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# Cost Benefit Analysis of Idaho's Fit and Fall Proof Program

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# Cost Benefit Analysis of Idaho's Fit and Fall Proof Program

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**Abstract**

Falls are common among the elderly population. Almost 30% of Idahoans aged 65+ fall at least one time per year (Bergen, Stevens, & Burns, 2016). Falls are a significant source of morbidity, mortality, and healthcare expense. Fall-related injuries often result in expensive hospitalizations with progression into costly long-term care facilities (CDC, 2015). In Idaho, estimated fall-related medical costs are estimated at $253 million annually (CDC, 2016; Mirel & Carper, 2014).

Fit and Fall Proof™ (FFP), is a fall prevention program serving approximately 2500 community dwelling seniors throughout the state of Idaho. It is an exercise program led by peer volunteer instructors incorporating evidence-based methods of reducing the risk of falls. In addition to fall prevention, exercise programs such as FFP have well-established positive benefits on mental health, obesity rates, diabetes, and cardio-vascular health. All of these health benefits translate to savings in healthcare expense.

This cost benefit analysis (CBA) of FFP estimates savings in total direct medical costs of participants, and also calculates the portion of savings due to averted falls and averted cases of major depressive disorder (MDD). The CBA adopts a societal perspective, incorporating all sources of funding, both federal and state. In a similar way, all savings in direct medical costs are included in the analysis whether these cost-savings accrue to Medicare, Medicaid, private insurers, or FFP participants themselves. Due to the community-based nature of the intervention and privacy considerations, there is no information available on falls and related medical costs among FFP participants. Therefore, this CBA relies on modeled data obtained from other studies; however, conservative estimates of program efficacy and base fall incidence rates were employed. All costs were adjusted for medical inflation to 2016 dollars.

The estimated positive financial impact of FFP is substantial, generating approximately two dollars in saved healthcare expense for every dollar invested in the program (ROI = 106%). At this level of financial return, FFP would be cost saving even if program costs were twice the current amount. This result is consistent with the high medical cost of falls and the relatively low cost of the community-based FFP program that relies on volunteer instructors. The following table summarizes estimated financial returns of FFP.

**Estimated FFP program savings in direct medical costs, FFP program expenses, estimated savings in direct medical costs net of program costs, and ROI, 2016**

| | Program total | Per FFP participant |
|---|---|---|
| Estimated savings in direct medical costs | | |
| Savings from averted falls | $837,205 | $337 |
| Savings from averted cases of MDD | 60,537 | 24 |
| Savings from other health benefits of exercise | 243,421 | 98 |
| Total estimated direct medical cost savings | $1,141,163 | $459 |
| FFP program expenses | | |
| Personnel, travel, training, evaluation, etc. | $552,998 | $223 |
| Estimated net program savings and return on investment | | |
| Estimated direct medical cost savings costs less program costs | $588,165 | $236 |
| Estimated return on investment | 106% | 106% |

The focus of this CBA is on direct medical costs savings; however, goals other than monetary savings are achieved by FFP. Gains in quality of life (improvements in independence, mobility, and mental and physical well-being) were examined in the analysis and found to be significant. FFP also improves health equity by providing a supervised exercise program at no cost to participants, thus addressing a critical need among low-income and rural elderly residents of Idaho.

This CBA finds significant benefits in health, health equity, and financial savings from FFP. Program continuation or expansion is recommended.

## Introduction

As the U.S. population ages at an unprecedented rate (Ortman, Velkoff, & Hogan, 2014; Rikli & Jones, 2013) age-related injuries and subsequent healthcare costs are increasing. Accidental falls are a common phenomenon among older adults. Almost 30% of Idahoans aged 65+ fall at least one time per year, with many people experiencing multiple falls in a 12-month period (Bergen, Stevens, & Burns, 2016). Fall risk increases with age, with incidence rates increasing significantly in the 75+ population compared to younger age groups (Verma et al., 2016).

Falls can have serious health consequences such as hip fractures, and spinal or head trauma. These injuries often result in expensive hospitalizations with progression into costly long-term care facilities (CDC, 2015). In 2015, national Medicare costs were $31 billion for falls (CDC, 2016). In Idaho, this amounts to $158 million annual Medicare expense after adjusting for population (CDC, n.d.). Total annual medical expenditures for all payers are even higher — an estimated $253 million annually — when costs are adjusted for the proportion of medical costs paid by Medicare (62.4%; Mirel & Carper, 2014).

