

Connecticut Tobacco Quitline Evaluation: Economic Analysis

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Executive Summary

The Connecticut Department of Public Health (CT DPH) contracted with external evaluator Professional Data Analysts, Inc. to conduct a process and outcome evaluation of the Connecticut Quitline that included an economic analysis. This report explores the cost allocation and cost effectiveness of the Connecticut Quitline for fiscal year 2012 (July 2011 to June 2012) from the perspective of the CT DPH using cost per registrant and cost per treated tobacco users (two alternative cost allocation measures), as well as cost per quit (a cost effectiveness measure). These analyses were conducted from the perspective of the CT DPH.

The cost per registrant and cost per treated tobacco user measures estimate the cost to DPH per service unit purchased. The number of **registrants** include all those callers from whom the CT DPH is charged, and includes proxies (health care providers, friends, or family call on behalf of a tobacco users), as well as tobacco users who receive information and/or services. This calculation is useful because it demonstrates the Quitline vendor's efficiency in providing all of its services.

The cost per **treated tobacco user** is an alternative measure to the cost per registrant. It includes only tobacco users who received counseling. This measure is useful because it reflects the primary goal of the Quitline – to provide evidence-based treatment to help tobacco users quit. This measure can also be compared to the DPH's community based program's cost per enrollment (Capesius, 2013) and the CDC's recommended cost per tobacco user counseled measure (Centers for Disease Control and Prevention, 2004).

- The **cost per registrant** for fiscal year 2012 is **\$143**
- The **cost per treated tobacco user** for fiscal year 2012 is **\$188**. This falls well below the CDC recommended range of \$235 - \$309 (2012 dollars) and suggests that the Quitline vendor is efficiently providing counseling services to tobacco users.
- We recommend that the DPH compare the Quitline's cost per treated tobacco user to the cost per enrollment produced for DPH's community based cessation programs (Capesius, 2013). Because both reports were in production simultaneously, we were not able to make that comparison here.

In addition to the cost allocation estimates that PDA produced above, we also calculated a cost effectiveness ratio called cost per quit gained by the Quitline. The cost per quit gained measure estimates the incremental value of the Quitline in terms of "quits" as it is commonly understood in tobacco cessation: 30 day point prevalence calculated based on the recommendations of the North American Quitline Consortium (NAQC). Cost per quit is a ratio composed of a numerator (the difference in costs with and without the Quitline in the numerator) and a denominator (the difference in number of quits with and without the Quitline intervention).

As with the cost per registrant and treated tobacco users, costs include direct programming and administration costs for the Quitline. Direct costs of marketing and promotion were included, as well as costs to administer the media, because without media few would be aware of or call the Quitline. Quit data were also used in the cost per quit calculation, based on Alere Wellbeing's FY2012 follow-up survey that estimates 30-day point prevalence abstinence seven months post-enrollment, per NAQC recommendations. Several assumptions were also made to calculate the number of quits attributable to the Quitline.

- Our best fit assumptions estimate that the cost per quit is \$1,147.

This is considered best fit because we feel the assumptions we employed are most common and reasonable. However, it is possible that our estimates are either over- or under-estimates, so we varied our assumptions about including marketing and promotions costs, the rate of spontaneous quitting used, and the quit rate used to examine the impact of these assumptions on our results.

- Sensitivity analyses result in estimated cost per quit ratios ranging from \$973 in the case where media costs are excluded from analyses to \$1,782, where the rate of spontaneous quitting is assumed to 14% instead of 7%, as is the case for the best fit assumptions. We consider our estimates to be fairly robust to alternative assumptions.

The estimated cost per quit gained with no media cost included (\$973) can be compared to similar quitlines in Minnesota and Oregon. **We see that the Quitline's cost per quit is about two-and-half times than half than that of the Minnesota Helpline (\$2,479) and almost three times less than the Oregon quitline (\$2,830), suggesting that it compares favorably to quitlines nationally.**

The Quitline's cost per quit is also much less than cost per quit projects set by the Agency for Health Care Policy Research for intensive physician interventions with NRT (\$5,412) for all cases presented in the sensitivity analysis. This comparison is most useful when considering the cost effectiveness of the Quitline in relation to other common cessation interventions in which stakeholders may be interested in investing dollars. **Here, the Quitline is seen as being much more cost-effective than a similarly intensive physician program.**

Taken together, the evidence of this economic analysis suggests that the state of Connecticut is receiving a very efficiently run and high value service in the Connecticut Quitline.

Background

The Connecticut Department of Public Health (DPH) provides a comprehensive tobacco use prevention and control program which strives to enhance the well-being of Connecticut's residents by promoting tobacco-free lifestyles and by educating communities about the economic and health costs and consequences of tobacco use. The Connecticut Tobacco Quitline is one component of this comprehensive program. The Quitline is a free telephonic stop-smoking service offered to Connecticut residents. The Quitline provides both general information about tobacco cessation and telephonic counseling for tobacco users. Quitline services are provided under a contract with Alere Wellbeing, Inc. ("Alere").

About the evaluation

Alere is contracted to provide some Quitline evaluation services including providing monthly reports of Quitline use, conducting follow-up with callers to assess smoking status and satisfaction, and producing an annual report with quit rates and other information as requested by DPH.

DPH has also contracted with Professional Data Analysts, Inc. (PDA), to conduct an independent, comprehensive evaluation of the Connecticut DPH tobacco control efforts. This multi-component effort evaluates media campaigns, community-based cessation programs, as well as the Quitline. To date PDA's evaluation of the Quitline has included four main components. First, we produced quarterly reports which monitor Quitline implementation and service delivery. Second, we conducted a site visit to Alere to assess the vendor's staffing levels and quality assurance protocols. Third, PDA conducted an independent assessment of Alere's data collection processes and made recommendations to improve the alignment of data with NAQC minimal data set and the CDC's specifications for the National Quitline Data Warehouse. PDA has produced a series of annual reports describing the relationship between media promotion and Quitline call volume. These reports describe the number of callers, the Quitline's reach among all tobacco users in the state, and patterns of Quitline registration in response to media ads.

This report

This report presents results of two analyses of the Connecticut Quitline costs, including cost per enrollment and cost per quit measures. The report is structured in three main sections. Section 1 provides an introduction to the two types of cost analyses presented in this report, along with the purpose and use of each. Section 2 focuses on the cost per enrollment measures, first presenting the methodology and key definitions used in the cost calculations, followed by the results. Section 3 focuses on the cost per quit measure, describing methodology and key definitions and then presenting results, including a comparison to cost studies conducted by other state quitlines.

