

Identifying Metrics for Health and Outdoor Initiatives: A Toolkit for Community Evaluators

by
Laura Wood

Dr. Lydia Olander, Academic Adviser
Robert Cochran, Willamette Partnership, Client
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Table of Contents

ABSTRACT	4
EXECUTIVE SUMMARY	5
I. INTRODUCTION.....	7
1.1. OUTDOOR PROGRAMMING FOR COMMUNITY HEALTH	8
1.2. HEALTH AND OUTDOOR PROGRAM EVALUATION NEEDS.....	9
1.3. OVERVIEW OF THIS TOOLKIT.....	9
II. PATHWAYS TO HEALTH FROM NATURE CONTACT	11
2.1. PHYSICAL ACTIVITY	11
2.2. MENTAL HEALTH.....	12
2.3. SOCIAL COHESION.....	13
2.4. AIR QUALITY	13
III. EVALUATION.....	15
3.1. TRANSLATE RESEARCH INTO ACTION.....	15
3.1.1. EXPAND THE EVIDENCE BASE	15
3.1.2. DEMONSTRATE THE BUSINESS CASE FOR INVESTING IN NATURE	15
3.1.3. GENERATE POLICY CHANGE	16
3.2. ENSURING A ROBUST PROGRAM EVALUATION.....	16
3.2.1 QUESTIONS TO GUIDE SUCCESSFUL PROGRAM EVALUATION.....	17
IV. HEALTH AND OUTDOORS PROGRAM EVALUATION DESIGN	19
4.1. THE OUTDOORS GREEN SPECTRUM.....	19
4.2. EXPOSURE	20
4.3. DOSE RESPONSE.....	20
4.4. HEALTH BENEFIT.....	21
4.5. VALUATION	21
V. METRICS FOR EVALUATING HEALTH OUTCOMES FROM OUTDOOR PROGRAMS.....	23
5.1. SUMMARY OF COMMUNITY PROGRAMS.....	23
5.2. SUMMARY OF PEER REVIEWED STUDIES	24

5.3. BENEFITS AND DRAWBACKS OF MOST COMMONLY USED METRICS	24
<u>VI. RECOMMENDATIONS</u>	<u>27</u>
REFERENCES	29
<u>APPENDIX I: SURVEY OF METRICS.....</u>	<u>36</u>

Abstract

Rising rates of urbanization and resource exploitation have reduced opportunities for human interaction with nature and motivated an expansion of interest in research and development of initiatives to achieve human health benefits from contact with nature. Despite a growing base of evidence linking health benefits to experience with the outdoors, little research has been conducted to generate evidence-based strategies for implementing health and nature interventions in practice. To better assist communities in developing effective health and outdoor initiatives, I conducted a comprehensive review of metrics used by national community outdoor initiatives to evaluate health outcomes. I compared community metrics to measures supported by scientific research and consolidated the results into a guideline for those developing metrics to evaluate community health and outdoor programs.

Executive Summary

In the United States and globally, humans are becoming increasingly disconnected from nature and the outdoors. Simultaneously, there is a growing global interest in understanding how our physical environment impacts health outcomes and how decision makers can design living environments that are safe and resilient (WHO, 2016). A growing body of evidence supports the critical role green space and nature contact have in addressing public health issues (Kleinert & Horton, 2016). The health benefits of nature contact include lower mortality rates from cardiovascular diseases, reduced stress, increased physical activity, and improved social wellbeing (Shanahan et al., 2016a). Opportunities for nature contact offer large potential for improved health, are relatively inexpensive compared to other health interventions, and they produce a large range of important co-benefits (Frumkin, 2013). Despite the tremendous potential of nature contact to improve community health, many questions remain for communities seeking to implement outdoor projects to improve health.

This project aims to better understand the metrics and measures currently used by communities and researchers to evaluate health outcomes from nature contact in order to inform a toolkit to help communities identify indicators to use to evaluate health and nature program success. This project is part of the [Oregon Health and the Outdoors Initiative](#) and will facilitate the growth and evaluation of the Initiatives' pilot health and outdoor programs. This is accomplished through 1) a review of the pathways to health from nature contact, 2) an exploration of evaluation best practices for health and outdoors program evaluation, and 3) a survey of metrics and measures currently used by communities and researchers to evaluate health outcomes from green infrastructure to inform future program evaluation design.

Given the wide-ranging health benefits derived from nature contact, this project focus on health benefits that fall under four widely accepted domains: physical activity, mental health, social cohesion and air quality (Hartig et al., 2014).

Research has demonstrated that health benefits from nature are obtained from a range of pathways (Kuo, 2015). To better understand the connection between health outcomes and metrics for outdoor programs, this project focuses primarily on three key factors that affect health outcomes:

- Green spectrum of nature contact, such as the type, amount, and quality of nature;
- Exposure, such as the proximity to nature needed to confer a health benefit; and
- Dose response, such as the quantity of vegetation needed to obtain a health benefit

The data on metrics and measures was gathered through research of community program websites, peer-reviewed studies, and interviews with health and outdoor experts and program practitioners.

Several important themes emerge that can inform decision-making around health and outdoor program design and evaluation. First, many of the metrics used to evaluate health outcomes in community programs do not actually measure health, but instead measure the type of nature and exposure to nature within the program. Metrics and measures across community programs and peer-reviewed literature fell generally into three categories: measures of nature (e.g., canopy cover), measures of exposure (e.g., proximity to a park) and measures of health (e.g., salivary cortisol levels). In addition, there were three types of measures: direct observation (e.g. Body Mass Index), self-reported (level of satisfaction), and technology based (physical activity level).

The majority of outdoor programs rely on self-reported measures for aspects of health and nature. Direct observation measures are also commonly used to measure aspects of nature. This survey revealed the need for researchers to develop more scientifically defensible metrics and measures of health that communities can feasibly implement. This research also identified the need for communities to consider evaluating outcomes when designing outdoor programs because many programs only track the number of participants.

Lastly, the survey of metrics and measures reinforced the importance of developing evaluation frameworks strongly rooted in the health needs and cultural attitudes of the targeted communities. This includes developing survey and reporting tools in different languages, identifying the appropriate community health partner, and understanding cultural barriers to access from the beginning of the program. The hope is that communities apply these metrics and measures and share their findings with the Oregon Action Framework to help generate a strong set of evidence-based measures for community health and outdoor programs.

I. Introduction

Rising rates of urbanization have reduced opportunities for human interaction with nature and motivated an expansion of interest in the health benefits of nature contact. A growing body of scientific evidence across disciplines demonstrates the numerous ways human health and well-being are connected to the natural environment (Hartig et al., 2014). To date, this large body of evidence remains spread throughout various peer-reviewed journals and program websites and is largely inaccessible to communities seeking to implement outdoor programs for health.

