

Public Opinion Regarding Photo Radar

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Photo radar is an automated speed surveillance system that photographs speeding vehicles, drivers, and license plate numbers so that citations can be sent by mail. A telephone survey was conducted among residents of two communities (Paradise Valley, Arizona, and Pasadena, California) where photo radar is being used; residents of nearby communities were also surveyed. Considerable awareness of the use of photo radar was found, especially in Paradise Valley, where 72 percent of the people surveyed mentioned it spontaneously. In all areas, 58 percent either approved or strongly approved its use; residents of Paradise Valley and Pasadena were more likely to approve than residents of nearby communities. Two-thirds of those who approved of photo radar thought its use should be increased. Almost half of the respondents who knew that photo radar was being used said that they were driving more slowly as a result.

Photo radar is a speed enforcement tool that has been used in about 40 countries during the last 15 to 20 years. A photo radar unit consists of a narrow-beam, low-powered Doppler radar speed sensor aimed across the road, a motor-driven camera and flash unit, and a computer. The portable unit detects, photographs, and records information on every vehicle that passes a particular roadway location while exceeding a certain speed. The photographs show the vehicle, its license plate number, and the operator. The photographic information enables the police to issue a citation for speeding to the vehicle's owner. The vehicle owner is normally held responsible for the citation. In the United States, photo radar has been used in a way that allows the citation to be transferred to the driver if the owner was not driving the vehicle.

Photo radar offers a number of advantages over conventional speed enforcement techniques. Photo radar can positively identify speeding vehicles in a nondiscriminatory fashion, producing photographic evidence that also provides the speed, time, date, location, and other relevant information. The equipment can detect and record nearly all speeders, photographing successive vehicles as close as 0.5 sec apart, while providing safeguards that ensure that the speed measurements will be associated with the correct vehicle. Photo radar emits a relatively low-powered microwave signal (in the gigahertz range) and is effective against vehicles with radar detectors. Because police do not need to pursue and stop offenders, hazardous exposure of police officers, speeders, other vehicles, and pedestrians is reduced. The resulting high level of speed enforcement could otherwise be achieved only by assigning several police officers and vehicles to each enforcement site. Consequently, officers are available for other tasks.

The photo radar operator may elect to measure speeds of both oncoming and receding vehicles simultaneously or sep-

arately. For receding vehicles, passenger cars and trucks can be distinguished using the radar to also measure vehicle length. Consequently, a different speed limit can be selected for each of the two vehicle types.

Several techniques are used to prevent errors in photographing vehicles or issuing citations when there is doubt about the vehicle in question. In one system, if two vehicles moving at different speeds are simultaneously within the limits of the radar beam, the computer stops the speed measurement and the camera is not triggered. In another system, if the computer determines through rapid repeated sampling that the measured speed is not correct or cannot be assigned to a specific vehicle, the measurement is stopped. The computer precisely controls the timing of a photograph so that the image of the target vehicle is always within a specific area of the photograph. If more than one vehicle is in the photograph, a template can be used to identify the target vehicle.

Photo radar is an efficient way to identify speeding drivers, and the initial evidence of its effects on speeds and crashes is promising. On the West German autobahn between Frankfurt and Cologne, photo radar was installed to help increase compliance with a 100-km/hr speed limit imposed to reduce the annual average of 300 crashes that resulted in 80 injuries and 7 deaths. Compliance with the new speed limit was poor before photo radar was used; photo radar recorded 63,000 violations during 1978, and the safety record improved to 9 crashes, 5 injuries, and no deaths (1).

The police department of Paradise Valley, Arizona, reported substantially fewer crashes in the year after the implementation of photo radar. An early form of photographic identification of speeding vehicles, known as ORBIS III, was tested in Arlington, Texas, over a 3-month period in 1976. This system was found to decrease the proportion of speeders on major urban roads by one-half or less with no enforcement (2).

Because photo radar combines several recent technologies in a novel manner, the American public has had relatively little experience with it as a law enforcement tool. Several legislative, judicial, and community acceptance issues surround the use of photo radar. In many jurisdictions, specific legislation may be required before photo radar can be used. Legal issues of due process concerning photo radar, such as whether mailing a ticket is permissible and whether an owner (not the driver) can be held liable for the ticket, have not yet been resolved. In addition, public knowledge about and acceptance of photo radar are important considerations regarding its use.