Introduction

Cost Analyses

Cost allocation studies are an important tool for program monitoring to ensure responsible financial management of resources. They are designed to identify what services are being provided for what costs. For tobacco cessation quitlines, **cost per enrollment** calculations can be used for this purpose and are reported here. The goal of this analysis is to better understand the efficiency of services provided by the Connecticut Quitline vendor, Alere Wellbeing. This report also sets a baseline cost per enrollment for future comparisons. Finally, the cost per enrollment reported here can be compared to the cost per enrollment reported for individual community based cessation programs funded by the DPH, reported under separate cover (Capesius et al., 2013). Comparing the cost per enrollment of the Quitline to those of the community based programs allows DPH to assess its investment of resources in these two interventions.

In contrast to cost allocation studies, cost effectiveness analysis (CEA) is a tool that compares the value of different health interventions, in this case the effectiveness of the Quitline compared to no Quitline. It answers the question: what are incremental gains in costs and health outcomes associated with the Quitline, compared to the situation where no Quitline exists? The health outcome used in this report is the “quit” and this report calculates **cost per quit**. The benefit of this analysis is it examines the value of the outcome of “quits” through the lens of cost.

The literature on cost-effectiveness for tobacco cessation interventions is rich, and has clearly demonstrated tobacco cessation as an extremely cost effective intervention (Grosse 2007, Drummond 2005, Gold 1996). The purpose of the cost per quit analysis here is to determine the extent to which the Quitline follows this trend using a **cost per quit** measure, and the extent to which the Quitline has a cost per quit commensurate with other similar programs. This report may be used to demonstrate to stakeholders the cost effectiveness of the Quitline compared to other interventions.

Background on the Connecticut Quitline

The Quitline provides cessation services to tobacco users, including telephone counseling and NRT. Eligibility for NRT is determined by health insurance status: uninsured callers and those in Medicaid are eligible for a free 8-week supply, and callers with commercial insurance and Medicaid are eligible for a free 2-week supply. The Quitline also provides general information and/or mailed materials to tobacco users who are not interested in counseling, and provides information to professionals and friends or family who want to help tobacco users to quit. These different levels of service are taken into account in the cost analyses.

Directly supporting the cessation service is a cessation marketing and promotion campaign designed and administered by the DPH to support cessation and drive tobacco users who are seeking to quit to the Quitline. In addition to this primary media campaign, the DPH used grant dollars from the American

Recovery and Reinvestment Act (ARRA) to support additional marketing and promotion efforts designed to drive tobacco users to the Quitline. Media efforts are critical to the success of the Quitline. Without them, few tobacco users would be aware or reminded of the Quitline and few would call.

Perspective of this Study

A key aspect of such analysis is the perspective of the study, which describes from whose perspective the value of the intervention is being evaluated. For the purpose of this analysis, we chose the perspective of the DPH. Therefore, all costs and gains considered from the Quitline in this analysis are directly relevant to the DPH (such as direct cessation program or marketing and promotion costs). Costs and gains outside the scope of the DPH are not considered. This perspective differs from that commonly seen in CEA literature, which focuses on the societal perspective. Often these economic studies are conducted in countries whose aim is to make societal decisions regarding health care coverage so all potential costs (direct or indirect) associated with intervention are considered. Examples of costs that would be included in a societal perspective, but are not in a perspective of the DPH, include a monetary valuation of callers' time to participate in the Quitline, or the medical cost savings to a health care payer (like Medicare) that are accrued with tobacco cessation and reduced disease burden due to the Quitline. While a societal perspective is broader and more comprehensive, the perspective of the DPH was selected because it was more feasible to calculate and more tailored to the interests of the DPH.

This report presents findings for both cost per enrollment and cost per quit gained analyses for fiscal year 2012 (July 2011 – June 2012) from the perspective of the DPH. The methods to calculate the estimated cost per enrollment and cost per quit gained with Quitline are described within their respective sections of this report.

Cost per Enrollment

This section first describes the methodology PDA used to estimate the cost per enrollment for fiscal year 2012, followed by the results and conclusions

Methods

Defining Cost per Enrollment

As described above, cost allocation calculations are designed to identify what services are being provided for what costs. Because the primary business unit of a quitline is an enrollment, we operationalized the cost allocation measure as cost per enrollment. However, it is important to acknowledge that quitlines pay for two primary types of enrollments: those who call and receive information only (proxies, general questions, tobacco users who receive no counseling), and tobacco users who call seeking to quit and receive telephone cessation counseling.

Based on this knowledge, PDA is calculating two cost enrollment calculations. The first is a **cost per registrant** calculation that considers ALL the callers to the Quitline for whom the DPH pays a fee. This group includes health professionals who call for information, friends and family of tobacco users, and tobacco users (both those who receive counseling and those who do not). The cost per registrant calculation is useful because it reflects the Quitline's efficiency in serving ALL callers, regardless of the level of service. This calculation is appropriate because the costs we use include the dollars that they DPH pays for all service provided, whether or not they are for counseling tobacco users. The cost per registrant calculation is best used if it is calculated annually and compared over time in order to assess the efficiency of the Quitline.

The second calculation is **cost per treated tobacco user**. This includes only tobacco users who call the Quitline who are seeking to quit for themselves and who receive some level of evidence-based treatment to help them. These participants reflect the ultimate goal of the Quitline – to help tobacco users who want to quit. This analysis excludes all non-tobacco users (health professionals and family and friends calling on about tobacco users) and all tobacco users who register but do not receive counseling. This latter group may include those who are not calling to quit themselves (this group may ask general questions and receives printed materials only). It also includes those tobacco users who may be ready to quit but do not receive any counseling for a variety of reasons.

The cost per treated tobacco user calculation may be used by the DPH to compare the Quitline to DPH's community based cessation programs, for which a cost per enrollment is calculated under separate cover (Capesius et al., 2013). The cost per treated tobacco user is the most appropriate measure to compare to the community based organization's cost per enrollment because the cost per enrollment figure for both interventions focus on those who receive cessation treatment. The cost per enrollment for the community based programs don't include an analogous cost per registrant measure because the

face to face interventions don't serve proxies in the same way the Quitline does and they don't have the participant drop off that is inherent in a multiple-session telephonic intervention.

It is important to note that the cost per treated tobacco user calculation for the Quitline has one important limitation. PDA does not have available to us the costs to serve proxies and all tobacco users who do not receive counseling. Because these groups are excluded from those enrolled, we would ideally like to exclude these costs from the calculation. By including these costs, the cost per treated tobacco users is inflated, and should be considered a very conservative estimate of the true cost per treated tobacco user.