Driven by the desire to improve health and environmental outcomes across Oregon, health and conservation leaders across the state formed a Health and Outdoors team and developed an Action Framework for linking health priorities with nature contact (Health and Outdoors Initiative, 2015; Box 1). Since the Action Framework's inception, the planning team has expressed the need to develop a set of metrics, data collection methodologies, and evaluation resources to help track and communicate health outcomes from outdoor programs.

To date, few resources exist for communities seeking to measure and evaluate the health outcomes generated through nature contact (Razani et al., 2016a). By equipping communities with the tools to measure community-specific health priorities, health and outdoor program developers and evaluators can increase program engagement and access to the outdoors across their communities. One of the goals of the Oregon Action Framework is for community-driven evidence-based evaluation to help break down barriers to spending time outdoors and scale up programs to get more people outdoors more frequently (Health and Outdoors Initiative, 2015).

This report aims to increase the accessibility of information on how to evaluate health outcomes by identifying and consolidating metrics and measures used by community programs and found in the peer reviewed literature. Although there are many ways through which communities can engage with nature, this report focuses on the pathways to health from nature contact derived from community-level outdoor

Box 1: Excerpt from the Oregon Health and Outdoors Framework

“The purpose of the [Oregon Action Initiative for Health and the Outdoors](#) is to improve health and conservation outcomes for all Oregonians by increasing the presence of, access to, and use of parks, nature, and the outdoors in communities experiencing inequities, including communities of color, low income communities, people with disabilities, the very young, elders, and other vulnerable populations.

The Health and Outdoors Framework seeks to integrate health and conservation efforts and concepts, and to provide tools and intervention ideas to healthcare providers, conservation organizations, public health practitioners, and community networks.” (Oregon Action Framework, 2015)

programming. This report is a starting point to encourage more work and innovation in how to measure, monitor, and evaluate health and outdoors programs.

1.1. Outdoor Programming for Community Health

Community health and outdoor programs serve as mediating variables between nature and improved health. While proximity to green spaces has been demonstrated as an important factor to receiving nature-related health benefits, other sociocultural barriers persist (Ekkel, 2017). For example, Kuo (2010) observed that community programming helped to increase perceptions of safety and park usage. Furthermore, evidence supports the notion that disadvantaged populations receive a disproportionate amount of nature exposure compared to other populations, and that community programming can help increase access and engagement in nature among disadvantaged communities (Astell-Burt et al., 2014; Rigolon, 2016).

Communities across the country area already making efforts to connect more people to the outdoors. In 2015, the Oregon Health and Outdoors team identified 25 programs and projects aimed at connecting communities across the state to nature (Health and Outdoors Initiative, 2015). Examples of existing programs include:

- Community gardens (Castro et al., 2013)
- Outdoor classroom opportunities (OPHI, 2017)
- Hiking groups (Blue Cross Blue Shield, 2017)
- Parks Prescription Programs (Zarr et al., 2017)

When the Oregon Health and Outdoors team interviewed program community leads¹, the leaders identified a strong desire for a menu of evidence-based health and outdoor solutions that could be easily implemented (Health and Outdoors Initiative, 2015). The desire to identify community-level metrics and tools has been reiterated by program leads in national organizations, including the National Environmental Education Foundation, The Nature Conservancy, and Seattle Public Utilities². The evidence linking improved health to outdoor contact is compelling, yet communities are struggling to make those linkages actionable and compelling (Health and Outdoors Initiative, 2015). The toolkit serves as the first step towards developing a scientifically defensible menu of

¹ Interviews were conducted with state and county public health officials, hospital and health care executives, conservation nonprofit leaders, and other health advocates and planners. Questions focused on opportunities to actualize the link between health and the outdoors in the next 3-5 years, innovative work already underway in this space, and identification of key partners and remaining gaps (Health and Outdoors Initiative, 2015).

² Interviews were informal and conducted through frequent Health and Outdoors Core team meetings from September 2016 to March 2017.

metrics community program practitioners can use to evaluate health outcomes from nature contact programs.

1.2. Health and Outdoor Program Evaluation Needs

Effectively measuring and communicating program impact is a key challenge communities face when designing programs that actualize the links between health and the outdoors. Community program leads and field experts interviewed in by the Oregon Health and Outdoors team in 2015 shared that determining the best indicators to measure health benefits from programs was one of the greatest challenges, especially concerning diverse cultural groups. For example, Health Impact Assessments (HIAs) are standard practice among public health projects that address inequalities and human impacts (National Research Council, 2011). Elements of HIAs are transferrable to health and outdoors programs, but HIAs often require rigorous data collection and a level of expertise that is outside the scope of many community outdoor programs. This toolkit hopes to facilitate the development of a standardized impact assessment for health and outdoor programs.

Monitoring and evaluating health outcomes and program success is vital to gaining and sustaining funding sources. Interest in developing initiatives to encourage interaction with nature has gained momentum in recent years across a range of disciplines, including health care, education, and conservation. Health care organizations have begun to allocate community benefit spending dollars to supporting health and outdoor initiatives. For example, providers such as Kaiser Permanente provide funding for programs such as [ParksRx](#). Large conservation organizations, such as [The Nature Conservancy](#), have begun to focus more intensively on natural solutions to improve urban health. These examples demonstrate the diversity in funding sources for health and nature programs. This emphasizes the need to effectively demonstrate program impact and quantify the health benefits from outdoors programs.

1.3. Overview of this Toolkit

Despite the considerable body of research suggesting that nature contact can result in a range of health benefits, little guidance exists for practitioners seeking to metrics and monitoring of specific interventions to promote well-being. Little research exists on how well different metrics do in evaluating health outcomes from nature contact and how well they capture variation among populations, type of nature contact, and health outcome.

This toolkit is designed to assist health and outdoor program evaluators in developing robust, community-relevant evaluation plans. The primary audience of this document is any community decision-maker, program administrator, or evaluator working to develop an evaluation framework for a health and outdoors program.

The guideline includes:

- Overview of the evidence linking improved health to interaction with nature.
- A compilation of metrics used to evaluate health outcomes from outdoor contact and recommendations about the relative strength of the connections between these metrics and health outcomes based on the scientific literature.
- Identification of remaining gaps in health and outdoors program evaluation and recommendations for moving forward.

Through surveying and consolidating metrics and tools from current programs and peer-reviewed studies to support robust program evaluation, this toolkit will also help communities:

- Expand the evidence-base linking health outcomes to nature contact;
- Enable communities to better demonstrate effectiveness of health and outdoor programs;
- Provide valuable data for grant proposals to facilitate the growth of health and nature initiatives;
- Provide evidence to support the business case for health and nature contact (Health and Outdoors Initiative, 2015).

