

A More Sustainable Minivan? An Exploratory Study of Electric Bicycle Use by San Francisco Bay Area Families

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A Research Report from the National Center for
Sustainable Transportation

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California, Davis



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EXECUTIVE SUMMARY

This study focuses on family users of electric bikes, including electrified cargo bikes to learn how e-bikes are substituted for a family car. No previous studies on e-bikes look at family travel or use. Through semi-structured interviews of 20 San Francisco Bay Area e-bicyclists, this study sought to understand who family e-bike users are, their motivations for purchasing an e-bike, and the challenges they encounter. While larger studies are still needed, findings suggest that e-bikes, including electrified cargo bikes, are a viable alternative for cyclists with children. This study also supports previous research findings on travel behavior that the arrival of children does not always result in the end of biking. Major challenges participants identified were price, parking, and perceptions. Recommendations to address these issues include providing subsidies to offset costs, increasing parking infrastructure to accommodate diverse bicycle types, and disseminating more information on electric bikes to overcome misconceptions and to provide parents with an alternative to cars.

Introduction

Children have a strong influence on parents' travel choices. Some studies have found that with childbirth, parents exchange bicycles for cars (1). They believe that to safely and conveniently transport children they must drive. Other studies have shown that this is not always the case (2; 3). Of note, a small but growing number of parents in the United States are using electric bikes or e-bikes to transport their children. Who are these users and what made them seek out such a unique transportation mode?

Electric bikes are still a relatively new transportation mode in the United States. Studies on e-bikes in the US have found that they can be used as a substitution for car trips and can be part of a healthy lifestyle (4-7). While some of these studies have identified e-bikes as potential transporters of children (4; 8; 9), no studies have focused on family travel.

More research is needed to understand this relationship between children and travel choice and electric bikes. This is not only to support more sustainable transportation choices for adults but also because parents' attitudes toward different travel modes leave an impression on children and influence their future travel choices (1).

To date, the majority of electric bicycle research has focused on China, as it remains the largest e-bike market (10-14). Electric bikes in China are more akin to scooters, with few requiring peddling and travel at greater speeds. Studies on China have shown that e-bikes are used to transport children (11). E-bikes in China are also used as a replacement for cars or act as an intermediary measure before a car purchase (12).

In contrast to China, electric bicycles in the European markets are mainly pedal assist e-bikes. Some European countries, for example Germany and Austria, see e-bikes as a way to reduce their carbon footprint and allow older cyclists to continue riding (15; 16), but these studies have not considered the role electric bikes could play in family travel. This is ironic considering many of the cargo e-bikes used by families in the United States come from Europe.

Therefore, understanding who family e-bike users are and how they have adapted this technology to their daily commute could provide practitioners and policy makers with ways to not only support lifelong cycling of parents but foster sustainable transportation habits of the next generation. This study seeks to address: (1) the gaps in electric bicycle literature on family use and (2) to expand upon travel behavior research to include role of e-bikes in supporting more sustainable travel.

Methods

To understand family e-bike users, I conducted interviews with 20 electric bicycle users with children (families and caretakers) in the San Francisco Bay Area. Questions included length of ownership, reasons for choosing an electric bicycle, how it has been incorporated into their daily lives, and the challenges or difficulties they faced.

I employed several recruitment methods, including advertising the study through the New Wheel Bicycle Shop's monthly newsletter, the San Francisco Bike Coalition's parents' email list, and Berkeley Parents Network Announcement listserve. My advertisement stated that the study was looking for parents or caretakers who used their electric bikes or pedal assist bikes (regular bikes that had an electric motor attached to them) on a daily basis to transport their children and do errands. Participants were compensated with at \$20 gift card.

Because most participants were working parents and had small children, I conducted interviews in different ways –by phone, in person or on Skype—to provide them with greater scheduling flexibility. The interviews lasted 30-60 minutes and were recorded. All participants were given the same interview questions, made up of both closed and open-ended questions that addressed motivations, daily travel and challenges to using electric bicycles. The recordings were professionally transcribed and text analysis was done to identify common themes.

The San Francisco Bay Area was chosen because of its strong bike culture. Many Bay Area cities have directed funding into improving bicycle infrastructure. In addition, the advocacy network in the Bay Area is also strong. The SF Bay Area has a high median income and education level; these are two characteristics previous studies have found correlate with electric bicycle use [(5; 17)].

