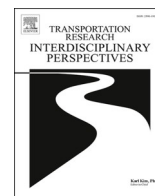


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## Public health framing in local media coverage of crashes involving pedestrians or bicyclists in Hawai'i, 2019: A content analysis

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### ABSTRACT

Media coverage of traffic crashes involving people walking and bicycling tends to frame crashes as isolated events rather than as a public health problem that disproportionately affects vulnerable populations. This study assessed public health framing in local media coverage of traffic crashes involving pedestrians and bicyclists in Hawai'i. We systematically searched the websites of all major local news sources (newspapers and local television stations) to identify articles about Hawai'i traffic crashes involving pedestrians/bicyclists that were published in 2019. Using content analysis, we extracted information on title and article attributes, crash details, language patterns, and public health framing elements. After screening 738 news articles for inclusion, 162 articles comprised the final sample. These articles reported on 164 crash events, representing 57 unique crash events. Most articles described the crashes factually as isolated events. Language patterns in article titles were non-agentive (77%) and focused on the pedestrian or bicyclist (77%) without mentioning the driver or vehicle (69%). When articles ascribed agents, vehicles (53%) were mentioned more often than drivers (13%). One-quarter of articles contained a counterfactual that subtly assigned responsibility for the crash to the person walking or bicycling. About 15% of articles described a traffic safety solution. These findings serve as a benchmark for local media coverage and can be used to inform state-level actions to improve local media reporting. Media coverage that considers the contextual and systematic factors contributing to the crash could better support local government policy change to protect pedestrians and bicyclists.

### Introduction

People walking and bicycling are vulnerable road users (VRUs), a term which acknowledges their lack of protection in the event of a motor vehicle traffic crash and, more generally, their exposure to unsafe and inequitable travel conditions (Sandt et al., 2020). The public health burden of deaths and injuries resulting from motor vehicle traffic crashes disproportionately affects VRUs (Gostin, 2018). In 2019, 7,338 pedestrians and bicyclists were killed in motor vehicle traffic crashes in the U.S., accounting for 20% of all traffic fatalities; an additional 140,000 injuries among pedestrians and bicyclists were reported (National Highway Traffic Safety Administration, 2020).

To decrease the risk of death and injury to VRUs, equity-focused approaches involving policy, built environment, and institutional changes are needed (Gostin, 2018; Sandt et al., 2020). Despite the evidence base for these types of public health solutions, there is a lack of

funding and implementation (Community Preventive Services Task Force, 2016; Smart Growth America, 2021; Stoker et al., 2015). Several recent studies suggest that media coverage of crashes involving VRUs may be one contributing factor to the lack of funding for and implementation of public health solutions (Brömmelstroet, 2020; Magusin, 2017; Ralph et al., 2019; Scheffels et al., 2019).

The local media environment plays an important role in setting the agenda for what issues are important to the public and policy makers, as well as shaping societal values, beliefs, and norms (Gollust et al., 2019). Ralph et al. (2019) argue that media coverage of traffic crashes involving VRUs influences public perceptions through two pathways: (1) *what* receives media coverage, and (2) *how* reporters frame their stories. Decisions along these pathways impact public knowledge and perceptions, and ultimately, political prioritization of the issue. Media coverage has the power to mobilize public responses that would encourage policy makers and government officials to fund and

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implement needed public health interventions to prevent traffic crash deaths and injuries. However, media coverage generally frames traffic crashes as isolated incidents (Rosales and Stallones, 2008) and often subtly attributes blame to the VRU rather than the driver of the motor vehicle (Magusin, 2017; Mattingly et al., 2018; Schmitt, 2020). Moreover, media coverage often “obscures the public health nature of the problem” (Ralph et al., 2019, p. 663) by not including relevant data on contributing factors, root causes, and context.

*Best practices in media reporting for traffic crashes*

The World Health Organization (WHO, 2015) provides recommendations for more complete and in-depth media coverage of traffic crashes that recognizes these incidents as a public health problem, educates the audience, and increases public awareness and understanding. This type of coverage can also directly influence policy makers, government officials, and other stakeholders to implement solutions. Rather than the typical news report, which focuses on the individual crash and frames it as an “unfortunate accident,” the WHO suggests writing stories that demonstrate newsworthiness by focusing on the human element, describing the big-picture relevance, placing statistics in context, identifying contributing factors and root causes, and being solutions-oriented. The prevalence of these public health frames in media reports of traffic crashes involving VRUs is not well-established.

In addition to these public health framing recommendations, Ralph et al. (2019) and Goddard et al. (2019) suggest specific editorial changes to reduce victim-blaming and generate support for public health solutions. These changes focus on language patterns: (1) instead of “accident,” using “crash” or other terms to convey that crashes have known contributing factors and are preventable, (2) using agentive language that specifies the involvement of the driver, (3) focusing sentences on the driver and vehicle rather than only the VRU, (4) omitting counterfactuals that imply a VRU could have avoided death or injury by behaving differently, and (5) employing thematic framing that emphasizes connections between crashes and multi-level contributing factors over episodic framing that considers crashes as isolated events. The suggested editorial patterns were found to be mostly absent from a study analyzing a sample of 200 articles from U.S. newspapers and television stations (Ralph et al., 2019). Because of the limited sample size for the national scale, the authors recommended exploring variation in local news coverage in future research.

The local media landscape is of specific interest because it can generate policy action and public health intervention at the local government level. Local news is able to speak more directly to the vulnerability of people walking and bicycling by tailoring content to specific communities than national broadcasts (Gollust et al., 2019). Local TV stations are the top source for local news and deliver their content through multiple pathways, including digitally (Pew Research Center, 2019). Previous studies of media framing have primarily examined coverage at a national scale (Brömmelstroet, 2020; Ralph et al., 2019; Rosales and Stallones, 2008). By conducting research at a local scale, we can begin to understand geographic variation in media framing and inform local interventions to improve media coverage through a public health lens.

*Study objectives*

The purpose of this study was to examine, in a statewide local news landscape, the extent to which media reports incorporated public health framing when describing traffic crashes involving VRUs. The overall goal was to characterize local media coverage of traffic crashes involving VRUs and to establish a baseline that would inform state-level actions to improve local media coverage. Specific study objectives included the following:

- (1) Describe the general features of news articles that cover traffic crashes involving VRUs;
- (2) Describe which types of traffic crashes involving VRUs generate news coverage;
- (3) Assess language patterns that attribute blame and responsibility for the traffic crash;
- (4) Assess the prevalence of thematic public health framing elements in news articles, including incorporation of public health statistics, built environment context, stakeholder perspectives, and solutions.

Our study was guided by the media analysis assessment methods established by Ralph et al. (2019) following the framing and editorial patterns that they tested in previous research. We expanded our content analysis to understand what types of crashes involving VRUs generate media coverage at a statewide scale over a one-year period.

