DO THE EFFECTS OF POLICE BODY-WORN CAMERAS ON USE OF FORCE AND COMPLAINTS CHANGE OVER TIME?

Results From a Panel Analysis in the Milwaukee Police Department

BRYCE E. PETERSON
DANIEL S. LAWRENCE
Urban Institute

Police body-worn cameras (BWCs) can help improve transparency, accountability, and policing behaviors. This study extends prior BWC research by using a panel analysis design with a measure of treatment duration to examine how the effects of BWCs change over time. Using data from the Milwaukee Police Department (N = 1,009), we propose and test two competing hypotheses: The program maturity hypothesis suggests that BWCs will be more effective at reducing use of force and complaints over time, whereas the program fatigue hypothesis expects BWCs to be less effective the longer officers wear BWCs. We find that BWCs reduced complaints overall and that, over time, each additional month with a camera resulted in 6% fewer complaints. There was no overall relationship between BWCs and use of force, but our treatment duration model suggests that there was an immediate decrease in use of force incidents, followed by a gradual increase in subsequent months.

Keywords: body-worn cameras; BWC; police; use of force; complaints; longitudinal; panel analysis

INTRODUCTION

In recent years, body-worn cameras (BWCs) have become nearly ubiquitous with policing. In the most recent survey available, nearly half of all general-purpose law enforcement

AUTHORS' NOTE: *This project was supported by Grant No. 2015-WY-BX-0006 awarded by the Bureau of Justice Assistance. The Bureau of Justice Assistance is a component of the Department of Justice's Office of Justice Programs, which also includes the Bureau of Justice Statistics, the National Institute of Justice, the Office of Juvenile Justice and Delinquency Prevention, the Office for Victims of Crime, and the SMART Office. The opinions, findings, conclusions, and recommendations expressed here are those of the authors and should not be attributed to the U.S. Department of Justice, the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute's funding principles is available at urban.org/fundingprinciples. We would like to thank staff from the Milwaukee Police Department, especially Sgt. Doug Wiorek, who played a significant role in working with the researchers for this study and article. Correspondence concerning this article should be addressed to Bryce E. Peterson, Justice Policy Center, Urban Institute, 500 L'Enfant Plaza SW, Washington, DC 20024; e-mail: bpeterson@urban.org.*

CRIMINAL JUSTICE AND BEHAVIOR, 201X, Vol. XX, No. X, Month 2020, 1–21.
DOI: 10.1177/0093854820970583

agencies in the United States had cameras, whereas 80% of departments with 500 or more officers had a BWC program (Hyland, 2018). The top reasons for deploying these devices were to improve officer safety, reduce complaints from community members, improve evidence quality, reduce agency liability, and improve accountability (Hyland, 2018). In short, police departments have adopted cameras to enhance the day-to-day operations of the agency and improve transparency and accountability among their officers.

These aims and motivations have been amplified by the recent social movements in the United States advocating for dramatic police reform following the tragic deaths of George Floyd and Breonna Taylor, among others. In the wake of these events, several states, including New Mexico (Senate Bill 8, 2020) and Colorado (Senate Bill 20-217, 2020), have enacted new laws requiring the statewide use of police body cameras, while both parties in Congress have similarly proposed police legislation that would require federal officers to wear BWCs and provide funding for local departments to purchase cameras (Norwood, 2020). Groups like the National Association for the Advancement of Colored People (NAACP), American Civil Liberties Union (ACLU), and public defender agencies are also calling for police body cameras and strong policies to guide their use (Lenninger, 2020; Miles, 2020; Stanley, 2020). These reform efforts and calls to action emphasize the potential for BWCs to hold officers accountable, make departments more transparent, and help rebuild community trust.

As a measure of these concepts, early research linked the efficacy of BWCs to their ability to reduce use of force incidents and citizen complaints. A study in Rialto, California, found steep reductions in both use of force and citizen complaints after the department deployed BWCs (Ariel et al., 2015; Farrar & Ariel, 2013; see also Katz et al., 2014). In more recent years, the impact of BWCs on these outcomes is mixed. Some authors continued to find reductions in complaints and force (Braga et al., 2017; Jennings et al., 2017) while others only found reductions in complaints (Ariel et al., 2016a, 2016b, 2017; Peterson et al., 2018) or no impact on either outcome (Yokum et al., 2017).

While the extant BWC literature is robust, mixed findings underscore areas of inquiry that warrant further exploration. For example, most studies have examined the immediate effects of BWC programs after their implementation, while less is known about how they impact officer behaviors and police–community interactions over time. There is also limited research on how department-wide adoption of BWCs affects policing outcomes as more and more officers are equipped with the technology. The current study contributes to the current body of research by using a quasi-experimental, panel analysis design to examine the effects of BWCs and how these change over time. We use data from the Milwaukee Police Department (MPD), which deployed cameras to all eligible officers in a four-phased rollout. This study aims to inform practice as agencies are still learning how best to deploy BWCs, create procedures and policies guiding implementation, and incorporate cameras and footage into operational activities, officer management, and training. This, ultimately, can help departments improve outcomes related to officer behavior and police–community interactions and inform budgetary decisions around their BWC programs.

LITERATURE REVIEW

BWCs are increasingly being used by police departments across the world under the assumption that they can improve transparency, accountability, and policing activities. Two

of the most widely used and relevant metrics of BWC effectiveness have been changes in the number of use of force incidents and citizen complaints. Regardless of whether they were justified or validated, both uses of force and citizen complaints are undesirable outcomes in police–community interactions. Thus, both outcomes are used in the literature as proxies for public accountability, perceptions of trust, and police misbehavior. Still, current research on the relationship between BWCs and these outcomes is mixed.

USE OF FORCE

Studies on the effect of BWCs on use of force have produced inconsistent findings and have been difficult to disentangle (Lum et al., 2019). In one of the pioneering studies on the topic, officers in Rialto, California, were randomly assigned to either wear a BWC or continue their shifts as usual without a camera. The researchers observed that shifts without BWCs had twice as many use of force incidents as shifts with BWCs (Ariel et al., 2015; Farrar & Ariel, 2013). Similarly, in a randomized controlled trial (RCT) with 416 officers from the Las Vegas Police Department, researchers found a 12.5% reduction in use of force for officers equipped with BWCs (Braga et al., 2017). BWC-equipped officers in Orlando, Florida, were found to have 5.0% fewer use of force incidents than the control group (Jennings et al., 2017).

Despite these promising findings, other studies have found nonsignificant and inconclusive effects of BWCs on police use of force. For example, the results from studies in Washington, DC (Yokum et al., 2017) and Milwaukee (Peterson et al., 2018) reveal that BWCs did not impact officers' levels of use of force. Ariel et al. (2016b) conducted a multisite analysis of 10 RCTs by shift and found that on average, BWCs had no effect on use of force incidents. While changes in use of force varied across geographical areas, there was no evident impact overall. To examine this further, Ariel et al. (2016a) placed each of the 10 departments into groups according to officer's compliance with the assigned experimental condition. The results were mixed: Use of force decreased in departments where officers wore the BWCs in compliance with their assignment in the experiment; however, no effect was found in the departments where officers had full discretion on when to wear the BWCs, for both experimental groups.

CITIZEN COMPLAINTS

Citizen complaints have been used in studies as a proxy measure for public perception of police legitimacy, satisfaction with police performance, and other justice-related outcomes (Ariel et al., 2015; Liederbach et al., 2008; Pate & Friddell, 1993). Early research has generally demonstrated large reductions in citizen complaints when evaluating the impact of BWCs on officer behavior. Specifically, there was a 40% reduction among offers wearing head cameras in Plymouth, England (Goodall, 2007); a 23% decline in Phoenix, Arizona (Katz et al., 2014); a 90% decrease in Rialto, California (Ariel et al., 2015); a 65% decline in Orlando, Florida (Jennings et al., 2015); an 11.5% decrease on the Isle of Wight, UK (Ellis et al., 2015); 51% fewer BWC-equipped officers with complaints than control group officers in Milwaukee, Wisconsin (Peterson et al., 2018); and a 2.5% reduction in the likelihood of U.K. officers receiving a complaint when wearing a BWC (Owens & Finn, 2018). Using data across a 10-site RCT, Ariel et al. (2017) found a 93% reduction in citizen complaints from before the BWC intervention to after it was fully implemented. One notable

exception to these findings was a large RCT conducted in Washington D.C., where the researchers found no association between cameras and complaints (Yokum et al., 2017).

