

Appendix for “Cellphone use while driving bans and traffic fatalities in the United States”

Table of Contents

eTable 1. Cellphone bans applicable to drivers of all ages by state and year	2-3
eTable 2. Cellphone bans and enforcement allowed	4
eTable 3. Codes and texts for texting plus bans and comprehensive handheld bans	5-9
DAG: Cellphone bans and traffic deaths	10-12
eTable 4. Potential confounding factors controlled for during analysis	13
eTable 5. Sensitivity analysis: Driver fatalities, fatality rates, and unadjusted and adjusted rate ratios for different effective durations of cellphone ban status, United States, 1999-2016	14
eTable 6. Sensitivity analysis: adjusted rate ratios for driver fatalities	15
References	16
eFigure 1. Driver fatality rates by year for each of the 46 intervention states (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)	17
eFigure 2. Non-driver fatality rates by year for each intervention state (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)	64
eFigure 3. Total fatality rates by year for each of the 46 intervention states (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)	111

eTable 1. Cellphone bans applicable to drivers of all ages by state and year, United States, 1999-2016

State	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Alabama																		
Alaska																		
Arizona																		
Arkansas																		
California																		
Colorado																		
Connecticut																		
Delaware																		
Florida																		
Georgia																		
Hawaii																		
Idaho																		
Illinois																		
Indiana																		
Iowa																		
Kansas																		
Kentucky																		
Louisiana																		
Maine																		
Maryland																		
Massachusetts																		
Michigan																		
Minnesota																		
Mississippi																		
Missouri																		
Montana																		
Nebraska																		
Nevada																		
New Hampshire																		
New Jersey																		
New Mexico																		
New York																		
North Carolina																		
North Dakota																		
Ohio																		
Oklahoma																		

Oregon																			
Pennsylvania																			
Rhode Island																			
South Carolina																			
South Dakota																			
Tennessee																			
Texas																			
Utah																			
Vermont																			
Virginia																			
Washington																			
West Virginia																			
Wisconsin																			
Wyoming																			
Note:		blank frames refer to no cellphone bans																	
		refer to calling-only ban																	
		refer to texting-only ban																	
		refer to texting plus ban																	
		refer to calling and texting ban																	
		refer to comprehensive handheld ban																	

eTable 2. Cellphone bans and enforcement allowed

Cellphone ban and enforcement allowed	States ^a
Calling-only ban: primary	CA, NY
Calling-only ban: secondary	NJ
Texting-only ban: primary	AL, ID, IN, KS, KY, LA, ME, MD, MA, MI, NH, NC, PA, RI, SC, TN, VT, VA, WI, WY
Texting-only ban: secondary	FL, IA, NE, OH, SD, VA, WA
Texting plus ban: primary	AK, AR, CO, GA, IL, LA, MN, MS, NM, ND, OK, UT, WI
Texting plus ban: secondary	--
Calling and texting ban: primary ^b	CT, NJ, WA
Calling and texting ban: secondary ^b	WA
Comprehensive handheld ban: primary ^a	CA, DE, HI, IL, MD, NV, NH, NY, OR, VT, WV
Comprehensive handheld ban: secondary ^a	MD, NY, UT, WV

^a A state may be listed more than once in the table if it amended cellphone ban during the study period.

^b If all the banned activities are at the primary enforcement level, it is defined as primary enforcement. Otherwise, it is defined as secondary enforcement (e.g., primary enforcement for texting, but secondary enforcement for calling).

eTable 3. Codes and texts for texting plus bans and comprehensive handheld bans

1. Codes and texts for texting plus bans

State	Code	Period	Text
Alaska	AS 28.35.161	5/11/2012	A person commits the crime of driving while texting, while communicating on a computer, or while a screen device is operating if the person is driving a motor vehicle, and (1) the vehicle has a television, video monitor, portable computer, or any other similar means capable of providing a visual display that is in full view of a driver in a normal driving position while the vehicle is in motion, and the monitor or visual display is operating while the person is driving; or (2) the person is reading or typing a text message or other nonvoice message or communication on a cellular telephone, personal data assistant, computer, or any other similar means capable of providing a visual display that is in the view of the driver in a normal driving position while the vehicle is in motion and while the person is driving.
Arkansas	Arkansas Code § 27-51-1504	10/1/2009	Except as otherwise provided in this section, the driver of a motor vehicle shall not use a handheld wireless telephone for wireless interactive communication while operating a motor vehicle. “Wireless interactive communication” means typing, text messaging, emailing, or accessing information on the Internet with a handheld wireless telephone
Colorado	C.R.S. 42-4-239	12/1/2009	A person shall not use a wireless telephone for the purpose of engaging in text messaging or other similar forms of manual data entry or transmission while operating a motor vehicle.
Georgia	O.C.G.A. § 40-6-241.2 or Hands-Free Georgia Act	7/1/2010	No person who is 18 years of age or older or who has a Class C license shall operate a motor vehicle on any public road or highway of this state while using a wireless telecommunications device to write, send, or read any text based communication, including but not limited to a text message, instant message, e-mail, or Internet data.
Illinois	625 ILCS 5/12-610.2	1/1/2010 to 7/19/2012	a person may not operate a motor vehicle on a roadway while using an electronic communication device to compose, send, or read an electronic message. electronic message includes, but is not limited to electronic mail, a text message, an instant message, or a command or request to access an internet site.
Illinois	625 ILCS 5/12-610.2	7/20/2012 to 12/31/2014	a person may not operate a motor vehicle on a roadway while using an electronic communication device to compose, send, or read an electronic message. Electronic message includes, but is not limited to electronic mail, a text message, an instant message, a digital photograph, a video, or a command or request to access an Internet site.
Louisiana	La. R.S. §32:300.5	8/1/2013	Except as provided in Subsection B of this Section, no person shall operate any motor vehicle upon any public road or highway of this state while using a wireless telecommunications device to write, send, or read a text-based communication. No person shall operate any motor vehicle

			upon any public road or highway of this state while using a wireless telecommunications device to access, read, or post to a social networking site.
Minnesota	Minn. Stat. § 169.475	8/1/2008	No person may operate a motor vehicle while using a wireless communications device to compose, read, or send an electronic message, when the vehicle is in motion or a part of traffic. An electronic message includes, but is not limited to, e-mail, a text message, an instant message, a command or request to access a World Wide Web page, or other data that uses a commonly recognized electronic communications protocol.
Mississippi	Miss. Code Ann. § § 63-33-1	7/1/2015	An operator of a moving motor vehicle is prohibited from writing, sending, or reading a text message and from accessing, reading or posting to a social networking site using a hand-held mobile telephone while driving said motor vehicle.
New Mexico	N.M. Stat. Ann. § 66-7-374	7/1/2014	A person shall not read or view a text message or manually type on a handheld mobile communication device for any purpose while driving a motor vehicle, except to ...; "text message" means a digital communication transmitted or intended to be transmitted between communication devices and includes electronic mail, an instant message, a text or image communication and a command or request to an internet site.
North Dakota	N.D. Cent. Code, § 39-08-23	8/1/2011	The operator of a motor vehicle that is part of traffic may not use a wireless communications device to compose, read, or send electronic message; "Electronic message" means a self-contained piece of digital communication that is designed or intended to be transmitted between physical devices. The term includes e - mail, a text message, an instant message, a command or request to access a world wide web page, or other data that uses a commonly recognized electronic communications protocol.
Oklahoma	47 Okl. St. § 11-901d	11/1/2015	It shall be unlawful for any person to operate a motor vehicle on any street or highway within this state while using a hand-held electronic communication device to manually compose, send or read an electronic text message while the motor vehicle is in motion. "Text message" includes a text-based message, instant message, electronic message, photo, video or electronic mail.
Utah	Utah Code Ann. § 41-6a-1716	5/13/2014	a person may not use a handheld wireless communication device while operating a moving motor vehicle on a highway in this state to manually:(a) write, send, or read a written communication, including:(i) a text message; (ii) an instant message; or (iii) electronic mail; (b) dial a phone number; (c) access the Internet; (d) view or record video; or (e) enter data into a handheld wireless communication device.
Wisconsin	Wis. Stat. § 346.89	8/1/2014	(1) No person while driving a motor vehicle may be engaged or occupied with an activity, other than driving the vehicle, that interferes or reasonably appears to interfere with the person's ability to drive the vehicle safely; 2. Subject to sub. 3) (a) No person may drive, as defined in s. 343.305 (1) (b), any motor vehicle while composing or sending an electronic text message or an electronic mail message.; Subject to subs. (3) and (6), no person while driving a motor vehicle, other than an authorized emergency vehicle, a commercial motor vehicle described in s. 340.01

			(8), or a tow truck, may operate or be in a position to directly observe any electronic device located within the vehicle that is activated and that is providing entertainment primarily by visual means. This subsection does not prohibit a person from using a cellular telephone for purposes of verbal communication.
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2. Codes and texts for comprehensive handheld bans

State	Code	Period	Texts
California	Cal Veh Code § 23123.5	1/1/2009	(a) A person shall not drive a motor vehicle while holding and operating a handheld wireless telephone or an electronic wireless communications device unless the wireless telephone or electronic wireless communications device is specifically designed and configured to allow voice-operated and hands-free operation, and it is used in that manner while driving.
Delaware	21 Del. C. § 4176C	1/2/2011	(a) No person shall drive a motor vehicle on any highway while using an electronic communication device while such motor vehicle is in motion. "Using" shall mean holding in a person's hand or hands an electronic communication device while: a. Viewing or transmitting images or data; b. Playing games; c. Composing, sending, reading, viewing, accessing, browsing, transmitting, saving or retrieving e-mail, text messages or other electronic data; or d. Engaging in a call.
Hawaii	HRS § 291C-137	7/1/2013	No person shall operate a motor vehicle while using a mobile electronic device. "Use" or "using" means holding a mobile electronic device while operating a motor vehicle.
Illinois	625 ILCS 5/12-610.2	1/1/2014	A person may not operate a motor vehicle on a roadway while using an electronic communication device
Maryland	Md. Transportation Code Ann. § 21-1124.1 & 21-1124.2	10/1/2010	Subject to subsection (c) of this section, a person may not use a text messaging device to write or send a text message while operating a motor vehicle in motion or in the travel portion of the roadway. (2) A driver of a motor vehicle that is in motion may not use the driver's hands to use a handheld telephone other than to initiate or terminate a wireless telephone call or to turn on or turn off the handheld telephone.
Nevada	Nev. Rev. Stat. Ann. § 484B.165	1/1/2012	Except as otherwise provided in this section, a person shall not, while operating a motor vehicle on a highway in this State: manually type or enter text, voice communication; Manually type or enter text into a cellular telephone or other handheld wireless communications device, or send or read data using any such device to access or search the Internet or to engage in nonvoice communications with another person, including, without limitation, texting, electronic messaging and instant messaging; Use a cellular telephone or other handheld wireless communications device to engage in voice communications with another person

New Hampshire	RSA 265:79-c	7/1/2015	No person, while driving a moving motor vehicle upon a way or temporarily halted in traffic for a traffic control device or other momentary delay, shall use any hand-held mobile electronic device capable of providing voice or data communication, including but not limited to: reading, composing, viewing, or posting any electronic message; or initiating, receiving, or conducting a conversation; or initiating a command or request to access the Internet; or inputting information into a global positioning system or navigation device; or manually typing data into any other portable electronic device. An operator of a motor vehicle who holds a cellular telephone or other electronic device capable of voice communication in the immediate proximity of his or her ear while such vehicle is in motion is presumed to be engaging in a call within the meaning of this section.
New York	NY CLS Veh & Tr § 1225-c & NY CLS Veh & Tr § 1225-d	11/1/2009	<p>1225-c. Use of mobile telephones.</p> <p>Except as otherwise provided in this section, no person shall operate a motor vehicle upon a public highway while using a mobile telephone to engage in a call while such vehicle is in motion....</p> <p>"Using" shall mean (i) holding a mobile telephone to, or in the immediate proximity of, the user's ear; and (ii) with respect to a person operating a commercial motor vehicle, holding a mobile telephone to, or in the immediate proximity of, the user's ear, or dialing or answering a mobile telephone by pressing more than a single button, or reaching for a mobile telephone in a manner that requires such person to maneuver so that he or she is no longer in a seated driving position, restrained by a seat belt that is installed in accordance with section 393.93 of title 49 of the code of federal regulations and adjusted in accordance with the vehicle manufacturer's instructions.</p> <p>1225-d. Use of portable electronic devices.</p> <p>Except as otherwise provided in this section, no person shall operate a motor vehicle upon a public highway while using a mobile telephone to engage in a call while such vehicle is in motion;</p> <p>"Using" shall mean holding a portable electronic device while viewing, taking or transmitting images, playing games, or composing, sending, reading, viewing, accessing, browsing, transmitting, saving or retrieving e-mail, text messages, or other electronic data.</p>
Oregon	ORS § 811.507	1/1/2010	A person commits the offense of operating a motor vehicle while using a mobile communication device if the person, while operating a motor vehicle on a highway, uses a mobile communication device.
Utah	Utah Code Ann. § 41-6a-1716	04/30/2007 to 5/12/2014	Utah Code Ann. § 41-6a-1715 (Repealed on 05/12/2014) a person operating a motor vehicle is guilty of careless driving if the person:

	Utah Code Ann. § 41-6a-1715		<p>.... using a wireless telephone or other electronic device unless the person is using hands-free talking and listening features while operating the motor vehicle.</p> <p>Utah Code Ann. § 41-6a-1716 (Effective since 05/08/2012) Except as provided in Subsection (3), a person may not use a handheld wireless communication device for text messaging or electronic mail communication while operating a moving motor vehicle on a highway in this state. to: (a) text message; (b) manually communicate through an electronic mail system; (c) manually enter data into a handheld wireless communication device; (d) send data, read text, or view images on a handheld wireless communication device; or (e) manipulate an application from a handheld wireless communication device.</p>
Vermont	23 V.S.A. § 1095b & 23 V.S.A. § 1099	10/1/2014	(b) Use of handheld portable electronic device prohibited. A person shall not use a portable electronic device while operating a moving motor vehicle on a highway in Vermont.
West Virginia	W. Va. Code § 17C-14-15	7/1/2012	Except as provided in subsection (c) of this section, a person may not drive or operate a motor vehicle on a public street or highway while: 1) texting; or 2) using a cell phone or other electronic communications device; Plus: "Using a cell phone or other electronic communication device" means holding in a person's hand or hands an electronic communication device while: (A) Viewing or transmitting images or data; (B) Playing games; (C) Composing, sending, reading, viewing, accessing, browsing, transmitting, saving or retrieving e-mail, text messages or other electronic data; or (D) Engaging in a call For purposes of this section; "Texting" means manually entering alphanumeric text into, or reading text from, an electronic communication device, and includes, but is not limited to, short message service, e-mailing, instant messaging, a command or request to access a World Wide Web page or engaging in any other form of electronic text retrieval or entry, for present or future communication.

Source: United States Statutes and Legislation. Available from: LexisNexis.

Directed acyclic graph (DAG): Cellphone bans and traffic deaths

Study Variables.

Cellphone use while driving bans. The primary policy intervention was cellphone bans for drivers of all ages. These were classified as: 1) no ban, 2) calling-only ban, 3) texting-only ban, 4) texting plus ban (bans activities such as accessing the internet or social media as well as texting), 5) calling and texting ban (bans calling and texting, but not activities such as accessing the internet or social media applications), 6) comprehensive handheld bans that prohibit almost all handheld cellphone use.

Outcome. The outcome measure was the number of traffic fatalities from passenger vehicle crashes per 100,000 residents.

Potential confounders and observed variables. Additional traffic safety laws, socio-economic, and travel factors could confound the association by changing driving behavior or crash risk.¹ We gathered information on seatbelt laws,^{1,2} maximum speed limits,^{1,2} impaired driving laws (pre-conviction administrative license suspension for driving under the influence),^{1,2} unemployment-population ratio,³ income per capita,⁴ cellphone ownership,⁵ vehicle miles traveled,⁶ gasoline price,⁷ and the percentage of rural roadway length out of total roadway length.⁶ Monetary information, such as income, was adjusted to 2016 dollars using the Consumer Price Index.

RoadDesignMaintenance: It cannot be directly measured. But we have a variable to measure the highway expenditure at the state level.

State indicator variables were used to adjust for differences in state crashes rates and safety environments such as quality of highways. Year indicator variables were used to control crash trends, because fatality rates were not linearly increasing or decreasing over 1999-2016. Seasonality was controlled by quarter indicator variable.

Unobserved variables: shaded nodes

StatePoliticalSocialEconomicFactors: Each state may have its own political, social and economic environment that plays a key role to enact and enforce various traffic safety laws including cellphone laws. In combination with year, state political social economic factors determine cellphone ownership, employment rate, income per capita, and gas price at the state level.

VehicleSafetyTechnology: Vehicle safety technology such as electronic stability control and emergency braking could affect the crash rate and crash fatality rate. It is determined by calendar year as vehicle safety technology becomes more popular and more advanced with more recent years.

RiskDrivingBehavior: Risk driving behaviors are considered at the state level, and it is a combination of risky driving behaviors such as speeding, driving after drinking, no seatbelt use, and many other unmeasured factors such as aggressive driving.

LawEnforceStatus: It refers to police enforcement efforts for seatbelt, speed, and alcohol-related driving, and this variable isn't readily available.

CellphoneLawEnforce: It refers to policy enforcement specific to cellphone violations, and this variable isn't readily available.

DAG Model

No Individual-level variables

Since the analyses are done at the state-level, we do not include individual-level variables.

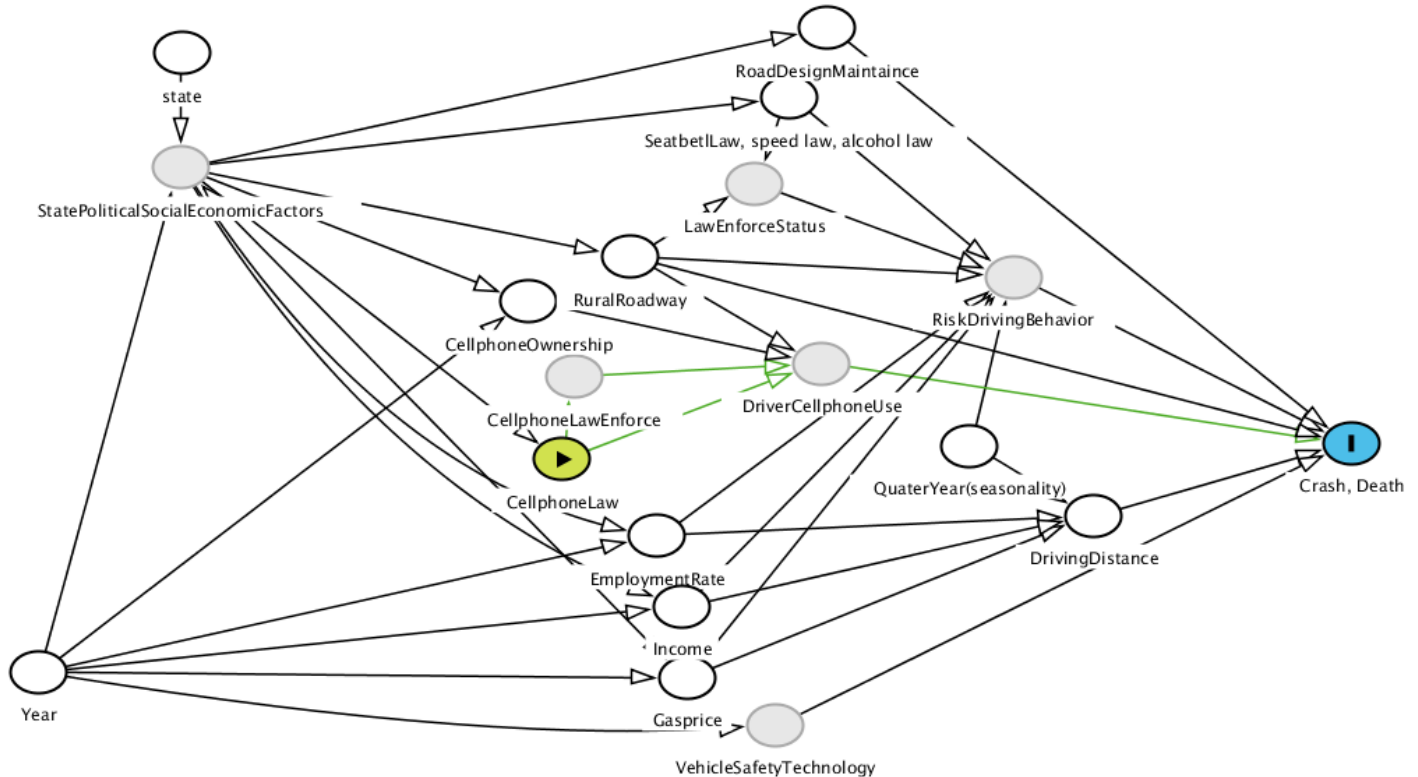
No direct arrow from CellphoneLaw to TrafficCrash, Death

There should be an arrow going directly from cellphone laws to fatal crashes according to a routine DAG. On the other hand, we think the mechanism for cellphone laws to reduce fatal crashes is through reducing driver cellphone use. Therefore the current draft model does not include this direct arrow from CellphoneLaw to TrafficCrash, Death.

The minimal sufficient adjustment sets for estimating the total effect of cellphone laws on traffic deaths are:

CellphoneOwnership, DrivingDistance, EmploymentRate, Gasprice, Income, QuaterYear(seasonality), RoadDesignMaintaince, RuralRoadway, SeatbetlLaw, speed law, alcohol law, Year, state

The figure and codes are below.



Codes for dagitty (<http://www.dagitty.net/dags.html#>)

```
dag {
"Crash, Death" [outcome,pos="0.724,0.109"]
"QuaterYear(seasonality)" [adjusted,pos="-0.125,0.123"]
"SeatbetlLaw, speed law, alcohol law" [adjusted,pos="-0.528,-1.970"]
CellphoneLaw [exposure,pos="-1.031,0.206"]
CellphoneLawEnforce [latent,pos="-1.006,-0.293"]
CellphoneOwnership [adjusted,pos="-1.106,-0.746"]
DriverCellphoneUse [latent,pos="-0.455,-0.372"]
DrivingDistance [adjusted,pos="0.151,0.544"]
EmploymentRate [adjusted,pos="-0.820,0.666"]
Gasprice [adjusted,pos="-0.754,1.518"]
Income [adjusted,pos="-0.765,1.092"]
LawEnforceStatus [latent,pos="-0.604,-1.452"]
RiskDrivingBehavior [latent,pos="-0.028,-0.893"]
RoadDesignMaintaince [adjusted,pos="-0.442,-2.390"]
RuralRoadway [adjusted,pos="-0.881,-1.012"]
```

```

StatePoliticalSocialEconomicFactors [latent,pos="-1.881,-1.549"]
VehicleSafetyTechnology [latent,pos="-0.557,1.804"]
Year [adjusted,pos="-2.196,1.485"]
state [adjusted,pos="-1.878,-2.237"]
"QuarterYear(seasonality)" -> DrivingDistance
"QuarterYear(seasonality)" -> RiskDrivingBehavior
"SeatbeltLaw, speed law, alcohol law" -> LawEnforceStatus
"SeatbeltLaw, speed law, alcohol law" -> RiskDrivingBehavior
CellphoneLaw -> CellphoneLawEnforce
CellphoneLaw -> DriverCellphoneUse
CellphoneLawEnforce -> DriverCellphoneUse
CellphoneOwnership -> DriverCellphoneUse
DriverCellphoneUse -> "Crash, Death"
DrivingDistance -> "Crash, Death"
EmploymentRate -> DrivingDistance
EmploymentRate -> RiskDrivingBehavior
Gasprice -> DrivingDistance
Gasprice -> RiskDrivingBehavior
Gasprice <-> StatePoliticalSocialEconomicFactors
Income -> DrivingDistance
Income -> RiskDrivingBehavior
LawEnforceStatus -> RiskDrivingBehavior
RiskDrivingBehavior -> "Crash, Death"
RoadDesignMaintaince -> "Crash, Death"
RuralRoadway -> "Crash, Death"
RuralRoadway -> DriverCellphoneUse
RuralRoadway -> LawEnforceStatus
RuralRoadway -> RiskDrivingBehavior
StatePoliticalSocialEconomicFactors -> "SeatbeltLaw, speed law, alcohol law"
StatePoliticalSocialEconomicFactors -> CellphoneLaw
StatePoliticalSocialEconomicFactors -> CellphoneOwnership
StatePoliticalSocialEconomicFactors -> EmploymentRate [pos="-1.426,0.306"]
StatePoliticalSocialEconomicFactors -> Income [pos="-1.434,0.378"]
StatePoliticalSocialEconomicFactors -> RoadDesignMaintaince
StatePoliticalSocialEconomicFactors -> RuralRoadway
VehicleSafetyTechnology -> "Crash, Death"
Year -> CellphoneOwnership
Year -> EmploymentRate
Year -> Gasprice
Year -> Income
Year -> StatePoliticalSocialEconomicFactors
Year -> VehicleSafetyTechnology [pos="-1.165,1.931"]
state -> StatePoliticalSocialEconomicFactors
}

```

eTable 4. Potential confounding factors

Confounding Factor	Definition	Source of Information
Seatbelt laws	Separate, binary indicators for: no law, secondary enforcement law, primary enforcement law	IIHS ² , Dr. Scott Masten ¹
Maximum speed limit	Separate, binary indicators for: 70, ≥ 75 miles per hour ^a	IIHS ² , Dr. Scott Masten ¹
Pre-conviction administrative license suspension for driving under the influence	Binary: 0=no law, 1=law	IIHS ² , Dr. Scott Masten ¹
Unemployment-population ratio ^b	Continuous, by year and quarter	BLS ³ , CDC ⁸
Income per capita ^c	Continuous, by year	USBEA ⁹
Cellphone ownership ^b	Continuous, subscriptions per residents of state, by year	FCC ⁵ , CDC ⁸
Gasoline price ^c	Continuous, by year	USEIA ⁷
Percentage of rural roadway length out of total roadway length	Continuous, by year	USDOT ⁶
Highway expenditure	Continuous, by year	USCB ⁹
Vehicle miles travelled ^a	Continuous, miles driven, by year ^a	USDOT ⁶

Abbreviations: BLS: Bureau of Labor Statistics, CDC: Center for Disease Control and Prevention, FCC: Federal Communications Commissions, IIHS: Insurance Institute for Highway Safety, USBEA: US Bureau of Economic Analysis, USDOT: US Department of Transportation, USEIA: US Energy Information Administration, USCB: US Census Bureau.

^a 1 mile = 1.61 kilometers

^b Calculated using population estimate of year and quarter

^c Adjusted to the 2016 US dollar based on each year's Consumer Price Index¹⁰

eTable 5. Sensitivity analysis: Driver fatalities, fatality rates, and unadjusted and adjusted rate ratios for different effective durations of cellphone ban status, United States, 1999-2016

Type of cellphone ban	No. of fatalities	Person-years	Unadjusted fatality rate per 100,000 person-years	Unadjusted rate ratio ^a (95% CI ^b)	Adjusted rate ratio ^c (95% CI)
No ban	254,540	13,769,497,319	7.4	Reference	Reference
Calling-only ban					
< 1 year	1,445	156,671,549	3.7	0.45 (0.40, 0.51)	1.01 (0.93, 1.09)
1-2 years	985	111,244,620	3.5	0.44 (0.37, 0.51)	1.02 (0.98, 1.05)
≥ 2 years	4,142	540,021,228	3.1	0.37 (0.32, 0.44)	0.99 (0.96, 1.02)
Texting-only ban					
< 1 year	6,187	420,903,618	5.9	0.77 (0.69, 0.86)	1.02 (0.99, 1.06)
1-2 years	7,848	529,723,712	5.9	0.76 (0.68, 0.85)	1.02 (0.99, 1.06)
≥ 2 years	28,202	1,900,127,260	5.9	0.74 (0.66, 0.84)	1.01 (0.97, 1.06)
Texting plus ban					
< 1 year	2,616	169,777,801	6.2	0.87 (0.68, 1.11)	1.00 (0.94, 1.06)
1-2 years	3,275	216,592,634	6.0	0.85 (0.66, 1.10)	1.01 (0.95, 1.08)
≥ 2 years	10,162	746,432,292	5.4	0.71 (0.54, 0.93)	0.97 (0.91, 1.03)
Calling and texting ban					
< 1 year	475	56,467,224	3.4	0.43 (0.32, 0.59)	0.92 (0.79, 1.07)
1-2 years	617	75,821,096	3.3	0.41 (0.33, 0.50)	0.96 (0.91, 1.01)
≥ 2 years	4,350	582,610,055	3.0	0.37 (0.31, 0.44)	0.99 (0.88, 1.12)
Comprehensive handheld ban					
< 1 year	2,239	270,864,974	3.3	0.48 (0.37, 0.63)	0.93 (0.88, 0.99)
1-2 years	2,969	362,106,615	3.3	0.49 (0.38, 0.63)	0.95 (0.90, 1.01)
≥ 2 years	13,951	1,793,246,782	3.1	0.46 (0.37, 0.57)	0.93 (0.88, 0.97)

^a The unadjusted rate ratio was calculated by including the durations of cellphone bans as the only predicting variable in the negative binomial regression with robust standard error estimates.

^b Confidence interval.

^c The adjusted rate ratio (aRR) was estimated using negative binomial regression with robust standard error estimates. The aRR compares the rates per quarter-year exposed to the corresponding durations of cellphone bans with no ban on cellphone use while driving. Comparisons are adjusted for state, year, quarter, traffic laws (i.e., seatbelt laws, maximum speed limits, and pre-conviction administrative license suspension for driving under the influence), socio-economic factors (i.e., unemployment-population ratio, income per capita, cellphone ownership, and highway expenditure), and travel factors (vehicle miles traveled, gasoline price, and the percentage of rural roadway length out of total roadway length).

eTable 6. Sensitivity analysis: adjusted rate ratios for driver fatalities

Type of cellphone ban	Excluded 3 states with calling-only ban ^a	The 27 states with cellphone bans in effect between 2010 and 2016 and the 4 states without any phone bans in effect by 2016 ^b	Limiting data years to 2010-2016 and comparing comprehensive bans vs everything else ^c	Non-alcohol-related driver fatalities ^d
No ban	Reference	Reference		Reference
Calling-only ban	NA	NA		0.99 (0.96, 1.03)
Texting-only ban	1.02 (0.98, 1.05)	1.04 (1.00, 1.08)	Reference ^c	1.02 (0.98, 1.06)
Texting plus ban	0.98 (0.93, 1.04)	1.04 (0.97, 1.12)		0.98 (0.93, 1.04)
Calling and texting ban	0.96 (0.82, 1.13)	NA		1.01 (0.92, 1.11)
Comprehensive handheld ban	0.95 (0.91, 0.99)	0.94 (0.85, 1.03)	0.93 (0.91, 0.96)	0.91 (0.87, 0.96)

NA: not applicable.

^a Excluded the three states with a calling-only ban in effect for at least a quarter between 1999 and 2016 (i.e., California, New Jersey, and New York)

^b Restricted analysis to the 27 states with cellphone bans first taking effect between 2010 and 2016 and the 4 states without any cellphone bans in effect by 2016.

^c Compared comprehensive bans vs everything else as the referent group for the period of 2010-2016.

^d Restricted analysis to non-alcohol-related driver fatalities.

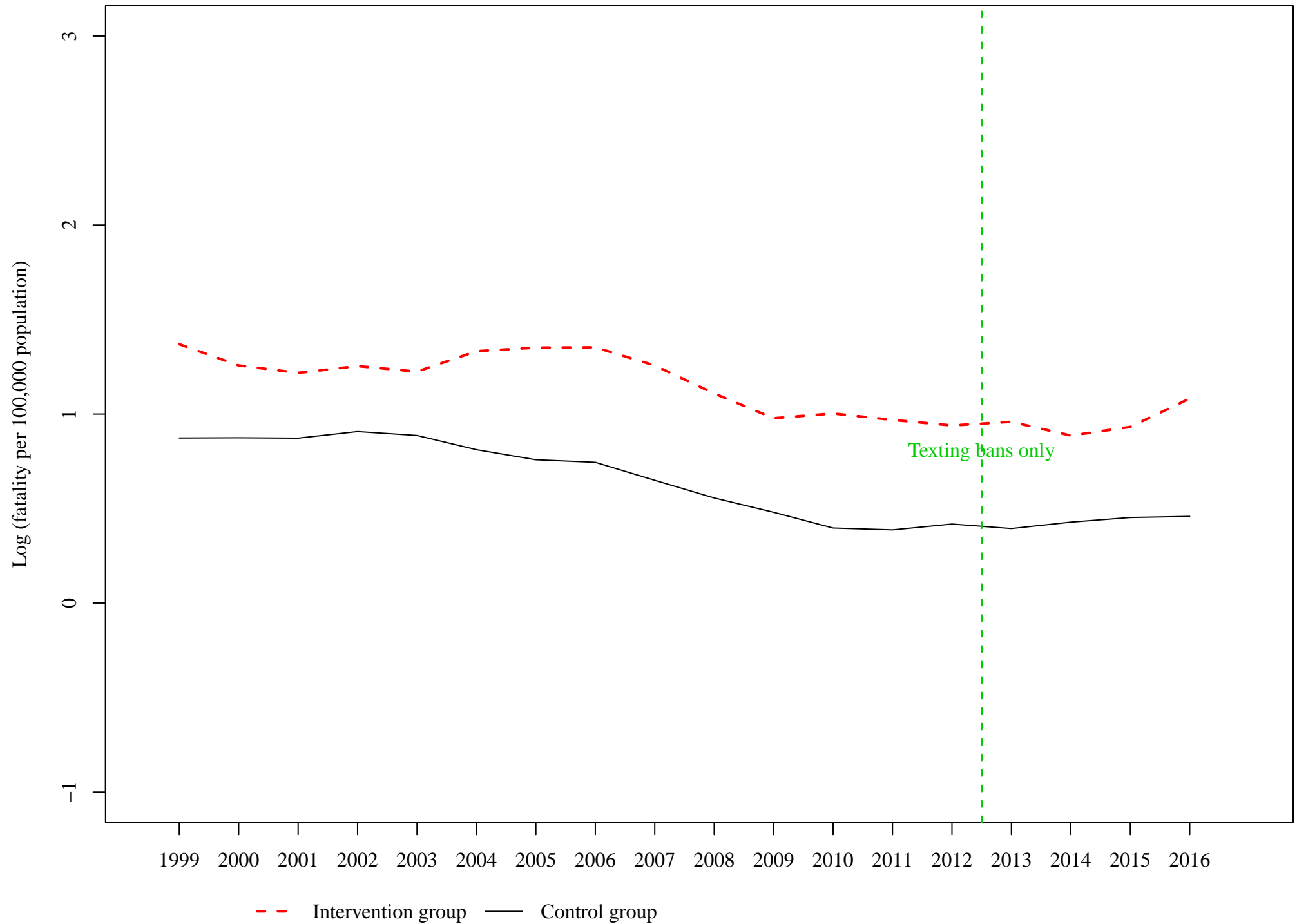
^e The reference group included: no ban, calling-only ban, texting-only ban, texting plus ban, and calling and texting ban.

