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# TC911 Service Coordination Program - analysis of program impacts & sustainability

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# TC911 SERVICE COORDINATION PROGRAM

## ANALYSIS OF PROGRAM IMPACTS & SUSTAINABILITY

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# TC 911 PROGRAM

## PROGRAM EVALUATION RESULTS: EXECUTIVE SUMMARY

## PURPOSE OF THE STUDY

This report describes findings from an evaluation of the Tri-County 911 Service Coordination Program (TC911) as part of the Health Commons grant. Conducted at the Providence Center for Outcomes Research & Education (CORE), the study was designed to assess program impacts, understand which elements of the program work best, and assess program sustainability.

The Tri-County 911 program goal is to reduce unnecessary use of EMS services by linking clients to the right care at the right place and time. Our study was designed to assess its early success in achieving that goal.

## DATA & METHODS

We used a combination of Medicaid data (collected via the Health Commons grant) and American Medical Response (AMR) data to assess the impacts of the program.

We assessed program impacts in the context of a counterfactual comparison group to represent what *would have happened* in the absence of the program. We compiled a "control" group of patients with similar 911 calling profiles who hadn't been in the program, then compared changes in key outcomes between the two groups over time.

## KEY QUESTIONS & FINDINGS

### DOES THE PROGRAM REDUCE 911 CALLS & ED VISITS?

**YES.** We did not find evidence of a reduction in 911 calls overall, but the program did reduce actual ED visits by an average of .35 per member month, or 4.2 visits per person per year, compared to the control group. This difference was statistically significant.

*SEE PAGE 4*

### DOES THE PROGRAM REDUCE INPATIENT HOSPITALIZATIONS?

**YES, IN SOME CLIENTS.** We did not find evidence of a reduction in inpatient events overall, but we did see evidence of a statistically significant reduction in non-OB admissions for a "high intensity" cohort of clients who met a higher minimum call criteria (10 or more 911 calls at baseline, rather than 6), .

*SEE PAGE 4.*

### DOES THE PROGRAM CHANGE UTILIZATION OF PRIMARY CARE?

**YES.** We found evidence that TC911 clients saw bigger reductions in primary care use than the control group. Overall primary care use was still high in both groups, so this may represent "more appropriate" use of primary care rather than impeded access to care that was truly necessary.

*SEE PAGE 4.*

### DOES THE PROGRAM GENERATE COST SAVINGS?

**YES.** We used our estimates of reduced ED and primary care use to impute total cost savings for the program from March 2013-July 2014, then compared those savings to the costs of the program over the same time period. Costs were about $740,000 over those 15 months, but estimated savings were $836,000.

*SEE PAGE 6.*

## THE BOTTOM LINE

**PROGRAM OUTCOMES:** The TC911 program has reduced rates of actual ED and primary care use. In a specific subset of "very high call volume" clients, the program also appears to be reducing non-OB inpatient events.

**SUSTAINABILITY:** Our estimates of total annual savings from the net reduction in ED and primary care utilization attributable to the TC911 program are greater than the costs of the program. We conclude that the program's ROI profile is favorable.

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# TC 911 PROGRAM

## ANALYSIS OF PROGRAM IMPACTS & SUSTAINABILITY

## INTRODUCTION

This report summarizes findings from a program evaluation of the Tri-County 911 Service Coordination Program in Oregon. Conducted at the Providence Center for Outcomes Research & Education (CORE), the study was designed to assess program impacts, understand which elements of the program work best, and identify potential paths toward sustainability.

## BACKGROUND

In 2006, in response to needs identified by emergency response providers, the Multnomah County EMS office began helping frequent 911 callers connect to more appropriate systems of care. In 2012, the program received funding, as part of the *Health Commons Grant*, to formalize and expand services as parts of the grant's effort to develop a regional system of care for targeted Medicaid patients in the tri-county area. Staff were hired in early 2013 and began serving clients in April 2013.

In this study we rely on data collected via the grant, as well as from emergency medical response data to assess program outcomes.

## KEY CONTEXT

Recent research published by CORE suggests that people gaining Medicaid via the ACA expansion may use more ED care than they did while uninsured (1), and those who gain new Medicaid coverage often face confusion and other barriers to using it optimally (2). In Oregon, Medicaid expansion and the coordinated care model have shed renewed light on the importance of connecting patients to the right care in the right place at the right time.

