

## Instructions

- This application should be used for state approval for use of Title III-D funding for an evidence-based program that is not currently listed on the National Council on Aging's chart of highest-level evidence-based health promotion programs.
- Programs for approval for Title III-D funding will be considered on a case by case basis.
- Per the Administration of Community Living, only evidence-based programs will be evaluated; evidence-based services/practices on their own will not be considered. Evidence-based services/practices refer to strategies or activities used by evidence-based programs as part of the larger intervention. According to ACL's website:  
*"Evidence-based programs refer to organized and typically multi-component interventions with clearly identified linkages between core components of the program and expected outcomes for an identified target population."*  
Source: <https://www.acl.gov/index.php/programs/health-wellness/disease-prevention>
- The completed application and all necessary documentation will be sent to the SC Department on Aging, Rowan Goodrich, III-D Program Manager, for approval.
- Contact Rowan Goodrich with any questions, [RGoodrich@aging.sc.gov](mailto:RGoodrich@aging.sc.gov)



**APPLICATION FOR STATE APPROVAL FOR  
OLDER AMERICANS ACT TITLE III-D FUNDING FOR EVIDENCE-BASED PROGRAMS**

Name of program being assessed: \_\_ Nymb1 Training

Date application submitted to SCDOA: \_\_ August 31, 2022

Contact person's name: \_\_ Nathan Estrada

Contact phone number: \_\_ 303-518-2134

Contact email: \_\_ nathan@nymblscience.com

The Division of Senior & Disability Services follows the Administration on Community Living (ACL) definition of evidence-based programs in order to determine if a program meets evidence-based requirements. All evidence-based programs will have to meet all of the following criteria:

- Demonstrated through evaluation to be effective for improving the health and well-being or reducing disease, disability and/or injury among older adults; and
- Proven effective with older adult population, using Experimental or Quasi-Experimental Design; and
- Research results published in a peer-review journal; and
- Fully translated in one or more community site(s); and
- Includes developed educational products that are available for dissemination to the public.

**Part 1:**

Is the program considered to be an evidence-based program by another Division within the US Department of Health and Human Services (HHS) and does it meet all of the above criteria?

Yes (Complete Part 1, do not complete Part 2)                       **No (Skip to Part 2)**

If so, which Division: \_\_\_\_\_

- Is the program demonstrated to be effective for older adults? (attach research results published in a peer-review journal): \_\_\_\_\_
- Documentation by HHS Division of evidence-based program designation (i.e. website, publication, press release), attach documentation as needed: \_\_\_\_\_

**Part 2:**

Summary of program for approval: Nymb1 is a personalized balance training app for older adults that was developed based on clinically validated data from Nymb1 Science's evidence-based fall prevention program. In just 10 minutes a day, older adults can follow key exercises to enhance their balance in the privacy of their own homes. By training the brain and body to work together, known as dual-tasking, Nymb1 guides older adults to engage in a combination of physical exercise and concurrent cognitive

challenges. Using this approach, Nymb1 is highly effective in improving balance for older adults, as well as their confidence to engage in daily physical activities.

**Criteria 1: Demonstrated through evaluation to be effective for improving the health and well-being or reducing disease, disability and/or injury among older adults**

What was the study population? Older adults 55+

What health outcomes were evaluated? Postural sway measures during quiet standing with feet at shoulder width apart and feet together, one leg standing and tandem stance were measured at baseline, and at the end of the 3 and 6 training weeks; the International Physical Activity Questionnaire (IPAQ) assessed participants' physical activity level before training; and app acceptability was recorded using a user experience questionnaire.

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Describe completed evaluation of program, including measures used and results: Research shows effectiveness of improving anteroposterior sway, mediolateral sway, sway area during tandem stance, for anteroposterior sway during one leg standing and for sway area during feet together stance. Research shows effectiveness at improving balance training.

**Criteria 2: Proven effective with older adult population, using Experimental or Quasi-Experimental Design**

(Experimental design is where participants are randomly assigned to either the treatment group or the control group. Quasi-experimental design includes a control group and treatment group but where the groups are not created using random assignment.)

Intervention Group: Thirty-five ≥55 years old's from the greater London area participating with the Imperial College of London Research Lab. (Mean age: 68±6.2 years 10 men, 25 women)

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Control Group: The researchers used quasi-experimental design with a one-group pre-test-posttest design.