Photo radar is being used in Paradise Valley, Arizona, and Pasadena, California. Paradise Valley is a small community (17 mi², with a population about 12,000) adjacent to Phoenix. One photo radar unit has been used there since September

1987. The unit is currently deployed about 30 hr per week, distributed among several locations on both residential and arterial streets. Pasadena, a suburb of Los Angeles, is a slightly larger and more densely populated community (23 mi², with a population about 130,000) than Paradise Valley. A photo radar unit has been operated in Pasadena since June 1988 for approximately 15 to 25 hr per week. In Paradise Valley, signs posted at the entrances to the community advise that photo radar is used for speed enforcement, and a sign saying "photo radar ahead" is placed upstream from the unit, giving motorists an opportunity to slow down before they reach it. In Pasadena, 75 signs saying "Speed enforced with photo radar" are posted throughout the city, and a sign saying "You have just passed through photo radar" is placed just downstream of the unit. In both cities, photo radar is deployed in vehicles prominently displaying local police markings.

To determine public attitudes about and acceptance of photo radar, a telephone survey of drivers residing in and around these communities was conducted. The surrounding communities were surveyed because of the possibility that drivers living in those areas had exposure to photo radar but different opinions of it than residents of Paradise Valley or Pasadena.

PHOTO RADAR OPERATING CHARACTERISTICS

Photo radar combines a narrow-beam (about 5 degrees horizontal, between 5 and 22 degrees vertical) Doppler effect radar system with a still-frame, motor driven camera and flash unit, which are controlled by a small computer. The system is aimed across the road (rather than up or down the road like conventional speed radar) at an angle of about 20 degrees from the road edge. The speed of each vehicle that enters the radar beam is measured and compared to the speed limit that has been entered into the computer. When the radar unit sends a signal to the computer that a vehicle has exceeded the speed limit, the computer directs the camera (and flash if necessary) to photograph the vehicle. The photograph rec-

ords the vehicle's appearance, license plate number, driver's face (for frontal views), vehicle speed (from information relayed by the computer), date, time, and other system and location details. The camera's motor drive then advances the film to the next frame. System recycle time ranges from 0.5 sec (without flash) to 3 sec for full flash power.

The radar transmitters operate in the gigahertz (GHz) microwave range; one manufacturer uses 13.45 GHz and another uses 34.3 GHz. Transmitter power output ranges from 0.5 milliwatts (mW) for one system to 10.0 mW for another. Because the radar frequencies are substantially different from those used by police radar in the United States (either 10.525 or 24.150 GHz), and the beam is narrow, low-power, and directed across the road, photo radar is not effectively detected by radar detectors. The systems can measure speeds in the range of 15 to 150 mph or more, with an error range of plus or minus 1 to 3 mph for speeds under 100 mph and plus or minus 1 to 3 percent for higher speeds.

METHODS

Interviews for the survey were conducted by telephone from August 18 through September 5, 1989, by Opinion Research Corporation. Random-digit dialing methods were used to select households. In each household, one interview of a licensed driver was conducted.

Approximately equal numbers of interviews were conducted with residents of Paradise Valley (501 interviews) and nearby areas (Phoenix and Scottsdale, 500 interviews), and residents of Pasadena (502 interviews) and nearby areas (Glendale, Burbank, South Pasadena, Alhambra, San Gabriel, Temple City, Arcadia, El Monte, Monrovia, Altadena, San Marino, La Canada, La Crescenta, Sierra Madre, and Duarte, California; 502 interviews). The maximum expected sampling error at the 95-percent confidence level for each study area is ± 4 percentage points. Differences of 6 percentage points or more between areas are statistically significant at $p \leq 0.05$.

