9)
South	710 (35.5)
West	374 (18.7)
Smoking variables	

Age first puff, mean (SD), year	14.21 (3.73)
Age onset of daily smoking, mean (SD), year	17.19 (3.86)
Daily smoking rate (cigarettes per day), mean (SD)	20.00 (9.96)
# quit attempts past year, * mean (SD)	3.27 (8.00)
General internet use variables	
Duration of internet use, * n (%)	
Less than 1 year	40 (2.00)
1–2 years	35 (1.75)
2–5 years	331 (16.54)
More than 5 years	1595 (79.71)
Frequency of internet use, n (%)	
Several times a day	1546 (77.11)
About once a day	288 (14.36)
3–5 days per week	119 (5.93)
1–2 days per week	39 (1.95)
Every few weeks or less often	13 (0.65)
Type of internet connection, * n (%)	
Dial-up connection	289 (14.45)
Broadband connection	1711 (85.55)

* Participants were able to refuse answering a question or respond 'Don't know'. Sample sizes are: income, n=1994; marital status, n=2003; employment status, n=2003; # quit attempts, n=1999; duration of internet use, n=2001; type of internet connection, n=2000; US region, n=2001.

[†] Regions based on definition by the US Census Bureau, http://www.census.gov/geo/www/us_regdiv.pdf

Table 2

Average costs per quitter in The iQUITT Study (Base case analysis)

Intervention arm and time point	Number of participants	Cost per person (\$)	SPP abstinence rate (%) [*]	No of quitters	Cost per quitter (\$)†	MPP abstinence rate (%)‡	No of quitters	Cost per quitter (\$)†
3 months								
Basic Internet	679	1	9.1	62	11	9.1	62	11
Enhanced Internet	651	40	10.4	68	383	10.4	68	383
Enhanced Internet+phone	675	145	19.0	128	765	19.0	128	765
6 months								
Basic Internet	679	1	12.2	83	8	6.6	45	15
Enhanced Internet	651	40	14.4	94	277	7.4	48	543
Enhanced Internet+phone	675	145	19.7	133	736	12.4	84	1165
12 months								
Basic Internet	679	1	17.5	119	6	4.6	31	22
Enhanced Internet	651	40	15.1	98	266	4.8	31	840
Enhanced Internet+phone	675	145	21.5	145	675	9.5	64	1529
18 months								
Basic Internet	679	1	19.0	129	5	3.5	24	28
Enhanced Internet	651	40	17.4	113	230	4.5	29	898
Enhanced Internet+phone	675	145	19.6	132	741	7.7	52	1882

^{*} SPP abstinence rate: 30-day single-point prevalence abstinence.[†] Cost per quitter: total cost (number participants multiplied by cost per participant) divided by number of quitters.[‡] MPP abstinence rate: 30-day multiple-point prevalence abstinence.

Table 3

Incremental costs per additional quitter in The iQUITT Study

Intervention arm and time point	Number of participants	Cost per person (\$)	Total incremental cost (\$)*	SPP incremental # quitters	Cost per additional quitter (\$) [†]	MPP incremental #quitters	Cost Per additional quitter (\$) [‡]
3 months							
Basic Internet	679	1	—	—	—	—	—
Enhanced Internet	651	40	25361	6	4227	6	4227
Enhanced Internet+phone	675	145	71835	60	1197	60	1197
6 months							
Basic Internet	679	1	—	—	—	—	—
Enhanced Internet	651	40	25361	11	2305	3	8453
Enhanced Internet+phone	675	145	71835	39	1841	36	1995
12 months							
Basic Internet	679	1	—	—	—	—	—
Enhanced Internet	651	40	25361	-21	Dominated [‡]	0	Dominated [‡]
Enhanced Internet+phone	675	145	71835	47	1528	33	2176
18 months							
Basic Internet	679	1	—	—	—	—	—
Enhanced Internet	651	40	25361	-16	Dominated [‡]	5	5072
Enhanced Internet+phone	675	145	71835	19	3781	23	3123

*Total incremental cost=(total # participants × cost per person) minus (total # participants × cost per person for the next less expensive intervention).

[†]Cost per additional quitter=total incremental cost divided by incremental number of quitters.

[‡]‘Dominated’ means that the intervention costs more but is less effective than the next least expensive intervention.

Table 4

Average costs per quitter in The iQUITT Study (adherence analysis)

	Number of participants	Abstinence rate (%) [*]	No of quitters	Cost per person (\$)	Cost per quitter (\$)
Base case analysis (from table 2 above)					
Basic Internet	679	9.1	62	1	11
Enhanced Internet	651	10.4	68	40	383
Enhanced Internet+phone	675	19.0	128	145	765
Adherence Scenario 1: no utilisation (time online=0 min, # people sent messages to=0, calls=0)					
Basic Internet	147	5.4	8	1	18
Enhanced Internet	163	4.9	8	40	815
Enhanced Internet+phone	68	5.9	4	145	2465
Adherence Scenario 2: increase in time online only (time online 30 min, # people sent messages to=0, calls=0)					
Basic Internet	108	13.9	15	1	7
Enhanced Internet	199	14.6	29	40	274
Enhanced Internet+phone	37	5.4	2	145	2683
Adherence Scenario 3: increase in time online+community participation (time online 30 min, # people sent messages to 1, calls=0)					
Basic Internet	108	13.9	15	1	7
Enhanced Internet	82	24.4	20	40	164
Enhanced Internet+phone	10	30.0	3	145	483
Adherence Scenario 4: increase in time online+telephone counselling (time online 30 min, # people sent messages to=0, calls 5)					
Basic Internet	108	13.9	15	1	7
Enhanced Internet	199	14.6	29	40	274
Enhanced Internet+phone	95	37.9	36	145	383
Adherence Scenario 5: OPTIMAL utilisation (time online 30 min, # people sent messages to 1, calls 5)					
Basic Internet	108	13.9	15	1	7
Enhanced Internet	82	24.4	20	40	164
Enhanced Internet+phone	62	41.9	26	145	346

^{*} 30-day point prevalence abstinence at 3 months.

MPP, multiple-point prevalence; SPP, single-point prevalence.