

1 **INTRODUCTION**

2
3 The bicycle has a potentially valuable role to play in responding to the many
4 challenges cities face in relation to traffic congestion, injury and loss of life from road
5 crashes, local air quality, climate change, obesity of the resident population, energy
6 availability and security. There are many factors that affect the extent to which
7 bicycling functions as a viable urban transportation mode although research
8 consistently highlights the importance of adequate infrastructure (1) and supportive
9 policies (2, 3). The performance of the bicycle, in relation to other modes, is however
10 dependent on the physical ability of the rider and the rider's willingness to provide all
11 the energy needed to reach their destination. The provision of power assistance to the
12 rider therefore has the potential to expand the role of the bicycle in urban transport.
13 Consumers are being presented with an increasing range of electric bicycles, referred
14 to generically as E-bikes, but this emerging category of vehicle has received limited
15 attention from a transportation perspective.

16
17 Since E-bikes are very much in the early adoption stage in the USA, their limited
18 penetration into the urban transportation system presents a challenge to traditional
19 quantitative research methods which could be employed to enhance understanding of
20 this mode. There is a growing recognition of the role that qualitative research
21 techniques can play in the field of transportation research in general and travel
22 behavior research in particular (4). Qualitative research techniques have, for example,
23 have provided valuable insight into understanding the factors motivating early
24 adoption of hybrid motor vehicles in the USA (5).

25
26 While sections of the travel behavior research community are recognizing the value of
27 qualitative research the emphasis tends to be on focus groups (5) or ethnographic
28 interviews which seek to understand another way of life through the study of people
29 (5). Other professions have recognized that valuable insight can be obtained from
30 broader forms of qualitative research which can involve analysis of any unstructured
31 material, including customer feedback forms, reports or media clips (6).

32
33 The world-wide web represents an increasingly important form of media. Weblogs are
34 emerging as a rich source of information for multifaceted sociological studies
35 including social network analysis (7, 8, 9) and examination of engagement in
36 democratic processes (10). Research on blog hyperlink networks within the United
37 States found such links to be indicators of social relationships among American cities
38 (11). Information from blogs produced in specific American urban areas has been
39 found to reflect the political agendas, opinions, attitudes and cultural idiosyncrasies of
40 the general population of those places (11). Academic researchers who are exploring
41 the ways in which social computing affects and reflects society at large have been
42 characterized as 'blogologists' (12). Consistent with the nature and spirit of
43 'blogological' study, the research reported here employs an analysis of two US blogs
44 to provide insight into what may be emerging reactions and concerns about E-bikes in
45 the US.

46
47 The structure of this paper is as follows. The following section describes the nature of
48 the two high profile blogs which were subjected to content analysis. The themes that
49 emerged from the content analysis are then examined. Consideration is given to user
50 experiences and travel behavior impacts; non-user attitudes; road space allocation in

1 mixed traffic; safety; environmental impacts; terminology, communication and lack of
2 understanding. These various threads are then brought together in a section that
3 addresses issues and implications for the transportation profession. The final section
4 presents the conclusions from this study and identifies directions for research.
5
6

7 **DATA FOR THE STUDY**

8

9 To obtain insight into community reactions and concerns about E-bikes in the USA,
10 an analysis was undertaken of reader responses submitted following two articles on
11 electric bicycles which appeared on high profile web sites. The first was an article
12 which appeared on bikeportland.org while the other was on the New York Times web
13 site. While the views expressed by people who were motivated to submit responses to
14 those articles do not reflect those of a representative sample of the community, they
15 never the less provide an indication of the types of issues and concerns which may be
16 echoed in broader community views. As noted earlier, qualitative research and
17 exploration of narratives are proving valuable in the context of understanding
18 adoption of other electric vehicles (5). An alternative approach is taken here to
19 understand the emerging issues, at least in the eyes of some members of the
20 community, in relation to the vehicles.
21

22 *The articles*

23

24 The bikeportland.org article < <http://bikeportland.org/2010/01/29/is-portland-and-america-ready-for-e-bikes/>>, titled “Is Portland (and America) ready for e-bikes?”
25 appeared on 29 January 2010 and resulted in 56 responses being posted to the
26 associated blog on the web site. The article highlighted the profile of a new e-bike
27 (Sanyo Eneloop) at a recent Consumer Electronics Show and plans to install solar
28 recharging stations for e-bikes in Portland, Oregon. The article flagged that two
29 specialist e-bike stores had opened in Portland (they had featured in earlier articles on
30 the site) and that introduction of e-bike models from some of the industries largest
31 manufactures along with sales of the vehicles through large electronics retailers were
32 identified as forces which could drive down prices. The image problem of e-bikes was
33 noted (citing the refrain that “They’re not bikes”) and concerns expressed over how
34 they will mix with conventional bikes. The existing Oregon legislation was briefly
35 described (that is the vehicles must have fully operational pedals for human
36 propulsion, a motor with output not greater than 1,000 watts and a 20 mph speed limit
37 under motor assist). Reference was made to an unsuccessful Oregon Senate Bill from
38 2009 which sought to increase the speed limit for electric assisted bikes to 35 mph
39 and allow motors up to 5 horsepower (about 3,800 watts). The article argued that
40 current inadequate infrastructure “makes many people afraid to even try biking - and
41 simply giving them a motor won't change their mind”. The article closed with two
42 questions which served to stimulate responses: “What do you think about electric
43 bikes? Will 2010 be the year of the e-bike in America?”
44
45