Description of study: BMJ Open: Feasibility and acceptability study on the use of a smartphone application to facilitate balance training in the ageing population. Participants were asked to follow a balance exercise program 7 days a week for 3 weeks using a phone application. Seventeen participants trained for a further 3 weeks. Primary measures: Postural sway measures during quiet standing with feet at shoulder width apart and feet together, one leg standing, and tandem stance were measured at baseline, and at the end of the 3 and 6 training weeks; the International Physical Activity Questionnaire (IPAQ) assessed participants' physical



activity level before training; and app acceptability was recorded using a user experience questionnaire.

Results of Study: Participants on the 3 and 6-week program on average completed 20 (±5) and 38 (±11) days of training, respectively, and all scored moderate to high on the IPAQ. Between baseline and the 3-week assessments, statistically significant improvements were observed or anteroposterior sway, mediolateral sway, sway area during tandem stance, for anteroposterior sway during one leg standing and for sway area during feet together stance. Improvements were observed at 6 weeks compared with baseline but those between 3 and 6 weeks were not significant. Based on the questionnaire, participants reported that the app is an appropriate tool for balance training (77%), they reported benefits from the training (50%) and found it easy to fit it into daily routine (88%).

### **Criteria 3: Research results published in a peer-reviewed journal**

Name of journal research published in: BMJ Open (Top 20 journal internationally)

Date of publication: December 23<sup>rd</sup>, 2020

Attach a copy of the research article. <https://bmjopen.bmj.com/content/10/12/e039054>

The first page is page 18, the article is free to access in the link above

### **Criteria 4: Fully translated in one or more community site(s)**

(In regards to Title III-D definitions, full translated means that the program in question has been carried out at the community level, with fidelity to the published research, at least once.)

Number of community sites program has been implemented: Nymb1 is currently deployed to 500K older adults and is available to the 640K older adults in the Denver Metro Area as part of the DRCOG (Denver Regional Council Of Governments) in charge of the 8 county regions AAA services

Type of location program has been implemented (i.e. senior center, church, etc.): Nymb1 is deployed to the entire 60+ older adult population in the 8 counties of Adams, Arapahoe, Broomfield, Denver, Douglas and Jefferson.

The program is deployed with a multichannel mass communication, grass roots partner engagement and a full time engagement manager to facilitate enrollment into the digital program.

Analyses and Results: Please see the attached report on page 6 of this report

### **Criteria 5: Includes developed dissemination products that are available to the public**

(Dissemination products are tools and materials to guide the implementation of the program for leaders and/or participants such as program workbooks, facilitator guides, and interactive software)



List products/materials/supplies available: The program is delivered through the company Nymbi and is available through their organization and their partner sites. The program is delivered through an app platform.

Location products can be found: Nymbiscience.com, co.fallsfree.com, In the Apple and Android app stores as Nymbi Training


Attach an example of one of the products available.

**SCDOA Process:**

- It is the AAAs responsibility to provide a complete application with all the necessary documentation. An application will not be evaluated until the application is fully complete.
- Applications will be reviewed on a case by case basis.
- Applications must first be approved by both the Senior Program Specialist overseeing Title III-D programs and the Senior Programs Bureau Chief. Final approval will come from the Division Deputy Director and Division Director.
- Applications will be reviewed to ensure all five criteria of the evidence program definition are met.
  - o In regards to Criteria 3: Research published in a peer-reviewed journal, a copy of the article must be provided with the application and come from a reputable peer-reviewed journal published, either in print or electronically, on a wide scale.
    - Peer-Reviewed Journals are defined as publications that contain articles that are written by experts and are reviewed by several other experts in the field before publication. In most cases, the reviewers do not know who the author of the article is, so that the article succeeds or fails on its own merit, not the reputation of the expert.
  - o If there is not sufficient enough information provided, the Division has the option to either deny the application or request additional information from the AAA.
- SCDOA will provide feedback to the AAA in writing either approving or denying the application.
  - o If the application is approved, the AAA must retain documentation and provide the written approval as documentation in their area plan under the AAAs Programs/Services.
    - Failure to do so may result in the Programs/Services section of the area plan to be rejected.
  - o If the application is denied, the Division will provide an explanation of why an application was denied (i.e. not enough documentation, missing criteria, research results are not published in a peer-reviewed journal).

