How overwhelming is the evidence in favor of Road Diets? A note on the cost-benefit methodology proposed by Noland et al. (2015)

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Abstract (250 words)

Writing in these pages, Noland and colleagues recently proposed a methodology for cost-benefit analysis of 'Road Diets' (re-design of the cross-section of a four-lane arterial). On the basis of the proposed procedures, the authors conclude that a Road Diet of an empirical case study (in New Brunswick, New Jersey, USA) would provide 'overwhelming' benefits. The study team has employed similarly unambiguous language in statements in other public fora. In this paper, I do not take a view of whether Road Diets are in general desirable or not (which will depend heavily on local context). Rather, I demonstrate here that the specification of benefits and costs in the proposed methodology is systematically biased (upwards in the case of 'benefits' and downwards in the case of 'costs'). I also show that the authors mis-interpret public opinion regarding the proposed Road Diet; general public opinion cannot be known on the basis of the evidence that is presented to readers. Finally, it has been previously shown that transportation planners tend to, on average, systematically under-estimate costs and over-estimate benefits. While the authors' motivations during the study at issue cannot be known, the systematic bias in specifying costs and benefits is consistent with Flyvbjerg's 'political-economic hypothesis', in which it is theorized that planners strategically misrepresent costs and benefits in order to increase the likelihood of a politically-preferred project being advanced. Flyvbjerg suggests making independent peer reviews publicly available as part of a strategy to encourage accountability through transparency; this is the spirit in which the present paper is disseminated.

Keywords: Road Diet, Cost Benefit Analysis, Traffic Simulation

1. Introduction

Writing recently in the pages of this journal, Noland et al. (2015) proposed a cost-benefit methodology to support decision-making regarding 'Road Diets', along with an empirical case study of an urban arterial in New Jersey (USA).

The general term 'Road Diet' describes reconfiguring a roadway's cross-section such that the number of 'through' lanes for motor vehicle traffic is reduced. In the specific study reported by Noland and colleagues, the proposed 'full Road Diet' treatment on Livingston Avenue, New Brunswick (New Jersey, USA) would involve converting the four-lane cross-section (two lanes in each direction) to a three-lane cross-section (one lane in each direction, plus a center two-way left-turn lane) with flanking bike lanes on both sides of the carriageway for the length of the study corridor (see Figures 1 and 2). This four-lane-to-three-lane conversion is a typical Road Diet treatment (FHWA 2014).

In various fora, the study authors have described the 'benefits' of this proposed Road Diet as *"overwhelming"* with respect to its 'costs':

- Noland et al. (2015): "*Results* ***overwhelmingly*** *find benefits exceed costs over a 20 year period."* (p.1). *"Our benefit/cost analysis balances the costs of travel time delay with the benefit of reducing crashes, and shows* ***overwhelming*** *positive benefits outweighing the travel time costs associated with the Road Diet conversion*." (p.9).
- Noland (2015), in plenary presentation at an international forum on pedestrian/motor-traffic trade-offs: "*A cost/benefit analysis of a road diet is evaluated showing that for the case studied, the safety benefits are* ***overwhelmingly*** *positive, with only minor costs associated with extra traffic delay*." (p.1) "*The results of a cost/benefit analysis of one specific approach, a road diet, that reduces vehicle capacity is presented and shows* ***overwhelming*** *positive benefits*. (p.1) *In all cases, the net present value of the road diet conversion was* ***overwhelmingly*** *positive*." (p.14).
- Noland et al. (2014a): "*Our conclusion is that a road diet conversion for Livingston Avenue would be* ***overwhelmingly*** *beneficial for the City of New Brunswick and Middlesex County*." (p.24).
- Noland et al. (2014b): "*The benefits of crash reductions and the costs of increased delay are evaluated based on the value of statistical lives saved versus the cost of travel time. This is done for various different scenarios and includes robustness checks. Results* ***overwhelmingly*** *find benefits exceed costs over a 20 year period."* (Abstract)

