



BlueCross.
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Blue Health Intelligence

**THE HEALTH
OF AMERICA**
REPORT

**THE STEEP RISE
IN CONCUSSION
DIAGNOSES IN THE U.S.**



BLUE CROSS BLUE SHIELD, THE HEALTH OF AMERICA REPORT

EXECUTIVE SUMMARY

Expansive news media coverage of football-related [concussions](#) and state legislation aimed at preventing participants of youth sports from “shaking off” signs of head injuries have coincided with a spike in the number of concussion diagnoses, according to Blue Cross and Blue Shield (BCBS) companies’ medical claims data.

Concussion diagnoses increased 43 percent from 2010 through 2015 in the U.S. Additionally, concussion diagnoses spiked 71 percent for patients ages 10 through 19 during the same time span. For this age group, the fall is peak concussion season, during which time a dramatic spike in diagnoses occurs for males. Concussion diagnoses for young males in the fall are nearly double that of young females. Even though concussion diagnoses for adults ages 20 through 64 increased 26 percent over the same time period, there was little seasonal change compared to their younger counterparts.

The percentage of concussion patients across all ages diagnosed with [post-concussion syndrome](#) nearly doubled between 2010 and 2015. Throughout the study, post-concussion syndrome was diagnosed equally for both males and females ages 10 through 19 who suffered concussions. Females ages 20 through 64 who suffered concussions, however, were nearly 60 percent more likely to receive such a diagnosis than males.

Finally, BCBS data in 2015 show that patients ages 10 through 19 in some states have nearly a three times higher rate of concussions diagnosed than in other states. The intent of this report is to document concussion diagnosis rates and increase awareness that could help inform policy and concussion treatment practices for school districts and medical professionals.



STUDY FOUND...

From 2010 through 2015, concussion diagnoses in the U.S.