**Check list of the five criteria for evidence-based programs:**

- |   |
|---|
| <ul style="list-style-type: none"><li>- <input checked="" type="checkbox"/> Demonstrated through evaluation to be effective for improving the health and wellbeing or reducing disease, disability and/or injury among older adults; <b>and</b></li><li>- <input checked="" type="checkbox"/> Proven effective with older adult population, using Experimental or Quasi-Experimental Design; <b>and</b></li><li>- <input checked="" type="checkbox"/> Research results published in a peer-review journal; <b>and</b></li><li>- <input checked="" type="checkbox"/> Fully translated in one or more community site(s); <b>and</b></li><li>- <input checked="" type="checkbox"/> Includes developed dissemination products that are available to the public.</li></ul> |
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**Reviewed and approved by:**   
Rowan Goodrich

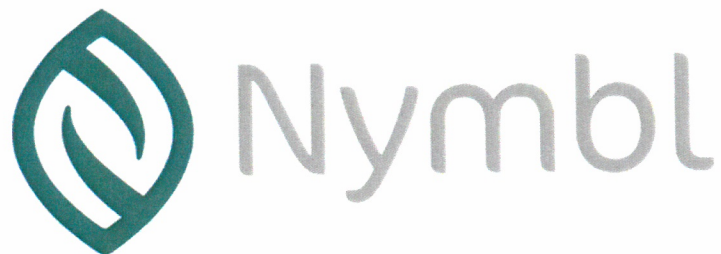
**Date if approval:** 9/31/2022

Revised 8/31/22



**Q4 2021: Nymbbl Science, Inc.  
Summary Report to  
Denver Regional Council  
of Governments (DRCOG)  
November 2021 - January 2022**

**March 4, 2022**





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### **DRCOG and NymbI Summary Report February 10, 2022**

#### **Introducing a new Team Member**

Kori Magallanez has joined the NymbI team as VP of Customer Success. Kori holds an MBA in Healthcare Management and has 20 years of experience in healthcare, across the spectrum of health systems and health plans. Much of her experience has been with older adults, and she has a true heart for ensuring that vulnerable populations have opportunities to improve and maintain their health. As we adjust our internal processes, we will keep the DRCOG team abreast of any changes to points of contact at NymbI. For now, see the call-out boxes throughout the report for Kori's insights into how the NymbI program is impacting older adults in the DRCOG region.

#### **Program Overview**

In partnership with Denver Regional Council Of Governments (DRCOG), the NymbI Science Inc. evidence-based fall prevention program launched on its first campaign on February 21, 2021, with the objective of enrolling 5,000 older adults, ages 60+ in the eight counties serviced by DRCOG, in just under four months.

Following the success of the first two campaigns, a third program launched with the intention of enrolling an additional 5,000 older adults by January 31, 2022.

**4x enrollment in 1/5 the time**, as compared to in-person evidence-based fall prevention programs

In 11 months, February 22, 2021 through January 31, 2022, NymbI and DRCOG have enrolled 11,660 Colorado older adult residents in NymbI's digital evidence-based fall prevention program. By comparison, fewer than 3,000 Coloradoans engaged in in-person evidence-based fall prevention programs over a 5-year period. The impact of NymbI's digital program is scalable and an example of the synergy that can be achieved when public and private sectors work together.

## Enrollee Demographic Information

NymbI and DRCOG demonstrated that a wide and diverse population of older adults will engage in a digital, evidence-based fall prevention program. The following information provides insights into the demographic profiles of the 11,660 DRCOG enrollees enrolled:

**Age:** enrollees who engage with NymbI are, on average, 73.5 years old which represents a slight, but not statistically significant, reduction from our last report. This continued to demonstrate ideal enrollment for injurious falls prevention and long term sustainability.

Members as young as sixty and even those over 90 years of age are engaging with NymbI's digital balance training!

**Gender:** 27% of NymbI training enrollees are male, 72% are female and 1% didn't report gender. The national average of male enrollee engagement in fall prevention programs is 23%. The most recent cohort does have a measurable 1% increase in female participation that we do not attribute to any specific changes or outreach tactics. As a reminder, a higher percentage of male engagement is valuable because studies prove men are less likely than women to report falls, seek medical care, and discuss falls and fall prevention with a healthcare provider.

**County Population Designation:** 29% of enrollees live in non-urban classified zip codes, as categorized by DRCOG's evaluation.

**Initial Fall Risk/Frailty from STEADI assessment:** 33% of DRCOG enrollees classified in the normal risk category (preventative), and 12% of enrollees fell into the borderline (emerging) risk category; these are both consistent with the figures from the last report. We saw changes in higher-level risk categories - an increase of 5.6% from 35.6% to 41.2% of enrollees are high risk and a decrease in severe risk from 19.4% to 12.2%. We are pleased to see this trend because it represents a slight shift in intervention for those who are more likely to have fallen in the past.

**STEADI Individual Risk Factor Insights:** The average STEADI score of DRCOG enrollees is 4.41; indicating enrollees self-reported an average of four of 12 fall risk factors per person. More than 50% of Nymb1 enrollees have an initial self-report during their risk assessment of the top risk factors that Nymb1 is designed and validated to overcome, which include the fear of falling and unsteady walking. There is a decrease of 4% with 41% reporting required use of hands to get out of a chair (a primary driver of homebound status). 37% of enrollees have sustained a recent fall (the greatest predictor of future fall risk).