Estimating Cost per Enrollment

Generally speaking, cost per enrollment can be expressed as a ratio of enrollments to costs, see Figure 1. This section details the methods used to derive the two types of enrollment figures need for calculation (registrants and treated tobacco users). It also includes information about costs, which is the same for both the cost per registrant and cost per treated tobacco user calculations.

Figure 1. Cost Per Enrollment Calculation

$$\frac{\text{Quitline Costs}}{\text{Quitline Enrollments}} = \text{Cost per Enrollment Ratio}$$

Two types of enrollments: Registrations and treated tobacco users

As described above, the count of registrants includes all callers for whom the DPH pays the Quitline vendor: proxies, tobacco users seeking information, and tobacco users seeking counseling. All these groups receive a service, even if it is not help to quit tobacco. PDA used the Quitline Experience Extract to gather the number of registrants to the Quitline. **In Connecticut, 11,187 individual registered for some kind of service in fiscal year 2012.**

Also as described above, tobacco users who receive treatment exclude proxies (health professionals, friends and family calling for someone else), tobacco users not seeking to quit, and tobacco users who do not receive service for some reason. See Table 1 below for an itemized count of these groups. We see that the largest proportion of people excluded are tobacco users who register but receive no counseling. As with the data on registrants, PDA obtained this data from the Quitline Experience Extract provided by the vendor. In sum, we see that a total of 8,456 tobacco users received evidence-based tobacco cessation treatment.

Table 1. Total number of enrollments for the cost analysis

	N	% of all registrants
Total callers registered in FY12	11,187	100.0
Exclude proxies	-761	6.8
Exclude general questions, materials only	-496	4.4
Exclude no counseling received (no evidence-based treatment)	-1,474	13.2
Total treated tobacco users	8,456	75.6

Quitline costs

Since this analysis was conducted from the DPH perspective, we included direct cessation program and administrative costs. Because one purpose of this analysis is to understand the efficiency of the Quitline vendor, we do not include media costs in this calculation, as the Quitline vendor is not responsible for the quality of media produced and its distribution.

Program costs for FY 2012 were obtained and provided to PDA by the DPH. The direct Quitline program costs are those necessary to provide cessation services, such as the intake and registration and the direct intervention costs for counseling, written materials, stop-smoking medications, etc. For the Quitline, these direct costs include services provided by the contracted cessation counseling vendor (Alere Wellbeing).

Direct administrative costs are defined as those that support the Quitline, but do not directly contribute to the cessation activity. These include: DPH employee costs as well as the costs of facilities, and other support that contributes only to the Quitline. It was necessary for PDA use an estimated amount of administrative costs as actual administrative costs were not available through CT DPH. PDA utilized an estimate based on industry standards derived from published studies, working papers, and government documents related to grant administration costs (Rooney, 2007; Bedsworth, 2008; Frumkin, 2000; Office of Management and Budget, 2004; State of Connecticut, 2011). From these sources, PDA estimated the proportion of costs expended by CT DPH on administering the Quitline to be 7% of the total Quitline budget amount for FY 2012.

Please see Appendix A for a complete list of costs included in the analysis.

Costs for external evaluation of the Quitline program are not included. Evaluation costs are not typically included in cost effectiveness studies because they are not considered necessary to provide cessation services.

Based on data provided by DPH and PDA's estimates, the total Quitline costs are \$1,594,839 (see Table 2).

Table 2. Quitline Cost Summary

	\$	%
Direct Programming Costs	\$1,490,504	93%
Direct Administrative Costs	\$122,941	7%
Total Costs	\$1,594,839	100%

Results

As described above, PDA calculated two cost per enrollment figures that have different purposes. The **cost per registrant** reflects all callers for whom the DPH is charged by the Quitline vendor, even those who are not tobacco users and not calling to quit. This calculation reflects the vendor's efficiency in providing services and is best compared over time. The second calculation is **cost per treated tobacco user**, and excludes all non-tobacco users and all tobacco users who received no counseling. This calculation is best suited to compare the cost per enrollment reported for community based programs.

As described in the methodology section, the **costs of the Quitline total \$1,594,849**. The **total number of registrants** calling the Quitline in fiscal year 2012 is **11,187**. The **total number of treated tobacco users** calling during this period is **8,456**.

These estimates result in a cost per registrant of \$142.56 and a cost per treated tobacco users of \$188.60 (see Figure 2). The cost per treated tobacco users is \$55 (or about 33%) more than the cost per registrant.

Figure 2. Cost per enrollment

$$\begin{aligned} \text{Cost per registrant} &= \frac{\text{Quitline Cost}}{\text{Number of Registrants}} = \frac{\$1,594,839}{11,187} = \mathbf{\$142.56} \\ \\ \text{Cost per treated tobacco user} &= \frac{\text{Quitline Cost}}{\text{Number of tobacco users receiving counseling}} = \frac{\$1,594,839}{8,456} = \mathbf{\$188.60} \end{aligned}$$

Comparisons to other Programs

The CDC provides a range of cost per person counseled for a proactive counseling protocol offering 4 to 6 calls (CDC, 2004) and recommends that Quitlines strive to operate within that range. They note that their recommended range is approximate because evaluation costs are sometimes included and sometimes not. Additionally, it is unclear if the CDC range includes NRT costs, which could impact the applicability of a comparison of the CDC recommendation to a Quitline cost per enrollment. However, the CDC guideline provides an important comparison to the cost per treated tobacco users reported above. The recommended CDC range is \$235 - \$309 per tobacco user counseled, in 2012 dollars. The cost per treated tobacco users for the Connecticut Quitline is \$189, which is well below the CDC recommended range. This suggests that Alere Wellbeing is efficiently providing counseling services to tobacco users.

The cost per treated tobacco users may also be compared to the cost per enrollment as reported for the DPH's community based programs. Because this report and that community based cessation program report were being developed at the same time, PDA is not able to make that comparison here.

Cost per Quit

Methods

The methods we use for the cost per quit analysis are consistent with general health economic guidelines for cost-effectiveness analysis (Gold, 1996; Drummond, 2005) as well as the North American Quitline Consortium (NAQC) guidelines for economic evaluation of cessation programs (Tinkleman, 2010). Our methods are also consistent with other published cost effectiveness studies assessing the incremental cost per quit gained with cessation in the literature to date (An et al., 2010; Hollis et al., 2007; Ong & Glantz, 2005; Kahende et al., 2009; Paech et al., 2010). The perspective from which this analysis is conducted is that of the CT DPH as they are the intended users of the study.

