Active Transportation
Health and Economic Impact Study

November 7, 2016
Table of Contents

1 Executive Summary 6

2 Introduction 8

3 Current Active Transportation Trends in the SCAG Region 9
   3.1 Regional Estimates of Active Travel from Active Transportation Modes 9
   3.2 Consumer Costs 10
   3.3 Annual Active Transportation Investments 11
   3.4 Active Transportation Events 11

4 Health Benefits of Active Transportation 13
   4.1 Overview on Modeling Health and Applying Cost of Illness 14
   4.2 Understanding Health Impacts of Current Infrastructure 14
      Modeling Health Outcomes from Physical Activity 15
      Monetizing Public Health Morbidity Benefits 17
      County Level Monetized Health Estimates 18
   4.3 Understanding Health Impacts of Planned Infrastructure 21
      Modeling Health Outcomes from Increased Physical Activity 21
      Monetizing Public Health Morbidity Benefits 22

5 Active Transportation’s Effect on Regional Employment and Regional Economic Growth 23
   5.1 Regional Economic Impacts of Implementing the 2016 RTP/SCS Active Transportation Infrastructure 24
   5.2 Regional Economic Health Impacts of Current Active Transportation Infrastructure 29

6 Conclusion 31

7 Appendix A: Task 5 – Methodology for Public Health Benefits Analysis 31

8 Appendix B: Task 4: Transportation System Cost Analysis 31

9 Appendix C: Task 5 - Technical Memo Summarizing Monetized Physical Activity Outcomes of Active Transportation Infrastructure 31
Appendix D: Task 5 - Technical Memo Summarizing 2016 Final RTP/SCS Monetized Health Outcomes

Appendix E: Task 6 - Technical Memo Summarizing Economic Impact of Active Transportation in SCAG Region

Appendix F: Task 5 Maps of Health Outcomes and Monetized Health Outcomes by County for Current Infrastructure

Figures

Figure 1. Average Cost per Traveler per Year and per Mile by Mode 10
Figure 2. Event Spending Per Participant by Event Size 11
Figure 3. Annual Revenue and Spending in Events that Support Active Transportation 12
Figure 4. Approach to Modeling and Monetizing Health Effects from Physical Activity from Active Transportation 14
Figure 5: Data Sources and Modeling Approach to Monetizing Health Benefits of Active Transportation 15
Figure 6. Change in Prevalence of Hypertension from Active Transportation Infrastructure, Adults (Ages 18-64) 17
Figure 7. Total (Direct + Indirect for Hypertension, Heart Disease, and Diabetes) Monetized Health Benefits by County, Adults (18-64) 20
Figure 8: Annual Per Capita Monetized Health Benefit for Adults (ages 18-64) by County 20
Figure 9. Modeled Health Outcomes for 2016 RTP Scenarios, Adults 21
Figure 10. Increased Sale Output per $1 in AT-RTP Spending 24
Figure 11. Output from Active Transportation, 2016-2040 ($ billions, 2015$) 25
Figure 12. Increased Value Added per $1 in AT-RTP Spending 25
Figure 13. Value Added from Active Transportation, 2016-2040 ($ Billions, 2015$) 26
Figure 14. Employment Gains per $1 in AT-RTP Spending 27
Figure 15. Employment Gains from Active Transportation, Thousands, 2016-2040 27
Figure 16. Top Sectors Impacted by Employment (from AT-RTP and Current
Tables

Table 1: Daily (Weekday) Distance and Time Traveled for Those who Use the Mode in SCAG Region

Table 2: Average Cost per Traveler per Year and per Mile by Mode

Table 3: Current Conditions and Cost-of-Illness, 2012

Table 4: Predicted Reduction in Prevalence (Change in Rate) and Reduction in Cases Assuming 18.3 Minutes of Walking and 2.4 Minutes of Biking Each Week, by Age Groups

Table 5: Estimated Annual Physical Activity\(^1\) Health Savings (2011$) for Adults\(^2\) in SCAG Region by Cost Type - Hypertension, Heart Disease, Diabetes, and Obesity

Table 6: Estimated Annual Physical Activity\(^1\) Health Savings (2011$) for Seniors\(^2\) in SCAG Region by Cost Type - Hypertension, Heart Disease, Diabetes, and Obesity

Table 7: Monetized Annual Health Benefits (Total and Per Capita) by County and Disease, Adults (18-64)

Table 8: Monetized Annual Health Benefits (Total and Per Capita) by County and Disease, Seniors (65+)

Table 9: Predicted Adult\(^1\) (ages 18-64) Prevalence and Avoided Cases from Increased Physical Activity in 2040 for RTP/SCS Scenarios as Modeled by C-PHAM

Table 10: Predicted Annual Physical Activity Health Savings (millions, 2011$) in 2040 for Adults\(^1\) (ages 18-64) by Cost Type – Hypertension, Heart Disease, and Diabetes

Table 11. Sales Output (Cumulative, Yearly Average, and Benefit per $1 AT-RTP Spent) for 2016-2040 (2015 $)

Table 12. Value Added (Cumulative, Yearly Average, and Benefit per $1 AT-RTP Spent) for 2016-2040 (2015 $)

Table 13. Employment Benefits (Cumulative, Yearly Average, and Benefit per $1 Billion AT-RTP Spent) for 2016-2040

Table 14. Personal Income (Cumulative, Yearly Average, and Benefit per $1 RTP Spent) for 2016-2040 (2015 $)

Table 15. Regional Economic Metrics from Health Benefits of Current Active Transportation Infrastructure
1 Executive Summary

The purpose of this Active Transportation Health and Economic Impact Study is to provide an understanding of the public health and economic benefits of building and maintaining active transportation infrastructure. Active transportation in this report, refers to walking and bicycling for utilitarian transportation purposes. Active transportation infrastructure elements that specifically support pedestrian and bicycle activity include sidewalks, bike facilities (lanes, paths), and complete street design. The study area is the six-county Southern California Association of Governments (SCAG) region. The study was initiated on behalf of SCAG in response to stakeholder input surrounding the development of the 2012 and 2016 Regional Transportation Plans and Sustainable Communities Strategies (RTP/SCS).

There are many different ways in which active transportation influences the economy. This report details outcomes related to the following:

- Active travel in the six-county Southern California Association of Governments (SCAG) region including:
  - current mode share,
  - costs of traveling by different modes and potential savings by changing modes,
  - costs of building and maintaining the active transportation infrastructure (Section 3);
- Health impacts from physical activity attributed to active transportation mode choice (Section 4); and
- The influence of active transportation infrastructure spending and changes in health expenditures (due to more physically active people) on regional employment and gross domestic product (GDP) (Section 5).

The findings below are a summary of multiple modeling exercises completed on behalf of SCAG for this project. A high level summary for each of these outcomes is provided in this report. The sources of data and methodologies used to complete this project are detailed in appendices A-E.

- Trips by active mode (walking, walking to transit, and biking) are an increasing share of the SCAG region’s transportation system. ¹
  - 13.3% of trips in the region are taken by an active mode.
  - This equates to 14.5 million miles and 5.4 million hours of physical activity daily.
- Walking and biking is a relatively inexpensive mode of travel.
  - Walking costs $0.02 per mile and biking costs $0.05 per mile compared to $1.22 per mile to drive a vehicle.
  - Total walking costs $169,426 per day or $61.8 million per year paid by consumers.
  - Upkeep of bicycles costs consumers $250,612 each day or $91.5 million annually.
  - Consumer spending on walking and biking for daily commutes costs $153 million. If these trips were made by single occupancy vehicle it would cost $6.45 billion annually.
- Current active transportation infrastructure (modeled for year 2012) improves health by supporting increased physical activity.
  - Among adults ages 18+, increased physical activity attributed to current active

¹ Source: California Department of Transportation (2012) California Household Travel Survey. Walking and bicycling trips are complete trips. Walking to transit trips are segments of larger trips.
transportation infrastructure prevents annually
  - 84,773 cases of hypertension;
  - 14,016 cases of heart disease; and
  - 29,824 cases of diabetes.