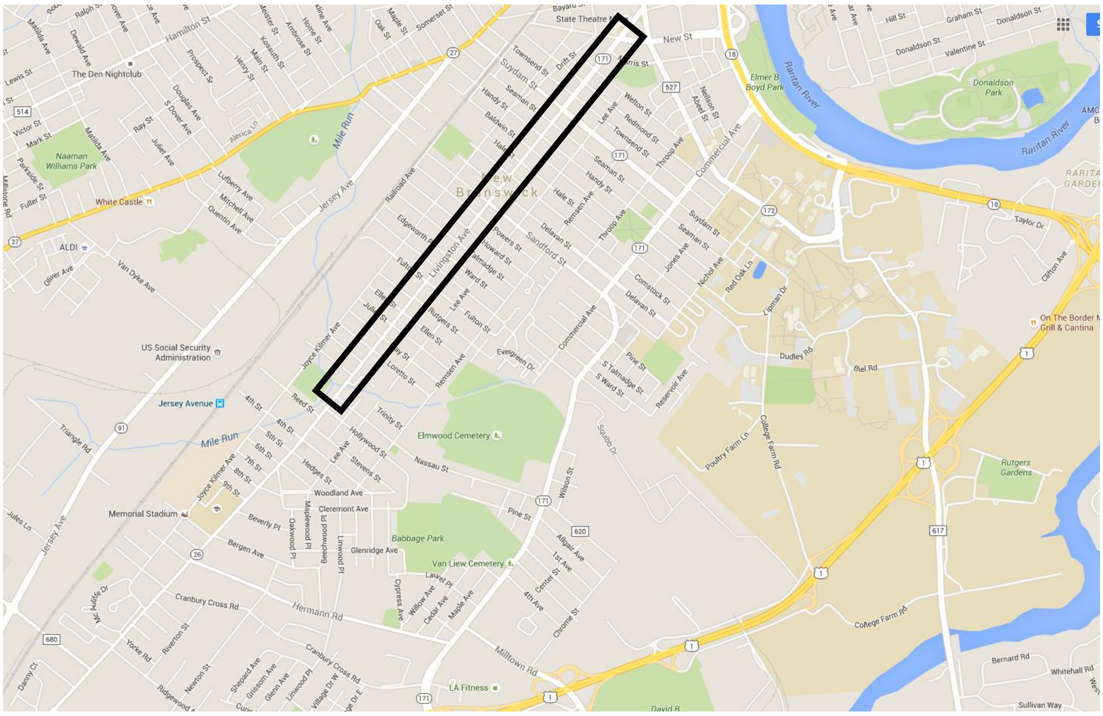

Figure 1: Context of Livingston Avenue, New Brunswick, New Jersey, USA. Extent of study area in the Noland et al. (2015) simulation analysis is highlighted.