Estimating Cost per Quit

We calculated an incremental cost per quit ratio using two components, the difference in costs with and without the intervention in the numerator, and the difference in number of quits with and without intervention in the denominator, Figure 3. In this section we discuss methods for calculating the numerator first, then the denominator.

Figure 3. Cost Per Quit Calculation

$$\frac{\text{Costs}_{\text{PROGRAM}} - \text{Costs}_{\text{NoPROGRAM}}}{\text{Quits}_{\text{PROGRAM}} - \text{Quits}_{\text{NoPROGRAM}}} = \text{Incremental Cost per Quit Ratio}$$

Cost per quit numerator: Incremental programmatic, administrative, and media costs

As indicated in the ratio above, costs for the Quitline program were estimated, as were costs for no Quitline program. Simply from the CT DPH perspective, the costs for no program are \$0¹. The costs for the Quitline used in this cost per quit calculation are the program and administrative costs used in the cost per enrollment calculations plus the addition of the costs to promote the Quitline using media. In the cost per quit analysis we include media costs because without media few people would be aware of or call the Quitline. Therefore, it is a necessary part of the Quitline service that is directly tied to both the number of callers and the number of resulting quitters.

Media costs include funds spent to market and promote the Quitline. Both state funds and grant dollars from the American Recovery and Reinvestment Act (ARRA) are included. As with Quitline costs, marketing and promotion costs include expenses related to administration. PDA estimated the costs for DPH to administer the cessation media as 7% of the total cessation media budget, using the same rationale used to estimate Quitline administration costs.

¹ From other perspectives, such as healthcare payers, the costs of no Quitline are substantial. For instance the medical costs associated with the smoking-related disease burden that would be incurred without the cessation programs would be significant.

Media and promotion costs total \$284,406 and are outlined in Table 3 below. We see that three-quarters of the media costs are funding for the FY12 cessation campaign, followed by 19% for the ARRA campaign, and 7% for administering both campaigns together.

Table 3. Quitline Media Costs

	\$	%
<i>Marketing and Promotions Direct Costs</i>		
FY12 cessation media budget (Cronin & Co.)	\$210,800	74%
ARRA media expenses in FY12 (Elkinson + Sloves)	\$55,000	19%
<i>Direct Administrative Costs</i>		
7% of FY12 and ARRA media budgets	\$18,606	7%
Total Media Costs	\$284,406	100%

When media costs are combined with Quitline costs, the total Quitline costs are \$1,879,245 (see Table 4). The largest share of costs are the Quitline programming costs (79%). Media costs are 14%, followed by administrative costs which are estimated at 7%.

Table 4. Quitline Summary of Direct Costs

	\$	%
Quitline Costs	\$1,490,504	79.3%
Media and Promotion Costs	\$265,800	14.1%
Administrative Costs for the Quitline	\$104,335	5.6%
Administrative Costs for Media	\$18,606	1.0%
Total Costs	\$1,879,245	100.0%

Cost per quit denominator: Incremental number of Quitline callers “quit”

This section describes the methodology for estimating the incremental number of tobacco users who quit because they participated in the Quitline program. This is the difference of the total number of tobacco users calling the Quitline who quit and those Quitline callers who would have quit without the Quitline (see Figure 4).

Figure 4. Calculation of number of additional quitters due to the programs

$$\begin{array}{rcccl}
 \text{Total \#} & & & & \\
 \text{tobacco users} & - & \text{Quitline callers} & = & \text{Additional Number of} \\
 \text{calling the} & & \text{who would} & & \text{Quitters Due} \\
 \text{Quitline who} & & \text{have quit} & & \text{to the Program} \\
 \text{quit} & & \text{without the} & & \\
 & & \text{Quitline} & &
 \end{array}$$

Total number of tobacco users calling the Quitline who quit

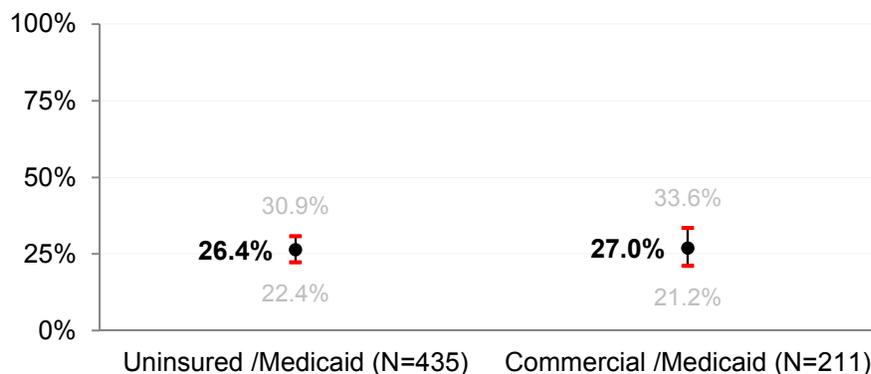
The number of tobacco users who called the Quitline and quit is the product of a **quit rate** for Quitline enrollees in FY12 and the **total number of tobacco users calling the Quitline** in FY12.

The **quit rate** is a 30-day point prevalence measure of abstinence gathered 7 months after enrollment in the program using a responder rate, which is the standard measure for quit rates determined by the North American Quitline Consortium (NAQC). NAQC has determined that biomedical verification is not necessary to eliminate bias in the self-reported quit status of respondents (NAQC, 2009).

The quit rates used in this analysis are based on the FY12 participant follow-up survey administered by Alere Wellbeing 7 months post enrollment expressly for the purpose of determining rates of 30-day point prevalence. The survey is conducted on a random sample of participants stratified by mental health condition history and month of registration. Prior to the calculation of quit rates, data were statistically weighted to reflect the entire Quitline population². Please see Appendix B for a more detailed description of how the quit rate is calculated.

For the Quitline, it is important to note that all participants may receive the 5-Call intervention, but they are eligible for differing NRT benefits based on their insurance status (uninsured and Medicaid may receive 8 weeks, commercially insured and Medicare may receive 2 weeks). Because NRT is an evidence-based intervention associated with higher quit rates, we would expect that the quit rate would be different for each NRT eligibility group, with the group receiving more NRT achieving a higher quit rate. Therefore, a separate quit rate is calculated for each NRT eligibility group, so that each quit rate can be applied to the number of people who received that service. The resulting numbers estimated to quit from both eligibility groups are summed to estimate the number quit for the Quitline as a whole. The 30-day point prevalence rates for each NRT group, along with the upper and lower bounds of the 95% confidence interval may be found in Figure 5 below.