References

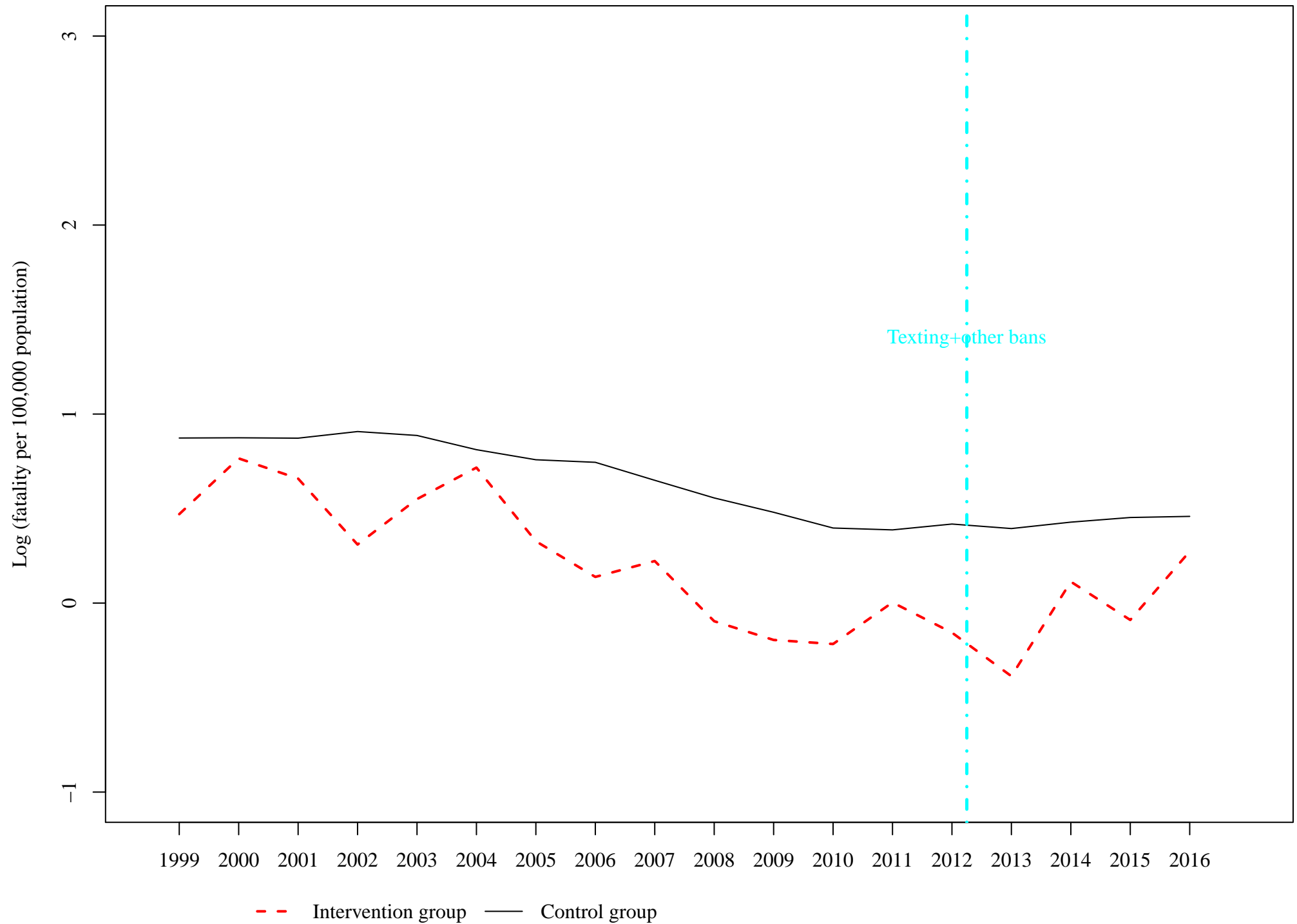
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10. Bureau of Labor Statistics. Consumer Price Index. <https://www.bls.gov/cpi/#tables> Accessed 03/14/20.

eFigure 1. Driver fatality rates by year for each of the 46 intervention states (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)

