

KidIQ: kidiq.csv

Widen the notebook.

```

• html"""
• <style>
•   main {
•     margin: 0 auto;
•     max-width: 2000px;
•     padding-left: max(160px, 10%);
•     padding-right: max(160px, 10%);
•   }
• </style>
• """
•

```

```

• using Pkg ✓ , DrWatson ✓

```

```

• begin
•   # Specific to ROSStanPluto
•   using StanSample ✓
•
•   # Graphics related
•   using GLMakie ✓
•
•   # Common data files and functions
•   using RegressionAndOtherStories ✓
• end

```

```

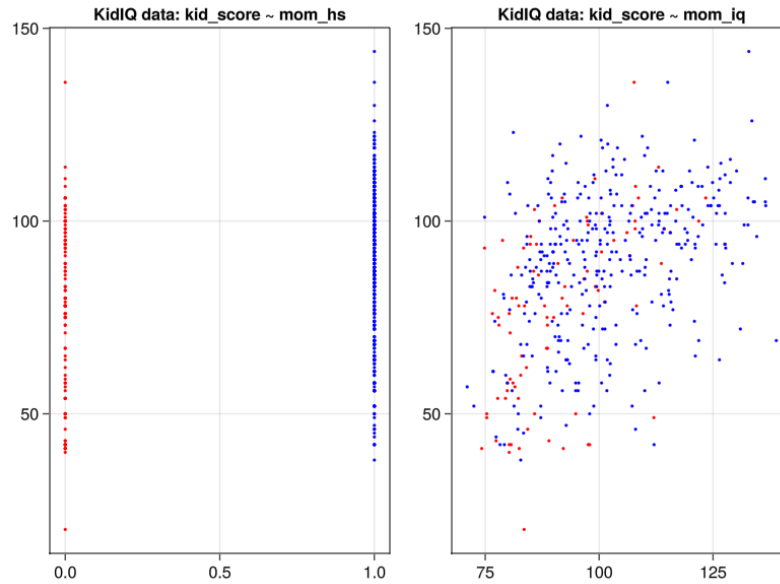
Replacing docs for `RegressionAndOtherStories.
rames.DataFrame, AbstractString` in module `R
\

```

`kidiq =`

	<code>kid_score</code>	<code>mom_hs</code>	<code>mom_iq</code>	<code>mom_work</code>	<code>m</code>
1	65	1	121.118	4	27
2	98	1	89.3619	4	25
3	85	1	115.443	4	27
4	83	1	99.4496	3	25
5	115	1	92.7457	4	27
6	98	0	107.902	1	18
7	69	1	138.893	4	26
8	106	1	125.145	3	23
9	102	1	81.6195	1	24
10	95	1	95.0731	1	19
⋮ more					
434	70	1	91.2533	2	25

```
• kidiq = CSV.read(ros_datadir("KidIQ",
    "kidiq.csv"), DataFrame)
```



```

let
    f = Figure()
    ax = Axis(f[1, 1]; title="KidIQ data:
    kid_score ~ mom_hs")
    scatter!(kidiq[kidiq.mom_hs .== 0,
    :mom_hs], kidiq[kidiq.mom_hs .== 0,
    :kid_score]; color=:red, markersize =
    3)
    scatter!(kidiq[kidiq.mom_hs .== 1,
    :mom_hs], kidiq[kidiq.mom_hs .== 1,
    :kid_score]; color=:blue, markersize
    = 3)
    ax = Axis(f[1, 2]; title="KidIQ data:
    kid_score ~ mom_iq")
    scatter!(kidiq[kidiq.mom_hs .== 0,
    :mom_iq], kidiq[kidiq.mom_hs .== 0,
    :kid_score]; color=:red, markersize =
    3)
    scatter!(kidiq[kidiq.mom_hs .== 1,
    :mom_iq], kidiq[kidiq.mom_hs .== 1,
    :kid_score]; color=:blue, markersize
    = 3)
    current_figure()
end

```

```

• stan10_1 = "
• data {
•     int N;
•     vector[N] mom_hs;
•     vector[N] kid_score;
• }
• parameters {
•     real a;
•     real b;
•     real sigma;
• }
• model {
•     vector[N] mu;
•     a ~ normal(100, 10);
•     b ~ normal(5, 10);
•     mu = a + b * mom_hs;
•     kid_score ~ normal(mu, sigma);
• }
• ";

```

	parameters	mean	mcse	std	
1	"a"	78.6581	0.048736	1.95038	7
2	"b"	10.5863	0.0545101	2.16914	6
3	"sigma"	19.9046	0.0143093	0.691521	1

```

• let
•     data =(N = nrow(kidiq), mom_hs =
•     kidiq.mom_hs, mom_iq = kidiq.mom_iq,
•     kid_score = kidiq.kid_score)
•     global m10_1s = SampleModel("m10.1s",
•     stan10_1)
•     global rc10_1s = stan_sample(m10_1s;
•     data)
•     success(rc10_1s) && describe(m10_1s)
• end