The TC911 program has been a key piece of the Health Commons grant's strategy to make those connections. By identifying frequent ambulance users and connecting them to supportive care systems, the program is designed to reduce unnecessary utilization while keeping people connected to the care they need.

Smart, cost-effective strategies to help optimize care delivery are desperately needed in health care. In this report, we explore the potential role of the TC911 program in this new and emerging health care landscape.

## CONTENTS

## KEY OBJECTIVES

This evaluation study was designed around two key objectives:

| EVALUATE IMPACT OF THE PROGRAM ON CARE PATTERNS | 2. ESTIMATE SAVINGS & ASSESS SUSTAINABILITY PATHWAYS |
|---|---|
| We set out to assess whether the TC 911 program impacted patterns of care utilization, focusing on outpatient care (including primary care and outpatient behavioral health services), and acute care (including 911 ambulance responses, ED visits, and non-OB hospital admissions). | We also wanted to estimate total program savings associated with any changes in utilization. Our intent was to compare any savings to the overall cost of maintaining the program. |

Taubman S, Allen H, Wright B, Baicker K, Finkelstein A. 2014. Medicaid Increases Emergency Department Use: Evidence from Oregon`s Health Insurance Experiment." Science,343: 6168, pp 263-8.
Allen H, Baicker K, Wright B. 2014. "After Enrollment: The Experience of New Medicaid Enrollees and Lessons for Health Reform." Health Affairs, 33:2, pp 1-8.
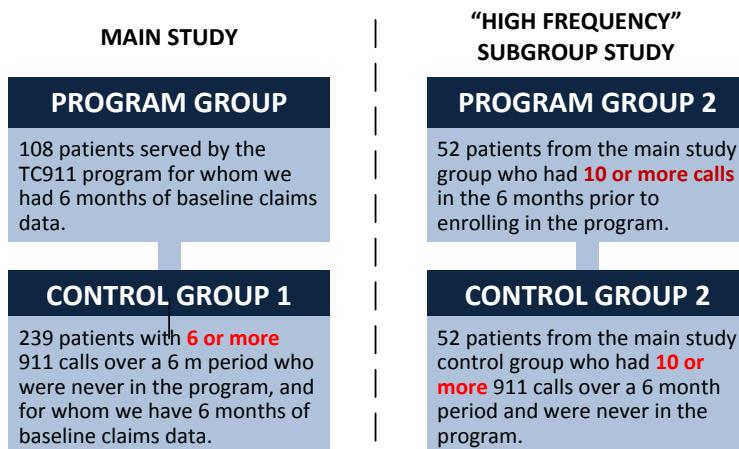
# METHODOLOGY

## IDENTIFYING PATIENTS

We used our available datasets (right) to identify TC911 clients. We included in our study any client who was a Health Share member for the six months prior to their program engagement; this ensured that we had baseline utilization data for each member against which we could measure program impact.
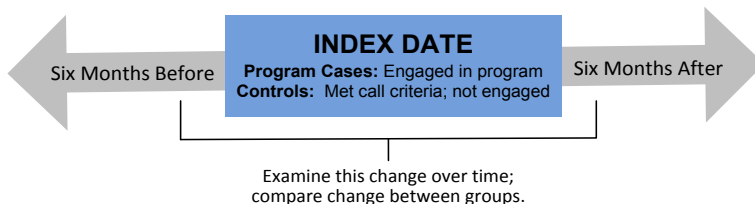
## COMPARISON GROUPS

In order to more confidently attribute any changes in utilization to program efforts, we set out to identify a comparison group of patients with similar 911 call histories who were not served by the program. However, the Tri-County 911 program actually used two different screening criteria for enrollment during our study period: the program initially set a screening criteria of 6 or more 911 calls in the preceding six months; but Multnomah County later began using a criteria of 10 calls.

