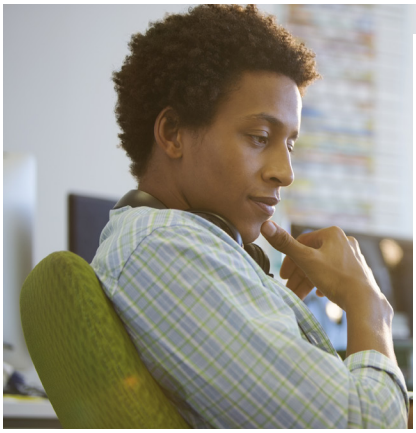
Teladoc HEALTH

WHITE PAPER

ROI methodology for whole-person chronic condition management solutions

Our approach to demonstrating client cost savings across multiple conditions



People with diabetes also struggle with

MANAGING WEIGHT

85%

HYPERTENSION

56%

DYSLIPIDEMIA

33%

MENTAL HEALTH ISSUES

21%

For years, our Livongo programs have empowered people with chronic conditions to live better, healthier lives. Our members receive tools and support to self-manage diabetes, hypertension and mental health challenges, as well as reduce weight and prevent diabetes. As a result, we're improving health outcomes and reducing the total cost of care for our clients by reducing unnecessary healthcare utilization. We have performed many client-level medical claims-based analyses that have demonstrated the savings associated with our Livongo for Hypertension and Livongo for Diabetes Prevention programs in separate white papers.[1,2,3]

While all our standalone programs yield both positive clinical impact and positive ROI, we know that many Americans are living with more than one chronic condition. For example, people with diabetes also struggle with managing weight (85%), hypertension (56%), dyslipidemia (33%) and mental health issues (21%).[4] Understanding and addressing the full spectrum of health challenges in our members is key to properly addressing the health and financial implications of these conditions.

As such, we now offer solutions for managing multiple chronic conditions through a single, comprehensive, integrated program. These whole-person solutions give members fully integrated access to core elements of the standalone Livongo programs for which they are eligible—including diabetes, diabetes prevention, hypertension, dyslipidemia, mental health and weight management. This approach provides a more meaningful, personalized experience for our members and even more value for our clients.

These solutions have been built around an underlying "anchor" condition but are designed to address multiple conditions; the three new solutions we now offer are summarized in the table below. Eligible members are enrolled in a solution based on the following anchor condition hierarchy: diabetes, prediabetes and hypertension (for our cardiovascular solution). This ensures that members have access to the full set of condition-specific program components from which they will benefit. For example, a member eligible for both the prediabetes and cardiovascular solutions would be enrolled in the prediabetes solution since it also incorporates elements of our cardiovascular solution.

	Diabetes solution	Prediabetes solution	Cardiovascular solution
Target population (anchor condition)	**People with diabetes**	**People with prediabetes**	**People with hypertension**
Additional areas of support (based on individual member need)	• Hypertension • Dyslipidemia • Weight management • Mental health	• Hypertension • Dyslipidemia • Weight management • Mental health	• Dyslipidemia • Weight management • Mental health
Standard platform features (available across all solutions)	**Effortless data collection** Apps and cellular devices per conditions covered	**Personalized health signals** Lifestyle change, medication adherence, emotional support	**Human-centered approach** Digital and expert coaching adapts to member needs

Savings represented as per participant, per month (PPPM)

$180 PPPM

DIABETES SOLUTION

$76 PPPM

PREDIABETES SOLUTION

$76 PPPM

CARDIOVASCULAR SOLUTION

This paper details a financial savings model for our Livongo whole-person solutions using an econometric approach that takes into account condition prevalence (which determines eligibility for enrollment), expected enrollment (of those eligible), and program- and combination-specific savings to conservatively project financial savings for members in each of these solutions.

Although our whole-person solutions represent a single, integrated user experience fluidly combining elements of our standalone programs for which a member is eligible, we use savings estimates from our standalone programs to model whole-person savings since they have been extensively evaluated and published.