*Study setting*

The study examined the local media landscape in Hawai‘i, USA. The State of Hawai‘i is comprised of four counties and has a population of 1.4 million people (U.S. Census Bureau, 2020). In addition, approximately 10.4 million tourists visited Hawai‘i in 2019 (Hawai‘i Tourism Authority, 2020). In 2019, the state tallied 108 deaths from traffic crashes, including 37 pedestrian deaths and 4 bicyclist deaths (Hawai‘i State Department of Transportation, 2020). Although 2019 data were not available, hundreds more pedestrians and bicyclists were likely involved in traffic crashes requiring a response from the Emergency Medical Services (EMS). In 2017, 529 pedestrians and 252 bicyclists were involved in EMS-attended traffic crashes (Oahu Metropolitan Planning Organization, no date).

**Methods**

We systematically searched for, screened, and analyzed the content of all identified news articles that described traffic crashes involving VRUs in Hawai‘i during the year 2019. Content analysis focused on the written reports (“articles”). For television station reports, we only analyzed the story text found online, not any associated video coverage.

*Search and screening procedures*

Three members of the research team (LBK, MDT, SLC) searched the websites of major local media sources in Hawai‘i: four local newspapers, targeting each county (Hawaii Tribune-Herald, Honolulu Star-Advertiser, Maui News, and The Garden Island), and three statewide television

**Table 1**  
Major Local Media Sources.

Source Name	Abbreviation	Coverage	Type	Website
KHNL/ KGMB Hawaii News Now	HNN	Statewide	TV Station	hawaiinewsnow.com
KHON2 News	KHON2	Statewide	TV Station	khon2.com
KITV4 News	KITV4	Statewide	TV Station	kitv.com
Hawaii Tribune- Herald	HTH	Hawai‘i County	Newspaper	hawaiitribune-herald.com
Maui News	MN	Maui County	Newspaper	mauinews.com
Honolulu Star- Advertiser	SA	Honolulu City & County	Newspaper	staradvertiser.com
The Garden Island	TGI	Kaua‘i County	Newspaper	thegardenisland.com

stations (KHNL/KGMB Hawaii News Now, KHON2, and KITV4 Island News) (Table 1). Only one newspaper, *Honolulu Star-Advertiser*, was indexed in the US West Newsstream Database and was searchable using the ProQuest database. In ProQuest, filters limited search results to the “news” category, location specified as “Hawaii,” and date range in 2019. For the remaining six media sources, we used Google to search each media source’s website, limiting the search results to January 1 – December 31, 2019.

Search terms were adapted from Ralph et al. (2019), and the final search strategy was “site:[website address] (bicycle OR bike OR bicyclist OR cyclist OR walking OR pedestrian) AND (accident OR collision OR crash OR injured OR injury OR hit OR struck OR killed OR fatality) -baseball -softball -sport.” The search results were saved and transferred into a spreadsheet to capture the source, article title, publication date, and web address for each article. Searches were conducted between March 30 – April 14, 2020.

In the first stage of screening, one researcher scanned article titles and the short blurb associated with the search result for relevance. A second researcher later reviewed the initial screening results to confirm the decision to include or exclude the article. Articles that appeared to describe a traffic crash involving a pedestrian and/or bicyclist that occurred in Hawai’i during 2019 were saved and included in the second stage of full-text review.

In the second stage of screening, one researcher read the entire article to determine if it met the following inclusion criteria: (a) crash occurred in Hawai’i from January 1 to December 31, 2019, and (b) article described traffic crash involving at least one pedestrian, bicyclist, or other VRU not in motor vehicle at the time of the crash (e.g., people using assisted mobility devices or riding skateboards). Articles that did not describe a specific traffic crash (e.g., articles describing aggregate traffic fatality statistics) or were not a news article type (e.g., letter to the editor or column) were excluded. A second researcher also reviewed the full-text screening decisions to confirm inclusion or exclusion.

### Content analysis

This study employed content analysis to extract relevant data from articles and code framing elements. The coding instrument was developed and refined over multiple rounds of coder training and inter-rater reliability testing by three research team members. The initial coding instrument was primarily based on the items described by Ralph et al. (2019), and the research team added several items to capture article characteristics and assess additional public health framing elements (e.g., humanizing details, description of built environment context for crash, mention of solutions). The final coding instrument was organized into the following sections:

**Article characteristics.** We extracted basic information about the article, including the news source, publication date, whether the article was updated, article length (<100 words, 100–499 words, or 500 + words), and inclusion of a crash-related image or video (crash scene photo, map graphic, generic stock photo or graphic, traffic camera image, photo of VRU, photo of driver, photo of community, and video content).

**Crash incident details.** Crash details included date, time of crash, general location of crash (island or unspecified), crash location details (community, highway, road, intersection, other, or no details), and number and type of VRUs involved (walking, bicycling, or other).

**VRU details.** For each VRU, we coded for gender, age, occupation, whether the person’s name was provided, where the person lived (local resident, other, unsure, or not specified), crash outcome (death, serious injuries, minor injuries, no injuries, or unknown), and other details (information provided about clothing or helmet use, location at time of crash, and other personal details).

**Driver and vehicle details.** Driver details in common with VRUs were gender, age, occupation, whether the person’s name was provided, where the person lived, and crash outcome. In addition, we assessed

whether information was provided about road/weather conditions, speed, influence of drugs/alcohol, seatbelt use, distracted driving, previous driver traffic violations, driver behavior before and after the crash, presence of passengers, and other personal details. The type of vehicle was categorized as sedan/compact, passenger minivan, SUV or crossover, pickup truck, commercial truck or large van, bus/trolley, other, or not specified.

**Title and sentence typologies.** To assess language and editorial patterns in the article title and primary sentences describing the crash, we coded: (1) title and sentence typology, (2) use of agentive language (yes or no), (3) focus (VRU, vehicle/driver, both, or neither), (4) whether object- or person-based language was used (vehicle vs. driver), and (5) words used to refer to the crash incident (accident, collision/collided, crash(ed), dead/deadly/death/die(s/d), fatal/fatality/fatally, hit, hit-and-run, incident, injured/injuries, kill(ed), struck, and other). Title and sentence typologies were based on agency (agentive or non-agentive), focus (VRU vs. car/driver), and use of object- or person-based language (vehicle, driver, not applicable). In total, there were nine possible typologies from Ralph et al. (2019), and we added an “other” category. We note that we adapted the non-agentive, VRU-focused, no referral to vehicle/driver typology to encompass results such as “a VRU was hit,” “a VRU died,” and “there was a VRU fatality.” We also distinguished between sentences that used “collided with” (non-agentive) and “collided into” (agentive). Multiple sentences per article were coded as long as they described the crash incident.

**Public health framing elements.** Several ways of assessing framing in media coverage were taken from previous studies. The overall framing of the article was coded as factual, criminal, or humanizing based on the research of Magusin (2017). Articles employing primarily factual framing focused on describing the crash using factual language; criminal framing focused on the act of the driver being charged, the police investigation, or other aspects of the judicial system (e.g., trials); and humanizing framing emphasized the tragedy of the crash or provided insight into the VRUs as people. Based on Ralph et al. (2019), we also coded whether the crash was framed using episodic framing (isolated incident) or thematic framing (connects crashes in a systematic or contextual manner).