Indirect and quality of life costs of falling are high as well. Indirect costs include lost wages and travel expenses for fallers and their family caregivers. Quality of life costs include loss of independence, increased anxiety and fear of falling, social isolation, inability to perform daily tasks, and pain and suffering caused by falls (Miller & Berry, 2008).

Exercise and flexibility programs are evidence-based methods of reducing fall incidence by improving balance and strength (Sherrington et al., 2008). However, a significant benefit of exercise is the reduction of depression, especially in the older population (Blumenthal et al., 1999; Khazaee-Pool et al., 2015). A seminal study of the effect of exercise on older patients with major depressive disorder (MDD) showed a significant decrease in the rate of MDD with

active participation in an exercise program (Blumenthal et al., 1999). Additionally, the CDC finds some exercise programs to be cost-beneficial, generating positive ROIs (Stevens & Burns, 2015). Therefore, effective exercise programs for older adults can improve physical and mental health and curb rising healthcare costs.

The effects of exercise programs on fall incidence, depression rates, and associated costs are dependent upon retention and adherence rates (Ackermann et al., 2003; Sherrington et al., 2008; Shumway-Cook & Brauer, 2000). Fit and Fall Proof$^{TM}$ (FFP), is a fall prevention program for older community-dwelling adults in Idaho with a retention rate of 85% from quarter to quarter (Idaho Department of Health and Welfare [IDHW], 2016). Peer volunteer instructors teach FFP, a practice that promotes program adherence and retention and lowers program costs (Dorgo, Robinson, & Bader, 2009).

Idaho's FFP program was implemented in 2004. FFP coordinators located within Idaho's seven local health districts administer the program with oversight from IDHWs Physical Activity and Nutrition Program (IPAN). Federal block grants and state resources provide funding for the program, with funding (75%) primarily coming from the federal government (K. Lamansky, personal communication, November 28, 2016).

FFP is a volunteer peer-led, community-based exercise program with a goal of improving strength, mobility and balance, while providing social and emotional engagement. Local peer volunteer leaders are trained to teach classes in their communities at locations such as senior centers, community centers, churches, libraries and hospitals. The curriculum is detailed in the FFP Class Leader Training Manual (Mittleider, Gibson, & Arnett, 2017). The manual specifies each class must provide 45–60 minutes of active exercise at least twice per week for a minimum of 10-weeks and provides detailed descriptions and pictures of key exercises.

Program protocol includes site-specific process and outcome evaluation measures. Standardized data collection forms are used to record site location, dates classes were held, participant name, attendance, and pre- and post- 8-foot Timed Up and Go (TUG) scores (Mittleider et al., 2017). The TUG is a simple, frequently used test used to assess a person's lower extremity function, balance and mobility (Podsiadlo & Richardson, 1991; Rikli & Jones, 1999a; Shumway-Cook & Brauer, 2000). A TUG score is the time it takes (in seconds) to rise from a chair, walk eight feet, turn around, walk back to the chair, and sit down. The TUG is reported to yield reliable and valid data for identifying persons at risk of falling (Nordin, Rosendahl, & Lundin-Olsson, 2006; Rikli & Jones, 2013). Class leaders are instructed to collect pre- and post-TUG scores for all new participants and at least twice a year for ongoing participants (Mittleider et al., 2017). FFP outcome evaluation measures show consistent improvements in TUG scores from quarter to quarter among participants.

This cost-benefit analysis (CBA) of FFP examines improvements in health outcomes attributable to FFP intervention at all 117 locations throughout Idaho. It estimates annual number of falls prevented, annual number of MDD cases prevented, and related savings in direct medical costs. Indirect costs of accidental falls, though likely significant, are difficult to estimate and excluded from the analysis. Program costs will be incorporated into the analysis to yield annual cost savings net of program costs and return on investment (ROI) of the program. Gains in quality of life measures are estimated and reported separately.

Cost-benefit analysis is generally used to help guide sound decision-making in policy and practice, and is not intended to be the sole criteria for program implementation and/or continuation. Program goals unrelated to financial outcomes, such as reach to underserved populations, should also be considered when arguing for program sustainability or expansion.

Transparency of methods was a primary goal in executing this CBA; accordingly, all necessary assumptions and calculations are based on best available evidence and thoroughly cited and delineated.

## Methods

This analysis calculates annual cost-savings related to the Idaho FFP program. The population of interest is FFP participants in all Idaho locations, both rural and urban. The average number of FFP participants for each quarter in 2016, 2485, was used as the basis of all cost-saving calculations. This method was chosen to avoid multiple counting of FFP participants who participate in more than one 10-week session during the fiscal year. Table 1 gives the number, age, and attendance frequency of FFP participants in 2016.