INCREASED 43%

SPIKED 71%
FOR PATIENTS
AGES 10 THROUGH 19

81% INCREASE IN
CONCUSSION PATIENTS
ACROSS ALL AGES
DIAGNOSED WITH
POST-CONCUSSION
SYNDROME

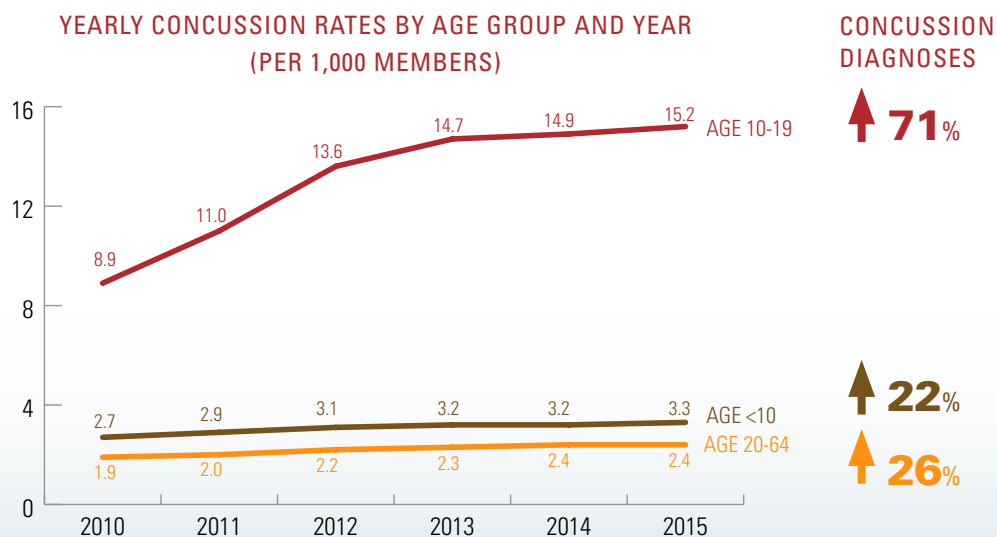
Background

News reports on the long-term effects of concussions and chronic traumatic encephalopathy (CTE) in football have created a new level of awareness about the seriousness of head injuries in the U.S. National and local organizations representing youth, collegiate and professional sports, as well as health care professionals, have taken significant measures to address this once overlooked issue. This awareness has inspired state lawmakers to act. In May 2009, the state of Washington approved the [Zackery Lystedt Law](#), named after a young football player who was permanently disabled after he sustained a concussion and prematurely returned to a game. Sometimes referred to as the “[shake-it-off law](#),” it requires medical clearance of youth athletes suspected of sustaining a concussion before sending them back in the game, practice or training. Within five years of the law’s passage, all [50 states](#) and the District of Columbia adopted much of its core principals, which were backed and promoted by the [National Football League \(NFL\)](#). Despite greater awareness and the new laws, there is still wide variability in concussion diagnosis rates from state to state.



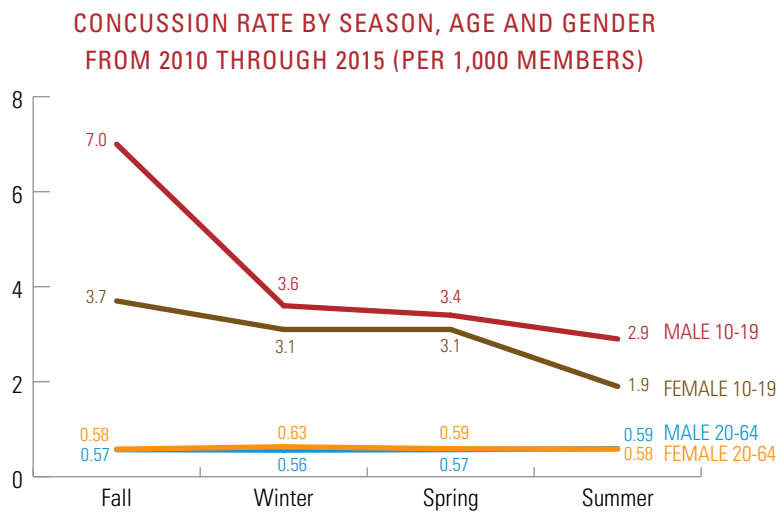
Comparing Youth and Adult Concussion Rates and Seasonality Effects

The increase in concussion diagnoses mostly took place from 2010 to 2013, when most states were enacting shake-it-off laws, and continued ticking up slightly through 2015. Concussion diagnoses during the six-year study period spiked 71 percent from 8.9 to 15.2 diagnoses per 1,000 members, for patients ages 10 through 19, for whom shake-it-off laws were written to protect. This compares to a 26 percent increase from 1.9 to 2.4 diagnoses per 1,000 members for those ages 20 through 64, whose concussion rates were consistently low compared to their younger counterparts.

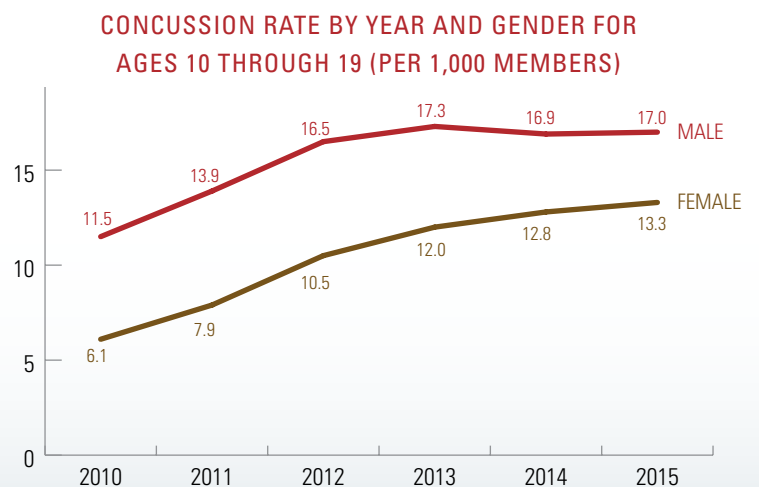


Data show that patients ages 10 through 19 are over five times more likely to be diagnosed with a concussion than all other age groups combined, with young males being diagnosed 49 percent more than young females. In the fall, there is a dramatic spike in concussion diagnoses, with young males being diagnosed at a rate of 7.0 per 1,000 members, which is nearly double that of young females at 3.7 per 1,000 members. Fall is when the most popular contact sports are in session (e.g. football and, in most states, soccer) at schools and parks. There are no significant seasonal differences for adults ages 20 to 64.