We also examined whether articles included counterfactuals that assign blame to VRUs (e.g., not wearing a helmet, not being in a marked crosswalk). In consideration of the built environment context of the crash, we coded if there was any description that would help the reader understand how the road design or street features may have contributed to the crash (e.g., presence or absence of sidewalks, type of crossing infrastructure, landscaping elements). We coded the inclusion of quotes from transportation/government officials, elected officials, police officers, family members of the VRU, witnesses, drivers, VRUs, community residents, and representatives of community organizations. Lastly, we assessed whether the articles included any current or proposed solutions to prevent future traffic crashes or improve safety for VRUs in the following categories: legislative/policy, education programs or public awareness campaigns, built environment changes, and police enforcement.

In addition to completing the coding instrument, coders were encouraged to write short memos to document any additional observations about article framing, as well as coding decisions that they wanted to discuss collectively. Coders met weekly or bi-weekly to determine any coding decisions that an individual coder was unsure of making.

### Inter-rater reliability

Inter-rater reliability (IRR) was assessed through comparing the independent coding results of three research team members over four rounds. Each round of IRR coding was performed on a random selection of articles representing about 15% of the total sample (23–25 articles). IRR was assessed among all raters using percent agreement and Krippendorff’s alpha, an IRR coefficient often used in content analysis

studies (Krippendorff, 2004). After IRR scores were calculated, the raters reviewed the results and discussed areas of disagreement for specific articles. Based on the discussion, the coding instrument was refined by adding or clarifying items and/or response categories. In the last round of IRR coding, coders reached IRR scores of percent agreement  $\geq 80\%$  and Krippendorff's alpha values  $\geq 0.70$  (Krippendorff, 2004).

*Data analysis*

We calculated descriptive statistics to summarize the article-level, crash report-level, VRU report-level, sentence-level, unique crash-level, and unique VRU-level information extracted from the coding instrument. Table 2 describes each level of analysis and summarizes the relevant variables of interest. The crash report-level data describe individual reports of crashes; this level is distinct from the article-level because a few articles reported on more than one incident. Similarly, the VRU report-level describes each accounting of a VRU involved in a crash across all articles. For both article-level and crash report-level data, a single crash may be described multiple times depending on the source (multiple news stations reporting on the same crash) and follow-up nature (news reporting on details or developments past the initial incident report). Similarly, VRU report-level data refers to each description of a VRU as the analytic unit, and thus may describe the same VRU multiple times. Multiple sentences were identified within articles that describe the incident; thus, sentence-level data refers to data in which the analytic unit is sentences across all articles.

Crash-level and VRU-level data describes information at the unique crash and unique VRU level, respectively. Using data extracted across article-level and VRU report-level data, crash-level and VRU-level data were derived by creating unique crash (based on date, location, and time of day) and VRU (based on name, sex, age, and crash ID) identifiers, then manually imputing to collapse the highest amount of detail across multiple reports.

Open-ended responses were inductively categorized by one researcher, then reviewed by other members of the research team. Open-ended responses included details provided on the crash location, driver behavior, counterfactual statements, article framing (i.e., thematic framing information), built environment, interview quotes, and proposed solutions to prevent future traffic crashes or improve VRU safety.

**Table 2**  
Levels of Data.

Level	Description	What was analyzed	Denominator
<i>Article</i>	All news articles included in the analysis	News source, word count, type of visual material, title typology, public health framing elements	162
<i>Crash Report</i>	Each account of a crash incident within all articles	Driver details, vehicle details, location (road, highway, etc.)	164
<i>VRU Report</i>	Each account of a VRU in a crash within all articles	Details about vulnerable road user (VRU)	284
<i>Sentence</i>	Each sentence describing the crash within all articles	Sentence typology	248
<i>Unique Crash</i>	Unique crash incidents after collapsing multiple reports across news sources based on date, location, and time of day	Number of media articles, crash details	57
<i>Unique VRU</i>	Unique VRUs after collapsing multiple reports across news sources based on name, gender, age, and crash event	Details about vulnerable road user (VRU)	66

**Results**

*Articles included in analysis*

The initial search yielded 738 articles, which then were systematically screened. After full-text screening, 162 articles were retained for the content analysis. The search flow diagram is shown in Fig. 1.

*Article characteristics*

General article characteristics are presented in Table 3. The number of articles per news source ranged from 5 (newspaper of smaller county) to 62 (statewide television station). News articles from television stations comprised 70.4% of the included articles, and about one-fourth of articles were accompanied by video content. The majority (67.3%) of articles were between 100 and 499 words in length. Crash scene photos were present in 22.2% of articles, whereas photos of the people involved in the crash were less prevalent (9.3% for VRUs, 4.9% for drivers).

*Crash characteristics*

In total, 164 traffic crash events were described in the included articles (2 articles described 2 separate crashes). Information about crash characteristics were included in the following percentage of crash event reports: 89.6% reported the highway name, road, or intersection where the crash occurred; 79.3% reported the time of crash; and 62.8% reported the type of vehicle involved.

Based on the crash date and location, we determined that the included articles described 57 unique traffic crash events. Although no vehicle details were provided for one-third (35.1%) of unique crashes, pickup trucks (26.3%) and SUVs/crossovers (17.5%) were the types of vehicles most involved in unique crashes. The majority of unique crashes involved one pedestrian (75.4%). However, the most coverage (17.1% of all reports) was generated by a crash involving six pedestrians, three of whom were killed. The proportion of coverage is visually represented by the area of each box in Fig. 2 below. Three other crashes generated notable coverage: a young female pedestrian (5.5%, lighter grey box), a young female bicyclist (5.5%, medium grey box), and a middle-aged male bicyclist (4.9%, medium grey box).

*Characteristics of people involved in the crash*

We assessed the type of details provided about the drivers and the VRUs involved in the traffic crashes. Table 4 reports the percentage of information provided in the news reports for both categories of people. The name of the VRU (39.8%) was reported almost twice as often as the driver (20.1%). Information about the outcome of the crash for the VRU (uninjured, minor injuries, serious injuries, or death) was reported in almost all reports, whereas it was omitted for the driver in most reports.

Driver-specific details were often absent or commonly stated as “police said that speed, alcohol and drugs did not appear to be factors in the crash.” For example, 58 reports mentioned “speed” but 30 of those reports (51.7%) were to state that speed did not appear to be a factor, whereas speeding may have been a factor in 13 reports (22.4%) and was definitely a factor in 14 reports (24.1%). Descriptions of driver behavior before (e.g., making a turn) and/or after the crash (e.g., fleeing the scene) were provided in about one-third of all reports. Only four reports (2.4%) alluded to distracted driving, in terms of statements that “speed and inattention” may have been contributing factors.