This being a qualitative study, conclusions cannot be drawn from the findings other than to support further study and to illustrate the need for wider research that incorporates more studies that take into consideration family travel behavior and/or the role of e-bikes. Furthermore, it is unclear how representative this study is because the population e-bike users are still relatively small and this study focused on a subset of a larger population.

Results

Study Participants

Socio-demographic characteristics

Of the 20 participants, 50% were women. Their approximate ages ranged from 30-55 years old. The number of children ranged from 1 to 3 children and ages from two years old to teenagers. Those children being transported by bike ranged in age from two years old to 13 years old. Participants live in San Francisco (11), San Jose (1), Berkeley (6), Oakland (1), and Albany (1).

All participants were experienced cyclists who either described themselves as avid cyclists or daily commuters. None of them were first time bicyclists; they had experience in the past of riding on urban streets. One participant took a course on urban cycling but had experience riding in other contexts. Three participants were European and came from cultures that supported bicycling.

Half of participants use an electrified Edgerunner Xtracycle cargo bike. Other cargo bikes included Yuba El Mundo (1), Bullitt (2), Metro Fiets (1) and the Butchers and Sons MK 1E (1) (See Figure 1 for images of cargo bikes; see Table 1 for participant demographics and bike type).

Almost all those with cargo bikes except one participant had two children or more. Those with only one child or who were not using the bike to transport their child used electric bikes similar to regular bikes. These included Focus, Motiv and Strommer. Two participants designed and built customized bikes.

Some of bikes get up to 80 miles on one charge depending on travel distance and load being carried. Most parents stated they charged at least once a week for those with short distance trips. A couple of parents charge every day because of the length of their commute and the types of trip chaining; the distance to their children’s schools and their job may add up to almost 25 miles in one direction. None of them felt limited by the range.

