Background
• Major rail and road CBA
• All areas of rigorous and accepted frameworks and guidance

Our View
If active transport wants to considered a viable transport alternative or avenue through which to pursue health outcomes, and seek funding for these, then it has to adhere to the same level of rigor as transport and health analysis.

Early stages – but come along way.
• Identify and acknowledge gaps and risk
• Control for these and set future research agenda.
• More people involved he quicker these gaps will be filled

Talk through the stages we have gone through
Agenda

1. Defining an economic framework
2. Populating the framework with costs and benefits
3. The application of this framework
Agenda

1. *Defining an economic framework*
2. *Populating the framework with costs and benefits*
3. *The application of this framework*
Start at the top with an appropriate economic theory
Most common tool used to analyze policies and projects is cost:benefit analysis, which specifically examines the changes in welfare or utility to consumers (you and I) producers and society at large through analyzing direct changes in consumer surplus, producer surplus and external costs.

This is the economic theory which underpins all transport, health analysis, or project / policy seeking Treasury finding.

Direct costs
It is also important to note that this only seeks to quantify direct (as opposed to indirect or second order) costs and benefits. Hence, it is possible to say that the costs and benefits are directly attributable to the active transport project or policy in question.

Secondly, established guidelines on how this framework should be applied to transport projects.
Here are existing, established guidelines which outline how this framework should be applied to transport projects. Adherence to these guidelines is a prerequisite for other transport projects seeking funding. So, any active transport framework should adhere to these.

Benefits of this approach – equal footing with other health and transport projects
Benefits of this approach
• Consistent with economic theory best used to inform policy decision (ie cost benefit analysis)
• Consistent with current appraisal guidelines
• Replicable and transparent
Our view – pass Treasury Litmus test
• Conservative
• Not designed to promote these modes, rather ensure that the full costs and benefits are better understood in order to make better policy and investment decisions.
• Focused on resource costs and utilitarian trips
So we have defined a robust and accepted framework against which to understand the costs and benefits of cycling. The next task is to populate the framework with these costs and benefits.

All benefits defined on a per KM basis – i.e., an additional KM cycled or walked, or one less KM travelled by a car. Consistent with current approach in transport for understanding changes in rail and road resource costs.

Overall finding
Average: Person who used to drive a car, but now walks or cycles.
Benefits per KM to the cyclist is $1.50
Benefits per KM to the walker is $2.38.

Unpacking this result further is best done by examine the transport networks and how changing behavioral patterns will effect these.
One of most interesting findings is the importance of reduced health costs / health benefits.

**Mortality**

Savings from avoiding premature death due to chronic desires. (See studies quantifying the physical costs of inactivity).

Cardio Vascular Disease

Obesity

High blood pressure

Type II diabetes

Cancers

There is a strong link between the prevalence of these chronic diseases and inactivity.

**Morbidity**

Same conditions as above, but refers to the cost of poor health due to this disease rather than the death.

These morbidity costs are making up an increasing burden of public health costs and again, there is a strong link here between the prevalence of morbidity and inactivity.

**Absenteeism**

Haven’t specifically quantified the reduced costs of absenteeism - the literature on this is less sound in drawing a direct link whic
Less walking studies
Higher walking value
• Walking values are higher because it takes a greater physical effort to walk one kilometer.

Same pattern
Again, see pattern repeat that including both morbidity and mortality costs generate higher benefits.

Recognize uncertainty
• Stress the range
• V. important given largest benefit
• Test uncertainty – talk about later

Three other important things to remember when applying
• Two aspects to health costs:
• We assume diminishing marginal health returns.
• Benefits ramp up progressively over 5 years.
Other benefits other than improved health.

**Safety**

Different relative risks associated with active transport:

- Relative to car or PT travel, active transport exposes users to more risk or minor injury, serious injury and death. Hence, there is likely to be a cost associated with more walking and cycling.
- However, risk levels differ on the nature of the infrastructure type: relative to riding a bike on the road, on-road bike paths, off-road paths and shared use facilities expose users to less risk.

**Different risks to dif user groups**

- Someone switching to cycling or walking from car is more exposed to injury or death – especially if some of their trip involves travelling on roads, footpaths to get there.
- A current cyclist of that route actually receives a safety benefit as, for that proportion of their trip, they are on a piece of infrastructure which reduces their exposure to risk. Hence, compared to the base case, this user is safer.

**Safety in numbers:**

- Exponent which can get applied to risk – Jacobsen, crashes only increase by 32% for a doubling in the number of cyclists.
- Care needs to be taken when applying on a project basis. If state / region wide policy push to increase cycling then potentially appropriate across the life of the appraisal period. However, judgment required on a project basis – would this generate sufficient new demand to warrant applying the SiN.

**VOCs**

**Travel time savings – common in transport appraisals**

Less robust – need to understand GJT in base cases. Area that requires further work,

Applicable to current cyclists

VOC savings for those switching from car.
So we have just gone through the impact of this new infrastructure on the people using it.

Now let’s talk about the changes that it has on other networks, starting with the road network. It is well accepted that marginal changes on the road network (i.e., adding or removing one car) have an impact on levels of congestion, pollutions etc.

There are a well defined and accepted set of benefits that are associated with reducing road use. These include:

- Decongestion
- External costs (GHG, pollution, etc)
- Parking spaces

All benefits and appropriate parameters well defined in existing guidelines.
So we have just gone through the impact of this new infrastructure on the people using it. PT represents a challenge.

**Marginal changes on the road network (ie one less car or one more car) have an impact on levels of congestion, pollutions etc.**

However, on the PT network this isn’t always the case. **The provision of public transport services can’t respond to marginal changes in demand.** For example, a small diversion to active transport will not, in most cases, lead to a long-run or short-run change in provision of public transport services. For an active transport scheme to have an impact it would have to be very meaningful, or targeted to a very specific area.