Because neither criteria was exclusively used across the entire study period, we created two distinct studies: a **main study** that included patients who met the "6 or more" call criteria, and a **"high frequency subgroup"** study that included a subset of the main study who met the "10 or more" criteria. We were interested in using the main study to understand global program impacts, and the subgroup study to see if the program's impacts looked any different in the "higher frequency" subgroup of persons with very high call volume.

| MAIN STUDY | "HIGH FREQUENCY" SUBGROUP STUDY |
|---|---|
| **PROGRAM GROUP** | **PROGRAM GROUP 2** |
| 108 patients served by the TC911 program for whom we had 6 months of baseline claims data. | 52 patients from the main study group who had **10 or more calls** in the 6 months prior to enrolling in the program. |
| **CONTROL GROUP 1** | **CONTROL GROUP 2** |
| 239 patients with **6 or more** 911 calls over a 6 m period who were never in the program, and for whom we have 6 months of baseline claims data. | 52 patients from the main study control group who had **10 or more** 911 calls over a 6 month period and were never in the program. |

We examined program cases who were engaged between April 2013 (program inception) and Dec 2013. This end date was to maximize the number of clients with six months of follow-up data For comparison group cases, we examined anyone with frequent enough 911 calls to meet program criteria, but who were not served. This included some cases from before the program was launched, but also some who met criteria after launch but were not reached by the program. Controls included those who met program criteria any time between April 2012 and Dec 2013. We used mortality records to exclude anyone who died during our study window from our analyses .

**INDEX DATE**
Six Months Before
**Program Cases:** Engaged in program
**Controls:** Met call criteria; not engaged
Six Months After

Examine this change over time;
compare change between groups.

## DATA SOURCES

### TC911 PROGRAM RECORDS

A list of all HealthShare clients served by the TC911 program since March 2013. Key elements include patient identifiers used to match to other data sources and data on the dates and intensity of intervention received by each client.

### EMS RECORDS

EMS response records were obtained from the American Medical Response (AMR) agency, the ambulance provider for Multnomah and Clackamas County. This dataset contains historical AMR usage for TC911 clients and comparison patients. Note data from Metro West, the ambulance provider for Washington County was not available.

### MEDICAID CLAIMS DATA

As part of the Health Commons grant, CORE maintains an aggregated claims dataset capturing comprehensive health care utilization and cost data for all HealthShare members.

## STATISTICAL METHODS

To assess the impact of the program on our key outcomes, we used multivariate regression models to conduct a difference-in-differences (DiD) estimation while controlling for potential confounders. We used generalized estimating equations (GEE) to account for correlated data within subjects (i.e., follow-up utilization may be influenced by baseline utilization patterns), allowing us to estimate on the impact of the program over time relative to a control group.

A DiD method assesses whether the pre-post changes in outcomes over time within each group were statistically different from one another. This allows us to distinguish between *program impacts* and the natural changes in outcomes that might occur in a population over time.

We assessed each model independently for outlier cases. Where necessary, we removed a handful of cases whose utilization diverged dramatically from that of the overall study sample, and were thus negatively impacting model fidelity.

# PROGRAM SUMMARY

## PROGRAM OVERVIEW

The Tri-County 911 Service Coordination Program serves Washington, Clackamas, and Multnomah County residents who call 911 frequently for emergency medical services (EMS) when other health and social services would more appropriately serve their needs. Clients are identified by data analysis or through direct referrals from EMS response partners (fire and ambulance) in the three counties. The program offers three broad types of services:

*Provider Notification and Consultation:* Notification of client EMS use, as well as brief advocacy, referral brokering, and facilitation of communication across service agencies.

*Short-Term Intensive Case Management:* Intensive engagement with the client to mutually identify goals and connect to appropriate health, behavioral, housing, and other social services.

*Care Coordination:* Intensive communication, advocacy, referral brokering and coordination with existing providers and clients to strengthen and support the client's care.

## CLIENT & CONTROL GROUP PROFILE

TC911 clients in our study and their counterparts in the control group are compared at the right. Overall comparability is strong, with a few exceptions: program clients differ significantly from controls in terms of race/ethnicity and county of residence. These differences are best seen as a function of selection into our study rather than evidence the program is systematically missing any particular population.

These demographic differences are important to understand as context, but our multivariate analysis accounts for significant demographic differences between groups. Because of this, differences in group composition are not likely to be key drivers or alternate explanations of the findings we report.

## BASELINE UTILIZATION PROFILE

We also compared program clients to our control group in terms of their baseline (pre-index date) utilization of health care. We found that program clients tended to use somewhat more care, especially ED care and inpatient stays (excluding OB), than comparison clients.

Our analytic design is a difference in differences (DiD) comparison. It compares the *change* in outcomes within and between groups over time, rather than comparing the pure rate or prevalence of an event at one time point. For this reason, differences in baseline utilization do not necessarily invalidate the conclusions that arise from our analysis of program impacts.