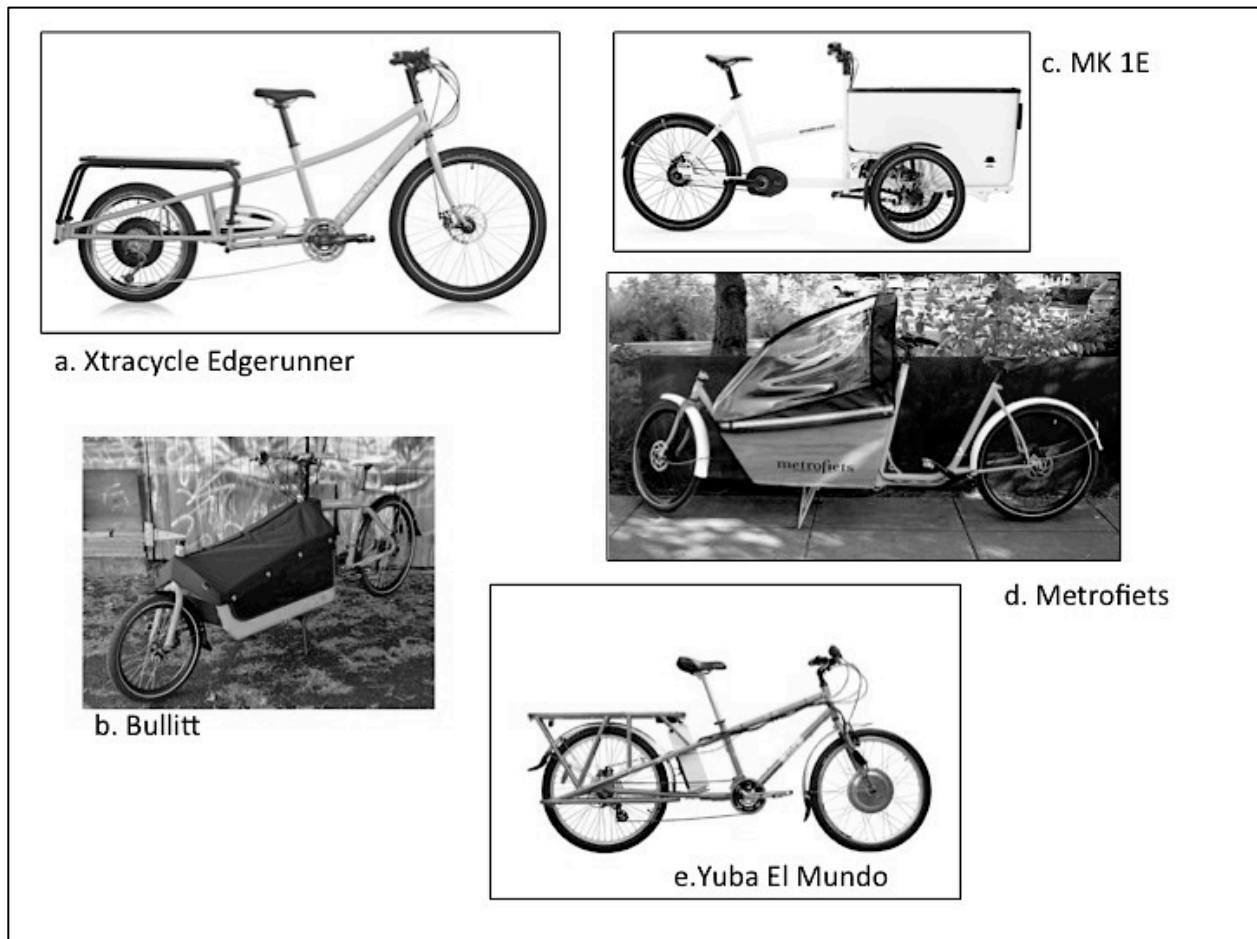


Figure 1. Types of electric cargo bikes used by study participants. (Sources: www.splendidbikes.com; www.butchersandsons.com; www.xtracycle.com)

Many of the participants spent extended amounts of time researching their bikes before purchasing—from a few months to over a year. Because these bikes are cost prohibitive (\$1500

-\$9,000), they wanted to know their options. They also had to spend this amount of time, particularly those who bought their bikes over five years ago because so few shops at that time specialized in electric bikes. A few became familiar with e-bikes because they are European and e-bikes are popular in their countries. Or, they went to Copenhagen or Amsterdam and saw that children could be transported by cargo bikes.

Some participants wanted to modify their bike to carry more children, especially if they had one younger child (1-3 years old) and an older child (eight years old). Others were unaware of all the different types of bike. Some sought out bike stores that specialized in electric bikes. One respondent from San Jose went to San Francisco to buy his bike. Another woman went to Portland and later created a website where she road tested over 30 different electric bikes. Another participant mentioned this website as a valuable resource in his search for a bike.

Daily Trips

Of the 20 e-bike owners surveyed, only two did not take their children to school on their e-bike. One owner removed the electric motor from his bike after trying it for a few months. The other had taken up using the electric bicycle to allow her teenage children to use her car because of afterschool activities. All other owners used their bikes for daily commute trips and taking their children to and from school, run errands, or for after school activities. They saw their e-bike as utilitarian.

In addition, one couple traded off transporting children and use of the electric bike. This participant took her non-motorized bike to the BART station; her husband used the e-bike to take their children to school in the morning. In the evening, she would ride back to the house, pick up the e-bike and then pick up her children.

Six participants' spouses also had an e-bike. At least one participant was planning on getting an e-bike for his spouse in the near future. The husband of one participant had an e-bike but chose not to use it. All other spouses either used a car because their job demanded it (commuting) or they felt more comfortable in a car.

Table 1 Study participants by bike type, number of children and location

Type of e-bike	Gender	Age of Children; Age	Previous mode choice	Length of ownership	Location
Xtracycle Edgerunner (\$6,500)	F	3 and 6 years old	Bike with a childseat and trailer.	8 months	Albany
	M	4 and 7 years old	Xtracycle no assist	Over a year	Berkeley
	M	2 and 6 years old	Car	Since January	Berkeley
	F	4 and 7 years old	Roadbike w/a trailer; car	Over 1 year	San Francisco
	F	2 and 5 years old		Less than year	San Francisco
	F	5 years old		Less than a year	San Francisco
	M	Two children	Regular bike	Less than a year	San Francisco
	M	4 and 7 years old.	Nissan Leaf	3 months	San Jose
Bullitt with a kid box in the front (\$8,000)	F	5 and 9 years old	Mamachuri	Several years, different e-bikes	San Francisco
	F	2 children under 7 years old	Bike with burley trailer	One year	Berkeley
MK1E bucket bike Butcherson (\$7000)	F	2 children	Xtracycle without an assist; bus	One year	Berkeley

