MILLIMAN CLIENT REPORT

Independent review of Teladoc Health's return on investment (ROI) estimation methodology for its Chronic Care programs

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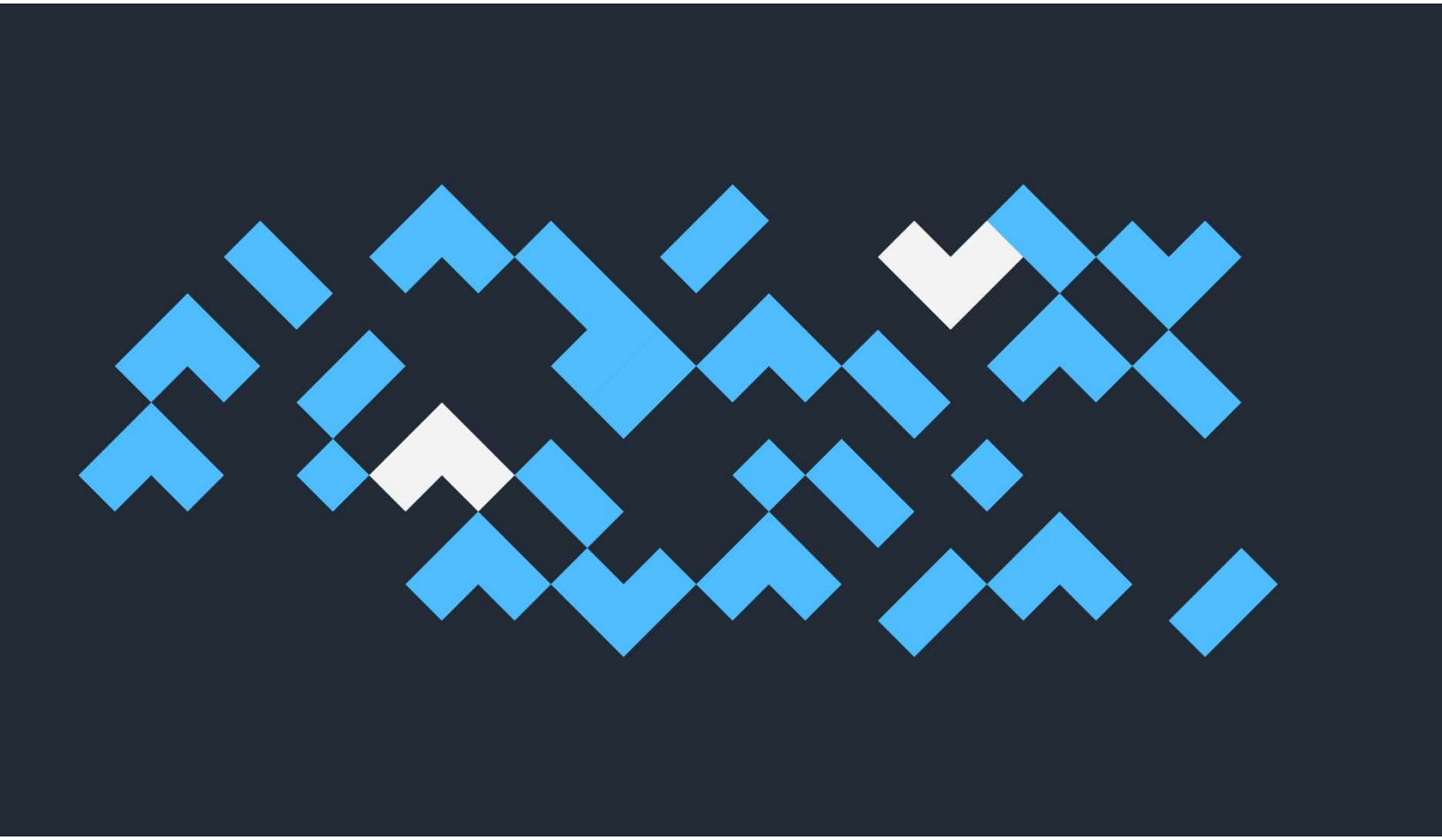

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Executive summary

Teladoc Health (Teladoc) developed a methodology to quantify the return on investment (ROI) of its chronic care multi-condition programs, diabetes management and hypertension management. Teladoc engaged Milliman to conduct a review of this methodology to determine its appropriateness for achieving the above purpose. This report:

1. provides an overview of Teladoc's chronic care programs,
2. describes Teladoc's approach to quantifying the ROI for these programs,
3. summarizes our opinion of the reasonability of Teladoc's standard methodology,
4. discusses potential limitations of the methodology used by Teladoc, and
5. outlines important caveats and limitations of Milliman's review of Teladoc's methodology.