### PROGRAM OVERVIEW

| | |
|---|---|
| 285 | Unique clients served to date |
| 4.0 | FTE staffing the program |
| $609k | FTE staffing the program |

### BREAKDOWN OF SERVICES DELIVERED

| | |
|---|---|
| 41% | Received a consult only |
| 51% | Received care coordination |
| 8% | Received above + case mgmt |

### PARTICIPANT PROFILE

| TC 911 Group | | Comparison Group |
|---|---|---|
| 54% | Female | 58% |
| 80% | White, non-Hispanic | 70% |
| 13% | Black/African American | 21% |
| 51 | Average Age | 51 |
| 70% | Multnomah County Resident | 85% |
| 22% | Clackamas County Resident | 13% |
| 26% | Also in Health Resilience Program | 21% |

### BASELINE UTILIZATION PROFILE
(MM=member months)

| TC 911 Group | | Comparison Group |
|---|---|---|
| 1.6 | Avg 911 calls per MM | 1.3 |
| 2.9 | Avg ED visits per MM | 2.1 |
| 0.43 | Avg inpatient stays per MM | 0.21 |
| 1.0 | Avg primary care visits per MM | 0.7 |
| 2.0 | Avg outpatient MH per MM | 1.8 |

# ACUTE SERVICES

We analyzed Medicaid claims data to assess whether TC911 clients' use of acute care services changed before and after exposure to the program, and whether those changes were larger than what would be expected in a similar population without the program. To determine this, we examined three measures of acute service utilization (right) before and after each client's index event, then compared the net change between the two study groups using our *Difference in Differences* (DiD) models. Our models control for significant demographic differences between the study groups.

## MEASURES

**911 CALLS:** The average number of AMR responses during each time period. Numbers represent average responses per member per month.

**ED Visits :** The average number of ED visits in each time period. Numbers represent average visits per member per month.

**Non-OB Inpatient Admits:** The average number of non-OB inpatient admissions in each time period. Numbers represent average visits per member per month.

## RESULTS

**MAIN STUDY:** We found evidence of a statistically significant program impact on ED visits—a net reduction of .35 visits per member per month, or 4.2 visits per person annually. We did not find evidence of a global reduction in call volumes or non-OB inpatient admissions—both outcomes declined in the program group, but not by a greater amount than they declined in the control group.

**HIGH FREQUENCY SUBGROUP STUDY:** Within our high frequency subset, we did find evidence of a significant reduction in non-OB admissions — a net reduction of nearly half a visit per person per month. This change was driven by a combination of declining visits among program cases and an increase in post-index date visits among controls, suggesting the program's efforts may be helping mitigate health crises that in its absence eventually result in a hospital admission.

| MAIN STUDY Program vs Control Group | TC911 CLIENTS n=108 | | CONTROL GROUP 1 (Six or More Calls) n=239 | | Net PMPM Program Effect[2] | P-value[3] |
|---|---|---|---|---|---|---|
| | Before | After [1] | Before | After[1] | | |
| AMR Responses PMPM | 1.52 | 0.94 | 1.20 | 0.59 | +0.02 | .80 (NS) |
| ED Visits PMPM | 2.73 | 1.50 | 1.97 | 1.10 | **-0.35** | **.08** |
| Non-OB Admissions PMPM | 0.43 | 0.35 | 0.21 | 0.15 | -0.01 | .86 (NS) |

| HIGH INTENSITY SUBGROUP STUDY Program Subset vs Control Subset | TC911 CLIENTS n=52 | | CONTROL GROUP 2 (Ten or More Calls) n=52 | | Net PMPM Program Effect[2] | P-value[3] |
|---|---|---|---|---|---|---|
| | Before | After [1] | Before | After[1] | | |
| AMR Responses PMPM | 2.27 | 1.45 | 2.14 | 0.86 | **+0.47** | **0.04** |
| ED Visits PMPM | 3.54 | 1.99 | 3.37 | 1.62 | +0.20 | 0.65 (NS) |
| Non-OB Admissions PMPM | 0.64 | 0.42 | 0.16 | 0.43 | **-0.46** | **0.06** |

## NOTES

"Before" and "after" are demarked by each case's index date (see methods section).

Net program effect = (change in TC911 scores) - (change in control group scores). PMPM = per member month.