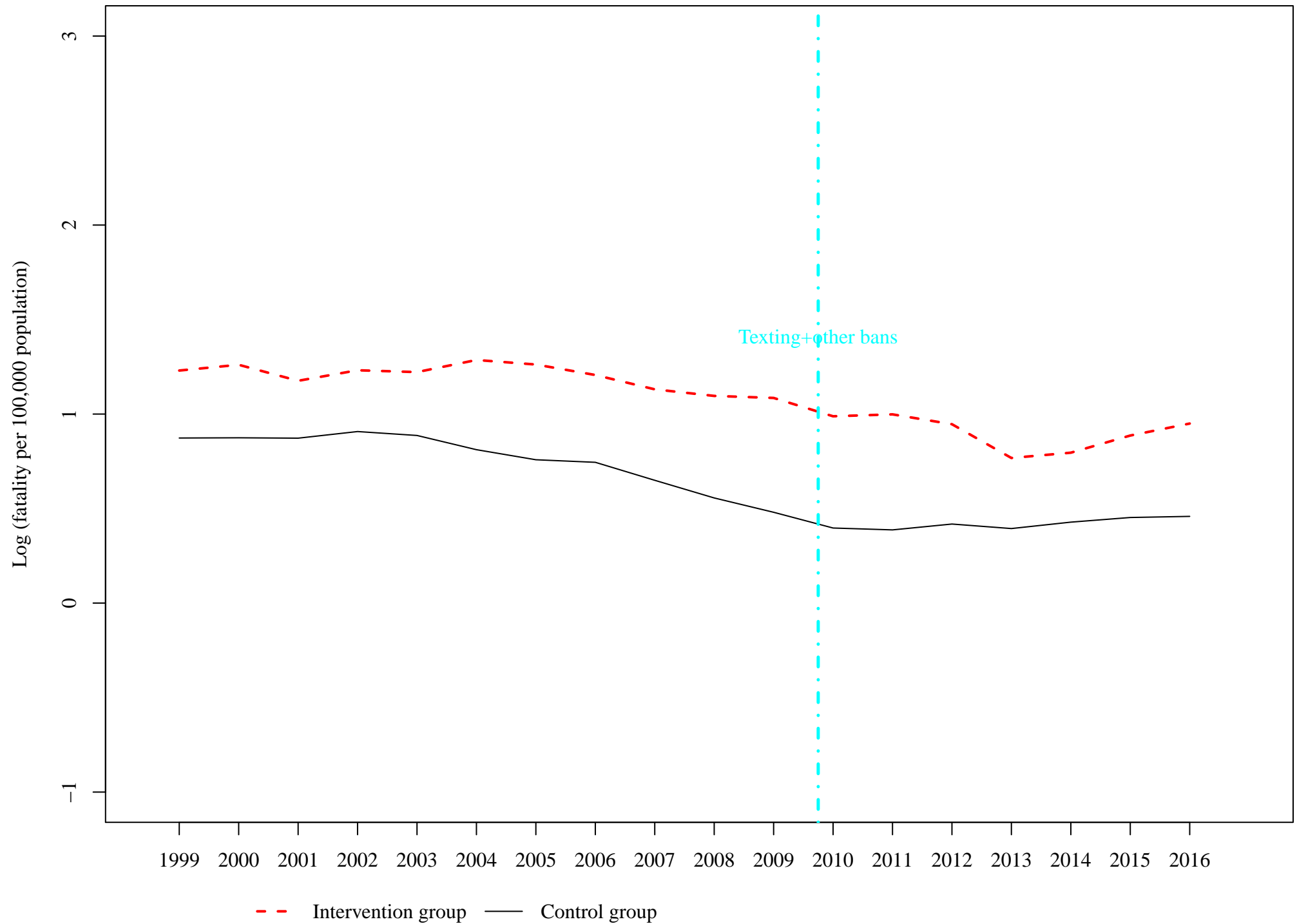
Alabama driver_fatality



Alaska driver_fatality



Arkansas driver_fatality



California driver_fatality



Colorado driver_fatality



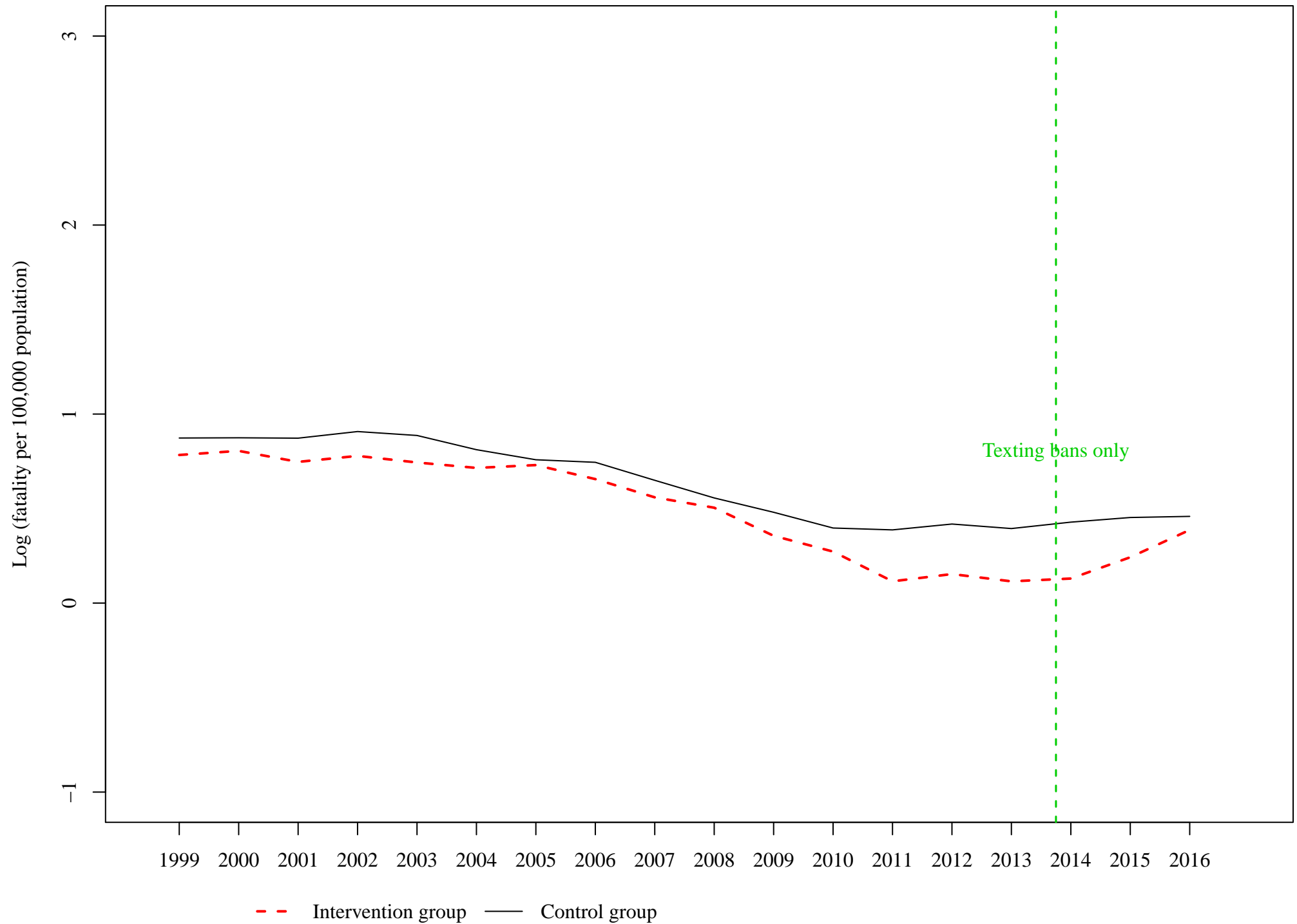
Connecticut driver_fatality



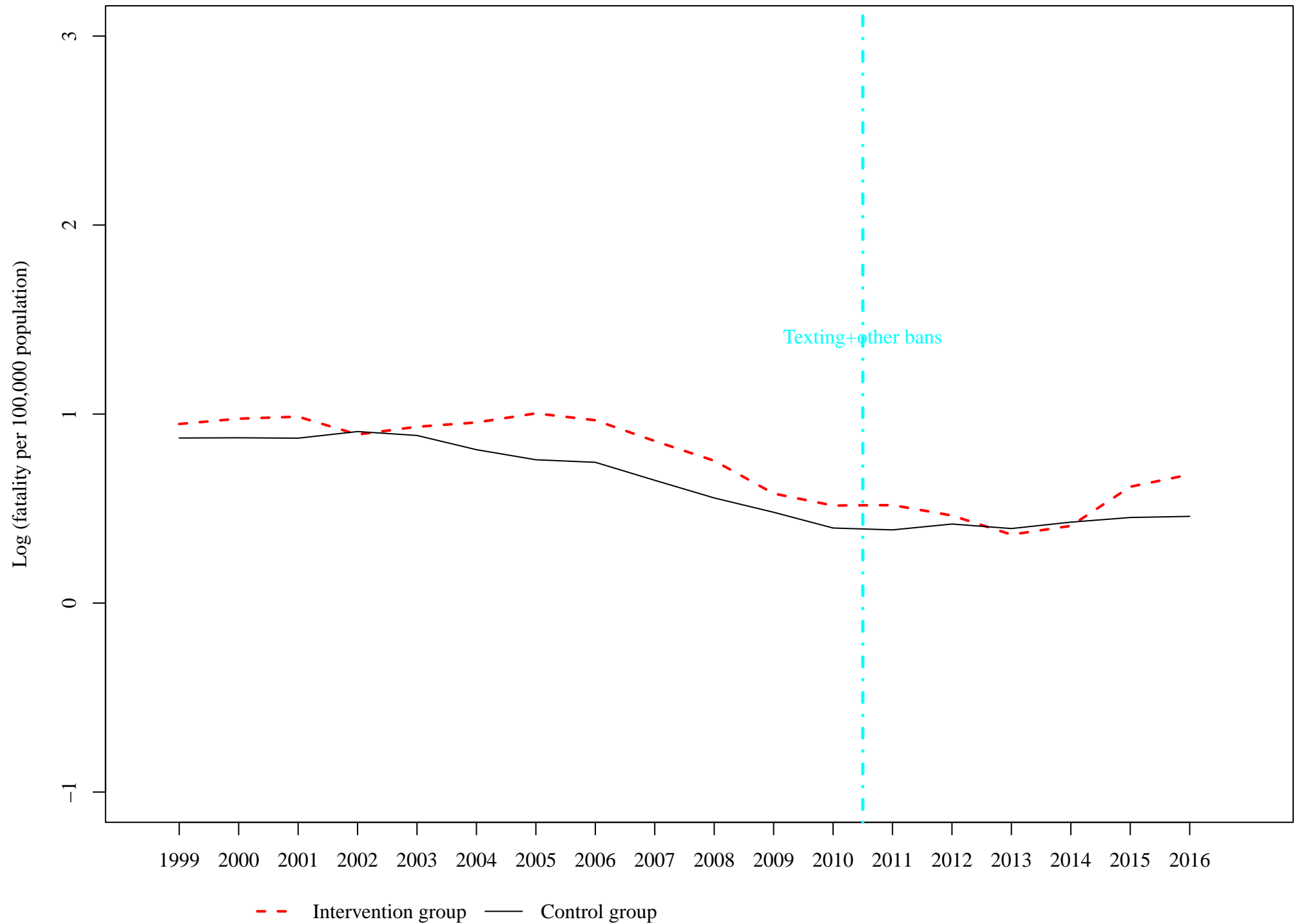
Delaware driver_fatality



Florida driver_fatality



Georgia driver_fatality



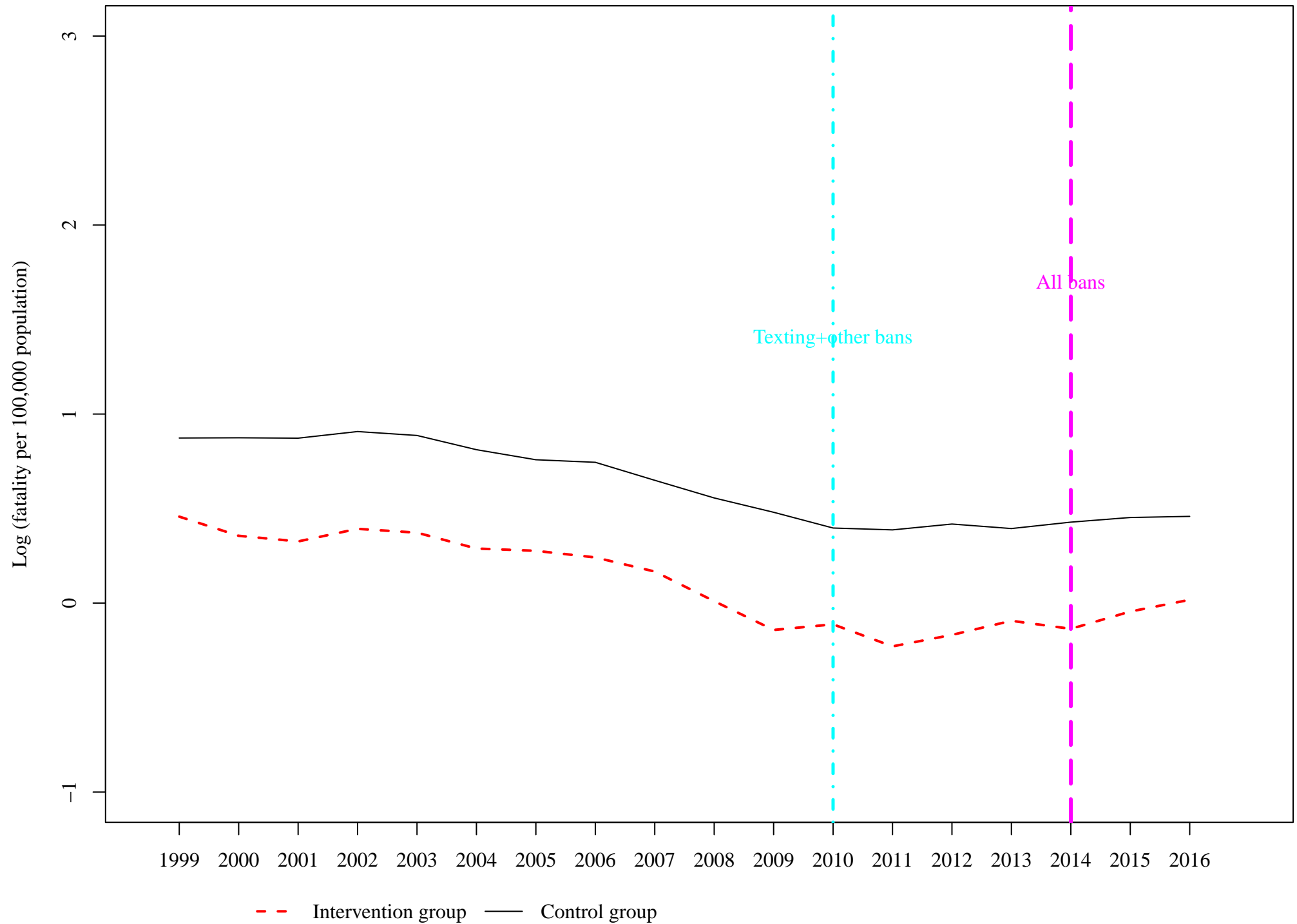
Hawaii driver_fatality



Idaho driver_fatality



Illinois driver_fatality



Indiana driver_fatality



Iowa driver_fatality



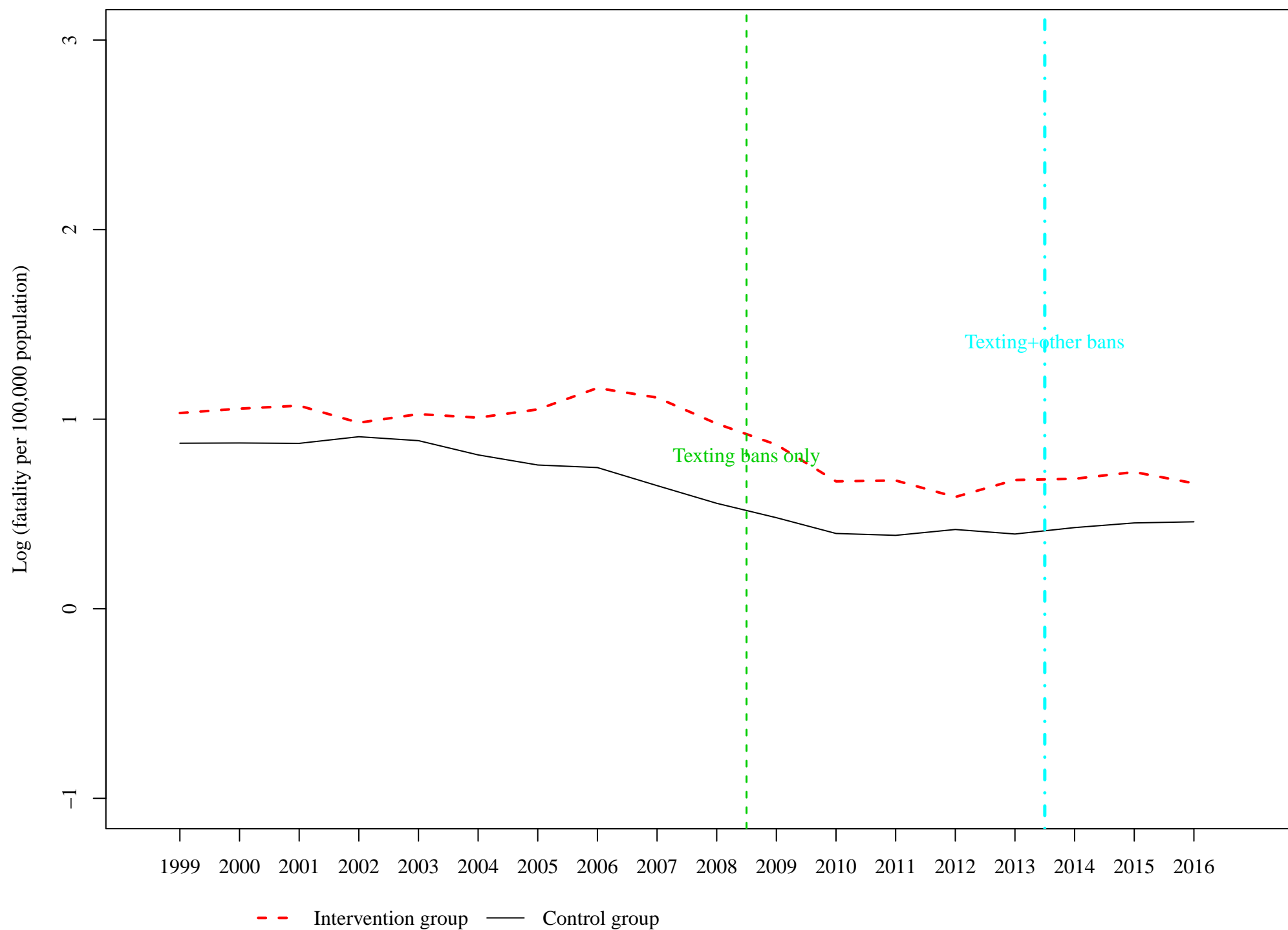
Kansas driver_fatality



Kentucky driver_fatality



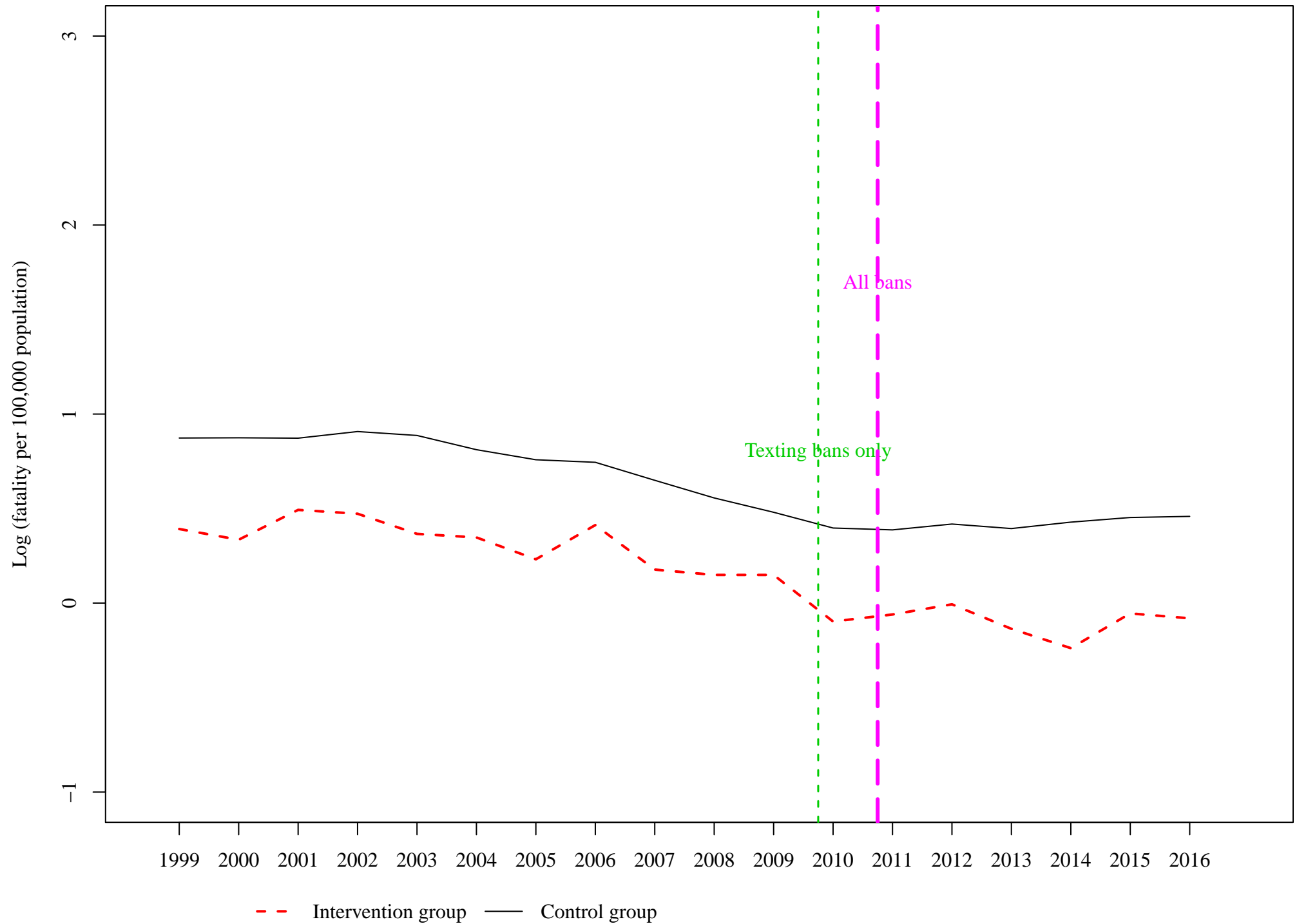
Louisiana driver_fatality



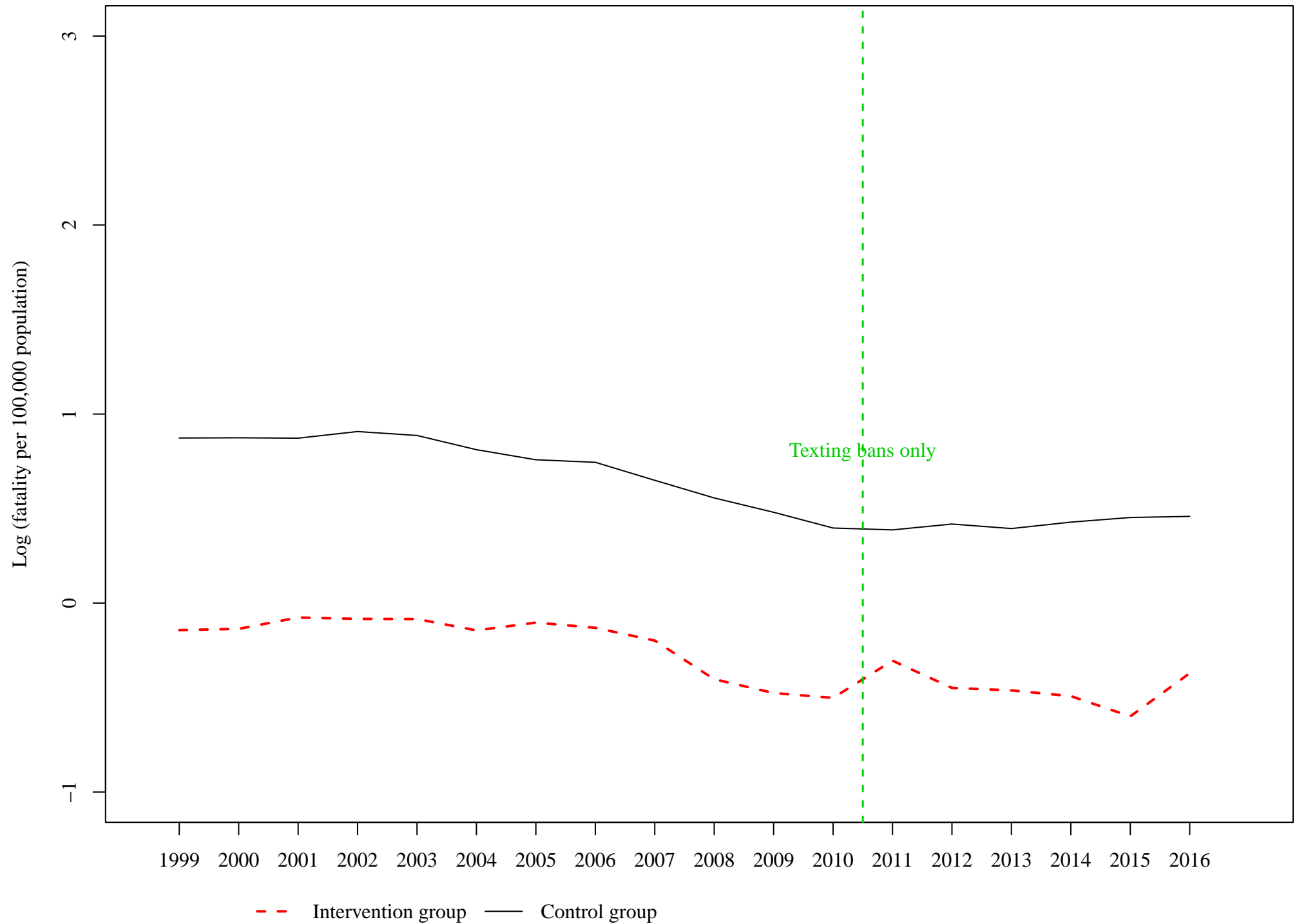
Maine driver_fatality



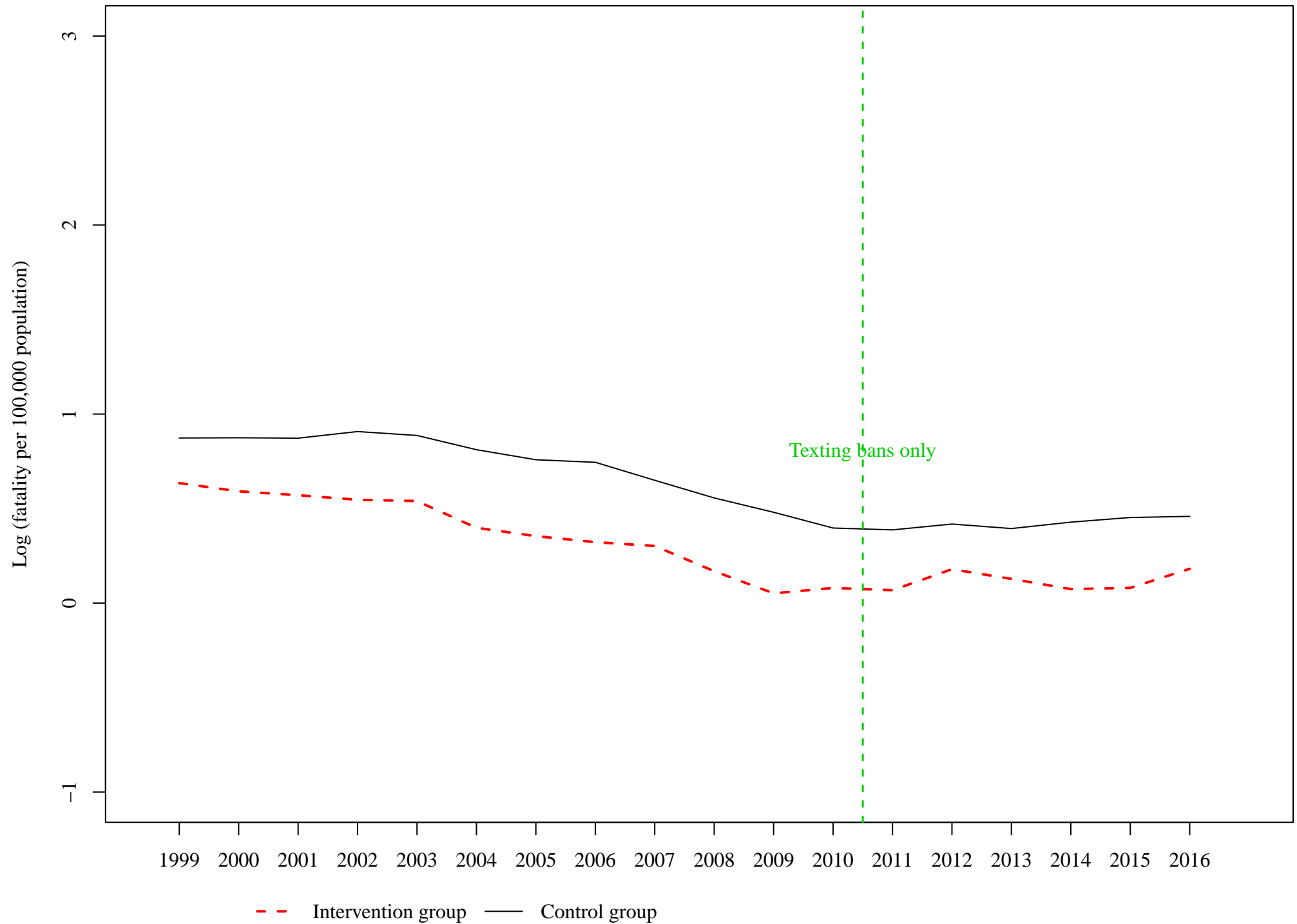
Maryland driver_fatality



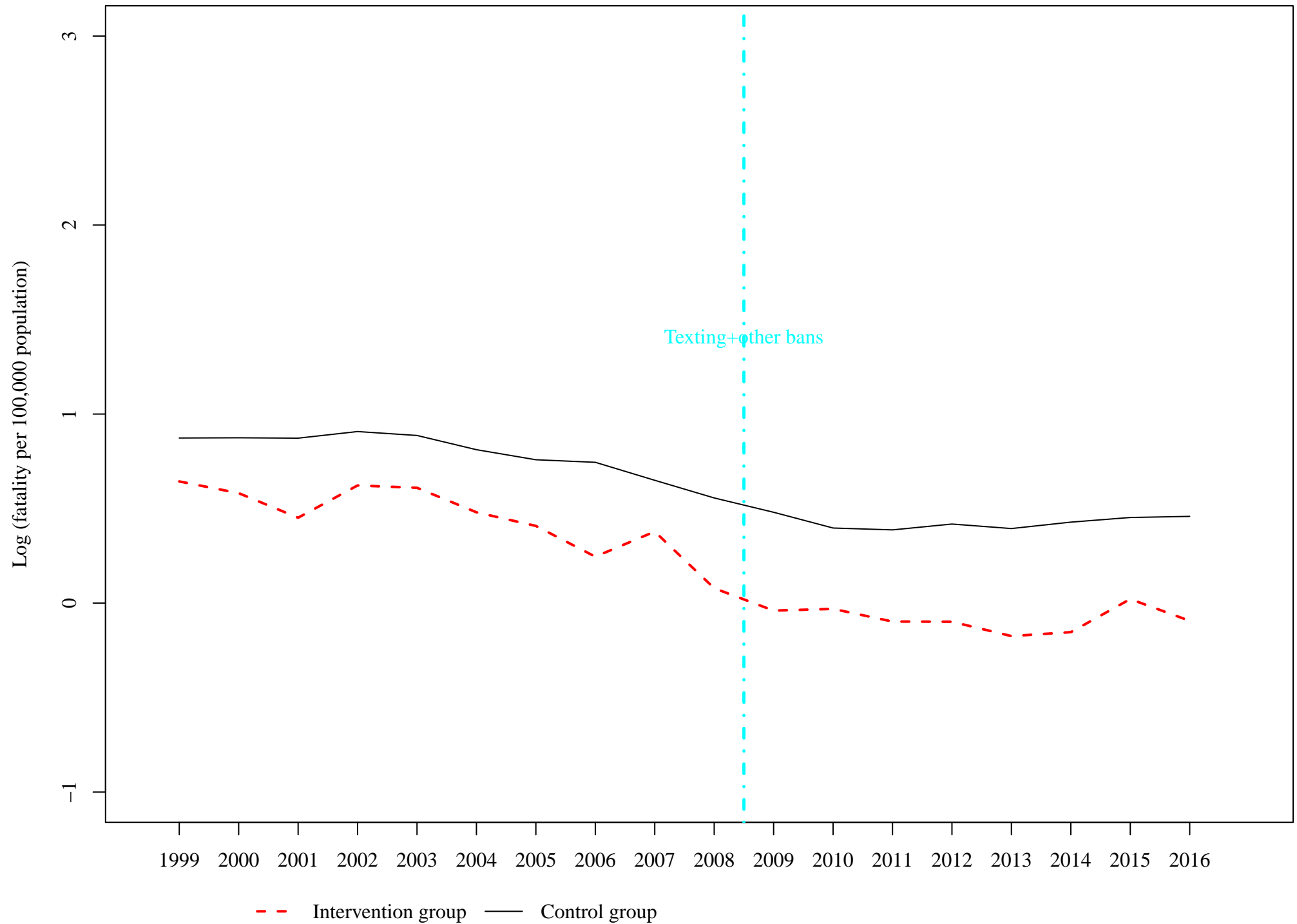
Massachusetts driver_fatality



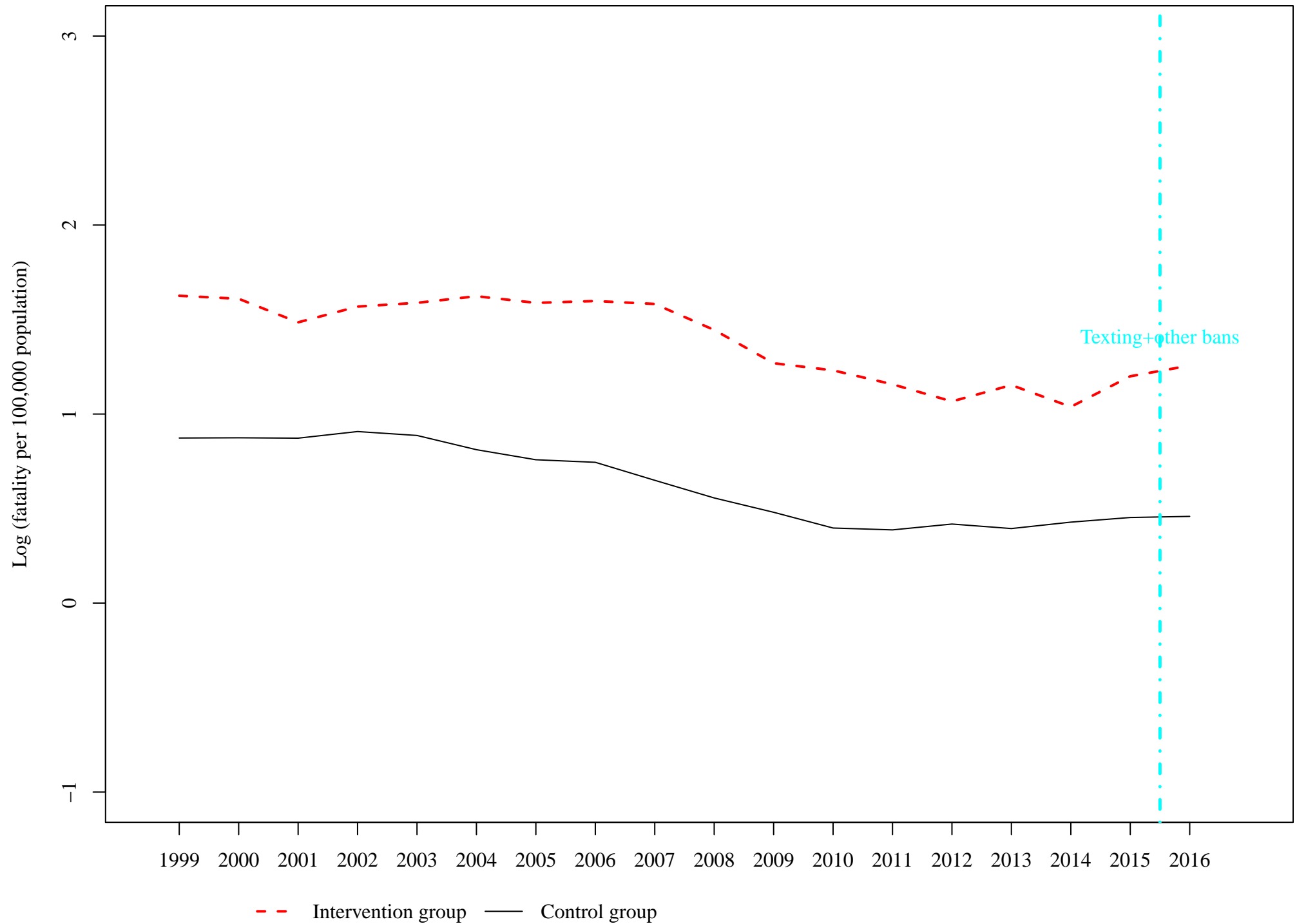
Michigan driver_fatality



Minnesota driver_fatality



Mississippi driver_fatality



Nebraska driver_fatality



Nevada driver_fatality



New Hampshire driver_fatality