Across crash reports, we determined that there were 66 unique VRUs involved in the 57 unique crash events. The majority of unique VRUs were pedestrians (83.3%), including 29 who were killed, 23 who were seriously injured, and 3 had minor injuries or unknown status. Among bicyclists, 4 were killed, 5 were seriously injured, and 1 had minor injuries. One VRU was skateboarding at the time of the crash and was killed. Reports for crashes with a fatal VRU outcome generated more

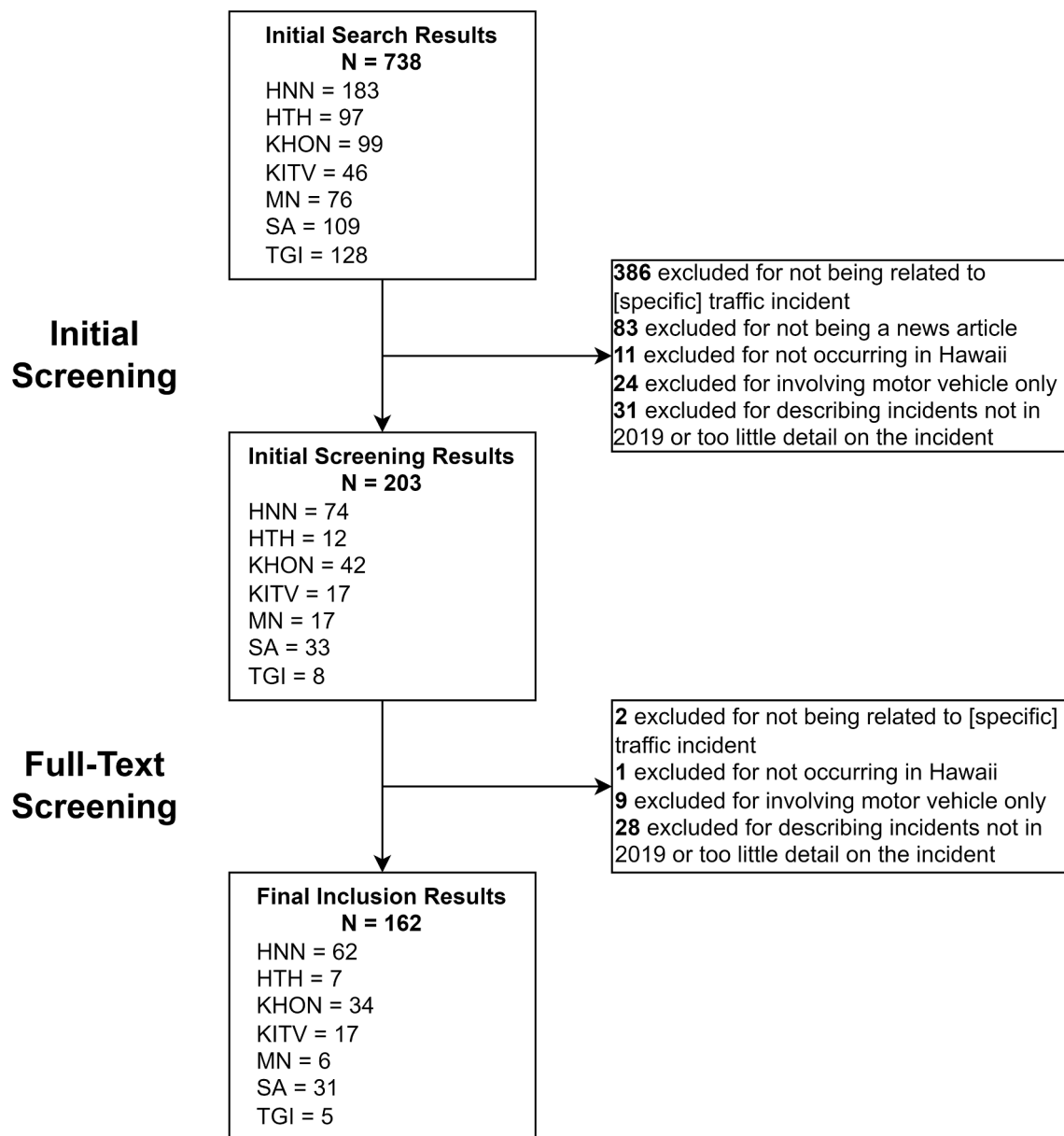


Fig. 1. Search flow diagram showing number of included articles after screening.

media coverage than crashes with non-fatal VRU outcomes: out of the 37 pedestrian deaths in the state in 2019, we determined that there was media coverage for 30 (81.1%) of them, including the person skateboarding at the time of crash; all 4 bicyclist deaths received media coverage. The remaining media reports only described traffic crashes involving 30 injured VRUs (and 2 VRUs with unknown outcomes) out of several hundred likely cases based on the 2017 state EMS data.

#### Language patterns in titles and sentences

We assessed the language patterns established by Ralph et al. (2019) of 162 article titles and 248 relevant sentences (Table 5). Article titles tended to lack agents (76.5%) and focus on the VRU (76.5%) without mentioning the involvement of the driver or vehicle (69.1%). Sentences were more likely to be agentive (75.8%), but maintained the focus on the VRU (61.7%). Sentences tended to use object-based language, referring to the involvement of a vehicle (52.8%) more often than a driver (12.5%).

The most common title typology was non-agentive, focused on VRU,

and did not refer to vehicle or driver (59.9%, e.g., *A VRU was hit*). Examples of this typology are: *Man in serious condition, dog dead after crash in Hawaii Kai* [ID: 053]; *Woman killed while walking along a Maui highway; 2 pedestrians hurt in crash* [ID: 017]. The most common sentence typology was agentive, focused on VRU, and refers to vehicle (37.3%, e.g., *A VRU was hit by a car*). Examples of this typology are: *The teen girl hit by a vehicle in Pearl City last week is slowly beginning on a road to recovery* [ID: 041]; *Honolulu police confirmed that a 90-year-old woman died after being struck by a vehicle Wednesday morning while crossing the street in Salt Lake, officials said* [ID: 014]; *She was struck by a white colored cross-over type vehicle* [ID: 093].

The word *crash* was more frequently used in titles than *accident*. *Accident* was rarely used in sentences (2.4%). Sentences were more likely to use verbs to describe the incident, such as *hit* and *struck*.

#### Public health framing

The overall article frame employed in news articles was primarily factual (59.3%) (Table 6). Only one-quarter (24.7%) of articles

**Table 3**  
 Characteristics of News Articles (Article-Level, N = 162).

		Frequency	Percent	
News Source	Statewide TV Station 1 (HNN)	62	38.3	
	Statewide TV Station 2 (KHON)	35	21.6	
	Statewide TV Station 3 (KITV)	17	10.5	
	Hawaii County Newspaper (HTH)	7	4.3	
	Maui County Newspaper (MN)	6	3.7	
	Honolulu City & County Newspaper (SA)	30	18.5	
	Kauai County Newspaper (TGI)	5	3.1	
	News Source Type	Newspaper	48	29.6
		Television	114	70.4
	Article Word Count	< 100	33	20.4
100–499		109	67.3	
500+		20	12.4	
Type of Visual included with Article (multiple categories possible per article)		None	28	17.3
	Crash Scene Photo	36	22.2	
	Google Map Graphic	20	12.4	
	Google Street View	3	1.9	
	Generic Stock Photo	26	16.1	
	Traffic Camera Photo	6	3.7	
	Photo of VRU	15	9.3	
	Photo of Driver	8	4.9	
	Photo from Community	6	3.7	
Time between Crash and Article Publication	Video Content	39	24.1	
	Same Day	49	30.3	
	Next Day	46	28.4	
	2–7 Days Later	41	25.3	
	Greater than 7 days Later	26	16.1	

employed a humanizing frame, which centered the humanity of the VRUs (e.g., *Family of Makakilo hit-and-run victim wants suspect to step forward* [ID: 082]; *6-year-old Laie girl thanks EMS responders* [ID: 097]). The remaining articles (16.1%) focused on the criminal or judicial processes involved.