This report is intended to provide feedback on Teladoc's methodology for quantifying its chronic care programs' impact as it was presented to Milliman and may not be appropriate and should not be used for any other purpose. Our review was based on a white paper from Teladoc entitled *Teladoc Health ROI Methodology,* dated December 8, 2023. Actual experience may differ from historical experience, and the results for any particular Teladoc chronic care client (client) may be unique to the characteristics of that client, point in time, and other factors not considered in this assessment. We are only commenting on the specific approach provided to us by Teladoc for calculating the estimated impact of its chronic care programs. This information does not constitute an endorsement or recommendation of its chronic care programs, nor does it quantify the value of its chronic care programs in general or in aggregate or for any specific group or individual historically or in the future.

We conclude that Teladoc's standard methodology represents a reasonable approach to quantify the potential financial impact of its chronic care programs subject to the limitations noted in the "Methodology Assessment" section of this report. As with any methodology, it is important to understand the caveats and limitations that may impact the accuracy, validity, and generalizability of the results and we have documented these considerations in this report. We have also referenced supplemental analysis and metrics that may provide additional insight on the ROI of Teladoc's chronic care programs, as described under "Methodology Assessment". It is important to read this report in its entirety.

Any reader of this report must possess a certain level of expertise in areas relevant to this analysis to evaluate the significance and reasonability of the assumptions and the effect of these assumptions on the results. We recommend that all parties be aided by their own actuary or other qualified professional when reviewing this report.

Background on Teladoc's chronic care programs

According to information provided by Teladoc:

> Teladoc is a virtual healthcare company that provides human-centered, whole person solutions spanning the health continuum inclusive of urgent care, primary care, mental health, metabolic health, and chronic condition management to improve the health of the diverse members they serve.
>
> Teladoc's chronic care multi-condition programs are comprehensive virtual care solutions that address the foundational areas of cardiometabolic health such as nutrition, activity, sleep, and mental health, covering the broadest spectrum of a member's chronic care needs, integrated into a single member experience. Teladoc's chronic care multi-condition programs are focused on empowering program participants to make lifestyle changes through a set of core capabilities, including connected devices that transmit biometrics to the Teladoc web and mobile app, personalized health signals for targeted member experiences, integrated mental health content, and expert live coaching with a dedicated care team of experienced professionals that follow evidence-based practices and tailor care plans for each member. Teladoc's clinical team model focuses on relationship-based, culturally concordant, longitudinal care, which allows for continuous evaluation of quality, effectiveness, and safety. The dedicated care team can be comprised of a provider,

certified health coach, mental health coach, and registered dietician, etc. This comprehensive model facilitates early identification of other conditions, supports sustained behavior modification, and helps to reduce the risk of complications and costly, adverse health events.

Teladoc currently offers both diabetes management and hypertension management chronic care programs which provide members with the following interventions in addition to the core capabilities included in all chronic care multi-condition programs outlined above:

- **Diabetes**. Members receive a connected, interactive blood glucose meter, unlimited blood glucose test strips, personalized health nudges to support behavior change, expert coaching and 24x7 monitoring.
- **Hypertension**. Members receive a connected blood pressure monitor and cuff, personalized health nudges to support behavior change, expert coaching and 24x7 monitoring.

The scope of this report is limited to the standard ROI methodology for Teladoc's diabetes management and hypertension management chronic care programs only. Any modifications to the ROI methodology that may produce variation in the financial impact are outside the scope of this review.

Overview and assessment of Teladoc's ROI methodology

METHODOLOGY OVERVIEW

Teladoc's ROI standard methodology for its chronic care programs is intended to estimate the program effect (measured on an allowed medical and pharmacy cost basis) for a cohort of members enrolled in the chronic care program compared to a propensity-matched control population. The components of this ROI methodology are summarized below.