```

```

/ Informational Message: The current Metropoli
l be rejected because of the following issue:
Exception: normal_lpdf: Scale parameter is -
tive! (in '/var/folders/l7/pr04h0650q5dvqtn
/m10.1s.stan', line 16, column 1 to column 3
If this warning occurs sporadically, such as
ariable types like covariance matrices, then
but if this warning occurs often then your m
ly ill-conditioned or misspecified.

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rejected because of the following issue:
Exception: normal_lpdf: Scale parameter is -
tive! (in '/var/folders/l7/pr04h0650q5dvqtn
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If this warning occurs sporadically, such as
ariable types like covariance matrices, then
but if this warning occurs often then your m
ly ill-conditioned or misspecified.

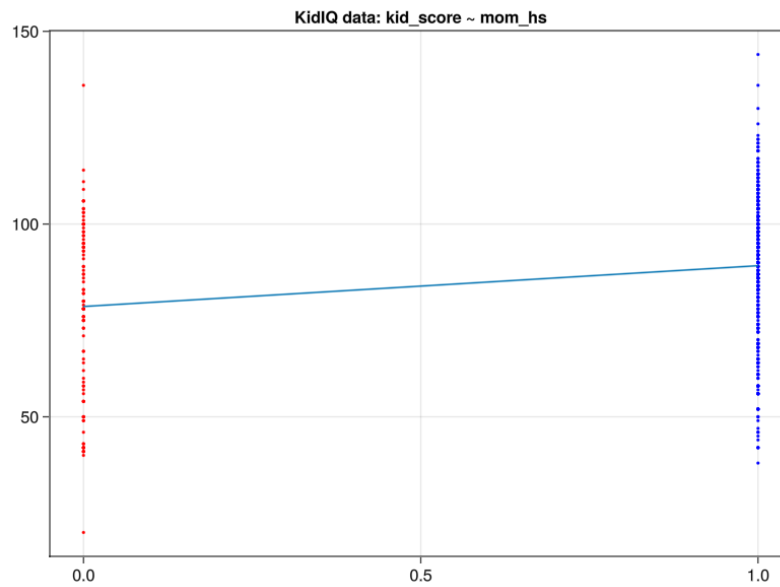
```

	parameters	median	mad_sd	mean	std
1	"a"	78.62	2.005	78.658	1.95
2	"b"	10.585	2.223	10.586	2.16
3	"sigma"	19.878	0.679	19.905	0.69

```

• if success(rc10_1s)
•   post10_1s = read_samples(m10_1s,
•   :dataframe)
•   ms10_1s = model_summary(post10_1s, [:a,
•   :b, :sigma])
end

```



```

let
  f = Figure()
  ax = Axis(f[1, 1]; title="KidIQ data:
  kid_score ~ mom_hs")
  scatter!(kidiq[kidiq.mom_hs .== 0,
  :mom_hs], kidiq[kidiq.mom_hs .== 0,
  :kid_score]; color=:red, markersize =
  3)
  scatter!(kidiq[kidiq.mom_hs .== 1,
  :mom_hs], kidiq[kidiq.mom_hs .== 1,
  :kid_score]; color=:blue, markersize
  = 3)
  lines!([0.0, 1.0], [ms10_1s[:a,
  :median], ms10_1s[:a, :median] +
  ms10_1s[:b, :median]])
  current_figure()
end

```

```
• stan10_2 = "  
• data {  
•   int N;  
•   vector[N] mom_iq;  
•   vector[N] kid_score;  
• }  
• parameters {  
•   real a;  
•   real b;  
•   real sigma;  
• }  
• model {  
•   vector[N] mu;  
•   a ~ normal(25, 3);  
•   b ~ normal(1, 2);  
•   mu = a + b * mom_iq;  
•   kid_score ~ normal(mu, sigma);  
• }  
• ";
```

	parameters	mean	mcse	std
1	"a"	25.0921	0.0652867	2.65439
2	"b"	0.616799	0.000672684	0.027225
3	"sigma"	18.301	0.0154653	0.65023

```

• let
•     data =(N = nrow(kidiq), mom_hs =
•     kidiq.mom_hs, mom_iq = kidiq.mom_iq,
•     kid_score = kidiq.kid_score)
•     global m10_2s = SampleModel("m10.2s",
•     stan10_2)
•     global rc10_2s = stan_sample(m10_2s;
•     data)
•     success(rc10_2s) && describe(m10_2s)
end