Example of 440.....

**Decongestion**

Leads to an issue – can actually decrease the cost recovery of public transport services. Same services, **less revenue leads to larger gov. subsidy.**

**However, crowding on PT services is marginal,** with the addition or removal or a passenger effecting the level of crowding experienced by others on that services. It think it is important to realize and recognize this. However, from experience undertaking rail and other PT eco appraisal, accurately measuring the change in crowding levels is one of the most difficult, and I think fare to say least robust aspects of these appraisals. As such, I would suggest it is well outside of the scope of many active transport appraisals to try and venture down this path with an acceptable level of accuracy and robustness.
So that wraps up looking at the benefits and costs accruing to cyclists / walkers, car users and public transport system. Aside from the health benefits, these are all consistent with existing transport appraisal best practice and guidance. However, important to note this framework doesn’t capture ALL benefits and costs associated with Active Transport – only those that can be directly attributed. There are two types of these benefits – indirect benefits or un-quantified benefits:

- **Unquantified benefits.** Social Capital, which includes outcomes such as equality and welfare, positive mental health outcomes, better educational outcomes, decreasing crime and violence social cohesion
  - Hard to quantify and directly attribute’
  - Treasury notes importance

- Indirect benefits are things like increased economic activity (ie potential tourism opportunities) and the benefits they bring like increased jobs and increased economic outputs.
  - These benefits do not fall within the cost benefit analysis framework and are not quantified / should not be quantified in any cost benefit analysis. Capturing these is done through another economic framework called an economic impact statement
Fair to say demand forecasting of cycling and walking is behind the economics – hence it is a weakness in any framework. This is due to historic data limitations and modeling frameworks. Single greatest weakness is these demand inputs.

At the most basic level you can estimate a plausible range of demand through examining existing bike and ped counts, benchmark potential behavioral responses to changes in infrastructure and use historic growth forecasts.

A more detailed

- Mode choice models
- Stated preference research
- Demand elasticities

approach would be to use mode choice model – calibrated on Sydney stated preference research. Understand users perceptions to different infrastructure types (ie on-road path, dedicated infrastructure, shared use facility) relative to on-road cycling conditions. Another way to consider it is a bike user perceives that:

A 1KM trip along a busy road without bike lanes is equivalent to a 2.3KM trip on a quiet street or a 2.9KM trip on dedicated off road infrastructure. Ie people willing to travel much further, incurring a longer travel time, to avoid riding on a busy street,
However, it is very interesting to look where the demand for new active transport infrastructure is likely to stem from. One assumption is that new active travel users will be equally attracted from all modes – ie demand profile of new users will mirror the mode share of the area. However, intercept survey’s in Qld indicated this wasn’t necessarily the case.

### CAR
Major cities – where car mode share is up around 60%, only 5% to 15% of your active transport demand is going to stem from people switching.

### PT
Greater diversion in inner city areas where PT is provided at a higher level of service – but very unlikely to get this shift outside of inner city areas.

### Reassigned
Most demand is reassigned – ie current active transport users who have changed their route to take advantage of the new infrastructure.

### Induced
Small component in inner city areas – but much larger from other areas. Interesting, could this suggest that the other areas are starved for infrastructure?

### Questions:
Who were the users, and for what purpose were they travelling? Is this the bump in recreational use??

### Very different depending upon infra location
Apply the benefits

• Once we have the demand, and where this demand is coming from, we can apply the unit value parameters applied earlier. However, not all benefits get applied to all users.

• Must again stress that the areas quantified are those backed up the strongest data – hence some of the PT impacts identified within the framework around crowding, costing and operating costs have not been carried forward to the quantification stage.

**KM * $/KM to get benefits** – in 20 year app period 7% discount rate.

This was all great, and the culmination of a few years work. However, the reality is the much of the money spent on active transport infrastructure and policies is very small scale. It’s not big ticket items which would not usually be subject to this rigor of analysis, either because the size of the project didn’t warrant it.

Hence, we have tried to take all this and wrap it up in a usable tool that can be used in local councils and anywhere a decision has to be made around the prioritization and funding of active transport infrastructure.
Practical tool, backed up by a user guide.

**Understand** – strengths and weaknesses of a project.
- *Is the project currently meeting its stated objective?*
- *What would happen if………..*

**Optimise** – Make the project the best it can be
- *When is optimal delivery time? What is the impact of delaying it two years?*
- *Should it be delivered as dedicated or shared cycling infrastructure*

**Prioritise** – Where does the project sit within a portfolio
- *Cull unviable projects*
- *Priorities delivery of projects*
- *Understand network / portfolio synergies*
Quick Example

- Assume active transport capital cost is 5% of total project cost (5% x $338m = $16.9m)

- Average daily demand is 1,100 cyclists and 500 pedestrians

- Average cycling trip is 10 km, walking is 3.75 km (i.e. 45 min @ 5 km/h)

- Bridge reduces travel distance by 300 m

Importantly – it has an explicit recognition of the risk and uncertainly around some parameter values. It comes predetermined with the plausible ranges for these parameter values, based on current literature, and use a Monte Carlo simulation to produce results.
Benefit Cost Ratio

Best estimate: 1.0

45% chance that BCR < 1.0

95% confidence interval: 0.6 – 1.4

Source: PwC & EKM
Hope of how this can be used:

Pull RTA text
Finally, a big thanks to:

- Cameron Munro (CDM Research)
- NSW Premiers Council for Active Living
- NSW Roads and Traffic Authority
- NSW Office of Environment & Heritage
- Qld. Transport & Main Roads
- PwC Economics Team
Questions?

Rob Tyson
Associate Director, Economics & Policy
rob.tyson@au.pwc.com