- The prevented cases of hypertension, heart disease, and diabetes equate to
  - $193 million in direct reduced healthcare expenditures and
  - $82 million in indirect benefits such as productivity gains from reduced absenteeism and lower expenditures for disability payments

- Without the current active transportation infrastructure system in place
  - 3,557 jobs and $560 million in personal income would be lost each year and
  - Annual sales output would be reduced by an average of $2.53 billion.

- Implementing the active transportation strategies and investments planned in the 2016 Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS) will result in significant health benefits from increased physical activity.
  - Among adults ages 18-64, implementing the 2016 RTP/SCS will result in the prevention of
    - 81,657 cases of hypertension;
    - 15,985 cases of heart disease, and
    - 15,076 cases of diabetes.
  - By 2040, these prevented cases of hypertension, heart disease, and diabetes equate to annual benefits of
    - $226 million in direct reduced healthcare expenditures and
    - $111 million in indirect benefits (productivity gains)

- Implementing the active transportation strategies and investments planned in the 2016 RTP/SCS will also result in significant regional economic benefits. When added to the health productivity benefits:
  - 11,500 jobs will be created on average each year creating $36 billion in personal income over the life of the plan; and
  - Sales output will increase $113 billion over the life of the plan, including $70 billion in value added that stays within the regional economy.
  - Increased productivity from healthier workers in all sectors drives a majority of these regional economic benefits;
  - Construction and strategy spending also contributes a significant portion of the economic benefits.

- Overall, implementing the active transportation investments within the 2016 RTP/SCS is cost effective.
  - For every $1 spent in implementing the active transportation strategy within the 2016 RTP/SCS, the regional economy will see an additional $8.41 in sales output, $2.65 in personal income, and $5.20 in value added.

**Understanding Regional Economic Indicators**

**REMI’s Transight model captures annual regional economic growth using the following metrics:**

- **Employment (total jobs)**
  - The total number of jobs associated with active transportation infrastructure spending and the associated health effects

- **Personal Income ($M)**
  - Employment total multiplied by average wages by position type

- **Sales Output ($B)**
  - Sales output discounted for prior stages of manufacturing that occurred outside the SCAG region.

- **Value Added ($M)**
  - The difference between retail sale prices and the cost to purchase the item being sold.
2 Introduction

The purpose of this Active Transportation Health and Economic Impact Study is to provide an understanding of the public health and economic benefits of building and maintaining active transportation infrastructure. The study area is the six-county Southern California Association of Governments (SCAG) region. Estimates are provided for both current conditions and for the impact of planned investment according to SCAG’s 2016 Regional Transportation Plan/ Sustainable Communities Strategy (RTP/SCS).

Active transportation in this report, refers to walking and bicycling for utilitarian transportation purposes, such as commuting or accessing neighborhood destinations. Active transportation infrastructure elements that specifically support pedestrian and cycling activity include sidewalks, bike facilities (lanes, paths), and complete street design. Compact land use design also plays an important role determining in rates of bicycling and walking.

There are many different ways in which active transportation influences the economy. This report describes the following elements:

- **Section 3: Current Active Transportation Trends in the SCAG Region** -- the amount of active transportation in the SCAG region including current mode share, costs of traveling by different modes and potential associated savings, and costs of building and maintaining the active transportation infrastructure;
- **Section 4: Health Benefits of Active Transportation** -- Health impacts from physical activity related to active transportation mode choice;
- **Section 5: Active Transportation’s Effect on Regional Employment and Regional Economic Growth** -- The influence of active transportation infrastructure spending and changes in health on regional employment, accompanying personal income, sales, and value added; and
- **Section 6: Conclusions** -- The cost effective nature of active transportation investments.
3 Current Active Transportation Trends in the SCAG Region

Regional estimates of active transportation costs and benefits incorporate the average daily utilitarian travel (physical activity) done using active modes. Also included in the costs/benefits analysis are active transportation-related infrastructure cost, and the economic impact of related special events in the region.

3.1 Regional Estimates of Active Travel from Active Transportation Modes

The vast majority daily trips in the SCAG region are taken by auto (84.7%). SCAG residents have been increasing the number and share of trips by alternative modes over the past decade. Active modes make up 13.3% of all trips. Of the active travel, 78.4% (10.4% of all trips) are walking trips and 12.1% (2% of all trips) are walking to transit. Biking trips make up 9.5% of active trips (or 1.6% of all trips).

While bicycling is the least likely type of trip, cyclists go 9.3 times further than those walking to transit and 4.6 times further on average than those walking to destinations (Table 1). Those who bicycle as a transportation mode take an average of 2.38 trips to their final destinations each weekday, going an average of 6.02 miles per trip. Pedestrians take an average of 2.19 trips to their final destinations per weekday with an average distance of 1.33 miles for each trip. Those who walk to transit as a segment of their trip average 1.61 trips to transit per weekday with an average length of 0.65 miles per trip to transit. The total daily distance traveled in the SCAG region is approximately 8.9 million miles of walking, an additional 675,497 miles of walking to transit, and 4.9 million miles of bicycling (Table 1). This translates into nearly 5.4 million hours of active travel per day.

Table 1: Daily (Weekday) Distance and Time Traveled for Those who Use the Mode in SCAG Region

<table>
<thead>
<tr>
<th>Item</th>
<th># of Trips</th>
<th>Average Distance (miles)</th>
<th>Average Speed (miles per hour)</th>
<th>Total Distance (miles)</th>
<th>Total Daily Time (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk Trips</td>
<td>6,706,814</td>
<td>1.33</td>
<td>2.50</td>
<td>8,920,063</td>
<td>3,345,111</td>
</tr>
<tr>
<td>Bike Trips</td>
<td>810,934</td>
<td>6.02</td>
<td>9.68</td>
<td>4,881,821</td>
<td>1,874,136</td>
</tr>
<tr>
<td>Walk to Transit</td>
<td>1,039,227</td>
<td>0.65</td>
<td>2.50</td>
<td>675,497</td>
<td>139,296</td>
</tr>
<tr>
<td>Total</td>
<td>8,556,975</td>
<td>1.69</td>
<td></td>
<td>14,477,381</td>
<td>5,358,543</td>
</tr>
</tbody>
</table>

Source: California Department of Transportation (2012) California Household Travel Survey (CHTS). Average Speed from 2010 CHTS GPS sample, restricted to SCAG.

2 See Appendix B for a more detailed discussion of methodology.
3.2 Consumer Costs

Travel costs vary by mode for residents in the SCAG region. Consumers spend money throughout the year on active transportation products and devices including purchasing, maintaining and upgrading equipment, and replacing perishable items such as tires, clothing, shoes, helmets, and parts. While these costs add up, Figure 1 shows it is relatively cheaper to own and maintain a bicycle ($0.05 per mile) compared to owning a car ($1.22 per mile).

Per mile consumer costs derived above can be used to estimate the cost borne by the consumer for active travel. Walking and walking to transit results in 9.6 million miles (Table 1) daily, costing, at $0.02 per mile, $169,426 per day or $61.8 million per year across the SCAG region. Upkeep of bicycles traveling 4.9 million miles daily equates to $250,612 each day or $91.5 million annually. Consumer spending on walking and biking for daily commutes costs $153 million a year.