Model methodology overview

The whole-person savings model projects a per participant, per month (PPPM) dollar savings amount for each solution. This PPPM savings represents the blended average savings across the entire population enrolled based on expected condition prevalence, rates of program enrollment and observed clinical outcomes.

Savings specific to each anchor condition program have been detailed in previously published results and white papers (noted above), and the whole-person model builds upon this foundation while accounting for expected overlap in savings across programs. For example, we know that managing diabetes and hypertension reduces the risk for both heart attack and stroke. Therefore, to avoid overestimating the impact of our diabetes and hypertension programs delivered together, we only incorporate the savings related to this risk reduction once.

The Weight Management and Mental Health programs represent sources of incremental cost savings for our members that do not overlap with savings for the anchor condition programs mentioned above. The methods for modeling cost savings specific to Weight Management and Mental Health, as well as the sources and rationale for these savings, are summarized below in the next section: "Program-specific medical cost savings."

In general, PPPM cost savings projections for members enrolled in whole-person solutions are built up from anchor condition-specific program savings and program combination savings, with Weight Management and Mental Health program-associated savings added on to these. Our model projects savings of $180 PPPM for the Diabetes Whole-Person Solution and $76 PPPM saving for both the Prediabetes and Cardiovascular Whole-Person solutions.

Key levers and financial outcomes

Condition prevalence

For most of our clients, member eligibility for a specific program is based on that member having a given condition documented in that member's medical claims history. As such, to model whole-person solution member eligibility, we determined prevalence rates for diabetes, hypertension and mental health disorders from 2015-2017 claims data for 13.2 million commercial lives and 1.3 million Medicare Advantage lives. Prevalence rates were calculated based on the presence of related ICD-10 diagnosis codes. We used nationally representative survey data instead of claims to determine the prevalence of prediabetes and obesity since these conditions are frequently under-coded in claims.[5]

Program enrollment and co-enrollment

Enrollment in each whole-person solution is anticipated to follow historical trends for our anchor conditions (e.g., 34% for diabetes, 10% for diabetes prevention, 20% for hypertension). The savings model below starts from an assumed base of enrolled members and uses conservative "co-enrollment" rates for comorbid conditions based upon eligibility. During the registration process, co-enrollment is pre-selected for all additional programs for which a member is eligible, but to keep savings projections conservative, we factor in 70% co-enrollment for most comorbid condition-specific programs, with the exception of Weight Management, for which we factor in 85% based upon early observations.

Program-specific medical cost savings

We discuss Weight Management and Mental Health savings first since these have not been previously detailed.

Weight Management savings

Estimates of cost savings associated with weight loss come from two models, Cawley et al. (2015)[6] and Thorpe (manuscript under review), [7] which demonstrate a J-shaped relationship between medical costs and weight, with costs increasing sharply at the highest weights. These studies also report that medical cost savings are much greater when losing weight from higher starting body mass index (BMI) and that cost savings differ depending on the presence of comorbid conditions like diabetes and hypertension.[8]

Using the Cawley and Thorpe models along with real-world evidence from the Livongo for Weight Management program, we estimate average cost savings tied to our Weight Management program, shown below. These account for the range of starting BMIs and actual weight-loss results we see in our members, as well as the presence of relevant anchor conditions impacting savings. A more detailed description of our methodology is found in the Appendix.