Dramatic spike in concussion diagnoses with young males in the fall

Although young males have more concussion diagnoses, the growth of diagnosis rates for young females increased 118 percent from 6.1 to 13.3 diagnoses per 1,000 members, compared to an increase for young males of 48 percent from 11.5 to 17.0 diagnoses per 1,000 members during the study period.



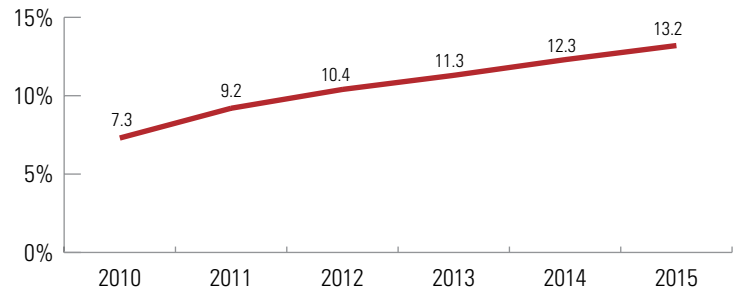
Post-Concussion Syndrome

The percentage of concussion patients across all ages diagnosed with post-concussion syndrome nearly doubled over the study period from 7.3 percent to 13.2 percent. Typical symptoms of post-concussion syndrome — including headaches and dizziness — can last for weeks and sometimes months after the concussion.

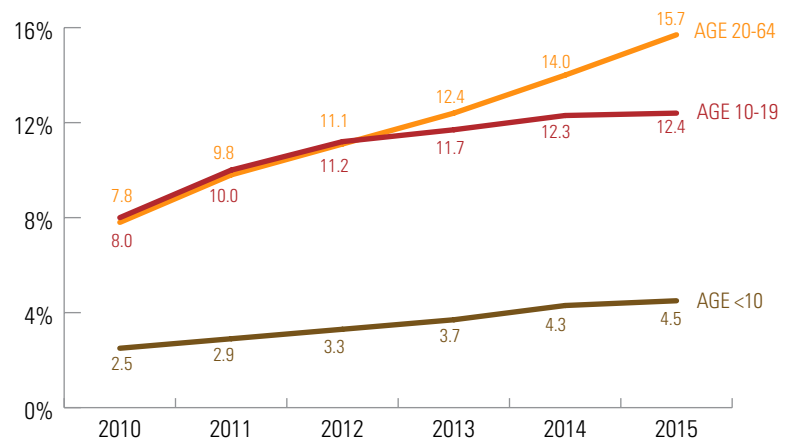
Adults ages 20 through 64 who were diagnosed with a concussion in 2015 were subsequently diagnosed with post-concussion syndrome 15.7 percent of the time, which was a higher rate than members ages 10 through 19 at 12.4 percent.

Females ages 20 through 64 accounted for 61.3 percent of all post-concussion syndrome diagnoses compared to 38.7 percent for males. For patients ages 10 through 19, post-concussion syndrome was diagnosed equally between males and females.