Teladoc has standard criteria to determine member eligibility for each program, inclusive of defined diagnosis and drug codes used to identify populations over a 24-month look-back period. Only the standard criteria are in scope for this review, and the impact of any variations from this definition should be evaluated by the client.

Teladoc is asked by clients of varying sizes to conduct an ROI analysis under this methodology and evaluates whether the population size is sufficient to conduct the study. Members with chronic conditions join the chronic care programs on a rolling basis after the client launch date, which is when the program becomes available to employees or group members. The standard methodology used to define the study period cohorts assigns members to cohorts based on the member's Teladoc enrollment year after program launch. For example, cohorts of members who enrolled in year 1, year 2, year 3, etc. after program launch are created, and the "activation date" for the members is defined based on the cohort start date (equivalent to the program launch date in year 1 and the anniversaries of that date in subsequent years).

Teladoc outlines the following inclusion and exclusion requirements for study membership:

- Members must be enrolled and activated in a Teladoc chronic care program for a minimum of 3 months in the post-treatment period. A member with less than 3 months of program enrollment is removed from the remainder of the analysis.
- Members must be eligible for medical and pharmacy health benefits continuously throughout the entire study period.
- Members over 64 years old are excluded from both pre- and post-treatment periods due to Medicare eligibility and likelihood of incomplete claims. For Medicare Advantage clients, this is not an exclusion criterion.
- Members with the following high-cost conditions, based on the Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses developed by the Agency for Healthcare Research and Quality, are excluded from both the pre- and post-treatment periods:
  - diagnosis of cancer, or
  - diagnosis of pregnancy.

- Members with no medical costs in the pre-treatment period are excluded.

Additionally, medical costs of both member and non-members are capped at the lesser of the 95th percentile of allowed cost or $100,000 annually.

The non-Teladoc control group is selected from the client's recruitable population using propensity score matching. The matching ratio (1 to 1 or 1 to many) depends on sample size of members and non-members with the aim to achieve balance, as determined by a standardized mean difference (SMD) less than 0.1 across all matching variables, between the Teladoc case and control groups across the matching variables as well as to maximize included membership. If the SMD is greater than 0.1 for any matching variables, they will be considered for exact matching.

Propensity score matching is performed using the nearest-neighbor method with the greedy algorithm. The standard model includes the following matching variables:

1. Age
2. Gender
3. Charlson Comorbidity Index
4. Diabetes type (when applicable)
5. Pre-treatment period spending
6. Insulin use (for the diabetes program only)

If no match can be found for over 5% of the case group, the analysis is terminated as an additional measure of prevention for overfitting.

Following achieving balance between case and control groups, Teladoc attributes its chronic care program's impact to a statistically significant difference-in-differences in average post-treatment period costs per member per month (PMPM) between the cases and the controls. This is compared over a 24-month study period which includes 12 months of claims prior to the chronic care program's implementation (the pre-treatment period), and the 12 months of claims after the chronic care program's implementation (the post-treatment period). If the trend in allowed PMPM from the pre-treatment period to the post-treatment period for the Teladoc case group is less than the pre- to post-treatment period trend for the non-Teladoc control group, this is interpreted as cost savings derived from the chronic care program's intervention.

For the diabetes management program ROI estimation, since Teladoc provides certain diabetes testing supplies during the course of the program, diabetes supply spending PMPM for Teladoc members is identified using a list of drug codes which represent the diabetes supplies that Teladoc provides/replaces. Manufacturer rebates for glucose test strips are included if applicable. Teladoc uses their internal diabetes supply average PMPM cost assumption for clients who do not provide their pharmacy data. The prior cost of these diabetes testing supplies is removed from the denominator of the ROI calculation because it is offsetting the cost of the diabetes management program (denoted as "Price of chronic care program (PMPM)" in the formula below).