II. Pathways to Health from Nature Contact

Ongoing research has demonstrated numerous pathways through which health benefits are achieved from contact with natural environments. This toolkit divides these pathways into four widely accepted domains: physical activity, mental health, social cohesion, and air quality (Hartig et al., 2014). The four domains through which health benefits are achieved are described in greater detail below.

2.1. Physical Activity

Spending time outdoors is connected to increased levels of physical activity (Hartig et al., 2014). Research has demonstrated that the presence of natural features such as street trees and parks, is generally associated with higher levels of physical activity in both children and adults (Shanahan et al. 2016a; Sugiyama et al. 2014). In turn, improvements in physical activity are correlated with a broad range of health benefits, including reduced rates of obesity, cardiovascular disease, diabetes, and some types of cancer (Bauman et al., 2016; Lee et al., 2015). Given this body of evidence, health and outdoor programs that focus on contact with nature for the purpose of increasing physical activity have potential to produce tremendous community health benefits.

There are several mediating factors and challenges that impact the pathway from nature contact to increased physical activity to improved health. For example, the duration of a specific physical activity has been shown to influence the magnitude of the benefit produced (Shanahan et al., 2015). While some research demonstrates correlations between the amount of neighborhood greenspace and lower body mass indices (Ghimire et al., 2017), other studies have shown that neighborhood greenspace is a poor predictor of improved physical activity (Cox et al., 2017). In addition to the amount of green space needed to encourage physical activity, researchers have generally struggled to determine how different characteristics of the natural surroundings, such as street trees versus open parks, influence physical activity (Kaczynski & Henderson, 2007). One explanation for this is that research demonstrates that preferences for the quality of nature vary significantly among individuals (Shanahan et al., 2016b). Understanding nature preferences and how that influences nature contact is critical to the design and evaluation of effective outdoors programs.

Within the context of health and outdoor programming for improved physical activity, the most commonly used green intervention is engagement with public parks. Examples include providing free transportation or admission to and from a park (Razani et al., 2016), prescribing “doses” of park visits as a form of treatment for obesity (Zarr et al., 2016), or adding amenities to a park to increase physical activity and integrate those amenities into programming (Gentry et al., 2014). The research on park accessibility and improvements in physical activity are mixed. Some studies have demonstrated that greater access to parks and green space for recreation is correlated with increased

physical activity (Godbey, 2009), while other studies have found no relationship (Richardson et al., 2013).

Improving access to parks and other types of greenspace are often used in community programs because rigorously measuring and tracking improvements in physical activity through health measures such as Body Mass Index (BMI) is challenging. Marginalized communities may be more reluctant to divulge health information relevant to improvements in physical activity, such as height and weight (Cohen-Klein, conversation with the author, April 25, 2017). Direct measure of BMI requires collaboration with registered health clinicians, which can increase program costs (Razani et al., 2016).

2.2. Mental Health

A considerable body of evidence has demonstrated the connections between nature contact and psychological well-being. Walks in nature have been shown to decrease rumination of negative thoughts, increase self-esteem, and decrease feelings of anxiety (Bratman et al., 2016; Berman et al., 2012). Studies have also demonstrated that psychological health is related to proximity of natural features, such as street trees, and community gardens (Ekkel, 2017; Alcock et al., 2014). Psychological benefits can be derived from viewing nature alone. For example, viewing nature through a window can increase recovery time among hospital patients (Ulrich, 1984) and increase short-term attention (Kuo, 2010). Greenspace has also been shown to serve as an important factor in maintaining population wellbeing and general feelings of happiness (Richardson et al., 2015; Kleinert & Horton, 2016).

Stress reduction is another key benefit derived from nature contact that impacts both physical and mental health. Research has shown that walks in nature can confer physiological benefits related to stress reduction, which have been assessed using measures such as reduce salivary cortisol levels (Bratman et al., 2015), sympathetic nerve activity, and reduced blood pressure (Park et al., 2010). Other studies have demonstrated self-reported stress reduction benefits from nature contact based on living conditions and extended time spent in nature. For example, people living in relatively greener neighborhoods have reported fewer stressful life events than individuals living in less green areas (van den Berg et al., 2010). A study conducted in Philadelphia demonstrated that greening vacant lots can reduce stress and increase safety in surrounding neighborhoods (Jennings et al., 2016).

Recent research has begun to reveal the attention restoration benefits of nature contact. Time spent in nature has been shown to increase attention and reduce symptoms of Attention Deficit Hyperactivity Disorder (ADHD) (Faber et al., 2011; Razani et al., 2015). The evidence supporting the psychological benefits derived from nature contact is strong. What is less clear is how mediating factors, such as increased social

interactions and improved health that often correspond with greater nature contact, influence the mental health benefits (Jennings et al., 2017).

Aside from wilderness therapy programs, this survey of metrics found no community programs specifically designed for improving mental health outcomes. Research has shown that wilderness treatment programs, such as Outward Bound, can produce a range of therapeutic benefits, including improved self-esteem and prosocial behaviors (Matz & Muller, 2016). Many community programs are marketed as therapeutic and include questions on self-reported mental health improvements in surveys and evaluations, but these mental health improvements often serve as co-benefits of the programs at large (Razani et al., 2016). Quantifying mental health improvements is inherently challenging given the personal nature of mental health issues. In addition, measuring physiological stress responses requires the presence of a registered health clinician, which may prove challenge for resource-limited communities.

2.3. Social Cohesion

Spending time in nature has the opportunity to increase social interactions and general feelings of social connectedness (Ward Thompson et al., 2016). Research has demonstrated that living in greener neighborhoods can increase social capital and prosocial behavior (Dadvand et al., 2016). More specifically, evidence suggests that park use in particular is associated with greater social cohesion (de Vries et al., 2013). Stronger social ties are significant contributors to health (Kuo, 2015). To date, few health and outdoor programs serve as a strong opportunity to achieve health benefits.

The survey of community metrics in this report did not identify any programs specifically designed to improve social cohesion. Instead, many community programs include questions related to social cohesion in evaluations. For example, LatinXplorers, a hiking program aimed at breaking down the barriers preventing residents in Hood River, OR from hiking and recreating in nature, identified improvements in community cohesion through asking participants to answer if a) their community is a source of comfort, b) they felt close to their community, or c) they did not feel as though they belonged in anything like a community (Cohen-Cline, conversation with the author, April 19, 2017). Improving social cohesion is stated as an outcome priority for many community programs, but few quantify improvements in social cohesion to the same degree as research scientists (Razani et al., 2016b).