Table 2: Average Cost per Traveler per Year and per Mile by Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Average $ / Year</th>
<th>Average $ / Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Alone</td>
<td>$11,407</td>
<td>$1.22</td>
</tr>
<tr>
<td>Carpool - 2 per Car</td>
<td>$5,704</td>
<td>$0.72</td>
</tr>
<tr>
<td>Public Transit</td>
<td>$1,182</td>
<td>$0.11</td>
</tr>
<tr>
<td>Bicycle - Personal</td>
<td>$395</td>
<td>$0.05</td>
</tr>
<tr>
<td>Walk</td>
<td>$30</td>
<td>$0.02</td>
</tr>
</tbody>
</table>

A rough estimate of current consumer savings can be calculated by assigning all active miles to single occupancy vehicles, at a per mile cost of $1.22. Doing so would increase annual costs from $153 million to $6.45 billion annually. This significantly overestimates the savings from use of active modes, since it is not expected that every mile walked or bicycled necessarily replace a mile of driving. A more nuanced understanding of active transportation’s benefit for consumers can be calculated by using SCAG’s travel demand model to understand the extent active modes substitute vehicle miles traveled (VMT). For example, in 2012, the SCAG travel demand model estimates an increase of 45,718 miles travel by motor vehicles daily if all bicycle lanes were removed. This suggests the annual economic savings due to consumers shifting from automobiles to bicycling in the year 2012 was over $19 million; this savings could be up to $976 million annually by 2040 with implementation of the 2016 RTP/SCS.

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3 See Appendix B for more information.

4 This assumes a 1:1 substitution of active travel miles for motor vehicle miles: \((4,881,821+9,595,561) \times 365 \times $1.22\).
3.3 Annual Active Transportation Investments

Of all the ways in which active transportation related investments influence the regional economy, maintaining existing and constructing new active transportation infrastructure is the most direct economic lever with a significant economic impact (see Section 6). The 2016 RTP/SCS forecasts active transportation infrastructure/program spending from 2016 to 2040 at $12.9 billion in 2011$ value.

The average planned annual economic spending on active transportation infrastructure for years 1-5 of the RTP/SCS totals $435 million per year, or $24 per capita per year. This will increase to $656 million per year or $36.41 per capita in years 6-20. Short trip enhancements including $5.6 billion in sidewalks and 6,016 additional miles of bikeways ($900 million) are the largest scheduled infrastructure investment ($7.6 billion) over the life of the plan.

3.4 Active Transportation Events

Communities sometimes look to running or biking events as a community or economic development strategy. While spending is localized and has minimal regional impact, bicycling, running, and walking participants are estimated to spend nearly $200 million annually as part of their attendance of active transportation related events in the SCAG region.

There is a range of event types and participant counts in the SCAG region. Medium–to-small running events, such as the Citrus Heritage Run, are the most prevalent, followed by triathlons and novelty races. Large running events, such as the Los Angeles Marathon, generate the greatest revenue per participant – nearly $700. Large running events often include many participants with registration and other fees – which bring the revenue generated to an estimate of $10.5 million per event. Conversely, open streets events, such as CicLAvia, generate very little revenue per participant, in part due to the lack of registration fees. Research shows, however, that events such as CicLAvia can have

Figure 2. Event Spending Per Participant by Event Size

5 While active transportation events are an important educational tool, their impact is generally limited to short window of time. Because of this, events have been excluded from the REMI analyses in Section 6.

6 See Appendix B for more information.
significant impacts on local businesses along the route.⁷ Events also support mode shift to walking and bicycling which promotes increased physical activity and improved health outcomes. When taken together, events contribute nearly $200 million to the total average annual spending. Running events provide the greatest contribution ($177 million).

Figure 3. Annual Revenue and Spending in Events that Support Active Transportation

$10.5 Million
Estimated revenue generated per large running event

$200 Million
Approximate spending of cycling, running, and walking participants in SCAG region active transportation events

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4 Health Benefits of Active Transportation

In the SCAG region, over 2.5 million adults ages 18-64 (21.7%) have hypertension. Over 3.1 percent have heart disease and 6.5% have diabetes (Table 3). Chronic diseases are costly, resulting in health care expenditures and lost productivity. For example, on average, someone with diabetes spends an additional $7,774 on healthcare expenditures and has reduced productivity of $3,311 per year due to missed days of work, reduced days of work, early disability, and/or early death. Diabetes, heart disease, and hypertension medical expenses and lost productivity for adults ages 18-64 costs the SCAG region $12 billion annually. Medical expenses and lost productivity for seniors related to diabetes, heart disease and hypertension is over $8.5 billion annually.

People who walk and bicycle, for transportation purposes increase their daily physical activity, which results in significant health benefits. This section summarizes the methods and estimates the financial impact of improved health due to the use of the current active transportation infrastructure in the SCAG region.

Table 3: Current Conditions and Cost-of-Illness, 2012

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>6.6% 750,000 Cases</td>
<td>21.1% 420,000 Cases</td>
<td>$7,774 $3,311</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>3.4% 391,000 Cases</td>
<td>19.2% 488,000 Cases</td>
<td>$4,055 $3,633</td>
</tr>
<tr>
<td>Hypertension</td>
<td>22.0% 2,514,008 Cases</td>
<td>61.1% 1,238,000 Cases</td>
<td>$551 $44</td>
</tr>
</tbody>
</table>

Prevalence Rates: 2012 California Health Interview Survey


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8 See Appendix C for a more detailed discussion of methodology.
9 Prevalence rates of diabetes, heart disease, and hypertension are significantly higher for seniors ages 65+.
10 Methodological documentation is provided in Appendix A and more detailed results can be found in Appendix C of this report.
4.1 Overview on Modeling Health and Applying Cost of Illness
The California Public Health Assessment Model (C-PHAM)\(^\text{11}\) is used to estimate the physical activity health benefits from the active transportation infrastructure. The financial savings of these benefits are estimated by applying cost-of-illness information to predicted avoided cases of obesity, diabetes, high blood pressure, and heart disease due to increased physical activity.

Cost of Illness (COI) studies are used to define additional costs per person and aggregate costs associated with major categories of disease. COI studies include an estimate of “direct” costs or money exchanged for healthcare. COI studies often also include a measure of indirect costs, such as absenteeism, reduced productivity, and, in some cases, early death. COI studies do not include intangible costs such as pain and suffering, making total costs a conservative estimate of the cost of disease. The “per case” costs reported in COI studies can be applied to modeled number of cases attributable to active transportation infrastructure through a chain of models (Error! Reference source not found.).

Figure 4. Approach to Modeling and Monetizing Health Effects from Physical Activity from Active Transportation

4.2 Understanding Health Impacts of Current Infrastructure\(^\text{12}\)
Current levels of active transportation are supported by active transportation facilities already in place throughout the SCAG region. This section seeks to understand the extent to which this current infrastructure prevents diseases associated with lack of active transportation. The following method was used:

- **Active transportation infrastructure and the number of active transportation trips was modeled by SCAG.** This accounted for active transportation demand throughout the region.
- **Active transportation trips were converted to time being physically active.** The literature suggests somewhere between 40% and 60% of active transportation trips are due to available

\(^{11}\) C-PHAM was developed by Urban Design 4 Health, and integrated into UrbanFootprint, a web-based scenario planning tool developed by Calthorpe Analytics. The RTP analysis reported in Section 4.3 uses the original UrbanFootprint version to monetize 2016 RTP/SCS outcomes and only includes land use measures. C-PHAM was modified to incorporate SCAG’s transportation demand model to model and monetize current active transportation infrastructure impacts reported in Section 4.2. To learn more about C-PHAM, please see http://urbandesign4health.com/projects/california-statewide-public-health-assessment-model

\(^{12}\) See Appendix A for a more detailed discussion of methodology and Appendix C for more detailed results.
infrastructure like bike lanes and sidewalks.\textsuperscript{13} This report’s analysis conservatively attributes the first 50\% of active transportation trips to land use destinations or basic transportation needs, and the remainder to active transportation infrastructure.\textsuperscript{14} Time was then converted to metabolic (MET) units, the preferred measurement of energy expenditure for modeling health benefits.