**Minority and Low Income:** It was mutually agreed by DRCOG and Nymb1 to not collect this data. Collecting these demographics will be part of Q1 2022 priorities. We are currently testing phrasing of the question set and have found some optimized language to decrease anxiety from the older adult to answer the desired minimum data set. We will deploy these learnings when there is a transition to a viable platform to deliver them at DRCOG.

#### **Enrollee Engagement:**

<p><b>On Average:</b> <b>&gt; 9 Balance Training sessions per enrollee</b> <b>&gt; 7 Educational Topics per person</b></p>
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**Balance Training:** As of January 31, 2022, DRCOG Nymb1 enrollees complete an average of over 9 training sessions per enrollee, totaling 103,831 enrollee balance training sessions. Our actuarial study indicates that there is great value in achieving 4 training sessions and we are proud to see the average DRCOG enrollee doubling this milestone.

#### **Cognitive Behavioral Training (CBT) Training:**



As expected, following the deployment of Nymbbl's extended 18 month educational program (versus its previous 12 week program), engagement rose by more than 9%, from 73% to 80%. Through January 31, 2022, Nymbbl enrollees consumed 65,433 CBT educational sessions. The value of this engagement is the continued achievement of novel health behaviors that this effort drives. Our last measurement indicated that >37% of enrollees surveyed reported a novel health behavior as a result of this aspect of the program. It is vital to achieving the multimodal aspect of Nymbbl for comprehensive fall risk reduction.

Of those who enrolled, 80% (9,357 enrollees) actively engaged in Nymbbl's CBT educational program, demonstrating Nymbbl's ability to impact large audiences at scale, as well as its capability for customized communication.

One-third of enrollees engaged on a mobile device. A quarter of all enrollees that engaged in educational program also downloaded content and/or watched Nymbbl's educational videos.

On average, Nymbbl enrollees engage in 7 fall prevention and health and wellness educational topics per person, 4 times more than the industry average. Enrollees indicated the most influential educational series to be: "How important is strength in my balance?", "Does walking improve my balance?", "Why should I have my feet checked?", and "How does vision affect my balance?"

#### **Mobile Platforms:**

According to AARP and Nymbbl data, 85% of older adults in Colorado have a smart device and of those who have a smart device, 95% report that they use it daily. Also, 93% report it's important to offer in-home fall prevention (part of enrollee survey results). 96% of enrollees utilize a smart device in their daily life.

## **Community Marketing and Engagement Efforts**

During the program's 11 month community outreach campaign, more than 30 tactics were deployed, ranging from newspaper print advertisement to local organization partnerships to digital email launches. Nymbbl's marketing team created and deployed the campaigns, designed and produced marketing materials, managed vendor coordination and outreach, curated a digital toolkit to further local organization reach, and adjusted marketing efforts based on insights and performance.

As a whole, the marketing campaign focused on educating and building trust, leading to action and enrollment in Nymbbl. This was achieved through messaging that emphasized Nymbbl's ease-of-use and empowerment message to older adults.

### **Recent Key Marketing Learnings:**

Each quarter, Nymbbl's marketing team conducts new experiments to continue its investment in novel learnings. These learnings further optimize branding and outreach efforts. The following are its most recent learnings:

1. Denver Post print newspaper spadea placement outperforms half page print advertisements: Throughout its 11 month outreach, print advertisements remain a consistent and reliable source of enrollment, specifically, half page advertisements. Nymbbl tested spadea placements (focal point; folded around the front of the newspaper) and saw success; driving 2-3x enrollment at a cost per acquisition (CPA) less than \$17.
2. Low efficacy in partnership with AARP:
  - . The Magazine: Nymbbl deployed a full page ad in AARP The Magazine (Denver Metro region, ages 60-69) that drove more than 150 enrollments; however, at 1/8th the industry average conversion rate and 3-4x higher CPA than Nymbbl has previously achieved.
  - a. Facebook Ads: Nymbbl partnered with AARP to deploy Facebook Ads in the Denver Metro area. We hypothesize efficacy was low due to AARP only allowing partner ads to be run on their AARP Media Solutions Facebook page, as opposed to their primary AARP Colorado Facebook page.
3. The importance of younger imagery: When compared to "older" imagery used in the first campaign phase, imagery of younger older adults performed higher. In conjunction with images of activities, such as hiking, campaigns performed even better.
4. The importance of younger language: Validated across various channels and mediums, language that includes "stay active" copy converted 2x higher than those that mentioned "reducing fall risk."
5. High efficacy in partnership with Rocky Mountain PBS:
  - . Over 7 months of partnership with Rocky Mountain PBS, we launched four tactics across 3 channels, driving more than 2300 enrollments, with a blended CPA below \$26. Among these channels, the most effective combination was television advertisements (30 and 60 second spots) coupled with Nymbbl-specific emails.

