

Loading the Data: Time-Series

Loading the Data: Creating a Data-Frame

Parsing the Data:

Comparing Averages:

Comparing Variability:

Rate of Fewer Deaths:

Visualizing the Data

Do Seat Belt Laws Predict a Reduction in Road Casualties?

Code ▼

Julian Adames-Ng

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```
library(tidyverse)
library(openintro)
```

Loading the Data: Time-Series

“UKDriverDeaths is a time series giving the monthly totals of car drivers in Great Britain killed or seriously injured Jan 1969 to Dec 1984. Compulsory wearing of seat belts was introduced on 31 Jan 1983.” - R Documentation

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```
UKDriverDeaths
```

```
##      Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
## 1969 1687 1508 1507 1385 1632 1511 1559 1630 1579 1653 2152 2148
## 1970 1752 1765 1717 1558 1575 1520 1805 1800 1719 2008 2242 2478
## 1971 2030 1655 1693 1623 1805 1746 1795 1926 1619 1992 2233 2192
## 1972 2080 1768 1835 1569 1976 1853 1965 1689 1778 1976 2397 2654
## 1973 2097 1963 1677 1941 2003 1813 2012 1912 2084 2080 2118 2150
## 1974 1608 1503 1548 1382 1731 1798 1779 1887 2004 2077 2092 2051
## 1975 1577 1356 1652 1382 1519 1421 1442 1543 1656 1561 1905 2199
## 1976 1473 1655 1407 1395 1530 1309 1526 1327 1627 1748 1958 2274
## 1977 1648 1401 1411 1403 1394 1520 1528 1643 1515 1685 2000 2215
## 1978 1956 1462 1563 1459 1446 1622 1657 1638 1643 1683 2050 2262
## 1979 1813 1445 1762 1461 1556 1431 1427 1554 1645 1653 2016 2207
## 1980 1665 1361 1506 1360 1453 1522 1460 1552 1548 1827 1737 1941
## 1981 1474 1458 1542 1404 1522 1385 1641 1510 1681 1938 1868 1726
## 1982 1456 1445 1456 1365 1487 1558 1488 1684 1594 1850 1998 2079
## 1983 1494 1057 1218 1168 1236 1076 1174 1139 1427 1487 1483 1513
## 1984 1357 1165 1282 1110 1297 1185 1222 1284 1444 1575 1737 1763
```

Loading the Data: Creating a Data-Frame

"Seatbelts is more information on the same problem." - R Documentation

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Seatbelts

##		DriversKilled	drivers	front	rear	kms	PetrolPrice	VanKilled	law
##	Jan 1969	107	1687	867	269	9059	0.10297181	12	0
##	Feb 1969	97	1508	825	265	7685	0.10236300	6	0
##	Mar 1969	102	1507	806	319	9963	0.10206249	12	0
##	Apr 1969	87	1385	814	407	10955	0.10087330	8	0
##	May 1969	119	1632	991	454	11823	0.10101967	10	0
##	Jun 1969	106	1511	945	427	12391	0.10058119	13	0
##	Jul 1969	110	1559	1004	522	13460	0.10377398	11	0
##	Aug 1969	106	1630	1091	536	14055	0.10407640	6	0
##	Sep 1969	107	1579	958	405	12106	0.10377398	10	0
##	Oct 1969	134	1653	850	437	11372	0.10302640	16	0
##	Nov 1969	147	2152	1109	434	9834	0.10273011	13	0
##	Dec 1969	180	2148	1113	437	9267	0.10199719	14	0
##	Jan 1970	125	1752	925	316	9130	0.10127456	14	0
##	Feb 1970	134	1765	903	311	8933	0.10070398	6	0
##	Mar 1970	110	1717	1006	351	11000	0.10013961	8	0
##	Apr 1970	102	1558	892	362	10733	0.09862110	11	0
##	May 1970	103	1575	990	486	12912	0.09834929	7	0
##	Jun 1970	111	1520	866	429	12926	0.09808018	13	0
##	Jul 1970	120	1805	1095	551	13990	0.09727921	13	0
##	Aug 1970	129	1800	1204	646	14926	0.09741062	11	0
##	Sep 1970	122	1719	1029	456	12900	0.09742524	11	0
##	Oct 1970	183	2008	1147	475	12034	0.09638063	14	0
##	Nov 1970	169	2242	1171	456	10643	0.09573896	16	0
##	Dec 1970	190	2478	1299	468	10742	0.09510631	14	0
##	Jan 1971	134	2030	944	356	10266	0.09673597	17	0
##	Feb 1971	108	1655	874	271	10281	0.09610922	16	0
##	Mar 1971	104	1693	840	354	11527	0.09536725	15	0
##	Apr 1971	117	1623	893	427	12281	0.09470959	13	0
##	May 1971	157	1805	1007	465	13587	0.09411762	13	0
##	Jun 1971	148	1746	973	440	13049	0.09353215	15	0
##	Jul 1971	130	1795	1097	539	16055	0.09295405	12	0
##	Aug 1971	140	1926	1194	646	15220	0.09283979	6	0
##	Sep 1971	136	1619	988	457	13824	0.09272474	9	0
##	Oct 1971	140	1992	1077	446	12729	0.09226965	13	0
##	Nov 1971	187	2233	1045	402	11467	0.09170669	14	0
##	Dec 1971	150	2192	1115	441	11351	0.09126207	15	0
##	Jan 1972	159	2080	1005	359	10803	0.09071160	14	0
##	Feb 1972	143	1768	857	334	10548	0.09027633	3	0
##	Mar 1972	114	1835	879	312	12368	0.08995192	12	0
##	Apr 1972	127	1569	887	427	13311	0.08909964	13	0
##	May 1972	159	1976	1075	434	13885	0.08867919	12	0
##	Jun 1972	156	1853	1121	486	14088	0.08815929	8	0
##	Jul 1972	138	1965	1190	569	16932	0.08890206	8	0
##	Aug 1972	120	1689	1058	523	16164	0.08818133	15	0
##	Sep 1972	117	1778	939	418	14883	0.08894029	8	0
##	Oct 1972	170	1976	1074	452	13532	0.08772661	5	0
##	Nov 1972	168	2397	1089	462	12220	0.08742885	17	0
##	Dec 1972	198	2654	1208	497	12025	0.08703543	14	0
##	Jan 1973	144	2097	903	354	11692	0.08644992	13	0
##	Feb 1973	146	1963	916	347	11081	0.08587264	5	0
##	Mar 1973	109	1677	787	276	13745	0.08539822	8	0

## Apr 1973	131	1941	1114	472	14382	0.08382198	5	0
## May 1973	151	2003	1014	487	14391	0.08459078	12	0
## Jun 1973	140	1813	1022	505	15597	0.08413690	11	0
## Jul 1973	153	2012	1114	619	16834	0.08377841	13	0
## Aug 1973	140	1912	1132	640	17282	0.08351074	15	0
## Sep 1973	161	2084	1111	559	15779	0.08280639	11	0
## Oct 1973	168	2080	1008	453	13946	0.08117889	11	0
## Nov 1973	152	2118	916	418	12701	0.08285361	10	0
## Dec 1973	136	2150	992	419	10431	0.09419012	13	0
## Jan 1974	113	1608	731	262	11616	0.09239984	8	0
## Feb 1974	100	1503	665	299	10808	0.10816148	6	0
## Mar 1974	103	1548	724	303	12421	0.10721169	8	0
## Apr 1974	103	1382	744	401	13605	0.11404297	14	0
## May 1974	121	1731	910	413	14455	0.11245412	12	0
## Jun 1974	134	1798	883	426	15019	0.11131625	14	0
## Jul 1974	133	1779	900	516	15662	0.11030125	13	0
## Aug 1974	129	1887	1057	600	16745	0.10819718	9	0
## Sep 1974	144	2004	1076	459	14717	0.10702744	4	0
## Oct 1974	154	2077	919	443	13756	0.10494698	13	0
## Nov 1974	156	2092	920	412	12531	0.11935775	6	0
## Dec 1974	163	2051	953	400	12568	0.11762190	15	0
## Jan 1975	122	1577	664	278	11249	0.13302742	12	0
## Feb 1975	92	1356	607	302	11096	0.13084524	16	0
## Mar 1975	117	1652	777	381	12637	0.12831848	7	0
## Apr 1975	95	1382	633	279	13018	0.12354745	12	0
## May 1975	96	1519	791	442	15005	0.11858681	10	0
## Jun 1975	108	1421	790	409	15235	0.11633748	9	0
## Jul 1975	108	1442	803	416	15552	0.11516148	9	0
## Aug 1975	106	1543	884	511	16905	0.11450120	6	0
## Sep 1975	140	1656	769	393	14776	0.11352298	7	0
## Oct 1975	114	1561	732	345	14104	0.11193018	13	0
## Nov 1975	158	1905	859	391	12854	0.11061053	14	0
## Dec 1975	161	2199	994	470	12956	0.11527439	13	0
## Jan 1976	102	1473	704	266	12177	0.11379349	14	0
## Feb 1976	127	1655	684	312	11918	0.11234958	11	0
## Mar 1976	125	1407	671	300	13517	0.11175347	11	0
## Apr 1976	101	1395	643	373	14417	0.10964252	10	0
## May 1976	97	1530	771	412	15911	0.10844090	4	0
## Jun 1976	112	1309	644	322	15589	0.10788494	8	0
## Jul 1976	112	1526	828	458	16543	0.10908477	9	0
## Aug 1976	113	1327	748	427	17925	0.10757145	10	0
## Sep 1976	108	1627	767	346	15406	0.10616402	10	0
## Oct 1976	128	1748	825	421	14601	0.10630000	5	0
## Nov 1976	154	1958	810	344	13107	0.10482531	13	0
## Dec 1976	162	2274	986	370	12268	0.10345175	12	0
## Jan 1977	112	1648	714	291	11972	0.10144992	10	0
## Feb 1977	79	1401	567	224	12028	0.10040232	9	0
## Mar 1977	82	1411	616	266	14033	0.09886203	7	0
## Apr 1977	127	1403	678	338	14244	0.10249615	5	0
## May 1977	108	1394	742	298	15287	0.10302743	10	0
## Jun 1977	110	1520	840	386	16954	0.10217891	5	0
## Jul 1977	123	1528	888	479	17361	0.09983664	6	0