More recent studies have yielded additional information about the effect of BWCs on complaint reduction. For example, results from the Las Vegas Metropolitan Police Department found that BWCs reduce about one complaint per officer. These results were derived from data from between both the treatment and control groups over the preintervention and intervention phases (Braga et al., 2017). Another study found that not only did complaints against BWC-equipped officers decline, but that those who did receive complaints while wearing the camera were less likely to have that complaint sustained (Katz et al., 2015). Finally, findings from another study suggest that the public's satisfaction with a police interaction, and therefore their likelihood to lodge a complaint, may be more influenced by whether the officer showed elements of procedural justice regardless of whether they had a BWC (McClure et al., 2017).

A key issue with examining the relationship between BWCs, police behavior, and citizen complaints is the already low incident rate of complaints. Small changes to the raw counts of complaints can result in large percentage changes. This was the case in Arlington, Texas, during 2015–2016 where researchers found that citywide complaints were reduced by 5.3% but overall complaints climbed 4.1% when officers equipped with a BWC were removed (Police Executive Research Forum [PERF], 2017).

THE EFFECTS OF BWCS OVER TIME

Most prior studies on use of force and complaints have examined the overall or average change in officers' behaviors after they are equipped with a camera, but there is limited information on the degree to which these effects vary over time. We propose two hypotheses to guide an examination of these effects over time. First, the "program maturity hypothesis" suggests that BWCs increase in their effectiveness as officers become more comfortable with the technology, develop muscle memory, and accept them as a part of everyday practice. Gaub and colleagues (2016) compared officer perceptions of BWCs in three police departments before and after implementation of a BWC program. Across all departments, officers were more likely to report that the technology was easy to use and comfortable to wear after implementation of the program, whereas officers in two departments were more likely to report that BWCs made their jobs easier and were received well by coworkers (Gaub et al., 2016). A study in the Los Angeles Police Department also found that officers were more likely to believe that BWCs were easy to use and comfortable to wear post-BWC deployment (Wooditch et al., 2020). Relatedly, a study by Lawrence and colleagues (2019) examined BWC activation levels and found that officers increased BWC use month-over-month across all policing activities, indicating that officers were more comfortable and familiar with the technology over time.

As familiarity and acceptance of BWC technology grow, police supervisors may also become more effective and efficient at using the technology to manage officers. For example, sergeants may increasingly pull and review officers' BWC footage, address specific behavioral problems, and proactively identify areas for improvement. Once officers realize how camera footage is used to correct these issues, they will gradually adjust their behaviors, including limiting negative or potentially volatile interactions with community members. Thus, the program maturity hypothesis suggests that BWCs will become more effective at improving officer behavior and, specifically, reducing use of force and complaints over time.

Conversely, the "program fatigue hypothesis" assumes that BWCs could become less effective over time as officers adapt their behaviors and the novelty of the cameras wears off. A study in Phoenix, Arizona, found that officer activation of BWCs varied significantly, but the rate of activations was highest in the month immediately after officers received cameras (Katz et al., 2015). Despite their promise as a supervisory tool, most departments do not regularly, proactively review footage to identify potential issues in officer behavior. If officers do not notice a change in the department and the behaviors of their colleagues after implementation of the BWC program, it is unlikely BWCs will change officers' behaviors that may result in a use of force incident or complaint, regardless of how long they are equipped with a camera.

Program fatigue may also occur if officers become disgruntled with the technology over time for failing to live up to their expectations. For instance, Gaub and colleagues (2016) found that officers in three departments were less likely to believe BWCs would make citizens cooperative and respectful after implementation of the BWC program. Wooditch et al. (2020) similarly found that some officers were less likely to believe BWCs could increase public trust after being equipped with a camera. Improved cooperation, respect, and trust have been the central justifications for departments to purchase and deploy these devices. Therefore, if officers are not seeing these benefits in their interactions with community members, departments may lose the buy-in of their officers and see declines in the overall effectiveness of the technology. Thus, even if officers initially adjust their behaviors in response to being equipped with a BWC, they may revert to their pre-BWC routines after a period. In this situation, the program fatigue hypothesis would suggest that the effectiveness of BWCs at improving officer behavior, use of force incidents, and complaints would diminish over time.

Although not a direct test of these competing hypotheses, Sutherland and colleagues (2017) conducted a 3-year follow-up study from the first RCT of police BWCs in the Rialto Police Department. Using an interrupted time series design, the authors incorporated rates of use of force and complaints during an arrest for the year before the experiment, the experimental year, and 3 years after the experiment. Results showed that initial rates of complaints against police and use of force during arrest were sustained in the 4 years following the introduction of the cameras (Sutherland et al., 2017). These findings suggest that persistence, rather than fade-out effects, may characterize the long-term impact of BWCs.

A related consideration of the time-variant effects of BWCs is how departments implement their programs. Many departments have chosen to pilot their BWC programs with a select group of officers and gather preliminary information on their utility and effectiveness before determining whether to deploy them department wide. As such, most studies have used a small group of officers within the department (e.g., Ariel et al., 2015; Gaub et al., 2016; Grossmith et al., 2015; Jennings et al., 2015, 2017; Katz et al., 2014; Sutherland et al., 2017; White et al., 2018) or split the full department into a treatment and comparison group (Wallace et al., 2018). There has been less research to date on how the department-wide implementation of a BWC program affects officer behavior (for an exception, see Sutherland et al., 2017).

A department-wide rollout of a BWC program has further implications for our two hypotheses. Under the program maturity hypothesis, officers will become more comfortable or supportive of BWCs as more of their colleagues are equipped with the technology and it becomes routine practice for all officers. As more officers become equipped with a

BWC, individuals may increasingly believe that their interactions will be recorded by their colleagues even if they do not activate their own camera. Thus, it is possible that BWC programs become more generally effective at deterring officer misbehaviors (e.g., unjustified use of force incidents and negative interactions with community members) as a greater number of officers in the department receive cameras.

Conversely, and in line with the program fatigue hypothesis, it becomes harder for supervisors to monitor compliance and use BWCs to manage officer behavior as more officers in the department are equipped with the devices. This may be particularly true in jurisdictions where BWCs were rolled out so quickly that department did not create a robust policy for addressing noncompliance or prescribing how supervisors should review and proactively use footage. If officers believe they and their colleagues can get away with not using the cameras as specified in the department's policy, or if they realize that cameras are not routinely used by supervisors to correct or reinforce behaviors, it is unlikely that BWCs will have a lasting, widespread impact on use of force incidents or complaints.

CURRENT STUDY

The current study seeks to build on prior research by examining the effects of BWCs on officer use of force incidents and citizen complaints over time in an agency that rapidly deployed BWCs to all its patrol officers. Specifically, we aim to test the following hypotheses:

Hypothesis 1 (H1): BWCs will reduce citizen complaints against officers. We expect our findings to be in line with existing research, which has consistently found that officers equipped with BWCs are less likely to have a complaint lodged against them than officers without a camera (Ariel et al., 2016a, 2016b, 2017; Braga et al., 2017; Ellis et al., 2015; Goodall, 2007; Jennings et al., 2017; Katz et al., 2014).

Hypothesis 2 (H2): BWCs will have no overall impact on use of force incidents. Based on numerous recent studies that have found no relationship between cameras and use of force (Ariel et al., 2016a, 2016b; White et al., 2018; Yokum et al., 2017), we similarly expect there to be no overall impact of BWCs on these incidents.