2.4. Air Quality

Greenspace can promote community health by both contributing positive factors, such as increased shading, and by reducing negative factors, such as reduced exposure to airborne pollutants (Rao et al., 2014). Canopy cover, in particular, has been shown to reduce localized ambient levels of particulate matter (PM10) and gaseous air pollutants (Nowak et al., 2014). One study found that row of roadside street trees lowered indoor

PM10 concentrations in houses along the street by 50 percent (Maher et al., 2013). Other research suggests that a single tree can lower PM10 concentrations by 15-20 percent. (McDonald et al., 2016). Fine particulate matter is the air pollutant with the greatest health burden and is strongly associated with myocardial inflammation and other respiratory conditions (Kuo, 2015). In the United States, extensive tree loss has been associated with increase mortality rates due to greater concentrations of fine particulate matter (Donovan et al., 2013).

Although improved air quality serves as an intermediary step between green space and health benefits, the evidence supporting the ability of green spaces to produce meaningful air quality benefits is significant and may offer strong protection against ailments such as respiratory and cardiovascular disease (McDonald, 2016). Although no community health and outdoor programs focus specifically on improving air quality (to date), air quality is included in this toolkit given the strong health benefits associated with greening programs.

III. Evaluation

3.1. Translate Research into Action

We know that spending time outdoors is responsible for measurable positive changes in the body. What communities are missing are meaningful and feasible to measures of those changes to inform program goals and future management strategies. The past twenty years of research have produced a strong body of evidence supporting the linkages between health and the outdoors. What is missing is the level of detail and granularity to translate the evidence into identifying the best implementable actions. Improved measures and metrics may be able to provide the additional level of detail needed.

It is important that community health priorities drive decisions about which health outcomes to focus on in designing health and outdoor programs. As such, health and outdoor program evaluations will likely vary considerably between communities. Developing a strong evaluation framework rooted in community health priorities is essential to ensuring program success and inclusion. Furthermore, a strong evaluation plan will help:

- Build upon the evidence base linking health and the outdoors
- Leverage funding and facilitate diverse partnerships
- Increase program participation to eventually demonstrate measureable community health improvements

3.1.1. Expand the Evidence Base

As evidenced in Section 2 of this report, there is a strong base of evidence supporting a range of health benefits derived from nature contact. The remaining gaps are in understanding the causal connections, best practices, and evidence-based approaches to health from outdoor contact (Health and Outdoors Initiative, 2015). Emerging research has called for scientists to identify evidence-based public health interventions or programs for nature contact that can be feasibly implemented at the community level (Frumkin et al., 2013). There is a tremendous amount of health and outdoor programming occurring across the country. These programs may be able to provide researchers with an understanding of what strategies are working and what interventions need to be reconsidered. The challenge remains in determining the best ways to bridge the communication gaps between the work researchers and community programs are doing.

3.1.2. Demonstrate the Business Case for Investing in Nature

There is rising demand for proactive health initiatives that accommodate all drivers of health. Drivers include clinical care approaches, socioeconomic factors, characteristics

of the physical environment, and health behaviors (Health and Outdoors Initiative, 2015). The effects of contact with nature on health are starting to be studied and documented in scientifically rigorous ways. Increasingly, foundations, hospitals, and other government entities are looking to invest in nature-based solutions for health. To harness these sources of capital, programs need to effectively quantify and track the health return on investment. Health and outdoor programs can augment the growing evidence base by creating outcome-driven evaluation plans (Cochran, 2017). For example, outdoor organizations such as [The Sierra Club](#), [American Mountain Club](#), and the [National Park Service](#) have begun collaborating with healthcare providers, such as [Kaiser Permanente](#), to administering “park prescriptions” that combat childhood obesity. Medical insurances companies are also beginning to consider the development of green infrastructure and outdoor programs as preventative care measures (Cochran et al., 2017).

3.1.3. Generate Policy Change

As discussed in Section 2, evidence suggests that contact with nature and greenspace may disproportionately impact disadvantaged populations. This suggests that nature can help reduce health disparities and achieve environmental justice goals (Jennings et al., 2015). Across the country, environmental and health policies evolved separately (Health and Outdoors Initiative, 2015). As we gain a stronger understanding for how our environment impacts health, there are greater opportunities to weave health and nature into policies in new ways. Within the context of the Oregon Action Framework, policy initiatives include:

- New or modified legislation
- The creation of financial incentives,
- Identification of institutional priorities

Steps such as these, and others, will create more opportunities to develop new and creative programming solutions to improve health and nature contact. In order to generate policy change, we need a stronger understanding of what types of programs and interventions work and under what circumstances are impacts best achieved. Robust program evaluations will help take us closer to that goal.

3.2. Ensuring a Robust Program Evaluation

While health and outdoor program-specific evaluation methods will vary across programs, there are several themes paramount to any successful program evaluation in public health. The public health program evaluation framework designed by the Center for Disease Control (CDC) serves as the standard among health care professionals. When developing an evaluation plan for a specific program the CDC recommends a clearly defined set of six steps, which are described in the Box 2 (CDC, 1999).

Box 2. The CDC's Steps for Successful Health Evaluation:

1. Engage stakeholders
2. Describe the program
3. Focus the evaluation design
4. Gather credible evidence
5. Justify conclusions
6. Ensure use and share lessons learned

Strong program evaluation frameworks must be firmly rooted in community health priorities. Every nonprofit hospital across the country is required to have a community health needs assessment, which is updated every five years and details the investment of community benefit dollars (OPHI, 2017). Some states, such as Oregon, require all communities within the state to be covered by a Coordinated Care Organization (CCO), which coordinates the implementation of a Community

Health Improvement Plan (CHIP). Similar to the community health needs assessment, CHIPs define community-specific health priorities and proposes strategies for addressing each priority.

The Oregon Action Framework has partnered with [The Providence Center for Outcomes Research and Education](#) to begin creating health and outdoors program evaluation tools (see Appendix II for an example). When developing health and outdoor program evaluations, Providence Health encourages evaluators to:

- Consider the need or ability to compare your program to similar programs in other places, or to other types of health interventions;
- Use language appropriate for your community; and,
- Understand the privacy protections required when asking questions about health, particularly for certain populations (e.g., children and youth or people with cognitive disabilities) (OPHI, 2017)

3.2.1 Questions to Guide Successful Program Evaluation

Effective program evaluation is firmly rooted in the quality of the evaluation's core questions. The processing of creating and refining questions helps prioritize research and determine what aspects of the program are most valuable (CDC, 1999). Guiding questions also help clarify stakeholder roles in the program evaluation process. At a basic level, any robust evaluation plan should consider the following questions:³

- Program design: What is the program and in what context does it exist?
- Program effectiveness: What standards must be met to determine if the program is successful?
- Program evidence: How measurable are the components of the program?
- Community needs: Does the program design address community needs?

³ Questions generated from conversation with Health and Outdoors Team on March 23, 2017)

- Evaluation: How will this evaluation be used and by whom?
- Barriers: What barriers exist and do we have a plan to overcome them?