Projected weight management savings based on anchor condition

$50

DIABETES SOLUTION INCREMENTAL PPPM SAVINGS

$13

PREDIABETES INCREMENTAL PPPM SAVINGS

$23

HYPERTENSION INCREMENTAL PPPM SAVINGS

Mental Health savings

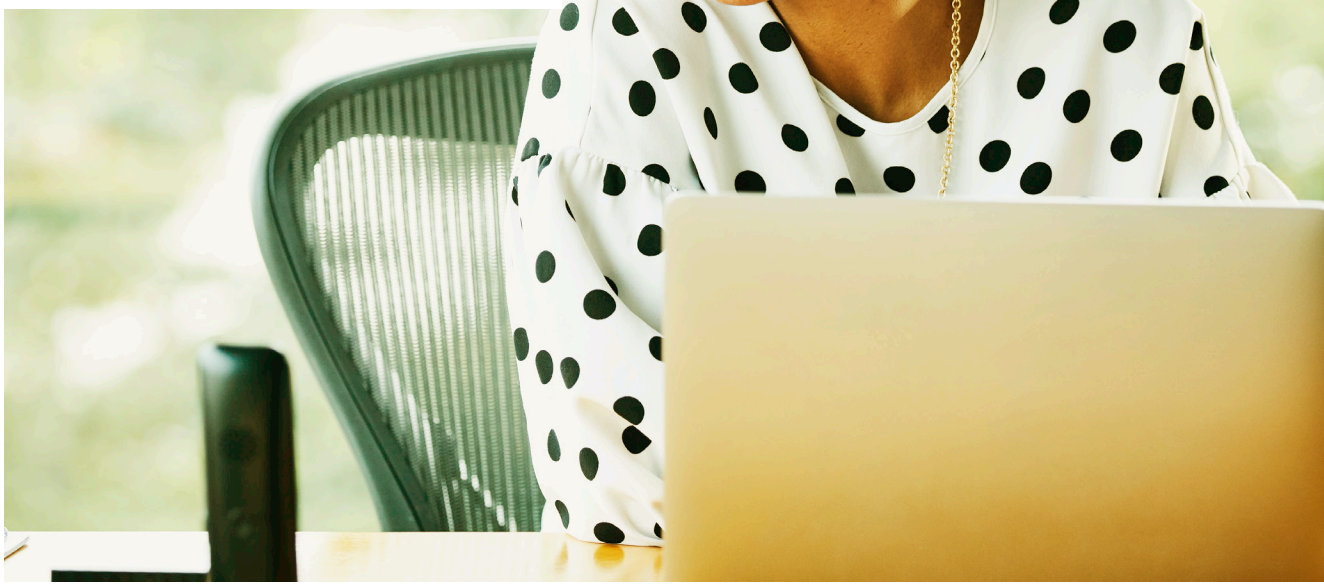
Estimates of cost savings from mental health support provided to whole-person solution members come directly from real-world cost savings achieved with myStrength (now Livongo for Mental Health) for people with clinically diagnosed behavioral health conditions, as published in a peer-reviewed study.[9] Difference-in-difference claims analysis of 1,514 people enrolled showed cost savings of $382 per member over an 11-month period, or $35 PPPM. These savings are applied to a portion of whole-person solution members who are projected to have clinically diagnosed mental health conditions based on prevalence in claims data.

We believe there is significant potential upside to the savings figure contributed by Mental Health since our estimate of PPPM savings generated by the program are likely conservative for several reasons:

- We do not factor in any savings that would be achieved through the use of this program by members with subclinical mental health conditions (i.e., those who are undiagnosed), which is expected to be at least as many members with clinically diagnosed conditions.[10]
- Savings above were demonstrated using an earlier version of myStrength, which was digital only. Livongo for Mental Health includes coaching, which has been shown to improve the outcomes of our other programs when used by members.[11]
- We do not factor in any of the significant non-claims cost savings (i.e., loss of productivity, days missed from work) from better managing mental health.

Anchor condition savings

Savings for Livongo's anchor condition-specific programs are summarized below with the methods and supporting literature available in the aforementioned white papers for Livongo for Hypertension and Livongo for Diabetes Prevention programs.