Hypothesis 3 (H3): BWCs will become more effective at reducing use of force and citizen complaints over time. To test the above-stated program maturity hypothesis, we hypothesize that BWCs will reduce use of force incidents and complaints more so the longer officers are equipped with cameras. Although we do not expect to see any immediate or overall relationship between BWCs and use of force, it is possible that BWCs will become more effective as the program matures. In addition, although we expect to see an overall decrease in complaints, this reduction may be more pronounced over time.

Hypothesis 4 (H4): BWCs will become less effective at reducing use of force and citizen complaints over time. Competing with H3, we will also test the program fatigue hypothesis. Under this hypothesis, we anticipate that BWCs will be less effective at reducing complaints and use of force incidents the longer officers wear BWCs. For instance, although we expect to see an overall decrease in citizen complaints, we would find support for this hypothesis if that effect becomes null or reverses over time.

To test these hypotheses, we used data collected through an evaluation of the MPD's BWC program, including information on personnel, officer demographics, use of force incidents, and citizen complaints. Milwaukee is the largest city in Wisconsin, with a diverse

population of nearly 599,000 people in 2016, including 36% White, 38.8% Black, and 18.2% Hispanic (U.S. Census Bureau, 2018). The city's BWC program developed out of two issues. First, the city has historically suffered from high crime rates. In 2016, Milwaukee's violent crime was 153.30 per 10,000 people, whereas its property crime rate was 406.40 per 10,000 people. This was the eighth highest violent crime rate and third highest property crime rate in cities with a population of 100,000 or more in the country (Federal Bureau of Investigation [FBI], 2017). The MPD also launched a number of other initiatives around the same time as their BWC program, such as the Public Safety Partnership and Project Safe Neighborhoods programs (Brackens & Miller, 2017; U.S. Attorney's Office, 2019). Both efforts had a heavy focus on reducing gun violence and making areas safer through community partnerships.

Second, the MPD faced steep challenges building trust among community residents, particularly in communities of color, in the years prior to implementing their BWC program. These issues came to a head in 2014 when an MPD officer shot and killed Dontre Hamilton. Mr. Hamilton suffered from schizophrenia and paranoia and had fallen asleep on a park bench when an officer confronted him. After Mr. Hamilton became aggressive, the MPD officer shot him 14 times. Although the officer was fired, he was not charged with a crime, which sparked a series of protests across the city (Rogan, 2018). This event, coupled with the department's focus on reducing crime, was the impetus for their BWC program.

Under increased pressure from the public and city officials, the MPD launched their BWC program rather quickly. They developed their BWC policy in mid-2015 and were tasked with deploying BWCs to all patrol officers by the end of 2016. To best meet this deadline, the MPD deployed cameras in four Waves. Wave 1 occurred in October 2015, where the MPD equipped 182 officers from the Neighborhood Task Force (a group of officers charged with conducting traffic stops and other proactive activities) and one district (District 5) with cameras. This served as a pilot test so the MPD could identify and address technological challenges and incorporate officer feedback into future trainings. Wave 2 occurred in March, 2016, during which a random and representative selection of 268 officers across all remaining districts (Districts 1–4 and 6–7) received their cameras. Wave 3 similarly involved 238 more randomly selected officers from across the department being equipped with BWCs in June 2016. Wave 4 occurred in November 2016, and resulted in all remaining eligible officers ($n = 423$) receiving their cameras. The staggered BWC rollout ensured MPD had the capabilities and capacity to train and equip the officers assigned to each Wave. Officers were required to receive a BWC once selected for a phase and were not able to join or postpone to another phase.

All officers received in-person training by the MPD sergeant who was managing the BWC program. They were equipped with the Axon Flex 2 BWC model, which are small devices that officers had the option to mount on their head, collar, or shoulder. As is the case with all current body camera models, these devices require officers to activate them during encounters with community members. However, this particular model from Axon has a small buffering period that captures video of the 30 s immediately before the officer turns the camera on, although they do not capture audio during this period. The MPD's BWC policy requires officers to wear the cameras "at all times when on duty and performing or likely to perform enforcement duties" (MPD, 2019, p. 4). The policy also prescribes that officers shall activate their cameras during nearly all community encounters, such as vehicle stops, field interviews and pedestrian stops, searches of persons or property, calls for

service, suspect/witness statements and interviews, and so on. One exception is that officers have discretion to turn off or not activate their cameras during potentially sensitive events or circumstances (when interviewing victims of a sexual assault, children, etc.).

The MPD's BWC program was partially supported by funding from the U.S. Department of Justice through the Bureau of Justice Assistance's (BJA) Strategies for Policing Innovation program. This funding also supported our evaluation of the BWC program and partnership with the MPD.

DATA

We collected data on the MPD officers who received a BWC during the four Waves of the department's BWC rollout, which included all officers assigned to patrol or similar duties. Officers were excluded by MPD from the BWC program if they were assigned to limited duty or administrative positions (positions that involve answering phones, observing surveillance cameras, etc.). Officers with a rank of lieutenant or higher were also excluded from the program because they have limited interactions with the public. If an officer was equipped with a BWC, but was later reassigned or promoted into a position that no longer required a camera, we retained them in the analyses and tracked the change. Of the 1,772 sworn officers employed by Milwaukee at the time of our analyses, 1,268 served a patrol function and were equipped with a camera during the MPD's deployment. We further limited our analytic sample to officers who were consistently employed by the MPD between January 1, 2015, and June 30, 2017, excluding new recruits hired during this period and officers who retired or were fired between these months ($n = 192$). We also excluded 67 officers due to missing demographic and outcome data.

This resulted in a full analytic sample of 1,009 officers. We then transformed these data into a panel data set so that use of force incidents and citizen complaints were aggregated into monthly counts for 30 unique, 1-month periods (i.e., each month between January 2015 and June 2017). This allowed us to generate baseline data on these outcomes (i.e., several months of use of force and complaint data before officers began receiving BWCs) and provided a way to measure changes in the effects of BWCs on these outcomes over time. The final data set offered us with a range of baseline and follow-up data for each officer. Those who received a camera in Wave 1 of deployment (October 2015) had 9 months of baseline data and 21 months of follow-up after being equipped with a BWC, compared with 22 months of baseline and 8 months of follow-up data for officers who received cameras in Wave 4 (November 2016).

VARIABLES

The current study examines two outcomes. First, we created a measure of the monthly count of use of force incidents per officer. A use of force is defined by departmental policy in Milwaukee and includes incidents ranging from physically subduing an individual who is not complying with officers' commands to discharging a weapon and deadly force.

We also examine the monthly counts of citizen complaints against each officer. People in Milwaukee may lodge a complaint against an officer by phone or in person with a supervisor at any of the department's district stations, MPD's Internal Affairs Division, or the Milwaukee Fire and Police Commission (MPD's civilian oversight board). Community members may file a complaint against an MPD officer for several reasons, including issues regarding the officer's competence, integrity, or behavior during their encounter.