Health and outdoors programs must have the ability to be robustly evaluated, which requires consideration of evaluation methodologies in all stages of program development (see Box 3 for additional resources). Within the context of health and outdoor programming, researchers are beginning to ask questions to generate evidence-based answers. Some of these questions include:

- Through what mechanisms does nature improve health (Kuo, 2015)?
- How much nature is needed to maximize health benefits? Is there an optimal dose of nature (Shanahan et al., 2016)?
- How do different populations respond to nature and how does this response impact health (Health and Outdoors Initiative, 2015)?
- When doctors prescribe nature through parks prescription programs, do patients actually “fill” the script (Coffey et al., 2016)?
- To what extent does the level of greenness impact the restorative effects derived from nature contact (Eckel, 2017)?

Box 3. Resources for Program Evaluation

The following resources may help in developing guiding questions for program evaluation in health and nature programs:

- CDC’s online [Introduction to Program Evaluation for Public Health Programs: A Self-Study Guide](#).
- [Health and Outdoors Initiative Health and Outdoor Education Guideline](#)
- The CDC [Parks and Trails Health Impact Assessment Toolkit](#)
- Robert Wood Johnson Foundation [Program Evaluation Resource Library](#)

IV. Health and Outdoors Program Evaluation Design

Health and outdoors programs design must take into account evaluation methodologies in all stages of program development. To help frame thinking about health and outdoors program evaluation, this section describes several elements along the pathway to health from nature contact that influence the success of health and outdoor programs. Figure 4.1 illustrates the causal linkages from the outdoors to improved health. The sections below parallel the steps in Figure 4.1.

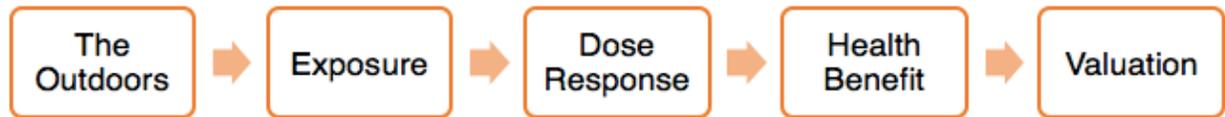


Figure 4.1. Conceptual framework linking contact with nature to improved health outcomes.

4.1. The Outdoors Green Spectrum

When designing a health and outdoors program, it is important to consider the range of outdoor experiences and select the appropriate intervention for a community in question. Contact with the outdoors and nature can include going for a walk in an urban park, tending a community garden, or simply viewing a natural landscape from a window (Hartig et al., 2014). This toolkit uses the Oregon Health and Outdoors Framework’s broad definition of the outdoors as “the clean, safe, and green places that let individuals, families, and communities be in the open air” (Oregon Action Framework, 2015). Given the green spectrum of outdoor opportunities, more research is needed to identify what types and qualities of natural features confer specific health benefits. Public parks and street trees are the most commonly studied green interventions within the health context (Hartig et al., 2014). This is likely due to the fact that most studies have been conducted in urban environments where street trees and parks serve as the primary green outdoor opportunities.

Evidence suggests that the level of greenness is just as important, if not more so, than the type of green space for producing health benefits (Ekkel, 2017). Studies have quantified the level of greenness using metrics such as Normalized Difference Vegetation Index (NDVI) (Ekkel, 2017), the presence/absence of a tree view from a window (Ulrich et al., 1984), and self-scored scenery ratings (Seresinhe et al., 2015). As researchers attempt to understand which natural features are associated with specific health outcomes, proxy measures must be used. Some proxy measures might include⁴:

- The biodiversity of the natural area as a proxy for inspiring beauty?

⁴ Proxy measures derived from conversation with the author and Bobby Cochran, April 4, 2017

- Distance from urban center as a proxy for remoteness
- Density of tree canopy as a proxy for greenspace quality

Several studies have demonstrated the importance of community outreach and educational activities associated with the outdoor space to encourage use (Kuo, 2010). When developing a health and outdoors program, it is important to understand the type of outdoor space within the program in order to develop appropriate measures to quantify and describe the natural space.

4.2. Exposure

Just as size, type, quality, and location of the outdoors influence how it is used and by whom, the magnitude of exposure to the outdoors influences the health benefit received. Exposure is defined as “the amount of a factor to which a group or individual can become in contact with” (Merriam Webster Online, accessed April 19, 2017). In the health and outdoors context, exposure can be thought of as the amount of nature and/or time spent in nature someone must be exposed to in order to receive a health benefit.

Exposure is important to consider when designing health and outdoor programs because it varies significantly based on demographic, behavioral, and physical factors (Ekkel, 2017). Community engagement can help determine how stakeholders are using types of nature and what the primary barriers to access are. For example, building a park in a low-income neighborhood may have no effect on the wellbeing of the population if those individuals are not inclined to use it in the first place.

There is little information for developers of community health and outdoors programs on how to quantify exposure to nature. Possible proxy measures include:

- Proximity to target community
- Park accessibility score
- Perceived safety levels
- Self-reported exposure through iPhone tracking

4.3. Dose Response

While medical researchers define exposure as the amount of a harmful substance with which a person comes in contact, dose is defined “the amount of a substance that enters or interacts with an organism” (Merriam Webster, 2017). For example, a higher “does” of vegetation may produce greater reductions in self-reported stress (Cox et al., 2017). Understanding nature dose response curves will directly help inform health and outdoor program design. A recent study on nature dose response curves by Shanahan et al. 2016 demonstrates some of these design considerations. The study recommends that programs aimed at reducing prevalence of depression should design a program with a behavioral intervention component, such as promoting longer duration in green

space, while programs designed to improve social cohesion should focus on increasing frequency of green space visitation (Shanahan et al., 2016a).

Many factors can affect the “dose” of nature resulting from a given exposure: the duration and intensity of exposure; the attitudes, level of awareness, and cultural filters a person brings to the interaction; and the ways in which a person interacts with nature (Hartig et al., 2014). When designing an effective health and outdoors program, it is important to consider how the community will interact with the outdoors (Box 4).

Box 4: Addressing Specific Cultural Needs

As we develop an understanding of the connection between health and the outdoors, we are seeing inequities in health widening along racial and economic lines. Health and outdoor programs that use a culturally-responsive lens in their programming can help ensure that all participants have access to the health benefits of being outdoors. Community evaluators and program developers should attempt to engage targeted populations in evaluation and health research so that eventually the community can take ownership over the project (Health and Outdoors Initiative, 2015)

4.4. Health Benefit

The health benefits derived from interaction with the outdoors are numerous. The four main pathways to health (physical activity, mental health, social cohesion, air quality) are described in greater detail in Section 2. When designing a health and outdoors program, it is important to consider how the type of health benefits expected impacts the type of evaluation needed. For example, for many studies and programs in public health, outcomes are evaluated through analysis of self-reported health questions collected through scientifically validated surveys. Many researchers have modified questions from validated self-reported health surveys for the purpose of measuring health benefits from nature contact (Shanahan et al., 2016a). These questions are often further modified for use in community programs, of which the majority rely exclusively on self-reported information to measure health outcomes. Some health outcomes are typically quantified using proxy measures, such as the number of trees planted as a proxy measure for decreased likelihood of respiratory illness. When considering design, a community health program, it is important to identify health outcomes and measures that align with the community’s greatest needs.