- The California Public Health Assessment Model (C-PHAM) was used to estimate the number of additional cases of obesity, diabetes, hypertension, and heart disease that would occur without the active transportation mode of travel. The C-PHAM model stratifies by age; adults (ages 18-64) and seniors (ages 65+) were modeled separately.
- Per-case cost-of-illness was then applied to estimated cases of disease prevented by active travel. (See Table 1 for per-case costs.)

**Figure 5: Data Sources and Modeling Approach to Monetizing Health Benefits of Active Transportation**

*Modeling Health Outcomes from Physical Activity*

The average adult in the SCAG region spends 36.6 minutes walking per week for transportation purposes. Of that, this study assumes that 50\% of active transportation trips are attributable to


\textsuperscript{14} See Appendix C for more detail on this methodology.
infrastructure and the remaining are attributable to land use. Thus, the active transportation system prompts the average adult to spend 18.3 minutes of walking for transport and 2.4 minutes of biking each week.

**Table 4: Predicted Reduction in Prevalence (Change in Rate) and Reduction in Cases Assuming 18.3 Minutes of Walking and 2.4 Minutes of Biking Each Week, by Age Groups**

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Adults</th>
<th>Seniors</th>
<th>Adult + Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change in Prevalence</td>
<td>Cases¹</td>
<td>Change in Prevalence</td>
</tr>
<tr>
<td>High Blood Pressure</td>
<td>-0.60%</td>
<td>70,621</td>
<td>-0.66%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>-0.06%</td>
<td>7,132</td>
<td>-0.32%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>-0.14%</td>
<td>16,151</td>
<td>-0.64%</td>
</tr>
<tr>
<td>Obesity</td>
<td>-1.47%</td>
<td>172,170</td>
<td>-1.37%</td>
</tr>
</tbody>
</table>

¹ Change in prevalence for adults is based off of a 20-64 year old’s CHIS-based statistical model; Cases for adults applies the 20-64 year old’s prevalence rate to the 2012 U.S. Census Estimate for 18-64 year olds for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties (11,722,630).

² Results apply to the 2012 U.S. Census estimate of 2.13 million seniors ages 65+ for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties.

³ Counts of cases for adults plus seniors equal the sum of the adult and senior models. The count in cases was divided by 2012 U.S. Census estimates of 18+ years old to calculate change in prevalence.

Walking 18.3 minutes and biking 2.4 minutes each week prevents, as modeled using C-PHAM, an increase of prevalence rates for the conditions listed in Table 4. For example, **without the active transportation mode of travel induced from SCAG’s current bicycle and pedestrian infrastructure**, hypertension for 18-64 year olds would rise from the current level of 21.7% to 22.3%, heart disease from 3.1% to 3.1%, and diabetes from 6.5% to 6.6%. In other words, we would expect an additional 70,621 cases of hypertension, 7,132 cases of heart disease, and 16,151 cases of diabetes. The spatial distribution of the change in hypertension is provided in Error! Reference source not found.. The darker green shading indicates greater reductions. Without active travel, an additional 172,170 cases of obesity for adults ages 18-64 would be expected.

Active transportation also helps keep seniors active and healthy. Using the process described above, it is estimated that our current active transportation infrastructure prevents 14,153 persons over the age of 65 from being obese annually. Additionally, without the active transportation mode of travel attributable to the active transportation infrastructure, there would be an additional 14,153 cases of high blood pressure, 6,884 cases of heart disease, and 13,673 cases of diabetes for those over the age 65 (Table 4).
Monetizing Public Health Morbidity Benefits

Table 5 presents the estimated annual health costs that would occur for adults ages 18-64 assuming the last 50% of active travel currently occurring in the SCAG region is attributable to active transportation infrastructure. The avoided health costs are broken out by direct (health care expenditures) and indirect (lost productivity) benefits. For example, the annual health benefit from avoided hypertension from increased physical activity for 18-64 year olds is estimated to be $42 million; of that, $38.9 million is from fewer healthcare expenditures, and another $3.1 million from greater productivity. Similarly, Table 5 shows total annual health savings of $54.5 million from fewer cases of heart disease, and $179 million from fewer cases of diabetes. It is appropriate to add these conditions together with minimal double counting, suggesting an aggregate annual savings from increased physical activity of $275.5 million or $23.50 for each of the 11.7 million adults ages 18-64 in the SCAG region.

Table 5: Estimated Annual Physical Activity Health Savings (2011$) for Adults in SCAG Region by Cost Type - Hypertension, Heart Disease, Diabetes, and Obesity

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
<th>Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>$38,912,093</td>
<td>$3,107,318</td>
<td>$42,019,411</td>
<td>$3.58</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>$28,563,944</td>
<td>$25,910,813</td>
<td>$54,474,757</td>
<td>$4.65</td>
</tr>
<tr>
<td>Diabetes</td>
<td>$125,561,187</td>
<td>$53,477,372</td>
<td>$179,038,560</td>
<td>$15.27</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$193,037,224</strong></td>
<td><strong>$82,495,503</strong></td>
<td><strong>$275,532,728</strong></td>
<td><strong>$23.50</strong></td>
</tr>
<tr>
<td>Obesity</td>
<td>$623,083,379</td>
<td>$46,830,251</td>
<td>$669,913,630</td>
<td>$57.15</td>
</tr>
</tbody>
</table>

1 Assumes the last 50% of active travel currently occurring in the SCAG region is attributable to active transportation infrastructure.
2 Results apply to the 2012 U.S. Census Estimate for 18-64 year olds for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties (11,722,630).
3 Hypertension, heart disease, and diabetes can be summed with minimal double counting due to statistical controls in original COI studies; obesity, as a risk factor for all three conditions cannot be included in the total without introducing significant double counting.
Similar results are provided for seniors (65+) for the SCAG region in Table 6 below. Over $141 million in direct and $70 million in indirect costs would occur annually for seniors without the active transportation system, based on the same assumption that 50% of the active transportation travel currently occurring in the SCAG region is attributable to active transportation infrastructure. The total per capita costs are much higher for seniors ($99.72) than adults ($23.50). This reflects the stronger effect of the built environment in preventing diabetes and heart disease for seniors.

Table 6: Estimated Annual Physical Activity Health Savings (2011$) for Seniors in SCAG Region by Cost Type - Hypertension, Heart Disease, Diabetes, and Obesity

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
<th>Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>$7,798,086</td>
<td>$622,715</td>
<td>$8,420,801</td>
<td>$3.95</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>$27,570,043</td>
<td>$25,009,230</td>
<td>$52,579,273</td>
<td>$24.67</td>
</tr>
<tr>
<td>Diabetes</td>
<td>$106,294,078</td>
<td>$45,271,378</td>
<td>$151,565,456</td>
<td>$71.10</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$141,662,208</td>
<td>$70,903,323</td>
<td>$212,565,530</td>
<td>$99.72</td>
</tr>
<tr>
<td>Obesity</td>
<td>$105,929,342</td>
<td>$7,961,531</td>
<td>$113,890,873</td>
<td>$53.44</td>
</tr>
</tbody>
</table>

1 Assumes the last 50% of active travel currently occurring in the SCAG region is attributable to active transportation infrastructure.
2 Results apply to the 2012 U.S. Census estimate of 2.13 million seniors ages 65+ for Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties.
3 Hypertension, heart disease, and diabetes can be summed with minimal double counting due to statistical controls in original COI studies; obesity, as a risk factor for all three conditions cannot be included in the total without introducing significant double counting.

Adding adults and seniors together, the SCAG region’s current active transportation system prevents $488 million in health related costs each year from physical activity. This includes preventing $335 million in healthcare expenditures and $153 million in benefits from increased productivity annually.