$131

DIABETES PPPM COST SAVINGS

$54

PREDIABETES PPPM COST SAVINGS

$58

HYPERTENSION PPPM COST SAVINGS

Diabetes: Medical cost savings are based on actual claims analysis and represent results from across our book of business. The analysis was completed in September 2019 using our Milliman-validated difference-in-difference method.[1]

Prediabetes: Medical cost savings are based on two components: (1) estimated number of diabetes cases prevented and incremental annual claims costs avoided, and (2) reduced healthcare costs associated with weight loss irrespective of diabetes prevention. Results are $41 PPPM for diabetes prevention plus $13 from weight loss savings unrelated to diabetes prevention.[3]

Hypertension: Medical cost savings are derived from two components: (1) cardiovascular risk reduction for heart attack and stroke, and (2) hypertension-related healthcare utilization reduction from emergency department visits avoided and decreased office visits.[2]

Anchor condition combination savings

$151

DIABETES + HYPERTENSION PPPM COST SAVINGS

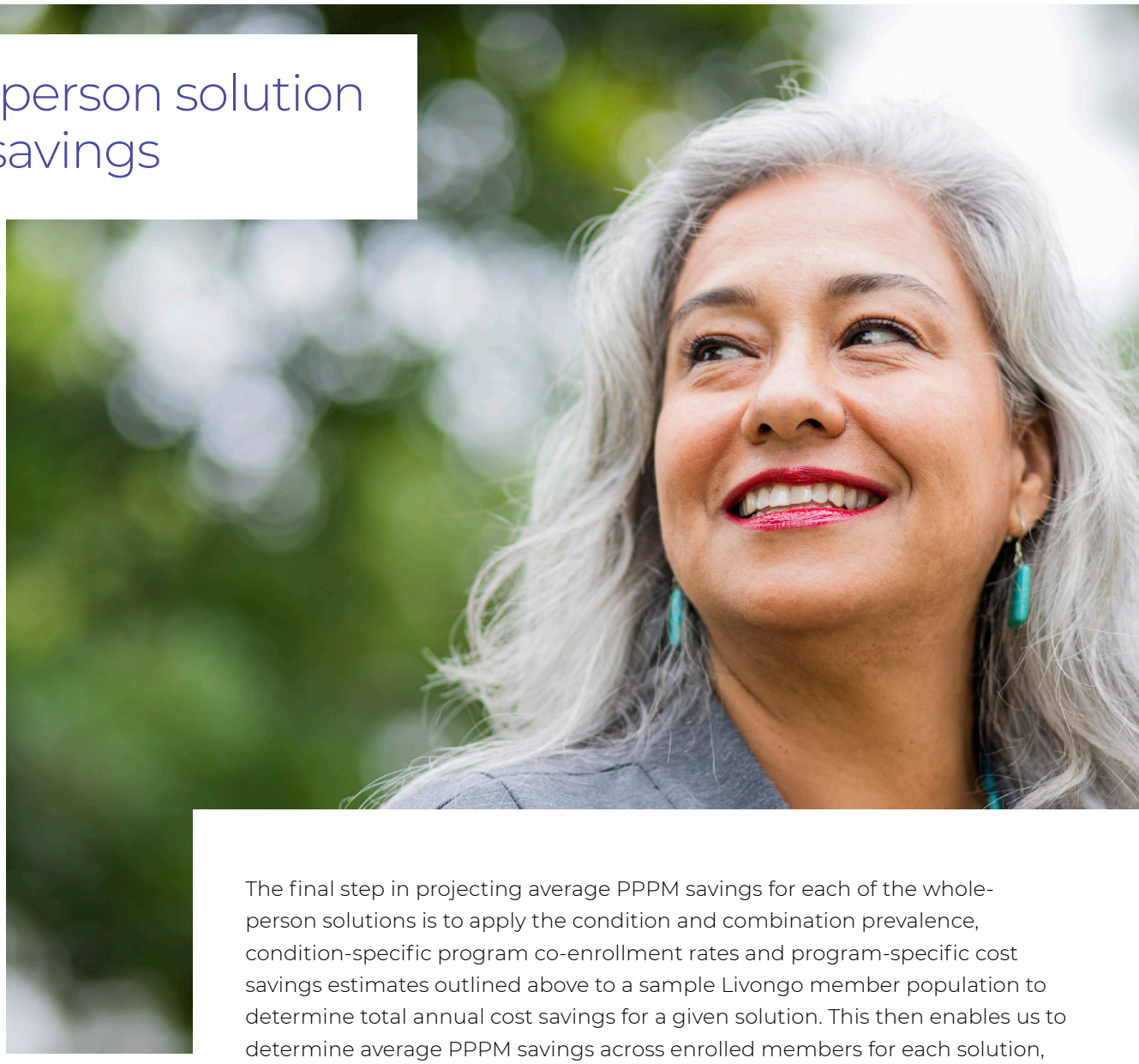
$122

PREDIABETES + HYPERTENSION PPPM COST SAVINGS

Diabetes plus hypertension: Medical cost savings combine observed savings from the Livongo for Diabetes program with a portion of savings estimated for the Livongo for Hypertension program resulting from decreased hypertension-related ED and office visits; hypertension-related savings from reduced cardiovascular events are not added since these savings are already accounted for in the diabetes program.[12]

Prediabetes plus hypertension: Medical cost savings are based on three components: (1) estimated number of diabetes cases prevented, (2) reduced healthcare costs tied to weight loss for people with hypertension and (3) estimated savings from the Livongo for Hypertension program. Results are $41 PPPM for $41 PPPM for diabetes prevention plus $23 from weight loss for people with hypertension (from "Weight Management Savings" section above) plus $58 for savings directly related to hypertension.

Whole-person solution PPPM savings