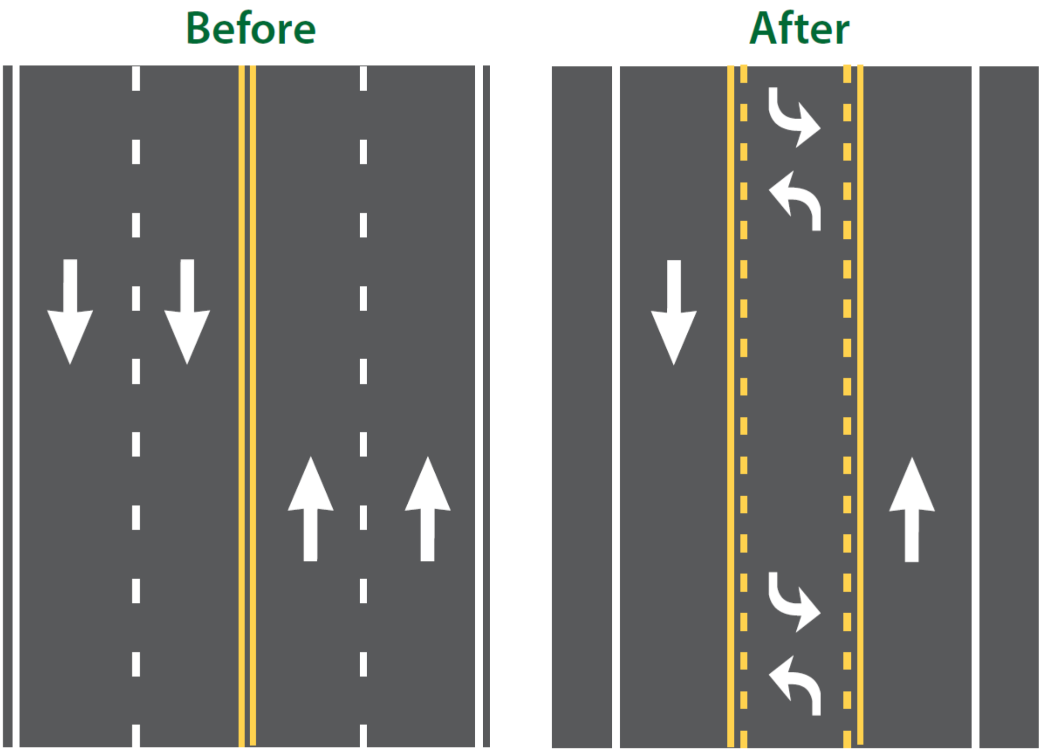

Figure 2: Typical Road Diet treatment showing a four-lane arterial (left) and two-lane arterial with two-way left turn lane (right). Reproduced from: FHWA (2014)

In addition to these public statements by the authors, there is evidence of planners elsewhere (Desmond and Hutchinson 2015) implementing the precise methodology (as well as the phrase *'overwhelmingly positive'* [p.101]) proposed by Noland and colleagues in this study. The study reported by Noland et al. has also been:

- synopsized on the Rutgers University (2015) public-facing web page, and posted in full on the University's *Bicycle & Pedestrian Resource Center's website*[1],
- referenced by other planners (Lowrie et al. 2015, Davis et al. 2015),
- featured in media targeted at both planning practitioners (Jaffe 2015a, 2015b, Calhoun 2015, Roberts 2015 and Smart Growth 2015 nationally, as well as Anand 2015 internationally) and the general public (Amaral 2014, Attrino 2014), and
- described as *"good, factual information"* by policymakers (Cangiano et al. 2014).

The proposed methodology is therefore of more than merely academic interest, as it appears to be having impact among the wider community of planning practitioners both in the U.S. and abroad.

In the remainder of this paper, however, I highlight a number of structural biases of the proposed methodology and the interpretation of findings. At issue is not whether or not Road Diets are in general a good idea, which will depend on local context. The objective of this paper is rather to demonstrate that the cost-benefit methodology reported in the case study cannot support a statement that the benefits are 'overwhelming', and does not represent good practice for planning practitioners to follow. While it might be that the proposed full Road Diet in the empirical case study will have benefits in excess of costs, this is not demonstrated by the methodology proposed in Noland et al. (2015).

In his seminal work on planners' use of cost-benefit analyses, Flyvbjerg (2005) documents systematic bias in cost-benefit analyses in favor of politically-desired projects (cf. also Wachs [1989]). Flyvbjerg proceeds to suggest making independent peer reviews available publicly as part of a strategy to encourage accountability through transparency. This note is disseminated in this spirit.

The specific flaws in the methodology are as follows:

1. The 'benefits' arise from an assumed 19% reduction in crashes, which is based on estimated crash rate reduction on a continuous (24/7/365) basis. By contrast, the 'costs' are assumed to be incurred only during two 3-hour periods during a representative weekday (on weekday mornings and weekday afternoons). The untested and implausible assumption is that no 'costs' in terms of traffic delays from the Road Diet would be incurred outside of these hours. The authors report no attempt to scale the estimated '6-hours-per-weekday' costs up to a 24/7/365 level that would allow an unbiased weighing against the 'benefits', nor do the authors describe this as a limitation or omission of this study.