Table 1. continued

Type of e-bike	Gender	Age of Children; Age	Previous mode choice	Length of ownership	Location
Yuba El Mundo with a bionix motor (\$4500)	F	5 and 7 years old	Walking and biking	3 years	San Francisco
Metrofiets (\$7,000)	M	5 and 10 years old	Non-motorized Xtracycle	3 years	San Francisco
Motiv (\$2,000)	F	2 high school/college aged	Bike	One year	Berkeley
Bionix motor kit on bike (n/a)	M	5 years old	Bike	Removed	Oakland
Focus Jarifa (\$5,000)	F	4 years old	Non-motorized traditional bicycle	One year	San Francisco
Kona Minute (long bike)	M	1 child	1967 Raleigh	2 years ago added electric assist	San Francisco
Civia Loring bike w/ Xtracycle FreeRadical, a Bionix 350 watt rear drive rearwheel motor, with a 48 volt battery.	M	1 and 2 years old	Civia Loring	2 years; had the Xtracycle FreeRadical since 2001.	San Francisco
Hase (half recumbent bike)+	M	12, 8, and 3 years old			San Francisco
Strommer (\$3,600-6,000)*	F	1 child	Car	Less than a year	Berkeley

* Prices are approximations based on current prices on company websites. Some participants declined to state the costs of their e-bikes.

Advantages of E-bike Ownership

The main motivations for buying an e-bike were convenience. They wanted to continue biking or take up biking again, but could not do so because of the weight of their child/children and hilly environments. Many participants stated that their children’s school or preschool was only within a few miles, but was too inconvenient to take public transit or use a regular bike because of hills.

I was living on a hill...and going up was really hard, especially with a kid, she was still small at that time, but she was growing.” (Father of one, San Francisco, CA)

At the time that we bought these bikes, we lived on a hill and the commutes we have to school and work are also extremely hilly, and our kids, who we carry on our bikes, because even though they are good riders, it's hard for them to get up some of these hills, they just kept getting heavier. (Mother of two, San Francisco, CA)

Some study participants mentioned the relationship between their car use and polluting environment; they wanted to drive less, particularly for short trips. The e-bike provided them with the convenience of a bike and a car without the hassles.

Others pointed to the difficulty in parking their cars in San Francisco, but of the freedom and joy that their e-bikes provided. Their e-bikes allowed them greater freedom of travel and route choice.

I HATED looking for parking in the city, and once I found it I was always angry that I had to pay for the parking. I had to pay parking fees after it took me twenty minutes to find the spot. So the fact that I can pull up right in the library, lock my bike, and walk in, and not circle ten times, and then tell my daughter, Sorry, there's no parking..It's a great feeling. I felt like we were missing out on life by having a car! I couldn't get where I wanted to go. Now, I just feel like I can go wherever I want and it's great. (Mother of one, San Francisco CA)

There are multiple reasons that are all related. There is the convenience. Where we live, we don't have a [fixed] parking spot... We're not going to get a second car, and it's expensive to own and operate a vehicle because there are costs, and the convenience factor—their school has no parking, they've got kind of an intense drop-off situation going on Valencia [Street], they were at a different school last year and so it's kind of a nightmare, it's actually slower to be driving in rush hour, and then lap around the block and do this crazy drop-off thing. Whereas now I can roll up on the sidewalk, and give them a high-five, and off they go. (Father of two, San Francisco)

This is not to say that participants are not making longer trips on their e-bikes. One father of two from San Jose stated his motivations for getting the e-bike:

It's a little too far to bike into work under my own power every day, but I had tried an electric bike before and it was much more feasible. (Father of two, San Jose, CA)

He also went on to state that the e-bike provided him with a reliable ride home. He knew exactly how long it would take him to go from work to home; it rarely changed. He was able to use bike paths for most of his commute. By the same note, if he had taken a car, it was unclear if it would take him 45 minutes or two hours depending on traffic.

Children's enjoyment

Children were one of the main factors in the decision to purchase the e-bikes, particularly the cargo bikes. The overall response to using the cargo bikes has been positive. The children enjoy the ride and parents have a different level of interaction with their children than they did when they were driving them.