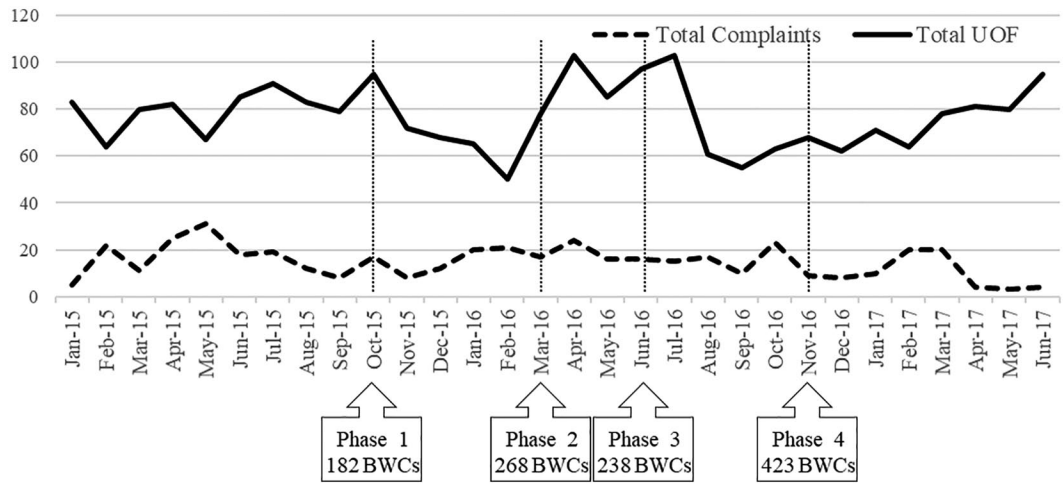

Figure 1: Total Use of Force Incidents and Complaints During Study Period

Figure 1 depicts the trends in these two outcomes across our 30-month study period. As indicated in the graph, numbers of use of force and complaints vary widely across time. Use of force numbers tends to be highest in warmer months, averaging nearly 90 incidents per month in the summer (June, July, and August) and only 67 during the winter (December, January, and February). There is no obvious seasonal trend with complaints, with a low of three incidents in May 2017 and a high of 31 in May 2015, although they tend to be infrequent across all months. Overall, it is not clear from these trends the degree to which Milwaukee's BWC program affected use of force or citizen complaints, underscoring the need for more rigorous analysis.

There are also two primary independent variables of interest. We created a BWC measure that indicates whether an officer was equipped with a BWC during a particular month in the panel data set. This variable was dummy coded as 0 = no camera, 1 = camera. During the first 9 months in the panel, all officers are coded as "0," whereas nearly all of the officers are coded as "1" during the last 8 months. Some officers were equipped with a camera and then had it removed at a later point in the study period. For example, sergeants were equipped with cameras during the initial four-wave rollout but had them removed in early 2017 (and thus before the end of our study period) after the department decided that they had limited direct interaction with the public and needed to reallocate their cameras for new recruits who would be on patrol. Likewise, some of the officers who were equipped with a BWC were promoted to a position that involved them having their cameras removed (e.g., lieutenant and sergeants after 2017).

Second, we created a measure of treatment duration to assess changes in the relationship between BWCs and the selected outcomes over time. Treatment duration is a variable coded as "0" for each month prior to an officer receiving a BWC, "1" for the first month in which they were equipped with a BWC, "2" for their second month, and so on. Thus, this variable ranges from 0 to 20 for officers who received cameras during Wave 1 of deployment.

The models below also control for several relevant demographics and job-related variables. These include sex (0 = female, 1 = male), race/ethnicity (Black, Hispanic, Other,

with White as the reference category), and tenure (years an officer had been working for the MPD at the time they received a BWC). Furthermore, we include a measure of officer rank (sergeant, detective, lieutenant, with officer as the reference category). Some of the officers received promotions during the study period; thus, their rank may vary between months.

Finally, we control for the wave in which the officer received a camera (i.e., Wave 2, Wave 3, Wave 4, with Wave 1 as the reference category). This allows us to distinguish between officers who received cameras during different Waves and identify any differences in the effectiveness between Waves. For instance, although the content of the training did not change significantly between Wave 1 and Wave 4, it is likely that the sergeant leading the training was more comfortable/better able to deliver the training during later waves. As indicated above, most of the officers who received BWCs in Wave 1 were part of the Neighborhood Task Force and had duties that were distinct from regular patrol officers (i.e., they rarely responded to calls and instead focused on engaging in traffic stops and other proactive activities). Similarly, the early adopters in Wave 1 had much fewer colleagues equipped with BWCs than those who received cameras in later waves. By the time officers received cameras in Wave 4, it had been over a year since the start of the BWC program and cameras were much more widely accepted among MPD officers. Furthermore, officers in these later waves may have begun changing their behaviors even before receiving their BWCs because of "anticipatory effects" (Ariel et al., 2019), underscoring the importance of controlling for these unique points in the study period. Finally, our models include dummy controls for each month (with January as the reference category) to account for seasonal trends in the selected outcomes.

ANALYTIC STRATEGY

Because the dependent variables in the present study are the number of use of force incidents and complaints for each officer over a 30-month period, we use panel analyses. Panel models account for the structure of panel data, which include a group of individuals (n), who are observed over a period of time (t), for a total of $n \times t$ observations. As a result, the unit of analysis for our panel models is the "officer-month." This allows us to estimate a more complicated model than analytic methods designed for cross-sectional data or a single time series. Panel models have more accurate and efficient estimates than those from other types of data, particularly when examining changes between time periods (see Verbeek, 2008).

As both outcomes in these analyses are count measures with evidence of skewness and overdispersion, we used random-effects negative binomial panel regression models. This protects against potentially biased estimates that we might observe if we used ordinary least squares regression (Hilbe, 2011; Long & Freese, 2006; MacDonald & Lattimore, 2010). We selected a negative binomial model over a Poisson model because negative binomial is appropriate when the assumption of equidispersion is not met (i.e., the conditional means do not equal the conditional variances; Cameron & Trivedi, 2007). We used the likelihood ratio test of the overdispersion parameter in Poisson models with random effects to determine that our data were overdispered and that a negative binomial model was more appropriate.

We used the XTNBREG command in Stata 15.1 to estimate these panel models. We tested two models for each outcome. The first, Model 1, includes the primary variable of interest—whether officers were equipped with a BWC in that month—along with all the

control variables described above. This model allowed us to examine the average/overall effect of BWCs on use of force and complaints. Model 2 builds on Model 1 by including our measure of treatment duration. In this model, the main effect of BWCs is interpreted as the immediate impact of BWCs, whereas treatment duration allows us to estimate the changes in the effects of BWCs over time by indicating how each additional month with a BWC affects the outcomes.

It should be noted that XTNBREG is a mixed model. We explored the option of instead using a generalized estimating equation (GEE), which relies on a population average model and can account for a model's correlation structure. We examined whether our models suffered from serial autocorrelation using XTSERIAL in Stata (Drukker, 2003), which is a test of panel model serial autocorrelation developed by Wooldridge (2002). None of our models had serial autocorrelation and, thus, did not require further adjustments. Despite these findings, we also reran our models with Stata's XTGEE command to ensure our results were not biased. We found very few differences between the results from our original models and the GEE models (i.e., in Model 1 of the GEE "complaint" analysis, the effect of BWCs was only marginally significant, although it was significant in the mixed model).

In all models, we report the coefficients, standard errors, and incident rate ratios (IRRs) for each covariate. We also report the model's Wald chi-square estimate and the Akaike information criterion and Bayesian information criterion to assess and compare overall model fit. Furthermore, we specify all the models with an exposure variable, which comprised the officers' total number of activities for that month. This measure pulls from all the calls assigned to that officer through the MPD's computer-aided dispatch system, as well as the officers' reported proactive activities (i.e., officer-initiated community interactions, such as subject stops and traffic stops). The exposure variable accounts for why some officers might have lower levels of force and fewer complaints than other officers for reasons beyond the impact of the BWC. In other words, the exposure variable allows us to examine the number of use of force incidents and complaints per month, controlling for officers' total number of policing activities.

RESULTS

Table 1 presents the summary statistics of the variables included in the analytic models. These numbers are aggregated values for officer-months. In other words, the mean represents the average from across 30,270 observations (i.e., 1,009 officers × 30 months). Unlike cross-sectional data, panel data can also vary between and within individuals. The overall standard deviation in Table 1 represents the variation from the overall mean for each observation $(X_{ij} - \bar{X})$, whereas the between standard deviation is the average standard deviation for each individual $(X_i - \bar{X})$, and the within standard deviation is variation of each individual's observation from his or her own mean $(X_{ij} - \bar{X}_i)$. The table indicates that both complaints and use of force are rare occurrences in Milwaukee, with only 0.014 complaints and 0.071 use of force incident per officer per month and a range of 0 to 5 incidents. However, both complaints and use of force vary more within than between officers.