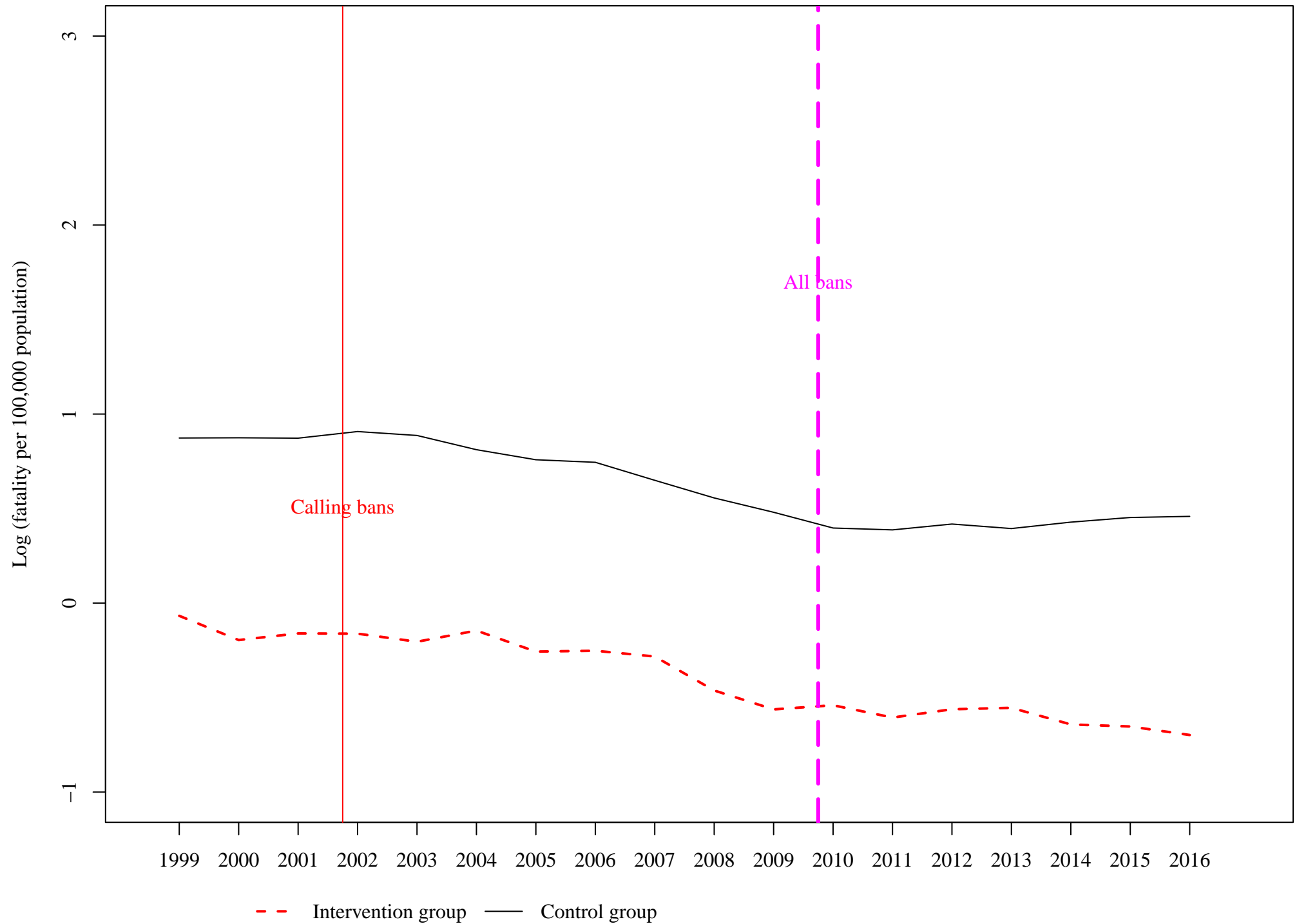
New Jersey driver_fatality



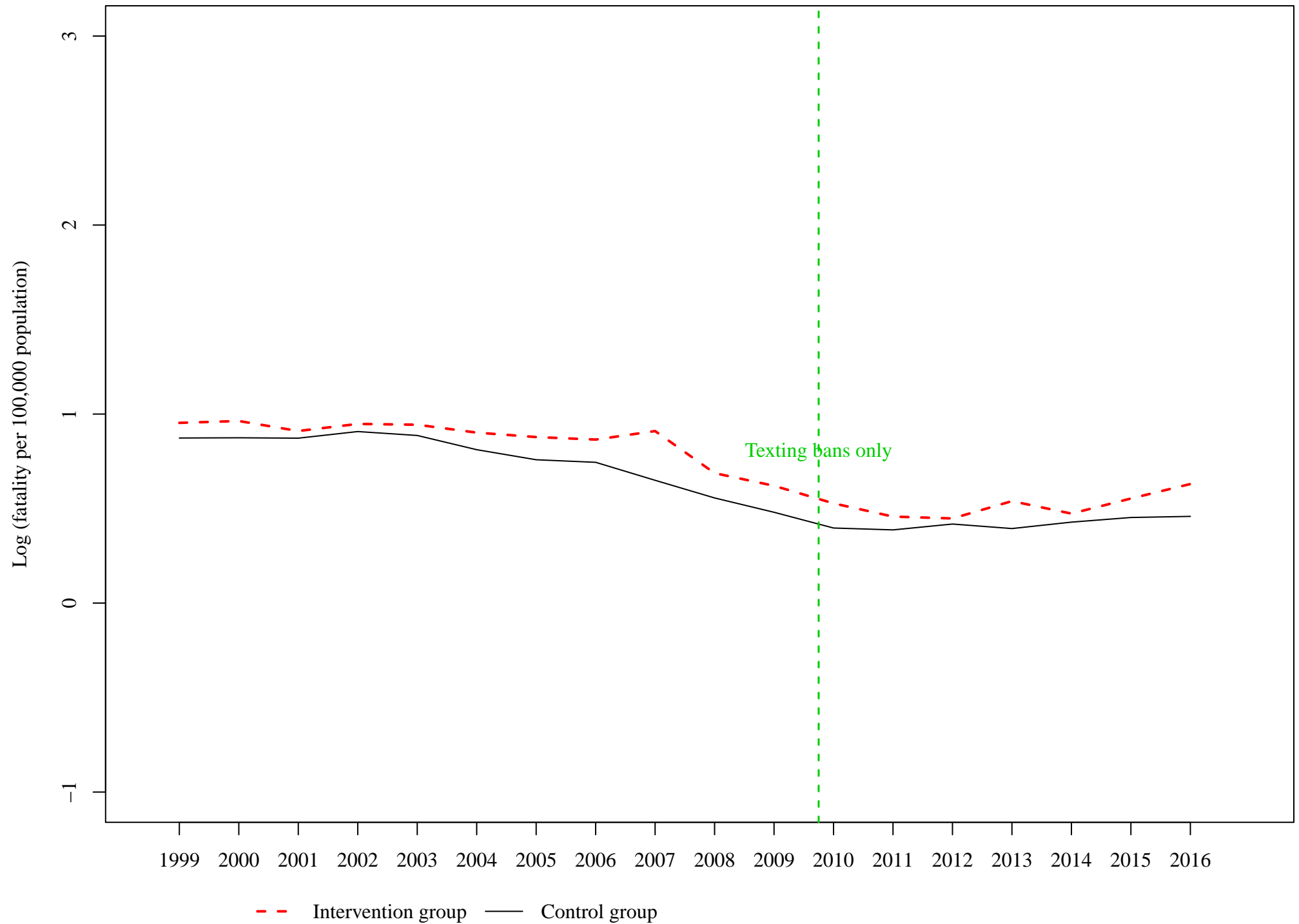
New Mexico driver_fatality



New York driver_fatality



North Carolina driver_fatality



North Dakota driver_fatality



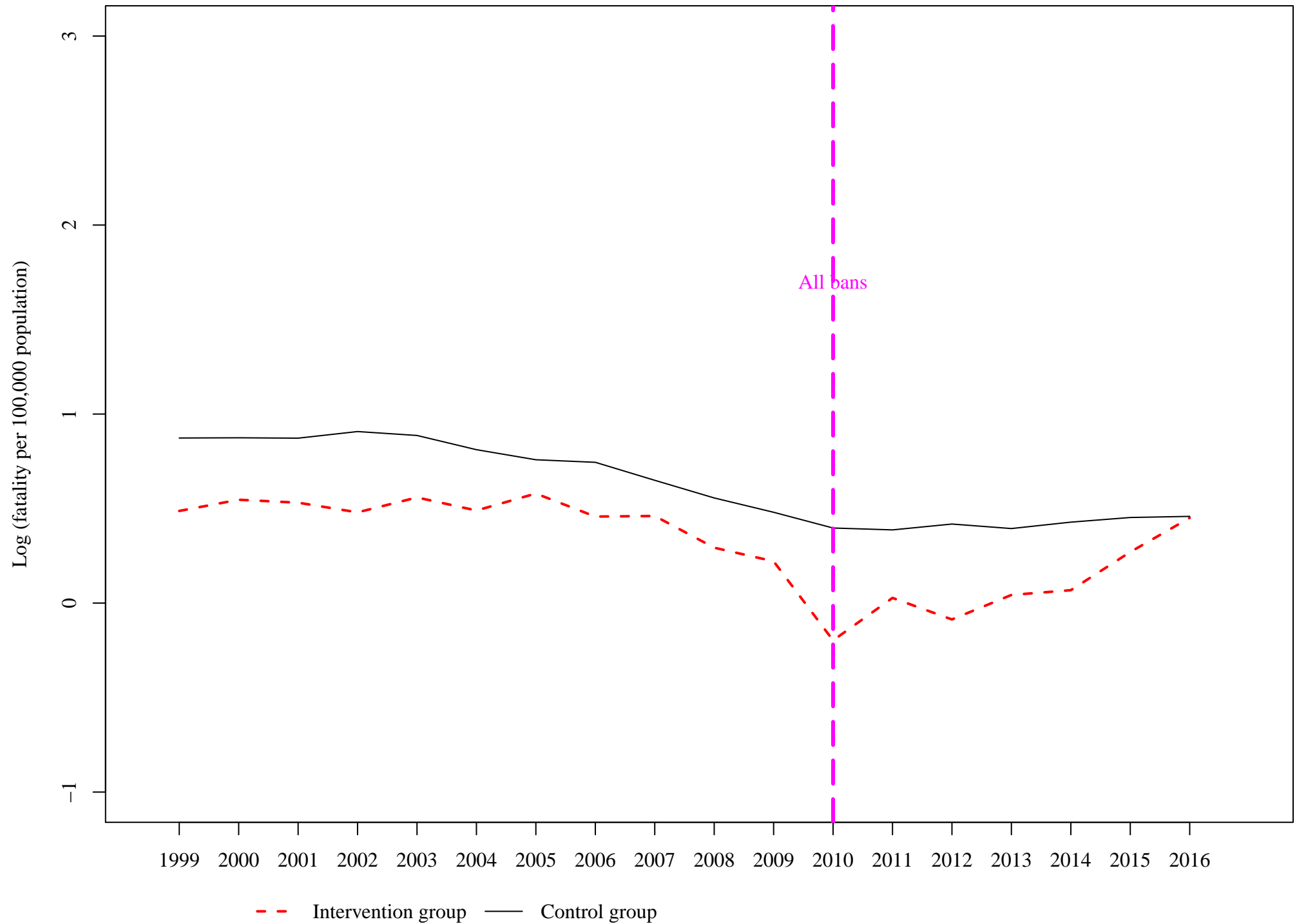
Ohio driver_fatality



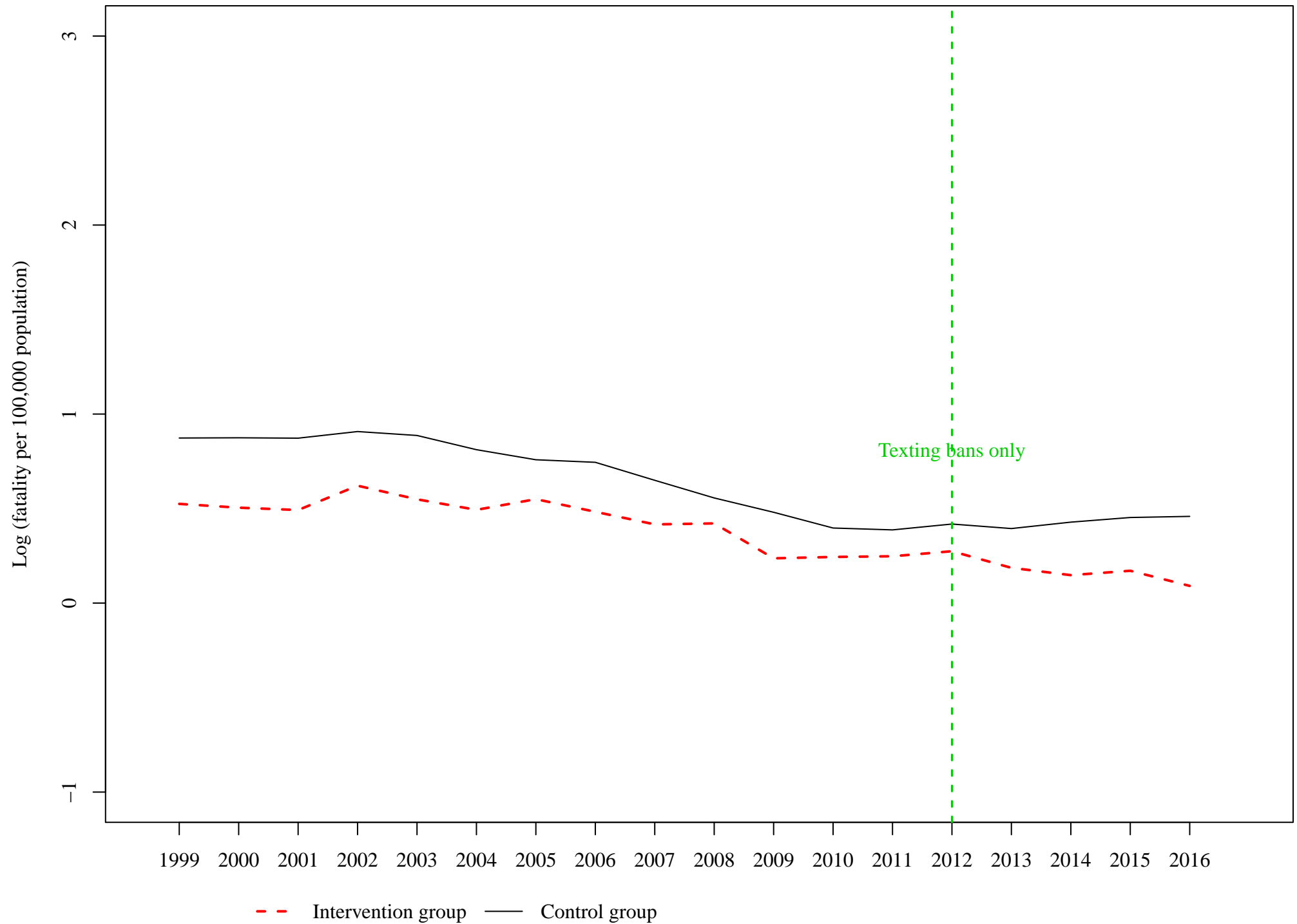
Oklahoma driver_fatality



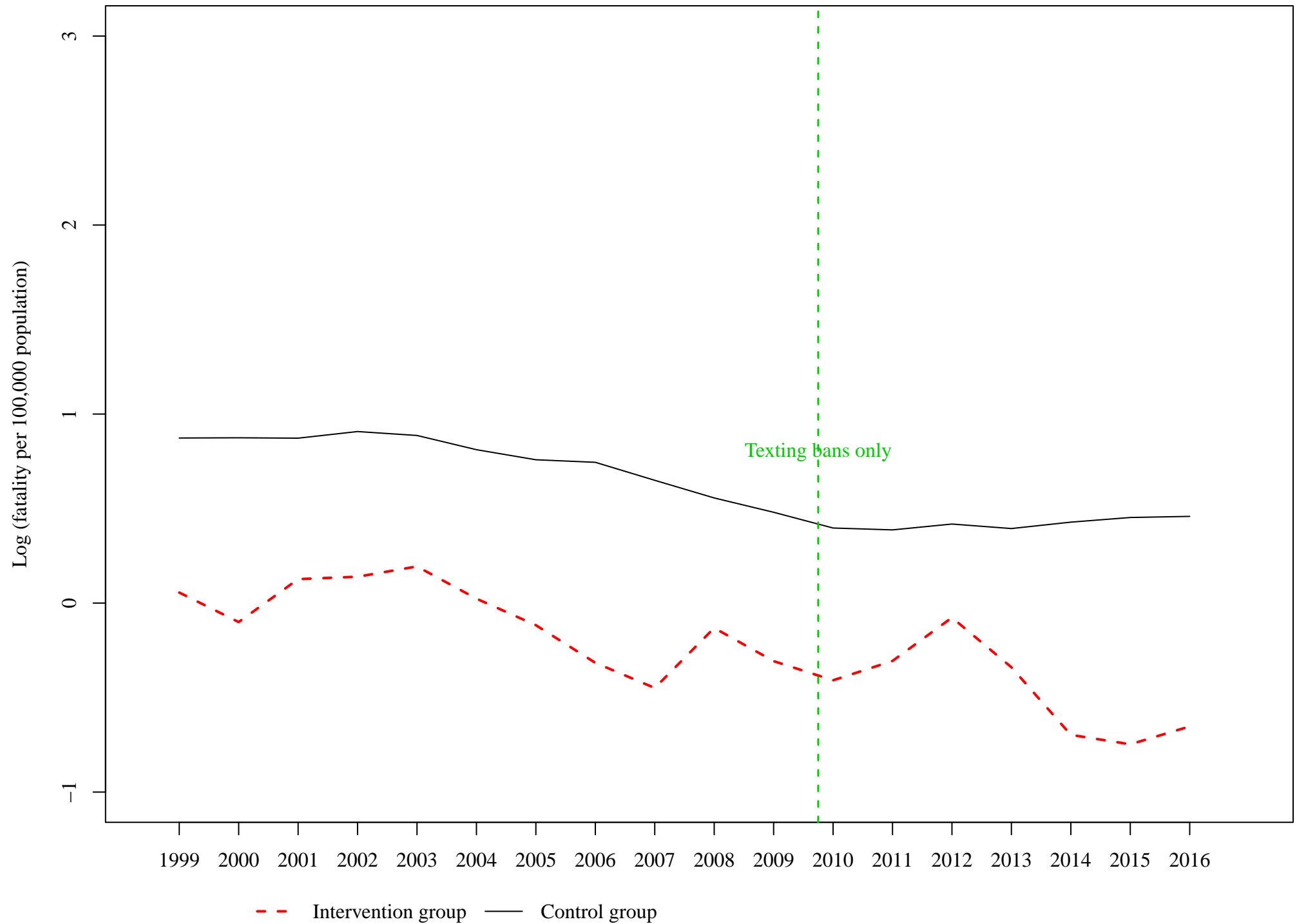
Oregon driver_fatality



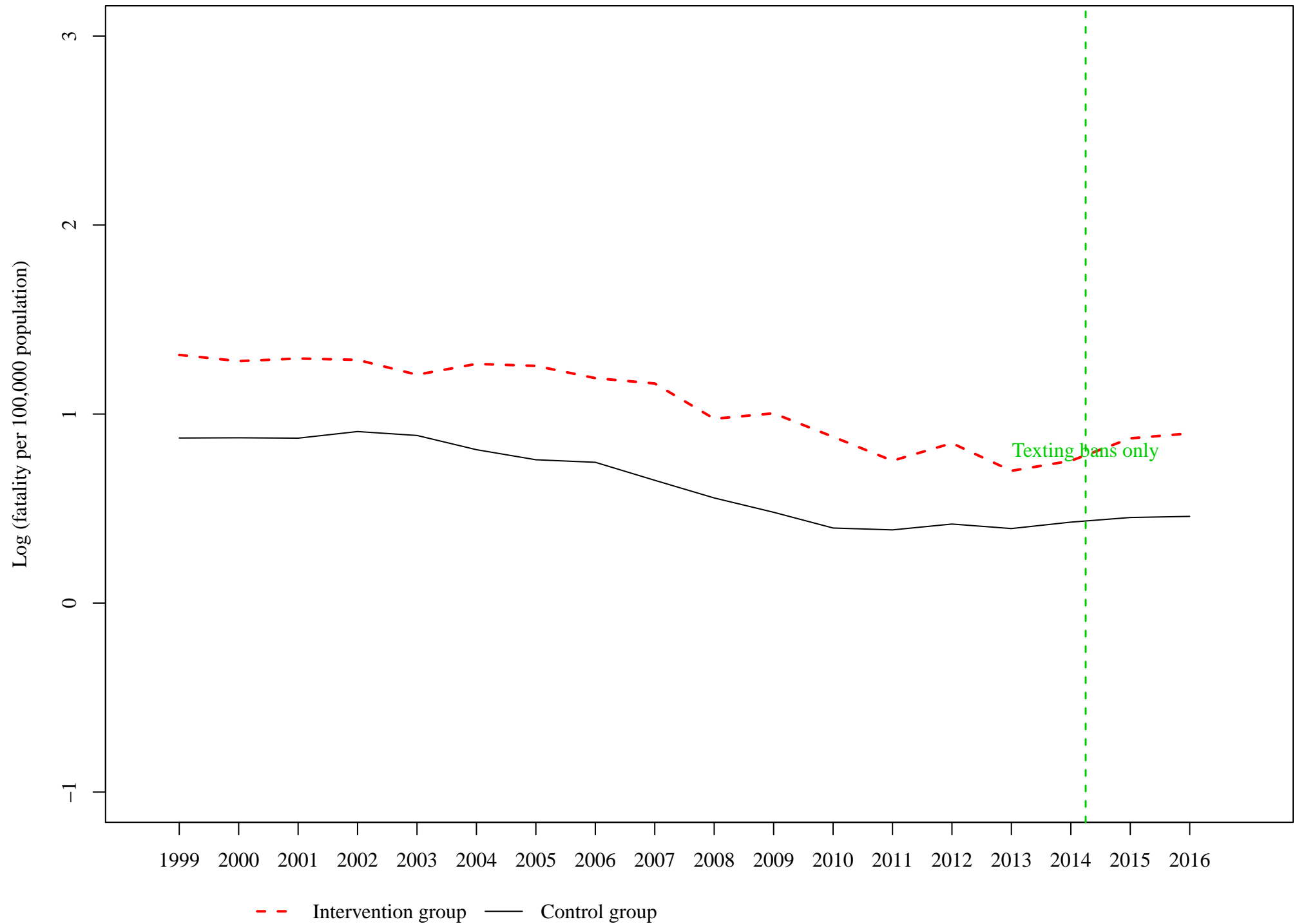
Pennsylvania driver_fatality



Rhode Island driver_fatality



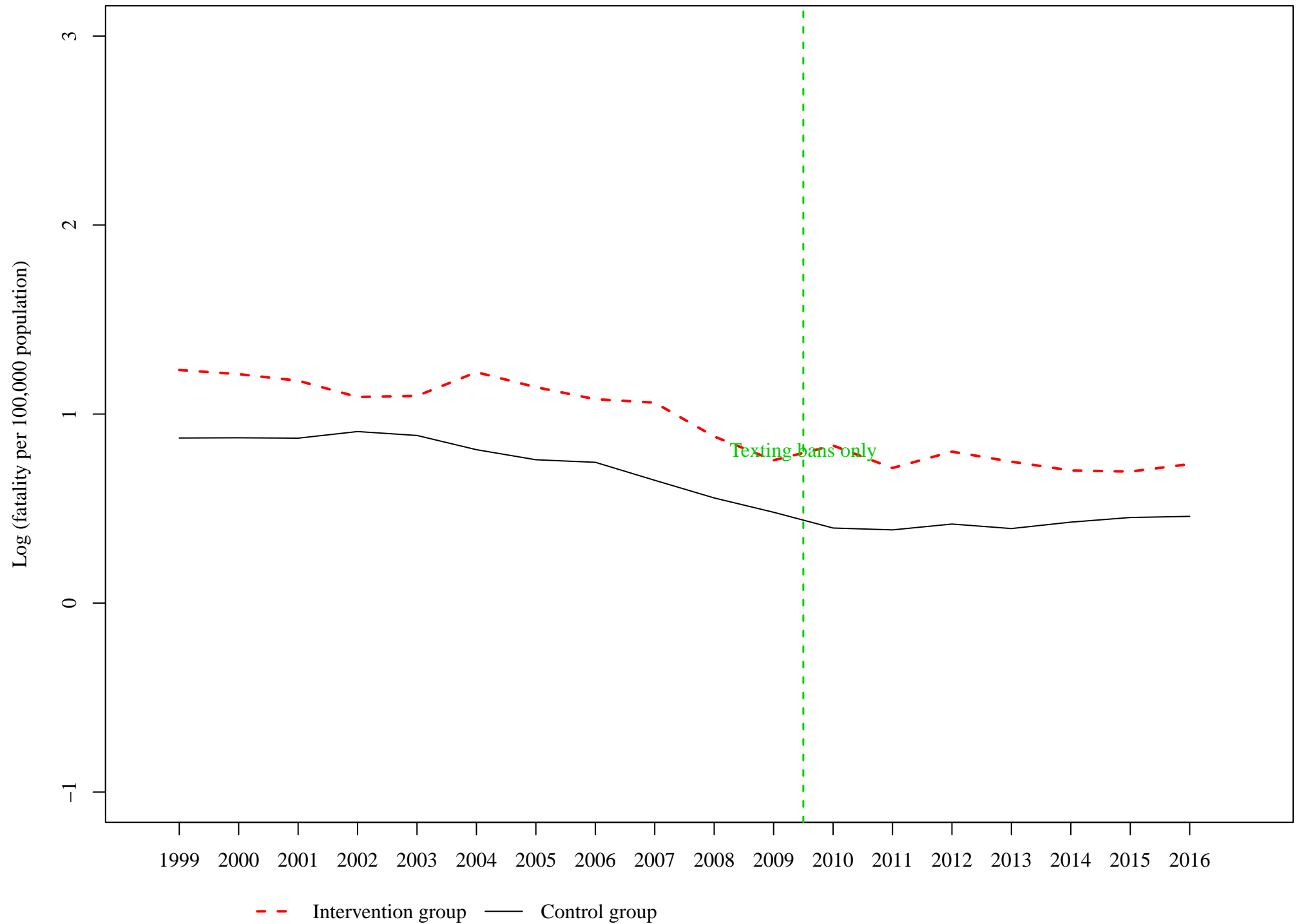
South Carolina driver_fatality



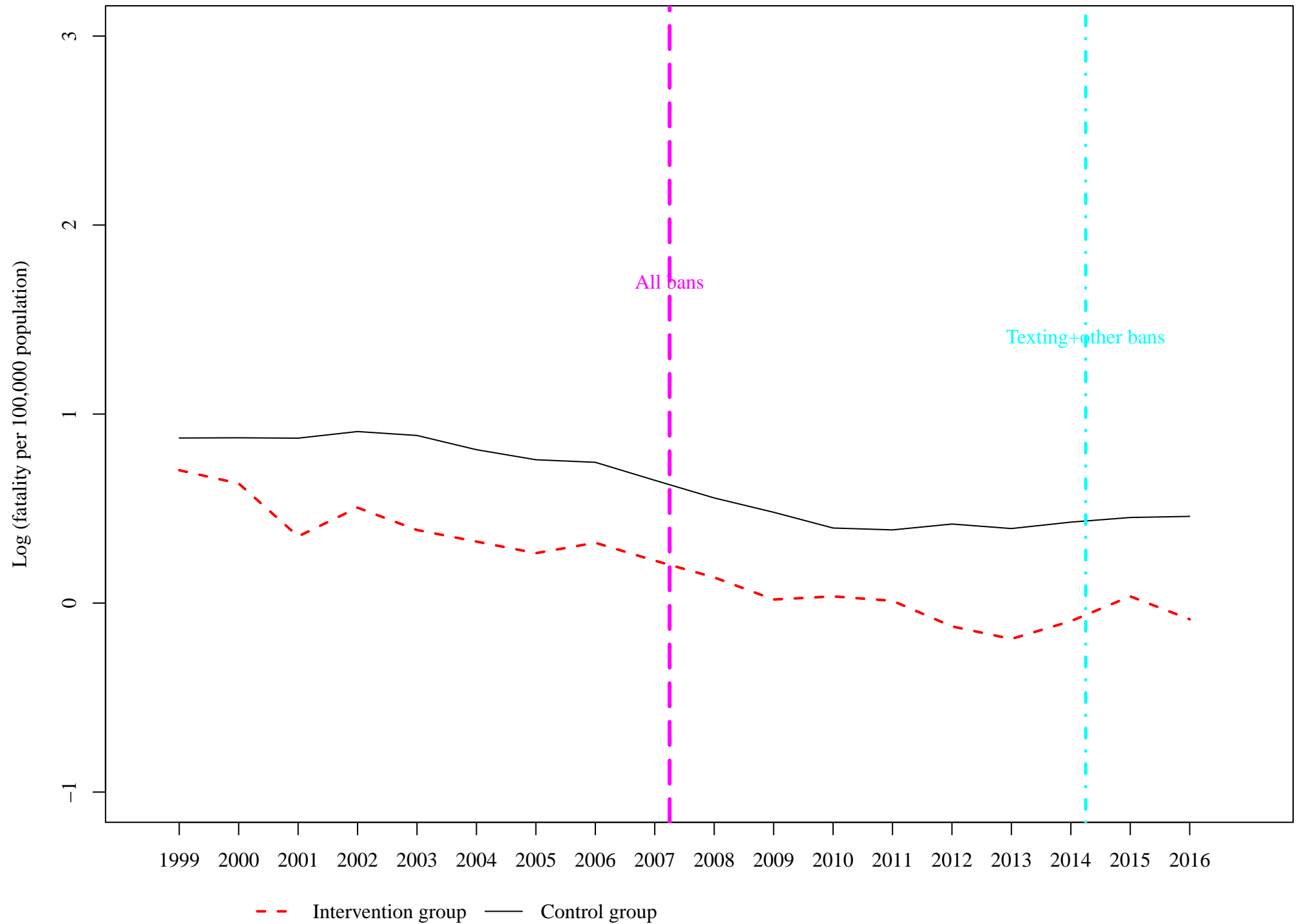
South Dakota driver_fatality



Tennessee driver_fatality



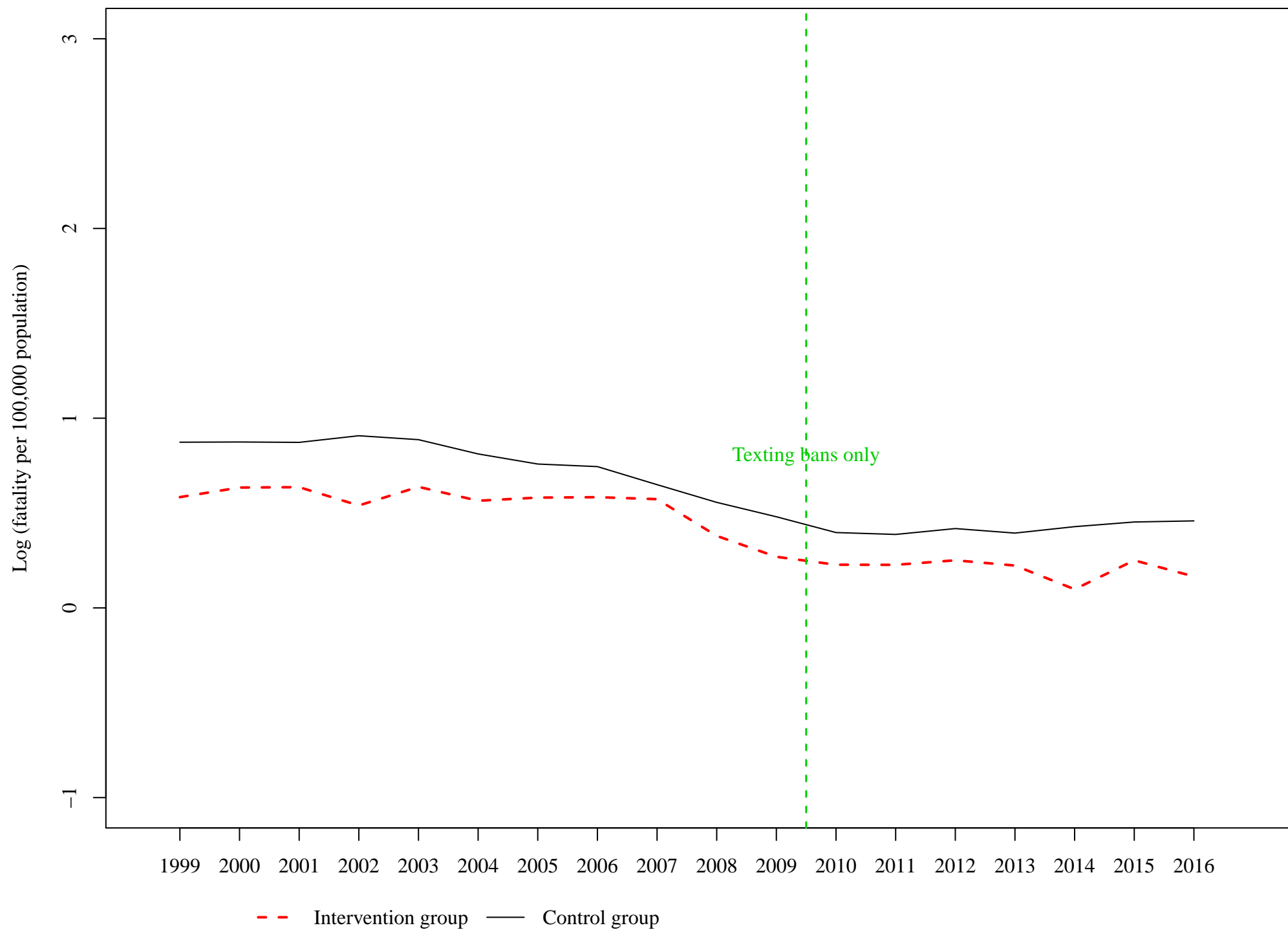
Utah driver_fatality



Vermont driver_fatality



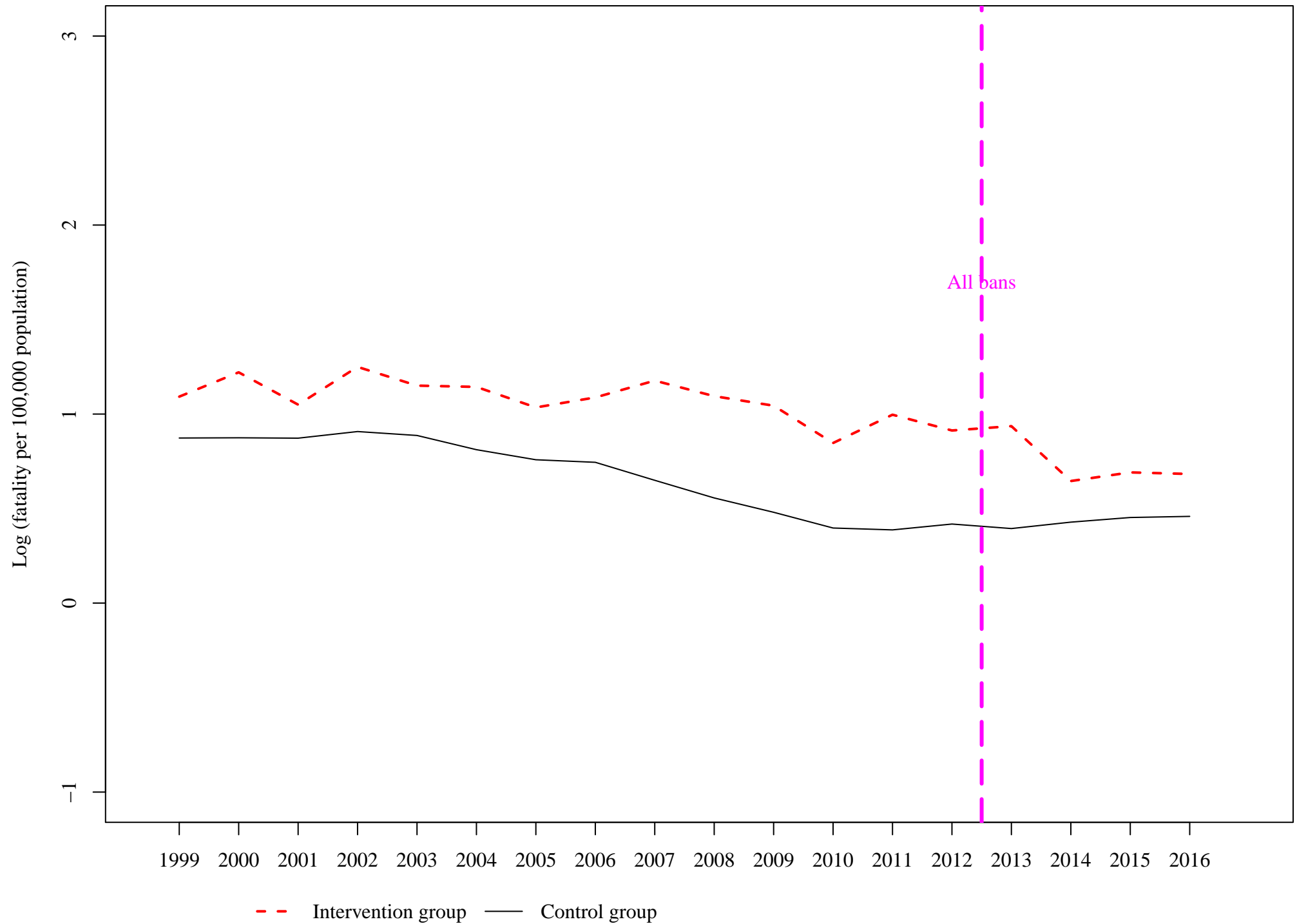
Virginia driver_fatality



Washington driver_fatality



West Virginia driver_fatality



Wisconsin driver_fatality



Wyoming driver_fatality



eFigure 2. Non-driver fatality rates by year for each intervention state (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)