4.5. Valuation

Although this toolkit will not investigate methods to value the health benefits derived from nature contact, it is important to mention this last step in the causal pathway. A growing body of research has quantified the health co-benefits from greening projects (Wolf & Robbins, 2015). The field of ecosystem services valuation contains a well-

established framework for quantifying the ecosystem services provided by the outdoors (Jennings et al., 2016).

In the field of global health, the primary non-monetary metric used to quantify disease burdens is disability-adjusted life-years (DALYs) (Whiteford, et al 2010). No health and nature studies to-date have quantified benefits in DALYs, but it may be a useful metric in future efforts. Although this toolkit does not include any valuation metrics, it is important for health and outdoor program developers to consider valuation in the design phase in order to accurately assess the relative program costs and benefits.

V. Metrics for Evaluating Health Outcomes from Outdoor Programs

This section describes the current state of and opportunities for metrics used to quantify health benefits from outdoor contact in scientific studies and community programs. It is important to note that this research is not exhaustive but serves as a representative sample of national programs and studies. These metrics are intended to be modified over time based on on-the-ground results. The full table of metrics is available in **Appendix I**.

The health outcomes metrics within this toolkit were collected through review of measures and tools commonly used in health and outdoor programs and peer-reviewed studies. Program metrics were collected through research conducted through program websites and interviews with program administrators and field experts. Metrics from scientific studies were collected through a review of recent studies and systematic reviews and input from the Oregon Health and Outdoors Core team. A systematic review of metrics from the full body of health and outdoor research was beyond the scope of this document. The community metric review was conducted first, and the scientific study review primarily served to validate community metrics and provide alternative and supplemental information.

5.1. Summary of Community Programs

The majority of community programs are aimed at increasing physical activity or improving access to the outdoors. Typically, programs focus broadly on getting people outside and less on specific health interventions. The most common metrics used measure nature as a proxy to health, and when health outcomes are actually measured, the vast majority of programs use self-reported data. For example, the tool SOPARC: System for Observing Play and Recreation in Communities, is commonly used within the research community to measure how different park amenities facilitate physical activity (McKenzie, 2016, Appendix I). Community programs have adopted this tool as a general measure of physical activity levels within a program (Evenson et al., 2016). Many community programs ask participants questions to determine what elements of nature bring them outdoors, such as wildlife viewing opportunity or feelings of remoteness (Cohen-Cline, conversation with the author, April 19, 2017). Researchers have designed and studied survey questions to determine the qualities of nature most important to people, yet some of the survey questions are not relevant to communities (Nisbet et al. 2009, Appendix I). Surveys administered to predominantly Latino communities, for example, are more successful when questions are framed around identifying the barriers to access nature, not the positive qualities that draw people to the outdoors (Cohen-Cline, conversation with the author, April 19, 2017).

Many community programs lack the resources to track and evaluate health outcomes. For example, for many of the National Environmental Education Foundation's (NEEF) Rx Outdoor Activity programs, the only evaluation measures NEEF collects are the number of participating health care providers (Jane Chang, conversation with the author, August 10, 2016). A few programs track the number of nature prescriptions written. The evidence for this measure as a proxy for improved health is limited (Coffey et al., 2016). It is important to note that for most programs, information on how health outcomes are evaluated is challenging if not impossible to determine from digging through the website. This may be because program decision makers lack the resources to design and conduct thorough evaluations, or it may be occurring because program decision makers do not want to release any information that could deter program participants.

5.2. Summary of Peer Reviewed Studies

The peer-reviewed health and outdoors literature surveyed included clinical trials, systematic reviews, urban planning guidance, and studies of specific interventions. Similar to community programs, health outcomes within the context of outdoor contact are most often measured through self-reported surveys or questionnaires taken directly or modified from the health research community. Most of the research papers surveyed are focused on strengthening the causality of the relationship from nature contact to health. The research that addresses implementation science is largely aimed at urban design of greenspace, such as determining how close parks need to be to facilitate improvements in physical activity (Eckel et al., 2017). In addition, although air quality is not a direct goal of any community programs, the evidence supporting health improvements in air quality generated from urban greening is strong (McDonald et al., 2016).

There is a tremendous amount of evidence supporting a range of health benefits from outdoor contact, but this information appears largely inaccessible to communities who want to translate the information into action. Many of the programs studied are integrated into school curricula, which helps maintain consistent program participation through engaging teachers and parents. Programs that are designed to help community members outside of education may not have access to much research and evaluation support. While, this survey of metrics has demonstrated that physical activity is the most commonly studied health outcome, the research suggests that mental health is the health benefit more strongly associated with nature contact.

5.3. Benefits and Drawbacks of Most Commonly Used Metrics

Despite the uniqueness of each health and outdoor program, many common metrics are by communities and these metrics share similar benefits and drawbacks. To better illustrate some of these shared benefits and limitations of community health and

outdoors metrics, the specifics of several of the most commonly used community metrics are described in Table 5.3.3. For a full list of measures, see Appendix I. For an example of how some metrics can be applied to evaluate a community program, see Box 5 below.

Table 5.3.3. Benefits and limitations associated with the most commonly used community metrics.

Metric	Measure	Scientific Support	Benefits	Limitations
Physical activity level (observed)	SOPARC : System for Observing Play and Recreation in Communities. This tool collects information on park users, park activity levels, and park attributes through direct observation (Evenson et al., 2016)	Validated for assessing park users' physical activity levels in parks (McKenzie, T.L., 2016)	Inexpensive Unobtrusive Scientifically validated	Does not directly measure health benefit Potential for incorrect interpretation of park use
Park quality score	Community Park Audit Tool - Active Living Research. This tool audits parks for their potential to promote physical activity	Validated as a site assessment tool but not as a measure of health (Kaczynski et al., 2012). Recommended by CDC and NPS.	Inexpensive Unobtrusive Scientifically validated User friendly	Does not directly measure health benefit Potential for incorrect interpretation of park use
Level of greenness	Normalized Difference Vegetative Index (NDVI) value	Validated as a positive correlate to higher birthweight, reduced depression, reduced mortality, and better mental health (Eckel et al., 2017)	Widely used and accepted measure of greenness across different fields Unobtrusive	Does not directly measure health benefit Requires access to land cover data and expertise on analyzing spatial data Static measure (changes year to year and season to season)
Nature Relatedness Score	Nature Relatedness Scale (Nisbet et al., 2009)	Validated as a measure of social cohesion and wellbeing (Shanahan et al., 2016a)	Inexpensive Unobtrusive Scientifically validated Easy to administer	Self-reported health data is often unreliable Difficult to translate effectively in other languages
Body Mass Index (BMI)	Physician measured or determined from patient health records	Validated as a measure of physical health (Bell et al., 2008), few studies linking BMI reduction	Scientifically validated Widely used and accepted	Requires patients' willingness to share height weight Often physician expertise is needed

		to outdoor access (Razani et al., 2017)	within medical community Easy to calculate	Hard to separate from dietary or other lifestyle factors
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Box 5. Metrics in Practice: An Example from LatinXplorers