2. The benefits are specified by the authors to be entirely due to the assumed 19% reduction in crashes along the Road Diet corridor, whereas

[1] http://njbikeped.org/wp-content/uploads/2015/10/Costs-and-Benefits-of-a-road-diet-conversion-paper.pdf

any countervailing increase in crash exposure on parallel routes due to motor traffic re-routing away from the Road Diet corridor is not taken into account. However, the original study from which the *"19% reduction in crashes"* value is sourced only took account of the Road Diet corridor itself, neglecting any increased crash risk on alternative routes from diverted traffic (Harkey et al. 2008). The authors of the 2008 study, as well as the author of a recent review of the evidence regarding Road Diets (Thomas 2013), clarified in personal communications that the correct interpretation of their findings are that the safety analyses encompass only the impacts on crash rates on the road diet corridor itself, rather than the full 'systemwide' effects (Harkey 2015, Thomas 2015). The systemwide effects are, by contrast, the correct and unbiased specification that should in principle be used in cost-benefit analysis.

3. The previous listed item is in conflict with the research team's assumption of an 8%-10% reduction in traffic volumes along the Road Diet corridor. The authors write that this assumption was made in order to prevent reporting that implementing the Road Diet would cause unacceptable congestion problems (during the PM peak period), and justify this level of traffic reduction by reference to the 'induced travel' literature [Noland and Lem 2001]). The unavoidable trade-off, however, is that either there will be lower traffic volume on the Road Diet corridor (in which case any 'costs' imposed by re-routed traffic, such as increased crash risk on parallel routes, must in principle be taken into account for the analysis to be unbiased) or there will not (in which case it is incorrect to run the traffic simulation analysis with a reduced level of traffic demand).

4. Despite describing their findings as *"very robust"* to future growth in traffic, the authors in fact assumed that traffic volumes are reduced below current levels (as described in the previous numbered item in this list) and present no evidence of having subsequently undertaken sensitivity testing in which any future growth in traffic volumes was taken into account. Instead, a non-standard treatment in which future-year *travel costs* were varied while traffic volumes were held constant was performed, which would have the effect of minimizing the calculated future-year costs. This non-standard methodology employed by the authors (which does not simulate any expected growth in traffic volumes) is inconsistent with the standard traffic-analysis procedures mandated by the relevant state-level Department of Transportation (NJDOT n.d.) given the expected traffic growth patterns of urban areas within the county in which the case study is located.

5. No account was taken by the authors of 'costs' associated with increased pollutant emissions, which can reasonably be expected to occur from the increase in delays to motorists. This category of 'costs' was not taken into account despite it being straightforward to estimate using outputs from the traffic simulation software that the authors employed (PTV 2012).

6. On the basis of protests (involving hundreds of people) in favor of the Road Diet, the authors put forward unsupportable conclusions regarding wider public opinion. It might be that the wider public (e.g. the approximately 40,000 adults in the municipality of the case study) is in favor of the proposed Road Diet at the studied location, but this is not knowable when the sole source of evidence presented is that protests took place by groups with a vested interest.

These issues are described in detail (in sequence) in the remainder of this paper.

2. Benefits accounted on 24/7/365 basis; Costs tracked 6 hours/weekday

There is a conceptual mis-specification in the time periods during which costs and benefits are tracked. The benefits (reduction in crash rates) are tracked on a 24/7/365 basis (approximately 8,760 hours per year), however the costs are summed across only three hours during weekday mornings and three hours during weekday afternoons (a total of approximately 1,564 hours per year). It is implausible that the proposed Road Diet would cause no additional delay to motorists outside of the six hours under study; therefore this methodology will systematically introduce downward bias in the estimate of 'costs' incurred due to traffic delays.