## **Program Outcomes**

### **Changing Behavior:**

The Nymbbl program uses a scientifically validated educational system that is based on Cognitive Behavioral Training (CBT) techniques and is cited as a top four program in the world by *BMC Geriatrics*. The primary outcomes of this technique focus on moving older adults from ambiguity on a healthy behavior to action through the use of coordinated educational programming.

The outcomes are as follows: (no significant change from previous reports)

- 66% report having a conversation about fall risk with their provider (45% is the national avg)
- 81% report completing a vision exam
- 37% report they are on four or more medications (lower numbers are associated with decreased fall risk)

### **Balance Improvement:**

When the Nymbbl Training program is experienced on a smart device, we are able to report on additional outcomes. The program is designed to meet the immediate needs of the older adult in terms of balance training for their current ability and progression based on their performance. These outcomes are split into subjective and objective measures and should be considered preliminary until enrollees experience additional months on the platform.

#### Subjective:

Members report their balance improves as they use Nymbbl:

- 46% of enrollees report “significant balance improvement”
- 42% of enrollees report walking is “significantly more stable”
- 70% of enrollees report they are “confident they will not lose their balance in their own home” (This is one of the most important outcomes and builds from a position of industry-leading fall prevention program prior to this optimization).

- |  |
|--|
| <ul style="list-style-type: none"> <li>• 46% of enrollees report “significant balance improvement”</li> <li>• 42% of enrollees report walking is “significantly more stable”</li> <li>• 68% of enrollees who started in the high-risk category are now at normal risk for falls</li> </ul> |
|--|

#### Objective:

As enrollees continue to engage, we continue to see greater impact on balance and fall risk:

- 37.8 (+5%) of all Nymbbl Training enrollees demonstrate a clinically meaningful improvement on physical balance post testing
- 68.5% (+1%) of enrollees who started the program in the high risk category left the high risk category on post testing (minimum of 2 sit to stand present).
  - Indicates over one-third (36.6%) of all enrollees who test in the high risk category at least once, have left the high risk category on post testing.
- The average Nymbbl enrollee with 15-24 balance training sessions demonstrates four repetitions higher on the 30-second sit to stand test than the national average for older adults their age and gender. This magnitude of change is a full degree higher than average, representing a significant protective buffer from falling back into high risk.

