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Bike share impacts on health

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What is Bike share?
Health Benefits and Risks

- Physical Activity
- Injuries
  a) Falls
  b) Collisions with other vehicles + helmets
- Air pollution exposure
Health Impact Modeling Studies

- Objective: Provide a combined estimate of benefits and risks of bicycle share programs

- Model assumptions are crucial
Health Impact Modeling Studies

- **Primary modeling tools**
  
a) **HEAT** – Economic assessment of the health benefits of walking and cycling estimating reduced mortality
  - **Health Economic Assessment Tool:**
    - [http://www.heatwalkingcycling.org/](http://www.heatwalkingcycling.org/)

b) **ITHIM** – Integrated assessment of the health effects of transport scenarios and policies at the urban and national level
  - **Integrated Transport and Health Impact Modeling Tool:**
    - [http://www.cedar.iph.cam.ac.uk/research/modelling/ithim/](http://www.cedar.iph.cam.ac.uk/research/modelling/ithim/)
Health Impact Modeling Studies

- **Rojas-Rueda et al., 2011**
  
  a) Change in mortality
     - Road traffic collisions = -0.03
     - Air pollution = -0.13
     - Physical activity = 12.46
  
  b) Benefit/Risk Ratio = 77

- **Benefits likely overestimated**
  
  a) Assumption of traffic collision risk low
Health Impact Modeling Studies

- **Woodcock et al., 2014**

  a) Change in disability adjusted life years (Bike share risk)
     - Men: –72 DALYs (95% CrI –110 to –43)
     - Women: –15 (95% CrI –42 to –6)

  b) Change in disability adjusted life years (Cycling risk)
     - Men: –49 DALYs (95% CrI –88 to –17)
     - Women: –1 DALYs (95% CrI –27 to 12)
Health Impact Modeling Studies

- **Woodcock et al., 2014**
  
  a) Majority of net benefit due to physical activity
  
  b) Majority of net risk due to injury due to collisions
     
     • Benefits increased dramatically in sensitivity analysis using injury risk based on data from the Netherlands.
City Specific Studies

- Objective: Provide estimates of health benefits and risks in individual cities or multiple cities

- Large variations in methods and research questions
Cycling and Physical Activity

- Fuller et al., 2013
  a) Year 1 OR for cycling = 1.47 (95% CI 0.99 – 2.19)
  b) Year 2 OR for cycling = 2.86 (95% CI 1.85 – 4.42)

- Probability of cycling
  a) Pre-implementation=0.07 (N= ~27,000 cyclists)
  b) Year 2=0.15 (N= ~57,000 cyclists)
Broader physical activity context

- Addition versus Replacement?
  a) Early active transportation suggests addition is more likely than replacement (no bike share specific)

- Longitudinal studies on bike share & physical activity
  a) Philadelphia
  b) ??

Goodman et al., 2014
Dangerous Bike share users

- No evidence that bicycle share riders are more dangerous
- If anything bicycle share riders may be safer
- Underpowered and still debated research question

Fuller et al., 2013; Woodcock et al., 2014
Helmets and Injury

- **Montreal**
  a) Bike riders = 12% (95% CI 10-15)
  b) Riders with their own bike = 51% (95% CI 49-52)

- **Toronto**
  a) Bike riders = 21%
  b) Riders with their own bike = 51%

Grenier et al., 2013; Bonyun et al., 2012
Helmets and Injury

Graves et al., 2014

a) The proportion of head injuries among bicycle-related injuries increased from 42.3% before PBSP implementation to 50.1%
Helmets and Injury

- Critique
  a) Injury registry only includes most severe injuries
  b) Change in denominator
     • -38% in PBSP cities
     • +6% in control cities
Helmets and Injury

Data (Table 2) from new study show declines in all injuries, including head injuries, after bike share system implemented. Because head injuries decline less than other injuries, they are now a larger proportion of all injuries.


Bike share cities = Montreal, Washington DC, Minneapolis, Boston, Miami Beach
Control cities = Vancouver, New York, Milwaukee, Seattle, Los Angeles
High profile incidents

- **London**
  a) 20 year old woman killed by a lorry on cycle superhighway
    • [http://www.theguardian.com/uk-news/2013/jul/07/first-fatal-boris-bike-crash-london](http://www.theguardian.com/uk-news/2013/jul/07/first-fatal-boris-bike-crash-london)

- **Montreal**
  a) 33 year old women killed by flatbed truck under viaduct
Broader bylaw context

Legislation applies to all cyclists
- New Brunswick
- British Columbia
- Nova Scotia
- Prince Edward Island
- Subtotal

Legislation applies to cyclists aged <18 years
- Ontario
- Alberta
- Subtotal
- Overall

Dennis et al., 2013

Rate ratio (95% CI)
- New Brunswick: 1.54 (0.11 to 22.48)
- British Columbia: 0.57 (0.34 to 0.96)
- Nova Scotia: 0.42 (0.11 to 1.61)
- Prince Edward Island: 1.86 (0.44 to 7.91)
- Subtotal: 0.64 (0.40 to 1.03)
- Ontario: 0.96 (0.52 to 1.79)
- Alberta: 0.95 (0.76 to 1.18)
- Subtotal: 0.95 (0.77 to 1.17)
- Overall: 0.86 (0.68 to 1.09)

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Helmets and Injury

- Is helmet provision or helmet bylaws a viable intervention to increase bike share user safety?
  a) In my opinion - No

- Should bike share users wear helmets?
  a) In my opinion - Yes
Many Remaining Questions

- **Type 3 Evidence**
  a) Cycling infrastructure*program implementation
  b) Helmet bylaws*program implementation

- **Scale**
  a) Is a certain size (reach) necessary for success?

- **Social inequalities**
  a) Can bike share improve transportation poverty?
     * Big question in USA not so much in other countries
Costs and Viability??

- BIXI Montreal is a mess but that fact does not at all invalidate the proof of concept
  a) Because one restaurant goes out of business does not mean restaurants are an impossible business model
Costs and Viability??

- Public transit and motor vehicles are subsidized at similar rates ~30-50% by tax payers
- Bike share should (and I believe will) be viewed as a public good and be subsidized by municipal governments
Thank you

“There is no holy grail. But a public bike share is pretty close.”

– Gabe Klein, Chicago Transportation Commissioner
References