**County Level Monetized Health Estimates**

Demographics and the built environment vary across the SCAG region suggesting the benefits of the active transportation network may also vary. The health modeling in C-PHAM occurred at the 150x150 meter grid (see previous section). This spatial scale allows the results for each grid to be aggregated to larger geographies, including county. The monetized health results were subtotaled by county and are provided for adults (Table 7) and seniors (Table 8). Total benefits – direct and indirect for hypertension, heart disease, and diabetes – are shown in Error! Reference source not found. and Error! Reference source not found.. Monetized totals by county incorporate differences in predicted prevalence rates. Because county populations vary significantly, this difference is difficult to see when comparing the total monetized benefits. To address this, a per capita benefit is provided in brackets (Table 7 for adults and Table 8 for seniors) to normalize by county size. For example, the diabetes benefits range from $12.49 per adult aged 18-64 in Orange County to $17.36 in Riverside County. In general, adults in Los Angeles see similar per capita benefits as that of the greater region; Orange and Ventura County per capita benefits are lower than the region; and the Inland Empire (Riverside and San Bernardino) show higher than regional per capita benefits. Error! Reference source not found. shows the differences in per capita benefits by county and disease.

Table 8 reflects similar patterns of per capita benefits by county. The largest difference from adults is that seniors show significantly higher per capita benefits for heart disease and diabetes; this reflects the

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15 Monetized benefits for Adults and Seniors by Disease at the county level are provided in Appendix F.
stronger relationship between physical activity and better health outcomes for seniors.

Table 7: Monetized Annual Health Benefits (Total and Per Capita) by County and Disease, Adults (18-64)

<table>
<thead>
<tr>
<th>County</th>
<th>Hypertension</th>
<th>Heart Disease</th>
<th>Diabetes</th>
<th>Total¹</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>$23,161,601</td>
<td>$29,347,776</td>
<td>$99,764,598</td>
<td>$152,723,976</td>
<td>$364,361,166</td>
</tr>
<tr>
<td></td>
<td>$3.59</td>
<td>$4.54</td>
<td>$15.45</td>
<td>$23.58</td>
<td>$56.42</td>
</tr>
<tr>
<td>Orange</td>
<td>$6,513,500</td>
<td>$8,508,728</td>
<td>$24,663,510</td>
<td>$39,685,739</td>
<td>$97,767,803</td>
</tr>
<tr>
<td></td>
<td>$3.30</td>
<td>$4.31</td>
<td>$12.49</td>
<td>$20.11</td>
<td>$49.53</td>
</tr>
<tr>
<td>Riverside</td>
<td>$5,192,384</td>
<td>$7,326,752</td>
<td>$23,712,631</td>
<td>$36,231,767</td>
<td>$88,276,793</td>
</tr>
<tr>
<td></td>
<td>$3.80</td>
<td>$5.36</td>
<td>$17.36</td>
<td>$26.52</td>
<td>$64.62</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>$4,884,564</td>
<td>$6,391,889</td>
<td>$21,891,510</td>
<td>$33,167,963</td>
<td>$83,326,792</td>
</tr>
<tr>
<td></td>
<td>$3.77</td>
<td>$4.93</td>
<td>$16.89</td>
<td>$25.59</td>
<td>$64.30</td>
</tr>
<tr>
<td>Ventura</td>
<td>$1,919,428</td>
<td>$2,490,022</td>
<td>$7,625,228</td>
<td>$12,034,678</td>
<td>$31,495,044</td>
</tr>
<tr>
<td></td>
<td>$3.68</td>
<td>$4.77</td>
<td>$14.61</td>
<td>$23.06</td>
<td>$60.34</td>
</tr>
<tr>
<td>SCAG²</td>
<td>$42,019,411</td>
<td>$54,474,757</td>
<td>$179,038,560</td>
<td>$275,532,728</td>
<td>$669,913,630</td>
</tr>
<tr>
<td></td>
<td>$3.58</td>
<td>$4.65</td>
<td>$14.61</td>
<td>$23.06</td>
<td>$57.15</td>
</tr>
</tbody>
</table>

¹ Hypertension, heart disease, and diabetes can be summed with minimal double counting due to statistical controls in original COI studies; obesity, as a risk factor for all three conditions cannot be included in the total without introducing significant double counting.

² Imperial County is not reported due to small sample size and insufficient built environment data. The SCAG benefit assumes Imperial County prevalence rates will match the SCAG average.

Table 8: Monetized Annual Health Benefits (Total and Per Capita) by County and Disease, Seniors (65+)

<table>
<thead>
<tr>
<th>County</th>
<th>Hypertension</th>
<th>Heart Disease</th>
<th>Diabetes</th>
<th>Total¹</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>$4,516,440</td>
<td>$27,784,105</td>
<td>$84,734,149</td>
<td>$117,034,694</td>
<td>$60,458,543</td>
</tr>
<tr>
<td></td>
<td>$3.95</td>
<td>$24.27</td>
<td>$74.03</td>
<td>$102.25</td>
<td>$52.82</td>
</tr>
<tr>
<td>Orange</td>
<td>$1,528,914</td>
<td>$9,031,832</td>
<td>$23,063,178</td>
<td>$33,623,924</td>
<td>$17,713,742</td>
</tr>
<tr>
<td></td>
<td>$4.01</td>
<td>$23.67</td>
<td>$60.44</td>
<td>$88.11</td>
<td>$46.42</td>
</tr>
<tr>
<td>Riverside</td>
<td>$1,103,170</td>
<td>$7,472,695</td>
<td>$20,106,714</td>
<td>$28,682,579</td>
<td>$16,590,345</td>
</tr>
<tr>
<td></td>
<td>$3.92</td>
<td>$26.54</td>
<td>$71.40</td>
<td>$101.86</td>
<td>$58.92</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>$778,800</td>
<td>$5,147,716</td>
<td>$15,354,327</td>
<td>$21,280,844</td>
<td>$12,380,653</td>
</tr>
<tr>
<td></td>
<td>$3.91</td>
<td>$25.87</td>
<td>$77.17</td>
<td>$106.96</td>
<td>$62.22</td>
</tr>
<tr>
<td>Ventura</td>
<td>$416,135</td>
<td>$2,654,773</td>
<td>$7,027,758</td>
<td>$10,098,665</td>
<td>$5,826,039</td>
</tr>
<tr>
<td></td>
<td>$3.95</td>
<td>$25.19</td>
<td>$66.67</td>
<td>$95.81</td>
<td>$55.27</td>
</tr>
<tr>
<td>SCAG²</td>
<td>$8,420,801</td>
<td>$52,579,273</td>
<td>$151,565,456</td>
<td>$212,565,530</td>
<td>$113,890,873</td>
</tr>
<tr>
<td></td>
<td>$3.95</td>
<td>$24.67</td>
<td>$71.10</td>
<td>$99.72</td>
<td>$53.43</td>
</tr>
</tbody>
</table>

¹ Hypertension, heart disease, and diabetes can be summed with minimal double counting due to statistical controls in original COI studies; obesity, as a risk factor for all three conditions cannot be included in the total without introducing significant double counting.

² Imperial County is not reported due to small sample size and insufficient built environment data. The SCAG benefit assumes Imperial County prevalence rates will match the SCAG average.
**Figure 7. Total (Direct + Indirect for Hypertension, Heart Disease, and Diabetes) Monetized Health Benefits by County, Adults (18-64)**

*Imperial County is not reported due to small sample size and insufficient built environment data. The SCAG benefit assumes Imperial County prevalence rates will match the SCAG average.*

**Figure 8: Annual Per Capita Monetized Health Benefit for Adults (ages 18-64) by County**

*Imperial County not reported due to small sample size and insufficient built environment data. The SCAG benefit assumes Imperial County prevalence rates will match the SCAG average.*
4.3 Understanding Health Impacts of Planned Infrastructure

SCAG recently adopted the 2016 RTP/SCS. As part of the RTP/SCS process, the California Public Health Assessment Model (C-PHAM) was used to estimate the number of avoided cases of obesity, diabetes, hypertension, and heart disease in 2040 from implementation of the RTP/SCS. The subsections below provide health outcomes, changes in healthcare expenditures, and indirect health benefits associated with the health outcomes reported in the RTP/SCS.