**Table 1. Number and characteristics of Idaho FFP participants, 2016**

| Statistic | Value | Source |
|---|---|---|
| Number of FFP participants | 2485 | IDHW |
| Percent of FFP participants aged 65-74 | 33% | IDHW |
| Percent of FFP participants aged 75+ | 67% | IDHW |
| Estimated number of FFP participants aged 65-74 | 820 | Number of FFP participants * % of FFP participants aged 65-74 |
| Estimated number of FFP participants aged 75+ | 1665 | Number of FFP participants * % of FFP participants aged 75+ |
| Percent of FFP participants attending once a week or more | 52% | IDHW |

## Estimation of intervention efficacy

The primary prevention outcome identified is estimated reduction in fall incidence and related direct medical costs. Because FFP does not collect fall data from participants, this analysis relies upon fall data obtained from a meta-analysis of exercise programs designed to reduce fall risk among older adults (Sherrington et al., 2008). Programs considered in this analysis had similar characteristics to FFP: community-based, older participants, and with a focus on exercise. Intervention efficacy is measured by reduced risk of falling as represented by

the relative risk ratio (RR). The analysis included 44 randomized controlled trials with 9603 participants and yielded a RR of exercise and fall rate of 0.83, (95% confidence interval [0.75, 0.91], $p<.001$) equivalent to a 17% reduction in the rate of falling. It is assumed that FFP has similar outcomes to the interventions in the meta-analysis.

Reduced incidence of MDD was a secondary prevention outcome examined in the analysis. Reductions in MDD were estimated using data from a seminal study on the effect of exercise programs on depression among older adults (Blumenthal et al., 1999). The study involved exercise three times per week and found that post-intervention rates of MDD were 60 to 70 percent of pre-intervention rates in groups of older exercise participants; equivalent to reduction in MDD rates of 30 to 40 percent. This analysis assumed a conservative 30 percent reduction of MDD rates. Cost savings from reduced MDD rates were calculated for the population of regular FFP participants who attended at least once per week (52% of total participants).

Expected annual reductions in the number of falls and MDD cases among participants were calculated by computing the expected number of falls and MDD cases without and with FFP intervention (FFP population multiplied by appropriate incidence rates) and then subtracting expected number of cases with FFP from expected number of cases without FFP to arrive at estimated number of cases averted. Table 2 lists base incidence rates, prevalence rates, and RRs that were used in the calculations. (See Appendices I and II for detailed calculations of estimated falls and cases of MDD averted.)

**Table 2. Incidence rates, prevalence rates, and RRs used in CBA calculations**

| Statistic | Value | Source |
|---|---|---|
| Relative risk of exercise programs and falls | 0.83 | Sherrington et al. |
| Base percentage of people 65+ who fall each year | 28.70% | Bergen et al. |
| Percentage of people 65+ who fall each year with FFP participation | 23.82% | RR of exercise programs and falls * base fall incidence |
| Relative risk of exercise programs and major depressive disorder (MDD) | 0.70 | Blumenthal, et al. |
| Base prevalence of MDD | 7.60% | CDC |
| Prevalence of depression in group with active FFP participation (once a week or more) | 5.32% | RR of exercise programs and MDD * base prevalence of MDD |

**Cost savings from averted falls and cases of MDD**

Cost-savings for reductions in falls and MDD cases were derived by multiplying the expected number of averted falls and cases of MDD by per-person costs of falls and MDD respectively. Per-person costs were obtained from a literature review using search terms, “falls, major depressive disorder, elderly, and costs” and utilizing Medline and PubMed databases. This CBA included all direct medical costs, regardless of payer. All costs were adjusted for medical inflation to 2016 dollars.

Medicare-reimbursed costs of falls were obtained from a 2016 study utilizing medical cost data from the CDC Web-based Injury Statistic Query and Reporting System (WISQARS) and fall incidence data from the 2008 National Health Interview Survey (NHIS; Verma et al., 2016). The study included direct medical costs from falls resulting in death, hospitalization, or emergency department (ED) visits. Costs were given in terms of cost per person in the general population for each age group considered (65-74 and 75+). WISQARS data tracks only Medicare reimbursed medical expense. Therefore, per-faller costs from WISQARS were adjusted to reflect total medical expense — Medicare-reimbursed expenses were divided by

the percentage of medical expense paid by Medicare in the older population (62.4%; Mirel & Carper, 2014). This number was then converted to cost per fall by dividing cost per person by the incidence rate of falls among the elderly. Cost calculations for falls involved separate calculations for population sub-groups of 65-74 and 75+ because cost of falls increases significantly with age. Table 3 gives detailed direct medical cost of falls calculations.