## Aug 1977	103	1643	852	473	17694	0.09263669	8	0
## Sep 1977	97	1515	774	332	16222	0.09181496	6	0
## Oct 1977	140	1685	831	391	14969	0.09072430	12	0
## Nov 1977	165	2000	889	370	13624	0.09002121	15	0
## Dec 1977	183	2215	1046	431	13842	0.08933071	7	0
## Jan 1978	148	1956	889	366	12387	0.08844273	14	0
## Feb 1978	111	1462	626	250	11608	0.08835257	4	0
## Mar 1978	116	1563	808	355	15021	0.08675736	10	0
## Apr 1978	115	1459	746	304	14834	0.08499524	8	0
## May 1978	100	1446	754	379	16565	0.08456794	7	0
## Jun 1978	106	1622	865	440	16882	0.08443190	11	0
## Jul 1978	134	1657	980	500	18012	0.08435088	3	0
## Aug 1978	125	1638	959	511	18855	0.08360098	5	0
## Sep 1978	117	1643	856	384	17243	0.08341726	11	0
## Oct 1978	122	1683	798	366	16045	0.08274514	10	0
## Nov 1978	153	2050	942	432	14745	0.08523527	10	0
## Dec 1978	178	2262	1010	390	13726	0.08477030	7	0
## Jan 1979	114	1813	796	306	11196	0.08445892	10	0
## Feb 1979	94	1445	643	232	12105	0.08535212	11	0
## Mar 1979	128	1762	794	342	14723	0.08755921	9	0
## Apr 1979	119	1461	750	329	15582	0.09038292	7	0
## May 1979	111	1556	809	394	16863	0.09078329	8	0
## Jun 1979	110	1431	716	355	16758	0.10874278	13	0
## Jul 1979	114	1427	851	385	17434	0.11414223	8	0
## Aug 1979	118	1554	931	463	18359	0.11299293	5	0
## Sep 1979	115	1645	834	453	17189	0.11132071	8	0
## Oct 1979	132	1653	762	373	16909	0.10912623	7	0
## Nov 1979	153	2016	880	401	15380	0.10769846	12	0
## Dec 1979	171	2207	1077	466	15161	0.10760157	10	0
## Jan 1980	115	1665	748	306	14027	0.10377502	7	0
## Feb 1980	95	1361	593	263	14478	0.10711417	4	0
## Mar 1980	92	1506	720	323	16155	0.10737477	10	0
## Apr 1980	100	1360	646	310	16585	0.11169537	4	0
## May 1980	95	1453	765	424	18117	0.11063818	8	0
## Jun 1980	114	1522	820	403	17552	0.11185521	8	0
## Jul 1980	102	1460	807	406	18299	0.10974234	7	0
## Aug 1980	104	1552	885	466	19361	0.10819393	10	0
## Sep 1980	132	1548	803	381	17924	0.10625536	8	0
## Oct 1980	136	1827	860	369	17872	0.10419303	14	0
## Nov 1980	117	1737	825	378	16058	0.10193397	8	0
## Dec 1980	137	1941	911	392	15746	0.10279382	9	0
## Jan 1981	111	1474	704	284	15226	0.10476034	8	0
## Feb 1981	106	1458	691	316	14932	0.10400254	6	0
## Mar 1981	98	1542	688	321	16846	0.11665552	7	0
## Apr 1981	84	1404	714	358	16854	0.11516148	6	0
## May 1981	94	1522	814	378	18146	0.11298954	5	0
## Jun 1981	105	1385	736	382	17559	0.11386064	4	0
## Jul 1981	123	1641	876	433	18655	0.11911808	5	0
## Aug 1981	109	1510	829	506	19453	0.12448999	10	0
## Sep 1981	130	1681	818	428	17923	0.12322295	7	0
## Oct 1981	153	1938	942	479	17915	0.12067793	10	0
## Nov 1981	134	1868	782	370	16496	0.12104898	12	0

## Dec 1981	99	1726	823	349	13544	0.11696857	7	0
## Jan 1982	115	1456	595	238	13601	0.11275026	4	0
## Feb 1982	104	1445	673	285	15667	0.10807931	5	0
## Mar 1982	131	1456	660	324	17358	0.10883852	6	0
## Apr 1982	108	1365	676	346	18112	0.11129177	4	0
## May 1982	103	1487	755	410	18581	0.11130401	4	0
## Jun 1982	115	1558	815	411	18759	0.11545436	8	0
## Jul 1982	122	1488	867	496	20668	0.11476830	8	0
## Aug 1982	122	1684	933	534	21040	0.11720743	3	0
## Sep 1982	125	1594	798	396	18993	0.11907640	7	0
## Oct 1982	137	1850	950	470	18668	0.11796586	12	0
## Nov 1982	138	1998	825	385	16768	0.11744913	2	0
## Dec 1982	152	2079	911	411	16551	0.11698846	7	0
## Jan 1983	120	1494	619	281	16231	0.11261054	8	0
## Feb 1983	95	1057	426	300	15511	0.11365702	3	1
## Mar 1983	100	1218	475	318	18308	0.11314445	2	1
## Apr 1983	89	1168	556	391	17793	0.11849553	6	1
## May 1983	82	1236	559	398	19205	0.11796940	3	1
## Jun 1983	89	1076	483	337	19162	0.11768661	7	1
## Jul 1983	60	1174	587	477	20997	0.12005924	6	1
## Aug 1983	84	1139	615	422	20705	0.11943775	8	1
## Sep 1983	113	1427	618	495	18759	0.11888127	8	1
## Oct 1983	126	1487	662	471	19240	0.11846236	4	1
## Nov 1983	122	1483	519	368	17504	0.11801660	3	1
## Dec 1983	118	1513	585	345	16591	0.11770662	5	1
## Jan 1984	92	1357	483	296	16224	0.11777609	5	1
## Feb 1984	86	1165	434	319	16670	0.11479699	3	1
## Mar 1984	81	1282	513	349	18539	0.11573525	4	1
## Apr 1984	84	1110	548	375	19759	0.11535626	3	1
## May 1984	87	1297	586	441	19584	0.11481536	6	1
## Jun 1984	90	1185	522	465	19976	0.11477748	6	1
## Jul 1984	79	1222	601	472	21486	0.11493598	7	1
## Aug 1984	96	1284	644	521	21626	0.11479699	5	1
## Sep 1984	122	1444	643	429	20195	0.11409316	7	1
## Oct 1984	120	1575	641	408	19928	0.11646552	7	1
## Nov 1984	137	1737	711	490	18564	0.11602611	4	1
## Dec 1984	154	1763	721	491	18149	0.11606673	7	1

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```
#Create a data frame from Seatbelts
sbelts <- data.frame(Seatbelts)
```