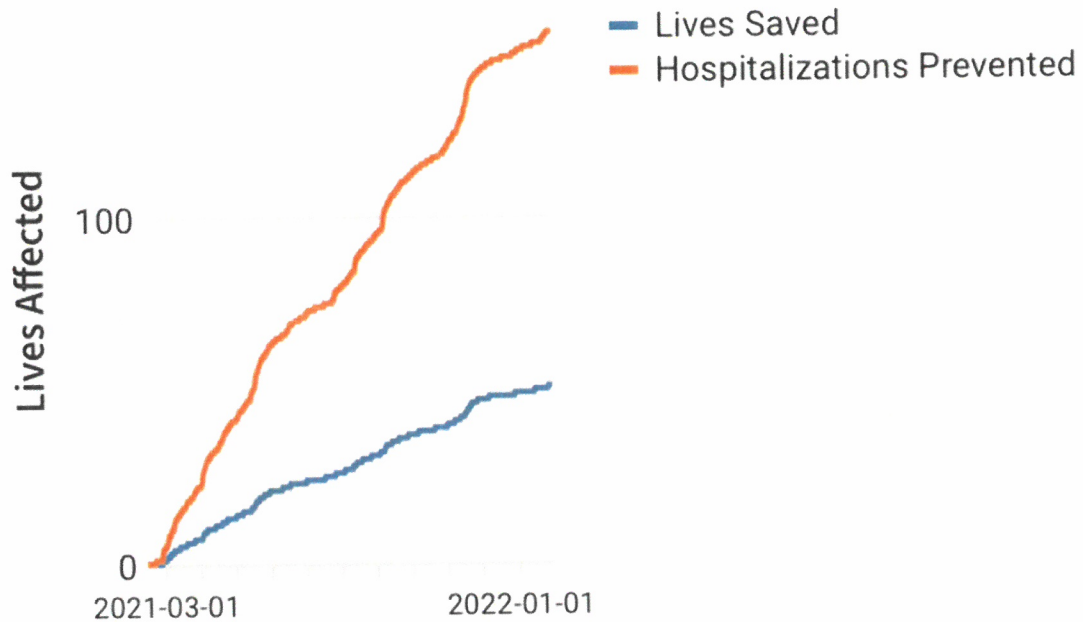
### **Estimated Human Impact:**

Improving balance and confidence results in an actual reduction in falls. Each stage of engagement in the Nymbbl program has validated impact on fall-related hospitalization and, ultimately, lives saved. The sad reality is that a third of those who are hospitalized for a fall do not survive 3 years. Preventing hospitalization literally saves lives. We are proud to report the correlation of our current engagement models to the following impact:



- 154 hospitalizations prevented (+40 from last report)
- 51 lives saved (+13)

## Cumulative Lives Saved and Hospitalizati...



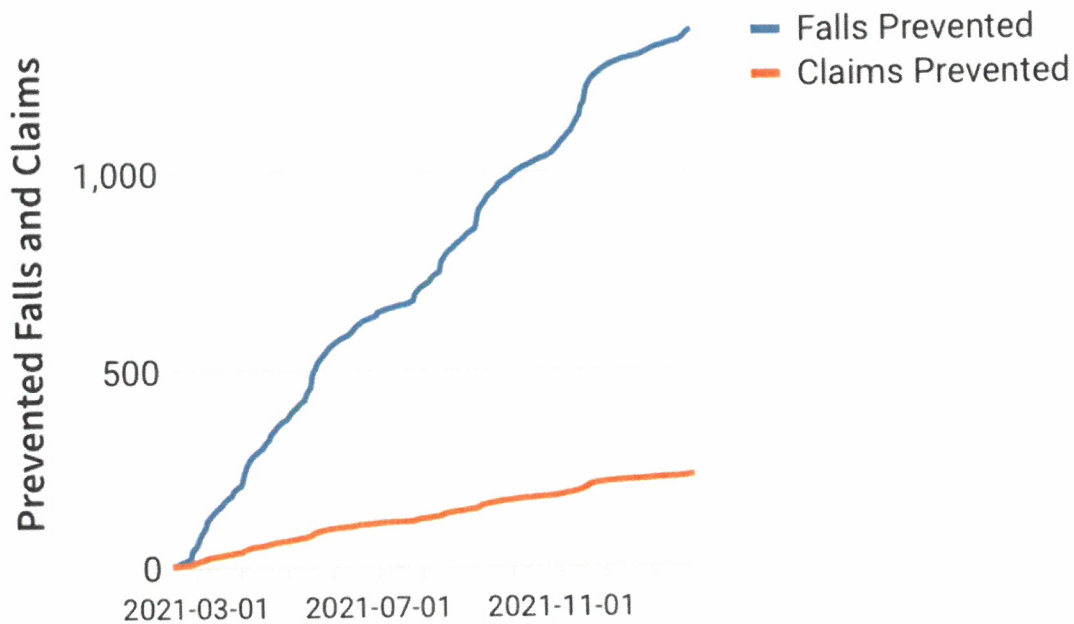
### Estimated Savings:

An important aspect of any evidence-based program is the global impact to the cost of healthcare services mitigated by the intervention. The combined outcomes from Nymbi are expected to result in the following reduction in medical cost savings of \$7,728,148 within 3 years from the start of the program.

Matching the current engagement to our newest actuarial findings in New Zealand, the model indicates Nymbi has already saved \$3,517,831 in realized direct medical cost of falls claims (assuming the U.S. national average of >\$15,000 per fall related claim). Most programs have to wait for 2 years before measurable impact is observed; Nymbi's cost savings are validated to be experienced after only 3-6 months in a market.

- 1,357 Falls prevented (+341 from previous report)
- 226 Total Claims Prevented (+58)