POST-CONCUSSION SYNDROME RATES AS A PERCENT OF TOTAL CONCUSSIONS BY YEAR



POST-CONCUSSION SYNDROME RATES AS A PERCENT OF TOTAL CONCUSSIONS BY AGE GROUP AND YEAR



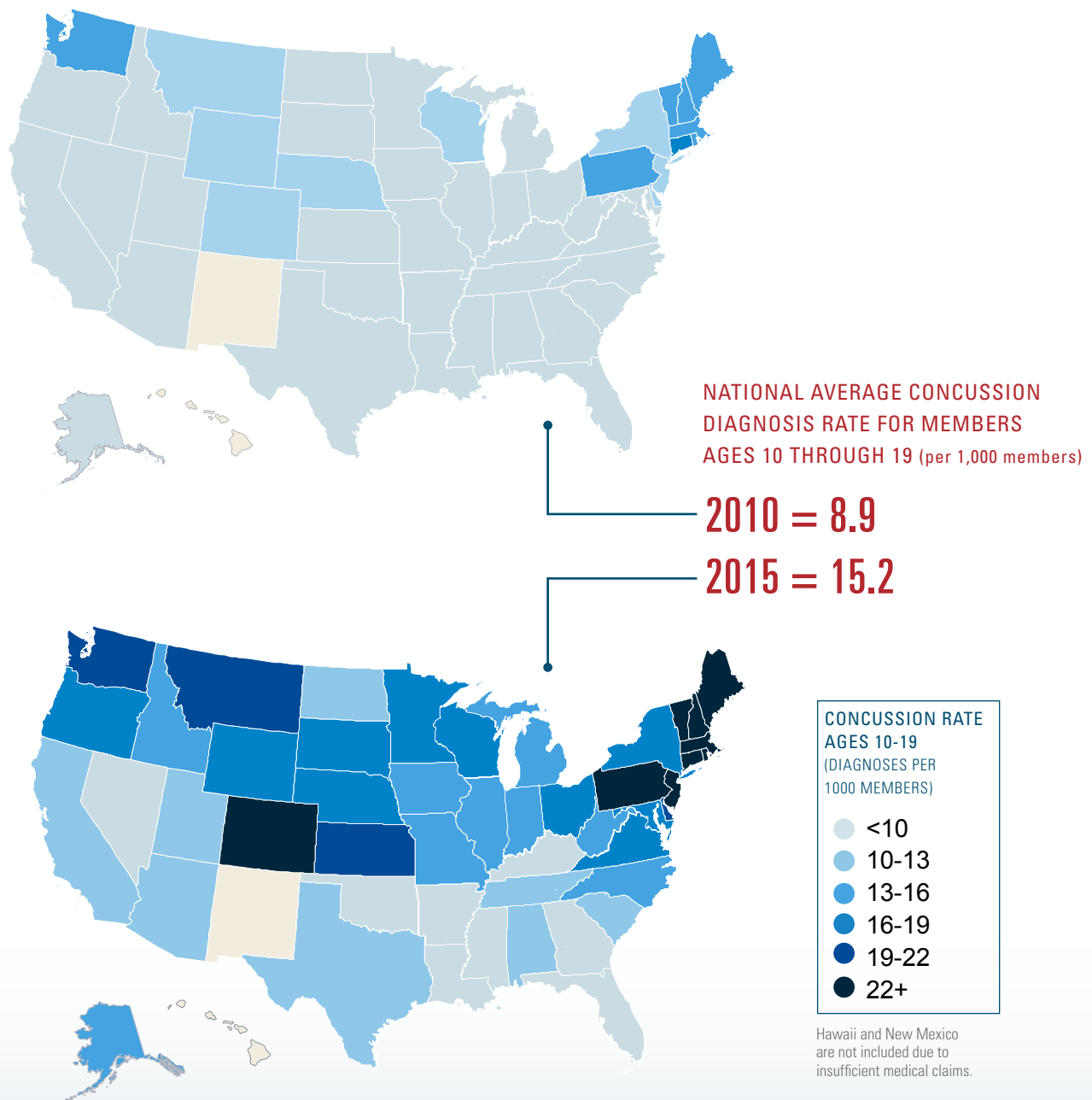
POST-CONCUSSION SYNDROME BY GENDER (2015)

AGE GROUP	MALE	FEMALE
10-19	50.0%	50.0%
20-64	38.7%	61.3%



Geographic Variation in Concussion Diagnoses

Concussion diagnoses grew at a significant rate in nearly all states between 2010 and 2015. The Northeast experienced higher rates of concussion diagnoses than other regions overall. Connecticut, Pennsylvania and Massachusetts had the highest rates of concussion diagnoses for patients ages 10 through 19. Data in 2015 show that patients ages 10 through 19 in some states have nearly a three times higher rate of concussions diagnosed than in other states. The national average concussion diagnosis rate in 2010 for members ages 10 through 19 was 8.9 per 1,000 members compared to 15.2 per 1,000 members in 2015.