Alabama nondriver_fatality



Alaska nondriver_fatality



Arkansas nondriver_fatality



California nondriver_fatality



Colorado nondriver_fatality



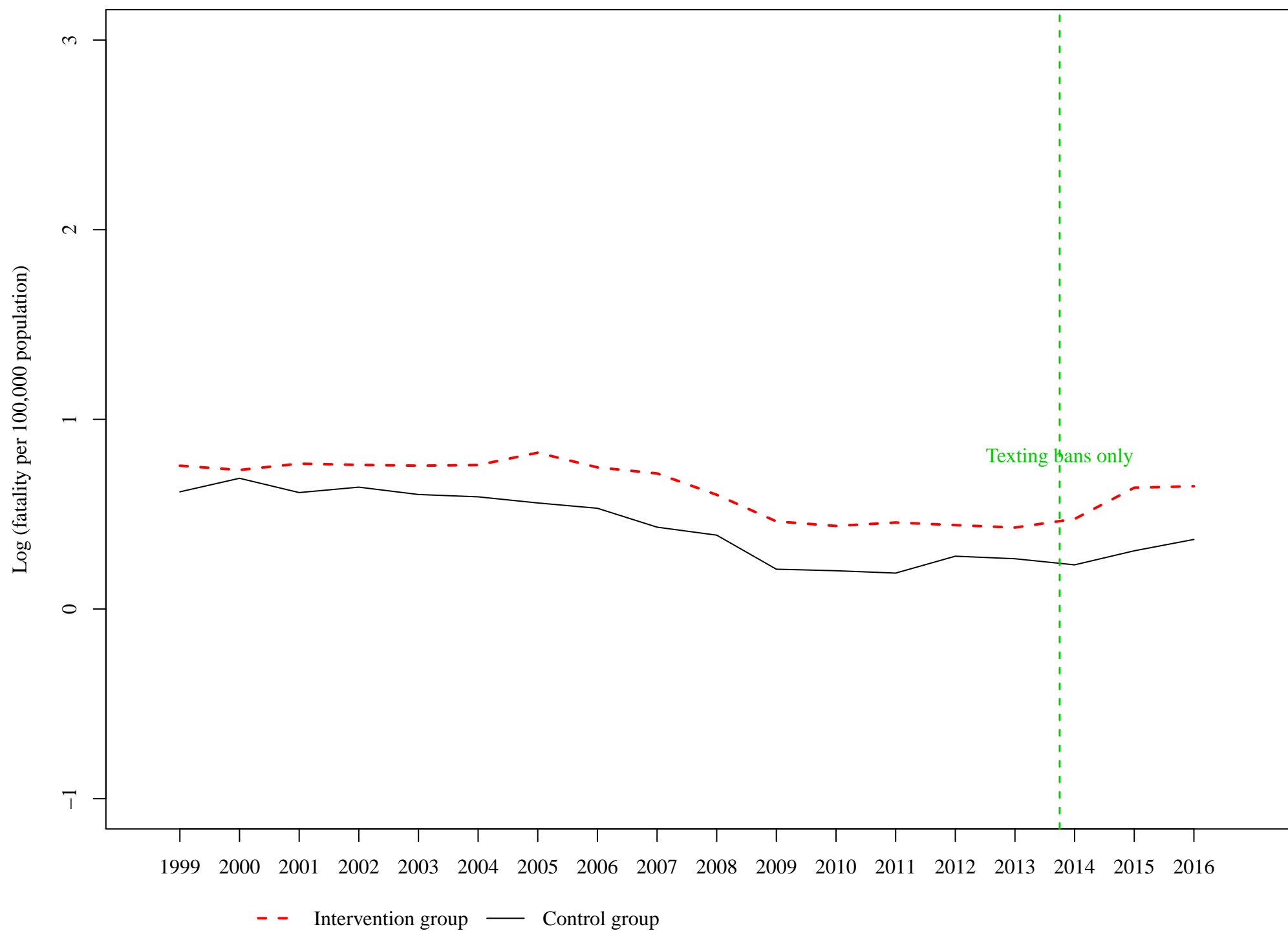
Connecticut nondriver_fatality



Delaware nondriver_fatality



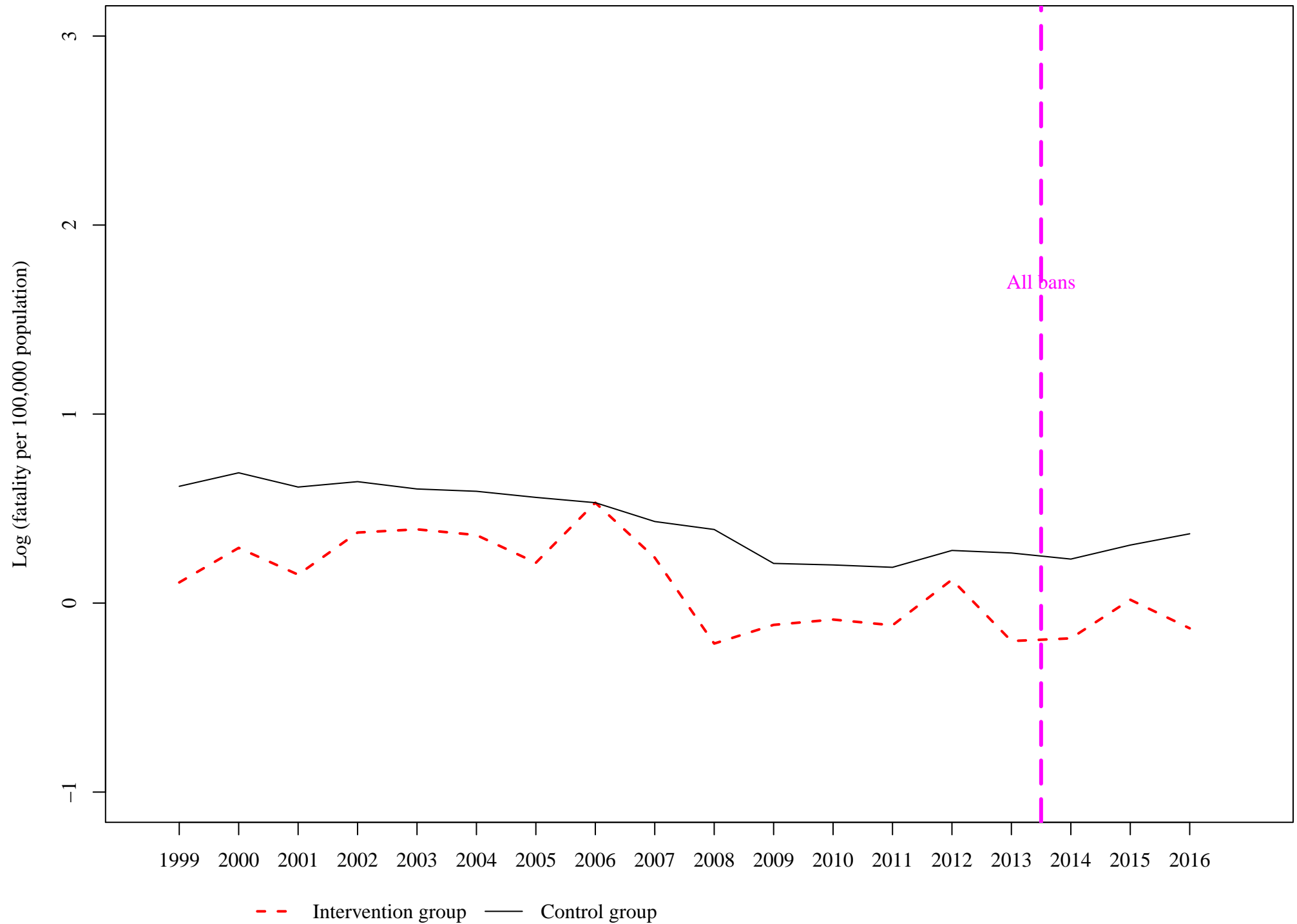
Florida nondriver_fatality



Georgia nondriver_fatality



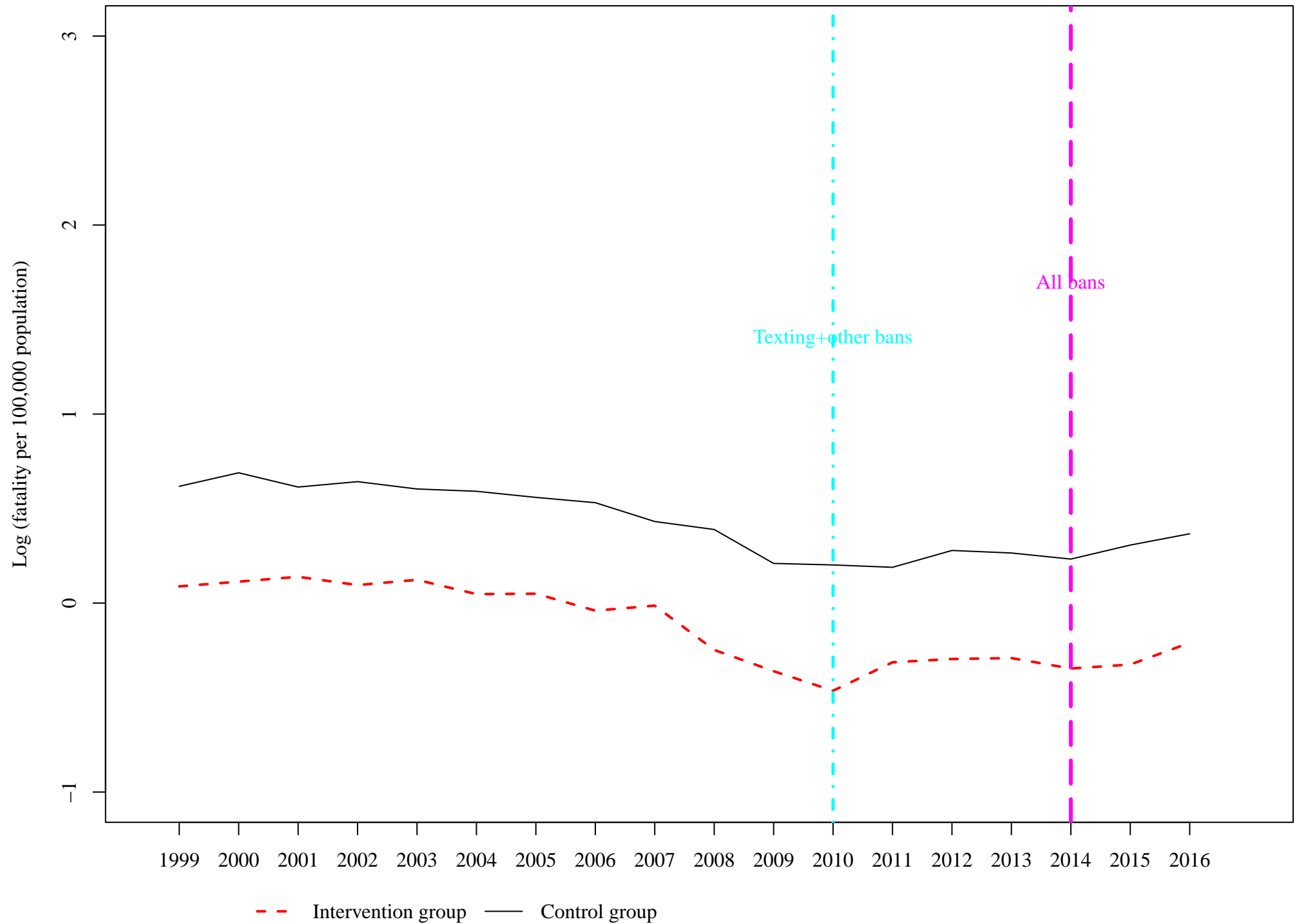
Hawaii nondriver_fatality



Idaho nondriver_fatality



Illinois nondriver_fatality



Indiana nondriver_fatality



Iowa nondriver_fatality



Kansas nondriver_fatality



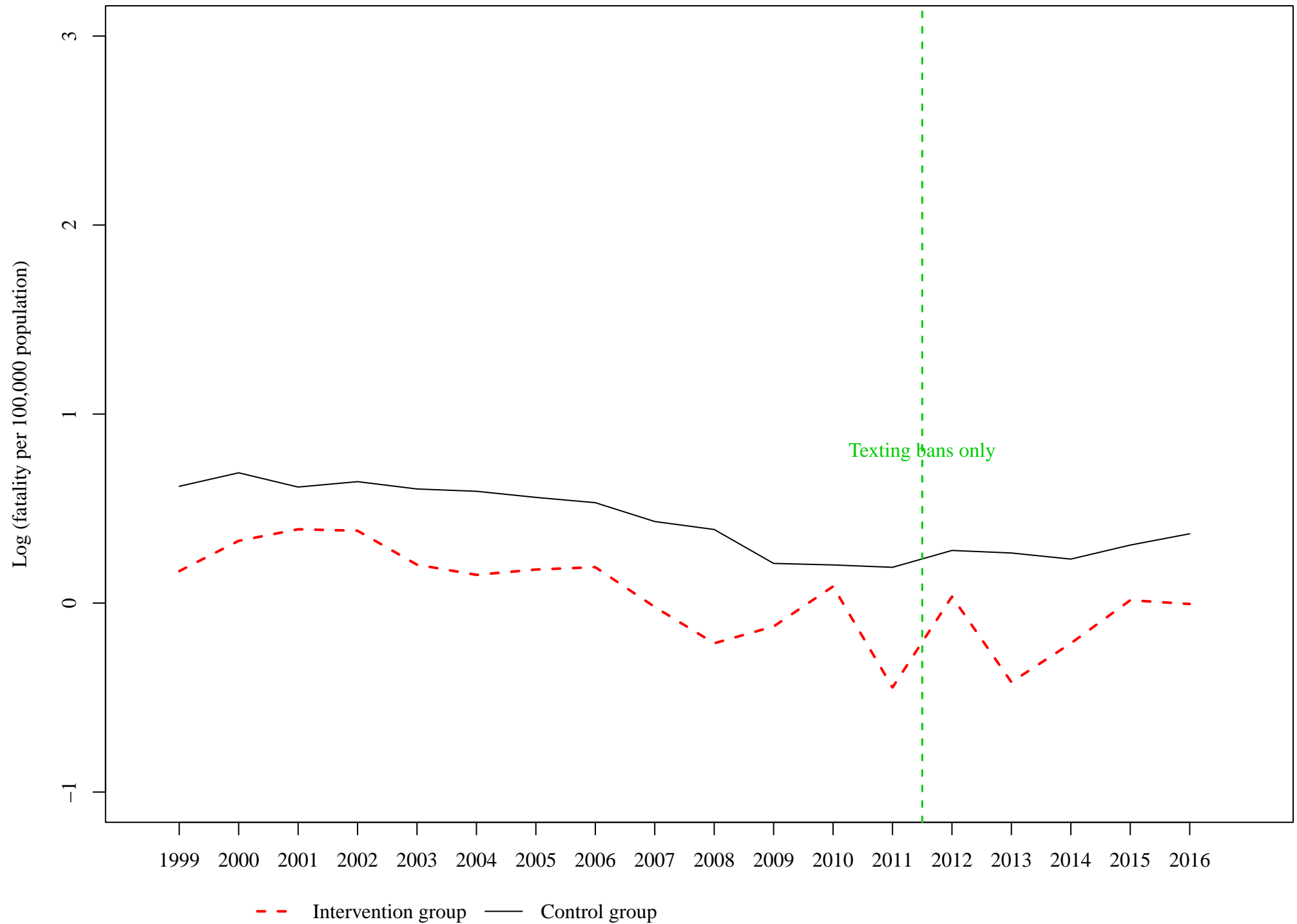
Kentucky nondriver_fatality



Louisiana nondriver_fatality



Maine nondriver_fatality



Maryland nondriver_fatality



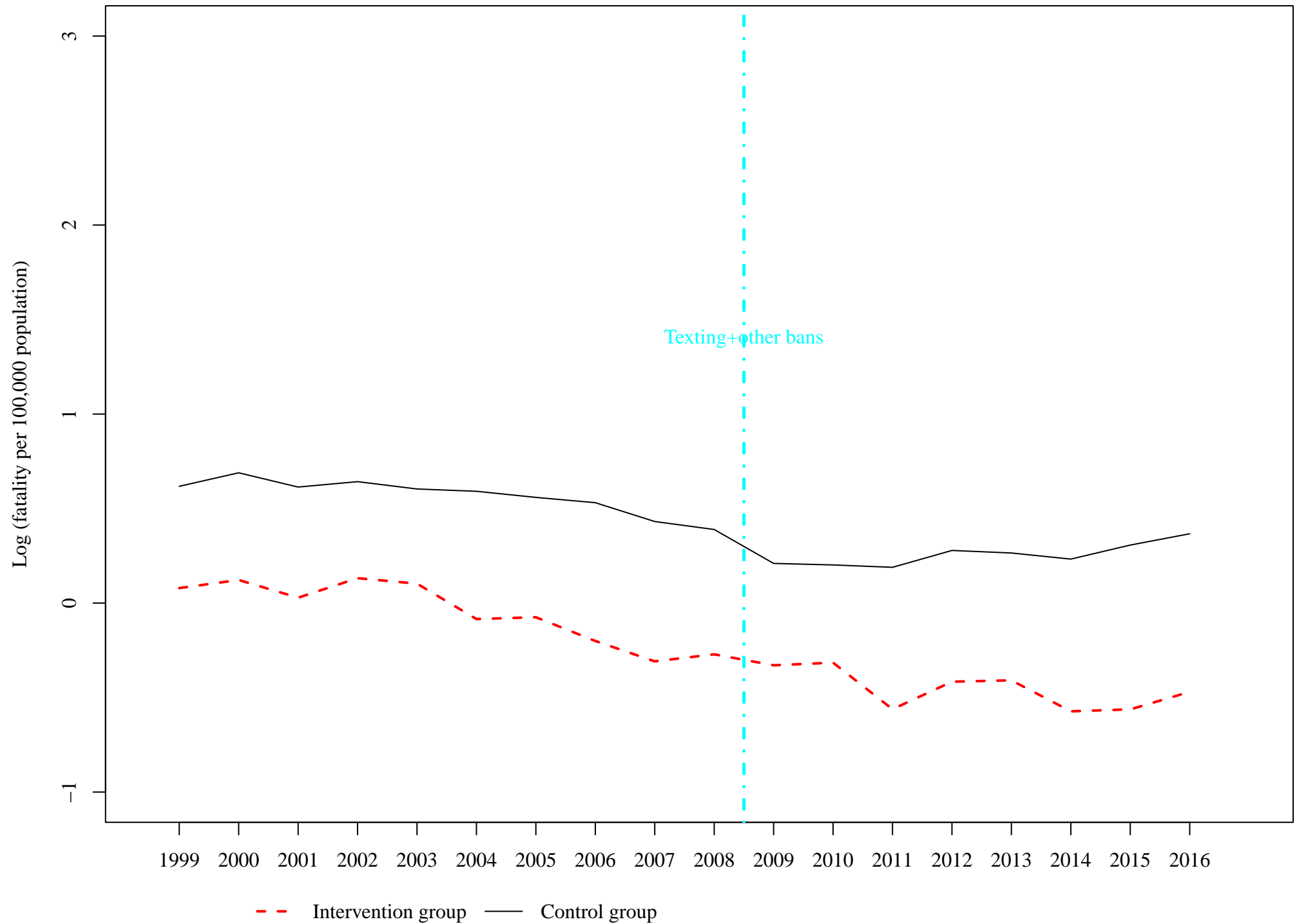
Massachusetts nondriver_fatality



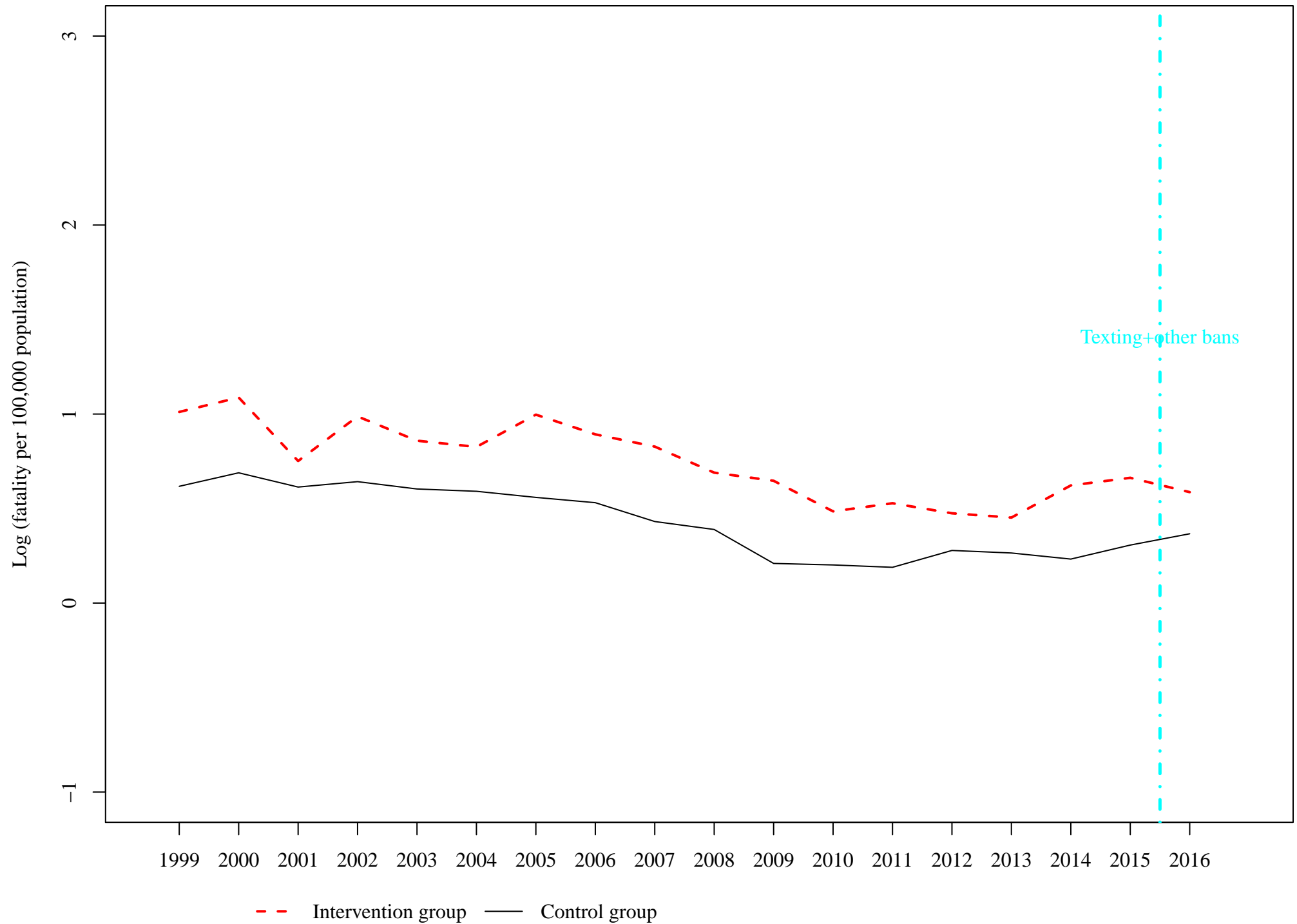
Michigan nondriver_fatality



Minnesota nondriver_fatality



Mississippi nondriver_fatality



Nebraska nondriver_fatality



Nevada nondriver_fatality



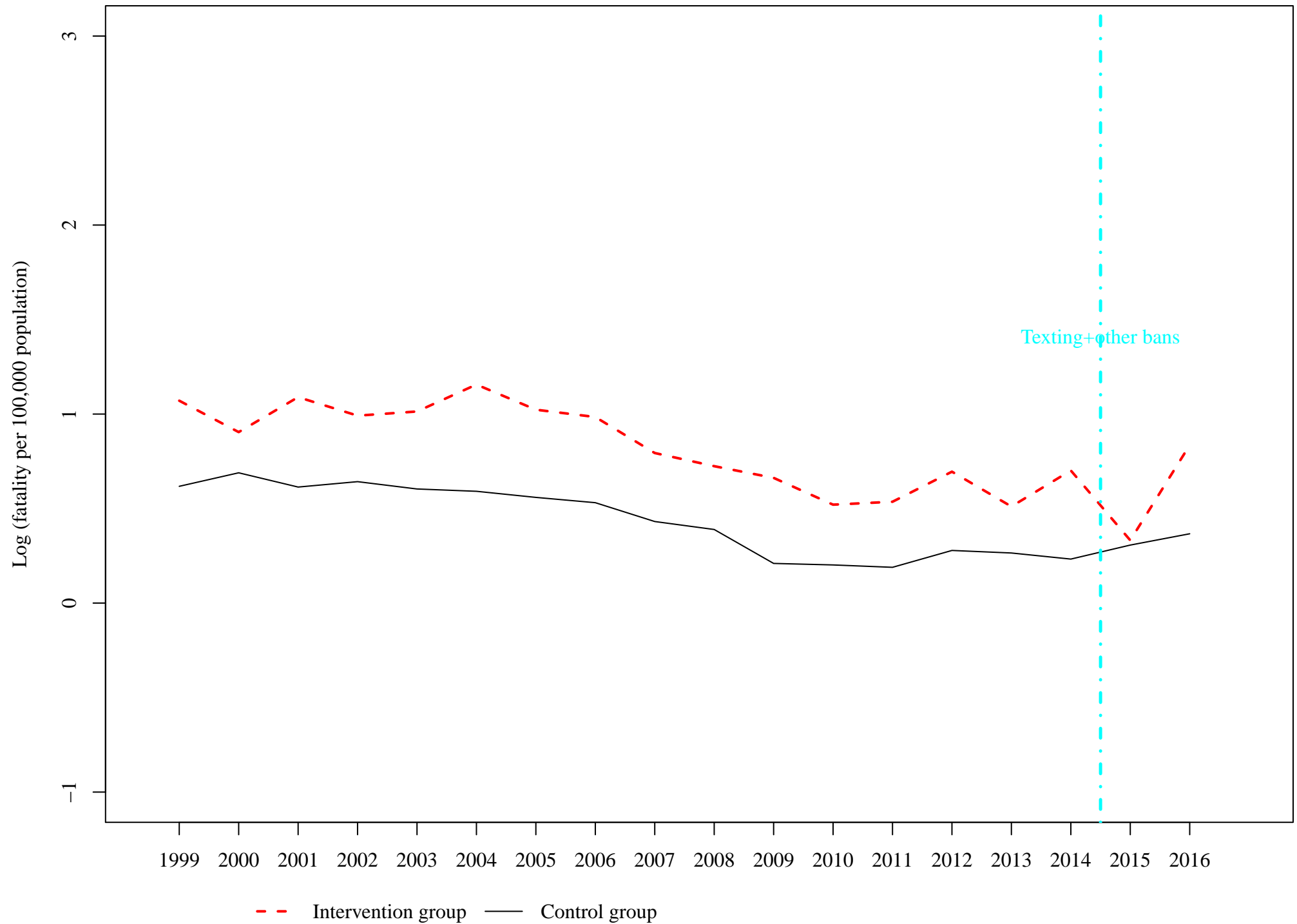
New Hampshire nondriver_fatality



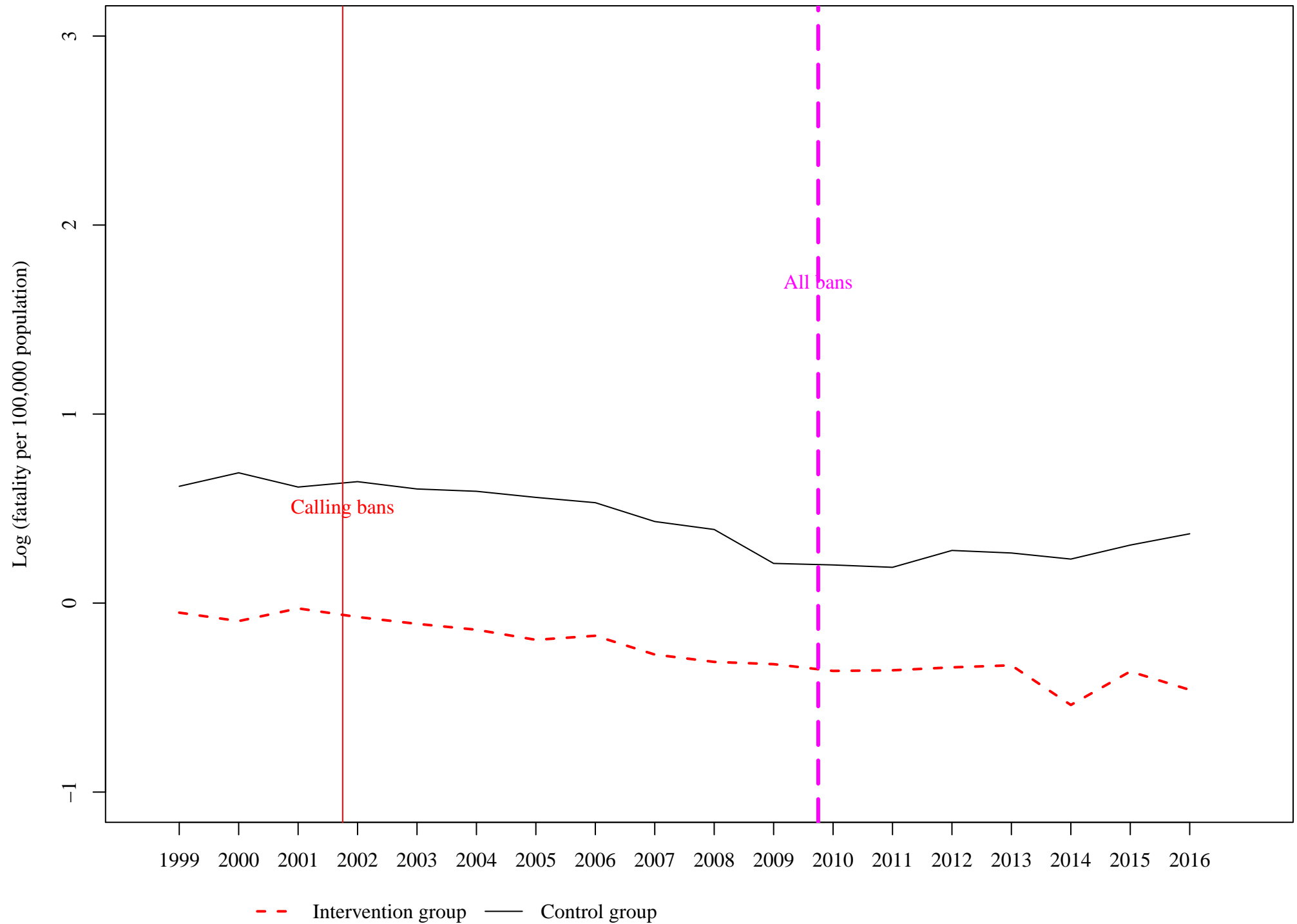
New Jersey nondriver_fatality