46 The article in the New York Times titled ‘An Electric Boost for Bicyclists’ <
47 <http://www.nytimes.com/2010/02/01/business/global/01ebike.html>>, was published
48 on 31 January 2010 and generated 95 responses on the associated blog. This article
49 opened by referring to the high use of e-bikes in China (specifically Shanghai) and
50 used examples of commuters in the US (New York and San Francisco) to provide

1 local relevance. Comments were included about the growth of the electric bicycle
2 market worldwide and the strong proportion of sales in overseas market (one third of
3 the money spent on bicycles in the Netherlands in 2009 was stated to have been spent
4 on electric-powered models). The existing American market was characterized as
5 ‘modest’ (200,000 units were reported to have been sold in 2009). It was noted that
6 the major manufacturers were introducing e-bike models and one large electronics
7 retailer was testing a range of electric vehicles (predominantly e-bikes) in three of its
8 nationwide stores. The article noted the two types of models being offered into the
9 market. Power assisted bicycles where the user had to be pedaling to gain assistance
10 and the powered models that resemble Vespa scooters. The article indicated that the
11 latter could travel at “30 miles an hour with a range of 50 miles on a fully charged
12 battery”. It was noted that “These larger models are causing headaches for global
13 transportation planners. They cannot decide whether to embrace them as a green form
14 of transportation, or ban them as a safety hazard”. Some cities were said to be
15 studying the halfway measure of banning them from bicycle lanes while permitting
16 them on streets. The article referred to the work of Cherry (13, 14) who studied e-bike
17 riders in China and found that one in six electric bike riders would drive a car or take
18 a taxi if their bicycle were taken away. Cherry’s concerns over lead pollution from the
19 production and disposal of the lead acid batteries common in the Chinese e-bikes
20 were noted. Safety issues were also flagged, particularly in China where there were
21 reported to be high accident and death rates among e-bike riders. The article
22 suggested there was potential for these vehicles to encourage bicycle commuting in
23 the USA, particularly for older riders. However it was noted that increased use would
24 result in more conflicts between electric bike and conventional bike riders. The article
25 noted that the vehicles were illegal for use on New York streets and cited a case of a
26 user who was concerned over his inability to get accident insurance. The article closed
27 by flagging that existing bicycle culture could be a barrier because it emphasized
28 cycling as a sport and a form of exercise rather than as a utilitarian travel mode. A
29 quote from the editor of a major bicycle magazine, that “To the core cyclist, it’s
30 cheating”, closed the article along with the suggestion that the move by some retailers
31 to sell the vehicles through electronics shops rather than bike shops was a response to
32 the cultural reaction that these vehicles are not real bicycles.

33
34 At the very least these two articles and the web sites where they appeared would be
35 expected to appeal to very different types of readers – one with a stronger interest in
36 cycling, the other read by a broader cross section of the community. The responses to
37 the New York Times article were also more geographically spread – not only in the
38 US but also from overseas.

40 **THESES EMERGING FROM THE RESPONSES**

41
42 The entries on the blogs were copied into a spreadsheet and individually reviewed.
43 Following a first pass through the data, an initial set of themes were identified and
44 then each entry was reviewed and a series of indicator variables added to highlight the
45 key themes associated with each entry. Sorting by the indicator variables then
46 grouped the entries associated with each theme. There was no clear distinction in the
47 types of issues readers raised in relation to the two different articles. Consequently, in
48 discussing the themes that emerged, examples of the responses to both articles are
49 included. Some of the posts were off topic and they are not considered here.