**Table 3. Direct medical cost of falls, per person in population and per faller**

| Statistic | Value | Source |
|---|---|---|
| Medicare-reimbursed per person cost of injury from falls for persons aged 65-74, 2010 $ | $730.92 | Verma et al. |
| Medicare-reimbursed per person cost of injury from falls for persons aged 75+, 2010 $ | $1,186.00 | Verma et al. |
| % of healthcare expense paid by Medicare in population 65+ | 62.4% | Mirel & Carper |
| Medical inflation adjustment, 2010-2016 | 1.19 | US Bureau of Labor Statistics |
| Total per person cost of injury from falls for persons aged 65-74, 2016 $ | $1,398.43 | 2010 cost * medical inflation adjustment/percent of healthcare expense paid by Medicare |
| Total per person cost of injury from falls for persons aged 75+, 2016 $ | $2,269.11 | 2010 cost * medical inflation adjustment/percent of healthcare expense paid by Medicare |
| Total per fall cost of injury from falls for persons aged 65-74, 2016 $ | $4,872.58 | Total cost per person/fall incidence rate |
| Total per fall cost of injury from falls for persons aged 75+, 2016 $ | $7,906.31 | Total cost per person/fall incidence rate |

Costs of MDD were obtained from a 2015 study giving results in terms of total costs of depression in the United States (US; Greenberg, Fournier, Sisitsky, Pike & Kessler, 2015). Costs were adjusted for the US population and prevalence of depression to yield cost per person with depression. Table 4 gives cost of MDD calculations. Appendices I and II give detailed calculations of estimated annual savings in direct medical costs from averted cases of falls and MDD respectively.

T**able 4. Direct medical cost of MDD, per person with MDD**

| Statistic | Value | Source |
|---|---|---|
| Direct medical costs of MDD in U.S. in 2010 (2012 $) | $42,997,000,000.00 | Greenburg et al. |
| Medical Inflation adjustment, 2012 to 2016 | 1.12 | US Bureau of Labor Statistics |
| Direct medical costs of MDD in U.S. in 2010 (2016 $) | $48,213,590,838.74 | Total 2010 direct medical costs of depression * medical inflation adjustment |
| 2010 U.S. population | 308,745,538 | US Census |
| Per person costs of MDD, 2016$ | $156.16 | Direct medical costs of depression/US population |
| Annual direct medical cost of MDD per person with MDD (2016$) | $2,054.73 | Cost per person/prevalence rate of depression |

**Cost savings from all health benefits**

Reduced fall incidence and reduced MDD rates are likely the largest sources of health benefits from an exercise program such as FFP; however, there are many other well-established health benefits of exercise, such as reducing rates of obesity, diabetes, and cardio-vascular disease. It is highly likely that these health benefits lead to savings in direct medical costs. To estimate savings in direct medical costs from all health benefits combined, this analysis utilized data from study that tracked changes in total healthcare expense for older adults participating in a community-based exercise program (Ackermann et al., 2003).While this method does not address reduced falls as a primary causal link between exercise programs and lowered healthcare expense, it enables calculation of total savings in direct medical costs from an exercise program like FFP, allows an estimation of percentage of direct medical cost savings attributable to reduced falls, and serves to validate the calculations of cost savings from reduced falls and MDD cases.

Ackermann et al. (2003) found that total healthcare expense in a test group participating in exercise at least once a week was 79.3% of the control group — equivalent to a 20.7%

reduction in total healthcare expense. The study authors concede there may be a "healthy cohort" effect, leading to an over-estimation of healthcare cost savings, and estimate base healthcare cost to be 12% lower in the frequent exercise group than the control group. Accordingly, in this CBA, base costs were reduced 12% to calculate cost savings. Additionally, cost savings were calculated only for the 52% of FFP participants attending once a week or more. Total cost savings from FFP were estimated by multiplying the number of participants attending once a week or more by expected per person savings in total healthcare expense (total per-person healthcare expense multiplied by 20.7%). Table 5 lists total healthcare expense for the population of interest. Appendix III gives detailed calculations of estimated total medical cost savings from FFP.