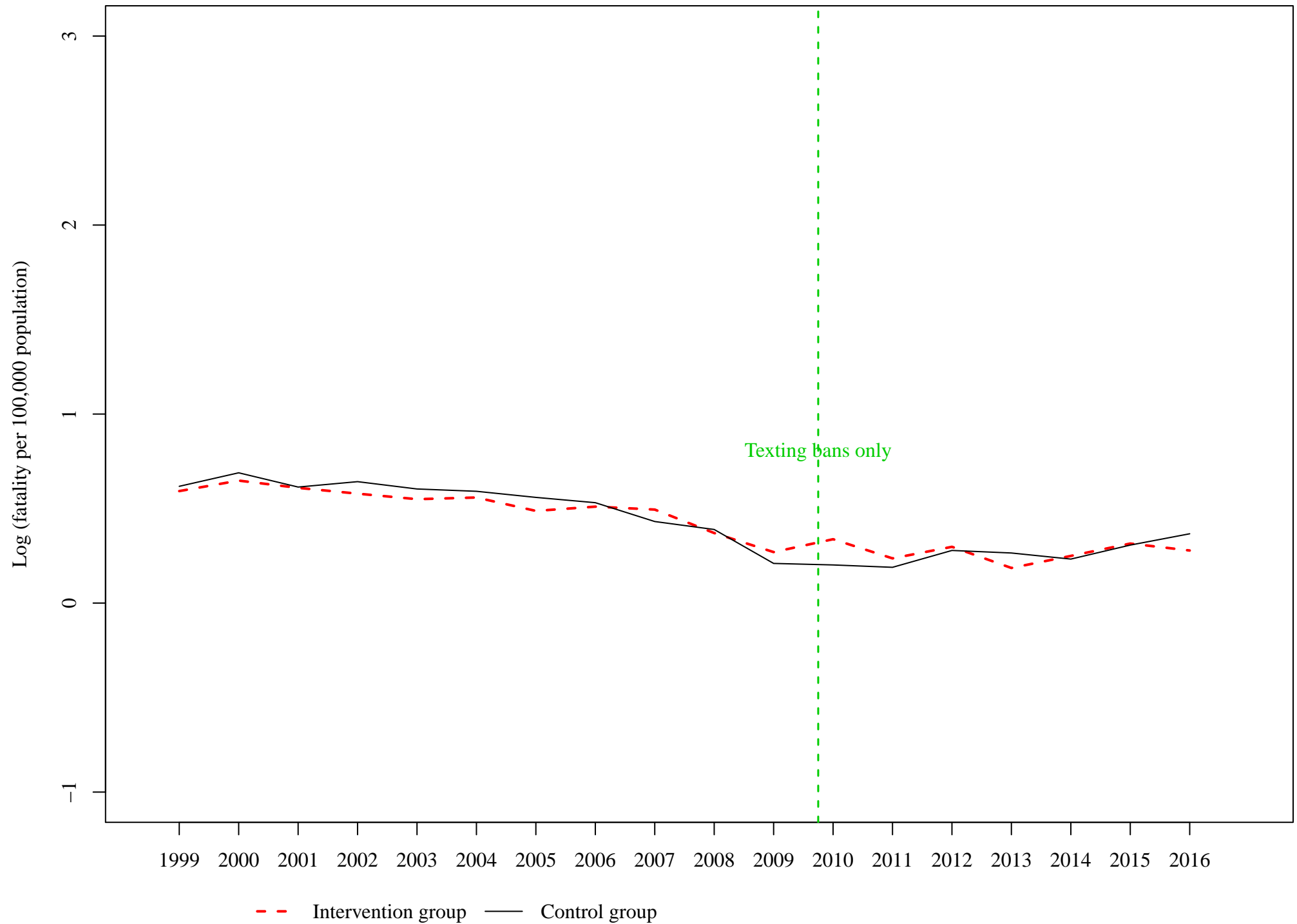
New Mexico nondriver_fatality



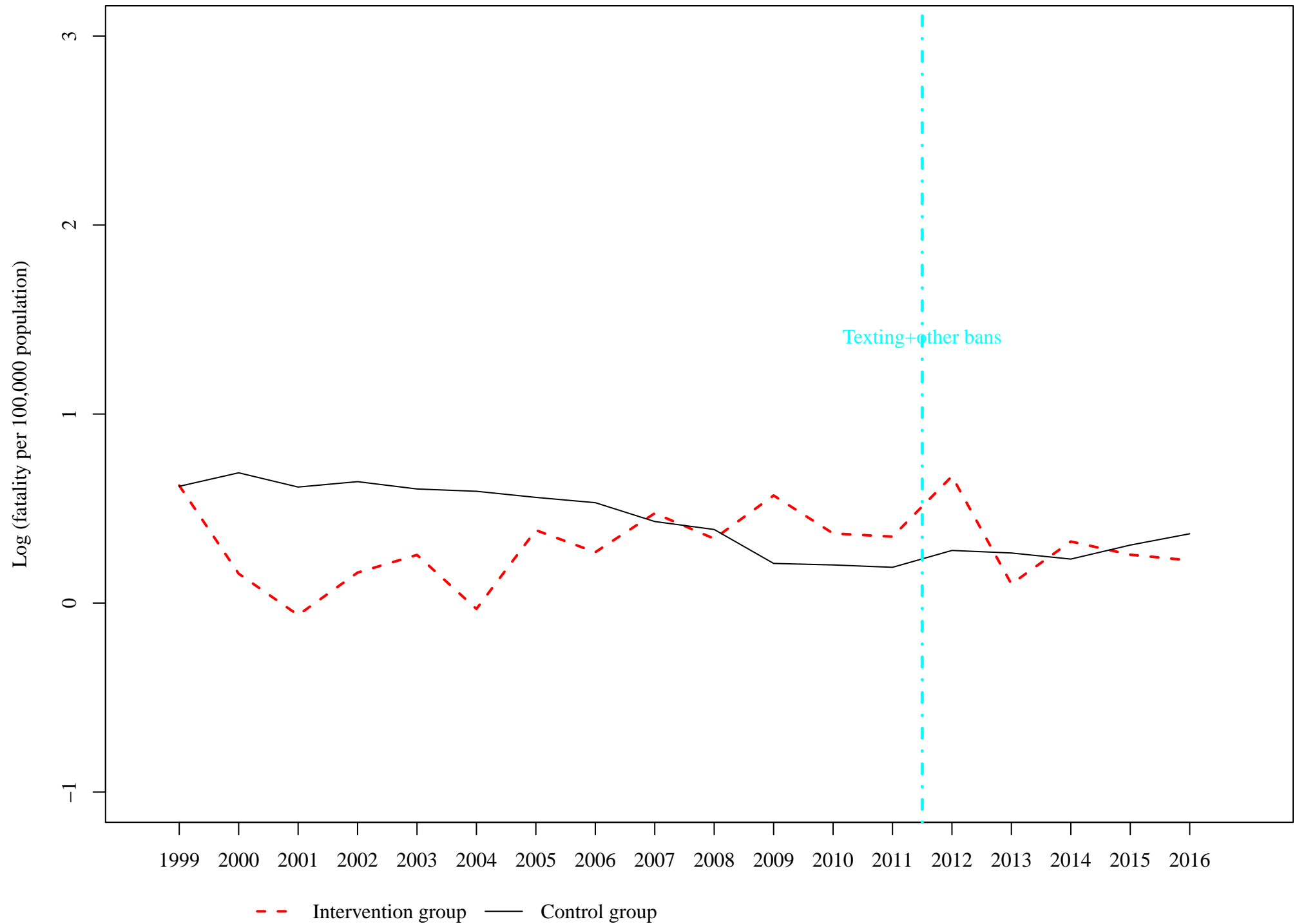
New York nondriver_fatality



North Carolina nondriver_fatality



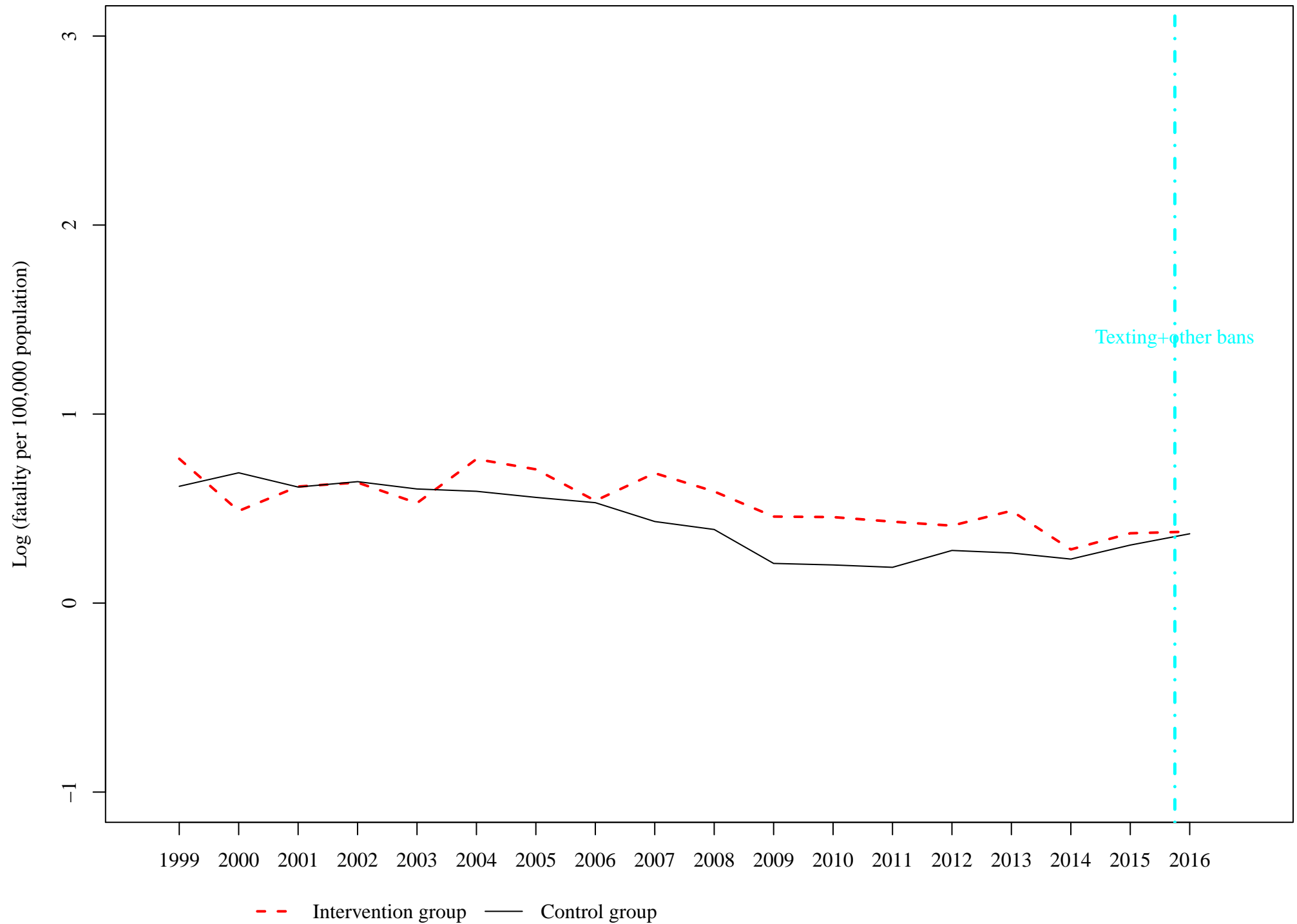
North Dakota nondriver_fatality



Ohio nondriver_fatality



Oklahoma nondriver_fatality



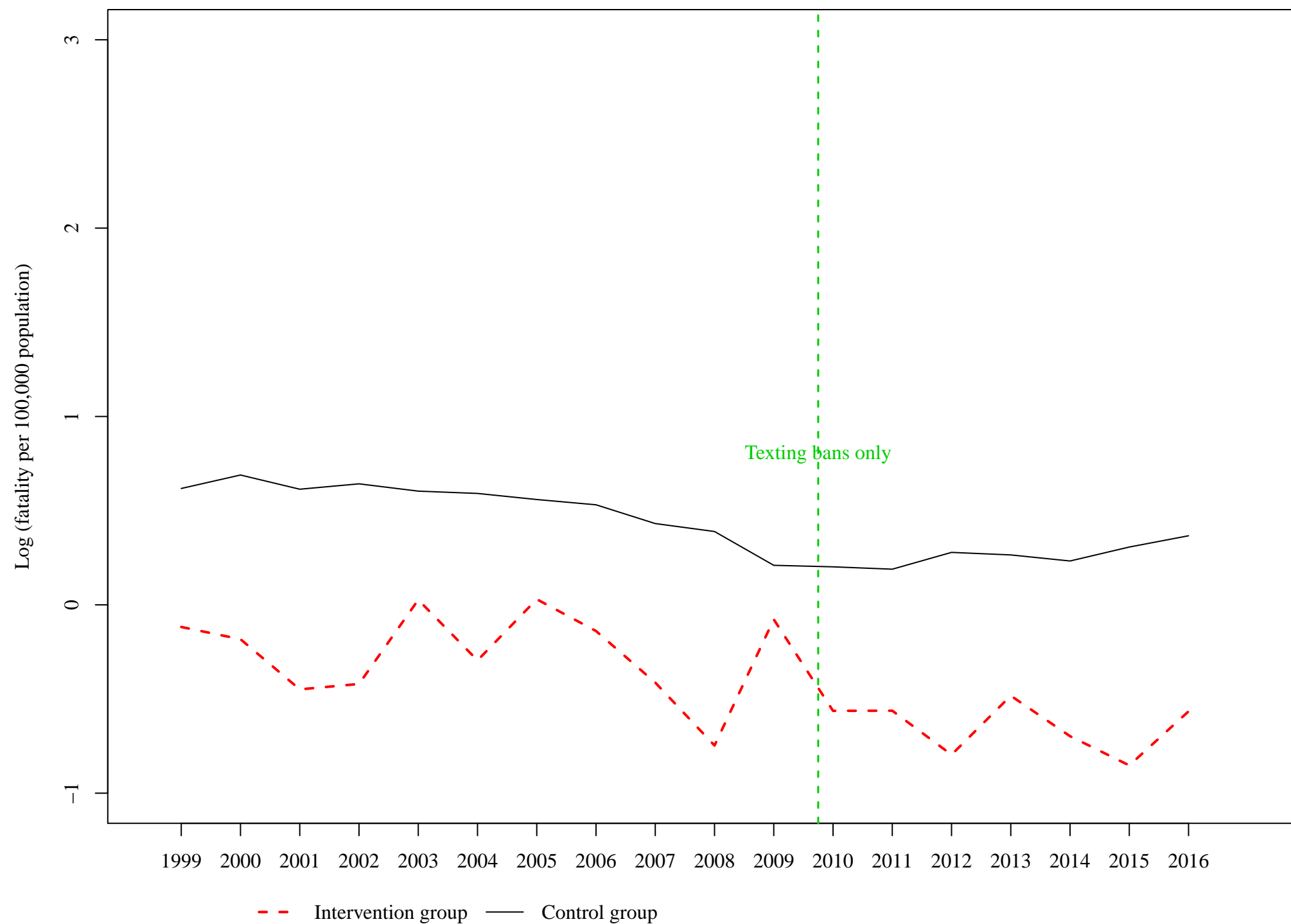
Oregon nondriver_fatality



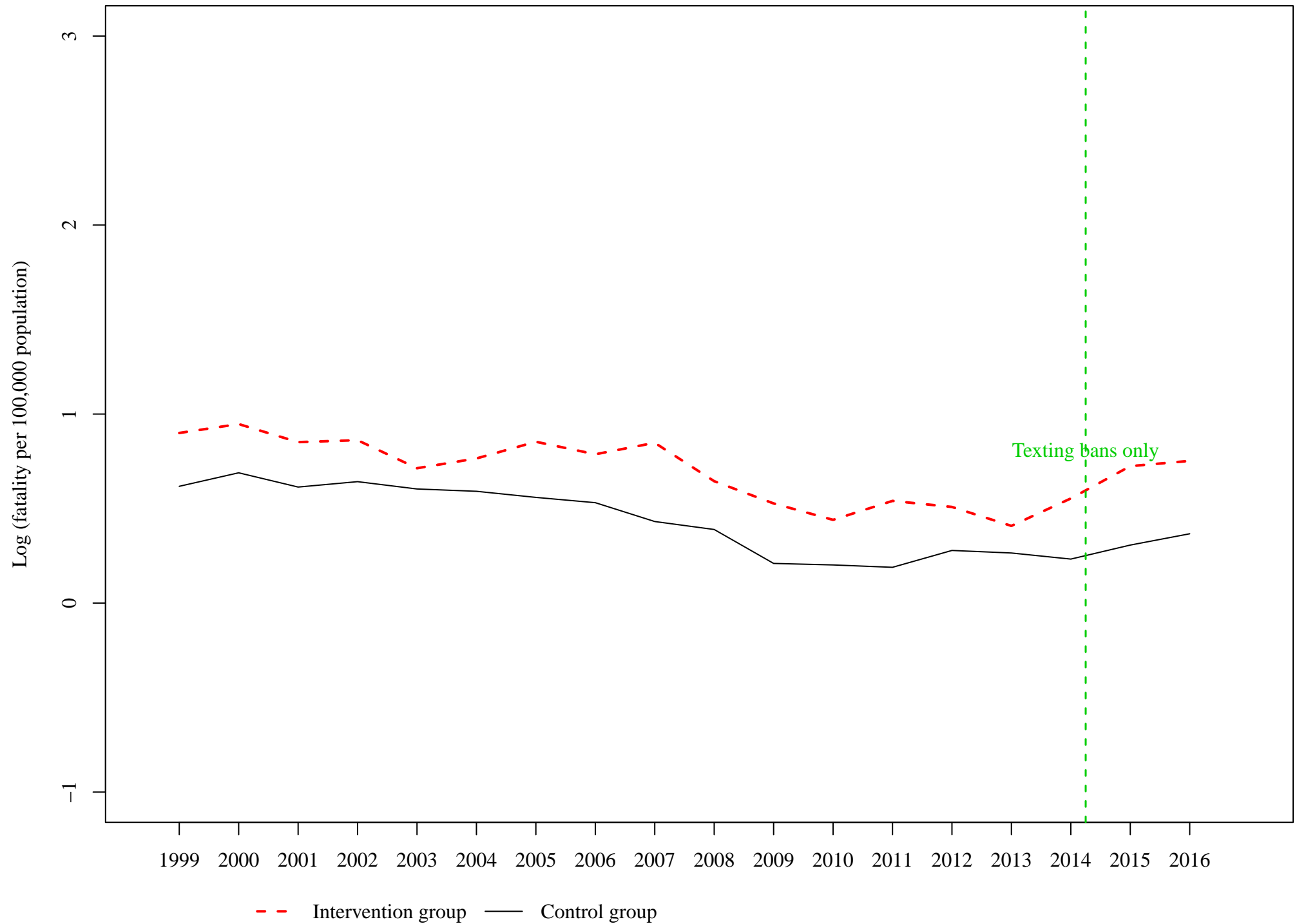
Pennsylvania nondriver_fatality



Rhode Island nondriver_fatality



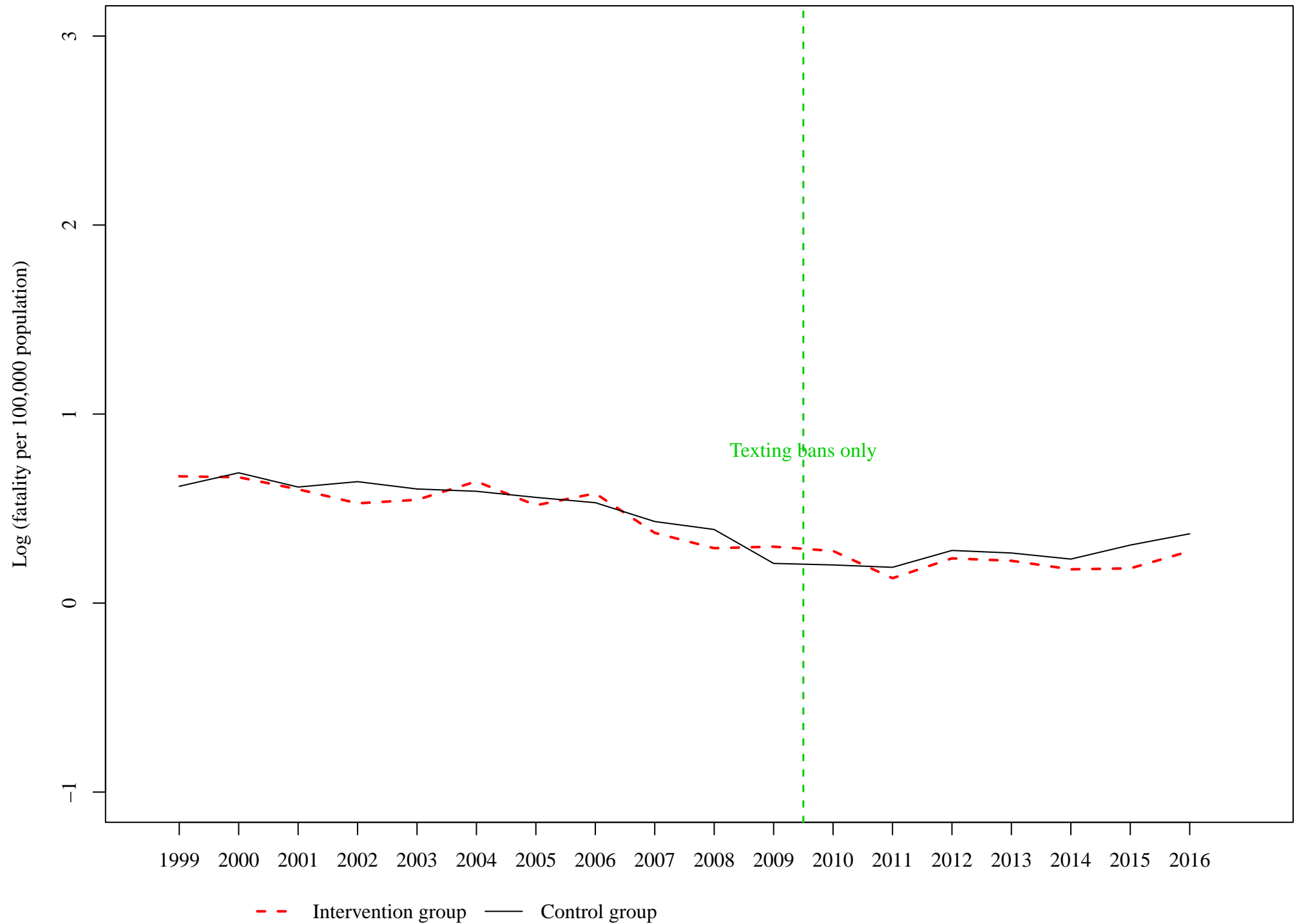
South Carolina nondriver_fatality



South Dakota nondriver_fatality



Tennessee nondriver_fatality



Utah nondriver_fatality



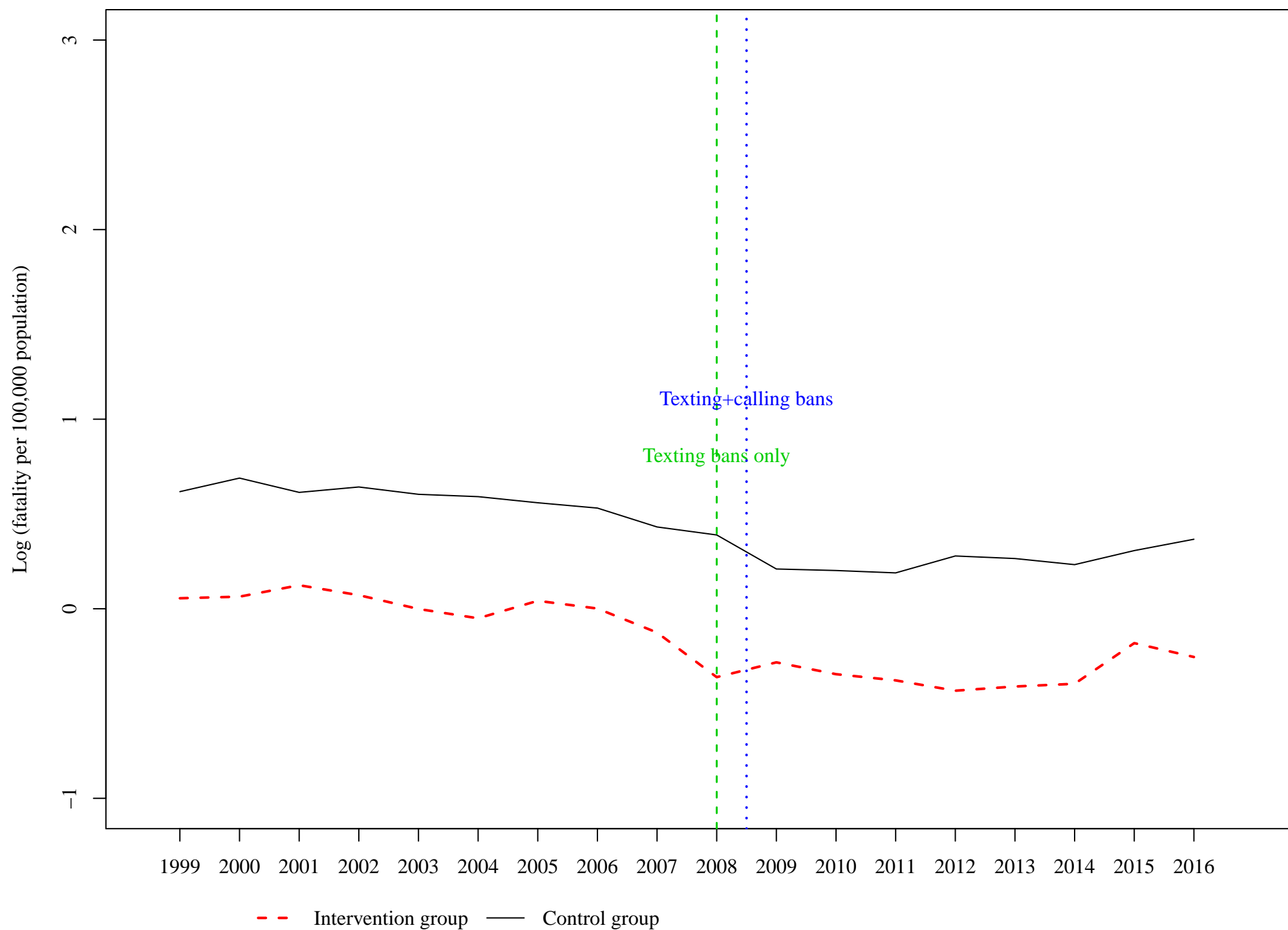
Vermont nondriver_fatality



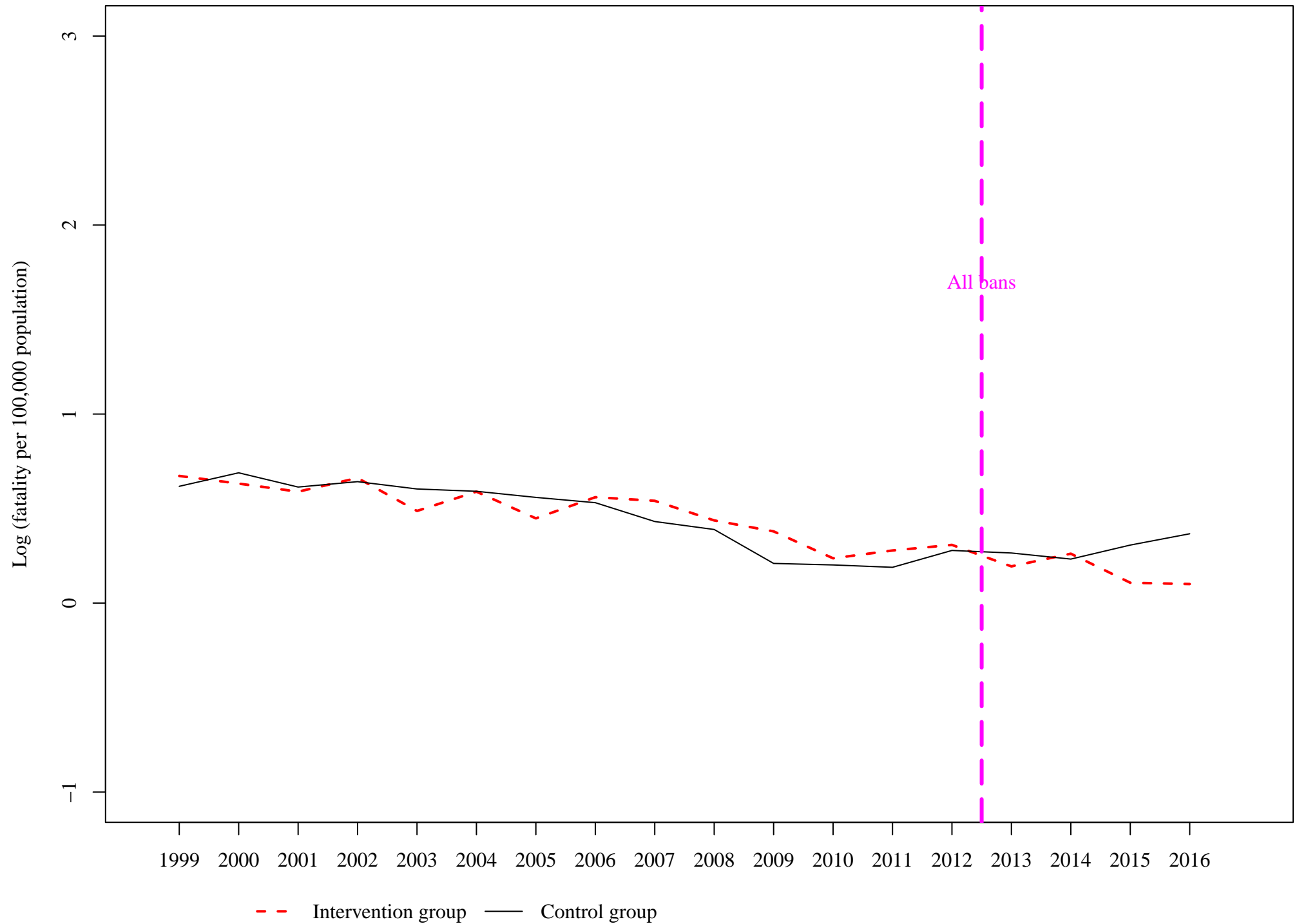
Virginia nondriver_fatality



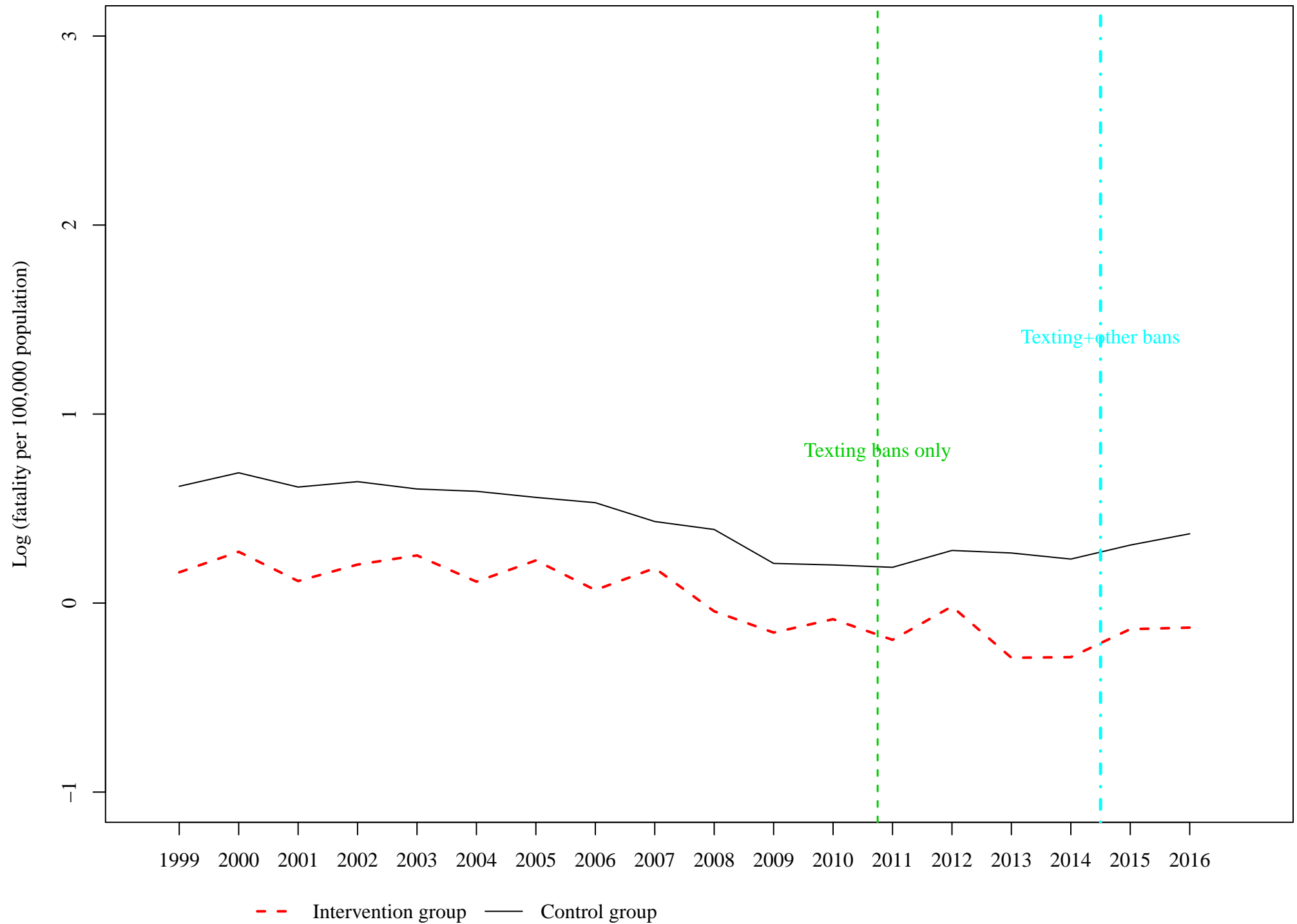
Washington nondriver_fatality



West Virginia nondriver_fatality



Wisconsin nondriver_fatality



Wyoming nondriver_fatality



eFigure 3. Total fatality rates by year for each of the 46 intervention states (states with cellphone bans) vs control states (Arizona, Missouri, Montana, and Texas without cellphone laws by 2016)