50

1 **User experiences and travel behavior impacts**

2 Both articles generated responses from users of electric bicycles which provide either
3 first or second hand tangible examples of the use of the vehicles for utilitarian travel.
4

5 *I completely switched my NE-downtown commute from car to ebike almost a*
6 *year ago, and am loving it. I still ride my bike regularly, but the ebike really*
7 *makes the difference between fair-weather and year-round commuter for me -*
8 *I haven't commuted by car since. Saving a lot on gas and parking is a nice*
9 *extra, too. I'm 'one less car', too.*

10
11 *At a group ride in Portland last year I met a very nice 70 yr old lady. She*
12 *commutes from her home in SE to Vancouver year round on the 205 bike path.*
13 *I didn't even notice her bike had electric assist until we hit the hill and I heard*
14 *the motor click on. She apologized for "cheating" but said her arthritis would*
15 *prevent her from riding 25+ miles every day without it.*

16
17 *It's too hilly where I live. I wouldn't be able to get off my own street! The ebike*
18 *really makes the difference between fair-weather and year-round commuter*
19 *for me. Ebikes are what enabled me to move from admiring bicycles to*
20 *actually -riding- them.*

21
22 *My wife and I have been riding our electric bicycles for a few years now. Top*
23 *speed is 17mph, and distance is 25 miles (best case scenario) Initially, we*
24 *got them because we live high atop a hill, and until electric bikes became*
25 *available, there was no way we could ride bikes in our town and reduce our*
26 *carbon footprint. These bikes are a great alternative to using the car, and the*
27 *benefits to the community include fewer cars on the road and less air*
28 *pollution. Our bikes require that we pedal, too, so we are more connected to*
29 *the experience of riding them than if we were on scooters.*

30
31 *I've been a bicycle commuter for nine years. I converted my .. bike to electric*
32 *with a .. kit - .., late last Spring and so far have put on over 1,600 miles,*
33 *commuting from hilly Washington Heights down to where I work on the Upper*
34 *East Side. The motor cuts off automatically at 20 MPH. It partially recharges*
35 *when I brake and go down hill. The battery charges in 2 hours or less plugged*
36 *into the AC at home. It's pedal assisted. I pedal all the time, but with less*
37 *resistance. I love it. It's liberating, in that I don't need to adjust my route to the*
38 *"path of least resistance", avoiding streets with steep hills. I can stop and buy*
39 *groceries - including a gallon of milk and I can still climb the hills home*
40 *without breaking too much of a sweat.*

41
42 *I am an avid e-bike rider. It has gotten me out of the car for those longer trips*
43 *(5-15 miles) that I would not have considered doing on a bike.*

44
45 *I'm 57 years old, a long time urban and cross country rider, and a long time*
46 *corporate cube worker. I bought my first e-bike kit, ..., about two years ago.*
47 *After 100 + commuter trips of 15 hilly Cincinnati miles each way, I upgraded*
48 *to my current .. lithium-ion setup e-bike ... Now my wife rides the (older) rig,*
49 *and I have the newer, more predictable setup. I'm the only person in our*
50 *entire outer-belt office part that regularly commutes to work by bike.*

1
2 *For older people there also are adult trikes -- three wheelers -- that are very*
3 *stable and have a large basket over the two rear wheels for shopping, etc. You*
4 *can buy them already with an electric motor installed or buy a conversion kit.*
5 *I had my adult trike converted and love the assist I get going up hills.*
6

7 *I've been riding an electric bike in Seattle for about three years, and*
8 *commuting to work on it almost daily.*
9

10 *I bought a ... Bike last summer and found it to be the perfect commuting bike*
11 *-- legal to ride on the bike trails, which are myriad and beautiful in the Twin*
12 *Cities -- and I can pick the level of "assist," for greater or lesser exertion on*
13 *my part. The bike has two lithium batteries, which I remove and recharge just*
14 *like my phone.*
15

16 *You also see all the restaurant delivery guys riding them so they really have a*
17 *tinge of downscale.*
18
19

20 The user experiences reported above paint a picture of the market for E-bikes which
21 includes the following dimensions:

- 22 - these vehicles are used for utilitarian travel including commuting to work,
23 shopping (assistance with load carrying) and as inner city delivery vehicles
 - 24 - there is evidence that use of these vehicles replaces car trips
 - 25 - they help to overcome constraints imposed by geography in the context of
26 longer distance trips (beyond a trip length which the user would feel
27 comfortable on a conventional bike) and in hilly areas
 - 28 - They potentially suit older riders, or individuals who have a medical condition
29 such as arthritis, which makes riding a bicycle difficult.
- 30

31 Parker (15, 16) has previously argued that these vehicles present a mobility option for
32 the elderly and lame who are unable, or find it uncomfortable, to ride a conventional
33 bicycle. The examples cited above reinforce that market niche.
34

35 Not all respondents to the articles gave their name and so it was not possible to assess
36 whether more women than men were indicating they used these vehicles for utilitarian
37 travel. Parker (17), referring to Japanese data from 1997 to 2002, notes that in relation
38 to the E-PAB markets, nearly three-quarters of purchasers in Japan were women
39 while about two-thirds of all purchasers were over 50 years of age. Informal feedback
40 from two E-bike retailers in Portland (Geoffrey Wagner and Wakefield Greg,
41 Personal communication) suggests their sales are about equally split between men and
42 women. Reflecting the underrepresentation of women in cycling (18, 19) there is
43 certainly not an even split in sales of conventional bicycles to men and women. This
44 aspect of E-bike use which warrants further examination because of the implications it
45 could have for increasing women's involvement in cycling.
46