P-values are computed for net program effect in our models, adjusted for demographic differences. Orange cells indicate statistically significant values of <.10 or less.

## BOTTOM LINE

We found that, in models that adjusted for demographic differences, clients served by the TC911 program had a significant reduction in ED utilization after their index date when compared to similar patients with high 911 call activity who weren't served by the program. Among high-frequency members (with call volumes of 10 or more over the preceding six months), we also observed a significant reduction in inpatient visits relative to our control group. This may suggest that, for this particular subset of members, the program is helping mediate health crises that would otherwise result in admissions.

# OUTPATIENT SERVICES

We analyzed Medicaid claims data to assess whether TC911 clients' use of outpatient services changed before and after exposure to the program, and whether those changes were larger than what would be expected in a similar population without the program. To determine this, we examined three measures of outpatient utilization (right) before and after each client's index event, then compared the net change between the two study groups using our *Difference in Differences* (DiD) models. Our models control for significant demographic differences between the study groups.

## RESULTS

**MAIN STUDY:** We found evidence of a statistically significant program impact on primary care visits—a net reduction of 0.23 visits per member per month, or 2.8 visits per person annually. This means clients in the program saw a larger average reduction in PCP visits after the program than similar persons without the program.

**HIGH FREQUENCY SUBGROUP STUDY**: in our high-frequency subgroup study, we found evidence of a larger primary care effect, as well as a significant reduction in outpatient mental health visits, within the specific subset of program enrollees who met the higher (10 or more calls) entry criteria.

## MEASURES

**PCP VISITS:** The average number of primary care visits in each time period. Numbers represent average visits per member per month.

**MENTAL HEALTH:** The average number of outpatient mental health visits in each time period. Numbers represent average visits per member per month.

**CHEMICAL DEPENDENCY:** The average number of chemical dependency visits in each time period. Numbers represent average visits per member per month.

| MAIN STUDY<br>Program vs Control Group | TC911 CLIENTS<br>n=108 | | CONTROL GROUP 1<br>(Six or More Calls)<br>n=239 | | Net PMPM<br>Program Effect[2] | P-value[3] |
|---|---|---|---|---|---|---|
| | Before | After [1] | Before | After[1] | | |
| PCP Visits PMPM | 0.94 | 0.64 | 0.70 | 0.63 | **-0.23** | **.01** |
| OP Mental Health visits PMPM | 1.88 | 1.64 | 1.45 | 1.65 | -0.43 | .15 (NS) |
| Chemical Dependency visits PMPM | 0.29 | 0.34 | 0.02 | 0.04 | +.03 | .33 (NS) |

| HIGH INTENSITY SUBGROUP STUDY<br>Program Subset vs Control Subset | TC911 CLIENTS<br>n=52 | | CONTROL GROUP 2<br>(Ten or More Calls)<br>n=52 | | Net PMPM<br>Program Effect[2] | P-value[3] |
|---|---|---|---|---|---|---|
| | Before | After [1] | Before | After[1] | | |
| PCP Visits PMPM | 1.20 | 0.86 | 0.5 | 0.62 | **-0.46** | **<0.01** |
| OP Mental Health visits PMPM | 2.23 | 1.88 | 2.15 | 3.77 | **-1.98** | **.09** |
| Chemical Dependency visits PMPM | 0.58 | 0.85 | - | 0.02 | +0.25 | 0.20 (NS) |

### NOTES

"Before" and "after" are demarked by each case's index date (see methods section).

Net program effect = (change in TC911 scores) - (change in control group scores). PMPM = per member month.

P-values are computed for net program effect in our models, adjusted for demographic differences. Orange cells indicate statistically significant values of <.10 or less.

## BOTTOM LINE

We found that, in models that adjusted for demographic differences, clients served by the TC911 program had a significant reduction in primary care utilization after their index date when compared to similar patients with high 911 call activity who weren't served by the program. Among our high-frequency subgroup, we also observed a significant reduction on outpatient mental health visits when comparing outcomes to our second control group, using the stricter criteria of 10 or more 911 calls. In each case, changes among program clients were significantly different from what occurred in our control population.

# RESULTS:

# MORTALITY

The program had records of mortality events for their clients and control group individuals who resided in Multnomah County.  We looked at how many individuals died after enrollment in the program, or in the case of controls, how many individuals died after the month when program enrollment would have occurred based on their qualifying 911 call patterns.  Note that in the comparison group, if someone died as a result of the call that made them eligible, that individual was excluded from the analysis.  This ensures we only looked at deaths the program could actually have impacted.