The table also shows that in nearly 65% of the officer-months, the officer did not have a BWC and that the largest group of officers received their cameras in Wave 4 of deployment. The descriptive statistics of the treatment duration variable indicate that, across all officer-months, officers were equipped with BWCs between 0 and 20 months. As all officers included in this sample received a BWC at some point in the study period, officers only had

TABLE 1: Descriptive Statistics of Variables

		SD			
Variable	*M*	Overall	Between	Within	Min–max
Citizen complaints	0.014	0.146	0.029	0.144	0–5
Use of force incidents	0.071	0.287	0.095	0.271	0–5
Tx duration	2.615	4.587	2.276	3.983	0–20
Tenure	11.945	6.536	6.539	0	0.9–35.1
	Frequency	%			
BWC					
No	20,974	64.5			
Yes	11,546	35.5			
Wave					
1	5,460	18.04			
2	7,380	24.38			
3	6,420	21.21			
4	11,010	36.37			
Rank					
Officer	28,784	88.51			
Sergeant	3,487	10.72			
Detective	195	0.60			
Lieutenant	54	0.17			
Sex					
Female	4,290	13.19			
Male	28,230	86.81			
Race					
White	22,620	69.56			
Black	4,890	15.04			
Hispanic	3,900	11.99			
Other	1,110	3.41			

Note. BWC = body-worn camera.

a "0" in the months before they were equipped with the camera or in the months after the BWC was removed (e.g., sergeants in 2017, and officers who were promoted to higher positions that did not require a BWC). Only officers who were part of Wave 1 of the BWC program had a treatment duration of "20" in the final month of the data collection period (i.e., they had cameras between October 2015 and June 2017).

The typical officer in the sample had been with the department just under 12 years when they were equipped with a BWC, with officers' tenure ranging between less than 1 year and more than 35 years. We also see that most individuals in the analytic sample were officers, while very few were detectives or lieutenants. This is not surprising as this would only include individuals who were promoted into those roles after they had already received a BWC as an officer or sergeant. Roughly 87% of the sample were men while 70% were White.

CITIZEN COMPLAINTS

Table 2 presents the results for the negative binomial panel models with random-effects estimators examining citizen complaints. On average, in months where officers had a BWC, they had approximately 29% fewer complaints than in months without a BWC (IRR =

TABLE 2: Results for Negative Binomial Panel Analyses of Citizen Complaints

	Model 1		Model 2	
Variable	*B* (*SE*)	IRR	*B* (*SE*)	IRR
BWC				
No[a]	—	—	—	—
Yes	**−0.336 (0.129)****	**0.714**	0.052 (0.184)	1.053
Tx duration	—	—	**−0.062 (0.023)****	**0.940**
Wave				
1[a]	—	—	—	—
2	0.310 (0.202)	1.363	0.216 (0.203)	1.241
3	0.402 (0.214)	1.495	0.295 (0.216)	1.344
4	0.219 (0.196)	1.245	0.098 (0.198)	1.103
Rank				
Officer[a]	—	—	—	—
Sergeant	**1.626 (0.245)*****	**5.086**	**1.608 (0.245)*****	**4.995**
Detective	0.835 (1.242)	2.305	0.800 (1.255)	2.225
Lieutenant	−13.934 (32,659.21)	0.000	−12.947 (32,590.080)	0.000
Sex				
Female[a]	—	—	—	—
Male	0.008 (0.210)	1.008	0.017 (0.210)	1.017
Race				
White[a]	—	—	—	—
Black	0.097 (0.186)	1.102	0.097 (0.186)	1.102
Hispanic	0.042 (0.198)	1.043	0.049 (0.198)	1.050
Other	−0.585 (0.457)	0.557	−0.587 (0.457)	0.556
Tenure	0.016 (0.011)	1.017	0.016 (0.01)	1.016
No. of obs.	30,270		30,270	
No. of groups	1,009		1,009	
AIC	4,412.523		4,406.863	
BIC	4,628.789		4,631.447	
Wald χ^2	**99.23*****		**103.67*****	

Note. Analyses included controls for month to account for seasonality (not shown), as well as an exposure variable tallying the officer's total number of CAD calls and proactive and activates. Bolded values indicate significance. IRR = incident rate ratio; BWC = body-worn cameras; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAD = computer-aided dispatch.
[a]Reference category.
*$p < .05$. **$p < .01$. ***$p < .001$.

0.714, $p = .009$). Furthermore, Model 1 indicates that sergeants were more than 5 times as likely to receive a complaint compared with officers (IRR = 5.086, $p < .001$). This could be because sergeants are supervisors called to scenes to back up officers, settle disputes between officers and community members, and address other issues raised by individuals being detained, arrested, or investigated.

Model 2 offers additional information on the relationship between cameras and complaints. In that model, the main BWC term is no longer significant, but the measure of treatment duration is. This suggests that BWCs may not have an immediate impact on complaints, but that over time, on average, each additional month that an officer is equipped with a camera results in a 6% reduction in their number of monthly complaints (IRR = 0.940, $p = .008$).

TABLE 3: Results for Negative Binomial Panel Analyses of Use of Force Incidents

	Model 1		Model 2	
Variable	*B* (*SE*)	IRR	*B* (*SE*)	IRR
BWC				
No[a]	—	—	—	—
Yes	–0.027 (0.049)	0.973	**–0.162 (0.072)***	**0.850**
Tx duration	—	—	**0.020 (0.007)****	**1.020**
Wave				
1[a]	—	—	—	—
2	0.308 (0.119)	1.361	**0.343 (0.120)****	**1.409**
3	**0.358 (0.125)****	**1.431**	**0.401 (0.126)****	**1.493**
4	0.043 (0.114)	1.044	0.092 (0.116)	1.096
Rank				
Officer[a]	—	—	—	—
Sergeant	**0.991 (0.166)*****	**2.693**	**0.997 (0.166)*****	**2.710**
Detective	0.983 (0.700)	2.673	0.976 (0.687)	2.654
Lieutenant	–20.996 (41,0799.8)	0.000	–19.986 (24,8410.1)	0.000
Sex				
Female[a]	—	—	—	—
Male	**0.673 (0.141)*****	**1.960**	**0.671 (0.141)*****	**1.956**
Race				
White[a]	—	—	—	—
Black	–0.041 (0.118)	0.960	–0.040 (0.118)	0.961
Hispanic	–0.026 (0.122)	0.974	–0.027 (0.122)	0.974
Other	–0.095 (0.222)	0.910	–0.096 (0.222)	0.909
Tenure	**–0.014 (0.007)***	**0.986**	**–0.014 (0.007)***	**0.987**
No. of obs.	30,270		30,270	
No. of groups	1,009		1,009	
AIC	15,631.39		15,626.33	
BIC	15,847.66		15,850.92	
Wald χ^2	**153.02*****		**159.7*****	

Note. Analyses included controls for month to account for seasonality (not shown), as well as an exposure variable tallying the officer's total number of CAD calls and proactive and activates. Bolded values indicate significance. IRR = incident rate ratio; BWC = body-worn cameras; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAD = computer-aided dispatch.
[a]Reference category.
*$p < .05$. ** $p < .01$. *** $p < .001$.

USE OF FORCE

The result of the panel models examining use of force incidents is presented in Table 3. The results from Model 1 indicate that, as expected, BWCs have no overall impact on use of force incidents. However, when combined with the results of Model 2, the findings are more nuanced. Controlling for both the main effect and the measure of treatment duration, we see that the immediate impact of BWCs on use of force might be negative. That is, officers have 15% fewer use of force incidents in the month after receiving a BWC (IRR = 0.850, $p = .023$), but then engage in 2% more use of force incidents for each subsequent month they have a camera (IRR = 1.020, $p = .008$), thus making the overall impact null, as detailed in Model 1.