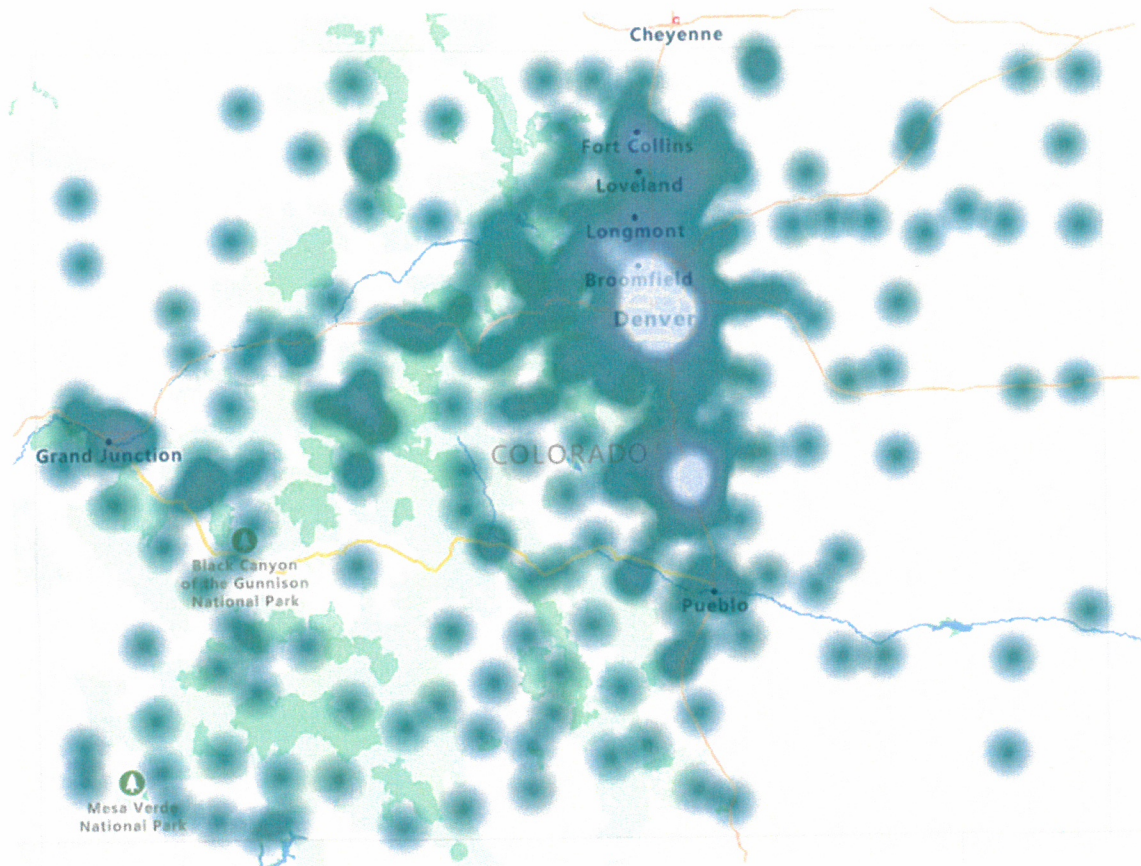
## Cumulative Falls and Claims Prevented



### Statewide Nymbi Use:

The Colorado effect: When Nymbi and DRCOG's partnership first started, DRCOG allowed 250 people outside of the Denver Metro area to enroll in Nymbi. Eligible people quickly enrolled and filled up these spots. Nymbi made a mission-based decision to not block people if they heard about our fall prevention efforts, but lived outside of the eight zip codes covered by DRCOG. Nymbi has not billed for anyone outside the original 250 out-of-area enrollees.

A current enrollment heat map of Colorado indicates enrollment from border to border. Every region has shown enrollment in Nymbi. This strategic choice allowed DRCOG and Nymbi to debunk the myth that older adults across the entire state of Colorado wouldn't engage in mobile based training. It is important to note that this engagement was not deliberate but a result of word of mouth and messaging coming from the Denver Metro Area. This data validates the notion that Nymbi is a tool that is viable in all regions of Colorado.



It is estimated that 40% of Colorado's rural population is over the age of 65 without effective or consistent access to fall prevention. In 2020 Colorado had an estimated 895,000 residents over the age of 65, by 2050 that is projected to exceed 1.7 million. Nymb1 has demonstrated the ability to successfully reach these older adults - of the enrollees living in non-urban areas, 56% reside in rural designated zip codes: 9.0% within the DRCOG defined zip codes and the other 47% in rural zip codes designated by the State of Colorado.

## Conclusion

Falling continues to be the number one cause of accidental death and injury for older adults in Colorado and across the nation. As more older adults desire to age in place, healthy mobility (empowered by not falling) is the number one predictor of success.

When you combine the recent contextually important loss of access to care and the increased injury severity, there is a severe "gap in care" for older adults and an acute need to transition services to the home in deployments that can meet the demands and challenges of effectively scaling to large populations.



Nymbl and DRCOG have successfully validated the deployment of a digital evidence-based program to combat the above issues by enrolling 11,660 older adults in the program in just eleven months. The initial implementation empowered the learnings required to continue in a predictable and scalable way in further meeting the needs of Colorado's older adults.