47 In contrast to the examples provided above, a post from a California manufacturer
48 provided a different perspective on the experience from the purchasers of their
49 bicycles:

1 *Many are missing the point of electric bikes in the US. As a manufacturer of*
2 *nearly 1000 electric bikes, I can attest that the buyers of these bikes are not*
3 *using them for commuting or exercise. They are baby boomers who are buying*
4 *them to have fun. Do they eventually use them for trips to the store, bank, etc.?*
5 *Yes, because it is more fun to go to the store that way. Do they get exercise on*
6 *them? Absolutely since people tend to pedal most of the time while riding. Are*
7 *they being eco friendly? Better than driving a car to the market. These people*
8 *remember how much fun it was riding a bike as a kid but today there is just a*
9 *hill or headwind that they do not want to fight. So, because they are not*
10 *willing or capable to struggle up some hill, they should not be allowed to ride*
11 *at all? Electric bikes allow them to get back on a bike and be a kid again.*
12

13 This manufactures comment about the vehicles not being used for commuting is
14 clearly not applicable to all models since some respondents comments highlighted
15 above include examples of the use of these vehicles for commuting. The perspective
16 provided by the California manufacturer does however provide insight into a potential
17 alternative pathway into utilitarian cycling even if the E-bike purchase is initially
18 motivated by a desire for recreational riding.
19

20 **Non-user attitudes**

21 The reader responses highlight a range of user views ranging from supportive to un-
22 supportive. At the supportive end of the scale, there tended to be a focus on the
23 potential role that e-bikes could have in reducing what would other wise have been an
24 auto trip:

25 *I would much rather see him riding an e-bike than driving a car if he's not*
26 *gonna commit to the effort involved with normal cycling.*
27

28 *I think these electric bikes could be one of the most significant developments*
29 *in transportation in years, much in the way that the Prius brought Hybrid cars*
30 *to the masses -- yes I'm serious. It basically makes bike commuting feasible for*
31 *a larger audience who may not want to pedal so far.*
32

33 *I agree, electric assists are never going to be for everyone, but I think they*
34 *may fill a valid niche in Portland, and America.*
35

36 *I am all for it, if it gets more people on bikes and out of their cars.*
37

38 *I have to look past my personal distaste for e-bikes and say if they help people*
39 *who would otherwise not ride bikes, then more power to them.*
40

41 *I'd *love* to see these catch on with the on-the-fencers in Portland, because*
42 *then there'd be actual success stories. From there, the marketing writes itself,*
43 *they start catching on in other places, demand increases leads to increased*
44 *production leads to lower sticker price, and then you've got a winner for a*
45 *number of communities. It's no Grail to be sure, but it's got potential to get*
46 *people out of their cars, and that's great.*
47

48 *Ebike haters, you know what will happen to you some day? Your body will not*
49 *be able to do what it does now. Maybe it'll be a blown knee, illness, whatever.*

1 *But your commute won't necessarily change because of that. Why hate on an*
2 *evolution that will let bike commuters STAY on their bikes?*

3
4 In the eyes of these current non-users, the potential for E-bikes to reduce car trips is
5 perceived to be a major advantage. While the examples of other responses cited
6 earlier provide reinforcement that these vehicles are being used for utilitarian travel,
7 and in some cases reducing car trips, there is certainly a need for a greater
8 understanding of the role that E-bikes play in the context of household mobility
9 decisions (20). Of particular interest is understanding the extent to which these
10 vehicles are substituting for bike, transit or auto trips. Alternatively they would
11 potentially moderate growth in motor scooter and motor cycle demand which is a
12 concern in many jurisdictions where strong growth in motorcycle and motorbike
13 registrations are translating into not only great numbers of crashed but also more
14 severe crashes (21, 22).

15
16 On the other end of the spectrum it was clear that e-bikes generate some very strong
17 negative emotions on the part of people who see themselves as 'true' or 'pure'
18 cyclists:

19 *Electric bikes are lame. As a year-round cyclist, I look upon people who use*
20 *these contraptions with utter disdain.*

21
22 There were even strong views about where the vehicles should, or more specifically,
23 should not, be sold.