The client ROI for the chronic care programs is calculated as:

$$\text{ROI} = \frac{\text{Teladoc diff-in-diff medical costs (PMPM)} + \text{Teladoc diff-in-diff pharmacy cost (PMPM)}}{\text{Price of chronic care program (PMPM)} - \text{Prior diabetes supply spending (PMPM)}}.$$

Teladoc has retained flexibility in approach for components of the methodology where an alternative technique may be used as Teladoc's clients request alternative approaches or the data available requires alterations; for instance, parameter adjustments to improve match quality, the cohort methodology, or other adjustments that may depend on the specific client data used or hypothesis of interest. As these decisions cannot be enumerated, we are unable to comment on the appropriateness of the specific methodology used for any particular client or study, only on the standard methodology outlined above. Other variations to the methodology that we have not reviewed include the following:

- The population eligible for the chronic care programs may be defined and generated by clients. Clients may utilize their own criteria (e.g., varying historical diagnosis and drug codes) to generate recruitable lists or work with consultants to create lists using similar approaches.
- Members with a new diagnosis in the post-treatment period of chronic kidney disease, congestive heart failure, cardiovascular disease, or transplants may be excluded from the study.
- Alternative methodologies for creating cohorts may be used, such as comparing incremental year-over-year program impacts ("year-over-year" methodology) or defining the member activation date as the start of the post-period ("member-year" methodology).
- In a population where the 95th percentile is low (around $50,000 annually), capping of annual costs above the 99th percentile will be considered instead of the 95th percentile.
- Matching without replacement is used when the non-member group's size is larger than members. In cases where the sample size of members is larger than non-members or there are less than five times as many non-Teladoc members as Teladoc members, matching with replacement will be considered.
- Other features including split medical and pharmacy cost deciles and region may also be used depending on the client based on whether the client spans multiple geographies and whether pharmacy data is provided.
- If available, a client-provided PMPM for diabetes supplies may be used in place of Teladoc's calculated value.

METHODOLOGY ASSESSMENT

We believe Teladoc's standard methodology for estimating the ROI of its chronic care programs is reasonable given its intended purpose. Notwithstanding this general conclusion, each client or organization relying on Teladoc's estimates should review the relevance and appropriateness of the assumptions and methodology used in the analysis as it applies to each population of interest. Client ROI estimates within the standard methodology are based on allowed dollars and are not split between the payer, any employer group, and the member. Parties relying on Teladoc's chronic care program ROI estimates should consider the extent to which benefit design, retention, and other contractual terms affect their modeled ROI.

There are several possible limitations that should be considered by any party that relies on results produced by Teladoc's chronic care programs' ROI estimation methodology. These limitations include, but are not limited to:

1. **Statistical credibility.** The size of the member population for which the Teladoc chronic care programs' impacts are estimated can impact the statistical significance of the ROI results. Smaller populations will likely contribute to higher variance within the program outcomes and statistically significant differences will be more difficult to achieve. Teladoc does not conduct a power analysis before proceeding with the analysis to determine if this sample size is sufficiently powered. Teladoc should perform a power analysis for various population sizes to determine whether an ROI study would be sufficiently powered. The criteria for which results will be reported as statistically significant were not defined in the methodology we reviewed.
2. **Claims runout for the pre- and post-treatment periods.** The timeframes used to measure the pre- and post-treatment periods may have inconsistent claims runout periods depending on the availability of data. We recommend using the same number of months of runout for both the pre-treatment and post-treatment periods. This is only a limitation to the extent that claims complete differently for the Teladoc group compared to the non-Teladoc group. Teladoc's default claims runout period for the post-period is five months, which should sufficiently capture a high percentage of total incurred cost, so we expect this impact to be minimal.
3. **Variation in methodology.** We reviewed the standard methodology outlined above for quantifying the ROI of the chronic care programs. Teladoc may modify this methodology based on the client data used or hypothesis of interest. Modifications can include, but are not limited to, handling outliers or missing data, adjusting the time period studied, increasing the number of matched controls beyond one per case, or adjusting the matching parameters. Teladoc will disclose and justify any methodology adjustments used in a study. We have not reviewed the entire range of these methodology variations and our opinion of the methodology's appropriateness is limited to the specific assumptions and methods outlined above. Adjusting the methodology could permit Teladoc to make changes that influence the results in a way that shows the

chronic care programs in a more positive light, intentionally or unintentionally. Any party relying on Teladoc's results should review any adjustments on a study-by-study basis to assess their appropriateness, both for validity of the study and for whether the study is still applicable for the party's population of interest after these adjustments. Interested parties should also understand that results from different Teladoc studies may not be comparable due to methodology changes or differences between the client data used for each study. We have not reviewed any particular study result and make no comment on the appropriateness of any adjustments (or lack thereof) in the methodology for any given study.