**Modeling Health Outcomes from Increased Physical Activity**

The original RTP/SCS analysis focused on the areas where there would be change, such as increased density, additional mixed use development, and active transportation investments, and the resultant increase of population of 2.56 million adults (age 18-64 only; excludes seniors age 65+) in those areas. For the purposes of monetization in this report, this analysis assumes all adults ages 18-64 in areas with planned housing or employment growth or transportation investments showed similar increases in health. Since these analyses include input variables describing the built environment, those people living in the parts of the region not planned/forecasted to change are not included. This is a conservative approach due to its focus on people’s home location. Even though the built environment where someone lives is very important to their mode choice and resulting physical activity levels, people can also be impacted by the built environment of where they work, learn and play.

Table 9 shows projected adult (ages 18-64) prevalence rates in 2040 based upon forecasted trends and fully implementing the planned active transportation strategies in the 2016 RTP/SCS. The difference in prevalence would result in 15,076 avoided diabetes cases, 81,657 avoided cases of hypertension, and 15,985 avoided cases of heart disease.

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Forecasted Trend</th>
<th>2016 RTP</th>
<th>Prevalence</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>6.1%</td>
<td>6.0%</td>
<td>-0.1%</td>
<td>-15,076</td>
</tr>
<tr>
<td>Hypertension</td>
<td>21.5%</td>
<td>20.8%</td>
<td>-0.6%</td>
<td>-81,657</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>4.4%</td>
<td>4.2%</td>
<td>-0.1%</td>
<td>-15,985</td>
</tr>
</tbody>
</table>

Table 9. Predicted Adult (ages 18-64) Prevalence and Avoided Cases from Increased Physical Activity in 2040 for RTP/SCS Scenarios as Modeled by C-PHAM

---

1 Analysis originally applied to the 2.56 million additional adults ages 18-64 who live in areas with built environment change in 2040. All adults ages 18-64 in areas of built environment change are assumed to have similar benefits for this application.

16 See Appendix A and Appendix C for a more detailed discussion of methodology.
Monetizing Public Health Morbidity Benefits

Avoided cases of diabetes, hypertension, and heart disease will result in both reduced healthcare expenditures and indirect labor productivity gains. Table 10 shows the health benefits of implementing the RTP will be $337 million annually; $226 million will be from reduced healthcare expenditures and $111 million will be from productivity gains. Assuming a steady rate of implementation, the cumulative impact will be nearly $5 billion over the life of the plan.

Table 10. Predicted Annual Physical Activity Health Savings (millions, 2011$) in 2040 for Adults (ages 18-64) by Cost Type – Hypertension, Heart Disease, and Diabetes

<table>
<thead>
<tr>
<th>Condition</th>
<th>Direct Healthcare Expenditures</th>
<th>Indirect Productivity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>$45.00</td>
<td>$3.46</td>
<td>$48.46</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>$63.79</td>
<td>$57.86</td>
<td>$121.65</td>
</tr>
<tr>
<td>Diabetes</td>
<td>$117.20</td>
<td>$49.95</td>
<td>$167.15</td>
</tr>
<tr>
<td>Total Physical Activity Health Benefit</td>
<td>$226.00</td>
<td>$111.27</td>
<td>$337.27</td>
</tr>
</tbody>
</table>

1 Analysis originally applied to the 2.56 million additional adults ages 18-64 who live in areas with built environment change; all adults ages 18-64 in areas of built environment change are assumed to have similar benefits for this application.
Active Transportation’s Effect on Regional Employment and Regional Economic Growth

Constructing, maintaining, and using active transportation infrastructure, such as bikeways, bike lanes, and sidewalks, provides economic and health benefits to a regional economy. Understanding the broad range of benefits provided by these investments is important in order to demonstrate their value to improved health. Quantifying these benefits also allows for a comparison to other transportation investments made by SCAG.

Sections 3 and 4 above describe direct and indirect impacts of the active transportation system. This section describes how those impacts multiply throughout the SCAG region’s economy to create employment and wages; increase sales output; and increase value added to the region. An input-output econometric model used in other SCAG planning activities, REMI’s Transight, is used here to capture how the funding and use of active transportation infrastructure impacts the overall regional economy. It is a leading tool for evaluation of the total economic effects of transportation systems. Travel demand modeling results are integrated with the REMI economic impact model to demonstrate how transportation contributes to economic competitiveness. The model is constructed with data from a wide range of economic and transportation topical areas, includes key econometric estimates, and integrates inter-industry transactions, long run equilibrium features, and regional characteristics.

REMI’s Transight model includes:

- substitution among factors of production in response to changes in relative factor costs;
- labor migration responses to changes in expected income and employment opportunity;
- access to regional and national consumer commodities, and exposure to positive and negative amenities;
- labor participation rate responses to changes in real wage and employment conditions; wage rate responses to labor market changes;
- consumer consumption responses to changes in real disposable income and commodity prices; and
- local, regional, and market shares responses to changes in regional production costs and in agglomeration economics.

The output of this model includes key economic indicators including (1) employment (2) associated

Understanding Regional Economic Indicators

REMI’s Transight model captures annual regional economic growth using the following metrics:

- **Employment (total jobs)**: The total number of jobs associated with active transportation infrastructure spending and the associated health effects.
- **Personal Income ($M)**: Employment total multiplied by average wages by position type.
- **Sales Output ($B)**: Sales output discounted for prior stages of manufacturing that occurred outside the SCAG region.
- **Value Added ($M)**: The difference between retail sale prices and the cost to purchase the item being sold.

17 This section is based on Appendix D and E, which include a more detailed discussion of the REMI methodology and application.
changes in personal income from employment; (3) output or sales and (4) a measure of value added.

Impacts to the region primarily result from (1) changes in construction and active transportation programmatic strategy spending and (2) improved labor productivity from workers who are healthier due to increased physical activity. Healthcare expenditures, while positive from a public policy standpoint, have the effect of shrinking economic activity in the healthcare sector. Additional smaller, but positive, impacts accrue from changes in healthcare spending, travel costs, mobility, and amenities. Impacts from construction and strategy/programmatic spending, mobility, amenities, and travel spending and labor productivity are all positive economic impacts.

5.1 Regional Economic Impacts of Implementing the 2016 RTP/SCS Active Transportation Infrastructure

Implementing the active transportation investments within the 2016 RTP/SCS will result in significant annual and cumulative benefits. On average, spending from the active transportation portion of the RTP (AT-RTP) results in 11,500 jobs each year. Over the life of the plan, this results in $36 billion in personal income, and $113 billion in output sales resulting in $70 billion in value added to the region. Each indicator is discussed below.

**Output**

Sales output from active transportation averages $4.53 billion annually. Cumulative active transportation RTP-induced output over the life of the RTP is $113.3 billion. When normalized by AT-RTP spending, every $1 spent in support of more walkable and bikeable communities is expected to increase sales output by $8.41.

Sales output is strongly influenced by construction spending rippling through the economy: $26.6 billion or 24% of the cumulative benefit is from construction, programmatic, and strategic spending. This equates to $1.97 in output from construction and strategy spending for every $1 spent on the AT-RTP.

Improvements in labor productivity due to healthier workers is the largest contributor to increased sales output; $79.5 billion or approximately 70% of economic growth is attributable to labor productivity gains. This is complemented by a small increase to regional sales output for general goods due to reduced demand for healthcare – on average, $30 million a year. Together, there is $5.96 in health-driven output for every $1 spent on the AT-RTP.