While it is standard practice in traffic impact studies to study only peak periods, this is because such impact studies are typically concerned with worst-case traffic demands for purposes of sizing road infrastructure (on the logic that network geometry/control that can accommodate peak-period demand can by definition also accommodate demand levels during off-peak periods). Traffic impact studies, however, do not typically attempt to perform cost-benefit analyses on the basis of aggregate costs (aggregated over an entire year) due to traffic delays, which is what the present study attempts to do.

A further element of systematic bias in the proposed methodology is that the authors report using average traffic counts for the three morning and evening hours. This is despite the typical observation that traffic is heaviest ("rush hour") during parts of the morning and evening periods and lower during other times (this is also the case for the Livingston Avenue corridor[2] under study; cf. NJDOT [2014]). Given that traffic delay increases more than proportionally in response to increasing traffic volumes when a road is congested (see Section #5

[2] For the AM and PM peak periods studied by Noland et al. (7:00 – 10:00 AM and 3:00 – 6:00 PM), the most recent (2014) publicly-available traffic count data from the Livingston Avenue corridor show average (across the two days sampled) bi-directional hourly traffic volumes of 1079, 1227, and 933 vehicles/hour during each of the three hours of the AM peak period and 1168, 1346, and 1453 during each of the hours of the PM peak period (NJDOT 2014). Thus the specification by Noland and colleagues of *constant* hourly traffic volumes during each of the two 3-hour periods results in traffic demand input into the microsimulation model that is 12% and 9% lower than the *actual* traffic volume during the AM and PM peak hours, respectively. This is in addition to the arbitrary 8-10% reduction in traffic levels input into the simulation, which is described in Section 4 of this Critique.

below), modeling a multi-hour peak period with stable traffic volume without accounting for maximum flows during the 'peak hour' (and lower flows on the 'shoulder' periods) will result in additional systematic bias (under-estimation of the 'costs' associated with traffic delays).

3. Systematic bias in the assumed 19% reduction in crashes

In the proposed methodology, the Road Diet's benefits consist solely of an assumed 19% reduction in crashes (these 'benefits' are weighed against the 'costs' of, solely, increased peak-period delay to motorists). The 19% reduction in crashes upon which the estimate of 'benefits' rests is justified by reference to Thomas (2013), who in turn references Harkey et al (2008) as the original source of the finding.

The methodology employed by Harkey et al (2008) takes no account of any effect of diverted traffic causing increased crash exposure at other segments/intersections on the road network, a fact which was confirmed through personal communications with the authors (Harkey 2015). This would be a reasonable assumption in the case of a proposed Road Diet that is not expected to cause an increase in travel times (e.g. through increased congestion), however this is not the case in the study reported by Noland and colleagues. Therefore, treating the expected 19% reduction in crashes on the Road Diet corridor as if it captures the full systemwide impact on crashes introduces systematic upward bias in the calculation of benefits.

As a countervailing effect, the Road Diet would be likely to reduce travel speeds on the corridor, a mechanism which would tend to reduce the frequency and severity of accidents on the corridor.

Noland and colleagues acknowledge that this 19% assumed reduction in crashes could be an overestimate, and report having performed sensitivity tests with reductions between a minimum of 16.5% and a maximum of 22.2%. The authors conclude that: *"Both of these are within the margin of error one would expect and [emphasis added] <u>given that this is the most conservative scenario</u>, it is clear that there would be net benefits from a road diet conversion".* (p.8). It is only accurate to describe the 16.5% reduction in crashes as the single "most conservative scenario" *that the authors chose to analyze*. It is inaccurate to describe this as the objective lower-bound of expected crash reduction, because no attempt was made to take account of the full 'systemwide' impact on crashes (including the expected increase in crash exposure on parallel routes). In order to credibly communicate to readers that the sensitivity analysis is a 'conservative' estimate of safety benefits would require undertaking straightforward analysis of 'costs' due to re-routed traffic that the authors do not report having performed.