TABLE 1 AWARENESS OF PHOTO RADAR BEING USED

	<u>Paradise Valley</u> % (N)	<u>Near Paradise Valley</u> % (N)	<u>Pasadena</u> % (N)	<u>Near Pasadena</u> % (N)
Mentioned Spontaneously	72 (363)	39 (197)	56 (283)	24 (122)
Knew when Prompted	24 (119)	47 (235)	34 (170)	51 (255)
Not aware of	4 (19)	14 (68)	9 (46)	25 (124)
Not Sure	0 (0)	0 (0)	1 (3)	0 (1)
Total	100 (501)	100 (500)	100 (502)	100 (502)

Question: What kinds of techniques do the police use to enforce speed limits where you drive?

The interview required about 10 min to complete. Respondents were asked questions in three areas: awareness of photo radar, attitudes toward its use, and reported behavior in response to photo radar.

SURVEY RESULTS

Awareness of Photo Radar

Respondents were first asked to indicate techniques used by the police to enforce speed limits in areas where they drive. Then a description of photo radar was read to them: "During the last year a new speed enforcement tool known as photo radar has been used in Paradise Valley (or Pasadena). It automatically photographs the license plate and the driver of only those vehicles traveling significantly faster than the speed limit." Respondents who had not already mentioned photo radar spontaneously were then asked if they had known it was being used.

Table 1 indicates that there was considerable awareness of the use of photo radar in Paradise Valley and Pasadena. Awareness of photo radar was greatest among residents of Paradise Valley, where 72 percent of the respondents mentioned it spontaneously, followed by Pasadena residents (56 percent). More respondents living near Paradise Valley mentioned it spontaneously (39 percent) than those living near Pasadena (24 percent). In all four areas surveyed, the great majority of respondents either mentioned photo radar spontaneously or claimed to know about its use after it was described to them.

Most of the respondents said that they drive in or through Paradise Valley or Pasadena at least occasionally (Paradise Valley, 99 percent; near Paradise Valley, 91 percent; Pasadena, 98 percent; near Pasadena, 90 percent). The majority of people who drive through Paradise Valley or Pasadena and had heard of photo radar said that they had seen photo radar in use (Table 2). Residents of Paradise Valley (89 percent) or nearby communities (75 percent) were more likely than

residents of Pasadena (64 percent) or nearby communities (52 percent) to say they had seen it. Including all respondents in the denominator, the percentages claiming to have seen photo radar in use were as follows: Paradise Valley, 84 percent; near Paradise Valley, 61; Pasadena, 57; near Pasadena, 36.

Table 3 presents the percentage of respondents (5 percent or less) who said they had received a speeding ticket because of photo radar.

Attitudes Toward Photo Radar

Overall, 58 percent of the respondents either approved or strongly approved of the use of photo radar, 37 percent disapproved or strongly disapproved, and 5 percent were not sure (Table 4). Paradise Valley and Pasadena respondents (both 62 percent) were most likely to approve of photo radar. Overall, the proportion of those who strongly disapproved of photo radar was the same as the proportion of those who strongly approved (15 percent).

Of those approving of photo radar, 67 percent said they thought its use should be increased (Table 5). In each of the four areas surveyed, about two-thirds of the supporters of photo radar thought its use should be increased.

Table 6 presents the major reasons that people disapproved of photo radar. These reasons were not read to respondents but were listed on the survey form and circled if mentioned. In addition to the five reasons for disapproval listed in Table 6, some respondents also said: "photo radar represents 'big brotherism' in government" (8 percent); "waste of taxpayers' money" (6 percent); "rather be pulled over; should be personal contact" (3 percent); and "illegal, entrapment, unconstitutional" (2 percent).

Response to Photo Radar

Tables 7-9 are based on the responses of drivers who had heard of photo radar and who drive through Paradise Valley

TABLE 2 RESPONDENTS WHO HAD SEEN PHOTO RADAR IN USE

Seen In Use	Paradise Valley		Near Paradise Valley		Pasadena		Near Pasadena	
	%	(N)	%	(N)	%	(N)	%	(N)
Yes	89	(423)	75	(307)	64	(287)	52	(182)
No	11	(50)	23	(92)	34	(152)	45	(160)
Not Sure	1	(3)	2	(8)	2	(11)	3	(11)
Total	101	(476)	100	(407)	100	(450)	100	(353)

Question: Have you ever seen or driven past a photo radar unit being used in Paradise Valley/Pasadena?