While most news articles described the traffic crashes as isolated incidents (episodic framing), 40.1% of articles included thematic framing. However, most (70.1%) of the thematic frames were simply stating the number of traffic fatalities that had occurred up until that point: *The crash brought the number of traffic fatalities on Oahu so far this year to eight* [ID: 009]; *This is the 17th traffic fatality this year compared to 24 at this same time last year* [ID: 061]. Another thematic frame pointed out the connection between crashes and impaired driving: *The deadly crash that killed three pedestrians in Kakaako Jan. 28 continues to raise calls for personal and government action against drunken driving* [ID: 167]. A few articles obtained thematic views from community residents: *Wright herself lives just blocks away from the crash site and is a regular witness to the near-misses that occur within an area heavily traveled by visitors, residents and cars* [ID: 136]. The built environment was rarely the focus of a thematic frame, as in the following example that points out a lack of safety infrastructure: *Laniakea Beach has generated controversy due to concerns over parking along the mauka [farther from the water] side of the highway and pedestrians, who haphazardly cross the highway with no crosswalks [emphasis added] to view the turtles as they rest on the sand* [ID: 147].

Details about the built environment context for the crash were included in almost half (47.5%) of the news articles. Built environment details were mostly mentions of a crosswalk (e.g., *the pedestrian was in a signalized marked crosswalk* [ID: 078]), road lanes or shoulders (e.g., *the bike also was within the two-way center median turn lane, police said* [ID: 062]), or pedestrian traffic islands (e.g., *the victims were simply standing*

*on a raised traffic island along Ala Moana Boulevard, waiting to cross the street* [ID: 162]). Three articles mentioned poor lighting conditions.

Counterfactuals were present in one-quarter of news articles. The most common type of counterfactual (48.8%) was stating that the VRU was not in a marked crosswalk. Six articles (14.6%) stated that the VRU was not wearing a helmet and five articles (12.2%) stated that the VRU was wearing dark clothing. Other examples of counterfactuals included: *walking within the inner northbound lane of the highway* [ID: 121] and *man attempted to cross the roadway against the “Do not walk” signal* [ID: 096].

Quotes or direct statements to help contextualize the crash, provide a public health perspective, or influence public perceptions of the people involved in the crash were included in a small fraction of articles. The most frequent source of quotes were the family members of the VRUs:

*“I refuse to call this an accident!” she said. “People don’t accidentally speed, drive impaired or race and drift on our roads. What we permit, we promote.” She added that drunk driving deaths are “completely preventable, if we want it to be.”* [widow of VRU, ID: 039]  
*“Every time you see a crosswalk whether you see people or not, please slow down because we never know if the person that gets hurt is one of your family members,” said Ms. Arellano.* [mother of VRU, ID: 095]

Police officers and leaders provided quotes, typically about the circumstances involved in the crash, dismay over the fatal outcomes, and calls to action.

*“The closest crosswalk was over 200 feet away,” said Hee, who is with the Vehicular Homicide Section. Hee said street lighting was also a possible factor since large, overhanging tree branches cast a shadow over the area the pedestrian was crossing.* [police officer, ID: 131]

When community members provided quotes, these were typically about the traffic and road conditions in their neighborhoods or reflecting on the tragic nature of the crashes.

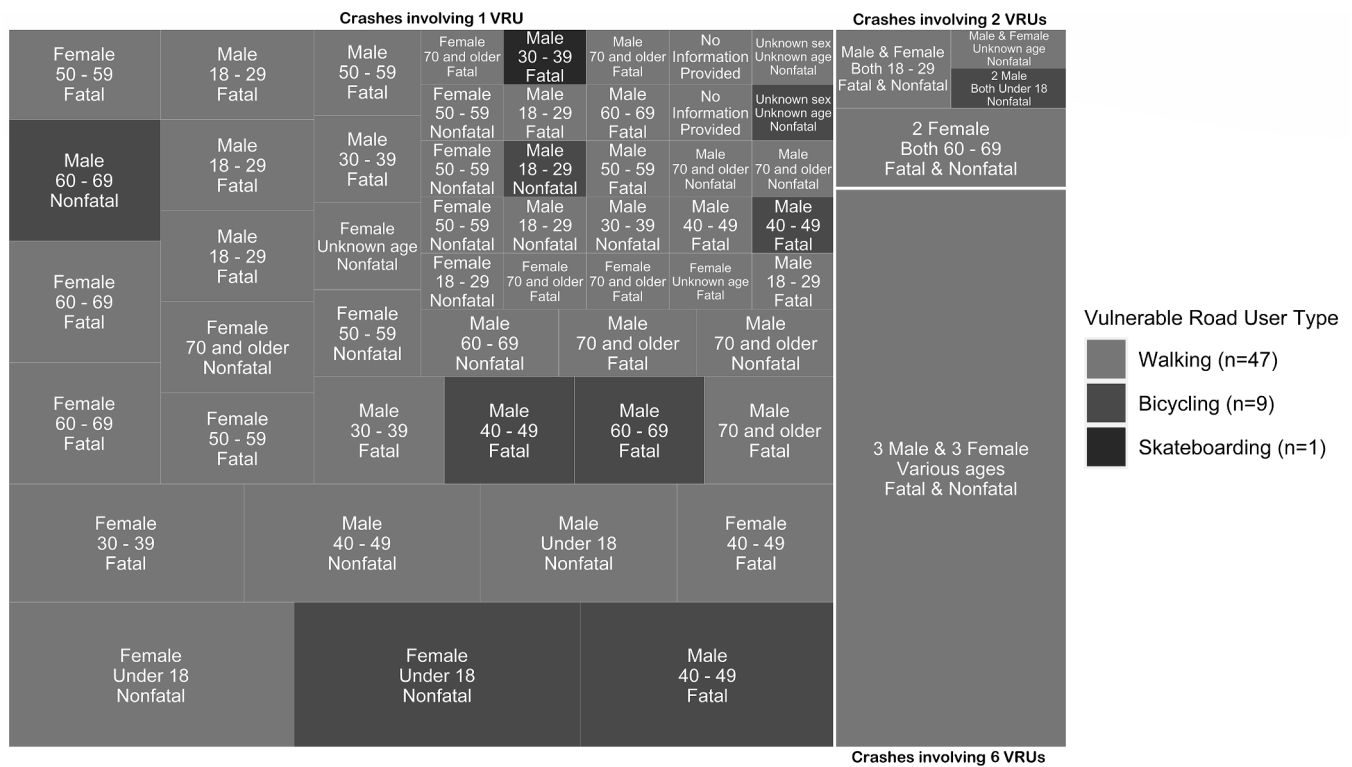
*“There’s a lot of times in bed you can hear screeching of them trying to slow down and hit the brakes,” said another resident Krissy Kahikina.* [community resident, ID: 084]  
*“It could have been me walking to the beach from my work. This is really profound and tragic, and gives me heavy emotions,” said one man from Honolulu.* [community resident, ID: 116]

Quotes from representatives of community-based or advocacy organizations, such as the Hawai’i Bicycling League and Mothers Against Drunk Driving, typically provided information about their efforts to increase VRU safety and honor the VRUs involved in the crashes.

