Cost of Illness Savings for People Recreating in OSU McDonald-Dunn Research Forests

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February 5, 2019
FINAL REPORT

Corvallis, OR 97331

Introduction

Being physically active is a key component to living a healthy lifestyle. Along with good nutrition, access to health care, and other preventative measures, physical activity supports healthy lives and reduces medical treatment costs. Physical activity may decrease the risk of many chronic illnesses such as heart disease, stroke, depression, dementia, diabetes and several cancers (e.g., breast, colon, endometrial, esophageal, kidney, stomach, lung) (U.S. Department of Health and Human Services, 2018). In 2014, these chronic conditions made up five of the top ten leading causes of death (Maizlish, 2016). Daily physical activity provides additional benefits to people such as increased memory function and improved quality of sleep (U.S. Department of Health and Human Services, 2018).

The U.S. Department of Health and Human Services published its Physical Activity Guidelines for Americans, 2nd Edition in 2018. The guidelines include recommendations for aerobic and muscle strengthening activities. The Physical Activity Guidelines recommend adults get at least 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity[1] (roughly equivalent to 500 to 1,000 MET-minutes[2] per week) to receive substantial health benefits (U.S. Department of Health and Human Services, 2018). Oregon Health Authority reports that 30% of adults in Benton County, OR meet recommended guidelines for physical activity, compared to 23% for the state of Oregon (Benton County Health Department, 2017). Physical activities (aerobic, anaerobic, and flexibility movements) include recreating outdoors or indoors, doing work on the job or at home, commuting by walking or bicycling, and even exercising at the gym or at home.

[1] There are a variety of ways someone could meet the minimum guideline of 500 MET-minutes. For example, if someone walked their dog (MET value of 3) every day for 25 minutes they would accumulate 525 MET-minutes every week (Ainsworth, et al., 2011). It is important to note that while the 500 MET-minutes per week result in substantial health benefits, any amount of physical activity is beneficial. The largest health improvements are received by those who are moving away from being sedentary to any physical activity.

[2] MET stands for metabolic equivalent task, where one MET is the typical energy expenditure of an individual at rest (1 kcal/kg/h). Activities are assigned MET values based upon how much energy they require to perform. METs are constants for activities and therefore are usually expressed as either MET-minutes or MET-hours. A MET-minute is a unit that describes the energy expenditure of a specific activity per minute. For example, walking at 3.0 mph requires 3.5 METs of energy expenditure and running at 6.0 mph is a 9.8 MET activity. Walking at 3.0 mph for 10 minutes would be expressed as 35 MET-minutes, whereas running at 6.0 mph for 10 minutes is 98 MET-minutes.

OSU McDonald-Dunn Research Forests (OSU Research Forests) provide opportunities and access for people to be physically active. This report estimates the Cost of Illness (COI) savings, or health benefits, associated with people recreating in OSU Research Forests (OSU Research Forests) and compares them with estimates for residents in Benton County, OR.

Methods & Data

This project uses visitation data collected using onsite surveys and observational data from January 2017 – January 2018 for OSU Research Forests as reported in Kooistra and Munanura (2018). Visitation frequency and duration were also provided. Recreation visitation is restricted to day-use only. The primary activities that visitors engage in include Walking / Hiking, Dog Walking, Trail Running / Jogging, Mountain Biking, and Horseback Riding.

COI savings, or health benefits, estimates from participating in outdoor recreation were estimated using the OR Estimator tool. This tool is built on the base of the Integrated Transport and Health Impact Model[3] (ITHIM) (Maizlish, 2016), which was calibrated to Oregon's county-specific health information and population distributions in the Transportation Options Health Impact Estimator (TO Estimator) (Haggerty and Hamberg, 2015). Dunn (2018) adapted the TO Estimator by integrating outdoor recreation participation data by urban / rural status from the 2017 Oregon Resident Outdoor Recreation Survey (aka Oregon Statewide Comprehensive Outdoor Recreation Plan (OR SCORP) statewide survey) (Bergerson, 2018) and MET-values from the Ainsworth Compendium (Ainsworth et al., 2011).