The final step in projecting average PPPM savings for each of the whole-person solutions is to apply the condition and combination prevalence, condition-specific program co-enrollment rates and program-specific cost savings estimates outlined above to a sample Livongo member population to determine total annual cost savings for a given solution. This then enables us to determine average PPPM savings across enrolled members for each solution, accounting for the various comorbid condition combinations of the members who enroll.

Diabetes Whole-Person solution

The Diabetes Whole-Person solution provides members access to the Livongo for Diabetes, Hypertension, Weight Management, Dyslipidemia and Mental Health programs. As such, the Diabetes Whole-Person solution average cost savings projection below incorporates estimated savings for members enrolled in the Diabetes program only, as well as combinations of Diabetes with Hypertension, Mental Health, and Weight Management.

For a sample population of 100 participants, we would expect:

Member type	Condition prevalence	Program co-enrollment	Enrolled members	PPPM cost savings	Annual savings
Diabetes Whole-Person solution overall			**100**		
Condition combinations (mutually exclusive)					
Diabetes only	**38%**	**---**	**38**	**$131**	**$60K**
Diabetes + Hypertension	**41%**	**70%**	**29**	**$151**	**$52K**
Diabetes + Mental Health	**6%**	**70%**	**5**	**$166**	**$9K**
Diabetes + Hypertension + Mental Health	**15%**	**70%**	**10**	**$186**	**$23K**
Diabetes only - portion above not co-enrolling[13]	**---**	**---**	**18**	**$131**	**$29K**
Diabetes + Hypertension + Mental Health					
Weight Management + Diabetes	**85%**	**85%**	**72**	**$50**	**$43K**
Total				**$180**	**$216K**

$180

DIABETES WHOLE-PERSON SOLUTION PPPM SAVINGS

Prediabetes Whole-Person solution

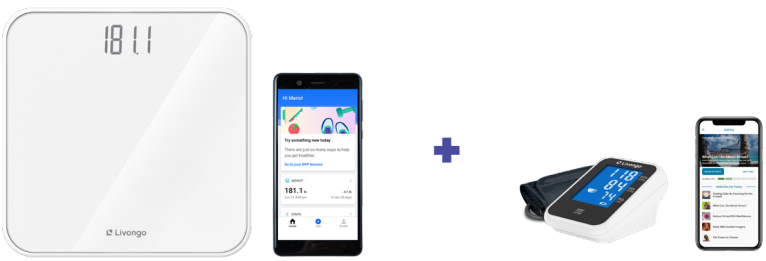
The Diabetes Prevention Whole-Person solution provides members access to the Livongo for Diabetes Prevention, Hypertension, Dyslipidemia and Mental Health programs. As such, the average cost savings projection below incorporates estimated savings for members enrolled in Prediabetes only and members enrolled in combination with Mental Health and Hypertension. Because the Livongo for Diabetes Prevention program is primarily a weight management program (delivered per Centers for Disease Control and Prevention (CDC) National Diabetes Prevention Program specifications), the projected savings from Weight Management ($13 PPPM) are already included in all condition combinations below and thus not called out separately as for Diabetes or Hypertension.