```
sbelts
```

##	DriversKilled	drivers	front	rear	kms	PetrolPrice	VanKilled	law
## 1	107	1687	867	269	9059	0.10297181	12	0
## 2	97	1508	825	265	7685	0.10236300	6	0
## 3	102	1507	806	319	9963	0.10206249	12	0
## 4	87	1385	814	407	10955	0.10087330	8	0
## 5	119	1632	991	454	11823	0.10101967	10	0
## 6	106	1511	945	427	12391	0.10058119	13	0
## 7	110	1559	1004	522	13460	0.10377398	11	0
## 8	106	1630	1091	536	14055	0.10407640	6	0
## 9	107	1579	958	405	12106	0.10377398	10	0
## 10	134	1653	850	437	11372	0.10302640	16	0
## 11	147	2152	1109	434	9834	0.10273011	13	0
## 12	180	2148	1113	437	9267	0.10199719	14	0
## 13	125	1752	925	316	9130	0.10127456	14	0
## 14	134	1765	903	311	8933	0.10070398	6	0
## 15	110	1717	1006	351	11000	0.10013961	8	0
## 16	102	1558	892	362	10733	0.09862110	11	0
## 17	103	1575	990	486	12912	0.09834929	7	0
## 18	111	1520	866	429	12926	0.09808018	13	0
## 19	120	1805	1095	551	13990	0.09727921	13	0
## 20	129	1800	1204	646	14926	0.09741062	11	0
## 21	122	1719	1029	456	12900	0.09742524	11	0
## 22	183	2008	1147	475	12034	0.09638063	14	0
## 23	169	2242	1171	456	10643	0.09573896	16	0
## 24	190	2478	1299	468	10742	0.09510631	14	0
## 25	134	2030	944	356	10266	0.09673597	17	0
## 26	108	1655	874	271	10281	0.09610922	16	0
## 27	104	1693	840	354	11527	0.09536725	15	0
## 28	117	1623	893	427	12281	0.09470959	13	0
## 29	157	1805	1007	465	13587	0.09411762	13	0
## 30	148	1746	973	440	13049	0.09353215	15	0
## 31	130	1795	1097	539	16055	0.09295405	12	0
## 32	140	1926	1194	646	15220	0.09283979	6	0
## 33	136	1619	988	457	13824	0.09272474	9	0
## 34	140	1992	1077	446	12729	0.09226965	13	0
## 35	187	2233	1045	402	11467	0.09170669	14	0
## 36	150	2192	1115	441	11351	0.09126207	15	0
## 37	159	2080	1005	359	10803	0.09071160	14	0
## 38	143	1768	857	334	10548	0.09027633	3	0
## 39	114	1835	879	312	12368	0.08995192	12	0
## 40	127	1569	887	427	13311	0.08909964	13	0
## 41	159	1976	1075	434	13885	0.08867919	12	0
## 42	156	1853	1121	486	14088	0.08815929	8	0
## 43	138	1965	1190	569	16932	0.08890206	8	0
## 44	120	1689	1058	523	16164	0.08818133	15	0
## 45	117	1778	939	418	14883	0.08894029	8	0
## 46	170	1976	1074	452	13532	0.08772661	5	0
## 47	168	2397	1089	462	12220	0.08742885	17	0
## 48	198	2654	1208	497	12025	0.08703543	14	0
## 49	144	2097	903	354	11692	0.08644992	13	0
## 50	146	1963	916	347	11081	0.08587264	5	0
## 51	109	1677	787	276	13745	0.08539822	8	0

## 52	131	1941	1114	472	14382	0.08382198	5	0
## 53	151	2003	1014	487	14391	0.08459078	12	0
## 54	140	1813	1022	505	15597	0.08413690	11	0
## 55	153	2012	1114	619	16834	0.08377841	13	0
## 56	140	1912	1132	640	17282	0.08351074	15	0
## 57	161	2084	1111	559	15779	0.08280639	11	0
## 58	168	2080	1008	453	13946	0.08117889	11	0
## 59	152	2118	916	418	12701	0.08285361	10	0
## 60	136	2150	992	419	10431	0.09419012	13	0
## 61	113	1608	731	262	11616	0.09239984	8	0
## 62	100	1503	665	299	10808	0.10816148	6	0
## 63	103	1548	724	303	12421	0.10721169	8	0
## 64	103	1382	744	401	13605	0.11404297	14	0
## 65	121	1731	910	413	14455	0.11245412	12	0
## 66	134	1798	883	426	15019	0.11131625	14	0
## 67	133	1779	900	516	15662	0.11030125	13	0
## 68	129	1887	1057	600	16745	0.10819718	9	0
## 69	144	2004	1076	459	14717	0.10702744	4	0
## 70	154	2077	919	443	13756	0.10494698	13	0
## 71	156	2092	920	412	12531	0.11935775	6	0
## 72	163	2051	953	400	12568	0.11762190	15	0
## 73	122	1577	664	278	11249	0.13302742	12	0
## 74	92	1356	607	302	11096	0.13084524	16	0
## 75	117	1652	777	381	12637	0.12831848	7	0
## 76	95	1382	633	279	13018	0.12354745	12	0
## 77	96	1519	791	442	15005	0.11858681	10	0
## 78	108	1421	790	409	15235	0.11633748	9	0
## 79	108	1442	803	416	15552	0.11516148	9	0
## 80	106	1543	884	511	16905	0.11450120	6	0
## 81	140	1656	769	393	14776	0.11352298	7	0
## 82	114	1561	732	345	14104	0.11193018	13	0
## 83	158	1905	859	391	12854	0.11061053	14	0
## 84	161	2199	994	470	12956	0.11527439	13	0
## 85	102	1473	704	266	12177	0.11379349	14	0
## 86	127	1655	684	312	11918	0.11234958	11	0
## 87	125	1407	671	300	13517	0.11175347	11	0
## 88	101	1395	643	373	14417	0.10964252	10	0
## 89	97	1530	771	412	15911	0.10844090	4	0
## 90	112	1309	644	322	15589	0.10788494	8	0
## 91	112	1526	828	458	16543	0.10908477	9	0
## 92	113	1327	748	427	17925	0.10757145	10	0
## 93	108	1627	767	346	15406	0.10616402	10	0
## 94	128	1748	825	421	14601	0.10630000	5	0
## 95	154	1958	810	344	13107	0.10482531	13	0
## 96	162	2274	986	370	12268	0.10345175	12	0
## 97	112	1648	714	291	11972	0.10144992	10	0
## 98	79	1401	567	224	12028	0.10040232	9	0
## 99	82	1411	616	266	14033	0.09886203	7	0
## 100	127	1403	678	338	14244	0.10249615	5	0
## 101	108	1394	742	298	15287	0.10302743	10	0
## 102	110	1520	840	386	16954	0.10217891	5	0
## 103	123	1528	888	479	17361	0.09983664	6	0

## 104	103	1643	852	473	17694	0.09263669	8	0
## 105	97	1515	774	332	16222	0.09181496	6	0
## 106	140	1685	831	391	14969	0.09072430	12	0
## 107	165	2000	889	370	13624	0.09002121	15	0
## 108	183	2215	1046	431	13842	0.08933071	7	0
## 109	148	1956	889	366	12387	0.08844273	14	0
## 110	111	1462	626	250	11608	0.08835257	4	0
## 111	116	1563	808	355	15021	0.08675736	10	0
## 112	115	1459	746	304	14834	0.08499524	8	0
## 113	100	1446	754	379	16565	0.08456794	7	0
## 114	106	1622	865	440	16882	0.08443190	11	0
## 115	134	1657	980	500	18012	0.08435088	3	0
## 116	125	1638	959	511	18855	0.08360098	5	0
## 117	117	1643	856	384	17243	0.08341726	11	0
## 118	122	1683	798	366	16045	0.08274514	10	0
## 119	153	2050	942	432	14745	0.08523527	10	0
## 120	178	2262	1010	390	13726	0.08477030	7	0
## 121	114	1813	796	306	11196	0.08445892	10	0
## 122	94	1445	643	232	12105	0.08535212	11	0
## 123	128	1762	794	342	14723	0.08755921	9	0
## 124	119	1461	750	329	15582	0.09038292	7	0
## 125	111	1556	809	394	16863	0.09078329	8	0
## 126	110	1431	716	355	16758	0.10874278	13	0
## 127	114	1427	851	385	17434	0.11414223	8	0
## 128	118	1554	931	463	18359	0.11299293	5	0
## 129	115	1645	834	453	17189	0.11132071	8	0
## 130	132	1653	762	373	16909	0.10912623	7	0
## 131	153	2016	880	401	15380	0.10769846	12	0
## 132	171	2207	1077	466	15161	0.10760157	10	0
## 133	115	1665	748	306	14027	0.10377502	7	0
## 134	95	1361	593	263	14478	0.10711417	4	0
## 135	92	1506	720	323	16155	0.10737477	10	0
## 136	100	1360	646	310	16585	0.11169537	4	0
## 137	95	1453	765	424	18117	0.11063818	8	0
## 138	114	1522	820	403	17552	0.11185521	8	0
## 139	102	1460	807	406	18299	0.10974234	7	0
## 140	104	1552	885	466	19361	0.10819393	10	0
## 141	132	1548	803	381	17924	0.10625536	8	0
## 142	136	1827	860	369	17872	0.10419303	14	0
## 143	117	1737	825	378	16058	0.10193397	8	0
## 144	137	1941	911	392	15746	0.10279382	9	0
## 145	111	1474	704	284	15226	0.10476034	8	0
## 146	106	1458	691	316	14932	0.10400254	6	0
## 147	98	1542	688	321	16846	0.11665552	7	0
## 148	84	1404	714	358	16854	0.11516148	6	0
## 149	94	1522	814	378	18146	0.11298954	5	0
## 150	105	1385	736	382	17559	0.11386064	4	0
## 151	123	1641	876	433	18655	0.11911808	5	0
## 152	109	1510	829	506	19453	0.12448999	10	0
## 153	130	1681	818	428	17923	0.12322295	7	0
## 154	153	1938	942	479	17915	0.12067793	10	0
## 155	134	1868	782	370	16496	0.12104898	12	0

## 156	99	1726	823	349	13544	0.11696857	7	0
## 157	115	1456	595	238	13601	0.11275026	4	0
## 158	104	1445	673	285	15667	0.10807931	5	0
## 159	131	1456	660	324	17358	0.10883852	6	0
## 160	108	1365	676	346	18112	0.11129177	4	0
## 161	103	1487	755	410	18581	0.11130401	4	0
## 162	115	1558	815	411	18759	0.11545436	8	0
## 163	122	1488	867	496	20668	0.11476830	8	0
## 164	122	1684	933	534	21040	0.11720743	3	0
## 165	125	1594	798	396	18993	0.11907640	7	0
## 166	137	1850	950	470	18668	0.11796586	12	0
## 167	138	1998	825	385	16768	0.11744913	2	0
## 168	152	2079	911	411	16551	0.11698846	7	0
## 169	120	1494	619	281	16231	0.11261054	8	0
## 170	95	1057	426	300	15511	0.11365702	3	1
## 171	100	1218	475	318	18308	0.11314445	2	1
## 172	89	1168	556	391	17793	0.11849553	6	1
## 173	82	1236	559	398	19205	0.11796940	3	1
## 174	89	1076	483	337	19162	0.11768661	7	1
## 175	60	1174	587	477	20997	0.12005924	6	1
## 176	84	1139	615	422	20705	0.11943775	8	1
## 177	113	1427	618	495	18759	0.11888127	8	1
## 178	126	1487	662	471	19240	0.11846236	4	1
## 179	122	1483	519	368	17504	0.11801660	3	1
## 180	118	1513	585	345	16591	0.11770662	5	1
## 181	92	1357	483	296	16224	0.11777609	5	1
## 182	86	1165	434	319	16670	0.11479699	3	1
## 183	81	1282	513	349	18539	0.11573525	4	1
## 184	84	1110	548	375	19759	0.11535626	3	1
## 185	87	1297	586	441	19584	0.11481536	6	1
## 186	90	1185	522	465	19976	0.11477748	6	1
## 187	79	1222	601	472	21486	0.11493598	7	1
## 188	96	1284	644	521	21626	0.11479699	5	1
## 189	122	1444	643	429	20195	0.11409316	7	1
## 190	120	1575	641	408	19928	0.11646552	7	1
## 191	137	1737	711	490	18564	0.11602611	4	1
## 192	154	1763	721	491	18149	0.11606673	7	1

Parsing the Data:

DnoLaw shows the data BEFORE the seat belt law was introduced.

DLaw shows the data AFTER the seat belt law was introduced.

Hide