**Table 5. Total annual per person healthcare expense in population 65+**

| Statistic | Value | Source |
|---|---|---|
| Annual median healthcare expense in population 65+, 2011 $ | $4,206.00 | Mirel & Carper |
| Medical inflation adjustment, 2011-2016 | 1.15 | US Bureau of Labor Statistics |
| Annual median healthcare expense in population 65+, 2016 $ | $4,848.03 | 2011 cost * medical inflation adjustment |

**Quality of life gains**

Quality of life gain calculations were based on a 2011 study of falls among older adults in The Netherlands. The study quantified loss of quality of life for the first nine months following a fall requiring an ED visit, reporting a 0.09 reduction in overall utility score measuring quality of life (with a score of 1 representing full health) even nine months after injury see figure 1, (Hartholt et al., 2011). This amounts to nearly a ten percent reduction in reported quality of life.

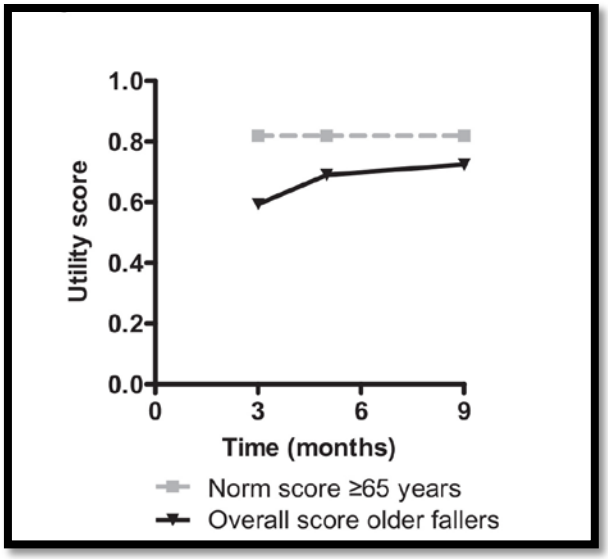


**Figure 1.** Quality of life up to 9 months after presentation at the emergency department in persons aged 65 years or older due to a fall incident in The Netherlands between 2003 and 2007. (Hartholt et al., 2011)

This analysis assumes a reduction of 0.09 in quality of life utility score for one year after injury and assumes one fall per person. The incidence rates of falls requiring an ED visit in the 65-74 and 75+ age groups were obtained from the NHIS (Verma et al., 2016), and a weighted average incidence rate was calculated for the FFP population, taking into account the proportion of FFP participants aged 65-74 and 75+. Intervention effectiveness in reducing falls requiring an ED visit was represented by RR of 0.83. For detailed calculations of quality of life cost savings, see Appendix IV.

**Calculation of financial returns**

Due to the ongoing nature of FFP, returns are given in terms of annual results. All results are adjusted for medical inflation and reported in 2016 dollars. Savings in direct medical costs achieved by averted falls, averted cases of MDD, and all health benefits of FFP were calculated separately as delineated above. Savings from health benefits other than reduced falls and reduced

cases of MDD were calculated by subtracting savings from reduced falls and MDD from total savings in direct medical costs. Annual net savings in direct medical costs were calculated by subtracting FFP program costs from savings in total healthcare expense. Return on investment (ROI) was calculated by dividing annual net savings by FFP program operating costs.

**Results**

This CBA finds significant health benefits and corresponding cost savings from the FFP program. In 2016, an average of 2,485 individuals participated in the FFP program each quarter. Based on a 2011 FFP assessment, approximately 33% of the participants (820 individuals) were between the ages of 65-74 and 67% of the participants (1665 individuals) were age 75 or older (Dunnagan, Peed, & Toevs, 2011). This CBA estimates 713 falls annually in the FFP population without intervention, 592 falls annually with intervention; a prevention of 121 falls annually due to FFP participation. Of these 121 estimated prevented falls, approximately 2/3 (81) are attributable to falls prevented in the 75+ age group. Regarding falls requiring an ED visit, this analysis estimates annual number of falls without FFP intervention at 228, annual number of falls with FFP intervention at 189, resulting in prevention of 39 falls requiring an ED visit. Quality of life gains were calculated from the estimated prevented number of falls requiring an ED visit and are estimated at 3.48 quality adjusted life years (QALYs). Table 6 gives a summary of estimated 2016 Idaho FFP results.