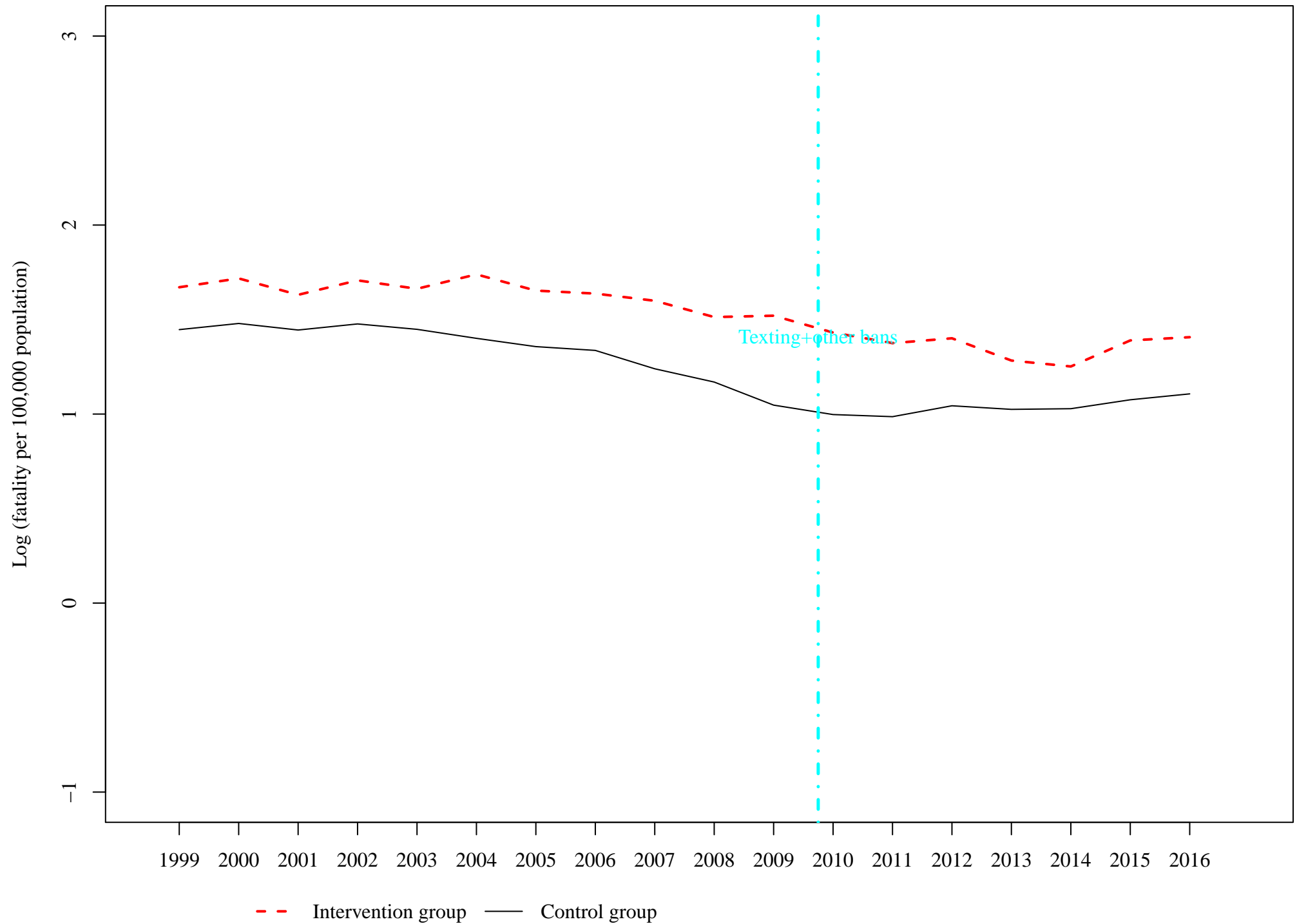
Alabama all_fatality



Alaska all_fatality



Arkansas all_fatality



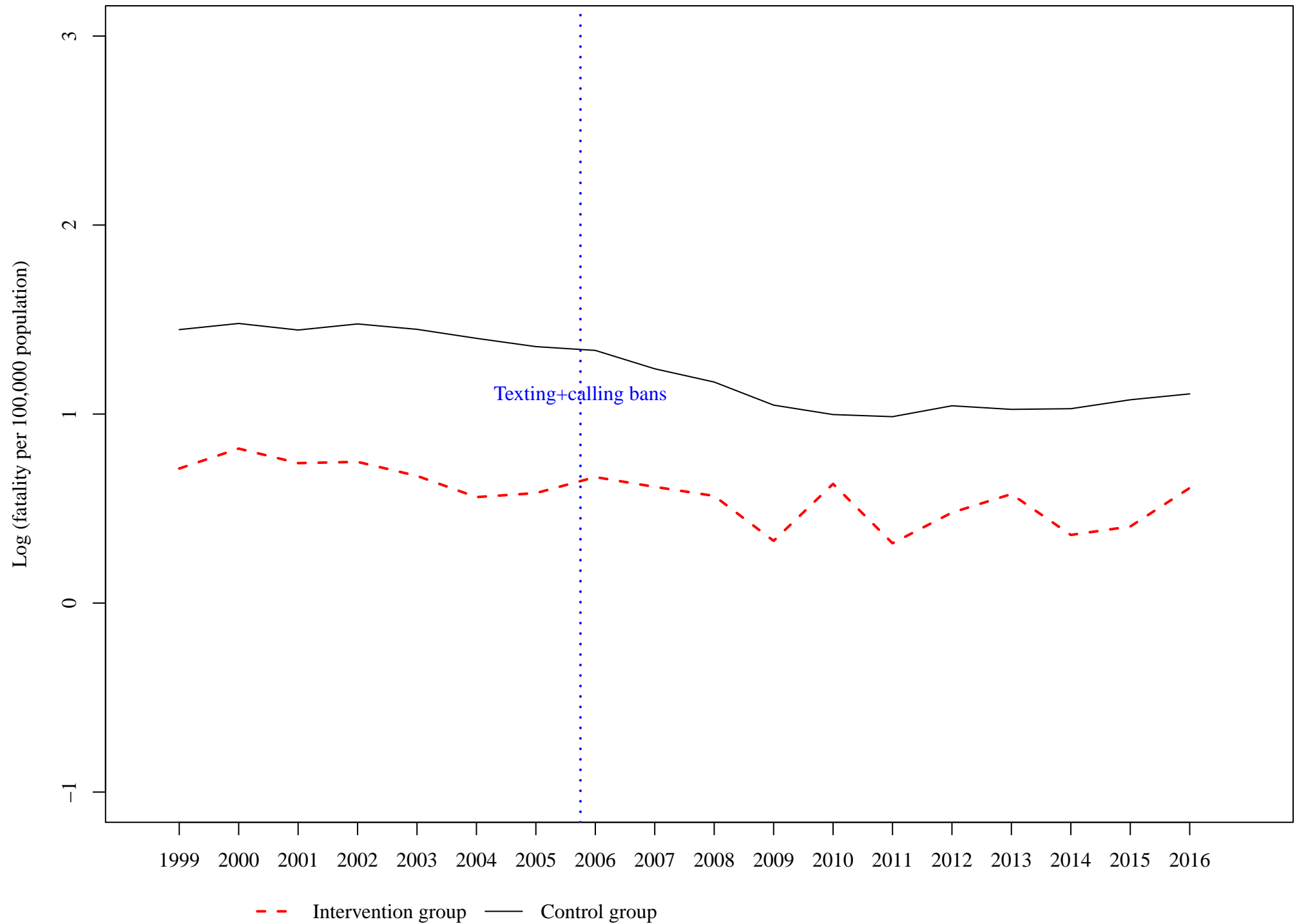
California all_fatality



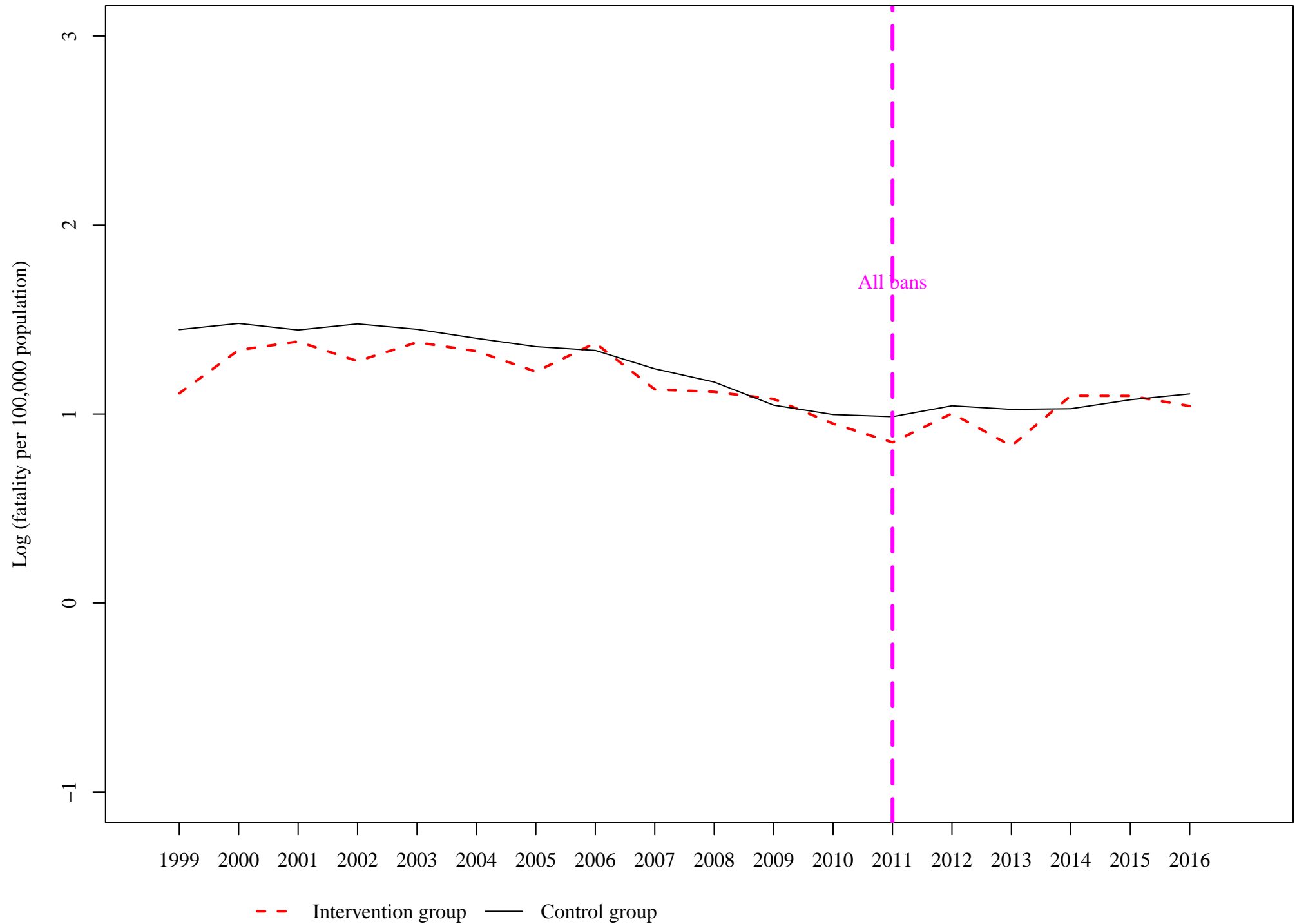
Colorado all_fatality



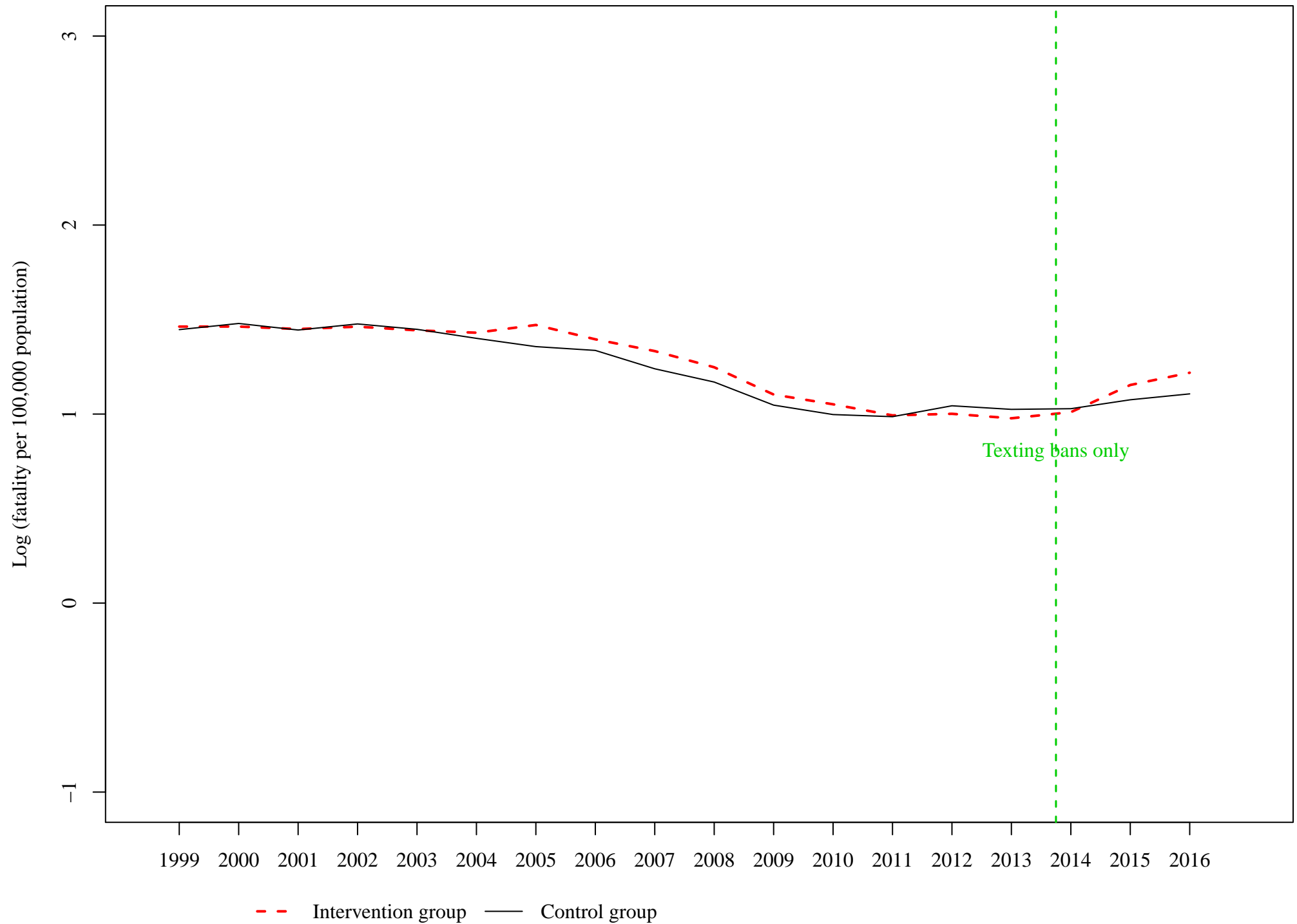
Connecticut all_fatality



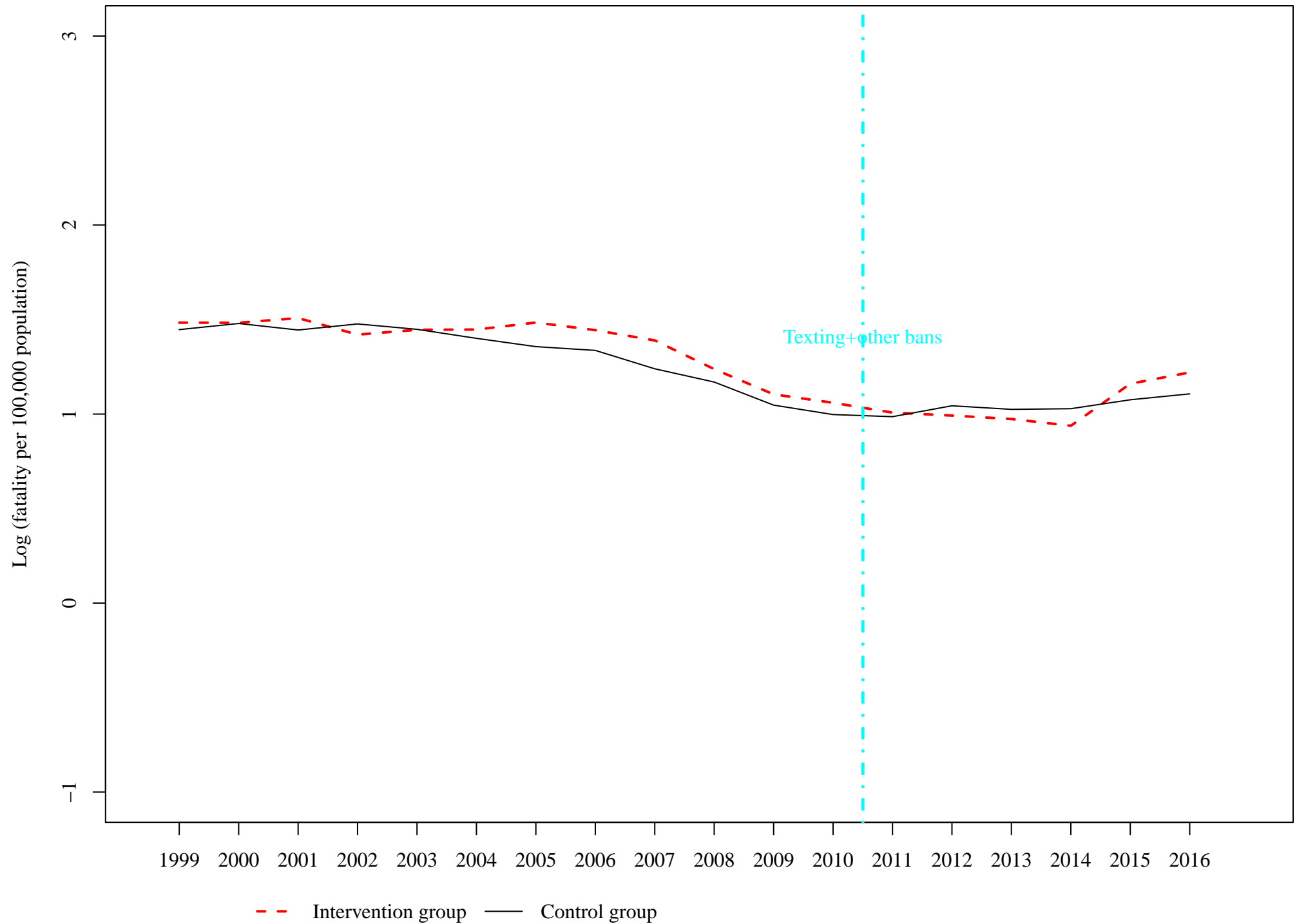
Delaware all_fatality



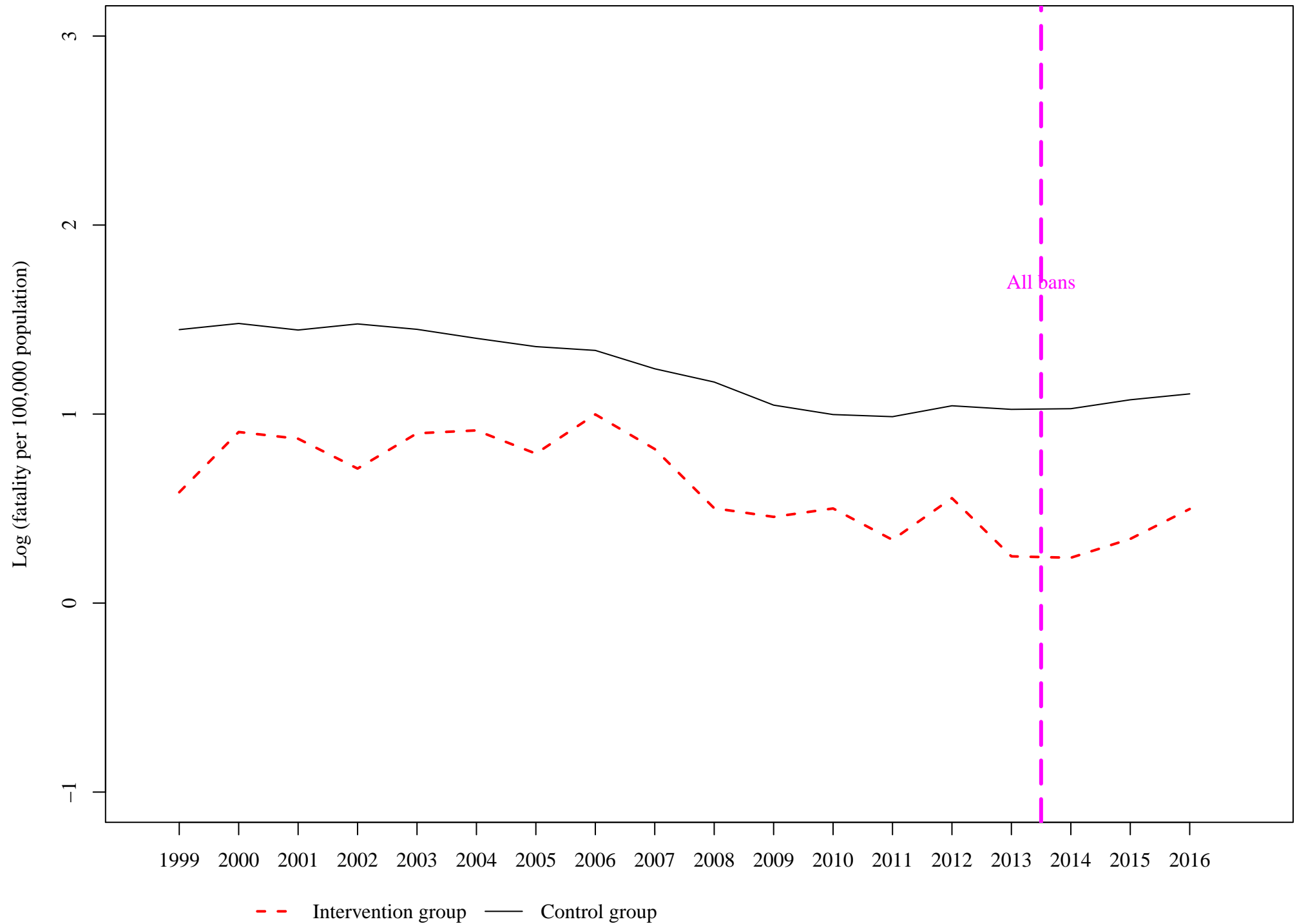
Florida all_fatality



Georgia all_fatality



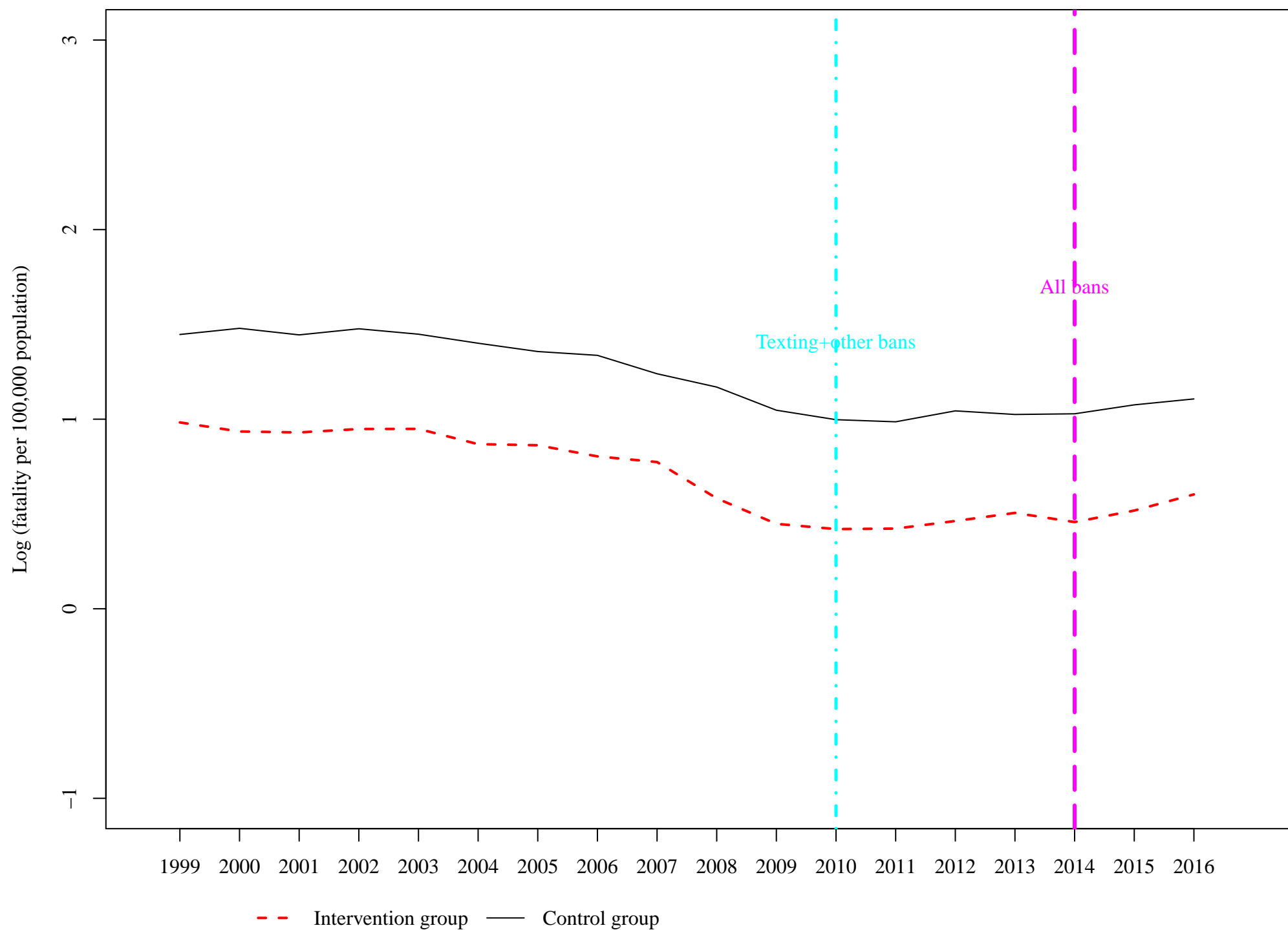
Hawaii all_fatality



Idaho all_fatality



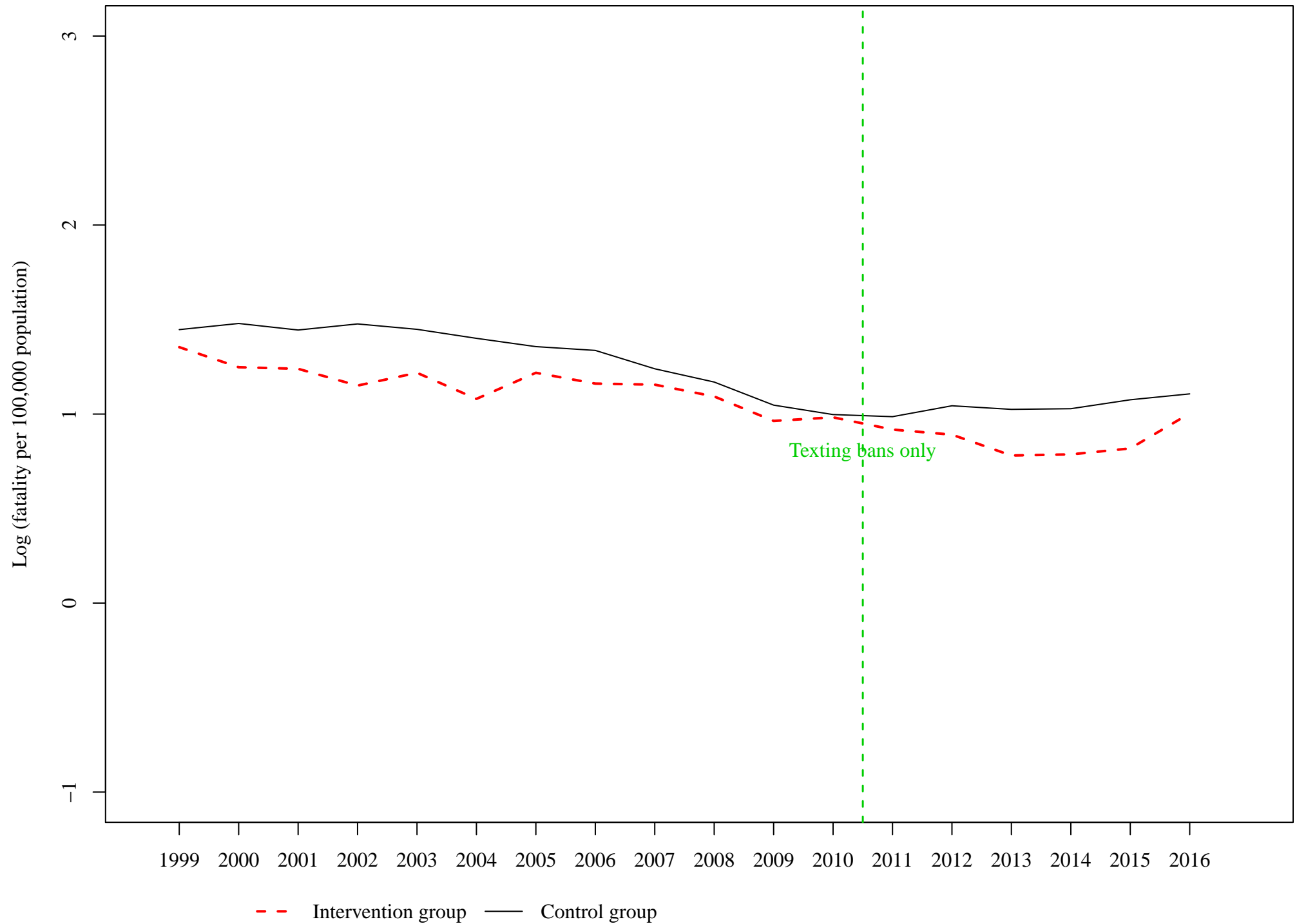
Illinois all_fatality



Indiana all_fatality



Iowa all_fatality



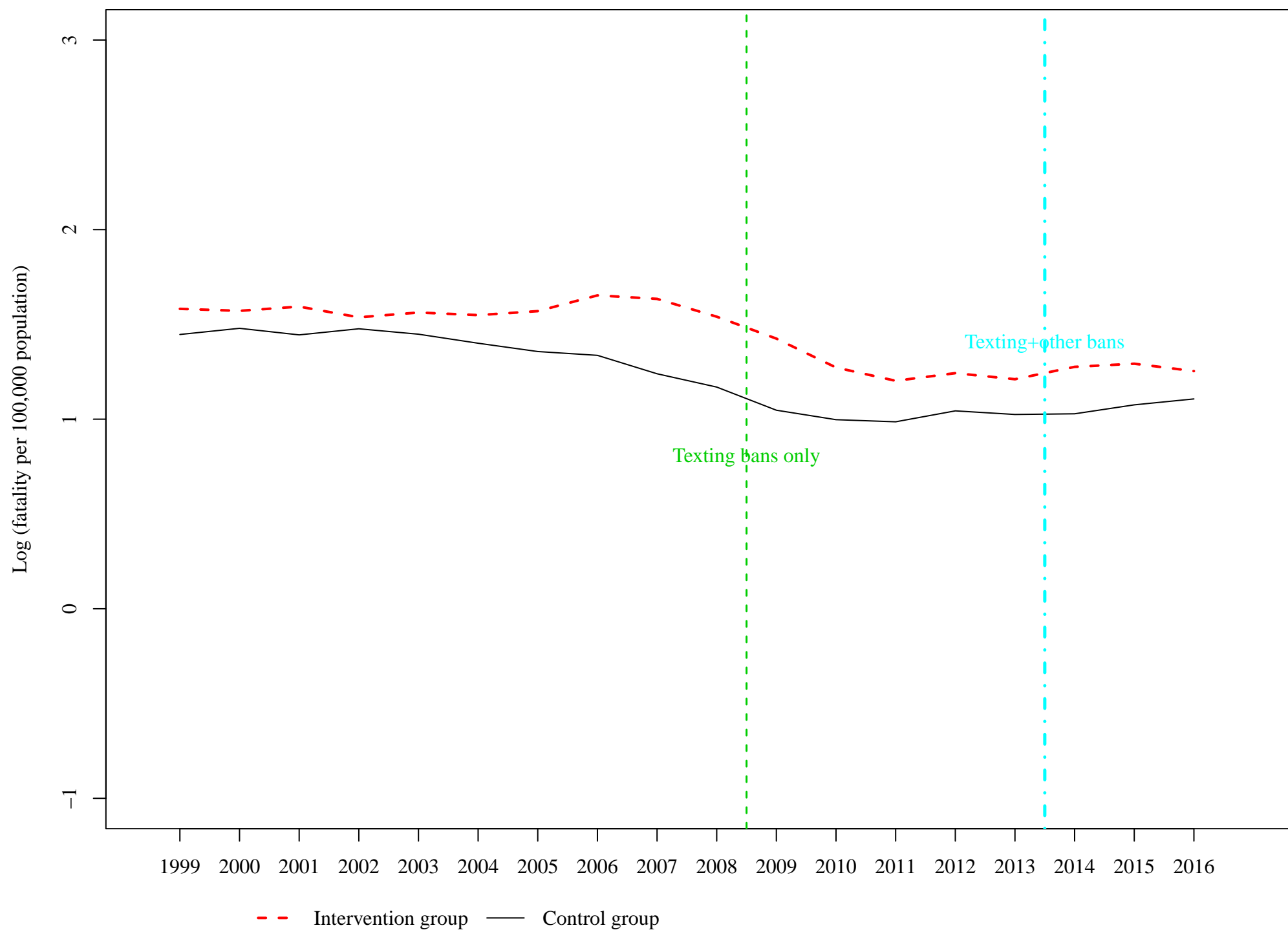
Kansas all_fatality



Kentucky all_fatality



Louisiana all_fatality



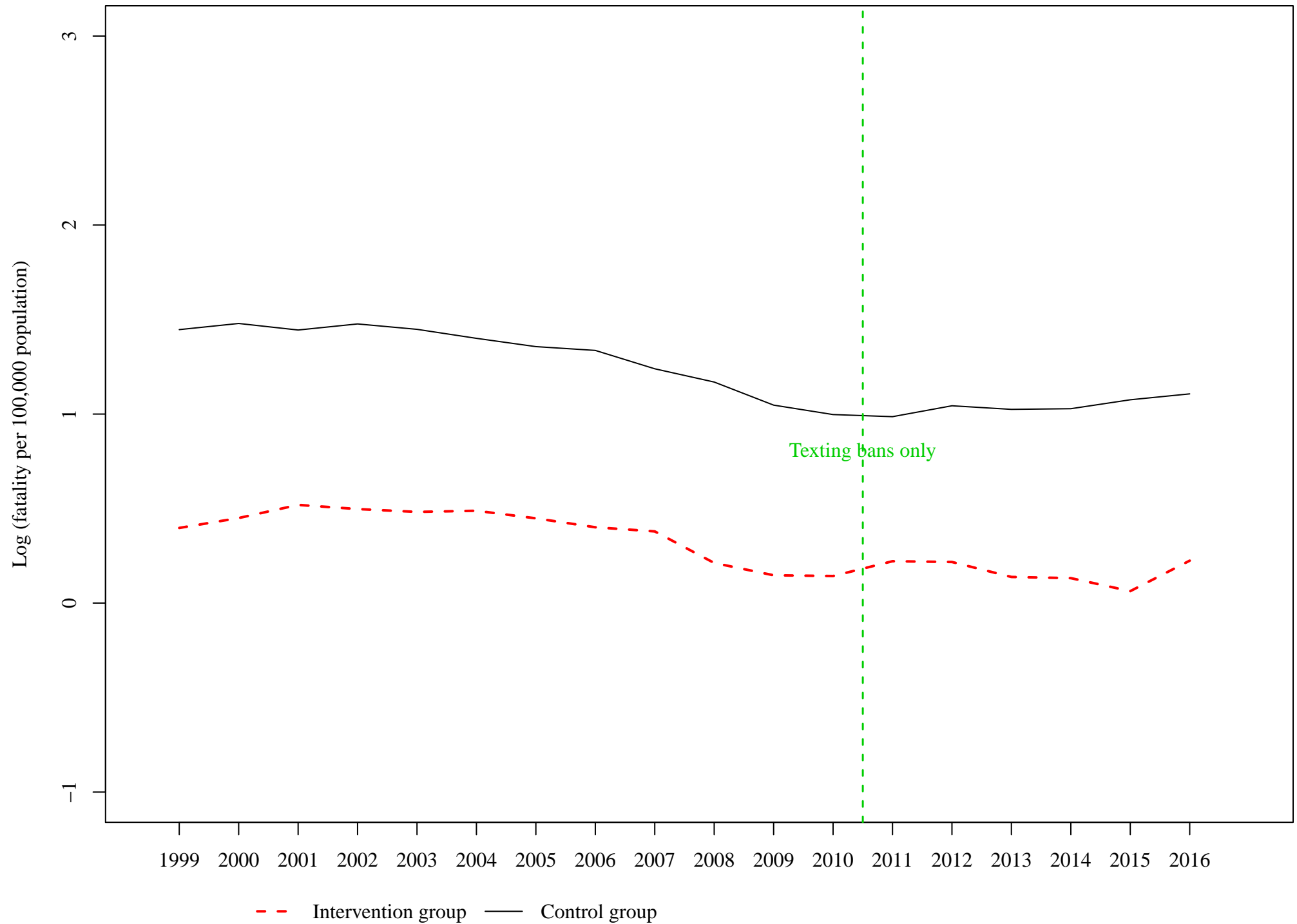
Maine all_fatality



Maryland all_fatality



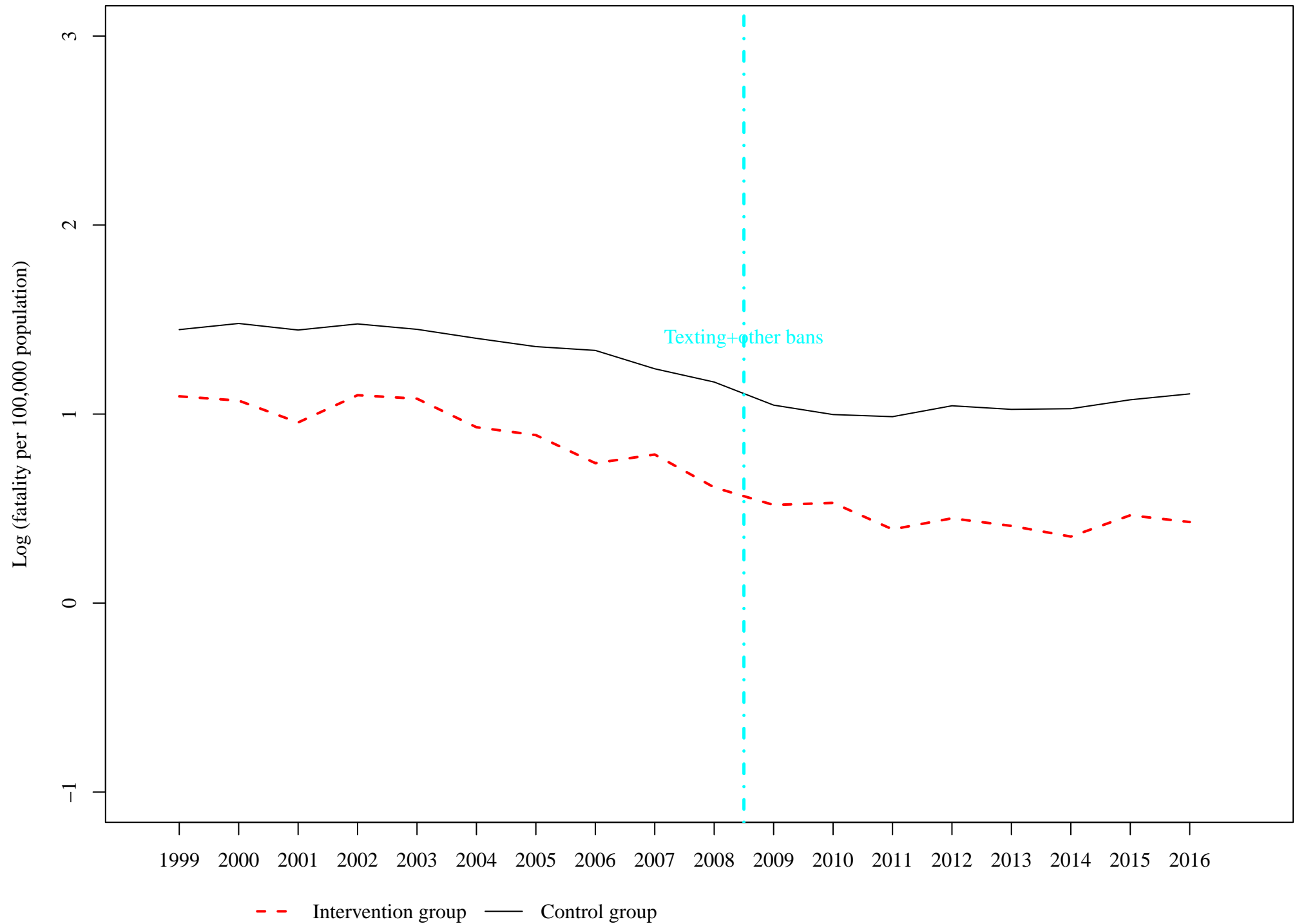
Massachusetts all_fatality



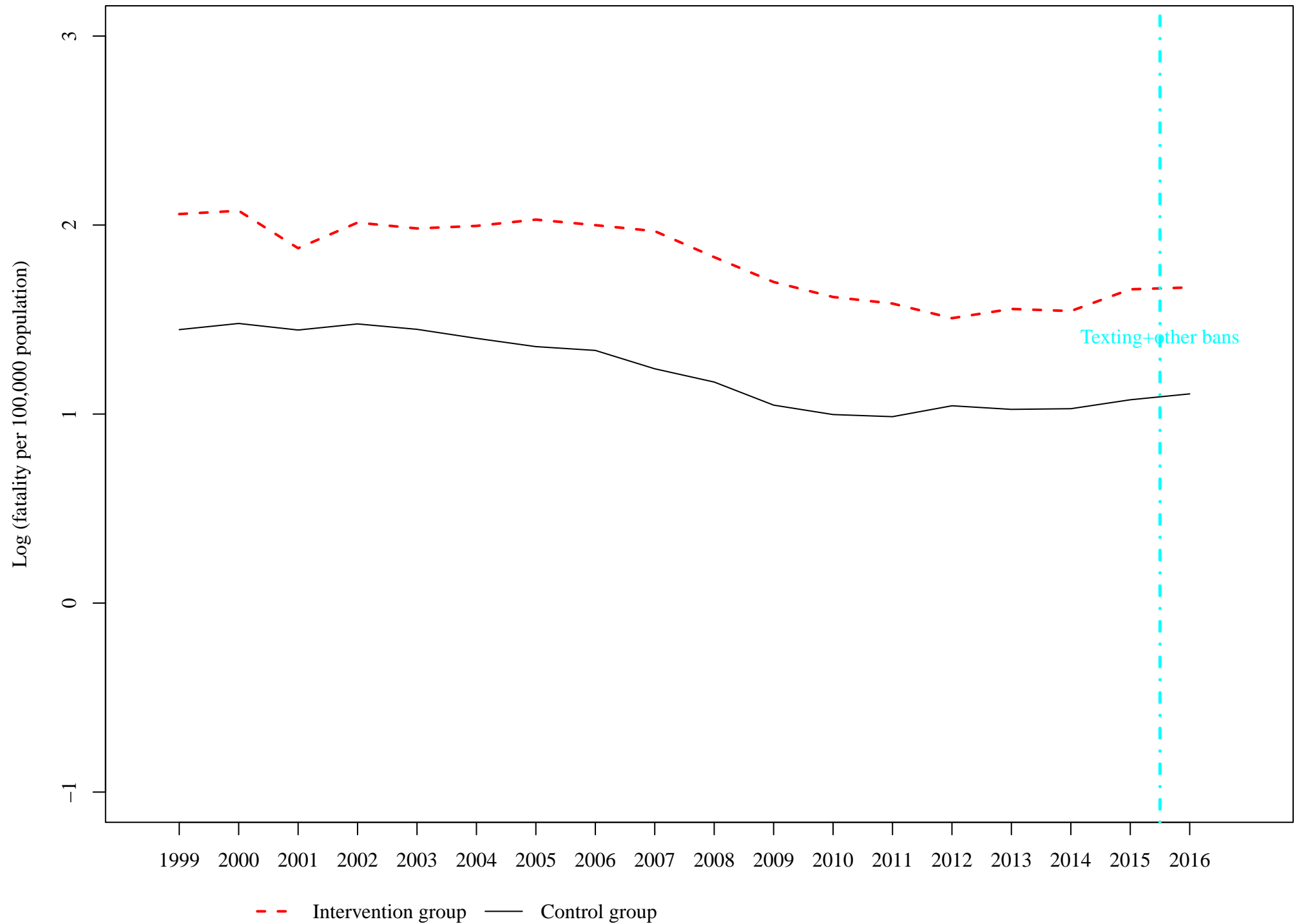
Michigan all_fatality



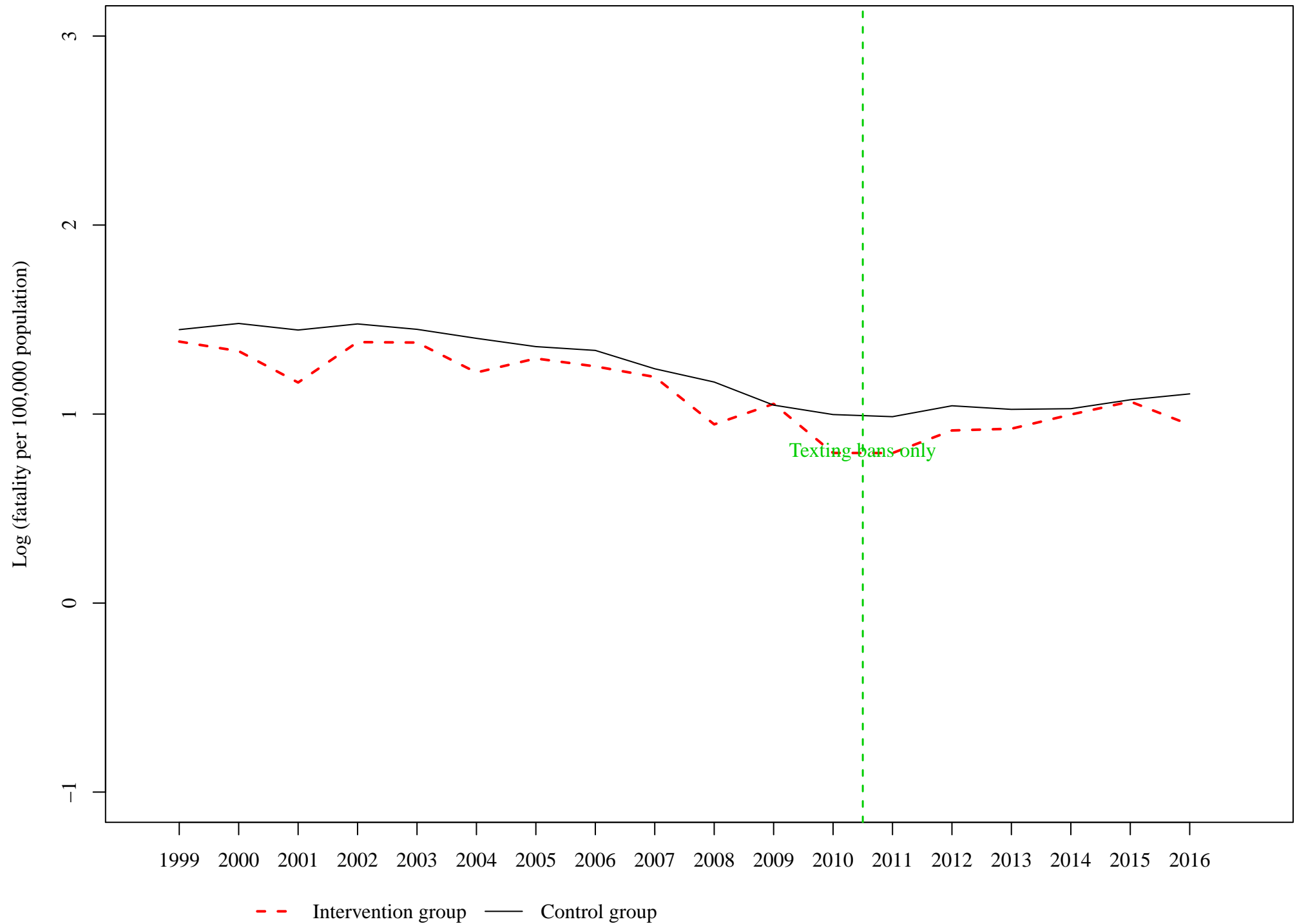
Minnesota all_fatality