The models presented in Table 3 also show that officers involved in Waves 2 (IRR = 1.409, $p = .004$) and 3 (IRR = 1.493, $p = .001$) of the program had significantly higher

monthly levels of force than officers who received their BWC during Wave 1. Sergeants were also more likely to have been involved in the use of force than officers (IRR = 2.710, $p < .001$). However, this could be because sergeants are more likely to be called onto scenes with hostile or otherwise difficult community members. The results also show than men are nearly twice as likely to have be involved in a use of force incident (IRR = 1.956, $p < .001$). Finally, officers with longer tenure have fewer use of force incidents such that each additional year of time on the job results in 1.30% fewer use of force incidents per month on average (IRR = 0.987, $p = .043$).

DISCUSSION

The current study sought to identify changes in the effects of BWCs on use of force incidents and citizen complaints over time. We tested four hypotheses about the relationship between BWCs and two outcomes: citizen complaints and use of force incidents. In general, we found support for our first two hypotheses. BWCs significantly reduced the number of complaints lodged against officers but had no impact on use of force levels. This is consistent with other studies (e.g., Ariel et al., 2016a, 2016b, Peterson et al., 2018).

In our third and fourth hypotheses, we examined two competing explanations for observed changes in program effects over time. The program maturity hypothesis suggests that BWCs will be more effective at reducing use of force incidents and citizen complaints over time, whereas the program fatigue hypothesis would mean that BWCs were less effective at limiting these outcomes the longer officers wear BWCs.

In terms of complaints, we generally found support for program maturity. The implementation of BWCs resulted in an overall drop in complaints and continued decreases over time. This could indicate that BWCs became more effective at preventing complaints as officers grew accustomed to the technology. This supports the notion of a "civilizing effect," whereby officers and community members treat each other with greater respect and civility during interactions because of the presence of a BWC (White, 2014).

However, it is also possible that the observed drop in complaints was attributable to community members becoming more wary over time about how the cameras were used by the MPD to investigate complaints. In Milwaukee, most complaints are lodged by community members by phone or in person with a police supervisor at a local district station. Based on interviews we conducted with Milwaukee police officers and supervisors, we learned that supervisors in these cases will inform people whether the officer targeted in the complaint was wearing a BWC during the encounter. The supervisor may also remind the individual that knowingly filing a false complaint against an officer is a prosecutable crime in Milwaukee. After being provided with this information, community members must decide whether they want to formally file the complaint.

Because community members could face severe penalties if the BWC footage does not support their recollection of events detailed in their complaints, they may feel the risk of filing a complaint does not outweigh the reward. This underscores the importance of community members trusting that the department will conduct a fair investigation of complaints. Taylor and Lee (2019) found that people arrested by the police questioned the legitimacy of BWC footage, as there is an intrinsic power imbalance as the cameras are owned and operated by the police, which increased the potential for manipulation of and misrepresentation in BWC footage. Trust may be further reduced as the community becomes aware that BWC

footage may be used to protect officers as much as hold them accountable. For example, examination of citizen complaints in Phoenix, Arizona, found that cases with BWC footage increased dispositions in the officers' favors (Katz et al., 2015). As such, the general finding across studies that BWCs reduce citizen complaints may not be due to a "civilizing effect," but instead be because community members are more reluctant to formally lodge complaints if they believe the footage would be used unfairly by the department to vindicate the officer.

Our analyses of use of force incidents did not offer clear support for either the program maturity or fatigue hypotheses. We did not find an overall relationship between BWCs and use of force, but did observe some changes in the effect over time. In our model with the measure of treatment duration, we found an immediate decrease in use of force incidents, followed by a gradual increase in the subsequent months. One interpretation for these results is that officers pulled back on using force in the month immediately after receiving a camera, but then adjusted these behaviors after they become more accustomed to the technology. Alternatively, it may have taken officers some time to realize the benefits of BWCs to their daily work. Camera footage offers documentation of the interaction that preceded the incident and, in many cases, justifies the use of force. Offering some support to this interpretation, Gaub et al. (2016) found that some officers were significantly less likely to think BWCs affect their decision to use force after receiving a BWC (the relationship was insignificant in the other two departments). Katz et al. (2014) similarly found that officers' concerns that BWCs would cause officers to be more cautious in making decisions, including to use force, declined after implementation of BWCs.

It is also worth mentioning that the MPD had experienced declines in the department's overall use of force between 2013 and 2016 (i.e., the years leading up to this study; Brandl, 2017). As such, it is possible that the limited overall relationship between BWCs and use of force is capturing increased restraint among officers to engage in force that predates the BWC program. In other words, if officers were already using force less frequently and following departmental policy on appropriate uses of force before the program began, it is unlikely that BWCs would further decrease these incidents.

There were a few limitations to the current study. We were unable to include several control variables that may be associated with the outcomes we selected. For instance, we could not include a measure of the officers' shift in our models. Officers in Milwaukee, as in most other departments across the country, work many different shifts that begin in early mornings, afternoons, or late evenings/nights. Similarly, we were unable to account for the district and specific work assignment an officer was given throughout the study period. Milwaukee only captures current shifts and assignments in their data and does not record these metrics from previous months. We know from conversations with MPD personnel that many of the MPD officers changed shifts and were reassigned multiple times throughout our study period, so we were unable to account for these dynamic factors. Including these controls may have changed some of our findings on the relationship between BWCs and use of force and complaints.

We were also unable to account for how often officers actually turned on their cameras and/or complied with departmental policies about activation during the study period. Rather, our model follows an intent-to-treat (ITT) approach whereby we assumed that study participants complied perfectly with the treatment protocol (see Fisher et al., 1990,). In other words, our models assume officers who had cameras were actually using them during their

interactions with community members. With few exceptions (e.g., Hedberg et al., 2017), this is the standard approach in the BWC literature because of limitations in police departments' administrative and BWC data. This is problematic because we know from research in other cities that activation rates vary widely between officers, time periods, and call types. In one study, activation rates ranged from 0% to 72% among 39 officers across the first 6 months of use (Lawrence et al., 2019). Research in Phoenix, Arizona, noted that BWC activations ranged from 6.5% for traffic stops to 47.5% for domestic violence cases (Katz et al., 2014) and that the rate of activations was highest in the month immediately after officers received the cameras (Katz et al., 2015).

In the current study, however, we were not able to estimate activation rates among MPD officers during use of force incidents and activities that resulted in complaints. It was impossible to link activation metadata from the BWC software to the data set containing use of force incidents and complaints because they are held in separate record management systems without a common identifier. Milwaukee's Internal Affairs Department can pull BWC footage from a specific incident by manually searching by the date/time of the event, but this process could not be automated for our purposes. This limitation makes it difficult for us to determine the true effect of BWCs on use of force incidents and complaints, as it is possible that we may have observed a greater impact on these outcomes among officers with higher levels of BWC activations/compliance to the department's policy (Ariel et al., 2016a; Hedberg et al., 2017). Still, it is worth noting that MPD's policy required officers to turn on their cameras for nearly all interactions with community members, which has been shown to increase camera activation rates compared with policies that leave these decisions to officer discretion (Young & Ready, 2018).

Finally, while our study examined how the effects of BWCs on relevant policing behaviors changes over time, our research period was only 30 months, which is not substantially longer than many existing studies. Most prior research has focused on how BWCs impact outcomes over relatively short periods (a few months or 1–2 years), with much less information about whether these changes are sustained over longer periods (for an exception, see Sutherland et al., 2017). Thus, future scholarship should develop better measures of the long-term impacts of BWCs, which could offer law enforcement agencies critical information about the possible successes or difficulties in sustaining a BWC program.