For a sample population of 100 participants, we would expect:

Member type	Condition prevalence	Program co-enrollment	Enrolled members	PPPM cost savings	Annual savings
Prediabetes Whole-Person solution overall			**100**		
Condition combinations (mutually exclusive)					
Prediabetes only	**53%**	**---**	**53**	**$54**	**$34K**
Prediabetes + Hypertension	**29%**	**70%**	**21**	**$122**	**$30K**
Prediabetes + Mental Health	**9%**	**70%**	**7**	**$89**	**$7K**
Prediabetes + Hypertension + Mental Health	**9%**	**70%**	**6**	**$157**	**$11K**
Prediabetes only - portion of above not co-enrolling	**---**	**---**	**13**	**$54**	**$9K**
Total	**---**			**$76**	**$92K**

$76

PREDIABETES WHOLE-PERSON SOLUTION PPPM SAVINGS



Cardiovascular Whole-Person solution

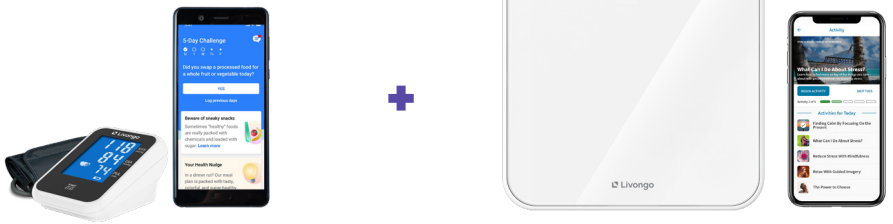
The Cardiovascular Whole-Person solution provides members access to the Livongo for Hypertension, Weight Management, Dyslipidemia and Mental Health programs. As such, the average cost savings projection below incorporates estimated savings for members enrolled in Hypertension only and members enrolled in Hypertension and Weight Management.

For a sample population of 100 participants, we would expect:

Member type	Condition prevalence	Program co-enrollment	Enrolled members	PPPM cost savings	Annual savings
Cardiovascular Whole-Person solution overall			**100**		
Condition combinations (mutually exclusive)					
Hypertension only	**78%**	**---**	**78**	**$58**	**$54K**
Hypertension + Mental Health	**22%**	**70%**	**15**	**$93**	**$17K**
Hypertension only - portion of above not co-enrolling	**---**	**---**	**7**	**$58**	**$5K**
Weight Management enrollment (overlapping with groups above)					
Weight Management + Hypertension	**65%**	**85%**	**56**	**$23**	**$15K**
Total				**$76**	**$91K**

$76

CARDIOVASCULAR WHOLE-PERSON SOLUTION PPPM SAVINGS



Conclusion

In addition to the savings outlined in this document, the whole-person solutions provide a synergistic experience that keeps people more active and engaged in managing multiple chronic conditions over the long term.

Digital health solutions have the power to improve the health of the people who use them and, in turn, reduce costs of care. These chronic condition management programs take on an even greater value when offered in combination.

Furthermore, we believe that the projections shared represent conservative estimates of the PPPM cost savings achievable through our comprehensive, integrated whole-person solutions for three reasons:

1. We discount over half of Hypertension anchor condition savings in members of the Diabetes Whole-Person solution as this portion of savings is tied to avoided acute cardiovascular events that can also be caused by diabetes. While we do this to ensure that we do not "double count" any savings, Hypertension should be expected to contribute to these events independently and incrementally of diabetes.
2. We make conservative assumptions on co-enrollment for comorbid condition-specific programs since the default option is for members to enroll in all programs for which they are eligible.
3. We incorporate no savings related to mental health management for members who have subclinical mental health conditions, nor do we incorporate indirect cost savings related to increased productivity from improved mental health management.