Note: Data based on those who have heard of photo radar being used and who drive through Paradise Valley/Pasadena.

TABLE 3 SPEEDING TICKETS OR WARNINGS IN PAST 3 YEARS

Speeding Tickets or Warnings	Paradise Valley		Near Paradise Valley		Pasadena		Near Pasadena	
	%	(N)	%	(N)	%	(N)	%	(N)
Yes - photo radar	5	(25)	3	(15)	3	(13)	2	(12)
Yes - not photo radar	22	(112)	22	(110)	17	(86)	16	(81)
No	73	(364)	75	(375)	80	(403)	81	(409)
Total	100	(501)	100	(500)	100	(502)	99	(502)

Question: Have you received a speeding ticket or warning in the last three years? Was the ticket issued by the photo radar system?

TABLE 4 ATTITUDE TOWARD USE OF PHOTO RADAR

Attitude	Paradise Valley		Near Paradise Valley		Pasadena		Near Pasadena	
	%	(N)	%	(N)	%	(N)	%	(N)
Strongly approve	20	(101)	12	(60)	16	(82)	12	(58)
Approve	42	(212)	37	(185)	45	(227)	47	(234)
Disapprove	23	(114)	26	(131)	23	(113)	20	(99)
Strongly disapprove	12	(62)	20	(99)	12	(59)	15	(74)
Not sure	2	(12)	5	(25)	4	(21)	7	(37)
Total	99	(501)	100	(500)	100	(502)	101	(502)

Question: Do you approve or disapprove of photo radar? Would you say you approve, strongly approve, disapprove, or strongly disapprove?

TABLE 5 ATTITUDE TOWARD INCREASED USE OF PHOTO RADAR

Photo Radar Should Be Used More Than It is Now	Paradise Valley		Near Paradise Valley		Pasadena		Near Pasadena	
	%	(N)	%	(N)	%	(N)	%	(N)
Agree	70	(226)	63	(169)	64	(212)	69	(228)
Disagree	24	(77)	22	(59)	22	(72)	12	(38)
Not Sure	7	(22)	16	(42)	14	(46)	19	(63)
Total	101	(325)	101	(270)	100	(330)	100	(329)

Question: Do you think photo radar should be used more than it is now?

Note: Data based on those who approve or strongly approve of the use of photo radar.

TABLE 6 MAIN REASONS FOR DISAPPROVING OF PHOTO RADAR

Reason	Percent who say yes			
	Paradise Valley	Near Paradise Valley	Pasadena	Near Pasadena
The wrong person can get ticket/errors will be made	38	43	35	32
Gives Police unfair advantage: is sneaky	39	28	31	39
Violates right to privacy	28	16	29	27
Does not give driver chance to tell his/her side of story	17	23	11	12
Does not slow people down, not effective/does not work	16	12	14	11

Question: *Why don't you approve of photo radar?*

Note: Data based on those who disapprove or strongly disapprove of the use of photo radar; respondents could give one or more reasons.

TABLE 7 REPORTED DRIVING BEHAVIOR WHEN IN PARADISE VALLEY OR PASADENA

Behavior	Paradise Valley	Near Paradise Valley	Pasadena	Near Pasadena
	% (N)	% (N)	% (N)	% (N)
Drive slower	56 (268)	50 (202)	39 (176)	42 (148)
Do not drive slower	42 (202)	49 (201)	60 (268)	56 (196)
Not sure	1 (6)	1 (4)	1 (6)	3 (9)
Total	99 (476)	100 (407)	100 (450)	101 (353)

Question: *Has photo radar made you drive slower when you drive through Paradise Valley/Pasadena?*

Note: Data based on those who have heard of photo radar being used and who drive through Paradise Valley/Pasadena.

or Pasadena. Table 7 indicates that many respondents (47 percent overall) say that photo radar has made them drive more slowly through Paradise Valley or Pasadena. Those living in or near Paradise Valley were more likely to report driving more slowly than those living in or near Pasadena.