24 *They shouldn't be sold in bike shops. They're not bikes!!!*

25
26 While framed negatively, this perhaps flags the potential for different retailers to
27 appeal to different segments of the market. A major electronics retailer like Best Buys
28 might stimulate interest in someone who may not have even been thinking about an E-
29 bike, because that was not their purpose in visiting the store. Alternatively, being
30 presented with the E-bike option in an electronics store might stimulate interest from
31 someone who might not have regarded themselves as a cyclist in the first place and
32 might therefore have been unlikely to go into a conventional bicycle retailer looking
33 for a vehicle to cater for their mobility needs. Alternatively, there are many specialist
34 e-bike retailers. Customers are likely to go to those establishments because they are
35 already at least thinking about an e-bike. Alternatively, some consumers might
36 perceive that a traditional bike store is where they would head to make a purchase and
37 the E-bike becomes one of the options they are presented with at the store depending
38 on whether the store they visit offers E-bikes. While this discussion highlights a range
39 of options for how greater variety in retail supply may influence E-bike demand there
40 is clearly a need for further research to quantify the relative contribution that the
41 different retail channels makes, or could make, to growth in demand.

42
43 Others, however seemed less convinced about the future of E-bikes:

44 *So we're not going Segway after all?*

45
46 Technology diffusion is often characterized as following a somewhat predictable
47 transition as the market grows from innovators, to early adopters to the early majority,
48 to the late majority and finally to the laggards (23). Moore (24) conceptualized that a
49 chasm exists in the early adopter market which can be difficult for some products to
50 cross. In that regard, the Segway could well be an example of a product which

1 has/may struggle to cross that chasm meaning that wide spread uptake is not
2 guaranteed. The same uncertainty exists about the uptake of e-bike technology and its
3 variants.

4
5 The price and underlying battery technology was also flagged as an issue:

6 *Sticker shock and uncertainty about expensive battery replacement keeps me*
7 *from buying.*

8
9 *Battery technology has been the big stumbling block as it has been for all*
10 *electric vehicles.*

11
12 However there is already a strong conversion market which could present an
13 alternative for many users:

14 *For those that see the price tag as excessive, there are conversion kits*
15 *available to turn your favorite second bike into an e-bike.*

16
17 E-bike batteries have certainly evolved over time. Relatively few models in the US
18 market today come with heavy Sealed Lead Acid (SLA) batteries. Those batteries
19 have largely been replaced by Nickel Metal Hydride (NiMH) and Lithium Ion (Li-
20 ion) batteries. Ulrich (25) has undertaken research to estimate the technology frontier
21 for personal electric vehicles. That research highlights the trade-offs between cost,
22 mass and range. In relation to E-bikes, the technology frontier equates to an increase
23 in retail price of about \$38 for each kilogram reduction in vehicle mass (primarily a
24 function of battery technology) (25). Apart from the capital cost of the battery there
25 will be a need for users to replace batteries over time and while battery prices
26 continue to decline, E-bike purchasers do face uncertainty over the replacement cost
27 for the battery. When assessing the mode as a travel option there is a need for users to
28 factor into their estimated travel costs not only the cost of energy to recharge the
29 battery but also the amortized replacement cost for the battery.

30 31 **Allocating road space to E-bikes**

32
33 There was a range of quite strong views expressed about the most appropriate place in
34 the road system for E-bikes

35
36 *I think there is a distinction between power assisted eBikes that give a little*
37 *extra boost as one pedals and those that are really just electric mopeds that*
38 *don't require pedaling. The latter are better than their gas burning cousins but*
39 *should be treated as motor vehicles and kept out of bike lanes.*

40
41 *Electric bikes are a good idea, especially extending out for longer, hillier*
42 *commutes into the suburbs, but they should take lanes away from cars, not*
43 *from regular bikes.*

44
45 *I absolutely do not want these in bike lanes, anything with a motor should stay*
46 *out.*

47
48 *There should be some kind of weight and max speed limit to electric bikes. If*
49 *your bike weights more than you, then it's a scooter not a bike, and if it can go*
50 *faster than you could ever peddle then it's a scooter.*

1
2 To a certain extent these comments reflect concerns over the safe operation of E-bikes
3 when mixed with conventional bicycles. That safety dimension is explored in more
4 detail in the following section. To a certain extent it is not unique to E-bikes since it
5 also reflects the issues which arise in when pedestrians and bicyclists mixed in share
6 use facilities.

7
8 One other contributor highlighted that the key lay in greater sharing of road space:
9 *Banning electric cyclists from downtown simply ignores the reality that there*
10 *is a need for cooperative sharing of the road.*

11 **Ensuring safety in mixed traffic**

12 Concerns over safety clearly resonated with a number of respondents to the articles as
13 illustrated by the following examples:
14

15
16 *Most of those e-bike they're having problems with in China and NYC are not*
17 *so much the low-powered pedal-assist kind. They are electric scooters that go*
18 *around 35 mph.*

19
20 *I don't like the idea of an ebike whizzing past me going 18-20mph on the bike*
21 *path, much as pedestrians dislike urban assault cyclists whizzing by them*
22 *going 12-16mph on the MUP.*

23
24 *I can understand people that don't want ebikes in the same space as bikes and*
25 *pedestrians. 20mph would certainly be an unsafe speed for both ebikes AND*
26 *bikes in a busy urban path or bike lane, especially when you throw pedestrians*
27 *into the mix.*