Figure 5. 30-day Point Prevalence Rate by NRT Eligibility Group



² For information about the follow-up survey methodology, please see *Connecticut QuitLine Standard Annual Plus Mental Health 7-Month Evaluation Report Fiscal Years 2011-2011*. Evaluation Services Division, Alere Wellbeing, Inc. Submitted to the Connecticut Department of Public Health, December 31, 2012.

Please note that according to NAQC recommendations, quit rates exclude the following groups of callers: those less than 18 years of age, those tobacco users who do not seek counseling but seek general questions or materials only, those quit for more than 30 days at intake, and those who do not receive at least minimal service. Callers in these groups are not sampled for the follow-up survey.

So that the total number of callers used in the calculation is commensurate with the quit rate, the number of enrollments excludes the same groups that were excluded from the quit rate, as described above: those under 18 years of age, those tobacco users who do not seek counseling but seek general questions or materials only, those quit at intake, and those who do not receive at least minimal treatment. Table 5 below provides this information for each NRT eligibility group.

Table 5. Total number of enrollments for the cost analysis by NRT eligibility group

	Uninsured/ Medicaid 8 Week	Commercial/ Medicare 2 Week	Total
Total tobacco users calling Quitline in FY12	6,813	3,613	10,426
Under 18 years old or missing age	-6	-38	-44
General questions, materials only	-98	-398	-496
Quit at intake	-29	-26	-55
No counseling received (no evidence-based treatment)	-926	-548	-1,474
Total enrollments for cost analysis	5,754	2,603	8,357

Finally, within each NRT eligibility group, the estimated quit rate (with its 95% confidence interval) for that group is multiplied by the total number of enrollments for the cost analysis (see Table 6). This produces the estimated annual number of quits for each NRT eligibility group, with an upper and lower bound that represents the 95% confidence interval. These figures are summed to produce the estimated annual number of quits for the initiative as a whole, also considering the upper and lower bounds of the 95% confidence interval.

Table 6. Estimated number of quits due to the Quitline by NRT eligibility and for the initiative overall

	30-day Point Prevalence (95% CI lower, upper)		Total Enrollments for Cost Analysis	=	Est N Quits due to Quitline (95% CI lower, upper)
Uninsured/Medicaid 8 weeks NRT	26.4% (22.4%, 30.9%)	X	5,754	=	1,521 (1,289 – 1,778)
Commercial/Medicare 2 weeks NRT	27.0% (21.2%, 33.6%)	X	2,603	=	703 (552 – 875)
Total initiative	---		---		2,224 (1,841 – 2,653)

Tobacco users who would have quit with no Quitline

We assume that a certain proportion of Quitline callers would have successfully quit on their own or using some other assistance, even without help from the Quitline. As described above, the denominator of the cost per quit calculation is the number of tobacco users who called the Quitline and quit, minus the number who would have quit with no Quitline program. To estimate this number, we turn to the literature on tobacco cessation to find a rate for spontaneous quitting for people similar to those seeking cessation services, preferably a quitline. To start, a meta-analysis conducted by Ballie, Mattick and Hall (1995) suggests that between 3% and 7% of tobacco users in the general population quit without assistance each year. However, it is important to note that this meta-analysis is of *smokers in the general population*, and this CEA study seeks to estimate the number of *Quitline callers* who would have quit spontaneously. It seems likely that Quitline callers would be more motivated to quit than tobacco users in the general population, so their spontaneous quit rate would be higher.

A study from Miller, et al. (2005) of a free NRT program from the New York City Department of Health and Mental Hygiene seems to provide a more accurate estimate. A free 6-week course of NRT patches was advertised as available to eligible³ smokers calling the New York Smokers' Quitline. A total of over 32,000 callers met the eligibility criteria for NRT program and for the 6 month follow-up survey. A naturally occurring comparison group that could be used to estimate a spontaneous quit rate presented itself when 506 people (1.6%) called and were eligible to receive NRT and the follow-up survey, but did not receive the NRT due to an address error. The NRT sent to this group was returned undelivered, so this group represents a group of tobacco users who sought quitline assistance, but received no treatment due to an address error. A total of 34.4% of this group responded to a follow-up survey and reported a 6% spontaneous quit rate (7-day point prevalence six months post-enrollment). Given that the spontaneous quit rate of the Miller study (6%) confirmed the high end of the Ballie, Mattick & Hall meta-analysis (7%), we elected to use a spontaneous quit rate of 7% in our analyses.

To capture the number of Quitline callers who would have quit without the Quitline, we then applied the 7% figure to the total number of enrollments (8,537) as shown in Table 5 above. The total number of spontaneous quits is therefore calculated to be 585.

Results

Cost per Quit Gained

The incremental cost per quit ratio is composed of two components, the difference in costs with and without the Quitline program in the numerator, and the difference in number of quits with and without Quitline intervention in the denominator.

³ Eligibility criteria was largely similar to that of the Quitline and included being 18 years of age and residing within the service area, having no medical contraindications to NRT patch use, not using other NRT or bupropion, agreeing to attempt to quit in the week after the screening call, have smoked 10 or more cigarettes per day for at least a year, and agree to be contacted for follow-up.

As described in the methodology section the costs used in the cost per quit calculation are the same program costs used in the cost per enrollment calculation plus media costs, and are summarized above. **The costs of the Quitline plus media total \$1,879,245.**

The costs of having no Quitline program are \$0.

Also as described in the methodology section, the number of tobacco users who called the Quitline and quit is derived from the 30-day point prevalence quit rate taken from the Alere FY12 follow-up survey multiplied by the total number of enrollees. Because the Quitline offers two different levels of NRT benefit based on insurance status, the estimated quit rate for each group is multiplied by the estimated number of enrollees for each group, and the products are added together. The resulting **total number of estimated Quitline callers who quit is 2,224.**

Finally, the number of Quitline callers who would be quit if no Quitline were in existence is estimated to be 7% of Quitline callers, or **585**, as demonstrated in the Methodology section.

These estimates result in a **cost per quit of \$1,147** (see **Figure 6**). This is considered to be the case of **best fit assumptions**, because we feel the assumptions made here are the most reasonable estimates of the actual Quitline program features.

Figure 6. Cost Per Quit – Best Fit Assumptions

$$\begin{array}{l} \text{Incremental} \\ \text{Cost per} \\ \text{Quit Ratio} \end{array} = \frac{\text{Costs}_{\text{Quitline}} - \text{Costs}_{\text{NoQuitline}}}{\text{Quits}_{\text{Quitline}} - \text{Quits}_{\text{NoQuitline}}} = \frac{\$1,879,245 - \$0}{2,224 - 585} = \frac{\$1,879,245}{1,639} = \mathbf{\$1,146.58}$$

Sensitivity analysis

The cost per quit presented above is considered best fit. However, it is possible that our estimates are either over- or under-estimates. To compensate for this we varied key assumptions in a sensitivity analysis to examine the impact of these assumptions on our results. This allows us to more fully understand the potential range of the estimated cost-effectiveness of the program, given the assumptions we are making.