```
DnoLaw <- sbelts %>% filter(law == 0)
DLaw <- sbelts %>% filter(law == 1)
```

DnoLaw

##	DriversKilled	drivers	front	rear	kms	PetrolPrice	VanKilled	law
## 1	107	1687	867	269	9059	0.10297181	12	0
## 2	97	1508	825	265	7685	0.10236300	6	0
## 3	102	1507	806	319	9963	0.10206249	12	0
## 4	87	1385	814	407	10955	0.10087330	8	0
## 5	119	1632	991	454	11823	0.10101967	10	0
## 6	106	1511	945	427	12391	0.10058119	13	0
## 7	110	1559	1004	522	13460	0.10377398	11	0
## 8	106	1630	1091	536	14055	0.10407640	6	0
## 9	107	1579	958	405	12106	0.10377398	10	0
## 10	134	1653	850	437	11372	0.10302640	16	0
## 11	147	2152	1109	434	9834	0.10273011	13	0
## 12	180	2148	1113	437	9267	0.10199719	14	0
## 13	125	1752	925	316	9130	0.10127456	14	0
## 14	134	1765	903	311	8933	0.10070398	6	0
## 15	110	1717	1006	351	11000	0.10013961	8	0
## 16	102	1558	892	362	10733	0.09862110	11	0
## 17	103	1575	990	486	12912	0.09834929	7	0
## 18	111	1520	866	429	12926	0.09808018	13	0
## 19	120	1805	1095	551	13990	0.09727921	13	0
## 20	129	1800	1204	646	14926	0.09741062	11	0
## 21	122	1719	1029	456	12900	0.09742524	11	0
## 22	183	2008	1147	475	12034	0.09638063	14	0
## 23	169	2242	1171	456	10643	0.09573896	16	0
## 24	190	2478	1299	468	10742	0.09510631	14	0
## 25	134	2030	944	356	10266	0.09673597	17	0
## 26	108	1655	874	271	10281	0.09610922	16	0
## 27	104	1693	840	354	11527	0.09536725	15	0
## 28	117	1623	893	427	12281	0.09470959	13	0
## 29	157	1805	1007	465	13587	0.09411762	13	0
## 30	148	1746	973	440	13049	0.09353215	15	0
## 31	130	1795	1097	539	16055	0.09295405	12	0
## 32	140	1926	1194	646	15220	0.09283979	6	0
## 33	136	1619	988	457	13824	0.09272474	9	0
## 34	140	1992	1077	446	12729	0.09226965	13	0
## 35	187	2233	1045	402	11467	0.09170669	14	0
## 36	150	2192	1115	441	11351	0.09126207	15	0
## 37	159	2080	1005	359	10803	0.09071160	14	0
## 38	143	1768	857	334	10548	0.09027633	3	0
## 39	114	1835	879	312	12368	0.08995192	12	0
## 40	127	1569	887	427	13311	0.08909964	13	0
## 41	159	1976	1075	434	13885	0.08867919	12	0
## 42	156	1853	1121	486	14088	0.08815929	8	0
## 43	138	1965	1190	569	16932	0.08890206	8	0
## 44	120	1689	1058	523	16164	0.08818133	15	0
## 45	117	1778	939	418	14883	0.08894029	8	0
## 46	170	1976	1074	452	13532	0.08772661	5	0
## 47	168	2397	1089	462	12220	0.08742885	17	0
## 48	198	2654	1208	497	12025	0.08703543	14	0
## 49	144	2097	903	354	11692	0.08644992	13	0
## 50	146	1963	916	347	11081	0.08587264	5	0
## 51	109	1677	787	276	13745	0.08539822	8	0

## 52	131	1941	1114	472	14382	0.08382198	5	0
## 53	151	2003	1014	487	14391	0.08459078	12	0
## 54	140	1813	1022	505	15597	0.08413690	11	0
## 55	153	2012	1114	619	16834	0.08377841	13	0
## 56	140	1912	1132	640	17282	0.08351074	15	0
## 57	161	2084	1111	559	15779	0.08280639	11	0
## 58	168	2080	1008	453	13946	0.08117889	11	0
## 59	152	2118	916	418	12701	0.08285361	10	0
## 60	136	2150	992	419	10431	0.09419012	13	0
## 61	113	1608	731	262	11616	0.09239984	8	0
## 62	100	1503	665	299	10808	0.10816148	6	0
## 63	103	1548	724	303	12421	0.10721169	8	0
## 64	103	1382	744	401	13605	0.11404297	14	0
## 65	121	1731	910	413	14455	0.11245412	12	0
## 66	134	1798	883	426	15019	0.11131625	14	0
## 67	133	1779	900	516	15662	0.11030125	13	0
## 68	129	1887	1057	600	16745	0.10819718	9	0
## 69	144	2004	1076	459	14717	0.10702744	4	0
## 70	154	2077	919	443	13756	0.10494698	13	0
## 71	156	2092	920	412	12531	0.11935775	6	0
## 72	163	2051	953	400	12568	0.11762190	15	0
## 73	122	1577	664	278	11249	0.13302742	12	0
## 74	92	1356	607	302	11096	0.13084524	16	0
## 75	117	1652	777	381	12637	0.12831848	7	0
## 76	95	1382	633	279	13018	0.12354745	12	0
## 77	96	1519	791	442	15005	0.11858681	10	0
## 78	108	1421	790	409	15235	0.11633748	9	0
## 79	108	1442	803	416	15552	0.11516148	9	0
## 80	106	1543	884	511	16905	0.11450120	6	0
## 81	140	1656	769	393	14776	0.11352298	7	0
## 82	114	1561	732	345	14104	0.11193018	13	0
## 83	158	1905	859	391	12854	0.11061053	14	0
## 84	161	2199	994	470	12956	0.11527439	13	0
## 85	102	1473	704	266	12177	0.11379349	14	0
## 86	127	1655	684	312	11918	0.11234958	11	0
## 87	125	1407	671	300	13517	0.11175347	11	0
## 88	101	1395	643	373	14417	0.10964252	10	0
## 89	97	1530	771	412	15911	0.10844090	4	0
## 90	112	1309	644	322	15589	0.10788494	8	0
## 91	112	1526	828	458	16543	0.10908477	9	0
## 92	113	1327	748	427	17925	0.10757145	10	0
## 93	108	1627	767	346	15406	0.10616402	10	0
## 94	128	1748	825	421	14601	0.10630000	5	0
## 95	154	1958	810	344	13107	0.10482531	13	0
## 96	162	2274	986	370	12268	0.10345175	12	0
## 97	112	1648	714	291	11972	0.10144992	10	0
## 98	79	1401	567	224	12028	0.10040232	9	0
## 99	82	1411	616	266	14033	0.09886203	7	0
## 100	127	1403	678	338	14244	0.10249615	5	0
## 101	108	1394	742	298	15287	0.10302743	10	0
## 102	110	1520	840	386	16954	0.10217891	5	0
## 103	123	1528	888	479	17361	0.09983664	6	0

## 104	103	1643	852	473	17694	0.09263669	8	0
## 105	97	1515	774	332	16222	0.09181496	6	0
## 106	140	1685	831	391	14969	0.09072430	12	0
## 107	165	2000	889	370	13624	0.09002121	15	0
## 108	183	2215	1046	431	13842	0.08933071	7	0
## 109	148	1956	889	366	12387	0.08844273	14	0
## 110	111	1462	626	250	11608	0.08835257	4	0
## 111	116	1563	808	355	15021	0.08675736	10	0
## 112	115	1459	746	304	14834	0.08499524	8	0
## 113	100	1446	754	379	16565	0.08456794	7	0
## 114	106	1622	865	440	16882	0.08443190	11	0
## 115	134	1657	980	500	18012	0.08435088	3	0
## 116	125	1638	959	511	18855	0.08360098	5	0
## 117	117	1643	856	384	17243	0.08341726	11	0
## 118	122	1683	798	366	16045	0.08274514	10	0
## 119	153	2050	942	432	14745	0.08523527	10	0
## 120	178	2262	1010	390	13726	0.08477030	7	0
## 121	114	1813	796	306	11196	0.08445892	10	0
## 122	94	1445	643	232	12105	0.08535212	11	0
## 123	128	1762	794	342	14723	0.08755921	9	0
## 124	119	1461	750	329	15582	0.09038292	7	0
## 125	111	1556	809	394	16863	0.09078329	8	0
## 126	110	1431	716	355	16758	0.10874278	13	0
## 127	114	1427	851	385	17434	0.11414223	8	0
## 128	118	1554	931	463	18359	0.11299293	5	0
## 129	115	1645	834	453	17189	0.11132071	8	0
## 130	132	1653	762	373	16909	0.10912623	7	0
## 131	153	2016	880	401	15380	0.10769846	12	0
## 132	171	2207	1077	466	15161	0.10760157	10	0
## 133	115	1665	748	306	14027	0.10377502	7	0
## 134	95	1361	593	263	14478	0.10711417	4	0
## 135	92	1506	720	323	16155	0.10737477	10	0
## 136	100	1360	646	310	16585	0.11169537	4	0
## 137	95	1453	765	424	18117	0.11063818	8	0
## 138	114	1522	820	403	17552	0.11185521	8	0
## 139	102	1460	807	406	18299	0.10974234	7	0
## 140	104	1552	885	466	19361	0.10819393	10	0
## 141	132	1548	803	381	17924	0.10625536	8	0
## 142	136	1827	860	369	17872	0.10419303	14	0
## 143	117	1737	825	378	16058	0.10193397	8	0
## 144	137	1941	911	392	15746	0.10279382	9	0
## 145	111	1474	704	284	15226	0.10476034	8	0
## 146	106	1458	691	316	14932	0.10400254	6	0
## 147	98	1542	688	321	16846	0.11665552	7	0
## 148	84	1404	714	358	16854	0.11516148	6	0
## 149	94	1522	814	378	18146	0.11298954	5	0
## 150	105	1385	736	382	17559	0.11386064	4	0
## 151	123	1641	876	433	18655	0.11911808	5	0
## 152	109	1510	829	506	19453	0.12448999	10	0
## 153	130	1681	818	428	17923	0.12322295	7	0
## 154	153	1938	942	479	17915	0.12067793	10	0
## 155	134	1868	782	370	16496	0.12104898	12	0

##	156	99	1726	823	349	13544	0.11696857	7	0
##	157	115	1456	595	238	13601	0.11275026	4	0
##	158	104	1445	673	285	15667	0.10807931	5	0
##	159	131	1456	660	324	17358	0.10883852	6	0
##	160	108	1365	676	346	18112	0.11129177	4	0
##	161	103	1487	755	410	18581	0.11130401	4	0
##	162	115	1558	815	411	18759	0.11545436	8	0
##	163	122	1488	867	496	20668	0.11476830	8	0
##	164	122	1684	933	534	21040	0.11720743	3	0
##	165	125	1594	798	396	18993	0.11907640	7	0
##	166	137	1850	950	470	18668	0.11796586	12	0
##	167	138	1998	825	385	16768	0.11744913	2	0
##	168	152	2079	911	411	16551	0.11698846	7	0
##	169	120	1494	619	281	16231	0.11261054	8	0

Hide

DLaw

##	DriversKilled	drivers	front	rear	kms	PetrolPrice	VanKilled	law
## 1	95	1057	426	300	15511	0.1136570	3	1
## 2	100	1218	475	318	18308	0.1131444	2	1
## 3	89	1168	556	391	17793	0.1184955	6	1
## 4	82	1236	559	398	19205	0.1179694	3	1
## 5	89	1076	483	337	19162	0.1176866	7	1
## 6	60	1174	587	477	20997	0.1200592	6	1
## 7	84	1139	615	422	20705	0.1194377	8	1
## 8	113	1427	618	495	18759	0.1188813	8	1
## 9	126	1487	662	471	19240	0.1184624	4	1
## 10	122	1483	519	368	17504	0.1180166	3	1
## 11	118	1513	585	345	16591	0.1177066	5	1
## 12	92	1357	483	296	16224	0.1177761	5	1
## 13	86	1165	434	319	16670	0.1147970	3	1
## 14	81	1282	513	349	18539	0.1157353	4	1
## 15	84	1110	548	375	19759	0.1153563	3	1
## 16	87	1297	586	441	19584	0.1148154	6	1
## 17	90	1185	522	465	19976	0.1147775	6	1
## 18	79	1222	601	472	21486	0.1149360	7	1
## 19	96	1284	644	521	21626	0.1147970	5	1
## 20	122	1444	643	429	20195	0.1140932	7	1
## 21	120	1575	641	408	19928	0.1164655	7	1
## 22	137	1737	711	490	18564	0.1160261	4	1
## 23	154	1763	721	491	18149	0.1160667	7	1

Comparing Averages:

We see that there is a significant reduction in the average amount of deaths after the seat belt law was introduced.

The mean for ALL deaths before the introduction of the law was 1717.751. After the law, the mean decreased to 1321.696.

Parsing the data, we see that the mean for DRIVER deaths before the introduction of the law was 125.8698. After the law, the mean decreased to 100.2609.

Parsing the data further, we can also compare the average FRONT SEAT passenger deaths/serious injuries. We see a significant reduction from 873.4556 to 570.9565.

However, the average REAR SEAT passenger deaths/serious injuries increased from 400.3195 to 407.7391. When compared to the reduction in overall or front seat deaths, this increase is negligible.

Hide