```

```

/ Informational Message: The current Metropoli
l be rejected because of the following issue:
Exception: normal_lpdf: Scale parameter is -
tive! (in '/var/folders/l7/pr04h0650q5dvqtn
/m10.2s.stan', line 16, column 1 to column 3
If this warning occurs sporadically, such as
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```


	a	b	sigma
1	24.2062	0.620637	18.1524
2	25.2893	0.628672	17.974
3	25.3209	0.629497	17.9755
4	24.9602	0.61315	18.2629
5	25.221	0.607521	18.3145
6	19.4434	0.67539	18.4654
7	25.2658	0.617265	16.9835
8	23.9615	0.63123	17.6272
9	26.4591	0.597469	18.361
10	26.4441	0.599622	18.4317
⋮	more		
4000	26.3476	0.609028	17.805

```

• if success(rc10_2s)
•   post10_2s = read_samples(m10_2s,
•     :dataframe)
end

```

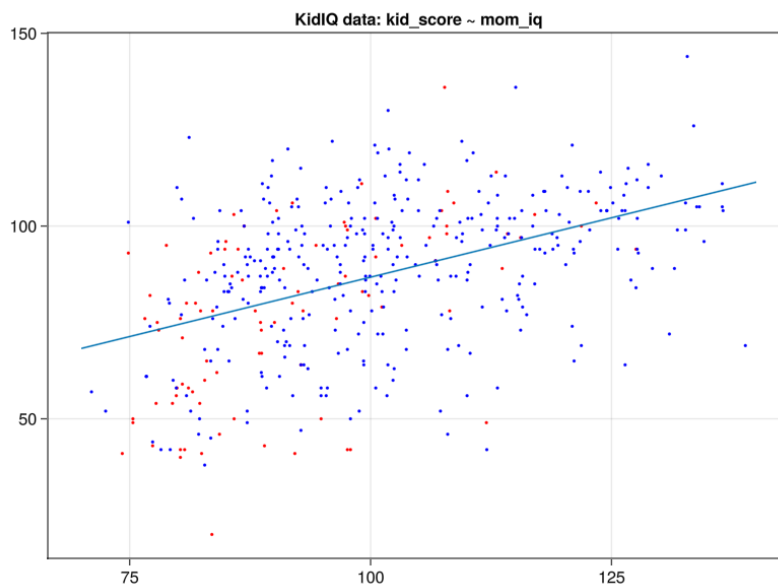
```
ms10_2s =
```

	parameters	median	mad_sd	mean	std
1	"a"	25.146	2.643	25.092	2.65
2	"b"	0.616	0.027	0.617	0.02
3	"sigma"	18.307	0.653	18.301	0.65

```

• ms10_2s = success(rc10_2s) &&
  model_summary(post10_2s, [:a, :b, :sigma])

```



```

let
    f = Figure()
    ax = Axis(f[1, 1]; title="KidIQ data:
    kid_score ~ mom_iq")
    scatter!(kidiq[kidiq.mom_hs .== 0,
    :mom_iq], kidiq[kidiq.mom_hs .== 0,
    :kid_score]; color=:red, markersize =
    3)
    scatter!(kidiq[kidiq.mom_hs .== 1,
    :mom_iq], kidiq[kidiq.mom_hs .== 1,
    :kid_score]; color=:blue, markersize
    = 3)
    x = LinRange(70.0, 140.0, 100)
    lines!(x, ms10_2s[:a, :median] .+
    ms10_2s[:b, :median] .* x)
    current_figure()
end

```

```
• stan10_3 = "  
• data {  
•   int N;  
•   vector[N] mom_hs;  
•   vector[N] mom_iq;  
•   vector[N] kid_score;  
• }  
• parameters {  
•   real a;  
•   real b;  
•   real c;  
•   real sigma;  
• }  
• model {  
•   vector[N] mu;  
•   a ~ normal(25, 2);  
•   b ~ normal(5, 2);  
•   c ~ normal(1, 2);  
•   mu = a + b * mom_hs + c * mom_iq;  
•   kid_score ~ normal(mu, sigma);  
• }  
• ";
```

	parameters	mean	mcse	std
1	"a"	25.0486	0.0370807	1.89158
2	"b"	5.3951	0.0292353	1.50938
3	"c"	0.574846	0.000491572	0.023362
4	"sigma"	18.1488	0.0106828	0.609261

```

• begin
•   data10_3 = (N = nrow(kidiq), mom_hs =
•   kidiq.mom_hs, mom_iq = kidiq.mom_iq,
•   kid_score = kidiq.kid_score)
•   global m10_3s = SampleModel("m10.3s",
•   stan10_3)
•   global rc10_3s = stan_sample(m10_3s;
•   data= data10_3)
•   success(rc10_3s) && describe(m10_3s)
end

```