We identified three primary assumptions in our cost per quit estimate that may impact the estimated cost per quit significantly. They are inclusion of media costs in our cost estimates, the assumed spontaneous quit rate, and the observed quit rate obtained through the follow-up survey. Each is discussed in greater detail below.

- 1. Media Costs.** The inclusion of marketing and promotion costs in CEAs for quitlines is currently debated. Cost per health outcome literature in health economics and tobacco cessation suggests that all program costs should be accounted for, including media and promotion costs (Grosse et al 2007, Tinkleman 2010). However, actual cost per quit analyses by state quitlines tend to exclude this cost from their calculations (Paech et al 2010, Solberg et al 2006, Tomson et

al, 2004). One rationale for this exclusion is that cessation media campaigns are designed for purposes other than to drive callers to quitlines. For example, media may seek to motivate tobacco users to quit generally – and a desirable outcome would be tobacco users quitting on their own, with the assistance of their doctor, or with sources other than the Quitline, such as the smokefree.gov website or community cessation programs.

In sum, determining the portion of a marketing and promotions campaign designed to motivate callers to call the Quitline versus using other cessation programs, or to quit generally, can be difficult, which is why some quitline cost per quit analyses exclude media and promotion costs entirely from the cost per quit calculation. In order to satisfy differing opinions on including media and promotion and different ways in which the cost per quit analyses have been conducted in the literature, PDA estimated the cost per quit with and without media and promotion costs. Excluding direct media costs and the associated media administration costs reduces the total costs of the Quitline by \$284,406 (15% of total costs).

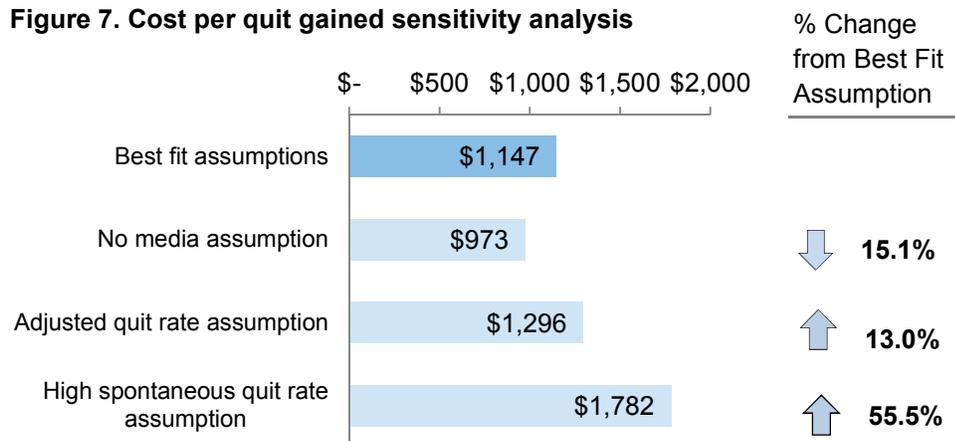
- 2. Spontaneous Quit Rate Estimate.** In order to calculate the number of Quitline callers who would have quit without the Quitline, we reviewed the literature to determine a rate for spontaneous quitting among those seeking cessation services (preferably a quitline). Given that the spontaneous quit rate of the Miller study (6%) confirmed the high end of the Ballie, Mattick, and Hall meta-analysis (7%, see page 13 for a fuller description of these studies), we elected to use a spontaneous quit rate of 7% in base case analyses. Because the population of the Miller study differs from Quitline callers and the comparison group was generated through address errors which are a non-random occurrence, we elect to conduct a sensitivity analysis on a range of rates for unassisted quits. We arbitrarily decided to double the 7% base estimate to 14% in the sensitivity analyses. This reduces the number of quitters due to the Quitline by an additional 585.
- 3. Quit Rate Accuracy.** The quit rate for this study was taken from the 7-month follow-up surveys conducted by Alere. NAQC recommends that quitlines attempt to achieve a response rate of 50% or higher in order to obtain a more accurate quit rate estimate. This is because callers who respond to the survey are more likely to have successfully quit than callers who do not respond, so response rates lower than 50% are likely to bias observed quit rates upwards. This quit rate survey used in this analysis achieved a response rate of 33.1%, so it is likely that the resulting quit rates are inflated. In the sensitivity analyses, the quit rate is adjusted downward based on a paper presentation to the 2012 North American Quitline Consortium meeting (Lein, et al, 2012). Based on findings from a state quitline with similar quit rates to Connecticut, the quit rate at a response rate of 33% is inflated by 8.5% as compared to a quit rate at 50%. Therefore, we adjusted the quit rate down by 8.5% for the sensitivity analysis, resulting in a 24.2% quit rate for the Uninsured/Medicaid population (N=1392 quitters), and a 24.7% quit rate for the Commercial/Medicare population (N=643 quitters). Together, this adjustment reduces the number of quitters by 189.

Given that these three primary assumptions vary, we created a series of sensitivity analyses that vary each of the assumptions in turn in order to shed light on the relative impact of each assumption. All analyses include the direct program costs (counseling and NRT) and direct administration costs of the Quitline (salary, fringe, overhead).

The resulting sensitivity analyses were performed and demonstrate the impact of each assumption, should it differ from the case of the best fit assumptions. The results of the sensitivity analysis can be found in Figure 7 below:

1. **Best Fit Assumptions** (reported in **Figure 6** above): This case includes all media costs, a spontaneous quit rate of 7%, and the observed point prevalence rate for 30-day abstinence.
2. **No Media Assumption**: This case excludes direct media costs and costs to administer the media initiatives. All other costs are included, and the best fit assumptions for spontaneous quit (7%) and observed point prevalence quit rate are used.
3. **High Spontaneous Quit Assumption**: This case assumes PDA’s estimated spontaneous quit in the best fit assumption is too low, so doubles the spontaneous quit rate to 14% to produce a more conservative estimate of cost per quit. The best fit assumptions for media (costs included) and observed point prevalence quit rate are used.
4. **Adjusted Quit Rate Assumption**: This case assumes that the observed point prevalence quit rate is biased upwards because the follow-up survey has a response rate of less than 33%, well below the NAQC recommendation of 50%. Therefore, this case adjusts the quit rates downward by 8.5% for a more conservative estimate. The best fit assumptions for media (costs included) and spontaneous quit rate (7%) are used.