28
29 *However, the question 'How is it possible that lady is going so fast?' is more*
30 *accurately 'Why is everyone on an electric or small displacement ICE bicycle*
31 *going flat out' ? Over ten years watching electrics in Florida, not once did I*
32 *witness either conveyance operated at a moderate speed. Yes, almost run over*
33 *by one running silently at 20 mph.*

34
35 *We've had quite a battle on this in Toronto. ... Dealers are selling Vespa-like*
36 *vehicles that really can't be pedaled. If these are used in a bike lane, they*
37 *block and cut-off narrower normally pedaled bikes - I was hit by one.*
38 *they are heavy and can cause serious damage. They are motorized vehicles*
39 *and should be seen for what they are. The fact that they are electric-powered*
40 *is irrelevant to use in bike lanes and parks. We don't allow a Prius into the*
41 *bike lane either.*

42
43 *Power-assisted bikes also need significantly enhanced braking capability for*
44 *safety, including both mechanical brakes as well as larger tire "footprints" to*
45 *compensate.*

46
47 *Sharing the very few bike lanes in Montgomery County, Maryland, with an*
48 *increasing number of bikes resembling motor scooters in speed will increase*
49 *risk. Not risk from responsible riders but risk from those who are now going at*

1 *speeds which are multiples of what they normally achieve and the addition of*
2 *those who think this performance entitles them to some special consideration.*
3

4 *I worry about the inevitable wandering of attention that occurs when a rider*
5 *isn't required to put forth any significant effort to motivate. There is a*
6 *sharpening of the senses that arrives in bicycling (ask any regular cyclist) that*
7 *has to do with the direct connection between muscles and motivation, and that*
8 *will be notably absent with e-bikes. So people will ride their e-bikes at 30 mph*
9 *(which is a pretty exhilarating speed if you're pushing to get it,) listening to*
10 *their iPods, minds wandering, and they'll have accidents. This is going to*
11 *happen; it's inevitable, and it will be exacerbated by both the lack of*
12 *protection (expressed correctly in the article) and by the general lack of*
13 *experience in bike-handling at speed.*
14
15

16 Some contributors tried to place the maximum speed of E-bikes into perspective:

17 *I notice several commenters suggesting that because electric bikes often reach*
18 *30 miles per hour, they should therefore be banned from bike lanes. It may*
19 *come as a shock to non-cyclists, but I (and tens of millions of other bicyclists)*
20 *reach 30 mph (and beyond) routinely. True, I don't maintain that speed, but*
21 *the notion that the typical electric bike is much faster than the (sprinting) top*
22 *speed of a conventional bike is simply false.*
23

24 *In fact my 1000W 48V OR maximum allowable motor size pusher trailer won't*
25 *go any faster than 20 mph under motor and due to the regen feature will only*
26 *go about 24 mph max, even down steep hills. But it allows me to scoot across*
27 *intersections and stop for stop signs and carry more cargo while doing so.*
28

29 The safety concerns reflected in the above comments relate particularly to the size of
30 the vehicles, their weight, speed and braking capacity and the fact that the electric
31 vehicles are quiet. There may be a need for transportation agencies to undertake
32 communication to raise awareness of riders to the need for caution if they are riding
33 an e-bike at a speed that they would not normally achieve on a conventional bike. The
34 potential safety implications for vulnerable road users of the relatively silent operation
35 of electric vehicles is certainly being recognized in the context of electric cars. The
36 recently released European Commission strategy on clean and energy efficient
37 vehicles (26) commits the EC to review, by 2012, whether the quietness of electric
38 vehicles is potentially dangerous to vulnerable road users.
39

40 From a safety perspective, it is interesting that one respondent highlighted the positive
41 impact the power assistance had on increasing propensity to stop for stop signs. That
42 triangulates with the findings from a Canadian where E-bikes were loaned to
43 commuters (27). Some participants in the trial reported an increased tendency to obey
44 road rules (specifically relating to mandatory stops) because of the motor assistance
45 available to help with the standing start.
46

47 The responses to the on-line articles also highlighted that there are already problems
48 with other types of motorized vehicles using bicycle facilities:

49 *I've seen more motor scooters, 'pocket bikes' and lawn mower engined bikes in*
50 *bikes lanes and off-street paths than ebikes.*

1
2 This perhaps flags that enforcement is already a challenge in some contexts. It may be
3 unrealistic to assume that enforcement will be an effective response to any issues
4 which arise from growing E-bike use particularly where there are major differences in
5 the performance of the vehicles in the mix. Taken to an even greater extreme in terms
6 of dramatic differences in performance of vehicles, there was considerable public
7 debate in Australia recently following a proposal from Motorcycle Riders Association
8 in Victoria, Australia for motorcycles to be given access to bicycle lanes (28).