In each of the four areas surveyed, the majority who reported driving more slowly said that they did so wherever they were in Paradise Valley or Pasadena (Table 8). The remainder said they drive more slowly where they think photo radar might be used (22 percent overall), where they see photo radar in use (19 percent), or where they were not sure (2 percent). About one quarter said that photo radar had also made them drive more slowly outside Paradise Valley and Pasadena.

Table 9 indicates that people were more likely to say that photo radar had made them drive more slowly if they had mentioned photo radar use spontaneously when asked about

speed enforcement techniques, if they had seen photo radar in use, and if they had received a speeding ticket—especially a photo radar ticket—in the last 3 years.

DISCUSSION OF RESULTS

In the two U.S. communities where photo radar is being used, there is considerable awareness of its presence. This is especially so for Pasadena and Paradise Valley residents but is also true among people in nearby communities, and many say they have seen it in use, even though photo radar is not used extensively in either community. There was greater familiarity with photo radar in Paradise Valley than in Pasadena, presumably because Paradise Valley is a smaller community and because it has been used there longer and more frequently.

TABLE 8 WHERE AND WHEN RESPONDENTS SAY THEY DRIVE MORE SLOWLY

Where/When	Paradise Valley	Near Paradise Valley	Pasadena	Near Pasadena
	% (N)	% (N)	% (N)	% (N)
<u>In Paradise Valley/Pasadena</u>				
All the time	60 (162)	53 (107)	56 (98)	57 (84)
Where they think photo radar might be used	24 (63)	26 (53)	19 (34)	17 (25)
Where they see photo radar being used	13 (36)	20 (40)	23 (40)	25 (37)
Do not know/not sure	3 (7)	1 (2)	2 (4)	1 (2)
<u>Outside Paradise Valley/Pasadena</u>				
Yes	28 (74)	20 (41)	27 (48)	25 (37)
No	70 (188)	77 (155)	70 (124)	73 (108)
Do not know	2 (6)	3 (6)	2 (4)	2 (3)

Question: When driving in Paradise Valley/Pasadena do you drive slower: All the time; where you think photo radar might be used, or just where you see photo radar being used?

Question: Has photo radar made you drive slower outside of Paradise Valley/Pasadena?

TABLE 9 REPORTED SLOWER DRIVING IN RELATION TO AWARENESS OF PHOTO RADAR

Awareness of/ Encounters	Percent Driving Slower			
	Paradise Valley	Near Paradise Valley	Pasadena	Near Pasadena
Mentioned photo radar spontaneously	60	55	40	49
Had heard of when prompted	45	45	37	39
Have seen photo radar in use	59	55	46	53
Have not seen photo radar in use	34	33	29	31
Photo radar ticket	72	71	54	78
Other speeding ticket	66	57	49	47
No speeding ticket	52	46	36	40

Many people, especially those with the greatest familiarity with the photo radar system, say they drive slower because of it. The majority of those who reported driving more slowly said they do so whenever they are in that community, not just where they see photo radar or think it might be, and a minority said they drive more slowly outside these communities as well. People often misrepresent their actual behavior in surveys, and research needs to be conducted to determine the effect of photo radar on actual speeds where the system is used and at other locations. Nevertheless, the survey suggests that some people change their behavior because of photo radar.

There is considerable support for the use of photo radar, especially by residents of communities that are using it, but a large minority of people disapprove of its use. The most popular reason for disapproval is the possibility of errors and the wrong person getting a ticket. However, virtually the only error this system generates occurs when the owner of the vehicle was not the driver. The owner still receives the ticket, but the photographic evidence allows the owner to show that he or she was not the driver. Otherwise, there is little possibility of error. The second most popular reason for disapproval was that it is "sneaky" and gives police an "unfair advantage." However, as noted previously, signs are used widely in both cities to warn drivers that photo radar is in use. Photo radar does eliminate interaction at the scene between police and driver that would allow the driver to explain

mitigating circumstances, but it is objective, accurate, and nondiscriminatory.

The evidence from this survey suggests that photo radar can be an effective speed enforcement tool and that a majority of the people who live in areas where photo radar has been used favors its use.

ACKNOWLEDGMENT

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