Figure 7. Cost per quit gained sensitivity analysis



We see from the comparison above that the factor that impacts cost per quit the most is the spontaneous quit rate. If PDA’s assumption that the spontaneous quit rate of 7% in the best fit case is incorrect, and the spontaneous quit rate is truly higher, at 14% the cost per quit increases by 56% as compared to the best fit case. Varying the assumptions about media and the quit rate produce smaller changes to the cost per quit at about 15% each. As would be expected, excluding media reduces the cost per quit, while adjusting the quit rate downwards increases the cost per quit.

Although the different assumptions impact the estimated cost per quit gained attributed to the Quitline, we consider our estimates to be fairly robust to these alternative assumptions.

Comparison to Other Quitlines

As described in the Introduction, one of the benefits of the cost per quit health economic measure is that there is a rich literature on cost per quit for cessation interventions that provide several suitable comparisons for the Quitline. These comparisons allow the DPH to examine the extent to which the Quitline provides similar value as other known cessation interventions.

After reviewing the literature, PDA has selected three comparisons:

- The Quitline can be compared to the **Agency for Health Care Policy and Research's (AHCPR) 1996 proposal to implement a national comprehensive tobacco cessation program (Cromwell et al., 1997)**. This proposal estimated the cost per quit for providing different forms of tobacco cessation counseling across the United States. This estimated cost per quit for an intensive physician intervention with the patch at \$2,871 per quit in 1995 dollars, or \$5,412 in 2012 dollars, not including any media costs (see Figure 8). While a physician intervention differs significantly from the Quitline, it provides an important comparison to another evidence-based and frequently used intervention.

The Minnesota QUITPLAN Helpline® is a multi-session intensive tobacco cessation telephone counseling program that provides cessation counseling and NRT to uninsured and underinsured tobacco users in Minnesota. This service is similar to the one provided by the CT Quitline. A cost per quit analysis of the Minnesota Helpline program estimated a cost per quit of \$1,850, excluding media costs in 2004 dollars (An et al., 2010), or \$2,479 in 2012 dollars (see

- Figure 9). It is important to note that the comparison between the Minnesota and Connecticut quitlines is approximate because the cost per quit calculations of the two differ. The Minnesota Helpline calculation uses an intention to treat (ITT) quit rate, which would bias its quit rate downwards, but does not subtract spontaneous quits from its calculation, which would bias the cost per quit upwards. The overall impact of these opposing effects on estimated quits is unclear.
- The Oregon quitline compares a brief intervention with no NRT to an intensive intervention with NRT. This differs from the incremental analysis that PDA conducted, which is no quitline vs. the Quitline. Additionally, like Minnesota's analysis, the Oregon cost per quit uses an ITT quit rate but does not subtract spontaneous quits. The impact of these methodological differences is unknown. The Oregon calculation also excludes media costs. The cost per quit gained reported by Oregon is \$2,112 in 2004 dollars (Hollis, et al., 2007, see Figure) or \$2,830 in 2012 dollars.

In Figure 8 we see that the Quitline compares favorably to the projections set by the AHCPR for intensive physician interventions with NRT for all assumptions varied in the sensitivity analysis. This comparison is most useful when considering the cost effectiveness of the CT Quitline in relation to other

common cessation interventions in which stakeholders may be interested in investing dollars. Here, the Quitline is seen as being more cost effective than a similarly intensive physician intervention.

Likewise, the Quitline compares favorably to both the Minnesota and Oregon quitlines, suggesting that the Quitline generates at least as much value as other, similar quitlines, if not more. This finding reflects positively on the management of and outcomes generated by the Quitline.

Figure 8. Quitline cost per quit gained compared to AHCPR projections

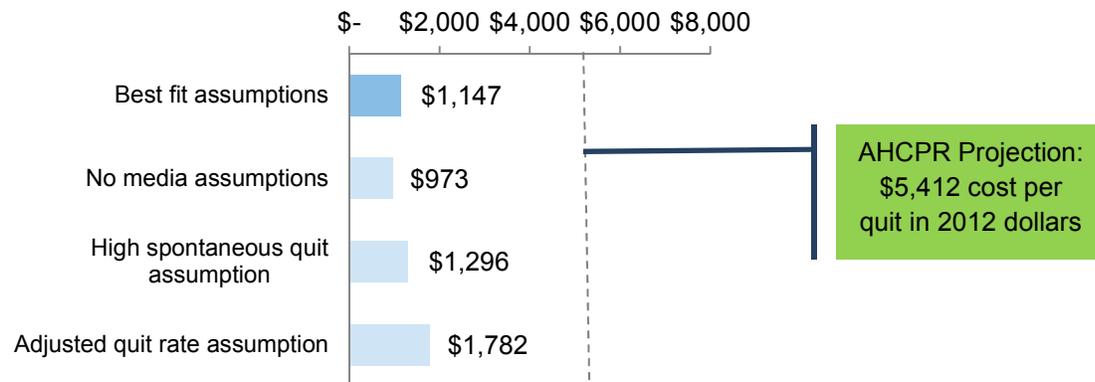
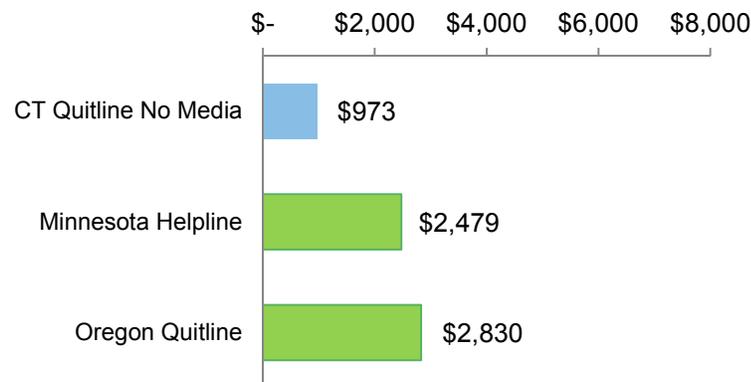


Figure 9. Quitline cost per quit gained compared Minnesota and Oregon Quitlines



Summary and Conclusions

Cost Allocation Analyses

The cost per registrant and cost per treated tobacco user measures estimate the cost to DPH per service unit purchased. The number of **registrants** include all those callers from whom the CT DPH is charged, and includes proxies (health care providers, friends, or family call on behalf of a tobacco users), as well as tobacco users who receive information and/or services. This calculation is useful because it demonstrates the Quitline vendor's efficiency in providing all of its services.