9
10 However many contributors recognized that it is the user rather than the vehicle itself
11 which generates the problems:

12 *I don't think the case of someone riding an eBike against traffic uphill weaving*
13 *in and out of traffic is saying something inherently bad about an eBike, sounds*
14 *like an inherently stupid person riding it. I agree, give them something that*
15 *will minimize the effect of their reckless behavior, which they would still be*
16 *doing no matter their means of transportation.*

17
18 *First, dangerous speeds and unsafe riding is an issue for regular bikes right*
19 *now, today. As advocates of biking, we need to get our own house in order.*
20 *Adding ebikes into the mix gives us more leverage to require more and better*
21 *education of all road users police on safe and courteous road sharing.*

22
23 *I have only gotten smiles and good comments from pedestrians and other*
24 *cyclists the last 10 years I have been riding motor assist because I ride with*
25 *courtesy and respect for others.*

26
27 *I disagree that mixing ebikes with regular bikes adds to the potential for*
28 *accidents. In Seattle it is legal to ride on bike trails, streets and sideways, and*
29 *I ride on all three. My preference would be to ride only on trails and the*
30 *street, but sometimes in heavy traffic going uphill I don't feel safe, so I ride on*
31 *the sidewalk, always taking care to slow down and watch for pedestrians and*
32 *cars entering and exiting streets from driveways and parking lots. It is*
33 *extremely rare in Seattle for bikes to injure pedestrians. The overwhelming*
34 *majority of pedestrian and cyclist injuries are caused by cars.*

35
36 One contributor pointed to the desirability of considering speed limits:

37 *It seems that the solution is just limiting the speed - both via technology and*
38 *with speed limits. Many towns and counties have bike speed limits for bike*
39 *trails - why not apply them to bike lanes?*

40 41 **Environmental Impacts**

42 Concerns over environmental impacts reflect dimensions of how the vehicles are
43 charged or how the batteries are recycled, or disposed of, and also the relative
44 efficiency of converting fuel to mobility in the case of both conventional and e-bikes:

45 *And when these things get plugged in to recharge, they will add to the*
46 *electrical consumption which pollutes the air. Great... a bike that pollutes.*
47 *Just what we needed.*

1 *I don't have a problem with it as long as the source of the energy is clean. I*
2 *think the idea of having solar recharging stations is great. Battery life and*
3 *recharge time will be important issues for this product.*

4
5 *Pollution from lead acid batteries is not a concern. They are entirely*
6 *recyclable and there is an active program to do here in California.*

7
8 *If you want to get all technical the human engine is less efficient at converting*
9 *fuel(food) to mechanical energy than an electric motor. The production of*
10 *food with anything other than sunlight and rain water consumes more*
11 *resources. That being said most Americans consume more fuel than they burn.*

12
13 A key issue is however the alternative, as highlighted by one contributor:

14 *Even without "clean" energy, charging an e-bike to make a trip from an outlet*
15 *is far more energy-efficient on a macro scale than the same trip made via car.*

16
17 One of the potential advantages of the lower power requirements of E-bikes is that
18 they are potentially an electric urban mobility option where solar charging is a
19 feasible alternative to grid recharging, particularly where the grid is supplied from
20 carbon intensive generators. In that vein, Sanyo recently completed installation of two
21 'Solar Parking Lots 'for E-Bikes in Tokyo (29). The power generated from the solar
22 panels installed on the roof is stored to be used to recharge the E-bike batteries and
23 illuminate the parking lot lights.

24 25 26 **Terminology, Communications and lack of understanding**

27
28 A number of comments reflected a degree of confusion about E-bikes and the
29 associated regulations. For example, one respondent sought clarification:

30 *Ebike, That does mean electric-assisted bikes, by the way, not some kind of*
31 *online virtual bike.*

32
33 This triangulates with a comment from a bike retailer in Portland Oregon. A sandwich
34 board outside the store flags the showroom of 'e-bikes/bikes'. Some people come into
35 the store and ask what the 'e' in 'ebike' stands for perhaps because they are used to
36 ipods, ipads and iphones (Todd Peres, Greenlight Bikes, LLC, personal
37 communication).

38
39 Other responses flag a lack of understanding about the regulations surrounding these
40 vehicles:

41
42 *Aren't electric bikes considered motorized vehicles and, therefore, subject to*
43 *motor vehicle laws as far as registration and licensing goes?*

44
45 Transportation agencies need to be aware of potential confusion regarding the
46 regulations and could consider how they can provide information to support
47 responsible decisions people make about the purchase and use of these vehicles.