They both really love riding on it, they ask for it – can you take the bike? My 2-year-old has a child seat and enjoys it; once he fell asleep on the way home for like 20 minutes, he just fell asleep on the bike, which is cute. My 6-year-old really likes it, but she kind of misses riding on the trailer cycle together. (Father of two, Berkeley, CA)

Oh she CRIED when I picked her up in the car one day. She cried all the way home. I wanted to ride in the bike! She loves it. (Mother of one, San Francisco, CA)

My son would prefer to ride on the “super bike” than ride in the car. He asks, “Why are we riding in the car? Can't we take super bike?” (Father of two, San Francisco, CA)

My daughter has a favorite tree in Golden Gate Park. She's like oh can we stop at the tree? And I'm like why not? You never have to worry about finding parking, you just stop. (Mother of two, San Francisco, CA)

Other children who have been biked around since birth are not as enthusiastic, but still enjoy their ride.

You know, I think that they like checking out the world around them a little bit, but actually—but there's no novelty for them. I've been bike commuting them since before they could really talk and say anything about it, so to them there's none of that kind of brochure joy of getting out on a bike and checking out the world around them. (Father of two, Berkeley, CA)

Weather

Because of the drought in California, weather was not a major concern for participants. When it did rain, the weather would have to be extremely inclement to deter them from biking. Most participants were prepared for rain and had their bikes set up to cover and protect their children.

We are pretty diehard about riding anyway, so we all have rain boots, rain pants, rain coats, and we all suit up and wore it. And we learned and loved that if you don't shy from rain, it's actually a kick! It's a good experience. (Mother of two, San Francisco, CA)

I have a rain cover that is made in Portland, Oregon, which makes sense. The kids are totally snug in that. The few times it did rain we just put the rain cover on and then I roll in just a rain jacket and rain pants and we're all good. (Father of two, San Francisco, CA)

I bike through the rain. I wish there had been more rain, but I have a trailer that's rainproof, so I can take him in the trailer if it's raining really hard. I use it regardless of the weather. I have rain clothes. (Mother of two, San Francisco, CA)

Back when it rained...I remember we went to the Academy of Sciences and it was pouring down rain.. just literally sheets, so we had our raingear and the kids had a weather bucket in the Bullitt, so we just actually like rode the bikes up to the door of the California Academy, which has this covered awning thing. They loaded up under the awning and we covered them up and we rode off home. We went into our garage, so they were covered the entire time. Then we watched people walking to their cars getting completely soaked and having their umbrellas blown inside out. Their kids are like! This is pretty sweet. (Mother of two, San Francisco, CA)

Six parents said they were concerned about riding in the rain and did not because they feared not being seen; one had an accident in the rain. Others avoided riding during the winter months when it can get too dark. Most said it had to be pretty miserable to stop them from biking and because of the drought in California, they have not been dissuaded from biking.

Traffic safety

Seventeen of the participants acknowledged safety was a concern but not as a deterrent for using their e-bikes to transport children. Many took precautions to avoid streets that had no bike lanes and heavy volumes of cars or multiple lanes. They also stated that they did not travel these streets alone either. Only two used streets that they would not take their children on but only if they were short on time. A couple of participants stated that the size of the cargo bikes provided greater visibility for them and that cars got out of their way.

Because of the electric assist, they had greater route choices. They could choose quieter streets or bike boulevards that would have added extra time or required extra effort without the assist. Their bikes allowed them full rein over their cities and they felt comfortable going multiple places.

Challenges

Price as a barrier

All of the study participants stated that price was a major hurdle to overcome. Some dealers provide financing and that made the difference for many of the participants. They also took into consideration the costs associated with having a car and parking.