CONCLUSION AND DISCUSSION

[Evidence](#) shows that shake-it-off laws passed over the last eight years have increased the number of concussion diagnoses particularly among young males and females ages 10 through 19. *Greater [awareness](#) generated by [news](#) media reports on concussions and CTE in current and former football players also coincided with increased diagnoses of concussions and post-concussion syndrome for patients of all ages. National and local organizations representing youth sports and health care professionals have also been effective at generating awareness about the need to diagnose and treat concussions.

Despite similar laws and heightened awareness throughout the U.S., there still is a significant variation in the rate of concussion diagnoses between states. More study on the differences in state regulations, their implementation, participation rates in contact sports and local health care utilization patterns is needed to understand the reasons for the variations. More research also is needed to understand why adult females are diagnosed with more post-concussion syndrome than males.

* Greater awareness is also demonstrated when using [Google Trends](#) to measure the number of people in the U.S. who [searched](#) for, and the amount of [news coverage](#) that included the word "concussion," which increased between 2010 and 2015. The term also was used more on the Internet during the fall.

METHODOLOGY NOTES

This is the ninth study of the Blue Cross Blue Shield: The Health of America Report series, a collaboration between BCBSA and Blue Health Intelligence, which uses a market-leading claims database to uncover key trends and insights into health care affordability and access to care. This report examines the medical claims of 936,630 diagnosed concussions for [BCBS](#) commercially-insured members (non-Medicare) from 2010 through 2015. The seasons consist of three month groups, with fall from September through November, winter from December through February, spring from March through May and summer from June through August. All concussion rates presented are average yearly rates per 1,000 members.

For more information and to read past reports, visit www.bcbs.com/healthofamerica.

APPENDIX

Geographic Variation in Concussion Diagnoses

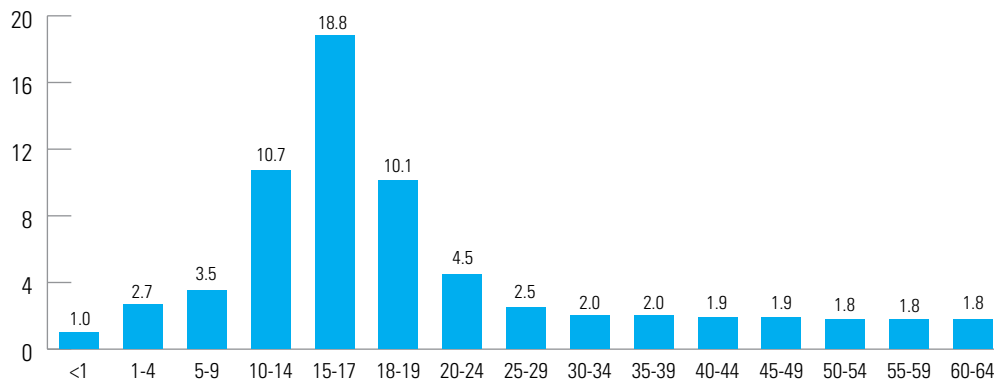
State	Concussion Rate (ages 10-19)		% Increase	Concussion Rate (Everyone under 65)		% Increase
	2010	2015		2010	2015	
AK	5.9	14.1	141%	2.5	4.5	82%
AL	7.4	10.3	39%	2.9	3.0	4%
AR	6.2	7.9	28%	2.3	2.6	16%
AZ	6.6	10.9	65%	2.9	3.9	33%
CA	6.3	10.5	66%	2.7	3.5	28%
CO	12.9	23.3	81%	4.4	7.0	58%
CT	17.0	25.5	50%	4.9	7.2	47%
DC	5.9	15.7	167%	2.4	3.8	58%
DE	10.9	20.5	88%	3.7	6.1	64%
FL	4.5	8.5	87%	2.0	2.5	27%
GA	5.1	9.7	92%	2.2	3.2	41%
IA	7.6	13.5	77%	2.7	4.1	54%
ID	9.5	15.0	59%	3.3	4.8	45%
IL	7.6	14.0	83%	2.6	3.8	44%
IN	8.5	15.3	79%	3.0	4.3	43%
KS	9.4	19.1	103%	3.4	5.1	51%
KY	6.2	9.7	57%	2.5	3.0	22%
LA	5.7	8.4	48%	2.3	2.8	18%
MA	15.1	27.5	82%	4.1	6.6	61%
MD	9.1	18.8	106%	3.3	5.5	68%
ME	13.8	22.2	61%	4.1	6.2	49%
MI	8.5	15.3	81%	3.0	4.5	49%
MN	9.7	17.1	77%	3.0	4.5	50%
MO	7.2	14.7	104%	2.9	4.4	56%