```

/ l
Informational Message: The current Metropoli
be rejected because of the following issue:
Exception: normal_lpdf: Scale parameter is -
tive! (in '/var/folders/l7/pr04h0650q5dvqtn
/m10.3s.stan', line 19, column 1 to column 3
If this warning occurs sporadically, such as
ariable types like covariance matrices, then
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rejected because of the following issue:
Exception: normal_lpdf: Scale parameter is -
tive! (in '/var/folders/l7/pr04h0650q5dvqtn
/m10.3s.stan', line 19, column 1 to column 3
If this warning occurs sporadically, such as
ariable types like covariance matrices, then
but if this warning occurs often then your m
ly ill-conditioned or misspecified.

```

`post10_3s =`

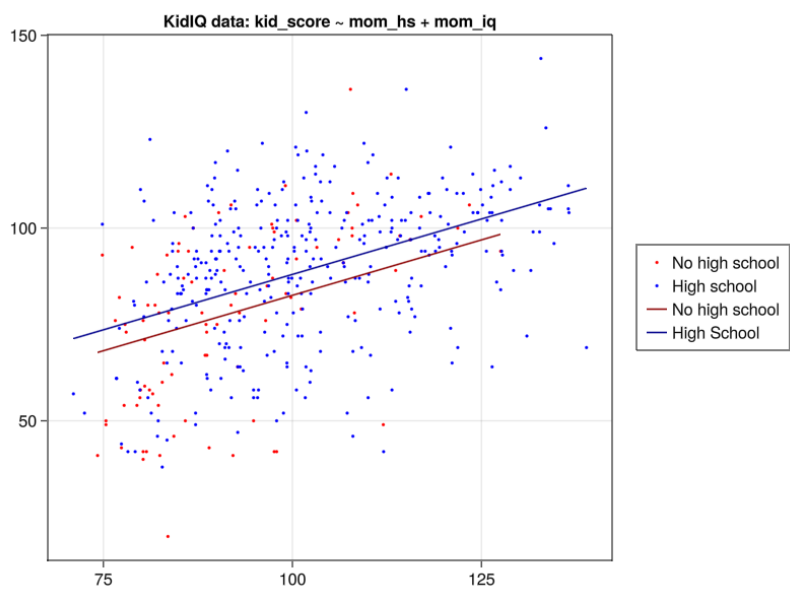
	a	b	c	sigma
1	21.6883	2.81421	0.629647	18.0215
2	28.3362	7.8725	0.50913	18.9602
3	28.7929	6.38476	0.530191	18.6924
4	27.2127	5.14371	0.548412	19.8968
5	28.0464	5.32153	0.54345	19.4797
6	27.6365	6.67817	0.540741	17.9639
7	22.0514	4.65375	0.608815	18.3959
8	29.7118	4.55955	0.527369	17.5474
9	21.5071	6.96058	0.603897	18.7018
10	20.6509	6.6703	0.608737	19.2263
⋮	more			
4000	21.1748	6.53332	0.619659	18.2215

- `post10_3s = read_samples(m10_3s, :dataframe)`

`ms10_3s =`

	parameters	median	mad_sd	mean	std
1	"a"	25.058	1.849	25.049	1.89
2	"b"	5.424	1.517	5.395	1.50
3	"c"	0.575	0.023	0.575	0.02
4	"sigma"	18.137	0.616	18.149	0.60

- `ms10_3s = model_summary(post10_3s, [:a, :b, :c, :sigma])`



```

• let
•     momnohs(x) = x == 0
•     nohs = findall(momnohs, kidiq.mom_hs)
•
•     momhs(x) = x == 1
•     hs = findall(momhs, kidiq.mom_hs)
•
•     f = Figure()
•     ax = Axis(f[1, 1]; title="KidIQ data:
•     kid_score ~ mom_hs + mom_iq")
•     sca1 = scatter!(kidiq[kidiq.mom_hs .==
•     0, :mom_iq], kidiq[kidiq.mom_hs .== 0,
•     :kid_score]; color=:red, markersize =
•     3)
•     sca2 = scatter!(kidiq[kidiq.mom_hs .==
•     1, :mom_iq], kidiq[kidiq.mom_hs .== 1,
•     :kid_score]; color=:blue, markersize
•     = 3)
•     x = sort(kidiq.mom_iq[nohs])
•     lin1 = lines!(x, ms10_3s[:a, :median]
•     .+ ms10_3s[:b, :median] .*
•     kidiq.mom_hs[nohs] .+ ms10_3s[:c,
•     :median] .* x;
•         color=:darkred)
•     x = sort(kidiq.mom_iq[hs])
•     lin2 = lines!(x, ms10_3s[:a, :median]
•     .+ ms10_3s[:b, :median] .*
•     kidiq.mom_hs[hs] .+ ms10_3s[:c,
•     :median] .* x;
•         color=:darkblue)
•     Legend(f[1, 2],
•         [sca1, sca2, lin1, lin2],
•         ["No high school", "High school",
•         "No high school", "High School"])
•     current_figure()
• end

```