Limiting the comparison to only those individuals in Multnomah County, we looked at "raw" mortality rates and there was a significant difference between the case and comparison groups; 2.6% versus 13.3% respectively.

| | |
|---|---|
| **2.6%** | Mortality rate in TC911 cases (n=76) |
| **13.3%** | Mortality rate in comparison group (n=203) |
| **5.3*** | Relative risk of mortality in comparison group (vs TC911 clients) |

Statistically significant difference (p = .02)

*estimated using log-binomial regression model controlling for gender, race, age, and co-morbidities

We also ran a regression-adjusted model that computed the relative risk of dying while controlling for gender, age, race, and comorbidity differences between treatment and control cases.  Even after controlling for these differences, we found that individuals in the comparison group had 5 times higher risk of dying in the six months after their index date.  Note that mortality is a rare event and it is difficult to extrapolate larger population trends from a small study sample when the event you are studying is rare.  Also a subset of the comparison group were *historical controls*, and factors other than the program could be responsible for the mortality results. Therefore, while these results warrant consideration, they should be interpreted with caution.

TC911 staff believe there are potential mechanisms for the program to impact mortality.   Many of their clients have multiple complex issues:  persistent mental illness, severe substance dependence, cognitive impairment, physical health issue(s), and unstable housing.  Also nearly all clients have prolonged exposure to chronic stress and trauma.  They routinely connect vulnerable clients to housing, in-home care, skilled nursing care, addictions treatment, and adult protective services.  TC911 clinical assessments in the field, advocacy, intensive case management, and multi-system care coordination could be protective.

# BOTTOM LINE

We found that, in models that adjusted for demographic differences, clients served by the TC911 program were five times less likely to die during the study period.  Program management hypothesizes that connecting a vulnerable population to longer term support and resources could be lifesaving.  This finding warrants further exploration.

# SUSTAINABILITY

## IS THE PROGRAM SAVING MONEY?

The program is designed to reduce "unnecessary" utilization, and the evidence suggests that TC911 clients see larger reductions in outpatient and acute care utilization than members with similarly high 911 call volumes who don't enter the program. These reductions in utilization equate to cost savings.

Although we did find evidence the program had an impact on utilization in our high-frequency subgroup, we estimate cost savings using the results of our main study. We chose this approach for two reasons:

♦ **LARGER & MORE REPRESENTATIVE STUDY:** Our main study includes everyone in the program for whom we had sufficient data, giving us a better estimate of the total effect of the program. Our high frequency subgroup study provides good estimates of impacts on a specific subset of the TC911 program, but it is more difficult to estimate global cost savings using results that only apply to a subset of participants.

♦ **MORE CONSERVATIVE ESTIMATES:** Our comparison to control group 1 generates smaller estimates of cost savings, because it does not include "credit" for the avoided inpatient utilization we detected in the high intensity subgroup (those avoided visits "wash out" in the overall program average). If the program is sustainable even without crediting it with those savings, it is likely doing even better than our estimates.

## RESULTS

Based on the results from our main study, we find good evidence that the TC 911 program has generated cost savings greater than its program expenses since the program's launch in March 2013.

The program saw 285 unique clients between March 2013 and June 30, 2014, a 15 month period during which it cost about $768,000 to operate. We found two types of statistically significant utilization reductions in our main study: primary care visits and ED visits. By applying our estimates for reduced ED and primary care utilization on a "per person" annualized basis, and then extrapolating them across all 285 participants, we estimate that the program's work during that 15 month time period generated total savings of $836,000.

**IMPUTED PROGRAM SAVINGS**
**(BASED ON COMPARISON TO CONTROL GROUP 1)**

| | |
|---|---|
| **$120** | Average cost of a primary care visit in this population. |
| **$336** | Imputed annual savings per patient from reduced primary care |
| **$617** | Average cost of an ED visit in this population. |
| **$2591** | Imputed annual savings per patient from reduced ED use |

**ESTIMATED ROI PROFILE OF TC911 PROGRAM**
**(BASED ON COMPARISON TO CONTROL GROUP 1)**

| | |
|---|---|
| **$614K** | Annual cost of program |
| **$768K** | Cost of program from launch until June 30, 2014 (@15 months) |
| **285** | Clients seen during that time period |
| **$96k** | Primary care savings if we apply our study's effect estimate to all 285 |
| **$740k** | ED savings if we apply our study's effect estimate to all 285 |
| **$836k** | Total savings for all people seen b/w March 2013 and June 30, 2014 |

**CONCLUSION:** Since its launch, the TC911 program appears to have generated annual cost savings in excess of its total costs.