```
cat(" Overall Mean: \n", mean(sbelts$drivers),
    "\n Mean (Pre-Law): \n", mean(DnoLaw$drivers),
    "\n Mean (Post-Law): \n", mean(DLaw$drivers),

    "\n\n Mean - Driver Deaths (Pre-Law): \n", mean(DnoLaw$DriversKilled),
    "\n Mean - Driver Deaths (Post-Law): \n", mean(DLaw$DriversKilled),

    "\n\n Mean - Front Seat Passenger Deaths/Serious Injuries (Pre-Law): \n", mean(
      DnoLaw$front),
    "\n Mean - Front Seat Passenger Deaths/Serious Injuries (Post-Law): \n", mean(D
      Law$front),

    "\n\n Mean - Rear Seat Passenger Deaths/Serious Injuries (Pre-Law): \n", mean(D
      noLaw$rear),
    "\n Mean - Rear Seat Passenger Deaths/Serious Injuries (Post-Law): \n", mean(DL
      aw$rear))
```

```
## Overall Mean:
## 1670.307
## Mean (Pre-Law):
## 1717.751
## Mean (Post-Law):
## 1321.696
##
## Mean - Driver Deaths (Pre-Law):
## 125.8698
## Mean - Driver Deaths (Post-Law):
## 100.2609
##
## Mean - Front Seat Passenger Deaths/Serious Injuries (Pre-Law):
## 873.4556
## Mean - Front Seat Passenger Deaths/Serious Injuries (Post-Law):
## 570.9565
##
## Mean - Rear Seat Passenger Deaths/Serious Injuries (Pre-Law):
## 400.3195
## Mean - Rear Seat Passenger Deaths/Serious Injuries (Post-Law):
## 407.7391
```

Comparing Variability:

We also see that the variability of road death data had reduced significantly post-law. This indicates more consistency in the data.

The standard deviation for front seat passenger deaths decreased significantly and the standard deviation for rear seat passenger deaths decreased less so:

Hide

```
cat(" Overall Standard Deviation: \n", sd(sbelts$drivers),
    "\n Standard Deviation (Pre-Law): \n", sd(DnoLaw$drivers),
    "\n Standard Deviation (Post-Law): \n",sd(DLaw$drivers),

    "\n\n Standard Deviation - Driver Deaths (Pre-Law): \n", sd(DnoLaw$DriversKilled),
    "\n Standard Deviation - Driver Deaths (Post-Law): \n",sd(DLaw$DriversKilled),

    "\n\n Standard Deviation - Front (Pre-Law):\n", sd(DnoLaw$front),
    "\n Standard Deviation - Front (Post-Law):\n", sd(DLaw$front),

    "\n\n Standard Deviation - Rear (Pre-Law): \n", sd(DnoLaw$rear),
    "\n Standard Deviation - Rear (Post-Law): \n", sd(DLaw$rear))
```

```
## Overall Standard Deviation:
## 289.611
## Standard Deviation (Pre-Law):
## 266.892
## Standard Deviation (Post-Law):
## 199.7233
##
## Standard Deviation - Driver Deaths (Pre-Law):
## 24.26088
## Standard Deviation - Driver Deaths (Post-Law):
## 22.2286
##
## Standard Deviation - Front (Pre-Law):
## 151.5416
## Standard Deviation - Front (Post-Law):
## 81.29099
##
## Standard Deviation - Rear (Pre-Law):
## 84.88012
## Standard Deviation - Rear (Post-Law):
## 69.91828
```

This reduction in variation is also evidenced by the range of road deaths in each scenario. After the law, the maximum and minimum road deaths decreased by a good amount each.

Hide


```
cat(" Maximum (Pre-Law):", max(range(DnoLaw$drivers)),
    "\n Maximum (Post-Law)", max(range(DLaw$drivers)),

    "\n\n Minimum (Pre-Law):", min(range(DnoLaw$drivers)),
    "\n Minimum (Post-Law)", min(range(DLaw$drivers)),

    "\n\n Range (Pre-Law):", max(range(DnoLaw$drivers))-min(range(DnoLaw$drivers)),
    "\n Range (Post-Law)", max(range(DLaw$drivers))-min(range(DLaw$drivers))
)
```

```
## Maximum (Pre-Law): 2654
## Maximum (Post-Law) 1763
##
## Minimum (Pre-Law): 1309
## Minimum (Post-Law) 1057
##
## Range (Pre-Law): 1345
## Range (Post-Law) 706
```

Rate of Fewer Deaths:

We can compare the average reduction in deaths to the average number of deaths prior to the law's introduction using a ratio.

Hide

```
reduc_rate <- (mean(DnoLaw$drivers)-mean(DLaw$drivers))/mean(DnoLaw$drivers)
reduc_drivers <- (mean(DnoLaw$DriversKilled)-mean(DLaw$DriversKilled))/mean(DnoLaw$
  DriversKilled)
reduc_front <- (mean(DnoLaw$front)-mean(DLaw$front))/mean(DnoLaw$front)
reduc_rear <- (mean(DnoLaw$rear)-mean(DLaw$rear))/mean(DnoLaw$rear)

cat(" Average Total Death Reduction Rate: ", "\n", reduc_rate,
    "\n\n Average Reduction Rate in Driver Deaths: \n", reduc_drivers,
    "\n\n Average Reduction Rate in Front Seat Deaths: \n", reduc_front,
    "\n\n Average Reduction Rate in Rear Seat Deaths: \n", reduc_rear)

```