Therefore, the assumed safety benefits are systematically biased upwards to an unknown degree; on the basis of the evidence presented by the authors there is no objective reason to believe that 16.5% (or 10%, as reported by the authors in another forum[3]) is in fact an appropriate lower bound (*"the most conservative scenario"*).

4. Inconsistency between diversion of traffic and assumed reduction in crashes

Noland et al. report that an assumed 8%-10% reduction of PM-peak-period traffic volume is required to avoid *"significant congestion and spillback"* (p.6) occurring after the introduction of the Road Diet. The authors suggest that this reduction in traffic would be likely to arise from the newly-caused congestion: *"if the road were to congest to the extent that our simulation suggested with a major spillback, then some drivers would opt to find different routes".* (p.6). From Figure 1, it can be seen that the road network in the vicinity of the Road Diet corridor is a modified gridiron pattern, with multiple alternative routing paths available to plausibly serve the origin-destination pairs served by the Road Diet corridor.

The problem is that these two assumptions are inconsistent: the assumed 19% reduction in crashes is based on *not* accounting for increased crash-risk exposure at nearby segments/intersections from re-routed traffic[4], but the authors indicate that a substantial re-routing of traffic volume would be *required* to prevent major congestion from occurring on the "Road Diet" corridor.

Furthermore, the authors explicitly acknowledge that their analysis *"does not account for any alternative routes that the 10% reduction in PM traffic may have taken to avoid the more congested road"*. (p.6). Having acknowledged that they neglected to account for this impact (as opposed to obscuring it) is to the authors' credit. However, it is inappropriate to systematically exclude costs that could in principle be readily taken into account (such as through defining the study area to also include intersections/segments that are likely to be impacted from the re-routed traffic).

In an unbiased analysis, systematic neglect of costs cannot be justified simply by noting that they have been omitted. This is especially inappropriate when the analysis has been interpreted by the study team to support their repeated public statements that the benefits of the proposed Road Diet are *'overwhelming'* with respect to costs. Noland and colleagues report analysis of a set of scenarios in which the 'full Road Diet' treatment was modified to result in reduced traffic congestion. However, the unambiguous statements made by the authors regarding the results of their cost-benefit analysis (see the *Introduction* above) communicate to readers the incorrect notion that all variations of the Road Diet have 'overwhelming' benefits.

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[3] In the non-peer-reviewed version of this study (Noland et al. 2014a), a sensitivity analysis assuming a 10% reduction in crashes is reported.

[4] We note that implementing changes to road geometry and/or traffic control on an areawide basis (in addition to the linear Road Diet corridor) could serve to reduce the negative effects of spillover traffic.

5. Non-standard and biased treatment of future traffic growth

Another inappropriate treatment of traffic demand in the simulation analysis is described by the authors as: *"while we did not run a simulation model with additional traffic [demand], we adjusted the travel cost for each scenario to assume a 3% annual growth in traffic over 20 years"* (p.9).

This methodology of not explicitly modeling increased traffic demand was employed by the authors despite them acknowledging that *"we might still expect some growth in traffic associated with further [real estate] development"* (p.9). It is not possible to know *ex post facto* why the authors chose to test a growth rate in *travel costs* rather than the standard treatment of annual growth in *traffic volumes* (the New Jersey Department of Transportation, for instance, mandates that traffic analyses employ a 1.0-1.5% background growth rate in traffic volumes in urban areas of Middlesex County, which is the county in which the proposed Road Diet corridor is located [NJDOT n.d.]). The non-standard methodology employed by the authors is, however, convenient if one were attempting to minimize the calculated 'costs' from delays to motor traffic. When a road segment/intersection is carrying traffic volume near to its capacity (as the Road Diet corridor would be, following the assumed 8%-10% reduction in traffic volume required to prevent volume from *exceeding* capacity), delays increase sharply (much faster than proportionally) with increases in volume (Speiss 1990). Therefore, if one were seeking to minimize the calculation of 'costs' due to traffic congestion in future years, it would be a convenient (but non-standard) assumption that traffic volumes would reduce from current levels and then would not increase in the future.