The enrollment outreach team has been able to identify over 30 successful outreach techniques and this learning of local older adult behavior will empower partner organizations to improve their own impact as well.

These successes go beyond simple enrollment to actual lives saved, hospitalizations prevented and significant cost savings for the Denver Metro Area. The data we are collecting, and the validated engagement has resulted in placing Colorado as a national leader in this space.

The partnership between DRCOG and Nymbl has continued to prove that falls can be reduced and prevented through the use of a digital fall prevention program. The Nymbl team has thoroughly enjoyed the partnership with DRCOG through the first and second phases of the project, and looks forward to continuing to expand our relationship through not only DRCOG, but with all Area Agencies on Aging across the entire state of Colorado. Thank you for your continued partnership in helping Nymbl prevent one million falls.

# BMJ Open Feasibility and acceptability study on the use of a smartphone application to facilitate balance training in the ageing population

Enrica Papi <sup>1,2</sup>, Shin-Yi Chiou,<sup>1,3</sup> Alison H McGregor<sup>1</sup>

**To cite:** Papi E, Chiou S-Y, McGregor AH. Feasibility and acceptability study on the use of a smartphone application to facilitate balance training in the ageing population. *BMJ Open* 2020;10:e039054. doi:10.1136/bmjopen-2020-039054

► Prepublication history and additional material for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-039054>).

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## ABSTRACT

**Objectives** This study aims to investigate the feasibility and acceptability of using an app-based technology to train balance in the older population.

**Design** Prospective feasibility study.

**Setting** The study was conducted in a university setting and participants' homes.

**Participants** Thirty-five volunteers  $\geq 55$  years old were recruited.

**Intervention** Participants were asked to follow a balance exercise programme 7 days a week for 3 weeks using a phone application. Seventeen participants trained for a further 3 weeks.

**Outcome measures** Postural sway measures during quiet standing with feet at shoulder width apart and feet together, one leg standing and tandem stance were measured at baseline, and at the end of the 3 and 6 training weeks; the International Physical Activity Questionnaire (IPAQ) assessed participants' physical activity level before training; and app acceptability was recorded using a user experience questionnaire.

**Results** Participants on the 3 and 6-week programme on average completed 20 ( $\pm 5$ ) and 38 ( $\pm 11$ ) days of training, respectively, and all scored moderate to high on the IPAQ. Between baseline and the 3-week assessments, statistically significant improvements were observed for anteroposterior sway, mediolateral sway, sway area during tandem stance, for anteroposterior sway during one leg standing and for sway area during feet together stance. Improvements were observed at 6 week compared with baseline but those between 3 and 6 weeks were not significant. Based on the questionnaire, participants reported that the app is an appropriate tool for balance training (77%), they reported benefits from the training (50%) and found it easy to fit it into daily routine (88%).

**Conclusion** The high level of adherence and improvements observed in the analysed measures demonstrate the feasibility of using an app to train balance in moderately to highly physically active older participants. This demonstrates that given appropriate tools the older population is positive towards and receptive of digital interventions aimed to improve balance.

## INTRODUCTION

A fall is an event during which a person inadvertently comes to rest on the ground.<sup>1</sup> Data

## Strengths and limitations of this study

- This study introduces the use of a digital app-based technology to train balance in the older population.
- App feasibility was assessed by comparing centre of pressure sway parameters before and after intervention.
- The use of centre of pressure parameters overcomes the subjectivity of clinical balance scales.
- App acceptability was evaluated.
- App effectiveness requires validation against a control group.
- Findings are based on a highly active small sample size  $\geq 55$  years old.

from the WHO indicate that 28%–35% of older people ( $\geq 65$  years) fall each year globally, with prevalence increasing with age. Falls can lead to severe consequences such as fractures, spinal cord injury and traumatic brain injury which all have a huge impact on socio-economic costs; close to 95% of all hip fractures are caused by falls, 20% of patients with hip fracture die within a year and 6.9% within 30 days.<sup>2</sup> Since population ageing is a global phenomenon, it is important to understand how to prevent and manage falls with a view to maintaining high levels of quality of life in our elderly populations.

The evidence supporting the use of an exercise programme for those at risk of falling is strong<sup>3</sup> and is endorsed by the WHO.<sup>4</sup> Moreover, exercising confers mental as well as physical healthcare benefits.<sup>5</sup> However, compliance with and adherence to exercise programmes in older age groups is problematic jeopardising the related benefits. Gillespie *et al*'s<sup>3</sup> review suggests that a preventative exercise intervention for older age groups should comprise balance and strength training. Balance deterioration seen with ageing has been associated with risk of falling.<sup>6,7</sup> Previous work has shown differences