My reservation was just the price tag. It's pretty significant—but using it in a year of biking would be the equivalent [to] paying for parking and driving, so after a year it would start to pay for itself. It's expensive, and I bought it from a place that I was able to finance it so that made a big difference. (Mother of two, San Francisco, CA purchased a cargo e-bike)

I was on the website and looking at the prices and they're not that expensive if you factor in using X amount of gasoline every day. You can pay for these in six months or whatever. (Mother of two, Berkeley, CA purchased an e-bike)

I'm thinking how can I not need it? Is there a way that I am fit enough? But I can't kill the kids, and myself because when you ride up the hill and you don't have enough

strength you can't balance. Other than price, I didn't have any reservations. (Mother of two, San Francisco, CA purchased a cargo e-bike)

Yeah, it was a hard sell to the wife! She was like you're going to take the kids and pick them up every day? And I was like yeah. She's like okaaaay. And the price tag kept creeping up and like the added tax and vendors and this and that. It was like holy crap, I can't believe I'm spending this on a bike. There was like 12-month financing, no interest financing. (Father of two, San Francisco, CA purchased a cargo e-bike)

I guess it's a reservation, but I don't think I ever thought it wasn't going to happen. We just had to figure it out and budget for it. (Mother of two, San Francisco, CA purchased a cargo e-bike)

The main reservation I had was the cost of it. As you know, extremely expensive. I didn't think I was going to get an electric bike when I went to the store. In fact, I had only vaguely considered it. The only reason I even considered it was because I had talked to a friend about her bike. She bought an Xtracycle, and she said they weren't using it very much because of the physical effort of pedaling. (Mother of two, Berkeley, CA purchased a cargo e-bike)

Weight and size of e-bikes

Most of the cargo bikes used by study participants weigh about 70 lbs. If participants added other accessories, the bike got even heavier. The length and width of the bike are also quite large. This limits how they link up to other modes, such as the Bay Area Rail Transit (BART). Only a couple of the participants are able to take their bikes on BART to cross from either side of the Bay. Those that were able to do so because their e-bike was more like a regular bike, but they are still heavy bikes. The Strommer bike, for example, weighs 62 pounds. Therefore, most participants either used their car or rented a car to do things on either side of the Bay.

The size of the bikes impede their owners choices as far as public parking and where it can be store, which is discussed in more detail below.

Theft and parking

Theft was a major concern for most participants since the cargo bikes some of their bikes cost close to \$10,000 when fully outfitted. Though some participants stated that it would require a tow truck to steal their cargo bikes and they just made sure that they were close to their bike when doing errands or out at the park. Others park at work in secure areas or at bike parking stations, such as Berkeley's Downtown Bike Parking station.

Another participant, citing the price as a major concern for theft, has gone to extreme measures to secure his bike and its parts.

..the other thing related to the cost is fear of theft. So I have five locks on my bike, and two locks are meant to secure the parts to make sure people are not taking the seats and front rack, and three locks are made to attach the bike to some structure from

different points, so making it really hard to steal anything, including the wheel—which is probably the most expensive part. Father of one, San Francisco, CA

Some are more philosophical about theft considering they live in an urban environment.

But to be fair about the whole question of safety and theft, it's a relative thing. When we owned our minivan we just sort of budgeted for the fact that probably twice a year someone would break our window and get into the car. It's the price you pay for driving.—Mother of two, San Francisco, CA

Parking at home can be another challenge. Almost all of the owners had a garage, secure storage area, or access to a garage. It would be difficult for someone with a second floor apartment and no secure space to store the bike. For those who are renting, they had to negotiate space.

Parking at home was a challenge in our own building trying to find a place to put it. We live in an apartment building and the parking situation in the building is not great. We had to negotiate with the landlord to have our own special space.—Mother of two, Berkeley, CA

As stated previously, the bike can weigh close to 100 pounds with all of its accessories. Even if they do have backyard, they may still need to reconfigure their space to accommodate the size of the bike. One owner built a ramp to get his bike in a secure place.

Other bicyclists and other people's perceptions

In previous studies (5; 17), participants mentioned that other cyclists have viewed their e-bikes negatively and commented. Participants in this study were asked similar questions about people's reactions to their e-bikes. Overwhelmingly, they have received positive responses and in many ways act as an advertisement for other parents looking for alternatives to being car dependent (18). One participant did state that she no longer rode her bike on certain streets in Berkeley.

It has been not so much that I'm concerned about the kids, but let's say an example of driving down Dwight two blocks in order to cross San Pablo instead of using Channing, I have done that a couple of times with kids and I've had drivers yell at me for riding on the road with kids.

While other individual e-bike owners may be criticized because they are not really riding a bike, most of the participants had positive responses for having an e-bike, particularly because they were carrying their children.