**Table 6. Estimated 2016 FFP program results, population of 2485**

| Metric | Result |
|---|---|
| Falls averted among FFP participants aged 65-74 | 40 |
| Falls averted among FFP participants aged 75+ | 81 |
| Total number of falls averted | 121 |
| Number of falls requiring ED visit averted | 39 |
| Number of cases of MDD averted | 29 |
| Number of QALYs saved by averted falls requiring an ED visit | 3.48 |

Financial savings (avoided direct medical costs) from averted falls, averted cases of MDD, and other health benefits of FFP are substantial. Return on investment for the FFP program was calculated using FFP program costs of $552,998 as the investment amount (K. Lamansky, Personal communication, November 28, 2016). This figure includes costs associated with personnel, travel, training, evaluation, supplies, marketing, and overhead expenses.

Cost savings is primarily attributable to averted falls (74% of total cost savings), and this CBA estimates FFP to be cost-saving from fall prevention alone. If fall prevention is the only health benefit of FFP considered, net cost savings are $284,207 and ROI is 51%. When we examine savings from all health benefits of FFP participation, this CBA estimates annual net FFP program savings of $588,165 and ROI of 106%. Stated another way, for every dollar invested annually in FFP, approximately two dollars are received back in direct medical cost-savings from all health benefits of the program. Table 7 gives a financial summary of estimated FFP program results for 2016.

**Table 7. Estimated FFP program savings in direct medical costs, FFP program expenses, estimated savings in direct medical costs net of program costs, and ROI, 2016**

| | Program total | Per FFP participant |
|---|---|---|
| Estimated savings in direct medical costs | | |
| Savings from averted falls | $837,205 | $337 |
| Savings from averted cases of MDD | 60,537 | 24 |
| Savings from other health benefits of exercise | 243,421 | 98 |
| Total estimated savings in direct medical costs | $1,141,163 | $459 |
| FFP program expenses | | |
| Personnel, travel, training, evaluation, etc. | $552,998 | $223 |
| Estimated savings in direct medical costs net of program costs | $588,165 | $236 |
| Estimated return on investment | 106% | 106% |

## Discussion

Idaho's FFP is an established program with a twelve-year history of serving seniors aged 65+ to increase physical activity and improve function, balance and mobility. It is an exercise program led by peer volunteer instructors in all seven health districts of Idaho incorporating evidence-based methods of reducing the risk of falls. In addition to fall prevention, exercise has well-established positive benefits on mental health, obesity rates, diabetes, and cardio-vascular health. This CBA of FFP estimates the financial impact of the program on direct medical costs of participants, examining savings from averted falls, averted cases of MDD, and total cost savings in direct medical costs. The CBA adopts a societal perspective, incorporating all sources of funding, both federal and state. In a similar way, all savings in direct medical costs are included in the analysis whether these cost-savings accrue to Medicare, Medicaid, private insurers, or FFP participants themselves.

The estimated positive financial impact of FFP is substantial, generating approximately two dollars in saved healthcare expense for every dollar invested in the program (ROI = 106%). At this level of financial return, FFP would be cost saving even if program costs were twice the

current amount. This result is consistent with the high medical cost of falls and the relatively low cost of the community-based FFP program that relies on volunteer instructors.

The percentage breakdown of savings in direct medical expense by source of savings is given in Figure 2. The majority (74%) of financial benefits are from averted falls. In addition, the positive financial effect of FFP on MDD and overall health was calculated, enabling an examination of financial benefits by category; however, percentage savings from averted cases of MDD was relatively low (5%).

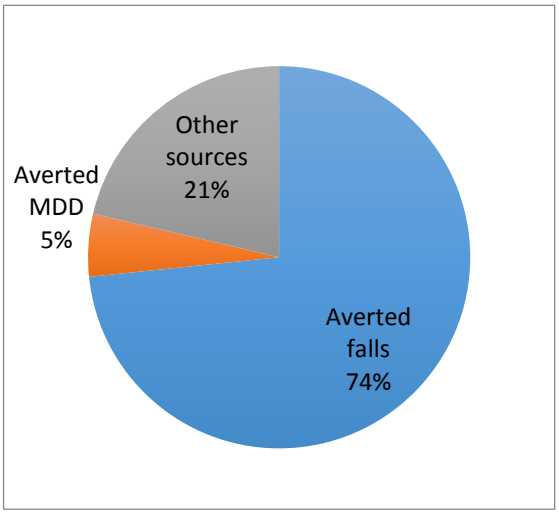


**Figure 2.** FFP program cost savings by category

Financial return mostly accrues from falls prevented in older (ages 75+) participants, making up 77% of direct medical cost savings due to fall prevention. The reason for this result is threefold: this age group makes up approximately 2/3 of FFP participants, fall incidence rate is higher for the 75+ age group, and direct medical costs after a fall are considerably higher for this group than younger (ages 65-74) participants, with costs averaging $7906 per fall in the 75+ age group compared to $4873 per fall in the 65-74 age group. Further, FFP outcome evaluation results suggest the intervention is effective in reducing fall risk for all age groups. Hannah et al. (2017) found that participants who attended FFP at least twice a week saw similar improvements in TUG scores regardless of age.