```
## Average Total Death Reduction Rate:
## 0.2305664
##
## Average Reduction Rate in Driver Deaths:
## 0.2034559
##
## Average Reduction Rate in Front Seat Deaths:
## 0.3463245
##
## Average Reduction Rate in Rear Seat Deaths:
## -0.0185342
```

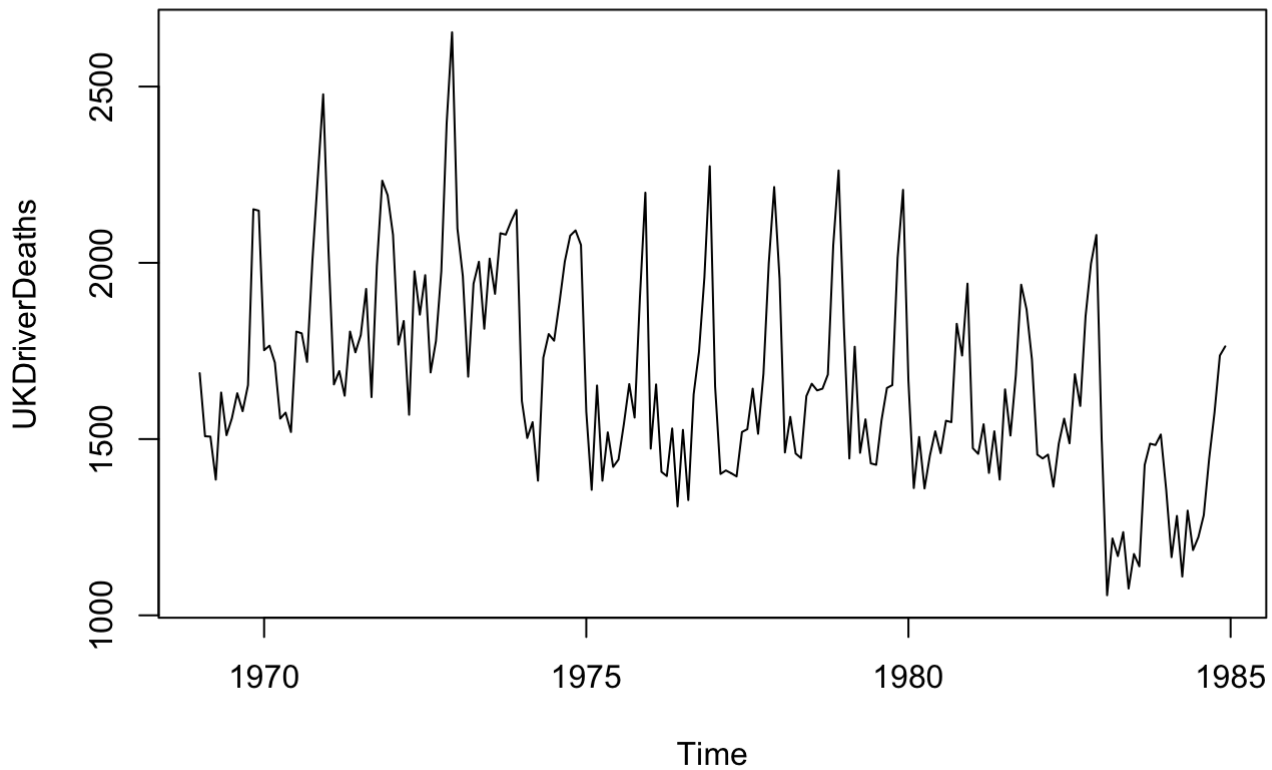
Visualizing the Data

Below we see the visualized time-series data on road deaths.

The first graph shows the entire timeline of data with Time (in years) on the horizontal axis.

Hide

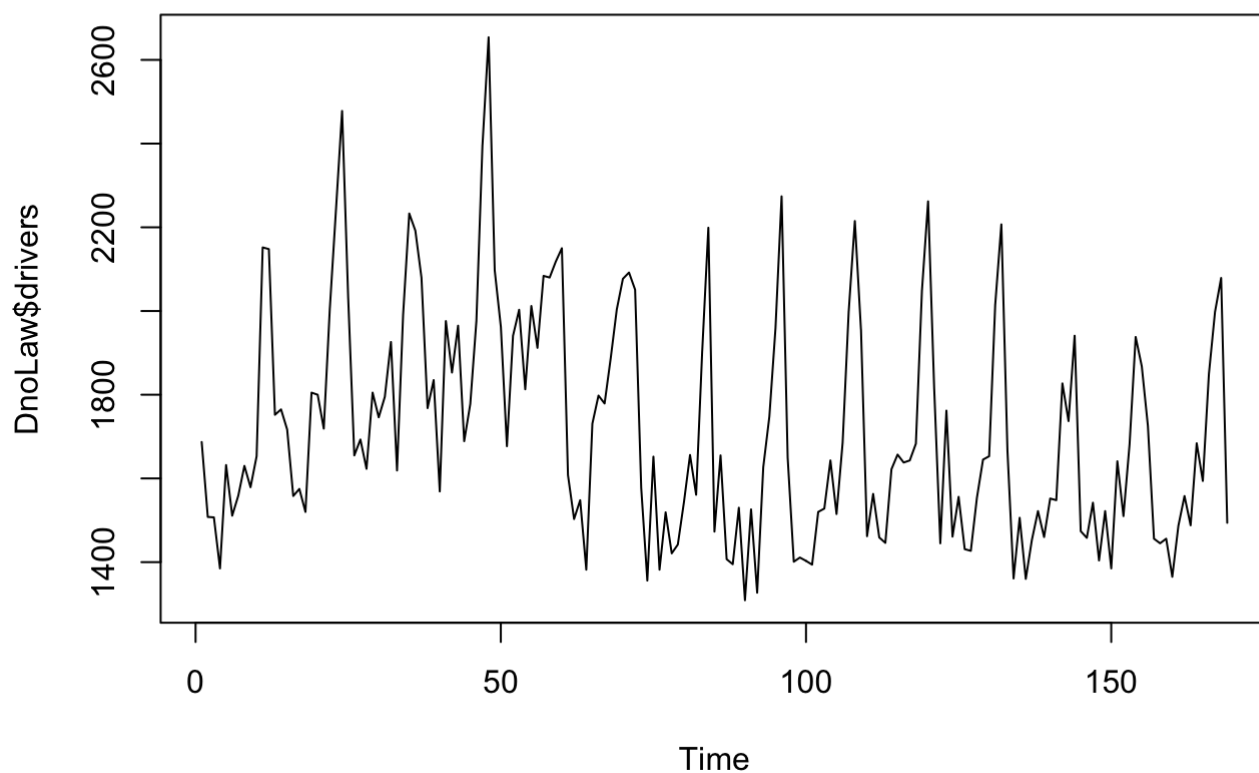
```
plot.ts(UKDriverDeaths)
```



The second graph shows the timeline of data BEFORE the law was enacted (the first 169 months), with Time (in months SINCE THE START OF THE STUDY) on the horizontal axis.

Hide

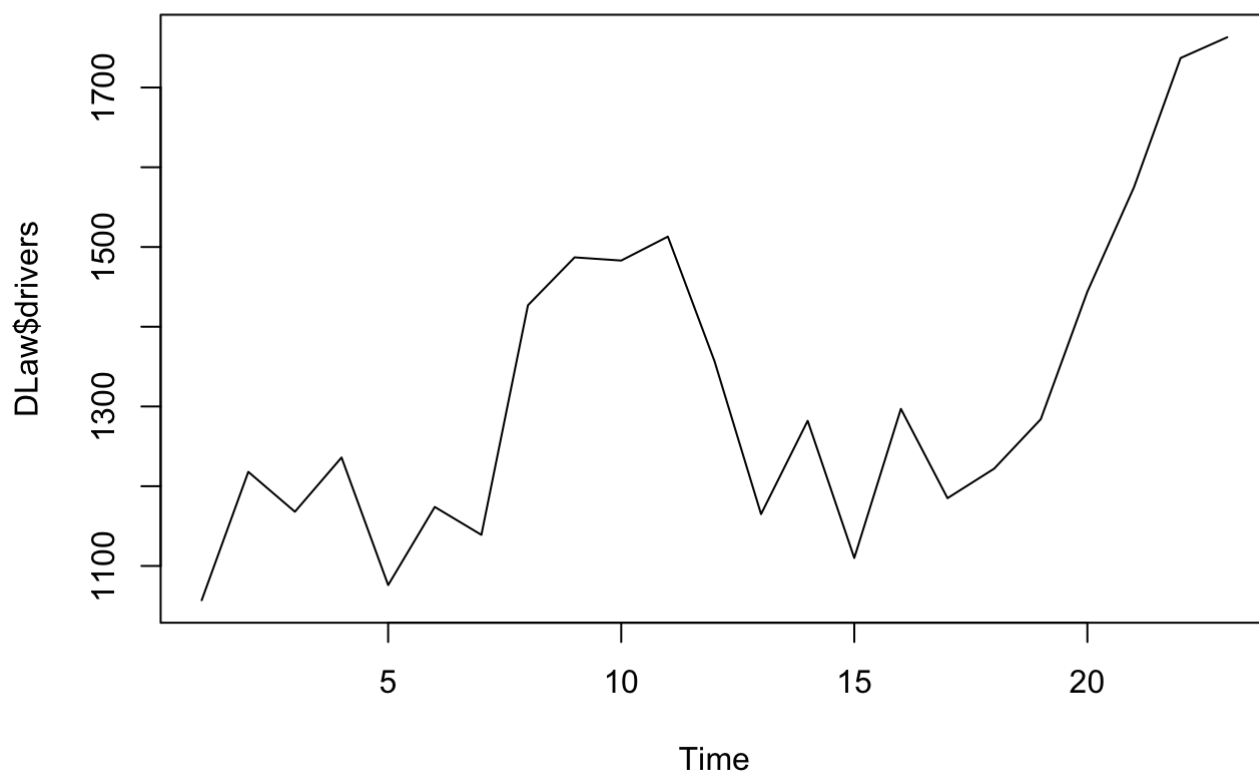
```
plot.ts(DnoLaw$drivers)
```



The third graph shows the timeline of data AFTER the law was enacted (the last 23 months), with Time (in months SINCE THE ENACTMENT OF THE LAW) on the horizontal axis.

Hide