48
49 There also broader issues for transportation agencies to consider for example where
50 they stand overall on this class of vehicle and importantly what policy instruments

1 they wish to use to either encourage or discourage their use. Advocacy and
2 information are potentially important policy levers that they can use to influence
3 consumers. To what extent are transportation agencies providing clear information to
4 support informed consumer choice about these vehicles where their use supports the
5 outcomes or objectives what the transportation agency seeks to progress?
6

7 The concerns over safety also have implications for the need for more comprehensive
8 data to understand the emergence of issues requiring attention. Since many existing
9 crash reporting systems focus solely on cases where a motor vehicle is involved,
10 researchers and policy makers may have to look to hospital admission data for insight.
11 In that case, it is possible the records may not clearly indicate if an E-bike was
12 involved in an incident and so under-reporting and erroneous reporting are likely to
13 undermine the quality of the data.
14

15 **ISSUES AND IMPLICATIONS FOR THE TRANSPORTATION** 16 **PROFESSION**

17
18 The discussion presented here serves to highlight a number of issues of relevance to
19 the transportation profession.
20

- 21 • There is an ongoing need to monitor the effectiveness of regulatory structures
22 as the market responds to what it sees as opportunities. Vehicles which adhere
23 to the letter but not the spirit of the law (e.g. large footprint, heavy scooters
24 with nominal pedals) have the potential to create conflict and safety issues and
25 need to be carefully monitored. There may be a need to consider the role of
26 rider education and perhaps licensing, or motor vehicle driver education, to
27 ensure riders are aware of their rights and responsibilities as road users and
28 also to ensure that non-users appreciate the legal status of these vehicles.
29
- 30 • There are reader responses which suggest that at least some parts of the
31 community are perhaps poorly informed about this class of vehicle and the
32 regulations which govern their use. Question therefore arise about the extent to
33 which retailers will provide adequate information for consumers or whether
34 transportation agencies need to ensure that they make information available to
35 support informed consumer decisions.
36
- 37 • From a demand side there is a need for deeper understanding about how E-
38 bikes sit relative to other options because that has a bearing on the green
39 credentials of the mode. Are these vehicles substituting for motor vehicle trips
40 or bike trips? In what ways are they doing that?
41
- 42 • Improvements in battery technology will impact this sector just as they will
43 with other types of electric vehicles. Over time most that is likely translate
44 through to lower prices and or improved battery performance for the same
45 price. That could be expected to stimulate the market and so there is likely to
46 be a greater number of these vehicles to manage as part of the transportation
47 system.
48
- 49 • A range of issues arise about the integration of E-bikes with others on multiple
50 user paths, bike paths etc. To a certain extent those issues are similar to those

1 that arise when pedestrians and conventional bicycles interact on shared use
2 paths.

3 4 **CONCLUSIONS**

5
6 The transportation community has traditionally relied on quantitative analysis to
7 advance understanding. For emerging issues and technologies there is a growing, but
8 still relatively small, awareness of the value to be gained from qualitative research.

9
10 Given the magnitude of the challenges facing mobility in urban areas it is important
11 for the transportation community to be aware of not only existing, but also emerging
12 options. E-bikes have the potential to play an important part in the urban
13 transportation mix but they are a mode about which little is known particularly in the
14 context of developed countries.

15
16 This paper has demonstrated the insight which can be obtained from content analysis
17 of blog entries posted in response to two on-line articles in the US about E-bikes. It is
18 acknowledged that the data is not drawn from a representative sample of the US
19 population and so there is a need to exercise caution in drawing conclusions for the
20 issues which emerged. The blog entries provide evidence of the use of E-bikes as an
21 urban transportation mode which replaces car trips and opens bicycle style travel to
22 those who would otherwise be impeded by local geography or health. The relatively
23 higher attractiveness of E-bikes to women riders is potentially important from a policy
24 perspective and worthy of further more detailed examination. Transportation agencies
25 have a potentially valuable role to play in reviewing regulatory structures, providing
26 information and undertaking advocacy in relation to E-bikes to manage expectations
27 and behavior of users and non-users alike. The safety and environmental credentials
28 of the mode are seen as important themes which emerged from the analysis of the data
29 considered in this paper and deserve further consideration from the transportation
30 community. The issues identified here could assist in framing further qualitative
31 research, particularly focus groups, which could be conducted with users and non-
32 users alike. Qualitative research may continue to enhance understanding until such
33 time as there are sufficient users to produce a sample of respondents of the size
34 required to provide confidence in the results from more traditional quantitative
35 research approaches.

36
37 E-bikes are still in the early stages of adoption in the US and there is nothing to
38 guarantee that they will become a mainstream urban transportation mode. Valuable
39 insight could be obtained from understanding the motivations, behavior and
40 experiences of early adopters of the technology. The lack of comprehensive,
41 quantitative data will mean that in relation to this mode, transportation agencies will
42 need to draw on a range of data sources, including qualitative data, when seeking to
43 understand this class of vehicle and in assessing what mix of policy instruments they
44 wish to use to either discourage, or encourage, their use.

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