The focus of this CBA is on direct medical costs savings; however, goals other than monetary savings are achieved by FFP. Gains in quality of life were examined in this analysis and found to be significant. The gain of 3.48 QALYs annually among the FFP population

represents improvements in independence, mobility, and mental and physical well-being resulting from participation (Hannah, Arnett, Toevs, & Bond, 2017).

FFP also promotes health equity by reaching underserved senior populations. Older Idahoans who are low-income or reside in rural areas often lack access to gyms, athletic trainers, and organized exercise programs, such as Silver Sneakers™. Bridging this gap provides needed social interaction and exercise opportunities for many seniors. By actively engaging in community partnerships with senior centers, churches, and other organizations that provide facilities for FFP, and by mobilizing and training volunteer peer instructors to lead the classes, FFP provides a supervised, evidence-based exercise program at no cost to participants. Participation in the program promotes healthy aging, allowing many Idahoans to age in place and avoid or delay institutionalization, regardless of income or location.

Due to the community-based nature of the intervention as well as budget and privacy considerations, there is no information available on falls and related medical costs among FFP participants. Therefore, this CBA relies on modeled data; however, conservative estimates of program effect on fall rates, MDD rates, and baseline fall incidence rates were employed. For example, the meta-analysis by Sherrington et al. (2008) found greater intervention effects in programs that included exercises that challenge balance, use a higher dose of exercise, and do not include a walking program — all attributes of FFP. Thus, the RR of 0.83 is likely a conservative estimate of FFP effectiveness. Fall incidence rates used in the analysis are for community-dwelling adults, thus avoiding overestimation of incidence that would occur if institutionalized adults were included.

Further, multiple methods of calculation were employed and found to be consistent with one another. Cost-savings were calculated using two methods: utilizing measures of program

effect on falls rates and MDD rates, and utilizing measures of program effect on total healthcare expense. Cost savings estimated from program effect on fall rate amounted to 74% of cost savings estimated from program effect on total healthcare expense — a result that seems plausible given the high cost of falls.

A 2010 CBA performed on an exercise program similar to FFP, Enhance® Fitness, in the state of Hawai'i provides further validation of FFP CBA results (Sugihara, Watanabe, Tomioka, Braun, & Pang, 2011). Sugihara et al. (2011) estimated an ROI of 83% compared to 106% for this CBA. Unlike FFP, Enhance® Fitness employs paid instructors and would likely have higher program costs and lower ROI than FFP.

Another limitation of the CBA is lack of data on indirect costs of falling. Indirect costs include hardship to family caregivers associated with stress, anxiety and lost wages. Other indirect costs include travel expense to seek medical care, especially for Idahoans living in rural/frontier areas. These factors lead to an underestimation of cost savings.

This CBA examined MDD alone as a source of mental health benefits; however, exercise is also beneficial for milder forms of depression, stress, and anxiety. Therefore, these results probably underestimate the mental health benefits, though the financial impact of these benefits is likely captured in the calculation of total health benefits.

## Conclusion

Accidental falls in the elderly population are a major problem in Idaho, leading to significant morbidity, mortality, and reduced quality of life. Falls are not an inevitable part of aging, and many exercise programs have demonstrated significant effectiveness in reducing the risk of falling in elderly populations (Sherrington et al., 2008; Stevens & Burns, 2015).

This CBA examined FFP results for 2016 and estimated program effectiveness in fall reduction and associated savings in direct medical costs. Estimated reductions in total number of falls, number of falls requiring an ED visit, and savings in associated direct medical costs are substantial. Findings also demonstrate that goals other than monetary savings are achieved by FFP. Gains in quality of life (improvements in independence, mobility, and mental and physical well-being) were examined in the analysis and found to be significant. FFP also improves health equity by providing a supervised exercise program at no cost to participants, thus addressing a critical need among low-income and rural elderly residents of Idaho.

The results of this analysis find significant benefits in health, health equity, and financial savings from FFP. Program continuation or expansion is recommended.