The cost per **treated tobacco user** is an alternative measure to the cost per registrant. It includes only tobacco users who received counseling. This measure is useful because it reflects the primary goal of the Quitline – to provide evidence-based treatment to help tobacco users quit. This measure can also be compared to the DPH's community based program's cost per enrollment (Capesius, 2013) and the CDC's recommended cost per tobacco user counseled measure (CDC, 2004).

- The **cost per registrant** for fiscal year 2012 is **\$143**
- The **cost per treated tobacco user** for fiscal year 2012 is **\$188**. This falls well below the CDC recommended range of \$235 - \$309 (2012 dollars) and suggests that the Quitline vendor is efficiently providing counseling services to tobacco users.
- We recommend that the DPH compare the Quitline's cost per treated tobacco user to the cost per enrollment produced for DPH's community based cessation programs (Capesius, 2013). Because both reports were in production simultaneously, we were not able to make that comparison here.

Cost Effectiveness Analyses

As with the cost per registrant and treated tobacco users, costs include direct programming and administration costs for the Quitline. Direct costs of marketing and promotion were included, as well as costs to administer the media, because without media few would be aware of or call the Quitline. Quit data were also used in the cost per quit calculation, based on Alere Wellbeing's FY2012 follow-up survey that estimates 30-day point prevalence abstinence seven months post-enrollment, per NAQC recommendations. Several assumptions were also made to calculate the number of quits attributable to the Quitline.

- Our best fit assumptions estimate that the cost per quit is \$1,147.

This is considered best fit because we feel the assumptions we employed are most common and reasonable. However, it is possible that our estimates are either over- or under-estimates, so we varied our assumptions about including marketing and promotions costs, the rate of spontaneous quitting used, and the quit rate used to examine the impact of these assumptions on our results.

- Sensitivity analyses result in estimated cost per quit ratios ranging from \$973 in the case where media costs are excluded from analyses to \$1,782, where the rate of spontaneous quitting is assumed to 14% instead of 7%, as is the case for the best fit assumptions. We consider our estimates to be fairly robust to alternative assumptions.

The estimated cost per quit gained with no media cost included (\$973) can be compared to similar quitlines in Minnesota and Oregon. **We see that the Quitline's cost per quit is about two-and-half times less than that of the Minnesota Helpline (\$2,479) and almost three times less than the Oregon quitline (\$2,830), suggesting that it compares favorably to quitlines nationally.**

The Quitline's cost per quit is also much less than cost per quit projects set by the Agency for Health Care Policy Research for intensive physician interventions with NRT (\$5,412) for all cases presented in the sensitivity analysis. This comparison is most useful when considering the cost effectiveness of the Quitline in relation to other common cessation interventions in which stakeholders may be interested in investing dollars. **Here, the Quitline is seen as being much more cost-effective than a similarly intensive physician program.**

Conclusions

Both the cost allocation and cost effectiveness analyses presented here suggest that relative to standards in the field and other tobacco cessation quitlines, the Connecticut Quitline is of high value. The Quitline vendor appears to be serving tobacco users efficiently. The value of the Quitline in terms of quits appears to be better than some cessation programs nationally, reflecting positively on the management and outcomes of the Quitline.

Taken together, the evidence of this economic analysis suggests that the state of Connecticut is receiving a very efficiently run and high value service in the Connecticut Quitline.

Appendix A. Quitline Costs

Cost	Description	FY 12 Amount
<i>Direct Program Costs</i>		
Counseling	Registration, counseling, materials, overhead, etc.	\$881,909
NRT	Distribution of NRT	\$608,595
Subtotal		\$1,490,504
<i>Marketing and Promotions</i>		
FY12	Cessation media budget (Cronin)	\$210,800.00
ARRA Media expenses during FY12	Cessation media budget (Elkinson + Sloves)	\$55,000.00
Subtotal		\$265,800.00
<i>Direct Administration Costs</i>		
	<i>Proportion attributable to QL</i>	
Estimate	7% of Quitline budget	\$104,335.28
Estimate	7% of Media budget	\$18,606.00
Subtotal		\$122,941
Total		\$1,879,245.28

Appendix B. Quit Rate Calculation

Tobacco cessation quitlines are among the most popular interventions to assist people to quit smoking. In fact, residents in all 50 states and 10 provinces in Canada have access to a quitline. Because of their popularity, the North American Quitline Consortium (NAQC) was formed as an independent, non-profit organization with the mission of improving quitline services. This group has developed a standard evaluation protocol that all quitlines are encouraged to follow. The Quitline vendor, Alere Wellbeing, produced quit rates in accordance with NAQC's standards. For example:

- The NAQC recommends many survey items in a document called the Minimal Data Set (MDS).
- The NAQC specifies that a follow-up survey be conducted seven months after enrollment. This time period was chosen because many quitlines use a four or five call intervention that takes about one month to complete. In this case, the survey is conducted six months after the end of the program.

The NAQC white paper on calculating quit rates (NAQC, 2008) recommends that quit rates be measured using 30-day abstinence point prevalence abstinence.

- **30-Day Abstinent.** This rate means callers have **not used** tobacco for the 30 days before the survey. They were asked, "have you smoked any cigarettes or used any other tobacco, even one puff or pinch, in the last 30 days?" Participants who respond "no" are considered 30-day abstinent. The 30-day abstinence rate implies that if a person has not smoked in the past 30 days, they can be considered a success.

Calculating Quit Rates

Tobacco cessation researchers and evaluators have been debating the best way to calculate quit rates. The NAQC white paper on calculating quit rates has also recommended the ways in which rates should be calculated. The underlying concern is that a substantial number of quitline callers do not respond to a telephone survey. Two types of quit rates are commonly used: 1) an "Intention to Treat" (ITT) rate, where all non-responders are assumed to still be smoking; and 2) a "Responder Rate" which is based only on those who respond to the survey. The former rate is considered to be overly conservative, while the latter is considered to overestimate quit rates.

The NAQC white paper sought to recommend one rate calculation method that all quitlines should use. The paper demonstrated that responder rates are likely to be at least as accurate or perhaps more accurate than ITT rates. Therefore, NAQC recommends responder rates be used.

Responder Rates. This rate is calculated as:

$$\text{Responder Rate} = \frac{\# \text{ abstinent}}{\# \text{ who responded to the survey}}$$

The NAQC paper also recommends that only those who receive at least minimal evidence-based treatment be included in the quit rates. Those with less than minimal treatment should be excluded. Another group recommended to be excluded is all callers who quit using tobacco 31 days or more before calling. All those quit 30 days or fewer prior to calling should be included.

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