Active transportation reduces the cost of travel through lower fuel and vehicle maintenance costs. Another $700 million in sales output over the life of the RTP or $0.05 for every $1 spent are expected from lower household travel costs. Active transportation also results in less congestion. Sales output increases $5.2 billion over the life of the RTP from savings due to less time spent in traffic.
Table 11. Sales Output (Cumulative, Yearly Average, and Benefit per $1 AT-RTP Spent) for 2016-2040 (2015 $)

<table>
<thead>
<tr>
<th></th>
<th>Cumulative (billions)</th>
<th>Average (billions)</th>
<th>Per $1 AT-RTP Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (Healthier Workers)</td>
<td>$79.5</td>
<td>$3.18</td>
<td>$5.90</td>
</tr>
<tr>
<td>Mobility (Less Congestion)</td>
<td>$5.2</td>
<td>$0.21</td>
<td>$0.38</td>
</tr>
<tr>
<td>Amenities (Air Quality)</td>
<td>$0.5</td>
<td>$0.02</td>
<td>$0.04</td>
</tr>
<tr>
<td>Household Travel Spending</td>
<td>$0.7</td>
<td>$0.03</td>
<td>$0.05</td>
</tr>
<tr>
<td>Healthcare Expenditures</td>
<td>$0.8</td>
<td>$0.03</td>
<td>$0.06</td>
</tr>
<tr>
<td>Construction + Strategy</td>
<td>$26.6</td>
<td>$1.06</td>
<td>$1.97</td>
</tr>
<tr>
<td><strong>RTP Total</strong></td>
<td><strong>$113.3</strong></td>
<td><strong>$4.53</strong></td>
<td><strong>$8.41</strong></td>
</tr>
</tbody>
</table>

*Current infrastructure per $1 spent assumes current levels of active transportation spending over the past 25 years or $6.0 billion (2011$). All other rows reflect the RTP analysis and are normalized by $12.9 billion (2011$) in expected future RTP spending on active transportation.

Figure 11. Output from Active Transportation, 2016-2040 ($ billions, 2015$)

**Value Added**

Value added is a measure of regional economic activity that restricts output to components (manufacturing inputs including labor) that occur inside the SCAG region. Value added impacts are important as they accrue to businesses inside the region. Value added from implementing the RTP active transportation element averages $2.80 billion annually. Cumulative AT-RTP-induced value added over the life of the RTP is $70.1 billion. When normalized by AT-RTP spending, every $1 spent is expected to increase value added by $5.20.

Value added is most impacted by improvements in labor productivity due to healthier workers, with
$49.2 billion or approximately 70% is attributable to labor productivity. Value added is increased further by a small increase from consumers shifting demand from healthcare to other goods – on average, $10 million a year. Together, there is $3.68 in health-driven value added for every $1 spent on the AT-RTP.

Construction spending as it multiplies throughout the economy also contributes to value added; $16.3 billion, or 23% of value added, is from construction, programmatic, and strategic spending. This equates to $1.21 in value added for every $1 spent on the AT-RTP.

Table 12. Value Added (Cumulative, Yearly Average, and Benefit per $1 AT-RTP Spent) for 2016-2040 (2015 $)

<table>
<thead>
<tr>
<th></th>
<th>Cumulative (billions)</th>
<th>Average (billions)</th>
<th>Per $1 AT-RTP Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity</td>
<td>$49.2</td>
<td>$1.97</td>
<td>$3.65</td>
</tr>
<tr>
<td>(Healthier Workers)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility (Less Congestion)</td>
<td>$3.2</td>
<td>$0.13</td>
<td>$0.24</td>
</tr>
<tr>
<td>Amenities (Air Quality)</td>
<td>$0.3</td>
<td>$0.01</td>
<td>$0.03</td>
</tr>
<tr>
<td>Household Travel Spending</td>
<td>$0.8</td>
<td>$0.03</td>
<td>$0.06</td>
</tr>
<tr>
<td>Healthcare Expenditures</td>
<td>$0.4</td>
<td>$0.01</td>
<td>$0.03</td>
</tr>
<tr>
<td>Construction + Strategy</td>
<td>$16.3</td>
<td>$0.65</td>
<td>$1.21</td>
</tr>
<tr>
<td>AT-RTP Total</td>
<td>$70.1</td>
<td>$2.80</td>
<td>$5.20</td>
</tr>
<tr>
<td>Current Infrastructure</td>
<td>$38.7</td>
<td>$1.55</td>
<td>$6.16*</td>
</tr>
<tr>
<td>Health Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Current infrastructure per $1 spent assumes current levels of active transportation spending over the past 25 years or $6.0 billion (2011$). All other rows reflect the RTP analysis and are normalized by $12.9 billion (2011$) in expected future RTP spending on active transportation.

Figure 13. Value Added from Active Transportation, 2016-2040 ($ Billions, 2015$)
**Employment**

Over the forecast period, 2016-2040, an estimated average of 11,500 jobs are created each year. The jobs are largely attributable to labor productivity from improved health outcomes and the construction of active transportation infrastructure (Figure 14). There are modest employment benefits associated with reduced congestion (mobility) and reduced travel spending. There are also modest reductions in employment in the healthcare sector. The most notable change over time occurs in 2021 when additional infrastructure construction spending begins.

### Figure 14. Employment Gains per $1 in AT-RTP Spending

### Figure 15. Employment Gains from Active Transportation, Thousands, 2016-2040

### Table 13. Employment Benefits (Cumulative, Yearly Average, and Benefit per $1 Billion AT-RTP Spent) for 2016-2040

<table>
<thead>
<tr>
<th></th>
<th>Cumulative 2016-2040 (2015$)</th>
<th>Yearly Average</th>
<th>Per $1 Billion AT-RTP Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (Healthier Workers)</td>
<td>106,637</td>
<td>4,265</td>
<td>7,910</td>
</tr>
<tr>
<td>Mobility (Less Congestion)</td>
<td>12,957</td>
<td>518</td>
<td>961</td>
</tr>
<tr>
<td>Amenities (Air Quality)</td>
<td>3,289</td>
<td>132</td>
<td>244</td>
</tr>
<tr>
<td>Household Travel Spending</td>
<td>6,478</td>
<td>259</td>
<td>481</td>
</tr>
<tr>
<td>Healthcare Expenditures</td>
<td>-538</td>
<td>-22</td>
<td>-40</td>
</tr>
<tr>
<td>Construction + Strategy</td>
<td>158,667</td>
<td>6,347</td>
<td>11,770</td>
</tr>
<tr>
<td>AT-RTP Total</td>
<td>287,490</td>
<td>11,500</td>
<td>21,326</td>
</tr>
<tr>
<td>Current Infrastructure Health Effects</td>
<td>88,936</td>
<td>3,557</td>
<td>14,170*</td>
</tr>
</tbody>
</table>

*Current infrastructure per $1 billion spent assumes current levels of active transportation spending over the past 25 years or $6.0 billion (2011$). All other rows reflect the RTP analysis and are normalized by $12.9 billion (2011$) in expected future RTP spending on active transportation.
Table 13 shows job creation by different active transportation economic drivers. Spending on construction and programmatic strategies (including education and encouragement strategies) account for the vast majority of job creation: 11,770 jobs per $1 billion of RTP active transportation spent. This includes both direct construction jobs and more general jobs created by increased spending by the construction workers. Healthier workers are more productive, allowing businesses to hire an additional 7,910 annual workers for every $1 billion in RTP active transportation spent. This is offset by slight job losses from reduced demand for healthcare. Household travel savings also free up household budgets, resulting in consumer spending that creates 481 jobs per $1 billion of AT-RTP spent.

Another way to analyze job creation is to ask in which sectors the job creation occurs. Again, RTP spending on active transportation infrastructure concentrates over a quarter of the jobs created in the construction sector (Error! Reference source not found.) with spillover into manufacturing (13%), housing and food (9%), and finance/insurance (6%). Reduced healthcare expenditures will result in concentrated job loss in health care and in associated professional science and technology jobs such as laboratories.