In addition to the savings outlined in this document, the whole-person solutions provide a synergistic experience that keeps people more active and engaged in managing multiple chronic conditions over the long term.

We believe that by allowing our members to manage multiple chronic conditions through a seamless, harmonious, single user interface, they will gain a better awareness of how their conditions interact and be empowered to take better care of their health. This drives enhanced member clinical benefits and client financial benefits relative to the use of our programs in isolation. We are pleased to send this value to our clients and the people they serve.

Appendix

Weight Management savings methodology detail

We estimate the PPPM cost savings impact of our weight management program within whole-person solutions by combining the Cawley and Thorpe models with real-world results from the Livongo for Weight Management program using a four-step process:

1. For each starting BMI, we determine the medical cost savings associated with a 5% weight loss as per Cawley and Thorpe models. We then calculate the medical cost savings per percentage point in weight reduction at each BMI so that we can model cost savings specific to historical weight loss in our program by starting BMI.
2. We calculate total annual savings across all enrolled members using the values derived above applied to the distribution of members by starting BMI. We do not include any cost savings for members with a starting BMI under 30 or for members with a weight loss of less than 5%.
3. We discount total annual savings so that, in effect, only the portion of members who engage with Livongo programs over the 12-month period contribute savings. That is, we assume that all members expected to be lost to attrition before 12-months enrollment generate zero dollars in cost savings.
4. We again discount the overall annual savings to account for the potential contribution of other programs included in whole-person solutions to the overall weight loss and cost savings. This prevents us from overestimating cost savings for whole-person solution members who are using the Livongo for Weight Management program along with the Livongo for Diabetes and/or Hypertension programs, which each contribute their own program-specific savings as detailed above.

[1]Data on file (DS-3S47).

[2]Livongo Return on Investment Model for Hypertension.

[3]Livongo Return on Investment Model for Diabetes Prevention; Livongo data on file DS-4286.

[4]Data on file for diabetes, hypertension and behavioral health prevalence (DS-4266); behavioral health prevalence is based on medical claims. The 2017 National Survey on Drug Use and Health found that the prevalence of behavioral health conditions was 25% for clinical conditions and an additional 35% for subclinical conditions. Overweightness and dyslipidemia prevalence from Kaiser Family Foundation 2018 and 2017 State Health Facts, respectively. Overweightness prevalence for people with diabetes from the CDC.

[5]Prediabetes: CDC using the 2011-2014 National Health and Nutrition Examination Survey. Obesity: Kaiser Family Foundation 2013-2018 CDC Behavioral Risk Factor Surveillance System.

[6]Cawley, John, Chad Meyerhoefer, Adam Biener, Mette Hammer, and Neil Wintfeld. 2015. "Savings in Medical Expenditures Associated with Reductions in Body Mass Index Among US Adults with Obesity, by Diabetes Status." PharmacoEconomics vol. 33, 7 (2015): 707-22.

[7]"The Impact of Weight Loss on Medical Care Expenditures Among Chronically Ill Adults" (under peer review).

[8]Used Crawley and Thorpe scenario for no comorbidities to estimate cost savings.

[9]Abhulimen, Sese, and Abigail Hirsch. 2018. "Quantifying the economic impact of a digital self-care behavioral health platform on Missouri Medicaid expenditures." *Journal of Medical Economics* vol. 21,11 (2018): 1084-1090.

[10]Per 2017 National Survey on Drug Use and Health Annual National Report.

[11]For example, members of Livongo Diabetes who use coaching have 2x the HbA1c reduction and 35% fewer ED visits compared to members who do not engage with our coaches (DS-1580).

[12]Livongo Return on Investment Model for Diabetes and Hypertension.

[13]Members eligible for comorbid condition-specific offerings that do not elect to co-enroll in those offerings only receive program features for the anchor condition, and as such, are modeled to achieve the same amount of savings as individuals with only the anchor condition.