*“The grief can turn into action and the horror can turn into power to make our streets safer,” Taniguchi said. “Red-light running is so common. If we got a 24/7, 365 enforcement, it’s definitely gonna change people’s behavior.”* [representative of bicycling advocacy organization, ID: 167]  
*“We can’t take away what happened, but we can show our support and aloha,” said Rich, who along with other visitor industry members and Mothers Against Drunk Driving Hawaii is organizing a healing and inspirational event for the victims of the Kakaako crash and those who care about them.* [representative of tourism organization, ID: 166]

Quotes from representatives of government agencies (including transportation, planning, and public health) and from elected officials tended to express sadness and focus on challenges to implementing proposed solutions.

*“Our hearts go out to everyone involved in this tragic incident,” said state Transportation Director Jade Butay in a news release.* [Department of Transportation Director, ID:164]  
*“We have proposed every possible solution under the sun, and we just can’t seem to get any traction,” explained [State Representative].* [Elected Official, ID: 091]



**Fig. 2.** Relative proportions of media coverage for unique traffic crashes involving vulnerable road users (VRUs) in Hawai'i, 2019. Crashes are organized by how many VRUs were involved in the crash while labels describe VRU gender, age group, and crash outcome. The light grey boxes are people walking, the medium gray boxes are people bicycling, and the darkest grey box is a person skateboarding at the time of crash.

**Table 4**  
Any Details Provided about Vulnerable Road User (VRU) and Driver by Number of Reports.

		Driver Reports, % (N = 164)	VRU Reports, % (N = 284)
Driver & VRU	Name	20.1	39.8
	Gender	51.8	61.3
	Age	53.1	59.2
	Occupation	0.0	10.2
	Residency	19.5	45.1
	Crash Outcome	29.3	96.1
	Other Personal	23.8	28.5
	Details		
VRU Only	Clothing	.	6.7
	Location at time of Crash	.	43.0
Driver Only	Type of Vehicle	62.8	.
	Road/Weather	0.6	.
	Conditions		
	Speeding	35.4	.
	Under the Influence	37.8	.
	Seatbelt Use	1.8	.
	Distracted Driving	2.4	.
	Previous Traffic Violations	1.8	.
	Behavior Before the Crash	33.5	.
	Behavior After the Crash	31.7	.
	Passengers in the Car	4.9	.

First-person accounts were rarely provided by VRUs themselves, and no quotes were ever provided by the drivers. When quotes from witnesses were included, they often described the horror of the crash and aftermath.

*From now on, Perry intends to stick to training on the stationary bike in his house and told his wife, "I am never gonna ride on the road again." "For now, I'm just trying to regain my strength," he said. "I'm just thankful to be given a second chance." [VRU, ID: 157]*  
*"You know, people gotta slow down over here," said an emotional Simmons. "On these roads especially, cause it's already dark, you know." [witness who rendered aid at scene, ID: 051]*

Only 14.8% of news articles described a current or proposed solution to prevent future crashes or improve safety for VRUs. Built environment solutions primarily involved improving pedestrian crossing infrastructure (*Manupule thinks more safe crossing areas are needed along that stretch of Kalakaua Ave. "Have the signs that blink with the crossing. They should do that, especially for night time," she said. [ID: 109]*). Several legislative solutions were mentioned, such as allocating funding for improvements and enhancing punishments for impaired driving. Under the educational solutions category, community events were mentioned as ways to increase awareness for safe driving behavior (*Espiritu joined others holding signs on Makakilo Drive to remind drivers that the speed limit is 35 miles per hour. [ID: 148]*). Police enforcement of existing traffic laws was the least frequently mentioned type of solution.

**Discussion**

Our findings contribute to growing evidence base suggesting that media reports of traffic crashes are presented as isolated events, miss opportunities to illuminate their preventable nature, assign responsibility and blame for the crash to the people walking and bicycling over the people driving the vehicles, and tend to lack humanizing elements (*Magusin, 2017; Brömmelstroet, 2020; Ralph et al, 2019; Schefels et al., 2019; Schmitt, 2020*). Returning to the first study objective, we found that the majority of media reports were relatively brief (100–499 words) and simply reported factual details about the crash incident. However, these factual details were more prevalent in relation

**Table 5**  
Framing of Responsibility from Article Text.

	Description/Levels	Titles, N = 162 (%)	Sentences, N = 248 (%)	
Agency	Yes	23.5	75.8	
	No	76.5	24.2	
Focus	Vulnerable Road User (VRU)	76.5	61.7	
	Vehicle/Driver	14.2	35.1	
	Both	0.6	2.0	
Driver referred to as:	Neither	8.6	1.2	
	Driver	16.1	12.5	
	Vehicle	14.2	52.8	
	Both Driver and Vehicle	2.5	17.3	
	Neither/Not mentioned	67.3	17.3	
Typology	A car hit a VRU	1.2	20.1	
	A driver hit a VRU	7.4	16.0	
	A VRU was hit by a car	11.1	37.3	
	A VRU was hit by a driver	2.5	1.2	
	A VRU was hit	59.9	16.0	
	A VRU and car collided	0.0	2.1	
	A driver and a VRU collided	0.6	3.7	
	A car was in a crash	0.6	0.4	
	A driver was in a crash	4.9	0.4	
	Other	11.7	2.9	
	Words referring to incident	Accident	11.1	2.4
		Collision/Collided	3.1	10.1
		Crash(ed)	39.5	7.3
		Dead/Deadly/Death/Die(s/d)	19.8	9.3
Fatal/Fatality/Fatally		14.2	2.8	
Hit		16.1	28.6	
Hit-and-run		13.6	2.4	
Incident		0.6	0.4	
Injured/Injuries		10.5	6.9	
Kill(ed)		16.1	10.9	
Struck		8.6	40.3	
Other		8.6	13.3	

**Table 6**  
Public Health Framing Elements (Article-Level, N = 162).

	Description/Levels	Frequency	Percent
Overall Article Frame	Factual	96	59.3
	Humanizing	40	24.7
	Criminal	26	16.1
Type of Incident Framing	Episodic Framing	97	59.9
	Thematic Framing	65	40.1
Built Environment Context Described	Yes	77	47.5
	No	85	52.5
Any Counterfactual Statement	Yes	41	25.3
	No	121	74.7
Article Includes a Quote from:	AnyQuote	58	35.8
	Family Member of VRU	26	16.1
	Community Resident	14	8.6
	Police Officer	13	8.0
	Community Organization Representative	12	7.4
	Witness	10	6.2
	Transportation Official or Other Expert	9	5.6
	Elected Official or Legislator	9	5.6
	VRU	8	4.9
	Driver	0	0.0
Solution Mentioned	Any Solution	24	14.8
	Built Environment	13	8.0
	Legislation	10	5.6
	Education	8	4.9
	Police Enforcement	3	1.9

to VRUs compared to the drivers. Details about drivers tended to follow boilerplate language about speed, alcohol, and drugs as potential factors contributing to the crash. One notable gap was that only 2.4% of all articles mentioned whether distracted driving contributed to the crash, which may reflect under-reporting in police crash reports (Rolison et al., 2018). Future research should use content analysis to compare and contrast police crash reports or police-issued press releases with media articles. We hypothesize that there is significant overlap in language and details due to limited reporter capacity. To more comprehensively describe features of media coverage for traffic crashes involving VRUs, future research should also examine what sources of information are used by reporters. This research could reveal whether police reports or statements are driving the majority of media coverage, thus representing a potential source of bias or underlying investigative purpose rather than a purpose of drawing thematic connections between crashes and built environment infrastructure.