A baseline level of physical activity is embedded in the OR Estimator tool, so this version of the tool uses the one-trip assumption in Rosenberger and Dunn (2018). There are four primary inputs necessary to estimate COI savings in the OR Estimator tool: 1) selection of county; 2)

[3] ITHIM is a comprehensive health impact assessment model that uses comparative risk assessment to quantify the estimated change in life expectancy and quality of life for a population due to changes in active transportation participation. ITHIM's physical activity pathway estimates health effects based on quantified relationships (dose-response functions) between physical activity (i.e., walking and cycling active transportation) and chronic illnesses, such as cardiovascular disease, diabetes, and some cancers. These estimated health effects are then converted into monetary units via Cost of Illness savings meta-analysis function. These Cost of Illness savings estimates include disease-specific direct treatment costs and lost productivity costs.

selection of outdoor recreation activity; 3) inputting each activity type's weekly-minutes; and 4) MET-values.

***Selection of County*:** For this application, Benton County is chosen given OSU Research Forests lie within this jurisdictional boundary and the majority of recreation visitors to the research forests live in Benton County.

***Selection of Outdoor Recreation Activity*:** Outdoor recreation activity types are cross-walked with those contained in the OR Estimator tool as identified in the OR SCORP statewide survey:

OSU Research Forest Activity	OR SCORP Activity
Walking / Hiking	Walking / Day Hiking on Non-Local Trails / Paths
Dog Walking	Dog Walking / Going to Dog Parks / Off-leash Areas
Trail Running / Jogging	Jogging / Running on Trails / Paths
Mountain Biking	Bicycling on Unpaved Trails
Horseback Riding	Horseback Riding

***Weekly-Minutes*:** Weekly-minutes are calculated from the OSU Research Forests onsite survey data, where hours per visit and number of visits per year are reported. The calculation is [(#hours per visit * 60 minutes per hour * #visits per year) / 52 weeks per year] = weekly-minutes. Below is a comparison of average weekly-minutes from the OSU Research Forests onsite survey data, and those estimated for similar activities from the OR SCORP statewide survey. The difference between these estimates is that OSU Research Forests' average weekly-minutes is only based on recreation occurring on the research forests, whereas the OR SCORP average weekly-minutes is based on total reported recreation participation for urban / suburban residents across the state regardless of where they occur (Rosenberger and Dunn, 2018). Walking / hiking and mountain biking weekly-minutes are similar between the OSU Research Forests and OR SCORP user data. Trail running / jogging, and especially dog walking, weekly minutes are lower for the OSU Research Forests than OR SCORP user data, which may simply be due to lack of differentiating between local and non-local trails / paths as is done for walking / day hiking, or any linear surface (e.g., sidewalks) for dog walking. Horseback riding weekly minutes are substantially higher for the OSU Research Forests user data than OR SCORP user

data, which may be due to uniqueness of the participants, location, and resource in Benton County compared to other urban/suburban areas in the state.

Activity	2017 OSU Research Forest Average Weekly-Minutes	2017 OR SCORP Average Weekly-Minutes, Urban
Walking / Hiking	20.46	24.16
Dog Walking	17.14	57.53
Trail Running / Jogging	18.90	28.77
Mountain Biking	22.22	23.01
Horseback Riding	32.30	9.20

MET-values: MET-values are metabolic equivalent task measures that identify the amount of energy expended through physical activity. The OR Estimator tool only includes outdoor recreation activities with minimum MET-values ≥ 3.0, which correspond with moderate intensity (3.0 – 5.9 METs) to vigorous intensity (6.0 or higher METs) in physical activity recommendations. Conservative MET-values were ascribed in the OR Estimator tool for use in deriving statewide COI savings estimates. The MET-values are adjusted to better reflect the intensity level of recreation activity participation on the OSU Research Forests. The typical OSU Research Forest outdoor recreation user's skill level is intermediate or higher, in particular for trail running / jogging and mountain biking. The trail systems are dirt or gravel, and challenging in their slope and elevation changes throughout the forests. The corresponding MET-values used in the OR Estimator tool reflect these differences in skill-level and intensity of activity participation in OSU Research Forests relative to baseline MET-values used in the OR SCORP analysis.