While the authors' motivations while performing this study are not knowable, applying a non-standard methodology (which is in conflict with guidance by the relevant state-level Department of Transportation, NJDOT [n.d.]) in a manner that flatters the calculation of 'costs' is consistent with the 'political-economic' explanation of systematic bias in cost-benefit analysis proposed by Flyvbjerg (2005). Flyvbjerg describes this as: *"Political-economic explanations see planners and promoters as deliberately and strategically overestimating benefits and underestimating costs when forecasting the outcomes of projects. They do this in order to increase the likelihood that it is their projects, and not the competition's, that gain approval and funding"* (p.9).

Finally, we note that Noland and colleagues write, despite performing no sensitivity analysis in which future-year growth of traffic volumes (or indeed current-day traffic levels) were tested in the traffic microsimulation model, that *"the results are very robust with respect to growth in traffic"* (p.9).

6. No effort to take significant categories of 'costs' into account

The proposed cost-benefit methodology takes account of one category of 'benefits' (the assumed 19% reduction in crashes) and one category of 'costs' (increased delay to motorists). In principle, cost-benefit analysis should explicitly consider all costs and benefits that can be readily quantified (Glaister and Layard 1994).

In the case of a proposed action that would impact traffic flow (either positively or negatively), impacts in terms of increased/decreased pollutant (and greenhouse gas) emissions can be readily established by analyzing the standard traffic microsimulation outputs. Noland and Quddus (2006), for instance, report one such analysis.

In the case of the proposed Road Diet, however, the authors report no evidence of an effort to take impacts on pollutant emissions into account. As the proposed Road Diet would increase delays to motorists (as well as increased vehicle-miles of travel from diverting some motorists away from their currently-desired route), it is reasonable to expect that pollutant emissions (and hence 'costs' arising from them) would increase (Barth and Boriboonsomsin 2008). Such effects can be readily estimated via the microsimulation analysis; failing to do so will tend to result in 'costs' being systematically underestimated. It also means that residents living adjacent to the Road Diet corridor are not informed by planners of the full set of trade-offs involved in a Road Diet conversion (i.e. a decrease in crashes alongside a potential increase in local-scale air pollutants).

7. Unwarranted conclusions regarding public opinion, and incorrect identification of the relevant cost-benefit analysis criterion

Finally, the authors write that after a particularly tragic vehicle-pedestrian crash in May 2014 involving young children, there was *"widespread demand in the community that something be done about Livingston Avenue"* (p.9). By way of reference to a local newspaper article (Cangiano et al. 2014) describing protests involving "hundreds" of people, the authors write that *"The protests suggested the public was very much in favor of changes"*, and that therefore *"public officials should be less timid in their approach to implementing positive changes that improve safety and walkability, even at the expense of potential delays to traffic".* This passage contains two major logical weaknesses.

The first of these weaknesses is that it is inappropriate to use an observed occurrence of protests as the sole source of evidence on which to draw a conclusion regarding wider public opinion (which in a democracy is presumably the relevant criterion). If a majority of voters/voting-age-adults/total-population (depending on the definition of the relevant population of interest) participated in protests, it might be reasonable to conclude that "the public is in favor" of the specific action requested by the protesters. This is not the case here (the "hundreds" of protesters described in contemporary news reports [Cangiano et al. 2014] represent, making generous assumptions, no more than 3% of the adult population of the municipality [US Census Bureau 2015]). Even in the unlikely case of a majority (50%+1) of the public taking part in a protest, it could not be concluded unambiguously that a majority of the public is in favor of the specific action. This is because participating in a protest involves making a public declaration of opinion, and it is possible that an individual may feel social pressure to make a public declaration that is at odds with their personal views which they would express in a secret ballot (the traditional mechanism for citizen participation in a democratic election) (Edwards 1957). Furthermore, it is a well-established phenomenon in governmental affairs that groups comprising a numerical minority with concentrated interests on a particular issue sometimes prevail over a majority with opposing interests, but whose interests are more diffuse (i.e. if each of the members of the minority stands to 'gain' more individually than each of the members of the majority stands to 'lose') (cf. Buchanan and Tullock 1962). In another context (that of a regulated industry with concentrated interests in opposition to the wider public interest), an analogous phenomenon has been termed 'regulatory capture' (Laffont and Tirole 1991).