Not all traffic crashes involving VRUs earned media coverage (2nd study objective). The most horrific crash involving 6 VRUs and an impaired, speeding driver generated the most coverage out of all crashes—both factual and humanizing articles. Humanizing media coverage was also provided for especially vulnerable pedestrians/bicyclists, including a young girl bicycling in her neighborhood and a teenage girl hit while in a crosswalk. With the exception of a former police chief, few other VRUs received humanizing media reports. These findings, while specific to VRUs, are aligned with previous research that found increased media coverage for traffic crashes that were more severe, involved younger people, and had female fatalities (De Ceunynck et al., 2015).

To address the third study objective, our findings from a statewide landscape largely aligned with the patterns found by Ralph et al. (2019) in a national sample. Article titles and sentences describing the crash largely focused on VRUs and referred to a vehicle more often than employing person-based language to refer to the driver. The most common title typology was the same (*A VRU was hit*), as was the most common sentence typology (*A VRU was hit by a car*). These typologies do not reflect current media guidelines for reporting on traffic crashes using “driver” instead of “vehicle” to specify the human agent involved (Laker, 2021). The use of the typology *Driver hit VRU* would be more in line with recommended media guidelines; this typology could include references to a vehicle such as *Driver of car hit VRU* or *Driver hit VRU with car*. While Ralph et al. (2019) reported a slightly higher prevalence of counterfactual statements (one-third vs. one-quarter), the types of counterfactuals were similar (e.g., not being in a crosswalk). The main difference between our studies was in the incident wording: Ralph et al. (2019) reported that “accident” was used in 47% of their analyzed sentences, while only 2.4% of our analyzed sentences used this term. The lower prevalence of the term “accident” in our study may be a function of differences in study coding instruments; a high proportion of our sentences employed typologies describing actions, thus using verbs to describe the incident (e.g., *struck*, *hit*). On the other hand, the reduction in the use of the word “accident” may reflect increased attention to recent journalistic guidelines that recommend using “crash” in place of “accident” (Laker, 2021; Schmitt, 2020). Additional research is needed to better describe trends in media reporting over time and the implementation of journalistic best practices.

From a public health framing perspective, media reports often failed to acknowledge that traffic crashes are not isolated incidents and that they can be prevented by improving policies, design, road environments, and systems. Our findings also highlight the lack of humanizing coverage of VRUs, especially considering why they are more vulnerable and what built environment conditions they encounter in their attempts to safely travel. This study looked at media coverage for VRUs as a collective group, and we did not compare how media coverage may have differed for pedestrians or bicyclists. Future research that qualitatively examines the content of media coverage may reveal differences in public health framing for different VRU types. For example, Rissel et al. (2010)

found that news stories tended to frame “cyclists” more negatively whereas stories about “cycling” focused more often on positive frames, such as being deserving of more support. We are not aware of media framing studies that focus specifically on traffic crashes involving people walking. Furthermore, future research should examine whether an equity lens is applied to media coverage, in which thematic framing is used to explain why certain populations may be more vulnerable than others (e.g., geographic disparities or VRU attributes).

### Implications for practice

This study assessed the local media landscape at a statewide scale over the course of one year. Our findings can serve as a benchmark of 2019 coverage, while informing state-level actions to shape media framing. Over time, it would be possible to track changes in the way media coverage frames traffic crashes involving VRUs. Moreover, by measuring public perceptions of traffic crashes involving VRUs over time, we could also determine if there were any shifts in public perceptions associated with changing media coverage. Other states or geographic regions may want to assess framing in their local news coverage, which would enable an assessment of geographic variation and exploration of contextual influences on framing.

At the local level, more efforts are needed to educate advocacy groups, legislators/policy makers and media stakeholders on root causes of crashes and to promote best practices. Within government agencies, it will be important to provide public information officials with public health language and perspective, such as acknowledging the need for transportation systems and infrastructure that promote safety for VRUs and centering healthy and safe mobility for all people as key values. Partnerships with local media may include promoting media best practices, developing media organizational policies for crash reporting, and finding ways to provide in-depth reporting of traffic crashes involving VRUs. In acknowledgement of reduced media staff capacity for in-depth reporting, one solution would be for community-based organizations, health departments, and/or university research centers to provide media partners with press statements or fact sheets that help to draw attention to contributing causes and provide public health framing that could be readily integrated in news reports. Fact sheets could summarize the relevant reporting guidance, such as highlighting the need to structure titles and sentences to focus on the driver rather than the vehicle (e.g., Laker, 2021). Policy actions should prioritize legislative funding for supportive, protective infrastructure for VRUs; reducing motor vehicle speed and distracted driving; and de-emphasizing punitive and compliance-centered strategies that disproportionately burden VRUs, such as crosswalk countdown infraction fines.

### Study limitations

Our findings are specific to the media sources included in our analysis and thus may not be representative of other states. We only considered one year of media coverage and did not compare the media reports to information in official crash data sources. The search and screening procedures may have excluded relevant articles if they did not describe a specific crash event. As a result, we may have excluded articles that described VRU traffic safety issues using thematic framing. We did not analyze the video coverage associated with television sources; framing in video coverage should be explored in future research. Similarly, we did not include relevant radio station coverage in this study. Future research could examine the verbal content of radio news stories to determine if similar patterns exist; radio coverage may be an important source of news coverage for certain populations (e.g., older adults). Finally, we acknowledge the potential for misclassifying unique crash events and VRUs if there were not enough details to ascertain overlap in coverage across articles and news sources.

### Conclusions

Media framing shapes public perceptions of crashes involving VRUs. Our findings suggest that local news coverage misses the opportunity to illuminate the need for funding and implementing public health solutions that will prevent the deaths and serious injuries of the most vulnerable users of public streets. Media reports that center the humanity of the people walking and bicycling and educate readers about solutions to improve safety and mobility are needed.