In June 2016, the Oregon Health and Outdoors Initiative collaborated with Sierra Club Outdoors, Latino Outdoors, and Next Door Inc. to launch LatinXplorers. This program aimed to break down the barriers preventing residents in Hood River, OR from hiking and recreating in nature. Next Door trained community health workers to lead hikes for community members and a new bus route was developed to connect two predominately Latino communities to national forest sites.

Providence Health, a member of the Oregon Health and Outdoors Initiative, integrated metrics from this survey with standard health questions to develop an evaluation survey. An example of metrics Providence Health adopted from this survey (Appendix II) are:

- Self-reported health and quality of life ([RAND 36-Item short form survey](#))
- Self-reported connection to the outdoors (; Bragg et al., 2013)

When they administered the survey, they found that few participants were willing to divulge any personal health information. Many of the program participants were or had relatives who were undocumented immigrants. Based on these results, Providence Health had to reframe the health questions in a less direct way.

VI. Recommendations

Through surveying community programs about the metrics and measures they used to evaluate health outcomes from nature contact, several key recommendations emerged for designers and evaluators of emerging programs.

1. **Create more tools that can serve culturally diverse communities.** Only a few tools surveyed contained examples in English and Spanish. By creating tools and measures that serve diverse populations and languages, program decision-makers can facilitate a culture of openness and trust around outdoor engagement.
2. **Develop compelling stories about community health and outdoor programs.** Where community programs lack in evaluation rigor they make up for in the ability to develop a strong narrative about health and outdoor experiences. Telling compelling stories about health and nature programs can facilitate donor engagement, grant funding, and new partnerships.
3. **Identify non-traditional partnerships and attempt to view health and nature through their lens.** There is enthusiasm among health care leaders, community organizers, and park agencies to integrate more health and nature into programming. Thoroughly integrating the outdoors into public health requires action from all levels.
4. **Make program evaluation a priority.** Too few programs are evaluated, which inhibits the sharing of knowledge among programs. Evaluation can help boost investment dollars and needs to be considered at the beginning of any program.
5. **Cultivate a better awareness of the larger sociocultural system impacting health disparities and access to green space.** Increasing access to the outdoors does not necessarily increase use of that space. The way individuals use nature is strongly related to larger socioecological forces. LatinXplorers (Box 5) is a good example of the need to understand the barriers to access in order to determine the kinds of questions to ask community members in a program evaluation.

This report serves as a first step in identifying quantitative and qualitative metrics to track the impacts of health and outdoor programs. The next step requires researchers to develop more scientifically robust measures that communities can then feasibly implement. In turn, communities need to implement, evaluate, and communicate the results to better inform future research and programming.

The growth in wearable technology also has tremendous potential to support health and outdoors data collection and evaluation. Watches can now track your heartrate, t-shirts can record your physical activity levels, and apps can monitor sleep patterns and moods throughout the day. While these products have not yet been widely adopted into the market, they pose exciting area of potential tools for health and outdoors data collection.

Epidemiologists, urban planners, and conservationists are coming together to design research agendas, tools, and programs that tackle may address evaluation needs. There is a place for community program evaluators and developers at this table, and it is important to continue share and track progress. New and creative partnerships have the potential to develop a shared language and platform through which health benefits can be communicated.

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Appendix I: Survey of Metrics

Summary table of metrics and measures from survey of community programs and peer reviewed literature. The three colors correspond to the three types of measures: measures of nature (green), measures of health (orange) and measures of exposure (blue). The Metric Category column identifies the measure category: direct observation (DO), self-reported (SR), and technology (T). References within the table are not intended to be exhaustive but rather demonstrate recent or thorough scientific support (or lack thereof) for the corresponding metric or measure. Where available, links to program or measurement websites are included also included.

Through reviewing these metrics, several themes emerged in the types of metrics, measures, levels of guidance that are generally absent from the literature and community programs. These include:

- Guidance on how metrics vary when applied in urban vs. rural populations
- Metrics and tools to quantify activity levels in natural spaces that are not under public ownership but may still be areas of recreation (e.g. smaller neighborhood greenways)
- Metrics and tools translated into Spanish or specific guidance or considerations to take when applying metrics within a Latino community
- Guidance on how to translate or modify metrics and measures from research to programming
- Program evaluations driven by community health care partners
- Understanding what metrics and proxy measures correspond to elements that deter individuals from accessing the outdoors to better understand barriers to access

This survey of metrics demonstrates that although many health and outdoor programs and studies share common themes, each program and study is unique to the specific population and location in question. It is important to understand that what works well for one community may not work well for others.

Metric	Metric Category	Measure	Scientific Evidence
Park quality score (All)	DO, T	Community Park Audit Tool- Active Living Research; ParkScore : Trust for Public Land tool combines park size, accessibility, and number of amenities.	Validated as a site assessment tool but not as a measure of health (Frank et al., 2013)
Walkability score (PA)	DO	Walkability Index (Frank et al., 2010); WalkScore (Duncan et al., 2011); Active Neighborhood Checklist - Active Living Research	Scientifically validated as measurement of greenspace or build environment (Maghelal & Capp, 2011; Brownson et al., 2012)
Number of activity-promoting park amenities (PA)	DO, SR.	Path Environmental Audit Tool - Active Living Research; Environmental Assessment of Public Recreation Spaces (EARS) . Active Where? Survey - RJF Foundation	Validated as a site assessment tool but not as a measure of health (Saelens et al., 2006)
Number of parks	DO, SR	Direct observation and self-report of number of parks within a defined area (McCormick et al., 2010)	Little scientific support as a strong proxy for increasing physical activity (Kaczynski et al., 2008; Godbey et al., 2010)
Accessibility/walkability score (PA, MH)	SR	Parks and Recreation Areas Self-Reported Survey - Active Living Research	Validated as a site assessment tool but not as a measure of health.
Crowdsourced aesthetic rating (All)	T	Scenic-Or-Not crowdsourced website scenicness scale; OpenStreetMap, Flickr	Little evidence. Only applied in UK studies (Seresinhe et al., 2015)
Level of greenness (All)	T	Normalized Difference Vegetative Index (NDVI) value	Validated as a positive correlate to higher birthweight, reduced depression, reduced mortality, and better