Activity	OSU Research Forest MET-value	OR SCORP Activity MET-value
Walking / Hiking	6.0	3.5
Dog Walking	6.0	3.0
Trail Running / Jogging	11.0	7.0
Mountain Biking	12.0	5.8
Horseback Riding	3.8	3.8

Further modifications: Two additional modifications to the OR Estimator tool were necessary in order to match visitation levels to OSU Research Forests. First, given Benton County is the selected county, the tool auto-populates county population levels from the 2010 U.S. Census. The proportion of participants was adjusted so that the number of participants reflected 2017 visitor levels for the OSU Research Forests. That is, while Benton County demographics are used in the model, visitation rates match those for the OSU Research Forests. The following proportions were inputted to the OR Estimator tool:

Recreation Activity	**Number of Visitors, 2017**	**% Benton County Population, 2010**
Walking / Hiking	8,942	10.39%
Dog Walking	3,331	3.87%
Trail Running / Jogging	2,805	3.26%
Mountain Biking	2,104	2.45%
Horseback Riding	89	0.10%
Total	17,271	----

Second, COI savings estimates are adjusted for inflation from 2010 USD to 2018 USD using a Consumer Price Index deflator tool. Adjustments for Benton County population growth from 2010 to 2017 are not necessary given it is already accounted for in the adjusted participation proportions.

Results

Kooistra and Munanura (2018) estimated that in 2017 OSU McDonald-Dunn Research Forests had 17,271 individual recreation visitors and 155,446 total visits. These total visits are apportioned by primary recreation activity as:

Activity	2017 OSU Research Forests Recreation Visits
Walking / Hiking	80,478
Dog Walking	29,982
Trail Running / Jogging	25,248
Mountain Biking	18,936
Horseback Riding	802
Total	155,446

Total recreation visits to OSU McDonald-Dunn Research Forests in 2017 are estimated to result in $754,395 in COI savings, or health benefits, associated with eight chronic illnesses. The COI savings by primary activity type are reported below along with estimates for Benton County, OR based on the OR SCORP data (Rosenberger and Dunn, 2018). These estimates are conservative and underestimate the total health benefits derived from physical activity because they do not include impacts on other illnesses and diseases, avoided deaths, or other activities, along with the use of conservative modeling assumptions. These COI savings accrue to health insurers, providers, and outdoor recreation participants.

Recreation Activity	2017 OSU Research Forest Cost of Illness Savings	2017 OR SCORP Benton County Cost of Illness Savings
Walking / Hiking	$278,421	$717,095
Dog Walking	$82,951	$1,947,751
Trail Running / Jogging	$199,582	$1,913,933
Mountain Biking	$190,769	$837,037
Horseback Riding	$2,671	$5,994
Total	$754,395	$5,421,810

The health benefits estimated for outdoor recreation participation in the OSU Research Forests may be compared[4] with those estimated for Benton County residents (Rosenberger and Dunn, 2018). The OSU Research Forests provide a significant proportion (14%) of the health benefits Benton County residents derive from being physically active in outdoor recreation, as noted below. People that recreate in the OSU Research Forests gain additional benefits from their recreation and physical activities elsewhere, as do people that do not recreate in the OSU Research Forests.

Activity	**Proportion of Benton County Cost of Illness Savings Provided by OSU Research Forests**
Walking / Hiking	39%
Dog Walking	4%
Trail Running / Jogging	10%
Mountain Biking	23%
Horseback Riding	45%
Total	14%

Parks and recreation providers have an important role in the health and wellbeing of Oregonians through providing places for people to be physically active through outdoor recreation activities (Rosenberger, Bergerson, and Kline 2009). The health benefits estimated in this report may be compared to the costs of providing recreation opportunities for the OSU McDonald-Dunn Research Forests, demonstrating the broad community and social returns on these investments. Investments in recreation opportunities and infrastructure are investments in building social well-being.

[4] When comparisons are made they should be done with respect to some of the survey sample design differences between the OSU Research Forests survey (Kooistra and Munanura, 2018) and the OR SCORP statewide survey (Bergerson, 2018), as well as differences in activity location and type as noted when discussing weekly-minutes differences above.

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