```
plot.ts(DLaw$drivers)
```



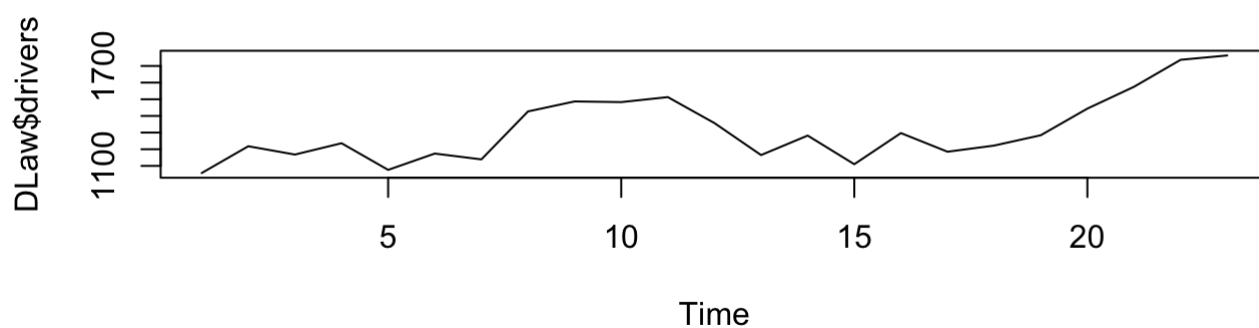
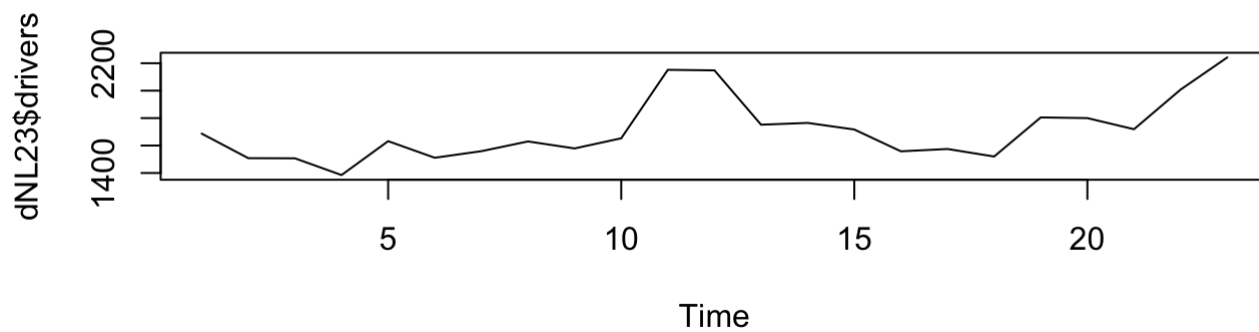
Since we're limited to 23 months worth of data after the law was enacted, for the following graphs I chose to zoom in on four particular 22-26 month time periods before the enactment of the law. I did this in hopes of having a more comparable amount of data points, being sure to include the lowest dips in road deaths for each period. I paired each 22-26 month pre-law period to the 23 month post-law period.

We can visually see that the scaling for the number of deaths, regardless of time frame, decreases significantly after the passing of the seat belt law.

First 23 Months (Pre-Law) vs Final 23 Months (Post-Law)

Hide

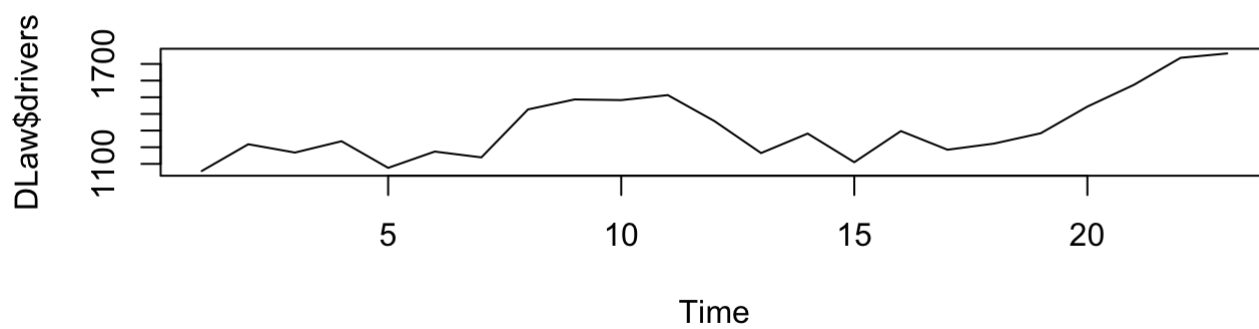
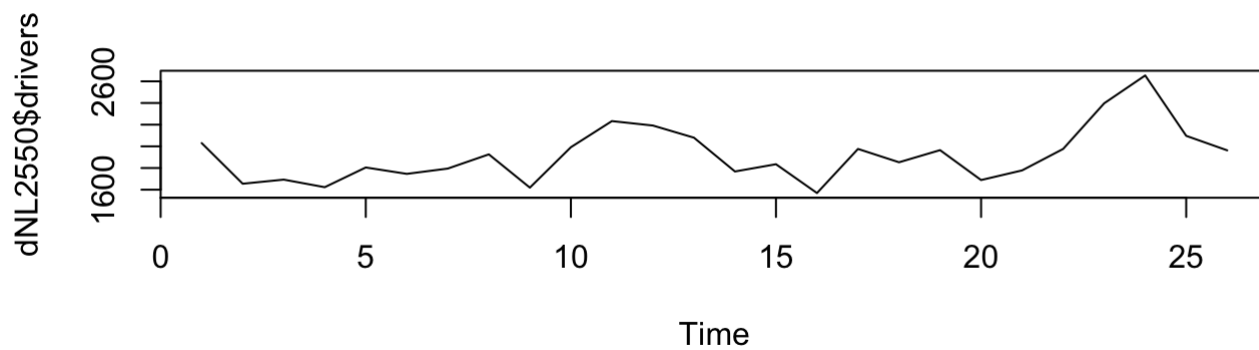
```
#first 23 months
dNL23 <- DnoLaw %>% slice(1:23)
par(mfrow=c(2,1))
plot.ts(dNL23$drivers)
plot.ts(DLaw$drivers)
```



Months 25-50 (Pre-Law) vs Final 23 Months (Post-Law)

Hide

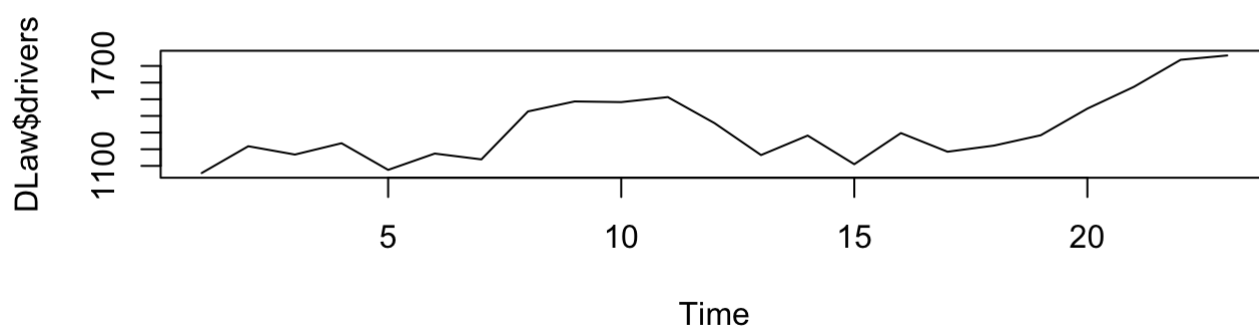
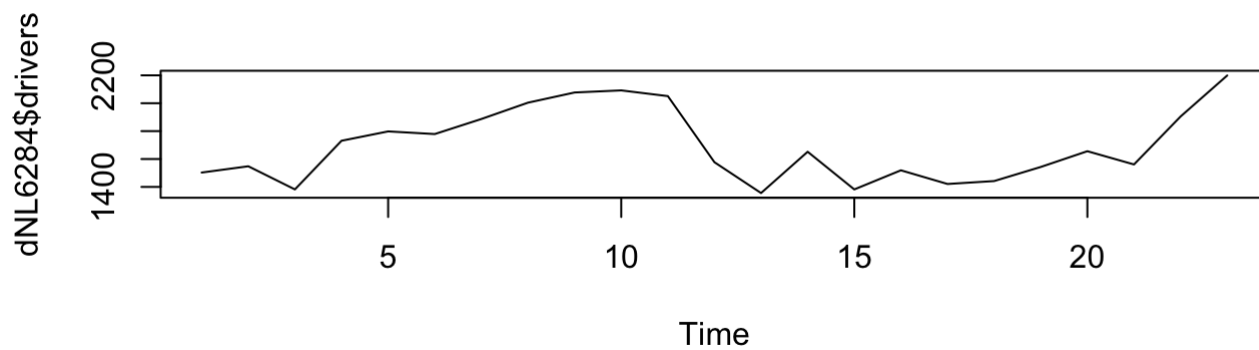
```
#months 25-50
dNL2550 <- DnoLaw %>% slice(25:50)
par(mfrow=c(2,1))
plot.ts(dNL2550$drivers)
plot.ts(DLaw$drivers)
```



Months 62-84 (Pre-Law) vs Final 23 Months (Post-Law)

Hide

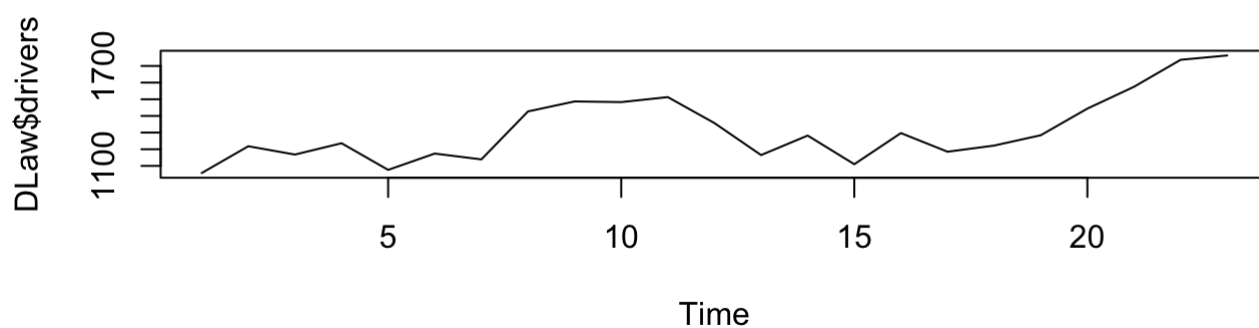
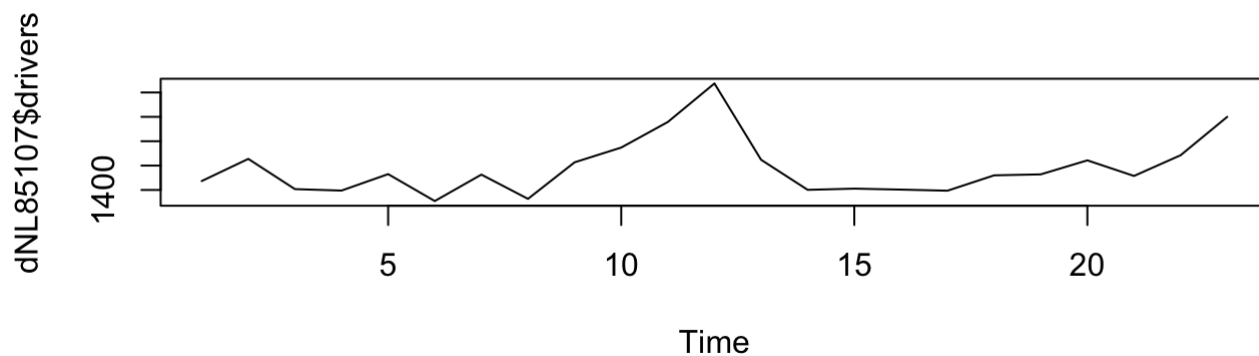
```
#months 62-84
dNL6284 <- DnoLaw %>% slice(62:84)
par(mfrow=c(2,1))
plot.ts(dNL6284$drivers)
plot.ts(DLaw$drivers)
```



Months 85-107 (Pre-Law) vs Final 23 Months (Post-Law)

Hide

```
#months 85-107  
dNL85107 <- DnoLaw %>% slice(85:107)  
par(mfrow=c(2,1))  
plot.ts(dNL85107$drivers)  
plot.ts(DLaw$drivers)
```



Hide

```
#summary(UKDriverDeaths)
#summary(DnoLaw$drivers)
#summary(DLaw$drivers)
```

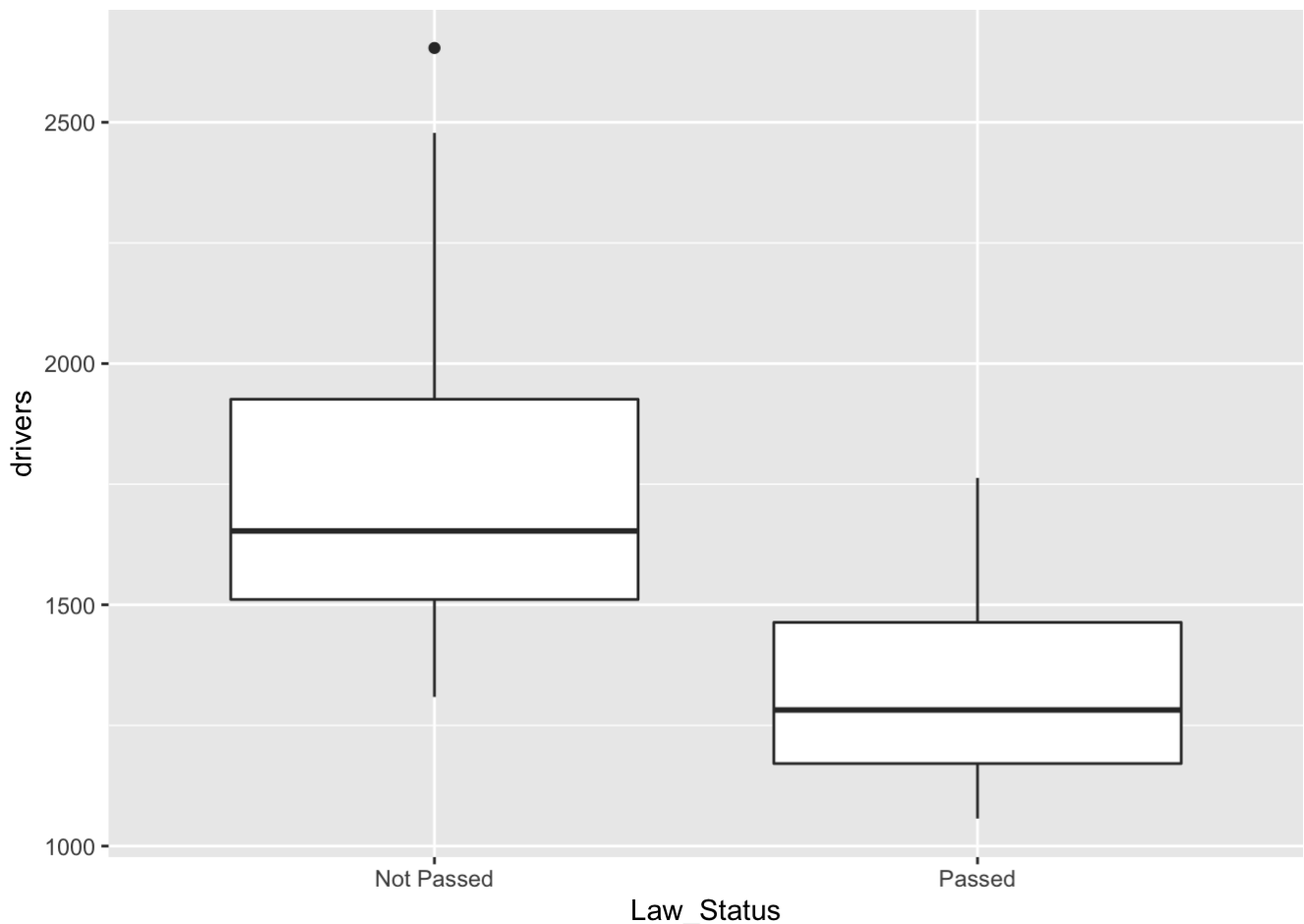
Boxplots of the Summary Data

Left shows the pre-law boxplot Right shows the post-law boxplot

Hide