CONCLUSIONS AND IMPLICATIONS

The findings from this study have implications for policy and practice. To ensure the long-term success of BWC programs in improving police–community interactions, departments should incorporate BWC footage into ongoing training for officers (Todak, 2018). Over time, BWC programs yield enormous amounts of footage depicting both successful and nonsuccessful community encounters. This footage can be invaluable for training new recruits in the academy, as well as for ongoing training opportunities, to encourage officers to engage with community members respectfully and in adherence to departmental policy. Phelps et al. (2018) conducted an RCT with Norwegian police recruits on how reflections of BWC footage can increase learning goals during trainings. They found that recruits who reviewed BWC footage as part of their training reported more statements about what they learned and methods to improve community interactions. Findings from the current study offer some support for this recommendation. During our interviews with MPD officers, we

learned that the department routinely pulled BWC footage to use in trainings with recruits and officers. It is possible that this contributed to the decline in complaints we found over time as officers were equipped with the cameras.

We also found that officers initially decreased their use of force after receiving a BWC, but that these behaviors gradually increased again in the subsequent months. Thus, we also recommend that departments develop ways to leverage BWCs to improve the management of officers. In Milwaukee, and in many other departments, the Internal Affairs Division investigates use of force incidents, which includes a review of BWC footage when available. However, these events are rare and may not offer enough consistent opportunities to identify and correct problematic behaviors. Moreover, police supervisors typically only pull and review BWC footage from their officers as needed to address specific issues. We recommend that departments create policies and procedures for systematically reviewing camera footage and to proactively manage officers. Ongoing feedback to officers can be more successful at affecting lasting changes in officer behavior, and potentially reducing outcomes like use of force incidents, than simply relying on ad hoc reviews.

These recommendations are supported by the model BWC policy from the International Association of Chiefs of Police (IACP, 2014) that recommends supervisors review recordings "at least monthly" to ensure officers are complying with department policy and identify areas which may require additional training. Conversely, the PERF's model policy suggests that an agency's internal audit unit, rather than the officers' direct supervisors, be responsible for systematic review of BWC footage to gauge officer compliance and performance (Miller et al., 2014). Both models have informed the policies of hundreds of departments and are recommended by the BJA in BWC funding opportunities (e.g., BJA, 2020).

Increased use of police BWCs have been a critical part of public discourse in recent months as community members, advocacy groups, and other organizations have advocated for officers to record their behaviors and be held accountable for inappropriate conduct. The findings from this article suggest that BWCs are a policing tool that has the potential for long-term use and success in reducing community complaints, not just as a temporary method for addressing immediate concerns around police accountability and transparency. However, much of the recent focus on BWCs is around their ability to reduce police brutality, particularly in communities of color. The current study, which is consistent with other research, found that BWCs do not lead to lasting reductions in use of force. Thus, the evidence does not suggest that BWCs should be the focal point of these reforms or discussions, but rather a single component that could complement or enhance other strategies. We also recommend that departments seeking to implement or expand existing BWC programs focus on research-informed BWC policies and procedures to guide a program's development and management, which could help this technology be a significant component to improving police–community interactions over time.

We believe this study contributed to the already robust literature on BWCs by examining how the effects of cameras on use of force and complaints changed over time. We found that BWCs led to an average, overall reduction in citizen complaints but had mixed impacts on use of force. We also found some support for our proposed program maturity hypothesis, particularly in terms of complaints. While there was an overall reduction in officer's monthly complaints after they began wearing BWCs, our models with "treatment duration" demonstrated that each additional month that an officer has a camera resulted in 6% fewer complaints. Future studies should replicate and extend this research by examining impacts of

BWCs over time on other outcomes, such as arrests and proactive activities, and by incorporating a measure of camera activation or compliance to departmental policies.

ORCID ID

Bryce E. Peterson https://orcid.org/0000-0003-1303-2696

REFERENCES

Ariel, B., Farrar, W. A., & Sutherland, A. (2015). The effect of police body-worn cameras on use of force and citizens' complaints against the police: A randomized controlled trial. *Journal of Quantitative Criminology*, *31*, 509–535.

Ariel, B., Sutherland, A., & Bland, M. (2019). The trick does not work if you have already seen the gorilla: How anticipatory effects contaminate pre-treatment measures in field experiments. *Journal of Experimental Criminology*. Advanced online publication. https://doi.org/10.1007/s11292-019-09399-6

Ariel, B., Sutherland, A., Henstock, D., Young, J., Drover, P., Sykes, J., Megicks, S., & Henderson, R. (2016a). Report: Increases in police use of force in the presence of body-worn cameras are driven by officer discretion—A protocol-based subgroup analysis of ten randomized experiments. *Journal of Experimental Criminology*, *12*, 453–463.

Ariel, B., Sutherland, A., Henstock, D., Young, J., Drover, P., Sykes, J., Megicks, S., & Henderson, R. (2016b). Wearing body cameras increases assaults against officers and does not reduce police use of force: Results from a global multi-site experiment. *European Journal of Criminology*, *13*(6), 744–755.

Ariel, B., Sutherland, A., Henstock, D., Young, J., Drover, P., Sykes, J., Megicks, S., & Henderson, R. (2017). Contagious accountability: A global multisite randomized controlled trial on the effect of police body-worn cameras on citizens' complaints against the police. *Criminal Justice and Behavior*, *44*(2), 293–316.

Brackens, K., & Miller, T. (2017). *National Public Safety Partnership: Annual report, January to December 2017*. National Public Safety Partnership.

Braga, A., Coldren, J. R., Sousa, W., Rodriguez, D., & Alper, O. (2017). *The benefits of body-worn cameras: New findings from a randomized controlled trial at the Las Vegas Metropolitan Police Department*. CNA Analysis & Solutions.

Brandl, S. G. (2017). *An analysis of 2016 use of force incidents in the Milwaukee Police Department*. Fire and Police Commission.

Bureau of Justice Assistance. (2020). *Body-worn camera toolkit: Funding*.

Cameron, A. C., & Trivedi, P. K. (2007). Essentials of count data regression. In B. H. Baltagi (Ed.), *A companion to theoretical econometrics* (pp. 331–348). Wiley-Blackwell.

Drukker, D. M. (2003). Testing for serial correlation in linear panel-data models. *Stata Journal*, *3*(2), 168–177.

Ellis, T., Jenkins, C., & Smith, P. (2015). *Evaluation of the introduction of personal issue body worn video cameras (Operation Hyperion) on the Isle of Wight: Final report to Hampshire Constabulary*. University of Portsmouth.

Farrar, T., & Ariel, B. (2013). *Self-Awareness to being watched and socially desirable behavior: A field experiment on the effect of body-worn cameras and police use of force*. Police Foundation.

Federal Bureau of Investigation. (2017). *Uniform crime reporting handbook, table 6, Wisconsin, offenses known to law enforcement by city, 2016*. https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/tables/table-6/table-6-state-cuts/wisconsin.xls

Fisher, L. D., Dixon, D. O., Herson, J., Frankoweski, R. K., Hearson, M. S., & Peace, K. E. (1990). Intention to treat in clinical trials. In K. E. Peace (Ed.), *Statistical issues in drug research and development* (pp. 331–350). Marcel Dekker.

Gaub, J. E., Choate, D. E., Todak, N., Katz, C. M., & White, M. D. (2016). Officer perceptions of body-worn cameras before and after deployment: A study of three departments. *Police Quarterly*, *19*(3), 275–302.

Goodall, M. (2007). *Guidance for the police use of body-worn video devices*. Home Office. http://library.college.police.uk/docs/homeoffice/guidance-body-worn-devices.pdf

Grossmith, L., Owen, C., Finn, W., Mann, D., Davies, T., & Baika, L. (2015). *Police, camera, evidence: London's cluster randomised controlled trial of body worn video*. College of Policing and Mayor's Office for Policing and Crime.

Hedberg, E. C., Katz, C. M., & Choate, D. E. (2017). Body-worn cameras and citizen interactions with police officers: Estimating plausible effects given varying compliance levels. *Justice Quarterly*, *34*(4), 627–651.

Hilbe, J. M. (2011). *Negative binomial regression*. Cambridge University Press.