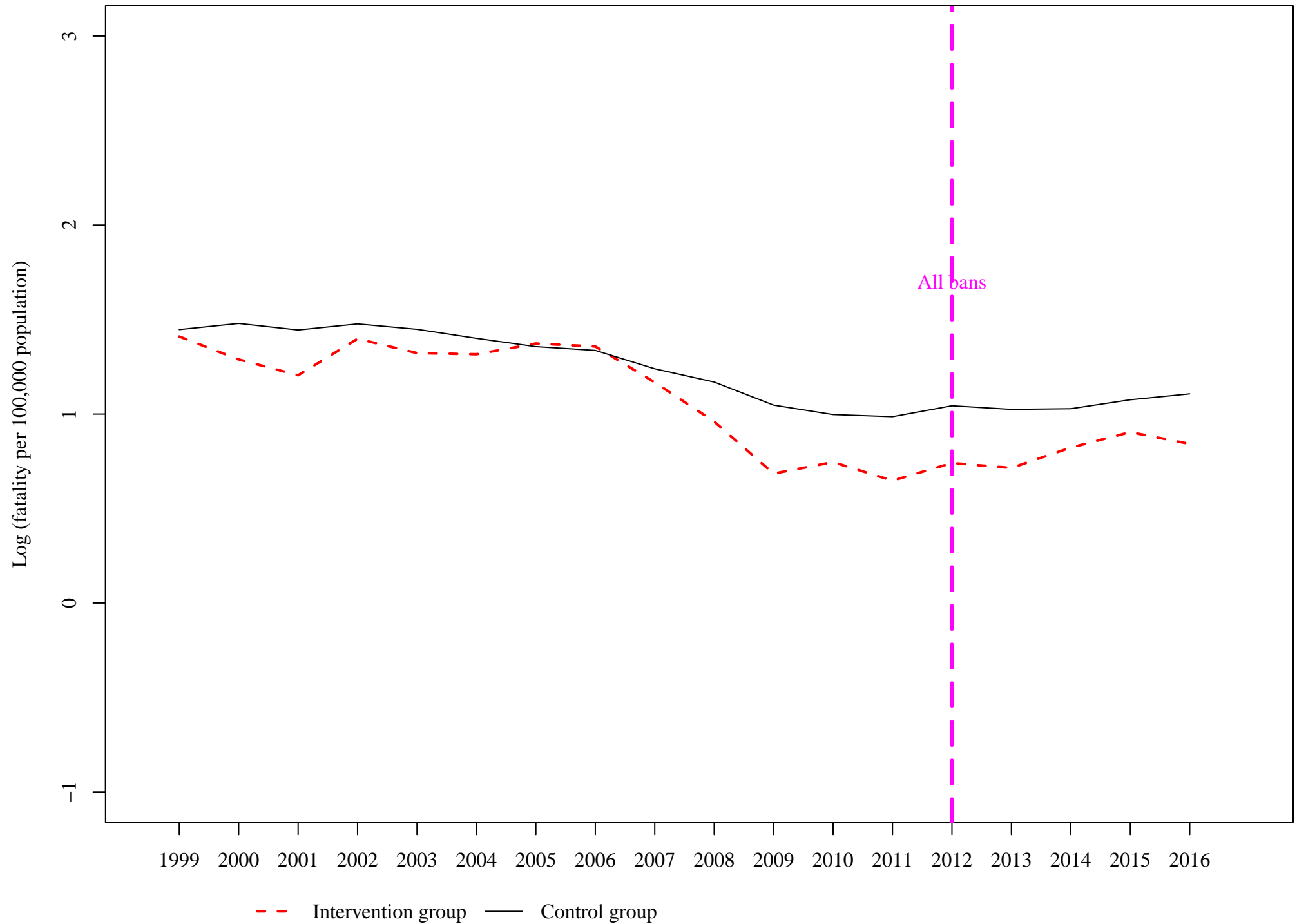
Mississippi all_fatality



Nebraska all_fatality



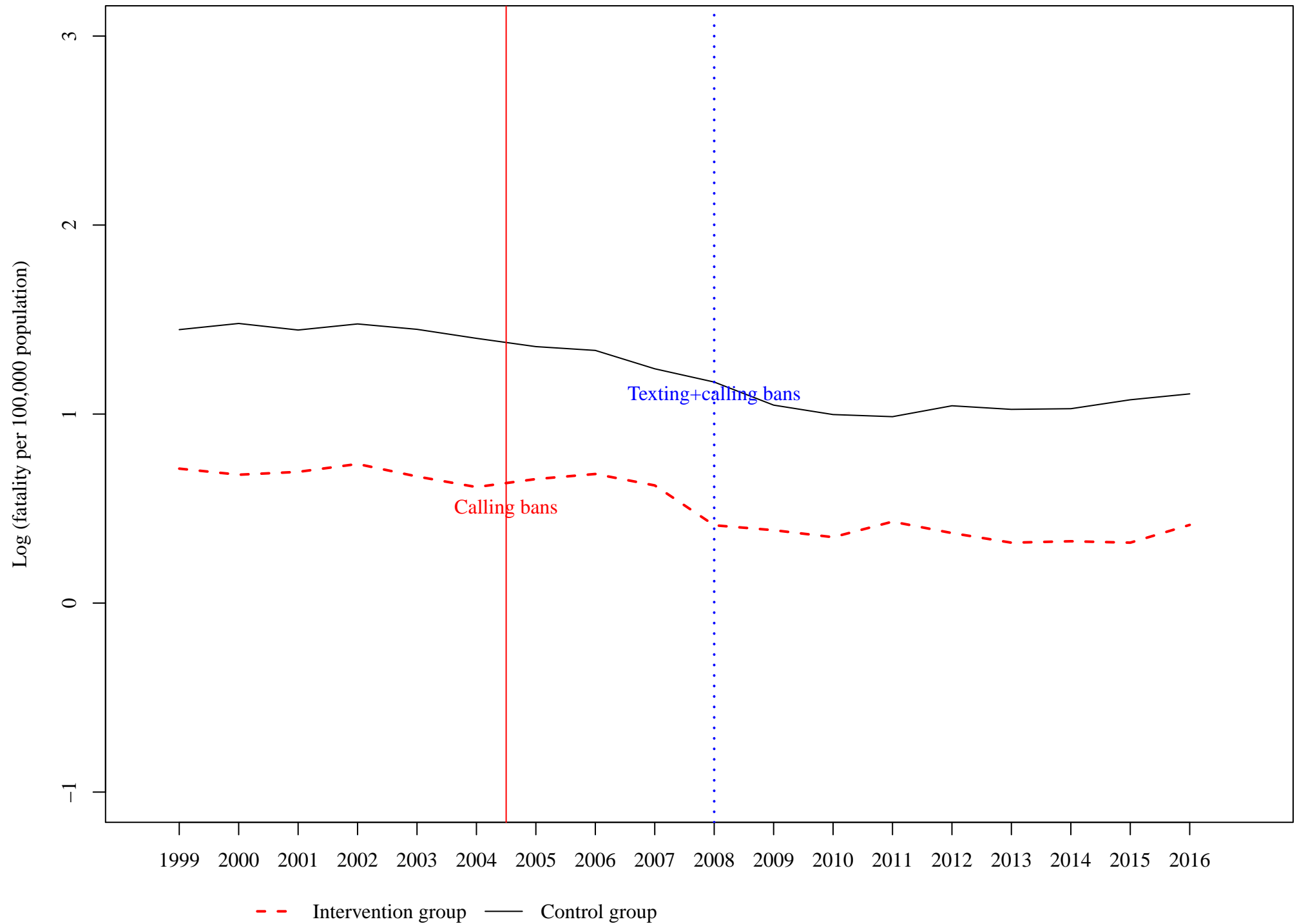
Nevada all_fatality



New Hampshire all_fatality



New Jersey all_fatality



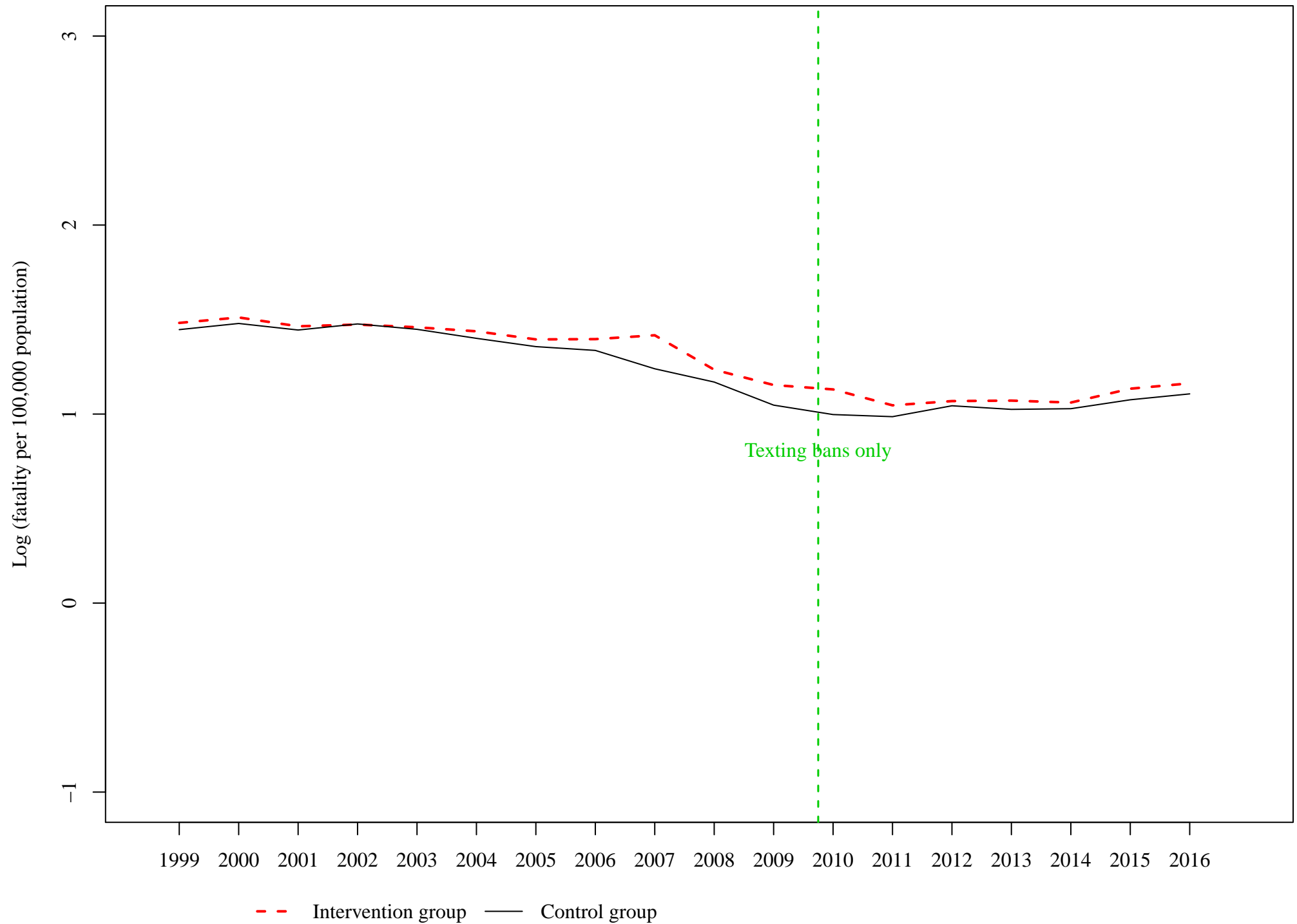
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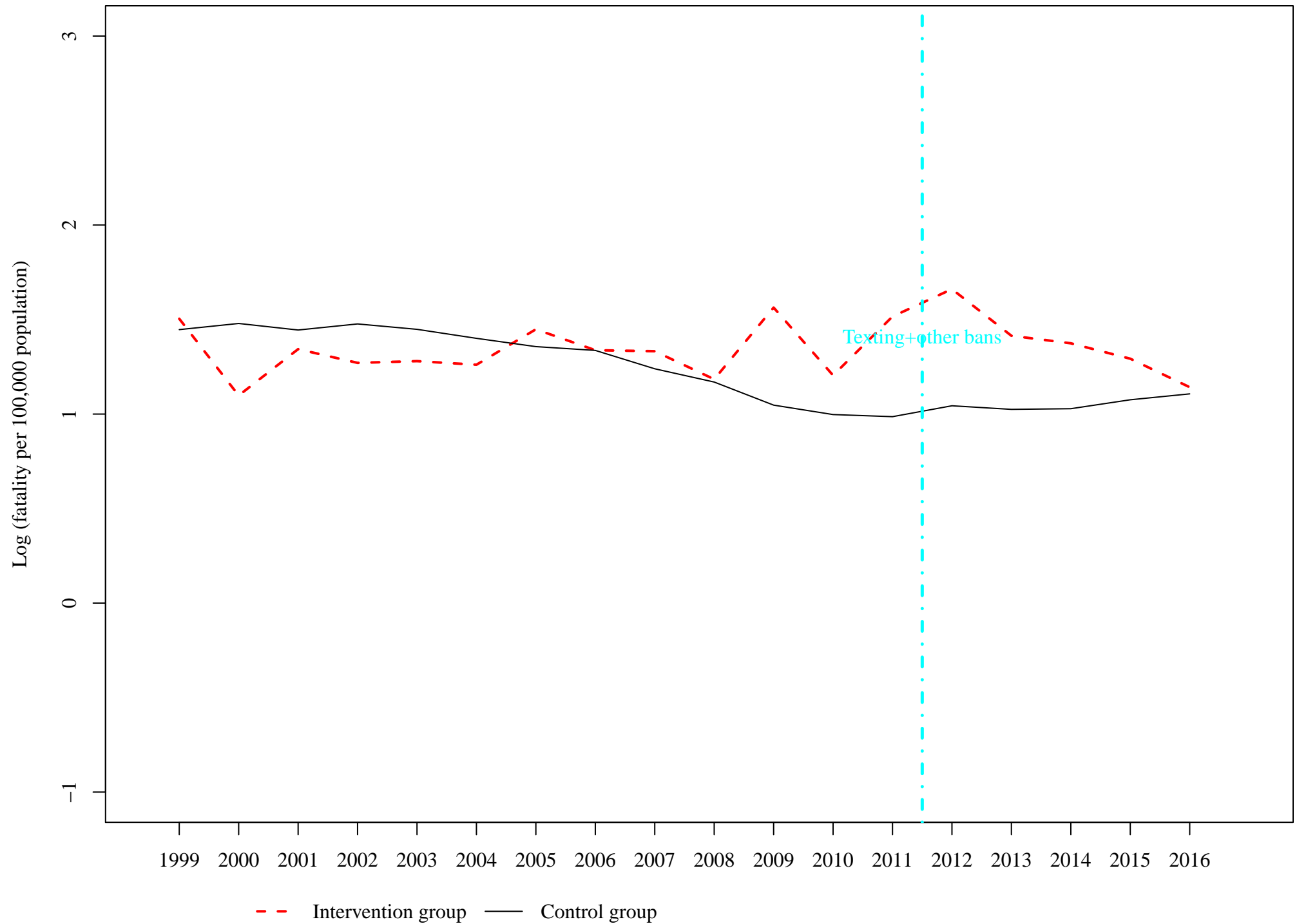
New York all_fatality



North Carolina all_fatality



North Dakota all_fatality



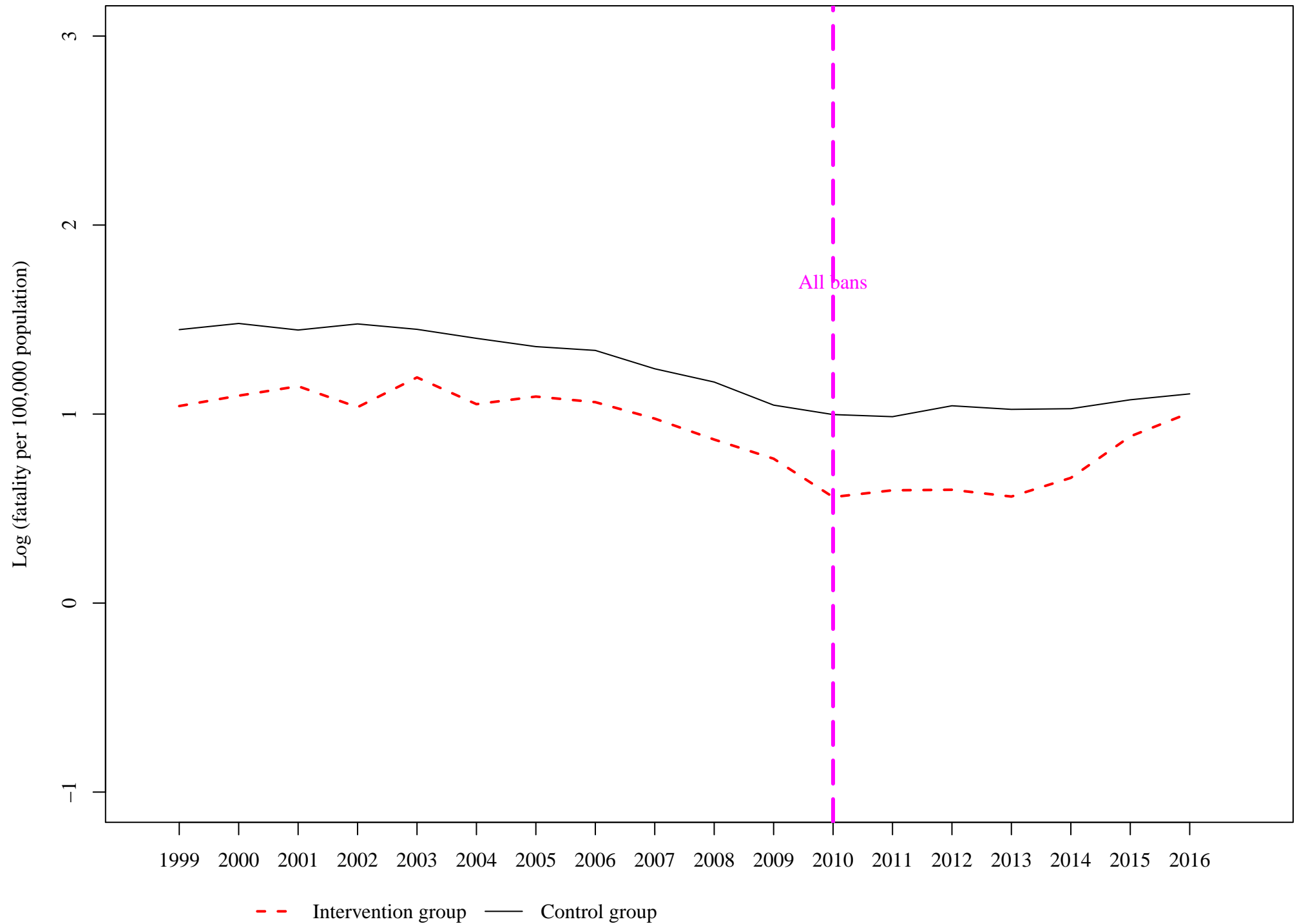
Ohio all_fatality



Oklahoma all_fatality



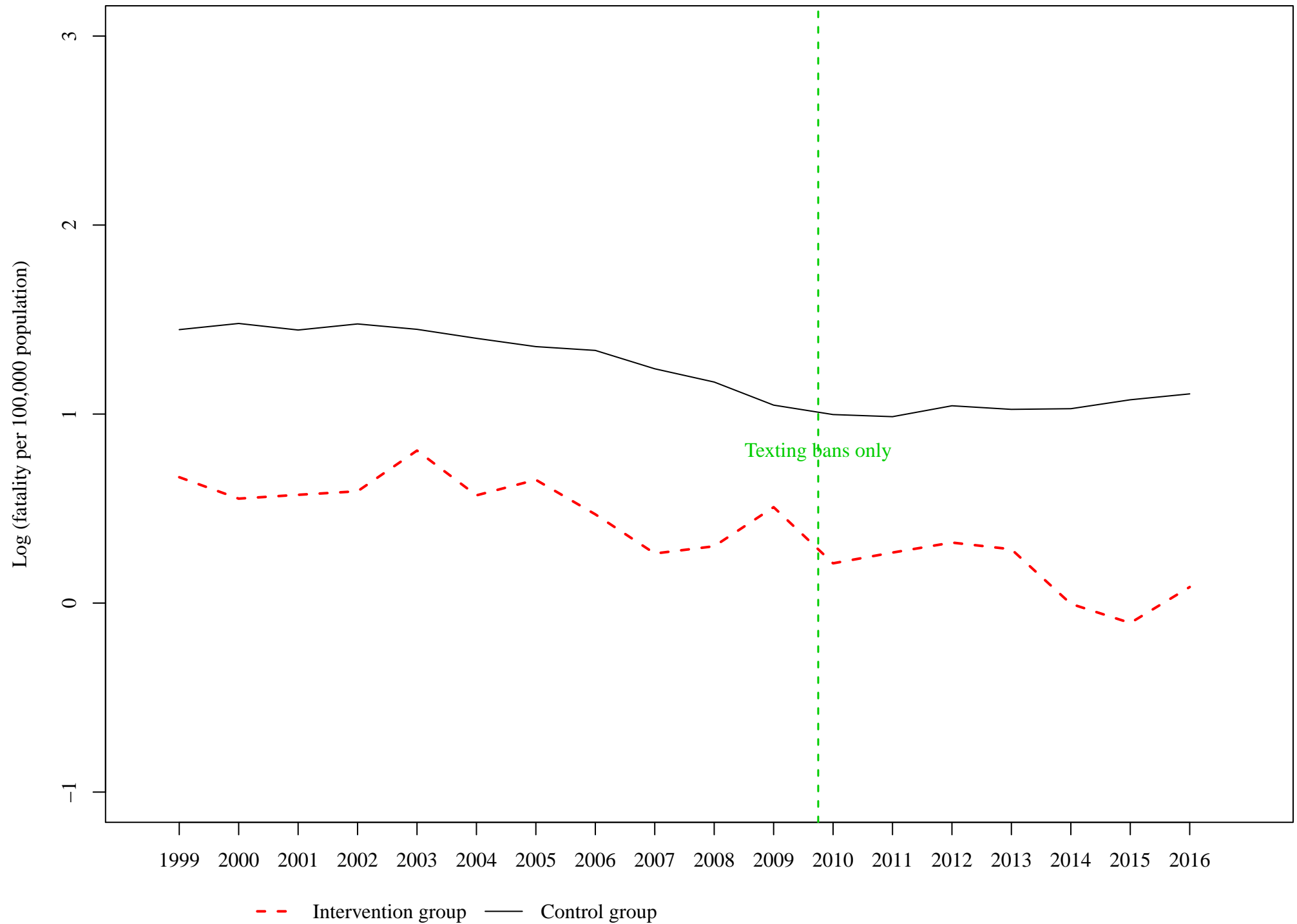
Oregon all_fatality



Pennsylvania all_fatality



Rhode Island all_fatality



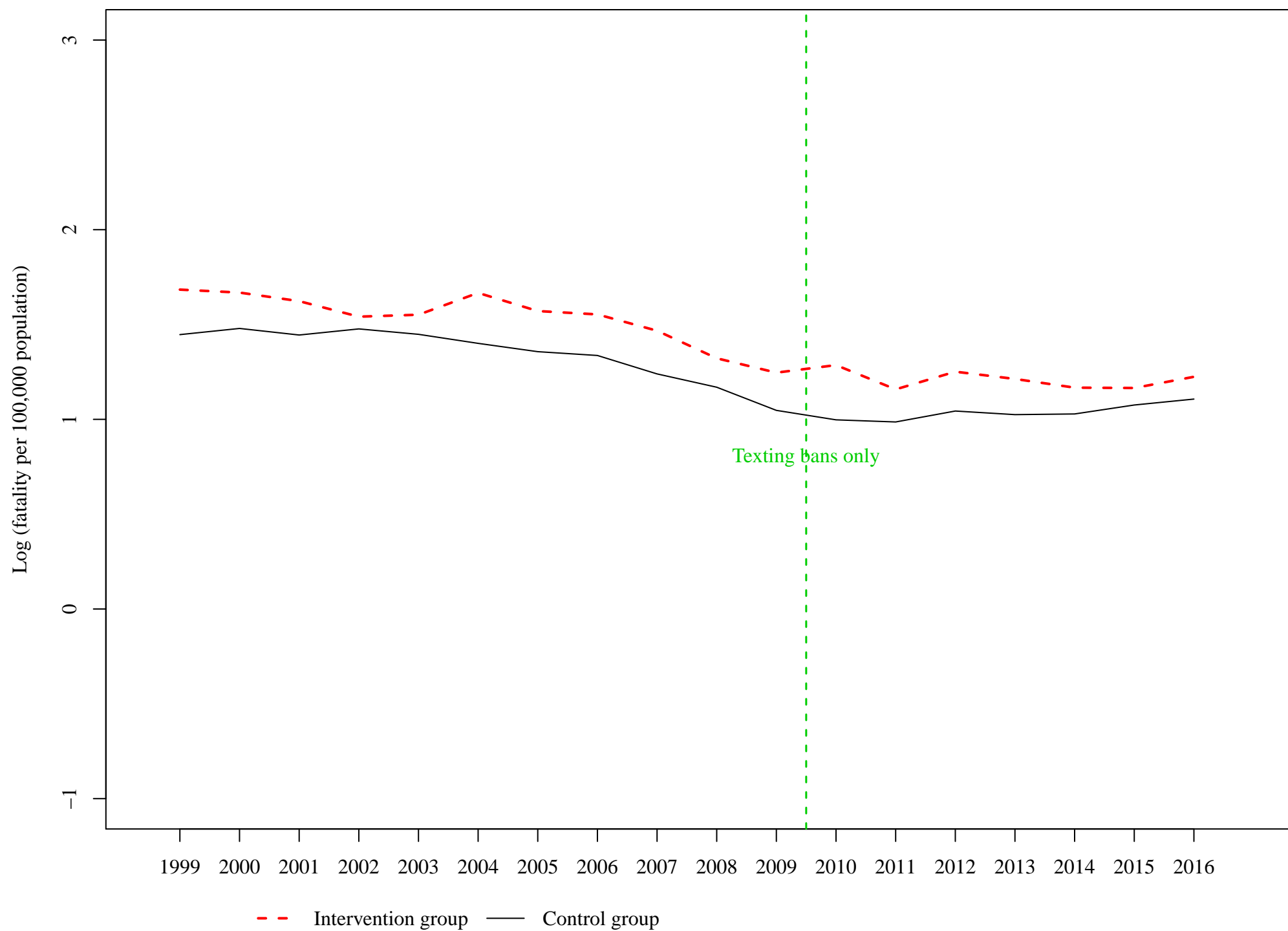
South Carolina all_fatality



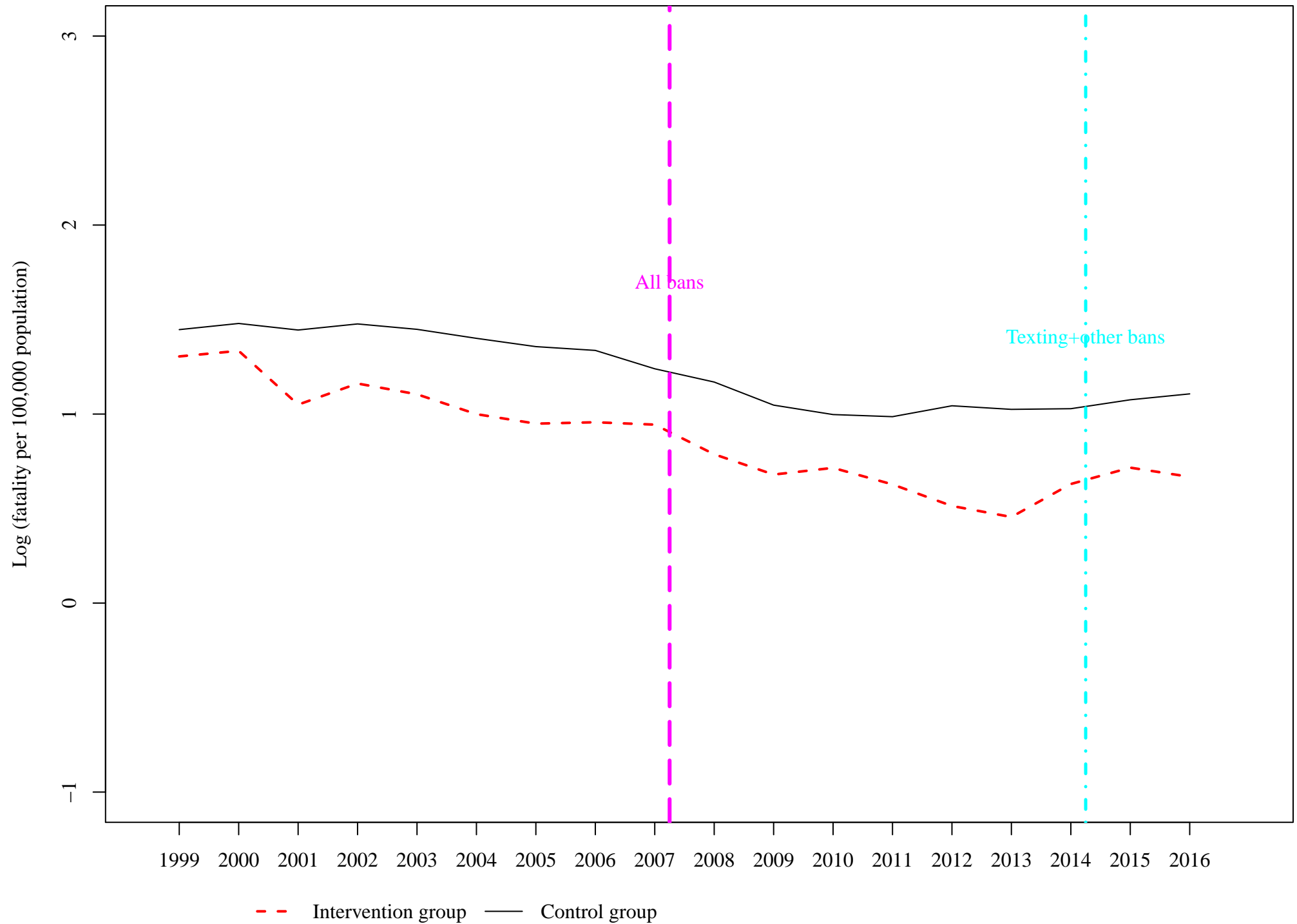
South Dakota all_fatality



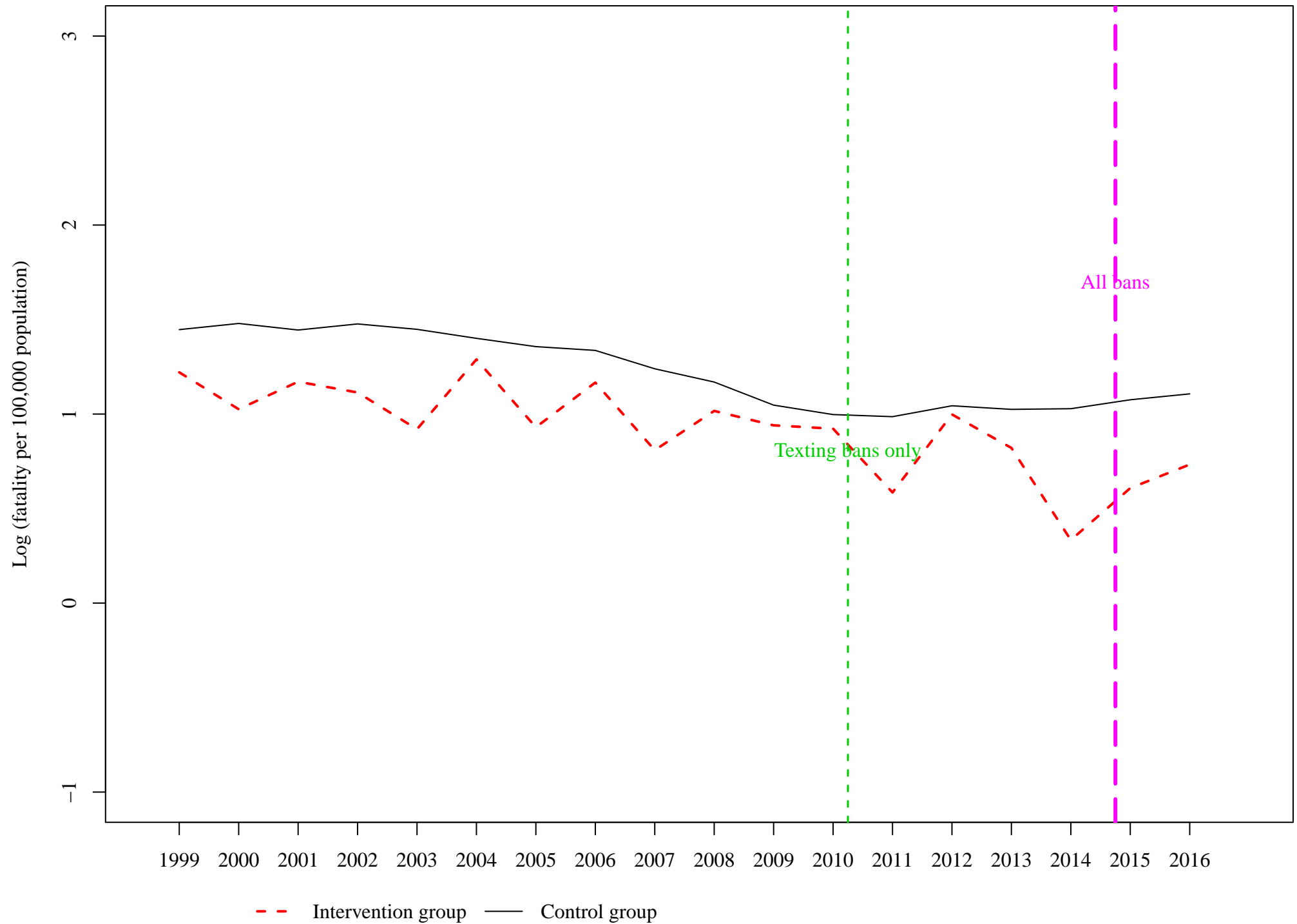
Tennessee all_fatality



Utah all_fatality



Vermont all_fatality



Virginia all_fatality



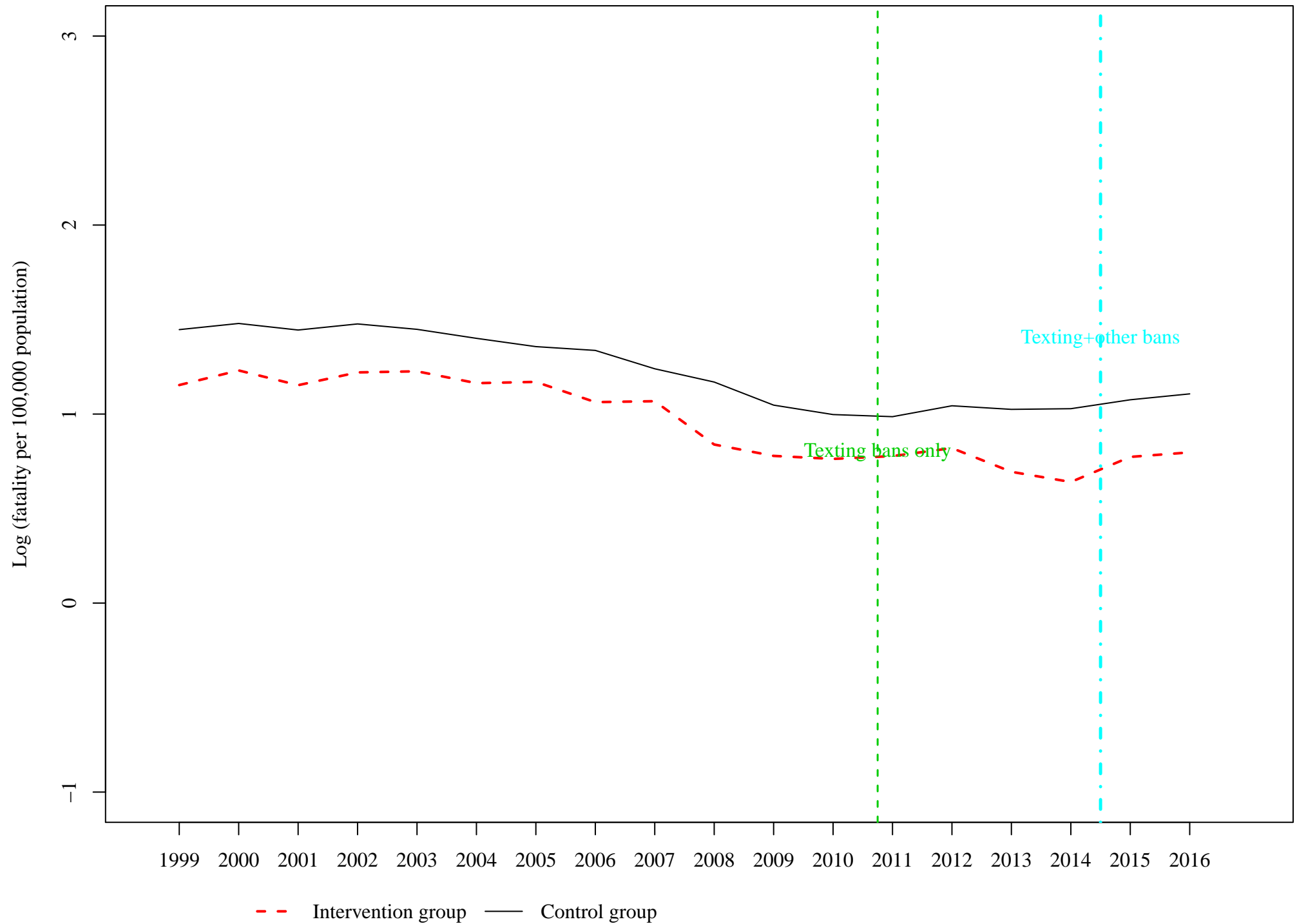
Washington all_fatality



West Virginia all_fatality



Wisconsin all_fatality



Wyoming all_fatality