```
sbelts <- sbelts %>%
  mutate(Law_Status = ifelse(sbelts$law > 0, "Passed", "Not Passed"))

p <- ggplot(sbelts, aes(x = Law_Status, y = drivers))+
  geom_boxplot()
p
```

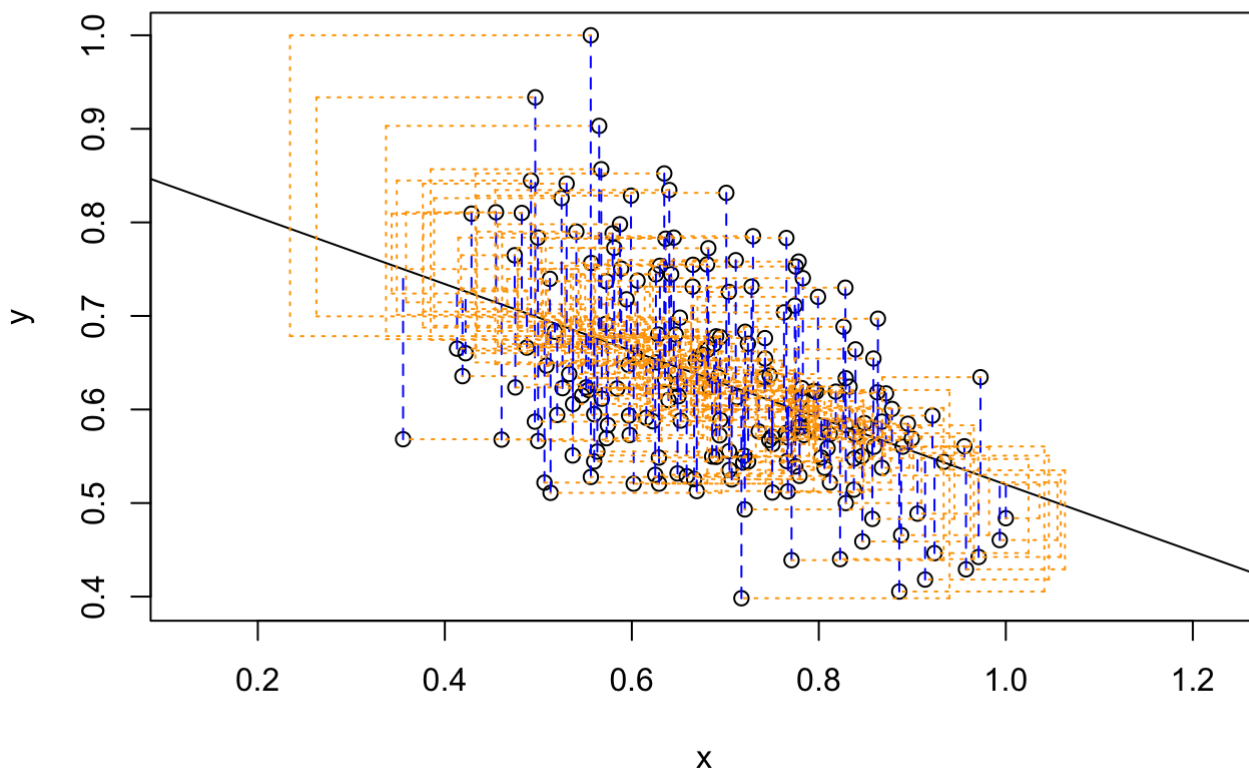
Comparison of Other Variables Using Scatterplots

The data set also included information on distance traveled and price of petroleum. I used a scatter plot to visualize the correlation between these variables and road deaths. I also normalized the data to get a better visual. Although there seems to be a linear correlation between both distance traveled vs road deaths and petroleum price and road deaths, using the `cor()` function gives us the correlation coefficient for each. We see that the values for r are -0.4447631 and -0.4576675 respectively. Although there seems to be a linear relationship in each case, the values for r indicate a weak correlation. There is not sufficient evidence that variables other than the status of the seat belt law are responsible for a rise or reduction in road deaths.

Hide

```
sbelts <- sbelts %>%
  mutate(deaths_norm = sbelts$drivers/max(sbelts$drivers))
sbelts <- sbelts %>%
  mutate(kms_norm = sbelts$kms/max(sbelts$kms))
sbelts <- sbelts %>%
  mutate(p_norm = sbelts$PetrolPrice/max(sbelts$PetrolPrice))

DATA606::plot_ss(x = sbelts$kms_norm, y = sbelts$deaths_norm, showSquares =TRUE)
```



```
## Click two points to make a line.
```

```
## Call:
```

```
## lm(formula = y ~ x, data = pts)
```

```
##
```

```
## Coefficients:
```

```
## (Intercept)          x
```

```
##      0.8770      -0.3572
```

```
##
```

```
## Sum of Squares:  1.824
```

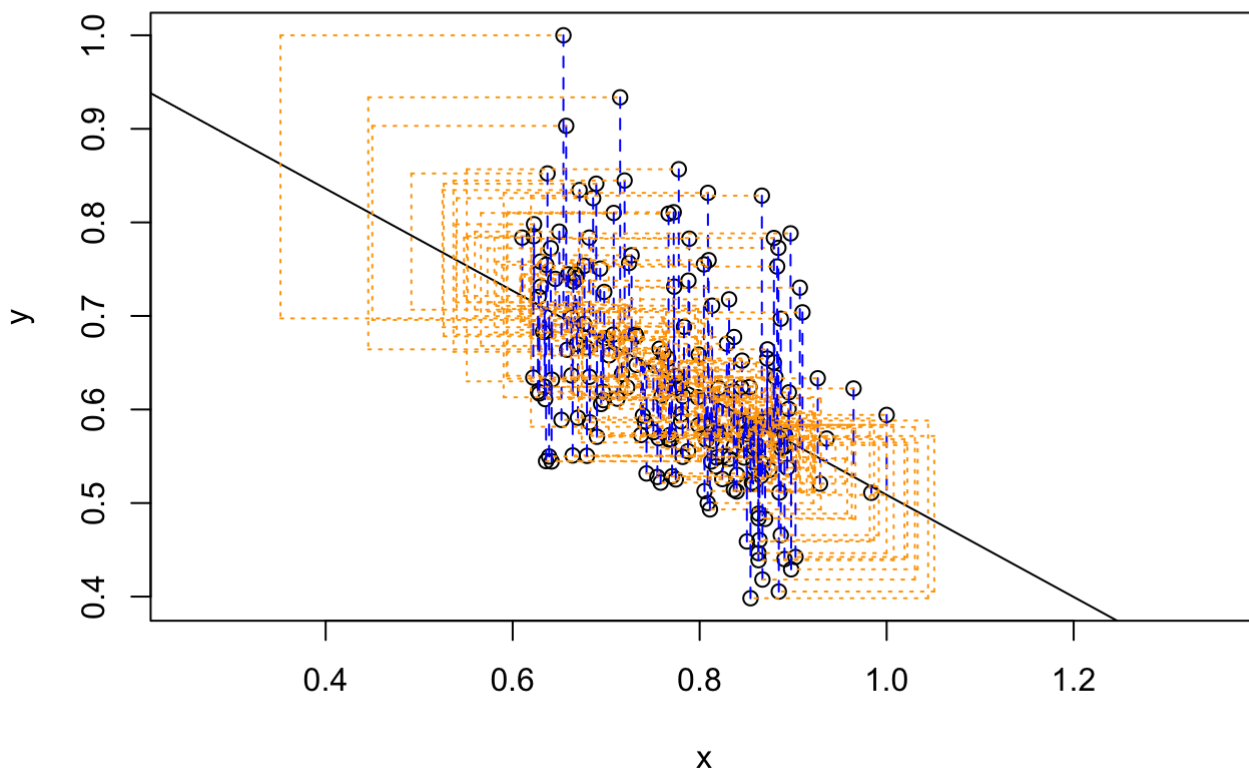
Hide

```
cor(sbelts$kms, sbelts$drivers)
```

```
## [1] -0.4447631
```

Hide

```
DATA606::plot_ss(x = sbelts$p_norm, y = sbelts$deaths_norm, showSquares =TRUE)
```



```
## Click two points to make a line.
```

```
## Call:
```

```
## lm(formula = y ~ x, data = pts)
```

```
##
```

```
## Coefficients:
```

```
## (Intercept)          x
```

```
##      1.0544      -0.5456
```

```
##
```

```
## Sum of Squares:  1.798
```

Hide

```
cor(sbelts$PetrolPrice, sbelts$drivers)
```

```
## [1] -0.4576675
```