**OTHER POTENTIAL SAVINGS:** This probably represents a conservative estimate of total program savings, since it does not account for the reductions in inpatient events we found for the high-intensity sub-cohort of our study. Those avoided visits actually did happen, though are "washed out" when we look at the overall program average. Inpatient events in this population cost an average of $8,800 each, so crediting the program with even a few of those visits would improve the sustainably profile even more.

Unfortunately, estimating precise savings with the data on hand is difficult. Inpatient events are rare events—much more rare than ED or primary care visits in this population — and imputing annualized savings estimates from a small study population that represents only a subset of the program's participants, and during a limited time window, is fraught with a high possibility of estimation. We have not included any savings estimates specific to our high intensity subgroup study here, but even without them, the program's overall ROI profile is favorable.

# CONCLUSIONS

## PROGRAM & STUDY GOALS

We used a pre-post, comparative design to assess the impact of the TC911 program on two main types of outcomes: outpatient utilization such as primary care visits, and the use of acute services such as ambulances, ED visits, and inpatient events. The TC911 program's stated goal is to help clients connect to the "right care in the right place and right time" reducing unnecessary utilization and the expenditures associated with them.

Our study was designed to assess the program's success in accomplishing those goals. We examined pre-post changes in outcomes of interest among persons seen by the program, then compared those changes to individuals with similar 911 call histories, but who were not seen by the program. The control group's experiences represent the "natural" change in outcomes over time; the difference between that natural change and the experiences of our program group may be attributed to the TC911 program's efforts. We can not control for other changes during this time period including increased access to other services related to healthcare transformation or protective interventions such as naloxone distribution.

## PROGRAM IMPACTS

**RESULTS OF MAIN STUDY:** We found evidence that, as a whole, TC911 clients experienced significantly reduced primary care and ED utilization relative to the control group. We did not see evidence of net declines in other outpatient care, call volumes, or inpatient admissions. In many cases these measures *did* decline among program clients; they just declined equally in the comparison group. We also found that TC911 clients had a lower mortality rate relative to the control group.

**RESULTS OF HIGH FREQUENCY SUBGROUP STUDY:** We separately assessed the experience of study members who met a stricter entry criteria — *10 or more 911 calls in the last 6 months* — because Multnomah County had adopted that stricter criteria for a portion of our study period to manage a long waitlist. We also wanted to understand the program's impacts on that specific "very high volume" subpopulation. We found that, *within that particular subset of members*, the program strongly impacted primary and outpatient mental health care and generated a net per-member reduction in non-OB inpatient admissions.

## SUSTAINABILITY & ROI

We use results from our main study, which best represent overall program effects, to estimate overall program ROI to date. We applied our estimates of reduced primary care and ED utilization to the population TC911 has served since its inception, then imputed total savings from those net reductions by multiplying those estimates times the mean (average) cost of each type encounter in our claims database. For this study, using averages to impute costs is superior to studying actual paid amounts in the claims, because actual expenditures are impacted by specific contract elements between payers and providers that we can't adequately control for in a comparative design. Imputing cost savings based on observable utilization changes equalizes those factors and allows for a 'fair' assessment of cost impacts.

**RESULTS OF SAVINGS ANALYSIS:** We estimate that, since March 2013, the program has generated $836,000 in savings by reducing ED and primary care utilization for the 285 people it has served. This is greater than the $768,000 cost of running the program for that same time period. Our savings estimates are conservative; they do not include any "credit" for the reductions in inpatient events we found within our high intensity subgroup. Even without those savings, the TC911 program has a positive ROI profile.

## BOTTOM LINE

Results from this study suggest that the TC911 program has not been successful in reducing 911 call volumes, but has had success in reducing actual ED visits, as well as primary care utilization. There is also evidence that, within the high-frequency subset of overall clients, the program may be reducing inpatient admits. These results are consistent with the program's goals and have resulted in a positive ROI profile across the 15 months since it was launched via the Health Commons grant.

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