State	Concussion Rate (ages 10-19)		% Increase	Concussion Rate (Everyone under 65)		% Increase
	2010	2015		2010	2015	
MS	4.8	7.0	46%	1.8	2.4	30%
MT	10.6	20.3	92%	3.8	5.6	44%
NC	8.3	14.9	79%	2.6	3.9	50%
ND	9.9	12.5	26%	3.0	3.6	22%
NE	10.3	16.6	61%	2.9	4.3	47%
NH	13.2	23.0	74%	4.4	6.6	51%
NJ	12.8	23.7	85%	3.9	6.1	58%
NV	6.2	8.4	34%	2.9	3.3	16%
NY	10.7	18.5	72%	3.3	4.6	42%
OH	9.0	16.7	85%	3.2	4.9	52%
OK	7.9	9.3	17%	3.0	3.0	2%
OR	9.7	17.7	83%	3.2	4.9	52%
PA	14.6	27.3	87%	4.2	6.9	66%
RI	13.9	24.8	78%	4.7	6.9	46%
SC	6.4	11.9	86%	2.3	3.3	44%
SD	8.5	16.2	92%	2.7	4.4	65%
TN	7.5	12.4	65%	2.8	3.5	25%
TX	7.0	11.8	69%	2.8	3.7	34%
UT	7.8	10.9	41%	3.6	4.7	29%
VA	8.4	16.2	92%	2.9	4.8	65%
VT	13.1	24.0	84%	3.4	6.0	77%
WA	13.5	19.5	44%	4.0	5.0	23%
WI	11.4	16.2	43%	3.2	4.3	34%
WV	8.2	14.2	74%	3.1	4.1	33%
WY	11.2	16.6	48%	3.9	5.0	27%
Nation	8.9	15.2	71%	3.0	4.3	43%

Hawaii and New Mexico are not included due to insufficient medical claims.

Patients ages 15 through 17 have the highest likelihood of being diagnosed with a concussion, with a rate of 18.7 diagnoses per 1,000 members. Patients ages 10 through 14 have the second highest rate of 10.7 diagnoses per 1,000 members, while patients ages 18 and 19 have a rate of 10.1 diagnoses per 1,000 members. There is a dramatic decrease in the likelihood of being diagnosed with a concussion after age 19.

AVERAGE CONCUSSION RATE BY AGE FROM 2010 THROUGH 2015 (PER 1,000 MEMBERS)



When analyzing patients of all ages, concussion diagnoses increased 40 percent from 3.0 to 4.2 diagnoses per 1,000 members between 2010 and 2015. Female concussion diagnoses increased 60 percent from 2.5 to 4.0 diagnoses per 1,000 members, compared to 25 percent (3.6 to 4.5 diagnoses per 1,000 members) for males. Males continued to be diagnosed with 26 percent more concussions than females (4.3 per 1,000 members for males versus 3.4 for females) during the six-year study period.

CONCUSSION RATE BY YEAR AND GENDER FROM 2010 THROUGH 2015 (PER 1,000 MEMBERS)