There's been a range. I had an Xtracycle before I had the electric part of it, so a lot of my colleagues were like, Oh, you're getting old! You're cheating with the engine. So that was kind of funny to me. That's been one interesting reaction is that it was me sort of saying Uncle to my physical abilities. I couldn't do it anymore. And then you also get reactions like that's really cool, that looks like you guys are having a great time. I see some people see it as liberation from a car, and so they get really excited about it and

see how cool it is and how they want one. (Father of two, Berkeley, CA)

Most of them when they see two or three kids on the bike... that's amazing. They look at the bike like "How does that work?", "That's not possible." So they will stop and literally study the bike, like which part is turning what. (Father of three, San Francisco, CA)

In response to other cyclists calling e-bikes cheating, participants pointed to what they were carrying and where they lived. No one was deterred in using e-bikes.

I think that's ridiculous. It's a 60-pound bike and I've got 75 pounds of kids. And given San Francisco hills there's just no way that you can negotiate that without the assist. The assist gives you so much more freedom to go places and do anything you wouldn't do otherwise. [Sheila]

I talked to the head of the San Francisco Bike Coalition family division, and the way she put it is "I know people say they're cheating, but when you have a family, if it gets you on the streets it doesn't matter. The electric assist becomes the reason you got out of the car, and that's what you needed." (Mother of one, San Francisco, CA)

Other misconceptions about the e-bikes are how much energy is required to charge them.

Our landlord, initially when we told him we were going to plug the bike in he was going to charge us like \$50 a month or something, and I contacted the company and found out that to charge the bike costs like ten cents and it goes 40 miles, so I thought it might be more like 25 cents a month or something? 50 cents a month? So that was a misconception. He didn't at all understand how little energy it uses. (Mother of two, San Francisco, CA)

Would you recommend an e-bike?

Almost all participants, except one, stated they would recommend purchasing an e-bike. As one participant stated: "Oh yeah, absolutely. I definitely feel like a pioneer!" One participant was so enamored with his e-bike that he was setting up a e-bike demonstration program at his children's school with a local merchant specializing in cargo e-bikes. Many of them stated that they talked about their e-bike all of the time and would encourage other parents or strangers to check them out. Some even gave test drives on their bikes because they felt people would not understand until they actually experienced using an e-bike.

Conclusion

While larger studies are needed, initial findings from this study point to the e-bikes, particularly cargo e-bikes, filling an important gap for families and that more diverse e-bike research is needed. Many of the benefits parents identified are similar to findings in other e-bike studies (4; 15; 17) greater mobility, convenience, and ease of parking (compared to cars). With the creation of cargo e-bikes, parents are able to transport their children more easily.

The biggest barrier for bicyclists is not topography, but price. This too was a major problem identified in previous studies (4; 5) To address the price, subsidies could be provided as they are for electric vehicles. Incentives such as tax rebates or subsidies should be considered to support this sustainable transportation mode; countries such as Austria, Germany, Switzerland, and France have subsidized e-bike purchases (15; 16). Subsidies could also help to disseminate information about electric bikes to address misperceptions. Austria and Germany have been quite successful in expanding the e-bike market and also to disseminate information about e-bikes.

Another challenge for these early adopters, especially cargo e-bike owners, is parking. E-bikes are good for shorter trips, which means places such as the San Francisco Bay Area that also have greater density. Parking may be an issue for apartment dwellers or renters. The parking issue requires more in-depth research in the next phase.

Similar to other early adopters of technology, participants also played a significant role in disseminating information about the e-bike (18). They were advertisements for using e-bikes and cargo e-bikes through their daily commute or by setting up e-bike demonstrations for other parents. They were also able to overcome some of the stigma of using an electric assist.

Other findings that need further study include how e-bikes can fill the role of third car for parents with older children who no longer need to be chauffeured. One participant gave her car up for an e-bike to allow her teenagers to use the car.

Most of the children in this study were between the ages of 2 years old and 10 years old. It is unclear how parents traveled when their children were younger or how they will travel when they are older. This was beyond the confines of this study but is worthy of future research.

Finally, bike shops and advocacy groups play an important role in disseminating information. Their role was mentioned in a couple of interviews, but more research is needed to understand how they can be utilized to expand the market.

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