Hyland, S. S. (2018). *Body-worn cameras in law enforcement agencies, 2016*. Office of Justice Programs, Bureau of Justice Statistics.

International Association of Chiefs of Police. (2014). *Body-worn cameras: Model policy*.

Jennings, W. G., Fridell, L. A., Lynch, M., Jetelina, K. K., & Gonzalez, J. M. (2017). A quasi-experimental evaluation of the effects of police body-worn cameras (BWCs) on response-to-resistance in a large metropolitan police department. *Deviant Behavior*, *38*(11), 1332–1339.

Jennings, W. G., Lynch, M. D., & Fridell, L. A. (2015). Evaluating the impact of police officer body-worn cameras (BWCs) on response-to-resistance and serious external complaints: Evidence from the Orlando police department (OPD) experience utilizing a randomized controlled experiment. *Journal of Criminal Justice*, *43*(6), 480–486.

Katz, C. M., Choate, D., Ready, J., & Nuño, L. (2014). *Evaluating the impact of officer worn body cameras in the Phoenix Police Department*. Center for Violence Prevention and Community Safety, Arizona State University.

Katz, C. M., Kurtenbach, M., Choate, D. E., & White, M. D. (2015). *Phoenix, Arizona, smart policing initiative: Evaluating the impact of police officer body-worn cameras*. Bureau of Justice Assistance.

Lawrence, D. S., McClure, D., Malm, A., Lynch, M., & La Vigne, N. G. (2019). Activation of body-worn cameras: Variation by officer, over time, and by policing activity. *Criminal Justice Review*, *44*(3), 339–355.

Lenninger, S. (2020, June, 8). Public defenders want mandated body cameras. *KOAT 7 Action News*. https://www.koat.com/article/public-defenders-want-mandated-body-cameras/32804338

Liederbach, J., Boyd, L., Taylor, R., & Kawucha, S. (2008). Is it an inside job? An examination of internal affairs complaint investigation files and the production of nonsustained findings. *Criminal Justice Policy Review*, *18*(4), 353–377.

Long, J. S., & Freese, J. (2006). *Regression models for categorical and limited dependent variables using Stata*. Stata Press.

Lum, C., Stoltz, M., Koper, C. S., & Scherer, J. A. (2019). Research on body-worn cameras: What we know, what we need to know. *Criminology & Public Policy*, *18*(1), 93–118.

MacDonald, J. M., & Lattimore, P. K. (2010). Count models in criminology. In A. R. Piquero & D. Weisburd (Eds.), *Handbook of quantitative criminology* (pp. 683–698). Springer.

McClure, D., La Vigne, N., Lynch, M., Golian, L., Lawrence, D. S., & Malm, A. (2017). *How body cameras affect community members' perceptions of police: Results from a randomized controlled trial of one agency's pilot*. The Urban Institute. www.urbn.is/2sVTocl

Miles, V. (2020, June 10). Arlington NAACP joins calls to equip police with body-worn cameras. *ARL Now*. https://www.arlnow.com/2020/06/10/arlington-naacp-joins-calls-to-equip-police-with-body-worn-cameras/

Miller, L., Toliver, J., & Police Executive Research Forum. (2014). *Implementing a body-worn camera program: Recommendations and lessons learned*. Office of Community Oriented Policing Services.

Milwaukee Police Department. (2019). *Standard operating procedure: 747—Body worn cameras*. https://bja.ojp.gov/sites/g/files/xyckuh186/files/media/document/747-bodyworncamerabwc.pdf

Norwood, C. (2020, June 25). Body cameras are seen as key to police reform. But do they increase accountability? *PBS Newshour*. https://www.pbs.org/newshour/politics/body-cameras-are-seen-as-key-to-police-reform-but-do-they-increase-accountability

Owens, C., & Finn, W. (2018). Body-worn video through the lens of a cluster randomized controlled trial in London: Implications for future research. *Policing: A Journal of Policy and Practice*, *12*(1), 77–82.

Pate, A., & Friddell, L. (1993). *Police use of force: Official reports, citizen complaints, and legal consequences*. Police Foundation.

Peterson, B., Lawrence, D. S., Yu, L., & La Vigne, N. (2018). *The Milwaukee Police Department's body-worn camera program*. The Urban Institute.

Phelps, J., Strype, J., Le Bellu, S., Lahlou, S., & Aandal, J. (2018). Experiential learning and simulation-based training in Norwegian police education: Examining body-worn video as a tool to encourage reflection. *Policing: A Journal of Policy and Practice*, *12*(1), 50–65.

Police Executive Research Forum. (2017). *Citizen perceptions of body-worn cameras: A randomized controlled trial*.

Rogan, A. (2018, May). 4 years later: Dontre Hamilton and Dontre Day. *Milwaukee*. https://www.milwaukeemag.com/dontre-hamilton-dontre-day-2018/

Stanley, J. (2020, June 25). Body cameras and the George Floyd protests. *American Civil Liberties Union*. https://www.aclu.org/news/privacy-technology/body-cameras-and-the-george-floyd-protests/

Sutherland, A., Ariel, B., Farrar, W., & De Anda, R. (2017). Post-experimental follow-ups—Fade-out versus persistence effects: The Rialto police body-worn camera experiment four years on. *Journal of Criminal Justice*, *53*, 110–116.

Taylor, E., & Lee, M. (2019). Off the record? Arrestee concerns about the manipulation, modification, and misrepresentation of police body-worn camera footage. *Surveillance & Society*, *17*(3–4), 473–483.

Todak, N. (2018). Using body-worn cameras to create an evidence-based de-escalation training program. In R. J. Mitchell & L. Huey (Eds.), *Evidence based policing: An introduction to key ideas* (pp. 295–310). Policy Press.

U.S. Attorney's Office. (2019, May 9). *Project safe neighborhoods (PSN): Eastern District of Wisconsin strategic plan*. https://www.justice.gov/usao-edwi/project-safe-neighborhoods

U.S. Census Bureau. (2018). *2012-2016 American Community Survey 5-year estimates*. https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2016/5-year.html

Verbeek, M. (2008). *A guide to modern econometrics* (3rd ed.). John Wiley.

Wallace, D., White, M. D., Gaub, J. E., & Todak, N. (2018). Body-worn cameras as a potential source of depolicing: Testing for camera-induced passivity. *Criminology*, *563*(3), 481–509.

White, M. D. (2014). *Police officer body-worn cameras: Assessing the evidence*. Office of Justice Programs.

White, M. D., Gaub, J. E., & Todak, N. (2018). Exploring the potential for body-worn cameras to reduce violence in police-community encounters. *Policing: A Journal of Policy and Practice*, *12*(1), 66–76.

Wooditch, A., Uchida, C. D., Solomon, S. E., Revier, L., Connor, C., Shutinya, M., McCluskey, J., & Swatt, M. L. (2020). Perceptions of body-worn cameras: Findings from a panel survey of two LAPD divisions. *American Journal of Criminal Justice*, *45*(1), 436–453.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. MIT Press.
Yokum, D., Ravishankar, A., & Coppock, A. (2017). *Evaluating the effects of police body-worn cameras: A randomized controlled trial*. The Lab @ DC.
Young, J. T. N., & Ready, J. T. (2018). A longitudinal analysis of the relationship between administrative policy, technological preferences, and body-worn camera activation among police officers. *Policing: A Journal of Policy and Practice*, *12*(1), 27–42.

Bryce E. Peterson, PhD, is a principal research associate in the Justice Policy Center at the Urban Institute. His research focuses on technological interventions in criminal justice settings and correctional policy. He received his PhD in criminal justice from John Jay College/The Graduate Center, City University of New York. He was a co-principal investigator on this project.

Daniel S. Lawrence, PhD in criminology, law, and justice, is a principal research associate in the Justice Policy Center at the Urban Institute. His research interests include police technology, police legitimacy and procedural justice, police screening and hiring practices, and community policing. He received his MA and PhD from the University of Illinois at Chicago. He was a co-principal investigator on this project.