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**Appendix I. Calculation of estimated annual savings in direct medical costs from averted falls, Idaho FFP program**

| Statistic | Number | Source |
|---|---|---|
| Number of falls averted | | |
| Estimated number of falls in group aged 65-74 without FFP | 235 | Number of FFP participants aged 65-74 * base fall incidence rate |
| Estimated number of falls in group aged 65-74 with FFP | 195 | Number of FFP participants aged 65-74 * base fall incidence rate * RR (0.83) |
| Falls averted in 65-74 age group by FFP | 40 | Difference in estimated # of falls without and with FFP |
| Estimated number of falls in group aged 75+ without FFP | 478 | Number of FFP participants aged 75+ * base fall incidence rate |
| Estimated number of falls in group aged 75+ with FFP | 397 | Number of FFP participants aged 75+ * base fall incidence rate * RR (0.83) |
| Falls averted in 75+ age group by FFP | 81 | Difference in estimated # of falls without and with FFP |
| Total number of falls averted by FFP | 121 | Total of falls averted in 65-74 and 75+ age groups |
| Savings in direct medical costs from averted falls | | |
| Direct medical cost savings from averted falls in 65-74 age group | $194,952.99 | Number of falls averted * cost per fall |
| Direct medical cost savings from averted falls in 75+ age group | $642,252.20 | Number of falls averted * cost per fall |
| Total direct medical cost savings from averted falls | $837,205.19 | Total of direct medical cost savings from falls averted in 65-74 and 75+ age groups |

**Appendix II. Calculation of estimated annual savings in direct medical costs from averted cases of MDD, Idaho FFP program**

| Statistic | Number | Source |
|---|---|---|
| Estimated number of FFP participants attending once a week or more (active participants) | 1292 | Number of FFP participants * percentage attending once a week or more |
| Expected number of persons with MDD in active FFP population in hypothetical absence of FFP | 98 | Prevalence of depression *# of active FFP participants |
| Expected number of persons with MDD in active FFP population with FFP | 69 | Prevalence of depression in group with active FFP participation *number of active FFP participants |
| Number of cases of MDD averted | 29 | Difference in number of cases of MDD without and with FFP |
| Total medical cost savings from averted cases of MDD | $60,536.84 | Number of averted cases of MDD * cost per person with MDD |

**Appendix III. Calculation of total annual savings in direct medical costs, Idaho FFP program**

| Statistic | Number | Source |
|---|---|---|
| Estimated number of FFP participants attending once a week or more (active participants) | 1292 | Number of FFP participants * percentage attending once a week or more |
| Annual median healthcare expense in population 65+, 2016 $ | $4,848.03 | 2011 cost * medical inflation adjustment |
| 12% cost reduction for healthy cohort | $581.76 | Assumption based on personal communication with Dr. Ackermann |
| Annual median healthcare expense in healthy cohort of population 65+, 2016 $ | $4,266.26 | Annual median healthcare expense in population 65+ less 12% reduction for healthy cohort effect |
| Percentage decrease in total healthcare expense among population participating in FFP at least one time per week | 20.70% | Ackermann et al. |
| Total annual healthcare expense saving per person attending FFP at least once a week | $883.12 | Expected annual healthcare expense for healthy cohort * 20.7% reduction in healthcare expense based on Ackermann study |
| Total annual savings in healthcare expense from FFP program | $1,141,162.89 | Number of FFP participants attending at least one time per week * annual per person saving in healthcare expense |

**Appendix IV. Calculation of quality of life savings, Idaho FFP program**

| Statistic | Number | Source |
|---|---|---|
| Weighted average incidence rate of non-fatal fall-related injuries requiring ED visit in population 65+, with 67% weighting on population 75+ and 33% weighting on population 65-74 | 9.16% | National Health Interview Survey data adjusted for FFP participant age characteristics |
| Expected incidence rate of non-fatal fall-related injuries requiring ED visit with FFP intervention | 7.60% | Weighted average incidence rate of non-fatal falls * RR of exercise programs and falls |
| Estimated number of falls requiring ED visit in FFP population without FFP | 228 | Incidence rate of falls * FFP population |
| Estimated number of falls requiring ED visit in FFP population with FFP intervention | 189 | Incidence rate of falls with FFP * FFP population |
| Number of falls requiring ED visit prevented by FFP | 39 | Difference in expected number of falls requiring ED visit without and with FFP. |
| 9 month fall-related disability weight in 65+ population experiencing fall-related ED visit | 0.09 | Hartholt et al. |
| QALYs saved due to FFP | 3.48 | Disability weight * number of falls prevented by FFP. *Assumes one fall per person.* |