The context of transportation planning is fertile ground for such phenomena; in the instance of this case study, residents living proximate to the road facility might be seen to have concentrated interests, whereas road users living further away from the facility might be larger in group size but have more diffuse interests in the outcome. Furthermore, in addition to the *magnitude* there is a second asymmetry in the *distribution* of costs and benefits among these interested parties, with vehicle-pedestrian crashes disproportionately imposing 'costs' on nearby residents, who reap proportionately fewer of the direct 'benefits' from the motorized mobility enabled by the road facility.

The second logical weakness with the passage quoted above refers to the prominent statement (the final sentence of the paper) that *"public officials should be less timid in their approach to implementing positive changes that improve safety and walkability, even at the expense of potential delays to traffic [emphasis added]".* Here the issue is quite straightforward: the well-established theory underpinning cost-benefit analysis (cf. Glaister and Layard 1994) is clear that the relevant decision criterion is to select the alternative with the maximum Net Present Value (NPV) if no exogenous budget constraint exists (NB: Noland et al. do not indicate that there is a budget constraint in this instance).

Performing cost-benefit analysis imposes rigor on decision-making and is therefore a laudable exercise, however the analyst's efforts are for naught if the appropriate decision criterion is not applied. The history of transportation planning is characterized by planners having arbitrarily 'favored' specific modes of transportation over others, with deleterious consequences (cf. Caro 1974, Plotch 2015). Cost-benefit theory instructs planners (and the policy-making 'public officials' that planners advise) to instead be guided by the objective results of dispassionate, rigorous and holistic cost-benefit analysis (including consideration of unquantifiable impacts), rather than an heuristic approach in which the decision criterion is the sign (positive or negative) of a proposed action's effects on individual dimensions of impact ('safety', 'walkability', 'delays to traffic'). A proposed action that improves safety and walkability at the expense of delays to motor vehicle traffic *may* be a 'positive change' in cost-benefit terms, though scholars must be clear to advise practicing planners that

Net Present Value is the appropriate decision criterion, rather than to advise public officials to be less *'timid'* in taking actions that would arbitrarily (in the sense of being outside of the realm of rigorous cost-benefit analysis) favor certain modes of transportation at the expense of others.

Rather than advising public officials to be less *'timid'*, therefore, the correct interpretation of the methodology proposed by Noland and colleagues is that planner-scholars and planner-practitioners ought to be more *'timid'* when performing and reporting cost-benefit analysis. Such *'timidity'* would involve designing cost-benefit analyses without biases, as well as not describing cost-benefit results to be *'overwhelming'* (or similarly unambiguous language) in favor of a proposed action when major categories of countervailing costs and benefits that could in principle have been quantified were not taken into account. It would also include making all reasonable efforts to take the full set of quantifiable impacts into account.

We close by noting that the planning profession's *Code of Ethics* states that "*We shall provide timely, adequate, clear, and accurate information on planning issues to all affected persons and to governmental decision makers"* (AICP 2016). As a profession, we must both undertake transportation planning studies to a higher standard, and exercise greater discretion in communicating our findings to policymakers and the public.

Epilogue

I have carefully reviewed Noland's rebuttal to this Critique (Noland 2016). I stand by all analyses and conclusions I have presented in this Paper, and leave readers to judge for themselves the relative strength of the arguments herein versus those in the Rebuttal.

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