There are limitations that no ROI estimation methodology outside of a randomized controlled trial can completely control for, which also apply:

- **Selection bias due to voluntary participation in a care management program**. It is generally the case that individuals who opt to participate in a care management program have behaviors and clinical risk that differ materially from individuals who do not.[1,2] This selection bias could result in higher or lower expected costs and utilization compared to average overall population costs and utilization. The propensity-matching process attempts to control for this bias, but it is impossible to control for completely.
    - For example, if individuals who opt into the chronic care program are more willing to engage in activities that will improve their healthcare outcomes and have been taking steps to manage their own care in the absence of the chronic care program, this could drive a reduction in baseline healthcare costs that is difficult to control for in the program impact methodology (thus overstating the impact of the chronic care program interventions).
    - As another example, if individuals who opt into the chronic care program are drawn to participate due to their higher level of clinical risk or difficulty managing their own care or costs due to its complicated nature, this could drive an increase in baseline healthcare costs that is difficult to control for in the chronic care program impact methodology (thus understating the impact of the chronic care program interventions).
    - There is no adjustment for or consideration of other care management programs that may influence cost and utilization in the baseline period or the performance period.
- **Plausibility and attribution of results**. Many factors impact healthcare costs, utilization, and outcomes, and impacts may not be fully attributable to the chronic care programs' interventions. For that reason, the chronic care programs' impact estimates should be evaluated alongside other metrics to help validate the plausibility of results. The following types of metrics may provide additional insight on the ROI of the chronic care programs:
    - Existence of a dose-response relationship – whether groups with higher use of the chronic care programs have better risk-adjusted financial results than groups with lower use of the chronic care programs.
    - Whether total cost of care results improve after increasing the chronic care programs' engagement, and whether this improvement is better than the results of groups that are not increasing the chronic care programs' engagement.

Caveats, limitations, and qualifications

Austin Barrington, Deana Bell, and Erin Birkeland are members of the American Academy of Actuaries and meet the qualification standards to render the actuarial opinion contained herein. To the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3760982/

[2] https://academic.oup.com/jrsssa/article/183/1/3/7056419

This report is intended to provide our evaluation of the standard Teladoc methodology for quantifying ROI of their chronic care programs. It may not be appropriate, and should not be used, for other purposes. We did not assess the effectiveness or impact of Teladoc's chronic care programs and make no opinions about their effectiveness or impact.

If distributed to third parties, this report must be shared in its entirety. We do not intend this information to benefit, or create a legal liability to, any third party, even if we permit the distribution of our work product to such third party. Those reviewing Teladoc's calculations should take full responsibility for interpreting the results, which should be reviewed by someone knowledgeable in the areas of healthcare data and impact calculations.

We understand that Teladoc intends to provide public access to this report and the methodology we reviewed through an internet link, and therefore it could be viewed by its prospective clients, competitors, potential investors, or other interested parties. We consent to this distribution if the work is distributed in its entirety.

In completing this review, we relied on information provided by Teladoc in November and December 2023, which we reviewed for reasonableness, but accepted without audit. Specifically, the information we received include:

- Teladoc Health ROI Methodology
- Teladoc chronic care program overview documents
- Qualifying diagnosis and drug code sets
- Case study results and supporting materials

If any of this information is inaccurate or incomplete, the contents of this report along with many of our conclusions may likewise be inaccurate or incomplete. This review incorporates Milliman's experience in working with similar programs that rely on administrative claims data. Teladoc's clients' actual results may differ from modeled projections due to factors such as population health status, reimbursement levels, delivery systems, changes in Teladoc's programs, changing regulations, and random variation. It is important that Teladoc and their clients monitor actual experience and make adjustments to assumptions and methodology, as appropriate.

While we find Teladoc's standard methodology for estimating ROI to be reasonable, all methodologies, algorithms, and formulas are by nature assumption driven. We are not commenting on the assumptions chosen for any particular calculation of the chronic care programs' impacts performed for any Teladoc client. We did not attempt to replicate Teladoc's assumptions, recalculate its results, test for potential omissions, weaknesses, or biases. Furthermore, we did not review Teladoc's specific care management activities or whether those activities would produce results to demonstrate a causal relationship between care management activities and resulting cost and utilization impacts.

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