**Figure 16. Top Sectors Impacted by Employment (from AT-RTP and Current Infrastructure Health Gains), 2020-2040**

![Bar chart showing top sectors impacted by employment](image)

**Personal Income**

Personal income captures the wages associated with increased employment. Over $35.7 billion in personal income is gained over the life of the RTP from the active transportation portion of the RTP (Table 14), averaging $1.43 billion annually. When normalized by RTP spending on active transportation, every $1 spent is expected to increase personal income by $2.65 (Figure 17).

Personal income, like value added and sales output, is strongly impacted by construction spending: $15.6 billion (44%) of the cumulative
benefit in personal income is from construction, programmatic, and strategic spending to support active transportation. This equates to $1.16 in value added from construction and strategy spending for every $1 spent on the AT-RTP.

Improvements in labor productivity due to healthier workers also contribute to increased personal income; $16.2 billion or approximately 47% of increased personal income is attributable to labor productivity. There is an increase of $1.21 in health-driven personal income for every $1 spent on the AT-RTP.

Table 14. Personal Income (Cumulative, Yearly Average, and Benefit per $1 RTP Spent) for 2016-2040 (2015 $)

<table>
<thead>
<tr>
<th></th>
<th>Cumulative (billions)</th>
<th>Average (billions)</th>
<th>Per $1 AT-RTP Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (Healthier Workers)</td>
<td>$16.2</td>
<td>$0.65</td>
<td>$1.21</td>
</tr>
<tr>
<td>Mobility (Less Congestion)</td>
<td>$2.8</td>
<td>$0.11</td>
<td>$0.21</td>
</tr>
<tr>
<td>Amenities (Air Quality)</td>
<td>$0.5</td>
<td>$0.02</td>
<td>$0.04</td>
</tr>
<tr>
<td>Household Travel Spending</td>
<td>$0.4</td>
<td>$0.02</td>
<td>$0.03</td>
</tr>
<tr>
<td>Healthcare Expenditures</td>
<td>$0.2</td>
<td>$0.01</td>
<td>$0.01</td>
</tr>
<tr>
<td>Construction + Strategy</td>
<td>$15.6</td>
<td>$0.62</td>
<td>$1.16</td>
</tr>
<tr>
<td>RTP Total</td>
<td>$35.7</td>
<td>$1.43</td>
<td>$2.65</td>
</tr>
</tbody>
</table>

*Current infrastructure per $1 spent assumes current levels of active transportation spending over the past 25 years or $6.0 billion (2011$). All other rows reflect the RTP analysis and are normalized by $12.9 billion (2011$) in expected future RTP spending on active transportation.

Figure 18. Personal Income (wages) from Active Transportation, 2016-2040 ($ billions, 2015$)

5.2 Regional Economic Health Impacts of Current Active Transportation Infrastructure

Physical activity prompted by active transportation infrastructure results in healthier communities today. This has a regional effect on the economy through healthier people and reduced healthcare spending. These direct and indirect health effects (see Section 4.2) induce additional economic benefits. Removing the current active transportation infrastructure would likely result in the annual loss of 3,557 jobs in the form of reduced productivity, $2.53 billion in lost sales output, and $1.55 billion in lost value each year.
The SCAG region is currently spending $250 million (2015$) each year to maintain and improve active transportation infrastructure and programs with spending expected to increase in 2020. This is resulting in an annual average of $2.53 billion in increased sales output, $1.55 billion of which is value added to the SCAG region. On average, maintenance of the current active transportation system generates 3,557 jobs a year resulting in $560 million in personal income. Over the RTP cycle, 2016-2040, the cumulative effect is $63.2 billion in sales output, $38.7 billion in value added to the regional economy, and $13.9 billion in personal income.

The past 25 years of active transportation spending is not available. Assuming approximately current (2016) levels of annual spending on active transportation over the past 25 years (in 2012 dollars without accounting for inflation), health effects of current infrastructure can be presented on a per $1 spent basis (Table 15). The current economy benefits greatly from healthier, more productive workers who use the current active transportation infrastructure; for every $1 spent, $10.07 in sales output, $6.16 in value added, and $2.21 in personal income in the SCAG region.

Table 15. Regional Economic Metrics from Health Benefits of Current Active Transportation Infrastructure

<table>
<thead>
<tr>
<th></th>
<th>Cumulative (25 years)</th>
<th>Annual Average</th>
<th>Per $1 Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Output (billions, 2015$)</td>
<td>$63.2</td>
<td>$2.53</td>
<td>$10.07</td>
</tr>
<tr>
<td>Value Added (billions, 2015$)</td>
<td>$38.7</td>
<td>$1.55</td>
<td>$6.16</td>
</tr>
<tr>
<td>Personal Income (billions, 2015$)</td>
<td>$13.9</td>
<td>$0.56</td>
<td>$2.21</td>
</tr>
<tr>
<td>Employment (Annual Jobs)</td>
<td>88,935</td>
<td>3,557</td>
<td>14,170</td>
</tr>
</tbody>
</table>

\(^{18}\) Current infrastructure per $1 spent assumes current levels of active transportation spending over the past 25 years or $6.0 billion (2011$).
6 Conclusion

The Southern California region is expected to spend approximately $12.9 billion (2011$) on active transportation infrastructure and programmatic spending by 2040 as outlined in the 2016 Regional Transportation Plan and Sustainable Communities Strategies (RTP/SCS). In order to determine the economic and health impacts of this investment, this study has outlined a process for modeling and monetizing the benefits of active transportation on the regional economy. This study demonstrates that the maintenance of current active transportation infrastructure and the investments in additional projects is cost effective.

Investing in active transportation is particularly important in improving health outcomes such as decreased rates of diabetes and heart disease. Today, 13.3% of trips (including trips to transit) in the region are taken by an active mode and trips by active modes continue to increase. Current levels of active transportation mode travel in the region result in 14.6 million miles and 5.4 million hours of physical activity daily. If half of this active travel is attributable to active transportation infrastructure, it prevents 84,773 cases of hypertension, 14,016 cases of heart disease, and 29,824 cases of diabetes among adults each year. The prevented cases of hypertension, heart disease, and diabetes, when monetized, is the equivalent of $193 million in direct reduced healthcare expenditures and $82 million in indirect benefits (productivity gains) annually. The current active transportation network is responsible for 3,557 jobs, $2.53 billion in sales output, and $1.55 billion in value each year.

Implementing the active transportation strategies and investments planned in the 2016 RTP/SCS will result in additional health benefits from increased physical activity. Among adults ages 18-64, implementing the 2016 RTP/SCS will result in the prevention of 81,657 cases of hypertension; 15,985 cases of heart disease, and 15,076 cases of diabetes annually by 2040. By 2040, these prevented cases of hypertension, heart disease, and diabetes equate to annual benefits of $226 million in direct reduced healthcare expenditures and $111 million in indirect benefits (productivity gains).

Investing in active transportation infrastructure also provides economic benefits in the form of increased jobs, additional personal income, sales output, and value added. By using REMI’s input-output econometric model TranSight, the regional effects of active transportation clearly show these investments are a net positive and are cost effective. The $12.9 billion (2011$) in active transportation investments included in the 2016 RT/SCS and resulting health benefits will result in the creation of an average of 11,500 jobs each year. This will result in an additional $36 billion in personal income, $113 billion in sales output, $70 billion in value added to the regional economy over the life of the plan. This is the equivalent of $8.41 in sales output, $5.20 value added, and $2.65 in personal income for every $1 in active transportation related RTP spending.

The REMI model also clarifies the relative impact of various active transportation elements in creating regional economic growth and employment. Construction is the largest driver of employment (56% of created jobs). Healthier workers are the largest driver of sales output and value added to the region. Additional benefits accrue from increased mobility and lower household transportation costs.