			mental health (Ekkel et al., 2017)
Percentage of greenspace (All)	DO	Landuse database	Validated as a positive correlate to improved mental, cardiovascular, and self-reported health (Ekkel et al., 2017)
Number of trees planted (AQ)	DO, T	Remote sensing, landuse databases, observation	Validated through systematic review a positively correlated with improved air quality, reduced temperature (McDonald et al., 2016)
BMI: Body Mass Index (PA)	DO	Physician measured or determined from patient health records	Validated as a measure of physical health (Bell et al., 2008), few studies linking BMI reduction to outdoor access (Razani et al., 2017)
BMI: Body Mass Index	SR	Calculated from self-reported heights and weights (Frank et al, 2006)	Validated as a measure of physical health (Frank et al., 2013)
Stress level	DO	Physician measured level of cortisol	Validated as a measure of health. Limited but strong evidence of correlation with nature contact (Roe et al., 2013)
Reduction in ADHD symptoms	DO	Physician measured symptoms	Strong evidence supporting link to nature (Faber Taylor et al., 2011)
Cognitive test scores (MH)	DO	Improved test performance before and after time spent outdoors.	Strong evidence linking time spent outdoors with cognitive function, especially among children (Faber Taylor et al., 2011; Barton et al., 2010)
Happiness index score (MH)	SR	Self-reported using validated questions from sources such as the Oxford Happiness Questionnaire (Hills et al., 2002) or Satisfaction with Life	Validated as a measure of wellbeing and strong evidence of connection to nature (Richardson et al., 2016)

		Scale (Sugiyama et al., 2009)	
Psychosocial health survey results (MH)	SR	Self-reported using validated questions from surveys such as the Neighborhood Quality of Life Study (Sugiyama et al., 2009), Psychosocial Health Survey (van den Berg et al., 2010)	Validated as measures of health and frequently applied in nature studies (Shanahan et al., 2016a)
Daily mental health score (MH)	T	Daylio and Moody : Phone applications that track moods throughout the day	No scientific support
Number of prescriptions written (MH, PA)	DO, S	Count of prescriptions written or self-report by physicians (Taylor et al., 2015)	Applied as a measure of program success. Evidence linking prescription to improved park use and health are mixed (Coffey & Gauderer, 2016; Zarr et al., 2017)
Self-reported health condition or medical conditions (PA, MH)	SR	Validated medical questionnaires, weight, BMI, respiratory treatment, mental or physical health issues (Example, RAND 36-Item Health Survey)	Scientifically validated as measures of health (Shanahan et al., 2015; Craig et al., 2003; VanderZee et al., 1996)
Tracked physical activity (PA)	T	Fitbit	Limited evidence to long-term health. Need for further exploration (Naslund et al., 2016)
Nature relatedness score (SC)	SR	Connectedness to Nature Survey (Nisbet et al., 2009)	Validated as a measure of social cohesion (Shanahan et al., 2016a)
Number and frequency of social networks (SC)	SR	Questions from the Neighborhood Quality of Life Survey (Sugiyama et al., 2009)	Validated as a measure of health (Mitchell et al., 2015)
Social cohesion scores (SC)	SR	Survey questions on perceived social cohesion (de Vreis et al., 2013)	Validated as a measure of social cohesion (Ward Thompson et al., 2013)

Asthma rates (AQ)	SR, DO	Self-reported or determined from publically available health data (Rao et al., 2014)	Strong evidence supporting connections between green space and improved air quality (MacDonald et al., 2016)
Proximity to greenspace (All)	SR, DO	Self-reported time or distance to greenspace. Land cover data to empirically calculate distance.	Mixed evidence supporting the significance of proximity to greenspace for health (Ekkel et al., 2017)
Crime rate	DO	Collected from publically available data	Mixed evidence linking canopy cover and crime rate
Physical activity level (observed) (PA)	DO	SOPARC : System for Observing Play and Recreation in Communities; SOPLAY : System for Observing Play and Leisure Activity in Youth; SOPARNA : System for Observing Physical Activity and Recreation in Natural Areas	Validated direct observation tool for assessing park users' physical activity levels in parks, free play settings (e.g. playgrounds), and natural areas (McKenzie, 2016)
Number of park users (observed) (PA)	DO	SOPARC : System for Observing Play and Recreation in Communities	Validated direct observation tool for assessing park and recreation areas (Evenson et al., 2016)
Number of wilderness zone/natural area users	DO	SOPARNA : System for Observing Physical Activity and Recreation in Natural Areas	Validated as a direct observation tool for simultaneously assessing the physical activity and other characteristics of the users of outdoor recreation settings such as wilderness zones and natural open space (Sasidharan et al., 2011)
Number of healthcare partners (PA)	DO	Health care partnerships count	Commonly used in programs but not validated as a measure of health

Number of program participants (PA)	DO	Program participant count	Commonly used in programming but not scientifically validated
Activity frequency (All)	SR, T	Number of times per day, week, or month in contact with nature. TRACK (Trails Rivers and Active Caring Kids) tool.	Scientifically validated as a measure of health. Strong evidence supporting positive correlation with nature exposure (Bratman et al., 2015)
Activity intensity (All)	SR	Self-reported activity level in green space (Lee et al., 2015)	Scientifically validated as a measure of health. Strong evidence supporting positive correlation with nature exposure
Activity duration (All)	SR	Length of time spent in nature (Lee et al., 2015)	Scientifically validated as a measure of health. Strong evidence supporting positive correlation with nature exposure (Kuo, 2015)
Perceived safety level (MH, SC)	SR	Validated questions	Validated as important mediating factor to green space use but not directly to health (Kondo et al., 2015)
Frequency of social interaction (S)	SR	Validated questions on social interaction	Strong evidence linking greenspace to increased opportunity for social interaction (Kondo et al., 2015)

Appendix II: LatinXplorers Survey

Survey for LatinXplorers

Instructions: Please answer the questions. Your answers are private. You can skip any question you do not want to answer.

PART

1

Your Health and How You Are Doing Now

1. Compared to people you know, are you more physically active, less physically active, or about the same?

- More active
- Less active
- About the same

2. How often do you exercise where you really sweat?

- Often
- Sometimes
- Never

3. In the past 2 weeks, about how often have you felt:

	Often	Sometimes	Never
a. Little interest or pleasure in doing things?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Down, depressed or hopeless?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Nervous, anxious, or on edge?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Not able to stop or control worrying?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. In the past 2 weeks, how often have you felt:

	Often	Sometimes	Never
a. You could not control the important things in your life?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Sure you could handle your personal problems?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. That things were going your way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Problems were piling up so high that you could not overcome them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>