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### CRedit authorship contribution statement

**L. Brooke Keliikoa:** Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft. **Mika D. Thompson:** Methodology, Formal analysis, Investigation, Writing – original draft, Visualization. **Chris J. Johnson:** Conceptualization, Writing – review & editing. **Stephanie L. Cagal:** Methodology, Investigation, Writing – review & editing. **Catherine M. Pirkle:** Funding acquisition, Writing – review & editing. **Tetine L. Sentell:** Conceptualization, Funding acquisition, Writing – review & editing.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### References

- Brömmelstroet, M.T., 2020. Framing systemic traffic violence: media coverage of Dutch traffic crashes. *Transp. Res. Interdiscip. Perspect.* 5, 100109. <https://doi.org/10.1016/j.trip.2020.100109>.
- Community Preventive Services Task Force, 2016. Physical activity: Built environment approaches combining transportation system interventions with land use and environmental design, Task Force Finding and Rationale Statement. Retrieved March 11, 2021, from: <https://www.thecommunityguide.org/sites/default/files/assets/PA-Built-Environments.pdf>.
- De Ceunynck, T., De Smedt, J., Daniels, S., Wouters, R., Baets, M., 2015. “Crashing the gates” - selection criteria for television news reporting of traffic crashes. *Accid. Anal. Prev.* 80, 142–152. <https://doi.org/10.1016/j.aap.2015.04.010>.
- Goddard, T., Ralph, K., Thigpen, C.G., Iacobucci, E., 2019. Does news coverage of traffic crashes affect perceived blame and preferred solutions? Evidence from an experiment. *Transp. Res. Interdiscip. Perspect.* 3, 100073. <https://doi.org/10.1016/j.trip.2019.100073>.
- Gollust, S.E., Fowler, E.F., Niederdeppe, J., 2019. Television news coverage of public health issues and implications for public health policy and practice. *Annu. Rev. Public Health* 40 (1), 167–185. <https://doi.org/10.1146/annurev-publhealth-040218-044017>.
- Gostin, J., 2018. Traffic injuries and deaths: A public health problem we can solve. *JAMA Health Forum* A7(1). Retrieved January 25, 2021, from: <https://jamanetwork.com/channels/health-forum/fullarticle/2760052>.
- Hawai'i State Department of Transportation, 2020. State of Hawaii traffic fatalities. Retrieved January 6, 2021, from: <https://hidot.hawaii.gov/highways/files/2020/04/Fatality-Breakdown-by-Counties-04-16-2020.pdf>.
- Hawai'i Tourism Authority, 2020. Hawaii Visitor Statistics Released for 2019. Retrieved January 6, 2021, from: <https://www.hawaiitourismauthority.org/media/4166/2020-01-29-hawaii-visitor-statistics-released-for-december-2019.pdf>.
- Krippendorff, K., 2004. Reliability in content analysis: some common misconceptions and recommendations. *Hum. Commun. Res.* 30 (3), 411–433. [https://repository.upenn.edu/cgi/viewcontent.cgi?article=1250&context=asc\\_papers](https://repository.upenn.edu/cgi/viewcontent.cgi?article=1250&context=asc_papers).
- Laker, L., 2021. Media guidelines for reporting road collisions. Retrieved September 9, 2021, from: <https://www.rc-rg.com/guidelines>.
- Magusin, H., 2017. If you want to get away with murder, use your car: a discursive content analysis of pedestrian traffic fatalities in news headlines. *Earth Common J.* 7 (1), 28–61.

- Mattingly, S., Bezboruah, K., Sloan, J., Ramezanpour Narges, S.R., Mahiyar, A., 2018. 16-07 Blame-the-Victim Policy Narratives and State-Level Transportation Policy Decisions. Transportation Research Center Reports 9. Retrieved January 14, 2021, from: <https://scholarworks.wmich.edu/transportation-reports/9>.
- National Highway Traffic Safety Administration, 2020. Overview of motor vehicle crashes in 2019. National Center for Statistics and Analysis. (Traffic Safety Facts Research Note. Report No. DOT HS 813 060). Retrieved January 25, 2021, from: <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813060>.
- Oahu Metropolitan Planning Organization. Vision Zero: Safe Streets for Everyone. Retrieved January 6, 2021, from: [https://www.oahumpo.org/?wpfb\\_dl=1755](https://www.oahumpo.org/?wpfb_dl=1755).
- Pew Research Center, 2019. For local news, Americans embrace digital but still want strong community connection. Retrieved July 6, 2021, from: <https://www.journalism.org/2019/03/26/nearly-as-many-americans-prefer-to-get-their-local-news-online-as-prefer-the-tv-set/>.
- Ralph, K., Iacobucci, E., Thigpen, C.G., Goddard, T., 2019. Editorial patterns in bicyclist and pedestrian crash reporting. *Transp. Res. Record* 2673 (2), 663–671. <https://doi.org/10.1177/0361198119825637>.
- Rissel, C., Bonfiglioli, C., Emilsen, A., Smith, B.J., 2010. Representations of cycling in metropolitan newspapers – changes over time and differences between Sydney and Melbourne, Australia. *BMC Public Health* 10, 371. <https://doi.org/10.1186/1471-2458-10-371>.
- Rolison, J.J., Regev, S., Moutari, S., Feeney, A., 2018. What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. *Accid. Anal. Prev.* 115, 11–24. <https://doi.org/10.1016/j.aap.2018.02.025>.
- Rosales, M., Stallones, L., 2008. Coverage of motor vehicle crashes with injuries in U.S. newspapers, 1999–2002. *J. Saf. Res.* 39 (5), 477–482.
- Sandt, L., Brookshire, K., Heiny, S., Blank, K., Harmon, K., 2020. Toward a shared understanding of pedestrian safety: An exploration of context, patterns, and impacts. Pedestrian and Bicycle Information Center, Chapel Hill, NC. Retrieved on January 25, 2021, from: [http://pedbikeinfo.org/cms/downloads/PBIC\\_Pedestrian%20Safety%20Background%20Piece%207-2.pdf](http://pedbikeinfo.org/cms/downloads/PBIC_Pedestrian%20Safety%20Background%20Piece%207-2.pdf).
- Scheffels, E., Bond, J., Monteagut, L.E., 2019. Framing the bicyclist: A qualitative study of media discourse about fatal bicycle crashes. *Transp. Res. Record* 2673 (6), 628–637. <https://doi.org/10.1177/0361198119839348>.
- Schmitt, A., 2020. *Right of Way: Race, Class, and the Silent Epidemic of Pedestrian Deaths in America*. Island Press, Washington, DC.
- Smart Growth America, 2021. Dangerous by design. National Complete Streets Coalition. Retrieved on March 11, 2021, from: <https://smartgrowthamerica.org/wp-content/uploads/2021/03/Dangerous-By-Design-2021.pdf>.
- Stoker, P., Garfinkel-Castro, A., Khayesi, M., Otero, W., Mwangi, M.N., Peden, M., Ewing, R., 2015. Pedestrian safety and the built environment: a review of the risk factors. *J. Plann. Literature* 30 (4), 377–392. <https://doi.org/10.1177/0885412215595438>.
- U.S. Census Bureau, 2020. QuickFacts: Hawaii. Retrieved on March 12, 2021, from: <https://www.census.gov/quickfacts/HI>.
- World Health Organization, 2015. Reporting on road safety: A guide for journalists. Retrieved on March 11, 2021, from: [https://apps.who.int/iris/bitstream/handle/10665/179826/9789241508933\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/179826/9789241508933_eng.pdf).